PATTERNS OF CONSOLIDATION

in a divided landscape

Oliver Syme

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ABSTRACT

This thesis uses design based research to meet the challenge of urban densification. It proposes an approach for higher density housing development that enhances livability, achieves compactness and responds to a city's unique landscape. To accommodate an increasing amount of people within the city, strategies and experimentation into the density of built form contributing to the urban fabric must be explored. The design based research addresses how improvements can be made upon an existing site through the reconfiguration of built form with an analysis into density, topography, existing natural ecologies and the key components fundamental to a successful urban and public realm.

The project proposes new arrangements of built form on sloped sites that integrate housing, ecology, the street and the broader public realm as a primary driver in urban housing design.

Keywords: *urban intensification, public realm, housing, natural ecology, inner city, topography*

Figure 1 // Wellington; town belt ridgeline & city

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1

THESIS INTRODUCTION

*Introducing the context, problem and significance of
the research, followed by a brief introduction to the site*

RESEARCH DISCOURSE

AN INTRODUCTION

PROBLEM

Wellington is remotely located at the south-western tip of the North Island along the Cook Strait, which separates New Zealand's North and South Islands.

The capital city has become densely populated, more so than most other cities in New Zealand due to the restricted amount of land that is available between the harbour and surrounding vegetated hills. The hills form around the inner city to create the capital's town belt reserve. It provides unique edge conditions for the urban fabric by enclosing the city and central suburbs. The topographical condition presents itself as a continuous green sweep of native vegetation and parkland providing an important part of Wellington's landscape and geographical identity.

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Figure 2 // Wellington aerial; town belt ridges

The centralization between land formations and adjoining harbours create very few open areas to expand. This has resulted in additional development of suburban towns located in the outer city and creates a decentralization of the city as increasing amounts of the population is pushed outwards. As this happens, longer commutes are experienced by residents and the proficiency of a city's urban infrastructure is tested. (Lynch, Kevin)

Rather than make attempts to expand outwards in a decentralized sprawl the existing inner city fabric should first be addressed.

A divided landscape;

Traditionally urban planning differentiates between landscape and architecture, green space and built form, horizontal and vertical. The approach supports development of each practice independently without inviting the potential of a merge. This thesis considers the two entities in equal significance and as a hybrid - one entity of built form and the other of landscape. They become mutually dependent and defining, and both combine to influence the public and private realm belonging to the city.

DESIGN & RESEARCH OPPORTUNITY

By utilizing the city's direct relationship to the vegetated town belt and terrain there is an opportunity to conduct research and design into the field of urbanism and housing. This tests a denser inner city housing model to the current norm of stand-alone detached dwellings. The design process is derived from urban conditions such as topography, urban public realm and natural ecologies which is solemnly implemented in the existing housing stock. Through research this thesis hypothesises the city would benefit from a more dense urban housing model located around the vegetated ridges of Wellington's town belt. A model that links both built form, landscape and urban design more concisely.

EXISTING SITE

This project focuses in a geographically defined area within Wellington. The research strategy selects an existing residential block to generate an investigation of how a new urban housing model could be applied to existing low-density city fabric that consists of mainly single detached dwellings. An existing site is used to propose new arrangements of built form consisting of higher density attached dwellings with a focus on extending the public realm. An existing site means qualitative and quantitative comparisons can be made between the current condition and an alternative solution to measure positive or negative changes in the research and design.

SIGNIFICANCE OF RESEARCH

Preparing an alternative for the future; Wellington City's population growth is expected to grow from the current 200,000 to approximately 250,000 over the next 30 years. (Wellington City Council) To counteract urban sprawl occurring in suburbs outside the city and to best utilise the existing infrastructure within, opportunities specific to Wellington are explored. In moving towards a denser urban environment the research becomes significant by addressing how a design with a shared focus between architecture and landscape can improve both components of housing densification and integrate quality public realm.

The vegetated ridges around Wellington's town belt contribute to both city character and ecological resilience by providing a centrally located source of green space. This provides important ecological connectivity to the heart of the city while stemming abroad to wider green networks growing to the city's west, south and eastern regions. In the event this area requires densification the experiments conducted within the thesis design process will help explore how additional dwellings and built form can be achieved. The arrangement of new dwellings is designed to ensure the retention and health of urban ecosystems while enabling vegetation and public space to become more integrated to the city.

▲
 Figure 3 // 1:200 massing model; linking topog-
 raphy, built form, street connections

RESEARCH QUESTION

& OBJECTIVES

How can the design of higher density housing on sloping sites enhance the public realm, support street activity and integrate with natural ecologies ?

In relation to this question, the following objectives were noted;

- Provide a low rise *medium density* residential model that acts as a transition between high density inner city apartments and low rise low density outer suburban housing.
- Integrate residential *built form* and *landscape* with a site's *ecology* and *topography*.
- Encourage social interaction through street networks and other transitional spaces that configure positive relations between *public, private and common areas*.
- Establish a higher quality network of the public realm, and the importance for a close and direct relationship with the street, as the primary driver in *urban housing design*.

2

THEORETICAL FRAMEWORK

Chapter containing literary + precedent reviews

LITERARY CONTEXT

This chapter provides an overview of urban design principles and theories that underpin successful public realms; ones that achieve livability especially in denser housing environments. From this overview, design principles are established to guide the subsequent design explorations.

The aims from this review are to distinguish design methods and theory that take precedent over existing principles in order to substantiate and apply additional knowledge to the scope of the thesis research and objectives.

URBAN CONSOLIDATION & NEW ORGANISATION OF SPACE

Keywords: compact city

A compact city has gained global impact as a planning approach for sustainable development with increasing urban population. (Konijnendijk, Cecil) Through densification and compact building, the objectives aim to counteract negative effects of urban sprawl in terms of inefficient land use and related environmental problems. While urban densification has its benefits it can also pose threats to urban green space. Cecil Konijnendijk says that there are challenges during the densification process which requires a provision of urban green space in compact residential and city environments. Loss in quantity of private urban green space can be offset by increased urban green space quality and is referred to by James Byrne as a “*compensation hypothesis*”.

Dense cities offer positive hope for living low-carbon lives and can be designed and managed in ways which ensure they remain socially and ecologically resilient. Compactness and density create the conditions in which walking and daily outside living becomes more possible. A livelier, denser and more active streetscape can reduce a pedestrian's perception of distance by directly engaging with their senses as they become more interested in what is happening in the immediate environment around them and less focussed on the act of walking making the trips feel shorter, more manageable and more enjoyable. (Beatley, Timothy. 85)

These spatial cues and factors are attributed to the design of the surrounding buildings and urban environment. Highlighting specific building orientation, street connectivity and layout, and building design (GLC). Also noted, is that surrounding buildings can adversely affect the public realm. Dull building facades and inactive or poorly defined building edges combine to reduce the visual

quality of the environment and decrease street legibility. (Bentley. 51).

According to Llewlyn Davis-Yeang, one of the most important parameters for good urbanism is for buildings to give positive definition to the shape and function of outdoor space. This can be applied to and becomes achievable when;

- Urban intensification takes place and built form increases.
- Outdoor spaces should be designed to encourage a range of activities to take place.
- Improvement to the usability and quality of the green space.

SITE COMPOSITION; APPLYING STRATEGIES OF BUILT FORM TO SLOPED TOPOGRAPHY

Keywords: topography, built form, landscape, geographic identity, urban identity

Explicit qualities dealt with when composing a site becomes the relationship between the built form and topography of the land. In general sense Enis Aldallal describes the employment of topography in architecture and urbanism as a distinguishing characteristic of the land, one which possesses the ingredients to determine an architectural plan, the organisation of paths, flow of utilities, use of areas, disposition of buildings whereby the resulting visual form is dependant upon it. (57) Through this intellectual and physical engagement, both built form and landscape can become significantly transformed and adapted. Dwellings should complement the site's natural conditions and it is important to examine site in the early stages to fully understand its potential.

Richard Neutra considers a city as an ‘evolving to-

pography' in which the landscape is consolidated over time from successive layers of intersecting built and ecological form. Other theories are made by Enis Aldallal which relates topography to the wider consideration of a city and the reflection of an inherent geographic identity being established. *"Identifiable topography is not only that which links architecture to nature but also to the city,"* which helps to make understanding of topography becoming related to the wider urban identity of a city and not just at a local scale. Lynch stresses that designers should be encouraged to look at the ground in ways that enable them to establish connections with an integrated framework of relation to place and that designing with urban topography is more heavily contingent on one's ability to direct and shape design ideas at both small and large scales. (Lynch, Kevin. 62)

Accompanying views of linking topography to built form, city form and place there are also general strategies which can be applied by designers when dealing with sloped conditions to conduct a more sensitive approach to dealing with inherent landforms. Friedman recommends for existing vegetated areas, clusters of homes should be constructed in natural clearings to avoid disrupting local flora and fauna while running parallel to contour lines which reduces sharp changes in elevation. He also elaborates on urban infrastructure related to residential settings, mentioning how similar to built forms, the siting of paths and roads can be adjusted to follow a site's natural contours. *"On sloped sites, paths can be constructed on existing flat areas rather than on new ones,"* so as to minimise the amount of land that is disturbed during construction. From this, dwellings can be designed perpendicular to them since they provide opportunities to build stepped or split level typologies. (Friedman, Avi. 25)

NATURAL ECOLOGIES IN AN URBAN ENVIRONMENT

Keywords: natural environment, human senses, human activity, desire for interaction, biophilic design

As most people on the planet live in towns and cities, the majority of daily interactions with nature take place in urban environments which prompted a recent interest in this field and the dynamics between these new found relationships. (Bradshaw & Bekoff) Urban dwellers seek out interactions with nature in many forms by engaging in activities such as visits to public green spaces, maintaining private gardens or watching wildlife. These are all examples in which human activity becomes an integral part of the natural environment and a relationship to be considered important for a quality urban environment. "Going outside is actually a more normal, ordinary activity in a dense city because there it's an indivisible element of daily life." (Opher, Philip)

Visiting urban green space can be no more than indirect exposure to natural vegetation while engaging with other leisurely activities such as sports or walking. Whereas, more intimate interactions may involve sitting and relaxing under a canopy of trees or more actively engaging with nature by bird watching or occasional community gardening. Peter Schantz's studies agree with this and he notes how the integration of biophilic design in urban settings help to draw people outside and propel humans to live more physically active lives. His studies conducted in Stockholm demonstrates a correlation between urban green space contributing to one's decisions to partake in urban environment activities - activities which are important for leading more physically and socially active lives. (Beatley, Timothy)

Irvine and Warber leads on to say that visual appreciation and vibrancy of quality natural environments is a strong trigger which prompts the desire for interaction through the human sense.

