NH102/2

Testing the Prototype Neighbourhood Sustainability Framework

Final

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About This Report

Title

Testing the Prototype Neighbourhood Sustainability Framework

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Abstract

This report presents the findings of an evaluative assessment of the prototype Neighbourhood Sustainability Framework (NSF) presented in NH101/2 and released in 2005. The assessment was undertaken by using the prototype to measure the neighbourhood sustainability of seven neighbourhoods in the areas of Harbour View, Blake Street -Ponsonby, Petone, Aranui and Christchurch East Inner City. Data on those neighbourhoods were collected through the use of a built environment assessment tool – LEED-ND – and through a neighbourhood questionnaire that collected self-report perceptual and behavioural data from neighbourhood residents. A number of critical questions are addressed in this report including: whether the fundamental structure and content of the NSF make sense in terms of modelling neighbourhood sustainability; whether LEED-ND and the "The Place Where You Live" survey provide useful mechanisms for measuring the parameters set out in the prototype NSF; and how the tools that form part of the NSF might need to be developed to provide both a robust measurement of the sustainability of neighbourhood built environments and a practical approach and tools for stakeholders. Application of the prototype NSF to the seven case study neighbourhoods demonstrates that the NSF's overall structure and content works well. The research shows that LEED-ND does not provide sound measurement of all elements of the NSF critical domains and that survey-based measurements of resident perceptions and behaviours are important modifiers of neighbourhood sustainability rankings. Two tool developments are suggested as ways of refining the prototype NSF. Those are the development of a built environment assessment tool, and a residential liveability assessment tool.

Contents

Annexes (available separately)

Testing the Prototype Neighbourhood
Sustainability Framework: NH102/2

Creating homes and neighbourhoods
that work well into the future
and don't cost the Earth

Page iii

Tables

**Testing the Prototype Neighbourhood
Sustainability Framework**: NH102/2

Creating homes and neighbourhoods
that work well into the future
and don't cost the Earth

Page iv

Testing the Prototype Neighbourhood
Sustainability Framework: NH102/2

*Creating homes and neighbourhoods
that work well into the future
and don't cost the Earth*

Page v

Figures

Info-boxes

Creating homes and neighbourhoods
that work well into the future
and don't cost the Earth

1   Executive Summary

Beacon's goal is that New Zealanders will all live in "homes and neighbourhoods that work well into the future and don't cost the Earth". In relation to neighbourhoods, Beacon's aim is for:

> Every new subdivision and any redeveloped subdivision or neighbourhood from 2008 onwards to be developed with reference to a nationally recognised sustainability framework.

To facilitate that objective, the Neighbourhood Research Stream has developed a prototype Neighbourhood Sustainability Framework (NSF). That prototype is presented in NH101 released in 2005. In developing the NSF, the strategic intent is to contribute to New Zealand's capacity to:

- Identify, monitor, design and develop/adapt neighbourhoods which function sustainably.
- Assess the behavioural impacts of different neighbourhood development forms, including whether the claims and assumptions result in lifestyles that are more sustainable.
- Improve the capability and capacity of the construction industry, developers and regulatory agencies to develop medium density and mixed use neighbourhoods in a sustainable manner.
- Provide tools and systems to assist in quantifying the costs, benefits and trade-offs when developing and implementing sustainable designs in retrofit, greenfield, medium density and mixed use neighbourhoods situations.

The NSF cannot, however, achieve those strategic objectives if it does not provide a robust, evidence-based approach which is accessible to practitioners engaged in the design, building and management of neighbourhoods. The research objectives for 2005/06, therefore, have been to test the NSF by:

- Applying the NSF by attempting to measure neighbourhood sustainability under different neighbourhood conditions through a case study methodology;
- Testing and refining the NSF framework by utilising international neighbourhood assessment tools; and
- Establishing the range of information needed to provide robust assessments of neighbourhood build environments that are associated with different residential perceptions and different behaviours among residents.

To test the NSF by measuring neighbourhood sustainability, data in seven neighbourhoods were collected, firstly through the use of an assessment tool - LEED-ND - and, secondly, through a neighbourhood questionnaire that collected self-reported perceptual and behavioural data from neighbourhood residents. LEED-ND is a tool currently under development by the US Green Building Council that aims to assess built environment sustainability. It is aimed at new developments and is a planning stage assessment tool. LEED-ND contains a number of

Testing the Prototype Neighbourhood
Sustainability Framework: NH102/2

Creating homes and neighbourhoods
that work well into the future
and don't cost the Earth

Page 7

prerequisites and credits that are grouped into location efficiency; environmental preservation; compact, complete and connected neighbourhood; and resource efficiency. Each credit results in the awarding of one or several points, an, overall, the tool is weighted to place particular importance on reducing car travel, increasing walkability and reducing sprawl. The tool was developed by the US Green Building Council, the Congress for New Urbanism, and the Natural Resources Defence Council in the United States.

Data were collected in five neighbourhoods in the areas of Harbour View, Blake Street - Ponsonby, Petone, Aranui and Christchurch East Inner City by way of "The Place Where You Live" Survey. That survey consists of a comprehensive, self-complete questionnaire that was adapted from two surveys developed by Oxford Brookes University in the context of their research into compact and sustainable cities. The adaptation of those surveys provides a strong comparative platform for the Beacon Neighbourhood Research Stream to better understand the impacts of the built environment on neighbourhood sustainability. That exercise is timed for year 3 of the Neighbourhood Sustainability research project. In the context of this report, the preliminary survey data has been used in three ways. The survey generates a profile of resident participant perceptions, behaviours and experiences of their neighbourhoods. The questionnaire allows us to test the extent to which N-SOS is amenable to direct measurement through residents' self-disclosure. The questionnaire allows us to test the robustness of neighbourhood sustainability rankings generated by LEED-ND.

Together, the application of the LEED-ND assessment tool and the neighbourhood data allow us to address five critical questions:

- Does the fundamental structure and content of the NSF make sense in terms of modelling neighbourhood sustainability?
- Are the tested research methods, LEED-ND and the "The Place Where You Live" survey, useful in measuring sustainability as part of the NSF?
- How do the tools that form part of the NSF need to be developed?
- How can uptake by different stakeholders be encouraged?
- What are the recommended next steps for the Neighbourhood Research Stream?

Application of the NSF to the seven case study neighbourhoods demonstrates that the NSF's overall structure and content works well. Of the supporting tools in NSF, N-SOS has proven vital as the base specification for assessing the neighbourhoods. By specifying critical domains of neighbourhood sustainability, N-SOS ensures that all elements are considered in any decision making tool and that the gaps left by the tools are transparent. It was found, however, that neither the LEED-ND tool nor the survey-based measures of N-SOS, using resident reporting of perceptions and behaviours, can, in themselves, provide all the information needed to assess neighbourhood sustainability. LEED-ND does not provide sound measurement of all elements of the N-SOS critical domains. Moreover, it is clear from the survey-based measurement of N-SOS that resident perceptions and behaviours which can only be gathered through self-report are important modifiers of neighbourhood sustainability rankings. The data from "The Place Where You Live Survey" clearly shows that information about resident perceptions and

Testing the Prototype Neighbourhood
Sustainability Framework: NH102/2

Creating homes and neighbourhoods
that work well into the future
and don't cost the Earth

Page 8

behaviours is important in assessing the sustainability of neighbourhoods. Those resident perceptions and behaviours can not be substituted by a tool such as LEED-ND.

Based on the results from this research phase, tool developments are suggested within the NSF: a built environment assessment tool, and a residential liveability assessment tool. The built environment tool would consist of two parts: an objective assessment tool based on set criteria and indicator measurement; and a subjective assessment by a suitable professional. If it is to be used, it needs to be simple and user-friendly, and also allow for different neighbourhood development conditions and stakeholders. The residential liveability assessment tool will be developed as a 'stripped down' version of "The Place Where You Live" questionnaire including only those questions from which data were used for the survey-based measures of N-SOS.

The successful testing of the prototype Neighbourhood Sustainability Framework (NSF) and associated generic tools in NH102 provides the platform for developing appropriate packaging, formatting and promotion with end-users. It is envisaged that this will involve three phases of work. The finalisation of the tools will be undertaken in Phase 1. Phase 2 will focus on an active iteration with, and engagement of, end-users by demonstrating the NSF and undertaking any necessary modifications. Phase 3 will develop 'vehicles' or 'formats' by which the NSF and associated tools can be used by different segments of the end-use market. Those 'vehicles' may range from paper-based guidelines, calculators and assessment sheets to interactive software which may be used in conjunction with a website.

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2 Part One: Introduction

Beacon's goal is that New Zealanders will all live in "homes and neighbourhoods that work well into the future and don't cost the Earth." In relation to neighbourhoods, Beacon's aim is for:

> Every new subdivision and any redeveloped subdivision or neighbourhood from 2008 onwards to be developed with reference to a nationally recognised sustainability framework.

To facilitate that objective the Neighbourhood Research Stream has developed a prototype Neighbourhood Sustainability Framework (NSF). That prototype is presented in NH101 released in 2005. At that time it was highlighted that the prototype NSF needed to be tested in the field to establish its robustness in the New Zealand context and to allow for refinement of the tools that make up the prototype NSF.

This report (NH102) presents findings generated by the operationalisation and application of the NSF in seven case study neighbourhoods. It is structured in four parts:

- Part One describes the context and purpose of the Neighbourhood stream of research within the Beacon programme and, in doing so, provides a brief review of the Neighbourhood Sustainability Framework (NSF) developed in 2004/05.
- Part Two evaluates the utility of the NSF and the instruments used to apply it in the case study neighbourhoods.
- Part Three provides an overall assessment of the utility and potential of NSF and the tools necessary to implement it.
- Part Four presents the resulting sustainability assessments generated by the application of the tools in each case study.

2.1 Neighbourhood Research in the Beacon Research Programme

The neighbourhood component of Beacon's research programme is tasked with developing tools to guide the sustainable design, building, retrofitting and management of neighbourhoods. Those tools should maximise neighbourhoods' environmental, social and economic outcomes and mitigate the inevitable impacts of human settlement and human activities. Neighbourhoods form an important connection between dwellings and settlements. By understanding the nature of sustainable neighbourhoods, the building and construction industry and planners will better understand and develop the designs, construction techniques, products and materials and approaches that will be required if our neighbourhoods are to last.

The research undertaken for NH101 in 2004/05 showed that neighbourhoods tend to work when characterised by:

- housing satisfaction – notably housing satisfaction is also determined by neighbourhood satisfaction

Testing the Prototype Neighbourhood
Sustainability Framework: NH102/2

Creating homes and neighbourhoods
that work well into the future
and don't cost the Earth

Page 10

- an acceptable physical appearance of the neighbourhood including low levels of dilapidation
- safety in the street both from traffic and other people
- low noise disturbance
- access to facilities and services
- access to other sites in the settlement system
- manageable cost of both residence in the neighbourhood and in connecting to other parts of the city system
- ability to have pleasant, friendly and non-threatening casual social relations
- ability to provide opportunities for neighbourhood action on local issues, and
- low tenure mix.

In NH101, we concluded, on the basis of international research, that the critical sustainability issues affecting, and affected by, the built environment areas are as follows:

- *The motor vehicle.* Greenhouse gas emissions, stormwater pollution and air pollution are caused by vehicle emissions. Time spent travelling in motor vehicles has significant social and economic costs, and presents the second highest direct costs to households. Those unable or unwilling to drive are at risk of social exclusion and marginalisation. Walking is associated with neighbourhood interaction and increased informal surveillance. Neighbourhood form impacts on both motor vehicle use and walking.
- *The quality and nature of public space.* Public space can generate interaction, provide local natural habitats, act as stormwater mechanisms, increase walking and provide for creative and physical activities. Design quality of public space is key to achieving these and other desirable outcomes.
- *Flexibility and adaptability.* Robust neighbourhoods stand the test of time, thereby avoiding neighbourhood decline and the associated social and economic costs. Key action pathways to ensure flexibility and adaptability include a mixture in building typology and dwelling size, mixed use, local facilities and the availability of public transport.
- *Higher density.* Density intensification can reduce sprawl, reduce the amount of land that is taken out of natural ecosystems, generate population critical mass, affect travel and neighbourhood behaviours. Higher density therefore improves the viability of town centres and public transport and directly affects travel behaviour.

Out of those research findings the Neighbourhood Research project developed a prototype Neighbourhood Sustainability Framework (NSF). The framework is set out in detail in NH101 but its principal structure and components are described below.

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2.2   The Neighbourhood Sustainability Framework Prototype

The NSF recognises that all neighbourhoods are dynamic and all neighbourhoods are unique in relation to their developmental histories, their built environments, their populations, and their geographical and socio-economic positioning within the broader settlement. Underpinning the NSF is a conception of the neighbourhood built environment as being generated out of complex interactions in a mix of social and environmental domains. Those critical domains are graphically portrayed in Figure 1.
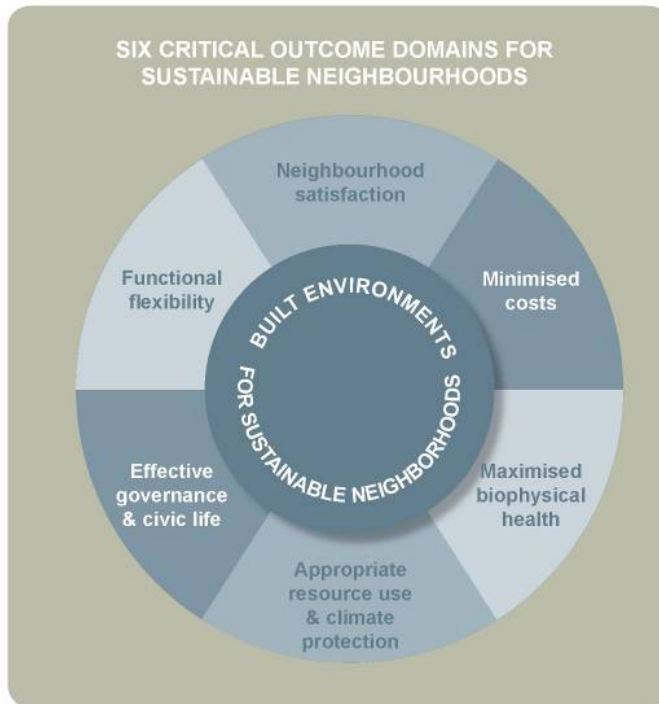
Figure 1: Six Critical Outcome Domains for Sustainable Neighbourhoods

The Neighbourhood Sustainability Framework (NSF) is designed to increase the capacity of those who have a stake in neighbourhoods to design, build, manage and renew neighbourhoods so that they provide liveable environments into the future.

The NSF focuses on those aspects of neighbourhoods that are influenced by the neighbourhood's physical form and structure and can be controlled through acting on the current or future built environment. In developing the NSF, the research team has been concerned to have a significant impact on sustainability by developing indicators that are measurable and practical. The NSF constitutes a set of tools to assist in goal and priority development and decision-making in those neighbourhoods. The effectiveness of the NSF in determining appropriate sustainability pathways and actions will, however, depend on active engagement with, and participation of, the various stakeholders in each neighbourhood, including the families and households that live there.

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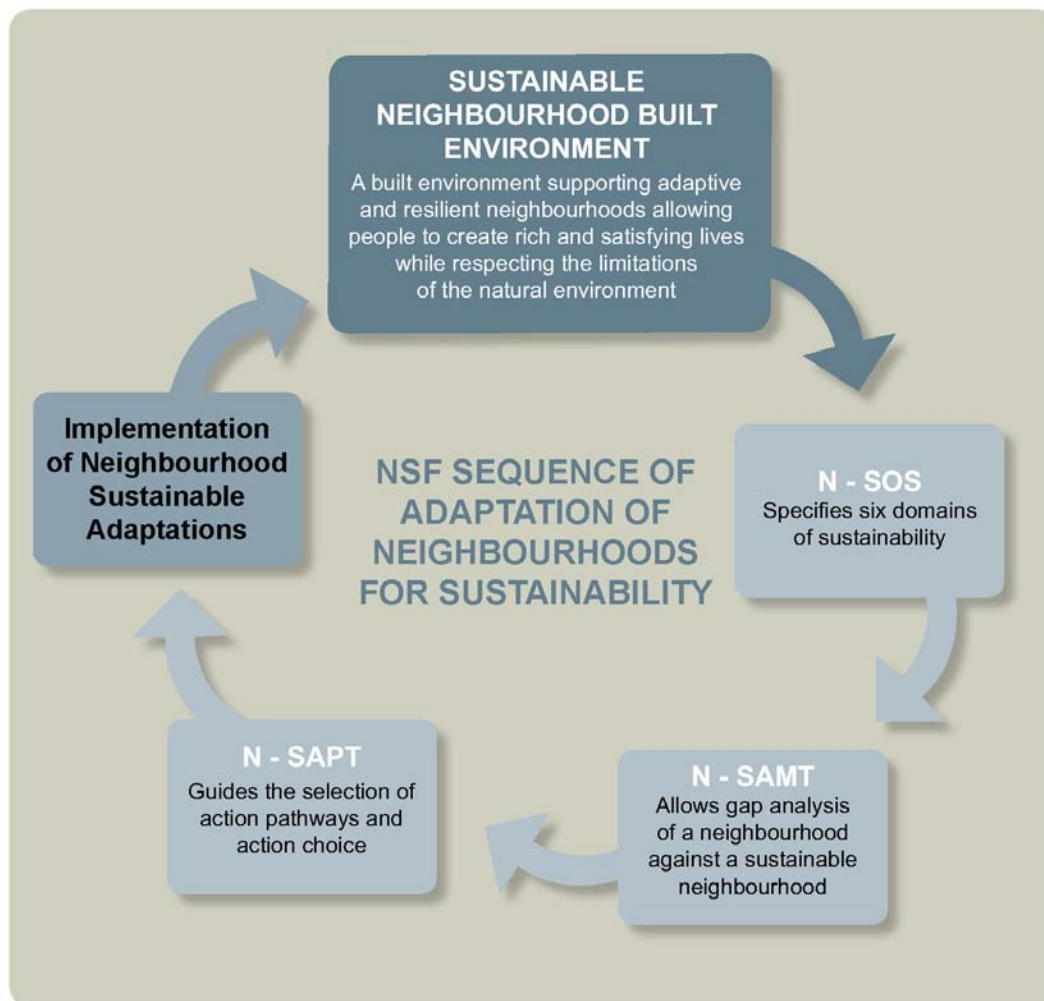
Figure 2: NSF Sequence of Adaptation of Neighbourhoods for Sustainability

The NSF consists of three main tools:

■ Neighbourhood Sustainability Outcome Specification – N-SOS:
The N-SOS specifies the goal for, and scale of, sustainable neighbourhood built
environments. The macro-specification of and connections between the N-SOS components
are presented in Figure 2. Infobox 1 provides a detailed specification of the outcomes sought
from the built environment in relation to the six critical domains and describes the
neighbourhood built environment elements as set out in N-SOS.

■ Neighbourhood Sustainability Assessment and Monitoring Tool – N-SAMT:
The N-SAMT consists of a series of matrices that set out objectives and indicators that focus
on the most fundamental elements of a sustainable built environment at the neighbourhood
level. N-SAMT connects the six critical outcome domains with indicators and measures that
can be tailored into the practical design process. It is intended to guide and focus the
development of neighbourhoods, whether at conceptual or retrofit stage, on those aspects

Testing the Prototype Neighbourhood
Sustainability Framework: NH102/2

Creating homes and neighbourhoods
that work well into the future
and don't cost the Earth

Page 13

that are essential to sustainability. The N-SAMT involves separate matrices for each element of the built environment, that is, for infrastructure, buildings and space. They are set out in Annex A, Infoboxes A.1, A.2 and A.3 respectively.

■ Neighbourhood Sustainability Action Planning Tool – N-SAPT:
The N-SAPT provides application guidance for specific neighbourhood typologies. It sets out the priority considerations for greenfield, brownfield and retrofit situations. N-SAPT is designed to provide a preliminary method of action prioritisation to map out sustainability pathways, and provide guidance on likely sustainability opportunities under various conditions. The NSF recognises that the actions that will contribute to the critical domain outcomes will vary according to the nature and site of a neighbourhood. Neighbourhood Development Conditions (NDCs) govern the potentialities, limitations and return of changes to, or design, of the neighbourhood built environment. Infobox 3 provides a brief description of five different NDCs. The 'retrofit urban' and 'retrofit suburban' development conditions are intended to cover those kinds of neighbourhoods where little alteration to the physical fabric is likely. Greenfield and brownfield developments offer significantly more scope for change. For each NDC, NSAPT identifies indicative sustainability pathways.

Those matrices can be found in Annex B, Infoboxes B.1, B.2, B.3, B.4, and B.5.

Figure 3: N-SOS: The NSR Goals, Critical Domains and Elements for Sustainable Neighbourhoods

Testing the Prototype Neighbourhood
Sustainability Framework: NH102/2

Creating homes and neighbourhoods
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Page 14

Application Scale	**Neighbourhoods**	Spatial nodes in which households and dwellings are clustered. Provide for residential functions and may facilitate non-residential functions through a built environment that allows for the interconnection and mutual use of infrastructure and services among neighbours and neighbouring dwellings. Connecting spaces between individual dwellings and the city system. Consist of the neighbours of a cluster of dwellings. Consist of boundaries that are loosely defined although those boundaries will typically go beyond a household's directly adjacent neighbours. Arenas of casual interaction. Key sites of the routines of everyday life.
Critical Outcome Domains for Neighbourhood Built Environment	**Functional Flexibility**	The built environment can be continuously adapted to the needs of diverse and changing populations, social, economic and environment conditions: ■ adaptability to changes in household structure ■ adaptability to changes in transport costs and choices ■ adaptability to changing ethnic and socio-economic mix of the population ■ adaptability to the effects of climate change
	Neighbourhood Satisfaction	The built environment maximises the key determinants of neighbourhood satisfaction: ■ housing quality ■ durability and low levels of dilapidation ■ street safety ■ low noise disturbance ■ opportunities for casual social interaction ■ opportunities for enclave living.
	Minimised Costs	The built environment minimises the direct and indirect costs and cost uncertainty for households and cities associated with: ■ travel ■ dwelling and section provision, maintenance and repair ■ infrastructure provision, maintenance and repair ■ facility provision, maintenance and repair.
	Effective Governance and Civic Life	The built environment encourages: ■ casual social interaction at street level ■ access to neighbourhood and city wide facilities and amenities ■ equitable access to basic services and amenities for children and adults with diverse levels of mobility within the neighbourhoods ■ formal interaction and spaces for formal interactions for neighbourhood governance, civic participation and government.
	Appropriate Resource Use and Climate Protection	The neighbourhood built environment encourages resource efficiency, resource conservation and the use of more sustainable resources in relation to: ■ maximisation of dwelling performance ■ land consumption ■ transport energy consumption ■ energy and other resource sources ■ sustainable and renewable sources of energy, potable water and materials. ■ lifecycle impacts

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Neighbourhood Built Environment Elements	**Maximised Bio-physical Health**	The neighbourhood built environment is designed to protect and enhance the biosphere, with particular focus on:: ■ reducing negative impacts on air quality ■ ensuring aquatic health ■ protecting/enhancing biodiversity and soil quality
	Infrastructure	The fixed physical elements associated with shared services, including water infrastructure (wastewater, stormwater and potable water), transport infrastructure (roads, footpaths, cycle-ways, public transport), energy infrastructure (gas and electricity), communications infrastructure (phone, cable TV, etc) and waste infrastructure (e.g. recycling depot)
	Buildings	Neighbourhood buildings include private dwellings, community buildings (such as schools or a community house), public buildings (such as libraries or a town hall) and commercial buildings. Some private buildings have a public use, such as cafes, bars or the foyer of an office building or apartment complex.
	Space	Space is the area not covered by buildings or infrastructure. It includes private space (such as gardens), public space (such as parks and squares) and publicly used private space (such as a privately owned square in a shopping complex).

Infobox 1: Definitions and Descriptions of Terms used in N-SOS

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NDC	Infrastructure	Buildings	Space
Greenfield/Brownfield - Suburban	Infrastructure is generally planned and built from scratch, but needs to be integrated with the wider settlement system. Opportunities for public transport infrastructure may be limited.	Traditionally stand alone dwellings, however an increasing trend to also include some medium density housing and limited suburban centre development. Opportunities to include some mixed.	Generally consists of neighbourhood parks, rather than urban spaces. Opportunities to create quality spaces as part of the road network.
Greenfield Urban	Infrastructure is planned and built from scratch. Capacity in receiving systems may be an issue. Generally better opportunities for public transport infrastructure than in suburban developments.	Higher density housing, often including a new town centre. Generally includes commercial and mixed-use buildings. Opportunities for communal services and facilities.	Generally more urban public spaces, such as public squares. Footpaths play an important role as public space.
Brownfield Urban	Similar to Greenfield Urban, however some infrastructure may exist (likely to require extensive work).	Similar to Greenfield Urban, however some existing buildings may be able to be retained/reused.	Similar to Greenfield Urban, however contamination may be present and providing quality greenspace may be a challenge.
Retrofit Urban	Infrastructure is existing but will often require upgrading. Demand management is an opportunity to reduce costs.	Additional housing is generally of high density. Many urban retrofit projects include some brownfield development.	Generally good opportunities to improve/create pedestrian spaces and urban open space.
Retrofit Suburban	Infrastructure is generally in place with limited opportunities for change. Improving walkability is a priority.	Existing housing tends to be stand-alone low density. Provision of community facilities is often a priority.	Local parks generally exist, but there may be opportunities for improvements.

Infobox 2: Neighbourhood Development Conditions (NDCs)

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2.2.2 Testing the NSF Prototype

In developing the NSF, the strategic intent is to contribute to New Zealand's capacity to:

- Identify, monitor, design and develop/adapt neighbourhoods which function sustainably.
- Assess the behavioural impacts of different neighbourhood development forms, including whether the claims and assumptions result in lifestyles that are more sustainable.
- Improve the capability and capacity of the construction industry, developers and regulatory agencies to develop medium density and mixed use neighbourhoods in a sustainable manner.
- Provide tools and systems to assist in quantifying the costs, benefits and trade-offs when developing and implementing sustainable designs in retrofit, greenfield, medium density and mixed use neighbourhoods situations.

The NSF can not, however, achieve those strategic objectives if it does not provide a robust, evidence-based approach which is accessible to practitioners engaged in the design, building and management of neighbourhoods. The research objectives for 2005/06, therefore, have been to test the NSF by:

- Applying the NSF by attempting to measure neighbourhood sustainability under different neighbourhood conditions through a case study methodology;
- Testing and refining the NSF framework by utilising international neighbourhood assessment tools; and
- Establishing the range of information needed to provide robust assessments of neighbourhood build environments that are associated with different residential perceptions and different behaviours among residents.

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3 Part Two: Measuring Neighbourhood Sustainability

■ To test the NSF by measuring neighbourhood sustainability, two sets of data were collected and seven neighbourhoods assessed. In this section, we:

■ Describe each of the data collection and assessment tools used.

■ Assess the utility of the tools in relation to the NSF and the robustness of the sustainability assessments generated by each tool in relation to the case study neighbourhoods.

3.1 Data Collection and Assessment Tools

Data in seven neighbourhoods was collected, firstly through the use of an assessment tool - LEED-ND - and, secondly, through a neighbourhood questionnaire that collected self-reported perceptual and behavioural data from neighbourhood residents.

3.1.1 The LEED-ND Tool

LEED-ND is a tool currently under development by the US Green Building Council that aims to assess built environment sustainability. It is aimed at new developments and is a planning stage assessment tool. LEED-ND contains a number of prerequisites and credits that are grouped into four sections:

■ The **Location Efficiency** section assesses the location of the new development in terms of previous land use, sprawl, infrastructure availability and proximity to services and employment.

■ The **Environmental Preservation** section assesses the development in terms of its impact on the immediate natural environment. It assesses elements such as soil quality, stormwater issues, habitat protection and riparian management.

■ The **Compact, Complete & Connected Neighbourhood** section assesses issues such as density, housing diversity, the presence of social housing, public transport, walkability and the reuse of historic buildings.

■ The **Resource Efficiency** section covers issues such as communal alternative water and energy infrastructure and waste management.

Each credit results in the awarding of one or several points, and, overall, the tool is weighted to place particular importance on reducing car travel, increasing walkability and reducing sprawl. The tool was developed by the US Green Building Council, the Congress for New Urbanism, and the Natural Resources Defence Council in the United States.

It is noted that the research team used the draft version of LEED-ND published by the US Green Building Council for comment on the 6th September 2005.[1] It is also noted that, by applying the tool to existing, and sometimes quite old, neighbourhoods, the research team used the tool for a purpose it was not specifically intended for.

■

1 https://www.usgbc.org/FileHandling/show_general_file.asp?DocumentID=959

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The intent of LEED-ND is similar to that of N-SAMT in that it assesses neighbourhoods against a number of built environment indicators. Prior to applying LEED-ND, a process of mapping LEED-ND to test its alignment to the NSF particularly N-SAMT was undertaken. Annex C presents those alignments in tabular form. The tables in Annex C show the alignment between LEED and N-SAMT to be relatively strong.

The LEED-ND tool was initially applied largely unchanged, it was however adapted to reflect New Zealand practices, such as changing imperial measures to metric and replacing US standards with local versions where available. The changes are documented in Annex D.

The tool was applied to seven neighbourhoods:, Harbour View, Blake Street-Ponsonby, Petone, Aranui, Christchurch East Inner City, Waimanu Bay, and Dannemora. Each prerequisite and credit of LEED-ND was assessed by the research team and was based on:

- Data collected on site.
- GIS data obtained from the relevant local authorities.
- Conversations with the local authority and other people knowledgeable about the area.
- Internet searches in regards to local facilities, such as schools.

3.1.2 Neighbourhood Surveying and "The Place Where You Live" Questionnaire

Data were collected in five neighbourhoods in the areas of Harbour View, Blake Street - Ponsonby, Petone, Aranui and Christchurch East Inner City by way of "The Place Where You Live" Survey. That survey consists of a comprehensive, self-complete questionnaire (Annex E) that was adapted from two surveys developed by Oxford Brookes University in the context of their research into compact and sustainable cities.

