Streets in the Sky

How Can Architecture Extend the Public Realm into the High-Rise?

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Explanatory Document
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ABSTRACT

Urbanisation is inevitably stretching our cities deeper into the ground and higher into the sky. Over the past century, influences of the motor vehicle and the High-Rise form have induced a growing disconnect between dwellers and street life. Although more and more people live in cities, the current High-Rise urban form encourages privatised living. It neglects the pedestrian experience, creates a vertical socio-economic hierarchy, and prompts poor social relations. By integrating pedestrian infrastructure into architecture, growing cities can increase and evenly distribute their public space.

Pedways (elevated and subterranean walkways) have been used since at least the 8th-7th century B.C. However, most of the significant research for this project has come from the past 100 years. Some of these visions have been partially realised in places such as North America and Hong Kong. However, these networks only engage in the lower floors of High-Rises, and often lack the elaborate social intent of the utopian visions. Current networks are constrained by social, political, economic factors. This project critiques previous visions, and investigates more holistic approaches to realising these visions.

This project aims to encourage ‘street life’ above and below ground level. It is important to identify the essential elements of ‘a great street’ and to reinterpret these within the High-Rise. The objectives are to enable ‘the vertical street’, ‘elevated neighbourhoods’, and ‘hybridisation’ throughout the entire building. In doing so, the project strives to remedy social issues resulting from the current High-Rise form.

Auckland is an appropriate test site for this topic, as it is in the early stages of dense urban development, and has the current opportunity to integrate pedways into its masterplan - an appropriate response to the accelerating population and the incomplete pedestrian network.
Any family members who can deal with the ups and downs of an architecture student deserve praise.

To friends, I promise to no longer be a nocturnal, antisocial creature.

To Christoph, I thank you for your guidance, and the occasional laugh in between.

Your professionalism was necessary to straighten my informalisms.

To the coffee group attendees, if nothing else, mutual pain brought mutual gain.

To those of Room 1017, your inspiration leaked on me like the window did onto my desk.

Thank you all.
1. INTRODUCTION

1.1 Project Background
1.2 Aims & Objectives
1.3 Project Outline
1.4 Scope & Limitations
1.5 State of Knowledge in the Field
1.6 Methods
Pedway networks (elevated and subterranean walkways) have been used for a long time and for many different reasons. It is difficult to encourage people away from the comforts of the ground plane. There must be strong incentives to do so.

The United Nations predicts that by 2050, the world population could exceed 10 billion people, 66% being urbanised.\(^1\)

The drive for density in urban centres is pushing the private realm further into the sky, whilst the public realm remains reliant on the ground plane. Current urban approaches expect the same infrastructure and public space to cater for an accelerating population. There is a growing imbalance of public to private space. This escalating privatisation of people in cities is developing large environmental and social issues as a result.

\(^1\) UN, World Population Prospects Report (2015 Revision), pg. 2
\(^2\) UN, World Urbanization Prospects Highlights Report (2014 Revision), pg. 1

The “Streets in the Sky” utopian approach is where High-Rise and urban design work harmoniously to integrate public space into the vertical city, so that public space increases proportionally to private space as we intensify our cities, but also these spaces are integrated in a way that brings social benefits.
1.2 AIMS & OBJECTIVES

RESEARCH QUESTION:
How Can Architecture Extend the Public Realm into the High-Rise?

AIMS:
To bring social benefits to urban environments by integrating the public realm into the vertical city. The social benefits include:
• Improving the pedestrian experience
• Improving social relations
• Disintegrating vertical hierarchy

OBJECTIVES:
This project attempts to meet these aims by introducing:
1. The Vertical Street
   To extend the ground street into the High-Rise, parts of it must be reinterpreted vertically.
2. Elevated Neighbourhoods
   To identify and address the necessary elements which encourage High-Rise occupants to act as a community body, and to contribute to ‘street life’ and safety.
3. Hybridisation
   To enable the mixing of functions throughout the entire High-Rise.
Auckland CBD is an appropriate test area for this concept. It still has many underdeveloped sites for implementing ideas of public High-Rises and pedestrian networks. With accelerating population growth and increasing tourism, Auckland will soon have the necessary densities to warrant such concepts.

The project operates at three main scales:

Scale 1. Urban Planning
Scale 2. Site and Context
Scale 3. High-Rise Design

The ‘High-Rise Design’ scale is the main focus of the project. Scales 1 and 2 show how urban planners and councils may use urban theories and contextual analysis to position these street networks within a city, whilst scale 3 shows how the architect may deal with these streets as they penetrate the building.

The chosen site is one of the two underdeveloped car parking buildings located to the north of Albert Park, at 1-71 Chancery Street (5.3 Site Selection). The second site will be developed as part of another thesis extending the same topic in 2018.

This project focuses on designing a new High-Rise, instead of retrofitting existing structures (Explained in Scope & Limitations). The existing structure would be demolished.
1.4 SCOPE & LIMITATIONS

The scope of this topic could be set anywhere from a city-wide scale, down to the intricate details of a suspended street. Setting scopes and limitations for this project is vital.

The Urban Planning Scheme in this project is only diagrammatic, enough to explain how these theories could be implemented by councils and urban planners.

The purpose of the Site & Context area, is to show how neighbouring buildings and parks could connect to the chosen sites through pedways (5.4 Site & Context). The intent is not on the viability of these connections, but instead to create an interesting context in the High-Rise for which will influence the architecture.

The High-Rise Design is the focus. It shows how an architect may deal with these streets as they penetrate the building - how it will affect their placement of functions, arrangement of spaces, circulation, and so on. Circulation and the 'street experience' are the primary intent, not the design of the 'function spaces': offices, retail stores etc. Functions only need to be considered for their influence on the 'street experience'.

An important question of scope has been raised - why does this project need to focus on a new High-Rise design instead of retrofitting an existing one? The short justification for this is that current High-Rises are not ready for public life; their structure, services and circulation systems are not prepared for public densities. To explore greater possibilities of this concept, it is more appropriate to start from scratch.

1.5 STATE OF KNOWLEDGE IN THE FIELD

Pedway networks have been explored since at least the 8th - 7th centuries B.C.E. However, most relevant knowledge in the field comes from the past 100 years.

These concepts have been applied for different reasons: climate control, security, religion, transport efficiency, safety, hygiene.

The knowledge around this topic is split into two categories:

1. Urban Planning Theories and Concepts, and,
2. High-Rise Design Theories and Concepts

1. Urban Planning:

In the early 20th century, many illustrations imagined a future with streets and train lines suspended between High-Rises from the C.I.A.M. Group to science-fiction comic-books by Frank R. Paul. Several decades later the economic situation, material and construction technologies allowed prototypes of these utopias to be constructed, such as the Futurama prototype streets at the New York World Fair 1964.

There are now extensive pedway networks in Hong Kong, Shanghai, the USA and Canada. These are beneficial precedents, but are often dedicated transportation spaces and lack the full 'street-like experience of utopias. Structural, economic, political and social reasons have prevented these networks from extending above the 3-4th storey (2.3 Streets in the Sky Critiques).

2. High-Rise Design:

Isolated High-Rise designs have offered more realistic approaches to public verticity than many utopian urban schemes and illustrations. Most High-Rise concepts investigated are not actually publicly accessible, but their forms and spaces show promise for public verticity. For example, the Dutch Embassy by OMA is - in reality, a private, highly secure building, but its forms and circulation system offer ideas for public habitation.

This project aims to extend the knowledge in the field by linking these elaborate High-Rise theories into urban theories. Infrastructure and High-Rises need to be an integrated approach to the future city.

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1 Note: Derinkuyu Underground City, Turkey, 7th - 8th Century B.C.E.
1.6 METHODS

Urban Concerns into Architectural Objectives

The Literature Reviews (Section 2.1) help identify the social issues of the current High-Rise form. The Urban Analysis (Section 2.2) explains the social issues identified in the literature reviews. The Social Science Research (Section 2.3) justifies the key issues in the urban analysis and converts them into the Architectural Objectives for this project (Section 2.4).

Urban Planning (Section 3.1 & 3.2): The project begins with Urban Planning. It looks at how pedways can be implemented within the selected city.

Site & Context (Section 3.4): A specific area of the Urban Scheme is focused on. It investigates how the pedways specifically interact with the site.

High-Rise Design (Section 4.3 & 6.4): Analyses the architectural response to an injection of pedways into the selected site. The designs in Section 6.1 & 6.2 are concepts explored before the inclusion of context. The designs from Section 6.4 onwards are concepts explored after the inclusion of context.

Research & Design Process

Design Mediums

With a topic that relies so heavily upon three-dimensionality, modelling is the most appropriate medium for the design process. So, which techniques can best explore the architectural objectives? Experimentation will help narrow down which modelling techniques allow the most malleable yet accurate design, and which forms and spaces offer the desired effects (Section 6.2).