By nature we as humans have a desire and appreciation for environments which our bodily senses can respond and engage with. “A brightly coloured bird to the smell of fragrant flowers, the taste of berries, the sound of a birdsong, wind in the trees or intermittent silence,” are emotive interactions which engage with our senses.

Summary; The importance of reading about these situations and engagements is understanding that whatever form of interaction takes place, access to urban green spaces are important for the quality of life for urban dwellers, given that it leads to benefits in physical and psychological health, urban regeneration, social cohesion, sense of community and environmental awareness. (Bird, Clinton) The quality of these interactions is crucial and depends on both the proximity of green space to potential users and level of recreational value.

PUBLIC LIFE BETWEEN BUILT FORM

Keywords: public life, transition zones, gentle transitions, territories, sense of belonging

When considering built form within an urban fabric the design is not solely limited to the communication of form and space. The environment architects and urban planners create have the responsibility to function at deeper territorial levels of engagement associated with a concept referred to in this review as public life. Unlike more fortitude understandings of form and space, public life is a more ephemeral consideration. It is a concept constantly changing over time and can vary depending on culture, gender and age. As a designer it can become difficult to incorporate this concept into architectural and urban design. (B. Savrre)

Public life in a broad sense can be contextualised

as human engagement taking place between buildings. Streets, alleys, squares, balconies, buildings, small or large, are all components considered to be part of the built environment in which public life unfolds. Jan Gehl’s Public Space and Public Life has been cited to learn about how built form and urban fabric can combine to foster an improved public realm. By creating a hierarchical system whereby the relationship of these spaces is linked to various social groups, designers can help define the public and private realm to order the challenging concept of public life.

Establishment of clearly defined social and physical structure has been proven to create transitions between the various categories of public spaces labelled above. Jan Gehl refers to Ralph Erskine’s housing project in Landskrona as a project with a well considered social and physical structure which makes gentle links between city street and residential groups to promote a sense of belonging. The designers’ goals were to inhibit and promote quality human interaction at different public and private levels while ensuring a spatial interplay between spaces is not over designed to create a sense of demarcation from the outside world.

Jan Gehl emphasises that it is particularly important for residential areas to establish gentle graduation of outdoor transitional zones with mediation of intimate, semipublic and semi private areas near the residence to extenuate the experience of outdoor space belonging to the residential realm. As public spaces become more integrated with the residential habitat, benefits at an urban scale mean it becomes easier to meet and interact with people while providing more defined spaces which link comprehensively as a hierarchical system. The focus on increasing the value of the common spaces is intended to create a better pedestrian experience with increased socialization and participation within the street.

REFLECTION

There is a remarkable amount of nature in and around cities and in addition to creating more environmentally friendly urban areas it can and should begin to serve as the foundation for deeper and more meaningful quality of living. There are opportunities for urban dwellers to live in closer connection with nature and with each other.

The aim for the subsequent design research is a greatly enriched and urbanized suburban public domain. The projected increase for residential development provokes the need for social sustainability and an opportunity for ecologically sustainable growth patterns, while the desired street conditions stimulate the need to address 'place-making' in the public realm.

The establishment of a successful gradient between the public and private realms within will be employed to help transform the suburban street into a suburban public place and consequently, improve the perception of community and willingness for residents to live together within a denser environment.

DESIGN PRINCIPLES

A. Urban consolidation and organization of space; one of the most important parameters for good urban design is that buildings provide positive definition to the shape and function of outdoor space.

B. Relationships between built form, topography and street network; how these components can be established from combining landscape types, public space and built form as a hybrid.

C. Interactions between people and nature; ensuring vibrancy and quality of natural environments to act as a strong trigger which prompts the desire for interaction, usability of spaces and physical and mental wellbeing.

D. An objective for the design and research is to facilitate a successful interaction between public and private to enhance the perception of community and ensuring quality public realm is retained and not sacrificed from the result of urban densification.

MOVING FORWARD

The following section of work explores precedents which aim to address design principles acknowledged in the literature review to advance and develop the knowledge of this thesis.

PRECEDENT REVIEW

This chapter provides a precedent overview of urban design principles and theories discussed in the previous literature review. Precedents of urbanism and housing are selected to discover successful public realms; ones that achieve livability especially in denser housing environments.

From this overview it is possible to identify design principles in the form of architectural devices and components to guide the subsequent design explorations.

- o developing *urban consolidation*
- o relationship between *built form and topography*
- o mediating interface between the *public and private realms*
- o provide an integrated *natural ecology* network

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 Figure 4 // Norrebro Solund Homes; facades

NØRREBRO, SØLUND HOMES

<i>Client:</i>	<i>Samvirkende Boligselskaber/ KAB</i>
<i>Architecture & Landscape:</i>	<i>C.F. Møller in collaboration with Tredje Natur</i>
<i>Engineers:</i>	<i>Bascon, Transsolar</i>
<i>Collaborators:</i>	<i>Smith Innovation</i>

PROJECT ANALYSIS

Located in Copenhagen's Nørrebro district, the Sølund care homes is a 360 dwelling urban housing project set to function as an urban activity generator to provide the area with life and atmosphere with its many residents, staff, and guests bringing life and atmosphere into the district. The mix of housing types, residents and visitors is unique in a Danish context, and it will become a central anchor point for the development of the entire Nørrebro district. The design gives residents an opportunity to interact with people of other generations while simultaneously setting higher standards for well-being, security, functionality, and community values.

This precedent will be analyzed for findings in;

- A. Urban Consolidation & Density
- B. Relations between built form and natural ecology network
- C. Public and Private Relation

Figure 5 // Norrebro Solund Homes; site plan with ecologies labelled

A

Figure 6 // Norrebro Solund Homes; hydrology and vegetation ecology

The architects are looking to re-emphasize the structure of the classic Danish city block's common areas. The central Generation's Square is a semi-public urban space, and connects to the two other more private courtyards. It is the largest yard functioning as a common space for everyone. A place which is a reflection of diversity as residents, youthful or elderly can meet. The Square appears as a green opening combining the housing blocks into a single and harmonious entity.

Major trees along the street have been retained and benefit the design by providing cooling shade for pedestrians and for the housing blocks. Smaller trees and shrub species with branches lower to the ground have been planted in closer proximity in and around the housing blocks.

The complex enhances the surroundings with an attractive, permeable green edge. The variations in landscape zones that face the city are completely public and can be used by the city. In addition to the extra planting around the building, natural ecology features such as storm water handling and sustainable urban drainage are fully integrated in the landscape design.

LEARNINGS + PRINCIPLES

A. Urban consolidation and resulting built form must be able to respond positively to a street edge. A building might respond to multiple street conditions so it is important that each response is considered whether it be confronting, stepping back or providing an interstitial space from the street.

B. Develop transitions between private and communal/public space to structure social interactions and enhance gradients of privacy.

Dwellings are located above street level with smaller, privatized balconies

Groundfloor Mixed-Use Retail to engage with streetscape and pedestrians and provide additional amenity

Recesses in street façade to break up otherwise linear block edge

Public sidewalk and road

The narrow street edge consisting of a public sidewalk and road means this edge of the housing block becomes more privatized and closed off when compared to other street scenarios. Mixed-Use retail is located at the ground floor to retain relationship to the street.

Privatized dwellings with view over lake and promenade

Outdoor semi-public recreation space

Public embankment and waterfront with cooling shade from existing plantation

A ground floor, multi-functional venue faces the lake that is densely populated by pedestrians. The block is set back from this edge to provide semi-public recreational space and outdoor café seating. An embankment, additional plantation and shrubs assist in providing privacy to residents, from the street.

The Solund Housing Block creates its own green cityscape inviting children, young people and seniors to be involved in shared activities and to partake in the urban life that has been created. This scenario in the design has been noted for having a clear structure of a public to private arrangement with a consistent scale progression at each shift.

The courtyards are a more open, semi-public urban space consisting of recreational areas and walkways for residents and visitors. Located between the courtyard and the housing block is a semi-private front garden which is used to provide adequate privacy for their dwellings.

Figure 11 // Springhill; housing and water basin

STROUD, SPRINGHILL CO-HOUSING

<i>Client:</i>	<i>David Michael, director of Co-housing Company Ltd</i>
<i>Architecture:</i>	<i>ARCHITYPE</i>
<i>Landscape:</i>	<i>Robert Bray Associates</i>
<i>Location</i>	<i>Stroud, Gloucestershire</i>

PROJECT ANALYSIS

Springhill Co-housing is a new build co-housing scheme consisting of 35 private dwellings, designed with the full participation of residents located within a suburban area of Stroud, UK. Based on the Danish model, co-housing is a form of collaborative housing that aims to create a sense of community and achieve true social and environmental sustainability. The emphasis of this precedent review is to focus and evaluate upon the integration of social and ecological housing design. The project creates social street networks between the units and links natural ecologies on the site through treatment of landforms down the slope and well considered ecological infrastructure, which enables the project to create a vibrant, strong and sustainable community.

This precedent will be analyzed for findings in;

- A. Integration of natural ecology networks in housing design
- B. Public and Private Relationships
- C. Relationship between built form and topography

Central park area functions as a recreational space for residents and as a water basin which naturally connects to the sustainable drainage system. It becomes an integrated rainwater feature visible as a threshold between houses.

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Figure 12 // Springhill; site plan with labelled water ecology

Timber and Rock retaining structure used to shape land on sloped site.

Planted rills along connecting walkways lead to a communal pond aiming to celebrate the flow of rainwater. The rills give life to vegetation which grows up to street level and also helps to clean the rainwater as it travels off the street.

Built on a steep site in Gloucestershire provided the project with an opportunity to integrate a sustainable drainage system that would complement the ‘green’ credentials of the development. Robert Bray Associates was engaged to organize a SuDS management network to link outdoor spaces around the housing together. Additional aims were to link people to these spaces as well. The SuDS design at Springhill aims to create this cohesion between ecologies, landscape and residents. Integrated rainwater features become thresholds between houses, thoroughfares, gardens, play areas and sub-catchments.

Planted rills with cascades along with a communal pond aim to celebrate the flow of rainwater and give the development a unique character desirable for residents.

The project has developed a new housing typology, based on the home owners’ requirements and principles for collective living and neighbourliness, including:

- o Pedestrian and child friendly site, with cars kept to one perimeter edge.
- o Communal/shared and outdoor space, with no private gardens.
- o One shared common house at the centre with facilities including work shops, playroom and kitchen.
- o An organized car share scheme and bulk buying of organic food.

