Retrofit Housing Catalogue

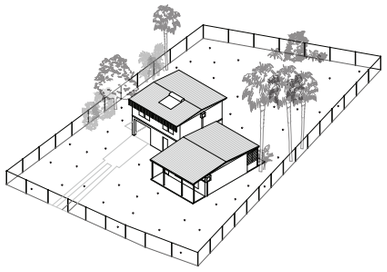
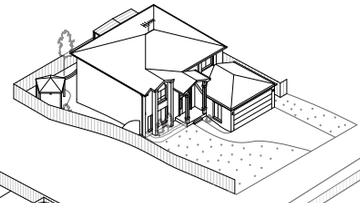
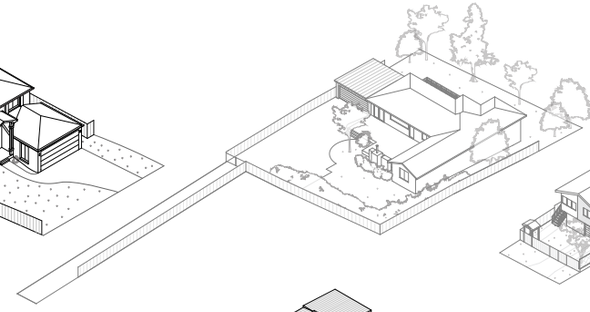
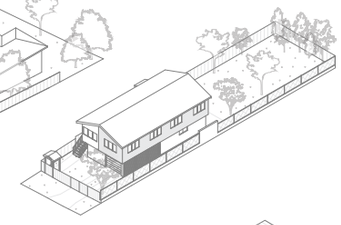
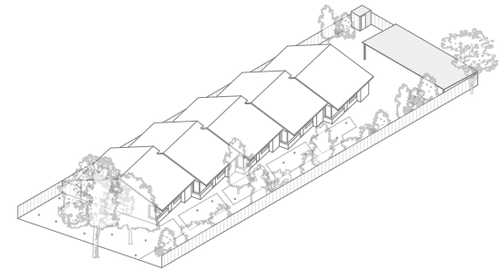
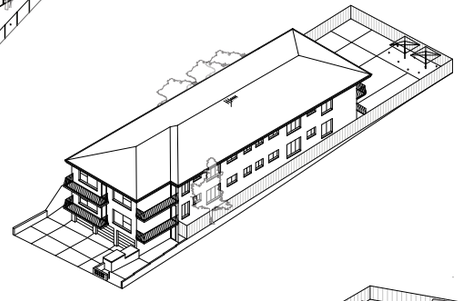
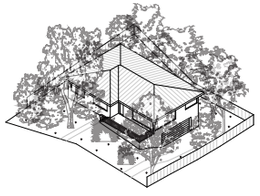
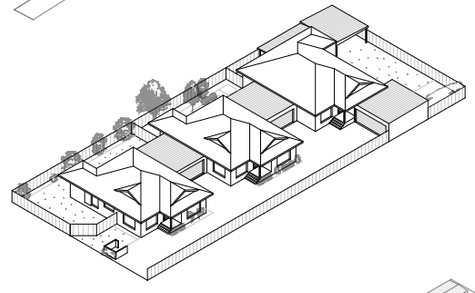
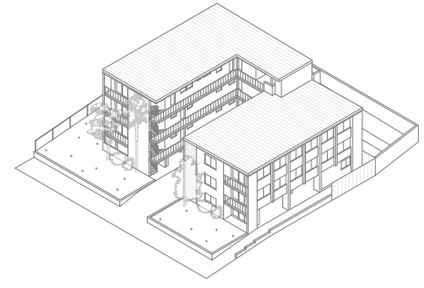
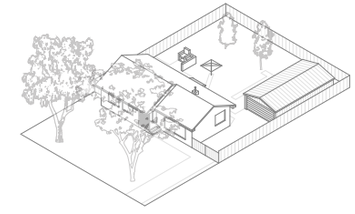
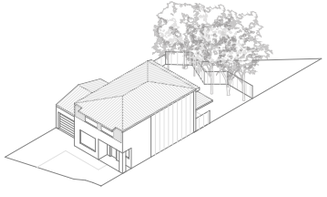
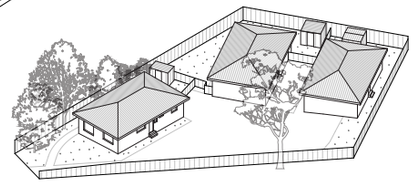
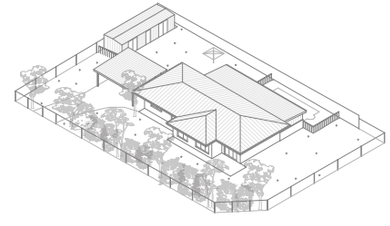
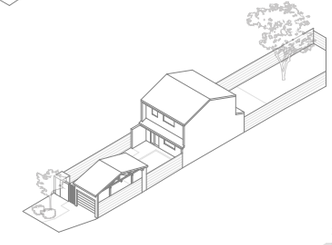
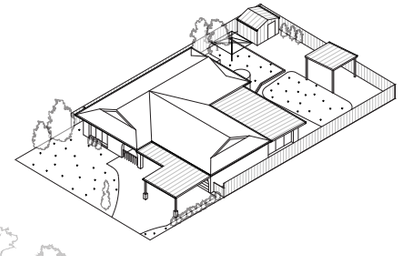
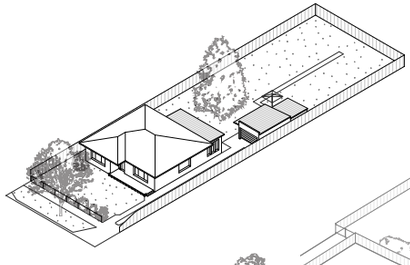
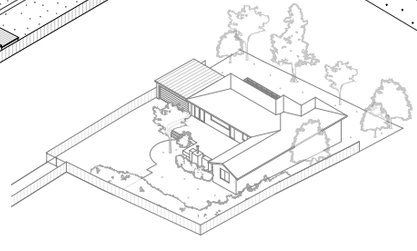
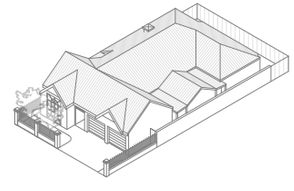
Systematic densification, diversification and greening of Australian common housing types

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Australian Government
Department of Industry, Science and Resources

Cooperative Research Centres Program

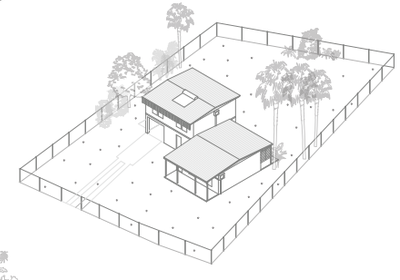
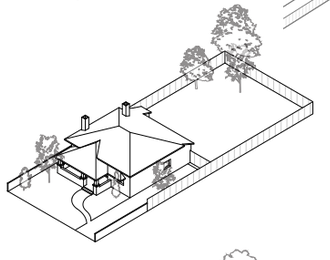
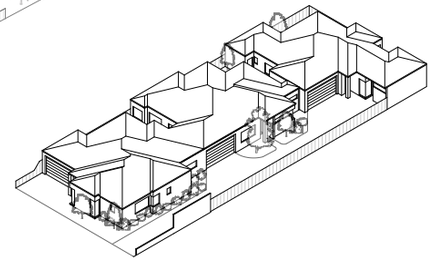
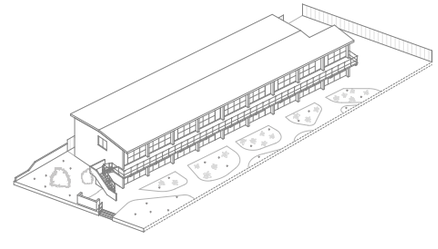
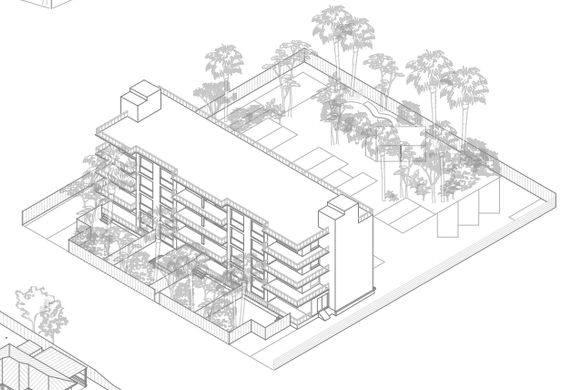
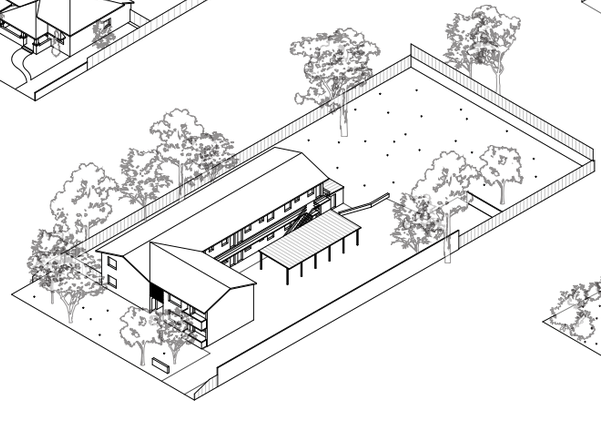
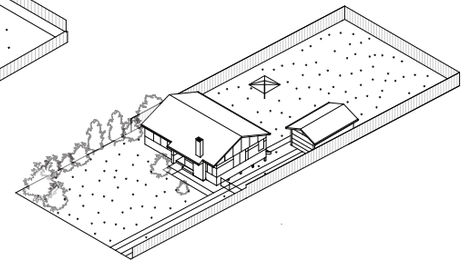
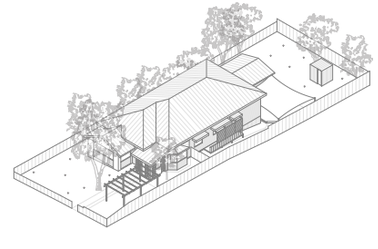
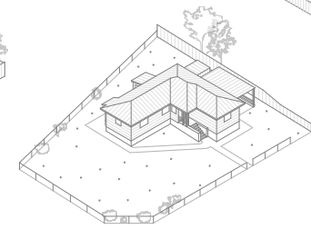










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Executive Summary

The Retrofit Housing Catalogue
Building 4.0 CRC, Project #58

Imperative

Australia faces a converging set of housing and climate challenges: the need to deliver more homes, support more diverse households, create greener neighbourhoods and reduce the carbon impacts of construction.

This project responds to these challenges by examining the latent capacity of Australia's existing suburban housing stock. It proposes that common housing types should not be understood as outdated or expendable, but as a significant national asset whose shared spatial, material and allotment characteristics can support a systematic approach through which to densify, diversify and green our suburbs without defaulting to demolition.

The *Catalogue* positions scalable retrofit as a strategic partner in achieving progressive urban transformation. Working alongside the intensive delivery of new housing supply, this complementary process would expand the pathways through which Australia can deliver more diverse, lower-carbon and adaptable households at density.

Process

The research features:

Mixed-methods: combining typological analysis, architectural documentation, design testing, GIS mapping and potential impact evaluation.

National scope: extends the Sydney pilot study (Government Architect NSW, 2024), to encompass all Australian capital cities.

Expert engagement: Targeted engagement with 10 housing experts across 8 capital cities in states and territories, to ascertain local insights on regional housing types, their evolution and specificities.

Building 4.0 CRC industry partner engagement: Targeted workshops with Project #58 industry partners to identify systemic barriers for Australian retrofit uptake, and future research pathways.

Findings

The project findings emerged from two parallel streams of research, the *Catalogue* and Building 4.0 CRC partner engagement. These outcomes are captured below.

Stream 1: An illustrated Catalogue of common house types, and manual of Actions + Impacts for strategic retrofit

The Retrofit Housing Catalogue: presents 4-5 common house types per Australian capital city, 35 examples in total. The selection represents common house types that align with the sequential development of the city from the 1940s to 2000s. The selection is organised according to 9 common typologies including: cottage, bungalow, walk-up flats, villa, villa cluster, mansion, townhouse, garage house and regionally specific examples.

The *Catalogue* documents the typological characteristics, distribution and frequency of these house types through representative case studies, and maps their location at precinct, suburb and metropolitan scales. As a result, the *Catalogue*:

- Measures the quantum of house types and provides the first concrete evidence of the national scope for impact

- Records the technical detail for each type, highlighting opportunities and barriers to achieve standardised retrofit solutions.

Actions and impacts of common houses: The *Catalogue* proposes a series of small, strategic retrofit and greening actions for existing housing that cumulatively produce urban transformation and benefits. The actions are designed to support contemporary demands for density, diversity and greening. They also:

- Align with modular building and Modern Methods of Construction (MMC)

- Show simple adaptive strategies to retrofit common house types and meet moden resident needs

The *Catalogue* then evaluates the potential impact of these retrofit actions across multiple house types, mapped in select cities only. This stage adopts a hypothetical 100% uptake scenario of retrofit and greening actions. Estimates illustrated on pp.486–495 show potential for:

- Up to 330,414 common types that could yield around 540,765 effective new homes

- Increased housing diversity for ageing in place, co-living, hybrid work, smaller households, culturally diverse household structures, and more affordable, smaller-footprint living

- Up to 4.45M sqm of canopy increase by maintaining and adding green spaces, and protecting and planting trees

While these scenarios are indicative rather than exhaustive – 100% uptake is neither likely nor advocated – the estimates show that even partial uptake would yield significant cumulative benefits.

The detailed tables overleaf capture these actions and impacts.

Retrofit Actions

Modular addition	A new architectural element, spatial unit or building added to an existing site.
Soft subdivision	A dwelling subdivided to support multiple households or other flexible forms of occupation.
Greening	Strategies that retain or increase deep soil, reduce hard surfaces and expand potential tree canopy.

Potential Impact Scenarios

Scenario	Applied to	Potential Impact
Modular addition: Secondary building + Greening	Bungalow (Sydney and Brisbane) + Cottage (all capital cities except Darwin)	62,000 dwelling uplift 1,071,000 m^2 tree canopy increase
Modular addition: Studio above garage	Villa cluster (Hobart, Melbourne and Perth) + Villa (all capital cities except Melbourne) + Garage house (Melbourne)	223,000 studio uplift
Modular addition: Additional level + Greening	Walk-up flats (all capital cities)	68,000 flat uplift 406,000 m^2 tree canopy increase
Soft internal subdivision + Greening	Villa (all capital cities except Melbourne) + Mansion (Sydney) + Garage house (Melbourne)	188,000 dwelling uplift 2,822,000 m^2 tree canopy increase

*Note: numbers are rounded to the nearest 1000. See pages 486–495 for detailed analysis.

Stream 2: Building 4.0 CRC partner engagement

Through a series of workshops with Building 4.0 CRC industry partners, the research identified systemic barriers that currently limit retrofit uptake in Australia. The workshops highlighted gaps in regulation, workforce training, data access, market demand and cross-industry coordination. Three priority areas for future industry research and development include a:

- Regulatory Retrofit Framework to enable and incentivise systematic adaptation

- Targeted Retrofit Education and Apprenticeship training to build the skills needed for this emerging field

- Retrofit Feasibility Matrix to assess cost-benefit analyses, compliance, construction logistics and commercial viability across common housing types and jurisdictions.

Contribution

The research findings make a significant contribution to knowledge about Australia's common housing stock by documenting its typological patterns, mapping its distribution, and demonstrating its adaptive potential for retrofit at scale. This aligns directly with Building 4.0 CRC priorities by identifying retrofit as a systematic pathway for new housing efficiencies, expanded markets and future workforce capability.

By treating common housing types as repeated systems, the *Catalogue* shows where standardised design actions, modularised components and Modern Methods of Construction (MMC) may be applied across multiple sites and typologies. This replication transforms retrofit from a one-off, bespoke renovation model towards a scalable housing and construction strategy with significant potential benefits for industry, government, residents and the environment.

The Catalogue presents retrofit as a systematic, scalable and nationally impactful mode of city-making. It demonstrates that Australia can increase housing choice, improve environmental performance and support social continuity by working intelligently with the homes and neighbourhoods that already exist.

In doing so, this research positions common housing retrofit as a critical contributor to meet the shortfall of housing targets, such as the National Housing Accord. As a complement to new housing supply, retrofit is an important pathway that addresses our housing and climate challenges now, and in the coming decades.

Introduction

The existing city fabric, with carbon already spent on its production, will provide the base from which we can build, demanding an end to demolition culture and a shift towards regenerative urbanism.

Joe Giddings, 2023

This report begins from a simple but critical architectural proposition: that the densification, diversification and greening of Australian housing can be achieved through precise, surgical adaptation of existing common residential fabric, alongside new development. *The Retrofit Housing Catalogue* (hereafter the *Catalogue*) draws on design-led and mixed methodologies to demonstrate this potential.

This project aligns directly with Building 4.0 CRC priorities by positioning retrofit as a systematic method for delivering new housing efficiencies, expanded markets and future workforce capability. By treating common housing types as repeated systems with common characteristics, the *Catalogue* identifies where standardised retrofit actions and modularised components can be applied at scale to improve existing homes rather than relying solely on demolition and new build supply. In this way, the research connects design-led knowledge with industry insights, outlining potential opportunities for new retrofit concepts. It further outlines future research agendas on regulatory pathways, training models and business development that support more diverse, lower-carbon and adaptable housing outcomes.

Common housing attributes

Australia's capital cities are overwhelmingly composed of ordinary housing types, including cottages, bungalows, walk-up flats, villas, garage houses and mansions. These types repeat in regular patterns and have accumulated over decades. Together, these dwellings form the granular structure of our suburbs, yet they remain largely invisible within architectural and urban policy discourse. Frequently dismissed as outdated, inefficient or expendable, such housing is typically subject to demolition rather than careful transformation. This project reframes those assumptions by understanding common housing types as an intelligent urban structure, capable of accommodating change at scale if its characteristics, quantities, distribution and potential for retrofit are better understood.

Common suburban housing stock is both extensive and durable. For instance, the average lifespan of a brick home in Australia is estimated at approximately 88 years, and a timber home at 58 years, with many dwellings lasting considerably longer through ongoing adaptation and maintenance.[2] When adaptations are made, the majority of them are one-off, bespoke renovations. This points to the fact that, while long-lasting, the common home is also increasingly unsuitable for the diversity of contemporary needs that include ageing in place, multi-generational households, co-living arrangements, working at home, and home-and-income opportunities.

This research works with the premise that the inherent regular characteristics of common housing types present a largely untapped opportunity to retrofit them at scale. As well as responding to the way Australians live now, retrofit at scale would address some of the country's most pressing urban challenges: the need for more homes, greater density, housing diversity, enhanced urban greening and reduced carbon consumption.[3] These homes hold the potential to continue shaping Australian cities for decades to come.

Scalar impact

Adopting a systematic retrofit approach to common housing types intersects directly with Building 4.0 CRC's focus on systematic approaches to delivering new and improved housing. Compared with business-as-usual (BAU) new builds, retrofits offer greater housing diversity and greening,[4] are often cheaper and quicker to deliver, and significantly reduce embodied carbon while cutting operational carbon costs for residents.[5] Through modular building and Modern Methods of Construction (MMC), retrofits could also create jobs and training opportunities to support new building practices. Critically, common housing types are largely free from the heritage protections that would limit their potential, making them well-suited to modular, replicable interventions at scale. Development pressures mean that knock-down redevelopment remains the preferred path, yet the relatively simple actions available through retrofit represent a credible alternative that would increase housing supply and diversity, support local community continuity[6] and social resilience.[7,8] Retrofit deserves serious consideration alongside established housing delivery methods, primarily focused on new builds.

Systematic action

The *Catalogue* frames spatial and formal dimensions of common housing types as a means to systemically impact on cities through retrofit actions, and is guided by two primary research objectives and associated methods:

- Documentation of the typology, frequency and concentration of a selection of common Australian housing types (1940s–2000s) to test retrofit impacts.
- Demonstration of systematic and scalar retrofit strategies to meet targets for urban density, diversity and greening.

To achieve this, the study extends the Sydney 2024 pilot study for the New South Wales Government Architect "Five Common Housing Types in Sydney: Densification and Greening without Demolition," (hereafter the GANSW report). The GANSW report outlined the potential of classifying common housing stock and identified retrofit strategies for everyday dwellings as an alternative form of density in established suburbs. A hypothetical scenario for the Sydney metropolitan area illustrated that adopted comprehensively, this could provide a total uplift of approximately 125,000 dwellings and a canopy increase of 1M sqm.[1]

Building on this foundation, the *Catalogue* expands the research to include all Australian capital cities. It adopts the same methodology and analytical techniques as the GANSW report and integrates its content within this larger study.

This systematic knowledge capture is unprecedented. Assembling this extensive catalogue of selected common housing types and retrofit actions offers a framework to address policy targets for housing density, greening and diversity. It also helps to meet the Building 4.0 CRC objectives for better buildings, new housing efficiencies and markets, and new training opportunities. In light of these priorities, it offers two main contributions:

- Identification of common housing types that can be adapted at scale to increase density, diversity and greening through retrofit actions aligned with standard industry products and MMC.
- Identification of future research pathways for business development, regulatory reform and training opportunities to support retrofit forms of housing density and diversity that are currently overlooked by BAU new-build housing supply.

Report structure

This retrofit housing catalogue is structured in three sections.

Section 1: Rationale + Methodology provides the contextual and methodological foundation for the report. Through a brief outline of policy, social and environmental imperatives, it presents the case for treating Australia's existing common housing stock as a significant national asset, capable of contributing to housing supply, climate resilience, emissions reduction and more diverse household needs. It outlines the project's mixed-methods approach, including expert engagement across states and territories, extension of the GANSW pilot study methodology, typological selection and documentation, retrofit design testing, mapping, as well as acknowledging the limits of the data, the anomalies encountered across jurisdictions, and the consequences of these findings for future retrofit delivery. Appendix I, includes detailed information on the mapping paramaters. Section 1 also evaluates the impact of the research alongside the workshops with Building 4.0 CRC industry partners.

Section 2: This catalogue presents the substantive illustrated outcome of this project, structured in two sections. First, as an illustrated catalogue of 35 representative case studies across nine building types, showing their spatial characteristics, distribution and frequency. Second, it provides a set of retrofit actions and estimated potential gains in household density, housing diversity and greening if these actions were adopted at scale.

Section 3: Contribution + Future Research summarises the project's key contributions: expert informed typological documentation of common Australian housing; systematic mapping of housing types, quantities and locations; demonstration of retrofit potential for density, diversity and greening; and relevance to policy, industry and Building 4.0 CRC objectives. It then identifies future research pathways needed to support retrofit at scale, including the publication and digital dissemination of the *Catalogue*, and three industry-led research streams: a regulatory retrofit framework, retrofit education and apprenticeship training, and a retrofit feasibility matrix. The outcomes from the Building 4.0 CRC partner engagements can be found in Appendix II.

Section 1:
Rationale + Methodology

Australian cities must simultaneously increase housing supply, diversify housing types through medium-density infill, and green existing suburbs in order to reduce ecological footprints and create more liveable, resilient urban communities.

Peter Newton, 2022

This section provides the contextual and methodological foundation for the report. Through an outline of policy, social and environmental imperatives, it presents the case for treating Australia's existing common housing stock as a significant national asset, capable of contributing to housing supply and more diverse household needs, as well as climate resilience through urban greening and emissions reduction. It describes the project's mixed-methods approach, including expert engagement across states and territories, extension of the GANSW pilot study methodology, typological selection and documentation, retrofit design testing, mapping, impact evaluation and Building 4.0 CRC partner engagement.

Rationale

A national housing asset

Australia's suburban housing stock, approximately 10 million dwellings, constitutes one of the nation's largest urban resources. Approximately 70% of Australians live in detached or semi-detached housing, much of it located within established metropolitan suburbs.[9] At the same time, governments are seeking to deliver 1.2 million new homes over five years under the National Housing Accord, while also responding to climate adaptation and emissions-reduction targets. Many metropolitan strategies now target urban canopy increases of between 30–40% by 2040–2050, recognising the role of trees and green infrastructure in mitigating urban heat island effects and improving biodiversity and public health.[10] [11] The built environment is also responsible for approximately 18–20% of Australia's carbon emissions when construction and materials are included,[12] highlighting the importance of retaining and adapting existing buildings rather than relying solely on demolition-led redevelopment.

At a time when Australia faces simultaneous crises in housing supply, climate resilience and emissions reduction, this project argues that the existing suburban fabric must be understood as a significant national asset: one capable of contributing meaningfully to these challenges if approached with care, precision and strategic intent.

A national housing imperative

Across Australia, governments are grappling with the need to deliver more housing, more quickly and in more sustainable ways. Targets from the federal and state governments continue to emphasise increased housing supply within existing urban areas, rather than ongoing greenfield expansion. Yet for nearly two decades, housing delivery has consistently fallen short of targets and greenfield housing continues to expand. The delivery of additional housing within established suburbs has been hampered by community resistance, high construction costs, rising interest rates, labour shortages, supply chain constraints and planning systems struggling to manage rapid change.[13] In short, housing supply remains an intransigent problem that has become one of the major problems facing our nation.

At the same time, incremental and ad hoc demolition of common housing stock has been occurring by stealth for decades, predominantly through dual occupancy redevelopment: two-for-one replacement models, largely driven by 'mum and dad' developers.[14] While achieving some degree of densification, this process results in the loss of mature trees and vegetation, reductions in permeability and biodiversity, the homogenisation of suburban character, and increases in embodied carbon emissions associated with demolition and redevelopment.[15]

The types of housing currently being delivered are also failing to meet the needs of contemporary Australian households. Much new development continues to produce relatively narrow housing options – detached homes at the fringe or standardised apartment models in activity centres – with insufficient diversity in between. Yet changing demographics require more adaptable forms of housing. Single-person households now account for approximately 25% of Australian households. Multigenerational living is also a significant but overlooked statistic: in 2011, 4.3 million Australians lived in multigenerational households; that is, one in every five people.[16] [17] Further, the rise of culturally specific household structures,[18] and the prevalence of home-based work and hybrid living arrangements[19] all demand more flexible housing typologies than the current market typically provides.[20]

Beyond physical and environmental considerations, Australia's suburbs also contain significant social and cultural value accumulated over time through everyday life, memory and long-term occupation: these are the places we live in and belong to. Established suburbs are places where social networks, care relationships, schools, local businesses and community infrastructures have evolved over generations, producing strong forms of place attachment and belonging.[21] Many residents wish to remain in these neighbourhoods as their circumstances change, such as through ageing, family restructuring, changing economic conditions or evolving care needs, yet often lack appropriate housing options to do so. Older residents may be forced to leave familiar communities because existing homes no longer suit their needs; the overwhelming preference of older Australians is to remain in their home, rather than move to dedicated elder housing.[22, 23] Meanwhile, younger generations are increasingly priced out of the suburbs in which they grew up.[24] More diverse and adaptable forms of common housing within established suburbs could support greater social continuity, intergenerational living and ageing in place, while reducing displacement and maintaining the social resilience embedded within existing communities.[25]

A national climate imperative

Climate imperatives add further urgency. Australian cities must cool rapidly in a warming climate, expand urban canopy cover and reduce both operational and embodied carbon emissions. Many state and local governments now target urban canopy increases to 30–40% coverage by 2050, recognising the critical role of trees in mitigating urban heat island effects, improving biodiversity and supporting public health.[26] Yet progress remains uneven. In Greater Sydney, for example, only 18 of 33 local government areas recorded canopy increases between 2019 and 2022, while many established suburbs across Australian cities continue to experience canopy loss associated with expedient redevelopment.[27]

The construction sector's carbon footprint further underscores the need for alternative approaches. Buildings and construction account for a substantial proportion of Australia's emissions, with the built environment responsible for approximately 18–20% of national carbon emissions when construction and materials are included.[28] Demolition-led redevelopment carries significant embodied carbon costs through the disposal of existing materials and the production of new construction systems.[29]

Taken together, these pressures demand new approaches to city making that are scalable, replicable and capable of being deployed nationally. As Carl Elefante famously argued: *"the greenest building is the one that already exists"*.[30]

Methodology

Mixed-methods

This project adopts a mixed-methods approach informed by design-led research processes. It combines national typological analysis, detailed architectural documentation, systematic design testing, large-scale Geographic Information System (GIS) mapping, and structured industry engagement. By integrating expert knowledge from every state and territory with forensic dwelling analysis and customised spatial datasets, the research develops a multi-scalar approach to understand and upgrade Australia's common housing stock. Design-led methods are complemented with industry engagement through a parallel series of workshops with Building 4.0 CRC partners. This combination of methods enables new insights into the spatial logics, retrofit capacities and systemic barriers embedded in existing housing – knowledge that has not previously been available at a national scale.

Expert engagement

To gather typological analysis and data at a national scale for major Australian cities, the research team collaborated with 10 housing experts across 6 capital cities. Their expertise ranged from award-winning architectural practice and government housing advisory roles to established academic research. The experts included:

Adelaide: Adelaide University, Associate Professor Damian Madigan, Dr Julie Collins, Associate Professor Lyrian Daniel.

Brisbane: The University of Queensland, Senior Lecturer Andrew Wilson, Architectural Researcher Gordon Macindoe.

Canberra: University of Canberra, Senior Lecturer Ann Cleary, Architectural Researcher Dr Prajakta Sane.

Darwin: Troppo Architects, Phillip Pender.

Hobart: City of Hobart, Program Leader Strategic Land Use Planning Dr Alysia Bennett.

Perth: University of Western Australia, Senior Lecturer Jennie Officer; Director, Officer Woods.

The knowledge provided by these experts extended the research team's prior research on Melbourne common housing types and subsequent investigation of Sydney common housing types, undertaken with GANSW.

Research sequence and parameters

The methodology adopted in the GANSW report provided a productive precedent for understanding, describing and identifying value in everyday housing across Australian cities. It also established a method for identifying typological patterns in the existing housing stock that could unlock the greatest potential for retrofit strategies at scale. This four-step process encompassed:

- Selecting types of common housing suitable for retrofit in each state and territory.

- Designing retrofit actions for these types that are aligned with MMC.

- Measuring the quantity and location/s of retrofitting each common type.

- Calculating the potential increase in densification, diversification and greening through common house retrofits at local, state and national scales.

In applying this process to an extended national study, several parameters were critical to define and limit the study and its outcomes They comprise selection, documentation, design of retrofit actions, and mapping the selected typologies and equivalent dwellings. Each aspect is summarised below.

Temporal scope
The selection criteria focused on dwelling types from post-1940 to homes that were at least 20 years old (i.e. built before 2005), generally free from heritage or other protections, and had clear potential for adaptive retrofit, including internal reconfiguration, extension and subdivision that make room for additional dwellings and increased tree canopy.

Case study selection
The advisory expert team was briefed to research and collate a range of common housing data for their city, drawing on archival and secondary sources, real estate listings, Google Maps and digital material.

The brief requested the selection of four to five common dwelling types with high concentration and frequency in their respective cities. Each type was to be identifiable by the specific post-1940 development era. The selection criteria prioritised small to medium-sized dwellings on large plots with potential for internal reconfiguration, extension or subdivision; larger buildings with potential for internal reconfiguration and/or additional dwellings on the site; plot sizes and shapes that could support increased tree canopy; and, where possible, sketches demonstrating the adaptive potential of the selected type/s.

Final selections were agreed with experts based on their research, local knowledge and bibliographic sources. This process yielded 35 case studies, representing nine common housing types across Australia's capital cities: bungalow, cottage, walk-up flats, townhouses (including duplex), villas, clustered villas, garage house, mansion house and regional types (elevated houses, single-storey flats).

This resulted in a targeted catalogue of types existing in large quantities in each capital city. They demonstrate *retrofit potential*: they do not claim to be a comprehensive survey of all existing housing. Some types were not documented and mapped in all cities to avoid repetition, such as Melbourne's Garage House type, which now exists in greenfield suburbs across Australia. The study's future potential is to extend and map all identified building types as national phenomena.

Case study documentation
For verifiable accuracy, a consistent documentation sequence was followed. This included comparative reviews of plans, documentation and photographs provided by state experts; use of real estate floor plans, with dimensions checked against multiple rooms and compared with overall building footprints from Nearmap imagery; and comparison of plans with available internal and external imagery, including Google Street View, real estate listings and photographs supplied by the expert teams.

This testing assisted in refining floor plans and checking room locations, including bathrooms and kitchens. External photographs also provided primary evidence to test building heights, for example by counting brick courses or window heights, and to confirm the accuracy of supplied sections or elevations. Where plans and photographs were unavailable for individual units, such as in some walk-up flat typologies, dimensions and arrangements were inferred from available information about surrounding units, with external imagery used to validate window locations and contextual accuracy.

This forensic work informed the selection of a representative case study sample for each type in each city. Based on the selection of an actual dwelling in an existing suburb, each house and plot was analysed to understand its organisational, spatial and material order. Architectural drawings translated this knowledge through plans, sections, elevations and axonometrics, enabling visual representation of each type and deeper comparative analysis of similarities and differences across cities.

Retrofit actions
The proposed retrofit actions adopted a systematic design approach. They consist of architectural actions that align with MMC, where possible, and are designed to apply across typologies to achieve density, diversity and greening at scale. This process was resolved into two general retrofit actions – modular addition and soft subdivision – a series of greening strategies.

Mapping
A mapping protocol was developed to identify the selected common housing types across Australia's metropolitan regions. As with the GANSW report, the protocol established a set of rules relating to building form and urban characteristics. These enabled searches to identify and verify the spatial distribution of each common type in every major city.

It was critical to estimate the quantity and location of common dwellings with the spatial qualities identified in each city-scale survey: this gauged the potential increase in new dwellings through retrofit. The maps showed where each type occurred and in what quantities. Rather than mapping every example of a historical type, the process focused only on sites with potential to accommodate retrofit design approaches. For example, plots or dwellings that had been significantly developed or modified and could not support densification and greening strategies were excluded from mapping.

A sequence of steps integrated information of building footprints, building heights, zoning data, and the dimensions of both buildings and property boundaries. The combination of these datasets generated specific city-level databases. Like commercially available datasets and assets, such as the Geoscape suite, these databases consolidate urban intelligence and broadly standardise material from multiple jurisdictions.

However, the databases differ in important respects. Crucially, the composite datasets developed for this project do not explicitly standardise material at a national level. Instead, they aim to provide a 'near-enough' comparison between states and territories, while preserving some of the specificity and idiosyncrasy of the source data. For example, there is no national data dictionary for the combined databases, and nomenclature varies from state to state, preserving the internal logic of original data sources.

The consistent criterion in the mapping is a single Geoscape product: the national building footprint dataset. No other comparable source exists for this kind of information. Beyond that, the research aimed to use available data sources for large scale mapping and GIS applications in each relevant state and territory. This data provided some key affordances – both in the ability to create a reasonably efficient custom dataset for queries, as well as in preserving useful information that is culled or flattened in national sets like Geoscape. The Australian Capital Territory, for example, provides an unusually verbose set of property information that underlies their ACTmapi service but also provides clear identification of strata and multi-residential parcels and buildings. Meanwhile, Tasmanian data includes rich definitions of property type, with a two-tier definition system of their cadastral data.[31]

Detailed Typological Parameter tables in **Appendix I** set out the parameters used to define typologies for all major cities. However, a brief summary of key filtering, data selection and indicators includes:

Setback calculation from street:

In many cases, a simple buffer setback from the street frontage was sufficient to begin to differentiate type. In other cases – increasingly more recent typologies – distance from side and rear setbacks was more critical in identifying types. These values – buffer, and front, rear and side setbacks – were calculated and baked into data for each of the cities.

Comparative measure of primary building and other structures on the lot:

An important consideration was both the size of the dwelling – as well as the presence (and type) of other development on the relevant property or lot. Many typology queries will reference both the building footprint, as well as the sum total of built area on a property. City by city – this was calculated by associating each building object with a parent property, and then summing the total area aligned with that property. This was often used to identify examples of types where little development had occurred.

Additional checks for strata title or equivalent:

A clear benefit of working with jurisdictional data where possible was the preservation of key indicators of strata title; the type of title; and geometry data associated with overlapping or superimposed polygons. This allowed a state and territory level approach to identifying strata properties and connecting additional useful information while doing so. Typology queries often reference both a strata check as well as a check on the 'real' addresses or tenancies at the property.

Deposited Plan Number:

While there is no standard form for deposited plans at a national level, in some cases, at state and territory level, the plan number preserves useful information. In Queensland, a prefix to their survey plans exposes information about types and date ranges of properties. In New South Wales, a broadly ordinal approach to plan numbers allows for a gross check of time periods.

The results produced a series of colour-coded maps across three scales – precinct, neighbourhood and city – that located the common housing types within their urban environment. This visual survey reveals useful, consistent clustering of types, highlighting where and how smaller 'islands' of types occur in an otherwise indistinct urban fabric. By illustrating the incremental scale shifts – from micro to meso and macro for each type, in each Australian city – the maps substantiate the potential impact of densification and greening if retrofit actions were systematically adopted across the cities. While undertaken methodically, the mapping process was not always simple to check. The 'Data anomalies' section below discusses this aspect in detail.

Limitations and outliers

Sites were identified by building form, not by historical 'type,' and this occasionally elided dwellings with similar characteristics of a type that sat outside the description. That is, buildings with similar spatial dispositions were returned in any search, regardless of whether they were a true representative of a narrower formal (historical) typology. In practice, the research approach still judges this as an effective outcome as the spatial type has similar capacities for retrofit and upgrade in line with the original typology.

Age of stock forms a vital yet guarded asset in the spatial and planning toolkit across all states and territories. The true age of stock, as managed by state valuer generals, was not used in this mapping exercise. Effective integration of this data would be within scope of further research, noting that an effective search can still be undertaken by adopting broad spatial characteristics alone.

A simple geometric calculation for front, side, and rear setbacks was conducted for all properties. While this was generally effective, the irregular nature of the datasets led to some gaps and issues. Crucially, 'landlocked' or battle-axe properties were less likely to have accurate measurements for front and rear setbacks because no clear road frontage could be established. Regardless, the addition of side and rear setbacks was critical for several recent typologies, which included Adelaide's courtyard house (villa).

Topographic conditions, especially for cities such as Sydney and Hobart, could be used to tighten the assessment of sites suited to retrofit development. A general topographic calculation for fall across site was included in the assessment for Hobart, based on feedback from the expert panel, and this was used to refine results for the double/triple villa typology.

Finally, the count of type is conducted across the 'greater' region[32] for the capital city in each state and territory. This excludes significant areas of urban settlement – especially in the Eastern states where a larger portion of the urban population lives outside of these areas. Many of these secondary cities have experienced similar housing markets and dynamics, inflected through their own specific climates, construction logics, and contexts. For example, 530 walk-up flat equivalents can be found in the Gold Coast; recognising that this local type evolved out of delivery of short-stay/holiday accommodation rather than speculative markets overturning existing stock.

Data anomalies

The mapping research used a combination of data sources, with some variation in temporal range. The use of some slightly older sources remained relevant for this project because the primary research focus was on the densification of established suburbs, not greenfield sites. The latter are the areas of greatest suburban growth that change more substantially from year to year.

Several points regarding the cadastral data itself were revealed in the process of mapping each common housing type nationally that create barriers to implement mapping. Importantly, only some states and territories have readily accessible cadastral data available, while others, including Western Australia, South Australia and the Northern Territory view the data as a commercial revenue stream, therefore creating a cost and administrative barrier to access this information.

There are significant differences in the way in which strata are documented within the geometry of datasets. Further difficulties are created due to states/territories adopting different approaches to describe cadastral data. For example, while a parent parcel identification of a site is widely available through title searches, strata title referencing is unevenly described nationally, therefore obscuring the search process.

Similarly, the codes and typologies of common housing types differ between states/territories. Western Australia uses R-codes[33] to identify residential district characteristics, the Australian Capital Territory adopts RZ 1-5 [34], while New South Wales adopts a similar R1-5 framework but with different local environmental plan overlays.[35] This varied approach to zoning has multi-layered consequences: the most significant issue for this research and potential retrofit impacts is that techniques to map density and typology vary nationally.

These inter-state anomalies highlight the difficulty of transferring a national 'pattern book' approach to retrofits. This has consequent impacts on the potential and ease of achieving actions for density, greening and diversity across Australia. Likewise, existing commercial cadastral products that attempt to cohere a 'national' dataset risk obscuring these crucial (and useful) distinctions and differences.

Building 4.0 CRC Partner Engagement

Another key part of the project research was a series of industry workshops with partners from the Building 4.0 CRC. This engagement was a critical factor in determining current and future industry opportunities and limitations. The workshops explored how existing buildings could be improved by adopting modern construction efficiencies and collaborating with industry expertise to develop a systematic retrofit approach.

Evidence from Australian policy and the objectives of Building 4.0 CRC, supports the case for housing retrofit, while also raising a key research question: why is retrofit not more widespread in Australia? This provocation was discussed across six industry workshops, engaging with more than 18 partners across a range of industries. These workshops provided valuable operational and expert knowledge; particularly around the commercial demands of retrofits. The key discussion points are outlined below, and documented in detail in Appendix II.

Broadly, the results of these workshops revealed that the main challenges relate to technical and regulatory gaps; economic feasibility; and market demand. Specific retrofit barriers that were cited throughout the workshop series included the lack of:

- A national regulatory framework to support specialist retrofit approaches.
- Reliable cost-benefit feasibility study to identify comparative business potential for retrofitting common types vs BAU development.
- Training pathways to support graduates skilled to deliver retrofits.
- Policies and incentives to reward carbon savings at federal and state levels.
- Standardised retrofit solutions that would meet modular production and MMC requirements.
- Cross-industry collaborative systems to meet the different demands of the retrofit process.
- Consumer demand.