The adaptation of those surveys provides a strong comparative platform for the Beacon Neighbourhood Research Stream to better understand the impacts of the built environments on neighbourhood sustainability. That exercise is timed for year 3 of the Neighbourhood Sustainability research project. In the context of this report, the preliminary survey data has been used in three ways:

- The survey generates a profile of resident participant perceptions, behaviours and experiences of their neighbourhoods.
- The questionnaire allows us to test the extent to which N-SOS is amenable to direct measurement through residents' self-disclosure.
- The questionnaire allows us to test the robustness of neighbourhood sustainability rankings generated by LEED-ND.

The profile of resident perceptions, behaviours and experiences for each case study neighbourhood is presented in Part 4 of this report.

3.2 Utility of the Data Collection and Assessment Tools

If the NSF can be usefully operationalised, a tool such as LEED-ND must be able to:

- Assess the critical domains of N-SOS;
- Provide appropriate indicators for each N-SOS domain;
- Allow for adequate differentiation between the case study neighbourhoods; and,
- Involve the collection of data that can be practically and cost-effectively accessed.

Likewise, N-SOS can be deemed to be amenable to direct measurement through residents' self-disclosure if data from "The Place Where You Live" Survey is able to be aligned with the critical domains articulated in N-SOS. The validity and reliability of that data should also be able to be demonstrated through triangulation and replication. Similarly, measures derived from N-SOS must generate data that adequately differentiates between neighbourhoods.

3.2.1 The LEED-ND Tool

The overall alignment of LEED-ND with N-SOS is good (Table 1). But it does have some deficiencies. The elements not covered well by LEED-ND broadly fall into three categories:

- Elements that are not covered but could be covered if LEED-ND was amended to include them, such as adaptability to climate change. The elements in this category are minor and could be resolved.
- Elements that cannot be covered by a tool such as LEED-ND because they require a professional opinion, rather than an assessment against rigid criteria. Quality of public space, for example, affects several of the N-SOS critical domains and is not easily assessed by a tool such as LEED-ND.
- Elements that, while related to the built environment, can not be reliably measured by assessing the built environment. Neighbourhood Satisfaction, for example, relates to people's perception and is therefore not measurable by a tool such as LEED-ND.

Those deficiencies show that a tool such as LEED-ND, by itself, cannot measure neighbourhood sustainability reliably.

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Domain	Domain Specification and Critical Indicators	LEED-ND (See Annex B for Measures)
Functional Flexibility	The built environment can be continuously adapted to the needs of diverse and changing populations, social, economic and environment conditions: ■ adaptability to changes in household structure, ■ adaptability to changes in transport costs and choices, ■ adaptability to changing ethnic and socio-economic mix of the population, ■ adaptability to the effects of climate change.	Adaptability to changes in household structure: ■ Housing Diversity Credit Adaptability to changes in transport costs & choices: ■ Transportation Efficiency Prerequisite ■ Reduced Automobile Dependency Credit ■ Contribution to Jobs-Housing Balance ■ School Proximity ■ Access to Public Spaces ■ Diversity of Uses Prerequisite and Credit ■ Transit Orientated Compactness Adaptability to changing ethnic and socio-economic mix of the population: ■ Affordable Rental Housing Credit ■ Housing Diversity Credit
Neighbourhood Satisfaction	The built environment maximises the key determinants of neighbourhood satisfaction: ■ housing quality, ■ durability and low levels of dilapidation, ■ street safety, ■ low noise disturbance, ■ opportunities for casual social interaction, ■ opportunities for enclave living.	Street Safety: ■ Locating Buildings to Shape Walkable Streets Credits ■ Designing Building Access to Shape Walkable Streets Credit ■ Comprehensively Designed Walkable Streets Credit ■ Pedestrian Network Credit ■ Maximised Pedestrian Safety & Comfort Credit Casual Social Interaction: ■ Access to Public Spaces ■ Diversity of Uses Prerequisite and Credit ■ Pedestrian Network Credit ■ Locating Buildings to Shape Walkable Streets Credits ■ Designing Building Access to Shape Walkable Streets Credit ■ Comprehensively Designed Walkable Streets Credit ■ Transit Amenities

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Minimised Costs	The built environment minimises the direct and indirect costs and cost uncertainty for households and cities associated with: ■ travel, ■ dwelling and section provision, maintenance and repair, ■ infrastructure provision, maintenance and repair, ■ facility provision, maintenance and repair.	Minimised Travel Costs: ■ Transportation Efficiency Prerequisite ■ Reduced Automobile Dependency Credit ■ Contribution to Jobs-Housing Balance ■ School Proximity ■ Access to Public Spaces ■ Diversity of Uses Prerequisite and Credit ■ Transit Orientated Compactness ■ Pedestrian Network Credit ■ Street Network Credit ■ Transit Subsidy Credit
Effective Governance and Civic Life	The built environment encourages: ■ casual social interaction at street level, ■ access to neighbourhood and city wide facilities and amenities, ■ equitable access to basic services and amenities for children and adults with diverse levels of mobility within the neighbourhoods, ■ formal interaction and spaces for formal interactions for neighbourhood governance, civic participation and government.	Casual Interaction: ■ Access to Public Spaces ■ Diversity of Uses Prerequisite and Credit ■ Pedestrian Network Credit ■ Locating Buildings to Shape Walkable Streets Credits ■ Designing Building Access to Shape Walkable Streets Credit ■ Comprehensively Designed Walkable Streets Credit ■ Transit Amenities ■ Access to facilities and amenities ■ Transportation Efficiency Prerequisite ■ Reduced Automobile Dependency Credit ■ Contribution to Jobs-Housing Balance ■ School Proximity ■ Access to Public Spaces ■ Diversity of Uses Prerequisite and Credit ■ Transit Orientated Compactness ■ Pedestrian Network Credit ■ Street Network Credit ■ Transit Subsidy Credit Equitable Access: ■ Open Community Prerequisite

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Appropriate Resource Use and Climate Protection	The neighbourhood built environment encourages resource efficiency, resource conservation and the use of more sustainable resources in relation to: ■ maximisation of dwelling performance, ■ land consumption, ■ transport energy consumption, ■ energy and other resource sources, ■ sustainable and renewable sources of energy, potable water and materials, ■ lifecycle impacts.	Land Consumption: ■ Compact Development Prerequisite and Credit ■ Contaminated Brownfields and High Cost Contaminated Brownfield Redevelopment Credits ■ Adjacent, Infill or Previously Developed Sites Credit ■ Farmland Preservation Prerequisite ■ Steep Slope Preservation Credit Transport Energy Consumption: ■ Transportation Efficiency Prerequisite ■ Reduced Automobile Dependency Credit ■ Contribution to Jobs-Housing Balance ■ School Proximity ■ Access to Public Spaces ■ Diversity of Uses Prerequisite and Credit ■ Transit Orientated Compactness ■ Pedestrian Network Credit ■ Street Network Credit ■ Transit Subsidy Credit ■ Transit Amenities Energy and Other Resource Use: ■ On-Site Power Generation Credit ■ Adaptive Use of Historic Buildings Credit Sustainable and Renewable Sources of Energy, Potable Water and Material: ■ On-Site Renewable Energy Sources Credit ■ Efficient Irrigation Credit ■ Greywater & Stormwater Reuse Credit ■ Reuse of Material Credit ■ Recycled Content Credit Lifecycle Impacts: ■ Efficient Irrigation ■ Comprehensive Waste Management Credit ■ Contaminant Reduction in Brownfields Remediation Credit

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Maximised Bio-physical Health	The neighbourhood built environment is designed to protect and enhance the biosphere, with particular focus on: ■ reducing negative impacts on air quality, ■ ensuring aquatic health, ■ protecting/enhancing biodiversity and soil quality.	**Air Quality:** ■ Transportation Efficiency Prerequisite ■ Reduced Automobile Dependency Credit ■ Contribution to Jobs-Housing Balance ■ School Proximity ■ Access to Public Spaces ■ Diversity of Uses Prerequisite and Credit ■ Transit Orientated Compactness ■ Pedestrian Network Credit ■ Street Network Credit ■ Transit Subsidy Credit ■ Transit Amenities **Aquatic Health:** ■ Wastewater Management Credit ■ Wetland and Water Body Conservation Prerequisite ■ Site Design for Habitat or Wetland Conservation Credit ■ Restoration of Habitat or Wetlands Credit ■ Conservation Management of Habitat or Wetlands Credit ■ Maintain and Reduce Stormwater Runoff Rates ■ Stormwater treatment ■ Outdoor Hazardous Waste Pollution Prevention **Biodiversity** ■ Imperiled Species and Ecological Communities Prerequisite ■ Support Off-Site Land Conservation Credit ■ Minimise Site Disturbance During Construction and Through Site Design Credits **Soil Quality** ■ Farmland Preservation

Table 1: Alignment of N-SOS with LEED-ND

Some areas of N-SOS are well measured by LEED-ND, while others are not. A brief assessment of LEED-ND in relation to each critical domain is shown here and more detailed comments about the LEED-ND tool can be found in Annex F.

Functional Flexibility: LEED-ND places a high value on the provision of local facilities and jobs, and access to public transport, which provides functional flexibility in that reliance on the car is reduced. Housing diversity, mixed use and low cost rental housing are also encouraged ensuring that neighbourhoods can adapt to changes in use, household structure and the socio-economic mix of the population. Adaptability to climate change is not covered, however LEED-ND could be amended to cover this quite easily. LEED-ND does not cover quality of public space well, which the NSF identified as a means of ensuring flexibility by allowing for a variety of uses.

Neighbourhood Satisfaction: This is an area not well measured by LEED-ND. Neighbourhood Satisfaction is influenced by the built environment but also by other factors affecting resident perception. Of the key determinants identified in N-SOS, none are covered well by LEED-ND. Street safety in LEED-ND is measured in relation to walkability and pedestrian safety and comfort. The scores achieved in this area by the various neighbourhoods did not give a good picture of street safety, as it was perceived by the researchers during their site visits, in fact scores seemed quite arbitrary. One of the major built environment influences on street safety is the presence of solid high fences that prevent casual surveillance and this is not covered by LEED-ND. Casual interaction is covered in that LEED-ND encourages access to reserves and the provision of footpaths where people have the opportunity to interact. However the quality of these spaces, other than in relation to walkability, is not covered. Interaction, for example, is more likely where a local focal point, such as a playground, is provided. LEED-ND does encourage mixed use, which in turn encourages casual interaction. Housing quality, durability and low levels of dilapidation, low noise disturbance and opportunities for enclave living are not covered at by LEED-ND.

Minimised Cost: LEED-ND encourages the provision of local facilities and employment, minimising travel costs. Costs in relation to maintenance of infrastructure and houses are not covered. These relate to quality of materials and robustness of infrastructure which are hard to assess by a tool such as LEED-ND.

Effective Governance and Civic Life: As discussed above, LEED-ND does not encourage casual street interaction well, even though it does have several credits relating to pedestrian space. Access to facilities beyond the neighbourhood is covered well, through the street network and access to public transport credits. Equitable access to services and formal interaction space is not covered well. LEED-ND requires all public space to be publicly accessible and does include spaces for formal interaction, such as community centres, in a list of services that if accessible locally go towards achieving one of the credits. This credit however can be achieved without such space being available.

Appropriate Resource Use and Climate Protection: Except in relation to the maximisation of dwelling performance, which is more appropriately covered at the individual house level, this domain is well covered by LEED-ND. It is noted that none of the neighbourhoods scored well

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in the resource efficiency section of LEED-ND, however, in the research team's opinion, this is entirely appropriate.

<u>Maximised Bio-physical Health:</u> Reducing car travel is seen as a priority in LEED-ND and is well covered. At the neighbourhood level, car emissions present the most significant threat to air quality and have a considerable impact on aquatic systems. The Environmental Preservation section of LEED-ND deals with the remaining indicators of this domain. The researchers have some concerns about this section in that the baseline is set too low. In New Zealand considerable base protection is provided through the Resource Management Act 1991 (RMA) and many of the LEED credits set lower baselines than the RMA. LEED-ND emphasises the protection of habitat for endangered or threatened species. It therefore largely aims to protect pristine areas.

In New Zealand the natural environment in most urban situations has been heavily modified, however often more intact natural areas are nearby. Retaining and enhancing the few remaining natural areas and waterways in urban areas needs to be an emphasis of any tool that forms part of the NSF. The aim is to achieve a green network that allows wildlife to move from natural areas through urban settlements. Protection of areas of native vegetation and waterways should be emphasised whether this provides significant habitat or not.

As is demonstrated by Harbour View, LEED-ND does not deal well with neighbourhoods that are part of larger master-planned areas. In Harbour View's case, the ecologically significant area on the lower terrace was separated off before development occurred. This resulted in no points being awarded for several credits because this area was no longer part of the development.

LEED-ND does differentiate between neighbourhoods and allows for neighbourhoods to be grouped into a number of clusters. Table 2 shows the LEED-ND scores achieved by each of the seven neighbourhoods; the results for each neighbourhood are described in more detail in Part 4.

	Points Possible	Harbour View	Waimanu Bay	Dannemora	Aranui	Christchurch East Inner City	Blake Street-Ponsonby	Petone
Total LEED-ND score	93	25	19	21	37	38	54	48
Location efficiency – total	31	11	7	10	23	21	25	27
Prerequisite transport efficiency		yes	yes	yes	yes	yes	yes	yes
Prerequisite: Water and stormwater infrastructure efficiency		yes	yes	yes	yes	yes	yes	yes
Credit: Contaminated brownfields redevelopment	4	0	0	0	0	0	4	4
Credit: High cost contaminated brownfields redevelopment	1	0	0	0	0	0	0	0
Credit: Adjacent, infill or previously developed sites	10	3	3	3	10	10	10	10
Credit: Reduced automobile dependence	6	0	0	0	3	5	4	4.
Credit: Contribution to jobs/housing balance	4	4	4	4	4	4	4	4
Credit: School proximity	4	2	0	3	4	2	2	3
Credit: Access to public spaces	2	2	0	0	2	0	1	2
Environmental preservation - total	14	4	3	1	4	3	4	4
Prerequisite: Imperilled species and ecological communities		yes	no	yes	yes	yes	yes	yes
Prerequisite: Parkland preservation		yes	yes	yes	no	yes	yes	yes
Prerequisite: Wetland and water body protection		yes	yes	no	yes	yes	yes	yes
Prerequisite: Farmland preservation		NA	NA	NA	NA	NA	NA	NA
Credit: Support for off-site land conservation	2	0	0	0	0	0	0	0
Credit: Site design for habitat or wetland conservation	1	1	0	0	0	0	0	0
Credit: Restoration of habitat or wetlands	1	0	0	0	0	0	0	0
Credit: Conservation management of habitat or wetlands	1	0	0	0	0	0	0	0
Credit: Steep slope preservation	1	1	1	1	1	1	1	1
Credit: Minimise site disturbance during construction	1	0	0	0	1	1	1	1

Testing the Prototype Neighbourhood Sustainability Framework: NH102/2

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Page 28

	Points Possible	Harbour View	Waimanu Bay	Dannemora	Aranui	Christchurch East Inner City	Blake Street-Ponsonby	Petone
Credit: Minimise site disturbance through site design	1	0	0	0	1	1	1	1
Credit: Maintain stormwater runoff rates	1	0	0	0	1	0	1	1
Credit: Reduce stormwater runoff rates	2	0	0	0	0	0	0	0
Credit: Stormwater treatment	2	2	2	0	0	0	0	0
Credit: Outdoor hazardous waste pollution prevention	1	0	0	0	0	0	0	0

	Points Possible	Harbour View	Waimanu Bay	Dannemora	Aranui	Christchurch East Inner City	Blake Street-Ponsonby	Petone
Compact, complete & connected neighbourhoods – total	**38**	**9**	**8**	**9**	**9**	**13**	**24**	**16**
Prerequisite: Open community		yes	no	yes	yes	yes	yes	yes
Prerequisite: Compact development		yes	yes	yes	no	yes	yes	yes
Prerequisite: Diversity of uses		yes	yes	yes	yes	yes	yes	yes
Credit: Compact development	5	0	0	0	0	1	5	0
Credit: Transit-oriented compactness	1	0	0	0	0	0	1	0
Credit: Diversity of uses	3	3	1	1	3	3	3	3
Credit: Housing diversity – Simpson Diversity Index	4	1	0	0	0	3	2	2
Credit: Affordable rental housing	2	0	0	0	2	0	0	0
Credit: Reduced parking footprint	2	1	2	2	2	2	1	1
Credit: Block perimeter	4	1	0	0	0	0	3	0
Credit: Locating buildings to shape walkable streets	1	1	1	1	0	1	1	1
Credit: Designing building access to shape walkable streets	1	0	1	1	0	0	1	1
Credit: Designing buildings to shape walkable streets	1	0	1	1	0	0	1	1

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	Points Possible	Harbour View	Waimanu Bay	Dannemora	Aranui	Christchurch East Inner City	Blake Street-Ponsonby	Petone
Compact, complete & connected neighbourhoods – total	**38**	**9**	**8**	**9**	**9**	**13**	**24**	**16**
Credit: Comprehensible designed walkable streets	2	0	2	2	0	0	2	2
Credit: Street network (intersections per sqkm)	1	0	0	0	0	0	1	0
Credit: Pedestrian network	1	0	0	0	1	0	1	1
Credit: Maximise pedestrian safety and comfort	1	0	0	1	0	0	0	0
Credit: Superior pedestrian experience	2	1	0	0	1	0	0	1
Credit: Transit subsidy	3	0	0	0	0	0	0	0
Credit: Transit amenities	1	0	0	0	0	0	1	1
Credit: Access to nearby communities	1	1	0	0	0	1	1	0
Credit: Adaptive reuse of historic buildings	2	0	0	0	0	2	0	2
Resource efficiency – total	**10**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Credit: On-site power generation	1	0	0	0	0	0	0	0
Credit: On-site renewable energy sources	1	0	0	0	0	0	0	0
Credit: Efficient irrigation	1	1	1	1	1	1	1	1
Credit: Greywater & stormwater reuse	2	0	0	0	0	0	0	0
Credit: Wastewater management	1	0	0	0	0	0	0	0
Credit: Reuse of materials	1	0	0	0	0	0	0	0
Credit: Recycled content	1	0	0	0	0	0	0	0
Credit: Comprehensive waste management	1	0	0	0	0	0	0	0
Credit: Contaminant reduction in brownfields remediation	1	0	0	0	0	0	0	0

Table 2: LEED-ND scores for the case study neighbourhoods

Data collection for LEED-ND was labour intensive and some credits could not be assessed for some of the developments. Given the issues highlighted above, it is questionable if LEED-ND provides good value for the effort required. In its current form it is clearly not practical as an assessment tool as part of the NSF. LEED-ND does however contain elements that are easy to assess and that provide valuable data that is well aligned with N-SOS. How a future tool may be developed is discussed in Part 3.

Testing the Prototype Neighbourhood
Sustainability Framework: NH102/2

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Page 30

3.2.2 Measuring Neighbourhood Sustainability through Resident Perception and Behaviour

Table 3 shows the key indicators developed from the "The Place Where You Live" Survey and the measures derived from the survey data do align with key parameters of N-SOS.

Testing the Prototype Neighbourhood
Sustainability Framework: NH102/2

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Page 31

Domain	Domain Specification and Critical Indicators	Survey-based Measures of N-SoS
Functional Flexibility	The built environment can be continuously adapted to the needs of diverse and changing populations, social, economic and environment conditions: ■ adaptability to changes in household structure, ■ adaptability to changes in transport costs and choices, ■ adaptability to changing ethnic and socio-economic mix of the population, ■ adaptability to the effects of climate change.	Adaptability to changes in transport costs and choices: ■ + % foot/bicycle for work/study (Q21)
Neighbourhood Satisfaction	The built environment maximises the key determinants of neighbourhood satisfaction: ■ housing quality, ■ durability and low levels of dilapidation, ■ street safety, ■ low noise disturbance, ■ opportunities for casual social interaction, ■ opportunities for enclave living.	Neighbourhood dissatisfaction: ■ - % intention to move because of neighbourhood (Q2a) ■ Housing quality, satisfaction, dilapidation: ■ - % intention to move because of housing (Q2a) ■ + % describing housing quality as 'very good' (Q66g) ■ Street safety ■ + % describing street walking as 'very safe' (Q32) ■ - % describing street walking as 'very unsafe' + 'do not go out at night' (Q32) Noise disturbance ■ + % noise disturbance described as 'not a problem' (Q33) ■ -% noise disturbance described as a 'serious problem' (Q33) ■ Casual social interaction ■ -% No chat or greeting of neighbours (Q64) ■ -% No neighbours known by name (Q64) ■ +% Strongly agreeing that the neighbourhood is friendly (Q65) ■ + % Knowing many in the neighbourhood (Q29) ■ +% Strongly agree that neighbourhood reflects own identity (Q65)

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Minimised Costs	The built environment minimises the direct and indirect costs and cost uncertainty for households and cities associated with: ■ travel, ■ dwelling and section provision, maintenance and repair, ■ infrastructure provision, maintenance and repair, ■ facility provision, maintenance and repair.	Minimises cost by allowing essential purchases in the neighbourhood: ■ + % Who expend more than half of their food expenditure in the neighbourhood (Q73)
Effective Governance and Civic Life	The built environment encourages: ■ casual social interaction at street level, ■ access to neighbourhood and city wide facilities and amenities, ■ equitable access to basic services and amenities for children and adults with diverse levels of mobility within the neighbourhoods, ■ formal interaction and spaces for formal interactions for neighbourhood governance, civic participation and government.	Participation: ■ +% Membership and participation in local or neighbourhood groups (Q27) ■ + % Participation in local or neighbourhood group at least once a month (Q28) ■ Public space ■ + % Use of local public spaces at least once a month (Q25)
Appropriate Resource Use and Climate Protection	The neighbourhood built environment encourages resource efficiency, resource conservation and the use of more sustainable resources in relation to: ■ maximisation of dwelling performance, ■ land consumption, ■ transport energy consumption, ■ energy and other resource sources, ■ sustainable and renewable sources of energy, potable water and materials, ■ lifecycle impacts.	Resource use and climate protection ■ - % Exceeding average aggregate kms last 4 weeks (759 kms) car use (Q12) ■ +% Describe house as energy efficient (Q50) ■ +% Describe house as water efficient (Q54)
Maximised Bio-physical Health	The neighbourhood built environment is designed to protect and enhance the biosphere, with particular focus on: ■ reducing negative impacts on air quality, ■ ensuring aquatic health, ■ protecting/enhancing biodiversity and soil quality.	Negative impacts on air quality ■ - % Exceeding average aggregate kms last 4 weeks (759 kms) car use (Q12) ■ + % Use public transport for work/study (Q21) ■ Biodiversity ■ +% Undertakes composting (Q58) ■ +% Leaves undisturbed area for wildlife (Q31a) ■ +% Maintains shrubs and garden (Q31c) ■ +% Provides pond (Q31c) ■ +% Provides food and water for wildlife (Q31c) ■ +% Undertakes organic gardening (Q31e)

Table 3: Key indicators for N-SOS for Survey-based Assessment of Neighbourhood Sustainability

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The measures used to assess the indicators in N-SOS need to be both valid and reliable. That is, measures need to be an adequate representation of the indicator being measured. In addition, the tool by which that measurement data is collected must elicit from respondents a consistent interpretation of the information required. It must be noted that data derived from a neighbourhood survey instrument such as this can not provide the capacity to measure some critical elements of N-SOS. In particular, the adaptability indicators of N-SOS, which are a central part of the Functional Flexibility domain, are not amenable to this type of measurement because of the 'single point in time' nature of this type of data collection. The indicators of Functional Flexibility primarily require diachronic or longitudinal data such as that generated through successive censuses. Similarly, there are some indicators that can be more accurately measured through direct observation than through resident reporting.

With regard to validity, in general, it is preferable that measurement of indicators be as direct as possible. For instance, when measuring access to public transport in a neighbourhood, more robust data is generated by observing the number of bus-stops in a neighbourhood and the timetabling of buses than asking residents their opinion of whether access is adequate or not. A question to residents around the latter is certainly a legitimate question, but it will provide data about the way in which public transport meets their particular needs rather than level of public transport provision within a neighbourhood.

This is clearly evidenced in "The Place Where You Live" Survey results compared to those of LEED-ND. Thus, 40 percent of the Harbour View survey participants tended to agree with the statement that "public transport is frequent and reliable in this neighbourhood", with a similar number disagreeing. A fifth of those respondents neither agreed nor disagreed with the statement. Those results do not reflect the reality of public transport availability in Harbour View. Harbour View only has 43 bus rides per week day compared to 343 in Petone, 424 in the Blake Street - Ponsonby neighbourhood, and 236 in Aranui. Those results do, however, reflect the extent to which Harbour View residents report using public transport and are consistent with the very high number of private vehicle kilometres Harbour View residents report over a month. In short, the data from the neighbourhood survey does not provide a valid measure of access to public transport, but it does provide an insight, when triangulated with other data, into the relative importance of different transport modes.

For data to be reliable, respondents must consistently interpret the information required from them in the same way. There are inherently some problems of reliability in relation to any self-report data around neighbourhoods, simply because it has been well established that people in similar locations can define their neighbourhood boundaries somewhat differently. The impacts of this, however, should not be over-stated. While the precise boundaries of a neighbourhood may differ slightly, research shows that there tends to be a shared area which neighbours all tend to agree is their neighbourhood. In some communities, research has found very high levels of consensus around the neighbourhood boundaries. Even where this is not so apparent, respondents are nevertheless responding on the basis of a concept of neighbourhood. It is notable that some groups tend to conceive of their locality in relation to neighbours rather than

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'neighbourhoods'. Their boundaries are likely to differ from those people that define neighbourhoods as localities that go beyond their neighbours.

In relation to the reliability of the data generated by the research instrument, the most accurate test of reliability is replication. Clearly, conclusions can not be drawn on that basis because there has been no opportunity for replication in the New Zealand context at this point. The questions in "The Place Where You Live" Survey have, however, been tested in the United Kingdom and future comparative analysis of the data will provide an opportunity to reflect on both the reliability of the data as well as the extent to which New Zealand and the United Kingdom show similar or different patterns of behaviour and perception in response to particular built environment characteristics.

While the replication of data from "The Place Where You Live" Survey to date is limited, the opportunities for triangulation of the data generated by "The Place Where You Live" Survey are significant. Triangulation is the process by which data from different sources, and using different measures and units of analysis but pertinent to the same phenomenon, are analysed to assess consistency. Application of LEED-ND and "The Place Where You Live" in the case study neighbourhoods gives a robust platform for triangulation. As the later discussion of the sustainability ranking of the case study neighbourhoods shows, there is every reason to believe that the data generated in each of the case studies reflects differences in behaviours and perceptions between the different cases.

The set of measures derived from N-SOS using data derived from the "The Place Where You Live" Survey provides an ability to differentiate between the separate neighbourhood cases. Later discussion also suggests that the rankings provided by the application of the N-SOS measures are relatively robust, with volatility adequately explained by the impact of particular case-specific characteristics and dynamics. Table 4 sets out the scores for each of the neighbourhoods in relation to the N-SOS measures as derived from the survey data.

	Petone	Chch East Inner City	Aranui	Blake Street-Ponsonby	Harbour View	Aggregate
Functional Flexibility						
- % intention to move because of housing (Q2a)	-10.7	-6.7	-4.3	-0	-13.3	-7.1
+ % foot/bicycle for work/ study (Q21)	14.9	36.1	9.3	20.8	8.3	22.9
Neighbourhood Satisfaction						
- % intention to move because of neighbourhood (Q2a)	-0	-11.7	-30.4	-0	-6.7	-10.7
+ % describing housing quality as 'very good' (Q66g)	24.2	15.2	7.4	45.8	50	21.9

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	Petone	Chch East Inner City	Aranui	Blake Street-Ponsonby	Harbour View	Aggregate
+ % describing street walking as 'very safe' (Q32)	24.2	16.3	7.1	33.3	226	18.7
- % describing street walking as 'very unsafe'/ 'do not go out at night' (Q32)	-13.2	-33.3	-57.2	-0	-19.4	-28.1
+ % noise disturbance described as 'not a problem' (Q33)	58	33.6	42.9	33.3	63.3	44.9
-% noise disturbance described as a 'serious problem' (Q33)	-3.4	-11.5	-26.5	-8.3	-0	-10.3
- % no chat or greeting of neighbours (Q64)	-5.6	-9.4	-16.3	-8.7	-7.1	-9.2
- % no neighbours known by name (Q64)	-6.7	-13.7	-10.0	-13.6	-6.9	-10.5
+ % knowing many in the neighbourhood (Q29)	30.7	12.6	30.4	16.7	26.8	22.2
+ % strongly agreeing that the neighbourhood is friendly (Q65)	37.4	19.0	12.2	30.4	30.0	25.1
+ % strongly agree that neighbourhood reflects own identity (Q65)	25.8	12.8	12.2	21.7	10.0	16.8
+ strongly agree that has a sense of belonging (Q65)	38.2	24.6	25.5	19.0	27.6	28.5
Maximised Bio-physical Health						
- % exceeding average aggregate kms last 4 weeks (759 kms) car use (Q12)	-73.0	-95.3	-93.4	-69.8	-212.9	-100.0
+ % use public transport for work/study (Q21)	37.9	39.5	16.3	45.8	16.6	33.2
+ % undertakes composting (Q58)	42.9	36.4	34.5	13.0	25.0	32.5
+ % leaves undisturbed area for wildlife (Q31a)	8.8	18.0	21.4	0	19.8	14.9

	Petone	Chch East Inner City	Aranui	Blake Street-Ponsonby	Harbour View	Aggregate
+ % maintains shrubs and garden (Q31c)	33.0	31.6	28.6	16.7	34.4	30.4
+ % provides pond (Q31c)	3.3	6.8	8.9	4.2	6.3	6.0
+ % provides food and water for wildlife (Q31c)	30.8	28.6	28.6	23.5	31.3	28.7
+ % undertakes organic gardening (Q31e)	31.9	24.1	26.8	17.6	34.4	26.9
Effective Governance and Civic Life						
+ % membership and participation in local or neighbourhood groups (Q27)	40.2	33.1	33.3	29.2	19.4	33.4
+ % participation in local or neighbourhood group at least once a month (Q28)	45.5	56.8	47.1	33.3	22.2	40.9
+ % use of local public spaces at least once a month (Q25)	77.0	68.2	40.0	62.5	83.9	66.8
Resource Use & Climate Protection						
- % average exceeding average aggregate kms last 4 weeks (759 kms) car use (Q12)	-73.0	-95.3	-93.4	-69.8	-212.9	-100.0
+ % describe house as energy efficient (Q50)	34.4	32.8	41.8	50.0	59.4	38.4
+ % describe house as water efficient (Q54)	31.9	32.3	43.6	40.9	56.3	36.8
Minimised Cost						
+ % who expend more than half of their food expenditure in the neighbourhood (Q73)	86.5	26.7	38.0	69.6	53.1	51.0

Table 4: Scores for Survey Based Assessment of Neighbourhoods

"The Place Where You Live" Survey is not designed to be a tool for planners or other groups to assess the appropriate management and/or retrofit of neighbourhood built environments. It is a research instrument which is designed to allow us to test the implications of the built environment on resident perception and behaviour. The questionnaire is very long and the complexity of implementing such a survey is considerable.