Figure 15 // Springhill; front elevation photo

FIG. 10
Communal Street Section / Public and Private

- Private
- Semi Private
- Semi Public

Figure 16 // Springhill; public and private street section

FIG. 10
Sectional Sketch through Storage Basin & Play Space

Figure 17 // Springhill; section sketch water basin and play space

All of the dwellings share a very close proximity to the communal streets. Privacy for residents is achieved by having entrances and front doors set back from the street as a slight buffer. Balconies are also lifted up above street level on either side to inhibit privacy yet still encourage social engagement between people in the dwellings and pedestrians or children playing out on the street.

The street between the buildings becomes a driver for social interaction and interest for the residents. The urban design is successful through the use of contrasting of spaces - It narrows down between buildings but also has the uniqueness of larger contrasting spaces such as the storage basin which is linked to the path.

LEARNINGS + PRINCIPLES

A. Integrate cohesion between ecologies, landscape and built form. Where there is opportunity public spaces can be linked with existing greenery.

B. If all spaces on a particular site are designed to the same amount of enclosure, scale, proportions and detailing then result can become monotonous. When linking public spaces the urban design should look to create contrasting spaces.

Figure 18 // Springhill; internal street view

Figure 19 // Siedlung Halen; roof bridge
Figure 20 // Siedlung Halen; urban stairwell

BERN, SIEDLUNG HALEN

<i>Client:</i>	<i>David Michael, director of Co-housing Company Ltd</i>
<i>Architecture:</i>	<i>Atelier 5</i>
<i>Location:</i>	<i>Bern, Switzerland</i>
<i>Density:</i>	<i>81 dwellings. 110dph</i>

PROJECT ANALYSIS

The Siedlung Halen Housing Estate is located 5km outside of Bern in Switzerland and consists of 81 low rise, high density terraced houses. Designed by Atelier 5, who were influenced by the work of Le Corbusier the project focuses on combining advantages found in both suburban and urban housing. The design also incorporates modernist program of the 1920's about community and privacy, garden city notions of a healthy lifestyle in a suburban setting and attitudes about material and standardization.

Built on a hillside the terraces are reminiscent of steps. The simple concept of stepping down the site means the built form creates views for the dwellings located towards the back, green balconies, walkways and intermediate space which residents can occupy.

This precedent will be analyzed for findings in;

- A. Relationship between built form and topography
- B. Urban Consolidation & Density

This precedent is influential due to its approach in establishing a high volume of built form on a sloped site. The terraced typology means it can maximize land use by stepping down the topography while still providing open green space either side of the dwellings. What this project does well is introduce the suburban idea of community into a higher density, while protecting the privacy of individuals and both the indoor and outdoor private spaces, concepts which have been developed from utopian socialist ideas.

There are designed communal and private areas throughout the site to enforce these ideals, such as communal playgrounds and private walled gardens. Like previous examples, the development is considered a success for the design not sacrificing community for individual privacy. However the aesthetic of the Siedlung Halen Housing has been

criticized for appearing overly artificial and likened to more of a practical success after being designed to achieve a medium between the common and private realm.

In terms of diversifying dwellings, there are only three types of units with only minor variations in plan. The units are positioned alongside in a row rather arbitrarily to give some illusion of diversity and to provide a high yield of 110dph. The width of each dwelling is a narrow five meters that would limit most design freedom in plan in order to follow along the ideas of standardization which was sought after as a suitable response to post-war housing. The standardized planning could be critiqued for not offering a wide range of opportunities in internal organization that might better influence the median between the common and private realm as well as aesthetic.

Figure 21 // Siedlung Halen; long sectional drawing
Figure 22 // Siedlung Halen; short sectional drawing

Figure 23 // Siedlung Halen; site plan

Figure 24 // Siedlung Halen; concept diagram of dual access to dwelling

LEARNINGS + PRINCIPLES

- A. Landscape form and built form can combine to create a morphology of housing types which adjust to one another.
- B. Multiple level, stepped dwellings have the ability to become accessed from both the front or rear yards at different levels.
- C. Built form and landscaping combine to create a terracing of land and terrace dwelling typology.

LONDON, DONNYBROOK QUARTER

<i>Architecture:</i>	<i>Peter Barber Architects</i>
<i>Location</i>	<i>Eden Way, London UK</i>
<i>Date of Completion</i>	<i>2007</i>
<i>Density</i>	<i>40 Dwellings at 400br/h</i>

PROJECT ANALYSIS

Donnybrook Quarter is a high-density, low-rise, mixed-use scheme designed by Peter Barber Architects. It is sited on a corner site in the East End of London. The aim was to provide vibrant and rich public space that was constrained by a harder edge of built form. Currently 130 people inhabit the 40 housing units. At the centre of the scheme a main pedestrianized street aligns the north-south of the site creating access to the dwellings on either side. The street also offers a walkable route to adjacent streets and urban fabric.

This precedent will be analyzed for findings in;

- A. Relationship between built form and urban fabric
- B. Urban Consolidation & Density
- C. Public and Private Relationships

Figure 25 // Donnybrook Quarter; courtyard photo

Donnybrook Site Plan

The scheme is laid out around two new tree lined streets which cross the site creating very strong spatial connections with adjacent neighborhoods.

Figure 26 // Donnybrook Quarter; site plan and street connections

The pedestrian street is of an intimate scale, measuring only 7 m wide and defined on either side by two and a half storey, notched terraced dwellings. Balconies, terraces, bay windows and numerous front doors overhang and overlap the central street to create a visual intrigue and promote use of the shared space. Additional infrastructure including deckchairs, outdoor lighting and colourful planting help provide a comfortable and social place for people to pass through, congregate and meet others.

A typical double unit includes a two bedroomed maisonette on both the upper ground and first floor and a two-bedroom flat at lower ground floor. The configuration as a notched terrace type enables high densities of up to 520 habitable rooms per hectare,

while maintaining good levels of privacy and amenity to each dwelling. All individual dwellings have their own front door facing the street and their own courtyard which measure 8m x 4m. The upper maisonette is entered from the street through a courtyard garden.

In certain cases the spatial relationship between the heights of buildings and the width of the space will induce a feeling of comfort. At 7m in street width and 7-8m in height the space created along this street becomes psychologically restful and complete by appearing and feeling spatially enclosed. (GLC Study. 33)

Figure 27 // Donnybrook Quarter; communal 7m wide street

FIG. 10
Sectional view through Donnybrook Quarter highlighting
street width to building height proportion of roughly (1:1)

Figure 28 // Donnybrook Quarter; street width to
building height proportion

8.00-8.15am

3.30-3.45pm

6.45-7.00pm

FIG. 10
Pedestrian Movement Patterns
11th OCTOBER 07

Figure 29 // Donnybrook Quarter; pedestrian move-
ment patterns

The post occupancy, pedestrian movement patterns show considerable movement through intimate internal street which is bordered on each side by two and three story buildings. At the intersection where the two streets broaden is a small tree lined square for residents and pedestrians.

Success of these paths can be credited to the design providing a positive definition to entry and exit with the 3 story buildings being used to frame these

points off from the main street.

The notched terraces create building cavities at every second interval on the 3rd level. Allowing light penetration for dwellings adjoining the cavity as well as allowing light to reach the street at ground level below.

Figure 30 // WDonnybrook Quarter; notched terrace form and light penetration

LEARNINGS + PRINCIPLES

- A. The degree of personal territory (Public, Semi Public, Semi Private, Private) varies according to how well the entrance is defined.
- B. Scale and proportion of spaces - spatial relationships between the height of the buildings and width of the space between will inhibit or prohibit a feeling of comfort. This becomes important when placing built form on either side of streets, pathways or small parks.

PRECEDENT REFLECTION

IN SUMMARY

The precedents were aimed at extending the body of knowledge discussed in previous literature review, to discover relevant thoughts and principles involved behind architectural and urban design relative to this project.

Further information was gained upon urban consolidation, new organisation of space, composition of built form relative to topography and the integration of natural ecologies in an urban environment and also demonstrated public life between built form. The projects cited were a useful step in learning from concepts outlined in the literary context. Across all precedents it was evident the importance in defining the street edge with the architecture. Analysis outlined the Norrebro Solund Homes in Copenhagen had the strongest strategies and intent for responding to each different scenario through organising both formal architectural setbacks, adapting the ground floor programme or making changes to the urban fabric by adding more public environments as interstitial space between the building and street.

A. Urban consolidation & organization of space; one of the most important parameters for good urban design is for buildings to give positive definition to the shape and function of outdoor space.

B. Relations between Built Form and topography; how housing typologies can be established which are a result of combining landscape types with built form.

C. Interactions between people and nature; ensuring vibrancy and quality of natural environments to act as strong trigger which prompts the desire for interaction, usability of spaces and physical and mental wellbeing.

D. An objective for the design and research is in facilitating a successful interaction between public and private to enhance the perception of community and ensuring quality public realm is retained and not sacrificed from the result of urban densification.

3

DESIGN & RESEARCH

*Chapter containing a visual and written documentation
of the design process, detailing the site analysis and
design phases with critical reflection.*

DESIGN PROCESS

This is a design-led document of research in which concepts significant to the research question have been identified and developed upon within the research and design process. It is an iterative method by which the work continues to develop at each stage and the goal of this section is to understand existing context, problems and opportunities around the project's four main components of;

- o *urban densification*
- o *built form and topography*
- o *natural ecology*
- o *gradients of privacy*

The configuration of work leads to a final design which is reflective of the process work conducted in the four main components of research. Response to a selected site and the specific location in Wellington the design outcome and process is considered a fundamental approach capable of being applied at a range of varied configurations and scales to achieve a design outcome.

Figure 31 // Diagram; design process

Figure 32 // Axonometric; wellington city buildings, topography, town belt

SITE ANALYSIS

This sub section includes Site and Context analysis for the Wellington City region, containing documented visual and written research to convey the detailed site analysis.

The *Site and Context* analysis includes information upon the existing *city context, inner city suburbs and population estimates, city transport, a town belt amenity analysis, and a topographical survey*. The 5 topics covered have been considered as important information required for distinguishing an area for an urban densification and ensuring it is suitably located within the city fabric. Maps are diagrammatic and aim to convey information important to the research of this project. From this site and context analysis a final site is determined for the project.

Figure 33 // Wellington aerial; context map

CONTEXT MAP

The built environment consists of the physical structure and organization patterns of building blocks, neighborhoods, towns and cities.