Further, there are challenges in accessing raw data about common housing. The research process revealed inconsistent access to cadastral property data across states and territories, as well as varied approaches to data record management across jurisdictions. From an industry perspective, it is critical for businesses to be able to accurately and efficiently calculate the potential and scope for retrofitting common housing. The difficulty of ascertaining this information presents another barrier to enabling retrofit at scale.

The partner engagement revealed three overarching future research streams that would support retrofits at scale. They encompass: a Regulatory Retrofit Framework to incentivise uptake; Retrofit educational and apprenticeship models to support new demand; and a Retrofit Feasibility Matrix of cost-benefit analysis. The potential for each of these streams is discussed in Section 3: Contribution + Future Research.

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Section 2:
Catalogue

There is a strong need to demonstrate how small, strategic interventions in existing suburbs can deliver meaningful density, diversity and affordability while preserving social and environmental continuity.

Associate Professor Damian Madigan, 2026

This section presents the substantive outcome of this project in the form of an illustrated catalogue and is structured in two sections. First, as a catalogue of 35 representative case studies across nine building types, showing their spatial characteristics, distribution and frequency; and second, as a set of retrofit actions and estimated potential gains in household density, housing diversity and greening if these actions were adopted at scale. Appendix I details how the mapping typology parameters were selected and tested.

Common House Types

Catalogue

Characteristics, location and frequency

This section documents a selection of widely occurring housing types from the 1940s to the 2000s (noting that some have earlier origins) across Australia's capital cities, presented through a consistent catalogue format. It is not intended to be read as a comprehensive survey of all common housing types; rather, it is a curated set identified by experts for their suitability for systematic retrofit, densification and greening. While some dwellings – such as mansions and garage houses – are products of volume-built, market-driven delivery, others are not mass-produced in a commercial sense but nonetheless share recurring spatial, material and morphological patterns across cities and decades. Together, these types represent a substantial portion of Australia's existing housing stock and exhibit consistent logics in form, allotment configuration and construction.

This catalogue captures this diversity through representative case studies for each capital city, mapping their distribution and illustrating how their shared characteristics and widespread presence create strong opportunities for coordinated retrofit strategies that deliver on critical policy agendas. The catalogue is organised alphabetically by capital city. In each city, four to five case studies are documented through a standard template comprising a short written description, aerial location photograph, two and three-dimensional architectural drawings, and dwelling and allotment data. This documentation is followed by mapping of the distribution and frequency of each housing type, and its formal equivalents, across precinct, suburb and metropolitan scales. These maps operate not only as a record of existing housing distribution, but as a tool for identifying the potential for retrofit actions to have cumulative effects across a range of urban scales.

The selected common housing types in the Australian capital cities they include:

Adelaide: cottage, walk-up flats, single-storey flats, villa.

Brisbane: bungalow, cottage, walk-up flats, townhouse, villa.

Canberra: cottage, townhouse types x 2, villa.

Darwin: elevated house types x 2, walk-up flats, villa.

Hobart: cottage, villa types x 2, villa cluster.

Melbourne: cottage, walk-up flats, townhouse, villa cluster, garage house.

Perth: cottage, walk-up flats, villa, villa cluster.

Sydney: bungalow, cottage, walk-up flats, villa, mansion.

This selection also captures the regulatory and policy frameworks that shaped housing types from the 1940s onwards. A detailed analysis of these forces is outside the remit of this report; however, as an illustration, examples include:

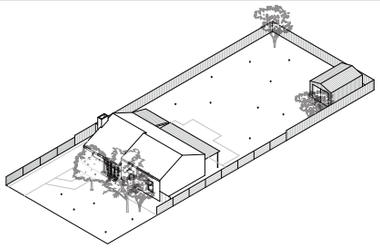
The opening of new suburbs during the decades post World War II. As state governments, local councils, and private developers released land for residential development, new housing followed. The 1,230-hectare Golden Grove development in Adelaide, a joint venture between the South Australian Government and Delfin/Lend Lease, is a prime example: a large-scale project designed specifically to deliver new, affordable homes to a growing population.

Development patterns in response to regulatory change. Shifts in infill controls across this period unlocked new housing forms that would otherwise have been impossible. For example, walk-up flats appeared nationally from the 1960s as planning rules loosened, while Canberra's National Capital Development Commission programme actively promoted townhousing between 1960 and the late 1980s.

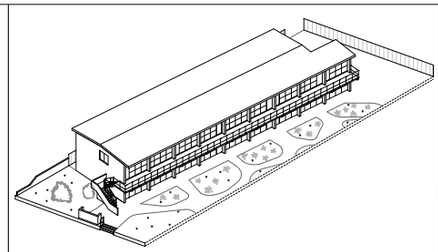
Government housing programmes formed the third major force. From post-war recovery to social housing delivery to disaster rebuilding, the state has repeatedly stepped in to make housing happen at scale. Adelaide's austerity war service homes (1941–55), Hobart's distinctive cottage typology (1945–70), and Darwin's split-level homes built after Cyclone Tracy (1974–80) all bear the clear imprint of government intervention.

The rise of the project home, arguably the greatest consequence for retrofit impact today. As discussed above, while all common post-war homes reveal the lineage of market-led housing, the rise of the repetitive house as product notably increases in quantity and decreases in variation from the villas of the 1970s to the garage and mansion homes of the 1990s onwards. Market-driven, mass-produced housing has come to dominate every state and territory, independently of the policy levers that had shaped housing in earlier eras. The result is strikingly homogenous housing. Where previous decades produced distinct regional typologies, recent Australian homes look broadly the same from Darwin to Hobart. This uniformity, while often lamented, carries a silver lining: the project home's consistency makes it a strong candidate for standardised, scalable retrofit solutions.

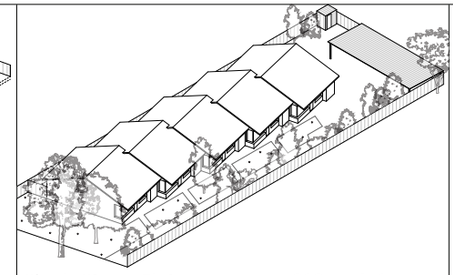
Adelaide



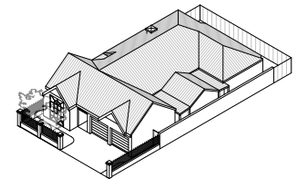
Cottage 1940s - 1950s
Lot Area: 792.4 m2 17.4 m x 45.6 m



Walk-Up Flats 1950s - 1960s
Lot Area: 1842.7 m2 36.8 m x 49.4 m

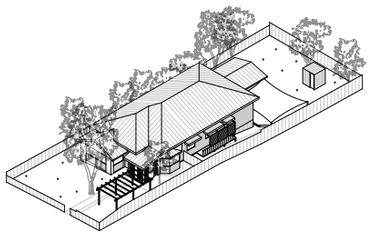


Single Storey Flats 1960s - 1970s
Lot Area: 1138 m2 20.5 m x 52.3 m

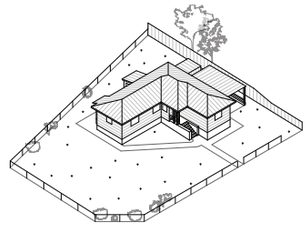


Villa 1990s - 2000s
Lot Area: 312.8 m2 12.5 m x 25 m

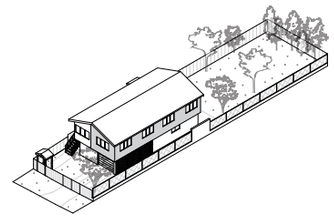
Brisbane



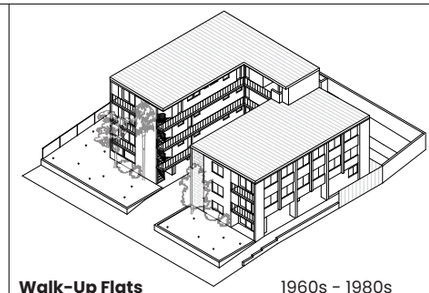
Bungalow 1930s
Lot Area: 704.2 m2 15.7 m x 44.8 m



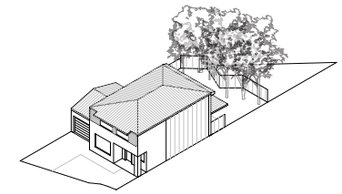
Cottage 1900s-1950s
Lot Area: 692.8 m2 26.4 m x 32.2 m



Villa 1950s - 1970s
Lot Area: 425 m2 10.3 m x 41.4 m

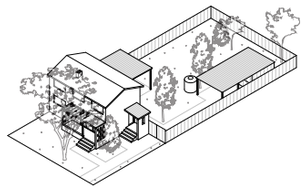


Walk-Up Flats 1960s - 1980s
Lot Area: 956.5 m2 30.8 m x 31 m

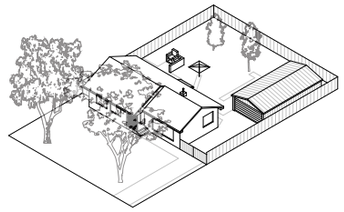


Townhouse 1990s - 2000s
Lot Area: 139 m2 9.2 m x 16.5 m

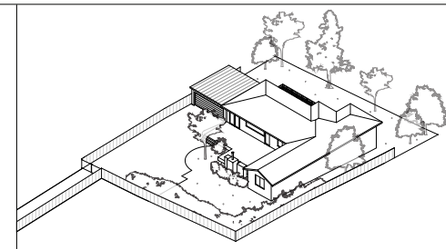
Canberra



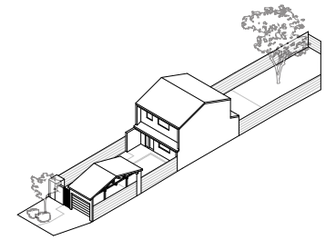
Townhouse I 1950s - 1970s
Lot Area: 513 m2 13.6 m x 35.2 m



Cottage 1950s - 1970s
Lot Area: 746 m2 21.2 m x 35 m

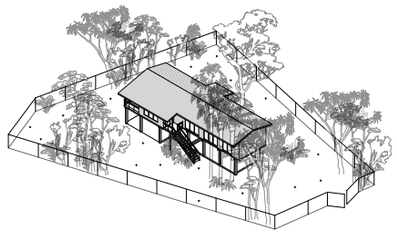


Villa 1960s - Ongoing
Lot Area: 986 m2 3/24 m x 34.7 m

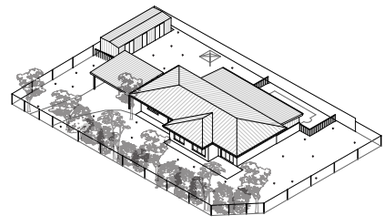


Townhouse II 1970s - 1990s
Lot Area: 221 m2 4.75 m 39.8 m

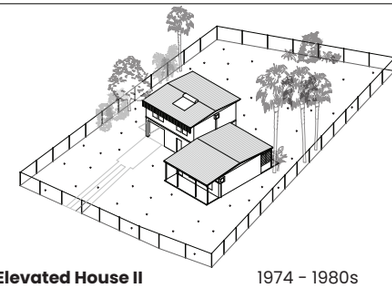
Darwin



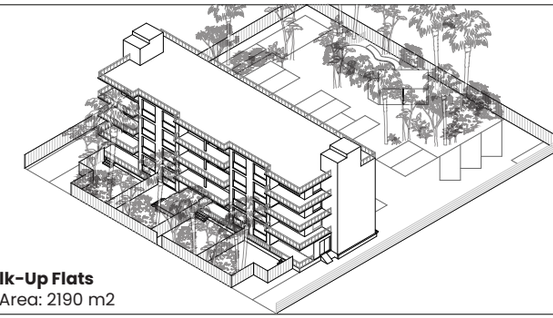
Elevated House I 1950s -1980s
Lot Area: 880 m2 15.3 m x 35 m



Villa 1970s
Lot Area: 937 m2 24.9 m x 38.1 m

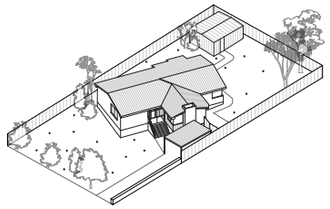


Elevated House II 1974 - 1980s
Lot Area: 1080 m2 28.9 m x 46.6 m

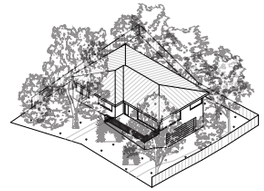


Walk-Up Flats 1970s - 2000s
Lot Area: 2190 m2 45 m x 49 m

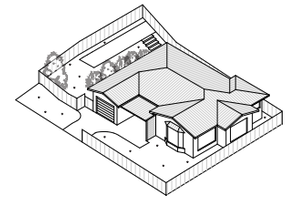
Hobart



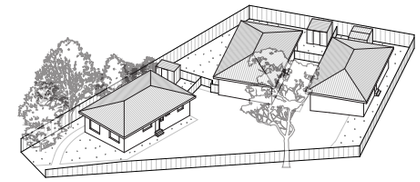
Cottage 1940s - 1970s
Lot Area: 651.3 m2 18.4 m x 35.9 m



Villa I 1950s - 1980s
Lot Area: 345.2 m2 16 m x 20.9 m

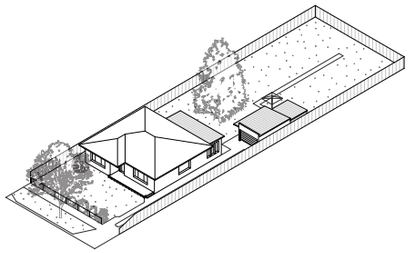


Villa II 1960s - 1990s
Lot Area: 456 m2 20.3 m x 25.9 m

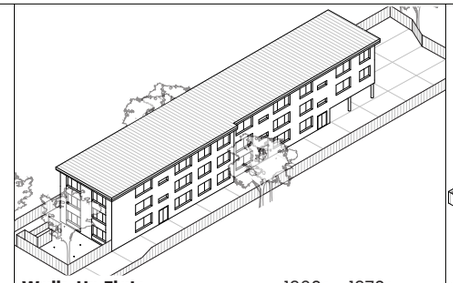


Villa Cluster 1970s - Ongoing
Lot Area: 950.4 m2 6.3 m x 39m

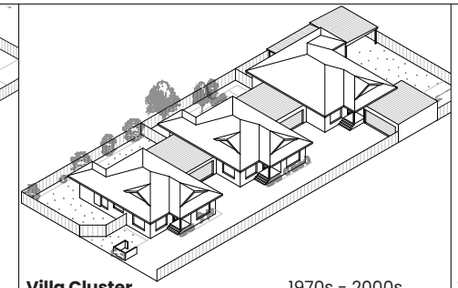
Melbourne



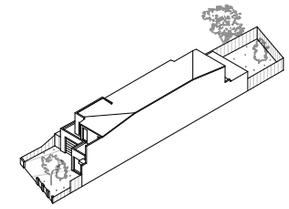
Cottage 1940s -1960s
Lot Area: 743.6 m2 15.3 m x 48.6 m



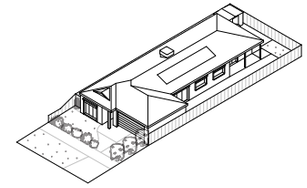
Walk-Up Flats 1960s - 1970s
Lot Area: 1015 m2 16 m x 65 m



Villa Cluster 1970s - 2000s
Lot Area: 1260 m2 23.2 m x 54.4 m

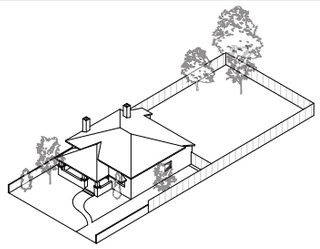


Townhouse 1980s - 2000s
Lot Area: 305.2m2 9.1 m x 38.7 m

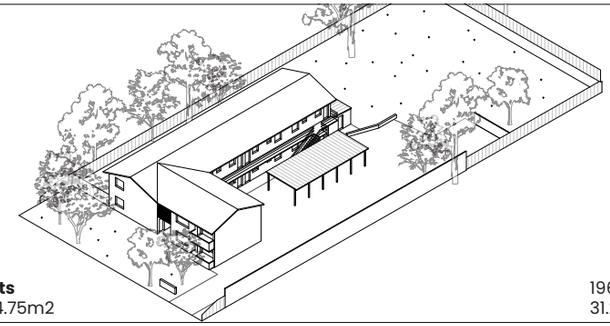


Garage House 2000s
Lot Area: 382.2 m2 12.3 m x 31 m

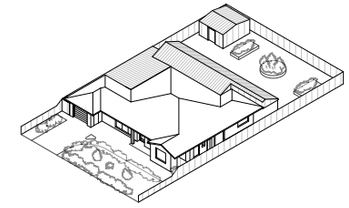
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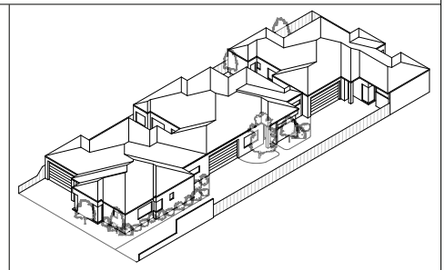
Cottage 1940s - 1960s
Lot Area: 562 m2 15 m x 37.2 m



Walk-Up Flats 1960s - 1970s
Lot Area: 2134.75m2 31.2 m x 68.3 m

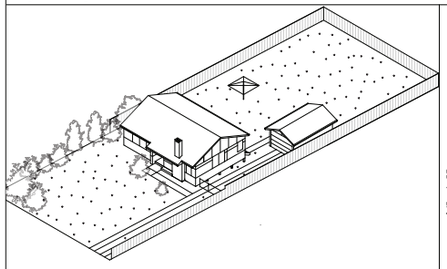


Villa 1970s - Ongoing
Lot Area: 700 m2 20 m x 35 m

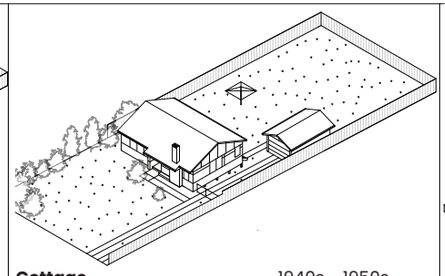


Villa Cluster 1980s - Ongoing
Lot Area: 1016.3 m2 20.2 m x 50 m

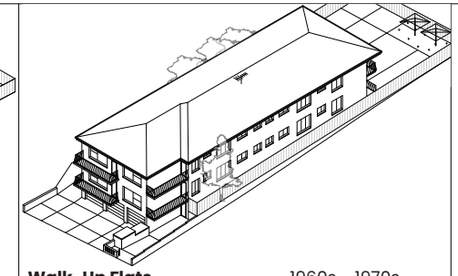
Sydney



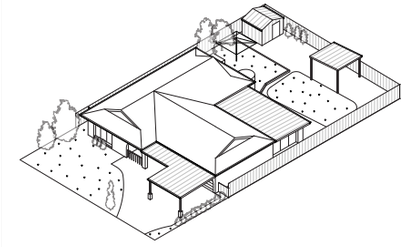
Bungalow 1930s-1940s
Lot Area: 537 m2 11 m x 48.8 m



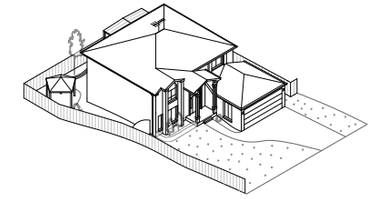
Cottage 1940s - 1950s
Lot Area: 720 m2 16 m x 45 m



Walk-Up Flats 1960s - 1970s
Lot Area: 750 m2 15 m x 50 m



Villa 1960s - 1970s
Lot Area: 647.5 m2 18.5 m x 35 m



Mansion 1990s - Ongoing
Lot Area: 504 m2 15.8 m x 32 m

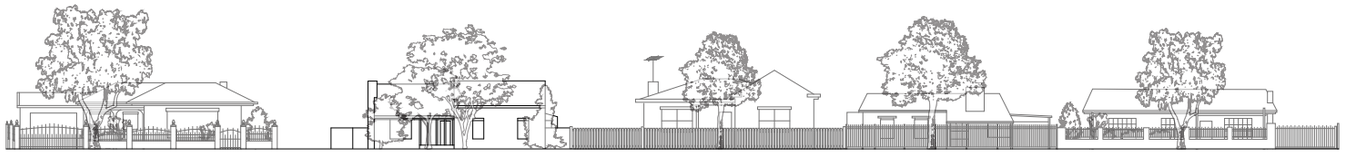
| Adelaide

Cottage
1940s-1950s

0 0.5 1km



Block Plan



Street Elevation

0 2.5 5m

| Adelaide

Cottage Description

When
Locally know as ‘austerity homes’, these cottages were prevalent in Adelaide from 1941 until the mid-1950s: a direct consequence of national building restrictions introduced to support the war effort.

Why
An existing housing shortage, compounded by post-war population growth driven by the baby boom and immigration, created demand for large-scale construction of housing. The South Australian Housing Trust (SAHT) delivered a notable share of these homes in response to the state’s demographic pressures. In its austere form and mode of delivery, the 'austerity' style is distinct from the earlie, more decorative federation cottage.

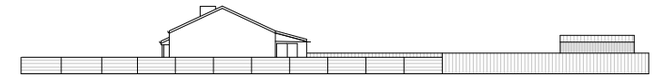
Where
Austerity homes were built predominantly in the inner north and western suburbs, later extending into new suburbs to the south. Homes typically occupied a quarter-acre lot – large enough for productive gardens, and future room additions.

Characteristic detail
This typology is defined by modest dwellings of around 110 sqm, with symmetrical frontages or projecting bays and a central entry porch beneath a flat overhang. Entrances lead into a living area, with a kitchen and dining to the rear. Most homes provided two bedrooms and a bathroom under the main roof, while a lean-to housed the laundry and WC – sometimes enclosed as a sleep-out. SAHT homes offered around 15 prescribed plans, with variation achieved through mirrored site placement.

Construction logic
A spartan approach dictated simple, inexpensive construction materials: strip footings with brick piers, timber joists and boards, and unpainted brick in place of stone facings or stucco. Gable or hip roofs had shallow eaves, typically finished with cement, asbestos or corrugated metal sheet. Window frames of timber or steel were usually small and casement-style. While brick construction dominated SAHT homes, timber-framed housing became more common from the 1960s onwards.



Elevation

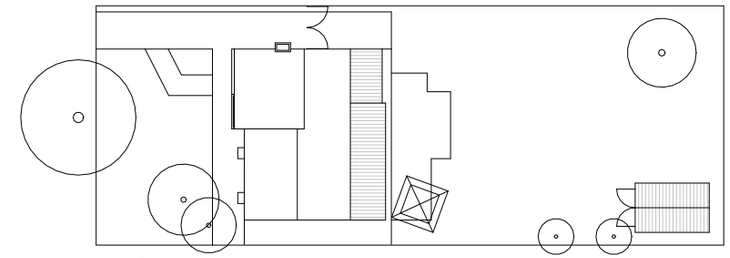


Elevation

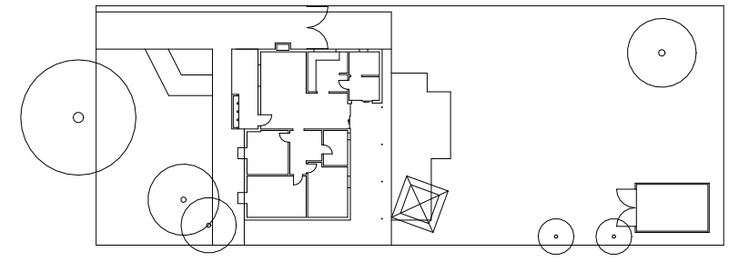
Lot Area
792.4m^2

Site Dimensions
17.4 x 45.6m

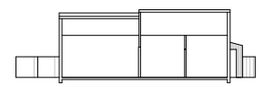
Floor Area
110m^2



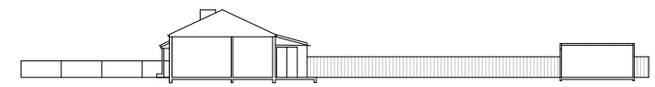
Site Plan



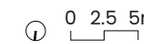
Ground Floor Plan



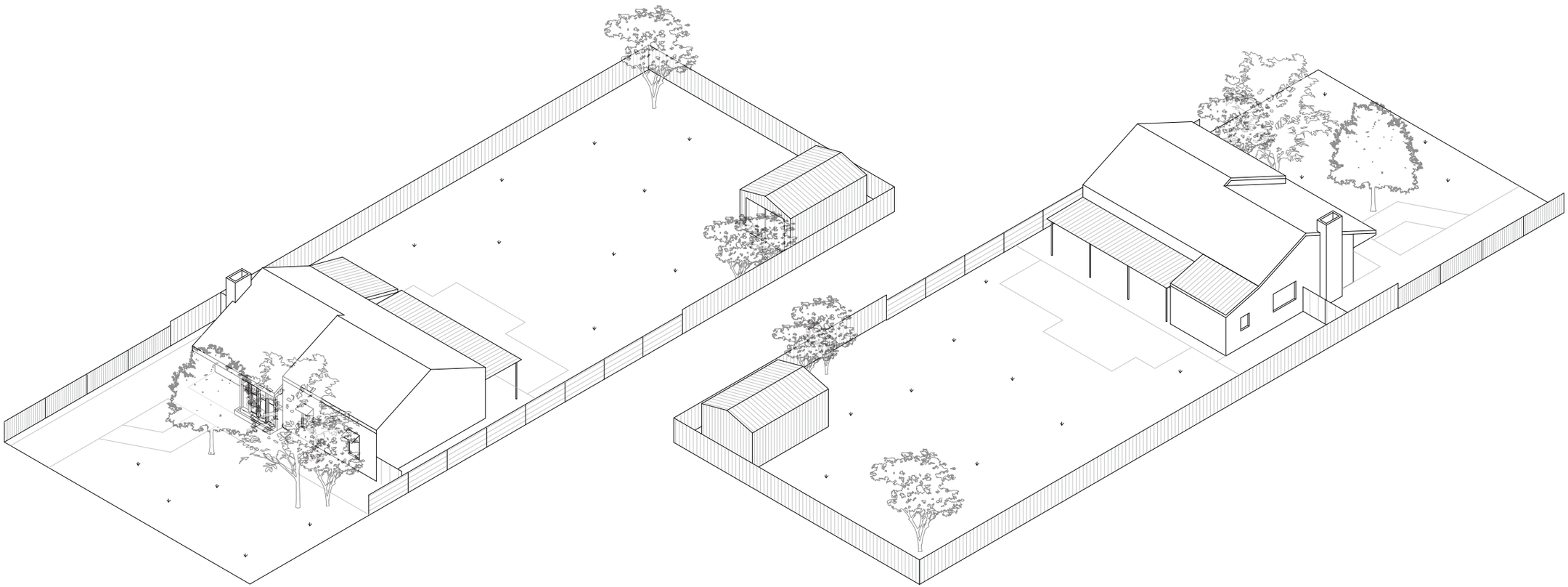
Section



Section



Cottage
Front and Rear Views



0 1 2m

| Adelaide

Cottage Type Equivalent Form Mapping

Example Precinct: Blair Athol



Cottage Type
Equivalent Form Mapping
North-Western Suburbs



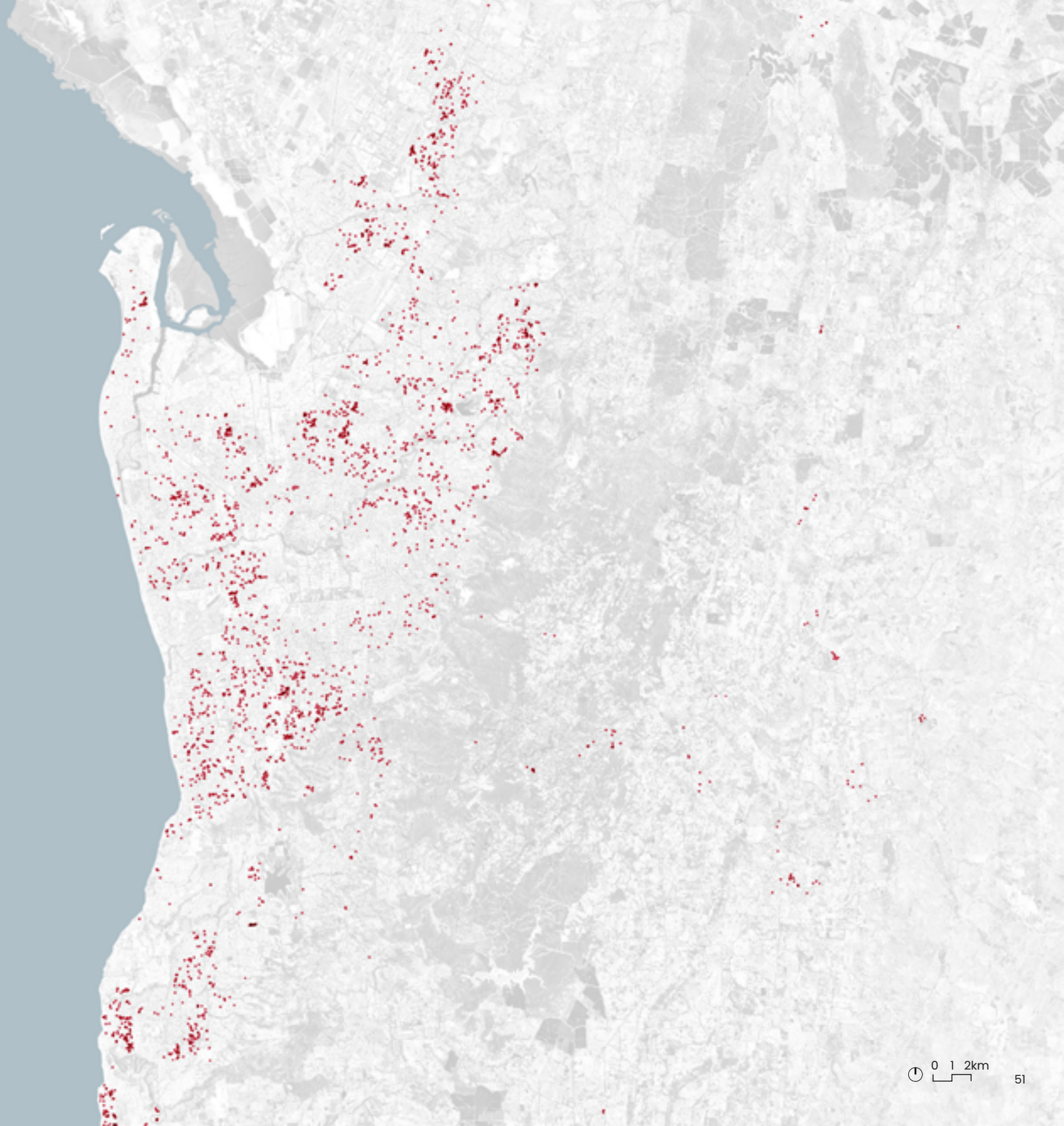
| Adelaide

Cottage Type

Equivalent Form Mapping

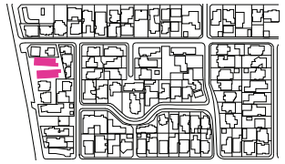
Metropolitan Adelaide

Number: 3124



| Adelaide

Walk-Up Flats 1950s-1960s



Block Plan

0 0.5 1km



Street Elevation

0 2.5 5m

Walk-Up Flats Description

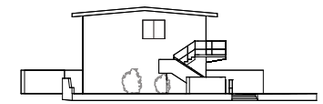
When
Two-storey walk-up flats became a popular housing form through the 1960s–70s.

Why
As the Australian economy entered a boom-bust cycle, the 'Australian Dream' of a detached house became increasingly unattainable.

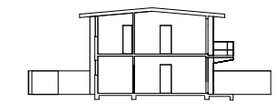
Where
Walk-up flats began appearing in developing suburbs, alongside new detached homes. These sites offered the opportunity to test infill and medium-density housing as a way to contain and consolidate suburban growth.

Characteristic detail
Adelaide's walk-up flats echo their counterparts in Western Australia, the Northern Territory and eastern states, typically arranged in a linear configuration along the length of the site. Organised in blocks of 4, 6, 8, 10, 12 or 14 units, dwellings provide a modest 55–65 sqm containing two bedrooms, one bathroom and an open-plan kitchen-living area. Access is via shared walkways and open stairwells. Smaller, square-shaped blocks of four to eight flats with comparable floor areas follow a different arrangement, set centrally on their sites, with individual entrance porches at ground level and a central shared upper-floor stairwell.

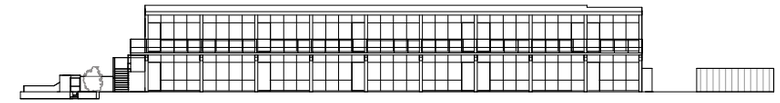
Construction logic
The efficiency and availability of concrete, brick and blockwork shaped the walk-up's construction: concrete slabs, brick or block walls, and solid internal block or brick walls. Timber window frames in earlier examples were later superseded by aluminium or metal frames.



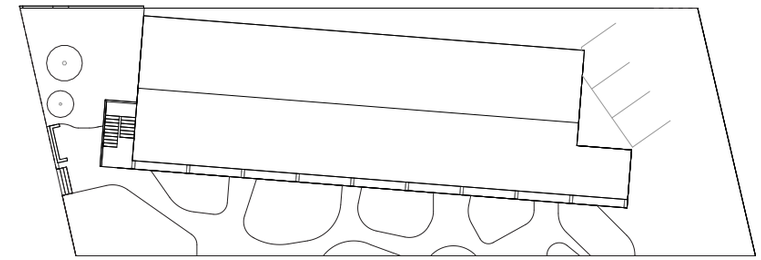
Elevation



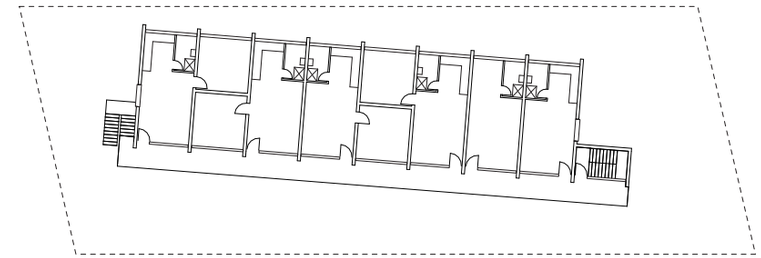
Section



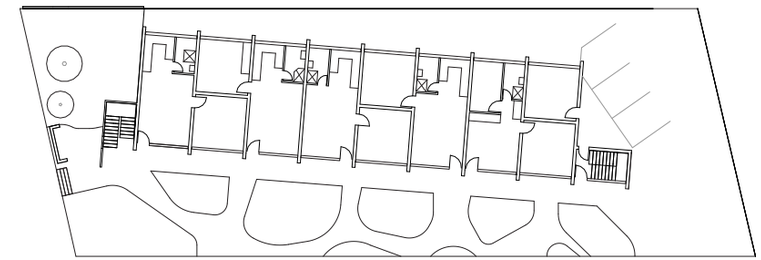
Elevation



Site Plan



Level 1 Floor Plan

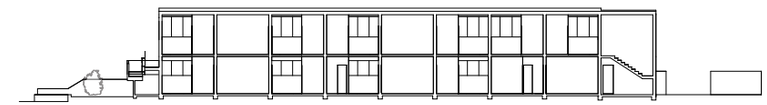


Ground Floor Plan

Lot Area
887m^2

Site Dimensions
18.4 x 49.4m

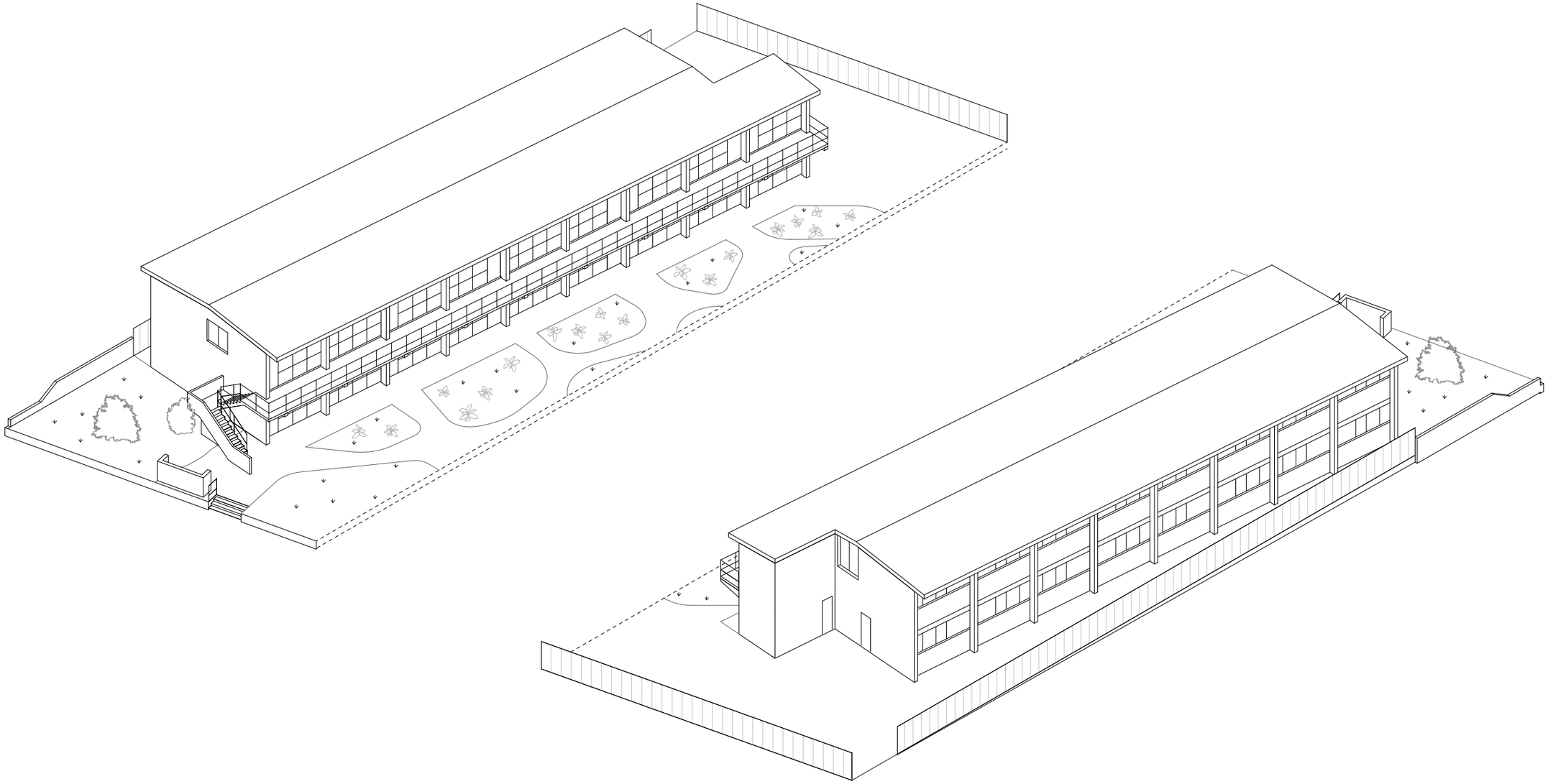
Floor Area
510m^2



Section

0 2.5 5m

Walk-Up Flats
Front and Rear Views



0 1 2m

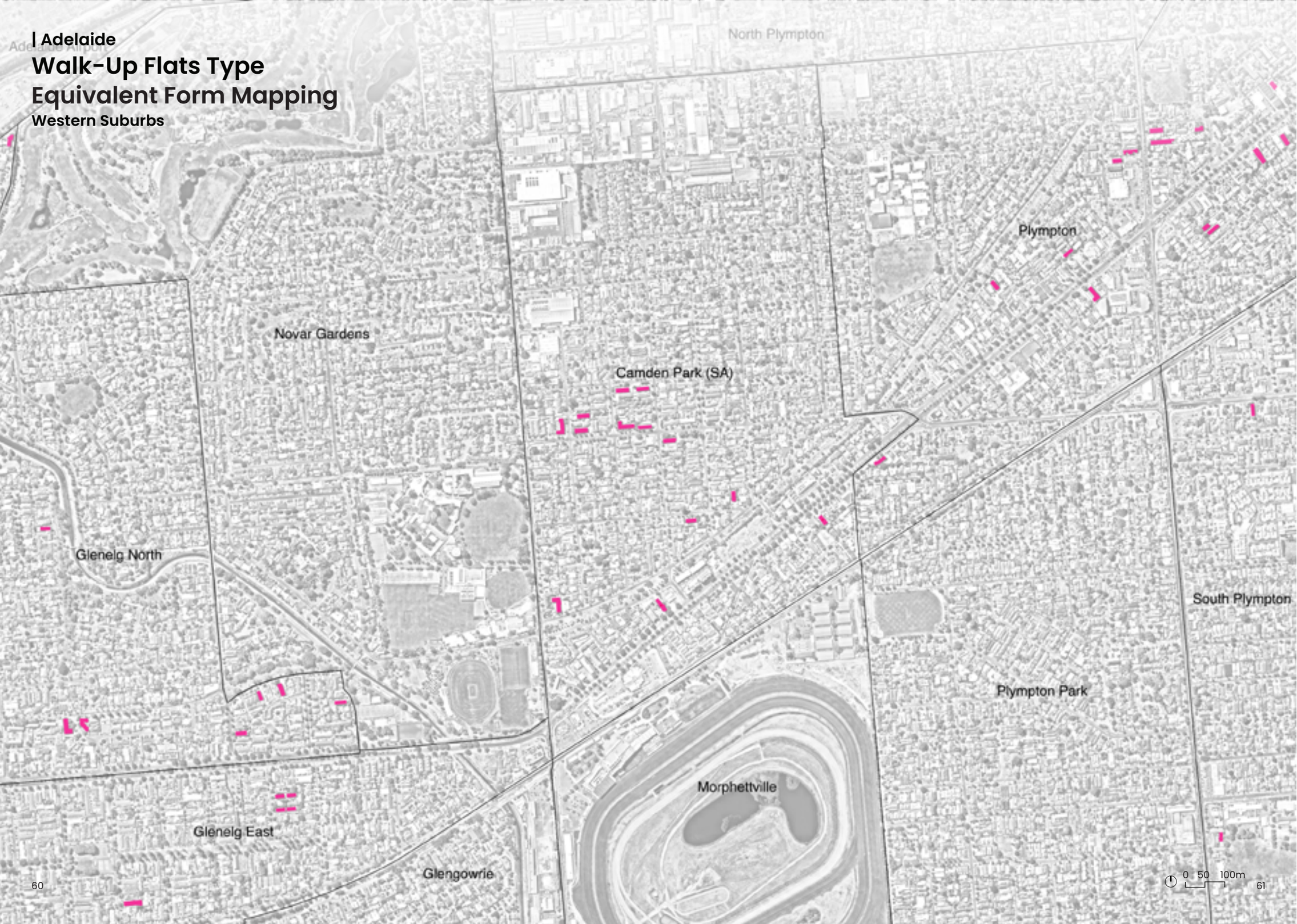
| Adelaide

Walk-Up Flats Type Equivalent Form Mapping

Example Precinct: Camden Park



Walk-Up Flats Type
Equivalent Form Mapping
Western Suburbs



| Adelaide

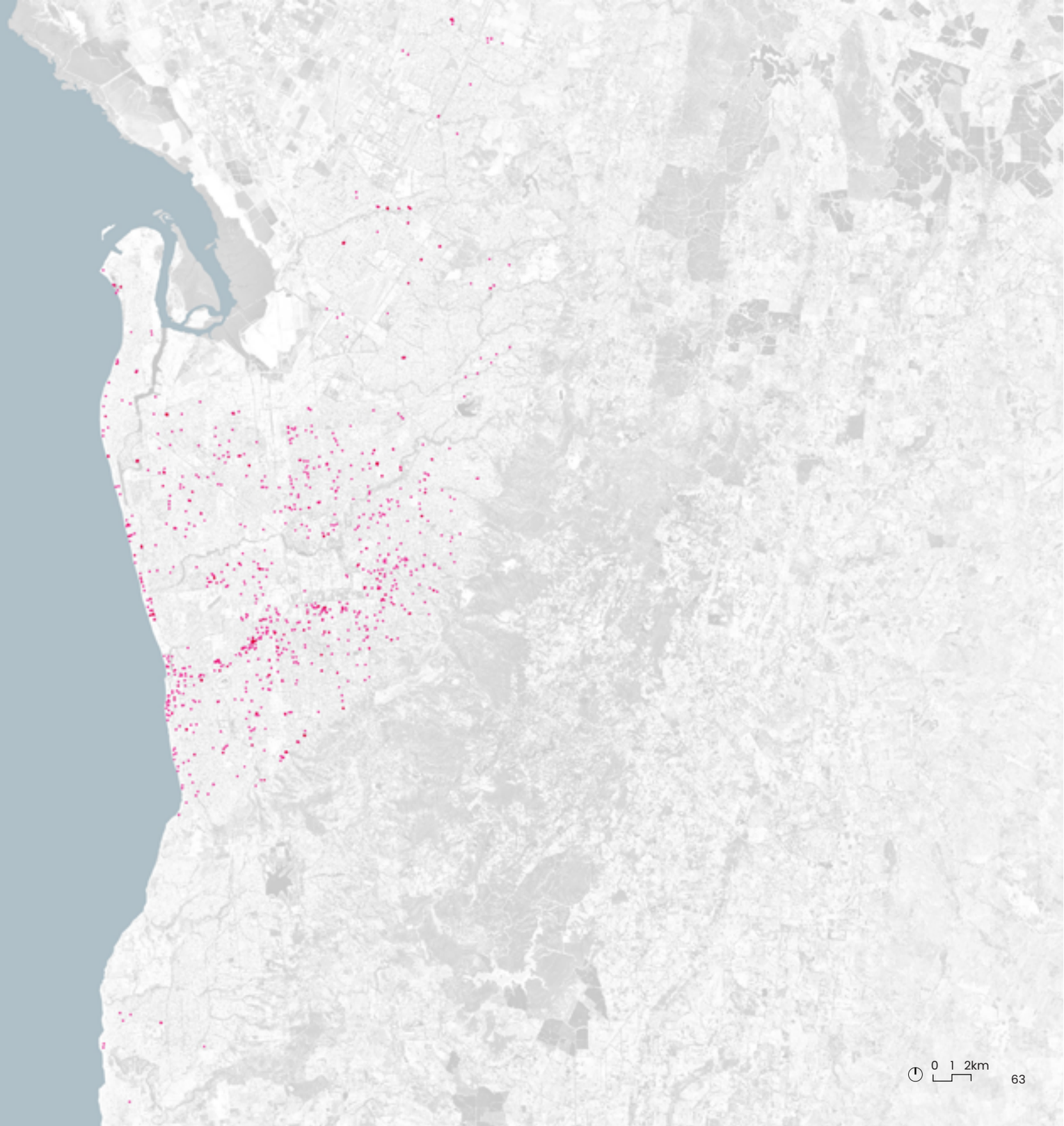
Walk-Up Flats Type

Equivalent Form Mapping

Metropolitan Adelaide

Number: 1005

(each unit containing multiple dwellings)