Fig. 5
Fig. 6
2. URBAN CONCERNS

2.1 Literature Reviews
   2.1.1 Metropolis (1927)
   2.1.2 High-Rise (1973)
   2.1.3 Rethinking the Skyscraper (1999)
   2.1.4 Delirious NY (1978)

2.2 Urban Analysis
   2.2.1 The High-Rise & The Street
   2.2.2 Private Lifestyles
   2.2.3 Concentration of Functions
   2.2.4 Vertical Hierarchy

2.3 Social Science Research

2.4 Architectural Objectives

Demolition of Pruitt Igoe only 20 years after construction due to uncontrollable crime & violence
2.2 LITERATURE REVIEW

2.2.1 “Metropolis” (1927)

“Metropolis”, directed by Fritz Lang, played a significant role in questioning ideas of pedways for the future. It depicted a dystopian future in which urban planners held power over the city’s workers. Pedways had a negative stigma, as they symbolised the life of aristocrats and city planners, whilst the working class lived underground. The film explained that if pedway networks are not made entirely public, the reality will surely end in vertigo-filled social hierarchy.

The illustrations for “Metropolis” were devised by architect and visual artist, Hugh Ferriss. His book, “The Metropolis of Tomorrow”, depicted a future where dense urban architecture and infrastructure were tightly interwoven. It influenced many architects, urban planners, and even comic-book artists; he became known as the creator of ‘Gotham City’. Urban planners such as Harvey W. Corbett, Raymond Hood, and Francisco Mujica worked with and/or extended on Ferriss’s visions.

2.2.2 “High-Rise” (1975 & 2015)

J.G. Ballard’s book, ‘High-Rise’ (1975) was a powerful critique of the oppressed, high-rise living. The book was an indirect critique of recent failures in tower block projects of the time, such as Robinhood Gardens (1972) and Pruitt Igoe (1954).

The book follows characters living in a High-Rise, and explains their gradual “descent into violent chaos.” The book implies that the High-Rise offers more social interaction (parties and spontaneous interaction), but also shallower relationships. The development of antagonistic character explains how introverts and anti-social behaviour thrive in the current High-Rise environment. The building’s architect lives in the penthouse suite, and plays the cynical ruler of mayhem – ironically also the ‘designer of mayhem’.

Perhaps concerns about current dense urban environments brought back the book’s relevance, and eventuated in its translation into a film in 2015.

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1 J.G. Ballard, High-Rise, ‘Synopsis’, (Jonathan Cape Ltd, 1975)
2 J.G. Ballard, High-Rise, 1975, pg. 26
2.2.3 Rethinking the Skyscraper (1999)

A stack of pancakes can symbolise the economic greed of typical High-Rise design - a rational tool to maximise rentable floor area and hence, profit.

"A series of [pancakes] piled homogeneously and vertically one on top of the other, ... seeking to optimise net-to-gross aerial spatial efficiencies." 1

Yeang discusses some theories to help enable 'streets in the sky':

Urban Design Framework
Yeang posits his 'Vertical Land-Use Mapping' theory as a means of maintaining desired land use and spatial sequences in the High-Rise (3.2.1 Vertical Land-Use Mapping). He analyses different urban fabrics of Beijing, London and Paris to show how the essence of such fabric can be transposed into a High-Rise.

Artificial Land in the Sky: Flexibility & Change
The wish to combine public and private realms in the High-Rise comes with many complications in property titles. Flexibility of tenancy is a difficult, but necessary, design aspect to consider. "Design of the new High-Rise could provide 'open' or 'half determined' structures in the three-dimensional matrix, which the users finish." 4 The idea of micro-societies within the High-Rise organising and changing its layout to suit their needs is a complex, but desirable idea.

Placemaking and Neighbourhoods in the Sky
The sequence or serial visions of courtyards, plazas, streets and boulevards are fundamental to placemaking.

In an increasingly multicultural and cosmopolitan society, the challenge for the architect is to reinterpret these elements into the High-Rise with a uniqueness of character and place. It is important to give occupants a sense of identity, and locality within the building - a sense of belonging.

1 Ken Yeang, Rethinking the Skyscraper: A Vertical Theory of Urban Design, (Wiley-Academy, 2002), pg.11
2 Yeang, Rethinking the Skyscraper, pg. 11-125
3 Yeang, Rethinking the Skyscraper, pg. 72-89
4 Yeang, Rethinking the Skyscraper, pg. 73-180

2.2.3 Delirious New York (1978)

The New York Athletic Club (1931) accentuates the mysterious qualities of the High-Rise. Koolhaas uses the term "Vertical Schism," 1 to explain this freedom of placing two incompatible functions, one above the other, where floors divide worlds.

Similar to the NY Athletic Club, OMA's following design for the Parc de la Villette (1982) also segmented its functions into layers, this time horizontally instead of vertically.

The Globe Tower Theorem (1909) shows that the High-Rise has always been perceived as a tool of urban privacy and perhaps mystery. 2 However, it took a long time before the High-Rise could be conceived as a tool for transparency and public life (2.2.4 Ten Canonical Buildings).

Design is still prioritised on the formalist beautification of façades, and the rationalist organisation of internal services and circulation spaces. This project aims to reorganise the priorities of High-Rise design by shifting the emphasis towards interior functionality for the public realm, to suppress this 'vertical schism' and 'lobotomy' that Koolhaas identifies. 3

1 Rem Koolhaas, Delirious New York, (The Monacelli Press, 1978), pg. 173
2 Koolhaas, Delirious New York, pg. 83
3 Koolhaas, Delirious New York, pg. 296

The Globe Tower Theorem (1909)
2.1 URBAN ANALYSIS

2.1.1 THE HIGH-RISE & THE STREET

The true birth of the High-Rise followed two key technologies: Otis’s elevator technology (1853)\(^1\) and Jenny’s steel skeleton construction (1885)\(^2\). Both enabled people’s desires to live in the clouds; the joys of expansive views, cleaner air and urban privacy. All whilst having close connection to amenities via public transport or on foot. For the developer, it gave the ability to maximise a site’s rentable floor area, and therefore profit. But what implications did these technologies have on the relationship between streets and architecture?\(^3\)

Before the introduction of the motor vehicle and the High-Rise, “streets were places where people liked to be, to walk, to shop, to meet, to play, and even just to people-watch”, not just a place to transport themselves from A to B.\(^4\)

This change in street life and public space cannot come without changes in the social structure of our cities. Recently, there has been a demand for the return to the idea of the walkable city. Part of this demand is the growing impracticality of vehicle traffic and parking, but the key desire is to bring back the experience of the Flâneur - the city stroller: propinquity, spontaneous interaction, and seamless street-to-building transitions.

A dichotomy of the contemporary city is:
1. The want for density - endorsing the vertical city, but also,
2. The want for intimate street life - endorsing human-scale construction

New York, Sao Paulo and Hong Kong are all examples of the current response to dense urbanisation. The environmental concerns linked with them are discussed frequently, as these concerns are tangible and quantifiable: high resource consumption, lack of local resource production, and quantity of carbon emissions. However, the social concerns linked to urbanisation are discussed less frequently, or are even subconscious among city dwellers. If architecture is equally a social science, then why are the social implications of dense urban High-Rise living so seldom discussed?

This research project is not anti-High-Rise, it accepts the High-Rise as the inevitable typology of the urbanised future city. It is a critical analysis of its implications, and aims to suggest social solutions for the future.

If public space is the heart of our cities and streets are the blood vessels, it makes sense to integrate them into the vertical city, to keep it alive.

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\(^{1}\) Encyclopedia Britannica, britannica.com, Elisha Otis
\(^{2}\) Chicago Architecture Information, The Home Insurance Building
\(^{3}\) Streets as Places, Using Streets to Rebuild Communities, Project for Public Spaces inc., (AARP. 2008), P g. 2
\(^{4}\) Streets as Places, Using Streets to Rebuild Communities, Project for Public Spaces inc., (2008) pg 2

2.1.2 Privatised Living

Contemporary urban living has become more private, ‘because of the consumer society’s emphasis on the individual and the private sector, creating Galbraith’s ‘private affluence and public squalor’, . . . (It is also because of) the spread of the automobile’¹. “The elevator - with its potential to establish mechanical rather than architectural connections” teleports people from the street (or lobby) to their destination, without any knowledge of what goes on in between. This anonymity means that occupants lose their sense of belonging and consideration for the High-Rise and those others in it.

Due to increasing traffic congestion and diminishing public pedestrian space in many cities, “public life (increasingly) depends on organised social events, commonly in an internal location.” Working, living and socialising at a friends become isolated events which no longer contribute to street life. The street is reduced to a means of transport between events.

³ Jacobs & Appleyard, *Towards an Urban Design Manifesto*, pg. 114

Figure 17 & 18
The small amount of blue represents the footpath where the pedestrian is pressed up against buildings to make space for motor vehicles. The pedestrian must circumnavigate a block when wanting to change direction. The grey represents the areas of the city this person will never know. Their journey is always to a dead end.

Figures 19 & 20
When pedways are introduced, a person can explore much more of the vertical city. Socialising is no longer restricted to the ground plane or a private apartment. The social activity adds to an elevated street life. Commuting becomes a vibrant, pedestrian journey from one High-Rise to another.
2.1.3 Concentration of Functions vs. Hybridisation

The concentration of ‘function spaces’ is a key idea pursued by modernist urban planners. Ludwig Hilberseimer’s plan for Hochhausstadt (1924) was a vertically segmented response to Le Corbusier’s Contemporary City for Three Million Inhabitants (1922). Hilberseimer separated dwellings and social spaces from the air and noise pollution of industry by placing them on top of a podium. People would live above their workplaces. It reduced dependence on horizontal transportation.

