

TAKING THE HIGH ROAD:
Retrofitting amenity onto urban arterial roads

BY

PAUL DEY

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How might New Zealand's urban arterial roads be architecturally retrofitted with improved amenity values to counteract the negative environmental and social effects of high-capacity traffic infrastructure?

ABSTRACT

Amenity values on urban arterial roads are fraught. This is largely due to the traditional traffic capacity versus amenity trade-off. This trade-off implies that high-capacity roads must be inherently deficient in amenity due to issues of air quality, noise nuisance and the physical barrier of streams of traffic. However, a more nuanced position – and one adopted by this thesis - is that arterial roads can be both busy thoroughfares and active, enjoyable destinations. This design-led research explores retrofitting amenity values onto existing arterial roads, creating new spaces and improving qualities of a system not originally constructed with amenity in mind.

Cuba Street in Lower Hutt is a regionally significant connector intended for future densified development. In addition to the current link function, this road needs to become more attractive as a destination and address. Consideration at the urban scale encourages broad, strategic planning to support amenity holistically. This urban planning addresses topics like desirable densification, transit-oriented development, walkable centres and how these affect the arterial road condition. In moving from urban-scaled to architectural design, the detailed implementation of the greater policies is tested. Architecture is engaged to respond to the immediate arterial road conditions with spaces and surfaces, protective buffers and layers. In this way - with architectural refinement and a comprehensive, coherent strategy - traffic capacity and amenity can be brought into balance.

I would like to express my thanks to:

Chris McDonald,

My parents & peers,

Rovie,

Sach

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INTRODUCTION

The Urban Arterial Road Condition

Urban arterial roads are ubiquitous elements in New Zealand’s hierarchical road system. They have a distinct condition as a result of their different functions. These roads still interface with the urban fabric i.e. they have buildings and activities ‘fronting’ onto them and function as a street – albeit a very busy one. However, the concessions to capacity profoundly affect the qualities of the space. Some texts address this distinct condition e.g. “Transitioning urban arterial roads to activity corridors” (by Curtis and Tiwari) and “Retrofitting Urban Arterials into Complete Streets” (by LaPlante). As seen in their titles alone, these texts suggest these roads must be carefully managed to create valuable spaces and positive urban qualities.

The key issue facing these arterial roads is the reconciliation of the high traffic capacity and its problems for amenity (e.g. through air quality and noise nuisance) with useful and quality spaces around the road. This balanced approach is important. The existing road system and its conditions have become factors affecting contemporary design in cities in New Zealand and elsewhere – not as problems that can be engineered out (Fraser and Kerr 326).

Research Intention

This design-led research explores the ‘retrofit’ of high-value public and private spaces onto urban arterial roads. This retrofit idea is important – framing the research around adding qualities onto an existing system not originally designed with them in mind. By recognising the varied demands on the arterial road, this thesis also becomes about reaching an ‘accommodation’ – where accommodation is used to refer to a negotiated compromise between different (sometimes conflicting) interests. So, how might New Zealand’s urban arterial roads be architecturally retrofitted with improved amenity values to counteract the negative environmental and social effects of high-capacity traffic infrastructure?

Key concepts and definitions

Though there are a number of quantitative definitions of arterial roads, the arterial road is fundamentally a regionally significant connector. Despite this, the understanding underpinning this research is that these roads are ‘places’ as well as just ‘links’ i.e. they are both destinations in their own right and efficient thoroughfares. To support this place function, amenity values are an important concept to protect. These amenity values include the physical qualities and characteristics of an area that contribute to people’s appreciation of its pleasantness and coherence in addition to any cultural and recreational attributes (as per Section 2AA of the New Zealand Resource Management Act 1991).

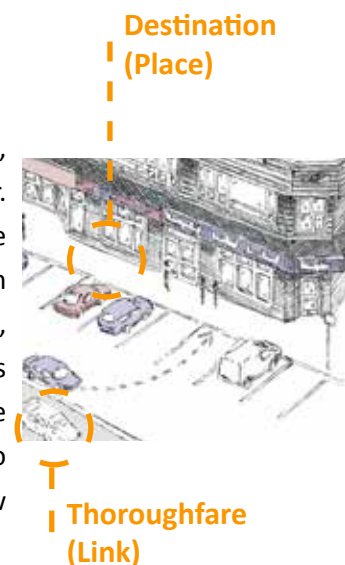


Fig.1.1 Arterial roads: thoroughfares and destinations.

Research Approach

A repertoire of design strategies that can enhance amenity values on arterial roads are collected. Also assembled is a range of design criteria - defining what a successful design achieves. Like the multi-faceted nature of amenity (which has different natures for different users) this investigation has a holistic bent – suiting integrated, sustainable urban planning – as well as responding to immediate nuisance issues with detailed architecture.

Research Process

BACKGROUND
RESEARCH

DESIGN
TESTING

CONCLUSIONS

Secondary research informs the testing and evaluation. Written discourse on the fraught relationship between automobiles and contemporary urbanism is common. There is a predominant notion that cars are inimical to good urban qualities but some authors have a more nuanced position and their work informs the engagement with amenity issues on arterial roads. The repertoire of strategies and range of criteria are extracted from a variety of precedent types (same problems yet different approaches). These precedent types include designed streetscapes, vernacular (mundane) responses and 'Carchitecture' – a label adopted from Jonathan Bell's book of the same name.

This design testing of these strategies moves between scales. The urban scale covers the arterial road as a whole and the way it connects to the rest of the city - allowing testing of broader, holistic design strategies. Within this larger-scale planning, focus areas are picked out. This closer look can test the detailed application of the larger planning as well as architectural design strategies that engage with the arterial road issues in a more immediate way.

The application and discussion of the design strategies and criteria allows them to be developed, thus making them more useful in future. From testing, some informed conclusions are drawn about the use of architecture to add amenity to existing urban arterial roads and identification of productive topics for future research. This is an advantage of choosing to work with a generic condition: generally applicable lessons learnt.

Scope of Research

Cuba Street, in Lower Hutt, New Zealand, is an important north-south route from Petone to the city centre (connecting important local features such as The Esplanade, the Jackson Street shopping centre and Alicetown). The existing District Plan (see p.41) and preliminary work on a Petone Spatial Plan - see the McIndoe Urban Limited's Petone 2040 Community Consultation Boards – identify Cuba Street as an appropriate location for intensified commercial and residential development. This thoroughfare exemplifies the arterial road's need for both capacity and amenity.

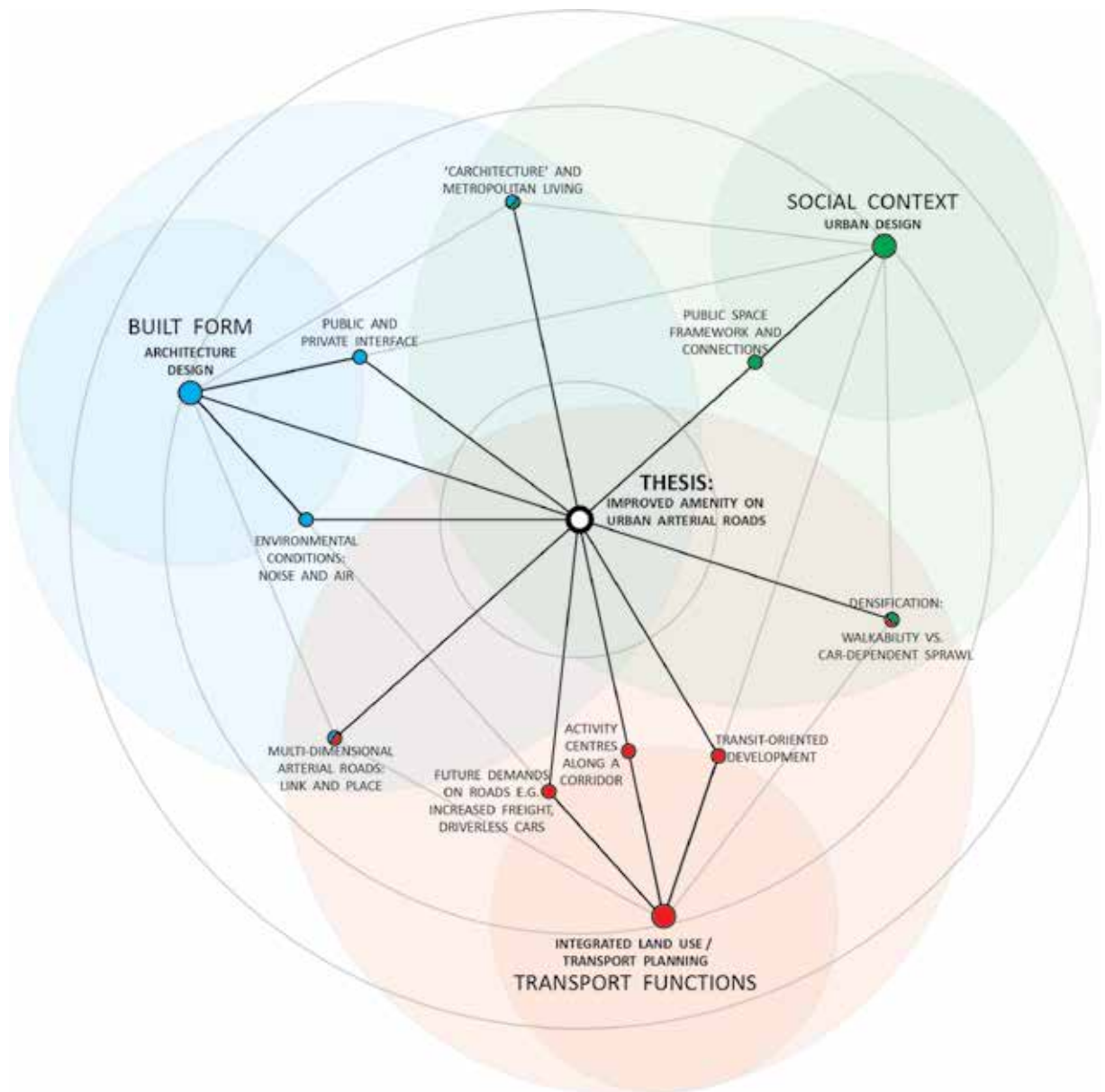
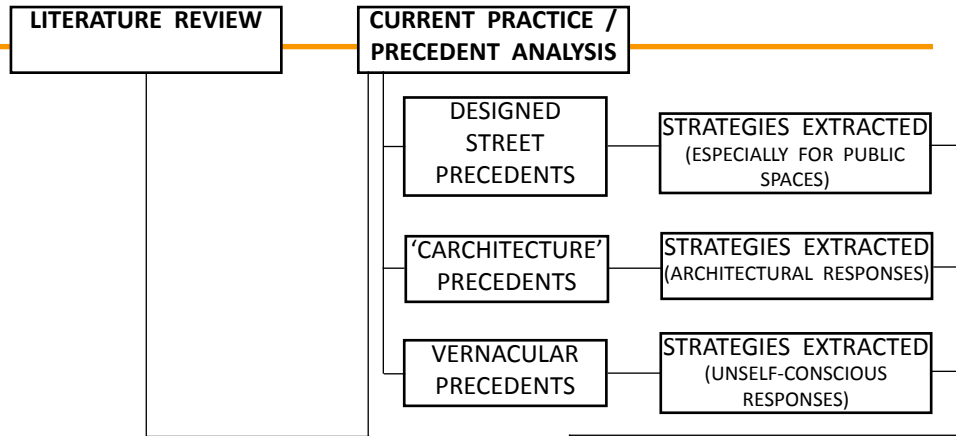


Fig.1.2 Thesis positioning

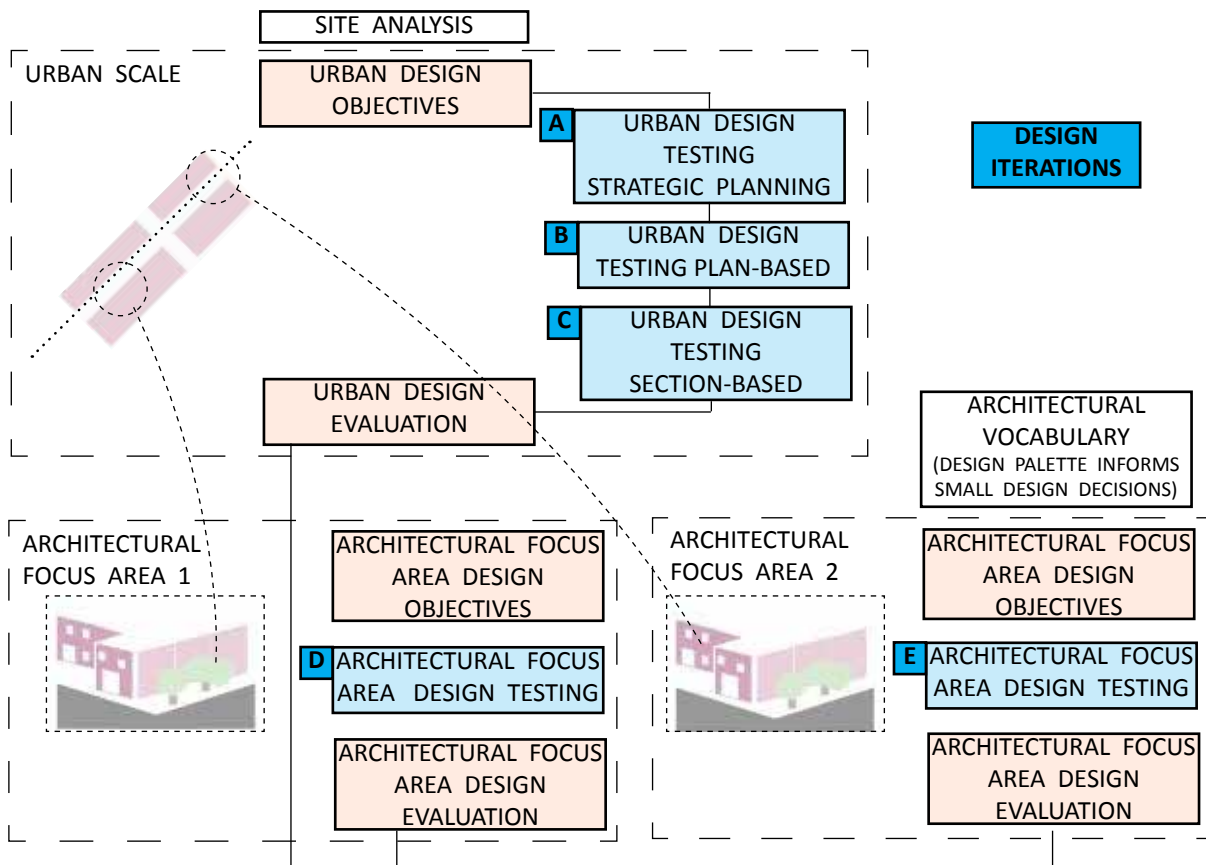
This diagram shows the thesis in relation to the disciplines of architecture and urban design and some prominent (and recurring) issues that these disciplines grapple with. The idea of integrated land use and transport planning is also important in reinforcing the idea that the amenity issues are not peripheral complications to be 'engineered out' but strongly related to urban and architectural design.

Fig.1.3 Methodology (Below)

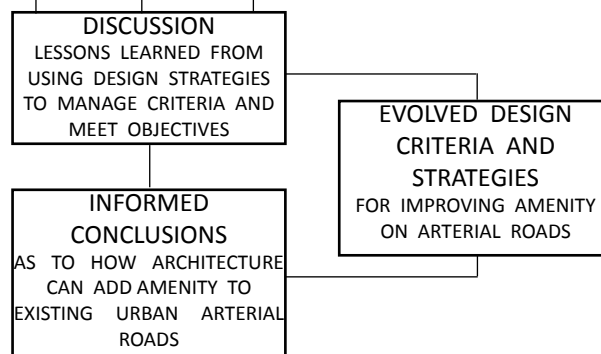
BACKGROUND RESEARCH:



DESIGN TESTING:



EVALUATION:



AN INTRODUCTION TO THE URBAN ARTERIAL ROAD IN LITERATURE

This thesis is about the reconciliation of arterial roads and amenity. The conventional implementation of unbalanced capacity-amenity trade-offs and car-centric planning has allowed detrimental consequences in both the urban and architectural realms. However, there is plenty of discourse on improvements to the current situation.

The literature spans a number of relevant topics - starting with the development of a conceptual framework (that covers the multiple aspects of the arterial road) which informs a full understanding of the arterial road and the different demands on it. With this, the issues with the present situation are comprehensively outlined, in turn allowing a comprehensive discussion of how to mitigate these issues and to improve the arterial road in a holistic manner. Additionally, there is pragmatic acknowledgement of the limitations on the design and the need to focus on key challenges such as the resistance to new patterns of development and to account for speculation on the future of the arterial road.

Defining the urban arterial road and amenity values

Under the Road Efficiency Group's *Functional Classification*, arterial roads might connect 'significant' places within a region. "In urban areas they may have significant passenger transport movements and numbers of cyclists and pedestrians using the road." However, there are inconsistent numeric classifications for arterial roads, for instance, the *Functional Classification* lists 'vehicles per day' (VPD) of over 5,000 as corresponding with an 'urban arterial road', while the Auckland Regional Transport Authority's *Regional Arterial Road Plan* holds that a 'district arterial road' has between 5,000 and 25,000 VPD. Due to this large variance, this thesis focuses on urban roads that have this loosely-defined significant nature rather than using a strict quantitative bracket.

Even less quantifiable, "amenity values are those natural or physical qualities and characteristics of an area that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes" as outlined in New Zealand's *Resource Management Act 1991*. This thesis explores the propagation and protection of these values on urban arterial roads.



Fig.2.1 Arterial roads have high traffic capacity

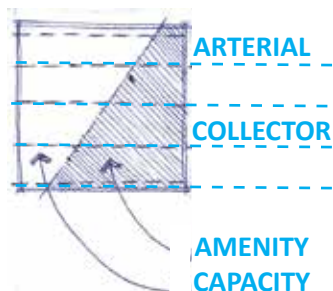


Fig.2.2 (Historic) conventional traffic-amenity trade-off

The conceptual framework for evaluating the urban arterial road

The conventional capacity-favouring trade-off in urban arterial road design

Douglass and Dryden cite this kind of inversely proportional amenity-traffic diagram (see figs.2.1 and 2.2) as being “well established in the 1960s and 1970s” (38). This is supported by the work of two authors published in 1978 - Robert Gutman criticising the ‘typical lay notion’ of the street as merely a link (249) and Peter Wolf noting that the streets’ “role as resources of immense economic significance is generally not recognized or reflected in administrative organization or in public resource allocation” (373).

The road hierarchy itself is less the issue here, so much as the typical acceptance of amenity values as a sacrifice for increased traffic efficiency. As Douglass and Dryden admit, “a central spine road within a suburb or passing through a town shopping centre” needs sympathetic management (38-39).

Link and place – recognising the urban arterial road as a destination as well as a thoroughfare

Numerous authors recognise that urban arterial roads (some pointedly referring to them as ‘arterial streets’) have both ‘link and place’ functions and are both thoroughfares and destinations in their own right (Jacobs, Macdonald and Rofé 8; Curtis and Tiwari 106; Plowright and Marshall 5C3.1; Svensson 5; Topp 95). Peter Jones and Natalya Bouyenko champion the ‘link and place’ concept as inclusive of “specific interests in the various aspects of streets, their development and their operation” - see figs.2.3 and 2.4 (47).

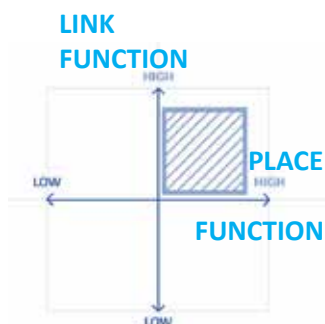


Fig.2.3 Arterial roads may have high place value



Fig.2.4 Link (multi-lane road) and Place (shopping centre).

In New Zealand, the focus on design for capacity is informed by standards like the Austroads guides to engineering practice. “Therefore, the overall place function of any particular road section has not been assessed holistically” – although NZS 4404:2010 *Land development and subdivision infrastructure* and the NZTA’s *One Network Road Classification* have taken steps in this direction (Burdett et al. 14). In general though, “separation of link and place function is particularly difficult for urban state highways and other urban arterial roads” (16).

Unpacking the FUS-ion model – more dimensions of the urban arterial road

Recently, Tiwari and Curtis produced another approach to urban arterial road classification based on the functional, physical and social qualities (also see figs.2.5 and 2.6). This three-dimensional model - called ‘FUS-ion’ – includes function (incorporating the link and place functions), universality (i.e. applicability for new and existing development and for all

users) and scale (i.e. the quality at different levels of detail) as measures of the overall quality of these roads (136).

While the 'F' in FUS-ion is straightforward, the weight given to questions of universality and the applicability of a variety of development reflects that "adaptability is emerging as a core issue in the sustainable design agenda" (Ministry for the Environment's *Value of Urban Design* 48). The built form and the environmental condition provide "an ultimate physical constraint on the type and intensity of activities which may take place" (Svensson 37).

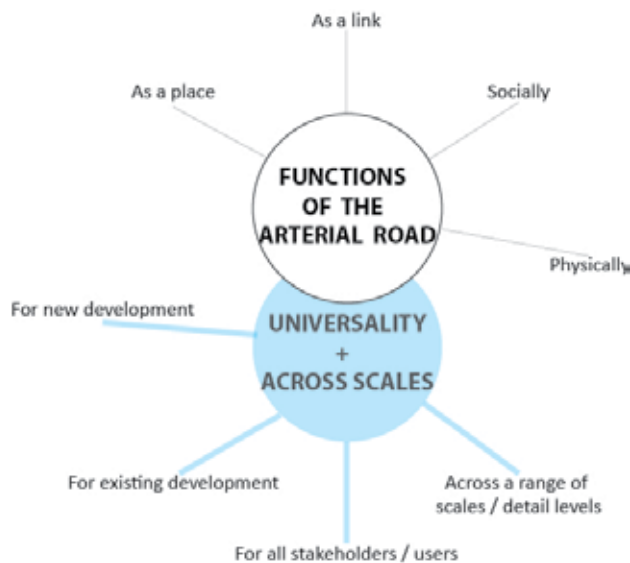


Fig.2.6 Author's diagram of conceptual framework based on FUS-ion model - showing Link and Place functions as qualified by their universality (applicability) and success across scales (Tiwari and Curtis 136).

This model also values the close-scaled detail and forms experienced at the pedestrian's easy pace (Tiwari and Curtis 129). Each level of detail is necessary as changes to a street-segment, for example, may affect the entire neighbourhood and even the entire metropolitan region (135). However, there are also different levels of detail in what is perceived by the easy pace of pedestrians versus the blur of speed for the motorist. In this way, the FUS-ion model can allow for a holistic model for evaluating the problems and improvements available for the urban arterial road – particularly for the distinctive New Zealand condition (see fig 2.6).

THE PROBLEM OF THE URBAN ARTERIAL ROAD

The state of the urban arterial road

Car-dependence in New Zealand urbanism

Due to New Zealand's relatively large land-mass and dispersed population, it is motor-vehicle-reliant (McCallum-Clark, Hardy and Hunt 11) – and see figs.2.7 through 2.9. In effect, "the car is no longer something 'other' that is to be emulated, symbolized, liked or disliked" and cars and



Fig.2.5 FUS-ion looks at place and traffic functions, physical and social dimensions, adaptability and levels of detail (Tiwari and Curtis 136).

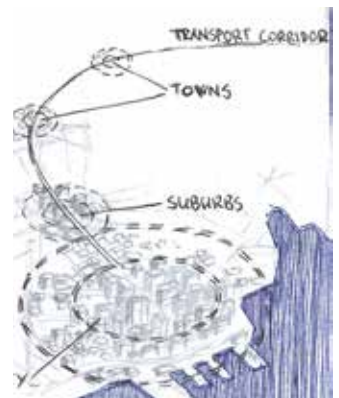


Fig.2.7 Typical NZ urban form with transport corridors and urban centres. Based on Ministry for the Environment *People+Places+Spaces* (16).



Fig.2.8 Inner-city arterial roads - separating city from amenity



Fig.2.9 Town arterial roads - dividing community from commercial activities

traffic infrastructure as topics are entirely subsumed into discussions of architecture and urbanism (Fraser and Kerr 326). The car and the road are an integral part of designing for NZ cities.

The enduring role of the urban arterial road

Carchitecture (edited by Jonathan Bell) and *Motopia* (an article by Murray Fraser and Joe Kerr) are both texts operating with a similar argument (and provocative portmanteau titles). They comment on the fundamental presence of the personal motor vehicle in modern society. Although it might be commonly accepted that orthodox architectural and urban values are incompatible with a car-based society (Fraser and Kerr 325), “a surgical removal of the car will surely endanger the life of the patient” (MacLean 11).

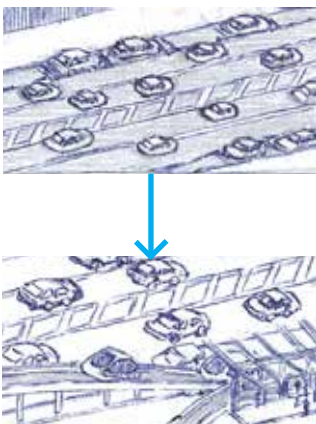


Fig.2.10 PRT (Personal Rapid Transit) features on-demand, automated, light vehicles on guide rails. Small footprint (it replaces a line of parking spaces in this drawing). Sketch based on Zarafu's description.

Additionally, “while PRT [Personal Rapid Transit – see fig.2.10] and other, perhaps more fanciful, proposals might be lauded, funded and researched, their success ultimately depends on our willingness to re-shape our cities once more, raze, re-build, re-structure and adapt to the new environment” (Bell 125). Given that “our cities are likely to feel the major effects of peak oil within the next decade,” most city residents will still be living in houses and suburban subdivisions already built (Stone and Mees 263).

Fortunately, there may be an alternative route in the pursuit of amenable urbanism. Voula P. Mega asserts that “land-use planning and transport are fundamental and interrelated instruments for the sustainable regeneration of cities, of their physical parts and of their extraordinary diversity” (159). In this way, the incremental / targeted redevelopment of the existing systems and urban form may be able to alleviate some of the problems created by car-centric planning in supporting sustainably evolving cities.

The symptoms of car-centric planning on urban arterial roads

Problems with car-dependence and sprawling development

Various authors discuss issues caused by car-centric planning. “Cities designed only around mobility by car have an uncertain future,” predicts Carey Curtis. Patrick Condon elaborates on the impacts of the hierarchical dendritic system (used in NZ) where the main urban centre is often beyond walkable distance from a residence – and driving is not a discretionary expense (25). Both cite health impacts (air pollution, excessive noise and reduced walking and cycling), economic cost, inefficient car use as well as the looming spectres of ‘peak oil’ and fossil-fuel-based energy’s contribution to climate change (Curtis 276; Condon 8-10).

New (car-enabled) patterns of urban life have appeared with out-of-town shopping malls, office complexes and low density residential suburbs (Fraser and Kerr 325) – see also fig.2.11. Monica Zarafu also describes ‘edge cities’, sub-centres of large blocks “emerging at major traffic nodes, around airports, shopping malls or business parks, which include higher concentrations of employment than housing and are often poorly integrated into the larger regional context” (2). Despite local benefits, these peripheral developments and highway projects (i.e. sprawling urbanism) can impose costs for the rest of the town or city. This includes “greater social isolation and inequity” and “a general weakening of the potential benefits of central city agglomeration” (Ministry for the Environment’s *Value of Urban Design* 26).



Fig.2.11 Typical commercial strip. Low-density commercial uses, surrounded by tarmac and big signage for traffic.

Degradation of urban design quality and walkability

Managing transport conflicts and congestion in urban centres and the effects on vibrancy, amenity and identity is a key concern of Victoria State Government’s *SmartRoads* plan – in particular providing for pedestrian movement across arterial roads (VicRoads 5). “Main arterial routes, for instance, turn into real boundaries,” writes Dietrich Garbrecht in a similar vein, also noting the trouble for the elderly (101). Barbara McCann discusses supporting walkability by “allocating more time to pedestrians: a walkable environment is one where people have time to cross the streets and where drivers are moving at slower, safer speeds” (151).

Jacobs, Macdonald and Rofé offer another example of traffic-oriented planning’s effects on urban quality, where the accepted standards for arterial roads recommend that distances between intersections be as great as possible and discourage direct access to abutting property (which is instead provided from side streets). This results in large stretches of development ‘turning their backs’ on the main road (209).

Degradation of the physical environment in private and public spaces

In “Transport in Cities” Hartmut Topp critiques the implications (and extremes) of the hierarchical system which leads to massive-capacity thoroughfares with little environmental amenity and quiet suburban streets (fig.2.12 and 2.13). In essence, residents’ desire for reduction of car traffic going past and motorists’ requirement for ease of movement have simply been separated and applied to different streets (97). In theory, this means most traffic noise is limited to the main roads and the cul-de-sacs are left quiet. However, this shifts the environmental burden to residents less fortuitously positioned (Condon 43).



Fig.2.12 Quiet cul-de-sac



Fig.2.13 Residential dwellings beside arterial road

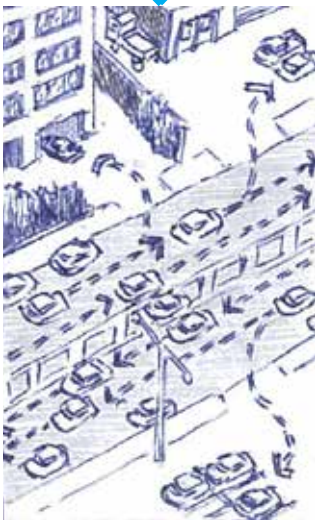


Fig.2.14 Main-Street-style development (top) and pure thoroughfare (bottom) – based on Topp (97).

This burden includes noise and air quality impacts – the latter are “highly localised, but not trivial” (Longley et al. 9). In New Zealand, “As the impacts of noise are better understood, transport noise has become a key environmental and social issue” and no longer an acceptable product of development (McCallum-Clark, Hardy and Hunt 7).

With regards to main streets (traditionally hosting cheap flats and shops), Topp disapproves of their transformation into main thoroughfares (which allow only heavily-constructed offices or residences set back from the road) to accommodate increased traffic capacity (see fig.2.14). He argues that the quality of these busy streets already tends towards the unbearable without the continued sacrifice of amenity for even more traffic capacity (97).

THE POTENTIAL OF THE URBAN ARTERIAL ROAD FOR REDEVELOPMENT

Employable design tactics mitigate the effects of conflicting demands on urban arterial roads

However, there is a significant amount of literature on the reconciliation and balancing (rather than a binary trade-off) of amenity and capacity. Åse Svensson describes these sometimes conflicting uses and activities competing for urban street-space – including movement of traffic and pedestrians as well as “demand for other on-street activities such as trading, sitting, talking, playing, and so on” (9). Other authors also comment on the occasionally fraught mix of public and private interests in the street design (Westerman 19; Wolf 373). Seen in this way, the purpose of this design-led thesis is to manage all, sometimes antithetical, demands on arterial roads.

For instance, while Curtis and Tiwari argue fast transport corridors are a necessary pairing with activity-filled arterial roads (108), other authors such as Jacobs, Macdonald and Rofé insist it is possible and desirable to have streets that accommodate pedestrians, vehicles, and both local and through traffic of different speeds – see fig.2.15 (234). Moreover, the latter authors stress that clearing swathes of space for widened or new thoroughfares is no longer practical - economically or politically (8). This suggests a practical approach is to work with the existing street system and retrofit in the additional qualities and support for different uses (instead of ‘blank slate’ designs).

Redevelopment on urban arterial roads

Urban arterial roads can make good hosts for ‘activity corridors’

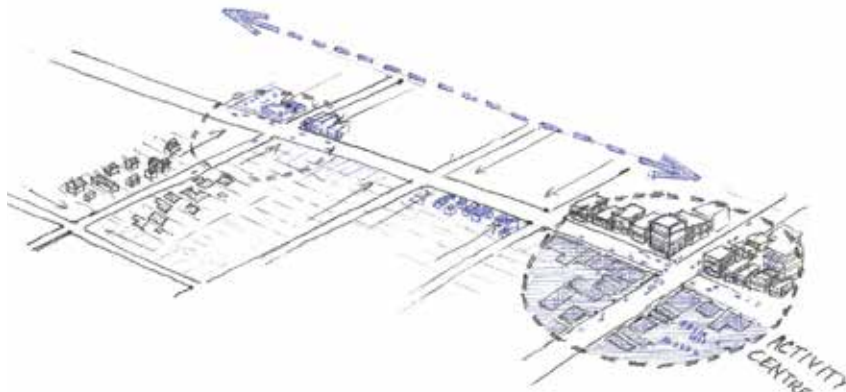


Fig.2.16 Activity centres on urban arterial road – walkable distance from local streets off main thoroughfare.