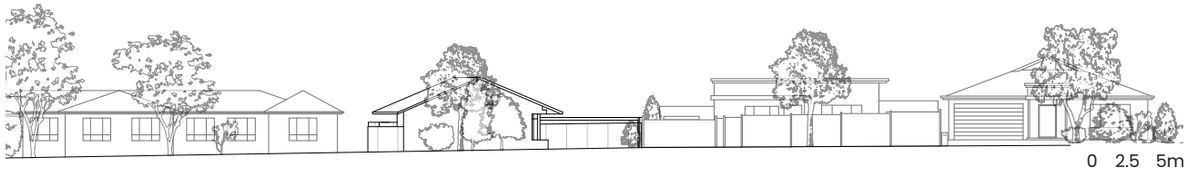
| Adelaide

Single Storey Flats
1960s-1970s

0 0.5 1km



Block Plan



0 2.5 5m

Street Elevation

Single Storey Flats Description

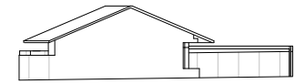
When
Single-storey flats began to appear in Adelaide in the late 1950s and continued into the early 1970s.

Why
Initially adopted by modernist South Australian architect Russell Ellis, this apartment typology was imbued with his modernist approach and initially designed for clients and developers including Hugh Pozza (Glenelg North, 1959) and Mecham Construction (Seacombe Gardens, 1965). The typology was then adopted more widely across the city.

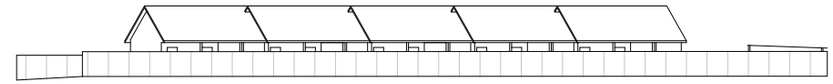
Where
Often found in well-located inner Adelaide suburbs such as Glenelg, Daw Park, and Broadview, flats occupy lots of around 950–1,200 sqm. The typology's staggered formation offered a replicable template that could expand or contract to fit the site.

Characteristic detail
Arranged in stepped or staggered patterns down the lot from the street boundary, this typology adopts efficient, identical floor plans. Typically, homes accommodate two bedrooms and a dual-aspect open-plan living-kitchen area facing individual service porches. Communal laundries feature regularly at the rear of lots, beside carports accessed from hardscape driveways. These run the lot's length, limiting capacity for deep soil zones.

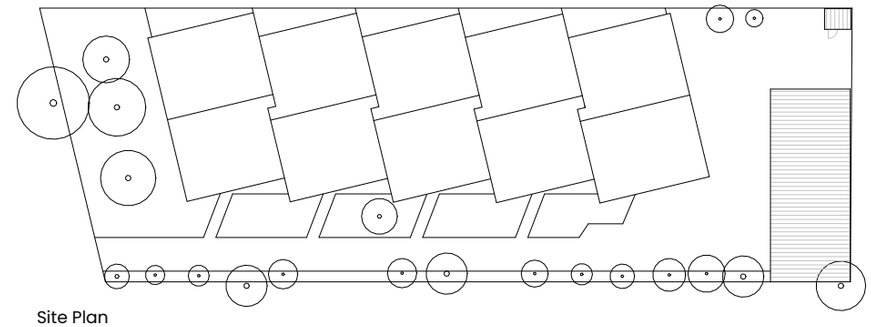
Construction logic
Built on concrete footings with double brick external and party walls, this apartment type usually adopts a tiled gable or simple hip roof with lightweight gable ends. Street elevations and unit entrances are often punctuated by feature walls of brick, fieldstone, or sandstone.



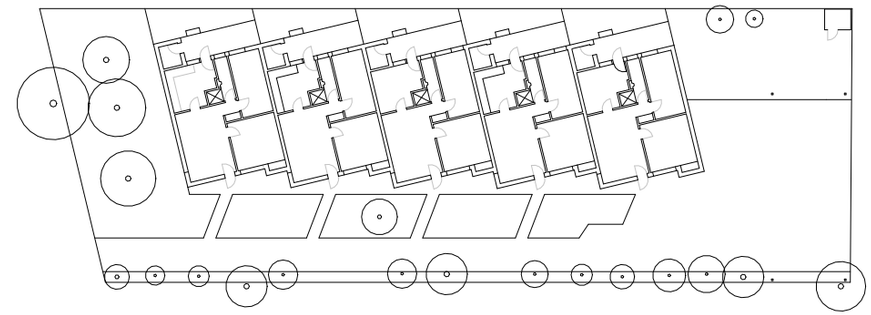
Elevation



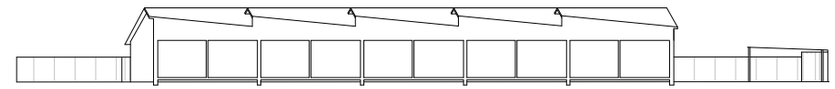
Elevation



Site Plan



Ground Floor Plan

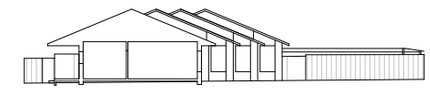


Section

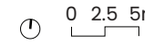
Lot Area
1138m²

Site Dimensions
20.5 x 52.3m

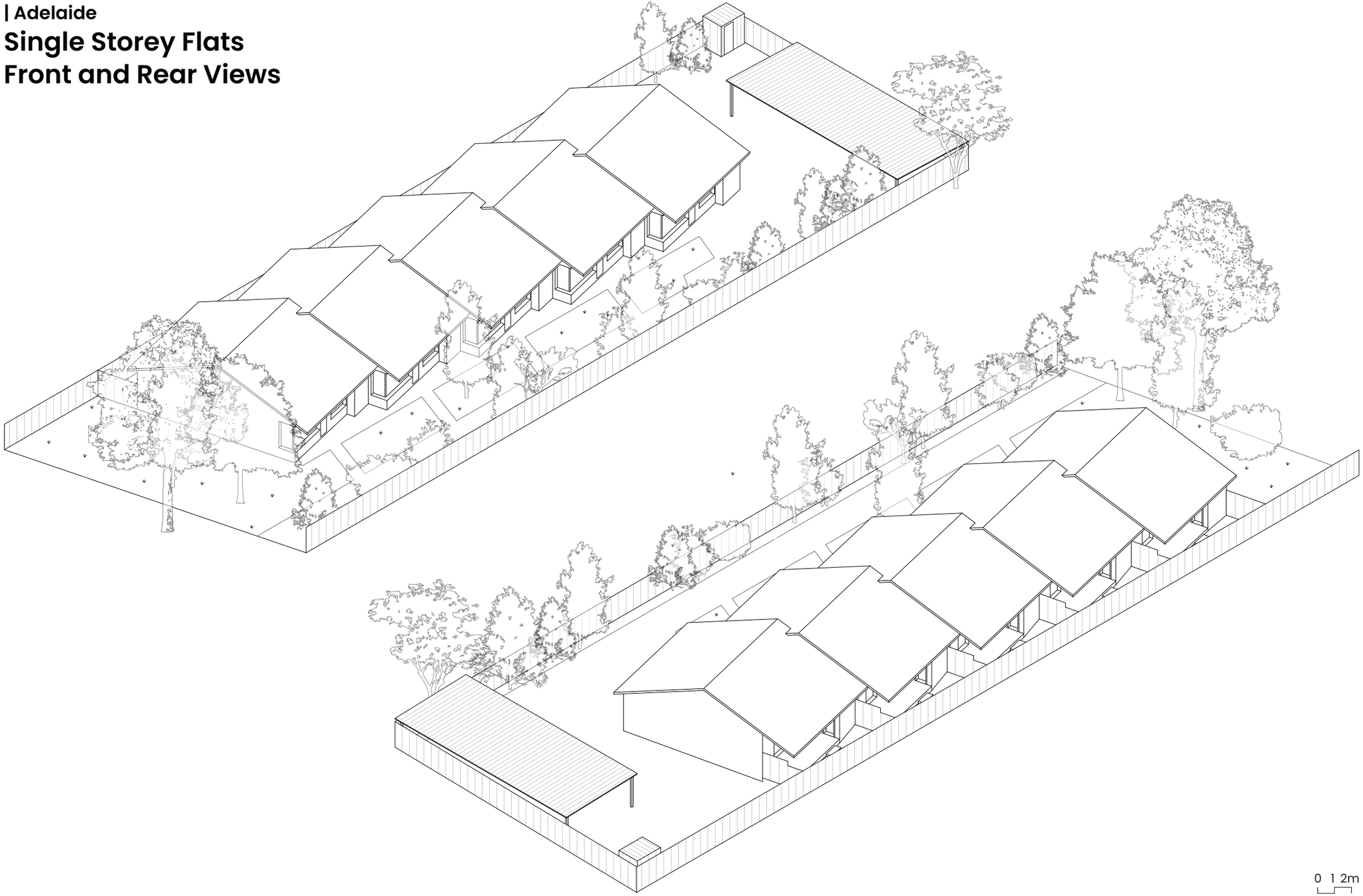
Floor Area
400m²



Section



Single Storey Flats
Front and Rear Views



Single Storey Flats Type Equivalent Form Mapping

Example Precinct: Glenelg East



Single Storey Flats Type
Equivalent Form Mapping
South-Western Suburbs

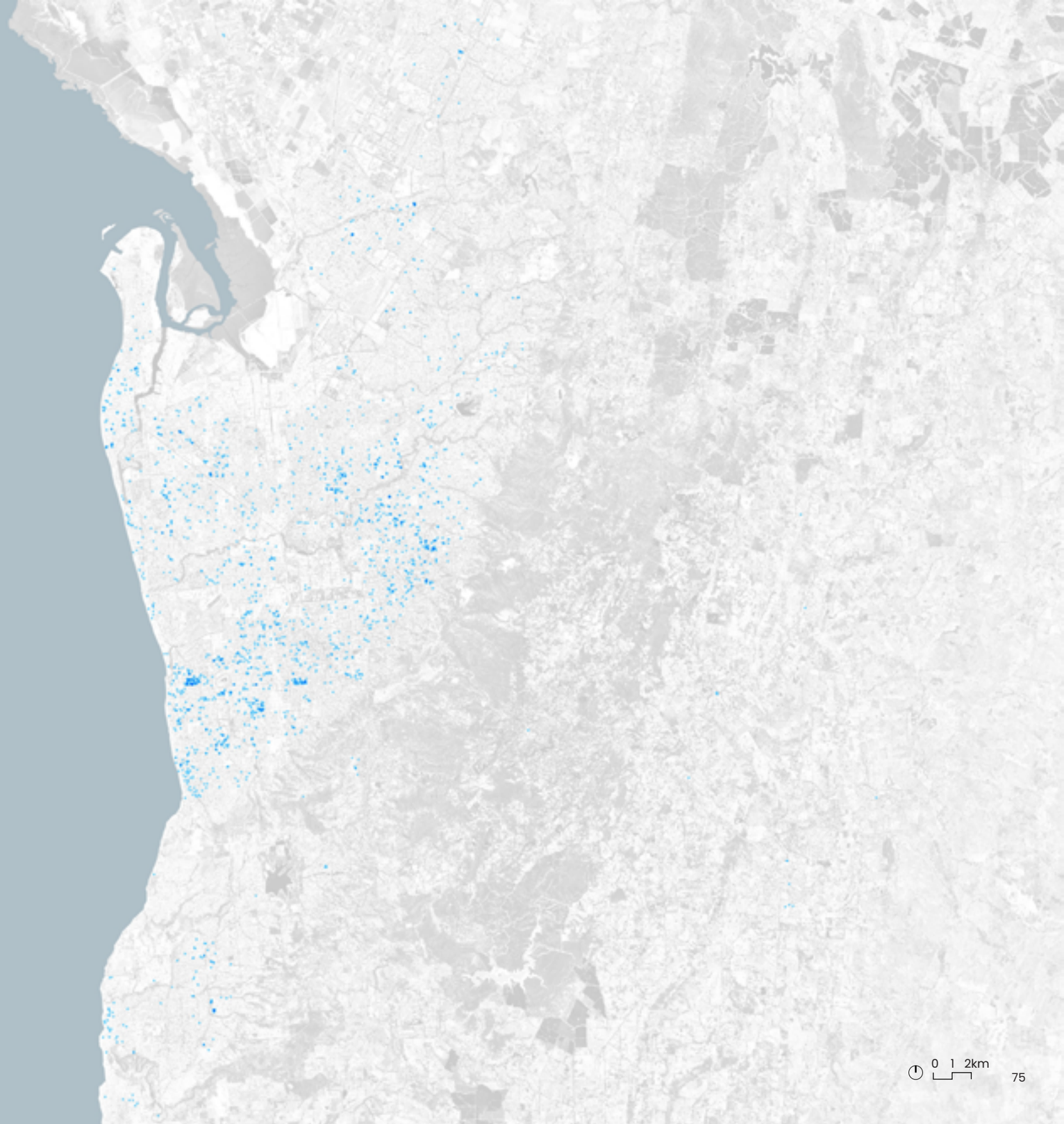


Single Storey Flats Type
Equivalent Form Mapping

Metropolitan Adelaide

Number: 1932

(each unit containing multiple dwellings)



| Adelaide

Villa
1990s-2000s

0 0.5 1km



Block Plan



Street Elevation

0 2.5 5m

Villa Description

When
Villa housing, locally known as courtyard homes or courtyard villas, was widespread in South Australia through the 1990s and into the early 2000s, anticipating today's McMansion homes.

Why
Population growth, neo-liberal government policies and demand from first-home buyers and downsizers fuelled the proliferation of this typology: smaller detached houses that were suited to car-based suburbs.

Where
Golden Grove, a 1230 ha low-density development in Adelaide's north-east, is the exemplar of this housing type. Delivered jointly by the South Australian Government's Land Management Corporation and Delfin/Lend Lease, the suburb provided more than 10,000 residential lots - typically around 450 sqm but ranging from roughly 300–620 sqm. These were intentionally smaller than a conventional block to support affordability, and many homes adopted the courtyard style.

Characteristic detail
The villa typically offers 150 sqm of living space and a 20 sqm garage, with a growing room count reflecting the era's rising expectations. An open-plan kitchen, dining and lounge room was standard; a dedicated family room was emerging as a mainstream feature. Most courtyard homes include three or four bedrooms, a family bathroom and an ensuite to the master. Street elevations are dominated by single or double garages with roller doors, set behind hardscape driveways.

Construction logic
Mass-market delivery standardised construction: concrete slab on ground, external brick veneer walls, and hip or gable roofs in corrugated sheet steel or tile. Internal timber-framed walls are typical, often dressed with faux heritage details such as projecting Queen Anne-style bay windows.

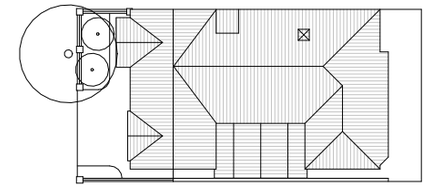
Lot Area
312.8m^2

Site Dimensions
12.5 x 25m

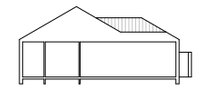
Floor Area
193m^2


Elevation

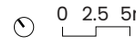

Elevation


Site Plan

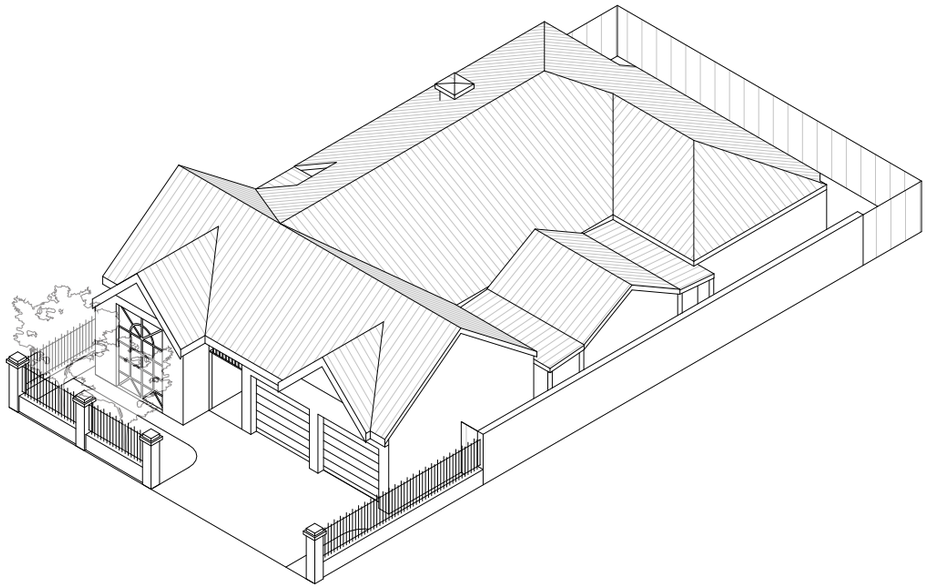

Ground Floor Plan

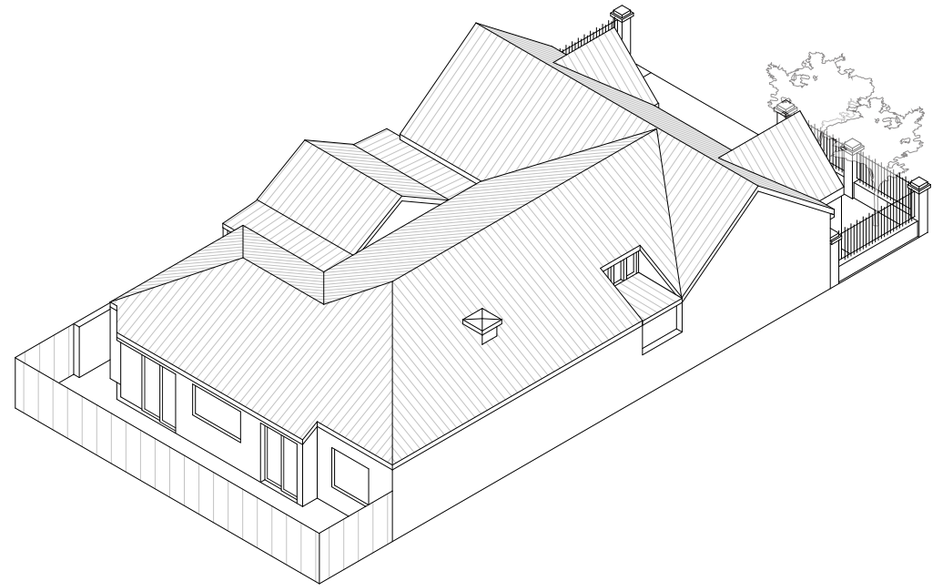

Section


Section



Villa
Front and Rear Views





0 1 2m

Villa Type Equivalent Form Mapping

Example Precinct: Seacombe Gardens



Villa Type
Equivalent Form Mapping
South-Western Suburbs



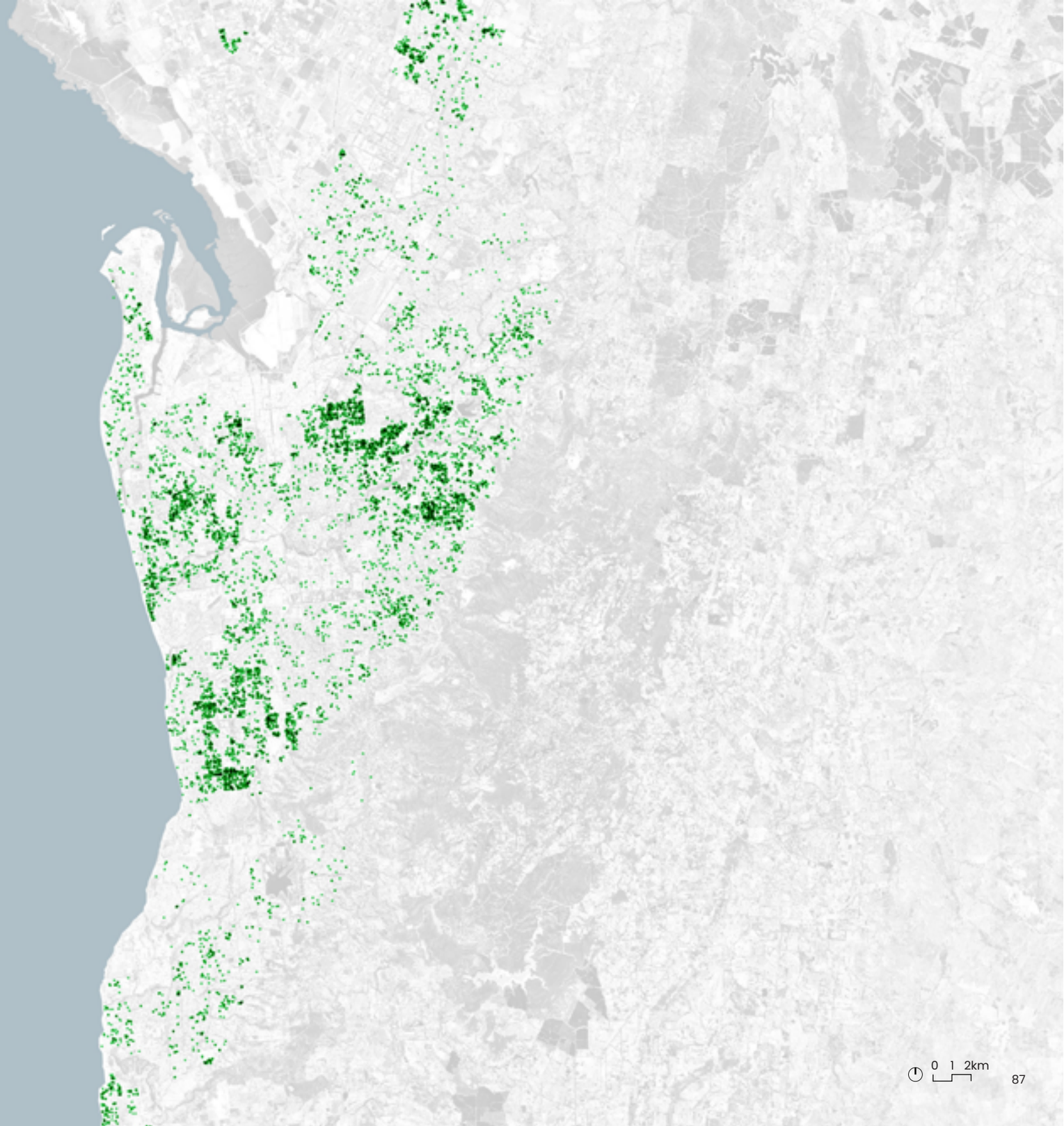
| Adelaide

Villa Type

Equivalent Form Mapping

Metropolitan Adelaide

Number: 13,589



| Brisbane
Bungalow
1930s



0 0.5 1km

Block Plan



Street Elevation

0 2.5 5m

| Brisbane

Bungalow Description

When, Why
The municipality of Brisbane was formed from the amalgamation of twenty local authorities in 1925, with large swathes of the city remaining unsewered: a situation prolonged by the Great Depression. In the inter-war period, timber bungalows in the Californian style became prevalent in new developments as the tram network expanded, driving rapid suburban growth within the city's newly established limits. Some pre-1945 bungalow types are now considered 'character homes' with heritage protection.

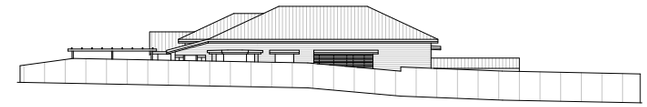
Where
North of the Brisbane River, new development enabled by the expanded tram network occurred in Ashgrove, Clayfield, Enoggera, Kedron, Wavell Heights, and Banyo. On the south side, suburbs such as Coorparoo, Camp Hill, and Morningside also saw development.

Characteristic detail
Floor plans of around 1,100 square feet (102 sqm) showed some variation, with built-in verandas and central corridors or living spaces providing access to bedrooms. With the turn to style during the inter-war building boom, Californian, Old English (Tudor Reviva)], Spanish Mission and Art Deco styles were often adopted for Queensland bungalows. Other common features included recessed entries, enclosed verandas or sleepouts and bay windows, with access to a backyard, where laundries and toilets were also often located.

Construction logic
Often raised slightly off the ground, bungalows featured dominant low-pitched street-facing gables with vertical battens, and rough cast rendering, drawing on the precedent of timber workers' cottages that had been built in the inner-city. While timber was the prevailing building material for this type, brick was also experimented with in speculative 1930s estates.



Elevation

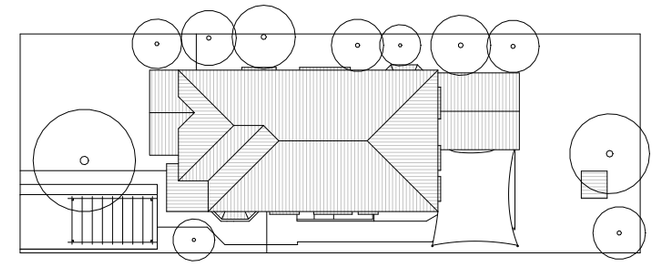


Elevation

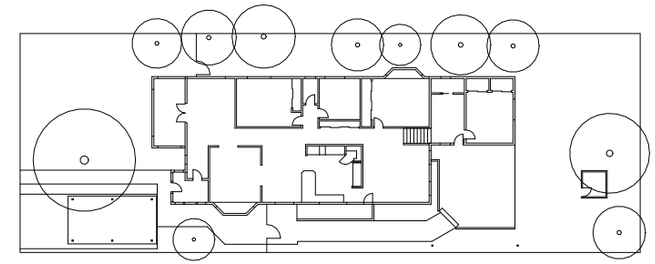
Lot Area
704.2m^2

Site Dimensions
15.7x 44.8m

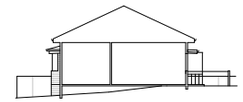
Floor Area
214m^2



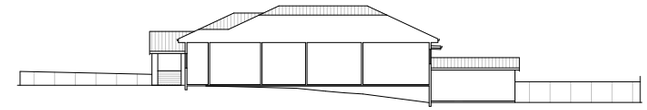
Site Plan



Ground Floor Plan



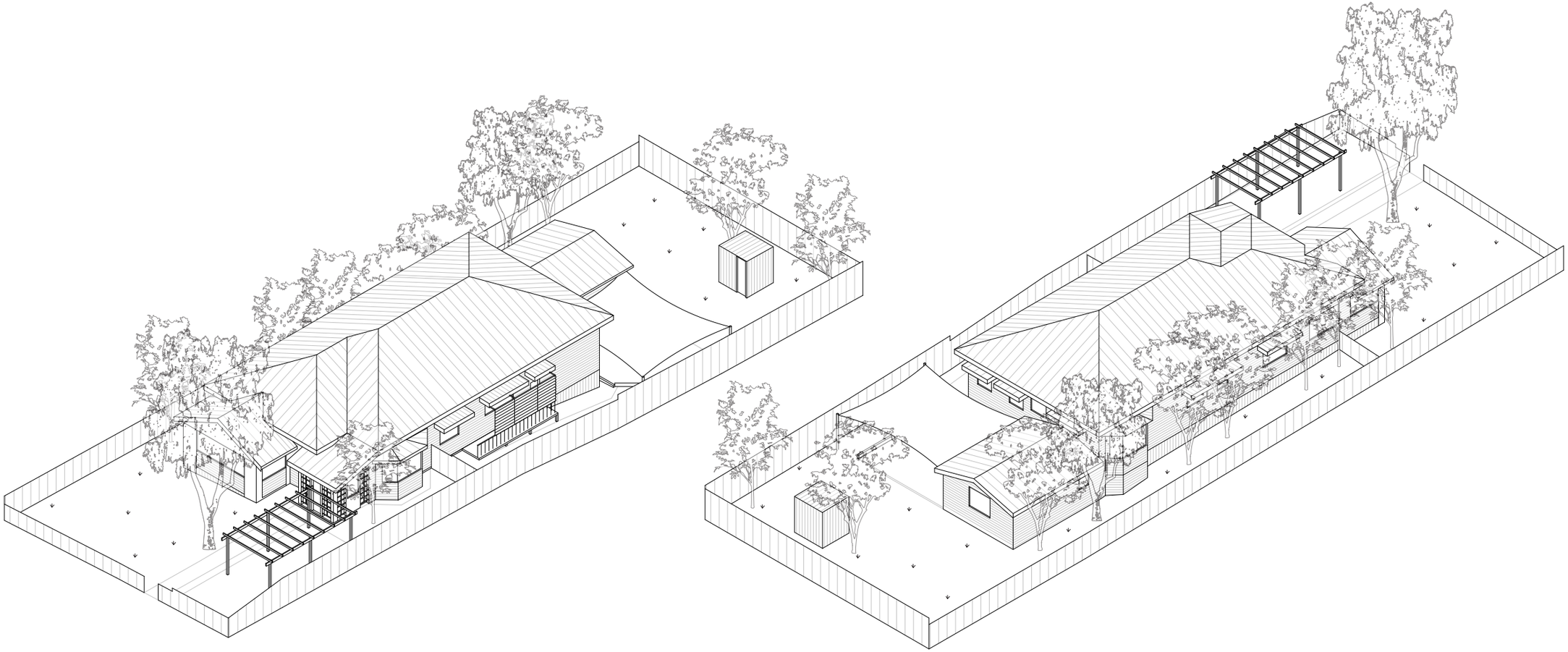
Section



Section

0 2.5 5m

Bungalow
Front and Rear Views



0 1 2m


| Brisbane
Bungalow Type
Equivalent Form Mapping
Example Precinct: Chermside
0 5 10m

Bungalow Type
Equivalent Form Mapping
Northern Suburbs



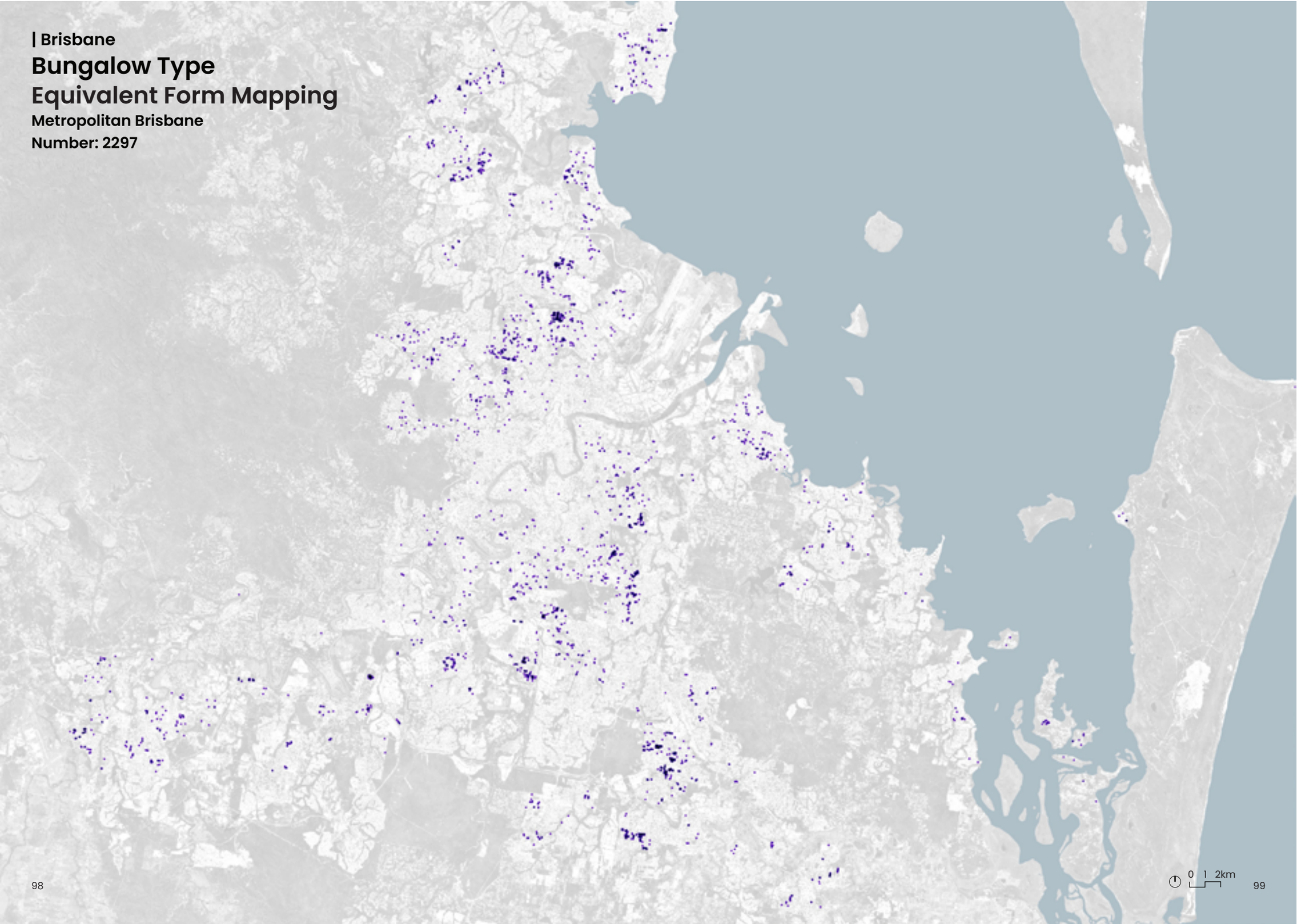
| Brisbane

Bungalow Type

Equivalent Form Mapping

Metropolitan Brisbane

Number: 2297



| Brisbane
Cottage
1900s-1950s



Street Elevation

0 2.5 5m

| Brisbane

Cottage Description



Block Plan

When
Cottages, sometimes known locally as post-war villas, were common in Brisbane's inner-city from the early 1900s until the 1950s.

Why
Small, detached workers' cottages provided modest accommodation in both pre- and post-war eras. The main difference between the stages was the materiality: from timber, to brick.

Where
Homes would often be built on 16 perch (400 sqm) lots financed by the State Advances Corporation and sourced from standard home plan catalogues produced by companies such as Brown and Broad Newstead Homes Limited and James Campbell and Sons Limited. Their standardised products of "ready to erect" and "redi-cut" homes provided flat pack housing that could be transported by rail across the state. Some, but not all, cottages occupied proportionally generous lots, as seen in the example illustrated.

Characteristic detail
This typology typically adopted an extruded gable roof form that would allow for the addition of a second component and verandas to the front and back. Post-war, small-lot houses in Brisbane's middle-suburban ring were often provided as social housing by the Queensland Housing Commission and varied from modern concrete to vernacular timber styles.

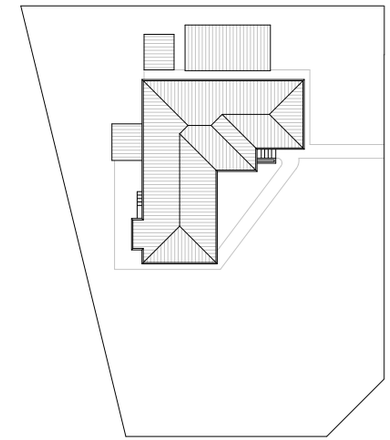
Construction logic
These homes are identified by their basic design, which has a smaller comparative footprint than later villas. Homes are clad in timber chamferboard or weatherboard, or brick in later versions, with hipped or low-pitched extruded gable roofs and no front veranda.