These modernist ideas appeared appropriate in theory, but the reality became evident in many housing projects built in the 1950s–70s, that architecture did not form a necessary, intimate streetscape.

One key aspect recognised by post-modernism was the importance of a mixed urban fabric over a modernist, patterned, urban fabric: “I would stress more strongly the need for integrating places of residence with other uses.”

Hybrid architecture is gaining popularity at a low-rise scale, with markets and office complexes, but struggles to engage with the entire High-Rise.

Developers are focused on the rational economics of the High-Rise - maximising rentable floor area of a site (Pg 22). This approach allows for calculable return on investment. Recent trends in hybrid architecture have suggested that mixing retail, office and residential functions can create a livelier atmosphere. Attracting more people, encourages a higher revenue, which can offset the developers’ loss of floor area to circulation space (Pg 23).

Figure 22
The typical High-Rise with segmented functions.

Figure 23
When streets penetrates the High-Rise, functions will naturally reorder themselves in relation to the street. Retail stores, consumer facilities, and public space will demand direct access to the new street, whilst offices and residential apartments will demand partial or complete detachment from the streets.
2.1.4 Conveying Private or Public Intent

The typical High-Rise is wrapped entirely in a repetitive facade system, conveying itself as one solid, impenetrable mass (Fig. 25). Pedestrians’ judgements are “lobotomised”. They only see the High-Rise for its superficial exterior. The building’s success in serving its occupants is not portrayed on the exterior. Its vertically repetitive forms encourage the eye to judge it in isolation, to disregard its context.

By fragmenting its mass, the High-Rise gains a greater level of visual penetrability (Fig. 26). It allows people to see others in the High-Rise and relate more easily to the scale of its spaces and their function. Large exterior spaces on a High-Rise would give hint of its public intent, and would entice the pedestrian to enter.

1. Koolhaas, Delirious NY, pg. 100
2. Koolhaas, Delirious NY, pg. 100
2.1.4 Vertical Socio-Economic Hierarchy

“Luxury tenements choking the skyline, Its low life’s getting too top high, It is a backwater remedy, A bitter intent to the memory.”

The desire to live on the highest floor comes from several pragmatic reasons - better views, cleaner air and more light but also the human instinct to seek high ground; an inadvertent search for dominance and power.

“Things would be better if we could afford to move to a higher floor.”

The Tower of Babel is cited as a warning against man’s pride and over-reaching in building tall structures. The story ends in segregation of man. How much of our desire to build taller is still attributed to mankind’s want for vertical dominance over others?

In the new public High-Rise model, the value of spaces will not increase relative to height (like Fig. 27). For example, a popular boulevard on the sixth floor may be more desirable to live on than a cycleway on the tenth floor i.e., the placement of pedways and their hosted functions can begin to abolish vertical hierarchy in the city.

1. Yasiin Bey (A.K.A. Mos Def), Hip Hop, Black on Both Sides, (1999), 2:25
2. Helen Wilder to Richard Wilder, High-Rise, 1:02:55, directed by Ben Wheatley

Fig. 27
2.3 SOCIAL SCIENCE RESEARCH

2.3.1 The Current High-Rise Form

The word ‘sustainability’ has been wrapped in a green blanket which covers its broader meaning. The debate between ‘High-Rise’ versus ‘low-rise’ is often judged in terms of environmental and economic impact. It seldom responds to problems surrounding social relations, crime, and behavioural issues.

To justify a case for the social concerns of urbanisation we must delve into social science studies.

“... Architectural science must be a social science as well as a physical and technical science.”

A range of studies collected by Robert Gifford of the University of Victoria in Canada, suggest that common High-Rise design has adverse effects on the well-being of its occupants; “fear, dissatisfaction, stress, behaviour problems, suicide, poor social relations, reduced helpfulness, and hindered child development”, have all been concluded.

Families in the High-Rise:
A child’s ability to play and develop in the High-Rise is rarely accounted for in design, which negatively affects the entire family.

“Children living on higher floors go outside to play less often.”

“Parents in High-Rises either keep their children indoors more often, in an over-protected environment, or allow them to play alone outside, resulting in under supervision.”

“Fathers had worse relationships with their children in apartments, including striking them more often.”

“Mothers who lived in flats reported more depressive symptoms than those who lived in houses.”

“The development of infants raised above the fifth floor in High-Rise buildings is delayed, compared to those raised below.”

To make the High-Rise more appropriate for families, it must facilitate communal playground areas. Internal transparency will allow these play areas to be easily supervised by parents.

3 Gifford, The Consequences of Living in High-Rise Buildings, pg. 11
4 Gifford, Consequences of Living in High-Rise Buildings, "Gittus, 1976", pg. 11
5 Gifford, Consequences of Living in High-Rise Buildings, "Edwards & Booth, 1982" pg. 7
6 Gifford, Consequences of Living in High-Rise Buildings, "Richman, 1974" pg. 6
7 Gifford, Consequences of Living in High-Rise Buildings, "Oda, Taniguchi, Wen & Higurashi, 1989" pg.11

Ceiling Heights Affect the Way We Think:
A study at the University of Minnesota found that ceiling heights affect the type of information processing we use. A higher ceiling induces relational processing, which encourages comparative analysis and abstraction (favours creative and design-based activities). A lower ceiling induces item-specific processing, which encourages focus towards specific tasks with concrete data (favours conservative, repetitive activities).

This study suggests that each function in a hybrid High-Rise should demand a specific ceiling height. The functional High-Rise will be of an Organic Form.


Green Space:
Studies suggest that green space encourages recreational activities, cultural expression, education, community focal point, socialising and health in general.

The presence of Organic Matter in the High-Rise is a challenging design task; soil depths and loads need to be calculated, as well as necessary sunlight, wind shelter, and general maintenance.


Fig. 28
Social Relations:

PoorsocialrelationsandcrimeintheHigh- 
Risearesynonymous. Eventhewhensocialrelations 
factors such as socio-economic background, 
the High-Rise still has an average, higher 
arms rates than low-rise buildings.1 The 
armes predominantly occur within the 
interaction spaces: corridors and elevators, 
places which offer the perpetrator refuge 
from the neighborhood watch.2 Elevated 
nearhoods require Internal Transparency, 
or "eyes on the (internal) street".3

There is generally more opportunity for 
spontaneous interaction amongst residents in 
High-Rises. However, occupants often have 
more distant relations with their neighbors.4

The level of anonymity amongst High-Rise 
residents is a significant contributor to crime 
and social relations. A study concluded that 
people tend to acquaint themselves 
with others on their floor: "67% knew 
everyone on their floor; in contrast, 30% 

knew less than one-third of all people living 
in their building".5 Neighboring relations are 
regulated by floor level, the architect should 
consider connecting floor plates to increase 
the potential of neighboring relations - to 
improve Vertical Continuity 
Residents of Pruitt Igoe - a failed social 
housing project of the 1950's - claimed 
that the architecture was the fundamental 
problem that led to the buildings infamous 
criminal activity and abandonment.6

"Many of the social problems experienced 
by residents of the project could be traced 
to the lack of semi-public space or facilities 
around which informal networks of friends 
or acquaintances may have developed. The 
absence (of public space) made informal 
socializing impossible. . . People seem to need 
structures that simultaneously encourage 
social relations and allow privacy."7

1 Gifford, Consequences of Living in High-Rise Buildings, "Newman, 1975, 
"Franck, 1982", pg.8
2 Gifford, Consequences of Living in High-Rise Buildings, "Gifford", pg.8
3 Jane Jacobs, The Death and Life of Great American Cities, (Knopf Doubleday, 1961), pg.35
4 Gifford, Consequences of Living in High-Rise Buildings, "Williamson, 1978", pg.10
5 Gifford, Consequences of Living in High-Rise Buildings, "Ginsberg & Churchman, 1985", pg.9
7 Jacobs, The Death and Life, pg.15

2.3.2 Conclusions into Architectural Objectives

Summary of Social Science Research:

Families in High-Rises:

To make the High-Rise more appropriate for families, it must 
facilitate communal playground areas. Internal Transparency 
will allow these areas to be easily supervised by parents.

Poor Social Relations & Crime:

Public to Private Thresholds need to be reconsidered in High-Rise 
design so for residents can establish crucial social networks 
while maintaining an appropriate level of privacy. Internal 
Transparency will also help create the idea of a neighborhood 
watch, by keeping "eyes on the (vertical) street".

Elevated neighborhoods require 
Internal Transparency, or "eyes on the (internal) street".