A built environment undergoing urban densification requires the support of physical infrastructure, resources and operational components, which are essential to its functioning. (Coyle, Stephen. 6)

Increasing the number of people in an area can provide support many businesses and the local community. Amenities such as swimming pools, public libraries, local schools, hospitals, parks, public transport networks, and the commercial areas all benefit from a densely populated environment resulting in increased activity. (Betanzo, Mike)

This map looks at identifying existing context within the city, which contribute to and assist urban densification. City and Suburban centres can provide additional infrastructure and mixed use urban amenities for higher density urban environments.

The following have been mapped and considered as important infrastructure, which can support urban densification and have been located on the Context Map.

LEGEND

- Urban Centres
- Educational Facilities
- Health Care Amenities
- Recreational Park Land

Figure 34 // Wellington aerial; suburb population map

INNER CITY POPULATION

The inner city is the central area of a major city and the area tends to have a higher population density to that of outer suburbs with more of the population living inside multi-floored town houses and apartment buildings.

The purpose is to gather information about the general population, in order to present a full and reliable picture of the population in the suburbs within the city and the expected demands some areas are facing with regards to housing conditions and population increases.

Aside from Wellington Central and Te Aro, the central suburbs are expected to have the largest forecasted population growth by 2043 is Newtown (37.47%), Thordon-Pipitea (29.42%), and Mt Cook (28.95%). Developing an urban intensification strategy in these areas could be considered beneficial for the city.

203,800

Wellington City's population in 2015

27%

Increase in number of dwellings by 2043

19%

Forecasted population growth by 2043

2.6

Average household size Mt Cook 2043

<p>[1.] WELLINGTON CENTRAL</p> <p>2016 Pop: 3,462 2043 Pop: [+116.62%] 7,499</p> <p>2016 Households: 1,100 2043 Households: 2,836</p>		<p>[6.] BERHAMPORE</p> <p>2016 Pop: 3,887 2043 Pop: [+23.11%] 4,786</p> <p>2016 Households: 1,533 2043 Households: 1,938</p>	
<p>[2.] TE ARO</p> <p>2016 Pop: 11,339 2043 Pop: [+73.26%] 19,647</p> <p>2016 Households: 3,839 2043 Households: 7,890</p>		<p>[7.] KELBURN</p> <p>2016 Pop: 4,175 2043 Pop: [+13.71%] 4,747</p> <p>2016 Households: 1,251 2043 Households: 1,535</p>	
<p>[3.] NEWTOWN</p> <p>2016 Pop: 9,123 2043 Pop: [+37.47%] 12,541</p> <p>2016 Households: 3,255 2043 Households: 4,686</p>		<p>[8.] MT VICTORIA</p> <p>2016 Pop: 5,270 2043 Pop: [+11.20%] 5,860</p> <p>2016 Households: 2,128 2043 Households: 2,443</p>	
<p>[4.] THORDON - PIPITEA</p> <p>2016 Pop: 4,639 2043 Pop: [+29.41%] 6004</p> <p>2016 Households: 2,017 2043 Households: 2,716</p>		<p>[9.] ARO VALLEY</p> <p>2016 Pop: 3,929 2043 Pop: [+6.55%] 4,186</p> <p>2016 Households: 1,543 2043 Households: 1,699</p>	
<p>[5.] MT COOK</p> <p>2016 Pop: 7,656 2043 Pop: [+28.95%] 9,872</p> <p>2016 Households: 2,482 2043 Households: 3,523</p>		<p>[10.] ROSENEATH - ORIENTAL BAY</p> <p>2016 Pop: 3,335 2043 Pop: [+8.35%] 3,613</p> <p>2016 Households: 1,503 2043 Households: 1,674</p>

Figure 35 // Wellington aerial; city circulation map

TRANSPORT

Having an urban intensification scheme directly linked in close vicinity to public transport nodes makes accessing the city easier for residents and places less demands on the requirements for private car ownership.

Wellington's hilly terrain has considerable affect on public transport. Wellington can be considered a good city for public transport utilizing around 470 buses within the region. The topography of the city concentrates dense corridors for transport routes through valleys or along coastlines passing through suburban and city centres.

GIS information indicates that 77% of the region's population lives within 800 meters radius of a public transport stop and will have to wait at the most of 30 minutes before catching a ride. (WCC)

Some of the main benefits of higher density environments is the reduction of private car travel. On a city-wide scale, areas with higher densities, accessible land and connected transport options demonstrate less reliance on private car ownership. (Miko Betanzo) These higher density areas show greater numbers of people walking, using public transport, cycling and spending less time commuting.

25 %

Increase in number of people using buses

5 km

Average commute distance to work

17 %

Wellington residents walk to work (5% nationally)

65 %

Residents use public transport, walk or cycle into the city

Figure 36 // Wellington aerial; town belt amenity map

WELLINGTON TOWN BELT

The Wellington City Town Belt is a significant part of Wellington and has played a critical role in both shaping a sense of place and defining the city's geographical identity.

Combined, the reserves and parkland create a large area of open space which acts as a scenic back drop to the inner city as well as providing recreational opportunities for visitors and residents. Over the last 170 years the belt has stretched in a horseshoe shape from Mount Victoria in the North-East back down and around towards Thorndon in the North-West consisting of around 520 hectares of land.

The entirety of the Town Belt has been drawn and this analysis highlights, in colour, all public areas located on the Town Belt that can easily be accessed by the public. This includes key public amenities such as;

Colour

- Parks, reserves, vegetated slopes visible from both the central city and from external suburbs
- A large range of sporting and recreational activities including football parks, velodromes, botanical gardens and walking tracks.

The remaining land acts as a continuous horseshoe form of undeveloped hills between the central city and surrounding suburbs.

TOPOGRAPHIC SURVEY

The hills encircling the inner city form the capital's Town Belt which provides a unique edge condition to the urban fabric by enclosing the city and central suburbs.

The topographical condition presents itself as a continuous green sweep of native vegetation and parkland providing an important part of Wellington's landscape and geographical identity. Effectively, the central city and suburbs rest within a basin surrounded by hills as the topography slopes upwards and outwards towards the encircling town belt.

The composition of flatter plains at the centre with sloping hills either side creates a wide range of topographical situations that vary across the city's geography. Large scale topographic meshes help identify different steepness's in slopes.

3 5 5 k m

Council managed tracks and walkways in the city's open space areas.

2 0 0 m ²

Green open space per resident, compared to 5m² per resident in Japan.

LEGEND

Figure 37 // Wellington aerial; GIS contour slope maps

SITE ANALYSIS REFLECTION

IN SUMMARY

The Site Analysis evaluated important information that was required to distinguish an area for urban densification. Any density increase must be carefully considered alongside quality design, land-use, accessibility and greater connectivity, which is why the various mapping of information was used to help distinguish a decision. (Opher, Philip) Important information gained from this exercise were;

Built environments undergoing densification require the support of physical infrastructure and resources to assist in the functioning of a densely populated area. For example, a small convenience store might be suitable to source resources for a block of residents. If this block of residents increases by 150% the resources available from the small convenience store might become insufficient. Densification would be more appropriate and suitable around an area with a stronger and more thriving infrastructure that residents can readily access.

Through information analysed and gathered from the Wellington City Council there were three inner city suburbs noted as appropriate areas to target for developing urban intensification. These central suburbs had the largest forecasted population growth and were as follows;

A considerable benefit of higher density environments is reducing private car travel. Higher density areas show greater numbers of residents walking, cycling and utilizing public transport. Therefore, ensure urban intensification schemes are directly linked in close vicinity to public transport nodes. This simple intent makes accessing the areas in the city easier for residents and creates less demand on the requirements for private car ownership as well as making more destinations and amenities accessible by non-drivers.

CONTINUED. REFLECTION

More intensive land use has the side effect of reducing green spaces and trees. It is not always a requirement to retain greenery however this project plans for the quality integration of usable green space and tree planting. Mapping and locating public areas around the town belt helps identify areas that can provide an abundance of vegetation and quality open green space that residents can utilise despite living in a denser environment. However, working with the vegetated slopes also provides challenges in locating urban and built form around natural occurring ecologies and landforms.

DETERMINED SITE

Rolleston Street. Mt Cook Prince of Wales Park, Wellington Town Belt

The site was determined by evaluating information from each component of the Site and Context analysis. It was important that the selected site either currently responded to or had the opportunity to connect with each of the five topics used for analysis. This ensures the final decision to an area that would be able to accommodate an urban densification and test research & design strategies upon.

The Rolleston Street block in Mt Cook was decided for existing qualities and opportunities because of;

- o Close vicinity to infrastructure that can support a denser population. City centre (north) and short walking distance to Newtown town centre (east)
- o Noted as an appropriate inner city suburb for urban densification due to its high forecast of 29% population growth across the next 25 years – developing a densification strategy here would be considered beneficial for the city.
- o Close vicinity to town centres makes accessing public transport simple for residents.
- o City bus route located adjacent to site.
- o Close vicinity to open green spaces and vegetated parkland which residents can use as communal outdoor space while living in denser environments.
- o Sloped topography encourages opportunities for research and design into combining built form with landscape

Figure 38 // Wellington aerial; determined site
Figure 39 // Wellington aerial; town belt context

^
Figure 40 // 1:200 model; experimentation of density

DENSITY ANALYSIS

'It is clear that by increasing density - the number of people per unit area - many economic, environmental and social benefits can be realised.' Miko Betanzo

The following *Density Analysis* is aimed at gaining quantitative information and research regarding the Rolleston Street site to make informed decisions upon appropriate urban consolidation. Dwellings per hectare (dph) will be referred to as a common measurement used to help compare density.

This section begins with an overview of the existing density and dwelling types on the site. Following this are investigations that inform and calculate suitable increases in net density with diagrammatic analyses into the effects increasing built form has on site coverage.

EXISTING DWELLING TYPES

An initial overview was conducted which identifies the four main dwelling types occupying the site. This study was done by measuring building footprints to distinguish approximate floor areas of each dwelling type. There is an even amount between one to two story houses (45 dwellings) with suburban subdivisions and a social housing complex consisting of three apartment buildings (54 dwellings).

Pages 74-75 show diagrams of existing dwelling types highlighted on site

Pages 76-77 has quantitative information of each dwelling's approximate floor area based upon building footprint and dwelling type. This provides information required to calculate dph and the total floor area (constructed surface) of the entire housing stock on site.