This is the fundamental argument behind Curtis and Tiwari’s “Transitioning Urban Arterial Roads to Activity Corridors” (see fig.2.16). Patrick Condon also subscribes to the view that busy thoroughfares can be desirable destinations. His ideal arterial roads are lined with commercial services along the ground-floor of the street-fronting buildings. The commercial space is distributed along the arterials and equitably available to all residents – ideally within walking distance (20). Commercial activities, in particular, do suit a position on an arterial road as this maximises their exposure to the non-local population using the road while being less sensitive to the environmental conditions. However, a difficulty in the New Zealand context is in lining arterial roads with enough commercial activities (given New Zealand’s centre-based urban form - see fig.2.7). Localised and incrementally developing centres of development (including commercial activities) on arterial roads is a more appropriate and achievable aim.

The case for mixed-use activity centres planned around public transport

Condon champions the ‘streetcar city’ as a model urban pattern supported by holistic ideas around community structure and movement demands – effectively gridded amenity-rich activity corridors with public transport (87). These ‘streetcar cities’ were historically defined by easy access to transit, a wide variety of house types, close services and jobs with short, interconnected networks of streets (14). Condon argues that this allows homes to “interface with the public realm in organic ways, the street becomes the milieu for social interaction, different demographic and cultural groups cross-fertilize, moving through the city is communal, and nature is always within easy reach” (163).

Although grafting light rail onto the existing arterial road system is likely not an optimal strategy, the streetcar city idea does parallel Curtis and Tiwari’s strategic-level planning for activity centres that would be introduced at intervals (across Perth’s network of wide, vehicle-oriented arterial roads).



Fig.2.15 Multiway boulevard as championed by Jacobs, Macdonald and Rofé.



Fig.2.17 Transit-oriented development - concentrated development precincts around public transport. Facilitates non-motorised travel within a precinct and public transit outside it. Diagram based Ministry for the Environment’s *People+Places+Spaces* (41).

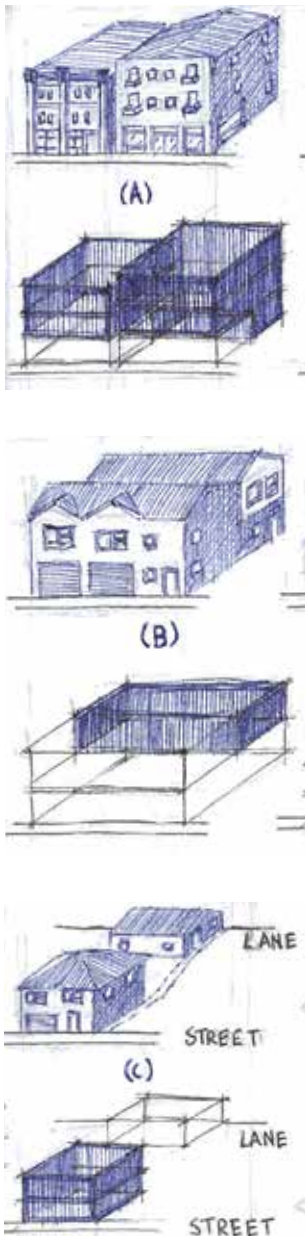


Fig.2.18 Common mixed-use typologies - blue shading indicates residences. Based on information in Ministry for the Environment's *People + Place + Spaces* (53).



Fig.2.19 high-density living concerns: parking, privacy, building height, form and noise. Based on Nematollahi, Tiwari and Hedgecock (7-8).

These are intended to become a focus of daily life, “including small-scale employment, shopping and services, and medium- to higher-density housing, all placed within walking distance of the public transport stop at the centre” – see fig.2.17 (Curtis and Tiwari 108).

Jacobs, Macdonald and Rofé also argue areas of mixed use create a lively city (234). The Ministry for the Environment's *Value of Urban Design* notes “mixed land use helps to minimise travel distances and improve access to employment, services and recreation. It provides convenience and a safer environment” (46) – see also fig.2.18.

CHALLENGES TO OVERCOME IN REDESIGNING URBAN ARTERIAL ROADS

Though activity centres and Transit-oriented Development are part of a promising strategy for adding amenity onto urban arterial roads, they do throw up some challenges for designers. These include resistance to intensified living and the need for localised, strategic centres over broad-brush aspirational planning.

Intensified development resistance

According to the Ministry for the Environment's *Value of Urban Design* “a number of integrated design issues must be successfully resolved if the potential benefits of higher density environments are to be realised” (39). Curtis and Tiwari list community concerns about increased crime, noise pollution and traffic impact that must be overcome (120). There is also a common association of higher densities with rental properties and physical amenity loss (Nematollahi, Tiwari and Hedgecock 7-8) – and see fig.2.19.

This sentiment is seen in Perth's faltering efforts to implement Transit-oriented Development (TOD). While policy translation and institutional barriers have been problematic, local government perceives “that the development industry has no preference for TOD, believing it risky and costly” – i.e. difficult to implement and market successfully. Curtis argues that more prescriptive, proactive action by the authorities is necessary (289).

In contrast, Paul Mees judges overhauling public transport as more efficient “than lining main roads with multi-storey apartments, even if developers could be persuaded to build these apartments, and residents induced to live in them” (42). However, Stone and Mees do acknowledge “localised, well-designed and democratically sanctioned urban consolidation is valuable,” though it is not the whole story - in terms of public transport effectiveness or regional density (267).

Future-proofing urban arterial roads

The segregation of road-users

In “Help or hindrance? The travel, energy and carbon impacts of highly automated vehicles”, Wadud, MacKenzie and Leiby argue that automation may change people’s relationship with the car to the point that car usage (i.e. number of cars on the road) is drastically increased (1). This may lead to roads with unceasing streams of driverless cars - as computers supplied with constant flows of data require smaller lane widths and enable tighter stopping times (Frey 39). To work with most efficacy (and this can also be seen in Rob House’s “The Future of our roads” – fig.2.20) the streams of driven cars, driverless cars, cycle-ways, freight shuttles and pedestrians need to be separated, in the illustration by multiple levels of overpasses, tunnels and roads. These changes would significantly alter the nature of the road system – though not the problem of the arterial road as a physical barrier, difficult to negotiate for the pedestrian.



Fig.2.20 Rob House’s “The future of our roads”: driverless vehicles, separated cycle superhighways, high-volume and freight system.

The changing nature of ‘link’ functions on the road: increasing public transport and freight

Authors describe limited ability to improve the service (relieve congestion and parking demand) of the road system in central areas by improving infrastructure (Rive et al. 17; Metz 268). David Metz observes that in rapidly growing cities, “car use in central areas tends to decline, allowing better use to be made of road space by pedestrians, trams, buses, taxis, freight, and emergency vehicles” (264). Similarly, Rive et al. predict increased demand for public transport in the future (168), especially with reallocation of right-of-way space to help the viability of public transport (McCann 155).

Another expected strain on the road system is truck traffic (see fig.2.21). “Modern supply chains require an unprecedented level of speed and reliability in freight transport to function properly” (Kawamura 46). While most freight operators know simply increasing the number of heavy vehicles on the road will not sufficiently meet this demand (New Zealand Transport Agency’s *Freight Demand Management* 1), most urban areas will see a mix of ‘last-mile’ deliveries, intermediate shipments and pass-through traffic (Kawamura 44). “Heavy vehicle noise is an increasing problem” warn McCallum-Clark, Hardy and Hunt (79). With these predictions, it is apparent that although future roads may be different to the present, there will likely still be the same types of issues and nuisances arising.



Fig.2.21 Dedicated loading bay for freight.

Recognising the social role of the urban arterial road

Jones and Boujenko point out that traffic is not entirely inimical to place-making e.g. vehicles may be loading, unloading, picking up, dropping off or parking (40). Likewise, Jonathan Bell criticises any approach that favours either society or traffic, each to the detriment of the other. The first denies the car's social function and the latter manifests in a "sea of asphalt and a state of siege between the car and society" (119). Authors attribute deep social importance to the road system e.g. David Brodsky's freeway as symbol of metropolitan life (279), Sandy McCreery's 'arena' for the 'spectacle of commodity domination' (72). Alex MacLean even describes contemporary society as 'culturally indebted' to automobiles (19). These arguments support the direction of this research in working on improvements to the existing system and not as a polemic attack on the road network or the automobile itself.

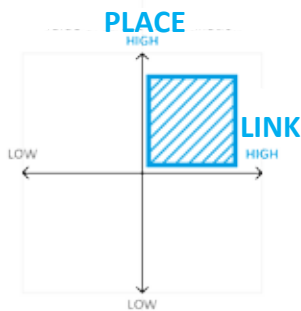
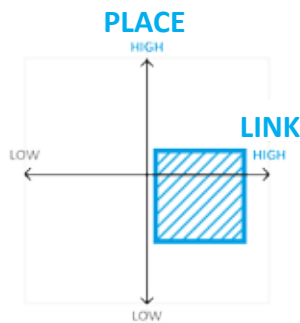


Fig.2.22 Research intentions - increasing arterial roads value as destination, without unduly compromising thoroughfare.

THE SUGGESTED WAY FORWARD

Speculation on the future of New Zealand roads does not detract from the thesis purpose of exploring a problematic historical condition. The new technologies are not likely to be a swiftly-implemented 'silver bullets' to the problems outlined here and may instead create new problems. Likewise arterial roads are a well-established part of New Zealand cities and are likely to persist into the future. It is the traditional approach to the design of these roads that has been problematic - creating issues such as car-dependence, sprawl, and low-amenity public and private spaces. However, the literature reviewed suggests the value of a designed retrofit - adding qualities to a system not initially designed to support them (see fig.2.22). To accommodate high-volumes of traffic and other users of the road, the literature suggests that localised, well-designed intensification of different activities can offer valuable holistic improvements for urban arterial roads.

While this is a productive direction to pursue, the literature review conclusions are strongly planning-oriented. They offer few architectural design strategies for retrofitting amenity onto arterial roads. Extrapolating a set of design strategies from precedents (with intentions copacetic to the larger approach outlined here) will add a useful depth to the research and help it operate across scales. This is the focus of the following chapter.

PRECEDENTS - DESIGNED STREETS

Some design strategies are drawn from precedents that have engaged with similar aims to this thesis. Some valuable precedents are designed streets where urban design has improved amenity on busy arterial roads. This streetscape study is complemented by the more architectural Architecture and vernacular studies that follow.

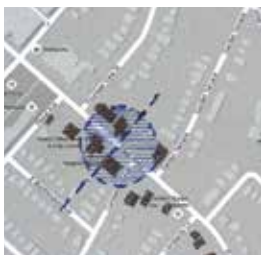
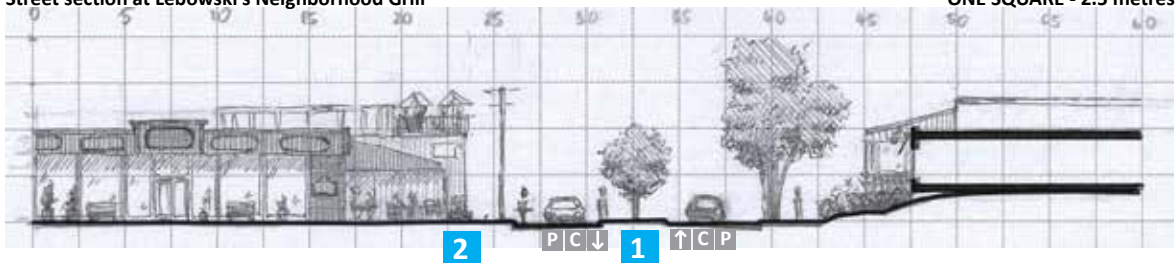
The designed streets studied here vary – in both physical layout and design approach. Physically, these cross-sections have different widths and are enclosed by different built forms. The range of design approaches span from drastic building projects through to smaller, piecemeal interventions. The difference is illustrated by comparison between the Byker Wall development – which refuses to engage the adjacent road at all – and the ‘road diets’ where the thoroughfare is narrowed.

These precedents are recorded in a consistent, scaled format (a gridded cross-section) for easy comparison of the physical spaces. These high-profile redevelopments also have been written about (sometimes with disapproval) and there is a connection between the physical characteristics of a street design and the social context underpinning it e.g. the community aspirations for Pitkin Avenue.

EAST BOULEVARD - CHARLOTTE (NORTH CAROLINA)

Street section at Lebowski's Neighborhood Grill

ONE SQUARE - 2.5 metres



This commuter-corridor, originally four-laned, was reduced to two.

‘Road diet’ – narrowed thoroughfare is easier to cross and has cycle lanes.

1 Generous medians planted and mature trees enclose street.

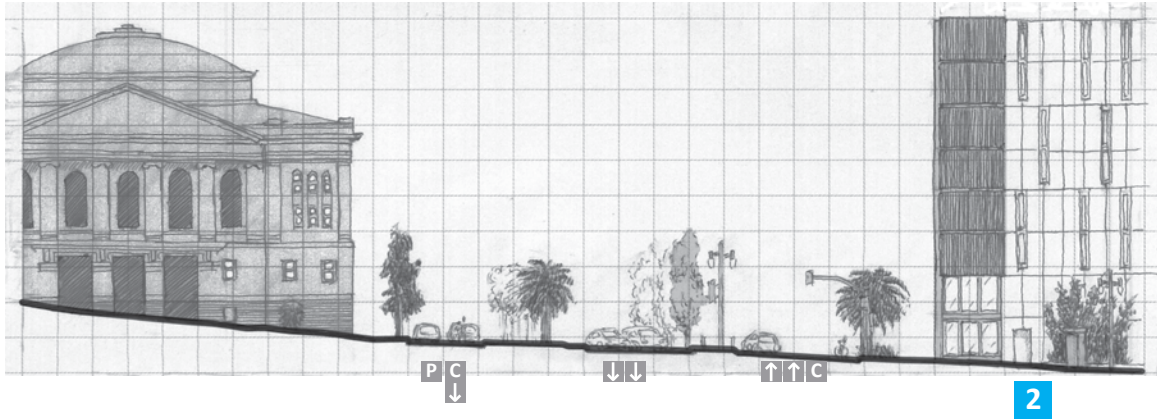
Varied land uses, (low-density residential and light commercial).

2 Eating outside more popular, less noise and greater separation from traffic.

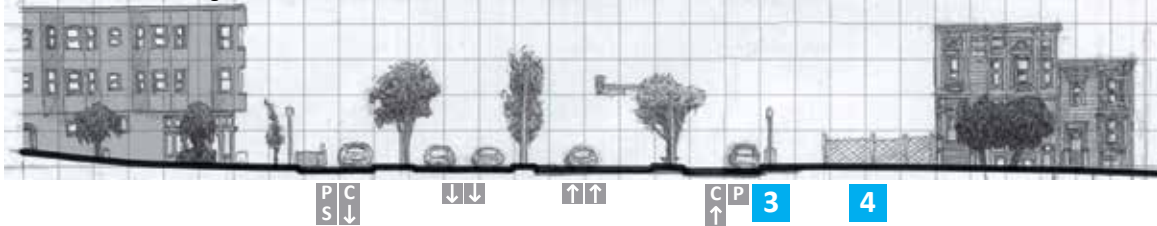
OCTAVIA BOULEVARD - SAN FRANCISCO (CALIFORNIA)

A - Street section at Waller Street

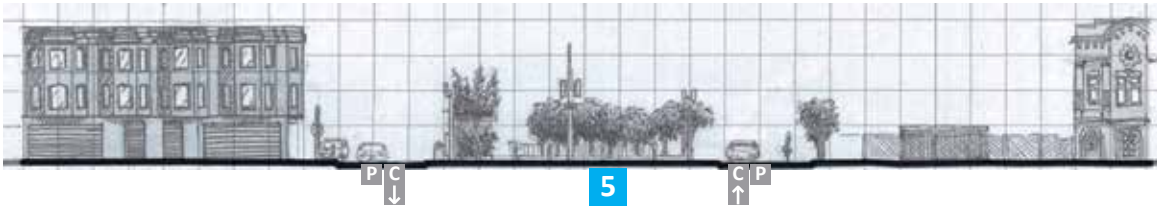
ONE SQUARE - 2.5 metres



B - Street section at Page Street



C - Street section at Fell Street



Part of San Francisco's popular rejection of urban freeways (similar to Embarcadero Boulevard).

Area typically had fine-grained residential dwellings.

Criticised for 'confusing' nature and complicated intersections.

1 Freeway ramp at end, boulevard disperses traffic into city. The "most attractive entrance into the city after the Golden-Gate Bridge" per writer John King.

2 Octavia Apartments at corner site. 'Gate' of high-quality buildings with First Baptist Church.

3 Side lines wide - less successful at discouraging fast traffic.

4 Observed setbacks for gardens and parking lots.

5 Patricia's Green park is popular.

N.B

[P] for parking space

[C] for cycling lane

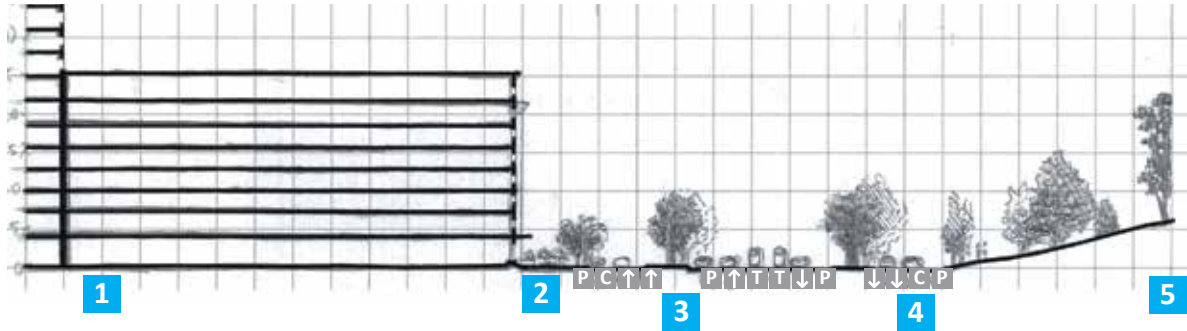
[S] for shared spaces (often parking spaces occupied for local business seating)

An arrow is for a lane of traffic

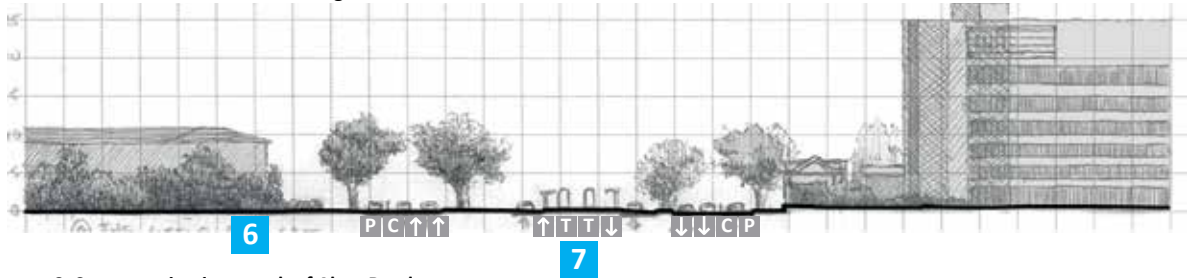
ST KILDA ROAD - MELBOURNE

A - Street section at Shrine of Remembrance

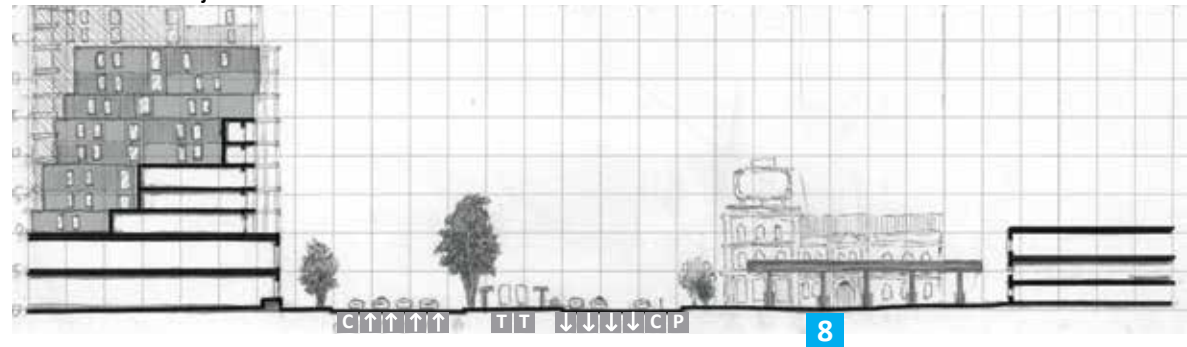
ONE SQUARE - 5 metres



B - Street section between Raleigh and Union Streets



C - Street section just south of Alma Road



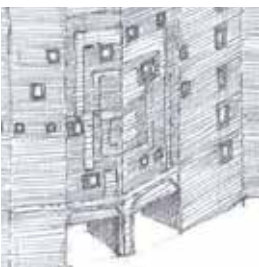
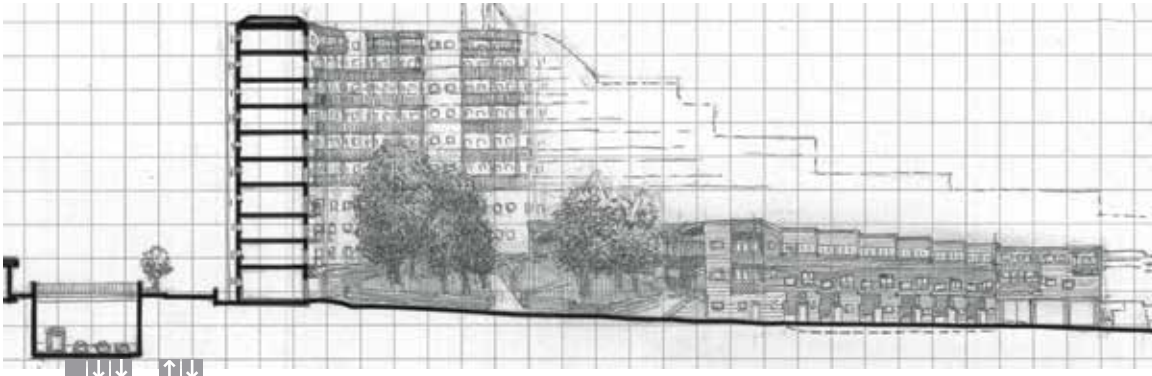
The Northern Precinct on St Kilda Road is closest to Melbourne's Central Business District and has similarly tall buildings. This road is a busy route and important civic feature. The Southern Precinct is an important commuter route.

- 1 High rises with office and increasing apartment living on this road. Some buildings have deep podiums.
- 2 Sizable landscaped private frontages seen to host outdoor dining.
- 3 Consistent line of trees frame boulevard
Cycle lanes separated from car doors.
- 4 Side lanes have high capacity.
- 5 Protected green space – e.g. Shrine of Remembrance.
- 6 Smaller historic buildings in streetscape.
- 7 Tram line connection to CBD.
- 8 Aside from large apartment buildings, scale smaller.

BYKER WALL - NEWCASTLE UPON TYNE

Section cut at (internal) Raby Street

ONE SQUARE - 5 metres



The Byker Wall was designed by Ralph Erskine to create a micro-climate away from the intense wind and sound pollution of a proposed motorway. This has proved contentious - partially due to politics around social housing.

Few car-parks inside and traffic segregated; maximum planting and landscaping in communal space.

Picturesque architecture: village-like, varied colour, form and heights. Random array of timber-slatted accessways, balconies and planters.



Wall displays patterned brick surface to road, with small glazed apertures. Open on other side, with balconies, more glazing.

WASHINGTON AVENUE - MADISON (WISCONSIN)

Street section at Blair Street

ONE SQUARE - 2.5 metres



This wide avenue was redeveloped to evoke a 'gateway' feel through consistent landscaping.

1 Heritage row houses, reflecting avenue's history.

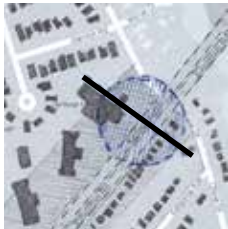
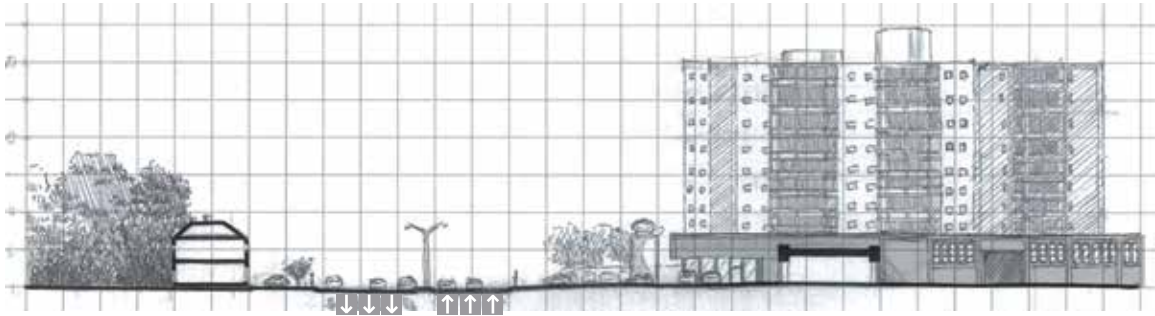
Footpath extends out at crossings and wider medians for easier crossing.

Parts of road have cycle lanes.

K I N G S T O N R O A D - TORONTO (ONTARIO)

Street section just before Chine Drive

ONE SQUARE - 5 metres



A key East-West route between Toronto and Kingston for commuters. Some places, like Scarborough Village had formerly thriving motel strips in the 1960's that have since fallen out of use.

High-density, low-income housing visible.

Currently, road has sparse low-rise storefronts, apartments and single-dwelling homes.

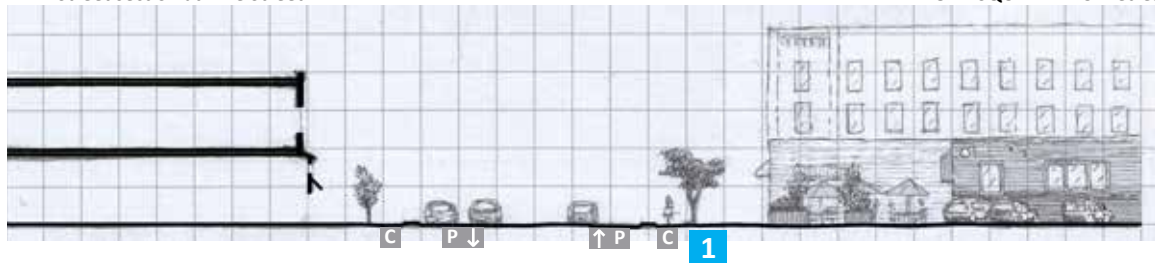


Road changing into a 'Main Street' with new development - particularly the mid-rise 3-bedroom, family-oriented condominiums.

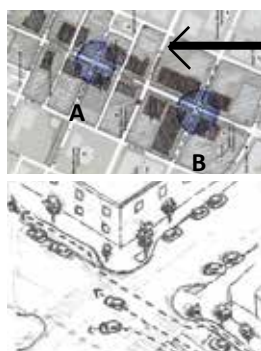
H I G G I N S A V E N U E - MISSOULA (MONTANA)

A - Street section at Pine Street

ONE SQUARE - 2.5 metres



B - Street section at Main Street



This a short (~ 300 metres) central-city major arterial road

1 Includes 'Sharrows' (shared cycle-car space), unprotected and protected cycle lanes.

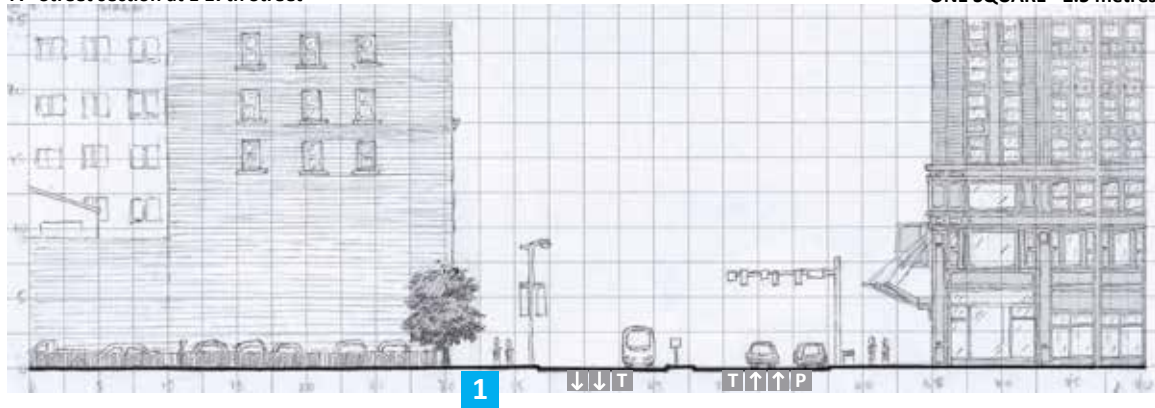
Seasonally, on-street parking spaces allocated to racks for cycle storage.

2 This downtown commercial corridor has some historic buildings and vacant frontage.

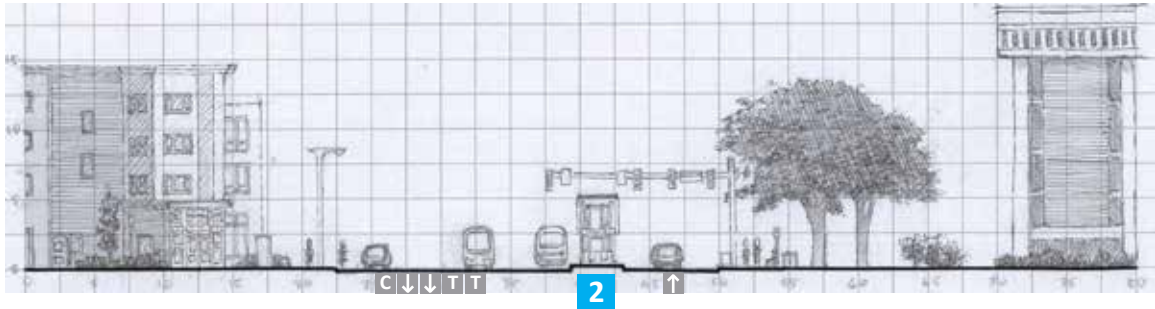
E U C L I D A V E N U E - CLEVELAND (OHIO)

A - Street section at E 17th Street

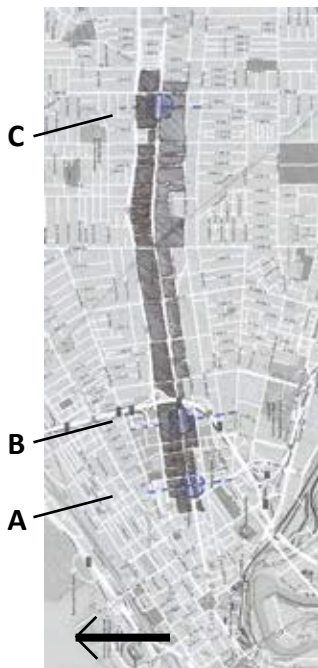
ONE SQUARE - 2.5 metres



B - Street section at E 24th Street



C - Street section at E 77th Street



This long avenue stretches from the Central Business District out to the suburbs. Cleveland has a strong history of transit use and the transit investment also spurred private investment on the avenue.

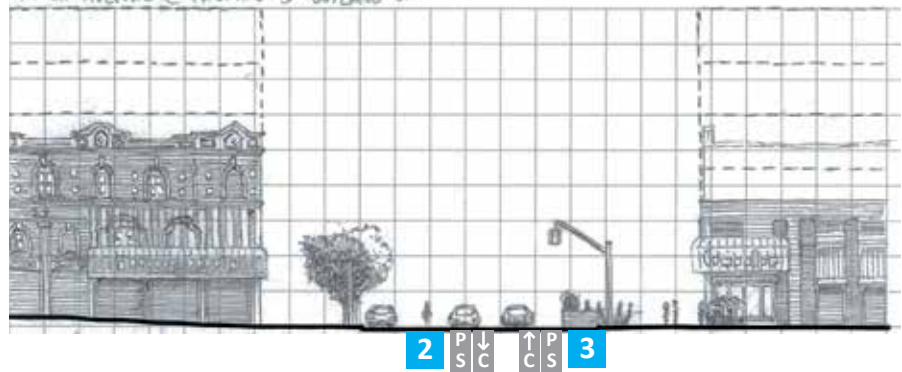
- 1 The city centre has increased pedestrian activity and high quality, distinctive paving.
- 2 Transparent, light transit stations on medians.
- 3 Landscaping and lighting improvements.
- 4 Cycle lanes.

PITKIN AVENUE - NEW YORK CITY

Street Section at Thomas S Boyland Street

ONE SQUARE - 2.5 metres

1



This avenue is in an area with a troubled socio-economic history. Improvements to the physical and social environment are intended to stimulate economic development. The avenue is positioned between high-density apartment blocks and two-storey terrace housing.