There is generally more opportunity for 
spontaneous interaction amongst residents in 
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5 Gifford, Consequences of Living in High-Rise Buildings, "Ginsberg & Churchman, 1985", pg.9
7 Jacobs, The Death and Life, pg.15

Four key Architecture Objectives have been established in 
response to the ideas discussed in 2.1, and the Social Science 
Conclusions discussed in 2.3.1:

1. Vertical Continuity/Connectivity 
To connect occupants vertically 

2. Internal Transparency 
To create transparency between function spaces and 
circulation spaces 

3. Thresholds 
To control the definition of public to private space 

4. Organic Matter & Form 
To create different spaces to cater for a range of 
functions. Introducing organic matter for social (physical 
and mental), and environmental benefit.
3. URBAN PLANNING THEORIES & CONCEPTS

3.1 Urban Planning - Critical Studies
3.1.1 Aims in the Past
3.1.2 Pedway Network Typologies
3.1.3 Existing Pedway Networks

3.2 Urban Planning Theories
3.2.1 Vertical Land-Use Mapping
3.2.2 Wagner’s Proximity/Distribution Theory - Public Space
3.2.3 Desire Paths
3.2.4 Flâneur

3.3 Streets in the Sky Critiques
3.1 URBAN PLANNING - CRITICAL STUDIES

3.1.1 AIMS IN THE PAST

DERIN KUYU CITY, Turkey, c.a. 8-7th centuries B.C.
The underground city, first excavated between the 8th - 7th Century B.C.E, proved to be a place to easily obtain water from aquifers, to stabilise temperatures in the hot-dry climate, and to hide from Muslim Arab invaders during the Arab-Byzantine wars.¹

¹ Diana Darke, Eastern Turkey, Bradt Travel Guides 2011, pg. 139-140

TOWER OF BABEL, c.a. 3000 B.C., Peter Bruegel’s Depiction, 1563
The Tower of Babel is cited as a warning against man’s greed in building tall structures, which ends in segregation of man. How much of our desire to build taller and taller is still attributed to mankind’s greed?

CITY OF THE FUTURE, Harvey Wiley Corbett, 1913 (Re-rendered 2012)
Elevated streets and transport systems were a prominent idea aligned with the modernist ideals of pedestrian safety, hygiene and the efficiency of transport.
There are six main Pedway Network Typologies:

1. Connecting Existing Buildings
2. Vertical Transportation Towers
3. Podiums
4. Tunnels
5. Converting Existing Infrastructure
6. New Public High-Rise

These Network Typologies can be dependent on, or independent of the High-Rise structure:

Pedways That Are Structurally Dependent on Buildings:
- Streets can be suspended at any level of the High-Rise
- Tension elements - less visible structure & shadowing
- Most existing building structures cannot cope with eccentric loading of streets
- Liability & maintenance are shared and complex

Pedways That Are Structurally Independent of Buildings:
- Can connect to existing buildings
- Liability & maintenance can be easily governed
- Streets restricted in height - approx. 4-5 storeys
- Compression elements - more visible structure & shadowing

This project focuses on the ‘new public High-Rise’ typology, but tries also to include the ‘tunnel’ and ‘connecting existing buildings’ typology.

1. Connecting Existing Buildings:
Most utopian visionaries use this typology, because of the desire to connect buildings without drastic changes to the existing structure, preserving the character of buildings and therefore the city. Unfortunately, most existing building structures cannot cope with the eccentric loading of pedway streets, meaning at minimum, all structures below the street need to be reinforced. Because of this structural dilemma, most cases of this typology are limited to about 4-5 storeys. The liability and maintenance of the streets are shared between two or more buildings which can add complication.

2. Vertical Transport Towers:
Sant’Elia, Richard Neutra, and other famous early modernist architects innovated ideas of isolated vertical transport towers. By decentralizing the primary elevators and staircases from buildings, the pedway networks were efficient in terms of space and transport, and simple in construction, maintenance, and organizing liability. Because of the mono-functional nature of this typology, the pedestrian experience is often neglected - paths are dedicated only to transportation. They struggle to provide a street-like experience.
The New York High Line has built on the success of previous railway re-use projects like the Promenade Plantée in Paris. The flâneur can enjoy an elevated stroll through the city. It is a place for gardening, swimming, weddings, and other events. These conversions are successful in their minimal economic cost, their ability to retain historic character, and the way they engage with surrounding architecture. The popularity of the recently converted Nelson Street Cycleway in Auckland justifies the city’s desire for pedestrian and bike transport. The next step is to introduce a multiplicity of function onto them.

Conscious of an urbanised future, many recent High-Rise designs aim to bring the desirable community traits of suburban and rural living to the city. Unfortunately, the designs appear more as gated communities than ones which engage in public street life. They also tend to be isolated architectural concepts, with little to no integration into the existing urban fabric.

### 3. Podiums:
Other members of CIAM were also looking at similar pedway schemes. Designs by Le Corbusier and Ludwig Hilberseimer admitted automobiles’ growing dominance of the ground plane, and responded by placing the pedestrian on a raised podium. The idea was that people could live above the ground plane which was polluted industry and transport; that people lived above where they work. One key limitation of the ‘Podium’ typology is the pedestrians displacement from nature and intimate street life.

### 4. Tunnels:
Tunnel or underground pedway networks are primarily used as a means of climate control. The PATH network in Toronto, for example, shelters the pedestrian from sub-zero temperatures by utilising the earth’s stable temperatures. The set back to this ‘tunnel’ typology is the minimal access to natural light, and the initial investment in excavation and retaining.

### 5. Converting Existing Infrastructure:
The New York High Line has built on the success of previous railway re-use projects like the Promenade Plantée in Paris. The flâneur can enjoy an elevated stroll through the city. It is a place for gardening, swimming, weddings, and other events. These conversions are successful in their minimal economic cost, their ability to retain historic character, and the way they engage with surrounding architecture. The popularity of the recently converted Nelson Street Cycleway in Auckland justifies the city’s desire for pedestrian and bike transport. The next step is to introduce a multiplicity of function onto them.

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3.1.3 Pedway Network Examples

There have been many proposed, discontinued, and existing pedway networks around the world. The ‘London Pedway Scheme’ (1955-80s) required the first floor of every new building to be accessible to a potential pedway network. The scheme was phased out in the 1980s due to the questionable benefits for pedestrians, and the increased crime rates. For people to want to use pedways instead of the ground street, they must provide higher pedestrian transport efficiency, climate control and/or a safer, more enjoyable experience.

The largest, and most integrated, pedway networks are found across North America and China. Places such as Hong Kong and Minneapolis have such extensive networks that there is no longer a need to go outside for everyday activities. The film, ‘Waydowntown’, follows a group of Canadian employees who all bet a month’s salary on who can last the longest without going outside. They last several months.

The key critique of existing pedways is their tendency to be mono-functional spaces, they only provide pedestrian transport from one location to another. They discourage the flâneur from strolling, observing and spontaneously socialising. Residents and offices are often very disconnected from these pedways.

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1 Gary Burns, "Waydowntown", (Alberta Foundation for the Arts, Burns Film Ltd., 2000)
What is Lorem Ipsum?

Pedestrians avoiding vehicle traffic in Hong Kong

Fig. 46

Fig. 47
3.2 URBAN PLANNING THEORIES

3.2.1 VERTICAL LAND-USE MAPPING

“A Skyscraper with an average typical floor-plate area of about 1 400m$^2$. . . . [With] an internal population of around 2000 persons (an average area of one person per 14m$^2$).”

Figure 48 shows how the mix of functions on the ground plane could be re-interpreted in the High-Rise. Yeang analyses the fabric of London, Paris and Beijing, and shows how elements of their urban character can be transposed into a High-Rise.

3.2.2 WAGNER’S PUBLIC SPACE PROXIMITY THEORY

Martin Wagner’s Dissertation of 1915 discussed rational theories to best distribute open public (particularly green) space in relation to dwellings in Berlin. Figure 51 is an illustration Wagner used to explain how the placement of public space must be based on its proximity to residents. The same theories can be applied to best distributing public space per capital in a city. However, for Wagner’s theory to be applicable to the vertical city, it must be three-dimensionalised (fig. 52).

Canteron air spaces in the city could be pre-assigned as public or green space. This means that to build taller, the developer/council must include these public spaces in the High-Rise.

1 Yeang, Rethinking the Skyscraper, p. 111

1 Martin Wagner, Das sanitäre Grün der Städte : ein Beitrag zur Freiflächentheorie (Technical University of Berlin, 1915)
3.2.3 Desire Paths

An experiment at the University of California in Irvine, saw students naturally cut ‘desire paths’ through the centre of the campus before they were paved. In this way, the public realm can unconsciously become a design resource.

‘Desire paths’ could also help the urban planning of pedway networks, but with an indirect approach. By studying common pedestrian routes on the ground plane, urban planners could bridge paths between buildings which provide a more direct route. The joy of public verticality is that design and therefore the pedestrian can be freed from the street layout on the ground plane.

1 Tom Hulme, TED Talk: What can we learn from short-cuts?, ted.com

3.2.4 Flâneur

Flâneur is a term coined by Charles Baudelaire in 1863, referring to someone who strolls with the intent of observing a city and its surroundings, in search of its physical, philosophical, and architectural experience.

1 Flâneur is the creation of Paris. 2

Since Haussmannisation, Parisian boulevards, arcades and parks have been highly regarded for their encouragement of the flâneur. Koolhaas suggests the vertical continuity in the Jussieu Bibliothèques (4.1.4) are a vertical contemporary of Haussmannisation.

“The visitor becomes a Baudelaian flâneur, inspecting and being seduced by ... the urban scenario.” 3

3 Koolhaas, Mau, S,M,L,XL, pg. 1322
3.3 STREETs IN THE SKY CRITIQUES

Structural and technological advancements are constantly taking us nearer to the realisation of ‘streets in the sky’ utopias. It appears that certain social, political and economic critiques are restricting the full potential of these concepts.

Wind
Wind loads and air pressure differences become a prevalent hazard and create discomfort at higher elevations.

