REVISITING THE HILLSIDE:
ORGANIC, AGGREGATIVE MEDIUM DENSITY
HOUSING IN A WELLINGTON HILLSIDE
ENVIRONMENT

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The ‘Conzen School’ of Urban Morphology identified by Kostof in his book *The City Shaped* is a western way of looking at parcels of land, lots, and the street grid from above in a geometric manner imposed on the land, then analysing this in terms of land use pattern, town plan, and building form. This model of analysis and development lends itself to flat sites, and separated, isolated developments, and forms the basis for the existing model of development in western colonial nations. This thesis investigates whether an alternate development approach based on aggregative design can provide a viable alternative to the standard model of Medium Density Housing found in New Zealand. Investigation in the frame of Christopher Alexander’s *New Theory of Urban Design*, Lucien Kroll, and The New Urbanists addresses a new way of approaching these sites through the use of organic geometries and accumulative principals. Accompanying and informing this approach is a case study of vernacular Cycladic Architecture.

In balance with the Cycladic case study the thesis addresses the acceptance of this model of development in a New Zealand context. In particular, with reference to the physical aspects of privacy, view, shared space as well as perceptions of ownership, individuality and identity in a higher density environment. The aggregative approach is similar to that explored through Ian Athfield’s Home in Khandallah; Athfield House. This housing and office complex is an early experiment into the same principles that this thesis addresses. The thesis develops a methodological approach to testing the aggregative nature of development and simulates this through the use of in studio design exercises. These exercises will be a combination of external input from other designers and internal; single author input. The final design outcome will be addressing the results of this simulation, the design principals, guidelines and rules, rather than producing a stand-alone design artefact.
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PART 1
THE APPROACH

The main intention of the thesis is to investigate and propose a new model for medium density housing developments in a hillside environment. The thesis questions how aggregative and organic approaches to design, could provide a new way of developing hillside sites using organic geometries and accumulative principals. The thesis analyses vernacular Cycladic Architecture of the Greek Aegean Islands focusing on their spatial structure, particularly their treatment of public/private space and their development structure through time. Through a series of designs of a medium density housing development sited in Wellington, this thesis seeks to establish a set of design principals/guidelines for a new way of looking at medium density housing in a hillside environment with particular reference to a New Zealand context.

Framing the paradigm of inquiry for the thesis are authors such as Christopher Alexander, Lucien Kroll and post-structuralist theorist Jean Baudrillard. I am particularly interested in Alexander’s work from A New Theory of Urban Design, where he advocates for a collective whole, embracing the complexity that results from an unplanned development pattern resonant with the ‘old city’. In this book he runs a design experiment, focusing on a consciously not master planned process. Alexander argues for a set of development principals, and the freedom to allow the city to grow outside of a pre-planned outcome. In a similar vein Kroll also argues for complexity in the urban fabric,

THE PROBLEMS

Wellington as a city and New Zealand as a whole continue to grow with the number of dwellings in Wellington forecast to grow from 77,940 in 2015 to 88,305 by 2028. With this growth in population and an increasing understanding amongst the general population about the need for intensification within our cities the need for higher density housing models that can make use of existing urban space becomes more and more important.

Urban Sprawl as a concept is well documented within the academic community and as such the argument for increased density within our cities and suburbs has been robustly debated. However despite this increasingly growing body of literature and a growing built stock of medium density developments, they have been focused primarily around flat sites. Wellington is a city with a majority of its land area located in hilly environments, this thesis seeks to fill a gap by combining the site and topological conditions as a design driver for a new model of medium density housing.

1. id the population experts, “Population Forecasts | Wellington City | Forecast.Id.”
2. “Population, Households & Dwellings | Wellington City | Forecast. Id.”
5. Andres Duany and Andres Duany, Visions of Suburbia: Commentaries and Observations on a City of Ideas(New York; Santa Rosa Beach, FL: Rizzoli : Distributed to the U.S. trade by Random House ; Seaside Institute, 2008).
with a major aspect of his argument calling for increased participation from the inhabitants in order to create obscurity, irrationality and therefore complexity within the architecture. Baudrillard's arguments on simulacra support the arguments of Alexander and Kroll in creating, at a more abstract level, a distinction between an imagined and artificially imposed idea of reality - in order to rationalise and simplify - and the real; the physical substance of a place.

A key outcome for this thesis is to develop a design process in addition to a development framework. In order to achieve the aggregative growth I am looking for, I am setting up a process to simulate this mode of production and design through a series of design exercises. As such the final built form is not set entirely by me as the designer but is strongly influenced by input from outside sources. However my role as the researcher and designer in this process revolves around process – analysis of precedent and setting up the guidelines and framework from which the designers will work. This process is informed by the case study of the Vernacular Cycladic Housing and in reference to a New Zealand context.

The design simulations take part in three stages; (i) the pilot study, an initial test for the process and as an early analysis tool to critique the design outputs and evaluate where additional control will be required. (ii) The first design stage where the developed guidelines are tested through the propagation of several designs. And the final stage (iii) will further develop some of the spaces and dwellings from the design stage in order to test the resulting outcome of the design simulations and the viability of this mode of production. Through this whole process the final design guidelines and process are intended to be the final thesis outcome.
The study on Cycladic vernacular architecture informs each stage through the research process and is ongoing for the entirety of the project. The initial framework and pilot study is run as a test case for the main design stages going forward and mainly influence the simulation methodology.

This section of the process diagram reads downwards, with each stage being fed by a new iteration of both the simulation methodology and development framework. At each stage the design will then inform the next iteration of these inputs.
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THE SCOPE

The nature of this research means that there are inherent limitations that are not practicable to overcome within the time frame of a master’s thesis. Firstly, the setup and framing of the research I have made a series of epistemological assumptions. These are mainly focused around the weight of academic literature surrounding the concept of urban sprawl and the inherent assumption that a higher density, infill residential model is a desirable condition.

The analysis of material for my case study of Cycladic Vernacular Architecture is relatively novel in that the majority of the material and academic publication on architecture in that area is either focused on a more social, historical, or anthropological aspect of the islands. Alternatively, studies apply an environmental perspective to the development of these areas. As such there is little dimensionally accurate material available on the areas so any analysis undertaken in the thesis is not to scale and is therefore indicative only.

The process, simulation methodology and framework for the proposed housing model makes up the main focus for the research. As a result, many of the more pragmatic considerations around building will fall outside of the scope of the research. Factors such as costing, engineering, ground condition, materiality and structural considerations would be dealt with on a case by case basis and will not be dealt with in the main thesis.

Finally, there are several limitations to the design simulation process I am undertaking due to the time limits for the thesis project and time demands on the participants themselves. As such the buy-in from any designers used in the design exercises will be less than that of a designer/architect involved in a real world process. This takes into account that the participants are only spending, on average, an hour to do a design that would otherwise take weeks or months of planning to put together. Also the motivation and pressure is not there with no financial or reputational impetus.
CHAPTER 1: PROCESS

Fig. 1.0: Crane Gears
Source: Kevin Uting (2006)
Spiro Kostof argues that there is a disconnect in urbanism between the fast rate of socio-economic change and the persistence of urban artefact. He cites Aston and Bond in stating that towns are built by and for people, not of some inevitable physical control. This view contrasts with that of most of the planned cities of the new world, and particularly of colonial Oceania. The utopian visions of order and progress evidenced in the colonial city planning contradict these ideas of the individual and complexity in favour of the grid. Kostof points to the treatment of cities after the breakdown of the Roman Empire and their development towards an organic structure as movement patterns soon cut swathes through the rigid and inflexible grid as an example of the prevalence of organic patterns of growth and change. This development strategy is seen by some as a positive that is not present in the new world, as the colonial power tended to wipe away previous land tenure systems and cultures making way for an organised version of western formal planning.

1 Ibid, 41.
2 Ibid, 25.
3 Ibid, 48.
4 Ibid.
Framing the main paradigm of enquiry for the thesis is Christopher Alexander's *A New Theory of Urban Design*. In this text Alexander posits the theory of an aggregative approach to urban design, by which the aggregative approach goes towards creating a "whole" reminiscent of the old city. Alexander follows this theory and proposes a methodology for design that is anti-master planning⁵, instead relying on a set of guidelines and rules that he tests in an academic environment though a studio exercise⁶. Alexander argues that the act of producing 'wholeness' in the city can only be achieved as a process. This process is in direct conflict with the modern ideas surrounding urban design and planning, where private ownership and property setbacks etc. produce largely unrelated acts of built form.⁷ Alexander's studio exercise, run in 1978 at UC Berkeley saw post-graduate students 'representing' developers in order to simulate the propagation of an area of downtown San Francisco in order to test their particular set of development rules. In this sense the conception of my project follows Alexander's work, fitting it instead to a more residential and hillside based context.