Improvements focused on facades, signage and upper floor windows.

Two-thirds of buildings are mixed-use: residences and ground-floor retail. Though there's no longer continuity in the commercial activities.

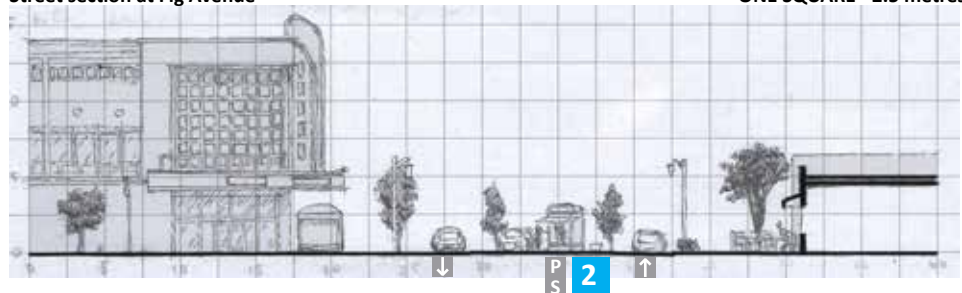
- 1 Long-term development with greater building heights proposed.
- 2 Bike racks and sharrows added for intended cycle-friendly commercial corridor.
- 3 'Street seats' created over parking spaces outside local business were in use even before completion.

WEST LANCASTER BOULEVARD - LANCASTER (CALIFORNIA)

Street section at Fig Avenue

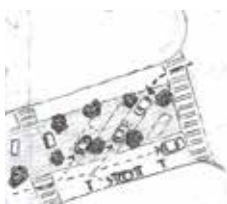
ONE SQUARE - 2.5 metres

1



The redesign of an originally wide road was part of an effort to improve a dysfunctional commercial centre.

Boulevard becomes a pedestrian mall on market days / holidays. Outdoor dining also supported.



- 1 Revitalised commercial development includes new housing complexes. New built form creates improved public spaces and healthy activity, day and night.
- 2 Central strip shared between parking, planting, seating and stalls. Paved for differentiation.

USEFUL DESIGN STRATEGIES FROM DESIGN STREETS

Layering of (sometimes physical) barriers and buffer spaces is important to protect amenity on these designed streets. This can be space-intensive - the large St Kilda Road has a 60 metre cross-width. However, there are strategies that could be employed (as outlined below) but on-site designing must carefully manage the limited space available.

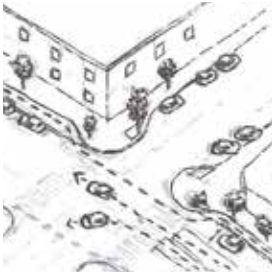


Fig.3.1 Cycle lanes

Cyclist concessions may include such features as painted 'sharrows' (used in America to indicate 'shared spaces') and dedicated cycle lanes (which can be separated from the danger of protruding car doors). These measures encourage cycling but the amenity benefits are less quantifiable. However, there may be some amenity value gained in increased separation between road traffic and pedestrians on the footpath.

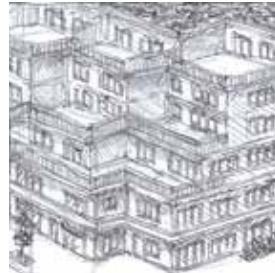


Fig.3.2 Mid-rise apartments

The new mid-rises on Kingston Road in Toronto are a happy-medium between the existing high and low density buildings. They retain private amenity – especially compared to the blocky high-density, low-income apartment buildings – and have outdoor space (balconies) and an articulated design. The spatial characteristics of the very wide road are changed with the new built form pushing the road closer to a town's main street.

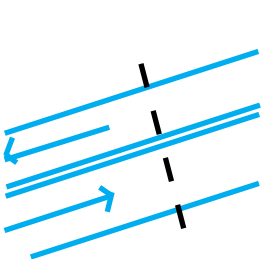


Fig.3.3 Reconfiguration of street cross-section

A wide median allows pedestrians to cross the road in two phases rather than having to cross both lanes of a wide arterial in one attempt. With angled parking being less penetrable for pedestrians, regular breaks in this pattern are required. At certain off-peak times these central spaces may be occupied by different activities. There is also a problem with the angled parking and how it backs out directly into traffic.

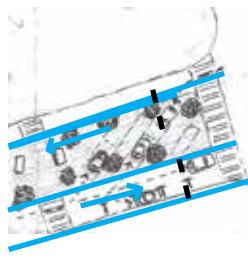


Fig.3.4 Maximising useful outdoor space

Activity on the street generally relates to healthy public spaces. A 'road diet' (narrowed roadway) here encourages more outdoor dining on the arterial road (additionally on the roof of one eatery in this example). Pitkin Avenue even has some road-space occupied for seating - which is a localised concession used to support a key place.

Most of these strategies likely increase friction on the arterial road (where free-flowing traffic is slowed by adjacent activities and other traffic). This threatens to compromise the traffic capacity for the sake of amenity - which is contrary to the aim of this thesis in reconciling both. However, smaller interventions may suit local application at key areas along the road. The mid-rise apartment precedent complements the discussion in the Literature Review about desirable densification in private amenity (p.12) with the public amenity (a 'sense of place') in an identified 'main street' feel.

THE PURPOSE OF THE CARCHITECTURE SURVEY

This survey extracts design strategies from 'Carchitecture' – a classification adopted from Bell's study. This architecture has a deliberate (often theoretical) relationship with the road. Using the survey of vernacular precedents that follows, there is a comparison between the self-conscious designs, often with extreme and unconventional spaces against the unreflective, informal vernacular.

This is a summary of the identified strategies, and representative examples - the full survey appears in Appendix B. The exhaustively collected examples were categorised based on the design's relationship with the road. For example, a designed streetscape is distinguished from a discrete building. These categories are further refined based on the strategic approach evident. While two examples may build over the road, one may be working as a connection (a bridge) whereas the other aims to 'stack' a place over ubiquitous (i.e. placeless) infrastructure. These essential relationships are diagrammed.



-Blue indicates space or surface treatment



-Red indicates complete building design

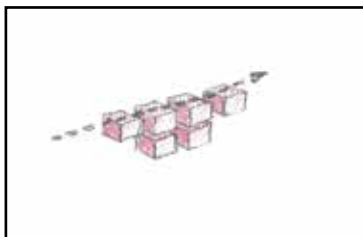
1. DESIGNED ROAD AND BUILDING HYBRIDS

As a theoretical alternative to the conventional street, some architects have proposed building/road hybrid structures. These tend to imply a drastically unconventional urban form if implemented.

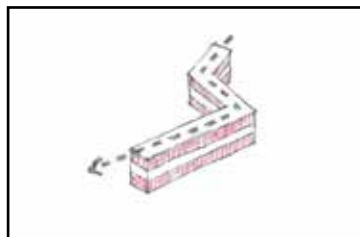


Immeuble Burdeau by Pierre-Marie

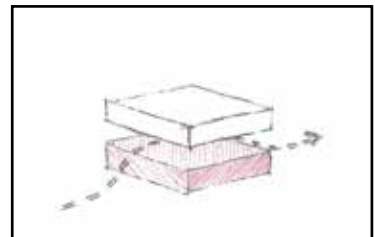
A project suggesting a kind of viaduct city form - where the road runs over apartment blocks. No interaction between the road and buildings though. Pierre-Marie's Immeuble Burdeau "Rock the Casbah." Mad To Be Saved. Wordpress, 11 June 2009. Web. 27 Sept. 2015.



Inhabitable bridges with living units slotted into the larger structure.



Utopian reimagined urban form seen in Le Corbusier's Plan Obus Algiers and in earlier 'linear cities'.



Some buildings are designed to incorporate roads running through, over or under them.



Conceptual 'vertical streets' and 'drive-up buildings'.

Inhabitable bridges: Beast Bridge (by Paolo Soleri), The Bay Line (by Rael San Fratello Architects), Contemporary Habitable Bridge (by Philippe Rizzotti, Vermet Tanguy, Manal Rachdi, and Samuel Nageotte), Beta-Bridge (by Fletcher Studio),

Linear cities: Roadtown (by Edgar Chambless), Living Arteries (by Benjamin Marks), Plan Obus Algiers (by Le Corbusier),

Building / road hybrids: The Gate Tower Building (by Azusa Sekkei and Yamamoto-Nishihara Kenchiku Sekkei Jimushō), Hudson Square (by Ltl Architects), Lyngby (by NL Architects), Roof Road NT (by NL Architects), Lingotto Fiat Factory (by Giacomo Mattè Trucco)

Vertical streets: Carstadt (by NL Architects), Strijp S (by NL Architects), Park Tower (by Ltl Architects)

2. BUILDING PUBLIC SPACES ABOVE THE ROAD

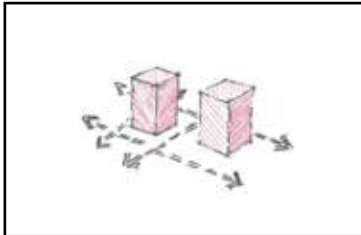
Stacked construction creates useful space while preventing busy roads from breaking up the continuity of public spaces. There is a common attraction to creating usable space (for private or public activities) out of thin air.



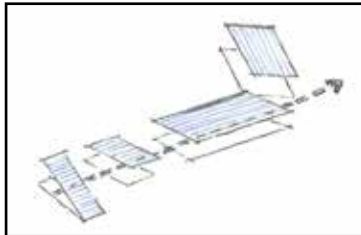
100 College Street by Elkus Manfredi

A connected downtown street network over a highway with a new building and paths constructed over the road.

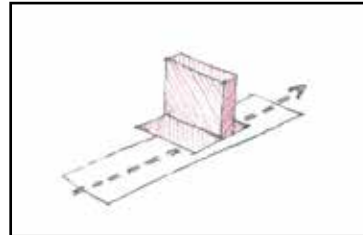
Li, Diana, Jordan Ascher, and Jenny Dai. "Transportation." A People's Guide to Infrastructure in New Haven. Yale University, 2014. Web. 24 June 2016.



Historically, zealous Modernists aspired to shift the activity of the street into towering blocks with open space at their base (as seen in Le Corbusier's Plan Voisin).



Connections (bridges) and open space created over extremely busy roads help free movement.



Combatting the 'placelessness' (i.e. the ubiquity) of road infrastructure with activities stacked above (yet connected to the urban fabric).

Modernist towers: Città Nuova (by Sant'Elia), Lower Manhattan Expressway (by Paul Rudolph)

Public space over roads: Golden Lane Project (by Smithson), Cultural Corridor Chapultepec (by FR-EE, FRENTE, RVDG), Hua Qiang Bei Road (by Work ac), FC Barcelona New Palau Blaugrana Arena plaza connection (by HOK), Rogers Place and the Ice District 'Winter Garden' entryway (by HOK), SOHO @ Podomoro City - Central Park connection (by DP Architects Pte Ltd.), Hong Kong pedestrian bridge network, former BNZ Centre - underground mall (by Stephenson & Turner Architects), Green Ribbon (by Les Klein / Quadrangle Architects Limited)

Stacked architecture: Tourbus Hotel (by Ltl Architects), Greenwich South District-Wide Sustainability Vision (by Ltl Architects), Infrabodies (by Monolab), Seattle C.A.P.I.TOL HILL (by Patano Studio Architects), A12 Long term (by Monolab)

3. DESIGNED STREETSCAPE

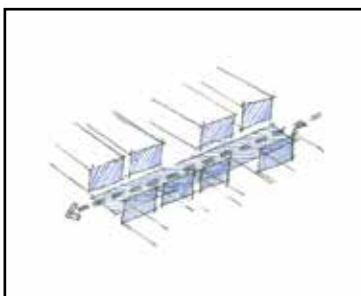
These designs work with the conventional understanding of the street: the linear open space around the road framed by separate buildings. The scope of the design varies from special design for prominent sites to larger developments that are planned around street-like corridors.



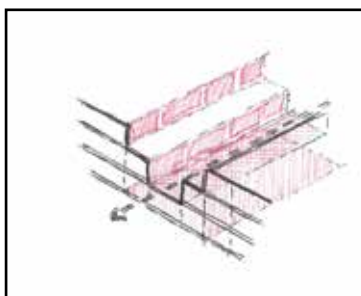
Hoshigaoka Terrace by Gensler

A coordinated commercial development that bridges the busy road in order to connect all the public spaces easily. The public space is not limited to the edges of the road and wraps up and over the traffic.

"Hoshigaoka Terrace." Gensler.com. Gensler, n.d. Web. 1 Nov. 2016.



Some facades (or all) designed to affect the perceived quality / character of the street.



An integrated corridor of development allows multi-level public spaces and paths as well as a complete aesthetic and amenity.

Designed streetscape: Godrej Garden City (by SOM), 5th Avenue Theatre Marquee Design (by NBBJ), V1 – isthmus houses (by Isthmus),

Designed corridors: Schwabinger Tor (by ATP Architects Engineers), SM City North EDSA (by Arquitectonica International Corporation), Yuexiu International Financial City (by Foster + Partners), Friedrichstraße Boulevard design (by the Ministry of Construction of the German Democratic Republic)

4. INTERFACE WITH OTHER MODES OF TRANSPORT

As people may well switch between different modes of transport to get around a city, arterial roads interface with other modes of transport. These may require a wider cross-section to integrate and can become complicated with pick-ups, drop-offs and parking.



Canadian Line Stations

by Perkins + Will

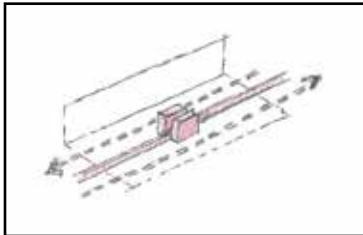
This station mediates the change in level between the wide arterial road and the elevated rail line. The architects have avoided a heavy (looming) aesthetic for the design.

"Canada Line Stations." Perkins + Will Work. Perkins + Will, n.d. Web. 24 June 2016.

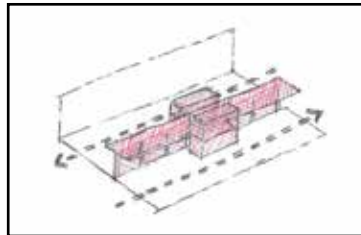
Rail lines integrated into the road examples:

Seen in the designed street precedents (St Kilda Road and Euclid Avenue), Sydney CBD and South East Light Rail (by HASSELL)

Elevated line station examples: Motorway Operations Centre (by Studio Odile Decq), All Aboard Florida (by Skidmore, Owings & Merrill LLP), Brentwood Skytrain Station (by Perkins + Will), Skycycle (by Foster + Partners), Transbay Transit Center (by Pelli Clarke Pelli Architects),



Rail or tram lines may be integrated into the road as part of the public transport system.



Elevated rail lines require managing the appearance of heavy structures and the access between levels.

5. HIGH-AMENITY SPACES ADJACENT TO THE ROAD

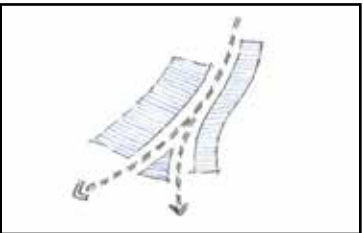
As part of densified occupation, there are examples of architectural designs making use of the challenging sites immediately around busy roadways.



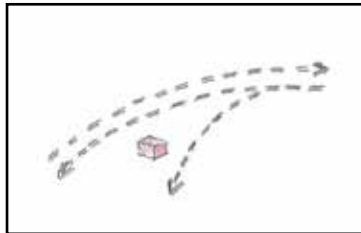
Two apartments by Sophie Wylie

This building takes advantage of the high-amenity views available and central site despite the position by an off-ramp in Auckland.

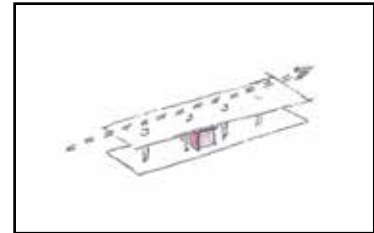
Rogan, Kate. "City Mission." Urbis Aug. 2012: n. pag. Urbis Magazine. AGM Publishing, 7 Aug. 2012. Web. 24 June 2016.



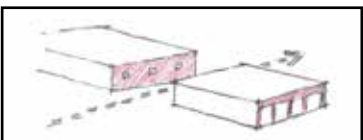
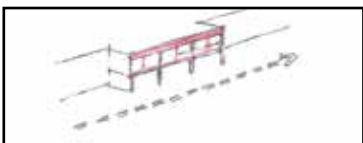
Public space amenity around the road may be protected by buffers e.g. vegetation and earthworks.



Occupation of marginal spaces around the road.



Some projects add activities to 'wasted', unoccupied spaces.



Varying levels of defensiveness visible at the facade.

Public space examples: Bronx River Parkway Reservation (landscape architect - Hermann Merkel), Parc Nus de la Trinitat (by Joan Roig & Enric Batlle), Slussen (by Bjarke Ingels Group),

Occupation of marginal spaces: Energizing Kowloon East Office (by Shui on Building Contractors Ltd.), The Cineroleum (by Assemble Studio), A8ernA (by NL Architects), Folly for a Flyover (by Assemble Studio), Under the BQE (by Buro Koray Duman), Terrabank (by Fletcher Studio), Former Maintenance Transport Depot (featured in Bell), Symonds Street off-ramp apartment (by Sophie Wylie), Vancouver House (by Bjarke Ingels Group)

Closed facade responses: Armadillo House (by Formwerkz Architects), Modern View Residence (by Elias Rizo Arquitectos), Regent Road (by architecture:m), The Wall Utrecht (by VVKH Architecten) and similarly, the Byker Wall (by Ralph Erskine)

Open facade responses: Samsung R5 Research Building and Landscape (by NBBJ), Columbus Metropolitan Library (by NBBJ), Brandtford YMCA (by Cannon Design), Daegu Civic Center Renovation (by Kunwon), Free Lobby, Block 1290 (by Ltl Architects)

6. DESIGN EXPERIENCED FROM THE ROAD

This relates to the different perception of surroundings and detail experienced by those in a fast-moving vehicle. Like a billboard, some buildings are designed with distinctive forms to act as landmarks and symbols - sometimes delineating a threshold in the manner of a "Welcome to ..." sign. A first impression on arriving in a new urban environment will likely be formed from the road.

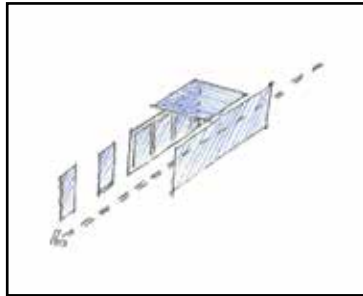


Georgia Street Bridge

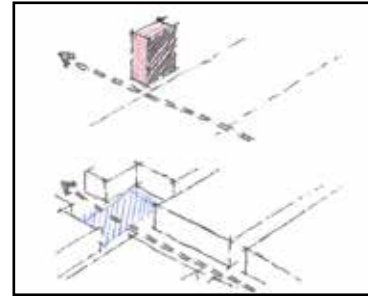
by James R. Comly

Designed by a civil engineer, the bridge is an "interpretation of the Beaux-Arts/ American City Beautiful Movement's penchant for monumental civic architecture."

Stiegler, Ione R. Georgia Street Bridge Historical Resource Technical Report. Rep. City of San Diego, 28 June 2012. Web. 24 June 2016.



Road infrastructure designed to 'beautify' utilitarian civil engineering.



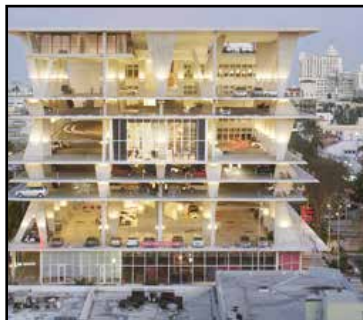
Landmark buildings and plazas designed to be seen first from the road.

Road-viewed designs:

MFZ, Vrbani, HR, Multifunctional Center (by ATP Architects Engineers), Karamay Expo District Master Plan (by NBBJ), Yanlord Landmark (by NBBJ), Lazika Municipality civic building (by Architects of Invention), Cockpit Building (by Kas Oosterhuis/ONL), Gateways to Fryslân (by Monolab).

7. DESIGNED ACCOMMODATION FOR THE VEHICLE

Without self-driving cars, vehicles need to be left somewhere when their driver leaves. This consideration stretches from houses with integrated garages through to massive parking structures (sometimes even designed by prominent architecture firms).



1111 Lincoln Road

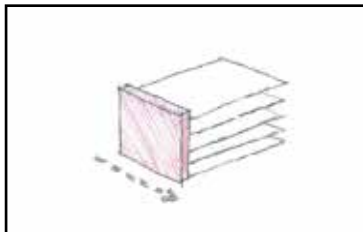
by Herzog & De Meuron

Notable as an intentional subversion of the common 'ugly' parking building which is concealed behind an attractive facade.

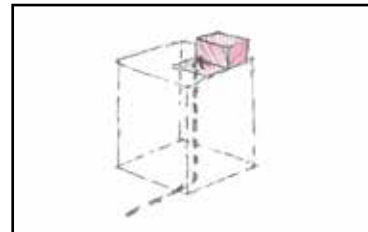
279 1111 Lincoln Road.» Herzog & De Meuron. HERZOG & DE MEURON BASEL, n.d. Web. 24 June 2016.



The spatial aspects of personal garages (dating back to the Modernists) are of interest in how people may enter buildings by driving directly inside.



'Parkitecture' is typically the design of large, utilitarian parking structures concealed by an aesthetic facade.



In the 'sky garages' trend, people enjoy the luxury of the personal garage - even while living in an apartment.

Notable Modernist integrated garages: Villa Savoye (by Le Corbusier), Villa Stein (by Le Corbusier and Pierre Jeanneret), The E. W. and Ben Levy House (by Walter Gropius with Maxwell Fry), Godoy House (by Hernandez Silva Arquitectos), The Cedar Lodges (by Adam Knibb Architects), Roadside House (by Naf Architect & Design)

'Parkitecture' examples: Danpalon lighting facade on Christchurch car parking structure (by Buchan Group), Pennsylvania Avenue Parking Garage (by Gehry Partners LLP), Collins Park Place (by Zaha Hadid Architects), Parking Structure Art Facade (by Rob Ley Studio), Parking Saint-Roch (by Archikubik), Ballet Valet Parking Garage (by Arquitectonica International Corporation)

'Sky garage' examples: 200 ELEVENTH AVENUE NYC (by Anabelle Selldorf of Selldorf Architects), The Porsche Design Tower, Miami (by Sieger Suarez Architectural Partnership), Hamilton Scott apartment building (developed by Hayden Properties)

USEFUL DESIGN STRATEGIES FROM CARCHITECTURE

Controlled openness



Fig.3.1 Angled facades - indirect but not entirely closed off.

'Openness' to the road is not a binary open/closed state. Some architects employ angled forms and indirect aspects onto the road to protect internal amenity while maintaining natural light and views. The attention to thresholds is relatable to the interface between public and private spaces.

Making marginal spaces valuable



Fig.3.2 The 'covered urban space' is a link from one side to the other - not an isolated pocket.

Some architects pointedly occupy marginal spaces around road infrastructure with activities due to the "idea that how spaces are imagined is often as important as their physical characteristics in determining their use" (Assemble Studio). These new (public) spaces are connected into the street network (e.g. A8ernA's under-motorway site is treated as 'covered urban space' and is linked to the public spaces either side). This link is important, as continuity, activity and passage are attributes of pleasant, safe public spaces.

Megastructures



Fig.3.3 Alternative movement paths over the main thoroughfare.

Carchitecture commonly utilises multiple levels. This suits the separation of movement paths – reducing the friction on the main road while allowing other modes of travel to negotiate a way around it. This also enables the stacking of different activities – to 'hide' low-amenity spaces such as parking or to add a 'place' into something otherwise purely utilitarian. These built-up structures are problematic to incorporate into the New Zealand context and the scale of these forms has more in common with the values of the technocratic Modernist than sensitive urban design. As Bell states however, some reappraisals of that zeitgeist offer a way to dismantle the road infrastructure as something inimical and disruptive to city living (123).

Double-scaling

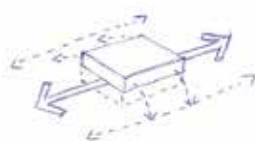


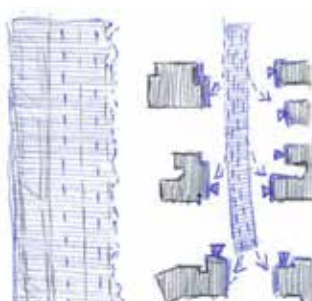
Fig.3.4 A valuable space built above the main thoroughfare.

The duality of scales is inherent with Carchitecture – as both infrastructure and architecture. It also acknowledges the dual experiences of the motorist and the pedestrian. This exercise shows inhabitable and useful spaces over and around the road are available to the designer. At a restrained level, placing designed spaces around wide, sweeping thoroughfares offers another way of breaking down busy road infrastructure as an impermeable, physical rift into the urban fabric.

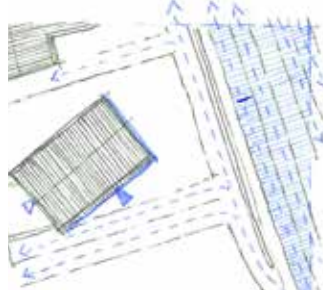
PRECEDENTS - VERNACULAR**THE PURPOSE OF THE VERNACULAR SURVEY**

This is a survey of how 'typical' New Zealand buildings interact with adjacent arterial roads. Variations are selected and used to gather design strategies for responding to roads. Examples are recorded as axonometric sketches. The spatial and geometric essence of the lot, the building and their relationship to the road are also diagrammed. Inherently, the vernacular architecture is less dramatically composed than the Carchitecture and this means that the important differences hinge on a few key aspects.

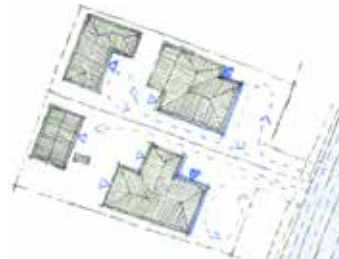
The survey focused on residential (low to medium density) and commercial activity centres (which could be important public spaces for a community).

A RESIDENTIAL OBSERVED RESPONSES TO ARTERIAL ROADS**A 1- Turns away from arterial roads**

~14 Carl Place, Auckland
Buildings turn backs on the Albany Highway.

**A 2- Controlled road access (slip lanes)**

~578 Glenfield Road, Auckland
Slow lane serves residences and minimises 'friction' on the road.

**A 3- Wide, open berms (minimal response)**

~92-94 Lincoln Road, Auckland
Residential plots set back from the road.



A key issue is the protection of private amenity at the expense of the public realm. The public-private space interface should be somewhat open - with lines of sight on to the street - as a series of blank, closed faces is not conducive to amenity values or safety.

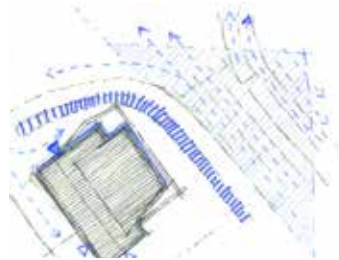
A 4 - Ancillary buildings / planting used to mediate street edge



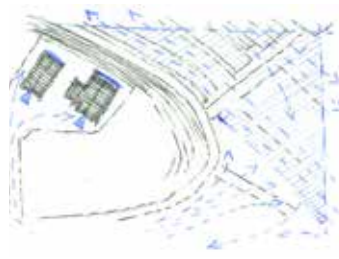
~201 Main North Road, Christchurch
Ancillary buildings, hedges and fences present a closed face to the road.



A 5 - Grade separation from the street edge



~618 Glenfield Road, Auckland
An occurrence rather than strategy - topology sets buildings below the road.



~4A Schnapper Rock Road, Auckland
Or above the road. The quality of the footpath suffers against a blank retaining wall.



A6 - Alternative 'front' spaces i.e. where the front is not aligned with the roadway



~152 Lincoln Road, Auckland
This distinctive 'sausage flats' form sits perpendicular to the road. The driveway becomes an uncomfortable neutral 'front' space and there is minimal outlook onto the arterial road. Similarly, the subdivision - with a front and back house - is also awkward where the back occupation is essentially facing the front's back.

~139 The Esplanade, Lower Hutt
Terrace housing parallels the road. Rear alley for circulation and parking.

~240 Main North Road, Christchurch
Motels often based around a central parking/circulation area.



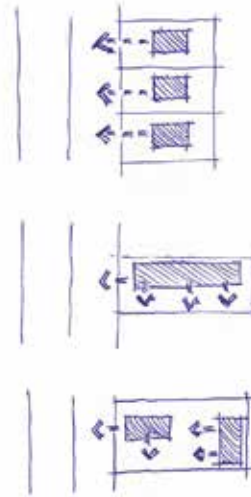
~298 Main North Road, Christchurch
Integrated garages and angled fronts.



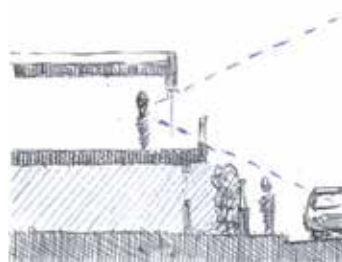
~101 Momorangi Cres., Christchurch
Flats perpendicular to main road with shared carpark.

A potential strategy is in the shared fronts. Fronts are the main entry to the property whereas the backyard is more private. See Fig.3.5. A design could manage shared front spaces that avoid the problems of the awkward sideways driveway/front, while avoiding the amenity issues of having this key space right next to the arterial road. In this way, there is a secondary 'public' space (not corresponding with the street) that the building fronts onto.

Fig.3.5. Regular lots fronting onto the street directly and two alternatives with an awkward (middle) and less awkward secondary 'front' space respectively (bottom).



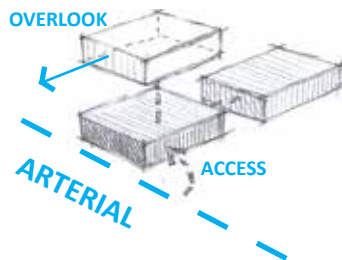
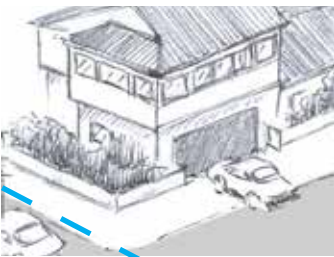
A 7- Protecting living spaces within the building



~2 Richmond Street, Lower Hutt
Outer balcony and fences may work to shield private spaces behind them from airborne noise (acoustic shadow principle).



DISCUSSION POINT: Screens are a psychological as well as physical measure in visually blocking out the busy traffic on the arterial road.

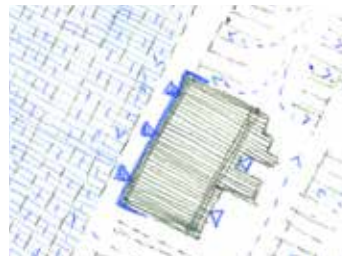


~177 The Esplanade, Lower Hutt
The living spaces occupy the upper floor and get best views and light. Street entry through the integrated garage.

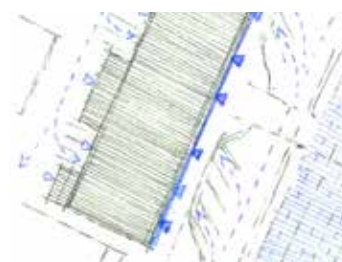


B - ACTIVITY CENTRE OBSERVED RESPONSES TO ARTERIAL ROADS

B 1- Parking spaces between activity and road

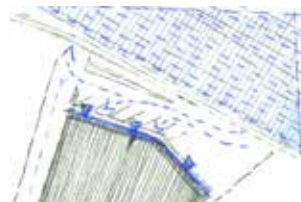


~806 Main North Road, Christchurch
Parallel parking is the only separation from footpath and through-traffic.



~436-440 Glenfield Road, Auckland
Slow lane created for those with the shopping centre as a destination.





~178 Albany Highway, Auckland
Separate parking lot off the road

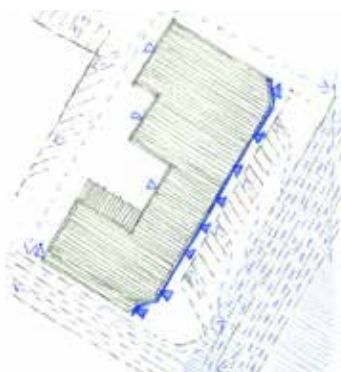


~226-250 Lincoln Road, Auckland
Big box retail typology with large parking lot off the street.

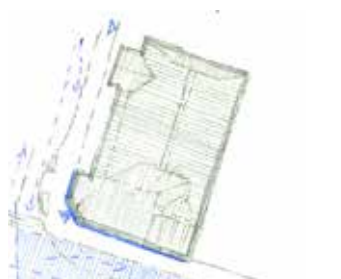


Centres of commercial activities suit arterial roads in that they benefit from the exposure to passing traffic and are less sensitive to amenity conditions (see p. 11). However these centres need to manage both the fast through-traffic as well as the participants in these activities. Streetscapes dominated by parking lots are a poor environment for pedestrians that have to negotiate around these lots.