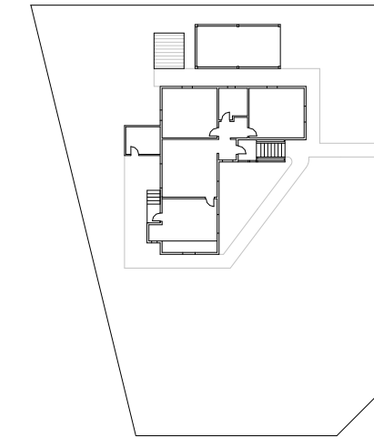
Elevation



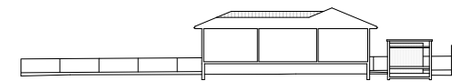
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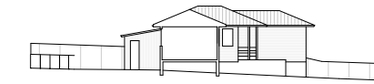
Site Plan



Ground Floor Plan



Section



Section

Lot Area
692.8m^2

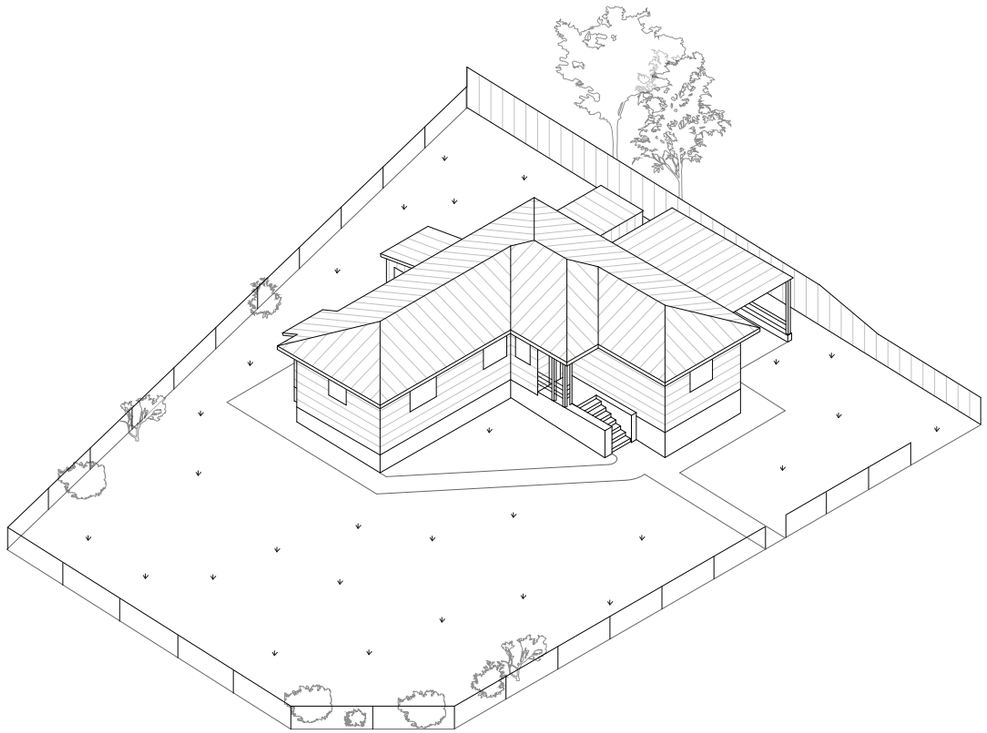
Site Dimensions
26.4 x 32.2m

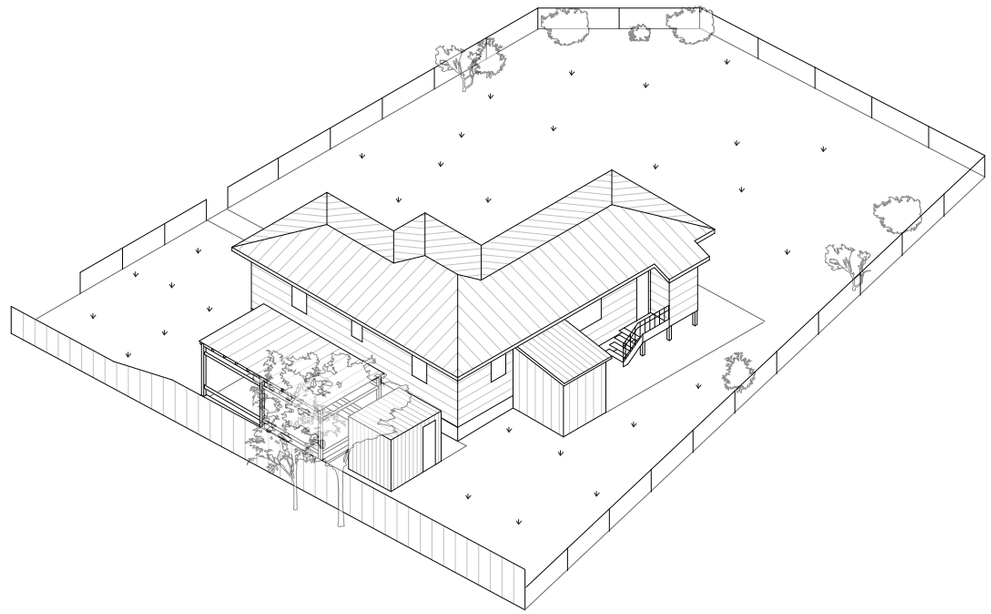
Floor Area
113m^2 (includes garage)

0 2.5 5m

| Brisbane

Cottage
Front and Rear Views





0 1 2m

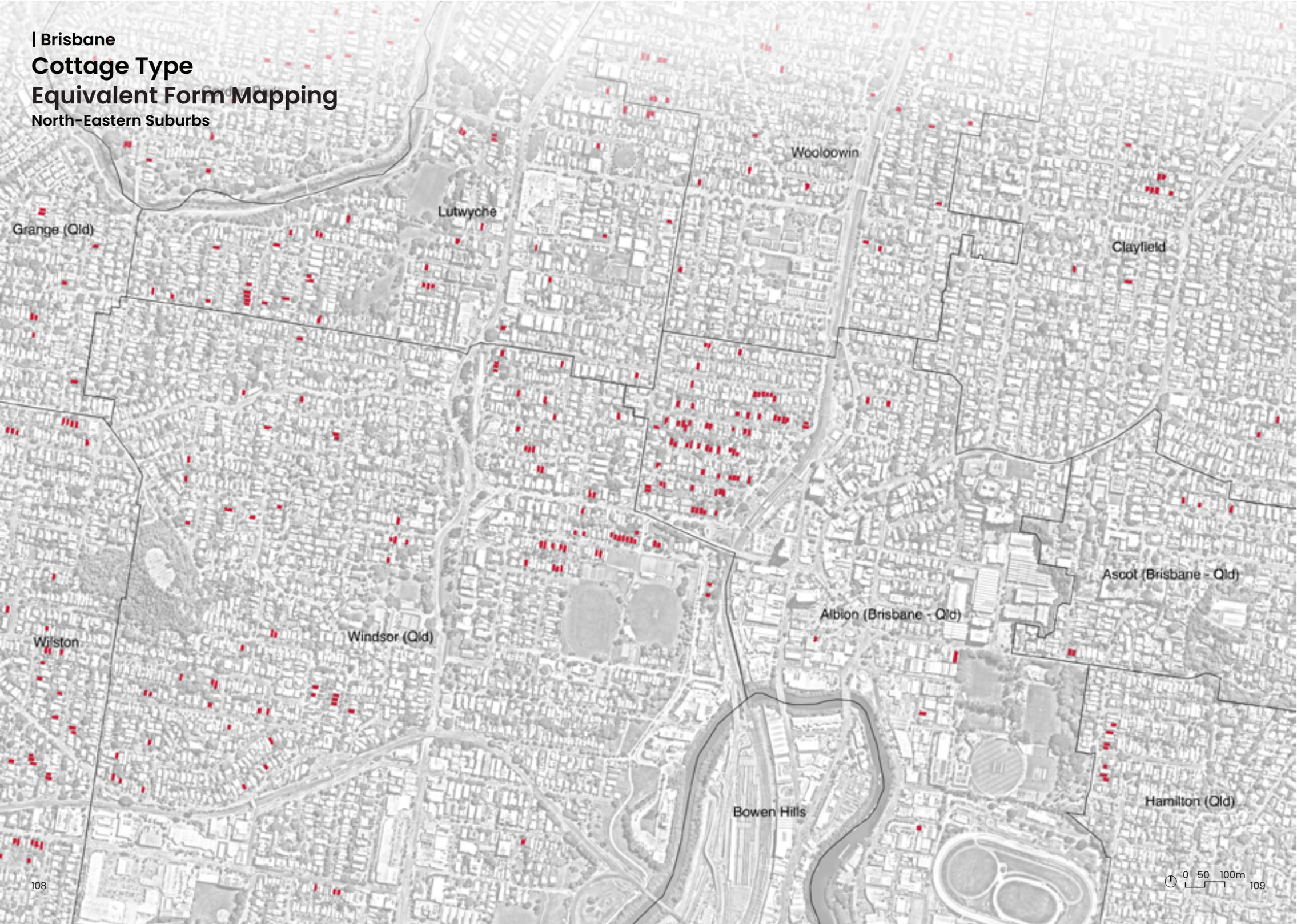
| Brisbane

Cottage Type Equivalent Form Mapping

Example Precinct: Albion



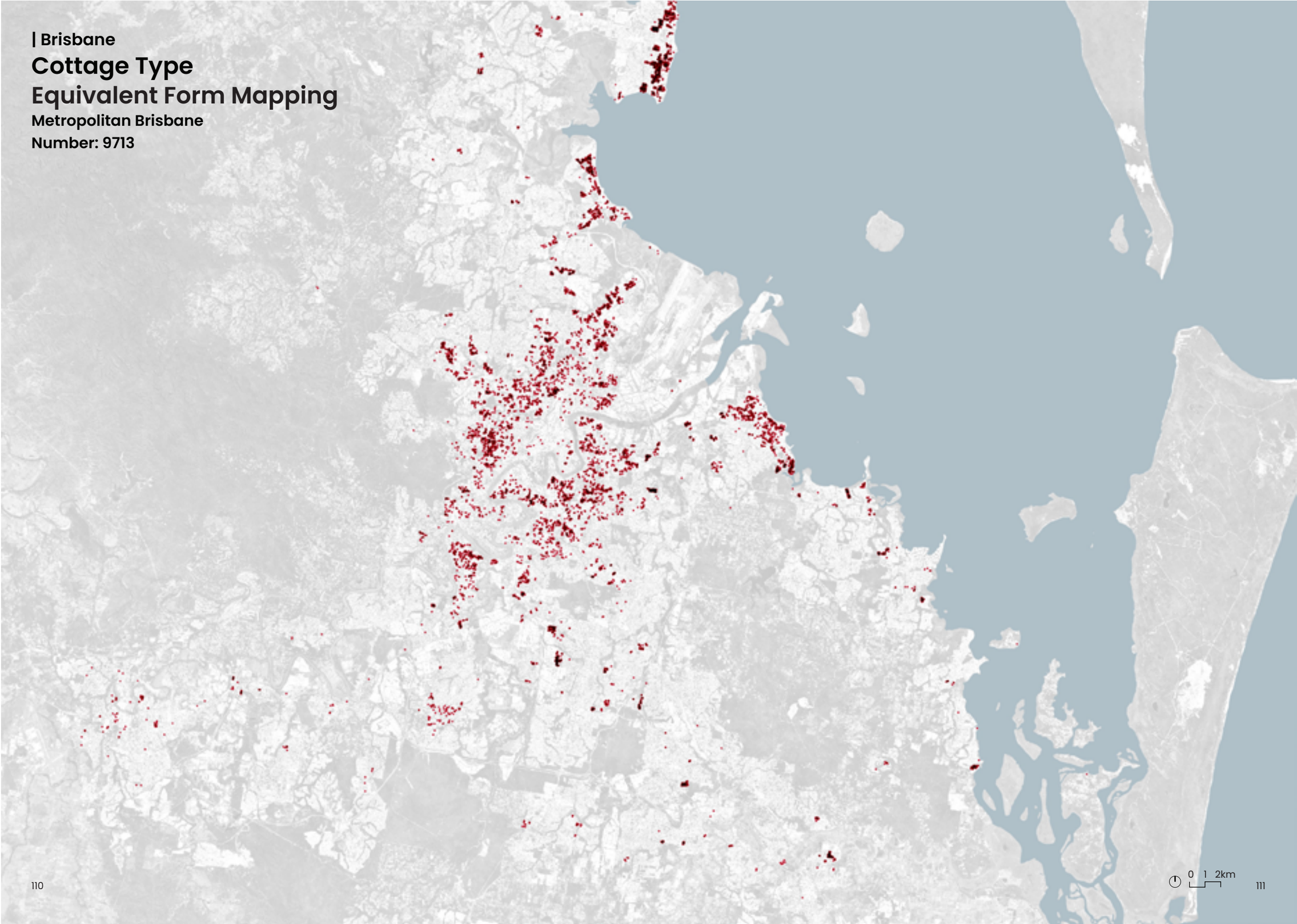
Cottage Type
Equivalent Form Mapping
North-Eastern Suburbs



Cottage Type
Equivalent Form Mapping

Metropolitan Brisbane

Number: 9713



| Brisbane

Villa
1950s-1970s

0 0.5 1km



Block Plan



Street Elevation

0 2.5 5m

| Brisbane

Villa Description

When, Why
This housing type was the state's post-war response to population growth and has been built from the 1950s in various styles, notably by the Queensland Housing Commission (QHC).

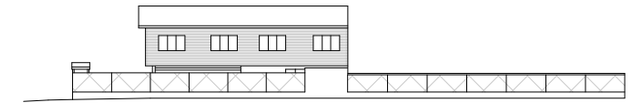
Where
Established in 1945, the commission built over 10,000 houses in the post-war period. While they are typically found across Brisbane, suburban homes of this type proliferated mostly in the city's middle suburbs and continue to be built today. Topographical variation across the city has produced a range of single- or double-storey variants, with sloping sites more commonly adopting the latter type.

Characteristic detail
War-time restrictions on house plan sizes were set at a maximum of 1,250 square feet (110sqm). These modest proportions were maintained post-war: the QHC produced compact plan variations of 100 sqm or less in rectangular or L-figure configurations due to material and labour shortages. Initially, it was difficult to distinguish between housing commission, speculative development and architect-designed houses.

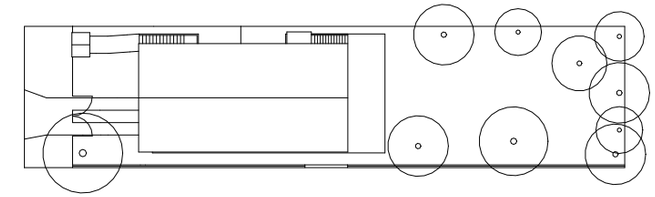
Construction logic
Houses with a hardwood timber structure and typically hoop pine chamferboard cladding set on brick plinths were developed during the war to deal with Queensland's topography and termites. This construction approach continued post-war, though other solutions for this type included the adoption of concrete stumps in lieu of timber where houses needed to be raised above the ground: this created car parking below the dwelling. Other variations occur in plan form, in either brick or timber, with terracotta-tiled roofs, low-pitched corrugated iron or fibrous cement sheet roofs. Fibrous cement sheet is featured in more modern solutions. A low-pitched, extruded, timber gable was often raised off the ground to accommodate the car and became a common form.



Elevation



Elevation

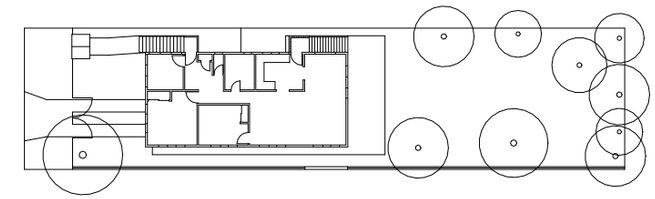


Site Plan

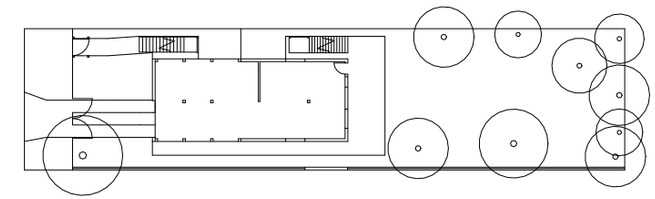
Lot Area
425m²

Site Dimensions
10.3 x 41.4m

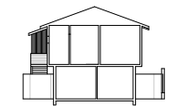
Floor Area
209m²



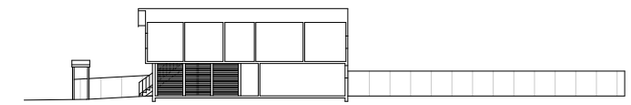
Level 1 Floor Plan



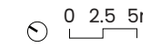
Ground Floor Plan



Section

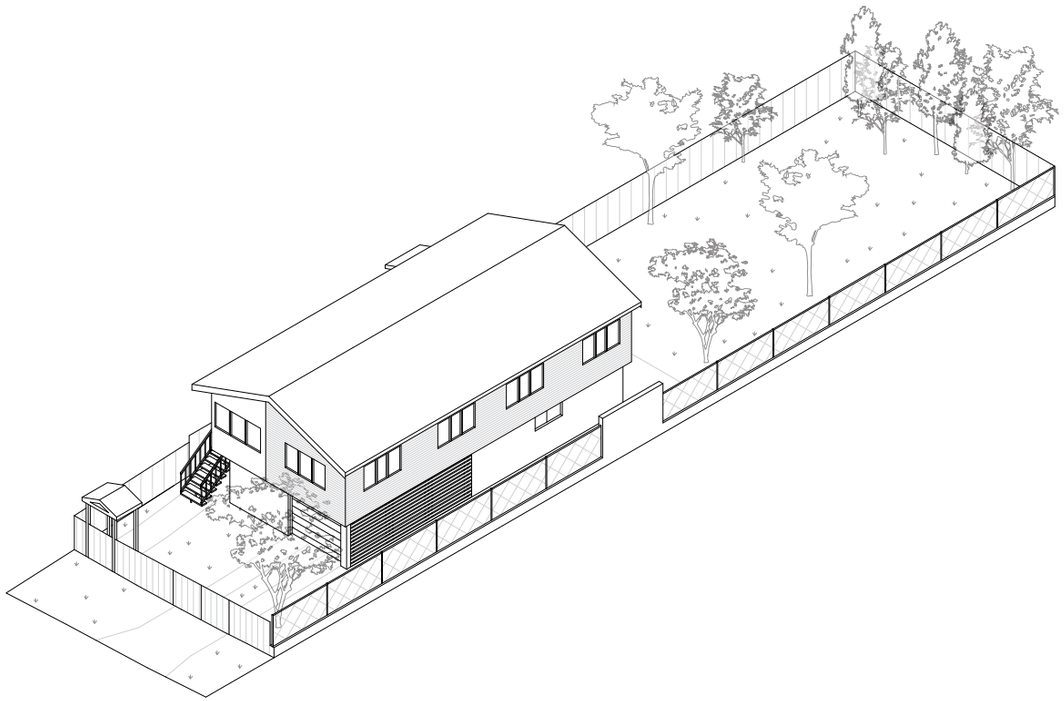


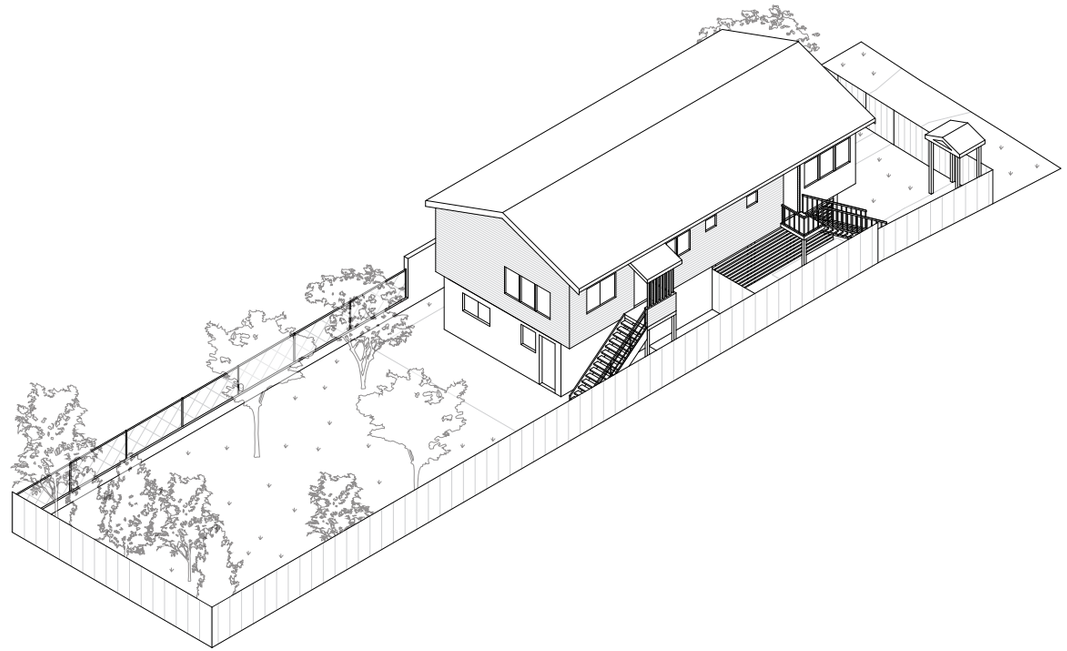
Section



| Brisbane

Villa
Front and Rear Views





0 1 2m

| Brisbane

Villa Type Equivalent Form Mapping

Example Precinct: Mount Gravatt East



| Brisbane

Villa Type
Equivalent Form Mapping
Southern Suburbs



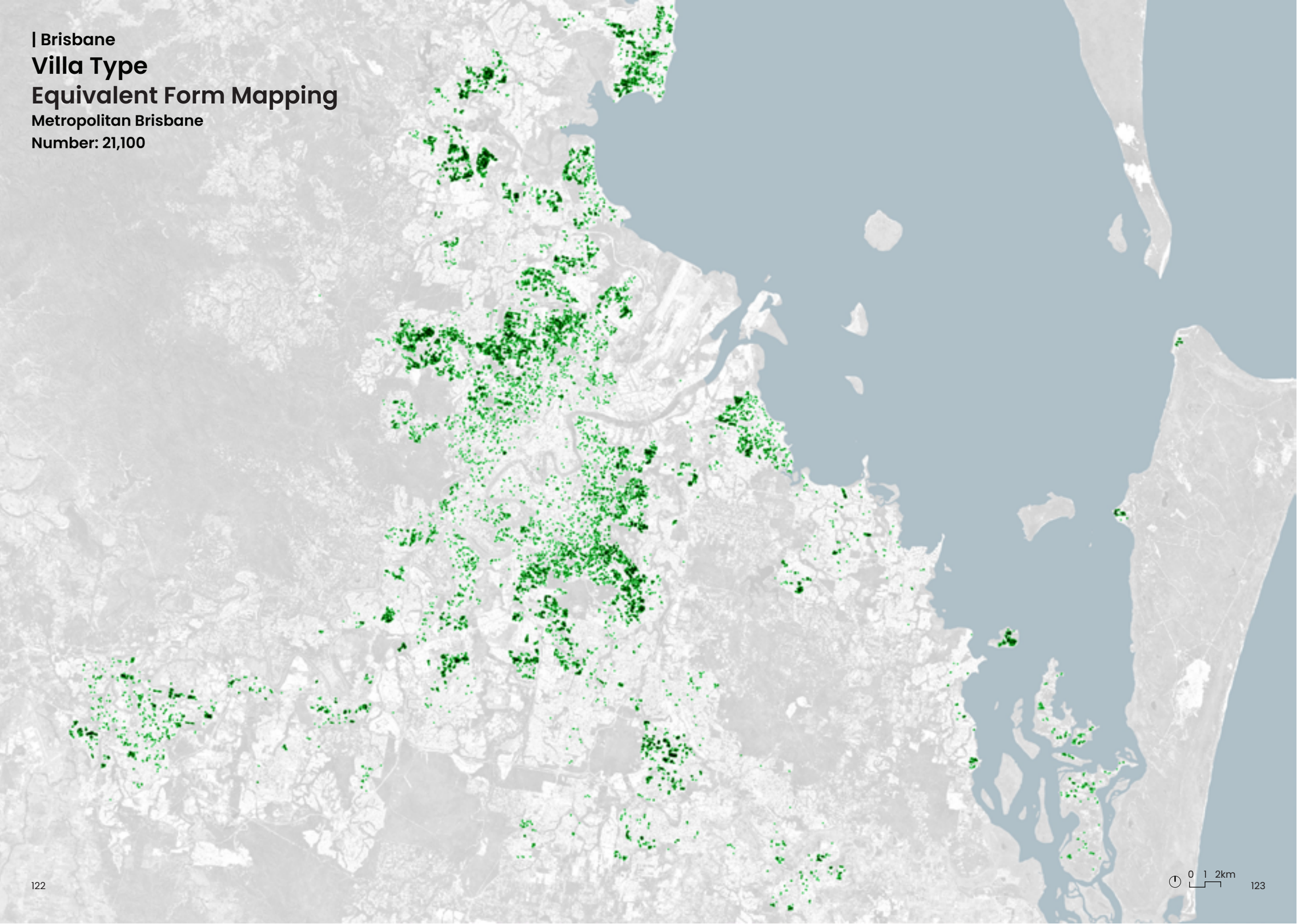
| Brisbane

Villa Type

Equivalent Form Mapping

Metropolitan Brisbane

Number: 21,100



| Brisbane

Walk-Up Flats 1960s-1980s



0 0.5 1km

Block Plan



0 2.5 5m

Street Elevation

| Brisbane

Walk-Up Flats Description

Lot Area
956.5m²

Site Dimensions
30.8 x 31m

Floor Area
1315m²

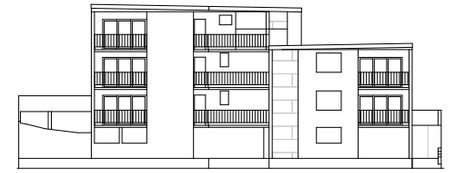
When
As with other Australian cities, Brisbane saw a proliferation of double-brick walk-up flat developments from the late 1960s into the early 1980s. Nicknamed 'six-packs' the moniker came from their common configuration of six, two-bedroom flats accessed by walk-up stairs.

Why
An update to inter-war flats in various styles that are found in the inner-city, this infill typology offered a response to Queensland's planning rules and population growth. From the 1970s, changes to the Brisbane Town planning regulations made it easier for developers to build walk-up flats of three storeys or less; they were often delivered by European migrant builder-developers.

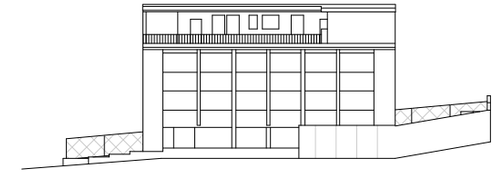
Where
Commonly sited on 800sqm lots that provided car parking on site at ground level, land was typically made available at the expense of existing, inner-city timber houses.

Characteristic detail
Walk-up flats span the length of the lot, with hardscape driveways and minimal landscaping. Apartments provide modest one- or two-bedrooms, a combined kitchen-living-dining room and separate bathroom. Living spaces frequently open to a private balcony or shared walkway.

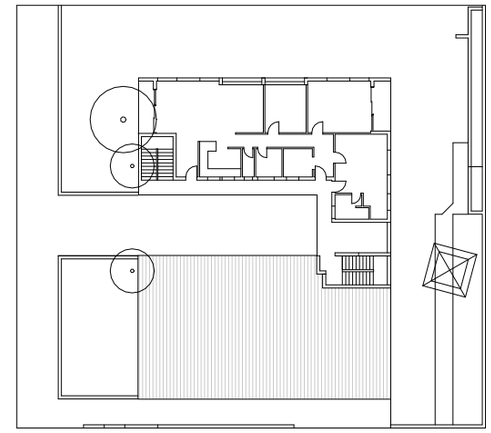
Construction logic
Brick was the prevailing walk-up construction material and was easily sourced: builders used local bricks from Newmarket Brickworks and Brittains Bricks at Darra. Adaptations of this typology to Brisbane's subtropical climate included concrete and terracotta breeze block screens, typically set in front of the street-facing staircase.



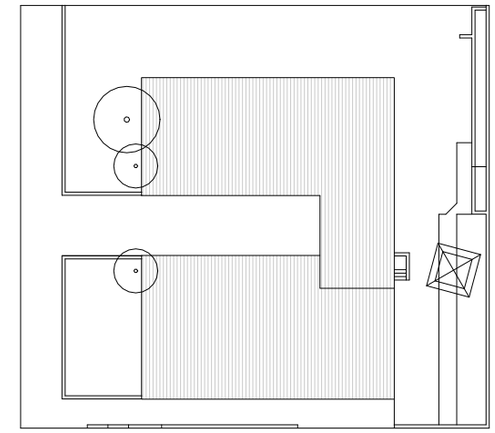
Elevation



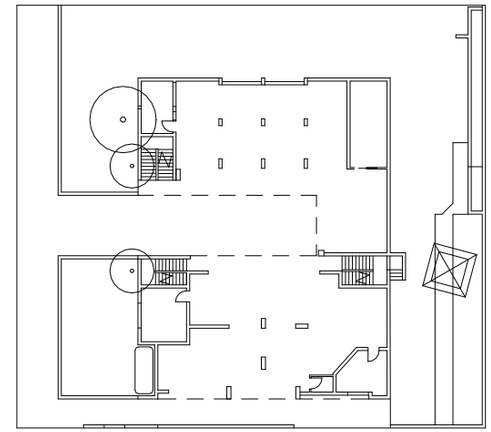
Elevation



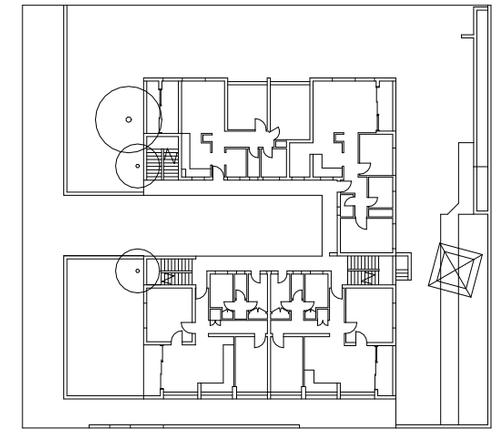
Level 3 Floor Plan



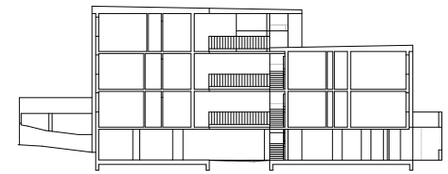
Site Plan



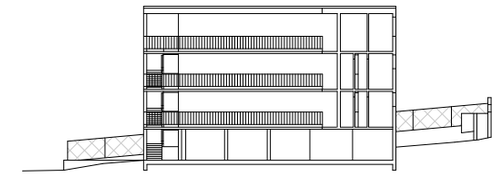
Ground Floor Plan



Level 1 and Level 2 Floor Plan



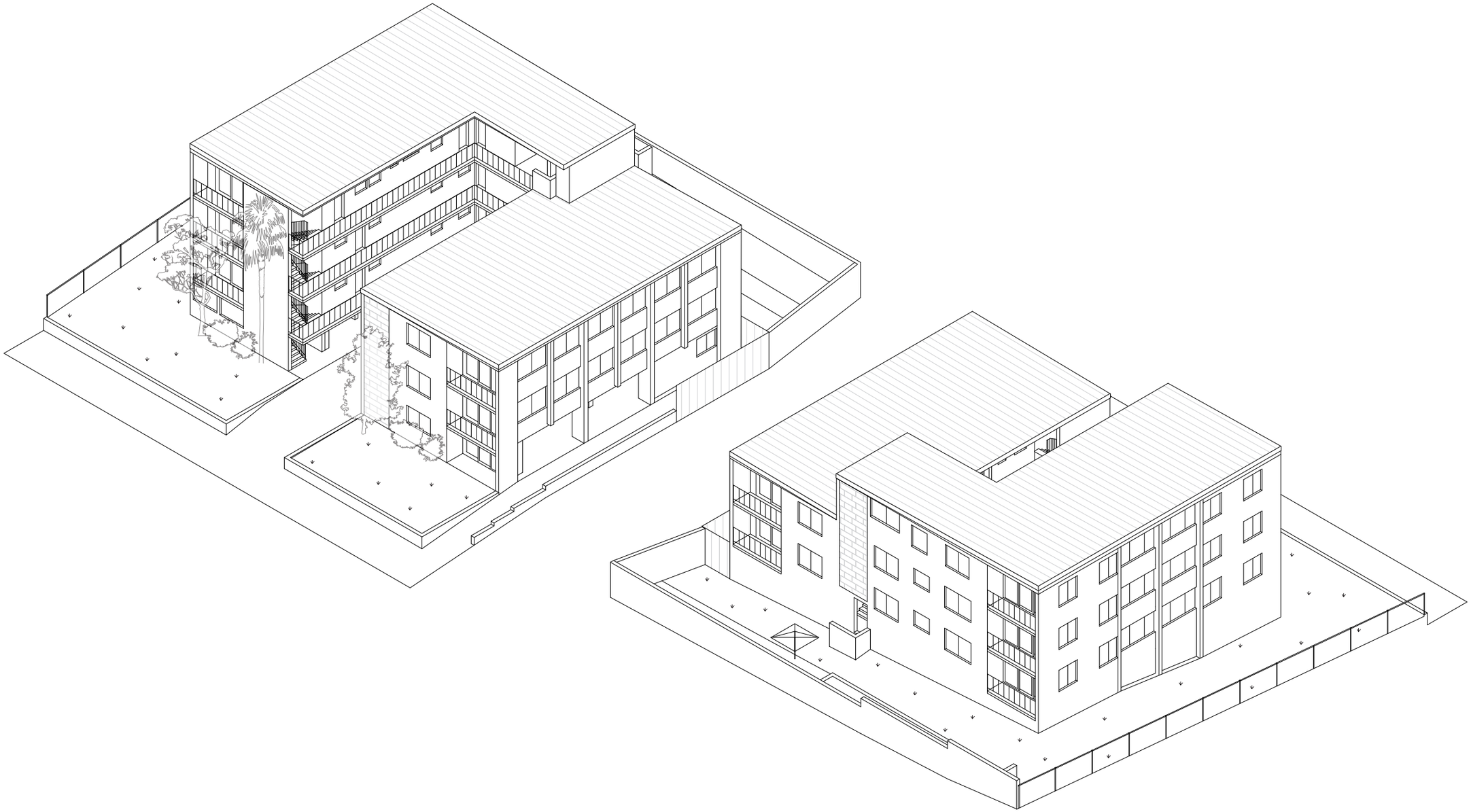
Section



Section

0 2.5 5m

Walk-Up Flats
Front and Rear Views



0 1 2m

| Brisbane

Walk-Up Flats Type Equivalent Form Mapping

Example Precinct: Coorparoo



| Brisbane

Walk-Up Flats Type
Equivalent Form Mapping

South-Eastern Suburbs



| Brisbane

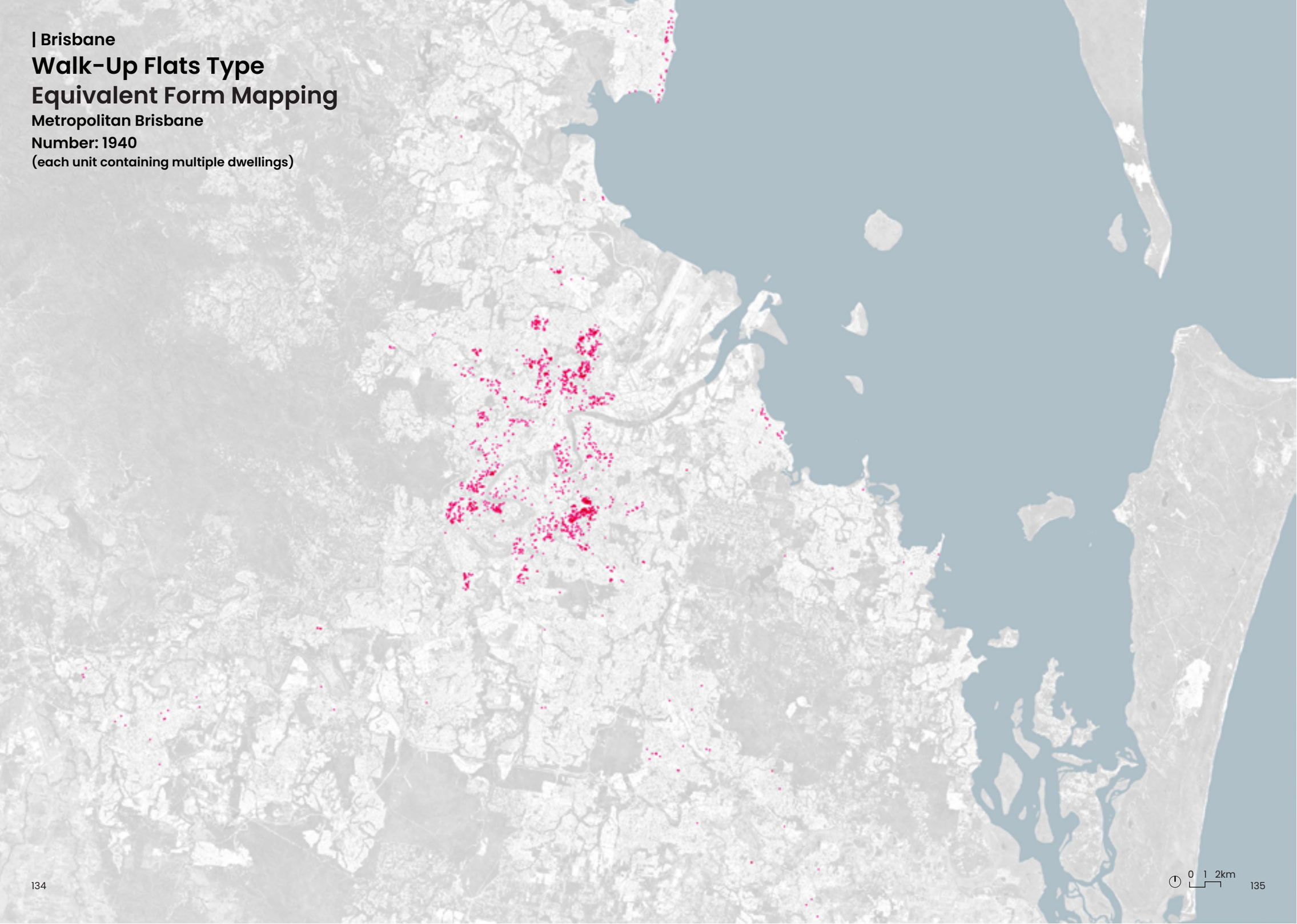
Walk-Up Flats Type

Equivalent Form Mapping

Metropolitan Brisbane

Number: 1940

(each unit containing multiple dwellings)



| Brisbane

Townhouse
1990s-2000s



0 0.5 1km

Block Plan



Street Elevation

0 2.5 5m

Townhouse Description

When
Townhouses in clustered strata-titled two-storey developments proliferated in Brisbane from the 1990s and continue today in response to a revised city plan introduced in the 1990s.

Why
This planning revision encouraged a new approach to residential provision that aimed to foster a greater variety of housing types as affordable alternatives to detached housing. These have been especially popular with first-home buyers.

Where
Townhouse clusters were procured through amalgamated quarter-acre blocks that occur across Brisbane but are most prevalent in new developments to the south and west of the city outskirts. Clusters are usually organised as ribbon developments and include a central communal recreation area shared by residents that often includes a swimming pool.

Characteristic detail
Typically, homes provide a gross floor area of 200 sqm with open-plan kitchen-dining areas and living spaces that open to a rear garden on the ground floor and two to four bedrooms and a single bathroom with WC on the upper level.

Construction logic
While developments of this typology adopt various styles, they are typically constructed of face or double brick with terracotta-tiled gable roofs. An integrated roller-door single garage usually faces the main street elevation and is accessed off a hardscape driveway.