Lucien Kroll, another major author informing the direction of my work, follows a similar approach as Alexander. Kroll seeks to achieve this through the input of the individual occupant into the design process, embracing the mistakes and irrationality created as a result.⁸ Kroll argues that by creating architecture or urban design as a process, not

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⁶ Ibid.
⁷ Ibid., 3.
⁸ Ibid., 10-16.

—fig. 1.1 Christopher Alexander *New Theory of Urban Design*
Source: Christopher Alexander (1987) pg 45-49
controlling or predetermining the outcome, it promotes a better understanding of a fluid reality as well as producing a more efficacious result. The resulting outcome is not necessarily rational, but is instead reasonable.\(^1\) Kroll’s work here cuts away at the hermetically sealed idea of urban design that persists in Alexander’s work. While Alexander used outside developers, the ideal was still to keep the process in an academic setting where greater control was possible. Kroll instead opens the door to diverse/external ideals and priorities, even if his Vignes Blanches project did struggle to implement these ideas into the built form.\(^1\)

New Urbanism as a movement has grown primarily in the United States over the past three decades as an alternative to prevailing low-density development patterns\(^1\). One stream of New Urbanism\(^1\) culture tends towards re-introducing the idea of incrementalism and complexity back into urban design. Emily Talen identifies this culture and suggests that the incremental build-up of the “old city” can be seen as a positive move in city building\(^1\). However there remains scepticism amongst parts of the academic community\(^1\). Many of these criticisms, although rebutted by the New Urbanist have not been adequately resolved. The main catch point for New Urbanism is that of nostalgia, a desire to return to an imaginary past. While New Urbanism has countered this, their main arguments treat nostalgia as a legitimate tool for combating a sense of severance from

\(^{10}\) Ibid.

\(^{11}\) Ibid.


\(^{13}\) New Urbanism: Peter Calthorpe Vs. Lars Lerup, vol. II, Michigan Debates on Urbanism (University of Michigan, 2000).


As the forms and styles that are often superficially affected - when talking about nostalgia - are either illusory, or from different cultural backgrounds, this argument becomes insincere. Many of the New Urbanist approaches towards incremental development, avoidance of sprawl through urban infill, and transport focused cities are good principals if applied in a different manner to the incumbent guard of New Urbanists. This criticism can again be levelled at Alexander, however the New Urbanist approach adds a tradition of visual, diagrammatic Urban Codes such as the ones seen in the Seaside development of the early 1980’s. This approach again cuts away at the esoteric, all-encompassing vision of Alexander’s work.

Baudrillard’s writings about simulacra deal with the idea of simulation and the simulacrum, representations where there is no original, where the representation or copy can either exist independently or precede the reality of the original.

Baudrillard quotes Émile Littré in describing the idea of simulation; “Whoever fakes an illness can simply stay in bed and make everyone believe he is ill. ‘Whoever simulates an illness produces in himself some of the symptoms’ (Littré)”

Therefore pretending or dissimulating leaves the “principal of reality” intact whereas simulation blurs the line between the real and imaginary. The lot patterns that direct Western development and ownership models are an abstracted model – or simulation – of space in order for us to more readily understand what is ours. Where this blurs the line between reality and the imagined is the way in which these abstract lines define the site.
Instead of re-representing this imagined past we can instead analyse and learn from the processes rather than the simulated representation. This approach is not without its own problems, however it seeks to avoid [at the most superficial level] the trap of the simulacrum into which many of the built examples of New Urbanism fall.

Urban design and planning theorists have long warned that normative theories are only statements of belief in “goodness” on the part of professional elites. These theories demand that followers make a leap of faith and simply trust in the beneficial outcomes that they claim will occur.21 - Anne Moudon (2000)

With all of these theories, and in particular the organicist principals from the preceding authors, there is a tendency to ignore the pragmatics of modern economic systems. This treatment rarely goes past the point of unrigorous generalisations of the way in which ‘mechanical’ market society forms cities and space.22 By using legal concepts that relate directly back to existing New Zealand Legislation this project addresses these concerns and justifies the non-conformity of the approach.

The ridge-line, or dip in the site that may otherwise be a useful rise to make the most of the sun, when transected by the lot boundary becomes in and of itself a barrier. In this way by the application of the abstracted simulation the site, and its use, changes without any change in the physical substance of place. Our conception of the site precedes our understanding of it as a physical object, in this way it becomes a simulacrum. By changing the way we look at the site and land division for ownership patterns I am intending to minimise (by the nature of ownership this cannot be completely negated) the limitations for building that arise out of this disparate view of the reality of the site.

This widespread critique of New Urbanist nostalgia is consistent with Baudrillard’s arguments about the generation by models of a real without origin or reality. In a way the idealised versions of the ‘old city’ upon which much of their arguments are built are themselves a representation, a simulation of the real, in reproducing these the outcomes are considered simulacra; a hyperreal generated without origin or reality. In trying to reproduce this condition one leaves reality behind.

1.1 CASE/FIELD BASED LITERATURE

New Zealand as a society comes from a postcolonial background, however Campbell Gibson argues that as a ‘virgin nation’ we had a comparatively high level of urbanization from very early in our colonial history.\(^\text{23}\) Due to the nature of our colonization and the speculative nature of the early colonists, owning land has become a large part of New Zealand culture.\(^\text{24}\) The Quarter Acre Dream and the imitation of an English country lifestyle that was present in the early colony\(^\text{25}\) has evolved, however this still leaves New Zealand with a different social and cultural attitude towards higher density housing. Any move towards the proposed aggregative method of design would require a change in either the views of the public towards higher density developments, or careful design to bring the expectations of the market into the design considerations. The quality of increased density housing has a bad reputation, however Walton, Murray and Thompson argue that there is not necessarily a negative perception of medium density housing in New Zealand.\(^\text{26}\) However Citiscope Consultants contradict this with their finding that the state house has tainted the reputation of increased density.\(^\text{27}\)


\(^{25}\) Ibid.


\(^{27}\) CityScope Consultants, “Improving the Design, Quality and Affordability of Residential Intensification in New Zealand,” (Centre for Housing Research, Aotearoa New Zealand, 2013), 8-11.
The process for the research (as described briefly in the introduction) is formed around the idea of aggregative, incremental growth. It adopts a housing model that will both support, and be formed by this process. Alexander’s work on a New Theory of Urban Design will form the basis for the studio experiment and simulation. The experiment consists of a simulated process of urban growth, using input from both myself as the researcher and outside participants who include final year post-graduate students and practicing professionals. All participants have architectural training or experience as the process does not seek to imitate some imagined idea of a new vernacular or of non-selfconscious design. Instead, the process introduces a new protocol through which successive designers might collaborate to produce a contemporary hillside settlement.

For the Simulation I have chosen a site (fig 1.5) in Wellington’s northern suburb of Khandallah. The site is roughly 39,500m$^2$ of the hillside with about 23,000m$^2$ of land within my build limits. The average slope of the site is 26º or a gradient of 1:2. This site looks out over Wellington’s harbour and is located in one of the more gentrified suburbs. Each participant designer is asked to site and design - at a basic level - a new dwelling for the simulation adding each time to the whole. Unlike the physical model created for Alexander’s work, modern BIM technology allows for a digital model that can be transcribed into different software and forms. It is this form where the projects exists, a simulation of an imagined reality. In addition to this main digital model, physical models will represent different stages and forms of the experiment.
In order to keep the time taken by the outside designers to a minimum, I will assist by driving the software and filling in some of the smaller scale architectural detailing (the form and structure of the spaces being the focus of the research). This mixing of inputs from outside designers and a single curator will be discussed further in the simulation methodology section.

This process has been finding a balance between the comprehensive control of exhaustive rules/guidelines and the desired flexibility and unpredictability of an informal aggregative process. This in part comes from the challenge of creating an outcome that is of sufficient quality and amenity to fit in with, or improve, the current New Zealand market. At the same time, the design must allow for differences in interpretation and approach that comes from many different designers collaborating on an aggregative whole.

This experiment is intended as a testing ground for the research and is not the outcome. The intended outcome of the research is not the final design as an object, but of the development guidelines and protocols of a delivery process which could be replicated in a modified form in the real world in order to build a medium density development on a steep hillside. As indicated in my research diagram, each new stage of design sees a new iteration of both the development framework and simulation methodology, working towards a final outcome.