B 2 - Mixed-use



~54 Lincoln Road, Auckland
Generous angle parking space beside the road. Space for staff parking, supply (i.e. a service lane) and circulation around the site. Residences on the second storey with sheltered outdoor spaces set back within footprint.



~2A Bay Street, Lower Hutt
Corner Store takes up arterial road edge - shields residence behind.



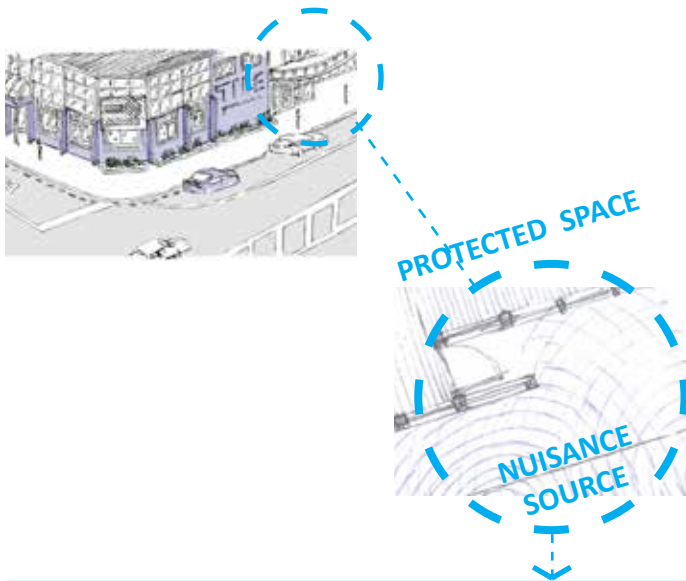
~414 Glenfield Road, Auckland
Commercial operations in residential building. Possible new amenity issues but less sensitive to road condition.



DISCUSSION POINT:

Mixed-use buildings benefit from positioning the commercial activity on the exposed frontage. Like the residential protection of living spaces, this also creates a buffer layer, given the commercial activities relative insensitivity to environmental conditions.

B 3 - Oriented away from the arterial road



~10 Nevis Street, Lower Hutt

Commercial showroom has entry around the corner - little concession to the public space on the arterial road.



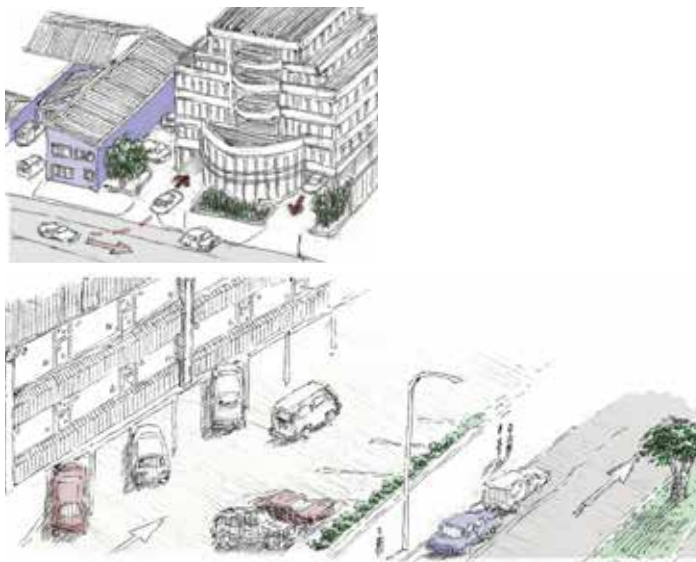
DISCUSSION POINT [1]:

Indirect exposure to the arterial road can be created architecturally through dog-leg entryways. The principle seen here supports developing an architectural strategy with indirect-aspect foyers, lobby and other threshold spaces.

DISCUSSION POINT [2]:

As can also be seen in some Residential and Activity Centre sketches, how the built form changes as it turns the corner off the arterial road is of interest. Some present the minimum form to the arterial and orient their front and entryway to the side road. Streetscaping is also sometimes employed to alert drivers to the different expectations (particularly speed) on the side road as a way of protecting amenity.

B 4 - Heavy construction and height



~75 The Esplanade, Lower Hutt

Some office buildings have parking integrated into the plan - allowing them to sit forward on the site and address the road.



~47 The Esplanade, Lower Hutt

Heavy construction and tall buildings can separate occupants from the road as well as offering more substantial insulation from outside conditions.



URBAN DESIGN ISSUES RAISED BY VERNACULAR PATTERNS

This survey of vernacular patterns (the relationships between typical buildings and adjacent arterial roads) offers both common issues for discussion as well as strategies for further testing.

Public and private amenity balance

The balance of public and private amenity is an important aspect of the designs to manage. This issue is identified in the Literature Review with very high traffic amounts encouraging the built form to 'turn its back' on the road (worsening the public space). Design can mitigate the physical and psychological components of nuisance – which is influenced by other senses (especially sight), activities and expectations (Luis and Coelho 212). Therefore a detailed investigation into architectural strategies for protecting sensitive living spaces (without closing off the façade) is needed.

Constraints from the existing suburban pattern

To accommodate different modes of travel and activities on the street, careful layering of space horizontally is necessary (where Carchitecture-style vertical layering is a drastic option) More separation will tend towards larger cross-sections and a significant part of the design work is in managing the changes of an existing arterial road and the public space at its edges. This change is constrained by the suburban pattern and conventional property access configurations. Altering this pattern successfully hinges on having complete control over whole blocks.

URBAN DESIGN STRATEGIES FROM VERNACULAR PATTERNS

Secondary front spaces

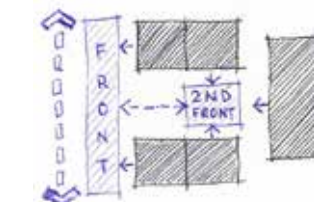


Fig.3.6. Secondary front

The 'backs' or 'fronts' condition extends to how the built form changes as it turns a corner off the arterial road and similarly building alignments which are oriented sideways or face into their site. There may be an awkward interface with the public space on the main road. Developed designs may need to create secondary 'fronts' that connect back to the arterial road (see fig.3.6).

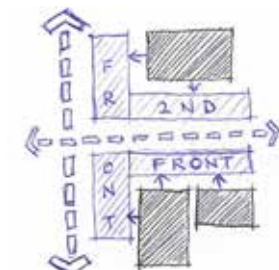


Fig.3.7. Secondary front at intersection

Streets running across the arterial road also offer secondary front spaces. These smaller cross-streets are likely narrower and less busy, suiting better public spaces than those directly beside the arterial road. With the right street layout, there may be regular high-amenity 'pockets' along the main road at each cross-street (see fig.3.7).

Localised 'slow lanes' at key centres

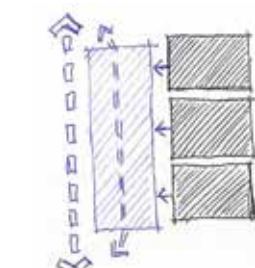


Fig.3.8. Separate slip lane for slow traffic

Activity centres need to manage through-traffic, vehicles parking / moving off and those making deliveries. To minimise the friction on the main thoroughfare, some separation is helpful. This could be a slow lane or a generous space for vehicles to stop/start without having to manoeuvre in the fast lane - disrupting traffic flow. Some examples of these are small and very localised – useful for key 'places' on arterial roads (see fig.3.8).

OVERALL PRECEDENT CONCLUSIONS

Main findings and relationships between the extracted strategies

Designed streets study

Dealing largely with the layering of spaces on the street (cycle lanes, reconfiguration and maximising usable outdoor space) these strategies are complicated by limited space. There emphasis shifts to prioritised, modest interventions. Also pertinent is a focus on the 'character' of a street and its social role e.g. as a 'main street' for an emerging community.

Carchitecture study

An architecture-focused study, the extracted strategies challenge road infrastructure to accommodate good urban and architectural spaces. This is seen in private/residential spaces designed in close proximity to the arterial road and in (active and continuous) public spaces running over, under and besides busy roads. The application of these strategies is constrained by an often overbearing scale however.

Vernacular study

As a closer-scaled look at the typical relationships between buildings, land parcels and the road, this study raised discussion points as much as strategies to test. The most promising strategy is in the creation of secondary front spaces (and similarly secondary/slow lanes) that are separated from the arterial road's busy traffic but relate back to it.

Common design issue – working with the existing patterns of development

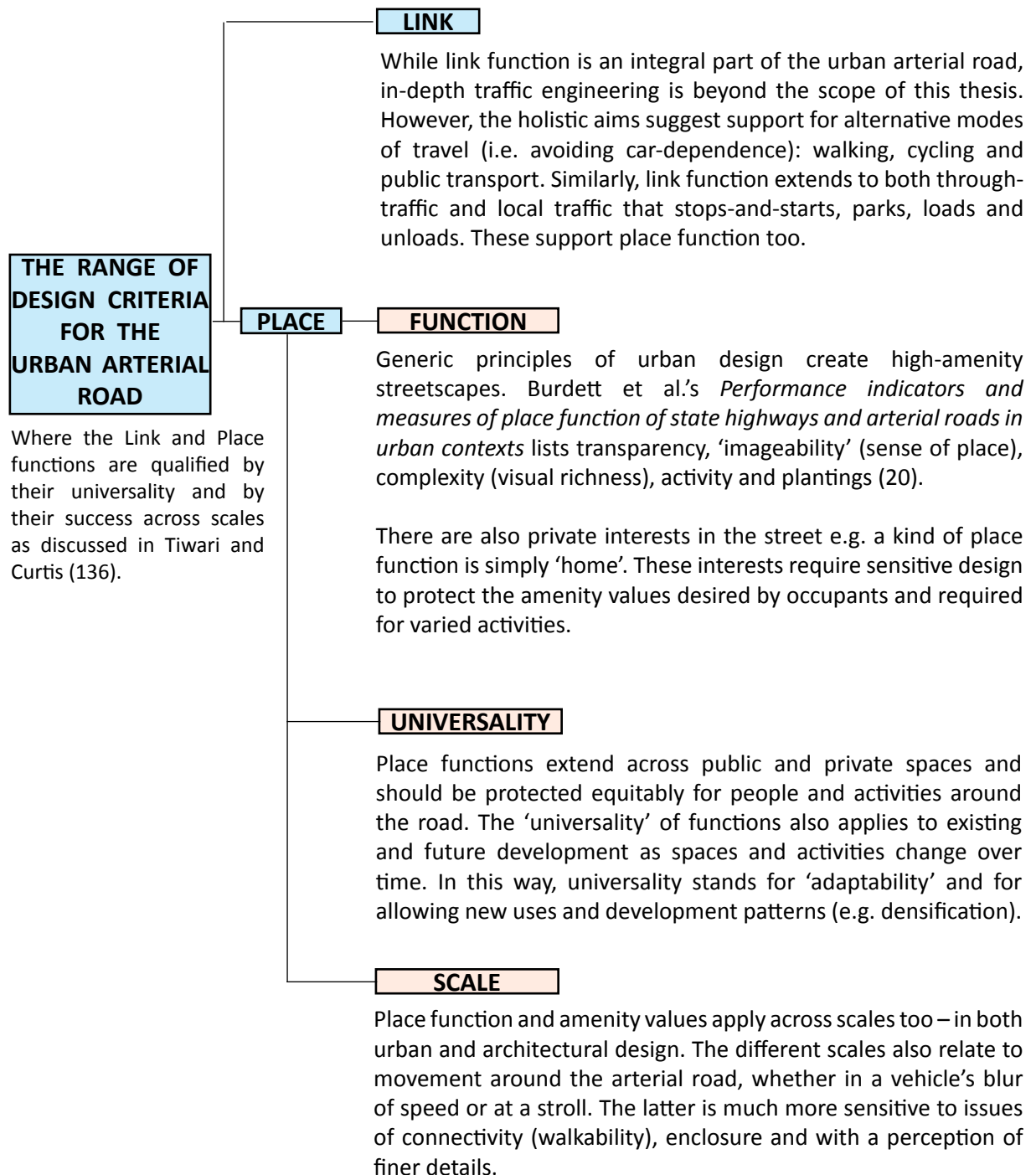
Both urban-level design strategies (e.g. Transit-Oriented Development and densification) as well as innovative architectural configurations must deal with existing property patterns. While the precedents often come from quite different contexts, successful adaptation of the strategies may come with consideration of relative priorities along the road and localised changes where suitable.

These findings in the rest of the thesis

The strategies extracted from these precedent responses to busy/arterial roads will contribute to the repertoire tested in the following sections. These strategies were collected from diverse sources with the designed streets (aimed at good public spaces), Carchitecture (of a mostly architectural nature) and the vernacular survey (of unself-conscious built responses). This contributes to the breadth of the options available and testing possible.

THE PURPOSE OF THE DESIGN CRITERIA

Deriving a range of design criteria creates a way of measuring the success of design case studies. These criteria are drawn from research and reflect the holistic and equitable aims for urban arterial roads discussed in the Literature Review. Appropriately, these criteria are structured like the conceptual framework for understanding the road (FUS-ion model, see Fig.2.6). These criteria are expected to be refined as the particular challenges of the urban arterial road become clearer in the design testing.



THE PURPOSE OF THE DESIGN STRATEGIES

Collected from the Literature Review and precedents, these strategies become more specific (in addressing arterial road issues) with rigorous design testing and evaluations. A direct connection is drawn here between principles and strategies.

URBAN DESIGN STRATEGIES

Some urban design principles here are generic but nevertheless contribute to high-amenity development on arterial roads. Other urban design principles are specific responses to challenges raised in the Literature Review (with Transit-Oriented Development, logistic issues and creating a 'pedestrian realm').

Desirable densification

[Place Function + Universality]

PRINCIPLE: Localised high-amenity densification supports sustainable development (avoiding sprawl and creating walkable centres) while creating an active place. Noise insulation, privacy, natural light and storage space are vital to comfortable and dense living. Other social considerations include secure parking, secure entrances and accommodating long-term occupants (Nematollahi et al. 2).

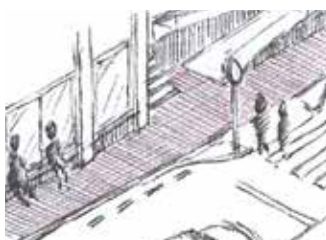


STRATEGY: Medium density offers a moderately increased use of space. The compact, low-maintenance dwellings with small gardens are compatible with the existing suburban lifestyle (Nematollahi et al. 8).

Walkability

[Place Function + Link Function + Scale]

PRINCIPLE: Centres benefit from active street-life and when walking is a viable way of getting around. Pedestrian networks should be continuous, ubiquitous, efficient and with different paths available.



STRATEGY: Path surfaces, width and easy crossings contribute to walkability. Architectural pedestrian concessions include small walls, ledges, balustrades, stairs and ramps at the edge of the buildings and the street (Garbrecht 105). Narrow, interesting lots encourage pedestrians.

Mixed use

[Place Function + Universality]

PRINCIPLE: Proposed and existing land uses should synergise and support a healthy (convenient and safe) balance of residential, employment and recreational activities (Ministry for the Environment's *Value of Urban Design* 46).

STRATEGY: Buffers (such as small businesses) by the road edge protect sensitive living areas above and behind. Commercial activities may use rear-lanes which can be developed over time. Design should accommodate multiple and future uses (see *People, Places, Spaces* 46).

PRINCIPLE: A multi-modal transit system integrated with land uses is efficient and helps support centres of employment, shopping, services and densified housing.

'Active management' of the street spaces

[Link Function + Universality]

PRINCIPLE: Different kinds of traffic (e.g. deliveries, buses) and their logistical demands must also be managed to protect public amenity.



STRATEGY: Active management of loading zones and shared lanes (perhaps reserved for particular uses at different times of day) maximise available curb space (Kawamura 52). Driveway prominence is minimised by sharing them between occupancies and using back lanes.

Creation of a 'pedestrian realm'

[Place Function + Scale]

PRINCIPLE: The pedestrian space on the arterial road should be a high-amenity space contributing to its place function.



STRATEGY: The pedestrian realm is defined by uninterrupted median strips and lined plantings. Drivers using this 'slow lane' – not the main thoroughfare – should be cued to different behaviour by narrowness, surface treatment and regular crossings (see Jacobs, Macdonald and Rofé 108).

Acoustic shielding

[Universality]

PRINCIPLE: The acoustic shadow principle should be used to arrange the built form to protect sensitive spaces from noise nuisance (see fig.4.5).



Fig.4.5 Acoustic shadow

STRATEGY: Buildings are arranged to protect sensitive areas from intrusive sound (see fig.4.6). This method works only with consistent shielding. Large blocks with wide open spaces tend to be used only for car parking (see fig.4.7).

Noise nuisance is also influenced by other senses (especially sight), activities and expectations (Luis and Coelho 212). Similarly, Jacobs, Macdonald and Rofé write that the generally improved pedestrian environment on boulevards "can effectively reduce the psychological impact of traffic" (210).



Fig.4.6 Line of acoustic shadows



Fig.4.7 Unprotected central space - lost amenity.

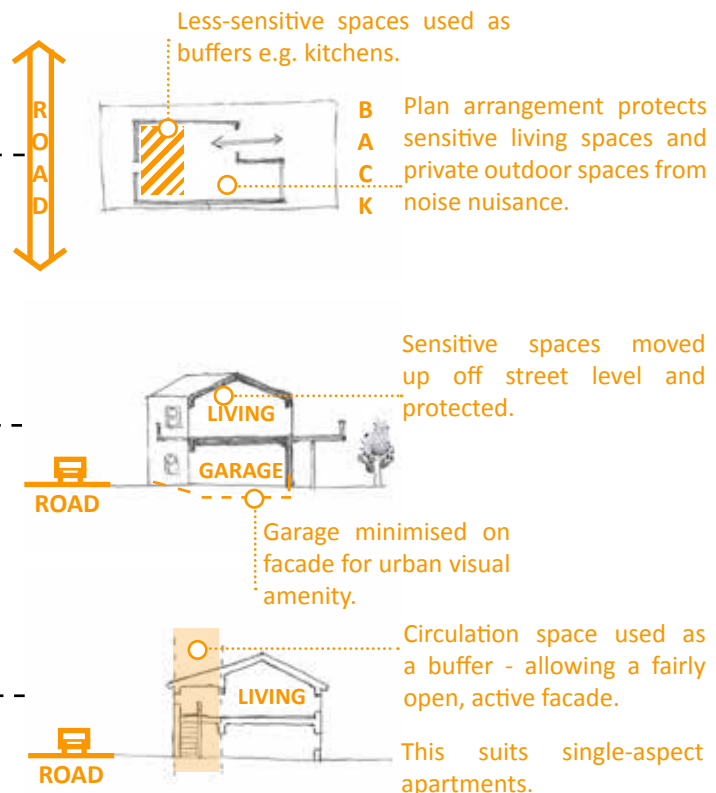
ARCHITECTURAL DESIGN STRATEGIES

The architectural design strategies focus on planning layout to protect private amenity in the most sensitive spaces while touching on the building's envelope and thresholds. These principles are adapted from good practice guides to emphasise the arterial road condition. One source is the *Good Solutions Guide for Apartments* by Aaron Sills, Diarmaid Brophy, and Krystina Kaza. *The Noise Control* appendices from Geoff Milne, Chris Reardon, and Paul Downton's *YourHome: Australia's Guide to Environmentally Sustainable Homes* deal directly with noise nuisance caused by traffic.



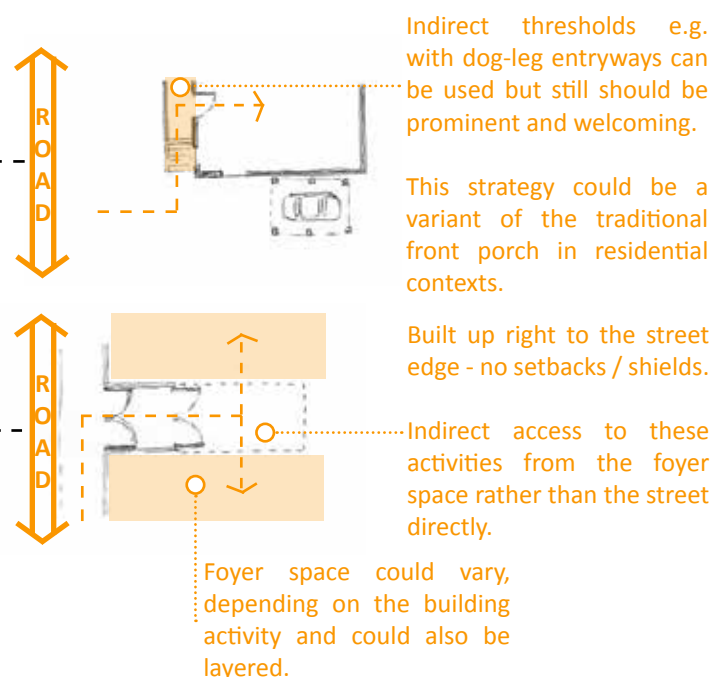
PRINCIPLE: Buildings may block off the road to protect (private) amenity. This worsens the public space on the street front.

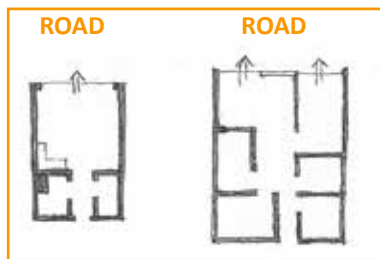
Strategies can protect private amenity while retaining an open facade that engages the street.



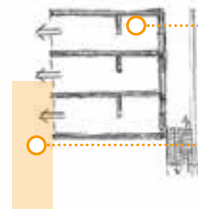
PRINCIPLE: (Road side) exterior doors and windows that open directly onto sensitive space may cause nuisance from the road traffic.

Strategies for indirect thresholds between road and interior may help.



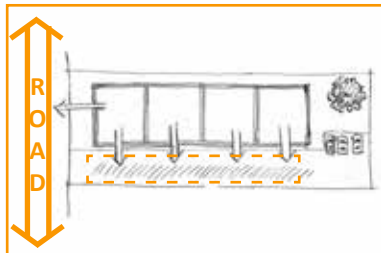


PRINCIPLE: A variety of housing options are important to underscore that arterial roads can be hosts for more than just cheap, temporary accommodation.



Deep plans present smaller surfaces to the road.

The circulation at the front of the building - expressed on the street face and used as a buffer space between road and apartments.

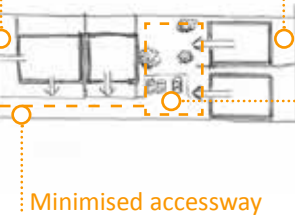


PRINCIPLE: Avoiding the sausage flat typology that creates an awkward 'front' space along the driveway.



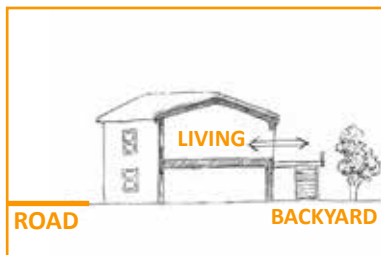
Addresses the street (although frontage not much improved).

Private outdoor spaces are important to inhabitants.

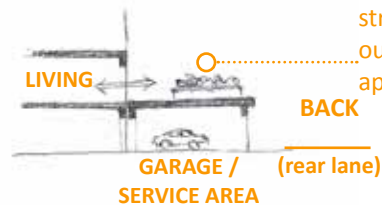


Secondary front space with overlooked, shared spaces and parking. Connected to the street.

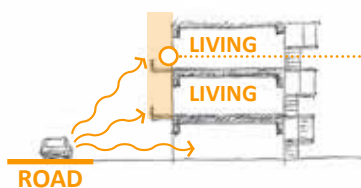
Minimised accessway



PRINCIPLE: Private outdoor spaces should be connected to living areas - they are important to residents. This can be difficult to arrange at higher densities or where the arterial road is north of the residence (leaving only a southern aspect for the outdoor space).



Commercial or parking structures below support outdoor space for apartments above.



Balconies are outdoor space and acoustic shields (provided that the sound reflections are managed) providing a layer of separation from the internal living spaces.

DESIGN STRATEGIES CONCLUSION

The urban strategies revolve around development planning (i.e. walkable catchments of densified occupation and activity) and strongly interrelate as well – suiting a holistic idea of urbanism. The architectural strategies deal mostly with the building layout and envelope – layering spaces and surfaces to protect the most sensitive internal spaces. These strategies are tested in design case-studies. This testing refines the repertoire of strategies and may offer new, developed strategies.

PETONE ANALYSIS

PETONE INTRODUCTION

Petone is a valuable area to study. This is due to the nature of the arterial roads here and the factors imposing on them to make a balance of capacity and amenity critical. While the proposed Cross-Valley Link (new east-west high-capacity road) is relevant to the thesis aims, the existing arterial roads are also interesting. These maps use information from the Lower Hutt City Council's *District Plan*.

Fig.5.1 The Esplanade is the current primary east-west route, although another Cross-Valley Link is proposed - possibly following the rail line (shown in solid black).



The Esplanade is the current main east-west route in the lower half of the city, connecting the greater region with Petone and industrial centres Seaview and Gracefield. The large volumes of traffic ("higher than many of the region's state highways) cause congestion, affect economic development and amenity values (*Hutt City Economic Development Plan* 32). The NZ Transport Agency also identifies "community severance" and a "poor level of service for cyclists and pedestrians" (Brennand and Bell 11).

Fig.5.2 Strongly gridded planning evident in Petone.



Fig.5.3 Existing Amenity

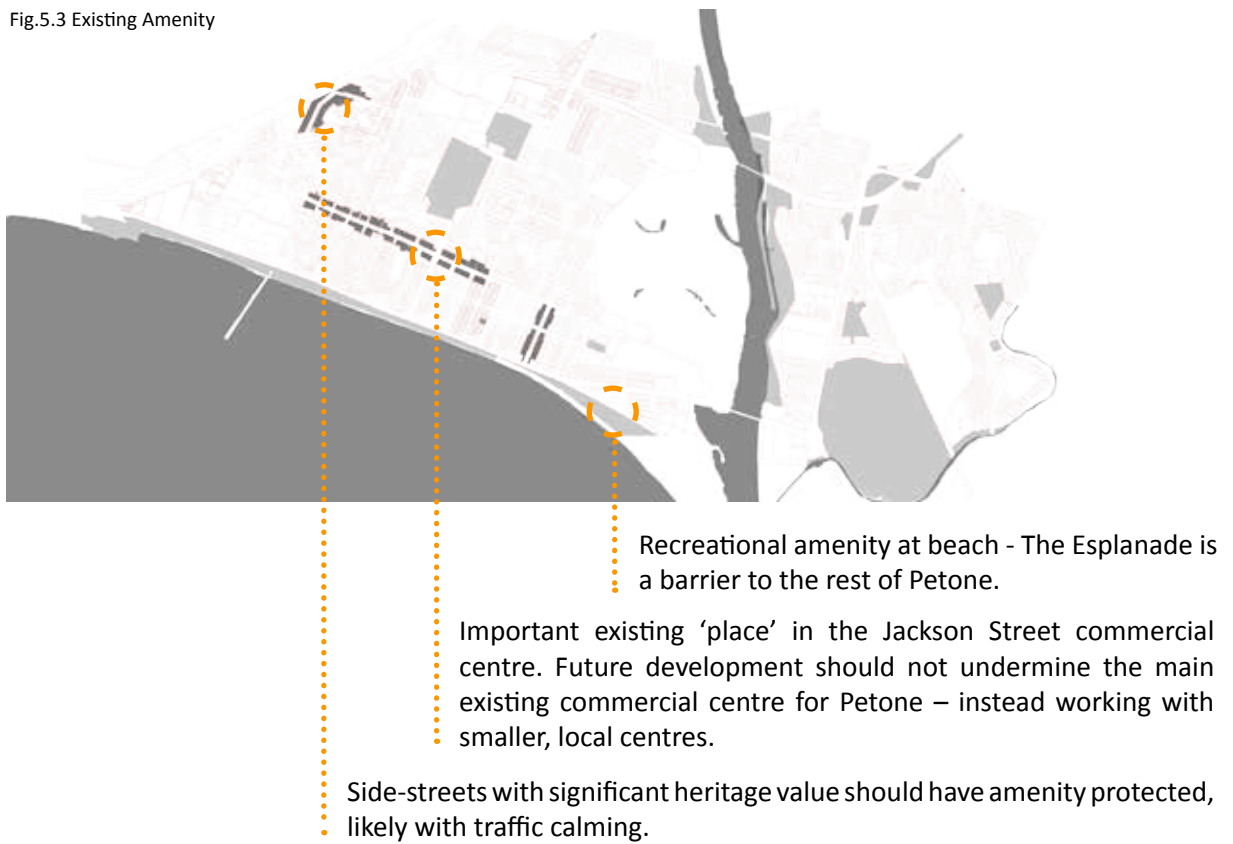


Fig.5.4 Designated medium density housing focused on the arterial roads.



Commercial activities (shown with muddy overlay) dominate western Petone and the important south-west gateway to Hutt Road and The Esplanade.

Fig.5.5 Centres



Designated suburban centres dotted on arterial roads. Particularly noticeable on Cuba Street (although southern end is served by the Jackson Street commercial area) and Randwick Road.

CONCLUSION

The Petone roads have both capacity and amenity needs but as illustrated by these maps, there are multiple dimensions to this condition. These roads are significant connectors across the region and also host designated suburban centres and medium-density zoning. Due to the geography and history of Petone, these roads also relate to (and affect the quality of) important places. These places include the 'gateways' to the region, the beach separated from the rest of Petone by The Esplanade, heritage areas and existing centres.

From here, urban-scale issues and strategies are investigated across Petone. The broader, holistic view helps to ground detailed, immediately responsive designs within the larger context.

DESIGN ITERATION 1 - PLAN-BASED

PURPOSE

Extending the Designed Streets research, case studies are overlaid onto arterial roads around Petone and adjusted to 'work' (on some level). This plan-based exercise is helpful in illustrating the essential differences between overseas examples and local context while enabling decision-making about the spaces to redevelop.

DONOR ROADS

OCTAVIA BOULEVARD
Standard boulevard



41 metre
cross-section.

WEST LANCASTER BOULEVARD
Reallocation of road space



31 metre
cross-section.

ST KILDA ROAD
Large boulevard,
maximum amenity

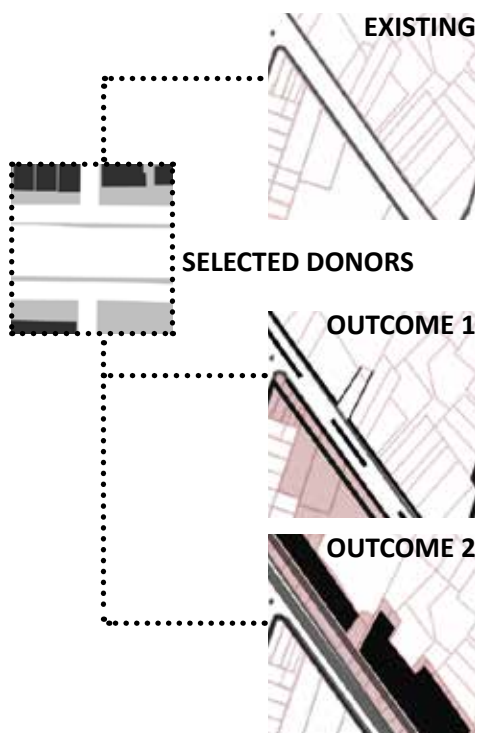


60 metre
cross-section.

HIGGINS AVENUE
Protected cycling
lanes



30 metre
cross-section.



-Grey lines indicate the width and layout of footpaths and medians.



-Solid black boxes indicate required new buildings or a completely redesigned street front.



-Affected parcels (by the overlaid street plan) highlighted in light red.



-Existing Petone land parcels

THE ESPLANADE TESTS



EXISTING

**A - West Lancaster Boulevard transplant**

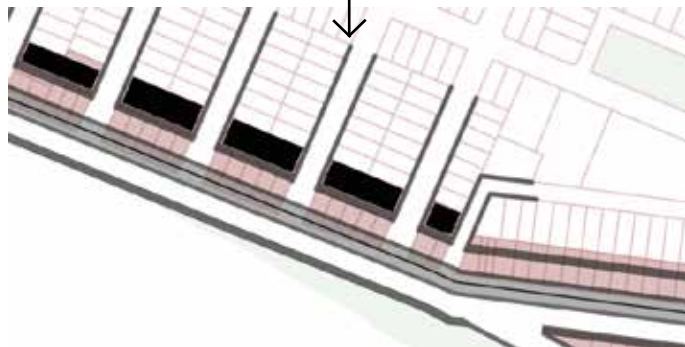
This is a modest proposal where the road design occupies some property frontages. The recreation area (beach) must be protected from road encroachment so additional width comes solely from the residential frontage. The whole street front on that side is redesigned.