Expense & Structural Feasibility
Modern-day engineering has stretched the possibilities of pedway utopias. Now it is more a question of the expense of these concepts, and the length of the ‘pay-back’ period is for developers. Also, integrating public infrastructure means the developer loses some control.

Difficulty to Navigate
Adding a third dimension to navigation adds complication.

Crime
Pedways can provide perpetrators more shelter from the public eye, and more escape routes. There need to be “eyes on the streets” and a ‘minimum density’ of people.

Functional Intent
People Are Like Water
People are like water in that they choose the path of least resistance, and/or paths of desirability - for climate control, better views, safety, or transport efficiency. (*4.1.6 People Are Like Water Experiment*) Presently, people do not seek elevated pathways for transport. The need will come as the city intensifies and hybridises.

Life Without Grounding
There have been many studies suggesting that the separation of people from the ground develops particular physical and mental problems.1

Breaking Mono-Function
Pedways can provide a flexible option.

Vertical Social Hierarchy
Capitalist drivers will always attempt to segregate people by dwelling height. If all pedways are not publicly accessible, there could be a further escalation of vertical segregation.

Bouncer Theory
With current terrorist tension, security has become stricter. A reality of streets in the sky would be dull if security was at every entrance to every building. It would allow single-use privatisation and gentrification to continue.

The Automobile
Pedway concepts can threaten public life on ground level like in Hong Kong where the automobile dominates. Ground streets pick up a dirty, uninhabitable connotation.

Noise Pollution
Pedways create noise conflicts as different functions are closer to each other.

Viewshaft Disruption
Pedways can block views of iconic buildings, and viewshafts to monuments/landscapes etc.

Monotony
Streets on the ground are made interesting by their spatial variation, fluctuant typography, and public-to-private thresholds. Currently, the elevated physical context is less intimate, and engaging. Existing pedway bridges tend to be repetitive mono-functional spaces which discourage spontaneous interaction.

Environmental Cost
Elevated and subterranean structures often use more resources. They must be designed to last.

1 Jacobs, *The Death and Life of Great American Cities* p. 35
2 Gifford, *Consequences of Living in High-Rise Buildings*
4. HIGH-RISE THEORIES & PRECEDENTS

4.1 High-Rise Design Theories

4.1.1 Doorstep Philosophy
4.1.2 Hybridisation
4.1.3 Strategies of the Void
4.1.4 The Function of the Oblique
4.1.5 People Are Like Water

4.2 Precedents

4.2.1 Très Grande Bibliothèque (Voids)
4.2.2 Jussieu Bibliothèques (Vertical Continuity & Organic Form)
4.2.3 Urban Village (Mass Fragmentation & Thresholds)
4.2.4 Spire Edge (Organic Matter)
In the war-torn city of London, Alison and Peter Smithson’s ‘doorstep philosophy’ identified the doorstep as a fundamental social mechanism that needed to be introduced into the new tower block. This philosophy - created from their “golden lane” project (1952) - was implemented into many tower blocks in Britain in the 1960s - 70s. The ideas was initially popular, but poor surveillance of these ‘streets in the air’ increased crime rates, and led to the concepts decay in the 1970s.

4.1 HIGH-RISE DESIGN THEORIES
4.1.1 Doorstep Philosophy
4.1.2 Hybridisation

Steve Holl’s Linked Hybrid is a good and bad example for this project. It does not fully accept the public realm, and chooses to disregard the surrounding urban fabric. It is however a good example of the structural and programmatic capabilities of today’s architecture.

The bridges contain functions which mediate and connect neighbouring buildings. A gym and spa centre are connected by a large lap pool that is suspended between them. A bar and art gallery are connected by a dining deck.

The lower roof-tops have been utilised as green spaces, proving a pleasant vista from apartments and an exterior social hub.

4.1.3 Strategies of the Void

Instead of using the floors as function dividers (2.2.3 Delirious NY) OMA began searching for methods of using voids and floor planes to connect spaces in unconventional ways. Peter Eisenman discusses these, “Strategies of the Void”, by analysing the key progressions over several designs.

OMA’s competition entry for the Très Grande Bibliothèque (1989) focused on the use of voids and their connections via circulation paths. Their model displays the void as a mass, which implies the voids importance over the generic layout of the library. The voids are used as a sensual (or indirect) vertical connection between floors. One can hear, see, and (hopefully not) smell the person on the floors above and below, giving them a vertical consciousness in the building.

The Agadir Convention Centre (1990) uses a non-geometric void as the sole excavator of space. The undulating floor and ceiling create a “voyeuristic gaze”, whereby the viewer unlocks new perspectives of the building by moving through it.

The Jussieu Bibliothèques (1992) project warps and welds the undulating floors of the Agadir Centre to create a vertically continuous, oblique urban landscape from the base to the roof.

“A warped interior boulevard that exposes and relates all programmatic elements.

2 Koolhaas, Mau S,M,L,XL, pg. 1318
4.1.4 Vertical Continuity

The typical high-rise is a rational tool which minimises circulation space to maximise rentable floor area. It deprives users the ability to understand their neighbours and have any idea of community. Their journey up the High-Rise is a quiet, awkward elevator ride, which teleports them to their floor.

OMA’s design for the Jussieu Bibliothèques breaks apart this idea by using a series of connected floor plates to create a vertically continuous, spatially diverse journey, from the ground to the roof. By offering a circulation path that is uninterrupted, the building encourages users to venture vertically.

This fascination in the Jussieu initiated a study of oblique architecture (4.1.5 The Function of the Oblique). An investigation of the library’s modelling methods is found in Section 6.2.5.
Ramps can provide vertical continuity between spaces. When the entire floor plate is inclined, it is no longer a ramp. It is an oblique plane. A ramp commands movement and dictates direction, whereas an oblique plane allows the user to be free in movement and direction.

Claude Parent and Paul Virilio were influential in promoting the use of oblique planes in architecture. They identified that oblique planes provide a fluid continuity between vertically displaced spaces. Parent and Virilio studied the ergonomic positions of people as the angles of incline changed. By using oblique angles in areas of public circulation, the circulation spaces can become habitable.

"Potentialism" 1: Oblique planes remind people of the effects of gravity. Balance becomes more conscious, so movements becomes more meaningful.

The Maritime Youth House by BIG Architects, explains how undulating planes create a playground for the public realm. People choose the slope instead of the stairs. The stairs symbolise a predictable, repetitive motion, where the users focus is always on the next step. The oblique plane sparks curiosity in a persons balance, and allows them to focus on the surrounding space, rather to the next step.

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Similarities between the movement of people and the movement of water:

1. Laminar & Turbulence Flow
On linear paths, people hold consistent laminar flow - good for efficient transport. Obstacles, path deviations, and surface changes cause a turbulent flow of people - good for socialising. Laminar Flow at point B, and Turbulent Flow at points 'A' and 'C'.

2. Alternative Routes
When traffic builds (water = back-pressure), people will find alternative routes which are less direct. Shown in Snapshot 1-2 at point 'C'.

3. Surface Material
People prefer a path with the most consistent and forgiving material. Shown in Snapshot 1-3 at point 'A', where the water chooses to travel down aluminium track as opposed to rough clay track.

Application of these Discoveries:
- Using Obstacles and Surface Materials to separate fast pace (cyclists) and slow pace (walking) activity on certain areas of the pedway.
- Creating Laminar Flow of people in circulation zones, and Social Turbulent Flow at intersections, and other meeting points.
- Pose more Alternative Routes in busier areas.

SNAPSHOT 1
SNAPSHOT 2
SNAPSHOT 3
The Tres Grande Bibliothèque was a project entered by OMA for a competition in Paris, in 1989.

In the design process, OMA modelled voids as masses. This allowed them to better analyse the relationships between the voids - how they collided, their distribution in the building, and their interaction with the circulation system. The resulting effect was that the viewer would see these spaces as objects.

Because the chosen site for this project is large, the building's masses must either be fragmented, or it must use voids (or atria) to allow light to penetrate all its spaces. Both have very different formal effects. Fragmenting implies that parts are making a whole, whilst voids imply an excavated or incomplete whole. The Tres Grande Bibliothèque project is iterated and further analysed in 6.2.4.
4.2.2 Jussieu Bibliothèques (Vertical Continuity & Organic Form)

The Jussieu Bibliothèques (1992) are another library project by OMA. It uses a series of warped and connected floor plates to create a vertically continuous surface from ground to roof. The project battles against the urge to create a simple spiral. The form is irregular, hard to read, and its spaces are unpredictable, hence, it creates pedestrian intrigue. The Jussieu Bibliothèques project is iterated and further analysed in 6.2.5.
4.2.3 The Urban Village (Fragmentation & Thresholds)

The Urban Village is a conceptual High-Rise entered by K. Chintala as part of the 2015 Evolo Skyscraper Competition. The project splits each function of a village into a “plastic mass” where each function requires a certain volume or form. If these masses are too large, the High-Rise becomes too segregated. If the masses are smaller, then social contact is higher.

The main circulation system is external and reaches between each mass. The entrance into each mass creates a clearer threshold between public and private space.