Initially the pilot study takes place with two parallel processes, each based on a single turning/parking area. A draft development framework is produced and dwellings are designed using its guidelines. In the first ‘comprehensive control’ process the four dwellings are designed, in successive stages, by myself as a single designer. The second ‘aggregative experiment’ process uses purely outside design input but applies the same Framework. Comparison of the two processes leads to refinement of the framework and the manner of its application.

Following the pilot study process (chapter 3) Design Stage One begins again on the same site. As an initial setup for the development, I have - in my role as curator and project architect – set up the main infrastructure for the project. This includes parking structures, road access to the top and bottom of the site, cable car access between these points and the location of key services. As well as this infrastructure I have also designed three ‘seed’ developments with two to three dwellings to be built before the start of the project to both allow for other designs to propagate out from and to set a precedent for the application of the development frameworks.
PART 2

PRE-DESIGN

Chapter 2: Cycladic Vernacular
Chapter 3: Pilot Study

Design Exercise: Hill impact study

< fig 1.6  A Street in Mykonos
Source: Bernard Gagnon (2011)
CHAPTER 2: CYCLADIC VERNACULAR

Theoretical Background
Town Development Studies
Street Studies

< fig 2.0  A typical white and blue painted house of Oia
CYCLADIC VERNACULAR ARCHITECTURE

Bernard Rudofsky, speaking about his work on native and vernacular architecture, *Architecture without Architects*, points out that the architectural field’s preoccupation with formal and noble architecture has led to the exclusion of the common dwelling in discourse. As such the vernacular is often relegated to the area of anthropology and geography. Since Rudofsky wrote this, there has been a resurgence in interest with the vernacular and the supposed ‘purity’ of this type of dwelling. However authors such as Dimitri Philippides argue that most often architects resort to an aesthetic evaluation of such architecture that is by its nature unsystematic and often leaning towards lyricism. However analysing the spatial structure of such a dwelling system could help to inform a response to a condition that has been largely overlooked in this country. Authors such as Philippides, Michaelides, and Vionis advance the study of these towns and their vernacular architecture, with in depth analysis of not only the typology (in a context less situation) but of the urban framework, history and residential scale as well.

This chapter analyses the development and patterns of these towns and streets in order to identify how they have overcome the challenge of building, not only on a steep hillside, but also of developing through time in a non-planned fashion.

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2 Ibid.
4 Ibid.
Many aspects of the vernacular building tradition were dependent on the local conditions, as well as the limited competence of the builders, who were often the inhabitants themselves. Typical construction type was heavy stone, plaster and cement based due to the arid environment and lack of usable timber for construction. Constantine Michailides argues that these towns are ‘grown’ towns, and that the form that is created is something recognisable to its inhabitants, something that could be seen and understood by everyone.

This idea is in line with the way in which accretion worked in these areas, where the logistics and details of building were not set by law, but instead by an unwritten tradition of the relationships between owners and inhabitants. In addition to this locally informed knowledge and tradition, there was some cultural cross pollination through both the Venetian (Latin) and Ottoman periods of rule in the form of traveling craftsmen. As such aspects of the building tradition found throughout the Cyclades can be seen in various forms throughout the Balkans and ‘Asia Minor’.

Exhaustive histories of the Cyclades have been covered by several authors such as Aalen, Arnaoutoglou, Bouras, Kovatsi, Michailides, Philippides, and Vionis. A comprehensive history of the Cyclades is outside the scope of the research, however some aspects of the history do greatly influence their development.

The area of the Cyclades, around the Aegean Ocean has been recorded as an area of maritime and agriculture since the late Roman times of around the 4th century. The area was hotly contested and control of the area changed hands many times throughout this period and as such has been subject to many rebuilds. The modern physical evidence, and hence the focus of my case study begins around the 13th-16th century with the Latin establishment in the Aegean, followed by the Ottoman dominance of the Cyclades. This time period is a transitional time for the area with many pirate attacks - such as the Ottoman corsair Heyreddin Barbarossa – causing devastation and instability in the region. This influenced the development of the towns, with new settlements built on steep hillside as a defensive measure against the maritime attacks. Towards the end of the 16th century as Ottoman power in the Cyclades solidified the area went through a period of economic growth and stability. Under the protection of the Ottomans the fortified towns were able to grow outwards, towards the ports from which they made their main living.


8 *A Crusader, Ottoman, and Early Modern Aegean Archaeology*.

9 Kovatsi, “The Church and the Urban Structure of the Aegean Island Towns.”

10 Vionis, *A Crusader, Ottoman, and Early Modern Aegean Archaeology*.

11 Ibid.


13 Michailides, *Hydra*.


SIFNOS

Apollonia, Matara, and Xampola

Three towns on the island of Sifnos.
Analysis of development patterns and structure.
These three towns on the island of Sifnos are primarily agricultural towns built away from the sea to avoid pirate attacks. The three towns began separately and have grown together (fig 2.8) over time due to the linear nature of their surrounding topology. The primary access around the town runs along the ridge lines or parallel to the contours of the land (fig 2.10). This has caused the majority of growth and accretion of houses to build up in a linear fashion following these access routes (fig 2.11). Further growth in the area happens along secondary routes perpendicular to the topography allowing for growth down the hills.
Main centres of the original villages developing over the edges of ridge lines.

Road pattern: primary and secondary pedestrian routes through the towns running parallel and perpendicular to the hill sides. (Vehicular access noted in dotted line)

< fig: 2.6  Sifnos Road Pattern
Source: Base map after original from Kovatsi (1979)
Analysis by Author

Tertiary access routes: in addition to the primary and secondary pedestrian access network of streets, semi-public access to houses develops down the hill sides as informal pathways

< fig: 2.7  Sifnos informal access
Source: Base map after original from Kovatsi (1979)
Analysis by Author
Development of housing spreads along main pedestrian routes and grows in behind (parallel to) this area, filling in the hillside.

Figure ground analysis of the area showing the spread out nature of the development to fit in and around the agricultural pastures of the area.

<fig: 2.9> Sifnos Figure Ground
Source: Base map after original from Kovatsi (1979)
Analysis by Author

Primary and secondary paths of built fabric accretion over time

<fig: 2.10> Sifnos Linear Development
Source: Base map after original from Kovatsi (1979)
Analysis by Author

Development of housing spreads along main pedestrian routes and grows in behind (parallel to) this area, filling in the hillside.

<fig: 2.11> Sifnos Figure Ground
Source: Base map after original from Kovatsi (1979)
Analysis by Author
<fig: 2.12 Hydra Map
Source: Image based on original by Michaelides (1967) pg 53

<fig: 2.13 Hydra Town
Source: Herbert Ornser (1993)

HYDRA
Chora and Kastiro (historic)
Two towns on the island of Hydra
Analysis of development patterns and structure
On the island of Hydra, the original settlement (Kastro, meaning fortified town) was built away from the port, on a steep section of hill to avoid pirate attacks. Following the stability brought by the Ottoman governance of the area the town grew outwards from this origin, developing different characteristics due to the topography of the area (fig 2.14-2.17). The main access from the port to Kastro was the first growth, creating a saddle town along the ridgeline, after this a valley town developed next to the port where the majority of inhabitants made their living. Finally the upper classes used the area to the north west of the port as a hilltop town, making use of the view and proximity to the port to build Archontika (mansions).
The Archontika made use of the area overlooking the harbour as an area for the rich merchants and ship captains to build large scale dwellings.

<fig: 2.18 Archontika (mansions)
Source: Base map after original by Michaelides (1967)
Analysis by Author

This drawing shows the rough development of the town as it spread away from the historic fortified town. This historic town now is mainly ruins, old wall or re-purposed and rebuilt dwellings; this can be seen in the map with many walls to the south but few buildings.

<fig: 2.19 Steep site
Source: Base map after original by Michaelides (1967)
Analysis by Author

This drawing shows the rough development of the town as it spread away from the historic fortified town. This historic town now is mainly ruins, old wall or re-purposed and rebuilt dwellings; this can be seen in the map with many walls to the south but few buildings.

<fig: 2.20 Hydra Development route
Source: Base map after original by Michaelides (1967)
Analysis by Author
Shaded area showing collectivised parking areas.

**Fig. 2.21 Santorini: Oia Map**
Source: Author

**Fig. 2.22 View of Imerovigli**
Source: Berard Gagnon (2011)

SANTORINI

Oia

Main historic town on the island of Santorini (Thira)
Analysis of development patterns and structure
Santorini (Thera) is a particularly arid, volcanic island and as such lacks timber for construction, the development of this town relied on the famous Theran cement to form an arched construction as well as the use of dug in, troglodyte housing. Oia is built on the steepest hillside of the three sites I look at here, while some others have vehicular access close to the dwellings, Oia has developed a system of collectivised parking (fig 2.23) to keep the access ways vehicle free due to the steep nature of the site.
Modern day Oia has developed almost solely on the flat area of town that would once have been planting and agriculture. The grain of development however is still apparent having a marked difference between the flat and sloped areas of the town.