The intent of this intervention is to parallel the Jackson Street commercial area and improve access to the waterfront with generous medians (aiding crossings of the wide road).

**B - St Kilda Road transplant**

A vastly enlarged road requires a new street front. Even after removing two lanes, the civic-scale boulevard is massive (especially if the central reservation accommodates rail lines) and Lower Hutt's urban planning would have to focus around this development.

These intersections also need controlled access to avoid slowing through traffic.





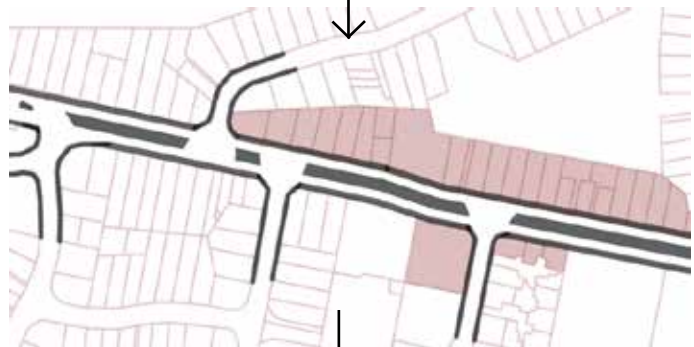
EXISTING



A - West Lancaster Boulevard transplant

Generous medians / central parking spaces should make crossing the busy road easier. This suits important locations around the shopping centre and school though it requires detailed design to ensure clutter and the middle-parking is not a hazard.

This Randwick test is effectively bottlenecked by the north bridge that crosses the rail line unless that structure is redesigned. Randwick Road redesigns are limited by existing character and physical constraints at the bridge and Moera's suburban centre. Smaller cross-section templates can be applied to reconfigure the existing space with minor impacts on neighbouring activities.



B - Higgins Avenue transplant (protected cycle lanes)

Despite the popular cycle route along the rail line, protected cycle lanes leading directly to the school and shopping centre are valuable. Again, detailed design is needed to consider safe intersections and incorporation of the existing planted frontages for character and amenity.



HUTT ROAD AND WAKEFIELD STREET TESTS



HUTT ROAD



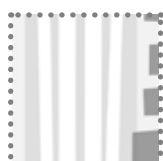
EXISTING



A - Higgins Avenue transplant



B - Octavia Boulevard transplant



C - St Kilda Road transplant

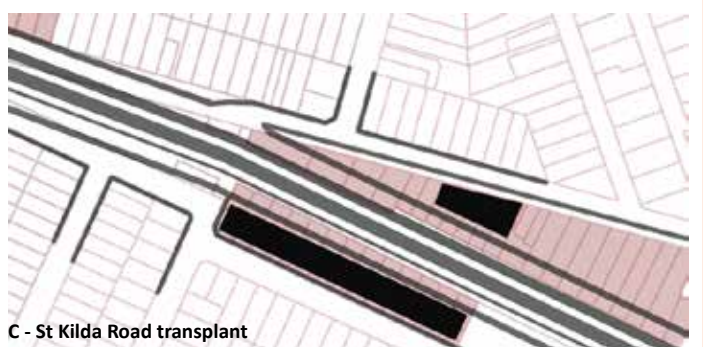
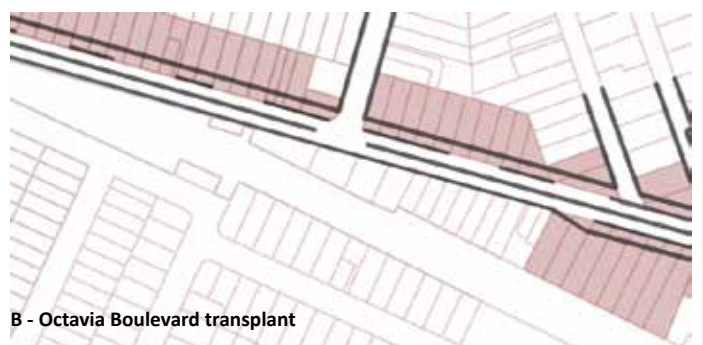
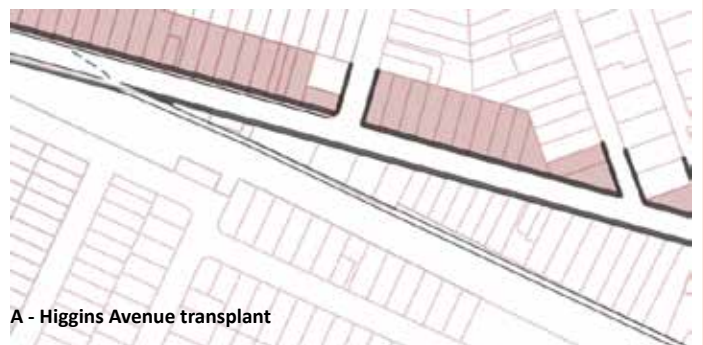


Running cycle routes independently of the actual road (here by the rail lines) help where road widths are constrained - although this does create a 'messy' plan.

The boulevard overlay is altered by the asymmetrical nature of this road where one side is built up, and the other has a landscaped buffer. In some parts of the layout two or three lanes are used - one of which is 'slow' for local traffic - although this creates an awkward patchwork configuration.

Complicated and wide road cross-sections have problematic intersections (especially with the obliquely-angled roads in this area). Key architectural redevelopments may raise perceived amenity.

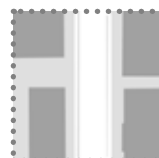
A north-south cycling or walking route connected but separate from the road is investigated here. However, it is difficult to create a good urban space there due to less activity and route past the 'backs' of existing development.



CUBA STREET TEST



EXISTING

**Higgins Avenue transplant**

A north-south cycle route is valuable as part of the region's larger cycling network. This transplant suggests that incorporating a lane could require little extra road space.

Again, more detailed design is necessary to resolve complicated intersections and how the cycle lanes travel past the bridge (whether up and over, or another path).

CONCLUSIONS

Unsurprisingly, the most complicated cross-sections are also the most problematic - with multiple lanes of travel and occupation of private property. It is apparent that some roads may accommodate widening in some sections but the built form creates a chokepoint in others. In this way the exercise identifies critical stretches on different roads that may require redesign if the width is increased. Some of the wider transplants would require the rebuilding of a whole street and decidedly affect the strategic planning of the whole area. This runs contrary to the intentions of measured 'retrofitting'.

The exercise shows the difficulty of 'creating' the extra space that the donor high-amenity, high-capacity streets have. Imposing a new consistent width along the arterials is fraught, especially where existing amenity-values need to be negotiated. This affirms the design intention to work with a minimal-intervention strategy focused on priority considerations for the greatest effect on amenity.

DESIGN ITERATION 2 - URBAN MOVES

PURPOSE

This exercise offers a wide look at selected thoroughfares in Petone. It draws from the plan-based cut-and-paste exercise that preceded it with regards to the limits of road configuration. As an early exploration, this exercise also picks out issues and potential responses. A comparison between the different arterial roads allows the thesis to narrow in focus and engage in productive closer-scaled, in-depth testing on a chosen road. The broader focus of these first urban exercises will also inform the smaller-scale testing, having studied the greater context around them.

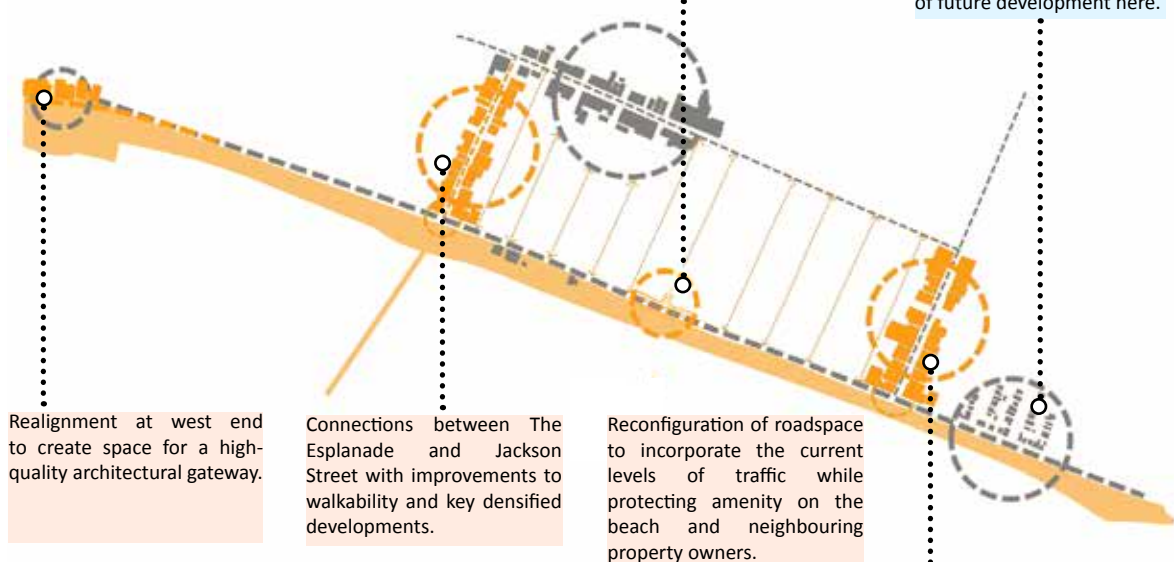
DESIGN ISSUES:

The entry to The Esplanade from State Highway 2 is dominated by commercial buildings.

Lack of connections between the beach south of The Esplanade and the Jackson Street commercial centre to the north.

Another 'one-sided' road, due to the beach reserve (and historic buildings) bordering the southern edge. These are an important amenity to protect.

Existing layout of residential area is already quite dense and some areas are protected due to their heritage significance. This is an issue affecting the nature of future development here.



Realignment at west end to create space for a high-quality architectural gateway.

Connections between The Esplanade and Jackson Street with improvements to walkability and key densified developments.

Reconfiguration of roads to incorporate the current levels of traffic while protecting amenity on the beach and neighbouring property owners.

Development of key thresholds to mark other main arterial roads (such as Cuba Street).

DESIGN RESPONSES:

DESIGN ISSUES:

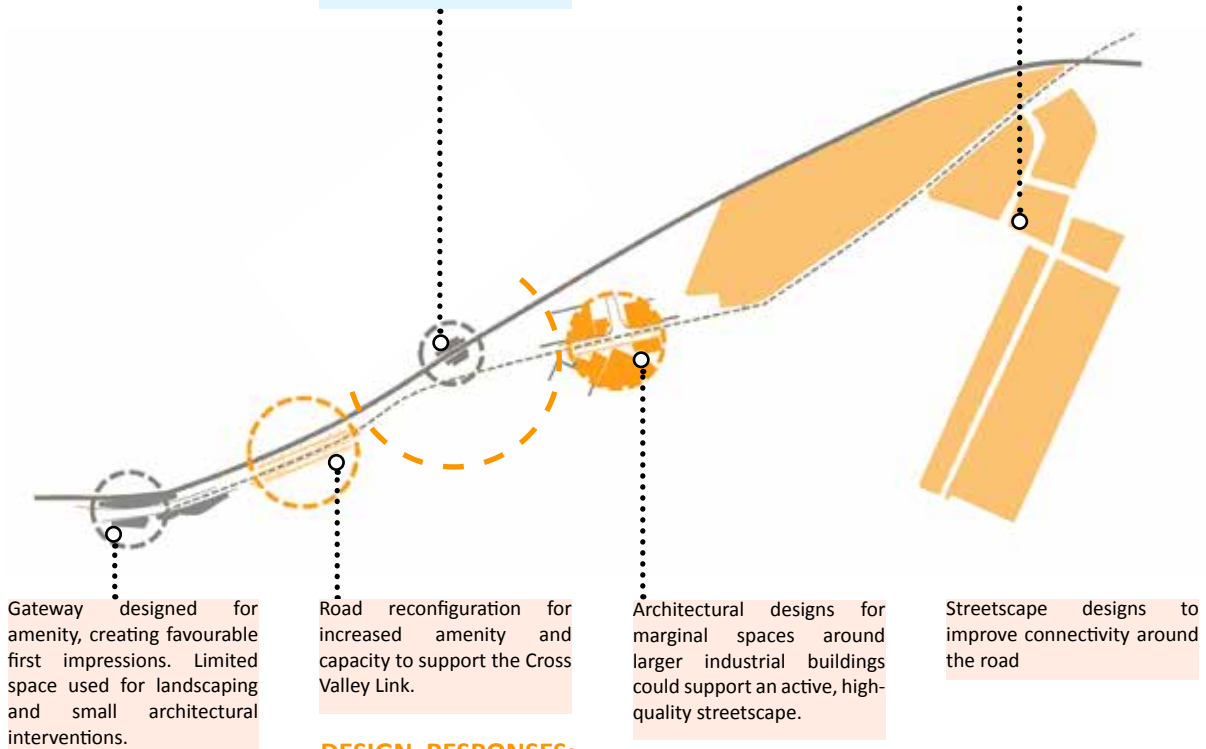
The southern end of Hutt Road has a key 'gateway' for those entering Lower Hutt.

Petone railway station at the end of Jackson Street. This could be developed into a walkable, developed precinct around the public transport

Some difference in amenity sensitivity and streetscape character between commercial operations and residential areas.

HUTT ROAD

Residential community has a tenuous connection to the rest of the Petone residential area.



DESIGN RESPONSES:

DESIGN ISSUES:

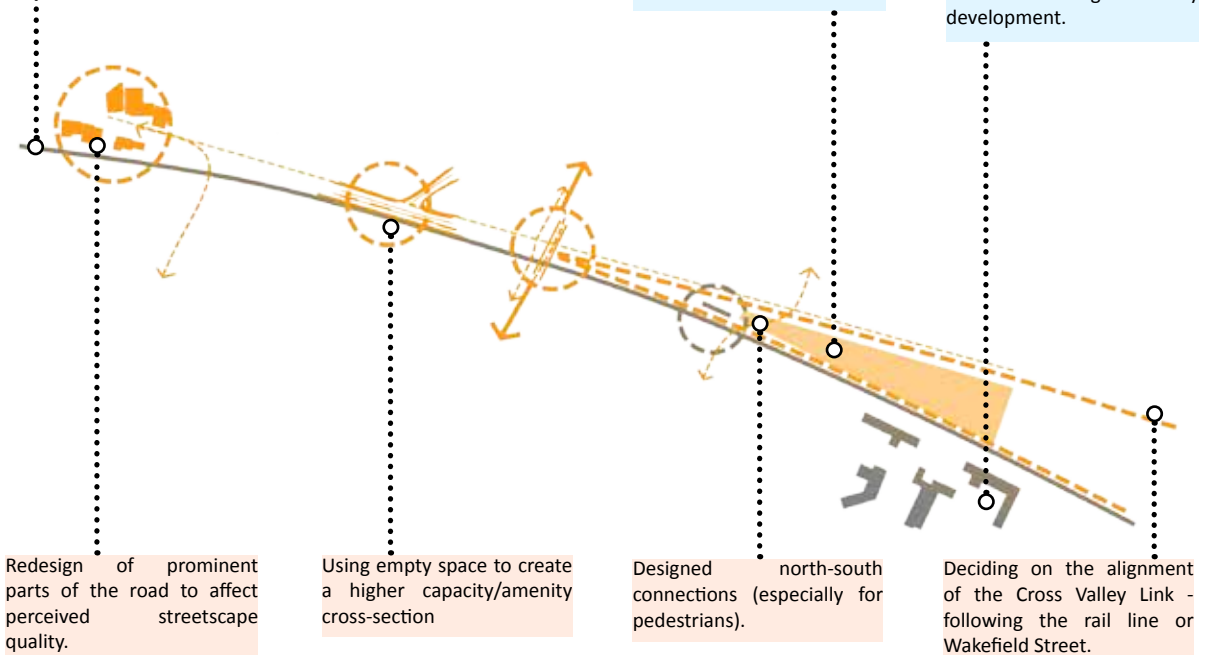
The rail line (with big box retail behind) effectively closes one edge of the street.

Not very walkable - large blocks of long and closed facades at west end.

This row of housing affected by potential Cross Valley Link route. Narrow wedge significantly altered by widened road.

High-rise apartments near rail line and potential Cross Valley Link. These are contextual precedents for new higher-density development.

WAKEFIELD STREET



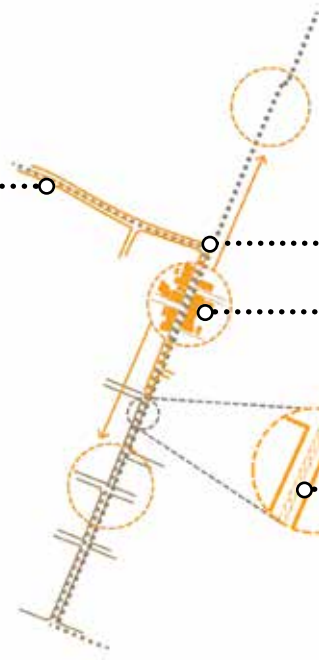
DESIGN RESPONSES:

CUBA STREET DESIGN RESPONSES:

DESIGN ISSUES:

Udy Street mentioned as a potential route for the Cross-Valley Link (see *Ngauranga Triangle Strategy Study*). Needs consideration of the new demands.

Cuba Street is a key north-south arterial route to the city centre. The (strategic) nature of future development on it is important.



Investigation as to if Udy Street could accommodate cross-valley traffic.

Densified development on walkable centres along this arterial road as per Transit-oriented Development.

Reconfiguration of roadscape to balance capacity with amenity.

Development of north-south connections along arterial road in walkability and for alternative modes of transport.

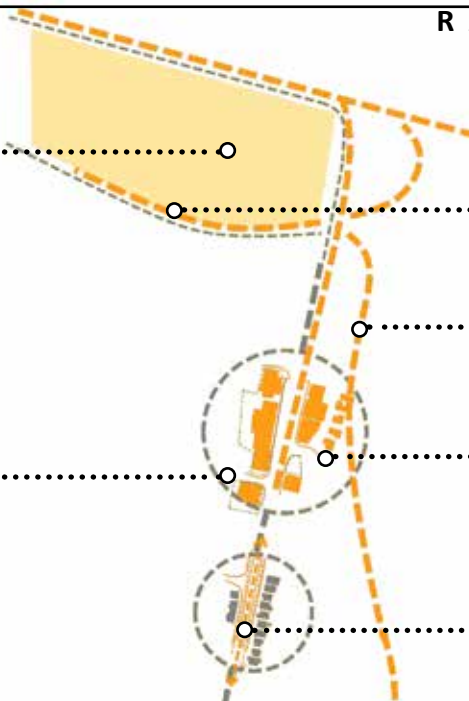
DESIGN ISSUES:

Community could be isolated between rail and Cross-Valley Link if the link follows the Wakefield Street alignment.

The intrinsic problem with a new Cross-Valley Link is with the indirect route - traffic having to head north and then south again.

Must maintain the amenity of the existing suburban centre, Moera.

The existing low-density suburban character is a constraint on context-sensitive design options.



RANDWICK ROAD

DESIGN RESPONSES:

Potential connections onto the Cross-Valley Link - as following the rail line would be a back route with nothing fronting onto the new arterial road.

Potential 'opt-out' plan by simply aligning to Cross-Valley Link east along the existing rail right-of-way.

Redesigning a new consolidated, high-amenity suburban centre.

Reconfiguration of the road to allow for increased capacity while protecting amenity

CONCLUSION

While the Cross-Valley Link is a topical challenge for urban design in Petone, it is a special situation. The difference comes from being a proposed new arterial road, a one-sided nature (flanked by the railway line) and the odd intersections and wedges created by the Hutt Road-Wakefield Street alignment. These factors could contribute to a formally dramatic design response but the atypical nature makes the project less relatable and thereby less useful to other arterial road projects elsewhere.

Cuba Street is important to the research objectives as a generic arterial road where tested and refined design strategies and criteria become more applicable.

CUBA STREET ANALYSIS AND FOCUS AREAS

EXISTING

INTRODUCTION

As seen in the Petone analysis, Cuba Street is lined with medium-density zoning (orange overlay) and has 'suburban centres'. This planning aligns with the thesis intentions for testing targeted, transport-oriented, densified development on arterial roads.

Abutting streets

Cuba Street connects The Esplanade, Jackson Street, Udy Street and is currently bridging Wakefield Street. Jackson Street has low capacity - with lots of 'friction' from slowed traffic around the street's primary function as a retail destination. Udy Street is a secondary connection between two arterial roads (Hutt Road and Cuba Street).

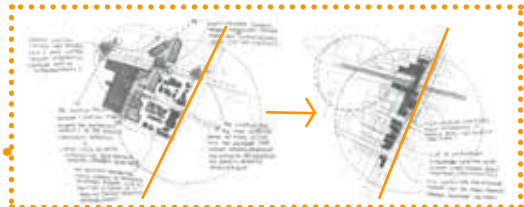
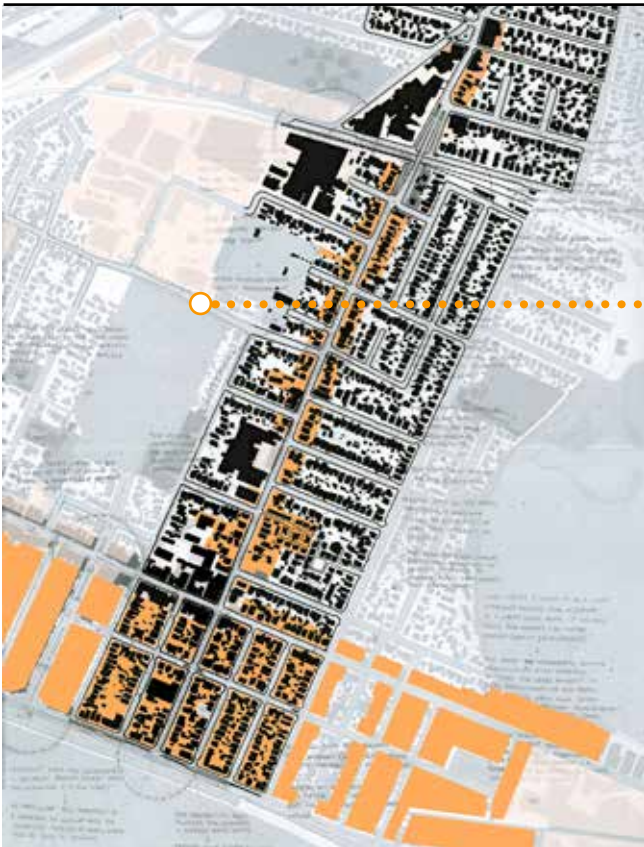
DESIGN APPROACH

The Wakefield Street Bridge (Focus Area 2)

Suits Carchitecture-style strategies of multi-levelled movement and incorporation of transit (with a shifted Ava Station).

Development precincts (Focus Area 1)

Measured design moves are key. These include improving poor frontages and creating a series of walkable centres with good 'place function' - though without detracting from existing places e.g. Jackson Street.



DESIGN ITERATION 3 - SECTION-BASED

PURPOSE

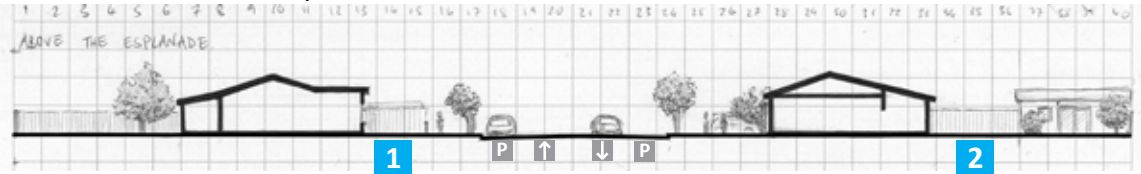
As a complementary exercise to the plan-based designing, this cross-section study deals with different aspects of the arterial road such as the design of the vertical planes that affect the perception of space. The process here shows existing cross-sections (and with minimal adjustments), through to entirely redesigned street sections. There is value in contrasting projected benefits of minimal intervention against those of greater redevelopment.



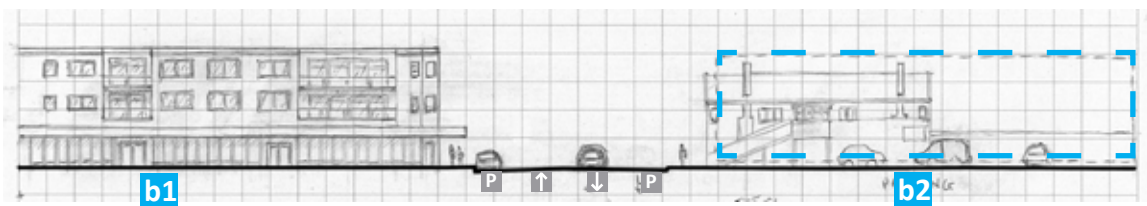
EXISTING SITUATION ANALYSIS

A - Street section between The Esplanade and Jackson Street

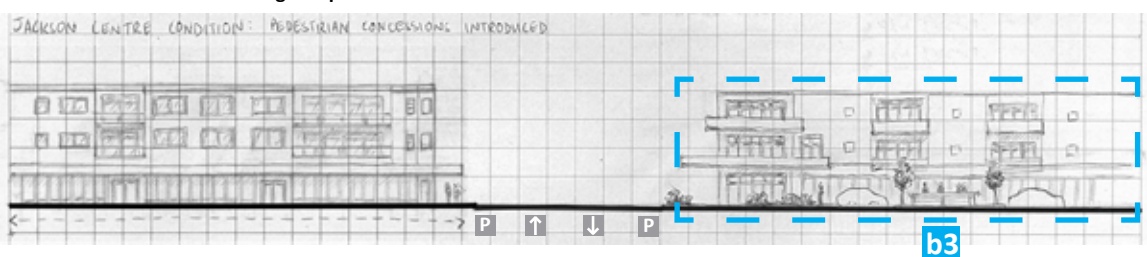
ONE SQUARE - 2.5 metres



B - Street section at the Jackson Street intersection



B2 - Jackson Centre -infill design response

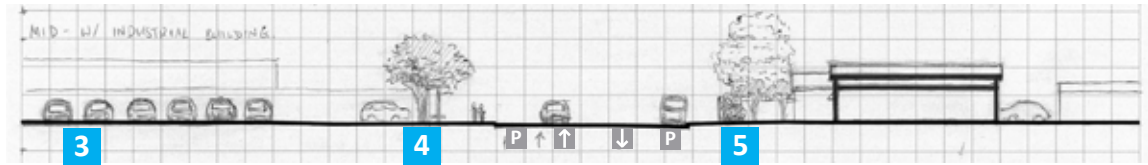


b1 Mostly built up around Jackson Street centre.

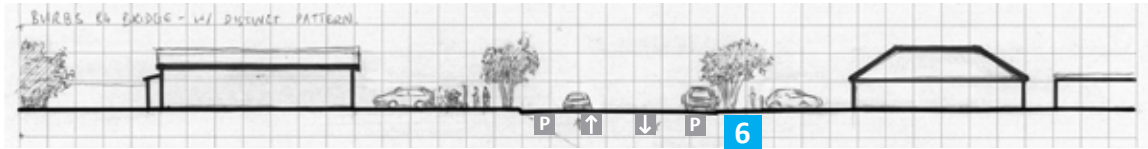
b2 Vacant space observed - could be built on.

b3 Balconies, plantings and seating that can occupy some road space. Consistency of urban values.

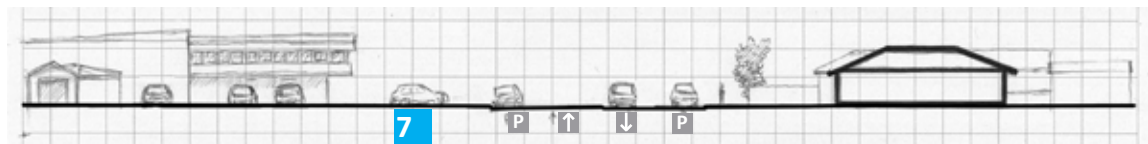
C- Street section between Emerson and High Streets



D- Street section between Bouverie and Burnham Streets



E- Street section between Central Terrace and Montague Street



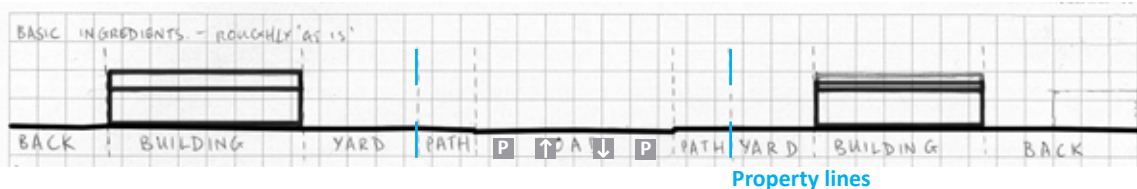
- 1 Suburban pattern dense at south end - smaller buildings and yards.
- 2 The backyard and shed are common residential features.
- 3 Large carparks at streetfront worsen amenity.
- 4 Bus stop shelter (isolated at present).
- 5 High fences/vegetation used as a screen.

- 6 Regular trees and plantings down Cuba Street.
- 7 Asymmetry of residences opposite commercial activities

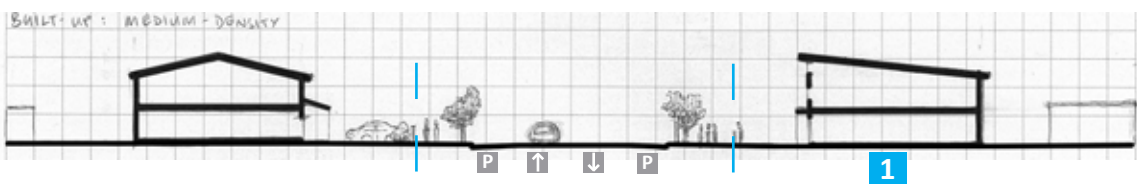
DESIGN OPTION ANALYSIS

A - Basic components of the arterial road and adjacent spaces

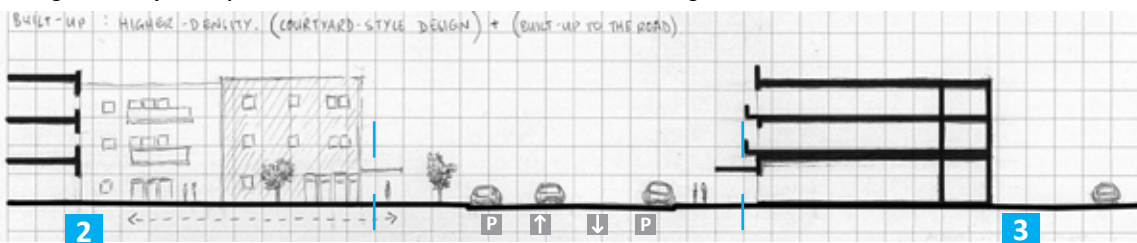
ONE SQUARE - 2.5 metres



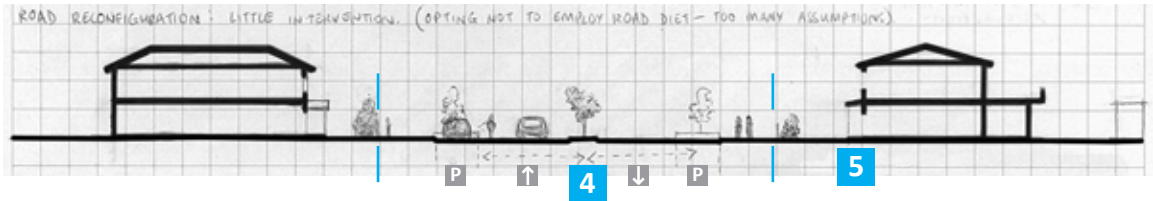
B - Medium-density development - two floors



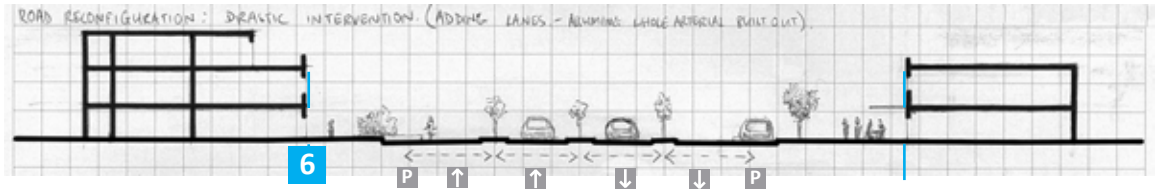
C- Higher-density development - three or more floors and minor road reconfiguration.



D- Moderate road reconfiguration - median and footpath extends out into roadspace at crossings for pedestrians.



E- Drastic road reconfiguration - additional lanes



- 1 Medium-density housing can retain the current outdoor spaces (e.g. yardspace) when building higher on compact floor plans.
- 2 Courtyard development creates front spaces off the street. By necessity designed to engage street while protecting private amenity.
- 3 Rear lanes can accommodate big development parking and supply logistics off the arterial road.
- 4 Encroaching on road can make it easier to cross

and more planting supports visual amenity.