Fragmenting also means an increase of surface area, which heavily affects the building’s thermal properties. The aesthetic impression becomes a part-to-whole relationship. The Urban Village project is iterated and further analysed in 6.2.2

4.2.4 Spire Edge (Organic Matter)

Implementing and maintaining organic matter in the High-Rise is a challenging design task; soil loads, sunlight, and water demands all need to be calculated. As a biologist and architect, Ken Yeang specialises in the implementation of green space in High-Rises. Together with T.R. Hamzah, Yeang designed the Spire Edge, as a commercial High-Rise in Manesar, India, in 2008. The building form and orientation receive adequate sunlight. The rainwater is collected and gravity fed down the building, being naturally filtered as it passes through the garden soils.
5. URBAN SCHEME & SITE SELECTION

5.1 Auckland Urban Analysis
   5.1.1 Auckland Public Space Analysis
   5.1.2 Auckland Masterplan
   5.1.3 Towards a Walkable/Bikeable City
   5.1.4 Albert Park Tunnels
   5.1.5 PAUP Building Setbacks & Heights Regulation

5.2 Urban Scheme

5.3 Site & Context
   5.3.1 Site Selection
   5.3.2 Site & Context
   5.2.3 Determining Building Volumes & Site Connections
Significant public green space was lost between 1940 and 1996. Since 1996, the amount has remained relatively constant. The four main, large green spaces are unevenly distributed, meaning many areas of the city are not within an adequate proximity of green space.

The reclamation of the Viaduct and Wynyard Quarter areas have encouraged the public realm towards the waterfront, and have increased the paved public spaces significantly.

The Auckland Masterplan identifies the pedestrian disconnection of public nodes, the poor connection to villages surrounding the city, the inadequate transport network, and the poor social infrastructure. All of these issues can be remedied by the implementation of a pedway network across Auckland’s CBD (5.2 Urban Scheme).

### 5.1 AUCKLAND URBAN ANALYSIS

#### 5.1.1 Auckland Public Space Analysis

![Significant Green Spaces](image)

<table>
<thead>
<tr>
<th>Year</th>
<th>Significant Public Green Spaces</th>
<th>Paved Public Spaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940</td>
<td>41%</td>
<td>4%</td>
</tr>
<tr>
<td>1996</td>
<td>6%</td>
<td>1%</td>
</tr>
<tr>
<td>2016</td>
<td>7%</td>
<td>32%</td>
</tr>
</tbody>
</table>

### 5.1.2 Auckland Masterplan

#### Commuter Transport

- Car: 47%
- Train: 7%
- Bus: 30%
- Cycle: 6%
- Walking: 1%
- Other: 1%

![Diagram](image)
As described in 3.1.3, pedways are only successful when they provide either: a higher pedestrian transport efficiency, climate control and/or provide a more enjoyable, safer experience. Each city needs to identify specific functional benefits of introducing pedways. For Hong Kong, it is to avoid traffic congestion and high temperatures at ground level. For North American cities, it is to avoid the cold temperatures and snow/ice hazards. For Auckland, it is to connect public spaces and manage topography.

Auckland is striving to be a compact, walkable and bikeable city, in the wake of international success, such as in Denmark. The proposed cycle lanes will dramatically promote this aim, however, Auckland’s topography challenges its feasibility.

Introducing pedways in Auckland has the potential to flatten gradients for pedestrians and cyclists. Pedways can also introduce the pedestrian to new perspectives of the city. There are pedways above Federal Street, Cross Street and Sturdee Street, but they are purely car park connections, not pedestrian avenues.
The tunnels under Albert Park form a dormant pedway network connecting Parnell to the city centre. Tunnel re-use expert Bill Reid, has led a recent proposal to re-open 3.5km of these WWII underground escape tunnels. The $17-19 million\(^2\) proposal put to Auckland Transport and tourism boards in July 2017, showed plans to use the main tunnel as a walk/cycleway, and considered introducing cheese and wine cellars and glow worm caves. The main tunnels are 4.4m wide and 3m tall.\(^2\)

If implemented, the network would have three tunnel exits around the perimeter of Albert Park, and two other exits via lifts.

The exit north of Albert Park onto Kitchener Street, would bring high densities of people onto the chosen ‘Site A’.

This project will assume the tunnels will be implemented to further extend Auckland’s history of public verticality, and to add more context to the site.

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1. Bill & Nicolas Reid, Nick Andreef, Albert Park Tunnels: Transport & Tourism Proposal, (July 2017), pg.3
2. Reid, Andreef, Albert Park Tunnels, pg.35
3. Reid, Andreef, Albert Park Tunnels, pg 6

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5.1.4 Albert Park Tunnel Network Proposal

![Site A](image1). If implemented, the network would have three tunnel exits around the perimeter of Albert Park, and two other exits via lifts.

The exit north of Albert Park onto Kitchener Street, would bring high densities of people onto the chosen ‘Site A’.

This project will assume the tunnels will be implemented to further extend Auckland’s history of public verticality, and to add more context to the site.

![Site B and C](image2).
5.1.5 PAUP Building Setbacks & Heights Regulation

The PAUP regulates set backs and heights of buildings in the CBD to ensure that public areas are provided adequate sunlight, that viewshafts are uninterrupted, and that building scale is reasonable. These urban planning regulations also help form the design parameters of pedway placement.

As seen in Figure 91, architects and urban planners such as Corbett, Ferriss and Muzika used New York’s zoning laws of 1916 as inspiration for their pedway schemes. They used set backs and roofs as platforms for pedways and railways to connect High-Rises. The platforms themselves became the new public space of the vertical city.

A majority of buildings in the Queen Street Valley Precinct must include a 5 metre minimum setback that is between 13 - 28 metres above street level. If pedways were considered in the PAUP, architecture could be prepared to host future connections to elevated streets. The regulations must consider failed systems like the London Pedway Scheme (3.1.3 Pedways Networks).

Figure 6.1 Special Height Control Plane

Figure 14.4 Queen Street Valley Precinct

CITY OF THE FUTURE, Harvey W. Corbett Utilising the NY Zoning Setbacks, 1913
5.2 URBAN SCHEME

Many cities plan urban walks and cycle paths which allow a sequential movement between their monuments, famous buildings and public spaces.

The movement between Auckland’s public nodes is interrupted by roads, architecture, and topographical challenges. For example, Route 1 and Route 2 on figure 92 connect significant parks and public spaces, but are interrupted many times.

Figure 93 shows how pedways across Auckland could connect and create public spaces.

Because the motorway divides the CBD from the surrounding villages, crucial pedway connections are necessary from places such as Parnell and the Domain to the city. The Nelson Street cycleway validates the popularity of these pedway connections. Encouraging more people to ride and walk to work via pedways reduces vehicle traffic and public transport.
5.3 SITE & CONTEXT
5.3.1 Site Selection

The ‘Site & Context’ area was chosen from five criteria:
1. A site with strong influence on the urban scheme
2. A site with variable topography
3. A site large enough to experiment with oblique circulation
4. A site with a variety of potential neighbouring connections
5. A site that is underdeveloped

Most of the pedways in the urban scheme made connection to Albert Park. It makes sense to use a site nearby to show how a high-rise could motivate the public realm to venture vertically in the city.
5.3.2 Site & Context

Both Sites A & B are underdeveloped car parking buildings just north of Albert Park. The chosen site for this project is ‘Site A’, at 1-71 Chancery Street.

The site area is around 4800$m^2$ whilst the site coverage is about 4300$m^2$.

The difference between the highest and lowest points of the site is 18 metres, producing a street gradient of around 1:2.

The pink dot to the south-west of the site is the Albert Park tunnel entrance (fig. 96).

Although the Chancery’s form expresses a strong connection between Freyburg Place and the site, minimal public life extends beyond the Chancery towards the site.

There is opportunity for the site to connect three large zones; retail, office and the Auckland University Campus. Special functions included within this project can help to mix these zones together.

High Street and Chancery Square were once regarded as the most popular retail areas in Auckland. “Latest Colliers International research shows the retail vacancy rate in Auckland’s CBD is 2.5%, while there are no vacancies at all at Britomart ... By contrast, High Street and Chancery Square have a vacancy rate of 5.1%.”

With the new Freyburg Place and Chancery Square developments, the project has great opportunity to build on the new public interest in this area - and restore its former glory.

Many pedestrians, particularly students, make the steep journey between the UOA Campus and Queen Street everyday. By providing preferable vertical transport for this journey, the High-Rise has the opportunity of hosting a large number of pedestrians.

When the sites are excavated, there is potential to link them via an underground pedway to Fort Street.

1. NZ Herald, Auckland’s Chancery Square in revival mode, 3 June, 2017
Chancery Street Towards The Site

New Freyburg Place Development

Site A

Site B

Fig. 98

Fig. 99

Fig. 100

On-Site Looking West

Fig. 101
5.2.3 Determining Building Volumes & Site Connections

The PAAUP contains strict sunlight admission requirements for Albert Park, ensuring it has uninterrupted sunlight for most of the year. The brown buildings in figure 103 display the maximum buildable volumes on the site.

Figure 104 shows the pragmatic placement of the pedways penetrating/extending from the site. There was a conscious effort to ensure the pedways avoided shear walls and other major structural elements of connecting buildings. Also, to ensure the pedways were relatively evenly spaced vertically.
What is Lorem Ipsum?