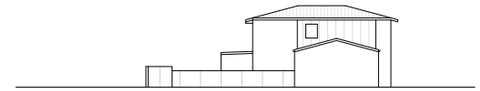
Lot Area
139m^2

Site Dimensions
9.2 x 16.5m

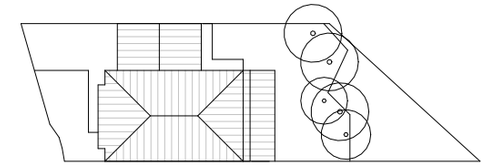
Floor Area
148m^2



Elevation



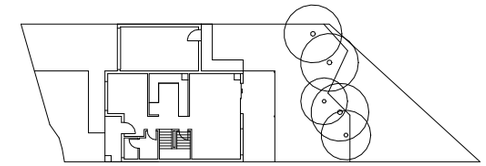
Elevation



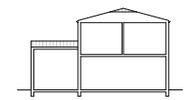
Site Plan



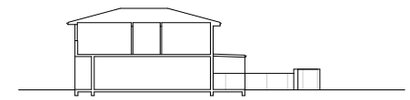
Level 1 Floor Plan



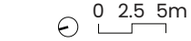
Ground Floor Plan



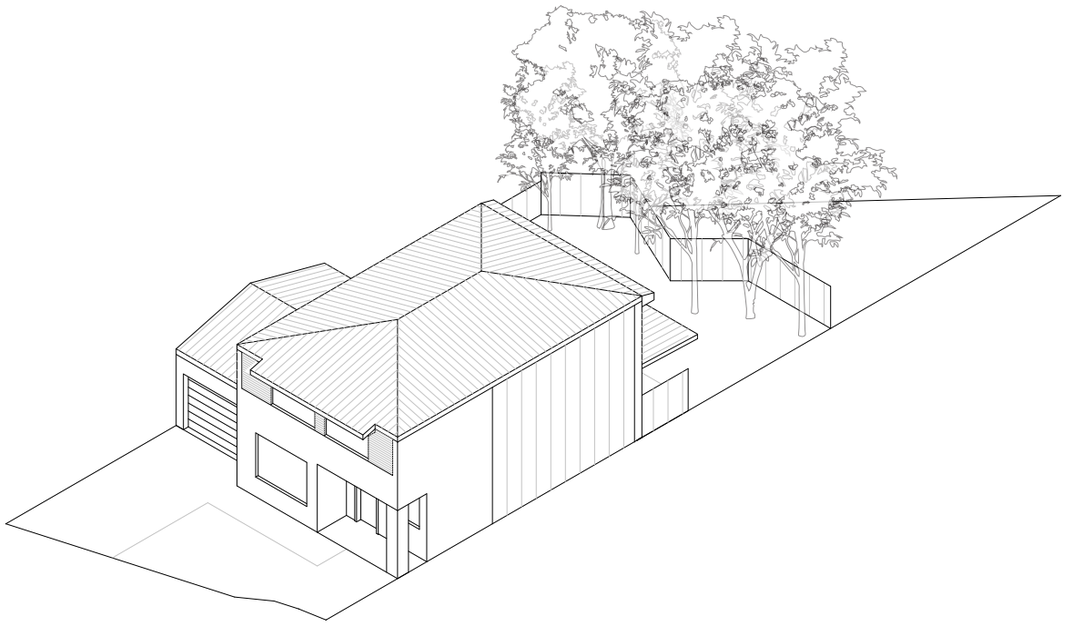
Section

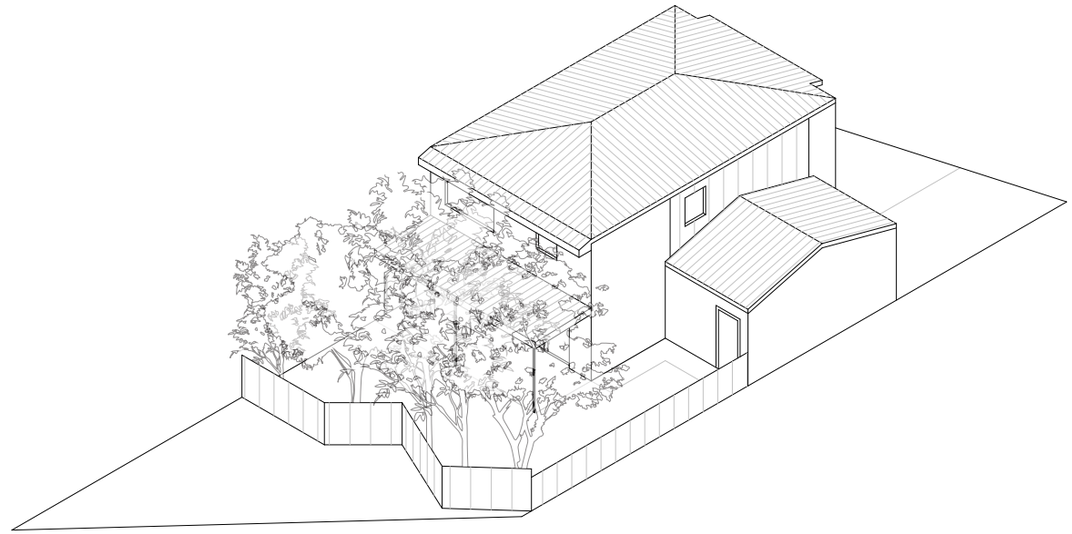


Section



Townhouse
Front and Rear Views





0 1 2m


| Brisbane
Townhouse Type
Equivalent Form Mapping
Example Precinct: Carina Heights
0 5 10m

| Brisbane

Townhouse Type
Equivalent Form Mapping

South-Eastern Suburbs



| Brisbane

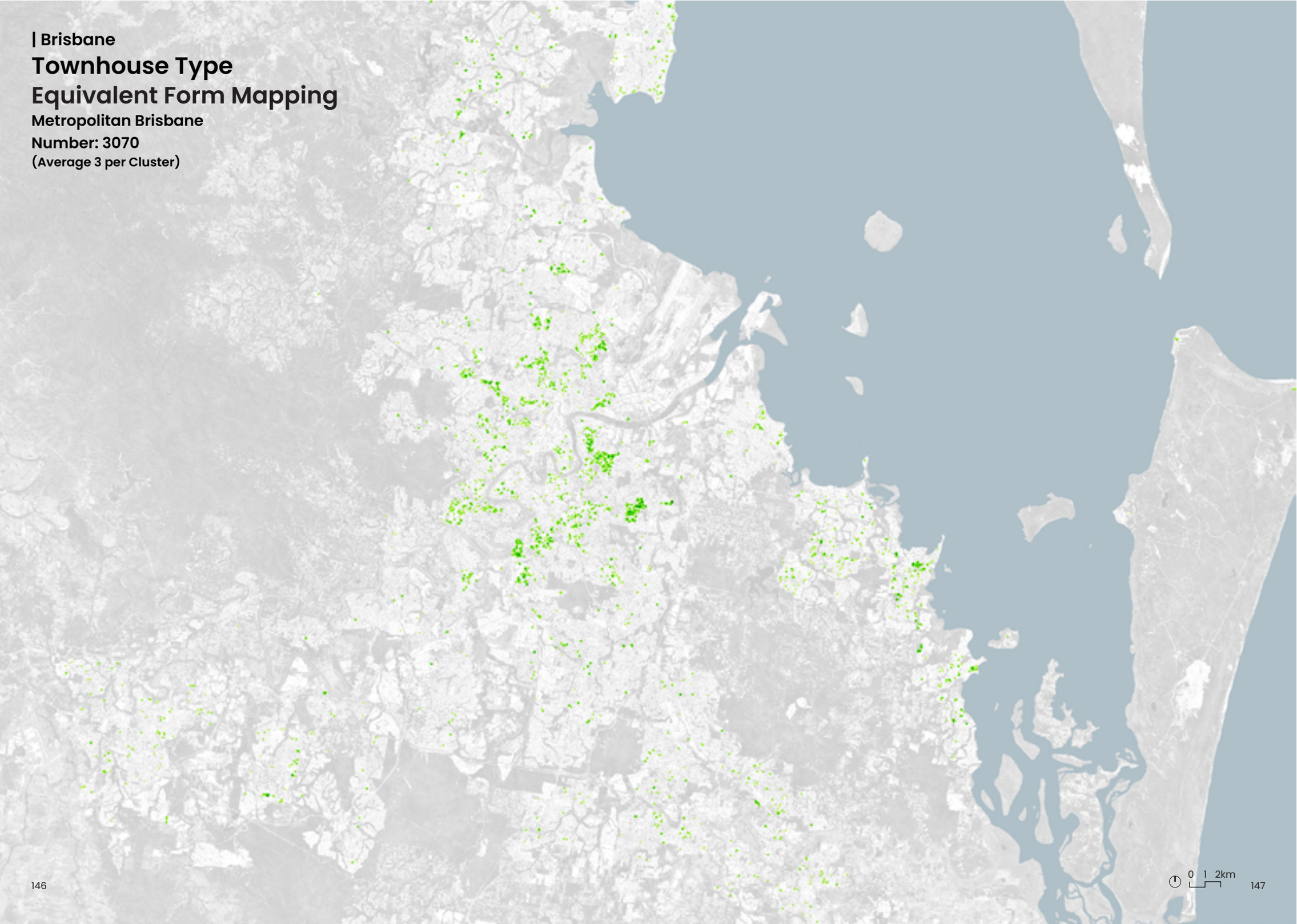
Townhouse Type

Equivalent Form Mapping

Metropolitan Brisbane

Number: 3070

(Average 3 per Cluster)



| Canberra

Townhouse I
1950s-1970s



0 2.5 5m

Street Elevation

| Canberra

Townhouse I Description



Block Plan

When
Early Canberra townhouses, known locally as duplex homes, were favoured during the city's expansion period from the early 1950s to the 1970s. This typology could economically provide housing en masse for the government's public servants and growing population.

Why
The duplex balanced the federal demand to provide medium-density housing quickly and efficiently but also to meet Canberra's aims for suburban unity and greening, underpinned by Walter Burley Griffin and Marion Mahony's Garden City philosophy.

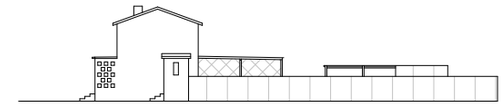
Where
Largely, the typology was built in the inner north suburbs such as Ainslie, Braddon and Reid, followed by neighbourhoods such as Hughes and Dickson. These are often located in RZ2 zones, which are now favoured for new, multi-unit medium density development. Original lots are usually around 500sqm with homes placed centrally and featuring large street setbacks with generous backyards. Carports, rather than garages, are more typical for this type and are accessed from a hardscape driveway along the boundary.

Characteristic detail
The prevailing features of the duplex are its twinned, two-storey houses with red brick veneer or double brick facades and gable tile roofs. Each home has a square-shaped floor plan that provides around 180sqm of internal accommodation. Plans follow a predictable convention with entry lobby, living and dining rooms, kitchen, and internal laundry downstairs. Upstairs are three generous bedrooms (9–14 sqm), many with inbuilt storage, as well as a single bathroom and WC.

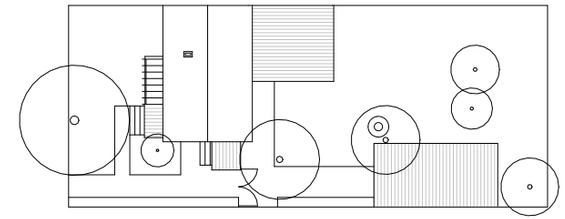
Construction logic
Brick piers on concrete foundations underpin the typical duplex double brick external and party walls, with occasional external brick veneer finishes. Timber features in floor construction, framed internal walls, doors and windows, and painted timber guttering and fascia.



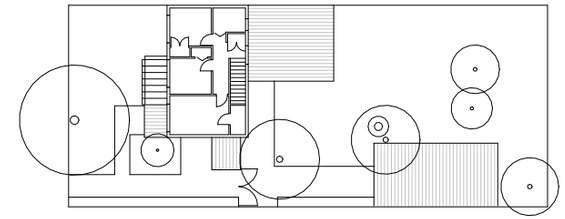
Elevation



Elevation



Site Plan

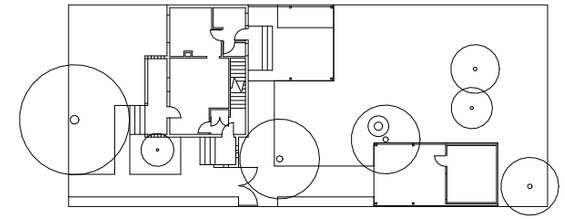


Level 1 Floor Plan

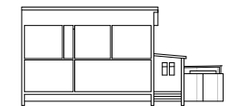
Lot Area
513m^2

Site Dimensions
13.6 x 35.2m

Floor Area
115m^2



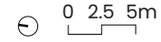
Ground Floor Plan



Section

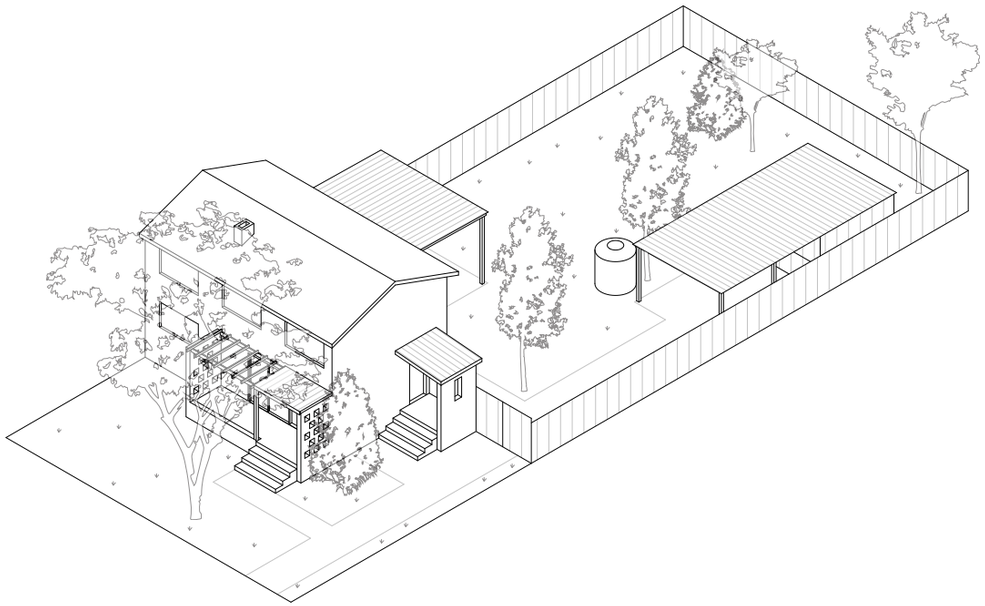


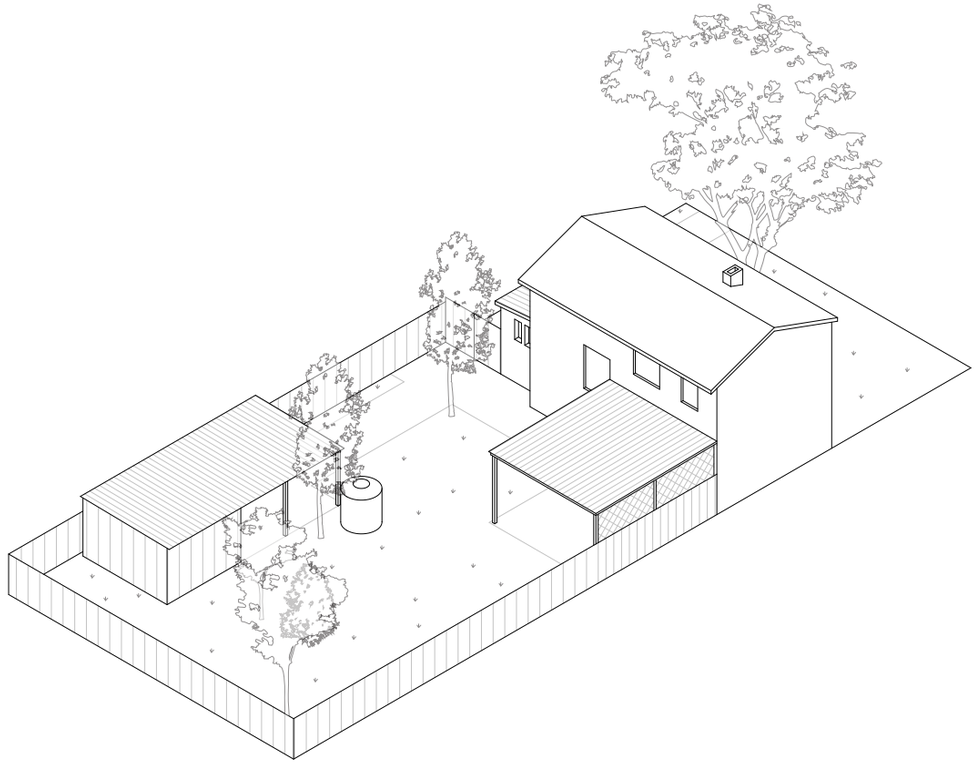
Section



| Canberra

Townhouse I
Front and Rear Views





0 1 2m


| Canberra
Townhouse I Type
Equivalent Form Mapping
Example Precinct: Dickson / Ainslie
0 5 10m

| Canberra

Townhouse I Type Equivalent Form Mapping

Northern Suburbs

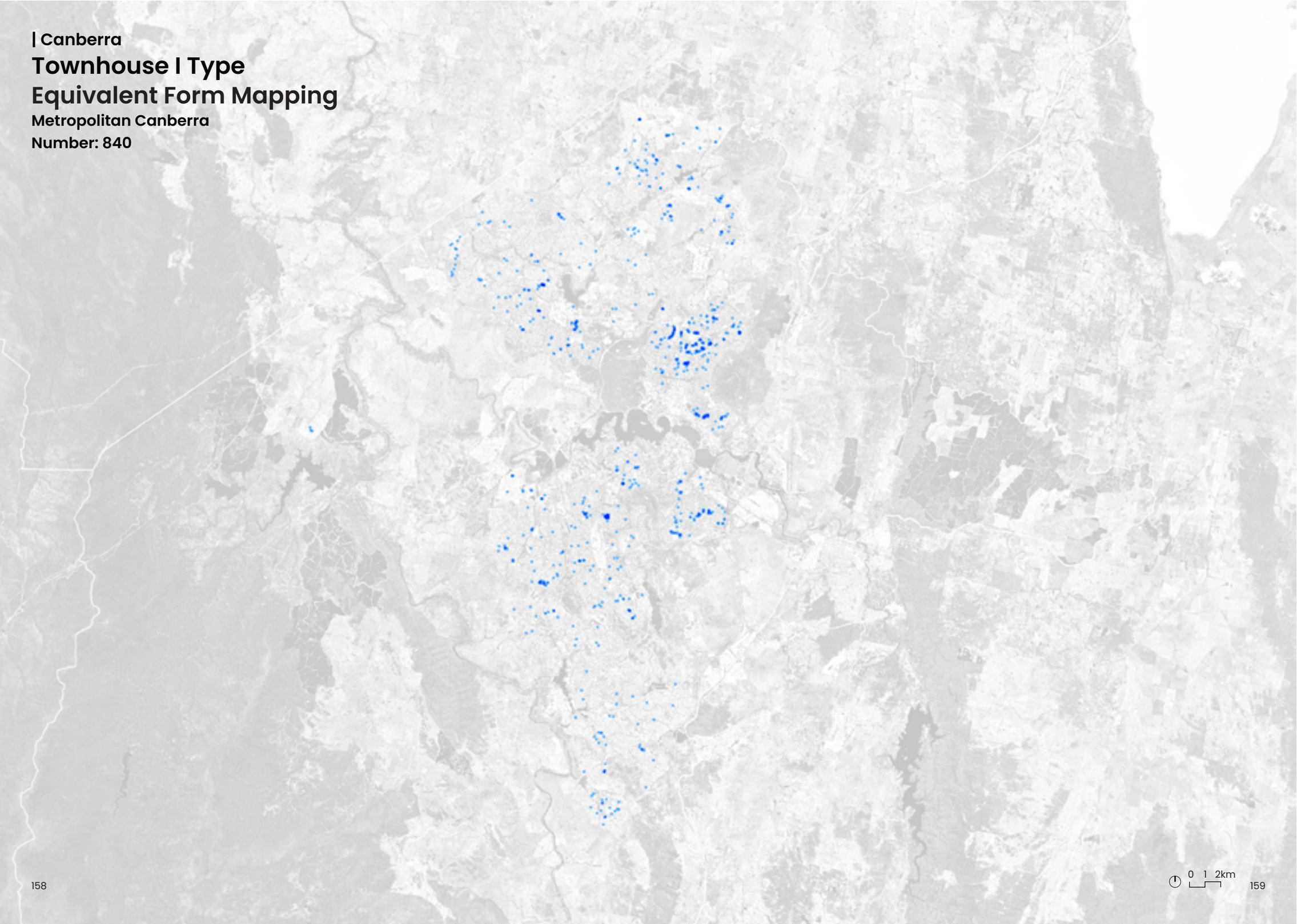


Townhouse I Type

Equivalent Form Mapping

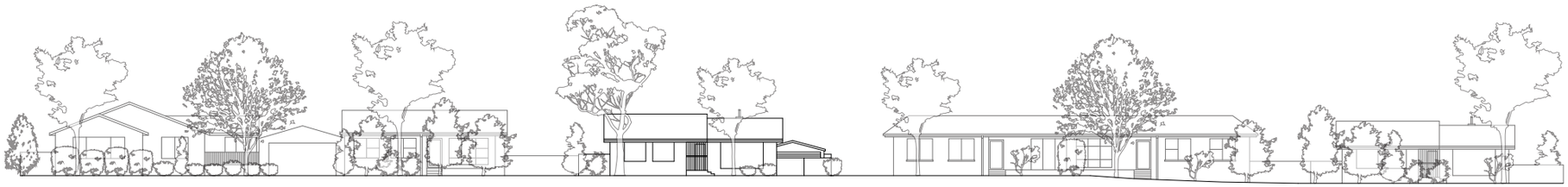
Metropolitan Canberra

Number: 840



| Canberra

Cottage
1950s-1970s



0 2.5 5m

Street Elevation

Cottage Description



Block Plan

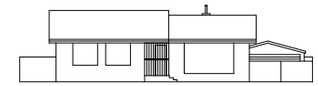
When
Known locally as ‘ex-govie’ houses, these government-built cottages were delivered in Canberra during the post-war decades from 1957 to the early 1970s.

Why
The 'govie' was developed by the National Capital Development Commission (NCDC), established federally in 1958 to accommodate Canberra’s rapid population expansion. The ‘400’ series is the best known of the type: modest, functional homes of around 110–115 sqm, designed to be low-cost while contributing to Canberra’s ‘City Beautiful’ aesthetic.

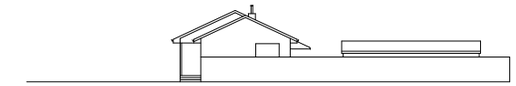
Where
Downer formed the first test-site suburb, where the Department of Works built and critiqued 13 examples of the 400 series in 1961. Following adjustments to site layout, corner sites, and suburban unity, subsequent 400 series homes were built largely in Canberra’s inner north and early Woden suburbs. Homes sit centrally on 800 sqm lots with generous street setbacks, large rear yards, and car parking along one boundary.

Characteristic detail
The NCDC’s Pattern Book originally provided 16 designs, many by Melbourne practice Leith & Bartlett. The 400 series is recognisable by its brick-veneer finish and rectilinear volumes. Floor plans are organised in two clusters: kitchen-dining and living room; and bedrooms. A bathroom, WC, and internal laundry sit between them. Smaller homes omit an entry hall, with front doors opening directly into the living room.

Construction logic
Timber-framed construction with floors raised on brick stumps or piles accommodates Canberra’s undulating terrain. Homes are economically clad in brick veneer or monocrete with gabled concrete-tiled roofs and single-glazed aluminium windows. Thin internal walls are often insulated with corrugated cardboard and result in poor thermal comfort throughout.



Elevation

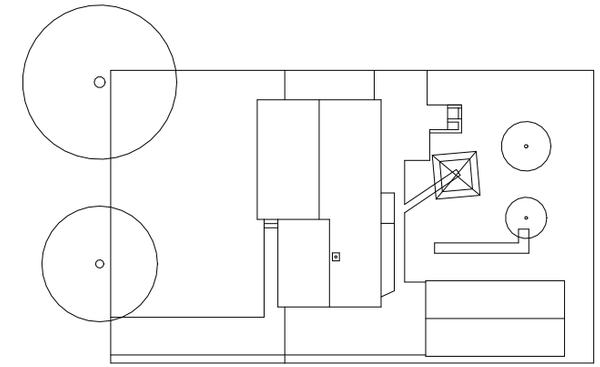


Elevation

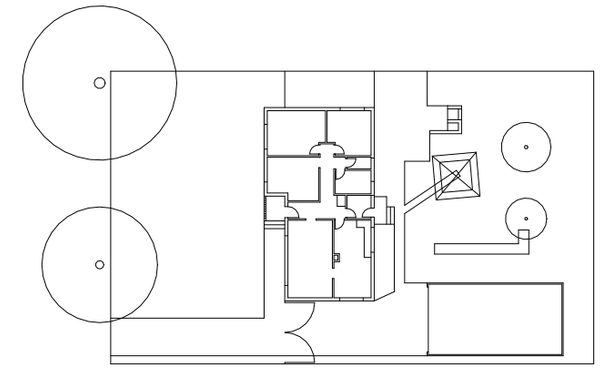
Lot Area
746m²

Site Dimensions
21.2 x 35m

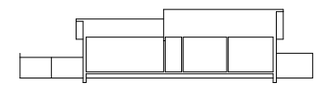
Floor Area
108m²



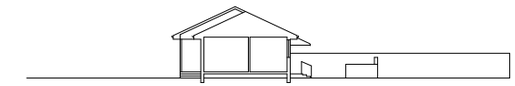
Site Plan



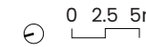
Ground Floor Plan



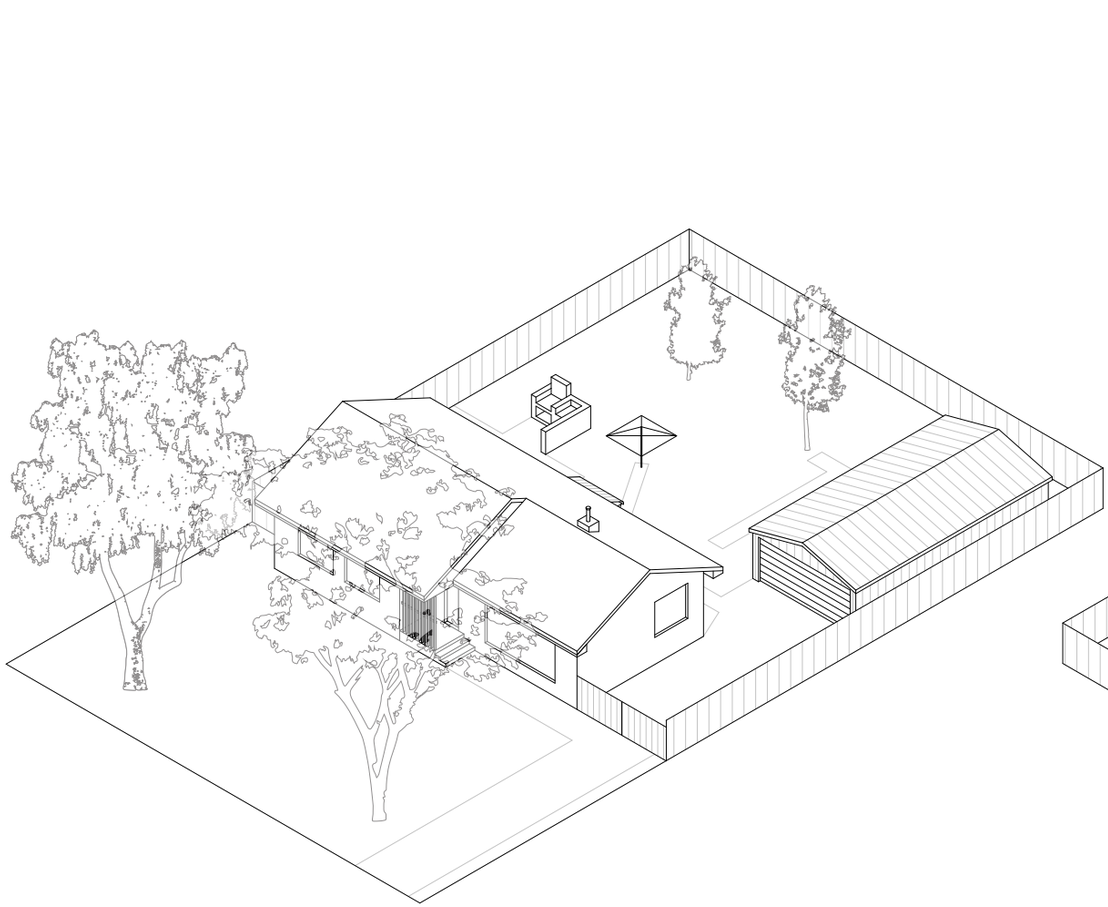
Section

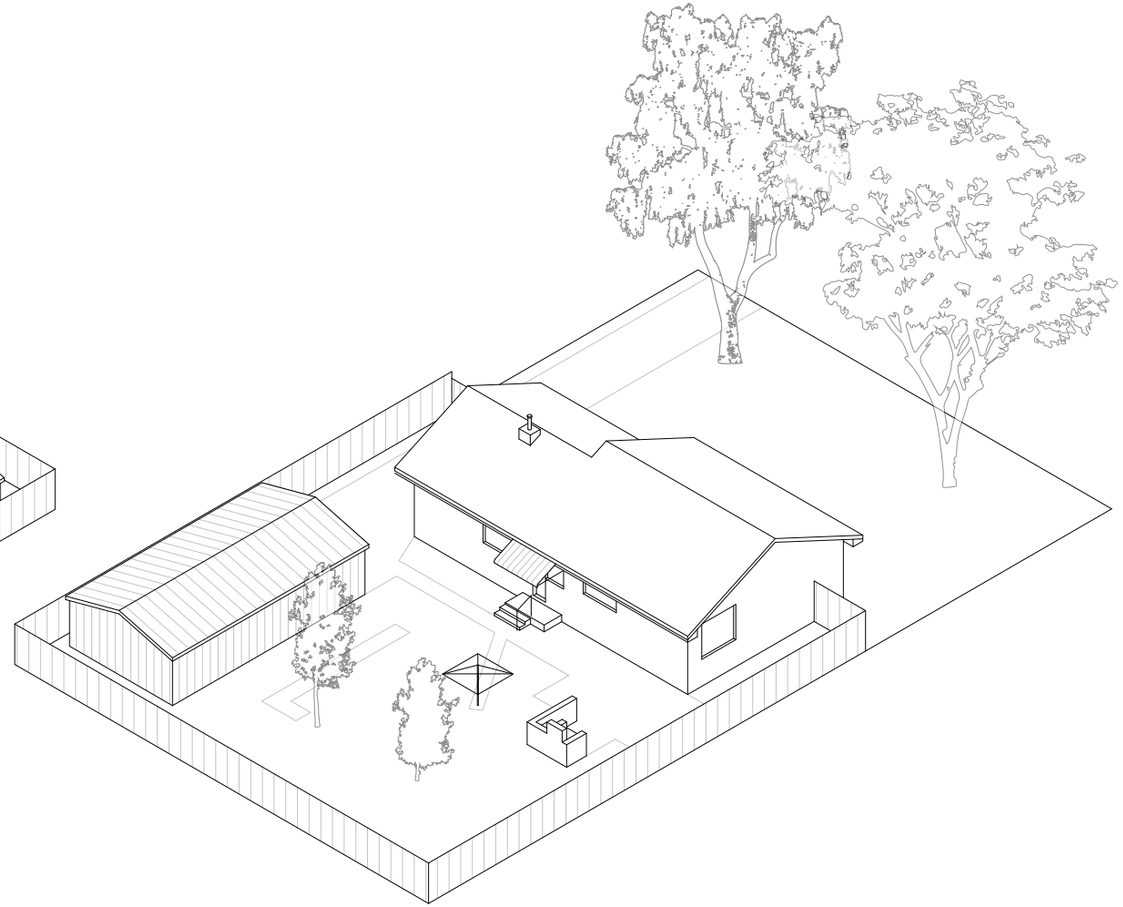


Section



Cottage
Front and Rear Views





0 1 2m

Cottage Type Equivalent Form Mapping

Example Precinct: Cook



Cottage Type
Equivalent Form Mapping
North-Western Suburbs

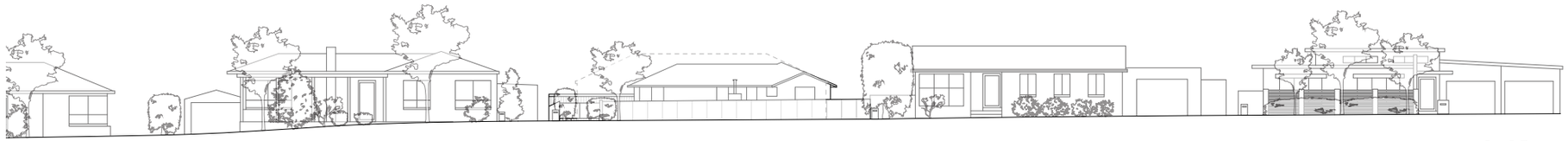


Cottage Type
Equivalent Form Mapping
Metropolitan Canberra
Number: 969



| Canberra

Villa
1960s-Ongoing



Street Elevation

0 2.5 5m

Villa Description



Block Plan

0 0.5 1km

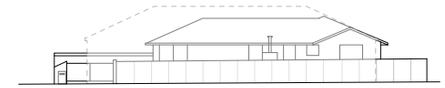
When
While early examples anticipating Canberra's speculative development began in the late 1960s and early 1970s (largely supported by capital expenditure), the private villa gained popular appeal from the 1980s to the current day.

Why
Canberra was granted self-government in 1989. This meant the end of federal funding for its professional planning and with it, the end of its government-led urban planning legacy for an ideal city. Instead, the role of neo-liberal market forces escalated in the ACT and the rise of project homes exemplified this change in city-making.

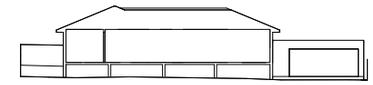
Where
Villas are typically located in Canberra's low- to medium-density suburbs of RZ1 and RZ2 zones, often in greenfield sites developed to raise revenue for the nascent Territory government. New regions such as Gungahlin (1991) are representative: the villa is its primary housing stock. Mirroring mass-market development across Australia, the villa is a detached home ranging from around 150–250 sqm on lots of 400–800 sqm.

Characteristic detail
Most dwellings provide an open-plan living-dining area, kitchen, and family room, alongside four bedrooms with master en suites and built-in robes as standard. Larger homes – often from the 1990s onward – add a dedicated study, rumpus room, and walk-in pantry. Consistent with its national cousins, the street elevation is dominated by a driveway and integrated garaging, internally accessed, for one or two cars.

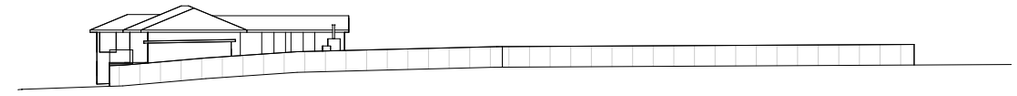
Construction logic
The mass-market villa adopts concrete slab foundations on level sites, brick-faced facades, and hip or gable tiled roofs. Upper storeys adopt lightweight construction. Throughout, homes typically have timber-framed interior walls, single-glazed aluminium windows, and timber or Colorbond steel cladding.



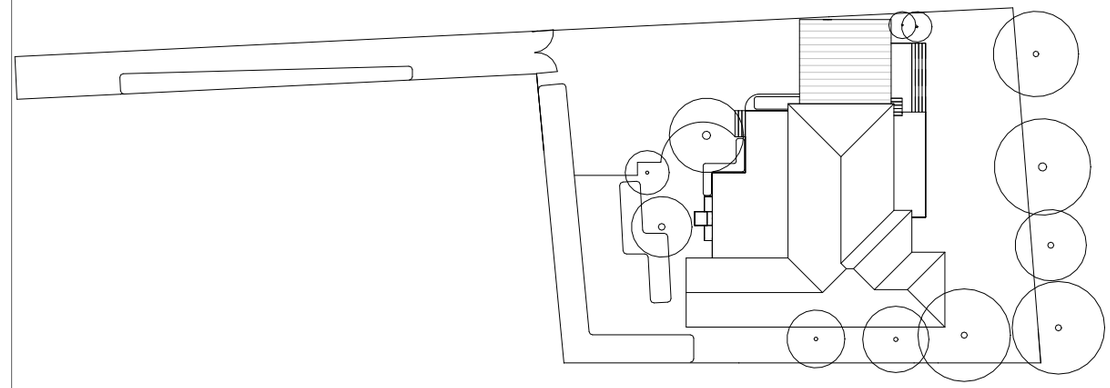
Elevation



Section



Section

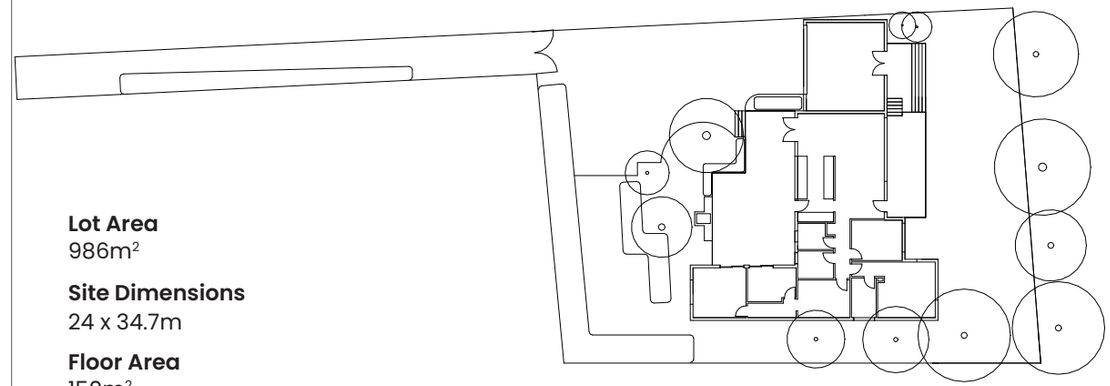


Site Plan

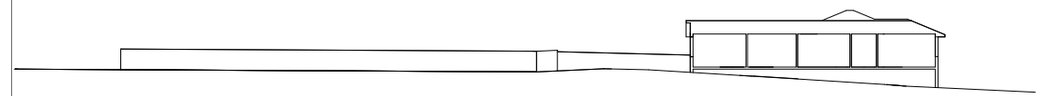
Lot Area
986m²

Site Dimensions
24 x 34.7m

Floor Area
150m²



Ground Floor Plan

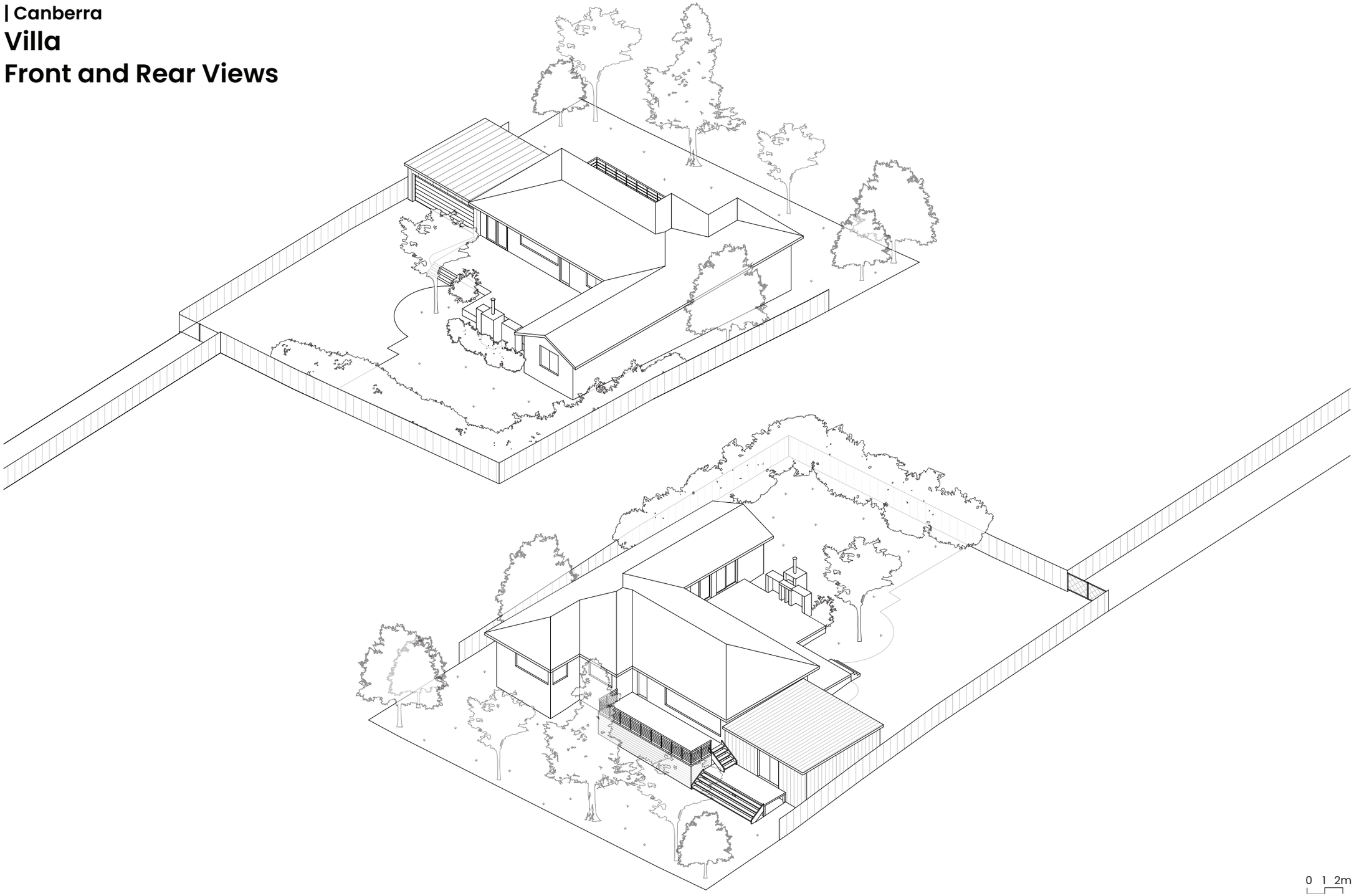


Elevation

0 2.5 5m

| Canberra

Villa
Front and Rear Views



Villa Type Equivalent Form Mapping

Example Precinct: Gowrie



| Canberra

Villa Type
Equivalent Form Mapping

Southern Suburbs



| Canberra

Villa Type

Equivalent Form Mapping

Metropolitan Canberra

Number: 19,566



0 1 2km

| Canberra

Townhouse II
1970s-1990s



0 0.5 1km

Block Plan



Street Elevation

0 2.5 5m

Townhouse II
Description

When
From April 1972, when the NCDC opened the first medium-density demonstration townhousing at Swinger Hill in Woden, to the late 1990s developments in Gungahlin, the townhouse has remained consistently popular in Canberra.