5 With moderately increased roadspace, the built form may need to be altered to retain a front yard.

6 Significantly altered road configuration and size demands a different built form and would change the street character entirely.

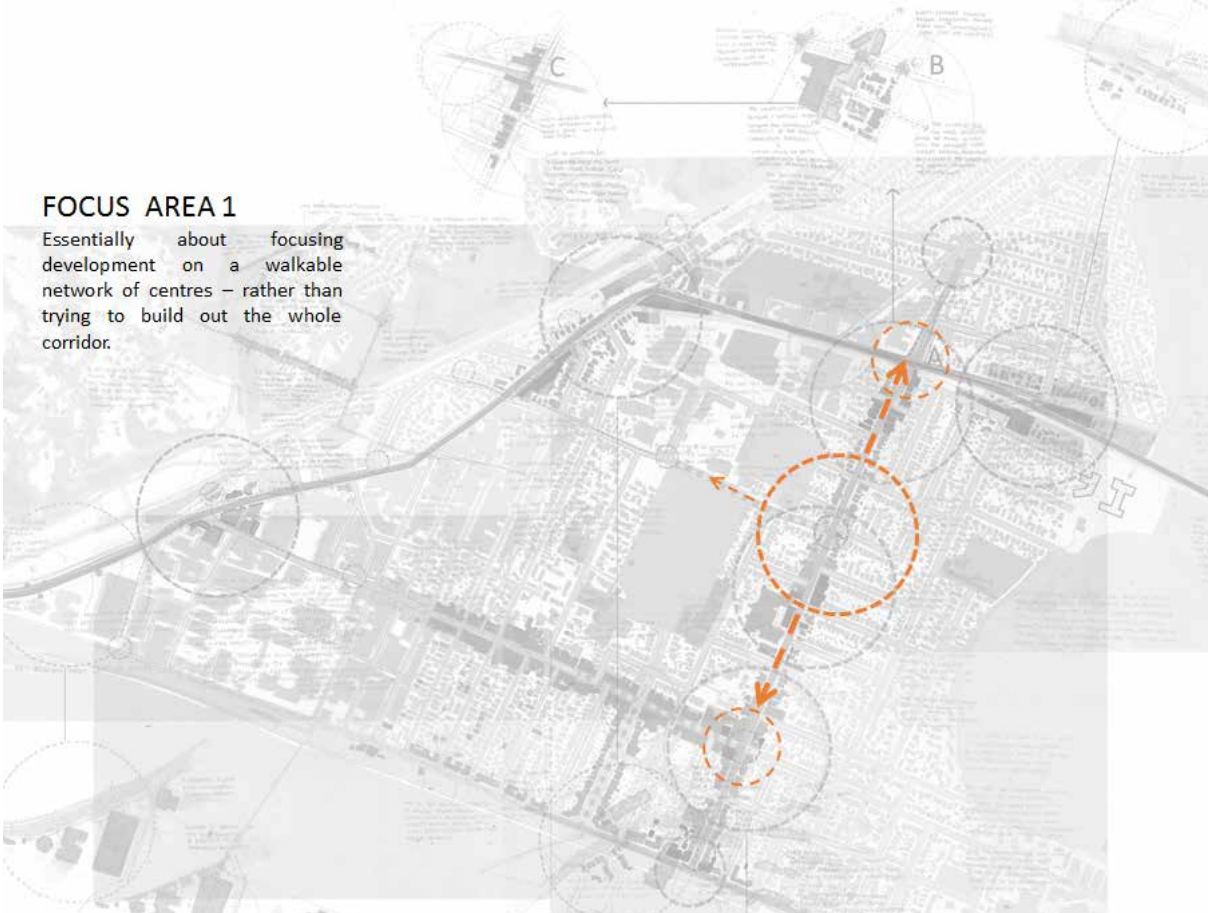
CONCLUSIONS

A modest increase in road width affects the character of the road – especially with regard to the existing suburban pattern and front yards. Like the plan-based exercise, even small changes to the road cross-section have large impacts with blanket-application down Cuba Street. While some measures like rear lanes and slow lanes could be restricted to important centres, they require changing whole blocks to work effectively. Overall, this exercise supports a minimal, light touch on the existing roadway with moderate alterations in the redesign of key places.

FOCUS AREAS

FOCUS AREA 1

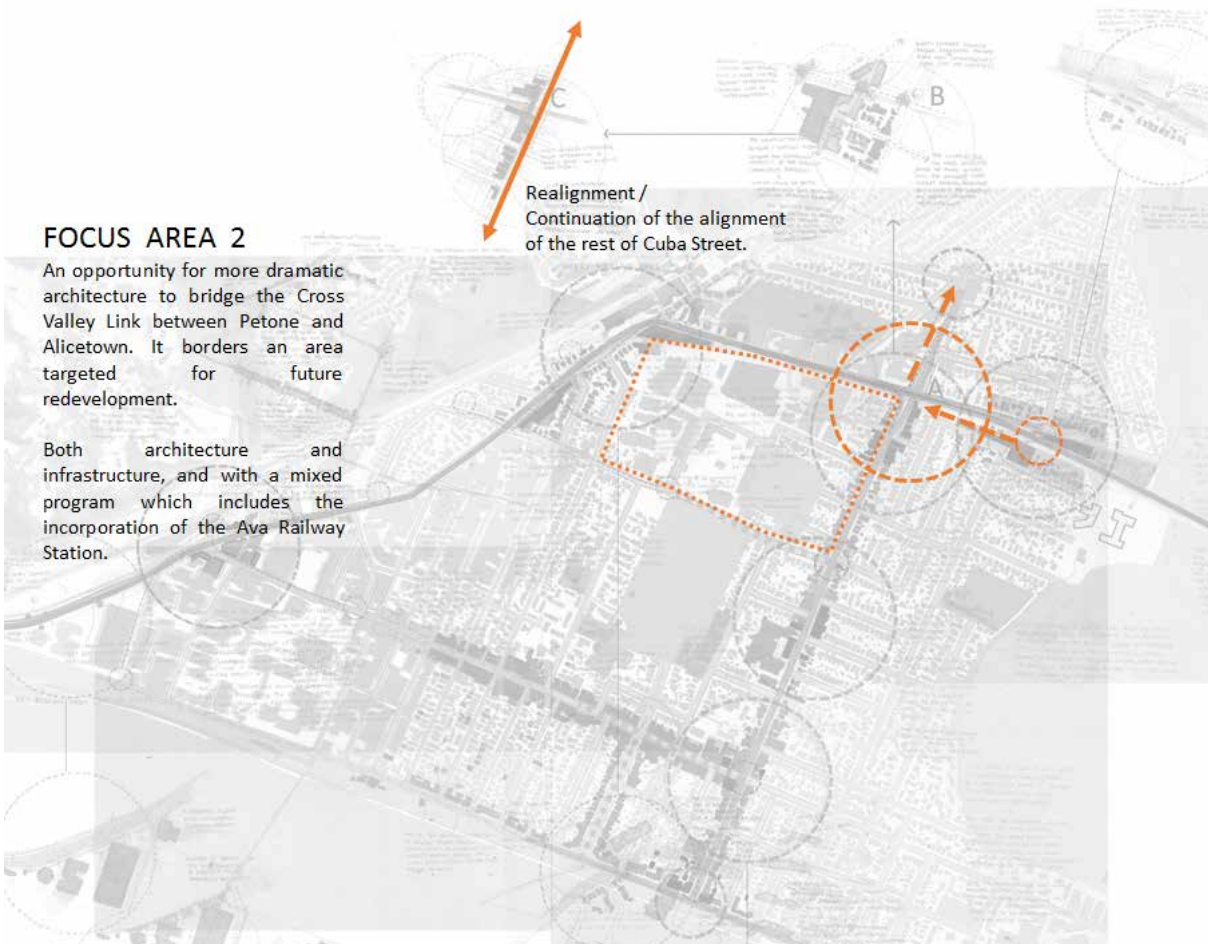
Essentially about focusing development on a walkable network of centres – rather than trying to build out the whole corridor.



FOCUS AREA 2

An opportunity for more dramatic architecture to bridge the Cross Valley Link between Petone and Alicetown. It borders an area targeted for future redevelopment.

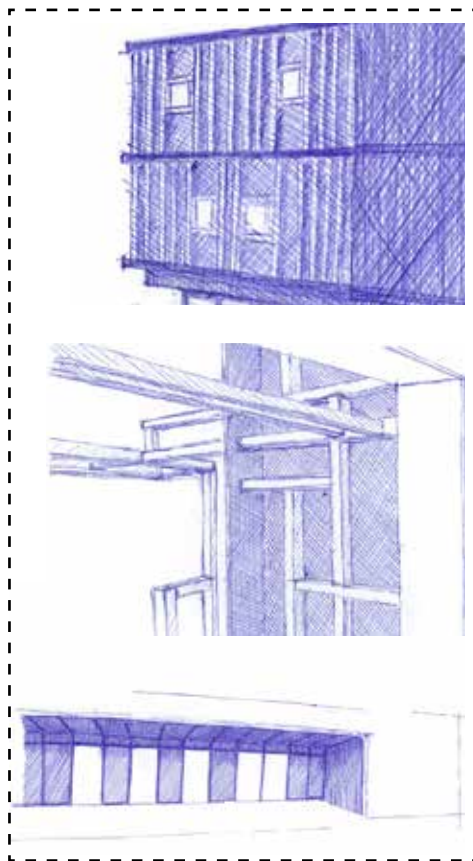
Both architecture and infrastructure, and with a mixed program which includes the incorporation of the Ava Railway Station.



ARCHITECTURAL VOCABULARY

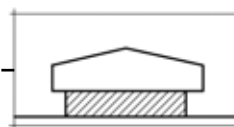
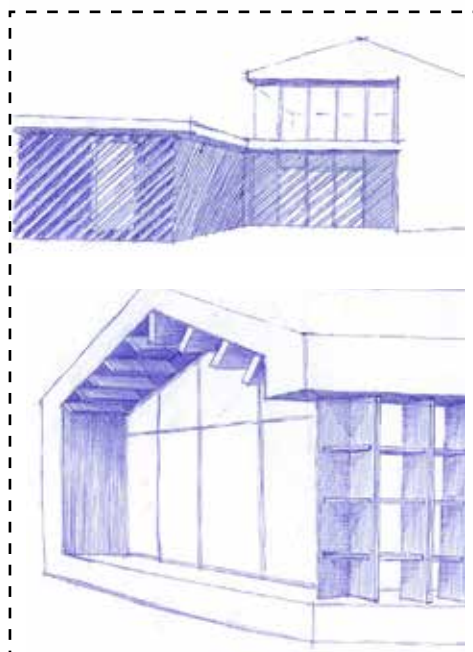
PURPOSE

For the purposes of the design case study, aesthetic decisions that are not directly related to the issues associated with the arterial road condition are informed by an 'architectural vocabulary'. This vocabulary supports a consistent, coherent design treatment while the main design work deals with the arterial road response. In this regard, this thesis is primarily working in the manner of So No Arhiteki and similar precedents which make use of clean, modern shapes and articulated timber. These precedents are interpreted in the following drawings and proposition.



**Fig.6.1 SONO AHITEKI - ARTICULATION
(Surface treatment)**

Visual interest and detail is created by the timber cladding (e.g. wooden slats and battens) and exposed structural members. This linear articulation is employed irregularly to add interest to larger surfaces. Timber members can protrude from the building to frame an outdoor pagoda-like space. This relates to the use of trellises and screens as an amenity-protecting strategy.



**Fig.6.2 SONO AHITEKI - CONTRAST
(Composition)**

The contrast of flat, blocky forms against the areas of detail and articulation is visually interesting. The Modernist-style clean, white surfaces are played against grainy, linear and warm wood areas. Negative sub-sections within the conventional house-form are used as a creative composition.

MEDIUM-DENSITY RESIDENCES



Fig.6.3

Name: Breathe - New Urban Village
Architect: Anselmi Attiani Architettura
Where: Christchurch, New Zealand
When: 2013 (design competition)
Comprehensive medium-density development that fills out the block with internal circulation and coherent, yet varied dwellings.



Fig.6.4

Name: Ridgeway Village
Architect: Proctor & Matthews Architects
Where: North West Cambridge, UK
When: Currently undergoing planning
A coherent urban 'grain' with internal alleys and parkspace. The basic building form is repeated, but there are variations in outbuildings, envelope design and how parking is accommodated.



Fig.6.5

Name: The Cedar Lodges
Architect: Adam Knibb Architects
Where: Winchester, Hampshire, UK.
When: 2015 completion
Cedar cladding, modern design, parking integration while still addressing the street in a positive manner.

INFILL HOUSING



Fig.6.6

Name: Grey Lynn home
Architect: Andrea Bell and Andrew Kissell
Where: Auckland, New Zealand
When: 2016
Reinhabitation of an industrial warehouse - adding a timber, warm dwelling unit.



Fig.6.7

Name: Austen House
Architect: Adam Knibb Architects
Where: Winchester, UK
When: 2015 completion
Small-scale intervention, unobtrusive insertion and relates aesthetically to other examples.



Fig.6.8

Name: 83a Marlborough Ave.
Architect: Drew Mandel Architects
Where: Toronto, USA
When: 2002
A minimal intervention responding to the intense constraints due to the small footprint available. The design prioritises occupant circulation and lighting needs.

MIXED-USE BUILDINGS



Fig.6.9

Name: Cardon House
Architect: Matt Brew Architect
Where: Auckland, New Zealand
When:
High-quality living spaces created behind and above the small historic and modern shops.



Fig.6.10

Name: Upper Queen Street
Architect: Irving Smith Architects
Where: Nelson, New Zealand
When: 2015 completion
Big-box development paired with (fine-grained, two-storey) mixed-uses in an urban centre. Articulated timber and perforated panels at the upper level protect internal environment and play with transparency.



Fig.6.11

Name: Piko Wholefoods
Architect: Solarchitect Ltd
Where: New Zealand
When: 2015 completion
Modern interpretation of traditional shop typology, expressed structure and light design. Timber a strong feature again.

CONCLUSION

This architectural vocabulary is about the use of articulated timber within a simple, modern composition. The collected precedents show that this style can translate across different types of building that would likely be a part of arterial road development. While modest formally, this vocabulary supports the sensitive design approach as a realisable (i.e. economic, desirable and marketable) style. These precedents appear light, warm and feature a pleasant play of regular modern forms against the irregular, grained character of timber.

DESIGN ITERATION 4 - CUBA-UDY FOCUS AREA

INTRODUCTION

This design premise is about the creation of a higher density centre around this intersection. This links back to the Literature Review and the ideas about sustainable, high-amenity development on arterial roads with moderate densification and mixed-uses (see p. 10-11). The aim here is to create a fully designed building around a response to the arterial road which is copacetic with the larger urban planning objectives and massing.

The urban design is defined by the criteria below. This design works with the qualities of the public space and the principles of good activity centres, while the architectural level leans towards private activities and occupancy.

LINK - Manage complicated travel paths through intersection and traffic turning off at Udy Street.

Integrate alternate modes of travel (pedestrians, cyclists, public transport).

SCALE - Create a walkable catchment of increased density.

Design operates within existing suburban pattern and development is framed by it.

UNIVERSALITY - Protect amenity while densifying around busy road and increasing commercial activity.



EXISTING INTERSECTION

PLACE - Create a new centre of activities (commercial/residential, public/private).

Develop ability to spend time pleasantly on the street or in buildings.

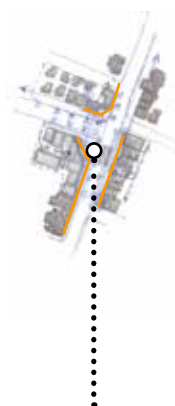
Valuable public space with greenery.

Improve built fabric in density and visual quality. Existing historical buildings have no special merit and are scattered - not contributing to a coherent place.

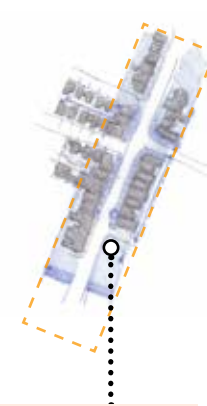
Engage the street with fine grained frontages - a consistent active edge for the street.



Line of active edges (commercial activities) along road - with residences behind this buffer.



Targeted development focused on arterial road - strongly linear.

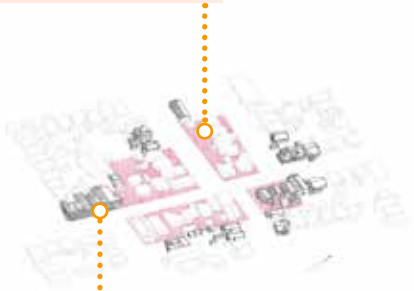


Central public spaces allocated with larger spaces centrally and 'pocket parks' where they can synergise with local activities.



MASSING / URBAN DEVELOPMENT

Small block of houses turn backs on the busier road - redevelop with fronts to public space.



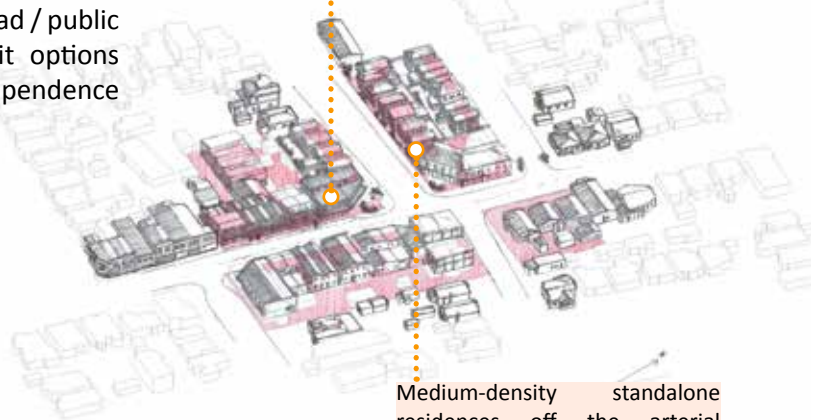
Connecting to currently-scattered 'places' - the ad hoc (often historic) shop fronts down this road.

Densification creates a localised centre with increased activity. The benefits of an active, walkable catchment are discussed in the Literature Review (refer to p.14).

Ideally there is a public transport stop on the arterial road at this centre too. Transit-oriented Development uses the walkable catchment around the arterial road / public transport route to make transit options more viable and reduces car dependence in reaching services.



ARCHITECTURAL DESIGN TESTING: BUILDING AT KEY CORNER SITE.



PROPOSED CENTRE



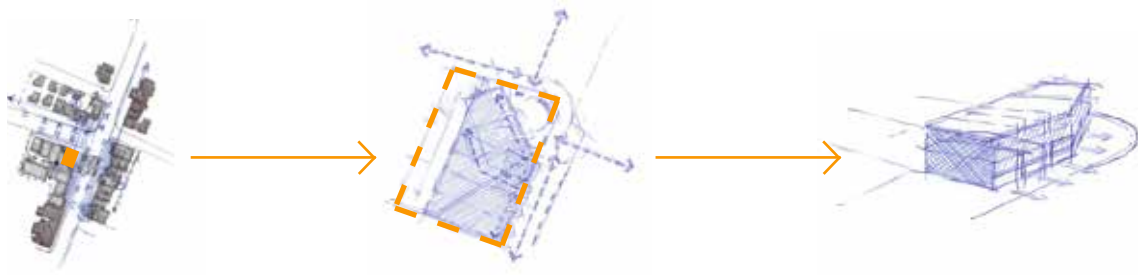
Fig.6.12 Cuba-Udy intersection, looking south-west streetview circa 2009
Google Maps. Google. 2016. Web. 22.8.16



Medium-density standalone residences off the arterial road. 'Desirable densification' is about retaining the amenity and characteristics of current suburban living while increasing the residents in this catchment.

Drawing showing general massing (i.e. not a full architectural design) but with indications of useful strategies such as balconies, shutters and screens as well as the commercial active-edge at street level.

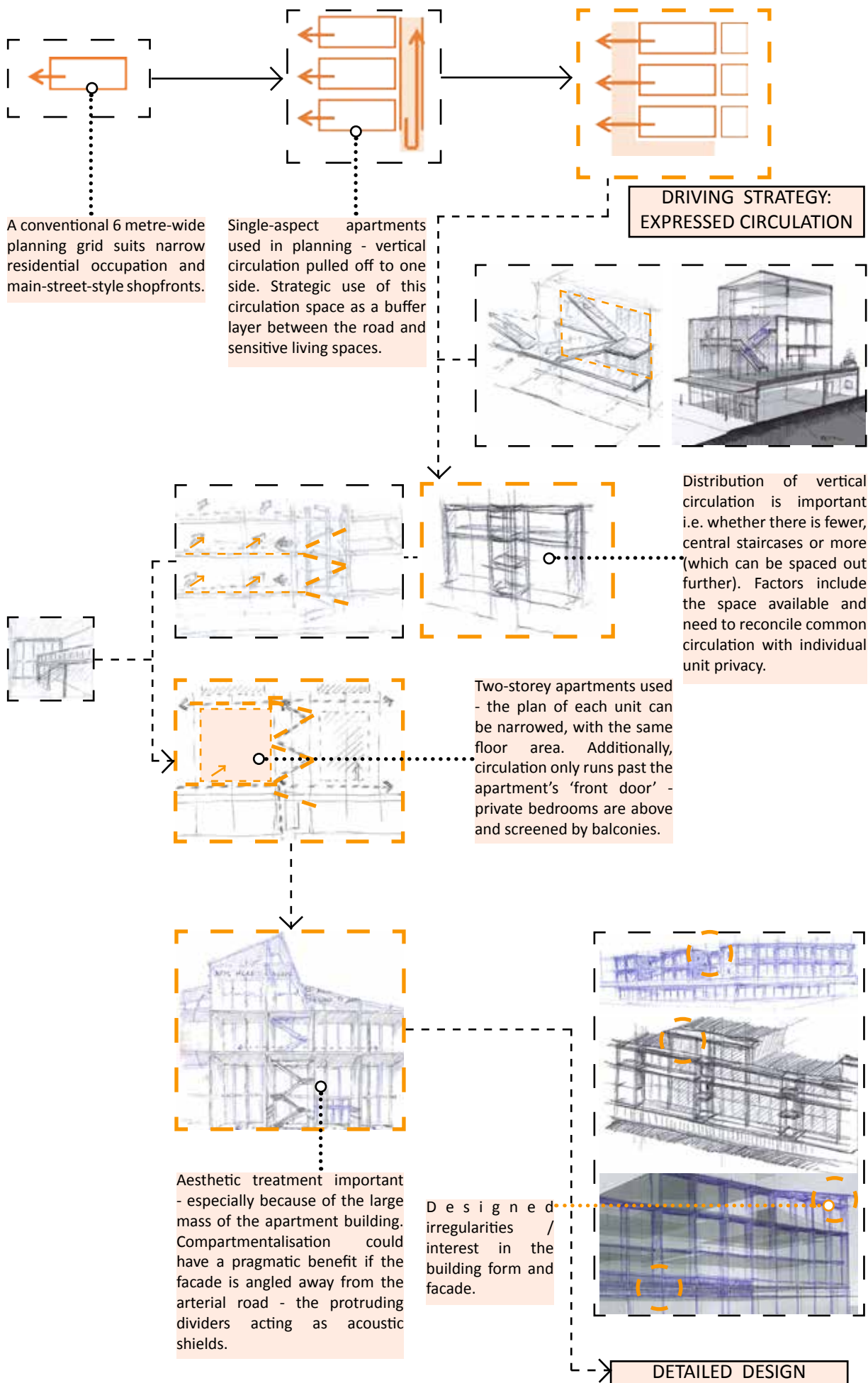
Built-up on the arterial (3/4 storeys) with medium (moderately increased) density housing on the side streets in the suburban pattern.



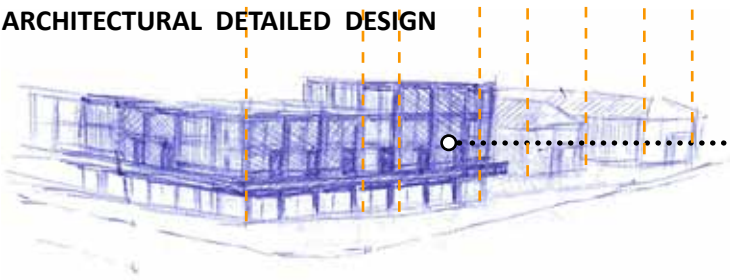
ARCHITECTURE INTRODUCTION AND CRITERIA

The architectural cornerstone of the urban scheme is in the design of a mixed-program, larger building which addresses the street and responds to the arterial road condition. This is sited on the prominent Cuba-Udy corner. The refined architectural design will fill out the intended massing and frame public space with a resolved, inhabitable, good-amenity structure.

There is also an aesthetic imperative for the architecture design due to the influence on visual amenity of this prominent site. The needs of occupants drive the building layout and planning. The mixed-programs of residential and commercial activities have separate manners of interacting with the arterial road and are arranged appropriately. The amenity of the quality-sensitive apartments is protected by internal layout and envelope-design as the building's massing and orientation were defined already in the urban design.



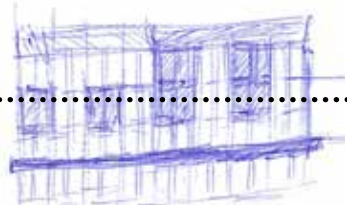
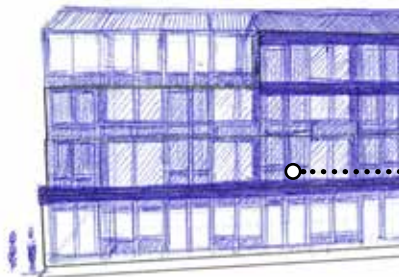
ARCHITECTURAL DETAILED DESIGN



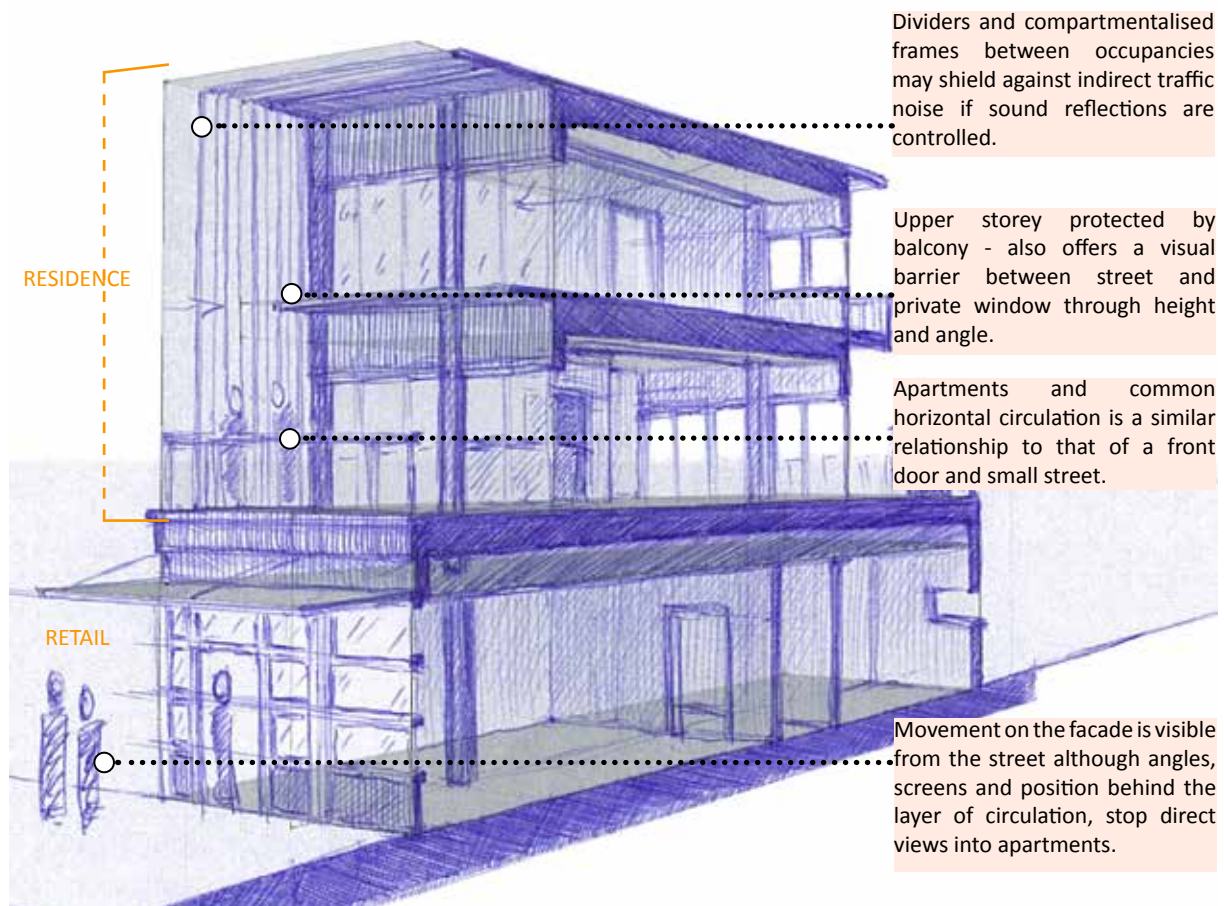
Sympathy to adjacent context (within larger redevelopment) in articulation of building mass and avoiding an abrupt interface between the building and its neighbours.



Horizontal circulation wraps around form. Strategically, this use of circulation works best with relatively low-rise 'walk-up' apartment buildings. Larger structures have technical requirements that shift emphasis to heavy construction, more efficient fire escape routes and elevators.



Hierarchy of facade features and modulations - assisted by the protective screens. Three-dimensional facade treatment supports indirect openings between the interior spaces and road.



Dividers and compartmentalised frames between occupancies may shield against indirect traffic noise if sound reflections are controlled.

Upper storey protected by balcony - also offers a visual barrier between street and private window through height and angle.

Apartments and common horizontal circulation is a similar relationship to that of a front door and small street.

Movement on the facade is visible from the street although angles, screens and position behind the layer of circulation, stop direct views into apartments.

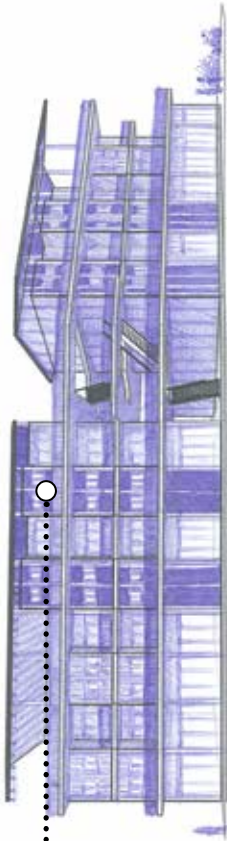
Consistent roofline avoids blocky silhouette associated with penthouses.



Screens and defensive treatment above open and light ground floor commercial fronts.

AESTHETIC DESIGN DECISIONS

In recognition of visual amenity and an exploration of how to incorporate the (pragmatic) expressed-circulation strategy into an aesthetically minded design.



Development perspective sketch - refining composition

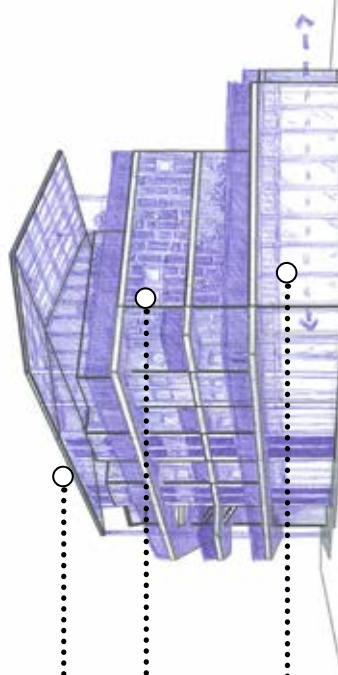
Articulation and depth in the facade apparent with balconies, screens and visible timber members.



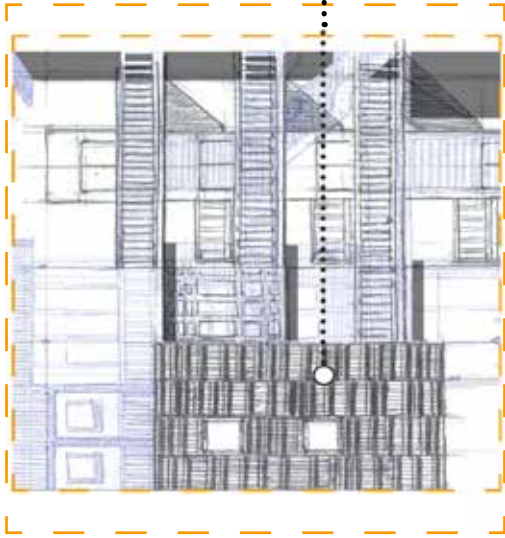
Irregular timber detailing (as per architectural vocabulary) adds visual interest to mass.