< fig 2.25 Oia Figyr Ground Source: Author

The larger grain development on the flat land housed the upper and land owning classes as well as ship captains, able to look down over the harbour, behind defensive lines.

< fig 2.26 Oia Flat Ground Source: Author

The steep area of the town formed a formidable defensive line on the hill, housing the families of the ship owners as well as craftsmen. These houses were often dug into the hill to allow for more space in the cramped area.

< fig 2.27 Oia: Rural Agriculture Source: Author
This street study looks at the access routes around two streets, from Sifnos and Hydra respectively. The main design aspect here is the primacy of public space and access routes. The access on such steep sites was hard, and because of this the public space was given priority, with the placement and building articulation done in such a way as to maintain the access ways. Life in a Cycladic village was very communal, and small areas of pause, rest and interaction were important. Without the space to build large open areas, these small spaces frequently dotted around (especially around churches or shops) became the main social gathering points of the town.
Mapping the public space structure around the houses for a given street in Sifnos (Apollonia)
This example is mainly focused around the main axis with a few perpendicular offshoots to accommodate further development, otherwise this is very linear in its development.

< fig 2.29 Street Study: Sifnos (Apollonia)
Source: Image based on original from Kovatsi (1979) pg 41a

Main access axis runs along the ridge line providing mainly flat access across the town.

< fig 2.30 Linear, Ridge line, major axis
Source: Base map after original from Kovatsi (1979)
Analysis by Author

Small offshoot routes provide the access to dwellings that developed further down the hill away from the main ridge.

< fig 2.31 Perpendicular minor axis
Source: Base map after original from Kovatsi (1979)
Analysis by Author
Perpendicular minor axis *axis plays a larger role here, often becoming less of a minor access and providing main routes of access in the town.

Main access axis runs parallel to the contours, however due to the nature of the hillside this is not as linear as the Sifnos street study. The route winds and compensates for a complexity in the hillside.

Mapping the public space structure around the houses for a given street in Chora (Hydra) This example shows a higher reliance on a two way street pattern, with the minor axis (perpendicular to contours) playing a larger role in the access/circulation.

Mapping the public space structure around the houses for a given street in Chora (Hydra) This example shows a higher reliance on a two way street pattern, with the minor axis (perpendicular to contours) playing a larger role in the access/circulation.

Perpendicular routes play a larger role here, often becoming less of a minor access and providing main routes of access in the town.
fig: 2.35  Street Study: Hydra (Chora)

Analysis of the enclosure of public space, between the walls of the surrounding dwellings (red) and the walls created for the pathways (black). The pathways are typically enclosed at different heights, with the wall bounding one side and a dwelling the other.

Source: Base map after original by Michaelides (1967)
Analysis by Author
The most common typology of housing in Cycladic vernacular, the double storey narrow fronted monospito had living on the upper storey, storage on the bottom.

< fig: 2.38 Narrow Fronted Monospito
Source: Author

In some areas of the Cyclades, in particular on Santorini, buildings were hollowed out of the hillsides to provide more structural support and make use of more space.

< fig: 2.37 Troglodyte building tradition
Source: Author

The wide fronted monospito is less common, however it is used heavily in some areas of the cyclades.

< fig: 2.39 Wide Fronted Monospito
Source: Author

This section is through a variation of a wide fronted monospito adapted to deal with the topography of the hillside.

< fig: 2.36 Building Section
Source: Author
This study directly maps an existing hillside in Wellington, identifying the buildings and their relationship to the roads. Dwellings follow the road line building above and below this line.

Source: Author
Comparing the above study, these drawings condense the same building mass further through 2D evaluation, with a butting relationship (top) and an overlapping relationship (bottom).

< fig. 2.41 Wellington hillside study
Source: Author

Comparing multiple access routes, in the existing example (above) the access paths are used for individual houses, below multiple routes service the whole development.

< fig. 2.42 Wellington hillside study
Source: Author
CHAPTER 3: PILOT STUDY

Text Framework
Pilot Study Methodology
Preliminary Simulation results

< fig: 3.0 Pilot Study Physical Model
Source: Author
The initial framework to run alongside the pilot study was designed to be as open as possible, with little clarification of the rules or their intentions in order to analyse the interpretations and deviations of the participants. In this way the main tenets of the framework could be tested without the designers being limited by the specifics.

As a test case the openness of the initial framework was also designed to address the amount of time participants would give up during the process and as such is closely tied with the simulation methodology used. The limitations of this approach are discussed later in the conclusions chapter.

The main aspects of the framework that were tested during this phase of the project were mainly the ideas surrounding the aggregative build up, namely the land division, sharing of a common wall, and the access network/public open space. These together frame a development methodology that differs significantly from the western norm. The other more specific rules are developed further in subsequent stages following the results of this study.

**Pilot Study**

The pilot study phase of this project was intended to test both the initial tenets of the development framework and the initial idea of simulating an aggregative process. This process took part in two parallel simulations, the first of which was an aggregative approach, where solely outside designers were used to propagate a design. Each designer was given - in stages - the existing site and dwellings and asked to design a new dwelling based on the development framework. This was kept in a relatively small area due to the common wall rule in the guidelines. This process, working with design professionals from practice as well as final year thesis students took longer than expected and therefore precipitated a change in the simulation methodology going forward.

In addition to this, several tendencies of the designers were identified that created undesirable conditions within the design. These included the use of stilt construction which alienates the dwell-
LAND OWNERSHIP
Land division follows a building concept, rather than preceding it.

BUILDING FOOTPRINT
Each dwelling has maximum building footprint area of 120m².

PARTY WALL
Dwelling must be based around existing party wall (unless good grounds for another site are made and accepted).

HEIGHT RANGE
All buildings to be between two and four storeys.

MAX HEIGHT
Maximum height from the ground at any given point of 12m.

PARTY WALL
Each dwelling to allow for (at least) one common wall for future dwellings.

VIEW/DAYLIGHT ACCESS
Each new dwelling will, in principal, allow for sight lines and sun shading of other buildings, whether existing or future.

OUTDOOR PRIVATE SPACE
Each dwelling is to provide for between 10m² and 30m² of private outdoor space.

ACCESS NETWORK
Each dwelling is to continue/add to the communal pedestrian access infrastructure, providing access to the new dwelling.

PUBLIC OPEN SPACE
Each dwelling will add a semi-public open space or add to an already existing open space adjacent to the new dwelling.
Around the Northern Suburbs the site sits in Khandallah on a south facing hillside with a view over Wellington harbour.

< fig: 3.1 Wellington Satellite Image
Source: Image based on original content from Google Earth (2009)

Around the Northern Suburbs the site sits in Khandallah on a south facing hillside with a view over Wellington harbour.

< fig: 3.1 Wellington Satellite Image
Source: Image based on original content from Google Earth (2009)

Zooming into the site further showing it relative to the rest of the suburb.

< fig: 3.2 Wellington Satellite Image
Source: Image based on original content from Google Earth (2009)

An existing access route on the site is used as the primary street access. Currently this area is slated for three apartments (on the cleared area photographed here).

< fig: 3.3 Site Satellite Image
Source: Base map after original from Google Earth (2009)
Analysis/Plans by Author
Comparative Density: Khandallah
Superimposition of figure/ground of surrounding Khandallah neighbourhood to compare site coverage.

Comparative Density: Hydra
Figure/ground of dwellings from Hydra superimposed onto site.

Dwellings: 80
Based off the density/grain found in the town of Chora on the Cycladic island of Mykonos. Footprints taken from a section of the town near the centre.

Dwellings: 14
Based off the surrounding density/grain in the Khandallah area. Footprints taken from nearby Amritsar St.

Source: Author

Access route following existing driveway with an added turning circle area.

Source: Author

Predicted area of land usage for the fully propagated development

Source: Author

Site access and turning area

Source: Author

Figures/ground of dwellings from Hydra superimposed onto site.

Source: Author
<fig: 3.9  Physical model: This model was given to participants to show massing relationship of dwellings and topography
Source: Author
AGGREGATIVE SIMULATION STUDY

ings from the ground and limits the ability of further dwellings to propagate due to the left-over spaces underneath these dwellings. These, as well as a severely undeveloped idea of privacy, view and daylighting rules were identified by almost all of the participants.

The other simulation was again done in stages, but was designed by myself, the author. This allowed me to compare the idea of aggregation versus comprehensive control. This process was intended to simulate the same aggregative build-up, with each stage being designed in sequence rather than as a whole.