ROLLESTON STREET APARTMENTS

*Approx. 75m²
Lot Area Approx. 5000m²
Separate on street parking*

1 STOREY HOUSE
Approx. 120m² - 230m²
Lot Area Approx. 400m²
Detached Garage

2 STOREY HOUSE
Approx. 104m² - 224m²
Lot Area Approx. 340m²
Detached Garage

2 STOREY HOUSE
Approx. 104m² - 224m²
Lot Area Approx. 340m²
Detached Garage

1 STOREY

20 DWELLINGS / 25dph

GF Plot Cover: $3500m^2$ (11,482 ft^2)

GFA: $3500m^2$ (11,482 ft^2)

Parking: *Detached Garage*

2 STOREY

25 DWELLINGS / 25dph

GF Plot Cover: $3120m^2$ (10,236 ft^2)

GFA: $6000m^2$ (19,685 ft^2)

Parking: *GF Garage*

Figure 45 // Density Type Axonometric; One Storey
Figure 46 // Density Type Axonometric; Two Storey

ROLLESTON ST APARTMENTS

54 UNITS / 100dph

Apartment Buildings (3)

Unit GFA: $80m^2$ (262 ft^2)

Parking: *Separate on street parking*

SITE COVERAGE

25,000m² SITE COVERAGE

Building GF Coverage of Site: $8500m^2$ (34%)

Average Lot Size: $520m^2$ (1706 ft^2)

Parking: *On street parking*

Figure 47 // Density Type Axonometric; Rolleston Street Apartments
Figure 48 // Density Type Axonometric; site coverage

1 STOREY (*ON SITE*)

1.	65m ²	6.	135m ²	11.	160m ²	16.	190m ²
2.	65m ²	7.	140m ²	12.	160m ²	17.	200m ²
3.	75m ²	8.	140m ²	13.	170m ²	18.	210m ²
4.	120m ²	9.	150m ²	14.	180m ²	19.	230m ²
5.	120m ²	10.	160m ²	15.	190m ²	20.	230m ²

2 STOREY (*ON SITE*)

1.	104m ²	6.	144m ²	11.	192m ²	16.	200m ²	21.	208m ²
2.	104m ²	7.	152m ²	12.	192m ²	17.	200m ²	22.	216m ²
3.	128m ²	8.	152m ²	13.	200m ²	18.	208m ²	23.	216m ²
4.	136m ²	9.	176m ²	14.	200m ²	19.	208m ²	24.	216m ²
5.	144m ²	10.	192m ²	15.	200m ²	20.	208m ²	25.	224m ²

ROLLESTON ST APARTMENTS (*ON SITE*)

54 Units	75m ²
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MT COOK HOUSES (*SEPARATE TO SITE*)

2428 Dwellings

MT COOK HOUSING

Total population in 2013 for Mt Cook was estimated as 7,118 people. An estimated increase of 1,300 people to 8,454 by 2028. This is an average annual growth rate of 1.15%. This information is based upon the increase of 530 households during the period. The average number of people per household is expected to fall from 2.64 to 2.60 by 2028. Therefore growth must occur in the number of dwellings for residents to live in to maintain population growth. (Wellington City Council)

Diagram illustrating the increasing demand lower average household sizes have on housing requirements.

MINIMUM FLOOR AREA TABLE

Minimum gross internal floor area information was sourced by the Department for Communities and Local Government. Information was configured into a format that relates internal space to the number of bedrooms available for a dwelling. This provided quantitative classification for assessment purposes; information from the table was used to size smaller dwellings and test how urban consolidation can be achieved on the existing site. This is explored in the following pages.

NUMBER OF BEDROOMS	NUMBER OF BED SPACES	1 STOREY HOUSE	2 STOREY HOUSE	3 STOREY HOUSE	BUILT-IN STORAGE
1 Bedroom	1 Occupant(s)	40m ²			1.0m ²
	2 Occupant(s)	50m ²			1.5m ²
2 Bedroom	3 Occupant(s)	61m ²			2.0m ²
	4 Occupant(s)	70m ²			
3 Bedroom	4 Occupant(s)	74m ²	84m ²	90m ²	2.5m ²
	5 Occupant(s)	86m ²	93m ²	99m ²	
	6 Occupant(s)	95m ²	102m ²	108m ²	
4 Bedroom	5 Occupant(s)	90m ²	97m ²	103m ²	3.0m ²
	6 Occupant(s)	99m ²	106m ²	112m ²	
	7 Occupant(s)	108m ²	115m ²	121m ²	
	8 Occupant(s)	117m ²	124m ²	130m ²	
5 Bedroom	6 Occupant(s)	103m ²	110m ²	116m ²	3.5m ²
	7 Occupant(s)	112m ²	119m ²	125m ²	
	8 Occupant(s)	121m ²	128m ²	134m ²	
6 Bedroom	7 Occupant(s)	116m ²	123m ²	129m ²	4.0m ²
	8 Occupant(s)	125m ²	132m ²	138m ²	

KEY FIGURES *from density calculations*

DENSITY
SITE DPH

42dph

OPEN SPACE

66% = 16,500m²

TOTAL EXISTING
FLOOR AREA

13,550m²

SITE COVERAGE %

34% = 8500m²

DENSITY TESTS

Following pages demonstrate diagrammatic tests which investigated the effects an increase of built form has upon site coverage. Densification tests of 100%, 125%, 150%, 175% and 200% were conducted. A legend for the following process work is shown below.

LEGEND

100%	DWELLING SIZE	NUMBER OF DWELLINGS	FLOOR AREA	Combined Footprint; Area Coverage
100 Dwellings (42 dph)	1 Bed (50m ²)	5	250m ²	: <u>9350m²</u>
	2 Bed (70m ²)	20	1400m ²	: <u>4675m²</u>
	3 Bed (95m ²)	50	4500m ²	: <u>3117m²</u>
	4 Bed (125m ²)	20	2500m ²	
	5 Bed (140m ²)	5	700m ²

125%	DWELLING SIZE	NUMBER OF DWELLINGS	FLOOR AREA	Combined Footprint; Site Coverage
125 Dwellings (52 dph)	1 Bed (50m ²)	6	310m ²	: <u>11,688m²</u>
	2 Bed (70m ²)	25	1750m ²	: <u>5844m²</u>
	3 Bed (95m ²)	63	5625m ²	: <u>3896m²</u>
	4 Bed (125m ²)	25	3125m ²	
	5 Bed (140m ²)	6	875m ²

150%	DWELLING SIZE	NUMBER OF DWELLINGS	FLOOR AREA	Combined Footprint; Area Coverage
150 Dwellings (63 dph)	1 Bed (50m ²)	8	375m ²	: <u>14,025m²</u>
	2 Bed (70m ²)	30	2100m ²	: <u>7015m²</u>
	3 Bed (95m ²)	75	6750m ²	: <u>4675m²</u>
	4 Bed (125m ²)	30	3750m ²	
	5 Bed (140m ²)	8	1050m ²

175%	DWELLING SIZE	NUMBER OF DWELLINGS	FLOOR AREA	Combined Footprint; Area Coverage
175 Dwellings (73 dph)	1 Bed (50m ²)	9	440m ²	: <u>16,365m²</u>
	2 Bed (70m ²)	35	2450m ²	: <u>8180m²</u>
	3 Bed (95m ²)	88	7875m ²	: <u>5455m²</u>
	4 Bed (125m ²)	35	4375m ²	
	5 Bed (140m ²)	9	1225m ²

200%	DWELLING SIZE	NUMBER OF DWELLINGS	FLOOR AREA	Combined Footprint; Area Coverage
200 Dwellings (83 dph)	1 Bed (50m ²)	10	500m ²	: <u>18,700m²</u>
	2 Bed (70m ²)	40	2800m ²	: <u>9350m²</u>
	3 Bed (95m ²)	100	9000m ²	: <u>6230m²</u>
	4 Bed (125m ²)	40	5000m ²	
	5 Bed (140m ²)	10	1400m ²	

DENSITY ANALYSIS REFLECTION

IN SUMMARY

Analysis of the Rolleston Street site gathered quantitative information to inform decisions of urban consolidation. Diagrammatic tests investigated what effects the increase of built form has upon site coverage. This assisted in suggesting suitable urban consolidation goals for the site.

The existing site contains 100 dwellings, measuring 42dph. To introduce more dwellings with suitable public space a densification of 175% dwellings was tested and determined as a functional increase. This percentage increase will allow for a balance to be retained between built form and landscape components, both required to achieve beneficial consolidation goals.

A consolidation goal to increase the site density by 175% results in providing 175 dwellings at 73dph. Creating smaller sized, attached dwellings in closer vicinity to one another attained initial densification in this section. This will be developed upon in later research and design process.

Continuing from the density investigation is a series of brief design tests conducted to provide alternative concepts for locating the higher density built form. These are included on the two following pages to develop upon the density reflection.

ATTACHED ROW ALONG

Arranging repetitive attached rows along contours opens up lateral street connections and allows access roads to be easily integrated.

ATTACHED ROW DOWN

Arranging repetitive rows down contours at the edge of site defines street edge and creates open space internal to the site.

ALONG & DOWN

Arranging dwellings both along and down contours provides most adaptable solution to dealing with topography. Lateral streets still easily integrated where breaks in built form occur.

PERIMETER ALONG & DOWN

Arrangement of dwellings create defined block on site that reinforce street edge while providing internal courtyard space

Figure 50 // 1:500 model; site contours

TOPOGRAPHY ANALYSIS I

Chapter contains visual and written documentation of the design process, with critical reflection.

The following investigation into topography and applying built form is divided into two sections. The first section takes a closer look at identifying gradients to classify slopes and landforms. The second section tests the fit of built form against the various types of slopes.

The aim of this study is to understand what are the most appropriate areas on a site for densification and which typologies best align with the various slope gradients and landforms

Figure 51 // Wellington aerial; site location in city

^

Figure 52 // Diagram; locating section cuts

^

Figure 53 // Iso Models; site slope sections

Iso Models of the site were taken through topography to discover variations in landform gradients and directionality of slopes. From analysis it was clear the site became divided into a top and bottom half with different topographical conditions. Steeper gradients were found towards the top of the site whereas shallower slopes were more common towards the lower half. *Section model A* consists of a gentle incline compared to *Section model B, C and D* located higher on the site, sloping upwards and towards to the Wellington Town Belt.

SLOPE ANALYSIS

Slope Classification

	Angle	Classification and Use
45°	Very Steep (<i>repose: Rock embankment</i>)
	20°	Steep (<i>max. slope: grade IV agricultural land</i>)
	10°	Strong (<i>max. slope: general house building</i>)
	5°	Moderate (<i>max. slope: pedestrian ramps, prams</i>)
	1°	Gentle (<i>max. housing with special provisions</i>)

TOPOGRAPHY ANALYSIS

The topography analysis and slope maps provided evidence of a variety in slope gradients and landform on the Rolleston Street site. Classification of gradients are then used to structure research and design tests of applying built form to slopes in topography analysis section two.