1.1

1.1.1 Empty
6. HIGH-RISE DESIGN PROCESS

6.1 Conceptual Explorations
6.1.1 Half Spiral
6.1.2 Extended Chancery
6.1.3 Stacked Tenement/Intersections
6.1.4 Conclusions from Conceptual Explorations

6.2 Exploring Architectural Objectives (Precedent Iterations)
6.2.1 Architectural Objectives
6.2.2 Additive Modelling
6.2.3 Subtractive Modelling
6.2.4 Physical Mesh Modelling
6.2.5 Digital Mesh Modelling
6.2.6 Vertical Continuity & The Function of the Oblique

6.3 Design in Context
6.3.1 Vertical Circulation & The Function of the Oblique
6.3.2 Functional Relationships
6.3.3 Vertical Circulation

6.3.4 Additive & Subtractive Iteration
6.3.5 Enclosing Space Iteration
6.3.6 Final Iteration
6.1 CONCEPTUAL EXPLORATIONS

6.1.1 Half-Spiral

By stacking smaller half spirals on top of each other, a continuous public street is created around the wider circumference. The private interior spaces and circulation are located toward the focal point of the arcs (polystyrene).

This concept is relatively unsuccessful in terms of practical use, as the tapering grows, it limits the building’s height. It also wastes a lot of space on an ordinary rectangular site. However, it lends some valuable ideas of semi-public and semi-private space.

Figure 110 shows the threshold interplay between public-to-private space. The red is the fixed private zone, and the blue is the public street space. The green ‘Optional’ semi-public zone is a space which the owner of the tenancy can either claim as private space, or can turn into an inviting semi-public transition space. Restaurants, cafes and some retail stores may use this as a semi-public zone to entice consumers into their tenancy. Residents may use it as a front lawn, whilst clothing stores and offices may enjoy the extra space. The offices, retail and dwelling spaces above street level do not have to follow the pattern of the tenancy below; the permanent structure will allow them to cantilever into this space if desired. The result is a more organic, constantly changing, three-dimensional facade.
6.1.2 Extended Chancery

The three separate buildings that make up the chancery complex define a pleasant civic space between them. This concept explored whether it was possible to extend the Chancery's spatial idea vertically.

The repetition of building masses makes for a somewhat repetitive spatial experience up the building. This level of repetition can be helpful for navigation of the building, but too much can lead to boredom in the space and activity. Drawing natural light in the centre of the building was another problem with this concept.
6.1.3 Stacked Tenement Block / Intersections

This concept was an attempt to create elevated neighbourhoods by reinterpreting the human scale experience of the tenement block into the High-Rise.

The typical Berlin tenement block is approximately 50m x 30m, and five storeys high. By splitting and making extrusions to the blocks’ original form, natural light can enter the central courtyard when the blocks are stacked.

The circulation space is a spiralling ramp which joins with the main floor levels (every 3-4 storeys).

The stacked tenement form (Fig. 17) became too vertically repetitive. In realising that the ‘courtyard space’ was most important, the concept evolved into a study of intersection spaces, such as the intersection in Wismar (fig. 110).

The polystyrene in figure 121 represents the street or intersection voids - the only space to remain permanently public. All other spaces can be purchased as either freehold titles, or as council parks and market places.

The top floor of figure 121 was a brief investigation of structure. The flooring system is a grid of steel T beams, and the space between is fitted with interchangeable concrete or steel grating flooring, with the possibilities of solid or permeable flooring.
6.1.4 Conclusions from Conceptual Explorations

All of the ‘preconceived concepts’ repetitively stacked forms and spaces. An implication of vertical repetition is that the pedestrian is not motivated to venture higher in the building because they expect there will be no new spatial experience. Buildings such as the Sky Tower, the Marina Bay Sands Sky Park and the Elbphilharmonie all intrigue and entice the pedestrian to travel up them - to reveal the elevated spaces they can identify from the ground below. The changes in formal and spatial properties provoke public vertically.

But why should an architect be expected to differentiate each level of the High-Rise if there are no significant changes in context?

A key realisation from these concepts is that, to avoid the architect having to use vertically repetitive forms, councils and urban planners must pre-plan pedway networks in order to create a vertically changing context. By embracing the impact of these pedways penetrating a site, the functional desires of the architect will lead to the design of organic forms around the streets which will intern entice the pedestrian.

Conversely, if a building has no vertically repeating elements, a pedestrian will struggle to navigate on each floor, which could also discourage their journey further up the High-Rise. It is important for future High-Rises to find the appropriate balance of spatial repetition to spatial differentiation.

If a space is repetitive, it is familiar, easy to navigate, but also not stimulating. If a space is constantly changing, it is stimulating, but not familiar, and difficult to navigate.

Natural lighting issues are prominent in 6.1.2 and 6.1.3. It appears that fragmenting the mass of the High-Rise and using some transparent/permeable flooring on the pedways could help natural light penetrate and diffract to more spaces.
6.2 EXPLORING ARCHITECTURAL OBJECTIVES

6.2.1 Architectural Objectives

The four main architectural objectives were identified by the research in 2.1 and 2.3, and were justified and exemplified in Section 4.

This section (6.2) explores different modelling techniques which formalise these Architectural Objectives.

1. Vertical Continuity/Connectivity

To connect spaces and therefore the public realm vertically. This can be achieved through:
- Vertical Continuity - A continuous oblique floor plane from the bottom floor to the roof of the building
- Vertical Connection - Using voids or atria to connect spaces vertically in the High-Rise

2. Internal Transparency

To create transparency between function spaces and circulation spaces - "eyes on the [internal] street" requires a level of transparency without encroaching on privacy.

3. Thresholds & Fragmentation

To monitor the definition of public-to-private and interior to exterior space. Public-to-private thresholds are important for security, privacy, and street life. Interior-to-exterior thresholds are important for building's thermal comfort and street experience.

4. Organic Matter & Form

To create diverse spaces to cater for a range of functions. Introducing organic matter for social (physical and mental) and environmental benefits.

6.2.1.1 Modelling Techniques

1. Additive Modelling
   Plastic architecture - separating functions into different masses, arranging them by association, then connecting them by an external circulation path.

2. Subtractive Modelling
   Subtracting the circulation path from the original mass. The remaining mass represents function spaces. Space could only be created by penetrating the facade.

3. Physical & Digital Mesh Modelling
   Priorities circulation spaces over function spaces. Physical mesh modelling encourages ground-up design. Digital mesh modelling has no dependence on structure, meaning ground-up design is no longer applicable. Digital meshes allow for accuracy, but physical meshes are more malleable.

4. Digital Void Modelling
   Using voids or atria to connect spaces vertically instead of floor plate. Voids influence circulation paths, but do not dictate their location.
### 6.2.2 Additive Modelling

Additive modelling gives the effect of fragmented masses.

Each fragment can represent a different function, connected by the pathways weaving between them.

The space between the masses allows natural light to penetrate and diffract into the central spaces.

Figure 129 shows how the structure from existing buildings could be reinforced and extended upwards. This would allow new masses (red) to be added on top of existing buildings, preserving heritage buildings in a city.

The smaller and more displaced the fragments are, the easier light can penetrate the spaces. At the same time fragment size will change thermal properties, and functional relationships.
6.2.3 **Subtractive Modelling**

In considering OMA’s modelling techniques for the Dutch Embassy, figures 137-140 show an iteration of subtractive modelling.

By carving out spaces from each façade, a person standing in the circulation space will always have external views, with the ability to frame views.

Subtractive modelling tends to prioritise the creation of circulation space over the formation of the ‘functional mass’ (polystyrene). Because of this, it may be more useful to begin with functional parameters to ensure interior spaces are not dictated by the circulation space.
6.2.4 Digital Void Modelling

In the design process of the Très Grande Bibliothèque, OMA chose to model the voids as masses. This isolation of the voids allowed them to better analyse their relationships.

Voids/atria encourage vertical movement without the need to connect every floor plate.

It was easiest and most accurate to manipulate these voids by modeling them on Sketchup (Fig. 143-145). For the sake of simplicity, the iteration used flat floor plates.

Figure 145 is an iteration which looks at the treatment of facades in conjunction with these voids. Some voids penetrate the facade, some do not. When a void sits beyond a facade, it could subtract the floor plates, using the exterior shell.
6.2.5 Physical Mesh Modelling

By cutting and warping physical meshes (paper and card), OMA was able to create a vertically continuous path from ground to roof. The final proposal uses a 1.5m x 1.5m column grid to support the floors, with occasional irregular columns where necessary.

Experiments in figures 148-150 investigated the possibilities of a column-free design. The wire mesh in figure 148, was too elastic, so a plaster was applied to it (fig. 149). Because the plaster dried too quickly and cracked, it was more practical to use builders putty over the mesh. Figure 150 investigated the heating and moulding of acrylic, which was much stronger in its final form.

None of the experiments provided the appropriate malleability and adaptability required for modelling. It was easier to use paper and card meshes with a column grid system.

Figure 151 shows the Jussieu Bibliothèques re-modelled to scale using bamboo skewers as the structural grid and paper as the flooring element. The paper did not provide the necessary rigidity for modelling, so different thicknesses of card were investigated in figure 152.
Influenced by the work of Parent and Virilio, Benjamin Dillenburger used digital mesh modelling to display his concept of oblique circulation.

Figure 154 shows an attempt to use Revit to recreate OMA’s Jussieu Bibliothèques. The rigid nature of Revit’s conceptual massing limited the malleability of the design process. AutoCAD provided mesh modelling tools which offered the desired malleability (Figs. 156-158). Digital modelling meant freedom from any design influence of structure.