Building encroaches over footpath - offering another layer of separation from road's noise nuisance and creating an indirect entry into building. Common outdoor space above.



Development perspective sketch



.....Alternative (defensive) facade option

Solid screens and areas of polycarbonate transparent shielding are varied, a mix of solid and transparent sections presented to street for some acoustic performance.

Larger plantings supported by the significant space created at the corner - contributing to a distinctive character (place function) and visual amenity.

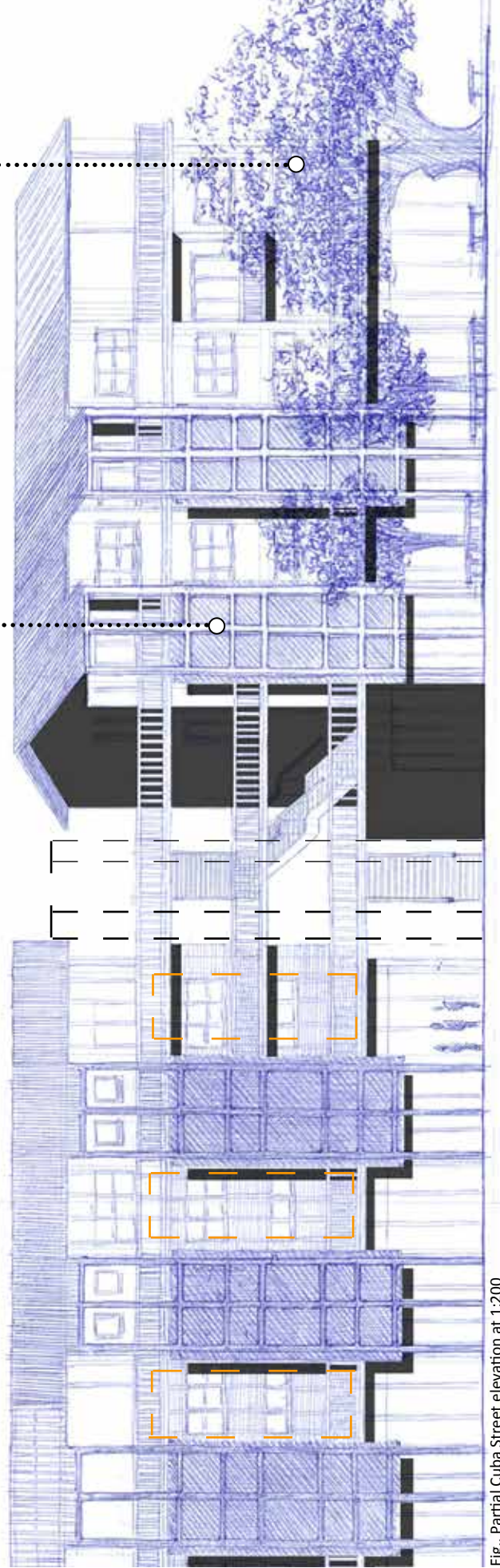


Fig.. Partial Cuba Street elevation at 1:200

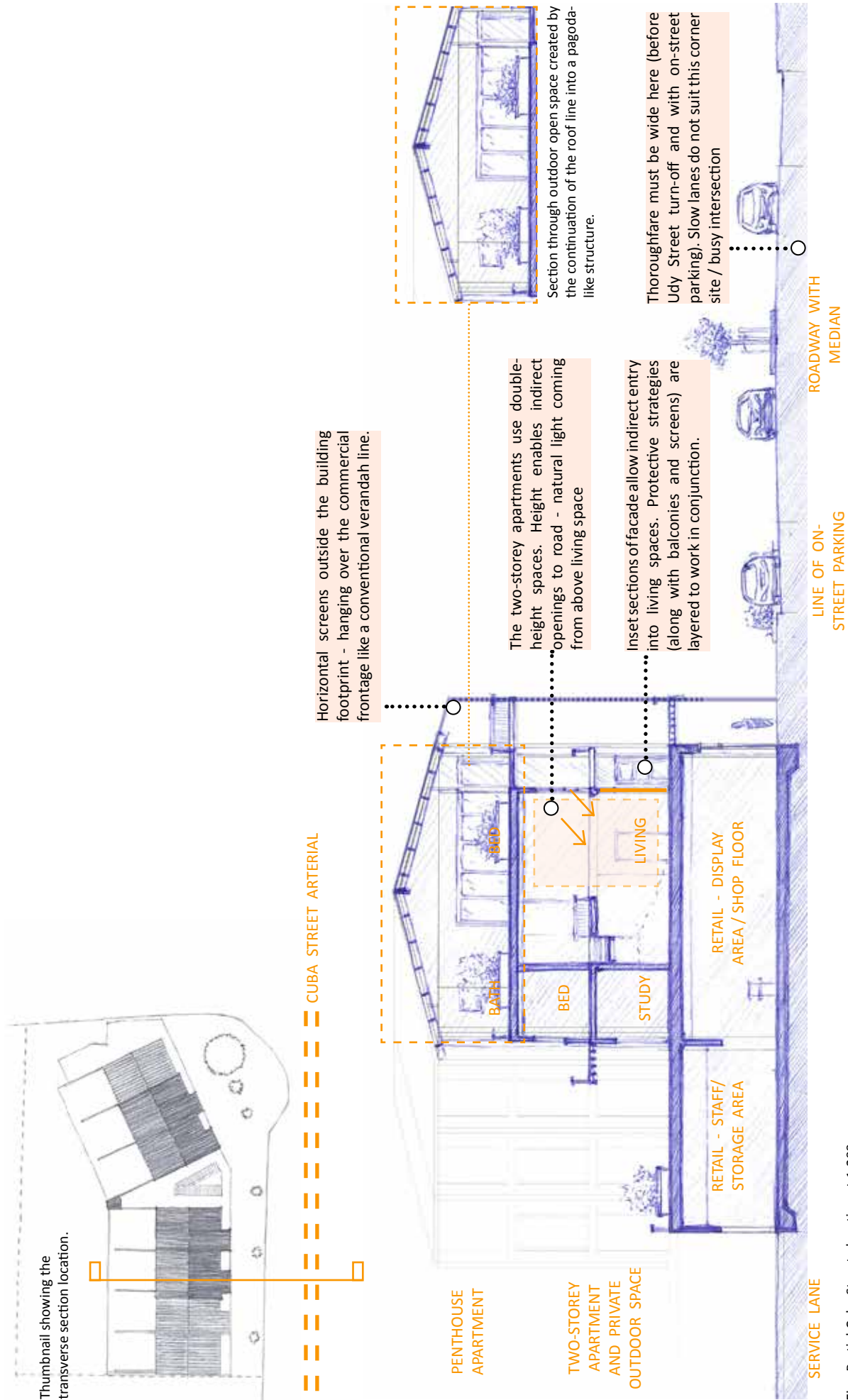
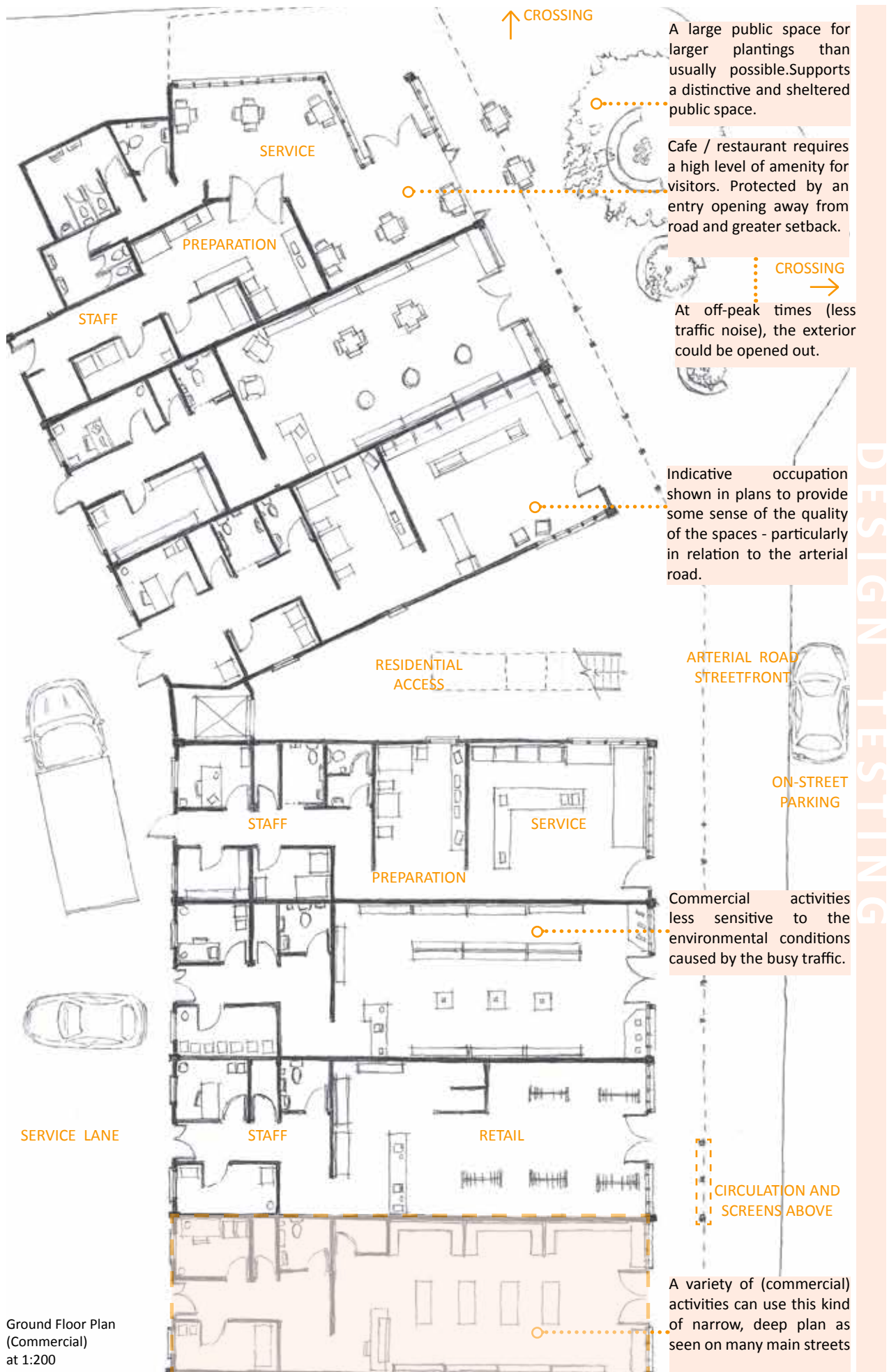
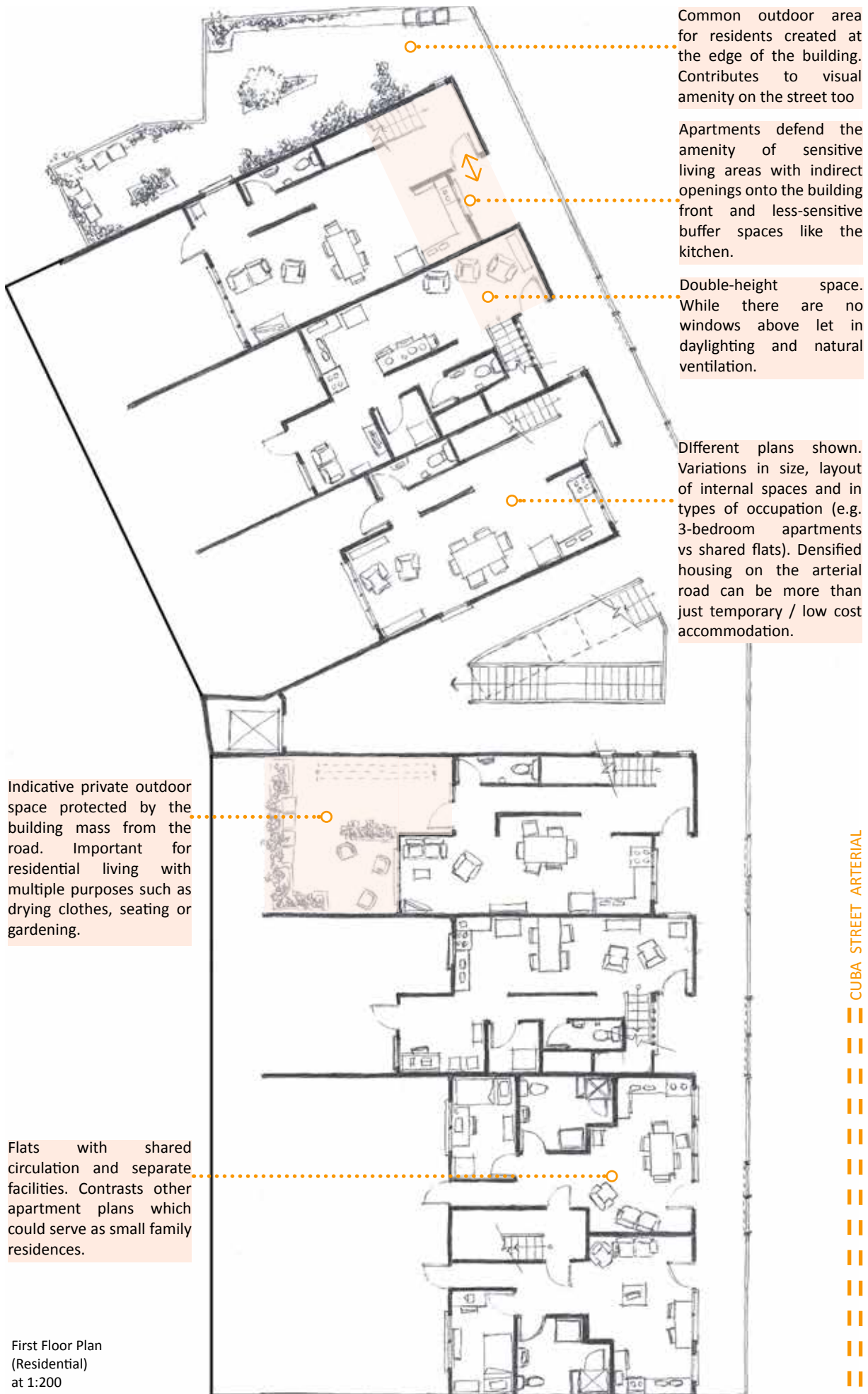


Fig.: Partial Cuba Street elevation at 1:200





First Floor Plan
(Residential)
at 1:200

This second storey of the apartments has an effective second-skin of layers between bedrooms (sensitive spaces) and the outside, with the double-height spaces and circulation in between.

Bedrooms oriented towards the arterial road are protected by layers at the facade.

Bedrooms facing away from the arterial road are protected.

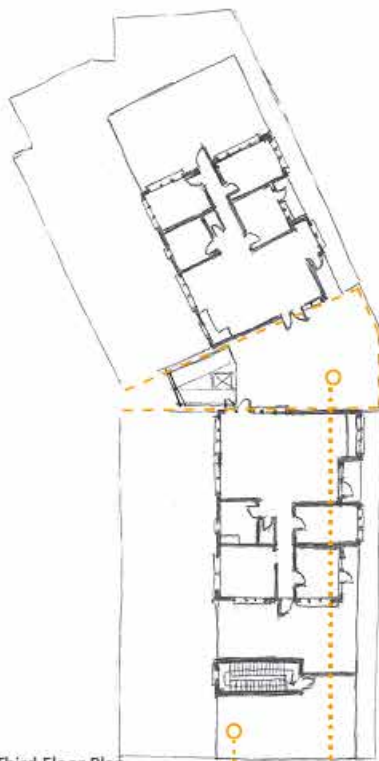
Balconies and appropriately detailed balustrades used as acoustic shields and to create intermediate space between the sensitive interior space and outside. Protrusion and angle above the road protect windows.

Second Floor
(Apartments Second Storey)
at 1:200



== CUBA STREET ARTERIAL

== CUBA STREET ARTERIAL



Third Floor Plan
(Single-Storey Apartments)
at 1:500

Private outdoor space
beside dwellings.

The top-floor single-storey apartments
front onto the vertical circulation
wedge. This level is protected by
elevation above road.

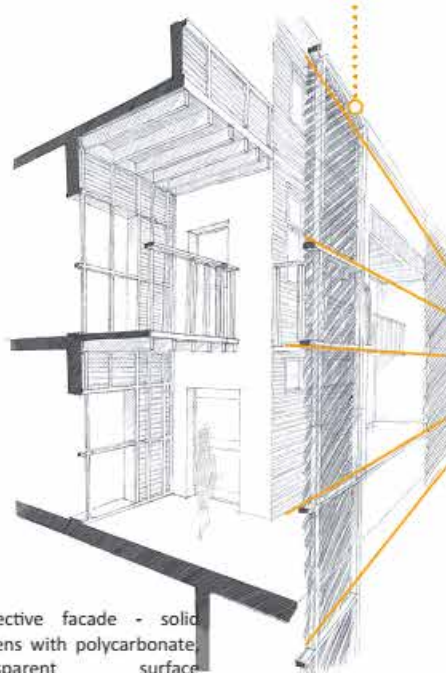


Roof Plan
at 1:500

Protective screens and
polycarbonate have
some physical effect and
psychological sense of
'shutting out' the road
for residents. This is a
half-way measure instead
closing up the facade
(even if it created a greater
environmental difference).



Perspective drawing
with slatted screen removed.
Showing interesting spaces
around the facade.



Protective facade - solid
screens with polycarbonate
transparent inbetween.

THIRD FLOOR (APARTMENTS)

Architectural vocabulary of areas of articulated timber against simple modern areas.

Alternate, more defensive facade treatment with three-dimensional niches and irregularities in the screen. Some windows for important views.

SECOND FLOOR (APARTMENTS 2ND STOREY)

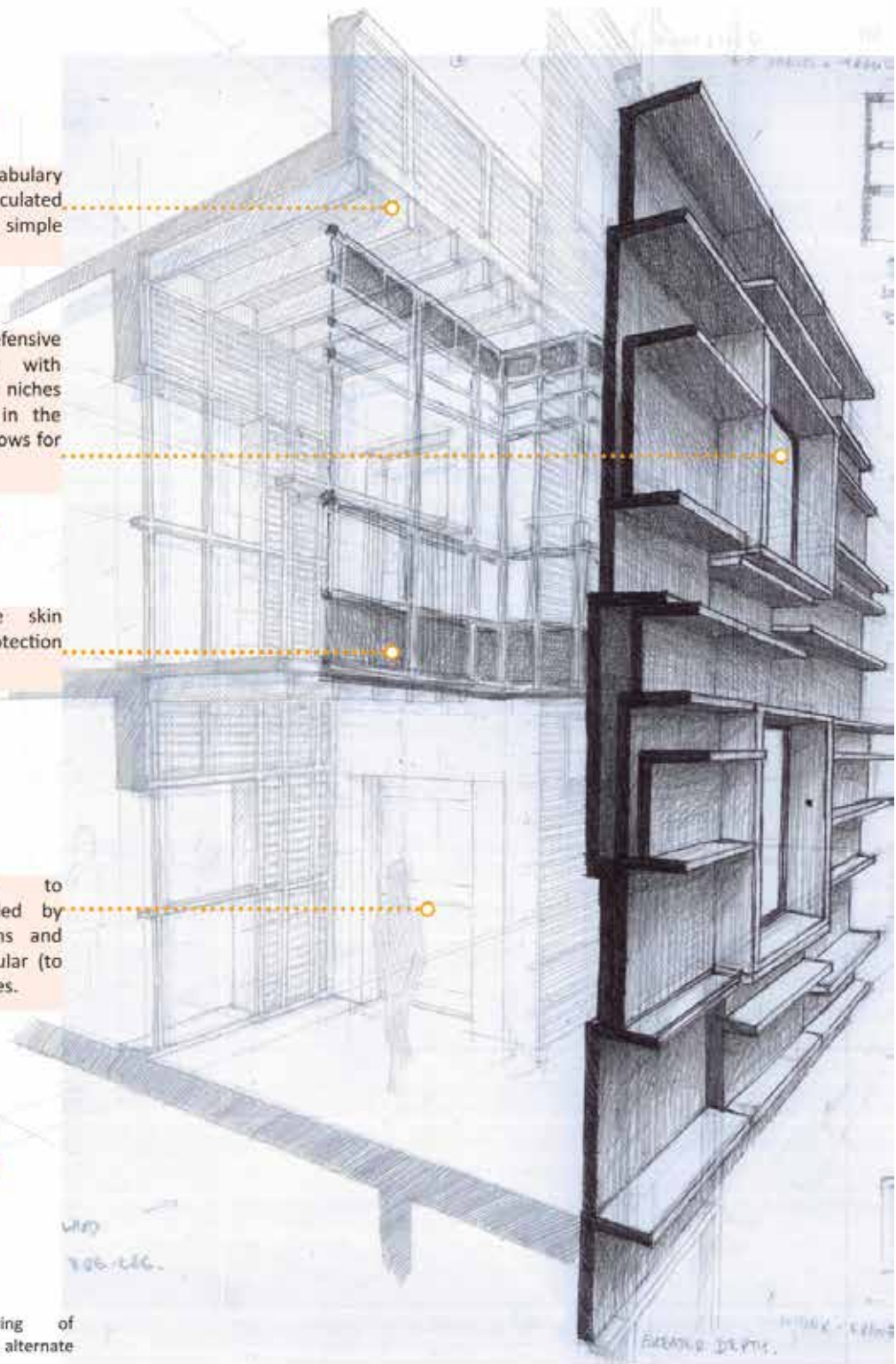
Second defensive skin behind - more protection than a balcony.

FIRST FLOOR (APARTMENTS)

Indirect entry to apartments enabled by envelope variations and created perpendicular (to street front) surfaces.

GROUND FLOOR (RETAIL)

Perspective drawing of circulation space and alternate protective facade.



EVALUATION OF FOCUS AREA 1

Urban Strategies

[Densification]	Densification increases activity in the centre. The use of this strategy is strongly tempered, recognising that a significant aspect of this scheme is in perceived amenity e.g. the medium-density 'desirable densification'.
[Street line]	Mixed use development is a good response to arterial roads in supporting the street activity and visual interest for the public space. It suits private interests as well as a buffer space deployed at immediate street level. Refining the strategy, it is important to have the available commercial activities on the arterial road directly creating a distinct 'line of development'. This recognises the limited amount of commercial activities in that they need to be used where most effective and in continuity.
[Management]	Slow lanes were not used due to difficulty to reconcile with the corner site and a complicated (probably light-controlled) intersection. Parallel parking is a separation between pedestrians and the road traffic in any case. Rear lanes are used for servicing and resident parking and are accessed from smaller side-streets.

Architectural Strategies

[Double-aspect]	Defensive front facades mean that the amenity of open space, and ability to open up the envelope is at the rear of the building. As a strategy used elsewhere, effectiveness is dependent on orientation - ideally with the outdoor space having both sun and protection from the main road. This strategy is similar to terrace housing, in presenting a solid built front to the road, and creating protected amenity on the inside of the block.
[Circulation buffer]	These buffers are very space intensive. This is similar to a costly double-skin of protective facades which suggests that this strategy needs technical, expediency-minded refinement for future application. However, the architectural nature of the common circulation as a kind of small street expressed on the facade is interesting. The community-minded aspects of this strategy elevate it beyond just a throwaway buffer space.

[Screens and indirect openings]

As a strategy, these are not very effective. This is in part because they are caught between the urban and architectural imperatives (openness versus defensiveness). The interior qualities of spaces relies on the double-aspect above where apartments are shielded from the road but lose much of the view out onto it (with more emphasis on the rear amenity).

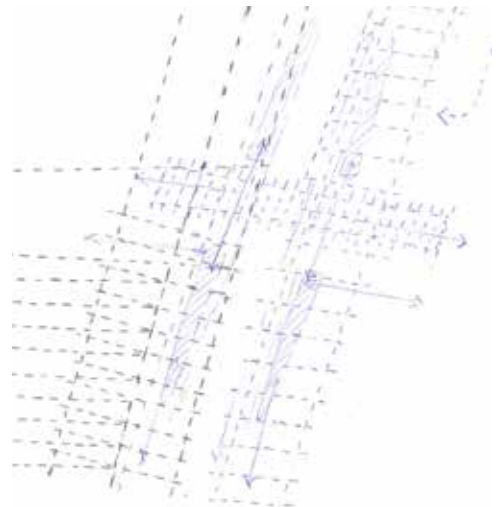
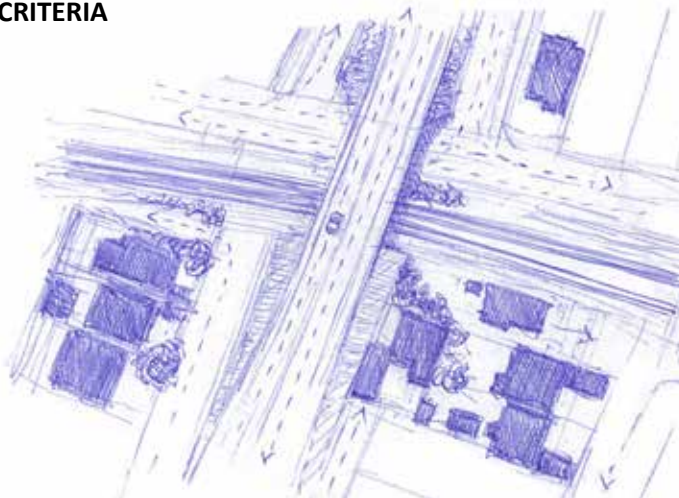
DESIGN ITERATION 5 - CUBA-WAKEFIELD FOCUS AREA

INTRODUCTION

This design case study is positioned on the edge of an area targeted for redevelopment - see the *Petone 2040 Spatial Plan: Community Consultation Boards* (McIndoe Urban Ltd 5). In this context, the bridge-building is a designed border between different areas. Due to the infrastructural scale and prominent site, the design's relationship to its surroundings is important.



CRITERIA



PLACE - Visual amenity in the levels of planting and greenery which should be protected.

Recognise contextual cues of existing surroundings that require sensitivity.

Recognise the visual amenity in the key views from and around the (prominently raised) bridge-building.

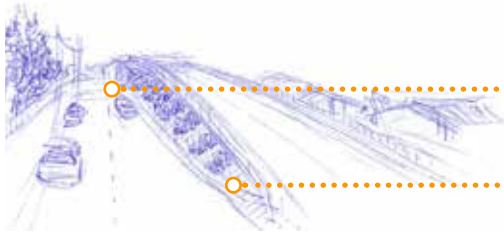
SCALE - Relation to human scale, must not be allowed to overbear its setting.

People need to walk comfortably over and around the bridge-building.

LINK - Support traffic across the bridge, as well as the different modes of travel such as cyclists and pedestrians.

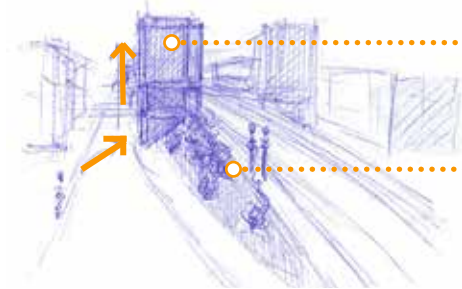
Connect public spaces - the bridge as a continuation of the Cuba Street streetscape.

Relationship to adjacent streets



The existing layout has side lanes running beside the bridge - here serving some residences. These residences are to be built out in the larger scheme.

The bridge side slopes have some planting which is a pleasant visual feature on the otherwise blank mass. Ideally, this feature would be retained within the new scheme.



The bridge building occupies a highly visible position. To avoid the appearance of an overbearing mass, the building can be articulated as separate blocks.

The way the bridge building interfaces with the arterial road at either end is a key issue. This is in terms of the continuity of the streetscape and having a consistent line of high-amenity urban spaces as well as supporting walkability along the street.

The nature of the street over the bridge

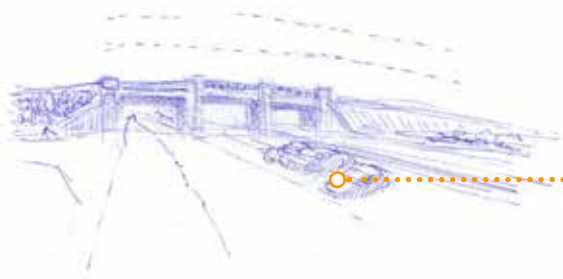


A key factor in the decisions around the massing of the bridge building is the quality of the 'street' over the structure. While neither a conventional street or a purely utilitarian bridge, the hybrid-architecture still engages with urban design values as a kind of constructed street section.



The formal nature of the combined building and the bridge masses precedes more developed design. For instance, whether the building encloses the road or hangs off one, or both, sides of the bridge structure.

Views of the large building in a prominent position

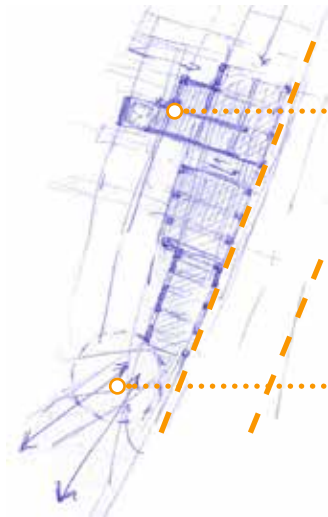


Currently, there is parking space between the rail and the road. With the redeveloped bridge building and shifted railway station this space should support a bus stop. Coordination of the public transport networks should help their viability and lessen car-dependence as discussed in the Literature Review - see page 8.



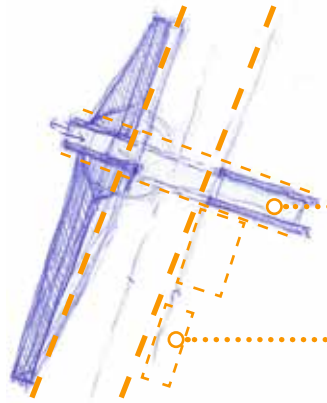
Efficient circulation between levels is vital to successfully mixing the railway station and bridge building functions. As indicated in this sketch, the circulation may be a way of breaking down the larger building mass visually and is a key element for architectural design.

Massing of large building



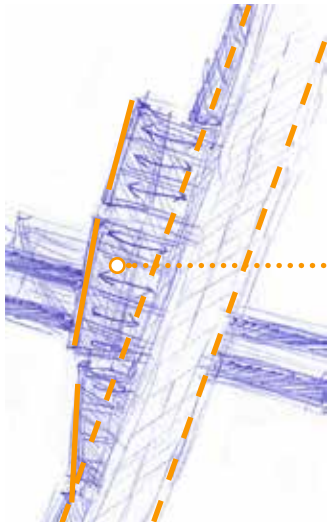
Visual interest can be added to the large volume with an irregular form and a degree of apparent randomness.

Connections to the rest of Cuba Street are assisted by the realignment in offering a more direct path for the pedestrian.

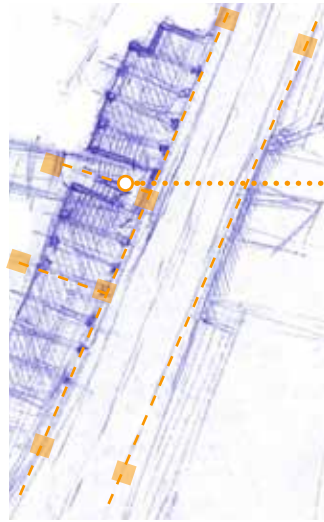


The station can be extended under the bridge creating an underpass that offers another (indirect) path for pedestrians to cross the road.

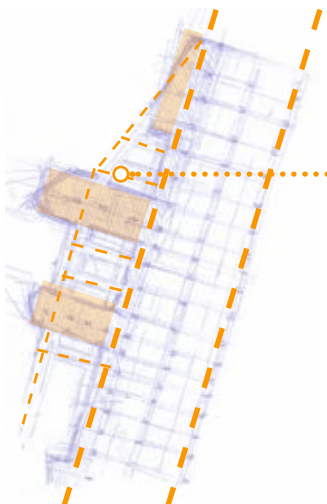
Cantilevered kick-outs and platforms on the bridge structure recognise the amenity of the views from these raised public spaces as well as offering the ability for pedestrians to stop without obstructing anyone else.



Like a typical street, the bridge building has occupied spaces beside the road which should create a kind of streetfront. To function properly, these spaces (especially if hosting commercial activities) will need adequate depth beside the road.



Complicated movement paths up-and-over the rail and road lines to either side of the new station. In this way, the bridge-building's form is defined by the movement paths.



The public space can be integrated into the bridge structure in such a way as to create gangways and platforms around the inhabited building blocks. This would create a detailed, and lighter form than a solid built volume.