A.

B.

C.

TOPOGRAPHY ANALYSIS II

APPLYING BUILT FORM TO SLOPES

Topography Analysis II involves research and investigation into the application of built form onto slopes. The study includes research into existing terrace housing projects that are displayed on both flat and sloped topography.

The aim of this analysis was to uncover the relationship between building depths and heights relative to gradient and from this develop an inventory of housing typologies that are organised according to gradient.

1

2

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12

TERRACE INVENTORY

FLAT SITE DWELLINGS

An inventory of housing typologies
organized according to gradient

1. Argyle Street Fitzroy
2. Design Handbook Type B
3. Design Handbook Type C
4. Design Handbook Type D
5. Design Handbook Type E
6. Design Handbook Type G
7. Design Handbook Type A
8. Park Street Abbotsford
9. Design Handbook Type F
10. Drummond Street Carlton
11. Michael Street Clifton Hill
12. Paddington Terrace
13. Grattan Street Carlton

14

15

16

17

18

TERRACE INVENTORY

SLOPED SITE DWELLINGS

An inventory of housing typologies
organized according to gradient

- 14. Duke Street
- 15. Beetham Cumbria
- 16. Langdon Hills
- 17. Peckarmans Wood
- 18. Siedlung Halen

ARGYLE STREET FITZROY

Floor Area : 81sqm
O/A Land Take : 132sqm
Density (75dph)
3 Bed 5 People
Flat topography

SUMMARY

Width : 4m
Length : 20m
Height : 1 Storey

Long and narrow plan aligning best parallel to contours. Low requirement for land excavations. Small front yard and medium rear yard.

Gains access from GF front;
10°, 15°, 25°

Gains access to roof at;
25°

25°

15°

10°

Axonometric Slope Test

Plan

25°

15°

10°

Sectional Slope Test

DESIGN HANDBOOK TERRACE TYPE B

Floor Area 95sqm
O/A Land Take 135sqm
Density (7dph)
3 Bed 5 People
Flat topography

SUMMARY

Width : 5m
Length : 14m
Height : 2 Storey

Narrow plan aligning best parallel to contours with central stairwell. Small depth reduces requirement for land excavations. Small front yard and medium rear yard.

Gains access from GF front;
10°, 15°, 25°

Gains access to 2nd Floor at;
25°

Axonometric Slope Test

Plan

Sectional Slope Test

DESIGN HANDBOOK TERRACE TYPE G

Floor Area 99sqm
O/A Land Take 147sqm
Density (68dph)
3 Bed 5 People
Flat topography

Axonometric Slope Test

Sectional Slope Test

SUMMARY

Width : 8m
Length : 10m
Height : 2 Storey

L' shaped plan with 10m length running along contour. Awkward shape and 8m width create high land excavation. Front yard

Access from GF front;
10°,15°,25°

Gains access to roof at;
25°

Gains access to 2nd floor at;
15°

Plan

PARK STREET ABBOTSFORD

Floor Area 105sqm
O/A Land Take 184sqm
Density (54dph)
3 Bed 5 People
Flat topography

Axonometric Slope Test

Sectional Slope Test

SUMMARY

Width : 8m
Length : 17m
Height : 1 Storey

More suited to flat sites. Building width of 8m limits the amount of daylight into rear rooms. High land excavation for a 1 storey dwelling. Front and rear yards.

Gains access from GF front;
10°, 15°, 25°

Gains access to roof at;
15°

Plan

DESIGN HANDBOOK TERRACE TYPE F

Floor Area 111sqm
O/A Land Take 119sqm
Density (84dph)
3 Bed 5 People
Flat topography

Axonometric Slope Test

25°

15°

10°

Sectional Slope Test

SUMMARY

Width : 6.5m
Length : 6.5m
Height : 3 Storey

Aligns either direction to contours. Low requirement for land excavation considering you gain 90sqm floor area across 3 floors. Good daylight until GF is placed at 25° Small front yard.

Gains access from GF front;
10°, 15°, 25°

Gains access to 2nd floor at;
15°

Plan

DRUMMOND STREET, CARLTON

Floor Area 113sqm
O/A Land Take 91sqm
Density (109dph)
4 Bed 7 People
Flat topography

Axonometric Slope Test

Sectional Slope Test

SUMMARY

Width : 13m
Length : 17.5m
Height : 2 Storey

*Long length requires large land excavation.
GF loses considerable daylight at all slopes.
Medium front yard and small rear yards.*

Gains access from GF front;
10°, 15°, 25°

Gains access to roof at;
15°

Gains access to 2nd floor at;
10°

Plan

PADDINGTON TERRACE, SYDNEY

Floor Area 117sqm
O/A Land Take 130sqm
Density (76dph)
3 Bed 5 People
Flat topography

Axonometric Slope Test

25°

15°

10°

Sectional Slope Test

SUMMARY

Width : 5m
Length : 17.5m
Height : 2 Storey

Longer length and narrow width fits most slopes well when positioned along contour. Would benefit from a third level. Front and rear yards

Gains access from GF front;
10°, 15°, 25°

Gains access to 2nd floor at;
15°

Plan

GRATTAN STREET, CARLTON

Floor Area 195sqm
O/A Land Take 266sqm
Density (37dph)
5 Bed 9 People
Flat topography

SUMMARY

Width : 12.5m
Length : 19m
Height : 2 Storey

Long length mean GF gains minimal sun when cut into topography. 2nd Floor function well at 10° slope. Small front yard and large rear yard.

Gains access from GF front;
10°, 15°, 25°

Gains access to 2nd floor at;
10°

Axonometric Slope Test

Sectional Slope Test

Plan

MICHAEL STREET, CLIFTON HILL

Floor Area 237sqm
O/A Land Take 280sqm
Density (35dph)
35 Bed 9 People
Flat topography

SUMMARY

Width : 7m
Length : 32m
Height : 2 Storey

Longer length and narrow width fits along contour. Building mass becomes unpractical at 25° as land excavation increases and day-light become hard to attain in rear rooms. Front and rear yards

Gains access from GF front;
10°,15°,25°

Gains access to 2nd floor at;
15°

Axonometric Slope Test

Sectional Slope Test

Plan

LANGDON HILLS ESSEX, ENGLAND

Parallel Terrace
Clive Plumb + Douglas Galloway
Floor Area 106sqm
O/A Land Take 105sqm
Density (49dph)
3 Bed 5 People
Slope Topography
Gradient 1:10 (5.7 degrees)

Axonometric Slope Test

Sectional Slope Test

SUMMARY

Width : 6m
Length : 12.5m
Height : 2 Storey

Longer length was placed against contours to develop a stepping form. Massing suits mild slopes as daylight is again lost in rear room on lower floor. Front yard

Gains access from GF front;
10°, 15°, 25°

Gains access to 2nd floor at;
10°

Plan

55 DUKE STREET THREE KINGS, AUCKLAND

Floor Area 117sqm
O/A Land Take 130sqm
Density (31dph)
3 Bed 5 People
Slope Topography
Gradient 1:20 (3 degrees)

Axonometric Slope Test

25°

15°

10°

Sectional Slope Test

S U M M A R Y

Width : 8m
Length : 15m
Height : 2 Storey

Orientation of massing along contour creates closer relationship to topography. Narrow GF reduces excavation while 2nd floor extends back until it reaches the slope. Front and rear yards

Gains access from GF front;
10°, 15°, 25°

Gains access to 2nd floor at;
15°

Plan

PECKARMANS WOOD DULWICH, LONDON

Split-level Terrace
Floor Area 188sqm
O/A Land Take 205sqm
Density (48dph)
4 Bed 7 People
Slope Topography
Gradient 1:6 (9 Degrees)

Axonometric Slope Test

Sectional Slope Test

SUMMARY

Width : 12m
Length : 10m
Height : 2 Storey

Aligns either direction to contours. Mild requirement for land excavation considering you gain 188sqm floor area across two floors. Could be increased to three floors. Reasonable daylight. Small front yard and rear yards.

Gains access from GF front;
10°, 15°, 25°

Gains access to 2nd floor at;

Plan

BEETHAM CUMBRIA

Curved Terrace/Rural site
 Floor Area 194sqm
 O/A Land Take 121sqm
 Density (82dph)
 4 Bed 6 People
 Slope Topography
 Gradient 1:5 (11 degrees)

Axonometric Slope Test

25°

15°

10°

Sectional Slope Test

SUMMARY

Width : 7.5m
 Length : 13m
 Height : 3 Storey

Attached row is designed to face each dwelling against contour, however the attached row of dwellings runs along the contour. direction to contours. Mild requirement for land excavation Good daylight. Small front yard.

Gains access from GF front;
 10°, 15°, 25°

Gains access to 2nd floor at;
 10°

Common

Plan

SIEDLUNG HALEN

Stepped Housing
Floor Area 720sqm
O/A Land Take 460sqm
Density (110dph)
Unit size vary
Slope Topography
Gradient 1:5 (11 degrees)

SUMMARY

Width : 6m
Length : Variable, 40m
Height : 3 Storey

Multiple level, stepped dwellings
create access from front and rear
yards at different levels. Built form
and landscaping combine to create
a terracing typology.

Gains access from GF front;
10°, 15°, 25°

Gains access to 2nd dwelling at;
10°, 15°, 25°

Axonometric Slope Test

Plan

Sectional Slope Test

BUILT FORM & TOPOGRAPHY

DESIGN STUDY

The terrace inventory illustrated how different displays of built form can respond to variable slopes. The next two pages include short design studies that are a reflection and development upon topography analysis II. The process involves applying built form to the existing site while altering room depths and floor levels to respond to slope gradient.

Spaces between built form are conceptualized as thoroughfares for the residents. Stepping the dwellings up the hillside and reducing the ground floor depth created less excavation to the natural slopes. Different typologies are explored to occupy the hillside.

- o Dwellings are arranged as an attached row moving along the hill contours
- o Building depth is adapted depending on slope
- o Building heights are increased to three levels to improve density
- o Built form is spaced at a distance to allow sunlight for streets
- o Dwellings accessed from street have setbacks at entrances to improve privacy
- o Level changes promote interesting thresholds between built form

>

Figure 71 // Section; built form and topography exploration

 Figure 72 // Axonometric; layering the landscape

Figure 73 // Iso Section; layering landscape with built form

Figure 74 // Aerial Perspective; early iteration of massing on slope

TERRACE INVENTORY REFLECTION

IN SUMMARY

The research involved identification of slopes and landforms that followed with an investigation into the application of built form on to slope. The topography analysis and slope maps provided evidence of a variety in slope gradients and landform on the Rolleston Street site. The quantitative slope results were categorized into a qualitative classification, which summarized the site as having gentle, moderate, strong and steep gradients - typically ranging between 1°-20°.