A limitation that became readily apparent is that with a single author this idea of designing in discrete stages does not have the same complexity and spontaneity of a multi author system. However, the aggregative approach suffered from a lack of control in the guidelines and produced a much less dense result that was almost completely missing any form of shared public space in the access infrastructure. The final result here was a much denser development with much better use of public open space. As shown earlier in the thesis, this denser, tighter clumping has less visual impact on the hillside and is therefore less likely to impact on the character of the suburb, and in fact the city as a whole.

1 The rules surrounding privacy, view and daylighting for this stage of the framework were little more than “try to be nice” and lacked any form of real or technical control.
Tracking the development as each new dwelling propagates and fills in the simulation. Each dwelling here was designed by a separate participant; stages 1,3,4 were postgraduate architecture students while stage 2 was designed by a practicing professional.

Source: Author
3.2
COMPREHENSIVE CONTROL STUDY
Tracking the development as each new dwelling propagates and fills in the simulation. Each dwelling here was designed by myself as the author.

Source: Author
AGGREGATIVE STUDY

These images identify the dwelling outlines and areas of public/private open space. The aggregative simulation produced more spread out results but with less open space that was not stairways/access routes.

Comprehensive Control Study

Comprehensive control iteration produced a much larger amount of open space as well as achieving a higher density. This simulation technique however has the drawback of less architectural complexity.

Source: Author
Dwellings: 14 Dwellings: 80

Based off the surrounding density/grain in the Khandallah area.

Footprints taken from nearby Amritsar St
Based off the density/grain found in the town of Chora on the Cycladic island of Mykonos. Footprints taken from a section of the town near the centre.

**AGGREGATIVE STUDY**

Another look at the figure/ground distribution of the aggregative simulation in comparison to surrounding Khandallah suburb.

*< fig: 3.16 Site Coverage: Aggregative Simulation Sources: Author>

**COMPREHENSIVE CONTROL STUDY**

This image compares the comprehensive control simulation to an existing Cycladic village.

*< fig: 3.17 Site Coverage: Comprehensive Control Sources: Author>
Fig. 3.18 Ship and houses, Khandallah, Wellington, New Zealand
Source: Phillip Capper (2006)
DESIGN EXERCISE:
PARAMETRIC MODELLING

- Parametric Simulation
- Building Articulation
- Massing

< fig. 3.19  Parametric Model
Source: Author
This quick maquette design exercise was intended as a test of the parametric approach to design and simulation of this kind of process. The design and programming of the system was not progressed sufficiently to create a viable alternative to the studio based simulations from the rest of the project. However this exercise did allow for very quick testing of spread, massing, building height and articulation.

The basic parametric logic I used here was to create a rectangle located in 3D on the topo surface, from there each rectangle is randomised to within maximum and minimum dimensions (which are able to be edited later) and given a random height (again able to be edited). This section simulates the maximum and minimums and allows for quick iterations on the effect of changing these parameters.

With each box a point is chosen from which to propagate a new “box” the point is chosen at random and allows for very quick iterations of difference in form from the same parameters (range of possible outcomes)

The main drawback of this process is the inability to control the rotation of the boxes and hence the outcome is very simplified. This process also does not account for the public space aspect, or indeed the creative faculties of the designers in a real life situation.
Comparing constant dimensions and heights, altering randomiser seed to see varying outcomes

Comparative dwelling heights: ≈6m

Comparative dwelling heights: ≈9-12m

Comparative dwelling heights: ≈24m

Comparative heights, from ≈6m to ≈24m. Other dimensions constant

<fig: 3.21  Parametric Study: Range of spread
Source: Author

<fig: 3.22  Parametric Study: Massing (Height)
Source: Author
Parametric Propagation on the hillside, massing

< fig 3.23 Parametric Study: Propagation
Source: Author
PART 3

DEVELOPED DESIGN

Chapter 4: Developed Design Stage 1
Chapter 5: Developed Design Stage 2

fig 4.0 Ancient Greek Theatre in Delos
Source: Berand Gagnon (2011)
CHAPTER 4: SIMULATION STAGE 1

Test Framework
Pilot Study Methodology
Preliminary Simulation results

< fig 4.1 Cycladic female figurine
DEVELOPED DESIGN

This next phase of the design started on the same site but from a clean slate. In order to set up the development and begin the aggregative build up in such a small and difficult area to access, the amount of infrastructure that is required was significantly more than was provided for the pilot study. The initial setup infrastructure consisted of three parts; vehicular access, parking, and initial seed dwellings.

The issue of vehicular access to within a reasonable distance to the dwellings is a major concern for the viability of a development such as this. Conversely for the desired density to work in site conditions such as these, direct access parking is not an option due to the access constraints. Instead I have proposed a system of collectivised parking based around car stacking buildings at the top and bottom access routes (fig 4.8-4.10). The lower access road was added following the pilot study in response to the tendency of designers to locate any new dwelling as close to the access road as possible, as such the spread of the development needed a base point to allow for a condition where the development could meet in the middle (fig 4.7).

In order to provide access for people with disabilities as well as ease of access for other residents, a cable car has been included in the development, connecting the upper and lower parking decks (fig 4.13). This cable car is intended to cross the primary pedestrian access routes that run parallel to the site topography, giving most dwellings a flat access point without having to use the stairs.

For this stage of the design, rather than relying on the initial designer to site the beginning phase of the project, the hypothetical developer has designed several ‘seed’ dwellings. These dwellings not only create a base platform from which other designers can propagate new dwellings (in line with the shared wall rule) but also begin to give intuitive cues as to the intent of the design guidelines. From a purely pragmatic and financial point of view these dwellings contribute to the ability of the developer to begin to sell from the plans, creating a marketing tool and also a way of generating capital to finance and offset the other initial infrastructure.

1 Cityscope consultants (need to add reference)
2 Here represented by myself as the author
2.1.2 The major axis of the pedestrian network will fall generally parallel to the site contours/topography.

2.1.3 Minor axis of pedestrian network will fall generally perpendicular to the site contours to act as vertical access and circulation through the development.

2.1.4 Irregular path width is recommended to avoid monotonous access routes, and allowing for spaces of pause where the path widens, even allowing for courtyards and public open space.

3.1.1 Maximum building footprint area of 120m².

3.1.3 Buildings are to be grounded [defined here as contact with the ground through slab construction] for at least 70% of their footprint area.

4.1 DEVELOPMENT FRAMEWORK

This new framework was written in a much more comprehensive form than the previous draft framework, with added detail on the intention and specifics of each rule. Additional rules to cover aspects of the framework that were identified as lacking control and could lead to undesired results. Due to the nature of this thesis and the limits on word count I have not included this framework in the text as it would have been 1/4 of the total allowed words. However, this iteration of the framework is in the same format as the included final framework in appendix 1.

The challenge throughout this process was finding the balance between the control required to satisfy the constraints of the site and the quality of the built environment contrasts with the need to allow for the organic aggregative qualities that this project is based on. From this stage in the development of framework, many of the changes made relate to fine tuning this, with the ability for exceptions and ways in which an architect can stretch or break the rules to create a richer architectural outcome. This in turn leads into the simulation methodology and the way in which I test the project but also the proposed implementation procedure.
3.1.4 Building envelope may encompass up to 10% larger floor area than building footprint to allow for architectural elements that contribute to building design and articulation, as long as this does not interfere with development of future dwellings.

3.3.1 Dwellings must be based around a connection to an existing party wall as a grounding element of the built fabric.

3.4.3 Maximum height from natural ground plane of 12m at any given point.

3.4.4 Exceptions may be made to maximum height where the topography of the site does not allow the building to be grounded at the natural ground level provided the building makes contact with an adjacent/existing party wall.

3.5.1 Each new dwelling may nominate up to two ‘view shafts’ of up to 30° that should not be built in front of above the level of the sill height. Nominated view shafts may not be located on the bottom story of the dwelling.

3.5.3 Skylights may be used for sun/daylighting but should be treated as secondary lighting for the purposes of the above rules (3.5.2).

3.5.5 New dwellings should not shade an existing dwelling so that any of the above conditions cannot be met by the existing dwelling.

3.6.4 Any retaining for buildings [not including public spaces] is to be included in the building structure. (no retaining walls set off from the walls of a dwelling).

3.7.3 Eves or roof overhangs are not permitted where roof line intersects with party walls. This allows for extension of new built elements past the existing roof line.
This stage of the design methodology is a combination of the comprehensive control strategy and aggregative study from the pilot study. One of the major concerns from the pilot study was the time taken to organise input from outside participants that did not have the same financial tie in that a designer would have in a real project. In order to minimise this, the designs were undertaken either solely by an outside designer, or by a designer in collaboration with myself. This collaborative process consisted of the designer spending a few minutes to give siting, use of shared walls, sizes and massing and then I would model and develop the design with input from the participant when major design decisions needed to be made.