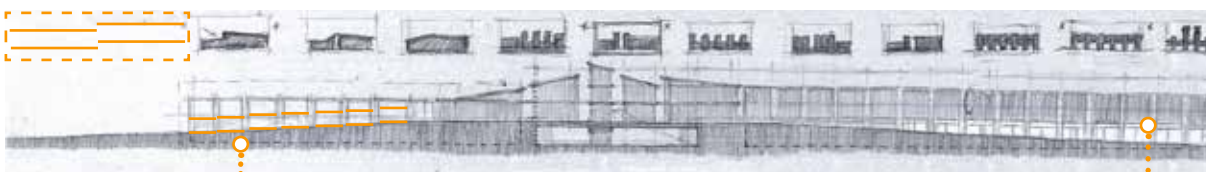


The new bridge section is approximately the same size, span and grade as the existing bridge. The change is in the realignment and inclusion of architectural occupation.



There is a basement level / service area required to support the bridge buildings (e.g. for parking or supply). This will likely sit below and beside the bridge-street.

With the hybrid of infrastructure and architecture, attention to massing and level of detail is vital. This is to relate the scale back to the human - avoiding overbearing masses.



Narrower unit / sub-section widths are ideal where the building sits adjacent to a change in grade. The narrower 'steps' allow the floor heights to follow the street level closely.

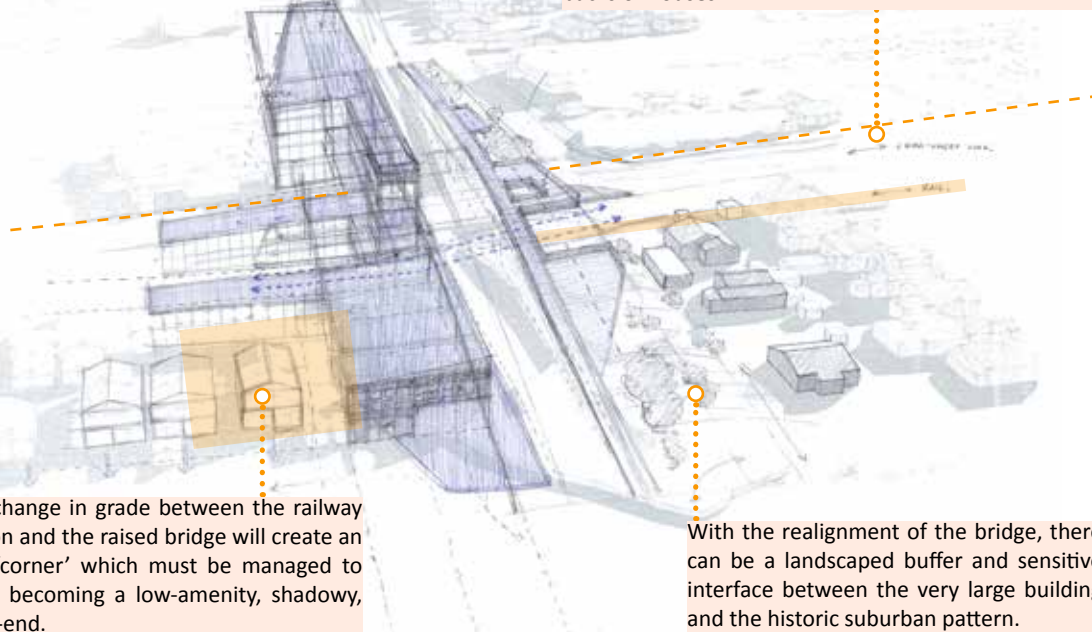
The bridge-building can be built up higher to the north due to the existing industrial/commercial built context. This is also relatively short (walkable) stretch to link to the Alicetown centre.



These tower blocks are centrally positioned, allowing either end to be used for more dynamic, expressive forms (or for more contextually sensitive moves).

Some asymmetry in the long elevations comes from the difference in contextual sensitivity between the northern, commercial operations and the southern historical suburban residential patterns.

Pedestrian movement to the east and the riverbank will likely travel along the northern side of Wakefield Street (the likely alignment of the Cross-Valley Link). This is due to other potential routes running awkwardly between the rail and arterial road or past the sides and backs of houses.



The change in grade between the railway station and the raised bridge will create an odd 'corner' which must be managed to avoid becoming a low-amenity, shadowy, dead-end.

With the realignment of the bridge, there can be a landscaped buffer and sensitive interface between the very large building and the historic suburban pattern.

The new bridge alignment removes the small side lanes that connected Wakefield Street back to the start of the bridge. With the new Cross-Valley Link the lanes will likely cause friction on the busy arterial road.

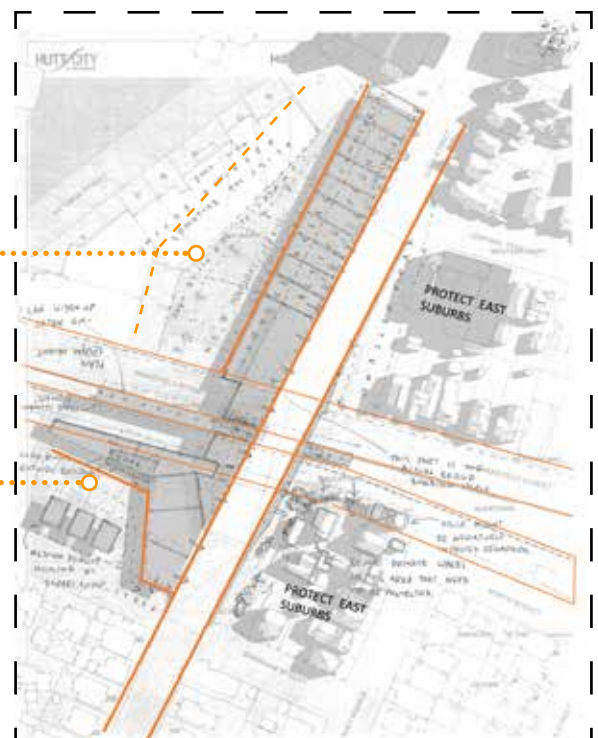
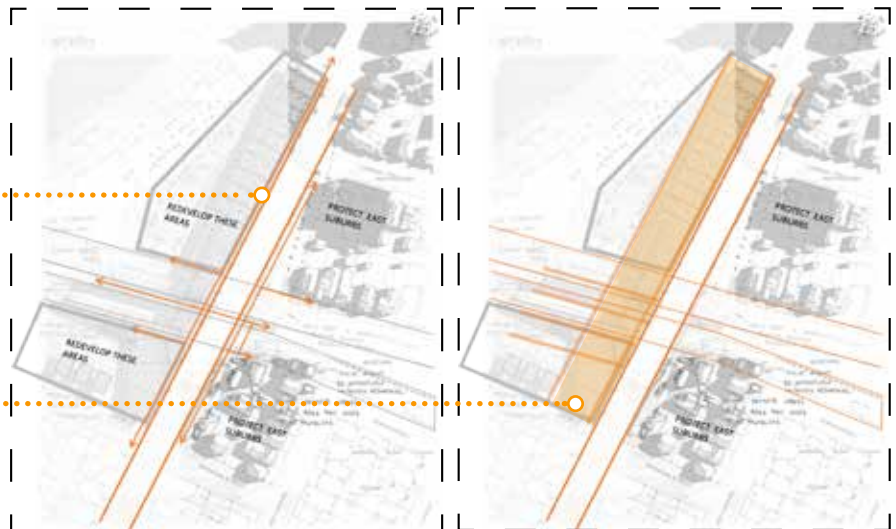
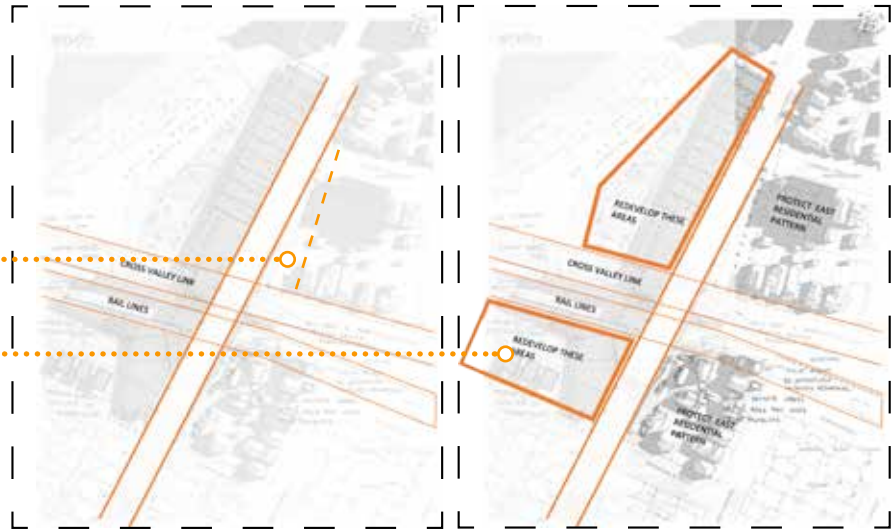
Bordering on an area of redevelopment, the bridge-building will largely be one-sided with more freedom to build higher on the west side. The historic residential pattern on the east side is valuable to retain and the boundary between these two sides needs to be sensitively designed.

With the realignment, Cuba Street should be largely contiguous with the bridge-building and so too the movement paths for pedestrians. With the incorporated transit stations, the ability for pedestrians to walk over and around the bridge-building freely is critical.

The bridge-building needs adequate building depth to support a variety of healthy activities. Commercial operations that address the street need staff offices and storage as well as the shop floor display space.

Open space is left behind the bridge-building as a service area for commercial activities, residential parking and amenity-contributing landscaping overlooked by the apartments on the bridge-building. However, this space will also need street calming to avoid becoming a short-cut onto the Cross-Valley Link.

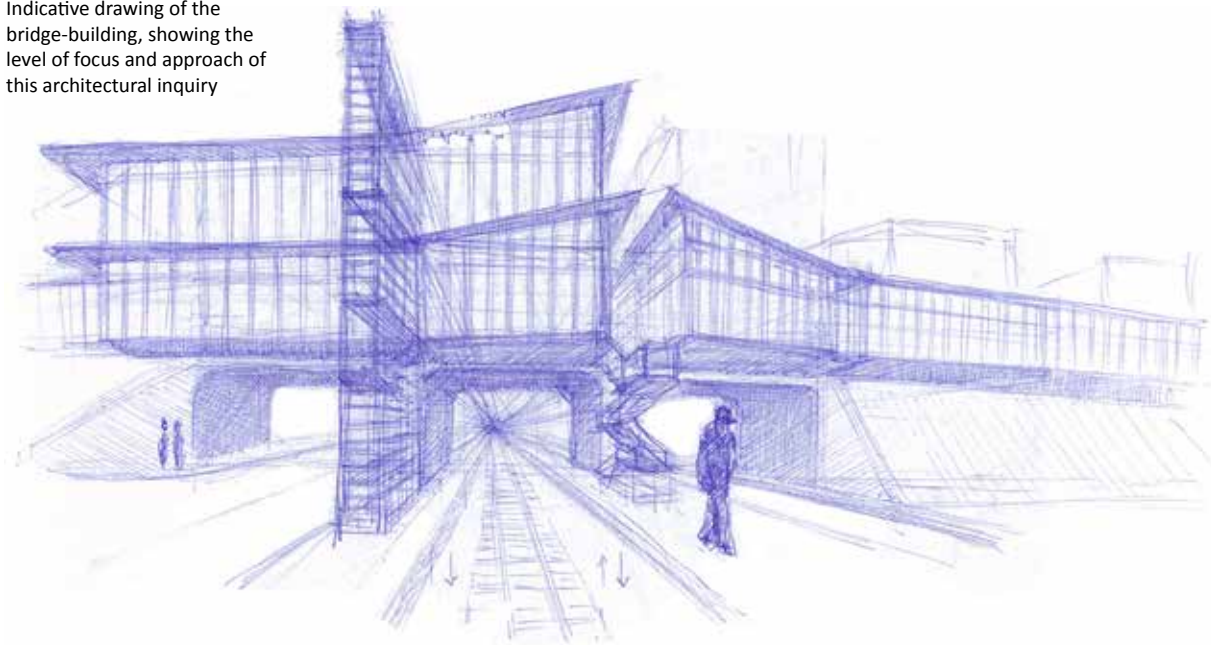
New residential development is shielded from the rail noise by the bridge-building extending back parallel to the rail line.



ARCHITECTURE INTRODUCTION AND CRITERIA

This building is both architecture and infrastructure as a constructed continuation of the street's public space. The building allows different activities to occupy the bridge and to link the public transit stations below into the urban fabric. This means smooth circulation around the large structure is important.

Indicative drawing of the bridge-building, showing the level of focus and approach of this architectural inquiry



ARCHITECTURAL CRITERIA

PLACE - Activity-wise, design must create viable occupied spaces (commercial and residential purposes).

Architectural design must support the transparency, visual richness and imageability of the built form.

LINK - Multi-level structure creates complicated movement paths around by protective architectural and over road and rail lines. These need management for efficient circulation.

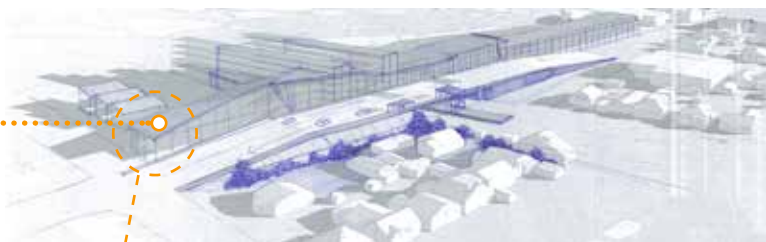
Interface to public and private transport and pedestrian routes designed for efficiency.

ADAPTABILITY - Noise nuisance mitigated from rail and road by protective architectural design.

SCALE - The bridge-building's architectural treatment appropriate to size. Huge, overly-detailed masses appear overbearing.

Must avoid undesirably shadowy and dark spaces under bridge-building - especially if used by the public.

Formally, this angularity tends towards 'airport terminal' aesthetics - 'swooping', alien forms. A restrained design is more appropriate.



Perspective from residences opposite, illustrates need for negotiated architectural and landscaped interface between domestic buildings and infrastructure-scale architecture.

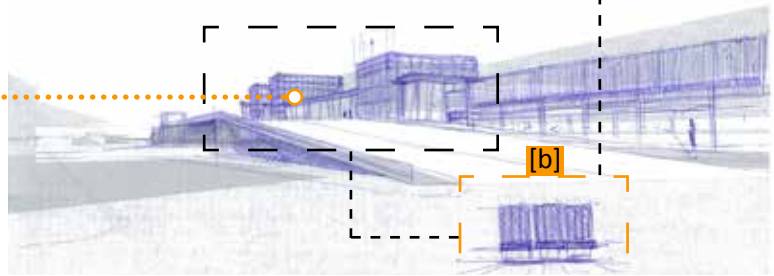
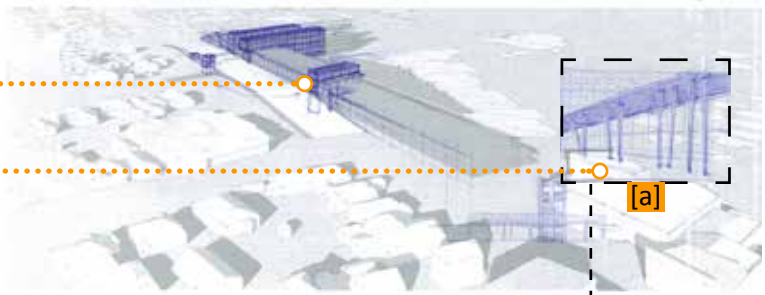


The secondary tower block is a visual 'step-down' at the north end and also offers a distinctive place with a lookout over the north.

[a] Aesthetic treatment: use of lightness and irregularity to off-set the scale of the scheme.

[b] Alternatively, a distinctive composition has a solid, stark mass suspended over the light line at the street.

[c] Or both aesthetic treatments applied separately to the two distinct elements making up the bridge form i.e. tower blocks and flat form.



Imposing mass ameliorated by sub-elements (balconies, screens, and expressed circulation and structure). Depth and variation added to building's form.

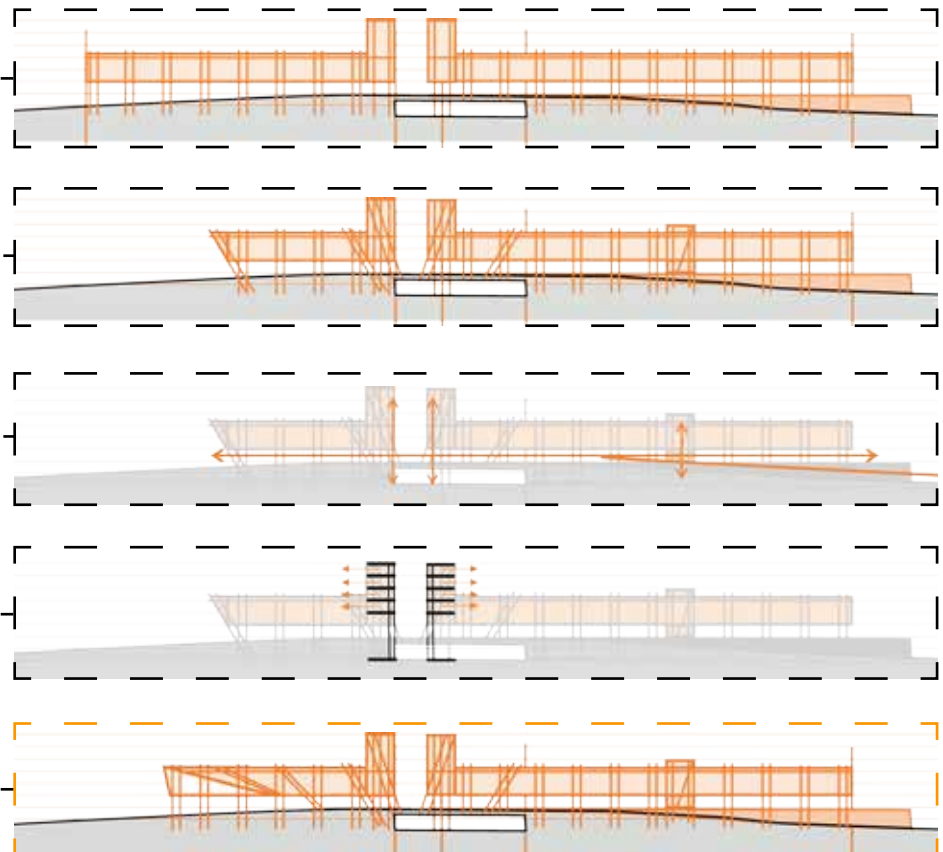
Apartment-scale architectural vocabulary adapted for larger mass with less-intricate use of structural members - adding interest and depth while breaking the mass down (visually).

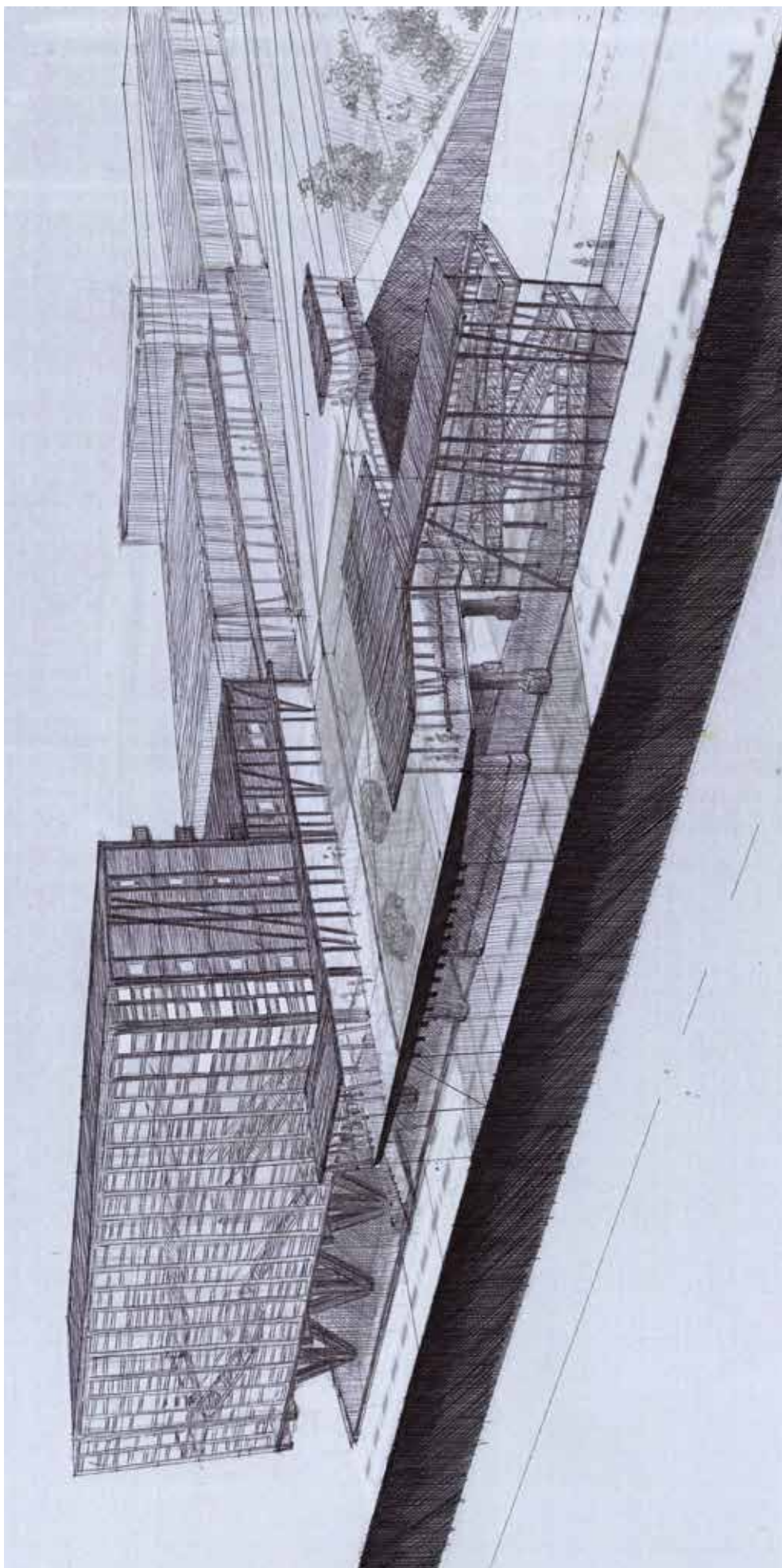


Similar to apartment building, circulation used as buffer space - this time with single-aspect dwellings. Dwellings enjoy views to the north and south, while the circulation is a layer of insulation on the rail line side.

High above Cross-Valley Link, north-facing apartments use balconies as acoustic shields against noise source below.

Expressed circulation around rail station designed for high-quality, distinctive architectural moments.





Urban Strategies

[Connectivity] From the early criteria, a key part of designing the building was to reconcile the differences with its surroundings (in continuity and visual impact). In this way, the design process was less driven by programmatic concerns. It would be expected that similar Architecture-style projects would be in much the same position. Here, the integration of movement paths became a key architecture feature, breaking up the larger mass and marking the connections between levels and different programs.

[Proposed new strategy] The Byker Wall used its mass and scale to protect more mundane residences from unwanted environmental effects. It also closed off the road-facing façade. Architecture could adopt a similar principle, albeit without presenting a closed front (using commercial activities or showrooms as less-sensitive buffer spaces instead). This features in a small part of the scheme, although the development is focused on the Cuba Street line – rather than the ability to parallel the rail and Cross-Valley Link as a shielding, high-amenity wall.

Architectural key strategy

[Circulation buffer + single aspect apartments]

Like the apartment building case study, circulation spaces are used as a buffer – directed at the noisiest parts of the site, while the apartments enjoyed a desirable open aspect in the other direction. Essentially, the architectural strategies employed were the same, although these were able to be separated from the street with a larger structure (i.e. apartments do not sit directly above commercial activities). With that, there is less need to ‘compromise’ to engage the street and sheer height reduces the immediacy of the nuisance anyway.

OUTCOMES OF USING DESIGN STRATEGIES TO MEET CRITERIA

(see also Focus Area Evaluations)

Urban Level

The urban exercises showed the limits of streetscape-led design - especially with regard to the 'pedestrian realm' strategy. While these are effective concessions to public space amenity, they are effectively just landscaping treatment – sometimes disrupting existing activities, character and creating unnecessarily complex roads. While this kind of strategy may be worthwhile in contexts with the space available already, it is not useful for a measured, incremental development in a limited context like this. That outcome reinforces the need for the holistic underpinnings this study has used with regard to development rather than immediately focusing on the spaces on the street.

The early urban moves worked primarily as a way of teasing out key connections and centres that detailed design would focus on. However, the urban strategies had a lot of crossover – again relating to the holistic approach to the arterial road. As a development of the larger urban planning, more nuances about the centres could be fed in based on the refined strategies tested. For instance, the 'active line' of commercial fronts can be plotted within the centre along a key stretch of the arterial road. Essentially, there could be a more detailed breakdown of the aspects of 'healthy' activity centres and their translation (in planning) to the arterial road condition.

Architectural Level

The key idea that emerged from architectural testing is the separation of the urban and architectural criteria and how they can conflict with regard to public (good streetscapes) and private amenity (comfort). A clear prioritisation would help deal with the detailed design of elements like the façade and to decide on the concessions to make for either criteria.

There is also another level of detail in the protective layers and smaller, specific strategies for their design. This is in regard to detailed considerations as well as the ability to present openness and activity while functioning as a defensive barrier.

THE PROBLEM OF THE ARTERIAL ROAD

The problem at the core of this research is how to provide amenity on arterial roads. There are multiple facets to this issue but the problem has its roots in the traditional traffic capacity vs amenity trade-off (as discussed in the Literature Review, p. 6). This trade-off implies that high-capacity roads are inherently deficient in amenity (due to air quality, noise nuisance and the physical barrier of a steady stream of busy traffic). A contemporary position – and one adopted by this thesis – is that these roads have potential as both thoroughfares and (active and enjoyable) destinations. With this position, the research goal becomes the reconciliation of traffic capacity with good amenity values for the spaces within and adjacent to the roadway. The idea of a design ‘retrofit’ is important in working with the existing road network, requiring new spaces qualities added onto an old system which was not originally constructed with amenity in mind.



Fig.8.1 Devitt Simon. Offramp apartments. Digital image. Urbis Magazine. AGM Publishing Ltd, 7 Aug. 2012. Web. 17 Feb. 2017.

Rationale for addressing this problem architecturally

Longley et al. note that with regards to air quality, “roadside corridor impacts in Auckland appear to be highly localised, but not trivial,” a result which questions the idea of developing along arterial roads. However, despite traffic-caused health concerns (including the effects of prolonged noise nuisance), “it is apparent that in the last 20 years there has been significant proliferation of accesses, sales activities and commercial ribbon development along the two-lane rural and arterial road network” (Douglass and Dryden 40). Similarly, as seen in Auckland’s off-ramp apartments (see fig.8.1), there are several contemporary projects that imply attractive views, proximity to a centre and lower-cost sites outweigh the disadvantages of living on the edge of an arterial road (Rogan). Building and occupying spaces on arterial roads is a common occurrence which makes this arterial road condition a pertinent issue to deal with. In this light, using architectural design to increase amenity is about ‘making the best of a bad situation’.

APPROACH AND SITE DRIVING THE DESIGN PROCESS

The nature of this approach defines the design process

Design strategies attempt to mitigate the negative impact of traffic on the arterial roads rather than to engineer out the problems entirely. The existing road network - and therefore the arterial road function is an integral part of New Zealand cities and urban planning. At a strategic level, discussions of design on these arterial roads relate to holistic ideas around sustainable densification, efficient public transport networks and walkable centres that avert a car-dependent community. By taking a closer look at the site-specific design responses (both streetscape and architecture), the effectiveness of the larger urban planning is tested. This testing deals with broader spatial configurations as well as the ability to protect internal and exterior amenity using targeted architectural design. This process of moving between scales is important because, while there is plenty of discourse around good urbanism and built examples which respond to abutting roads, there is another kind of reconciliation in this thesis, in matching broad intentions with detailed architectural implementation.

The nature of the site defines the design process

The site (Cuba Street in Lower Hutt) works to ground the research's design criteria in a 'real' context. This suits the measured, sensitive design approach by situating the design testing within the constraints of existing urban fabric including connections to key places, current amenity values and character. Cuba Street is a regionally significant connector but the key design driver in its redesign is the street's potential to accommodate higher density development including medium density housing. To realise this potential, Cuba Street's attractiveness as a destination and an address needs to increase. This relates to the idea of the retrofit: adding new qualities, activity and spaces while avoiding treating the context as a blank slate.

THE POTENTIAL AND LIMITATIONS OF SELECTED PRECEDENTS AND THEIR DESIGN SOLUTIONS

How precedents solve these kinds of design issues

A variety of precedents are relevant to this research, reflecting the way the capacity versus amenity issue spans different contexts and situations. There are designed streetscapes that use reconfiguration and allocation of road and public space to protect amenity and convey a distinct 'character' (e.g. a civic boulevard). Other precedents address the issues in an architectural manner; the Carchitecture examples largely look at the subsuming of automotive infrastructure into the urban fabric. They do this by creating 'places' around the infrastructure as well as connections over and through them. The third distinct type of precedent, the vernacular response, deals with the conditions of the arterial road in a more mundane manner. However, even the vernacular study suggests some atypical subversions of the conventional pattern for employment by designers, such as the creation of secondary front spaces.

The limitations of these precedent solutions

Many of these precedents have limited application to the New Zealand context where a more restrained design approach is appropriate. Also, as alluded to in the Literature Review, there are difficulties in incentivising 'ideal' development and policy (p. 12) in any case. This difficulty is heightened by the differences between the (mostly overseas) contexts and the chosen site. Other cities and high-profile design projects may have an excess of space to work with, more freedom to redesign the whole arterial road and the opportunity to create dramatic architectural solutions. By contrast, this research has a closer, constrained suburban pattern that frames the developing centres. This leads to a different solution with emphasis on localised, focused interventions and compromises based on the key design priorities.

ARCHITECTURAL SOLUTIONS PROPOSED BY THIS THESIS

How architecture is engaged in response to the arterial road problem

While the urban design strategies are largely about the adaptation of generic guidelines to reflect the arterial road condition, the architectural strategies are more developed. The architectural design works to deal with the condition at an immediate level (spaces and surfaces, protective layers and buffers), as well as supporting good urbanism at the larger scale of whole streets and neighbourhoods. There is also a strong relationship between the building's front and immediate urban context, with regard to the quality of the street spaces and the fraught relationship between defensiveness, on one hand, and

openness with visible activity on the other. In this way, the design process again becomes about the negotiation of different demands.

A key part of the design experimentation is the testing of an expressed-circulation strategy. Circulation (usually a service or 'back' element) is moved to the front of the building to function as a buffer space as well as helping to create a high-quality elevation. This idea applies across the activity centre to the larger infrastructure-scale design case study (where it is particularly useful in emphasising architecturally-choreographed movement within a very large building).

Limitations on these architectural solutions

The nature of the negotiated, measured approach does lead to a lack of a 'silver bullet' solution. For instance, the architectural strategies associated with spatial layout and envelope design have to work in tandem. This requires multiple layers of application as well as working around other considerations such as orientation, natural light, heat gain and privacy to achieve a good result. For other (particularly larger) building types it may be expedient to simply rely on heavy construction, a sealed envelope and air conditioning. Despite the limitations on practicability, this research has tested ways of developing on arterial roads which maximise urban and architectural amenity – and which also lend themselves to interesting architectural spaces.

FUTURE STUDY

Appropriately, for a study dealing with holistic strategies and multi-dimensional issues, this research touches on a number of off-shoot areas for further research. Most prominently though, while the design process crosses scales, more study at either the micro or macro scales would be useful to add to these research findings. At the micro-scale there is a wealth of technical information that could be fed into the design of facades and buffer spaces to achieve efficient shielding while also supporting other qualities (such as transparency and openness) as well as technical and construction standards. This supports the reconciliation of policy and implementation, bringing the architectural research closer to actual realisation.

The macro-scale research has a broader focus, which allows design research to go beyond the built form and explore the different aspects that underlie proposed development. For instance, many precedents have a strongly social dynamic reflecting community aspirations (see Kingston Road and Pitkin Avenue on p. 19, 21). Another example is seen in the Petone 2040 produced "Community Consultation Boards" accompanying McIndoe Urban Ltd's strategic analysis. In this vein, the broader focus can also support the policy-to-implementation sequence by underpinning the process with a better understanding of social, political and economic viability. Specifically, design-based feasibility studies can give future occupation and activity a more tangible expression that goes beyond abstract concepts.

CONCLUSION

With some technical refinement and as part of comprehensive, coherent strategy, traffic capacity and amenity can be brought into balance. A sensitive, measured negotiation adds new, high-quality spaces and qualities onto the existing road to create desirable destinations and occupation in addition to the road's link function.

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APPENDIX A : DESIGNED STREETS INFORMATION

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