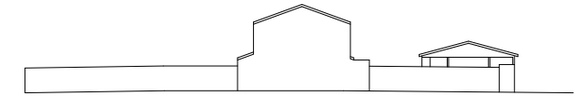
Why
Townhousing was championed by the NCDC as a medium-density alternative to flats and semi-detached housing – providing small-footprint homes that protected open green space. The Whitlam Labor government's focus on urban planning further encouraged the type, as did exemplary precedents at Swinger Hill (1972), Urambi Village, Kambah (1977), and Wybalena Grove, Cook (1979).

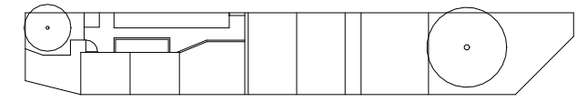
Where
The rise of townhouses intersected with the NCDC's General Growth Strategy (1970), which contained urban growth within valleys to protect surrounding hills and created new town centres at Woden (1971), Belconnen (1977), and Tuggeranong (1987). Much townhousing is concentrated in these suburbs. Notable 1980s examples include Gary Willemsen's work in Holder and Harry Seidler's Lakeview at Yarralumla (1982–84). Lot sizes have gradually decreased since the 1970s, while more recent Gungahlin examples have increased in scale, achieving higher-density clustered developments.

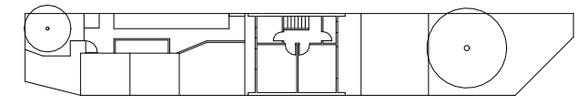
Characteristic detail
Townhouses typically cover around 30% of their site, with two- or three-storey attached homes allowing for vertically stacked living. The typical 1970s version – a budget-conscious interpretation of Sydney's terrace – was often built in dark-brown brick, with living, dining, kitchen, laundry, and WC at ground level, and two to four bedrooms, a bathroom, and second WC above. Later 1980s and 1990s examples maintain this floor planning but introduce an internally accessed single or double garage at ground level in place of earlier detached carports.

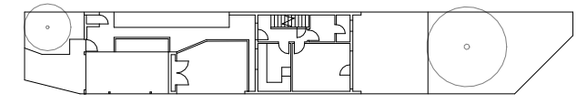
Construction logic
Typically arranged in row or terraced formations of brick construction, townhouses are set on concrete footings with concrete ground slabs, lightweight upper floors, external walls of brick veneer, metal roof trusses, and concrete tiles.

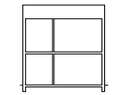

Elevation

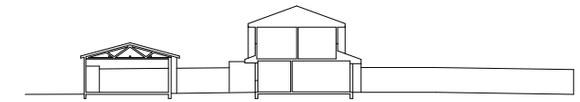

Elevation


Site Plan


Level 1 Floor Plan


Ground Floor Plan


Section


Section

Lot Area
221m^2

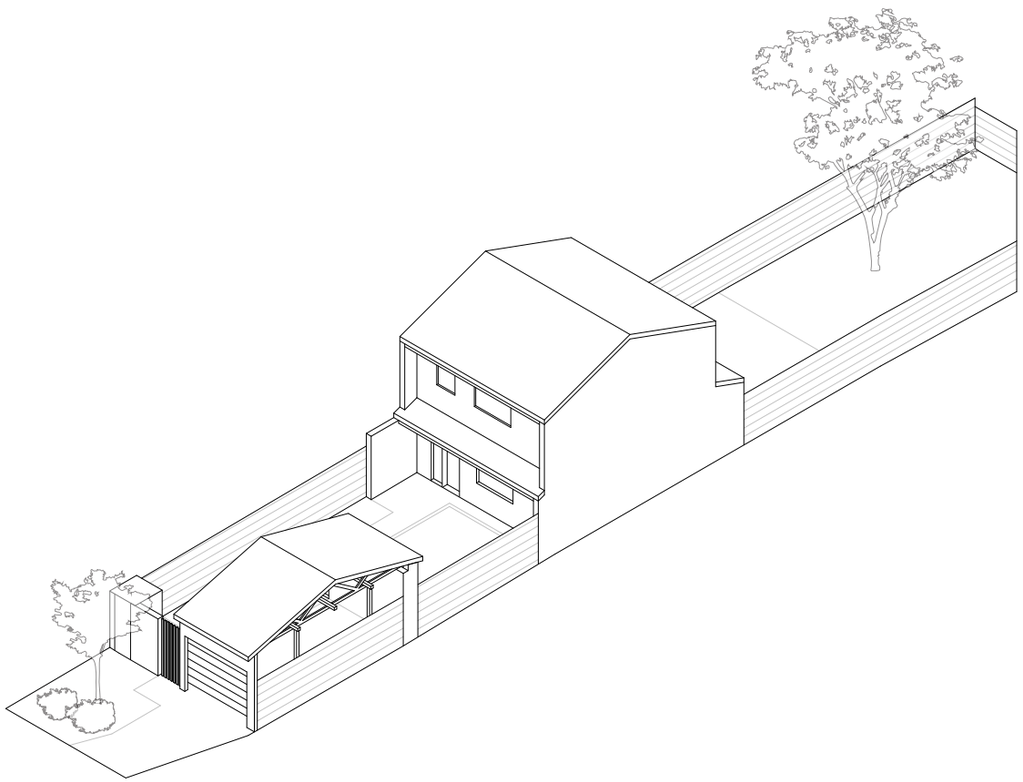
Site Dimensions
4.75 x 39.8m

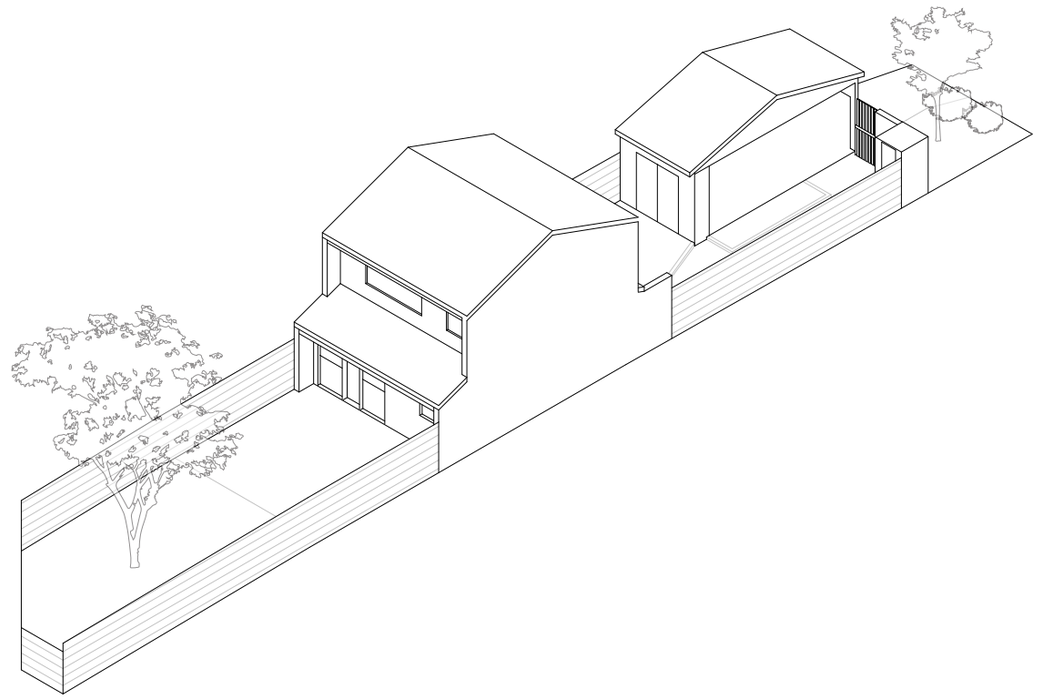
Floor Area
75m^2

0 2.5 5m

| Canberra

Townhouse II
Front and Rear Views





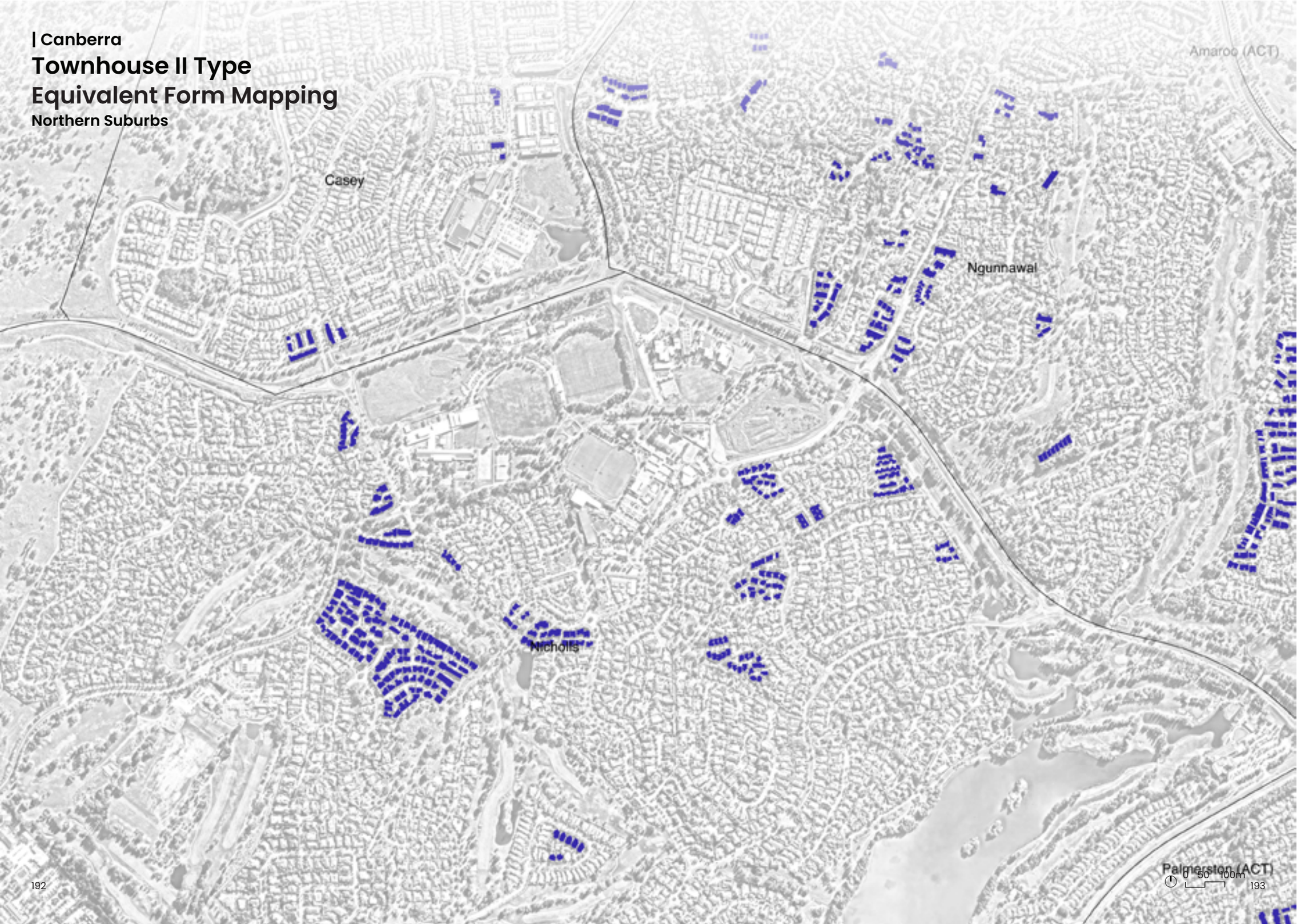
0 1 2m

Townhouse II Type Equivalent Form Mapping

Example Precinct: Nicholls



Townhouse II Type
Equivalent Form Mapping
Northern Suburbs



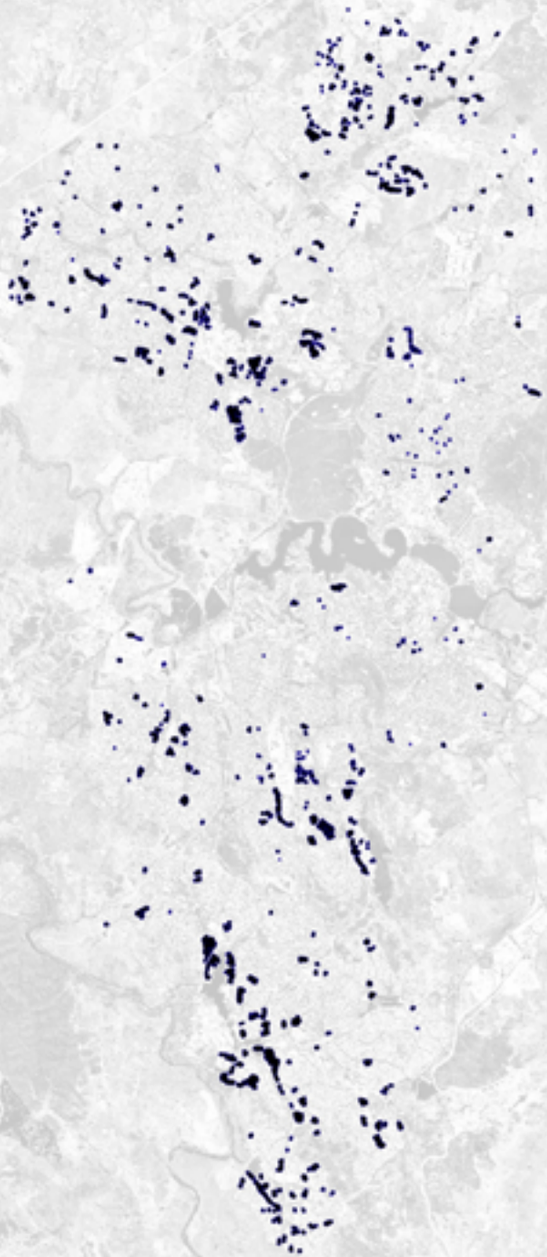
| Canberra

Townhouse II Type

Equivalent Form Mapping

Metropolitan Canberra

Number: 8797



0 1 2km

| Darwin

Elevated House I
1950s-1980s



Block Plan

0 0.5 1km



Street Elevation

0 2.5 5m

| Darwin

Elevated House I Description

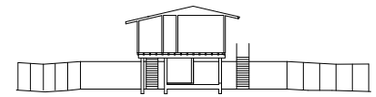
When
Elevated houses were the defining feature of Darwin's post-war landscape, primarily constructed between the 1950s and 1980s.

Why
The Commonwealth developed this typology for public servants during the city's rapid growth, as part of the 1954 Menzies Development Plan. Spare and functional in character, the type also reflects the influence of Beni Burnett's Anglo-Asian bungalow types, prefabricated Riley-Newsum houses, and emerging literature on designing for thermal comfort. The typology lost favour post-Cyclone Tracy to lower-set dwellings that proved more resilient to extreme wind damage.

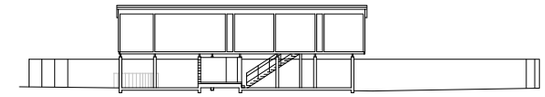
Where
Elevated housing is concentrated in Darwin's inner suburbs – Fannie Bay, Parap, Ludmilla, Nightcliff, and Rapid Creek – as well as newer suburbs including Alawa, Tiwi, Jingili, and Moil. Early examples sit on large, irregular lots while later versions repeat the typology on smaller, more standardised blocks.

Characteristic detail
Multiple types were released across the period – from the Standard Type C (1951) through to the M and various Type D iterations (1957–66) – reflecting varied room counts and spatial configurations. All orient east-west to minimise heat gain and capture prevailing breezes, with projecting eaves, narrow axial plans, tall louvred windows on north and south sides, and insulated east and west end walls. The elevated upper level creates a covered undercroft used for parking, recreation, and laundry, while providing ventilation and termite protection.

Construction logic
Limited material availability shaped the approach: reinforced concrete and concrete block at ground level, with hardwood timber beams, joists, roof trusses, and framing above. Dwellings are typically clad in asbestos, fibrolite, or metal sheeting, with corrugated steel roofs and louvre windows with aluminium or glass blades.



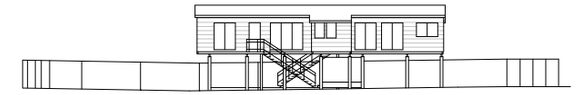
Section



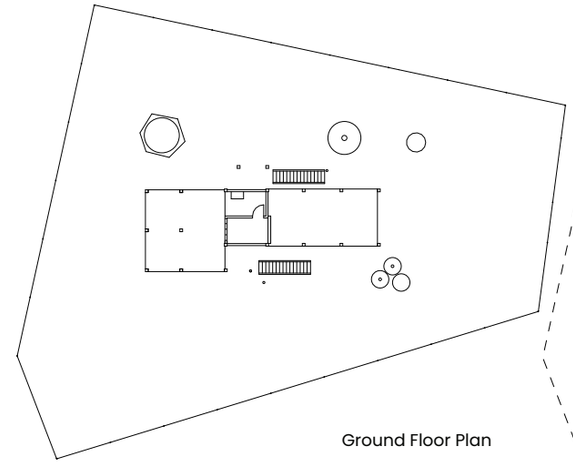
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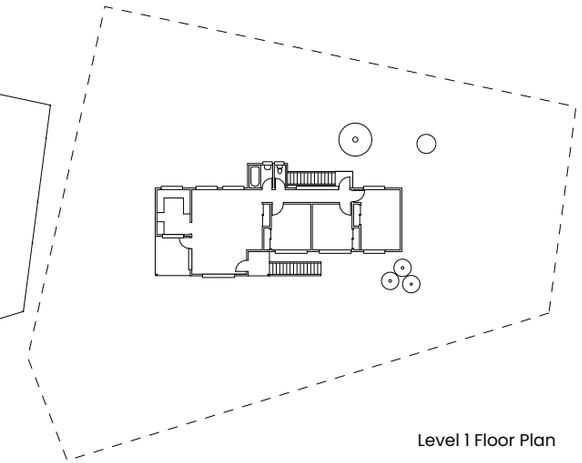
Elevation



Elevation



Ground Floor Plan

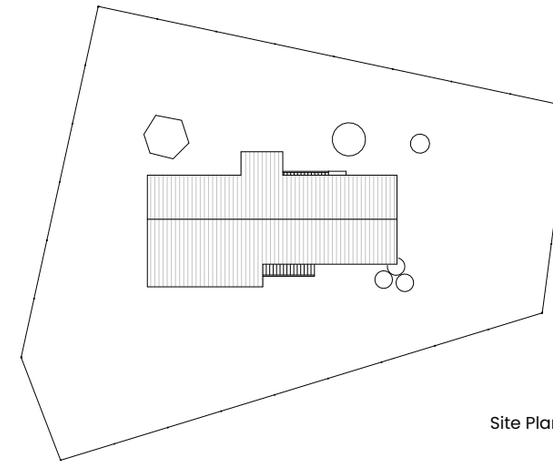


Level 1 Floor Plan

Lot Area
880m²

Site Dimensions
15.3 x 35m

Floor Area
126m² (+ undercroft)



Site Plan

0 2.5 5m

Elevated House I
Front and Rear Views



0 1 2m

| Darwin

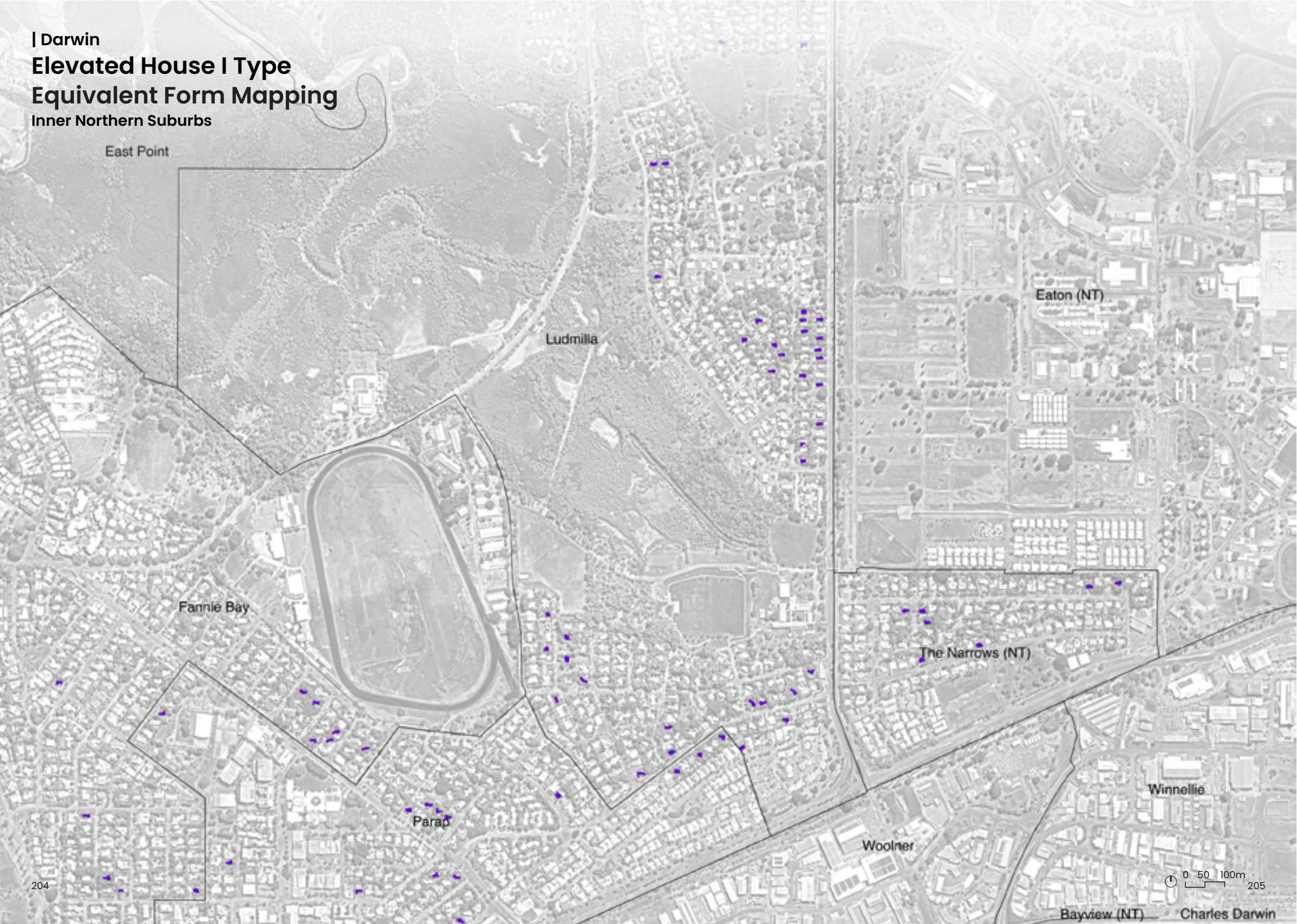
Elevated House I Type Equivalent Form Mapping

Example Precinct: Ludmilla



Elevated House I Type
Equivalent Form Mapping

Inner Northern Suburbs



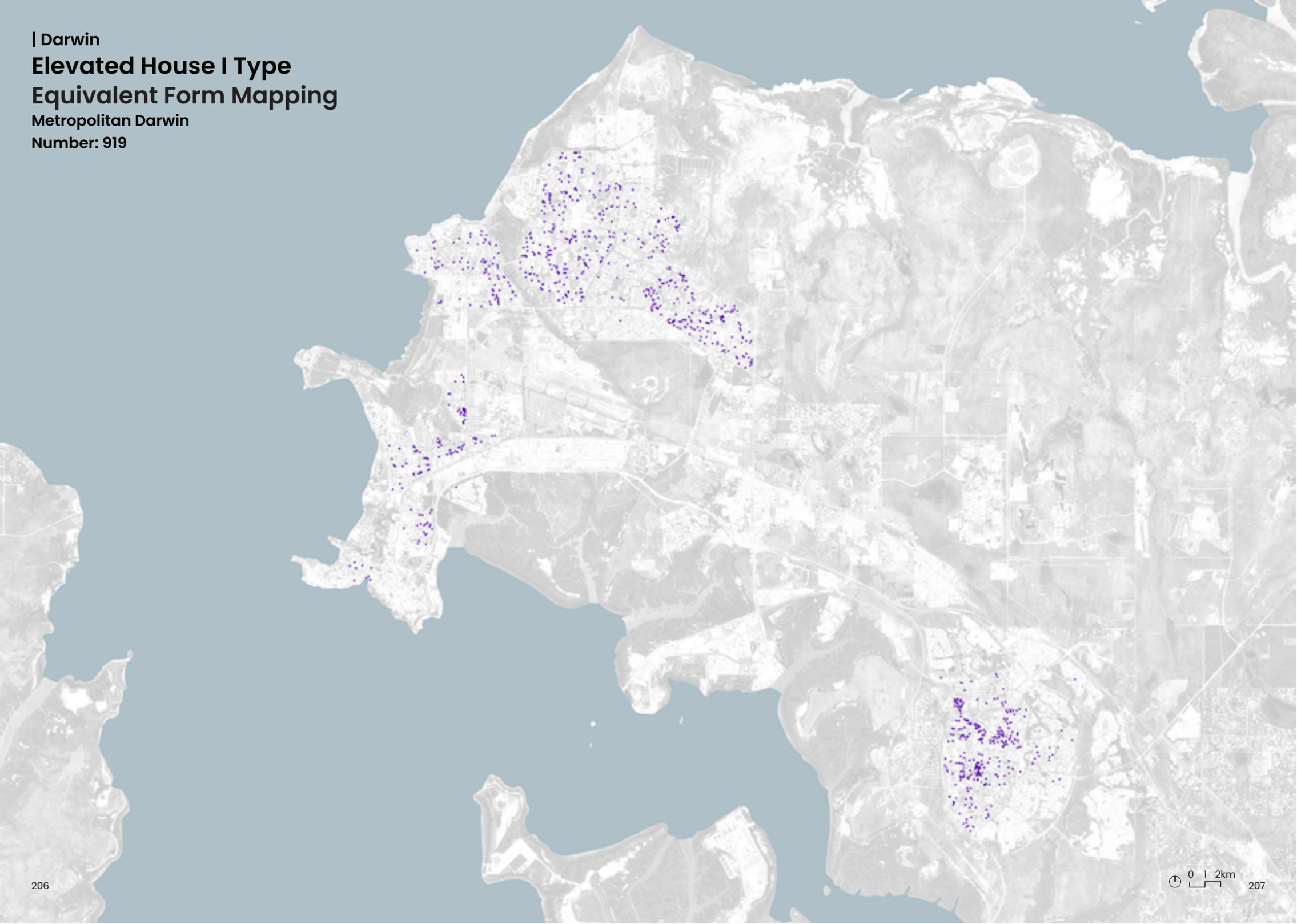
| Darwin

Elevated House I Type

Equivalent Form Mapping

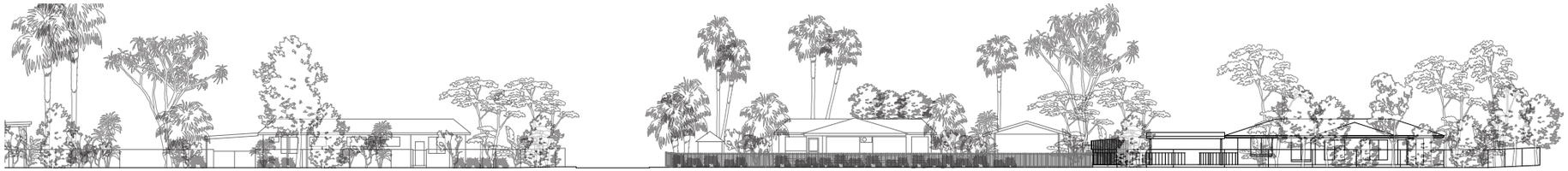
Metropolitan Darwin

Number: 919



| Darwin

Villa
1970s



Street Elevation 0 2.5 5m

Villa Description

When
The Northern Territory Housing Commission had built detached single-storey double-brick homes before Cyclone Tracy, but the majority of this type was delivered between 1974–77 as part of reconstruction efforts.

Why
As with Darwin's split-level homes, mass delivery of single-storey detached housing was driven by post-Tracy reconstruction – earning the colloquial nickname 'Tracy-trauma' homes. Built by Grollo-Wincope, Orlit Pty. Ltd., and Barclay Bros, the scale was unprecedented: the initial tender of 600 homes awarded to Barclay Bros was the largest Commonwealth housing contract ever issued, at its peak delivering 20 houses per week.

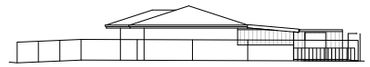
Where
Most prevalent in Anula and Wulagi, comparable homes also appear in the newer suburbs of Wanguri, Karama, and Malak – though these adopt more recent materials and a greater number of rooms than the original type.

Characteristic detail
Homes sit centrally on lots of around 800 sqm, with concrete driveways creating generous street and boundary setbacks. Floor plans cluster living, kitchen, and dining areas around a central corridor serving the bedrooms. The type relies on air-conditioning rather than cross-ventilation, though some variants – notably the Barclay design – incorporate wraparound verandahs better suited to passive cooling. Standard government homes omitted carports, sheds, and storage; these were commonly added later by residents.

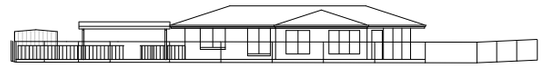
Construction logic
On-ground concrete slabs, rendered double-brick walls, and cast-in-situ ring beams or lintels at 2,100mm. Most internal walls are brick-rendered, with some timber stud framing. Roofs are low-pitched hipped forms in corrugated steel sheet or tile.