Survey implementation required hand delivery of the questionnaire with a complex process of questionnaire identification designed to simultaneously preserve the anonymity of respondents while at the same time allowing for targeted follow-up. In neighbourhoods with high proportions of English as a second language, translated material was provided in four languages (Arabic, Chinese, Korean and Urdu). Two postcard follow-ups were undertaken and a small recognition of participation was also provided. The process was supported by a free-phone contact which was attended throughout the working day. As a result 371 questionnaires have been returned at the time of writing. For the analysis of neighbourhood sustainability these are treated in aggregate as a quota sample. The number of returns from Waimanu Bay and Dannemora at the time of writing is too small to be included in the aggregate analysis for profiling purposes. The resultant data is very rich for research purposes, but it does require considerable effort to input the data and subsequently analyse that material.

"The Place Where You Live" Survey is clearly not suitable in its current form to be transported from being a research tool to an assessment tool. Nevertheless, the analysis of the survey data in relation to the proposed N-SOS measures does show that the residential perception and behaviour is a necessary part of assessing neighbourhood sustainability. Moreover, data on the N-SOS elements amenable to resident reporting can be collected by using just 14 of the 81 questions in "The Place Where You Live" Survey. This suggests that resident reporting can be integrated into neighbourhood planning and management by way of a practical information gathering and assessment tool that collects self-reported information about resident perceptions and behaviours.

3.3 The Robustness of LEED-ND and the Survey-Based Measures of N-SOS

To test the robustness of the sustainability assessments derived from LEED-ND and the survey-based measures of N-SOS, sustainability rankings have been given nominal categorisations of 'High', "Medium' and 'Low'. The use of nominal categories in which a range of scores are clustered is used to avoid any suggestion that neighbourhoods with close scores can be finely or precisely differentiated in relation to ranking.

For LEED-ND the following neighbourhoods ranked in similar clusters:

■ *Blake Street-Ponsonby* and *Petone* are in the top cluster and their high score is helped by their location in the wider settlement near excellent public transport and a wide variety of

Testing the Prototype Neighbourhood
Sustainability Framework: NH102/2

Creating homes and neighbourhoods
that work well into the future
and don't cost the Earth

Page 38

services. Both are sited on contaminated brownfield sites and this alone results in 14 points.[2] The differentiation between the two developments is largely around density and block length.

- *Aranui* and *Christchurch East Inner City* form the middle cluster. Both are brownfield sites (10 points), however there was no contamination cleanup involved. Like Blake Street-Ponsonby and Petone, Christchurch East is located very centrally within the wider settlement and therefore scores highly on public transport availability and access to facilities (with the exception of reserves). Aranui also scores highly even though it is some distance from central Christchurch. This is because bus services are reasonable and there are a good variety of local services available.

- The last cluster is formed by *Harbour View, Waimanu Bay* and *Dannemora*. All are greenfield developments adjacent to existing development, which results in considerably lower scores than the above brownfield developments. All three are located near sub-urban town centres where bus services are poor. All three score low for density, which is somewhat predictable in a suburban situation. They are differentiated by their scores for services within walking distance, treatment of the natural environment and housing diversity.

Two different approaches were used to develop scores that would allow a sustainability ranking to be given to each of the neighbourhoods using the survey-based measures of N-SOS. The first approach simply treats the percentages for each measure as a credit or debit score. It then involves aggregating those scores for each neighbourhood. This approach is similar to LEED-ND in the sense that it assumes that sustainability is a matter of an absolute condition in which the prevailing tendencies within a society require no recognition. The sustainability ranking of the neighbourhoods using this absolute sustainability approach to scoring is set out in Table 5.

Sustainability Ranking	Absolute Sustainability Approach (Survey-based Measure of N-SOS)
High (>450)	Petone Blake Street-Ponsonby
Medium (226-450)	ChCh East Inner
Low (<226)	Aranui Harbour View

Table 5: Neighbourhood Sustainability Using Survey-based Measures of N-SOS – Absolute Sustainability Approach

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[2] LEED-ND encourages the development of brownfield sites to conserve land and to achieve continuous development. Because of the costs involved brownfield sites that are contaminated are often left undeveloped, extra points are therefore awarded for decontamination.

Testing the Prototype Neighbourhood
Sustainability Framework: NH102/2

Creating homes and neighbourhoods
that work well into the future
and don't cost the Earth

Page 39

The second approach is somewhat more complicated, but has been developed to act as a ranking that sees sustainability as a relative condition which is societally specific. That is, the rankings assume that New Zealand neighbourhoods typically exhibit certain types of behaviours and attributes around sustainability performance. Specific neighbourhoods are ranked according to the extent to which those neighbourhoods score higher or lower than the average neighbourhoods. In this case, the average is represented by the sustainability score for the survey respondents across all neighbourhoods. The sustainability ranking of the case neighbourhoods using this approach is set out in Table 6.

Sustainability Ranking	Relative Sustainability Approach
High (15+)	Petone Blake Street-Ponsonby
Medium (10-14.9)	Harbour View ChCh East Inner
Low (<10)	Aranui

Table 6: Neighbourhood Sustainability Using Survey-based Measures of N-SOS – Relative Sustainability Approach

It is notable that the most volatile neighbourhood in relation to these rankings is Harbour View. In the relative sustainability approach the impact of Harbour View residents driving high numbers of kilometres is modified by the impact of Harbour View on the aggregate score. As a consequence the impact of high car usage on the sustainability ranking is diminished.

Table 7 provides a ranking comparison of the sustainability rankings generated by the survey-based measures of N-SOS and LEED-ND.

Sustainability	Relative Sustainability Approach	Absolute Sustainability Approach (Survey-based Measures of N-SOS)	LEED-ND
High	15+	>450	46-60
	Petone Blake St-Ponsonby	Petone Blake St-Ponsonby	Blake St-Ponsonby Petone
Medium	10-14.9	226-450	30-45
	Harbour View ChCh East Inner	ChCh East Inner	ChCh East Inner Aranui

Testing the Prototype Neighbourhood
Sustainability Framework: NH102/2

Creating homes and neighbourhoods
that work well into the future
and don't cost the Earth

Page 40

Low	<10	<225	<30
	Aranui	Aranui Harbour View	Harbour View

Table 7: Comparing Neighbourhood Sustainability Ratings Derived from Self-report Information and the LEED-ND Assessment Tool

The similarity between the rankings generated by each approach provides confidence in the overall robustness of these approaches. It is notable that relative to the survey based measures of N-SOS, LEED-ND generates a higher ranking for Aranui and confirms a low ranking for Harbour View. This is easily explicable.

Relative to the other neighbourhoods, Aranui scores relatively poorly on safety related criteria and a desire to move from the area. The latter appears to reflect two important factors. One factor appears to be that Aranui residents in the public rental stock have a sense that their residence in Aranui has been determined by others rather than their own choice. Thus, while they regard the built environment as satisfactory and have high levels of neighbourhood engagement, moving into another neighbourhood appears to be associated with a sense of achievement. Secondly, Aranui residents score the area poorly, relative to other neighbourhoods, in relation to safety. By comparison, Harbour View scores well in relation to safety but poorly in relation to domains concerned with private vehicle use.

The impact of survey-based data which, unlike LEED-ND, captures the views of residents on the sustainability rankings of neighbourhoods is important for two reasons. Firstly, it shows that resident-based information is important in the NSF assessments. Secondly, the very differences between the rankings of LEED-ND and survey-based N-SOS measures provide important information for decision-making around increasing the sustainability of particular neighbourhoods. From the Aranui and Harbour View rankings, for instance, two different sustainability directions are indicated.

In the case of Aranui, the different assessments suggest that modifications to the built environment in Aranui need to be particularly directed to improving the perception and experience of safety. However, the assessments also suggest that the focus in Aranui should be on managing safety within the built environment and supporting the engagement that residents in that community have within that environment. By way of contrast, however, increasing the sustainability of Harbour View will require a focus on the consumption and travel patterns of residents, particularly the reduction of private vehicle use.

Overall it can be said that a limited number of criteria dominate the results. Contaminated brownfield developments with good public transport will always score highly, for example. Even though the overall results rank the neighbourhoods in an appropriate order, it needs to be questioned if quite so many assessment criteria are needed and if the "one size fits all" approach taken by LEED-ND is appropriate. Taking the same approach to neighbourhoods regardless of where they are situated within the wider settlement seems inappropriate. Given its poor access to public transport and suburban location, the densities at Harbour View for example are

Testing the Prototype Neighbourhood
Sustainability Framework: NH102/2

Creating homes and neighbourhoods
that work well into the future
and don't cost the Earth

Page 41

probably appropriate, but Harbour View is measured against the same criteria as neighbourhoods such as Blake Street-Ponsonby which has an excellent bus service and is very close to Auckland's CBD. While intense urban developments with good access to public transport, employment and services are inherently more sustainable than developments in suburban areas, more differentiation is needed within the different development conditions identified in the NSF. Measurements that are divorced from resident perception are unlikely to provide a robust understanding of neighbourhood sustainability or the critical neighbourhood dynamics that need to be managed or redesigned to ensure sustainability.

Testing the Prototype Neighbourhood
Sustainability Framework: NH102/2

Creating homes and neighbourhoods
that work well into the future
and don't cost the Earth

Page 42

4   Part Three: The Utility of NSF

The prototype NSF and associated tools and specifications have been tested to assess the extent which it can provide a robust, evidence approach to assessing neighbourhood sustainability to allow the better design, management, building and retrofitting of neighbourhood built environments. That testing has involved the application of NSF to seven neighbourhoods by way of an LEED-ND assessment tool. In five of the seven neighbourhoods, a neighbourhood survey has allowed us to:

- ■ Assess the sustainability of neighbourhoods; and
- ■ Identify the key parameters of resident perceptions and behaviours that act as critical indicators of neighbourhood sustainability.

Together the application of the assessment tool and the survey data allow us to address five critical questions:

- ■ Does the fundamental structure and content of the NSF make sense in terms of modelling neighbourhood sustainability?
- ■ Are the tested research methods, LEED-ND and the "The Place Where You Live" survey, useful in measuring sustainability as part of the NSF?
- ■ How do the tools that form part of the NSF need to be developed?
- ■ How can uptake by different stakeholders be encouraged?
- ■ What are the recommended next steps in the Neighbourhood Research Stream?

4.1   The NSF as a model of neighbourhood sustainability

The application of the NSF to the seven case study neighbourhoods demonstrates that its overall structure and content works well.

The N-SOS has proven vital in guiding this research phase by providing a framework to assess the tools and then the research results against. By specifying critical domains of neighbourhood sustainability, N-SOS ensures that all elements are considered in any decision making tool and that the gaps left by the tools are transparent. During this research phase the N-SOS has highlighted that neither the LEED-ND tool nor the survey were able to provide all the information needed to make sound decisions to improve neighbourhood sustainability. Only too often sustainability assessment tools are used in isolation from a wider framework and are driven by what is easily measured rather than guided by critical outcomes that contribute to sustainability. It is therefore important that N-SOS is used alongside any tools developed for the New Zealand situation.

N-SAMT aims to assess and monitor neighbourhood sustainability. Draft indicators in relation to the three neighbourhood built environment elements, infrastructure, buildings and space, were included in the draft NSF. It is highlighted that the intention of these was only to demonstrate what sorts of indicators could develop as part of the final NSF. LEED-ND and the

Testing the Prototype Neighbourhood
Sustainability Framework: NH102/2

Creating homes and neighbourhoods
that work well into the future
and don't cost the Earth

Page 43

survey were used as tools to provide the indicator measurements for N-SAMT. It is clear that a measurement tool needs to remain within the NSF.

N-SAPT is an action-planning tool for neighbourhoods. This phase of the research did not include working with existing neighbourhoods to plan their improvement or working with developers to improve their development plans. It has, however, become clear that a one solution fits all approach is entirely inappropriate and that different approaches are needed for different neighbourhood development conditions and different stakeholders. It can therefore be argued that the basic structure of N-SAPT, in that it differentiates between various development conditions, is sound.

4.2   Operationalising NSF

During this research phase the N-SOS has highlighted that neither the LEED-ND tool nor the survey-based measures of N-SOS using resident reporting of perceptions and behaviours can, in themselves, provide all the information needed to assess neighbourhood sustainability.

LEED-ND does not provide sound measurement of all elements of the N-SOS critical domains. Moreover, it is clear from the survey-based measurement of N-SOS that resident perceptions and behaviours, which can only be gathered through self-report, are important modifiers of neighbourhood sustainability rankings. Nevertheless, a built environment assessment tool is needed and many of the elements measured in LEED-ND will be useful in this context. The data gathered with the help of the LEED-ND tool has been extremely valuable in assessing the sustainability of the case study neighbourhoods, however, the tool is very complex. The research team therefore believe that ,given LEED-ND's limitations, a New Zealand tool, that is able to measure the critical aspects of neighbourhood sustainability more simply, needs to be developed independently of LEED-ND. How such a tool may be developed is discussed below.

The data from "The Place Where You Live" survey clearly shows that information about resident perceptions and behaviours are important in assessing the sustainability of neighbourhoods. Those resident perceptions and behaviours cannot be substituted by a tool such as LEED-ND.

4.3   Development of the NSF tools

Based on the results from this research phase, the following format for the N-SAMT tool development is suggested: a built environment assessment tool, and a residential liveability assessment tool.

This approach acknowledges that decisions about the built environment cannot be made in isolation from the communities that live in those environments. The residential liveability assessment tool would not be used in large greenfield developments, but would be part of the assessment when working with existing neighbourhoods or planning smaller new developments within existing communities.

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The built environment tool would consist of two parts: an objective assessment tool based on set criteria and indicator measurement; and a subjective assessment by a suitable professional. If it is to be used, it needs to be not only simple and user friendly but also allow for different neighbourhood development conditions and stakeholders. Overall this tool would not be dissimilar from the N-SAMT proposed as part of the prototype NSF. Reflection upon this research phase would be used to refine the tool. It is envisaged that the tool would be considerably simpler than LEED-ND and consist of fewer elements to assess. It could be based on a refined version of the Action Pathways to Neighbourhood Sustainability identified in the N-SAPT of the NSF. Each measured element would contribute to several critical domains. The residential liveability assessment tool will be developed as a 'stripped down' version of "The Place Where You Live" questionnaire including only those questions from which data were used for the survey-based measures of N-SOS.

4.4 Recommended Next Steps in the Neighbourhood Research Project

The successful testing of the prototype Neighbourhood Sustainability Framework (NSF) and associated generic tools in NH102, provides the platform for developing appropriate packaging, formatting and promotion with end-users of tools noted above.

It is envisaged that this will involve three phases of work. The finalisation of the substantive part of the tools would be undertaken in Phase 1. Phase 2 would focus on an active iteration with, and engagement of, end-users by demonstrating the NSF and undertaking any necessary modifications. Phase 3 would develop 'vehicles' or 'formats' by which the NSF and associated tools can be used by different segments of the end-use market. Those 'vehicles' may range from paper-based guidelines, calculators and assessment sheets to interactive software which may be used in conjunction with a website.

Achievement of these objectives requires an on-going and systematic engagement over an extended period of time. Consequently, it is proposed that Phases 1 to 3 will stretch across two years. The objectives for the next two years are to promote the take-up and use of the NSF and associated tools by end-users by:

- Finalising the NSF and associated generic tools to reflect the findings of NH102.
- Identifying, engaging with and developing a set of supporting tools for each sector segment of end-users.
- Promoting the use of NSF among end-users through:
  – End-user workshops.
  – Demonstration of the tools in the context of one retrofit and one recent greenfield development.
  – Demonstration of NSF utility in the context of the key policy question of settlement density.

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The activities in each of the three phases of development consist of a series of components. In Phase 1, on the basis of the findings of NH102, the NSF would be further specified and guidelines regarding its application would be developed.

This would be supported by the finalisation of two generic supporting tools:

- An assessment tool – This is the equivalent of the LEED-ND tool tested in NH102.
- A residential liveability assessment tool – This will allow residents' behaviours and perceptions to be taken into account in the process of sustainability assessment and will reflect the key measures N-SOS captured through resident surveying.

These tools would be further refined in the light of Phase 2 activities. In addition to refining the content specification, this phase would also involve developing mechanisms by which users can easily use these tools in the context of their work, including interactive software and paper-based templates.

Phase 2 consists of three activity components directed at achieving end-user take-up by demonstrating the NSF and its generic tools and further developing those generic tools for use by specific segments of the end-user market.

4.4.1   Component A: Framework and Tool Demonstration

This would involve the application of the NSF and the two tools specified in Phase 1 in two different development settings. Those settings are:

The Addison development in Takanini, Manukau City. Addison is a large greenfield master-planned development based on new urbanist principles being undertaken by McConnell Properties in a phased approach. Phase 1 dwellings have been inhabited for approximately three years and phases 2 and 3 are currently underway. These include a community retail and service centre, proposed gym, swimming pool and railway station as well as parks and community lakes. Building is expected to continue for several more years and McConnell Properties are currently in negotiation with Housing New Zealand to develop an adjacent site. Addison is also the site of a proposed long term research project on "valuable urban design" to be undertaken by the Ministry for the Environment. The application of the NSF and tools will inform both the future development of tools for use under these conditions as well as informing the developers of opportunities available to them for improving the sustainability of this development.

Brougham Place in Massey, Waitakere City. Massey is the location of a Community Building project being undertaken by Waitakere City Council and other partners. In summary, the Massey Community Building Project aims to work alongside the local community and other partners to develop a programme for long term community driven, sustainable neighbourhood renewal and development in the Massey area. Early discussions between Beacon and Council have confirmed that there are strong linkages between the Beacon Massey Case study (Brougham Place) and the wider Building Community in Massey project. As a first stage, the application of the NSF and tools would assess the case study area with a view to informing an action or implementation programme developed by Council (and other partners) to make the current urban form and neighbourhood more sustainable. In addition, the Brougham Place case

study offers the opportunity to become a demonstration project within both the building community in Massey project and for Beacon itself. Should this be agreed, it will be as a separate project within the Neighbourhoods Research Stream.

4.4.2 Component B: Framework and Tool Knowledge Promotion – End-User Workshops

This component is directed at the national promotion of the NSF through knowledge sharing with key segments of the end-user market. Those key segments are:

- Developers and associated professions and industries.
- Territorial authority and other planners.
- Territorial authorities who have responsibilities for strategic decisions around the management and well-being of neighbourhoods.
- Key stakeholders in the built environment affecting neighbourhoods including HNZC, Department of Building and Housing, Transit and LTNZ, Ministry for the Environment and providers of other infrastructure and community facilities/amenities.

These workshops would have two objectives. Firstly, they would be used to promote the NSF and its tools with end-users. Secondly, they would be used to identify the particular modifications to the generic tools that will encourage NSF take-up among specific segments of end-users. It is envisaged that North Island and South Island workshops would be undertaken with both major urban and major provincial centres being targeted. The latter would be identified on the basis of projected growth pressure.

4.4.3 Component C: Framework Demonstration – Policy Issue Analysis

This component is directed at demonstrating how the NSF can connect the broad strategic issue of higher settlement density to practical consideration of neighbourhood design and management, and to issues of the design of individual dwellings within neighbourhoods. It would draw on the data generated through the application of LEED-ND and the Oxford Brookes Surveys in NH102 to address the questions of:

- The relationship between density and neighbourhood sustainability.
- The built environment characteristics that generate sustainability outcomes under different settlement densities.
- The issues that should be taken into account in dwelling design under higher density scenarios.

This analysis is particularly pertinent to decisions by regional councils and local councils in relation to growth strategies as well as central government agencies concerned with settlement and building design and the design and construction industries.

The Phase 3 component is directed at identifying and developing appropriate vehicles and formats for tool dissemination and end-use. These may include: guidelines, templates, interactive software, and web-based tools. It will involve testing the end-user interface vehicles

Testing the Prototype Neighbourhood
Sustainability Framework: NH102/2

Creating homes and neighbourhoods
that work well into the future
and don't cost the Earth

Page 47

and formats, different end user groups through workshops, and subsequent release and promotion of those tools building on the Phase 2 work.

4.5 Concluding Summary

Applying the NSF to seven case study neighbourhoods has confirmed the NSF and the critical domains within it as being both valid and measurable. The two international tools utilised to gather neighbourhood sustainability data, LEED-ND and the "The Place Where You Live" survey, are useful in assessing the critical domain outcomes. There are however some significant issues around the LEED-ND tool and both tools are too resource intensive to be practical in the New Zealand context in their present form. The data collected about the case study neighbourhoods has given valuable insights into the key drivers of neighbourhood sustainability and these drivers can form the basis of a more refined assessment tool within the NSF. As well as further refinement of the tools within the NSF, more stakeholder engagement is needed to ensure that the format and content of the tools develops in a manner that encourages wide uptake of the NSF. The following next steps are recommended:

- Refinement of the neighbourhood assessment tools described above. There will likely be two tools.
  - A built environment assessment tool.
  - A community survey tool.
- Application of the refined tools to two case study neighbourhoods with the aim of improving sustainability in those neighbourhoods. This would further test the tools and allow them to develop in a decision making rather than an assessment context.
- Stakeholder engagement. While a limited number of stakeholders have been engaged during this research phase, the draft NSF has not been presented to a wider audience. The purpose of extensive stakeholder engagement would be twofold:
  - It would promote the NSF to a wide audience hopefully aiding uptake once the NSF is further refined.
  - Feedback from stakeholders will help ensure that the NSF is refined in a way that meets stakeholder needs, aids decision making and is applicable to a wide range of situations.
- An assessment of how the NSF could be used to inform policy decisions at the regional and local level.
- Development of an end-use interface. As highlighted above, a successful New Zealand tool needs to be user friendly and able to adapt to different development conditions and stakeholder needs. A well developed vehicle to allow easy use and dissemination is therefore crucial.

We believe that the NSF provides a useful mechanism for decision-making about the building and retrofitting of neighbourhoods. It differs from other tools in its outcome orientation and focus on the integration of social with environmental performance. It also has the ability to identify the appropriate focus of neighbourhood investment to generate the best performance return, including the relative benefits of focusing on built environment adaptation compared to

Testing the Prototype Neighbourhood
Sustainability Framework: NH102/2

Creating homes and neighbourhoods
that work well into the future
and don't cost the Earth

Page 48

other management and investments in social and economic development. In addition, we believe that the way in which the tool can be used both at strategic levels of decision-making, as well as in the operational decisions about neighbourhood built environments across a number of different market segments, makes the NSF somewhat different from, and more practicably useful than, existing tools.

The challenge is to generate a real commitment among end-users to ensure they take the tools up. This involves ensuring that:

- tool application is practicable and within the informational and skill capacity of users
- tool use shows added value
- tools are easily accessible to end-users and the transaction costs of use are not prohibitive
- the generic tool is developed into tools shaped to the specific needs, accountabilities and interests of different market segments
- end-users are not only aware of, but familiar with, the practical potential of the NSF and associated tools.

Typically, take-up of tools such as these is most likely where the use of tools become part of the routine activity of practitioners working within different sectors. The work plan for the next two years sets out a multiple approach consisting of targeted workshops with end-users in both phase 2 and 3 combined with the use of the demonstrations in phase 2 and the development of vehicles to promote good end-user interface with the tools. This is designed to optimise the end-user take-up of the NSF. The strategic outcomes of this two years of Neighbourhood research are to contribute to New Zealand's capacity to:

- Identify, monitor, design and develop/adapt neighbourhoods which function sustainably.
- Assess the behavioural impacts of different neighbourhood development forms, including whether the claims and assumptions result in lifestyles that are more sustainable.
- Improve the capability and capacity of the construction industry, developers and regulatory agencies to develop medium density and mixed use neighbourhoods in a sustainable manner.
- Provide tools and systems to assist in quantifying the costs, benefits and trade-offs when developing and implementing sustainable designs in retrofit, greenfield, medium density and mixed use neighbourhoods situations.

5   Part Four: The Case Study Neighbourhoods

Part 4 summarises the findings for each of the neighbourhoods. It contains detail of the case framing and specification of the neighbourhood case study areas as well as the findings for each case study of the NSF, using an adapted LEED-ND assessment (Annex D). Survey data were collected from five of the seven case study neighbourhoods. Harbour View, Blake Street - Ponsonby and Petone were pilot neighbourhood case studies and an amended LEED-ND tool (Annex F) was subsequently applied to Aranui, Christchurch East, Waimanu Bay and Dannemora. Individual case study scores should therefore not be compared. A comparison of neighbourhoods, adjusted for this change, is included in Part 2 as Table 2.

Census data has been provided to contextualise the different case studies, but this too must be treated with some caution. Several of the case study neighbourhoods, for example, form only a small section of the Census Area Unit (CAU) and are not necessarily representative of the wider CAU. This is discussed in the findings of each case study. As well, this census data was collected in 2001 and several of the neighbourhoods have undergone significant changes since then so the data may no longer be relevant. This too is discussed in the findings of the relevant case study areas. Subject to Beacon approval, the census information will be updated once the 2006 data is available.

5.1   Case Studies

It is important to highlight that the information about each neighbourhood must be seen in context. Data was collected to form an illustrative picture of that neighbourhood and different levels of background information were available for each site. Any comparisons between neighbourhoods or claims of one neighbourhood being more sustainable than another are inappropriate. Before discussing those substantive results, we provide an overview of case studies as an analytic method, and the criteria and process for case study selection.

Case studies are a method by which complex phenomena can be understood through 'structured focused comparison'. Those comparisons can be between cases which are typical, or illustrative of a particular type of sub-grouping, or deviant examples, or some permutation of all three. Through careful description and systematic interrogation of data, both causal inference and evaluative assessments can be made.

For the neighbourhood stream, both causal inference and evaluative assessment are required. In relation to causal inference, the goal is to be able to establish the extent to which particular neighbourhood characteristics postulated as generating sustainable outcomes actually do so. In relation to evaluative assessments, the goal is to test the extent to which the NSF provides, either itself or in combination with other refined instruments, a practical means by which the sustainability of existing and planned neighbourhoods can be assessed and sustainability initiatives developed, targeted and implemented.

5.2   Selecting Case Studies

The selection of case studies is guided by a systematic framing of the characteristics relevant to the substantive issues being addressed in the neighbourhood stream. Case frames are developed to guide the selection of case studies and ensure that selected case studies allow for focused comparison. The case frame establishes the set of criteria by which cases can be selected that hold constant, or systematically vary, parameters critical to the explanatory and evaluative purposes of the research. In doing so, the selected cases should allow for contrast and comparison and provide a means by which the purposes of the research – to develop and test the NSF – can be met.

Because we have suggested that the prototype NSF should be able to be applied to a variety of neighbourhood development conditions, the case frame was designed to generate case studies that fall into the following neighbourhood conditions:

- Greenfield/Brownfield Suburban
- Greenfield Urban
- Brownfield Urban
- Retrofit Urban
- Retrofit Suburban

Selecting cases that fall within those neighbourhood condition categories allowed us to assess the extent to which the NSF provides a tool that can be usefully applied across neighbourhood built environments.

In addition to selecting cases which represent those different neighbourhood conditions, the case study neighbourhoods also must allow us to test the causal inferences that underpin the NSF as well as the policy and debate around settlements. Central to the prototype NSF and the public and political debate surrounding human settlements and neighbourhoods are a postulated relationship between sustainability and certain neighbourhood characteristics. In particular, higher density rather than lower density is presented as associated with higher sustainability. Similarly, mixed use rather than single use neighbourhoods are associated with sustainability.

To test those assumptions the case frame generated neighbourhood case studies that allowed us to analytically contrast between:

- cases with different density conditions, and
- cases with different use conditions.

We also included within the case frame a 'branding' criteria for those neighbourhoods that are branded as sustainable. This ensured that the selection of case studies allowed us to compare the neighbourhood characteristics and sustainability outcomes of neighbourhoods branded as sustainable neighbourhoods with those not marketed in that manner. Finally, because of the potential impact of housing classes on the social and economic resources in a neighbourhood, a measure has been included in the case frame to reflect this in the form of above average and below average housing access limit compared with the settlement average.

Testing the Prototype Neighbourhood
Sustainability Framework: NH102/2

*Creating homes and neighbourhoods
that work well into the future
and don't cost the Earth*

Page 51

To generate a case set that represents permutations of all the characteristics within each of the neighbourhood condition categories, would exceed the resources available to this project. For that reason, we used the technique of illustrative clusters. These clusters focus on particular sets of conditions that are, or appear to be emerging as, the neighbourhood conditions that are typically of concern to stakeholders. They are:

- Retrofit
- Greenfield/Brownfield Urban
- Greenfield/Brownfield Suburban

This focus, combined with the resource limits within the research project, generated the case frame set out in the table below.

	Density	Use	Branding	Housing Access Limit
Greenfield/Brownfield Urban	1 higher density	1 mixed 1 single use		1 higher
Retrofit	1 higher density 1 lower density	1 mixed 1 single use	1 sustainable	1 lower
Greenfield/Brownfield Suburban	1 lower density 1 higher density	1 mixed 1 single use	1 sustainable	1 lower 1 higher

Table 8: Case Study Selection with Illustrative Clusters

The primary criteria of the case frame are those set out in Table 8 above. There are, however, secondary criteria which have been identified to manage confounding factors. Confounding factors are variables that may impact on, or mediate, the critical variables which have generated the case frame. A number of those factors have been identified and have been systematically reviewed as variables when selecting cases. Those variables are:

1) **Geographical location** – The geographical location of neighbourhoods, not only within their immediate 'parent'-settlement but nationally, may be attached to variables that influence both the need and opportunities for neighbourhood adaptation. Those variables include cultural differences. There are indications that there are cultural differences between neighbourhoods situated in rural, provincial and metropolitan settlement contexts. Similarly, there are north-south differences and also differences associated with ethnic mix which may equally be expressed in geographical clustering. Geographical location is also important with regard to the particular position a location has in regional and national economies. Similarly, geographical location may have implications for the structure of territorial governance arrangements. Location may also influence the acceptability of, and meanings of, neighbourhood sustainability for local communities.