In addition to the changes in the method by which the designs were completed, the overall role that I play as curator of the project changed to reflect a decision that additional oversight and control of the process was needed. This oversight by a third party such as a design committee would be needed given the difficulty of the site and the desire for complexity and flexibility of the framework in addition to the pragmatic concern of compliance with the framework. As such the role that I take in the simulations is similar to this, where changes would be submitted to the designer in the real process, I am making the changes myself to ensure compliance with the framework. Additionally I am present during the design process and am able to answer questions around exceptions to rules that would be otherwise submitted to the design committee. In practice the majority of these changes that took place during the first stage of developed design were to do with access and public outdoor space, with many designers privileging the dwelling over the access network.
**fig 4.4** Physical model: CNC routed topography model from gold foam
*Source: Author*

**fig 4.5** Physical model: This model was given to participants to show massing relationship of dwellings and topography
*Source: Author*
ACCESS INFRASTRUCTURE

Access and Parking
Accessibility Cable Car
Logic of the car parking stacking, allowing for multiple cars in a small centralised area.

fig 4.11 Puzzle Stacking Parking
Source: Author

fig 4.12 Parking Infrastructure images
Source: Author
fig 4.13 Site Access: Cable Car for access through site
Source: Author

fig 4.14 Cable Car through site
Source: Author
DEVELOPMENT SEEDS

Initial development setup
Design oversight led

< fig. 4.16 Chia Seeds
Source: Stacy Spensley (2010)

< fig. 4.17 Development Seeds
Source: Base map after original from Google Earth (2009)
Analysis plans by Author
< fig 4.18  Overall Development 'Seeds'
Source: Author

< fig 4.19  Upper Seed Dwellings
Source: Author
<fig: 4.20 Mid Seed Dwellings
Source: Author

<fig: 4.21 Lower Seed Dwellings
Source: Author
fig 4.26 Seed Stage + 4 dwellings
Source: Author

fig 4.27 Seed Stage + 5 dwellings
Source: Author
This image looks at the second stage of the development as a reference point.

< fig 4.29 Stage 2
Source: Author
RESULTS/CHALLENGES

The resulting form of this first stage of developed design created a much denser and more compact form than that of the pilot study. The addition of the seeds greatly influenced the design of the subsequent dwellings, their form and even siting. However, the intention to privilege the shared outdoor spaces did not make a significant impact on the way in which participants approached the design. This limitation is partially the impact of the participant’s limited time, but also the way in which the design oversight of the project is simulated. Where areas of public space are ignored, the design decisions would be referred back to the original designer in a real process; however, in this simulation, these decisions are often made by the curator after the participant has finished their involvement.

The form of the architecture here by its nature is undeveloped and therefore lacks some of the sculptural qualities that could be achieved in a real process. A limiting factor in this is the combination of footprint and height rules—which create a limited set of masses—outlined in the framework. Moving into the second phase, an exemption for massing rules will be added to allow for a more original building form for those designers that wish to go down that route.
CHAPTER 5: SIMULATION STAGE 2

Additional Open Space
Developed Framework
Methodology
Narrative Testing

< fig 5.0 Thira, Santorini
5.0

STAGE 2

This next stage of the design simulation is focusing less on the propagation of the project and more on the development of certain areas in order to test the amenity of the proposal. The test of the success or otherwise of this project lies in the viability and amenity of the dwellings. Given the designs from stage 1 and with additions both from a curatorial (design committee) role and from outside designers designing new dwellings, this stage looks at taking sketch design phases and testing them at a higher level of resolution and detail.

< fig 5.1  New Zealand Medium Density Housing
Source: Ministry for the Environment (2016)
Fig. 5.1 Physical model: This model was given to participants to show massing relationship of dwellings and topography.
Source: Author

Fig. 5.2 Physical model: CNC routed topography model from gold foam
Source: Author
fig 5.4  Added open spaces and dwellings (Stage 2)
Source: Base map after original from Google Earth (2009)
Analysis/plans by Author
This section explores a cluster of dwellings at a higher level of resolution to test their amenity and how an everyday inhabitant would experience the spaces both internally and externally in the shared spaces.
Focus on individual dwellings, demonstrating the narrative of the access pathways and experiential qualities of these dwellings.

< fig 5.17  Pathway View Author
Source: Author
< fig 5.18 Narrative images tracking the access and inhabitation of houses in the development
Source: Author
fig 5.19 Pathways / Access Routes to apartments
Source: Author
<fig: 5.20 Narrative images tracking the access and inhabitation of houses in the development
Source: Author
<fig: 5.22 Narrative images tracking the access and inhabitation of houses in the development
Source: Author
fig 5.25 Stage 2: inhabitation images
Source: Author
fig 5.26 Stage 2: inhabitation images
Source: Author
I have stated earlier in the thesis that the arguments against urban sprawl and the need for intensification of residential areas has been well documented and have very few opponents within the academic and architectural communities. As such, the basic need for an increased density residential model to make use of under-utilised hillside sites in Wellington is easily argued. The test of the success of this process is in the impact of the proposed model on the Wellington landscape and the potential amenity that the development offers being of the same level or higher that of existing medium density models.

The existing definition of medium density as identified in a report written for the Ministry for the Environment;

...multi-unit developments with an average site area density of less than 350 m² per unit. It can include detached (or stand-alone), semi-detached (or duplex), terraced or low rise apartments on either single sites or aggregated sites, or as part of larger master-planned developments.1

The design simulations that I have run through the research process has resulted in an average density of 170m²/dwelling for the main design stages. This calculation is based on the inhabited areas and following the current trends this density should continue for the remaining area to be developed.

One of the main aspects of any hillside city or town is the existing pattern of development and the character of that development pattern. This pattern was taken into account from very early on in the project and it was found that dense clumps of houses over the hill had less impact on the visual aspect of the hillside than a more spread out development (fig.6.1). In addition to this the proposed pattern on the hillside recalls - but does not replicate – the

1 Boffa Miskell Ltd., “Medium-Density Housing Case Study Assessment Methodology” (Wellington: Ministry for the Environment, 2012).
existing hillside pattern of dwellings following the roads (fig 6.2). The decisions made throughout the development of the framework have displayed an evolution of this hillside massing. Following the parametric exercises (fig 6.3) it was found that the mass of a building will affect the hillside more than the height as an isolated variable. The difference that a six storey building made to the character of the hillside was negligible when compared to a three storey building. This finding informed the height rules and exceptions defined in the final development framework.

With the findings that the proposed development pattern will have minimal impact on the visual amenity of the city as a whole, the question of amenity that the individual dwellings possess becomes one of the main tests as to the viability of the proposal. A limitation from the inception of the proposal was that of access. The current MDH models prevalent around the country provide vehicular access and parking with direct access to each individual dwelling. One of the trade-offs of the steep topography of the sites addressed in this research is the inability to provide this amenity directly to each dwelling. In order to minimise this the design has been developed to allow for collectivised parking and both pedestrian access and flat path access via the cable car. While this still puts this amenity below that of the flat site MDH developments, the design minimises the impact.

The quality of MDH developments plays a large role in interest and adoption of any model. New Zealand as a society comes from a postcolonial background. However, Campbell Gibson argues that as a ‘virgin nation’ we had a comparatively high level of urbanization – and in fact suburbanisation – from very early in our colonial history. Due to the nature of our colonization and the speculative nature

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of the early colonists, owning land has become a large part of New Zealand culture. The Quarter Acre Dream and the imitation of an English country lifestyle that was present in the early colony has evolved, however this still leaves New Zealand with a different social and cultural approach to areas where hill towns and aggregative growth are abundant. The intentional looseness of control over materiality and building form (outside of meeting massing objectives) allows for some personalisation of dwellings and some form of architectural expression so as to create a more interesting and complex final outcome. This is intended to allow for – through aggregation - the personalisation that is seen as an important motivator for New Zealand buyers. The limitation here, which will be discussed later, is that of the amount of control over this process and finding the balance between quality of the built environment and freedom for the complex aggregative system to run its own course.

From an architectural standpoint, the amenity of these dwellings can be viewed in terms of access to views/sunlight, public outdoor space, and privacy. The site chosen for this project is a south facing hillside, so access to sun is limited, however the majority of the buildings have sufficient (as evidenced in chapter 5) access to the sun due to the articulation of the forms down the hillside (fig 6.4). The design of these dwellings for the simulation has been done very quickly and the detailing to maximise sun access is inherently undeveloped. During the developed design phase six of these dwellings have been advanced further to show how small architectural gestures (that would normally be developed along with the design of the dwelling) can further improve daylighting access.