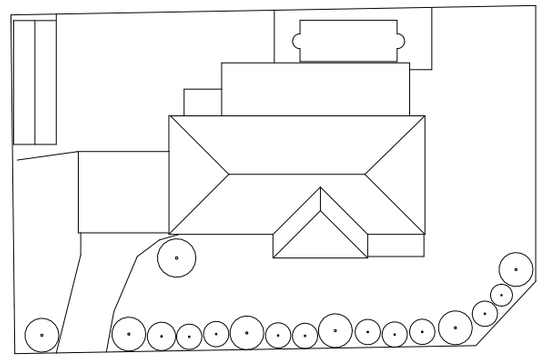
Block Plan 0 0.5 1km



Elevation



Elevation

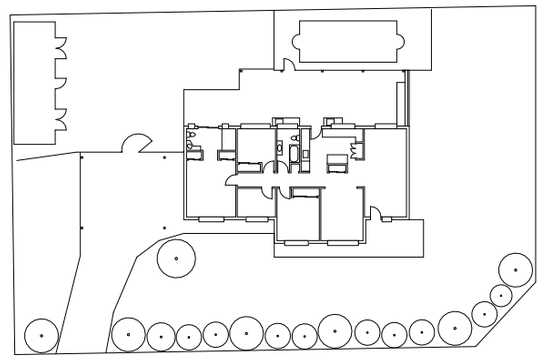


Site Plan

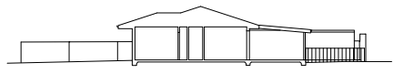
Lot Area
937m²

Site Dimensions
24.9 x 38.1m

Floor Area
122.5m²



Ground Floor Plan



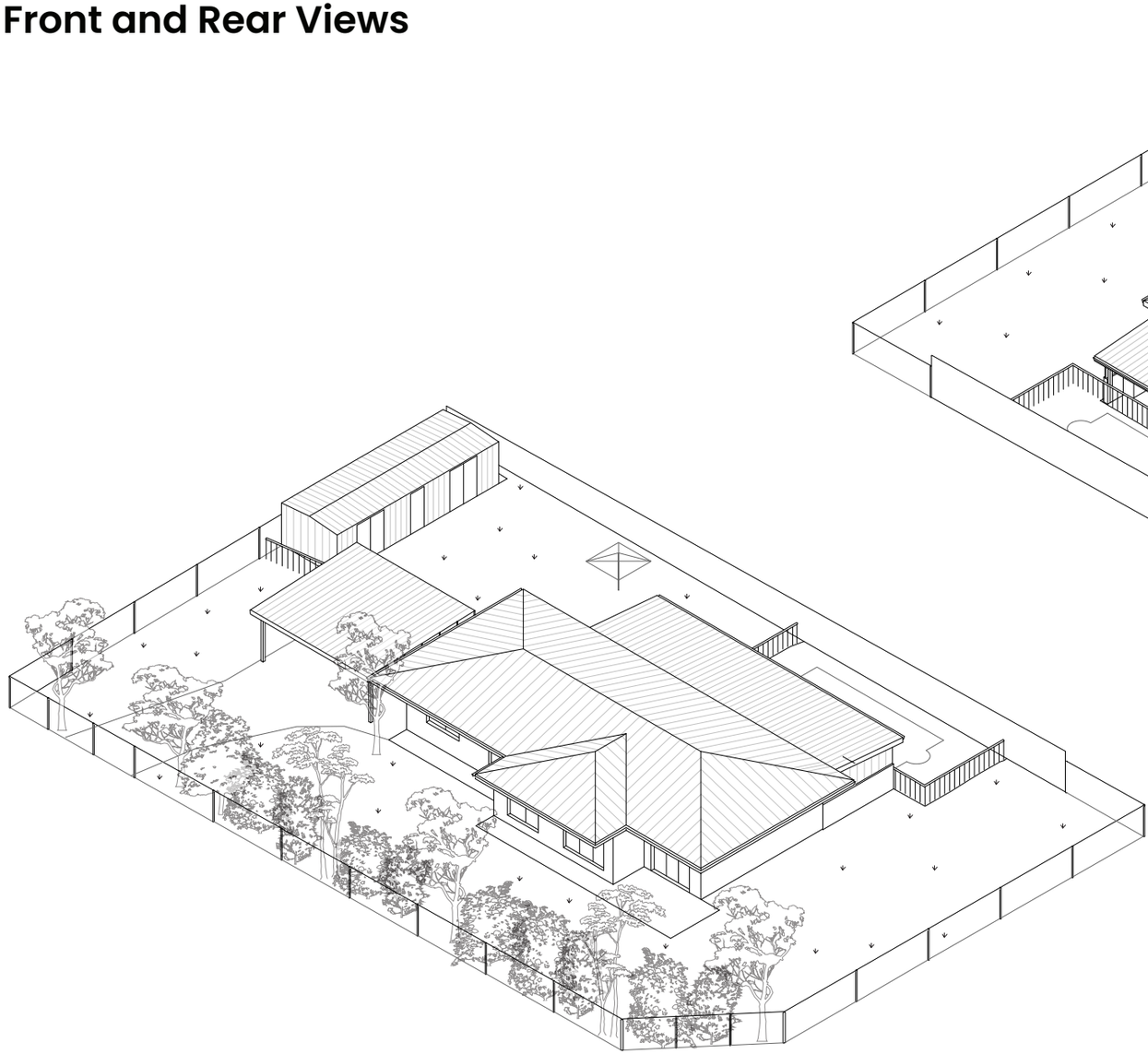
Section

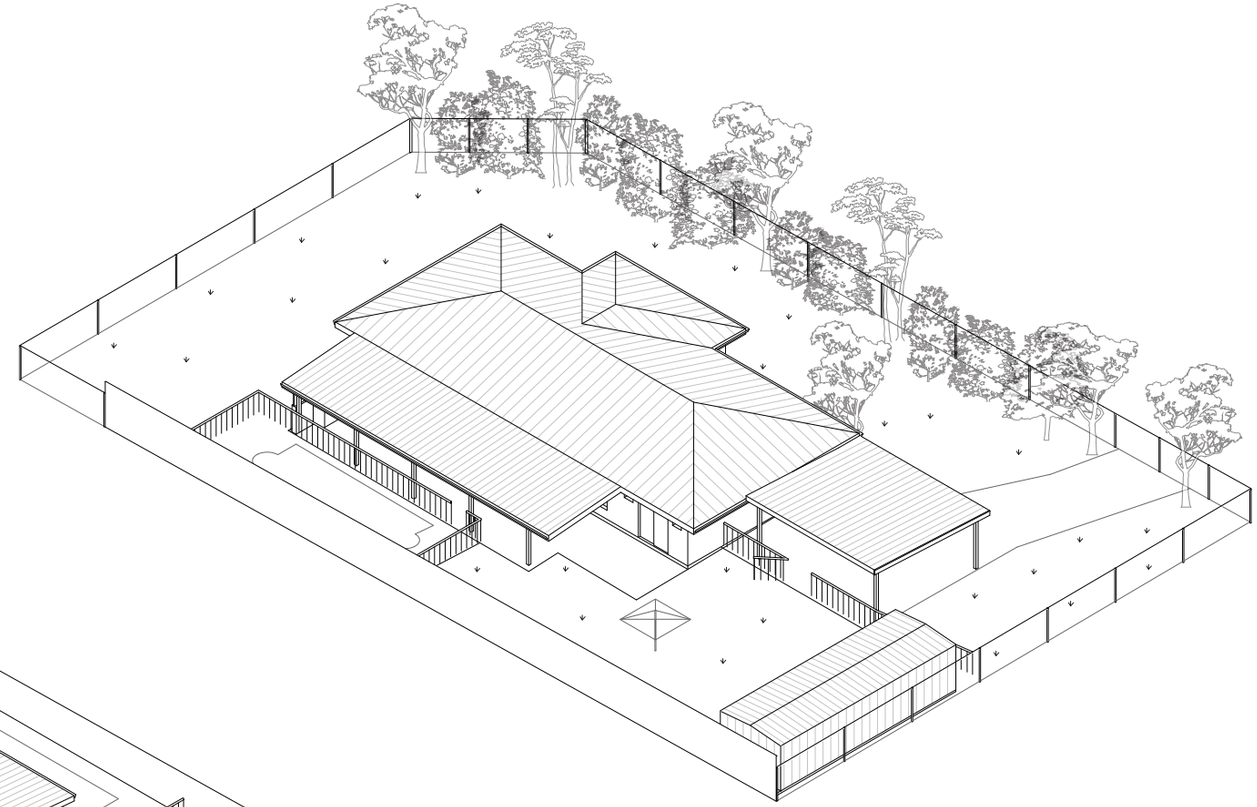


Section

0 2.5 5m

Villa
Front and Rear Views





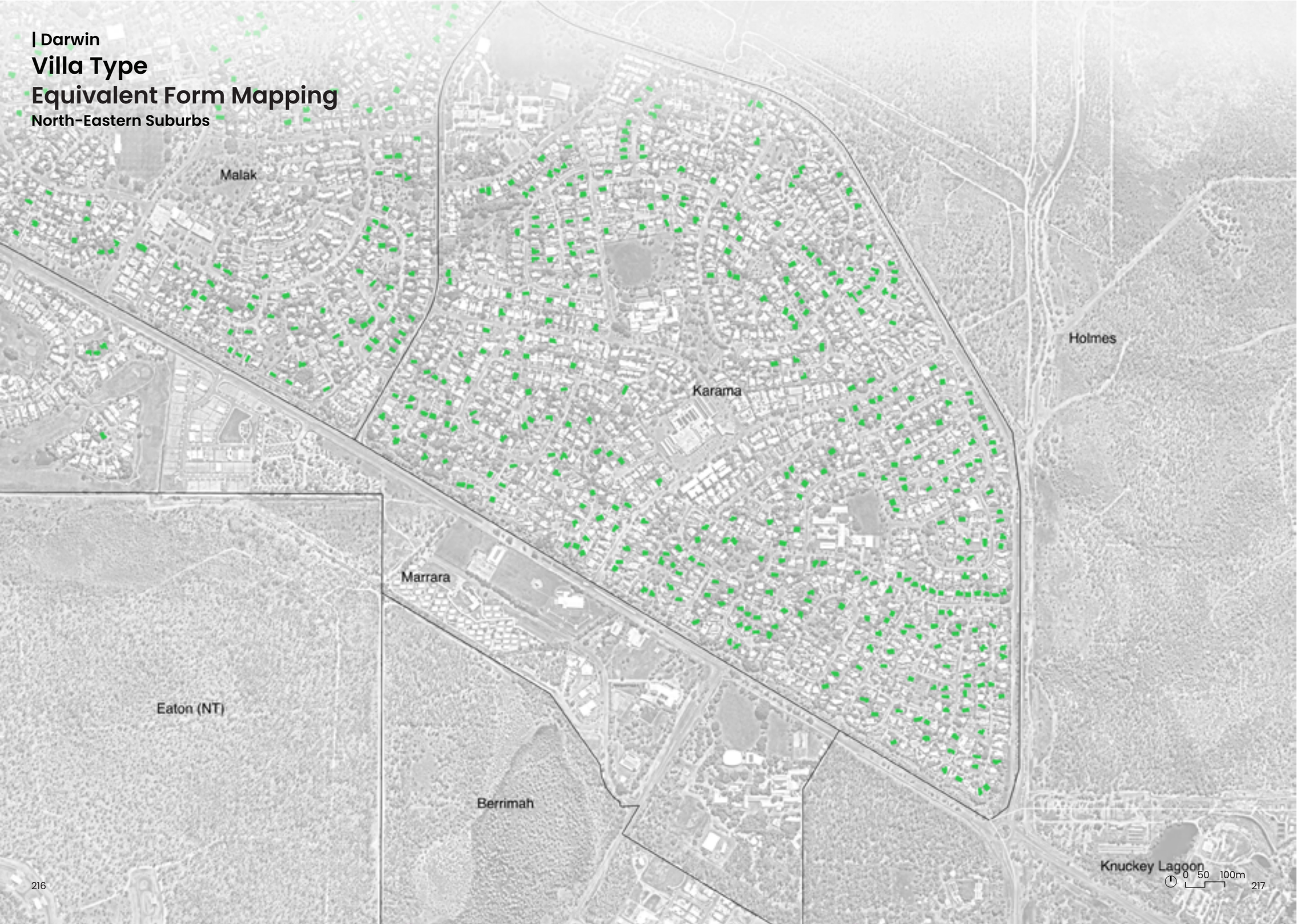
0 1 2m

Villa Type Equivalent Form Mapping

Example Precinct: Karama



Villa Type
Equivalent Form Mapping
North-Eastern Suburbs

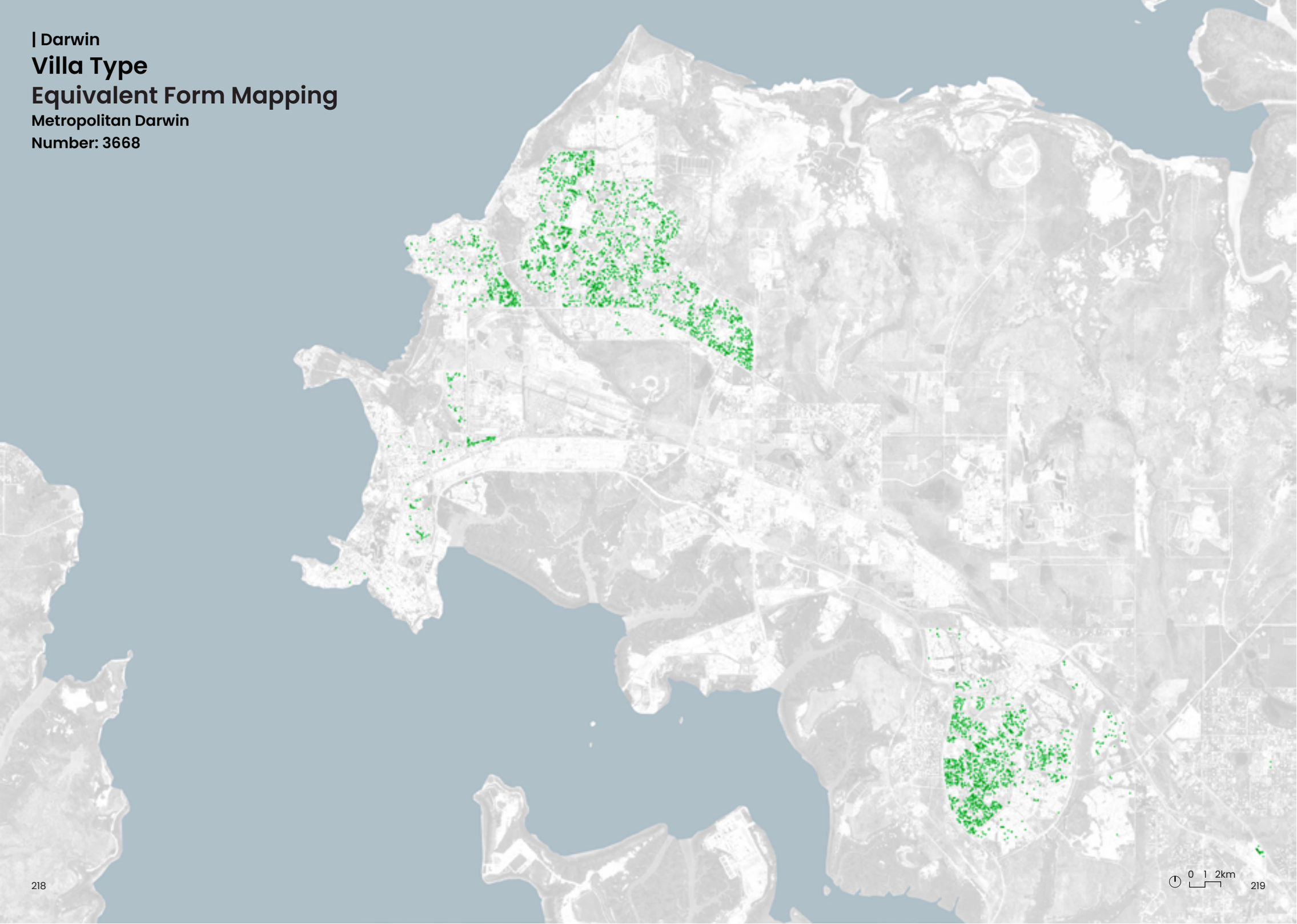


Villa Type

Equivalent Form Mapping

Metropolitan Darwin

Number: 3668



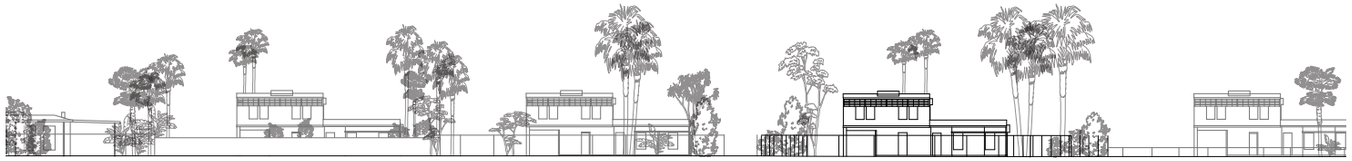
| Darwin

Elevated House II
1974-1980

0 0.5 1km



Block Plan



Street Elevation

0 2.5 5m

| Darwin

Elevated House II Description

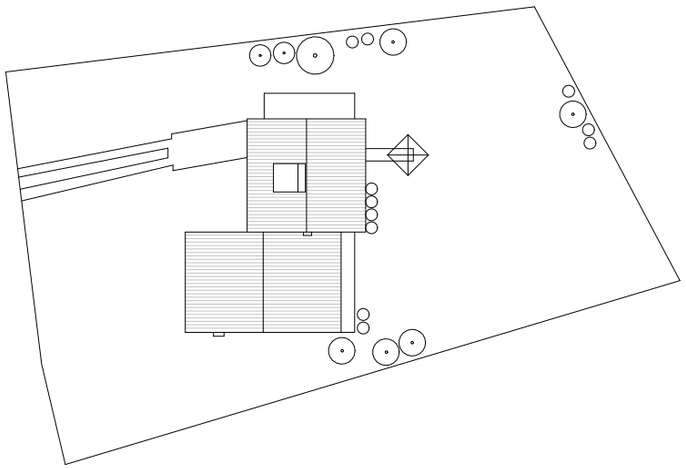
When
A variant of elevated housing, split-level homes found favour in the post-Tracy period, as a suitable typology for providing economical housing en masse for the Darwin Reconstruction Commission.

Why
This typology addressed the need for housing that was efficient to build, cyclone-resistant and compliant with the revised building code, while also providing a shaded undercroft area that had made the elevated homes so popular.

Where
The typology was primarily constructed in new suburbs established by the Commission after Cyclone Tracy, such as Anula and Wulagi. These areas are characterised by their low density and the proliferation of detached three- or four-bedroom dwellings. Occasionally, split-level houses are found in older established suburbs where they replaced homes destroyed by the cyclone.

Characteristic detail
Typical split-level features include an undercroft and shared living spaces at ground floor with bedrooms and a bathroom on the first floor. In response to the cyclone, louvred or double-hung windows are smaller in size than in pre-Tracy housing.

Construction logic
Two primary variations of the split-level exist: the Grollo and PDC, reflecting the different approaches by the two main construction companies that won building tenders from the Reconstruction Commission. Both Grollo and PDC types have a prevailing concrete construction method, with concrete slabs, columns, and walls at ground level, and suspended first-floor concrete slabs. PDC variants include lightweight steel construction on the first-floor. All types include corrugated steel sheet roofs with cyclonic fixings.

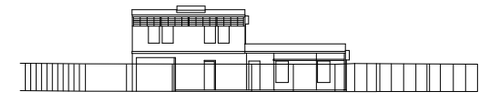


Site Plan

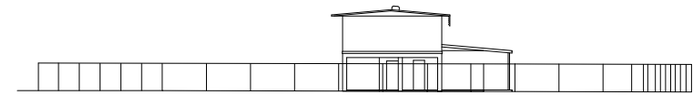
Lot Area
1080m²

Site Dimensions
28.9 x 46.6m

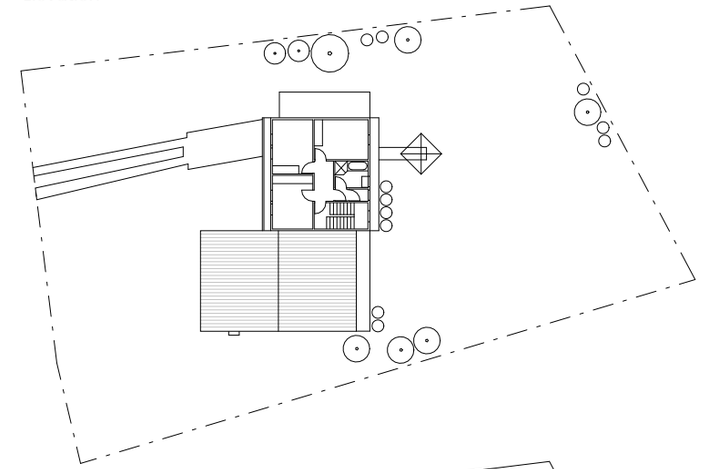
Floor Area
131m² (+ undercroft)



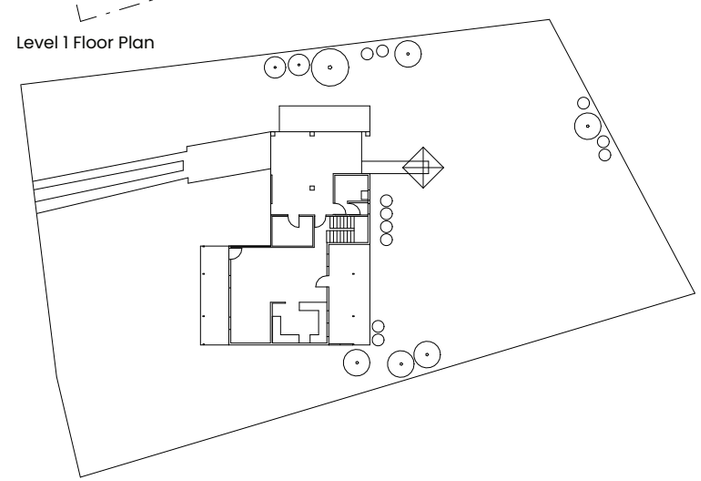
Elevation



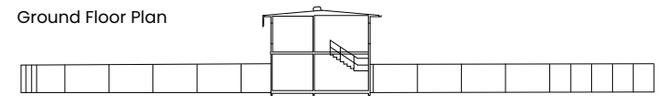
Elevation



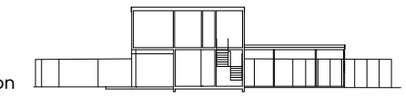
Level 1 Floor Plan



Ground Floor Plan



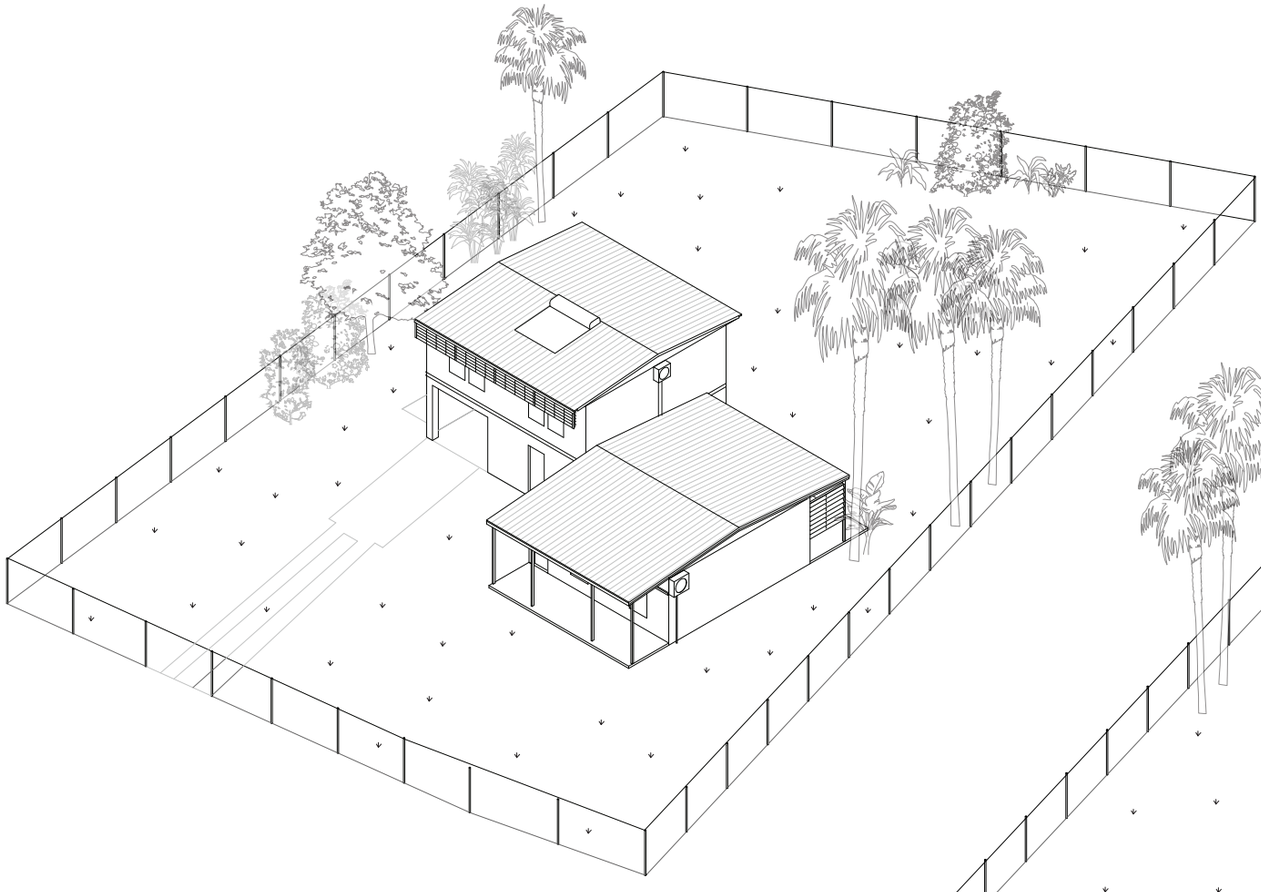
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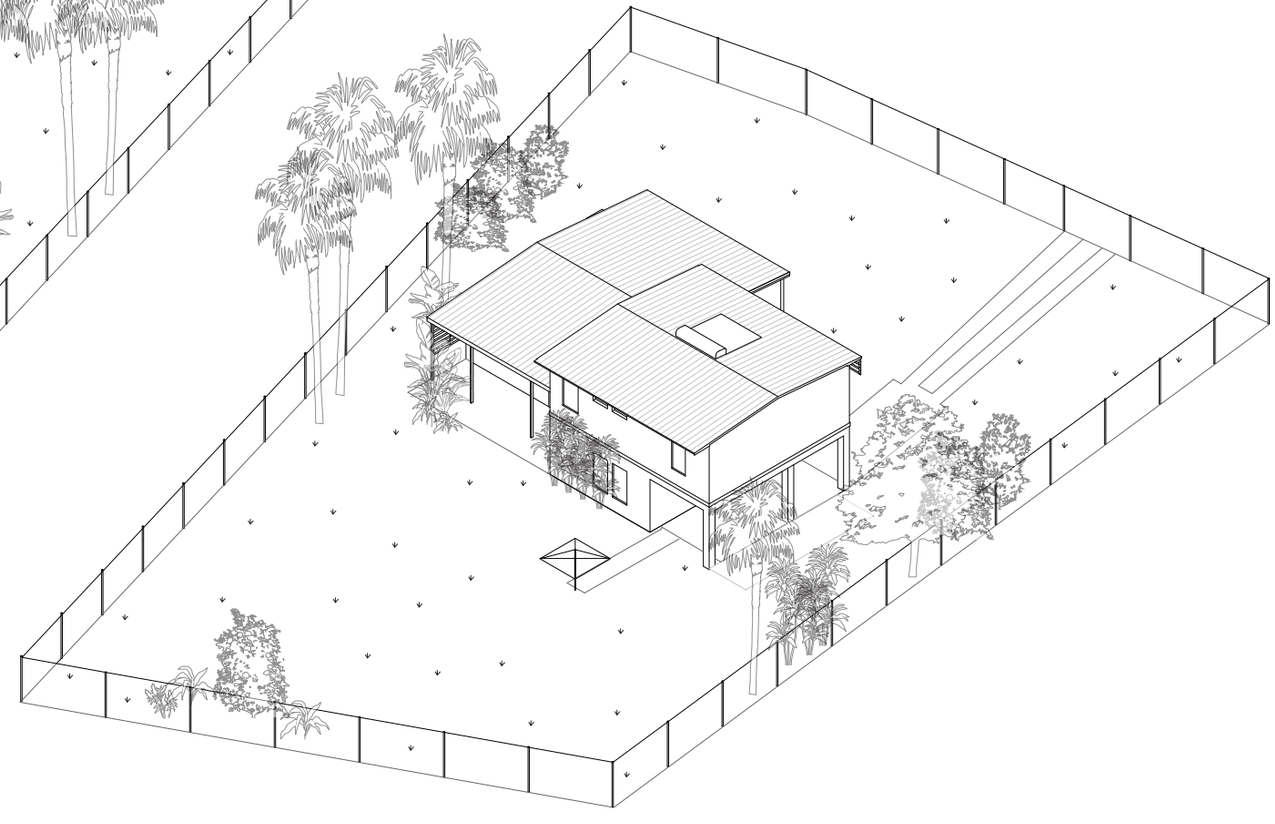


Section

0 2.5 5m

Elevated House II
Front and Rear Views





0 1 2m

Elevated House II Type Equivalent Form Mapping

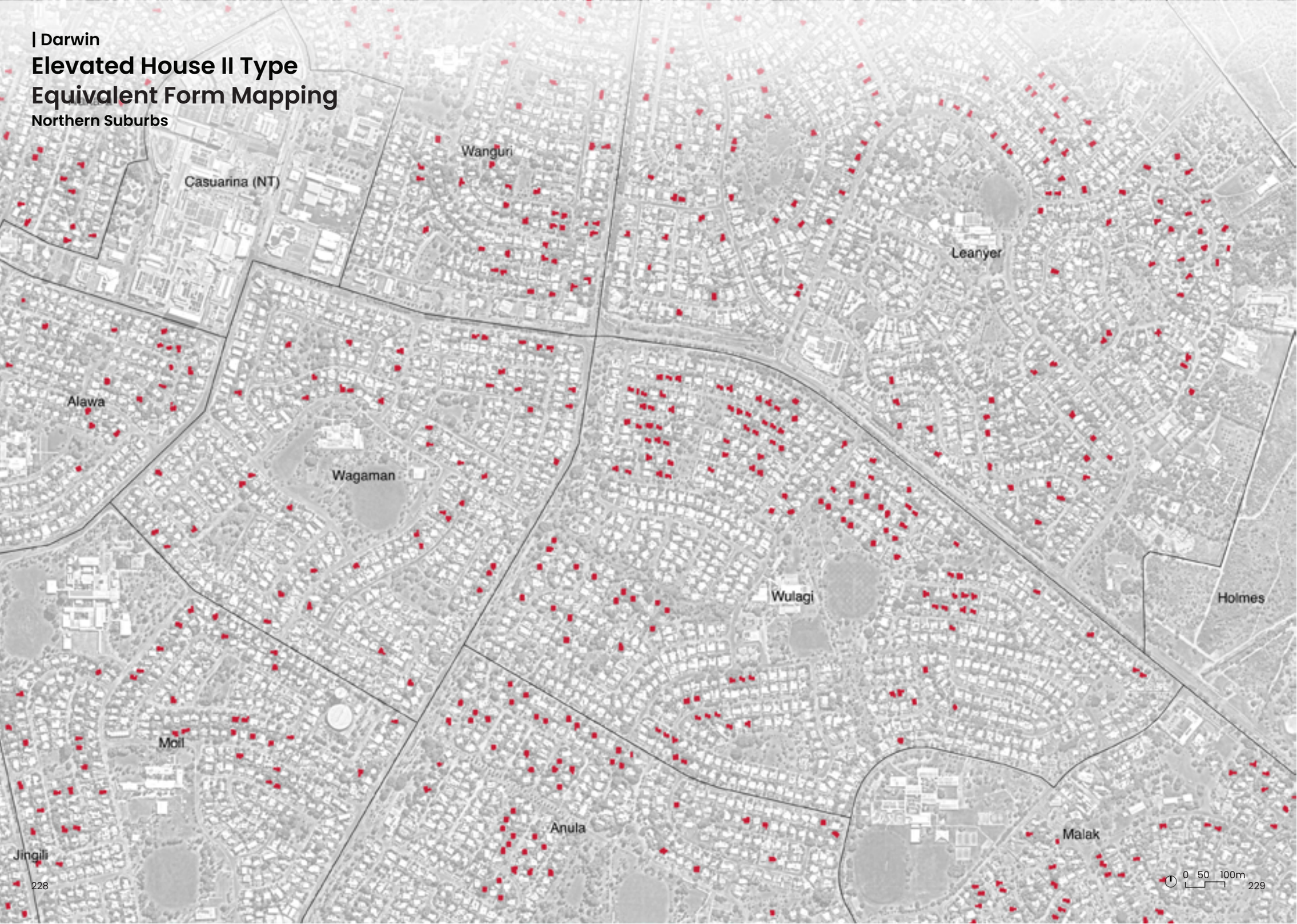
Example Precinct: Wulagi



| Darwin

Elevated House II Type Equivalent Form Mapping

Northern Suburbs



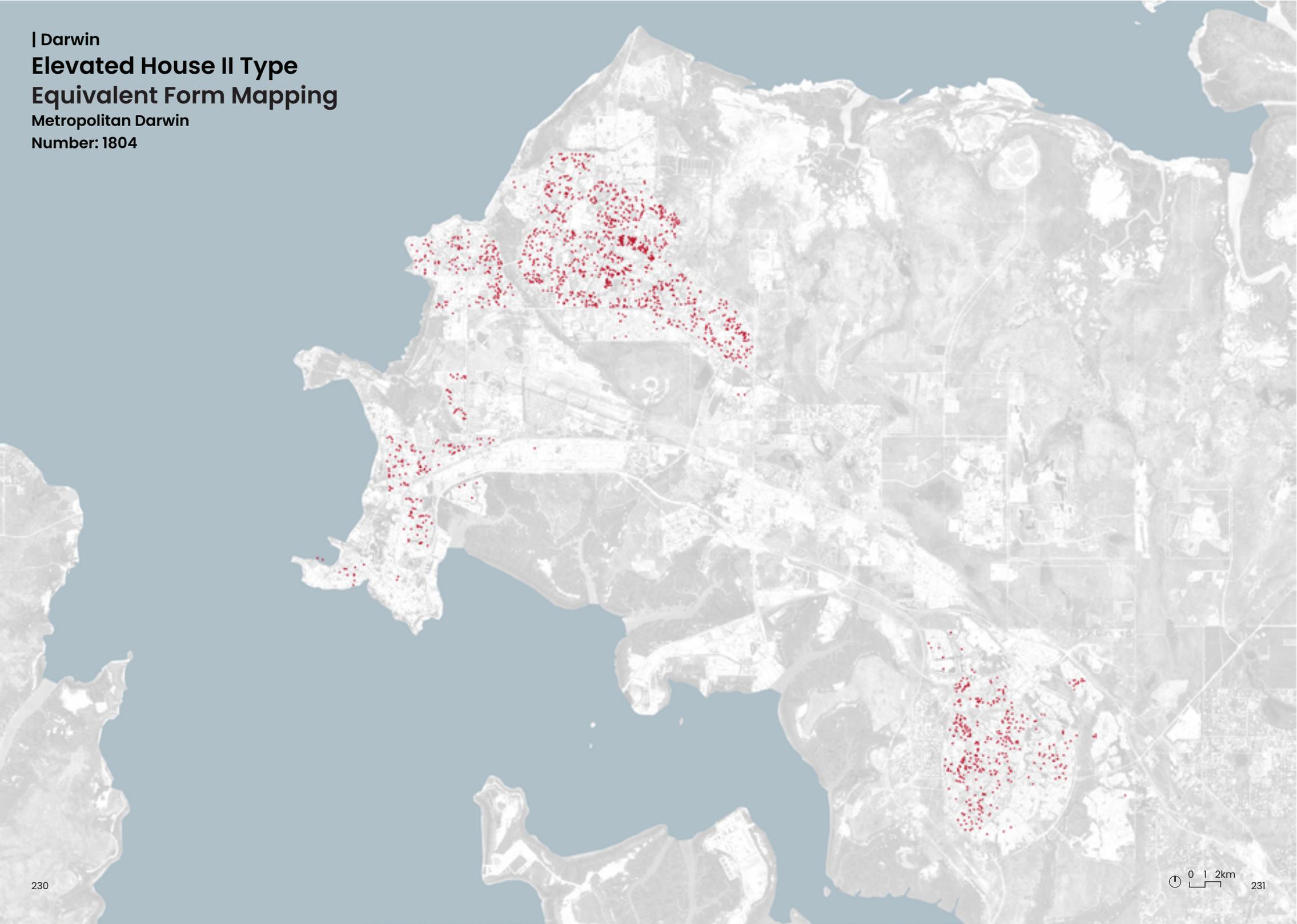
| Darwin

Elevated House II Type

Equivalent Form Mapping

Metropolitan Darwin

Number: 1804



| Darwin

Walk-Up Flats
1970s-2000s



Street Elevation 0 2.5 5m

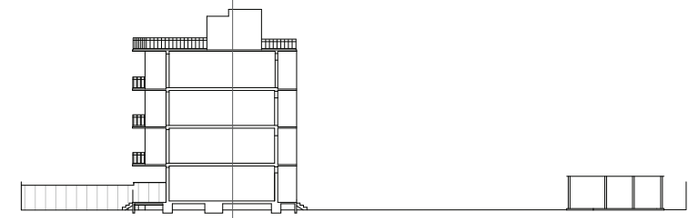
Walk-Up Flats Description

When
Walk-up flats were built from 1970 until 2000 as a response to population growth and allied to the rise of subdivision and densification in older inner suburbs.

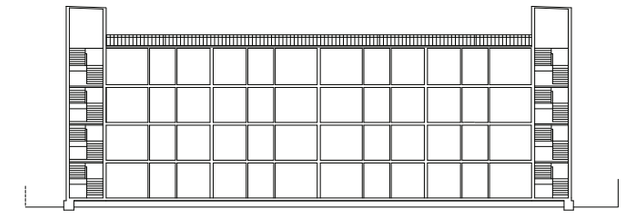
Why, Where
Pre-Tracy walk-up flats were developed by the Department of Housing and Construction in inner suburbs such as Fannie Bay, Nightcliff and Coconut Grove. Post-Tracy, damaged homes and vacant lots were sometimes replaced by medium-density development, which saw the expansion of this type across the city.

Characteristic detail
Flats are typically two to four storeys high and follow a linear plan of double-fronted dwellings facing a narrow shared balcony or walkway along one elevation. Stairs are either located on the side of the building or arranged as a series of staircases along the walkway. Shared concrete driveways provide access to car parking. This site arrangement conforms to the prevailing quarter-acre lot parcel. Flats often have two bedrooms and include a small L-shaped kitchen near the entry, adjoining a small laundry and bathroom.

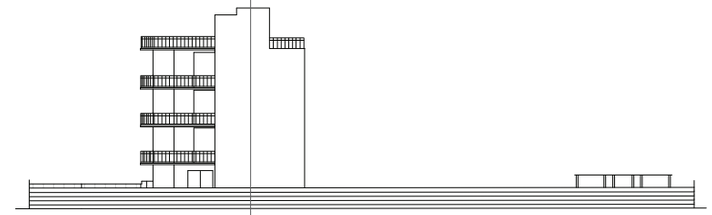
Construction logic
Walk-up flats are usually constructed on concrete slabs at grade with concrete blockwork or brick exterior walls and party walls. Interior walls are primarily brick, with some timber stud examples. Roofs, typically clad in corrugated steel, are low-pitched with short eaves.



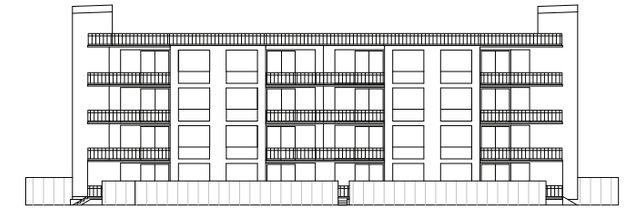
Section



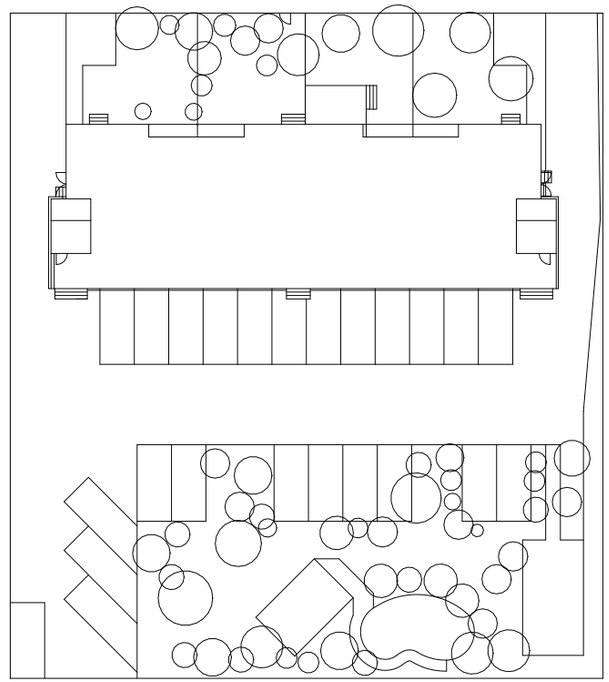
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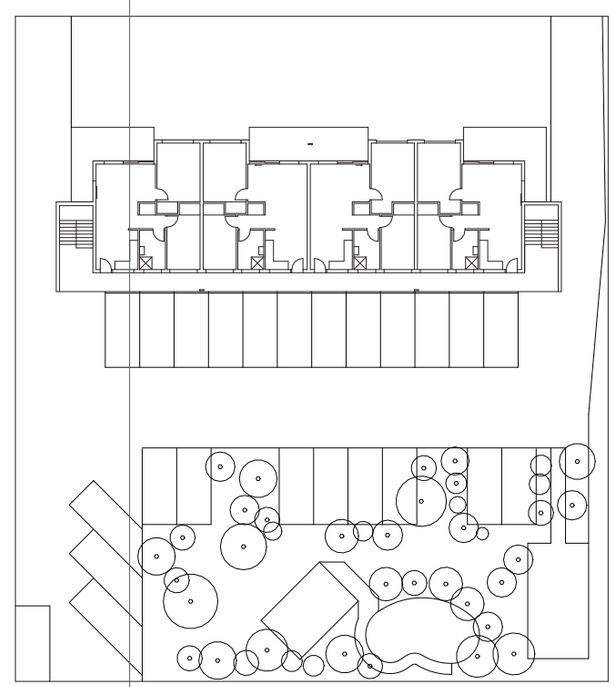
Elevation