2) **Settlement age** - Settlement age can have a profound affect on the shape, form and engineering of neighbourhood built environments, the connections that a neighbourhood has

to transport infrastructure, and the current capacity and adaptability of the built environment.

3) **Infill** – Like settlement age, the use of infill may have an affect on the current capacity of the built environment and its adaptability.

The case selection was, in the first instance, determined by the primary parameters of the case frame and the secondary variables set out in the previous discussion. In addition, the selection of case studies was also informed by practical considerations. In particular, the availability of the comprehensive range of data required for the case study itself and the willingness of local stakeholders to participate in the case study process. The specific case study areas were defined by significant roads as well as by the LEED-ND focus on access to various facilities within an 800m walk from the case study area. The selection of boundaries has been done in conjunction with advice from the relevant local authorities to ensure the scale and size of each case study is reflective of what a neighbourhood might reasonably be in the given area.

Eighteen possible case studies were identified by the research team and then assessed against the case frame. Three case studies were selected for the initial phase of the project, after which the tool was amended, and a further five were identified for the second phase.

The initial three case studies selected were:

- Harbour View, Te Atatu Peninsula, Waitakere City
- Blake Street, Ponsonby, Auckland City
- Petone, Hutt City

The second phase case studies were:

- Christchurch East Inner City, Christchurch
- Aranui, Christchurch
- Waimanu Bay, Waitakere City
- Dannemora, Manukau City

5.2.2 The Neighbourhoods

This section presents the findings of the assessments of each of the seven case study neighbourhoods and the information regarding perceptions and behaviours emerging from "The Place Where You Live" survey. In addition, census data has been used to contextualise the neighbourhoods. That data is presented in each neighbourhood discussion. Annex G provides a summary table of the 2001 Census data for all neighbourhoods. Subject to Beacon approval, census data will be updated to the 2006 census in February 2007.

The case studies contain a summary of the LEED-ND scores, the full set of scores with explanations how these scores were reached are included as Annex H.

5.3   Dannemora

lower density, mixed use, medium cost suburban greenfield
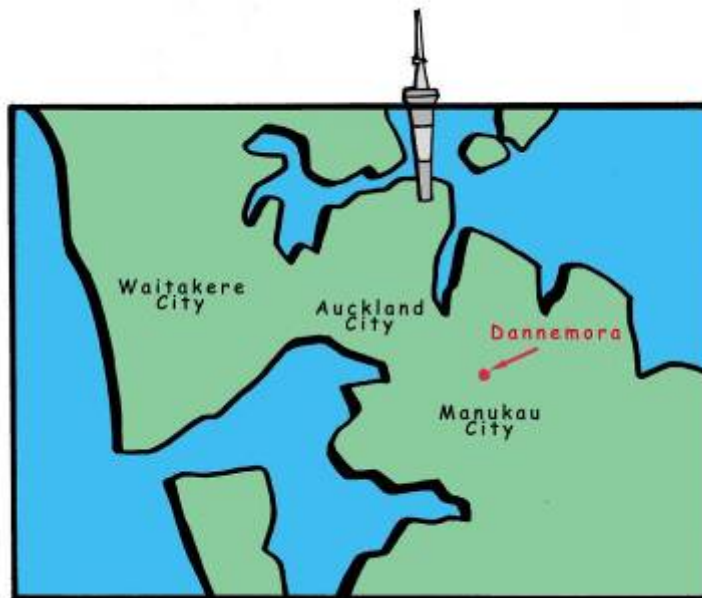
Figure 4: Location of Dannemora

The section of Dannemora that was studied consists of 214 dwellings and a small shopping centre with a number of commercial properties. All of the dwellings are relatively new (less than 10 years) and all are free-standing. Dwellings range in size from 3 bedrooms to 5-6 bedrooms. The neighbourhood includes a small commercial/retail area and is within easy walking distance of a primary school and childcare centre. The study area is bounded to the east by lifestyle blocks and countryside but apart from this there is little outdoor recreation space provided within 800m of the study area. Within 800m of the neighbourhood there are arterial roads with speed limits of up to 80km/h and only limited options for safe pedestrian crossing (at traffic lights). There are bus stops available close to the development, however the bus service available is poor.

The neighbourhood is reasonably affluent and is characterised by large luxury dwellings. Section sizes vary and dwellings dominate the property so the rate of impermeable surfaces is high.

Key Positives	Key Negatives
Good walking environment Good surveillance of public space Good access to schools	Poor public transport service Lack of affordable housing Large dwellings and low overall density Poor treatment of streams Lack of playgrounds or other park facilities

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Sustainability Framework: NH102/2

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Page 54

Table 9: Key Positives and Negatives, Dannemora.

The Dannemora neighbourhood study area is a small part of the Point View CAU. The study area is a newly built neighbourhood in a greenfield area undergoing extensive subdivision and construction. It is bounded by lifestyle blocks and these are included in this CAU. It is important therefore to note that the CAU data is unlikely to accurately reflect the study area, and that it is also likely to change significantly in the 2006 count. The census data does, however, still provide a useful context for the case study information.

Consistent with Manukau City, where the population has increased (11.4 percent), the population in this CAU also increased between the 1996 and 2001 censuses but at a very much higher rate (256.5 percent). This is largely due to extensive greenfield development in the area during this time. In 2001, the usually resident population of 2064 lived in 660 households. Almost 85 percent of these (84.2 percent) were owned with or without a mortgage. The area thus has a very low number of rental properties. The study area included 214 of these households.

The average household size in Point View was lower than the average for Manukau City (3.3) and higher than that for New Zealand as a whole (2.7) at 3.1 people. In 2001, there were 594 families in Point View. 34.8 percent of these were couples without children, 53.5 percent were couples with children and 12.1 percent were one parent families. At this time most of the population was aged between 15 and 65 (72.5 percent). Almost 22 percent were aged under 15 years and nearly 6 percent were aged over 65 years. The most common ethnic group was European (74.9 percent) and there were significantly less Maori and Pacific peoples but significantly more Asian peoples in Point View than for the whole of Manukau City.

In 2001, 39.5 percent of residents in Point View had a post-secondary school qualification, compared to 27 percent in Manukau City. The median income of people in Point View was $30,300 compared with $19,000 for Manukau City and $18,500 for all of New Zealand. The most popular occupational group in Point View was Legislators, Administrators and Managers (25.3 percent) and the rate of unemployment was lower in Point View (4.5 percent) than that of Manukau City (10.1 percent) and of New Zealand (7.5 percent).

The total average annual spending for households in Point View was $65,802 compared with $49,350 for households in Manukau City and $43,682 for the whole of New Zealand. 99.5 percent of households in Point View had access to a telephone and 66.3 percent of households had access to the internet, while 99 percent of households had access to a motor vehicle.

In 2002 there were 110 business locations (geographic units) in Point View.

Photo 4.1: Typical houses in Dannemora

Dannemora study area is a relatively dense recently built environment on the edge of the urban area. There are lifestyle blocks and countryside to the East while the remaining surroundings consist of similar dwellings with "big box retail" to the north and west.

Dannemora was observed as being very walkable, with a relatively pleasant streetscape and easy terrain. Roads are narrow and quiet and footpaths are provided on all urban roads (none in the lifestyle block areas). All urban roads are planted with street trees and these are in good condition. This neighbourhood includes a small retail area and is within easy walking distance of a primary school and childcare centre. Pedestrian spaces and other public open spaces are largely well cared for and all are overlooked by houses, providing passive surveillance to those public spaces.

Walking within the neighbourhood and to the small local commercial area seems pleasant, safe and convenient. There are, however, few amenities or facilities to walk to. Although the retail area provides a grocery, fruit shop and butcher, it does not have a full banking or postal service or any medical services. In addition, there is only one area of public open space (excluding the primary school which has lockable gates) and this is a square with a pathway through the middle to a pavilion. It is possible to walk in the nearby countryside, although road safety may be an issue. As well, urban arterial roads with speed limits of up to 80km/h create a significant barrier for extensive urban walking. There are extremely limited bus services to the area.

All of the dwellings are relatively new (less than 10 years) and all are free-standing. Dwellings range in size from 3 bedrooms to 5-6 bedrooms and some are marketed as suitable for extended families. The housing stock is of high quality and the risk of dilapidation was assessed as being low. There appears to be no social housing in the study area. The research team also noted that several homes were being used for home occupations, largely by converting garage space into home offices or showrooms.

Photo 4.2: The neighbourhood shopping centre

According to Auckland Regional Council hydrological maps there are two streams on the site. There is now little evidence of these and it is assumed that they are largely piped.

More generally, Dannemora is marketed by real estate agents as an area of sophistication and luxury. It is promoted as suitable for family life and proximity and access to schools is

Photo 4.3: Typical streetscape

highlighted. Dwellings are promoted as guaranteed, well appointed, low maintenance and easy care. Marketing targets working couples, and families including those in extended family situations. It is presented as safe, private, and with easy driving access to amenities and facilities (particularly shops). Car parking is emphasised.

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Sustainability Framework: NH102/2

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Page 57
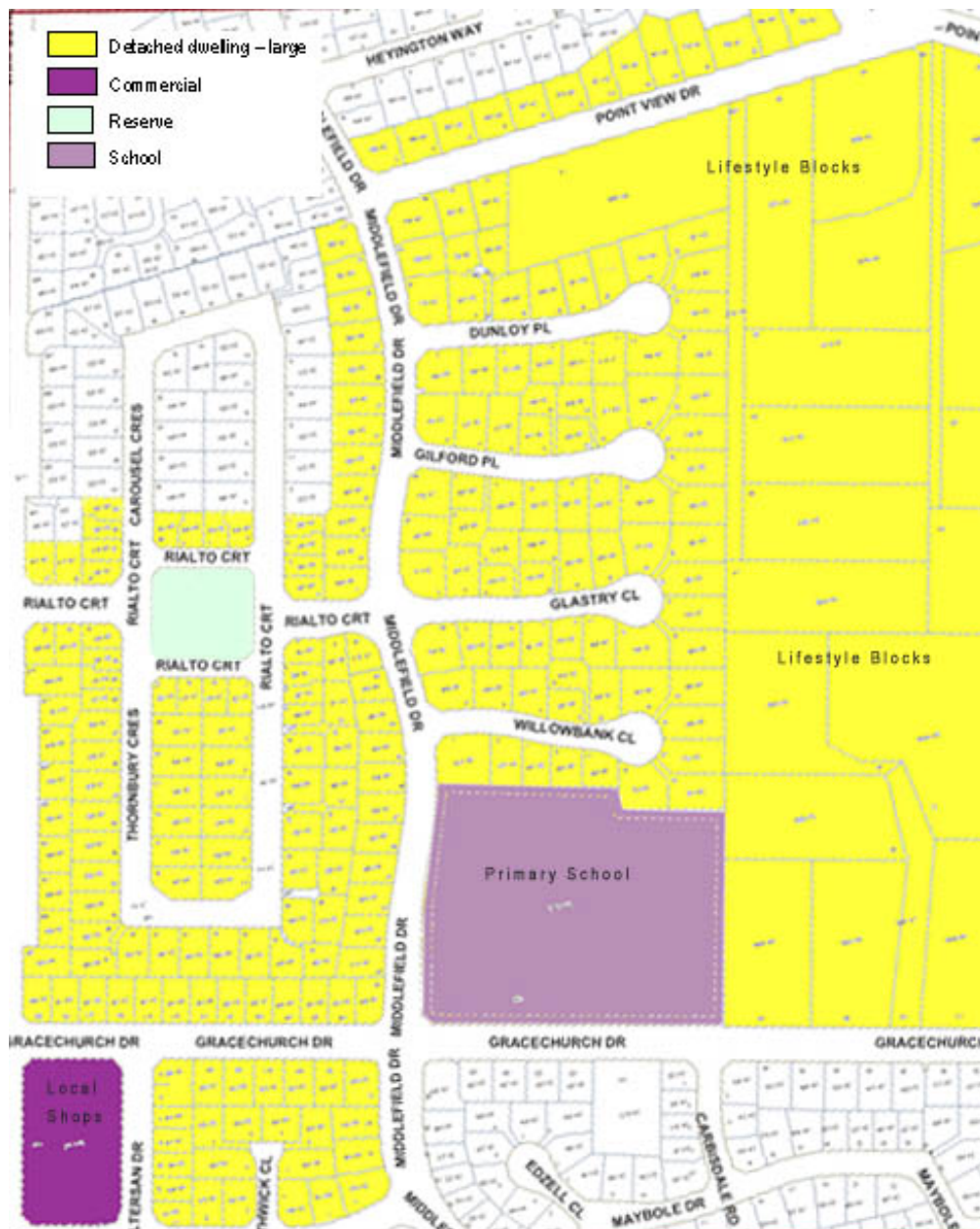
Figure 5: Map of the study area, Dannemora

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Page 58

5.3.2 LEED-ND assessment results
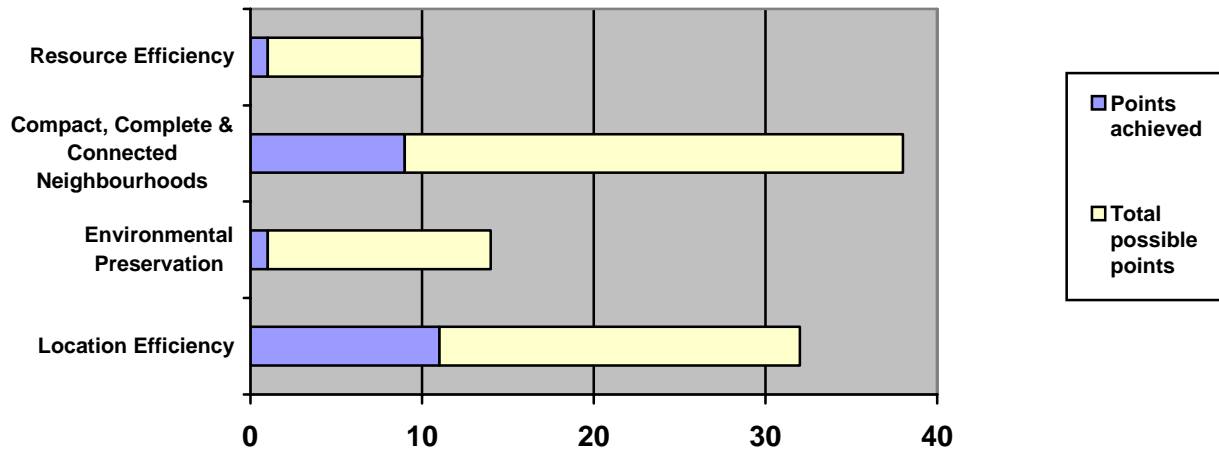
Figure 6: LEED-ND Summary of Results, Dannemora

Location Efficiency – 11 out of 31 points

All prerequisites are achieved. The following key points stand out for Dannemora:

- Access to public transport services is extremely poor.
- A primary school, secondary school and early childhood centre are in walking distance.
- A good number of local jobs are available.
- Public open space is limited to one small passive reserve.

Lessons for the use of LEED-ND as part of NSF:

- Dannemora's rating seems appropriate given its location.

Environmental Preservation – 1 out of 14 points

Not all prerequisites are achieved. The following key points stand out for Dannemora:

- There are two streams on the site which were not protected.
- There appears to be no stormwater treatment or retention.
- No native vegetation has been used in reserves.

Lessons for the use of LEED-ND as part of NSF:

- Dannemora's low score seems appropriate.

Compact, Complete & Connected Neighbourhoods – 9 out of 38 points

All prerequisites are achieved. The following key points stand out for Dannemora:

- Dannemora scores poorly on density.
- There is no housing diversity; all dwellings are large stand alone houses.

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Sustainability Framework: NH102/2

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Page 59

- Walkability is very good.
- Passive surveillance of public space is good.
- Block perimeter is long and there are several cul-de-sacs without pedestrian connections.
- Local service provision is limited.

Lessons for the use of LEED-ND as part of NSF:

- Dannemora scored only 1 point for access to services, the same as Waimanu Bay, while clearly the range of services at the shopping centre at Dannemora is much better. This raises questions about the list of services in this credit.

Resource Efficiency – 1 out of 10 points

There are no prerequisites in this category. The following key points stand out for Dannemora:

- The only credit earned is for the absence of in-built irrigation in communal areas. Dannemora does not have any communal infrastructure or services aimed at the reduction of resource use.

5.3.3   Neighbourhood Survey

In Dannemora, the numbers of responses to the survey were too low to undertake any meaningful analysis.

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Page 60

5.4 Waimanu Bay

lower density, single use, higher cost suburban greenfield
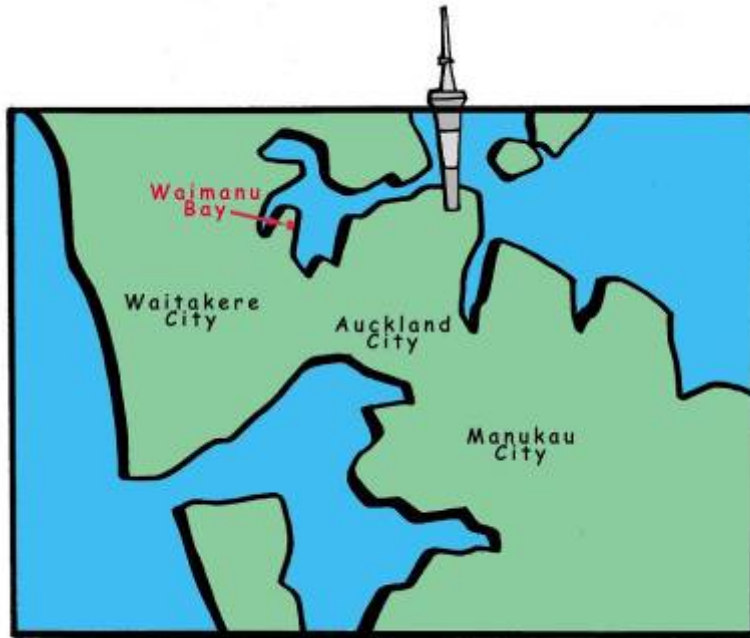
Figure 7: Location of Waimanu Bay

Photo 4.4 Typical Waimanu Bay houses

Waimanu Bay is a new affluent subdivision on the eastern coast of Te Atatu Peninsula. It consists of 202 dwellings most of which are large stand-alone houses. There is a gated retirement community which has some smaller stand-alone dwellings and some duplexes. The site has stunning sea views and there is significant habitat along the coast. A wetland area has been included in one of the reserves and this is vegetated with native plants. There is a stormwater pond at the northern end of the development. There are extensive walkway systems along the coast, picnic tables and seating, but no children's play equipment. All public spaces are overlooked by houses and walkability is good. There are however very few facilities within 800m walking distance and the bus service is extremely poor. The Te Atatu Peninsula town centre is about a kilometre away from most houses and all day to day services, including a supermarket, are found there. There are a primary and intermediate school nearby, however these are beyond 800m from most homes.

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Page 61

Key Positives	Key Negatives
Good walking environment Good surveillance of public space Walking tracks along the coast	Poor public transport service Lack of affordable housing Very large dwellings and low overall density Lack of local services Lack of playgrounds or other park facilities

Table 10: Key Positives and Negatives, Waimanu Bay

The Waimanu Bay neighbourhood study area is a part of the Durham Green CAU. The study area is a newly built neighbourhood in a greenfield area, surrounded by older housing. It is important therefore to note that the CAU data is unlikely to accurately reflect the study area, and that it is also likely to change significantly in the 2006 count. The census data does, however, still provide a useful context for the case study information.

In comparison with Waitakere City where the population increased by 8.5 percent, the population in this CAU only increased by 0.1 percent between the 1996 and 2001 censuses. This reflects the stage of development in Waimanu Bay at that time, when few houses were occupied and this is likely to change significantly in the 2006 census count. In 2001, the usually resident population of 3750 lived in 1182 households. Over 65 percent of these were owned with or without a mortgage. The study area included 202 of these households.

The average household size in Durham Green was higher than the average for Waitakere City (3) and higher than that for New Zealand as a whole (2.7) at 3.1 people. In 2001, there were 954 families in Durham Green. 29.6 percent of these were couples without children, 43.4 percent were couples with children and 26.4 percent were one parent families. At this time most of the population was aged between 15 and 65 (65.8 percent). Over 25 percent were aged under 15 years and nearly 9 percent were aged over 65 years. The most common ethnic group was European (65.1 percent) and there were significantly more Maori and Pacific peoples but significantly less Asian peoples in Durham Green than for the whole of Waitakere City.

In 2001, 26.7 percent of residents in the Durham Green had a post-secondary school qualification, compared to 28.9 percent in Waitakere City, and the median income of people in Durham Green was 20,100 compared with $20,800 for Waitakere City and $18,500 for all of New Zealand. The most popular occupational group in Durham Green was Clerks (15.4 percent) and the rate of unemployment was higher in Durham Green (10.1 percent) than that of Waitakere City (8.3 percent) and of New Zealand (7.5 percent).

The total average annual spending for households in Durham Green was $48,061 compared with $49,420 for households in Waitakere City and $43,682 for the whole of New Zealand. 95.4 percent of households in Durham Green had access to a telephone and 35.9 percent of households had access to the internet, while 91.6 percent of households had access to a motor vehicle.

In 2002 there were 174 business locations (geographic units) in Durham Green.

Waimanu Bay was observed as being very walkable. Roads do appear excessively wide and many only have footpaths on one side, however traffic is light and there is good surveillance from houses making walking pleasant. While the neighbourhood is clearly walkable there is little to walk to. The only services within 800m of most dwellings are a church and a toy library. The people observed walking during the field work were walking for exercise rather than using walking as a mode of transport. The Te Atatu Peninsula town centre is nearby and is within walking distance for keen walkers (about a kilometre from most houses).

Photo 4.6: Coastal Walkway and views

Houses are clearly of high quality and are well cared for. The risk of dilapidation is therefore low. Public space is limited to a wetland and walking tracks along the coast, there is no playground.

The coastal area includes fernbird habitat (a species threatened at a national and local level). The coastal roads and buildings are quite close to the coastal scarp in some areas. Where the road is set back from the scarp the top of the scarp is grassed rather than

planted in native vegetation. Some illegal vegetation clearance is recorded as occurring during the site development. While no ecological assessment was accessed, it appears that the coastal

habitat is likely to be negatively impacted by the development, mainly through stormwater run-off. One of the local reserves is very densely planted with native wetland plants and this is likely to have created habitat and provides some stormwater treatment.

The dwellings in the neighbourhood are very large. There is little diversity and no commercial premises. The neighbourhood includes a gated retirement community.

More generally, Waimanu Bay is marketed by real estate agents as an area of luxury and elegance with large dwellings befitting the occupier's position in life. The

Photo 4.7: Gated retirement community

neighbourhood is described as executive, exclusive and desirable with stunning views and property prices reflect this. It is promoted as private and secure and seen as great value for money as well as a location for a healthier quality of life. Both proximity to local facilities,

including shops, beaches and parks, and access to the city are highlighted. While car and boat parking is emphasised so too is walkability.
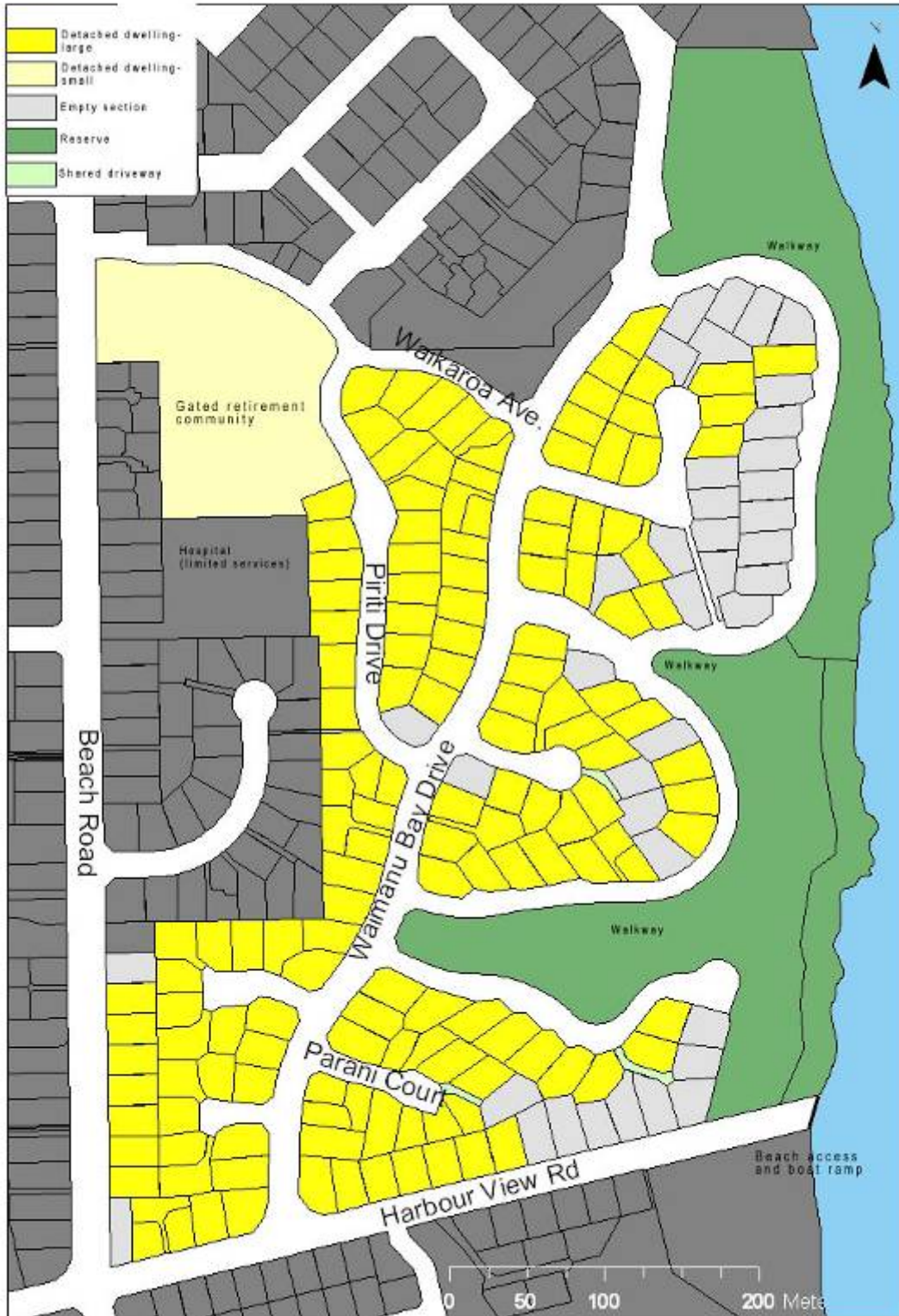
Figure 8: Map of Waimanu Bay study area

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5.4.2   LEED-ND assessment results
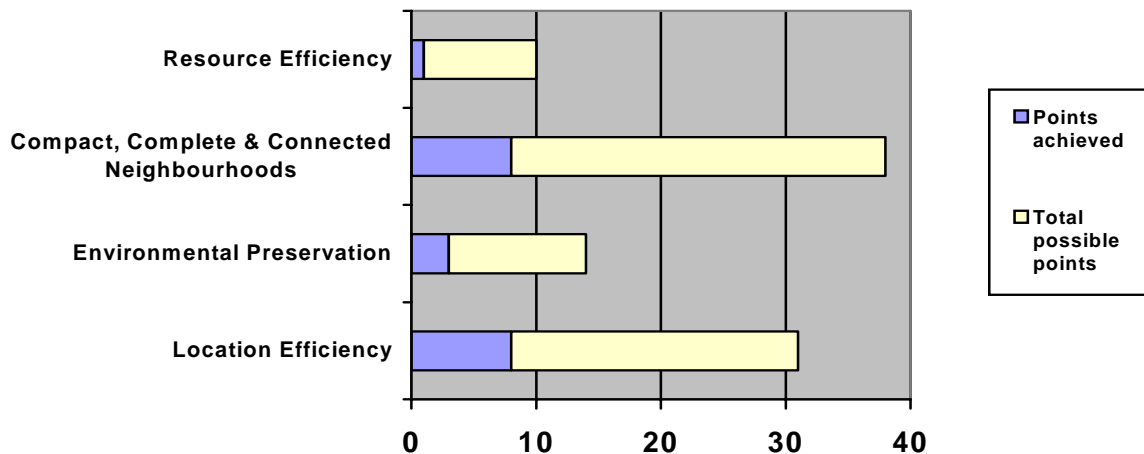
Figure 9: LEED_ND Summary of results, Waimanu Bay

Location Efficiency – 8 out of 31 points

All prerequisites are achieved. The following key points stand out for Waimanu Bay:

- The development is just beyond walking distance of Te Atatu Peninsula town centre and there are very few services within walking distance.
- Access to public transport is poor.
- There are no schools with walking distance of the majority of dwellings. However a primary and intermediate school are relatively nearby (beyond 800m walk).
- A good number of local jobs are available.
- Public open space is limited to passive reserves and walking tracks.

Lessons for the use of LEED-ND as part of NSF:

- Waimanu Bay's rating seems appropriate given its location.

Environmental Preservation – 3 out of 14 points

Not all prerequisites are achieved. The following key points stand out for Waimanu Bay:

- The coastal area of the development contains fernbird (a threatened species) habitat and development is relatively close to the coast.
- There was some illegal vegetation clearance during the development.
- The development contains a wetland area however this is not large enough to earn the "Restoration of Habitat or Wetlands" credit.

Lessons for the use of LEED-ND as part of NSF:

- Assessing these credits is complicated and the needed information is not readily available for already-developed sites.

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Compact, Complete & Connected Neighbourhoods – 8 out of 38 points

All prerequisites are achieved. The following key points stand out for Waimanu Bay:

■ Waimanu Bay scores poorly on density and only just meets the prerequisite for density.
■ Waimanu Bay scores poorly on housing diversity; the development is dominated by large stand-alone dwellings.
■ Services within walking distance are extremely limited.
■ Passive surveillance of public space is good.
■ Block perimeter is long and there are several cul-de-sacs without pedestrian connection.