5 Ibid.
6 Consultants, “Improving the Design, Quality and Affordability of Residential Intensification in New Zealand.”
Working with challenging topographies such as this site creates challenges to fitting irregular and separately planned building forms together. However the idea of the primacy of public space that is introduced with the development framework (appendix?) allows for these potentially problematic leftover spaces to create a rich network of ‘semi-public spaces’ (fig 6.5). This aspect of the design is documented and evidenced in the serial vision study in chapter 5.

While dwellings with unconventional geometries and relationships tend to create obscurities and contradictions, the vast majority of issues surrounding privacy have been minimised through small design moves at a more detailed level. However a limitation of this method of aggregation is that there is the potential for either privacy breaches with a new dwelling, or for limiting daylight access to certain rooms. These issues would require active supervision of designs by the oversight committee, but in the end each dwelling and therefore designer would be responsible for upholding the development framework guidelines.

7 Here I refer to “semi-public spaces” in terms of the space will be accessible by everyone as it forms part of the access network, however this would primarily be limited to other inhabitants of the development and would tend to be shared only by dwellings which border it.
The final written development framework has been included in the appendices (appendix 1) however here I will discuss some of the major points of difference for the framework, their limitations and implications. The first of these is the idea of land division, where this follows building concept rather than preceding it. In effect this would do away with the traditional lot pattern that has limited hillside development due to the complexity of superimposing a two dimensional boundary onto a site sloped in three dimensions. The research has shown this creates a development pattern that both greatly increases available density on the site and produces a pattern that will fit in with and enrich the visual amenity of the hillside (fig 6.2&6.3). This idea is also the major framing principal of the aggregation of the development that provides not only much of the character (through complexity) but also the viability of such high density urban infill given the current residential market.

However this rule does have limitations. Firstly, this approach calls for much higher levels of design oversight than currently exists within the residential building market. Given the trend towards more and more draconian regulation and legislation within this sector, this could be seen as a negative outcome. However, oversight would probably not come from regulating bodies but from either a panel, or architectural firm engaged to work on behalf of the collective body corporate. While this extra level of control could harm efficiency of production, it would also allow for architectural supervision and inherently a higher quality of the built fabric.

The second point of contention with this idea is the legal frameworks behind property ownership. While the intricacies of this process are outside of the scope of this thesis - and would require further research – I have proposed an
ownership structure" based on the existing "unit title" system which allows for individual ownership of the dwelling while still having a collective portion of ownership for shared areas and facilities. This has limitations including the increased risk and financial responsibility involved with any form of collective ownership\textsuperscript{9}. For this reason the very nature of the system required for higher density may discourage buyers in the short term. However with the changing views and habits of the New Zealand buyer\textsuperscript{10} this attitude may alter in time.

The second idea of this framework is that of the access network. The hillside topography and the desired density exclude the possibility of vehicular access to each dwelling. This could create a barrier to adoption by the market. The design has shown that access is possible to each dwelling. With the addition of the cable car, primarily flat access routes are available to the majority of dwellings on the site.

Massing, form, and architectural articulation of the dwellings in this framework have been a challenge throughout the project, with the dichotomy between control and aggregation continually clashing. I have responded to this by giving a number of tight controls but also allowing areas where exceptions can occur to allow for a richer, more complex outcome. As I have stated above this project does not seek to mimic or recreate a vernacular architecture rather it proposes a new development model within which the building traditions and practices of the Wellington industry can work to produce MDH for these sites.

\textsuperscript{9} New Zealand Unit Titles Act 2010

\textsuperscript{11} Consultants, “Improving the Design, Quality and Affordability of Residential Intensification in New Zealand.”

\textbf{PROJECT CONCLUSION}

As discussed above, this project has had many successful points and has produced a viable basic principal from which to build a development framework for this type of MDH development for hillside sites. However due to the nature of the project timeline and format there are several limitations and inherent assumptions that have had to be made to go forward and would require further research to either solve or to test the project in such a way as to negate them.

The main issue that has arisen at each stage of the process has been that of the dichotomy between control and aggregation. A free process has the potential to allow for more complex and interesting outcomes as well as giving good designers and architects more freedom of expression. However this needs to be balanced against the professional requirements of the discipline to lower the risk of a poor quality outcome. For this research I have taken a specific position on allowing for maximum freedom of siting and creating some massing/stylistic rules\textsuperscript{12} while allowing for freedom around materiality and architectural articulation. In doing so, I have attempted to keep the individuality of the Wellington built environment. One of the major criticisms of Ian Athfield’s Amritsar St property is the single ownership of the property and the social and financial implications of trying to transplant that model elsewhere. In addition, the “foreign”/“exotic” appearance of Athfield’s house is another reason why it has not been adopted as a development precedent.

The theoretical basis on which this project has been founded follows Christopher Alexander’s New Theory of Urban Design, Lucien Kroll, and to a lesser extent the precedent of Ian Athfield’s Amritsar St house. These theories have been discussed earlier in the thesis.\textsuperscript{13} Particular reference is made to their somewhat contrived design processes. While this

\textsuperscript{12} See roof pitch and massing/height restrictions appendix 1
\textsuperscript{13} See chapter One
research steers away from these authors in some respects and uses the aggregative process in a more pragmatic form, it is still based on the work of these writers/architects.

In the same vein, the use of a vernacular architecture to inform contemporary architecture has been widely criticised. This thesis has consciously avoided the aesthetic interpretation of the vernacular and the resulting social lyricism. Consequently the systematic and analytic approach taken has attempted to avoid these traps. However, with any study of the vernacular, some aspects of a false and imagined past must be present. This occurs because analysis is often taken from multiple sources, and their biases, interpretations and imaginations (in some cases) play a part in the picture the researcher can put together to analyse.

For the simulation portion of the thesis the ideas of aggregation and land division were able to be successfully tested and returned useful results for the evolution of the development framework. However the resulting architectural outcomes were often not of the quality one would expect from participants with architectural training. This problem of uninteresting and relatively undeveloped forms results from the methodology. Each participant in the simulation was given around an hour to design (at a conceptual level) their dwelling for the proposal. This hour of independent work was taking the place of what would normally be a collaborative process undertaken over weeks or months as the design of the dwelling evolved. On top of this lack of time, there is the issue of minimal investment in the design process. Designing in the real world has consequences, for owners and occupants and for the designer’s reputation and remuneration. However designing in this simulation process holds none of those consequences, complications and motivations. As such it does not allow for a real level of interaction and commitment with the design. For the purposes of this research this issue is less important as the simulation provided the requisite information to continue to work on the framework outcome. However, the final design work is not up to the standard that would be achieved in a real life process.

To continue this research to a point where it was implementable for a built project there are several areas that would require more development. Firstly the ownership structure of the development would need to be addressed in more detail, making specific reference to New Zealand Unit Titles Act 2010. In addition to this, the technical requirements surrounding compliance for a multi-stage development would need to be addressed. For this project, the current building codes – with the assumption that each building would be consented separately – have been followed in regards to fire separation, access and water tightness etc. While these issues have been kept in mind during the design of the project, they were not its main focus, so were treated as a base assumption and not specifically developed. In terms of implementation, the role and composition of the oversight committee and their legal relationship to the body corporate would need to be further developed.

If time had allowed, I would like to have applied the framework and process to another site. I would also have given the participants a longer time to develop their designs. The amount of time spent by each designer (as discussed above) lowered the quality of the designed outcome. If put through an extended process, participants could conceivably have produced richer results and a more accurate reflection of how to evolve the frameworks and processes further. Similarly application to another site would have reduced the site-specific nature of the case study/test/random outcomes, again allowing for a fuller picture of the implication of the framework.

From the outset of this project, the development framework and an indicative implementation process have been the intended outcome of the thesis. Rather than foregrounding the design - which in this case has been a simulation to test both the process and framework – the intent of the research is to propose a new model that could be used for a range of different sites and locations within Wellington, but also conceivably elsewhere in New Zealand.

The thesis has achieved these goals and has been shown to have provided a credible model for hillside development. This higher density housing model provides a high level of amenity to potential inhabitants of the development, as well as making use of the abundant sloped sites around the Wellington area. The success of this project lies in the potential for creating a discussion around utilising these steep hillside areas for development in an attempt to negate any further urban sprawl.
APPENDIX

Bibliography
Development framework

<fig 7.0 Wooden Window
Source: Skitterphoto (2014) (CC0)
BIBLIOGRAPHY


McDonald, C. “City of Melbourne.” Lighting Strategy (Melbourne, 2003).