Application of built form was the next phase in the topography research and an inventory of terraced housing located on flat and sloped topography was tested. The application of precedents designed for flat sites was to acknowledge problems associated when this typology is applied to hill sites. This is similar to and reflects the existing site built form and display.

Design outcomes testing flat topography housing on to sloped sites;

- o Shorter width was typically placed running along contours – Design Handbook Terrace Type F displayed 6-7m was the most ideal width as it allowed suitable daylight for all three floors
- o Large excavation of land required to site building mass
- o Built form is constructed vertically with no offsets in upper floors

Design outcomes testing sloped topography housing onto sloped sites;

- o Stepped dwellings display deeper built form width and provide daylight to rear rooms – Siedlung Halen and Langdon Hills begin to show this.
- o Less excavation required as built form is more suited to slopes
- o Offsetting upper floors to fit slope more appropriately

HUMAN
SCALE

SENSE OF
ENCLOSURE

DEFINING TERRITORY & PRIVACY

'Only architecture that considers human scale and interaction is successful architecture.' Jan Gehl

The following analysis explores the extent to which built form can define territory and demarcate privacy. It demonstrates how building envelopes – their scale, proportion and extent of openings - can enclose or expose the occupant and influence their experience.

These components are vital for influencing the degree of privacy experienced at a human scale. The study is relative to the densification project by exploring how a continuity of spaces can be achieved by ensuring a clear definition between the public, common and private realm.

Figure 75 // Diagram; Jan Gehl's degree of privacy

SCALE & OPENINGS

Larger scale;
courtyard, plaza, foyer, park

Smaller scale;
street, room, stairs

SCALE

Large urban areas create a grand feeling making the occupant feel small, less significant, and exposed within the space. Confined spaces create a sense of enclosure and can be used to enhance privacy.

OPEN CORNERS

Spaces designed with open corners appear and feel less enclosed for an occupant. The example to the left indicates only 4 internal faces defining the space.

CLOSED CORNERS

Spaces designed with closed corners create a sense of enclosure. Another example illustrates the number of internal faces defining the space. When corners are closed the faces increase to 8. This increases an occupant's sense of enclosure.

SENSE OF ENCLOSURE

LOW ENCLOSURE

The space is less identifiable when opened up to a larger scale, has many entrances and has large spaces inbetween. This could be associated to a low-density suburban or rural street where the urban fabric lacks a sense of direction or building grain.

MILD ENCLOSURE

The urban fabric becomes denser and more organized. This creates a sense of mild enclosure for an occupant. The user becomes more aware of the boundaries created around them and can understand certain limitations set in place by the built form.

HIGH ENCLOSURE

Common in well-defined streets and confined courtyard spaces. Boundaries are clearly defined by the built form. This improves a user's sense of location and directionality.

URBAN ELEMENTS DEFINING SPACE

VEGETATION

Vegetation can define the boundary of a space. Boundaries are more permeable than solid walls as they permit views, light and sound. Tree canopies provide a soft sense of enclosure from above, functioning similar to an awning.

LEVEL CHANGES

Level changes divide the horizontal plane of a space. They add verticality, which defines space as either above or below. Generally a hierarchy in gradients of privacy is created as higher spaces (more private) look down upon the lower levels (less private).

TOPOGRAPHY

Natural or artificial changes in landscape help define the boundary of a space. In a public park for example; flatter and more direct areas encourage people to walk while sloped mounds or embankments appear more appealing to sit and occupy.

BUILT FORM DEFINING SPACE

SCREEN WALLS

Create clear definition and boundaries enforcing privacy. Common elements include front or rear yard fences, interior partitions and balcony balustrades. Level of privacy can be adapted by changing permeability of screen, size, height, scale and materiality.

BUILDING FORM

Openings and building forms are common to create a definition of space. The scale and proportion of an opening provides a clear indication of whether the space feels enclosing or exposed. Building form can influence the privacy of entrances and streets.

STREETS

Scale and proportions of a street is defined by the urban form enclosing it. Streets are important spaces determined by their scale and degree of privacy. They can be large or small, busy or quiet and have different functions depending on how they are designed.

CONTRASTING SPACES

CONTRAST

Examples to the left show two contrasting spaces. A courtyard designed as a static space for people to occupy compared to a longer and more direct space encouraging movement and thoroughfare.

CONTINUITY

Continuity of spaces is when one naturally leads to the next and is important when designing networks of spaces. They encourage people to move through designed spaces as intended. This concept can also be applied to linking networks of ecologies.

UNLINKED SPACES

Unrelated spaces lack continuity and contrast. Undefined spaces can become isolated through separation caused by car parks, roads and play areas – any spaces that interfere with the linking of spatial networks.

TERRITORY & PRIVACY

LOW ENTRANCE DEFINITION

Entrances that appear less defined encourage use and access by the public. Pedestrians have a detailed view of the space and therefore feel invited, comfortable and less conscious entering from one space to the next.

MILD DEFINITION

Arrangement of built form is closer together. Defines and limits people entering. Entry remains permitted however it appears more suited for semi-public and semi-private spaces which can deter public.

WELL DEFINED ENTRANCE

Common in residential settings where owners clearly define boundaries between public spaces and privatised territory. Arrangement of dwellings and grain become tighter. Additional fences or gates deter public entry.

SPATIAL PROPORTION - NARROW

CONTEMPORARY LONDON MEWS

1.8:1

Height: 5.5m Width: 3.0m
Narrow and very confined, private

MINIMUM RATIO

1:1

Height: X Width: X
Suggested minimum height/width ratio by GLC - less feels claustrophobic

TRADITIONAL LONDON MEWS

1:1

Height: 6.5m Width: 6.5m
Mildly confined, semi private

CONTEMPORARY LONDON MEWS

1:1.2

Height: 7.6m & 5.2m Width: 9.2m
Mildly confined, semi private

SPATIAL PROPORTION - WIDE

TRADITIONAL LONDON TERRACE

1:1.5

Height: 6.0m Width: 9.0m

Wide with openness to sky, semi public

TRADITIONAL LONDON TERRACE

1:2

Height: 6.0m Width: 12.0m

Considerably wide, semi public

MAXIMUM RATIO

1:2.5

Height: X Width: 2.5X

Suggested maximum height/width ratio by GLC - greater feels too exposed

TRADITIONAL COURTYARD

1:4

Height: X Width: 4X

Extremely wide, public space

HARD & SOFT EDGES

Hard and soft edges create a visual variety, interest and change of character of a space while keeping contrast and retaining spatial definition.

Other elements such as change in level can be used to define a space without entirely enclosing it. A subtle change in levels can become an alternative to enclosing a space with built form.

SPATIAL PARAMETERS REFLECTION

IN SUMMARY

Determining the spatial characteristics of successful spaces between buildings can inform the design of future ones in ways that will stimulate the human senses. Human reactions and feelings are related to the observable characteristics and qualities of a given space, whether it be wide or narrow, large or small, high or low. (Gehl, Jan)

Sense of enclosure and the proximity to which each dwelling is arranged to another is an important consideration. When working with an urban consolidation scheme the main focus is to provide a more densely populated floor area with additional built form. Densely populated urban environment generally create a more confined and enclosed space for people down at street level. If managed well these more enclosed and privatized areas can be contrasted with larger spaces more suited to a public realm. This creates positive contrasts leading to more intriguing and well-designed networks of spaces.

Smaller groupings of dwellings tend to create a feeling of intimacy, protection and security, which helps to define a resident's territorial boundary. People are one of the most important elements of a space and therefore the spaces should be scaled to their use.

Using a combination of hard and soft edges to create a visual variety in spaces becomes an opportunity as the intensification scheme looks to increase built form while integrating the natural ecologies of a site. The strategic arrangement of built form and additional planting can help structure and enclose desired public spaces while providing an interesting contrast in character through hard and soft edges.

NATURAL ECOLOGY

'Nature visible in cities today, every landform, hydrologic feature, or plant life is to some degree shaped by the life history of that point on Earth' - Timothy Beatley

The analysis began with an overview of the natural ecologies existing on the site. From this simple strategies for strengthening and integrating these ecologies alongside urban densification were devised.

The subsequent design concepts integrate ecological systems to complement, add vitality to and improve the quality of outdoor spaces and the public realm.

They suggest how urban densification can incorporate ways to regenerate the existing ecological networks, nurture vegetated slopes and the wider natural systems of Wellington's town belt and parkland.

GREEN

VEGETATION: The Green network is *plants, trees and parkland* contributing to the spatial structure of urban systems. In urban areas, along with buildings and surfaces, it is a principal ecological element of urban structure (Ridd 1995).

BLUE

HYDROLOGY: The Blue network is a study of *movement and distribution of water* in relation to land. Observations of hydrologic processes predict the behavior of water flow to test strategies of integration with both built form and landscape.

GREY

STREET CONNECTIONS: The Grey network is connections between places and spaces on site and includes *pedestrian, bicycle, and shared roads*. The component shapes, organises and enables movement. Networks are defined by size, scale and functionality.

The following ecology analysis section identifies the inherent qualities embedded in the site; an important first step in creating positive links between the new organization of built form and the existing landscape. The natural ecologies researched in this section have been refined into the three categories of green, blue and grey networks – relating to vegetation, hydrology and street connections respectively.

ECOLOGY AXO GREY

ECOLOGY AXO GREEN

GREEN NETWORK

VEGETATION

This *Green Network* analysis is a study of existing vegetation and where proposed planting would be appropriate to take place. The existing vegetation is categorized into both low and high planting. The study also concludes where areas for public open green space would be suitable.

Clearly denoted on the map is a strong vegetated spine stemming from the top of the site at the Prince of Wales Park down through to the centre of the site where it connects to a more scattered groupings of vegetation. The central green spine is a strong ecological component that provides a unique link vertically through the site while strengthening the sloping landform.