Lessons for the use of LEED-ND as part of NSF:

■ Waimanu Bay scored only slightly lower than Harbour View, even though access to services and housing diversity is much better at Harbour View. This highlights the need for further work on this section if it was to be used in the New Zealand context.

Resource Efficiency – 1 out of 10 points

There are no prerequisites in this category. The following key points stand out for Waimanu Bay:

■ The only credit earned is for the absence of in-built irrigation in communal areas. Waimanu Bay does not have any communal infrastructure or services aimed at the reduction of resource use.

5.4.3 Neighbourhood Survey

In Waimanu Bay, the numbers of responses to the survey were too low to undertake any meaningful analysis.

Testing the Prototype Neighbourhood
Sustainability Framework: NH102/2   Page 66

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5.5 Harbour View

higher density, mixed use, sustainably branded, higher cost suburban greenfield
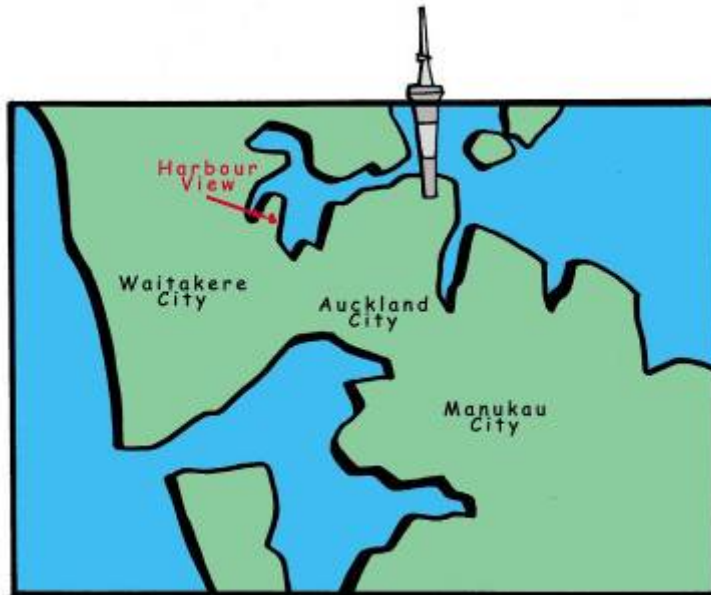
Figure 10: Location of Harbour View in the Auckland Region

The section of the Harbour View development that was studied consists of 249 dwellings and three commercial properties. There is a mixture of townhouses (duplexes or terrace style houses) and free standing dwellings, with a small number of apartments above a block of shops. The development is within easy walking distance (less than 800m) of the Te Atatu Peninsula town centre where a wide variety of shops, services, restaurants and cafes are available. Te Atatu Intermediate School is within walking distance and Rutherford College and Primary School are also nearby. However, a four-lane road without pedestrian crossings separates the development from the college and primary school. Extensive walking tracks and outdoor recreational opportunities (including a skate park, playground and petanque court) are also available within walking distance. There are bus stops available close to the development but the bus service available on the peninsula is poor.

The neighbourhood is reasonably affluent and characterised by large luxury dwellings near the waterfront and smaller higher density dwellings closer to the town centre. Section sizes are small and dwellings large; the rate of impermeable surfaces is therefore high.

Even though the study site itself does not contain any outstanding ecological features it forms part of a larger area, commonly referred to as Harbour View, that contains extensive wetlands and significant habitats for several native bird species on the lower terrace. The wetlands are buffered from the development area on the upper terrace that is the subject of this study.

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Sustainability Framework: NH102/2

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Page 67

Key Positives	Key Negatives
Good walking environment	Poor public transport service.
Good range of services available locally	Lack of affordable housing.
Protection of lower terrace from development	Very large dwellings.
Stormwater mitigation	High run-off (however this is treated and
Slow narrow roads	detained).
Excellent provision of public space	Street trees ad hoc and in poor condition.
High level of resident satisfaction with the	Poor walking connection to western side of the
degree of privacy, the condition of their house,	peninsula and Rutherford high school and
their dwellings out door environment and	primary school.
parking amenities.	Low use of public transport, walking and
	cycling on journey to work.
	Low degree of neighbourhood social contact.
	High degree of use of services outside local
	area.

Table 11: Key Positives and Negatives for Harbour View

The Harbour View Neighbourhood study area is a small part of the Te Atatu Central Census Area Unit (CAU). The study area is bounded by Te Atatu Road, Gunner Drive, Provence Esplanade, Danica Esplanade, Landmark Drive and Cellarmans Street and is a newly built enclave within Te Atatu Central. It is significantly different to the pre-existing neighbourhoods in terms of housing styles and prices and neighbourhood design. It is important therefore to note that the census area unit data is unlikely to accurately reflect the study area but it provides a useful context for the information gathered.

Consistent with Waitakere City where the population has increased (8.5 percent), the population in this CAU also increased between the 1996 and 2001 censuses but at a much higher rate (17.5 percent). This is largely due to greenfield development in the area during this time. The usually resident population of 3750 lived in 1281 households in 2001. Close to three quarters of these (70.9 percent) were owned with or without a mortgage. The area thus has a low number of rental properties. The study area included 249 of these households.

The average household size in Te Atatu Central was lower than the average for Waitakere City (3) and higher than that for New Zealand as a whole (2.7) at 2.9 people. In 2001, there were 984 families in Te Atatu Central. 42.1 percent of these were couples without children, 36.9 percent were couples with children and 21 percent were one parent families. At this time most of the population was aged between 15 and 65 (64.5 percent). Almost 24 percent were aged under 15 years and nearly 12 percent were aged over 65 years. The most common ethnic group was European (72.7 percent) and there were significantly more Maori but slightly less Pacific and Asian peoples, in Te Atatu Central than for the whole of Waitakere City.

In 2001, 28.1 percent of residents in the Te Atatu Central had a post-school qualification, compared to 28.9 percent in Waitakere City, and the median income of people in Te Atatu

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Sustainability Framework: NH102/2

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Page 68

Central was $20,700, compared with $20,800 for Waitakere City and $18,500 for all of New Zealand. The most popular occupational group in Te Atatu Central was Clerks (15.6 percent) and the rate of unemployment was lower in Te Atatu Central (7.2 percent) than that of Waitakere City (8.3 percent) and of New Zealand (7.5 percent).

The total average annual spending for households in Te Atatu Central was $47,455 compared with $49,420 for households in Waitakere City and $43,682 for the whole of New Zealand. 97.1 percent of households in Te Atatu Central had access to a telephone and 40.5 percent of households had access to the internet, while 92.2 percent of households had access to a motor vehicle.

In 2002 there were 227 business locations (geographic units) in Te Atatu Central.

Harbour View was observed as being a neighbourhood that is very walkable. Roads are narrow and quiet. Even though footpaths are not provided on all roads and most roads only have a footpath on one side, the research team felt that walking was pleasant and easy. Pedestrian spaces and other public open spaces seemed pleasant and largely cared for. All are overlooked by houses, providing passive surveillance to those public spaces. Harbour View's quality public space and good walkability was confirmed by an independent urban design assessment.

Photo 4.8: Te Atatu Road

While walking within the neighbourhood and to the adjacent town centre seems pleasant, safe and convenient, Te Atatu Road provides a significant barrier for access to the western side of the peninsula and most notably Rutherford College and Primary School. Te Atatu Road is a four lane road with fast moving traffic and has no pedestrian crossings south of the town centre.

Photo 4.9: Lower Terrace

The extensive lower terrace appears to buffer the sensitive coastal environment and associated habitat well from the developed area on the upper terrace. Stormwater is treated via stormwater ponds and wetlands in the lower terrace before being discharged into the sea. Access to the lower terrace is via boardwalks, therefore protecting ecologically sensitive areas.

The walkways along the coast appear to be well used and extend to the south and north of the development.

Photo 4.10: Playground overlooked by houses

There are several small neighbourhood reserves in the development and these provide for a variety of activities, such as a small children's playground, petanque and informal seating. The research team did however note that the raised, concave nature of some of the reserves made them less usable for ball games and the like.

The streetscape appears pleasant but street trees are ad hoc and often in poor quality.

The housing stock in the development seems of high quality and especially the properties along the coast are in the top price range in the area. There are some leaky home cases in the development but this is likely to be a symptom of the time of development rather than low cost/quality housing. In fact it appears that some of the more expensive homes are affected. Densities increase towards the town centre and the development includes a group of smaller dwellings targeted at older persons near the town centre.

There are a few commercial buildings on the town centre edge of the neighbourhood and one of these is mixed use with apartments above retail space. The development also contains a commercial early childhood centre at the southern end.

Photo 4.11: Higher density housing near the town centre

In the research team's opinion, the housing stock should age well and the risk of dilapidation is considered to be low (leaky buildings aside).

More generally, the Harbour View neighbourhood is marketed as executive, exclusive and desirable and dwellings are promoted as low maintenance and easy care. Some areas have sea and city views and there is access to a bathing beach. Marketing targets busy people, and families as well as those approaching retirement. It is presented as safe, private, close to amenities

Photo 4.12: Apartments above retail

and facilities and with easy access to the motorway. Car parking is emphasised but so too is the walkability of the neighbourhood.

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Figure 11: Harbour View study area

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Sustainability Framework: NH102/2

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Page 71

5.5.2 LEED-ND assessment results
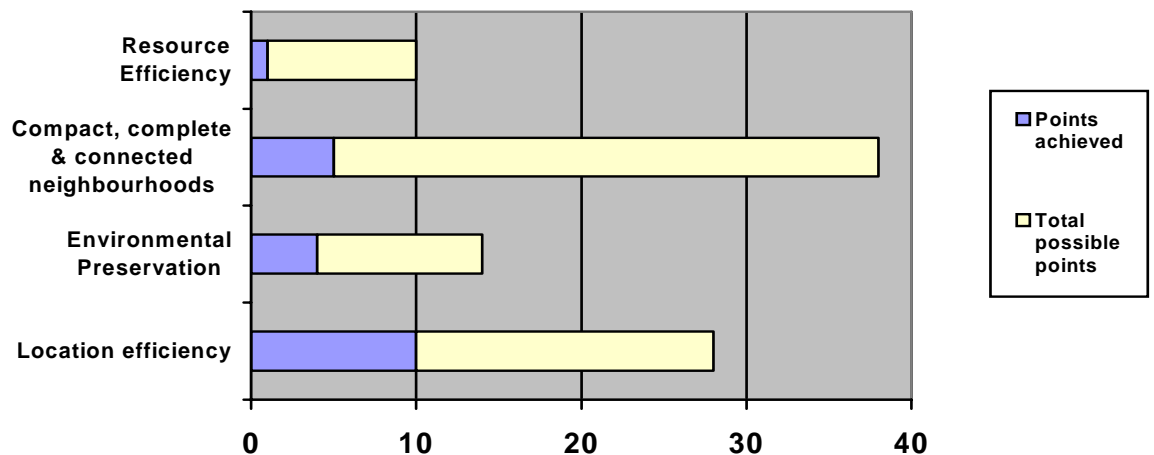
Figure 12: LEED-ND Summary of Results

Location Efficiency – 10 out of 28 points

All prerequisites are achieved. The following key points stand out for Harbour View:

- The development is within easy walking distance (400m) of all 15 service types described by LEED-ND.
- Even though bus stops are within walking distance of most dwellings, the service at these stops is poor.
- Early childhood education, primary, intermediate and a secondary school are all nearby (within 800 m), however the walk to the high and primary school was judged to be unsafe because of the need to cross Te Atatu Road (four lanes) and the absence of any pedestrian crossings en route.
- A good number of local jobs are available.
- Access to, and quality of, open space is excellent.

Lessons for the use of LEED-ND as part of NSF:

- The proximity to schools credit seems too simplistic. The research team believes that it is necessary to measure access to primary, intermediate and high schools as well as early childhood centres separately to account for the need of children of all ages. The research team also has questions about the low relative weighting of this credit.

Environmental Preservation – 4 out of 14 points

All prerequisites are achieved. The following key points stand out for Harbour View:

- Harbour View scores poorly, largely because the ecologically sensitive areas of the area were separated off before the land was made available for development and this land does therefore not form part of the case study site. The lower terrace adjacent to the development contains significant habitats that appear to be managed well. The area has been restored and

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Sustainability Framework: NH102/2

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Page 72

extensive stormwater treatment takes place, however this is off-site and therefore not included in the credits.

Lessons for the use of LEED-ND as part of NSF:

■ The research team questions how well LEED-ND deals with neighbourhoods that are part of a larger "master planned" area. In this case the most ecologically sensitive land was set aside for preservation, while the remaining land was developed intensively and more concentrated impacts, such as stormwater run off and tree removal occurred. LEED-ND does not provide an effective mechanism to acknowledge the advantages of this approach for the environmental preservation credits. Had the lower terrace been included in the study area, the development would have been penalised for achieving a low overall density.

■ Assessing the environmental preservation section of LEED-ND is extremely difficult retrospectively because records are not always available. For new developments, where the developer would aim to earn some of these credits, records would be likely kept for this purpose.

Compact, Complete & Connected Neighbourhoods – 5 out of 38 points

All prerequisites are achieved. The following key points stand out for Harbour View:

■ Harbour View scores poorly on density and only just meets the prerequisite for density.
■ Harbour View scores poorly on housing diversity, the development is dominated by large stand alone dwellings and large terraced houses.
■ Most residents can not access any services without crossing a road.
■ Block perimeters are relatively large.
■ Some dwellings do not face a public space.

Lessons for the use of LEED-ND as part of NSF:

■ Compared to standard suburban developments, Harbour View is relatively compact and generally seen a more sustainable. In the New Zealand context, the appropriateness of the scores in this category needs to assessed. It is also questionable that the same densities are appropriate for urban and suburban neighbourhoods. A better approach may be to provide different density targets for different types of developments.

■ 0 scores for several credits result from the few dwellings that do not face a public space, when passive surveillance of all streets and pubic spaces is clearly achieved. These credits may need to be reworded to better reflect their intent.

■ The loss of the street network credit because the only cul-de-sac in the development does not have a pedestrian connection seems very 'black and white'

Resource Efficiency – 1 out of 10 points

There are no prerequisites in this category. The following key points stand out for Harbour View:

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Sustainability Framework: NH102/2

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Page 73

- The only credit earned is for the absence of in built irrigation in communal areas. Harbour View does not have any communal infrastructure or services aimed at the reduction of resource use.

5.5.3 Neighbourhood survey

The Harbour View residents sample consists of 32 householders. 62.5 percent of those residents have lived in Harbour View less than four years, and half reported that they intend to move from their current house within the next few years. Intending movers reported that a move would be prompted by job-related reasons, retirement or dissatisfaction with their current dwelling.

Residents reported that Harbour View was desirable because of the following factors:

- General appearance of the neighbourhood (81.3 percent)
- Quality of the neighbourhood (design and materials) (59.4 percent)
- Quality of local facilities (amenities and services) (56.3 percent)
- Type of home (e.g. 2-storey house/flat/bungalow) (43.8 percent)
- Size of home (40.6 percent)
- Private garden (34.4 percent)
- Convenient to city or town centre (28.1 percent)
- Convenient to family/friends (21.9 percent)
- Convenient to public transport (21.9 percent)
- Parking space for cars (21.9 percent)
- Convenient to work (12.5 percent)

The majority of these residents have access to a private garden (90.3 percent) and a patio or yard (71.0 percent). A minority (19.4 percent) report sharing a garden or communal space with their households.

The housing type in Harbour View is mixed with 8 respondents living in detached single storey houses, a further 8 in detached double-storey houses and 8 living in terrace housing. A further 5 live in semi-detached buildings. The dwelling stock for these residents is primarily three-bedroom (53.1 percent) and four-bedroom (28.1 percent) dwellings.

The vast majority of these residents expressed satisfaction with the degree of privacy they had (71.9 percent), the condition of their house (84.4 percent) their dwellings out door environment (81.3 percent) and parking amenities (80.6 percent).

Only two households had no access to a private car or van. Twenty of the households had access to two or more cars. Only 12 dwellings had access to an adult bicycle.

These residents reported high levels of service and amenity use within Harbour View. Table 12 sets out the proportions of respondents reporting use of various services within Harbour View.

Service	% Respondents Using Services Within Harbour View	% Walking
Local shops e.g. food, newsagent, post office	96.9%	83.4%
Pub, café or restaurant	87.5%	60.7%
Open space, park, play areas	87.5%	85.7%
Shopping centre	84.4%	63.0%
Healthcare centre or GP practice	75.0%	50.0%
Workplace	56.3%	16.7%
Community hall or place of worship	53.1%	76.5%
Indoor leisure facilities	46.9%	33.3%
School	25.0%	50.0%

Table 12: Respondent Use of Services within Harbour View

In addition, 90.3 percent of Harbour View respondents reported visiting friends in Harbour View while 71.6 percent reported visiting relatives in Harbour View. Table 12 also shows the relatively low proportion of respondents compared to Petone, for instance, reporting that they walk when accessing services, facilities and amenities within Harbour View. There is low use of cycling and bus travel for in-neighbourhood access. By comparison, Table 13 shows that similarly high proportions of respondents use services, facilities and amenities outside the neighbourhood on a regular basis and, when they do so, they predominantly travel to those services, facilities and amenities by car.

Twenty-four of the 32 respondents report that they travel to work or study. Of those respondents, only two travelled by public transport and two travelled by foot or bicycle. Sixteen of the respondents who travelled to work or study reported that they had access to free car parking. The average household car kilometres travelled in the last four weeks was reported as 1616 km.

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Sustainability Framework: NH102/2

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Page 75

Service	% Respondents Using Services Outside Harbour View	% Driving
Shopping centre	90.6%	82.8%
Pub, café or restaurant	81.0%	96.2%
Healthcare centre or GP practice	75.0%	91.7%
Local shops e.g. food, newsagent, post office	75.0%	75.0%
Open space, park, play areas	65.6%	76.2%
Community hall or place of worship	56.3%	81.8%
Workplace	53.1%	94.1%
Indoor leisure facilities	43.8%	78.6%
School	21.9%	85.7%

Table 13: Respondent Use of Services outside Harbour View

Harbour View respondents expressed a degree of confidence about walking in Harbour View with 48.4 percent reporting that they felt 'fairly safe' and 22.6 percent reporting feeling 'very safe' while walking alone in the neighbourhood at night. However, five respondents said they felt unsafe and another five respondents reported not ever walking outside at night.

While most respondents felt that they could walk to public transport, less than half found public transport reliable and frequent. Even less found that public transport took them to where they wanted to go. Substantial minorities of respondents identified the following ways to encourage walking, cycling and use of public transport in Harbour View:

- better cycle, pedestrian and public transport connections between community facilities (26.7 percent)
- increased number of bus stops (26.7 percent)

There was a low degree of neighbourhood social contact reported by Harbour View respondents (Table 14).

Level of Contact	% of Respondents
Know many of the people in your neighbourhood and area nearby	25.8%
Know some of the people in your neighbourhood and area nearby	22.6%
Know a few of the people in your neighbourhood and area nearby	48.8%
Do not know people in your neighbourhood and area nearby	3.2%

Table 14: Degree of Neighbourhood Social Contact in Harbour View

Only six respondents reported belonging to, helping or supporting local community or neighbourhood groups. Only two respondents reported active involvement of more than once a month over the last twelve months.

There were low levels of neighbourliness (Table 15). Seven of the 32 respondents reported that they avoided contact with neighbours.

Level of Contact	% of Respondents
Know neighbours by name	93.1%
Have a chat with/greet neighbours	92.9%
Would ask to borrow tools from neighbours	83.3%
See neighbours socially on average once a week	31.0%
Would ask to borrow food from neighbours	10.7%

Table 15: Neighbourliness in Harbour View

Similarly, a positive perception of the quality of the neighbourhood and the people that live there was held among the respondents (Table 16).

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Perception of Neighbourhood	% Respondents Agreeing
I am proud of my neighbourhood	86.7%
Compared with other neighbourhoods, this one has many advantages	81.3%
This is a place where neighbours look out for each other	74.2%
I feel that I belong to this neighbourhood	69.0%
People from different backgrounds get on well together in this neighbourhood	66.7%
If I needed a favour, I could rely on someone in this neighbourhood to help me	65.6%
This is a friendly neighbourhood	63.3%
My local neighbourhood reflects the type of person I am	63.3%

Table 16: Perception of Neighbourhood Harbour View

Almost two thirds of respondents typified the neighbourhood as a 'very good' place to live, while about a third typified it as a 'fairly good' place to live. Table 17 shows that both access to public transport and open spaces and parks are seen as very good.

Facility/Amenity	% of Respondents Reporting 'Very Good'
Access to public transport by foot	74.2%
Open spaces and parks	71.0%
Condition of other homes & gardens within the neighbourhood	50.0%
Street lighting	48.4%
General appearance of area (i.e. attractiveness)	45.2%
Provision of shops	43.3%
Provision of recreational facilities	36.7%

Table 17: Amenity/Facility by Respondent Reporting 'Very Good' Harbour View

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Sustainability Framework: NH102/2

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Page 78

Food shopping tends to be done outside Harbour View with 46.9 percent of respondents reporting they expended less than 50 percent of their food budget in Harbour View. The facilities and amenities were also positively perceived with a very low proportion of respondents seeing those amenities as inadequate. Table 18 sets out the proportions of respondents that typified amenities and facilities as 'completely adequate' or 'inadequate'.

Facility/Amenity	% Respondents Perception 'Completely Adequate'	% Respondents Perception 'Inadequate'
Exercise	58.6%	0.0%
Walking the dog	56.7%	0.0%
Taking children to play	53.3%	3.3%
Seeing local wildlife	33.3%	6.7%
Sport	4.4%	6.9%

Table 18: Perceived Adequacy of Amenities and Facilities for Activities in Harbour View

In relation to environmental issues, 31.3 percent of respondents expressed themselves as 'very concerned' about the environment. 65.6 percent reported that they felt 'fairly concerned'. There variable proportions that reported using what they considered energy-saving activities (Table 19), 59.4 percent believed that they lived in an energy efficient or energy saving house.

Energy Reducing Activity Used	% of Respondents
Turn off lights in empty rooms	93.8%
Use open windows for ventilation in preference to power driven methods such as electric fans	90.6%
Take showers instead of baths	81.3%
Leave empty rooms unheated (or at a low temperature)	71.9%
Time heaters and heating systems to be on only when someone is at home	53.1%
Heat only the water you need	46.9%
Set thermostats on heaters and heating systems to the lowest temperature needed to meet your needs	43.8%

Table 19: Respondents Reporting Use of Energy Reducing Activities Harbour View

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In contrast to energy saving, almost none of the respondents recorded actions directed at saving water. The use of dual flush toilets (by 29 of the 32 respondents) was the one action that emerged as leading to water saving. 56.3 percent of respondents reported their house as water efficient and 28 respondents reported paying water charges.

Recycling of waste was more common with 90.6 percent of respondents regularly recycling waste using kerbside recycling collections. Only seven households use waste stations and eight households compost in their garden areas.

5.6   Blake St, Ponsonby

higher density, mixed use, higher cost urban brownfield
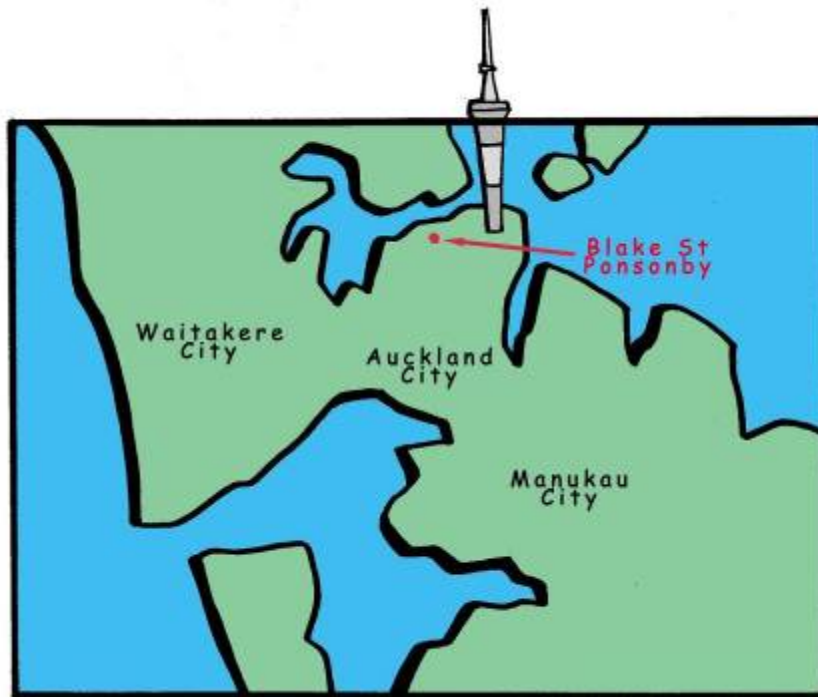
Figure 13: Location of Blake Street area in Auckland

The area studied is a relatively new (less than 10 years old) development south-west of the
Jervois and Ponsonby Road intersection, consisting of 142 dwellings. The development consists
of a mixture of relatively upmarket terrace houses and small apartments on a former light
industrial site and is very urban in nature. There are several old villas and older commercial
buildings within the study area. The development is within an easy walk of both Jervois and
Ponsonby Roads and the wide variety of services, shops and entertainment available there. The
site borders Ponsonby Intermediate School and a primary school is nearby. Bus services are
easily accessible and frequent. Tole Street Reserve and other small neighbourhood reserves are
within walking distance. The area has a high percentage of impermeable surfaces and some
contamination is present due to its previous use.

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Key Positives	Key Negatives
Good walking environment.	Lack of affordable housing.
Good range of services available locally.	High run off.
Good bus service available.	Reserves in walking distance are limited.
Very dense development. High level of resident satisfaction with privacy, dwelling condition, their dwellings' outdoor environment and parking amenities. Most residents report feeling safe walking at night.	Very high proportion of residents access services outside the neighbourhood by car.

Table 20: Key Positives and Negatives, Blake St, Ponsonby

The Blake Street Neighbourhood study area is a very small part of the Ponsonby East CAU. The study area is bounded by Blake Street, Prosford Street and Sheehan Street and comprises a modern higher density enclave within an older but gentrified and expensive neighbourhood that sits on the cusp of Ponsonby and Herne Bay. It is important to note, therefore, that the CAU data may not accurately reflect the study area but it provides a useful context for the information.

Consistent with the surrounding city, the population in this CAU increased between the 1996 and 2001 censuses (6.5 percent) and had a usually resident population of 3300 living in 1287 households in 2001. Over half of these (52 percent) were owned with or without a mortgage. The area thus has a high number of rental properties. The study area included 142 of these households.

The average household size in Ponsonby East was smaller than the average for Auckland City (2.7) and New Zealand (2.7) as a whole at 2.5 people. In 2001, there were 675 families in Ponsonby East. 52 percent of these were couples without children, 32.4 percent were couples with children and 15.6 percent were one parent families. At this time most of the population was aged between 15 and 65 (83 percent). Just over 11 percent were aged under 15 years and 5.6 percent were aged over 65 years. The most common ethnic group was European (82.5 percent) and there were significantly less Maori and Asian people, and slightly less Pacific people, in Ponsonby East than for the whole of Auckland City.

In 2001, 53.2 percent of residents in the Ponsonby East had a post-school qualification, compared to 41.2 percent in Auckland City. The median income of people in Ponsonby East was $33,100, compared with $22,300 for Auckland City and $18,500 for all of New Zealand. The most popular occupational group in Ponsonby East was Professionals (26.9 percent) and the rate of unemployment was lower in Ponsonby East (5.2 percent) than that of Auckland City (7.9 percent) and of New Zealand (7.5 percent).

The total average annual spending for households in Ponsonby East was $59,493 compared with $50,178 for households in Auckland City and $43,682 for the whole of New Zealand. 97.3 percent of households in Ponsonby East had access to a telephone and 51.9 percent of households had access to the internet, while 89.1 percent of households had access to a motor vehicle.

In 2002 here were 736 business locations (geographic units) in Ponsonby East but significantly more in the neighbouring area.

Photograph 4.13: Home occupation

The Blake Street neighbourhood is very dense as a small enclave of new development within a wider neighbourhood largely dominated by old villas immediately to the south and light industrial units to the north. It is close to the shops, cafes and restaurants of both Jervois Road and Ponsonby Road. The neighbourhood's character and vibrancy largely feeds of these neighbouring facilities, rather than of facilities within the neighbourhood.

The neighbourhood is very walkable, with a relatively pleasant streetscape. The independent urban design audit highlighted that the light industrial nature of Prosford Street and limited interaction between some buildings and the street make the streetscape less pleasant but still rated walkability for Ponsonby at 4 out of 5. The research team also felt that none of these issues would be significant barriers to walking; in fact the old light industrial units on the northern side of Prosford Street were noted as adding a certain charm to the area. These units also appeared to provide an opportunity for small-scale industries to locate in the area.

The research team also noted that several homes were being used for home occupations and that some older villas had been converted to commercial premises. Both are an indication of housing stock flexibility. A former rugby club has been converted into a commercial building. Also, under construction, is an apartment block with a café on the ground floor.

The housing stock is of extremely high quality and the risk of dilapidation was assessed as being low. The provision of a high number of small apartments (mainly one bedroom) appears to fill a gap in the local housing stock, which appears largely dominated by old, three bedroom villas.

Photograph 4.14: Terrace housing

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Although most developments had a good relationship to the road and provided passive surveillance, two developments did not. One shown here appears to have the only access into the dwellings via a garage. It is however noted that living spaces still face the road on this challenging site.

The development contains no public open space and there are few neighbourhood reserves in walking distance. The school grounds however appear open to the public (or at least were on the day of the fieldwork) and these contain a fitness trail.

Photograph 4.15: Townhouse development of driveway

The natural environment has been heavily modified many years ago and there would have been no significant ecological features or habitats present at the time of development of the new townhouses and apartments.

More generally, the Blake Street case study area is marketed by real estate agents as a place in which to live the city lifestyle easily. It is promoted as sophisticated, executive, secure and private. Marketing targets busy people and high achievers. Emphasis is placed on carparking, the abundance and proximity to local facilities and amenities, and the possibilities of working from home.