IMAGE SOURCES


DEVELOPMENT FRAMEWORK

1.0 Introduction

1.1 Actual Process (simulated for this project)

The process that will be set up for the design aspect of the project is intended to allow an organic, aggregative, multi-authored outcome to develop over time. Each individual dwelling will be designed by a different architect/designer, rather than a single author in a single stage as is common with current MDH typologies and models. This aggregative process allows for a more dynamic response to both site and existing built conditions over time as well as allowing for the complexity, and sometimes irrationality, which gives a richness and character to a space or development.

The project as a whole is governed by an oversight committee, this role will be held by an architectural firm that is hired as consultants to the body corporate. Their role includes oversight of designs submitted by outside designers, as well as the upkeep of the master drawing set for the development. In addition, the firm would also lead the development and upkeep of the Public Space and Access Infrastructure network on behalf (and in collaboration with) the body corporate.

1.2 Simulation Methodology

To simulate the aggregative build-up of the development, the design simulation will encompass multiple discrete stages, alternating between outside design input from third party designers, and input from the researcher. Input from outside designers simulates the different interpretation of the guidelines as well as different views on the process as a whole. Meanwhile the input from the researcher allows for a faster process, with the iterations able to propagate faster throughout the process. To try and limit the idiosyncratic nature of the single author stages, student designers will be approached in the role of client to choose an architect, formal strategy and brief requirements such as programme, orientation and priorities of sun vs. view etc. The researcher will also fill the role of the oversight committee, to develop the collective aspects of the project and maintain editorial control over the process.

1.3 Land Division/Ownership

The major element of this development that sets it apart from other MDH projects is the treatment of ownership and site. Here the site is treated as something to be defined following the design of the dwelling rather than helping to form the design. In this way the design of individual dwellings can adapt to the topography of hillside as well as the existing building stock in a much more organic and dynamic way. This approach is consciously not master planned, instead relying on an aggregative and organic build-up of the site. Ownership structure is based on unit title ownership, whereby the body corporate owns the land and has collective responsibility for shared access areas and collective parking amenity. Land division follows building concept; a set area of land is not defined prior to design and is instead defined by the area that design inhabits.

2.0 Access/Public Space

Without the mediating and regulating backdrop of a traditional street, lot, and yard pattern the public interaction between dwellings becomes one of the main organising factors of this development. Social interaction plays an important role in our perception of a place and this development seeks to allow for informal meeting places, whether by the variation of the access network allowing places of pause, or more formal courtyard areas shared by several adjacent dwellings. The following points give structure to these goals.

2.1 Access Network

Create an efficient network of access to and around dwellings, as well as allowing for a means of social interaction and meeting place around the development.

2.1.1 Each dwelling is to continue/add to the communal pedestrian access infrastructure, providing access to the new dwelling with scope for extension of the pathway.

2.1.2 The major axis of the pedestrian network will fall generally parallel to the site contours/topography

2.1.3 Minor axis of pedestrian network will fall generally perpendicular to the site contours to act as vertical access and circulation through the development.

2.1.4 Irregular path width is recommended to avoid monotonous access routes, and allowing for spaces of pause where the path widens, even allowing for courtyards and public open space [see 2.2]

2.2 Public Open Space

Create formal and informal shared public space to increase the communal usage of the outdoor space and allowing for a richer sense of community.

2.2.1 Open space can be defined either as a stopping place in the access network, through to a shared courtyard, deck area, or inhabitable activity space.

2.2.2 Each dwelling will initiate/extend/complete a semi-public open space within easily accessible distance of the new dwelling.
3.0 Designing Dwellings

Dwellings for this development are to be designed around a higher level of response to the topography of the hillside as well as a higher density model. The traditional model of building on hillsides in New Zealand has developed out of the way in which streets sit in the hillside and the resulting lot patterns that follow these streets. With the restrictions of the street pattern lifted as well as pre-defined lots, the connected dwellings are able to achieve a higher density while following the natural lines of the hillside more closely.

3.1 Building Footprint (single dwelling)

Define the footprint area of the building [area of building in plan] within the maximum 120m². Buildings must be partially grounded on the site, rather than supported on stilts construction.

3.1.1 Maximum building footprint area of 120m²
3.1.2 Minimum width for building sections to be 4m to allow for habitable internal areas
3.1.3 Buildings are to be grounded [defined here as contact with the ground through slab construction] for at least 70% of their footprint area
3.1.4 Building envelope may encompass up to 10% larger floor area than building footprint to allow for architectural elements that contribute to building design and articulation, as long as this does not interfere with development of future dwellings (see 4.3)

3.2 Building Footprint (multiple dwellings)

Multiple dwellings may be developed together, designers are encouraged to minimise impact of large masses and conform to principals of the development.

3.2.1 Up to four dwellings are permitted to be purchased and developed as a single unit. These must be separate dwellings but can be built as a single form.
3.2.2 Where multiple dwellings are developed together the total building footprint is 120m² for the first dwelling then 80m² for all subsequent dwellings

3.3 Party/Common Wall

Use party walls as origin point for, and connection to, existing built form and provide further party walls to act as origin/connection points for future dwellings

3.3.1 Dwellings must be based around a connection to an existing party wall as a grounding element of the built fabric
3.3.2 Exceptions may be made to this rule where no party wall areas can be found suitable to accommodate building. Decision at this stage sits with the planning committee
3.3.3 Dwellings to allow for (at least) one common wall for future dwellings
3.3.4 Party wall construction to be of heavy construction (defined here as concrete or masonry construction)
3.3.5 Party wall to allow for structural stability for up to four storey future building to attach to it
3.3.6 Any retaining walls as part of the building structure should be treated as a possible party wall, but may not be the nominated minimum common wall allowance.

3.4 Height Range

Buildings are to conform to a height range to normalise the massing on site. This range allows for some articulation of topography and how that affects building mass and sizing

3.4.1 New Dwellings/building forms are to be a minimum two storeys
3.4.2 Built forms are to be a maximum of four storeys, even where multiple dwellings are present within the same form.
3.4.3 Maximum height from natural ground plane of 12m at any given point
3.4.4 Exceptions may be made to maximum height where the topography of the site does not allow for the building to be grounded at the natural ground level provided the building makes contact with an adjacent/existing party wall.

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3.5 View/Sunlight Access

Ensure new dwellings do not destroy or limit existing dwellings access to both sunlight/daylight access and views. Each new dwelling will, in principal, allow for retaining existing view shafts and sun shading of other dwellings, whether existing or future.

3.5.1 Each new dwelling may nominate up to two ‘view shafts’ of up to 30° that should not be built in front of above the level of the sill height. Nominated view shafts may not be located on the bottom story of the dwelling.

3.5.2 Each new dwelling should receive at least 2 hours of direct sunlight between 9am and 4pm at mid-winter, unless site condition and orientation makes this unfeasible, in which case designers must demonstrate sufficient daylight availability to create a desirable living condition.

3.5.3 Each new dwelling may nominate up to two openings of up to a combined area of 10m² where no future dwelling may shade incoming sunlight.

3.5.4 Skylights may be used for sun/daylighting but should be treated as secondary lighting for the purposes of the above rules (3.5.2)

3.5.5 New dwellings should not shade an existing dwelling so that any of the above conditions cannot be met by the existing dwelling.

3.5.6 New dwellings adjacent to an existing opening should provide for a light court with minimum 3m² and set back from the opening at least ½ of the height of the new wall to allow for daylighting to existing dwellings.

3.6 Materiality

Ensure a loose consistency of building type and construction method to create relaxed unifying elements to the architecture of the development.

3.6.1 Light weight construction of timber and steel structure is encouraged.

3.6.2 Heavy concrete or masonry construction is required for common party walls.

3.6.3 Heavy concrete or masonry construction is recommended for excavated areas where retaining of the hillside is required.

3.6.4 Any retaining for buildings [not including public spaces] is to be included in the building structure. (no retaining walls set off from the walls of a dwelling)

3.6.5 Use of cladding materials should take into account the surrounding buildings and style so as to create a unity within the development.

3.7 Roof Pitch/Treatment

Ensure a visual consistency and unity of roof elements for larger planes, while still allowing for smaller feature elements.

3.7.1 Mono or double pitched roofs are to be used with a minimum slope of 4° and a maximum slope of 15° unless the roofed area is less than 10m².

3.7.2 Flat roofs are permitted only as habitable deck areas or as a further articulated architectural element such as a green roof.

3.7.3 Eves or roof overhangs are not permitted where roof line intersects with party walls. This allows for extension of new built elements past the existing roof line.