Decisions on additional planting was based on;

- o Linking existing vegetation into stronger and more resilient networks
- o Framing public open green spaces with vegetated to help define boundaries
- o Strengthen steep areas of topography to improve resilience of landform

Decisions on locating public open green space was based on;

- o Proximity to existing vegetation and green ecology
- o On plateaus in landform as they provide flatter areas for the public to occupy
- o On areas of land that would provide intriguing views down and across the site
- o Staggering open green space as pocket parks that pedestrians pass through

Figure 90 // Ecology Site Map; green networks

BLUE NETWORK

HYDROLOGY

The *Blue Network* analysis is a study of movement and distribution of water in relation to the natural topography. GIS maps and 3d modelling assisted with informing where stormwater and rainwater would move through the site. Demonstrated on the previous page, the flow chart maps water flowing at right angles to the contour lines. Only major water bodies are mapped and are located in areas of the landscape where;

- o Topography converges into valley and gully shaped landforms
- o Topography becomes steeper
- o Topography has a constant direction of slope fall meaning water flow does not disperse
- o Down the edges of the site towards gutters

Figure 91 // Ecology Site Map; blue networks

Figure 92 // Ecology Sketch; blue and green combined networks

Walkways link to contours

Steps used to accomodate access on steeper slopes

Grey network overlaps with green spine - connecting pedestrians to vegetation

Strengthen slopes & landform with planting

Walkways link to pocket parks

Connections to each side of site

Prince of Wales Park

GREY NETWORK

STREET CONNECTIONS

This analysis consists of iterative design work to establish how people can move across the sloped topography. The design goals were to create an efficient and beautiful response to moving around the landforms and connecting residential streets to public areas on the site. Process models displayed below demonstrate iterations of providing lateral links across the site. The most successful results were realized when;

- o Walkways were aligned with contour datum lines
- o A path connected to each side of the site improve accessibility
- o Connections at consistent datum levels reduce land excavation
- o Steep inclines utilize steps

Figure 93 // Ecology Site Map; grey networks
Figure 94 // 1:200 Model; site circulation iterative process

Following on from the natural ecology research a new layout of built form was tested. The layout attempted to integrate previous ecology concepts. The iteration was discussed in a design review and the following feedback was noted;

Figure 95 // Site Aerial; iteration of built form and ecologies

SITE PLAN ITERATION

BUILT FORM + INTEGRATED ECOLOGIES

FEEDBACK

- The design requires more extreme contrast of spaces, large and small
- Pocket parks are too large and undefined
- Bottom of the site could be made more permeable for the public
- Top part of site might be more closed off.
- Define the major and minor paths across the site
- Define the major and minor pocket parks
- Clearer hierarchy in site plan of typologies
- Variety of typologies needs development
- Utilize hardscape vs vegetated areas / landscape
- Greater attachments in built form, then create cuts and breaks
- Too many small pieces, more attached dwellings

NATURAL ECOLOGY REFLECTION

IN SUMMARY

When considering urban densification the new arrangement of built form around existing ecological networks can achieve a more sensitive response to the site. Allowing natural ecologies to remain on the site creates opportunities to benefit the urban densification, as they are the component that contributes the quality of an urban environment. (Bradshaw & Bekoff) As most people are now living in towns and cities there is a requirement for urban dwellers to seek out interactions with nature by engaging in activities such as visiting urban green space. Encouraging natural ecologies to be retained and strengthened means a quality urban environment can be achieved which is localised for dwellers.

Key design opportunities attained from the ecology studies include;

- o Street networks and pathways that orientate with natural contours of site
- o Form new relationships between ecological networks and site topography
- o Natural ecologies support existing urban green space
- o Regenerate existing ecological networks to nurture vegetated slopes
- o Ecology networks are mutually benefited and strengthened when combined with one another.

Figure 96= // Ecology Diagram; blue, green, grey ecology overlap

4

FINAL DESIGN

*Chapter containing a visual and written documentation
of the final design response. Also included is the final
conclusion and critical reflection the thesis.*

Prince of Wales Park

C.

C.

D.

D.

B.

- A. Park - Street - Green Spine;
Contrasting space that varies through size, scale, form and the function.
- B. Courtyard;
Located on plateau, defined by built form.
- C. New Vegetation;
Plants strengthen steep topography and provide privacy from street.
- D. Vehicle Parking;
Resident parking located at perimeter.
- E. Terraced Garden;
Change in level evokes partial enclosure and encourages pedestrian movement.

Linked Spaces

- A. Steps between housing;
Narrow stairwells contrast to wider paths.
- B. Terraced Gardens;
Gardens step down topography to linking to lateral streets and hydrology.
- C. Private Gardens;
Private outdoor space with direct link to dwellings. Separated from public realm.
- D. Shared Road;
Access for cars and pedestrians.
- E. Ecological Walkway;
Integrated with topography.
- F. Green Ecology;
Vegetation links with walkway.

- A. Community Green House;
Provides new function to housing that encourages community engagement.
- B. Green Ecology;
Additional planting connects new vegetation with existing to strengthen ecology.
- C. Community Park;
Located on plateau, defined by built form.
- D. Vehicle Parking;
Garages accessed from shared road
- E. Main Garden;
Links hydrology with rain water gardens and open public green space. The largest open space contrasts in scale to other pocket parks and terraced gardens.

- A. Moving Space;
Narrow, green corridors through site
- B. Static Space;
Larger courtyard for people to occupy
- C. Private Gardens;
Separated from public realm.
- D. Street continuity;
Resident parking located at perimeter
- E. Wider street entrance;
Permeable entry encouraging pedestrians
- F. New Vegetation;
Plants strengthen steep topography and provide privacy from street.

^
 Figure 104 // Site Section; housing types D and B

^
 Figure 105 // Section; terracing dwelling and landscape

Figure 106 // Section; through stairwell with semi-private gardens either side

▲
 Figure 107 // Section; dwelling proportion and scale
 in relation to site

Green Ecology;
Vegetation integrates
with public spaces
providing soft edge
to hard streetscape.

**Grey & Blue
Ecology;**
Street edge widens
to create entry. Rain
gardens use storm-
water and link paths.

Built Form;
Housing is arranged
around site vegetation.
Front yards create
buffer to street.

▲
 Figure 108 // Axonometric; linking housing and
 natural ecologies at street edge

Figure 109 // Axonometric; final site composition with public and private realm

Housing;

Height defines street edge while stepping down towards public park for engagement.

Rainwater Garden;

Linking natural flow of water with topography to create ecological public spaces.

Semi Private Garden;

Terraced landscape defines above and below creating privacy for higher spaces.

Housing Types;

Various types responding to different slopes. Vertical circulation between.

Community Park;
Engaging spaces for
all to use. Pocket
parks are located on
plateaus in landscape

Shared Road;
Provides access for
cars and pedestrians
off main street.

Natural Landscape;
Preserving natural
land forms and clear-
ings that provide views
across the site

Ecological Paths;
Paths integrated with
topography to con-
nect along natural
landforms.

Figure 110 // Axonometric; shared road with housing and bikes

CONCLUSION

IN SUMMARY

The research & design addressed how the arrangement of higher density housing on sloping sites can enhance the public realm, support street activity and integrate with natural ecologies. The project developed through iterative research and design phases and explored specific concepts relevant to achieve the research question and scope.

In this thesis, the research acknowledged mutually dependent components of urban design. The components were applied to the thesis as a design process to develop ideas and findings of new arrangements of built form on sloped sites that integrate housing, ecology, the street and the broader public realm. The end goal was to provide opportunities for densification of an urban site that improved the quality of the public and private realm and environmental ecology for urban dwellers.

CRITICAL REFLECTION

As the research and design process progressed the importance of considering multiple components contributing to the urban environment became evident. Main urban components covered were; housing densification, relationship between built form and topography, defining territory and privacy of public realm, and strengthening natural ecology networks. All four components started

as individual concepts that developed throughout the research and design process. The development led to strategies and opportunities that were not recognized at the early phases of the project. The most successful moments in the process came from testing research objectives and determining key learning as to how a component could provide beneficial opportunity to the final and combined design.

This study of urban housing densification, specific to Wellington, was seen as a way to improve upon the current formalities of how the city has subdivided its residential allotments around the city's town belt. Acknowledged prior, the vegetated ridge around the city has compelling landforms and unique natural ecologies that are not reflected in the current arrangement of built form. This evaluation combined with the forecasted growth in suburban and inner city areas encouraged the design process to formulate a response that complimented the city by adding quality public and private space and vitality to residential areas while positively allowing for a denser shift in population. To achieve the result, emphasis was placed equally on components stemming from both built form and landscape. The final design consolidates with both disciplines to create a strategy specific to Wellington yet influential from various literature and precedent projects.

Derived design principles and learning from the theoretical framework were carried throughout

the process and ensured conclusions in the final stages would reflect that of initial goals and standards.

Increasing dwelling density met the initial goals for consolidation in an urban environment. The existing site had a total of 100 dwellings, measuring 42dph. To introduce more dwellings with increased public space a densification of 175% dwellings was tested and considered a functional increase. This amount allowed for a balance between the built form and landscape components, both required to achieve consolidation goals for this project. The final net density reached an improvement of 160%, measuring 65dph. This was attained by creating smaller sized attached dwellings in closer vicinity to one another with typologies that better aligned with the various sloping landform. Findings for not reaching the desired 175% increase in dwellings are as follows;

- o reductions caused by removing attached housing to preserve ecology networks and public spaces
- o underestimated additional planting to improve natural green network ecology to desired level
- o main streets were made wider to function as shared roads
- o council apartments measuring 108dph increased the site's initial net density

A high level of recreational activity was achieved. Throughout the process topography influenced street connections and location of newly organized public spaces. In the final design, flatter plateaus in the topography functioned as permeable pocket parks that pedestrians pass through or oc-

cupy. Further research into the topography component led to discoveries in associating housing typologies with the variation of sloping gradients. This achieved dwellings that could strategically occupy a desired slope to be accessed from both upper and lower levels – connecting well to street networks while reducing excavation of the land.

Natural Ecologies met the initial goals and design standards set at the start of the project. Integrating ecological networks into public and shared spaces resulted in quality open green space for residents despite living in a more densely populated urban environment. Ecologies of vegetation, hydrology, and street connectivity were discovered as prominent networks associated to the urban town belt location and topography. The integration of this was vital as access to urban green space is essential for the quality of life experienced by urban dwellers and promotes social cohesion, physical and psychological well being (Bird 2004) - important for people living in denser environments.

CONCLUDING COMMENTS

The analysis of urban components specific to the selected Rolleston Street site can be applied to wider residential slopes in the city that are in close vicinity to the city's town belt. Based on the Site and Context analysis of the city, conducted in Chapter Three, suburbs with similar geography and urban environments include Mt Victoria, Kelburn, Aro Valley and areas of Newtown. The research could also be applied to these areas as a system for establishing improved liveability in denser housing environments.

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