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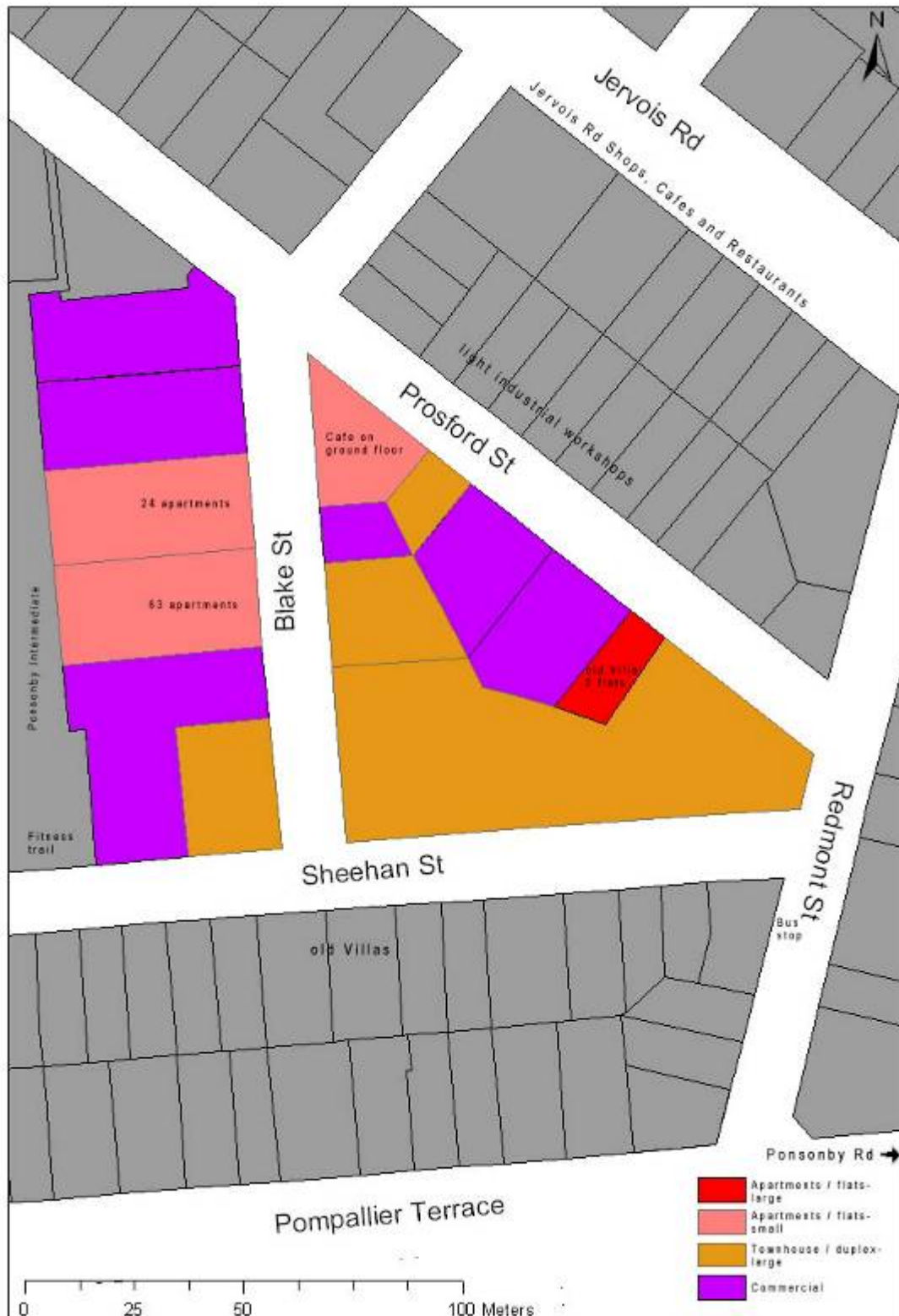
Figure 14: Blake Street study area

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Sustainability Framework: NH102/2

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Page 85

5.6.2 LEED-ND assessment results
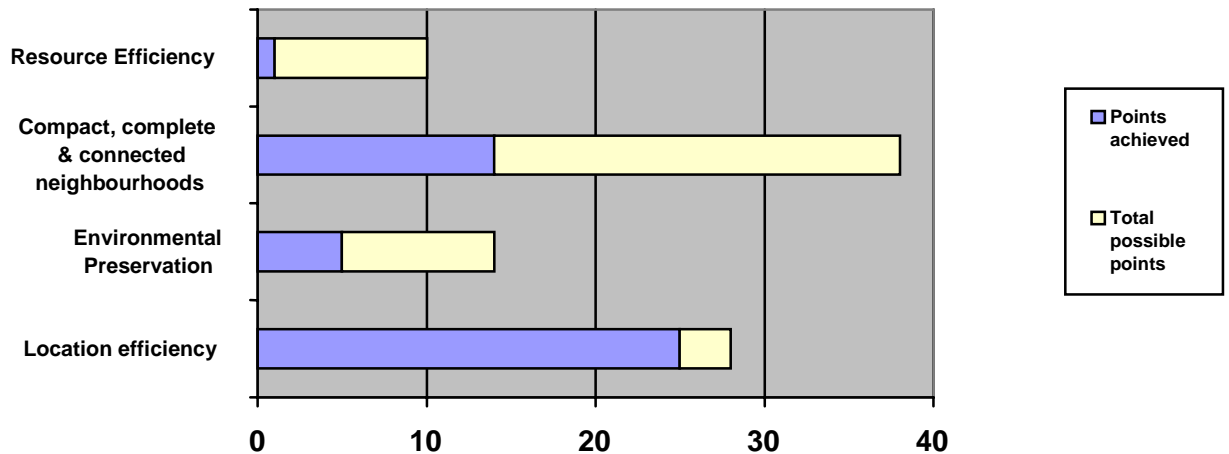
Figure 15: LEED-ND Summary of results, Blake Street

Location Efficiency – 25 out of 28 points

All prerequisites are achieved. The following key points stand out for Blake Street:

- The development is on a brownfield site and therefore scores highly because it involved the clean-up of contaminated land and because the site was previously developed.
- The development is within easy walking distance (400m) of all 15 service types described by LEED-ND.
- Very good bus services are available nearby.
- Early childhood education, primary and intermediate schools are nearby (within 800 m), however the only secondary schools available are catholic single sex schools that are unlikely to cater to all local needs. A school bus to Northcote College is however available.
- A good number of local jobs are available.
- There are local reserves available, however they are relatively small.

Lessons for the use of LEED-ND as part of NSF**:**

- Blake Street scored highly in this category reflecting its urban nature, good public transport service and the fact that the site was previously developed. This appears to be appropriate when comparing its score with Harbour View and Petone.

Environmental Preservation – 5 out of 14 points

All prerequisites are achieved. The following key points stand out for Blake Street:

- Blake Street does not have any significant ecological features.
- No attempts to reduce stormwater run-off or undertake stormwater treatment appear to have been made.

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Lessons for the use of LEED-ND as part of NSF:

- It is interesting that Blake Street scores slightly higher than Harbour View. This reflects that it utilises a previously developed site.

Compact, Complete & Connected Neighbourhoods – 14 out of 38 points

All prerequisites are achieved. The following key points stand out for Blake Street:

- The residential component of the development is very dense, however the commercial intensity scores much lower.
- Housing diversity within the development is low, however when the wider area is assessed the Blake Street development adds to diversity by providing dwelling types previously under-represented.
- One site contains dwellings facing a common driveway, rather than a public street. This results in the loss of points related to several credits.
- Only the residents on the western side of Blake Street can access services beyond the development without crossing a road without a pedestrian crossing. However the local roads are not busy and easy to cross.

Lessons for the use of LEED-ND as part of NSF:

- The requirement to only count access to local services if these can be walked to without crossing any road without pedestrian crossings seems inappropriate when the roads in question are relatively quiet.
- The development is clearly very walkable, however it scored relatively poorly because one site contained dwellings facing a joint driveway, rather than a public road. This credit may need to be reworked to better reflect its intent of passive surveillance of the road which was clearly present in this development.
- The development would have achieved the maximum score for residential density if this were separated from commercial intensity. It seems unreasonable to penalise intensive largely residential developments for containing a few not very intense commercial premises.
- Assessment of housing diversity beyond the project boundary is labour intensive, however it is an important part of assessing diversity and probably needs to be done for all smaller and relatively homogenous neighbourhoods, particularly when they are quite different from the surrounding area.
- Blake Street is a very compact development that is well serviced. It is surprising that it scored so low in this category. The research team believes that this raises serious questions about this category of the LEED-ND tool in the New Zealand context.

Resource Efficiency – 1 out of 10 points

There are no prerequisites in this category. The following key points stand out for Blake Street:

- The only credit earned is for the absence of in-built irrigation in communal areas. Blake Street does not have any communal infrastructure or services aimed at the reduction of resource use.

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Sustainability Framework: NH102/2

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Page 87

5.6.3 Neighbourhood Survey

The Blake St, Ponsonby residents sample consists of 24 householders. Seventy-five percent of those residents have lived in Blake St, Ponsonby less than four years and fifty-eight percent reported that they intend to move from their current house within the next few years. The largest single group (28.6 percent) of intending movers reported that a move would be prompted by a desire to shift from rental to owner-occupation.

Residents reported that Blake St, Ponsonby was desirable because of the following factors:

- Quality of local facilities (amenities and services) (75.0 percent)
- Parking space for cars (75.0 percent)
- Quality of the neighbourhood (design and materials) (50.0 percent)
- Convenient to work (50.0 percent)
- Type of home (e.g. 2-storey house/flat/bungalow) (45.8 percent)
- General appearance of the neighbourhood (45.8 percent)
- Convenient to public transport (37.5 percent)
- Size of home (33.3 percent)
- Convenient to city or town centre (33.3 percent)
- Private garden (16.7 percent)
- Convenient to family/friends (8.3 percent)
- Energy efficient development (4.2 percent)
- Potential to extend/change house (4.2 percent)

Nearly half these residents have access to a patio or yard (45.8 percent). A third (33.3 percent) have access to a roof terrace or large balcony and smaller proportion (29.2 percent) have access to a private garden. Under a fifth (16.7 percent) report sharing a garden or communal space with their neighbours.

The housing type of respondents in Blake St, Ponsonby is predominantly apartments (62.5 percent) with a mix of detached and other buildings. The dwelling stock for these residents is spread between one and two-bedroom (66.7 percent) and the three and four-bedroom (33.3 percent) dwellings.

The vast majority of these residents expressed satisfaction with the degree of privacy they had (87.5 percent), the condition of their house (79.2 percent) their dwelling's out door environment (62.5 percent) and parking amenities (87.5 percent).

The vast majority of these residents (95.8 percent) had access to a private car or van. Only one household reported that they have access to a motorcycle, but a third (33.3 percent) report access to an adult bicycle.

These residents reported high levels of service and amenity use within Blake St, Ponsonby. Table 21 sets out the proportions of respondents reporting use of various services within Ponsonby.

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Sustainability Framework: NH102/2

Page 88

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Service	% Respondents Using Services Within Blake St, Ponsonby	% Walking
Local shops e.g. food, newsagent, post office	100.0%	100.0%
Pub, café or restaurant	100.0%	95.8%
Shopping centre	91.7%	31.8%
Open space, park, play areas	91.7%	90.9%
Healthcare centre or GP practice	83.3%	65.0%
Workplace	66.7%	37.5%
Community hall or place of worship	25.0%	50.0%
Indoor leisure facilities	41.7%	40.0%
School	29.2%	85.7%

Table 21: Respondent Use of Services within Blake St, Ponsonby

In addition, 96 percent of Blake St, Ponsonby respondents reported visiting friends in Blake St, Ponsonby while 58 percent reported visiting relatives in Blake St, Ponsonby. Table 21 also shows the relatively high proportion of respondents reporting that they walk when accessing services, facilities and amenities within Blake St, Ponsonby. There is relatively low use of cycling and bus travel for in-neighbourhood access. By comparison, Table 22 shows that smaller proportions of respondents use services, facilities and amenities outside the area on a regular basis and when they do so, they predominantly travel to those services, facilities and amenities by car.

Service	% Respondents Using Services Outside Blake St, Ponsonby	% Driving
Shopping centre	87.5%	81.0%
Pub, café or restaurant	83.3%	90.0%
Open space, park, play areas	79.2%	100.0%
Healthcare centre or GP practice	54.2%	92.3%
Local shops e.g. food, newsagent, post office	54.2%	76.9%
Workplace	54.2%	69.2%
Indoor leisure facilities	35.5%	88.9%

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Sustainability Framework: NH102/2

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Page 89

Community hall or place of worship	29.2%	100.0%
School	20.8%	100.0%

Table 22: Respondent Use of Services outside Blake St, Ponsonby

The transport mode of respondents changes, however, when travelling to work or for study purposes, with 96 percent of respondents reporting that they travelled to work or study. Of those respondents, 26.1 percent travelled by public transport and 21.7 percent travelled by foot or bicycle. Notably 69.6 percent of respondents who travelled to work or study reported that they had access to free car parking. The average household car kilometres travelled in the last four weeks was reported as 530 km.

The majority of Blake St, Ponsonby respondents expressed a high degree of confidence about walking in Blake St, Ponsonby with half (50.0 percent) reporting that they felt 'fairly safe' and a third (33.3 percent) reporting feeling 'very safe' while walking alone in the neighbourhood at night. Ninety-two percent of respondents strongly agreed that they felt comfortable and safe while waiting for public transport in the public neighbourhood. Nevertheless, seventeen percent of respondents reported that they found that local traffic travelling fast and making walking unsafe was a 'serious problem' and 58.3 percent reported that this was a 'minor problem'.

Respondents identified a number of ways to encourage walking, cycling and use of public transport in Blake St, Ponsonby. In particular:

- establishment of more convenient pedestrian routes (52.2 percent)
- improved lighting on cycle and pedestrian routes (52.2 percent)
- ensuring good frequency of public transport (52.2 percent)

In addition, 43.5 percent of respondents believe that more convenient access to train and bus stations and more convenient pedestrian crossings would increase public transport use and walkability of the neighbourhood.

There was a high degree of neighbourhood social contact reported by Blake St, Ponsonby respondents (Table 23). The majority of Blake St, Ponsonby respondents (87.0 percent) had friends or relatives in Blake St, Ponsonby.

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Sustainability Framework: NH102/2

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Page 90

Level of Contact	% of Respondents
Know many of the people in your neighbourhood and area nearby	16.7%
Know some of the people in your neighbourhood and area nearby	37.5%
Know a few of the people in your neighbourhood and area nearby	45.8%
Do not know people in your neighbourhood and area nearby	0.0%

Table 23: Degree of neighbourhood social contact Blake St, Ponsonby

In addition, 29 percent of respondents reported belonging to, helping or supporting local community or neighbourhood groups. Thirteen percent of respondents reported active involvement of more than once a month over the last twelve months.

There was a strong feeling expressed about Blake St, Ponsonby as a place of neighbourliness expressed in casual meeting but lower levels of socialising and exchange (Table 24). Nearly a third (31.8 percent) stated that they avoided contact with one or more of their neighbours.

Level of Contact	% of Respondents
Have a chat with/greet neighbours	91.3%
Know neighbours by name	86.4%
Would ask to borrow tools from neighbours	45.5%
See neighbours socially on average once a week	40.9%
Would ask to borrow food from neighbours	22.7%

Table 24: Neighbourliness in Blake St, Ponsonby

Similarly, a positive perception of the quality of the neighbourhood and the people that live there was held among the respondents (Table 25).

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Perception of Neighbourhood	% Respondents Agreeing
Compared with other neighbourhoods, this one has many advantages	91.3%
I feel that I belong to this neighbourhood	81.0%
This is a friendly neighbourhood	78.3%
My local neighbourhood reflects the type of person I am	73.9%
If I needed a favour, I could rely on someone in this neighbourhood to help me	73.9%
I am proud of my neighbourhood	69.6%
People from different backgrounds get on well together in this neighbourhood	56.5%
This is a place where neighbours look out for each other	52.2%

Table 25: Perception of Neighbourhood Blake St, Ponsonby

Three-quarters (75.0 percent) of respondents typified the neighbourhood as a 'very good' place to live, while a quarter typified it as a 'fairly good' place to live. As Table 26 shows, access to shops and access to public transport were seen as especially good.

Facility/Amenity	% of Respondents Reporting 'Very Good'
Access to public transport by foot	91.7%
Provision of shops	66.7%
General appearance of area (i.e. attractiveness)	54.2%
Condition of other homes & gardens within the neighbourhood	45.8%
Street lighting	33.3%
Open spaces and parks	16.7%
Provision of recreational facilities	12.5%

Table 26: Amenity/Facility by Respondent Reporting 'Very Good' Blake St, Ponsonby

Food shopping tends to be done in Blake St, Ponsonby with over two thirds (69.6 percent) of respondents reporting they expended more than fifty percent of their food budget in their neighbourhood. A third reported expending over 75 percent of their food budget in Blake St, Ponsonby. The facilities and amenities were also positively perceived with typically very low proportion of respondents seeing those amenities as inadequate – the exception to this being local wildlife viewing. Table 27 sets out the proportions of respondents that typified amenities and facilities as 'completely adequate' or 'inadequate'.

Facility/Amenity	% Respondents Perception 'Completely Adequate'	% Respondents Perception 'Inadequate'
Walking the dog	45.5%	9.1%
Sport	33.3%	15.8%
Taking children to play	30.8%	7.7%
Exercise	28.6%	9.5%
Seeing local wildlife	14.3%	50.0%

Table 27: Perceived Adequacy of Amenities and Facilities for Activities Blake St, Ponsonby

In relation to environmental issues, fifty-four percent of respondents expressed themselves as very concerned about the environment. Forty-two percent reported that they felt 'fairly concerned'. There was a significant proportion that reported using what they considered energy-saving activities (Table 28), and half the respondents (50.0 percent) believed that they lived in an energy efficient or energy saving house.

Energy Reducing Activity Used	% of Respondents
Leave empty rooms unheated (or at a low temperature)	91.7%
Use open windows for ventilation in preference to power driven methods such as electric fans	87.5%
Turn off lights in empty rooms	83.3%
Take showers instead of baths	75.0%
Time heaters and heating systems to be on only when someone is at home	62.5%
Set thermostats on heaters and heating systems to the lowest temperature needed to meet your needs	54.2%
Heat only the water you need	12.5%

Table 28: Respondents Reporting Use of Energy Reducing Activities Blake St, Ponsonby

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In contrast to energy saving, almost none of the respondents recorded actions directed at saving water. The use of dual flush toilets (used by 79.2 percent of respondents) was the one action that emerged. Six respondents reported that they were exposed to water charges. Two fifths of respondents (40.9 percent) reported their house as water efficient.

Recycling of waste was more common with 86.4 percent of respondents regularly recycling waste. The vast majority of respondents (87.0 percent) use kerbside recycling collections. Nine percent use waste stations and thirteen percent have composting facilities in their garden areas.

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Sustainability Framework: NH102/2

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Page 94

5.7 Petone

higher density, mixed use, older neighbourhood
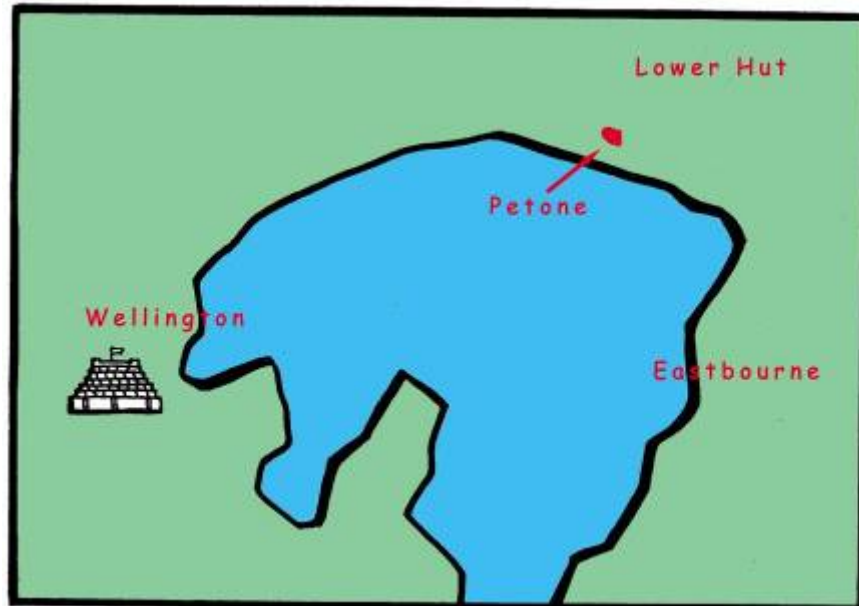
Figure 16: Location of Petone in the Wellington area

The neighbourhood studied consists of 657 dwellings and is bound by The Esplanade, Victoria, Cuba and Jackson Streets. It includes both sides of Jackson Street. The neighbourhood is older, containing a variety of dwellings from over 100 years old to less than one year old. It started out as a relatively low cost neighbourhood serving the freezing works (now closed) at the western end of Petone. In recent years the area has become

Photograph 4.16: Evening Post building, Jackson Street

more upmarket and now has a large number of restaurants and cafes on Jackson Street attracting people from the wider Wellington region. Jackson Street is a designated heritage area and maintains its role as a local service centre with shops selling a wide variety of products including appliances, paint, fresh produce and speciality items. Bus services are regular, a train service exists at the western end of Petone and a ferry service into downtown Wellington was recently established. There are two full primary schools (year1-8) and early childhood centres available locally, however there is no local secondary school. All residents are within easy

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Sustainability Framework: NH102/2

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Page 95

walking distance of Petone beach and the associated reserve, additionally there are a number of smaller neighbourhood reserves and extensive sports grounds available within walking distance.

The area has a high percentage of impermeable surfaces and some contamination is present due to its previous use.

Key Positives	Key Negatives
Good walking environment. Good range of services available locally. Good bus service available. Very diverse neighbourhood. Some affordable housing present. Residents mainly use local services and most access these by walking. High level of casual interaction among neighbours.	Lack of pedestrian crossings on The Esplanade. No high school nearby. Majority of residents felt that fast moving traffic was a problem that made walking unsafe.

Table 29: Key Positives and Negatives, Petone

The Petone Neighbourhood study area is largely located within the Esplanade CAU. The study area is bounded by Victoria Street, Jackson Street, Cuba Street and the Esplanade. One side of Victoria Street is outside the Esplanade CAU and the CAU is only slightly larger than the study area.

Consistent with the surrounding city, the population in this CAU declined slightly between the 1996 and 2001 censuses (-0.4 percent) and had a usually resident population of 2,436 living in 954 households in 2001. Over half of these (57.5 percent) were owned with or without a mortgage. The area thus has a high number of rental properties. The study area included 657 of these households.

The average household size in Esplanade was smaller than the average for Lower Hutt (2.7 percent) and New Zealand as a whole (2.7 percent) at 2.5 people. In 2001, there were 606 families in Esplanade. 40.1 percent of these were couples without children, 35.6 percent were couples with children and 23.8 percent were one parent families. At this time most of the population was aged between 15 and 65 (70 percent). Almost 20 percent were aged under 15 years and just over 10 percent were aged over 65 years. The most common ethnic group was European (69.7 percent). There were more Maori and Pacific peoples in Esplanade than for the whole of Lower Hutt City and about the same number of Asian peoples.

In 2001 37.5 percent of residents in the Esplanade CAU had a post-secondary school qualification, compared to 33.6 percent in Lower Hutt City, and the median income of people in Esplanade was $21,500, compared with $22,000 for Lower Hutt City and $18,500 for all of New Zealand. The most popular occupational group in Esplanade was Professionals (17.8 percent) but the rate of unemployment was higher in Esplanade (10.0 percent) than that of Lower Hutt City (7.8 percent) and of New Zealand (7.5 percent).

Photograph 4.17: Commercial street

The total average annual spending for households in Esplanade was $42,302 compared with $46,099 for households in Lower Hutt City and $43,682 for the whole of New Zealand. 95.0 percent of households in Esplanade had access to a telephone and 34.4 percent of households had access to the internet, while 78.2 percent of households had access to a motor vehicle.

The research team found Petone to be very walkable, with a wide variety of local services available in walking distance and a streetscape that is interesting and functional. Several of the residential streets are designated "Slow Zones" and have traffic calming measures. While there are issues with cars parking on the footpath and poor building/street interface in the light industrial area in the west of the study area, this is unlikely to be a significant deterrent to walking in the area.

Walking after dark in this part of the neighbourhood may be less pleasant. There are, however, alternative routes available to access the train station or bulk retail areas from the main residential areas. The independent urban design assessment concurred and rated walkability for Petone at 5 out of 5.

Photograph 4.18: Apartment development at the back of main street shops

The housing stock in Petone is extremely diverse and appears to cater for a wide mix of people. Small old workers' cottages are often adjacent to 1970s flats and newer town houses and there appears to be relatively affordable rental housing available alongside renovated owner occupied workers cottages. Along the main street there are a number of new apartment developments alongside older blocks of flats and flats above shops.

The area has vertical mixed use with many of the shops on the main street having accommodation above as well as industrial and commercial uses within the residential area. Many of the spaces would be suitable for locals starting a small business near home.

On the surface Petone seems like a socially inclusive neighbourhood where people can meet most of their day to day needs locally. The research team found the area to be very interesting because of its diverse building stock which appears to have adapted well over the last 100 or so years.

The quality of the housing stock is mixed with some dwellings in quite poor condition, however the overall impression of the neighbourhood is positive, partly because it is so mixed and partly because the number of poor quality buildings is relatively low.

The neighbourhood also features some buildings and small developments with extremely poor urban design, such as street facades dominated by garages, however this appears not to affect the overall walkability and attractiveness of the area.

Photograph 4.19: New mixed use development

There are a variety of public spaces available in the neighbourhood. The beach reserve has an extensive playground catering for small and older children and there are a number of small more urban public spaces on the northern side of Jackson Street. The urban design audit however noted that the neighbourhood role of these spaces is limited. The research team agrees that there is a lack of small neighbourhood reserves on the southern side of Jackson Street, however it particularly liked the small intimate public reserve just north of Jackson Street pictured here, which is overlooked by a community house.

Photograph 4.20: Small neighbourhood reserve north of Jackson St

The natural environment has been heavily modified for a long time and as a result there are no significant ecological features in the study area. An exception to this is the shoreline, which is likely to have some significance, however this too is heavily modified.

More generally, Petone is marketed by real estate agents as a place in which to invest. As well as investors, marketing targets families and first home owners. Descriptions such as charming, secluded and popular, traditional yet trendy are common. Petone is also often promoted as walkable, within easy access to a great variety of local facilities and amenities as well as motorway access to Wellington City. Dwellings are frequently marketed as ripe for capital gains and car parking is emphasised.

Figure 17: Petone study area

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5.7.2 LEED-ND assessment results
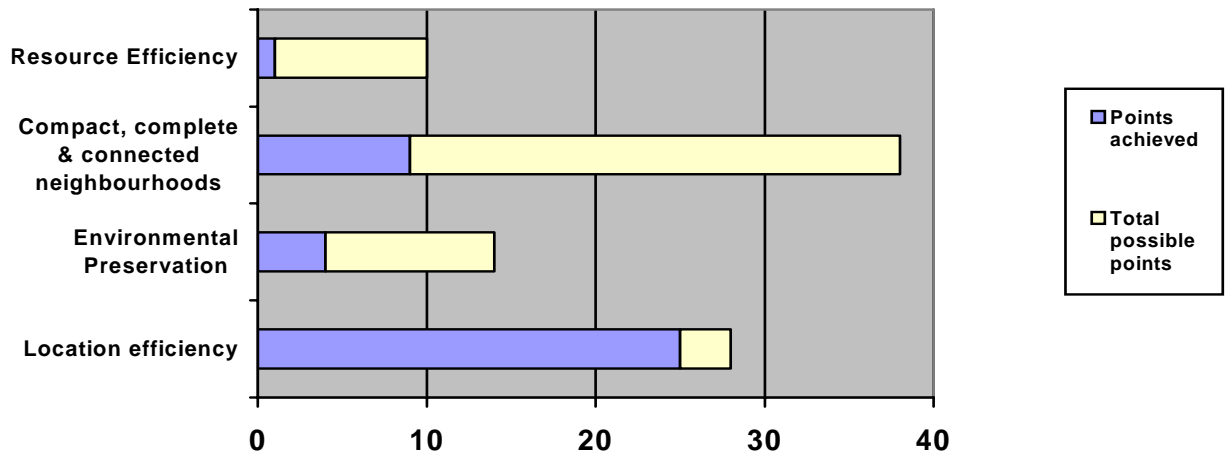
Figure 18: LEED-ND Summary of Results, Petone

Location Efficiency – 25 out of 28 points

All prerequisites are achieved. The following key points stand out for Petone:

■ The development is on a brownfield site and therefore scores highly because it involved the clean-up of contaminated land and because the site was previously developed.

■ The development is within easy walking distance (400m) of all 15 service types described by LEED-ND.

■ Very good bus service and a limited ferry service are available nearby. The train station is not within 800m of the majority of dwellings, however it is nearby.

■ A full primary school and a kindergarten are available within walking distance. There is no high school nearby.

■ A good number of local jobs are available.

■ A variety of public spaces are available.

Lessons for the use of LEED-ND as part of NSF:

■ Petone scored well in this category reflecting its urban and well connected nature.

Environmental Preservation – 5 out of 14 points

All prerequisites are achieved. The following key points stand out for Petone:

■ Petone does not have any significant ecological features within the study area that are assessed by LEED-ND. There is however an aquifer present that supplies free drinking water to the community and the neighbourhood borders the foreshore.

■ No attempts to reduce stormwater run-off or undertake stormwater treatment appear to have been made.

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Sustainability Framework: NH102/2

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Page 100

Lessons for the use of LEED-ND as part of NSF:

■ It is hard to assess these issues for neighbourhoods that were developed a long time ago. It is assumed that there would have been significant ecological features before development occurred over a hundred years ago. It is beyond the scope of this study to investigate the distant past.