Figure 157 shows a raw mesh with rigid, linear planes. This would be easier to construct as plates could be prefabricated.

Figure 158 shows the smoothed mesh, giving a more fluid connection of floors plates. This would likely require cast-in-situ construction.

6.2.6 Digital Mesh Modelling
6.3 DESIGN IN CONTEXT

6.3.1 VERTICAL CONTINUITY & THE FUNCTION OF THE OBLIQUE

The following studies were inspired by Claude Perrault and Paul Virilio’s study of oblique surfaces.1

Figure 16.1 shows the current regulations put in place by the PAUP for accessibility angles.

A brief study of the hill gradients around Auckland CBD proved that streets are much steeper than the pedestrian gradients outlined in the PAUP (only 70° incline for dry slopes). The green dashed line in figure 16.1 proposed floor angles for this project, with a maximum ramp angle of 130°, and an average slope angle of 60°.

Figure 16.3 explains how a helix has a steeper gradient on the internal circumference (red) than the external circumference (green). People have a choice of gradient.

With a new consciousness for slope angles, figure 16.4 investigated a continuous section running from the pedestrian entrance at Fort Street, through to the first floor of the high rise.

To reinterpret ‘the street’ vertically in the high-rise, the designer must consider relationships between functions and the street.

Figure 166 is a table of functions that can be expected inside this project. The functions are ordered by those which rely directly on the street, to those which prefer more privacy. Food markets and flower shops for example rely on direct contact with the street, whereas many offices and residential apartments prefer partial or full seclusion from the street.

### 6.3.2 Functional Relationships

<table>
<thead>
<tr>
<th>Access</th>
<th>On Street Functions</th>
<th>Spill Onto Street</th>
<th>Local Stairs</th>
<th>Membership Clubs</th>
<th>Street-Side Access</th>
<th>Private Residence/Office</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>✓ Direct</td>
<td>✓ Direct</td>
<td>✓ Transparent</td>
<td>✓ Transparent</td>
<td>✓ Private</td>
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<td>✓ Load</td>
<td>✓ Moderate</td>
<td>✓ Moderate</td>
<td>✓ Moderate</td>
<td>✓ Private</td>
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<tr>
<td>Public</td>
<td>✓ Direct</td>
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</tbody>
</table>

* Food Markets
  * Amphitheater
  * Cafe
  * Local Convenience
  * Gym
  * Large Restaurant
  * Banquet Hall

* Movie Theater
  * Night Club
  * Resident Lounge
  * Resident Fitness Center

* Bank
  * Food & Wine
  * Lecture Theater
  * Pool

* Park
  * Skate Park
  * Billiards

* Food Truck
  * Bar
  * Convenience Store
After determining the pedway connections, the goal was to create a continuous circulation path from the ground to the roof, intercepting each pedway connection. This task provided approximate ceiling heights, floor slopes, and travel distances. There needs to be multiple circulation systems in this high-rise to meet different user requirements. While lifts are available for those requiring direct paths, the layers of circulation within the building encourage users to participate in the internal street.
Recognising that there must be some contained, interior space, the following iterations used mass to represent this. This iteration is a combination of the additive and subtractive modelling methods carried out in 6.2.2 & 6.2.3, whilst taking context into account. The inclusion of mass inevitably altered the pathway determined in 6.3.3.

The result is aesthetically chaotic, structurally overcomplicated, and would be difficult for the pedestrian to navigate.
6.3.5 Enclosing Space Iteration

This iteration aimed to shift the masses to the perimeter of the site area for several reasons:

- To shelter the exterior space from wind and sun
- To increase exterior views from mass units
- To focus the main services into the centre

The composition of masses defined some interesting space in this experiment, many of which followed through to the final proposal. However, the concentration of services in the centre became too dominant, neglecting the boulevard idea.
6.3.6 Final Iteration

Although there was less interior volume in this iteration, the overall pedestrian experience is enhanced. It presents a variety of larger, more usable public spaces than the previous iteration (6.3.5), whilst being simpler to navigate. Exterior views are prioritised towards the public pedestrian as opposed to the private dweller.
7. FINAL PROPOSAL & CONCLUSIONS

7.1 Final Proposal
    7.1.1 Urban Scheme
    7.1.2 Site & Context
    7.1.3 High Rise Design

7.2 Conclusions

7.3 Reflection
7.1 FINAL PROPOSAL

7.1.1 URBAN SCHEME

Elevated Pedways
Subterranean Pedways
City Rail Link

CURRENT
- Paved Public Space
- Usable Green Space

PROPOSED
- Elevated Pedways
- Subterranean Pedways
- Planned Routes
- City Rail Link
7.1.2 **Site & Context**
7.1.3 **High-Rise Design**
Meeting Objectives:

1. **Vertical Continuity/Connectivity**
   
   The floor plates are vertically continuous, which entices the pedestrian further up the high rise. Not all sites are big enough to allow this, so voids/atria are generally more appropriate to provide vertical connectivity.

2. **Internal Transparency**
   
   The 'function masses' that define the vertical street will have a level of transparency that act as a neighbourhood watch for crime, and allow child supervision from apartments.

3. **Thresholds & Fragmentation**
   
   The deep building area demands the building's mass to be fragmented into 'function masses', allowing daylight to penetrate and diffuse to all its spaces. The fragments create interior-to-exterior thresholds which emphasise the definition between private and public space.

4. **Organic Matter & Form**
   
   When a high-rise is private and without pedways, the architect tends to repeat spaces and forms vertically. When it is made public and pedways are connected to the high-rise, the context changes and the architects must now carefully consider the design of every floor. The pedway breaks uniformity in the facade, leading the architect to functional design over their photogenic, formal desires. Pedways undo the "lobotomy" of high-rises, and motivate organic form which reflects the internal function. A range of different spaces are created for a range of different functions.

Rainwater will be collected and naturally filtered as it weaves down the vertically continuous garden beds. A constant outlook on this greenery will motivate social activity and well-being.

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1. Koolhaas, Delirious NY, pg 100

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**Realising Pedways in Auckland**

Pedways already exist in Auckland. The Nelson Street cycleway and Albert Park tunnel proposals have already captured public interest. Offering pedway connections from surrounding suburbs will allow shorter commutes, with flatter travel gradients. To make extensive networks within the CBD, pedways must be integrated into the high-rise. The current buildings are not prepared to support pedways; so planning of setbacks, building structure and public vertical transport need to be regulated. Pedways can shift Auckland towards a walkable/bikeable city.

**Future Social Science Research**

Social science research suggests confirm links between high-rise design and its negative impacts on social well-being. But more research is required to persuade change in high-rise design. To moderate architectural features, such as ceiling height, floor level, private-to-public space, circulation and room layout, is vital.

**When a high-rise is private and without pedways, the architect tends to repeat spaces and forms vertically (6.1 Conceptual Explorations). When it is made public and pedways are connected to the high-rise, the context changes and the architects must now carefully consider the design of every floor. The pedway breaks uniformity in the facade, leading the architect to functional design over their photogenic, formal desires. Pedways undo the "lobotomy" of high-rises, and motivate organic form which reflects the internal function. A range of different spaces are created for a range of different functions. Rainwater will be collected and naturally filtered as it weaves down the vertically continuous garden beds. A constant outlook on this greenery will motivate social activity and well-being.**

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7.3 REFLECTION

There are several limitations of this research project:

Structure & Adaptability:
The project did not explore structural solutions to cater to the idea. It assumed a generic 1.5x1.5m column grid, with 1.5m wide columns, which gave little consideration for buckling.
The final proposal suggested that the ‘private masses’ had some level of future adaptability in form, space, and materiality, but it did not explicitly explain any structure which could allow this flexibility.

Interior-to-Exterior Thresholds:
The final proposal did not cater to the wind and thermal comfort effects on pedestrians at higher levels of the high rise. This is because there was fear that a perimeter facade system would eliminate the powerful suggestions of interior-to-exterior thresholds throughout the high rise.

As part of another research project for Hochschule Wismar, the structural possibilities and particularly the facade systems of the project will be developed further.
Full name of author: Harrison Alister Craigie

ORCID number (Optional):

Full title of thesis/dissertation/research project ("the work"): Streets in the sky

Practice Pathway: Architecture

Degree: Master of Architecture (Prof) March 2017

Year of presentation: 2017

Principal Supervisor: Christoph Schmeer

Associate Supervisor: Kerry Francis

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Date: 11.10.2017
Declaration

Name of candidate: Harrison Alister Craigie

This Thesis/Dissertation/Research Project entitled: Streets in the Sky

is submitted in partial fulfillment for the requirements for the Unitec degree of Masters of Architecture (Prof)

Principal Supervisor: Christoph Schinor

Associate Supervisor(s): Kerry Francis

CANDIDATE'S DECLARATION

I confirm that:

- This Thesis/Dissertation/Research Project represents my own work;
- The contribution of supervisors and others to this work was consistent with the Unitec Regulations and Policies.
- Research for this work has been conducted in accordance with the Unitec Research Ethics Committee Policy and Procedures, and has fulfilled any requirements set for this project by the Unitec Research Ethics Committee.

Research Ethics Committee Approval Number: N/A

Candidate Signature: ___________________________ Date: 11/10/17

Student number: 1420714