Compact, Complete & Connected Neighbourhoods – 9 out of 38 points

All prerequisites are achieved. The following key points stand out for Petone:

■ Petone earned no points for density because its density of 35 dwellings per hectare is just below the minimum required.
■ The Simpson housing diversity index was surprisingly low.
■ Petone lost a lot of points due to the long narrow block shape, which increased block perimeter, reduced intersections and through roads in the east west direction.
■ One site contains dwellings facing a common driveway, rather than a public street. This results in the loss of points related to several credits.
■ The research team feels that the score in this category poorly assesses a neighbourhood that is clearly compact, complete and well connected.

Lessons for the use of LEED-ND as part of NSF:

■ The requirement to only count access to local services if these can be walked to without crossing any road without pedestrian crossings seems inappropriate when the roads in question are relatively quiet.
■ The development is clearly very walkable, however it scored relatively poorly because one site contained dwellings facing a joint driveway, rather than a public road. This credit may need to be reworked to better reflect its intent of passive surveillance of the road which was clearly present in this development.
■ The density requirements will require adjustment for the New Zealand context. Petone is a relatively dense neighbourhood and it seems inappropriate that it did not achieve any points in this category. Petone is twice as dense as Harbour View, yet both achieved the same score of 0.

Resource Efficiency – 1 out of 10 points

There are no prerequisites in this category. The following key points stand out for Petone:

■ The only credit earned is for the absence of in-built irrigation in communal areas. Petone does not have any communal infrastructure or services aimed at the reduction of resource use.

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5.7.3 Neighbourhood Survey

The Petone residents' sample consists of 90 householders. Forty-three percent of those residents have lived in Petone less than four years, 31 percent reported that they intend to move from their current house within the next few years. The largest single group (36 percent) of intending movers reported that a move would be prompted by a desire to shift from rental to owner-occupation.

Residents reported that Petone was desirable because of the following factors:

- Quality of local facilities (amenities and services) (53.3 percent)
- Size of home (52.2 percent)
- Convenient to public transport (45.6 percent)
- General appearance of the neighbourhood (45.6 percent)
- Type of home (e.g. 2-storey house/flat/bungalow) (37.8 percent)
- Private garden (35.6 percent)
- Convenient to city or town centre (32.2 percent)
- Convenient to work (32.2 percent)
- Parking space for cars (28.9 percent)
- Convenient to family/friends (21.1 percent)
- Quality of the neighbourhood (design and materials) (20.0 percent)
- Potential to extend/change house (15.6 percent)

The majority of these residents have access to a private garden (86.5 percent) and a patio or yard. A minority (14.6 percent) report sharing a garden or communal space with other households.

The housing type in Petone is mixed with 26.1 percent living in structures that are semi-detached, apartment or other buildings. The dwelling stock for these residents is spread between one and two-bedroom (44.8 percent) and the three and four-bedroom (52.8 percent) dwellings.

The vast majority of these residents expressed satisfaction with the degree of privacy they had (66.5 percent), the condition of their house (73.3 percent) their dwellings out door environment (77.9 percent) and parking amenities (75.3 percent).

A small but significant minority of these residents (15.4 percent) had no access to a private car or van. A very small minority reported that they have access to a motorcycle, but 53.3 percent report access to an adult bicycle.

These residents reported high levels of service and amenity use within Petone. Table 30 sets out the proportions of respondents reporting use of various services within Petone.

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Service	% Respondents Using Services Within Petone	% Walking
Local shops e.g. food, newsagent, post office	100.0%	87.9%
Pub, café or restaurant	89.0%	91.4%
Shopping centre	89.0%	53.1%
Open space, park, play areas	87.9%	92.5%
Healthcare centre or GP practice	71.4%	50.8%
Workplace	50.5%	32.6%
Community hall or place of worship	49.5%	85.4%
Indoor leisure facilities	46.2%	59.5%
School	22.0%	50.0%

Table 30: Respondent Use of Services within Petone

In addition, 86.8 percent of Petone respondents reported visiting friends in Petone while 59.3 percent reported visiting relatives in Petone. Table 30 also shows the relatively high proportion of respondents reporting that they walk when accessing services, facilities and amenities within Petone. There is low use of cycling and bus travel for in-neighbourhood access. By comparison, Table 31 shows that smaller proportions of respondents use services, facilities and amenities outside the area on a regular basis and when they do so, they predominantly travel to those services, facilities and amenities by car.

Service	% Respondents Using Services Outside Petone	% Driving
Shopping centre	73.6%	83.6%
Pub, café or restaurant	65.9%	86.7%
Open space, park, play areas	65.9%	80.0%
Healthcare centre or GP practice	56.0%	80.4%
Local shops e.g. food, newsagent, post office	52.7%	83.3%
Workplace	45.1%	63.4%
Indoor leisure facilities	41.8%	86.8%
Community hall or place of worship	25.3%	73.9%
School	16.5%	80.0%

Table 31: Respondent Use of Services outside Petone

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Sustainability Framework: NH102/2

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Page 103

The transport mode of respondents changes, however, when travelling to work or for study purposes, with 81.3 percent of respondents reporting that they travelled to work or study. Of those respondents, 23 percent travelled by public transport and 14.9 percent travelled by foot or bicycle. Notably 62.5 percent of respondents who travelled to work or study reported that they had access to free car parking. The average household car kilometres travelled in the last four weeks was reported as 554 km.

The majority of Petone respondents expressed a high degree of confidence about walking in Petone with 48.4 percent reporting that they felt 'fairly safe' and almost a quarter (24.2 percent) reporting feeling 'very safe' while walking alone in the neighbourhood at night. 74.7 percent of respondents strongly agreed that they felt comfortable and safe while waiting for public transport in the public neighbourhood. Nevertheless, 14.6 percent of respondents reported that they found that local traffic travelling fast and making walking unsafe was a 'serious problem' and 41.6 percent reported that this was a 'minor problem'.

Substantial minorities of respondents identified a number of ways to encourage walking, cycling and use of public transport in Petone. In particular:

■ establishment of more convenient pedestrian routes (41.4 percent)
■ more convenient pedestrian crossings (33.3 percent)
■ improved lighting on cycle and pedestrian routes (26.4 percent)
■ better cycle, pedestrian and public transport connections between community facilities (25.3 percent)

In addition, 31 percent of respondents believes that increased frequency of public transport and more convenient access to train and bus stations would increase their public transport use.

There was a high degree of neighbourhood social contact reported by Petone respondents (Table 32). A considerable proportion of Petone respondents (67.9 percent) had friends or relatives in Petone.

Level of Contact	% of Respondents
Know many of the people in your neighbourhood and area nearby	30.7%
Know some of the people in your neighbourhood and area nearby	30.7%
Know a few of the people in your neighbourhood and area nearby	34.1%
Do not know people in your neighbourhood and area nearby	2.3%

Table 32: Degree of neighbourhood social contact in Petone

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Sustainability Framework: NH102/2

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Page 104

In addition, 40.2 percent of respondents reported belonging to, helping or supporting local community or neighbourhood groups. 28.6 percent of respondents reported active involvement of more than once a month over the last twelve months.

There was a strong feeling expressed about Petone as a place of neighbourliness expressed in casual meeting, support and exchange (Table 33). Only 24.7 percent stated that they avoided contact with neighbours.

Level of Contact	% of Respondents
See neighbours socially on average once a week	52.3%
Have a chat with/greet neighbours	94.4%
Would ask to borrow tools from neighbours	54.7%
Know neighbours by name	93.3%
Would ask to borrow food from neighbours	39.1%

Table 33: Neighbourliness in Petone

Similarly, a positive perception of the quality of the neighbourhood and the people that live there was held among the respondents (Table 34).

Perception of Neighbourhood	% Respondents Agreeing
This is a friendly neighbourhood	84.6%
Compared with other neighbourhoods, this one has many advantages	84.3%
If I needed a favour, I could rely on someone in this neighbourhood to help me	74.4%
I am proud of my neighbourhood	74.2%
I feel that I belong to this neighbourhood	73.0%
People from different backgrounds get on well together in this neighbourhood	72.5%
This is a place where neighbours look out for each other	71.9%
My local neighbourhood reflects the type of person I am	57.3%

Table 34: Perception of Neighbourhood in Petone

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Sustainability Framework: NH102/2

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Page 105

Almost two thirds (64 percent) of respondents typified the neighbourhood as a 'very good' place to live, while 34.8 percent typified it as a 'fairly good' place to live. As Table 35 shows, access to shops and access to public transport were seen as especially good.

Facility/Amenity	% of Respondents Reporting 'Very Good'
Access to public transport by foot	94.5%
Provision of shops	80.0%
Open spaces and parks	45.5%
Provision of recreational facilities	43.8%
General appearance of area (i.e. attractiveness)	39.6%
Street lighting	37.4%
Condition of other homes & gardens within the neighbourhood	24.2%

Table 35: Amenity/Facility by Respondent Reporting 'Very Good' in Petone

Food shopping tends to be done in Petone with 86.5 percent of respondents reporting they expended more than 50 percent of their food budget in Petone. Indeed the majority (61.8 percent) reported expending 76-100 percent of their food budget in Petone. The facilities and amenities were also positively perceived with very low proportion of respondents seeing those amenities as inadequate. Table 36 sets out the proportions of respondents that typified amenities and facilities as 'completely adequate' or 'inadequate'.

Facility/Amenity	% Respondents Perception 'Completely Adequate'	% Respondents Perception 'Inadequate'
Exercise	51.7%	1.1%
Taking children to play	50.6%	0.0%
Walking the dog	44.9%	3.4%
Sport	36.8%	0.0%
Seeing local wildlife	26.1%	8.0%

Table 36: Perceived Adequacy of Amenities and Facilities for Activities Petone

In relation to environmental issues, 36.7 percent of respondents expressed themselves as 'very concerned' about the environment. Fifty percent reported that they felt 'fairly concerned'. There was a significant proportion that reported using what they considered energy-saving activities (Table 37), but only 34.4 percent believed that they lived in an energy efficient or energy saving house.

Energy Reducing Activity Used	% of Respondents
Time heaters and heating systems to be on only when someone is at home	47.8%
Set thermostats on heaters and heating systems to the lowest temperature needed to meet your needs	54.4%
Leave empty rooms unheated (or at a low temperature)	87.8%
Heat only the water you need	38.9%
Take showers instead of baths	82.2%
Turn off lights in empty rooms	95.6%
Use open windows for ventilation in preference to power driven methods such as electric fans	88.9%

Table 37: Respondents Reporting Use of Energy Reducing Activities in Petone

In contrast to energy saving, almost none of the respondents recorded actions directed at saving water. The use of dual flush toilets (used by 60.2 percent of respondents) was the one action that emerged. No respondents reported that they were exposed to water charges and only 31.9 percent reported their house as water efficient.

Recycling of waste was more common with 92.3 percent of respondents regularly recycling waste. The vast majority of respondents (93.4 percent) use kerbside recycling collections and 40.7 percent use waste stations with 42.9 percent composting in their garden areas.

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Sustainability Framework: NH102/2

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Page 107

5.8 Aranui

Lower density, single use, sustainably branded, low cost, suburban retrofit
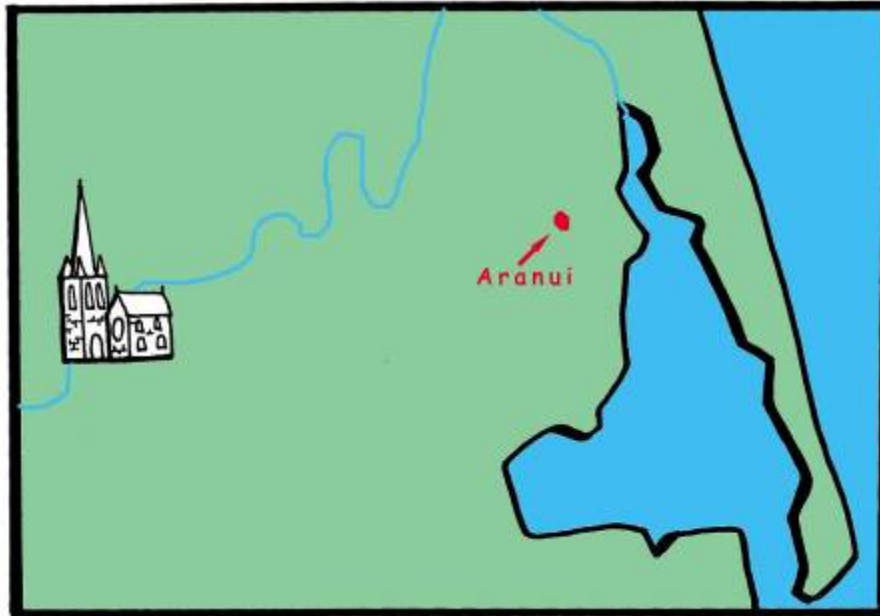
Figure 19: Location of Aranui within Christchurch

The study area of Aranui consists of a large percentage of Housing New Zealand dwellings, and a smaller number of homes in private ownership. There are 322 dwellings in the study area which is bound by Breezes Road, Wainoni Road, Portsmouth Road, Marlow Road and Aranui School.

The area is older but has undergone an extensive neighbourhood renewal programme in recent years. As part of this a new road is being constructed and a number of new dwellings have been constructed. This gives better passive surveillance to the neighbourhood park.

Photograph 4.21. Street in Aranui

There are a range of local community services and basic shopping facilities available within the neighbourhood. Schools and a large supermarket, currently under construction, are nearby.

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Key Positives	Key Negatives
Good walking environment. Good range of community services available locally. Majority of dwellings address the street well. Very functional public space. Affordable housing. High degree of social interaction among neighbours. High level of resident satisfaction with the degree of privacy, the condition of their house, their dwellings out door environment and parking amenities.	Poor interface between some properties and the neighbourhood park. Poor bus stops (no signs, timetables or shelters). The majority of residents report feeling unsafe walking at night. Low perception of quality of the neighbourhood and the people who live there.

Table 38: Key Positives and negatives in Aranui

The Aranui Neighbourhood study area is located within the Aranui Census Area Unit (CAU). The study area is bounded by Breezes Road, Wainoni Road, Portsmouth Road, Marlow Road and Aranui School.

In comparison with the Christchurch City where the population has increased (2.3 percent), the population in this CAU decreased between the 1996 and 2001 censuses (-3.1 percent). The usually resident population of 4530 lived in 1554 households in 2001. Over half of these (56.1 percent) were owned with or without a mortgage. The area thus has a high number of rental properties. The study area included 322 of these households.

The average household size in Aranui was larger than the average for Christchurch City (2.5) and New Zealand (2.7) as a whole at 2.8 people. In 2001, there were 1,122 families in Aranui. 27 percent of these were couples without children, 37.2 percent were couples with children and 18.9 percent were one parent families. At this time most of the population was aged between 15 and 65 (63 percent). Almost 28 percent were aged under 15 years and just over 9 percent were aged over 65 years. The most common ethnic group was European (74.4 percent) and there were significantly more Maori and Pacific peoples, and significantly less Asian peoples, in Aranui than for the whole of Christchurch City.

In 2001, 13.9 percent of residents in the Aranui had a post-school qualification, compared to 32.8 percent in Christchurch City, and the median income of people in Aranui was $13,100, compared with $17,600 for Christchurch City and $18,500 for all of New Zealand. The most popular occupational group in Aranui was Plant and Machine Operators and Assemblers (19.6 percent) and the rate of unemployment was higher Aranui (14.3 percent) than that of Christchurch City (6.8 percent) and of New Zealand (7.5 percent).

The total average annual spending for households in Aranui was $33,796 compared with $40,492 for households in Christchurch City and $43,682 for the whole of New Zealand. 88.4

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Sustainability Framework: NH102/2

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Page 109

percent of households in Aranui had access to a telephone and 20 percent of households had access to the internet, while 81.1 percent of households had access to a motor vehicle.

In 2002 there were 83 business locations (geographic units) in Aranui.

Aranui seems to be a pleasant, very walkable neighbourhood with good local services. Passive surveillance of roads is excellent and footpaths are functional. There appears to be a lot of interaction among neighbours with people chatting and children playing in the street (the fieldwork was undertaken during school holidays).

The housing stock is mixed with older 1960 and onwards state housing and some recently built Housing New Zealand Corporation developments. More Housing New Zealand dwellings are under construction. The area is dominated by social housing but some privately owned dwellings also exist (these were possibly sold off by Housing New Zealand in the nineties).

Photograph 4.23. Older housing stock

While some housing is quite old and there are several blocks of two story Housing New Zealand Flats, over all the area appears well cared for. This is probably because of regular maintenance by Housing New Zealand, rather than an inherently durable housing stock.

Wainoni Park is at the centre of the neighbourhood. This is a largely functional reserve with extensive play equipment for younger and older children, including a full basketball court, playing fields and flying fox. There is some informal

seating (on large rocks), however the absence of formal seating was noted. A recreation centre on the park is currently being renovated. The reserve is lined by back fences on two of its four sides. On the north/western edge a new road has been constructed (Ben Rarere Ave, shown in photo below) that will have housing overlooking the reserve, improving the situation dramatically. For the road to be built two blocks of flats have been demolished. A land swap has occurred between Christchurch City Council and Housing New Zealand which has

Photograph 4.24. Ben Rarere Road – houses are under construction on the right side of the road

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ensured that the reserve remained roughly the same size.

The area behind the shops, along the service lane was identified as a potentially problematic area because it lacks surveillance. This area is likely to have safety issues at night.

The row of local shops has a well stocked dairy, which sells fresh produce as well as the usual items, a bar and a number of community organisations aimed at drug rehabilitation, medical services and other social services. There is a local kindergarten and several churches. Over all most day to day needs can clearly be met locally.

There are reasonable local bus services available, however most bus stops lack shelter and time table information. One bus stop did not even have a sign and was only identifiable by people waiting for a bus.

There are no significant ecological features present in the neighbourhood. The reserve consists of grassed areas and some exotic trees. There are no contamination issues in the neighbourhood.

More generally, Aranui is marketed by real estate agents as a place in which to invest in for rental returns as well as a place in which to retire. The proximity to local facilities, amenities and public transport is often highlighted, and the development of a local Pak'n'Save is frequently mentioned. The Aranui neighbourhood is marketed as affordable. Marketing targets families and first home owners as well as those approaching retirement. Car parking is emphasised.

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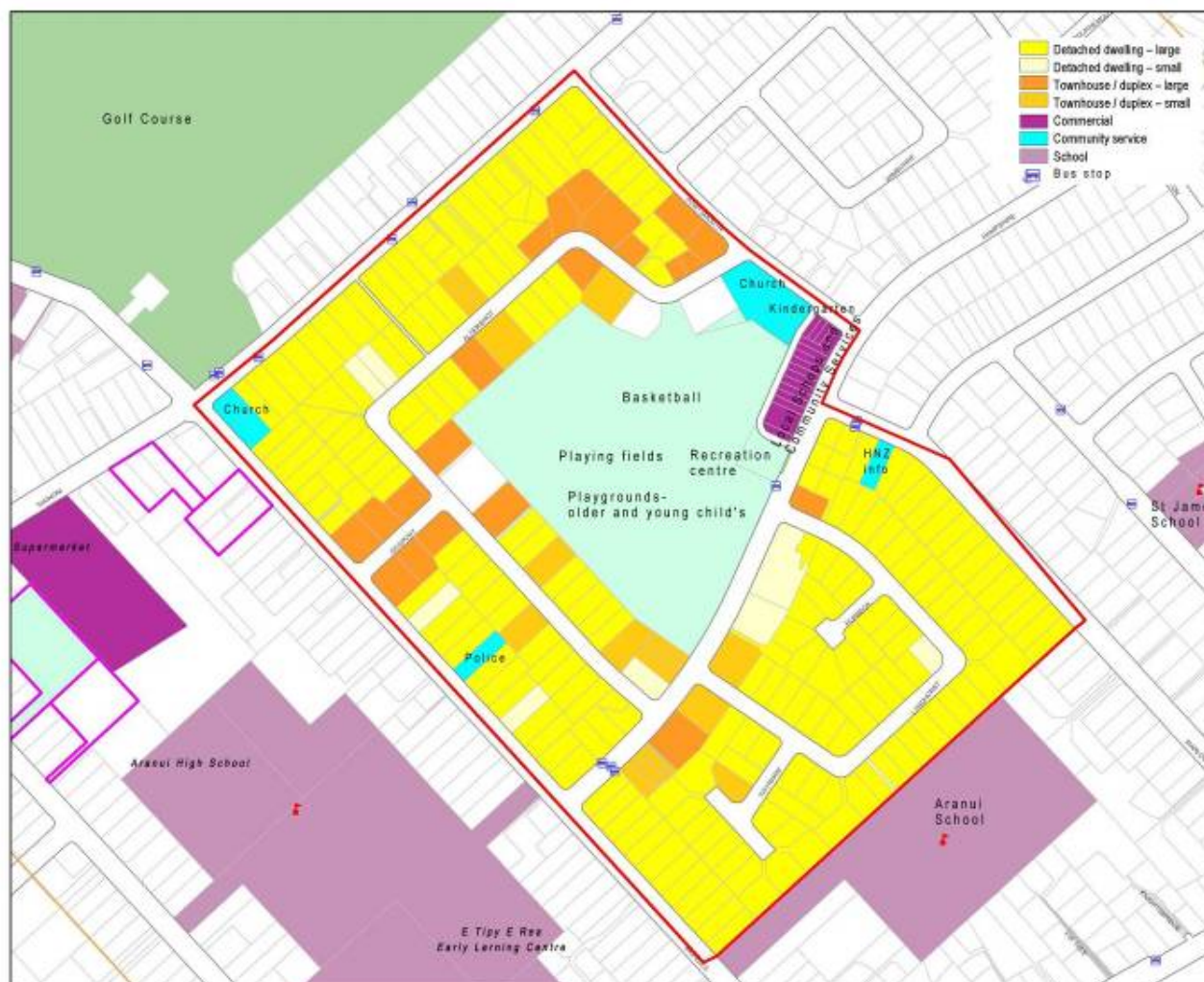
Figure 20: Aranui study area

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5.8.2 LEED-ND assessment results
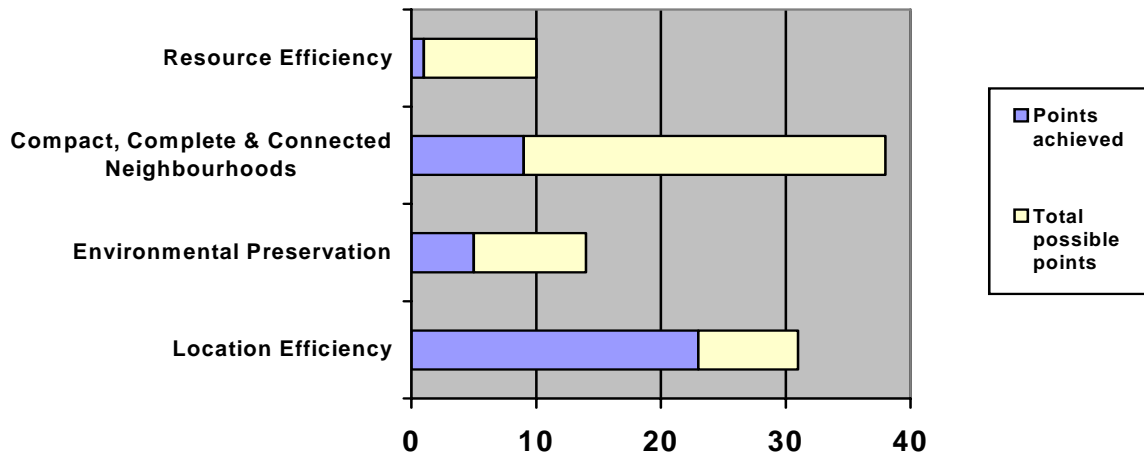
Figure 21: LEED-ND Summary of Results, Aranui

Location Efficiency – 23 out of 31 points

All prerequisites are achieved. The following key points stand out for Aranui:

■ The site is previously developed.
■ There is no contamination present.
■ Bus services are reasonable.
■ Basic services are available locally.
■ Public space is excellent.
■ Access to all four types of schools is available within walking distance.

Lessons for the use of LEED-ND as part of NSF:

■ Aranui scored well in this area, which appears appropriate.

Environmental Preservation – 5 out of 14 points

Not all prerequisites are achieved. The following key points stand out for Aranui:

■ There are no significant ecological features in Aranui.
■ Aranui did not meet the prerequisite for parkland preservation because part of the park was developed when the new road was built.

Lessons for the use of LEED-ND as part of NSF:

■ This section does not work well for existing neighbourhoods, where natural features were modified a long time ago. The few credits aimed at brownfield sites seem questionable in their ecological benefit and largely impractical.
■ The redevelopment of part of the park would have had no significant ecological impact because the park consists of playing fields, grassed area and play equipment and some

**Testing the Prototype Neighbourhood
Sustainability Framework**: NH102/2

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Page 113

exotic trees. Additionally a land swap has resulted in the size of the park remaining roughly the same and the quality of the space has been improved dramatically as a result of the new road.

Compact, Complete & Connected Neighbourhoods – 9 out of 38 points

The prerequisite for density is not achieved. The following key points stand out for Aranui:

- Aranui has a high proportion of social housing.
- Availability of local services is good.
- Aranui scores poorly on density and does not meet the prerequisite for density.
- Housing diversity is poor.
- Block perimeters are large.
- The park is lined by high fences on two sides and so is the service lane behind the shops.

Lessons for the use of LEED-ND as part of NSF**:**

- Aranui did not score well in this section, even though it is very walkable, has a good level of local services, reasonable public transport and a high level of social housing. In other words it is a neighbourhood were people can go about their daily life on foot or public transport and generally do not have to travel far. This further highlights issues with this section of LEED-ND identified earlier. The LEED rating also does not pick up one of the main positives identified in Aranui by the research team. Because Housing New Zealand has control over most of the housing stock there are very few high fences and passive surveillance of the roads is therefore excellent.
- That Aranui did not meet the minimum for density highlights the need to calibrate LEED-ND for New Zealand. The density is probably appropriate for a suburban area of Christchurch and any New Zealand tool needs to have different density requirements for different locations.

Resource Efficiency – 1 out of 10 points

There are no prerequisites in this category. The following key points stand out for Aranui:

- The only credit earned is for the absence of in-built irrigation in communal areas. Aranui does not have any communal infrastructure or services aimed at the reduction of resource use.

5.8.3 Neighbourhood Survey

The Aranui residents sample consists of 56 householders. 42.9 percent of those residents have lived in Aranui less than four years, 42.9 percent reported that they intend to move from their current house within the next few years. The largest single group of intending movers reported that a move would be prompted by a desire to shift from the neighbourhood.

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Residents reported that Aranui was desirable because of the following factors:

- Size of home (66.1 percent)
- Private garden (51.8 percent)
- Parking space for cars (46.4 percent)
- Type of home (e.g. 2-storey house/flat/bungalow) (42.9 percent)
- Convenient to public transport (30.4 percent)
- Convenient to family/friends (21.4 percent)
- Quality of local facilities (amenities and services) (19.6 percent)
- Convenient to work (17.9 percent)
- General appearance of the neighbourhood (16.1 percent)
- Convenient to city or town centre (14.3 percent)
- Potential to extend/change house (12.5 percent)
- Energy efficient development (8.9 percent)
- Quality of the neighbourhood (design and materials) (5.4 percent)

The majority of these residents have access to a private garden (89.1 percent) and a patio or yard (58.2 percent).

The housing type for the respondents in Aranui is primarily single storey dwellings. The dwelling stock for these residents is spread between two and three-bedroom dwellings (76.8 percent).

The vast majority of these residents expressed satisfaction with the degree of privacy they had (72.1 percent), the condition of their house (73.1 percent) their dwellings out door environment (71.7 percent) and parking amenities (80.8 percent).

A significant minority of these residents (18.5 percent) had no access to a private car or van. A very small minority reported that they have access to a motorcycle. 67.9 percent report no access to an adult bicycle.

These residents reported high levels of service and amenity use within Aranui. Table 39 sets out the proportions of respondents reporting use of various services within Aranui.

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Service	% Respondents Using Services Within Aranui	% Walking
Local shops e.g. food, newsagent, post office	87.5%	46.9%
Shopping centre	76.8%	34.9%
Healthcare centre or GP practice	75.0%	40.5%
Open space, park, play areas	69.6%	84.6%
Pub, café or restaurant	46.4%	34.6%
Workplace	46.4%	19.2%
Community hall or place of worship	41.1%	66.7%
Indoor leisure facilities	35.7%	35.0%
School	33.9%	57.9%

Table 39: Respondent Use of Services within Aranui

In addition, 85.7 percent of Aranui respondents reported visiting friends in Aranui while 71.4 percent reported visiting relatives in Aranui. Table 39 also shows the relatively low proportions of respondents reporting that they walk when accessing services, facilities and amenities within Aranui. There is low use of cycling and bus travel for in-neighbourhood access. By comparison, Table 40 shows that smaller proportions of respondents use services, facilities and amenities outside the neighbourhood on a regular basis and when they do so, they predominantly travel to those services, facilities and amenities by car.

Service	% Respondents Using Services Outside Aranui	% Driving
Local shops e.g. food, newsagent, post office	76.8%	67.4%
Shopping centre	73.2%	80.5%
Healthcare centre or GP practice	64.3%	69.4%
Open space, park, play areas	51.8%	48.3%
Pub, café or restaurant	46.4%	84.6%
Workplace	42.9%	91.7%
Indoor leisure facilities	39.9%	86.4%
School	33.9%	63.2%
Community hall or place of worship	19.6%	45.5%

Table 40: Respondent Use of Services outside Aranui

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The transport mode of respondents changes, however, when travelling to work or for study purposes, with 76.8 percent of respondents reporting that they travelled to work or study. Of those respondents, 5.3 percent travelled by public transport and 5.3 percent travelled by foot or bicycle. Notably 87.9 percent of respondents who travelled to work or study reported that they had access to free car parking. The average household car kilometres travelled in the last four weeks was reported as 709 km.

The majority of Aranui respondents felt unsafe walking at night. 39.3 percent reporting that they never went out alone at night and 34 percent reporting feeling 'very unsafe' or 'a bit unsafe' while walking alone in the neighbourhood at night. In general safe walking was seen as problematic. 34.6 percent of respondents reported that speeding traffic was a serious problem for walkers. Nevertheless, 92.7 percent reported that they could easily reach public transport on foot. Over two-thirds (68 percent) of respondents reported that they felt comfortable and safe waiting for public transport.

30.2 percent of respondents reported that bus frequency was important to whether they used public transport.

There was a high degree of neighbourhood social contact reported by Aranui respondents (Table 41). A considerable proportion of Aranui respondents (69.6 percent) had friends or relatives in Aranui.

Level of Contact	% of Respondents
Know many of the people in your neighbourhood and area nearby	30.4%
Know some of the people in your neighbourhood and area nearby	26.8%
Know a few of the people in your neighbourhood and area nearby	32.1%
Do not know people in your neighbourhood and area nearby	8.9%

Table 41: Degree of neighbourhood social contact Aranui

A third of respondents (33.3 percent) reported belonging to, helping or supporting local community or neighbourhood groups. 47.1 percent of respondents reported active involvement of more than once a month over the last twelve months.

There was a strong feeling expressed about Aranui as a place of neighbourliness expressed in casual meeting, support (Table 42). But 54.8 percent stated that they avoided contact with at least a few neighbours.

Level of Contact	% of Respondents
Know neighbours by name	90.0%
Have a chat with/greet neighbours	83.7%
See neighbours socially on average once a week	54.5%
Would ask to borrow food from neighbours	17.0%
Would ask to borrow tools from neighbours	10.9%

Table 42: Neighbourliness in Aranui

There is a relatively low perception of the quality of the neighbourhood and the people that live there was held among the respondents (Table 43).

Perception of Neighbourhood	% Respondents Agreeing
If I needed a favour, I could rely on someone in this neighbourhood to help me	64.5%
This is a place where neighbours look out for each other	52.8%
This is a friendly neighbourhood	50.8%
People from different backgrounds get on well together in this neighbourhood	41.3%
Compared with other neighbourhoods, this one has many advantages	41.2%
I am proud of my neighbourhood	31.4%
I feel that I belong to this neighbourhood	31.1%
My local neighbourhood reflects the type of person I am	28.5%

Table 43: Perception of Neighbourhood Aranui

Less than a fifth of respondents typified the neighbourhood as a 'very good' place to live, while 34.5 percent typified it as a 'fairly good' place to live. 18.2 percent typify the neighbourhood as a bad place to live. As Table 44 shows, access to public transport was seen as especially good.

Testing the Prototype Neighbourhood
Sustainability Framework: NH102/2

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Page 118

Facility/Amenity	% of Respondents Reporting 'Very Good'
Access to public transport by foot	70.9%
Open spaces and parks	38.9%
Street lighting	30.2%
Provision of shops	24.1%
Provision of recreational facilities	17.3%
Condition of other homes & gardens within the neighbourhood	7.4%
General appearance of area (i.e. attractiveness)	5.7%

Table 44: Amenity/Facility by Respondent Reporting 'Very Good' Aranui

Food shopping tends to be done outside the Aranui neighbourhood with 62 percent of respondents reporting they expended less than 50 percent of their food budget in the neighbourhood. The facilities and amenities were positively perceived but substantial minorities of respondents saw those amenities as inadequate. Table 45 sets out the proportions of respondents that typified amenities and facilities as 'completely adequate' or 'inadequate'.

Facility/Amenity	% Respondents Perception 'Completely Adequate'	% Respondents Perception 'Inadequate'
Exercise	32.7%	7.7%
Taking children to play	32.0%	6.0%
Sport	26.9%	3.8%
Walking the dog	22.4%	14.3%
Seeing local wildlife	5.2%	28.5%

Table 45: Perceived Adequacy of Amenities and Facilities for Activities Aranui

In relation to environmental issues, 30.8 percent of respondents expressed themselves as very concerned about the environment. 48.1 percent reported that they felt 'fairly concerned'. There were variable proportions that reported using what they considered energy-saving activities (Table 46). 41.8 percent believed that they lived in an energy efficient or energy saving house.

Energy Reducing Activity Used	% of Respondents
Turn off lights in empty rooms	85.7%
Take showers instead of baths	83.9%
Use open windows for ventilation in preference to power driven methods such as electric fans	76.8%
Leave empty rooms unheated (or at a low temperature)	62.5%
Time heaters and heating systems to be on only when someone is at home	37.5%
Set thermostats on heaters and heating systems to the lowest temperature needed to meet your needs	33.9%
Heat only the water you need	26.8%

Table 46: Respondents Reporting Use of Energy Reducing Activities Aranui

In contrast to energy saving, almost none of the respondents recorded actions directed at saving water. The use of dual flush toilets (used by 36.5 percent of respondents) was the one action that emerged as used by a substantial minority. Only one respondent reported that they were exposed to a water charge and only 43.6 percent reported their house as water efficient.

Recycling of waste was common with 92.6 percent of respondents regularly recycling waste. The vast majority of respondents (85.5 percent) use kerbside recycling collections, although 45.5 percent of respondents use waste stations with 34.5 percent composting in their garden areas.

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Sustainability Framework: NH102/2

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Page 120

5.9 Christchurch East Inner City

Higher density, mixed use, lower cost, urban retrofit
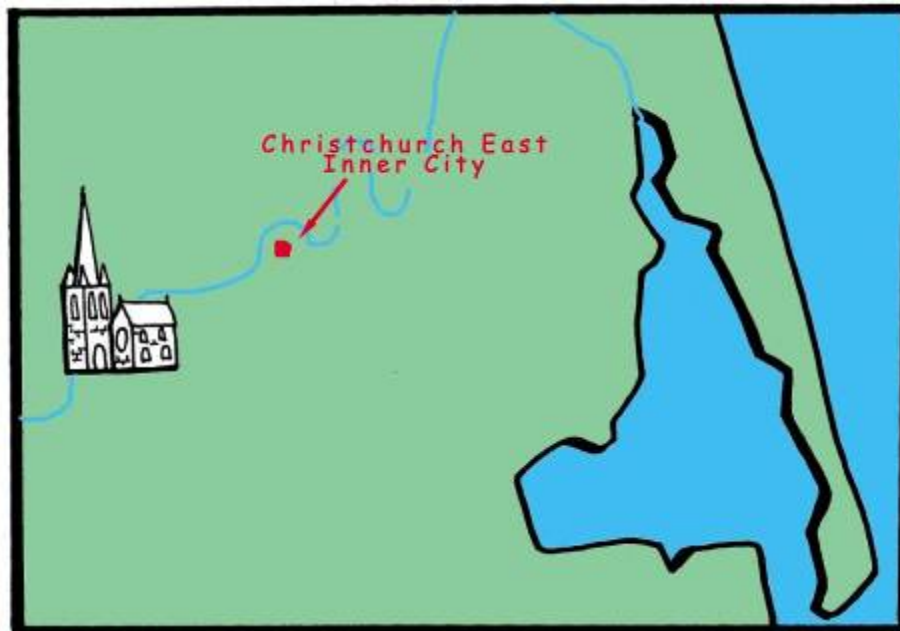
Figure 22: Location of the Christchurch East Inner City Area

The section of Christchurch East Inner City studied contains 755 dwellings and is quite varied with a mixture of higher and lower density housing and commercial and community uses. Because of its location near the centre of Christchurch, public transport and local services are good. Walkability however is low, largely because of fast moving traffic and a tendency for high fences and therefore reduced surveillance of the pedestrian space. There are a large number of derelict houses and empty sections, several of which appear to have been this way for some time. Empty sections are commonly used as car parks and some are fenced and gated with barbed wire along the top.

The study area contains two distinct sub neighbourhoods: Avon Loop, the northern area, bordered by the Avon River and Kilmore Street and the Christchurch East area to the south of Kilmore Street.

Access to reserves is poor. A small neighbourhood park with small children's play equipment is within walking distance of the Avon Loop sub neighbourhood and Latimer Square, which has no seating or other facilities, is close to the remaining dwellings.

Photo 4.25: Mix of older and newer housing

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A full primary school (year 1-8) is available within walking distance, however there are no early childhood centres or high schools within walking distance.

The area contains several buildings listed by the Historic Places Trust that appear to have adapted well over time.

The area does contain some social housing; however, the amount is unclear at this stage as the research team is awaiting a response from Housing New Zealand.

Key Positives	Key Negatives
Location close to the CBD.	Poor walking environment.
Good range of services available locally.	Poor provision of open space.
High housing diversity.	No early childhood or high school education within walking distance.
Social housing included.	
Good public transport service.	Cars travelling fast, making walking unsafe was reported as a problem.
Majority of residents walk, cycle or catch public transport to work.	
Large percentage of residents walk to access services within and outside the neighbourhood.	Majority of people feel unsafe walking alone at night.
	Low level of satisfaction with amenities.
	Low levels of neighbourly interaction.

Table 47: Key Positives and Negatives, Christchurch East Inner City

The Christchurch East Inner City Neighbourhood study area is located within the Avon Loop CAU. The study area is bounded by Oxford Tce, Fitzgerald Ave, Worcester St, Latimer Square and Madras Street.

Consistent with the Christchurch City where the population has increased (2.3 percent), the population in this CAU increased between the 1996 and 2001 censuses, but at a much higher rate (9.3 percent). This is largely due to the construction of higher density dwellings. The usually resident population of 4563 lived in 2169 households in 2001. Less than a quarter of these (23.5 percent) were owned with or without a mortgage. The area thus has a very high number of rental properties. The study area included 755 of these households.

The average household size in Avon Loop was smaller than the average for Christchurch City (2.5) and New Zealand (2.7) as a whole at 1.9 people. This is largely a function of the dwelling type. In 2001, there were 714 families in Avon Loop. 63.4 percent of these were couples without children, 16.4 percent were couples with children and 19.7 percent were one parent families. At this time most of the population was aged between 15 and 65 (83.6 percent). Just over 6 percent were aged under 15 years and over 10 percent were aged over 65 years. The most common ethnic group was European (82.8 percent) and there were slightly more Maori and Asian peoples, and slightly less Pacific peoples, in Avon Loop than for the whole of Christchurch City.

In 2001, 40.1 percent of residents in the Avon Loop had a post-school qualification, compared to 32.8 percent in Christchurch City, and the median income of people in Avon Loop was $16,500, compared with $17,600 for Christchurch City and $18,500 for all of New Zealand. The most popular occupational group in Avon Loop was Service and Sales Workers (16.8 percent) and the rate of unemployment was higher Avon Loop (10 percent) than that of Christchurch City (6.8 percent) and of New Zealand (7.5 percent).

The total average annual spending for households in Avon Loop was $33,625 compared with $40,492 for households in Christchurch City and $43,682 for the whole of New Zealand. 92.6 percent of households in Avon Loop had access to a telephone and 33.6 percent of households had access to the internet, while 71.9 percent of households had access to a motor vehicle.

In 2002 here were 733 business locations (geographic units) in Avon Loop but significantly more in the neighbouring area

Christchurch East Inner City is an older area in the inner city that has seen continuous re-development over the last 50 or so years. Some of the original large and often two storey homes and smaller workers' cottages built early last century remain and a small number have been renovated. Many are in poor condition. A number of medium and higher density dwellings have been built in more recent times. These range from 1960s attached units to modern apartment blocks. As a result the area's housing stock is extremely diverse.

Photo 4.26: Medium density development

The area contains a wide mix of uses, including light industrial, residential, community facilities, an arts centre, hotels, retail and other commercial activities. Several of the older local shops have accommodation above.

Photo 4.27: Overgrown section

The condition of dwellings is generally poor, with several abandoned houses and overgrown sections. Other houses have been pulled down and the sections are used as pay and display car parks while awaiting re-development. Many of the larger two storey old houses appear to be boarding houses. Overall the neighbourhood appears quite dilapidated and not cared for, this is especially the case towards the southern boundary of the

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study area.

Development seems piecemeal and quite poor from an urban design perspective, with many dwellings facing shared driveways rather than the street. In the research team's opinion, the newer (post 1960s) housing stock will not age well and in places already looks quite run-down. The risk of dilapidation is therefore deemed to be high. The area is characterised by high impermeable fences along long stretches of the footpath. Quite a few hotels and motels have been built in the area over the last 20 or so years.

While the area is technically quite walkable, walking felt unpleasant especially towards the end of the day (around 5pm) when daylight faded. This was largely due to the lack of pedestrian traffic and poor surveillance of footpaths. Additionally the local streets are quite busy and there is a lot of traffic going in and out of driveways.

On a positive note there are a variety of local shops present and the area is served well by buses. The Avon Loop sub area seems to have more of a community feel to it and residents approached the researcher in this area repeatedly.

Photo 4.28: Boarding House

There is some interesting re-use of historic buildings, including the conversion of the historic brewery complex into a gym and arts centre, outside of which is a sheltered dedicated bicycle parking facility.

The Avon Loop sub area has a small neighbourhood park with play equipment and access to the reserve along the river and is reasonably well catered for in this respect. The area to the south of

Kilmore Street however has no public spaces that allow for casual interaction and recreation. Latimer Square is nearby, but the research team feels that this is unlikely to be a place for locals to meet or send their children to play.

Photo 4.29: Poor surveillance of footpath

The area has been heavily modified for many years, and there are no significant ecological features, with the exception of the Avon River. It is however likely that recent development has resulted in an increase in stormwater run-off and there appears to be no mitigation of this.

The area contains one contaminated site that is currently used as a car yard.

More generally, Christchurch East Inner City is marketed by real estate agents as a site of future development. It is located in the historic precinct yet zoned for intensive development so investment opportunities are highlighted. It is promoted as valuable, special and eclectic. Along

with investors and developers, marketing targets professionals and the artistic. Dwellings are presented as safe and secure as well as private. Walkability and proximity to the city are both frequently promoted but car parking is always emphasised.

Photo 4.30: Bicycle parking

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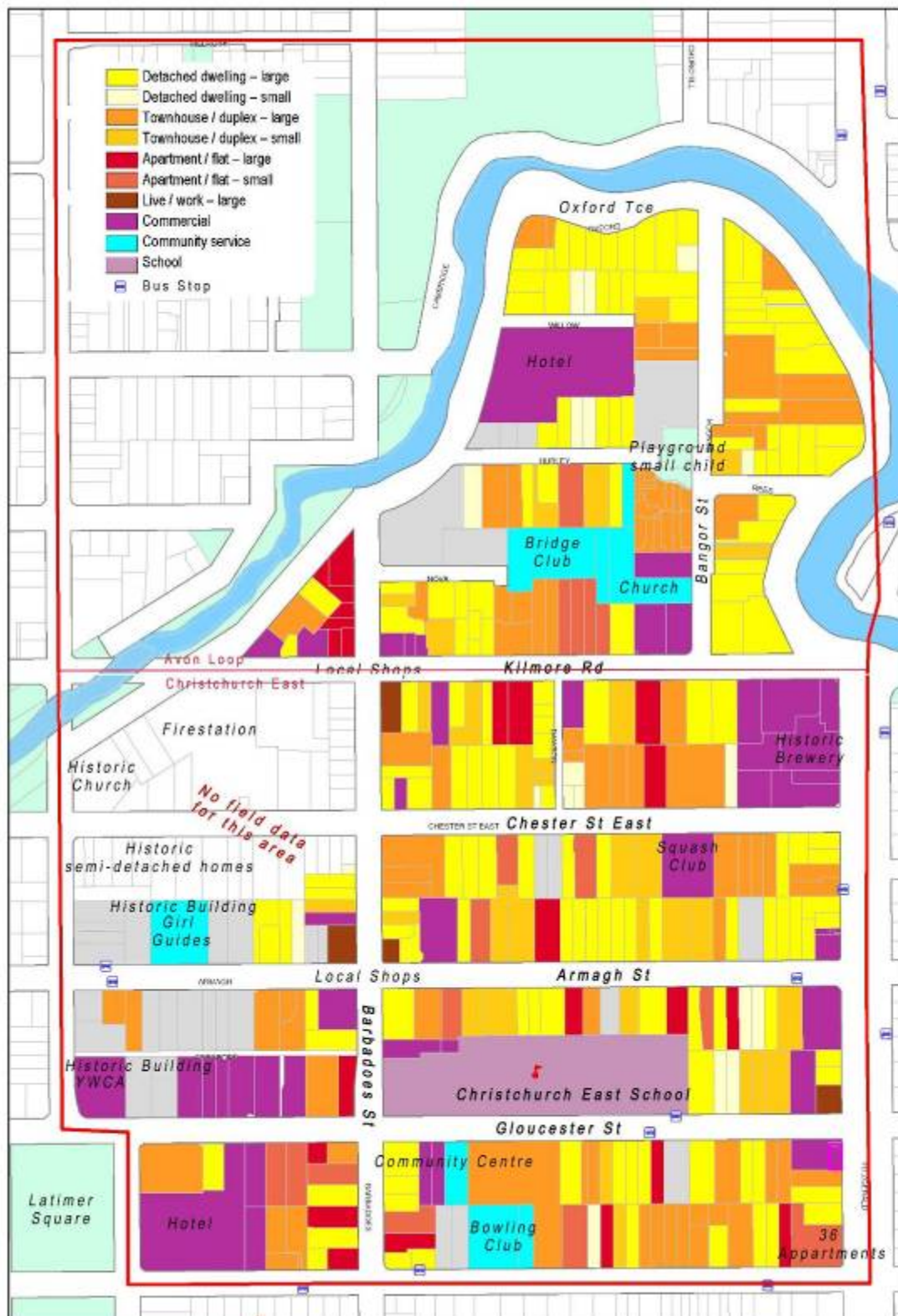
Figure 23: Map of study area, Christchurch East Inner City

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Sustainability Framework: NH102/2

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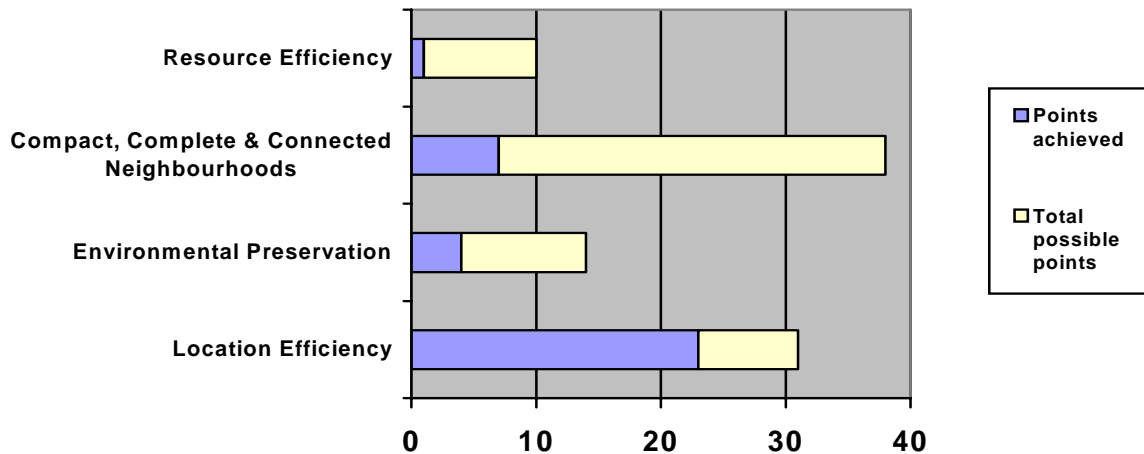Page 126

5.9.2 LEED-ND assessment results

Figure 24: Summary of results, Christchurch East Inner City

Location Efficiency – 21 out of 31 points

All prerequisites are achieved. The following key points stand out for Christchurch East Inner City:

- The site is previously developed.
- Bus services are good.
- A good range of services are available locally.
- Public space is poor.
- Only a full primary school is available within walking distance.

Lessons for the use of LEED-ND as part of NSF:

- The rating seems appropriate given the area's location near Christchurch's CDB but poor access to schools and reserves.

Environmental Preservation – 3 out of 14 points

All prerequisites are achieved. The following key points stand out for Christchurch East Inner City:

- The Avon River is the only outstanding feature on the development. The banks of the river however have been highly modified a long time ago.
- Recent development has seen an increase in impermeability and therefore stormwater run-off. There appears to be no stormwater treatment or detention.

Lessons for the use of LEED-ND as part of NSF:

- This section does not deal well with existing neighbourhoods.

Testing the Prototype Neighbourhood
Sustainability Framework: NH102/2

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Page 127

Compact, Complete & Connected Neighbourhoods – 13 out of 38 points

All prerequisites are achieved. The following key points stand out for Christchurch East Inner City:

- Residential density is higher than in most other neighbourhoods.
- Housing stock diversity is high.
- Walkability is low because of poor surveillance of pedestrian space.
- Average block length is high.
- The area contains some affordable housing.
- There is some re-use of historic buildings.

Lessons for the use of LEED-ND as part of NSF:

- The biggest issue for walkability is high fences along many of the footpaths. This is not captured in LEED-ND.
- No points were earned for block length; in the research team's opinion block length didn't seem to be overly long. There may be a calibration issue with this credit.

Resource Efficiency – 1 out of 10 points

There are no prerequisites in this category. The following key points stand out for Christchurch East Inner City:

- The only credit earned is for the absence of in-built irrigation in communal areas. Christchurch East Inner City does not have any communal infrastructure or services aimed at the reduction of resource use.

5.9.3   Neighbourhood survey

The Christchurch East Inner City residents sample consists of 133 householders. 55 percent of those residents have lived in Christchurch East Inner City less than four years, 45.8 percent reported that they intend to move from their current house within the next few years. The largest single group (26.7 percent) of intending movers reported that a move would be prompted by a desire to shift from rental to owner-occupation.

Residents reported that Christchurch East Inner City was desirable because of the following factors:

- Convenient to city or town centre (58.0 percent)
- Type of home (e.g. 2-storey house/flat/bungalow) (52.7 percent)
- Parking space for cars (47.3 percent)
- Size of home (46.6 percent)
- General appearance of the neighbourhood (42.0 percent)
- Convenient to work (41.2 percent)
- Quality of local facilities (amenities and services) (37.4 percent)
- Private garden (35.9 percent)

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Sustainability Framework: NH102/2

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Page 128

- Convenient to public transport (20.6 percent)
- Quality of the neighbourhood (design and materials) (18.3 percent)

The majority of these residents have access to a private garden (79 percent) and a patio or yard (48.1 percent). A minority (16.0 percent) report sharing a garden or communal space with other households.

The housing type in Christchurch East Inner City is mixed.

Type of Dwelling	% of Respondents
A detached single-storey house	23.8%
A purpose built flat	19.2%
A semi-detached house with more than one storey	13.8%
A detached house with more than one storey	11.5%
An apartment in an apartment block with more than two floors	11.5%
A terrace house	5.4%
A flat in a converted building	3.1%
A semi-detached single-storey house	2.3%

Table 48: Type of dwelling Christchurch East Inner City

The majority of these residents expressed satisfaction with the degree of privacy they had (65.1 percent), the condition of their house (69 percent), their dwellings' outdoor environment (64.5 percent) and parking amenities (66.7 percent).

A small but significant minority of these residents (15.2 percent) had no access to a private car or van. A very small minority reported that they have access to a motorcycle, but 51.9 percent report access to an adult bicycle.

These residents reported substantial levels of service and amenity use within Christchurch East Inner City neighbourhood (Table 49).

Service	% Respondents Using Services Within Christchurch East Inner City	% Walking
Local shops e.g. food, newsagent, post office	96.2%	70.3%
Pub, café or restaurant	88.0%	71.8%
Open space, park, play areas	85.7%	79.8%
Shopping centre	82.7%	27.3%
Healthcare centre or GP practice	69.2%	37.0%

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Indoor leisure facilities	61.7%	63.4%
Workplace	60.9%	35.8%
Community hall or place of worship	41.4%	50.9%
School	25.6%	50.0%

Table 49: Respondent Use of Services within Christchurch East Inner City

In addition, 82.7 percent of Christchurch East Inner City respondents reported visiting friends in Christchurch East Inner City while 65.4 percent reported visiting relatives in Christchurch East Inner City. Table 49 also shows the relatively high proportion of respondents reporting that they walk when accessing services, facilities and amenities within Christchurch East Inner City. By comparison, Table 50 shows that, in general, smaller proportions of respondents use services, facilities and amenities outside the neighbourhood on a regular basis. When they do so, however, they still tend to walk and use public transport although driving is predominant

Service	% Respondents Using Services Outside Christchurch East Inner City	% Driving
Shopping centre	89.5%	72.3%
Local shops e.g. food, newsagent, post office	80.5%	63.6%
Open space, park, play areas	79.7%	65.1%
Pub, café or restaurant	78.9%	68.6%
Healthcare centre or GP practice	72.2%	77.1%
Indoor leisure facilities	55.6%	74.3%
Workplace	54.1%	70.8%
Community hall or place of worship	35.3%	68.1%
School	26.3%	62.9%

Table 50: Respondent Use of Services outside Christchurch East Inner City

The transport mode of respondents changes, however, when travelling to work or for study purposes, with 89.5 percent of respondents reporting that they travelled to work or study. Of those respondents, 3.4 percent travelled by public transport, 36.1 percent travelled by foot or bicycle, and 48.7 percent drove. Notably 72 percent of respondents who travelled to work or study reported that they had access to free car parking. The average household car kilometres travelled in the last four weeks was reported as 723 km.

The majority of Christchurch East Inner City respondents expressed anxiety about walking alone at night with only 18.6 percent reporting that they felt 'very safe' and 16.3 percent reporting feeling 'a bit unsafe' while walking alone in the neighbourhood at night. 14.7 percent of respondents reported that they never walked in the neighbourhood alone at night, however, 65.4 percent of respondents agreed that they felt comfortable and safe while waiting for public transport in the public neighbourhood. Travelling fast and making walking unsafe was a 'serious problem' and 37.6 percent reported that this was a 'minor problem'.

Substantial minorities of respondents identified a number of ways to encourage walking, cycling and use of public transport in Christchurch East Inner City. In particular:

- establishment of more convenient pedestrian routes (46 percent)
- improved lighting on cycle and pedestrian routes (33.3 percent)
- more convenient pedestrian crossings (28.6 percent)

There was relatively limited neighbourhood social contact reported by Christchurch East Inner City respondents (Table 51). 55.1 percent of respondents had friends or relatives in Christchurch East Inner City.

Level of Contact	% of Respondents
Know many of the people in your neighbourhood and area nearby	12.6
Know some of the people in your neighbourhood and area nearby	22.8
Know a few of the people in your neighbourhood and area nearby	44.1
Do not know people in your neighbourhood and area nearby	15.0

Table 51: Degree of neighbourhood social contact Christchurch East Inner City

A third (33.1 percent) of respondents reported belonging to, helping or supporting local community or neighbourhood groups. 40.9 percent of respondents reported active involvement of more than once a month over the last twelve months.

There was a low level of formal social contact with neighbours but higher levels of casual meeting (Table 52).

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Level of Contact	% of Respondents
Have a chat with/greet neighbours	90.6%
Know neighbours by name	86.3%
Would ask to borrow tools from neighbours	48.8%
See neighbours socially on average once a week	44.1%
Would ask to borrow food from neighbours	33.6%

Table 52: Neighbourliness in Christchurch East Inner City

Low levels of positivity about the quality of the neighbourhood and the people that live there was apparent among the respondents (Table 53).

Perception of Neighbourhood	% Respondents Agreeing
Compared with other neighbourhoods, this one has many advantages	59.5%
If I needed a favour, I could rely on someone in this neighbourhood to help me	55.8%
This is a friendly neighbourhood	47.6%
This is a place where neighbours look out for each other	43.8%
I feel that I belong to this neighbourhood	43.7%
I am proud of my neighbourhood	39.7%
People from different backgrounds get on well together in this neighbourhood	38.3%
My local neighbourhood reflects the type of person I am	37.6%

Table 53: Perception of Neighbourhood Christchurch East Inner City

Almost a third (32.3 percent) of respondents typified the neighbourhood as a 'very good' place to live, while 38.6 percent typified it as a 'fairly good' place to live. As Table 54 shows, access to public transport was seen as 'very good' but other amenities and facilities were seen as 'very good' by substantially smaller proportions of the respondents.

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Facility/Amenity	% of Respondents Reporting 'Very Good'
Access to public transport by foot	57.9%
Open spaces and parks	30.9%
Street lighting	28.6%
General appearance of area (i.e. attractiveness)	26.8%
Provision of recreational facilities	23.3%
Provision of shops	19.0%
Condition of other homes & gardens within the neighbourhood	15.2%

Table 54: Amenity/Facility by Respondent Reporting 'Very Good' Christchurch East Inner City

Food shopping tends to be done outside Christchurch East Inner City with 73.2 percent of respondents reporting they expended less than 50 percent of their food budget in Christchurch East Inner City. Table 55 sets out the proportions of respondents that typified amenities and facilities as 'completely adequate' or 'inadequate'. There is a low level of satisfaction with the adequacy of amenities and facilities.

Facility/Amenity	% Respondents Perception 'Completely Adequate'	% Respondents Perception 'Inadequate'
Exercise	32.2%	7.5%
Walking the dog	26.3%	6.1%
Taking children to play	23.5%	11.3%
Seeing local wildlife	19.3%	16.0%
Sport	18.1%	18.9%

Table 55: Perceived Adequacy of Amenities and Facilities for Activities Christchurch East Inner City

In relation to environmental issues, 36.4 percent of respondents expressed themselves as very concerned about the environment. 48.1 percent reported that they felt 'fairly concerned'. There were relatively low proportions of respondents that reported using what they considered energy-saving activities (Table 56), but only 32.8 percent believed that they lived in an energy efficient or energy saving house.

Energy Reducing Activity Used	% of Respondents
Turn off lights in empty rooms	87.7%
Use open windows for ventilation in preference to power driven methods such as electric fans	81.5%
Take showers instead of baths	79.2%
Leave empty rooms unheated (or at a low temperature)	77.7%
Time heaters and heating systems to be on only when someone is at home	56.2%
Set thermostats on heaters and heating systems to the lowest temperature needed to meet your needs	47.7%
Heat only the water you need	20.8%

Table 56: Respondents Reporting Use of Energy Reducing Activities Christchurch East Inner City

In contrast to energy saving, almost none of the respondents recorded actions directed at saving water. The use of dual flush toilets (used by 46.6 percent of respondents) was the one action that emerged. No respondents reported that they were exposed to water charges and only 32.3 percent reported their house as water efficient.

Recycling of waste was more common with 93.1 percent of respondents regularly recycling waste. The vast majority of respondents (92.2 percent) use kerbside recycling collections and 23.3 percent use waste stations with 30.2 percent composting in their garden areas.

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