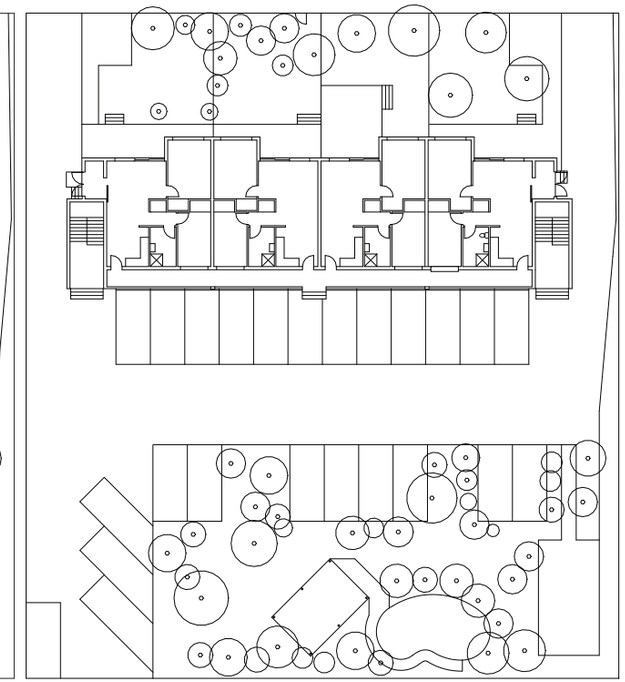
Elevation



Site Plan



Level 1 Floor Plan



Ground Floor Plan

0 2.5 5m

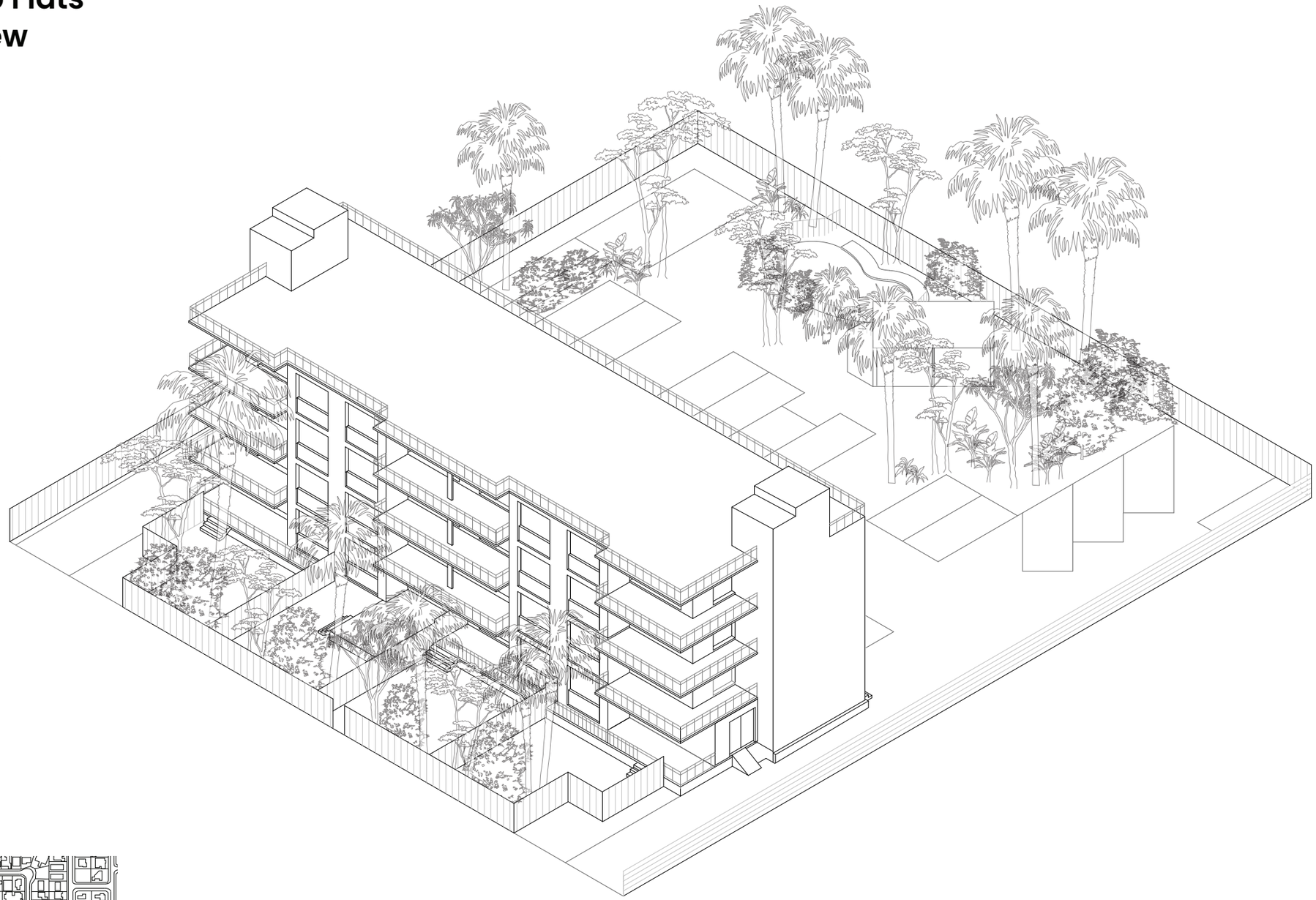
| Darwin

Walk-Up Flats
Front View

Lot Area
2190m²

Site Dimensions
45 x 49m

Floor Area
1600m²



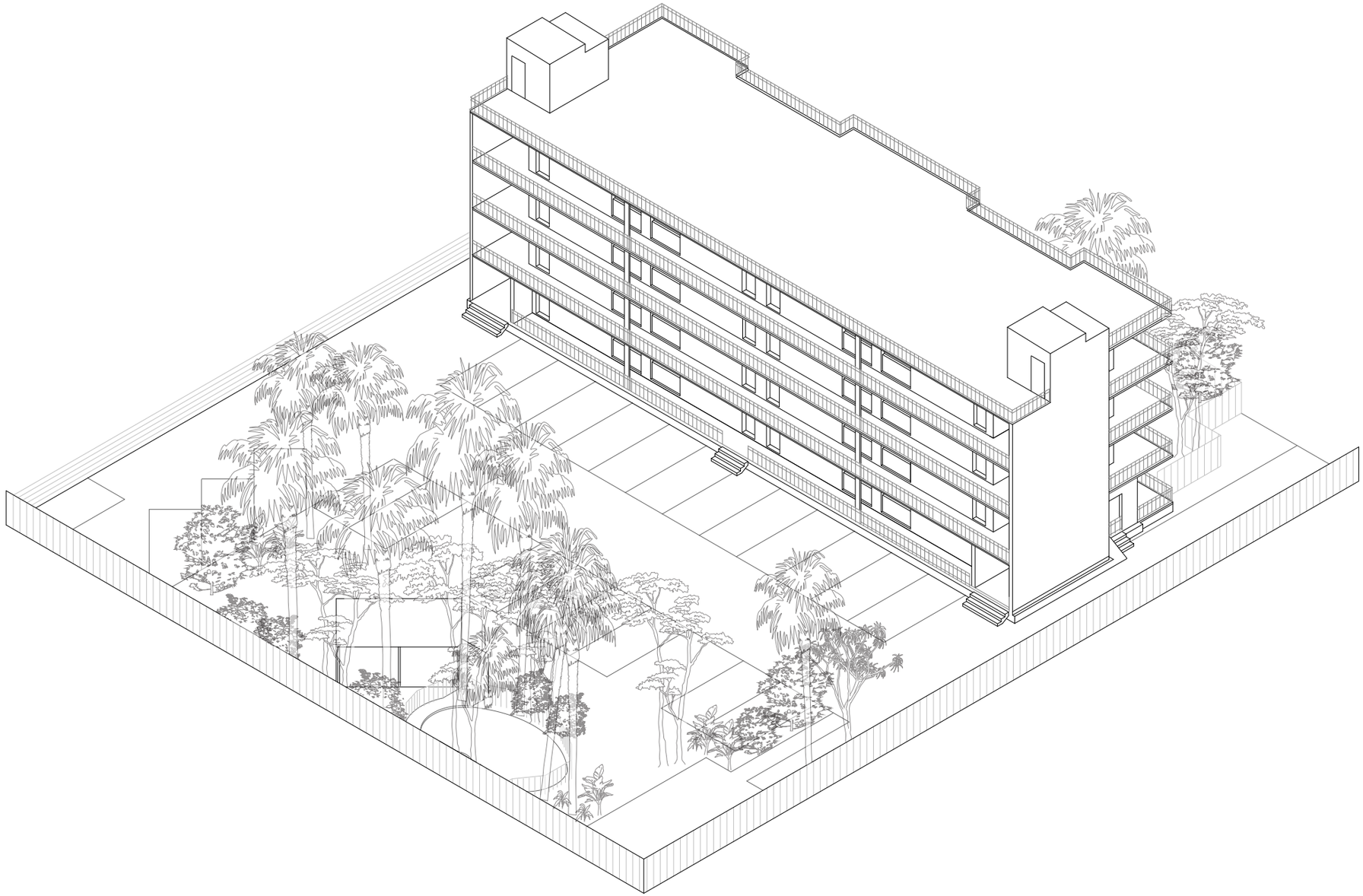
0 0.5 1km



Block Plan

0 1 2m

Walk-Up Flats
Rear View



0 1 2m

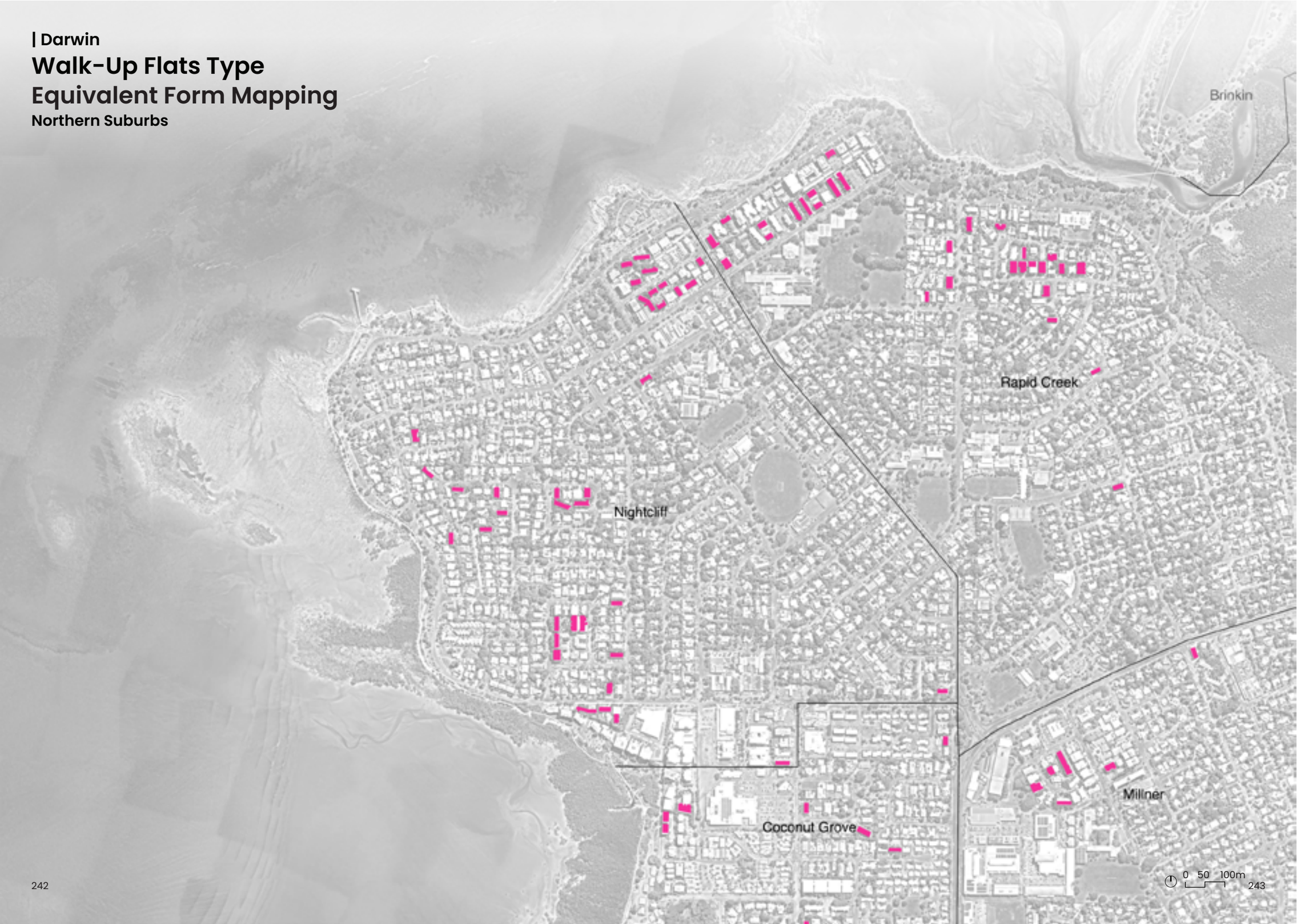
| Darwin

Walk-Up Flats Type Equivalent Form Mapping

Example Precinct: Nightcliff / Rapid Creek



Walk-Up Flats Type
Equivalent Form Mapping
Northern Suburbs



| Darwin

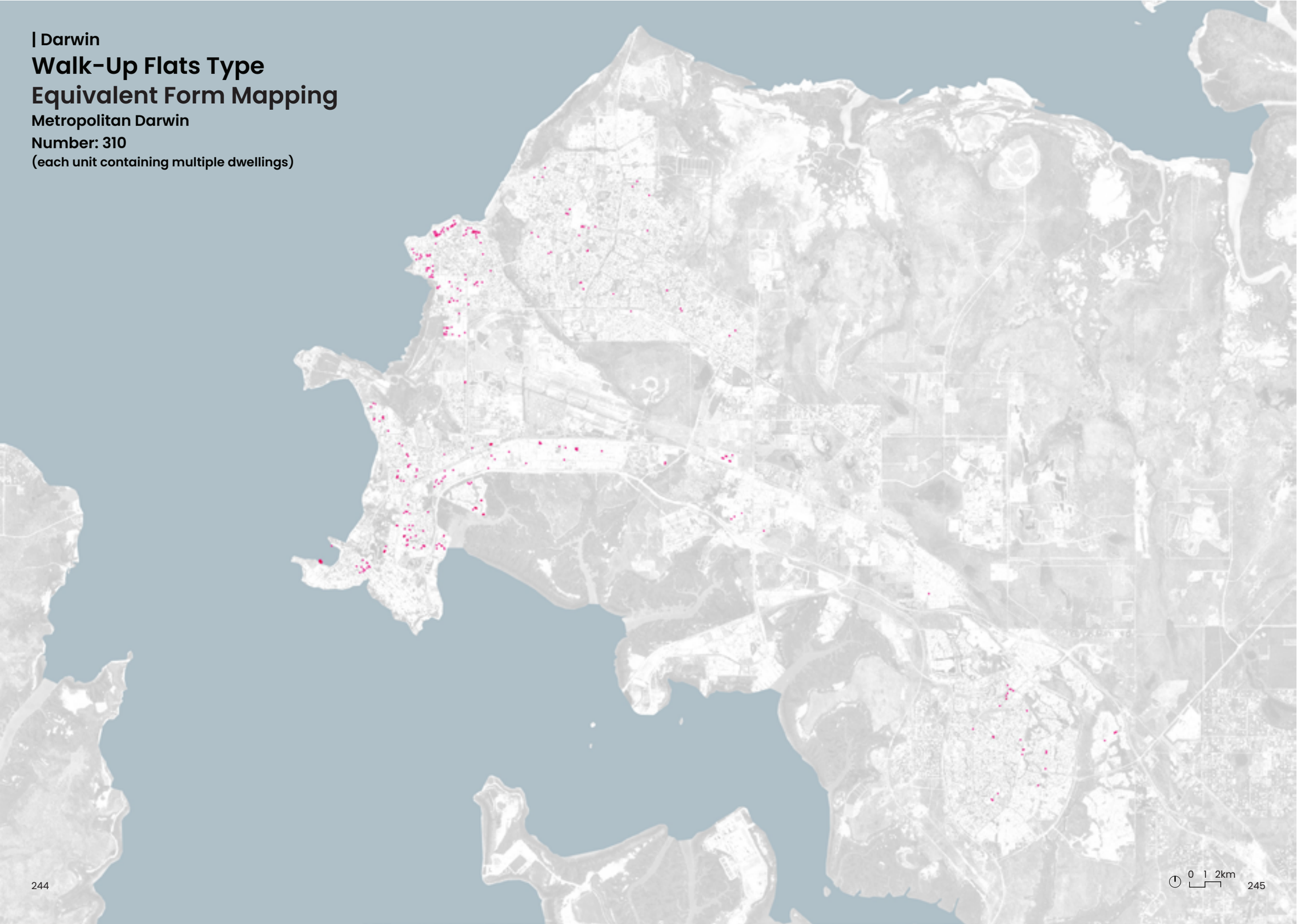
Walk-Up Flats Type

Equivalent Form Mapping

Metropolitan Darwin

Number: 310

(each unit containing multiple dwellings)



| Hobart

Cottage
1940s-1970s



0 0.5 1km

Block Plan



Street Elevation

0 2.5 5m

| Hobart

Cottage Description

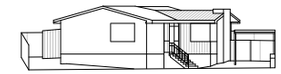
When
Cottage houses have been built in Hobart since the pre-war period, peaking between 1945 and the 1970s. Their modest origins inform the state's prevailing social housing model today, though contemporary versions have greater stylistic variety.

Why
Compact, single-storey, and built with spartan materials, cottages were largely delivered by the Tasmanian Government for social rental and affordable ownership. Post-war funding following the 1945 Commonwealth and State Housing Agreement provided steady supply; 67% of dwellings completed between 1945–1970 were leased to low-income families.

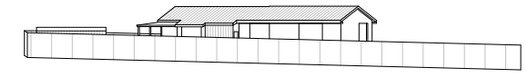
Where
Post-war demand drove broad-acre development: whole suburbs were built at a time. Major subdivisions included Chigwell (1,036 homes), Clarendon Vale, Gagebrook, Bridgewater, Rokeby, and Warrane. Cottages from 1945–70 sit centrally on lots of 740–850 sqm; post-1970s examples occupy smaller lots of around 500 sqm. From 1953, dwellings were distributed at varied angles and setbacks to address public complaints of streetscape repetition.

Characteristic detail
Compact plans cluster together kitchen, living, and dining rooms, in cellular or open-plan configurations, They also often incorporate the entry. One to four bedrooms and a single bathroom are standard, with laundries housed internally or in outbuildings.

Construction logic
Weatherboard cottages from 1945–55 reflect an abundance of timber; by the mid-1970s, brick veneer or concrete block prevailed. Homes sit slightly raised on brick or blockwork walls with brick stumps or piles. Tiled roofs dominated the 1940s to early 1950s, with steel sheet becoming more typical as supply chains eased.



Elevation

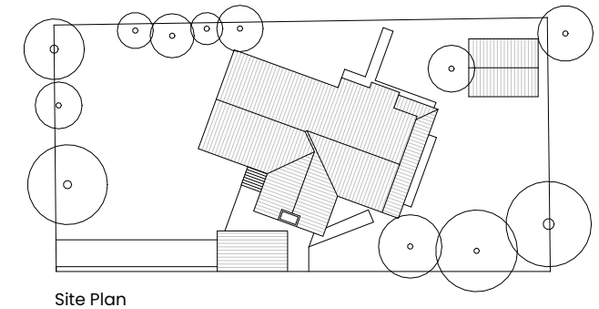


Elevation

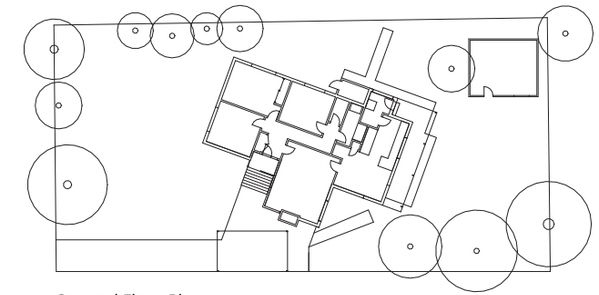
Lot Area
651.3m²

Site Dimensions
18.4 x 35.9m

Floor Area
110m²



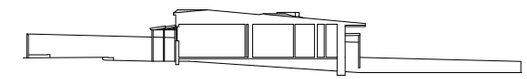
Site Plan



Ground Floor Plan



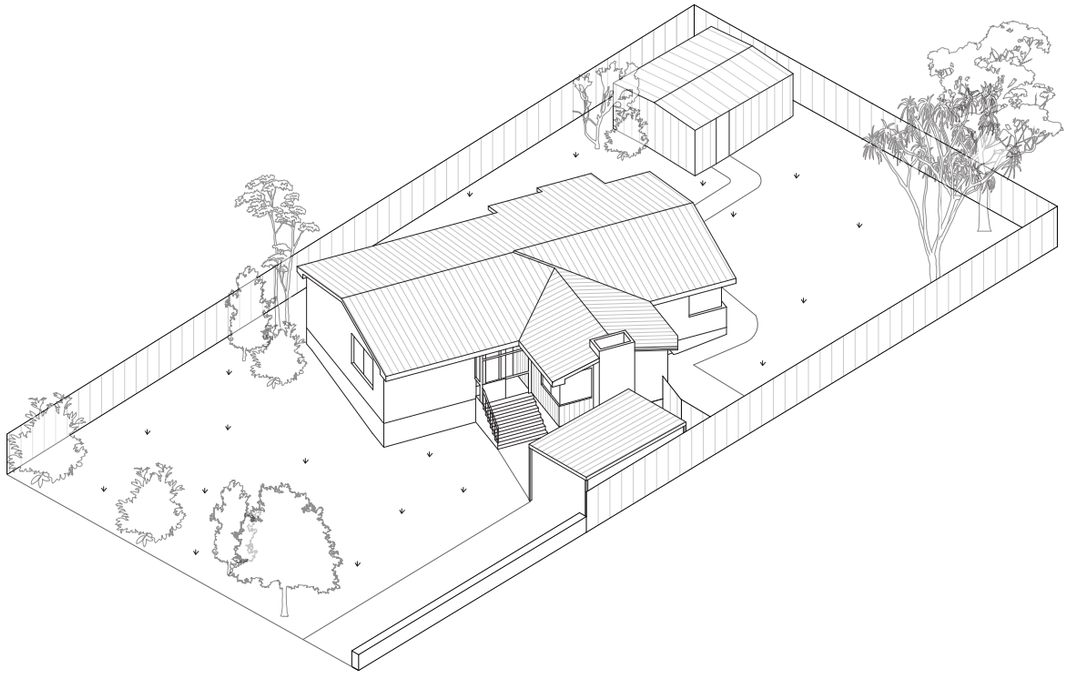
Section

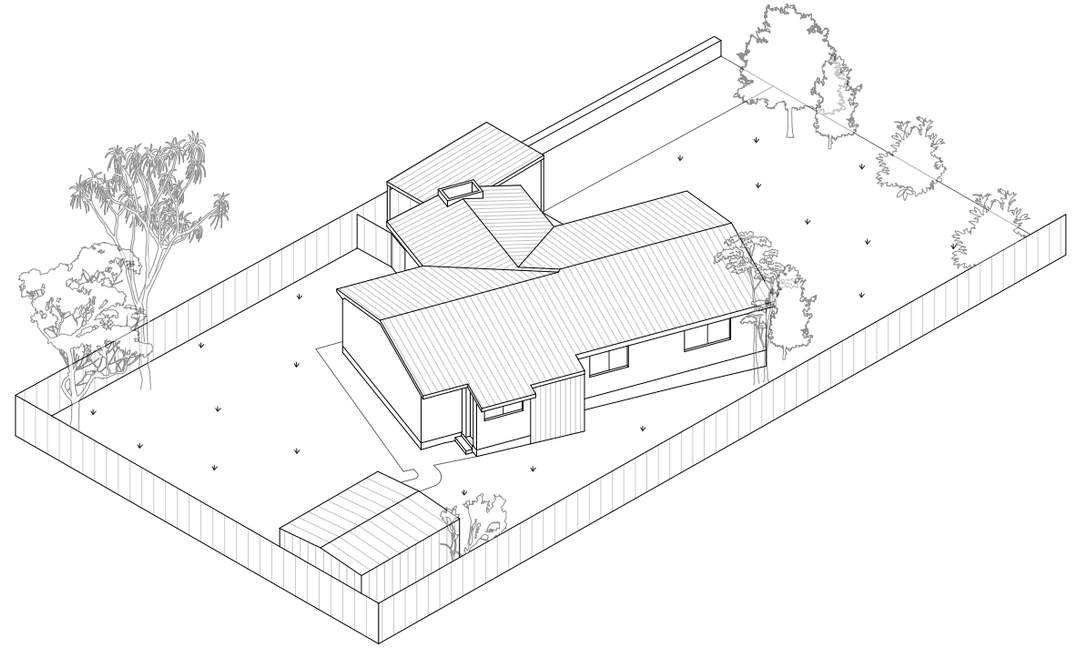


Section

0 2.5 5m

Cottage
Front and Rear Views





0 1 2m

| Hobart

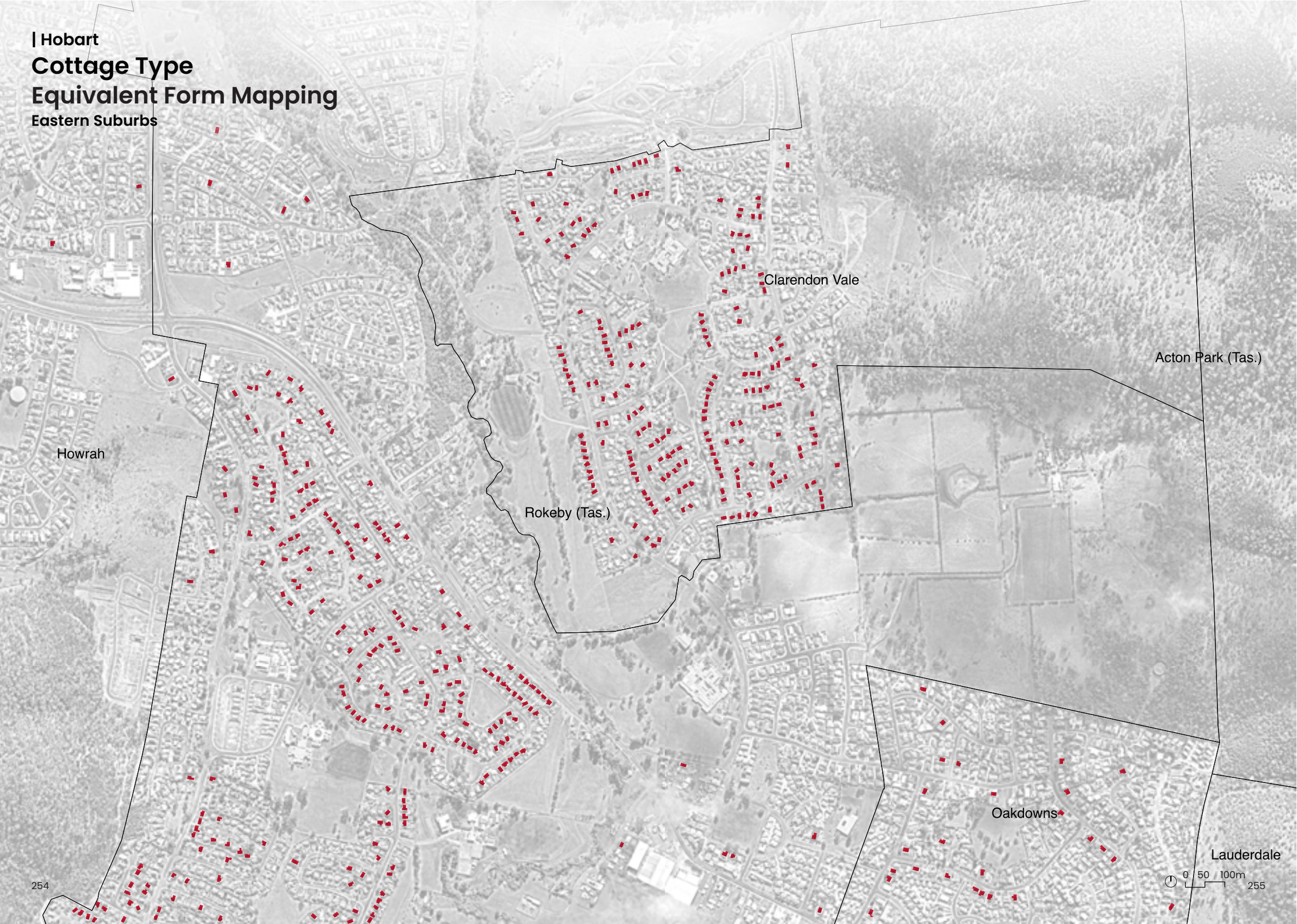
Cottage Type Equivalent Form Mapping

Example Precinct: Clarendon Vale

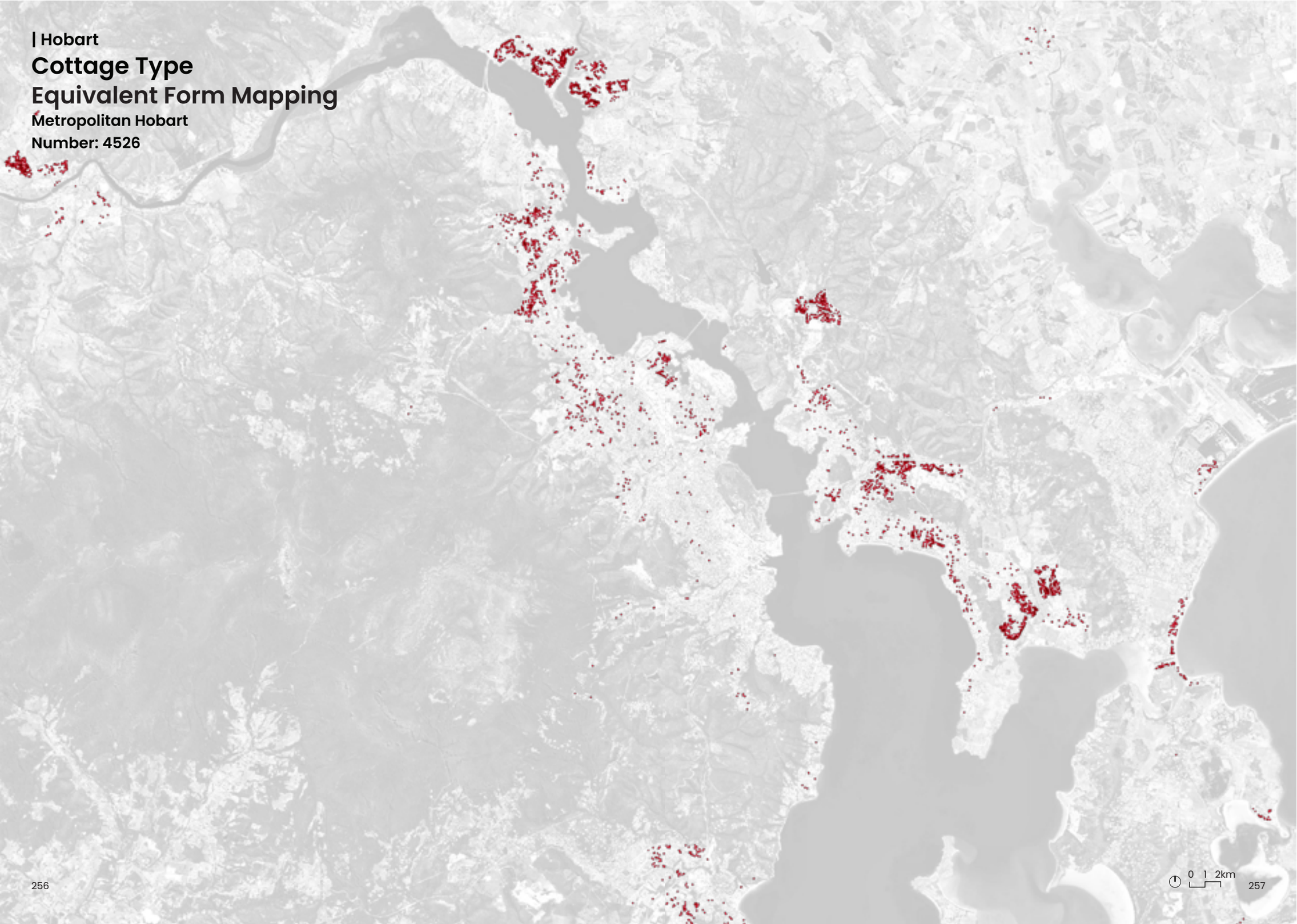


| Hobart

Cottage Type
Equivalent Form Mapping
Eastern Suburbs



Cottage Type
Equivalent Form Mapping
Metropolitan Hobart
Number: 4526



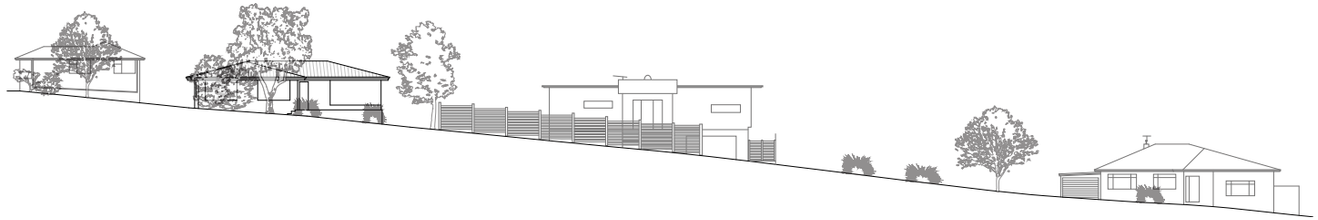
| Hobart

Villa I
1950s-1980s



0 0.5 1km

Block Plan



0 2.5 5m

Street Elevation

Villa I
Description

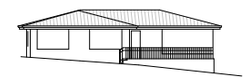
When
Most prevalent from the 1950s to the 1980s, the two-storey villa typology reflects Hobart's post-war suburban growth. Offering more space and greater amenity than a modest cottage, the double-front dwelling is more common than its triple-front variant.

Why
Post-war housing support for families encouraged demand for detached homes, while women entering the workforce in greater numbers during this period contributed to rising household affluence. Together, these shifts shaped cultural expectations for private ownership over state-supplied housing.

Where
New subdivisions developed in sloped suburbs – Lower Sandy Bay, Mount Nelson, Lenah Valley, and New Town – supported the city's rapid growth. Streets set perpendicular to the slope produce lots that rise or fall from the street: these have shaped the varied configurations of entrances, garaging, and floor plans across the type.

Characteristic detail
The upper level comprises the main living space: an open-plan kitchen-living-dining area alongside a cluster of three to four bedrooms, a single bathroom, and separate WC. Laundries are accessed internally, adjacent to kitchens. The floor below houses a garage and/or workshop; later alterations commonly add a bedroom, second WC, and occasionally a rumpus room.

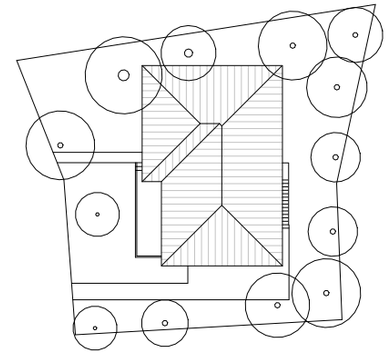
Construction logic
Brick is the overarching villa material, with structural brick or blockwork walls extruding from the external envelope and a network of piles or pillars supporting timber subfloors and interior timber-framed walls. Unlike Brisbane's Queenslanders or Darwin's elevated houses, the undercroft in Hobart is fully enclosed. Upper levels combine either timber cladding with sheet metal roofing, or brick and tile finishes.



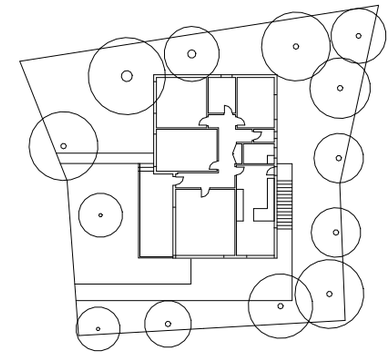
Elevation



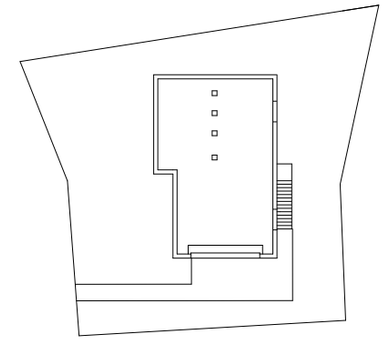
Elevation



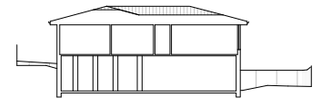
Site Plan



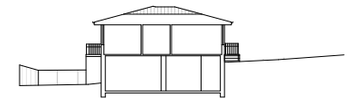
Level 1 Floor Plan



Ground Floor Plan



Section



Section

Lot Area
345.2m^2

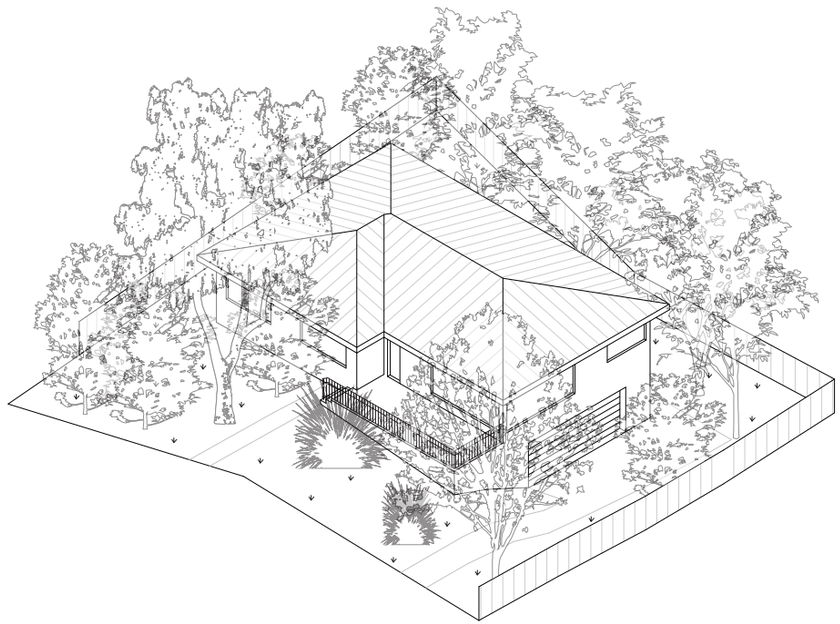
Site Dimensions
16 x 20.9m

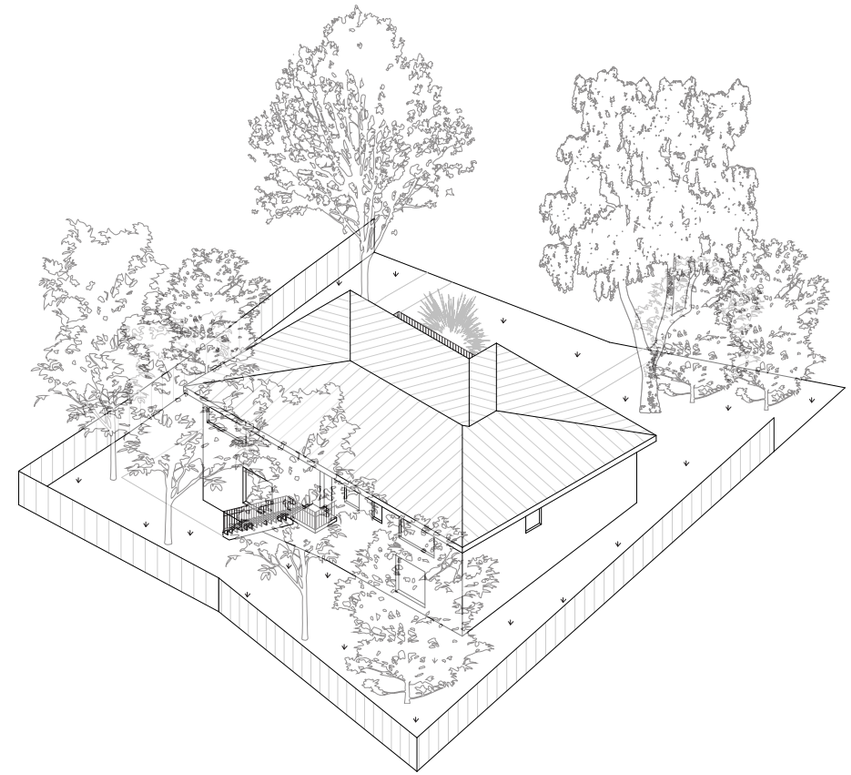
Floor Area
235m^2

0 2.5 5m

| Hobart

Villa I
Front and Rear Views





0 1 2m

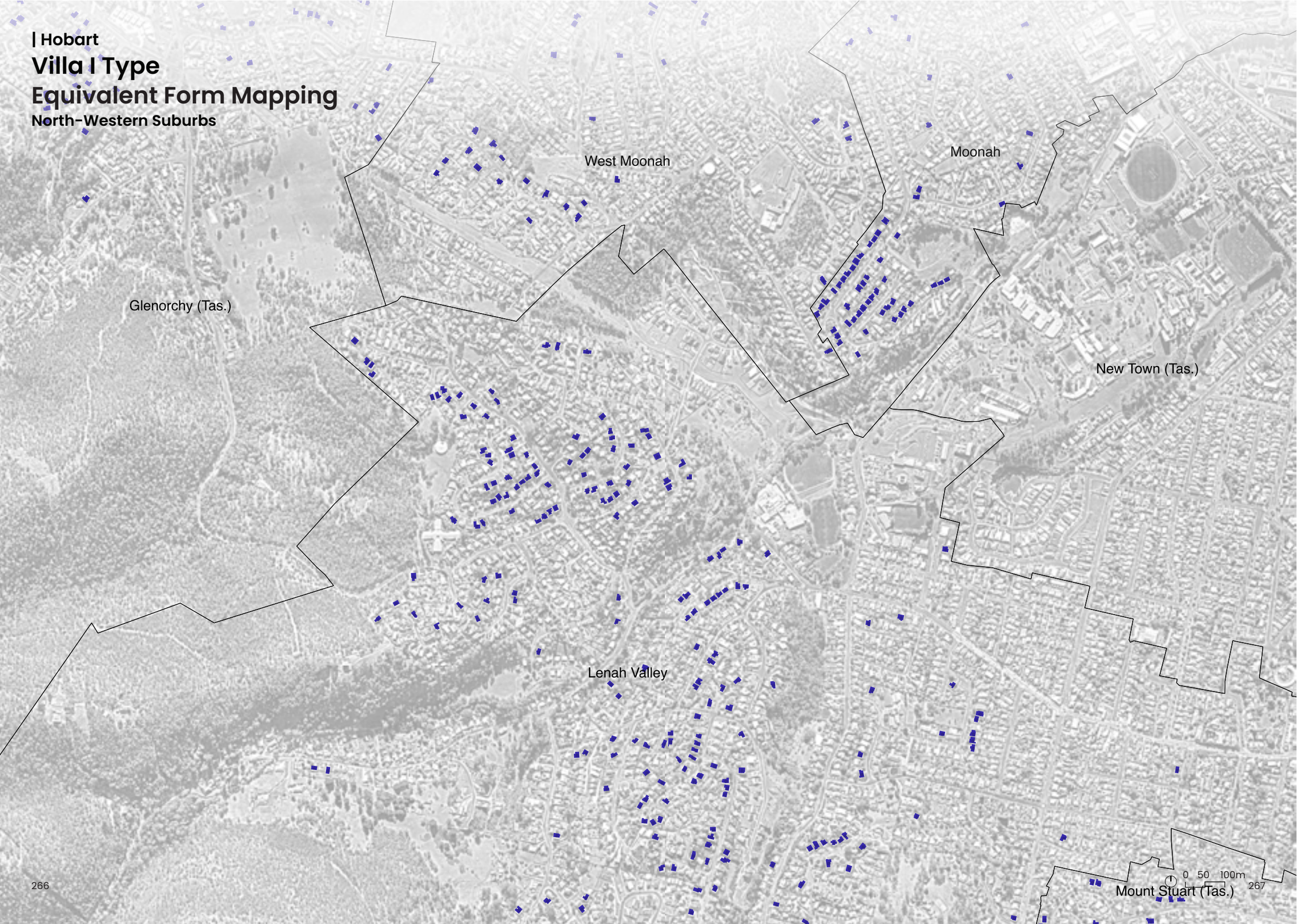
Villa I Type
Equivalent Form Mapping

Example Precinct: Lenah Valley



| Hobart

Villa I Type
Equivalent Form Mapping
North-Western Suburbs



Villa I Type

Equivalent Form Mapping

Metropolitan Hobart

Number: 2381



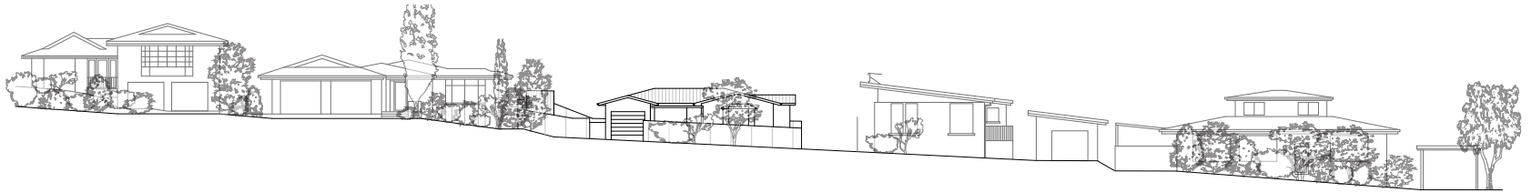
| Hobart

Villa II
1960s-1990s



0 0.5 1km

Block Plan



0 2.5 5m

Street Elevation

Villa II
Description

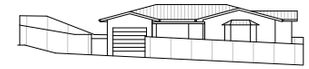
When
Widely adopted from the 1960s and continuing into the 1990s, the single-storey villa is one of Greater Hobart's most typical mass-market dwellings.

Why
The primary driver of the villa was the rise of speculative, private-market development, when home ownership came within reach of many Tasmanians. Villas were often seen as the first rung on the housing ladder, expressing both rising affluence and shifting cultural expectations around buying a family home.

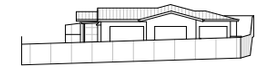
Where
Single-storey villas are typically sited on lots of around 350–700 sqm in areas including Kingston, Glenorchy, and Howrah. Hobart's steep topography also produced split-level variants that adapted to site contours; larger double-storey versions tend to occur from the 1970s.

Characteristic detail
Modest versions typically contain two to three bedrooms and a bathroom at the rear, with open-plan kitchen-living-dining areas facing the street and accessed directly from the entrance. Larger versions from the 1970s tend to provide more bedrooms and master ensuites. While styles vary, floor plans favour indoor-outdoor connections. The integrated street-facing roller door garage is the prevailing feature of this type.

Construction logic
Structural brick or brick veneer walls extrude from the external wall arrangement, with piles or pillars supporting timber subfloors and interior timber-framed walls lined with fibrous plaster. Most homes are brick veneer with low-pitched tiled hip or gable roofs, or flat skillion roofs in sheet metal.



Elevation

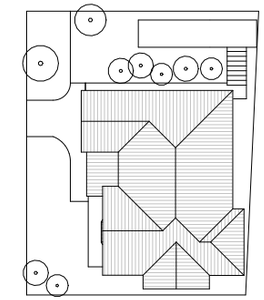


Elevation

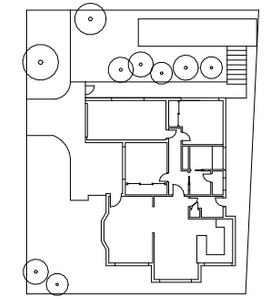
Lot Area
456m²

Site Dimensions
20.3 x 25.9m

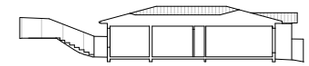
Floor Area
114m²



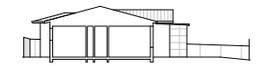
Site Plan



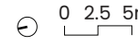
Ground Floor Plan



Section

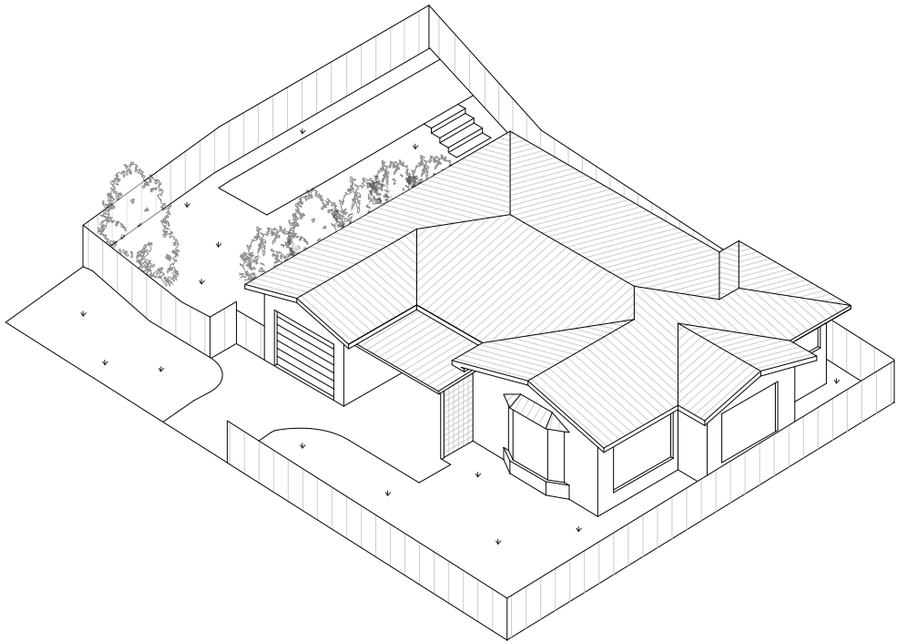


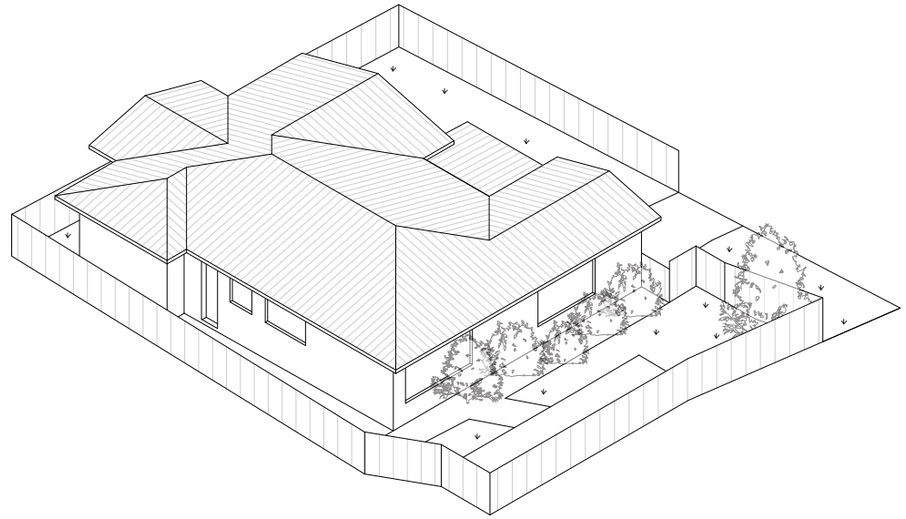
Section



| Hobart

Villa II
Front and Rear Views





0 1 2m

Villa II Type
Equivalent Form Mapping

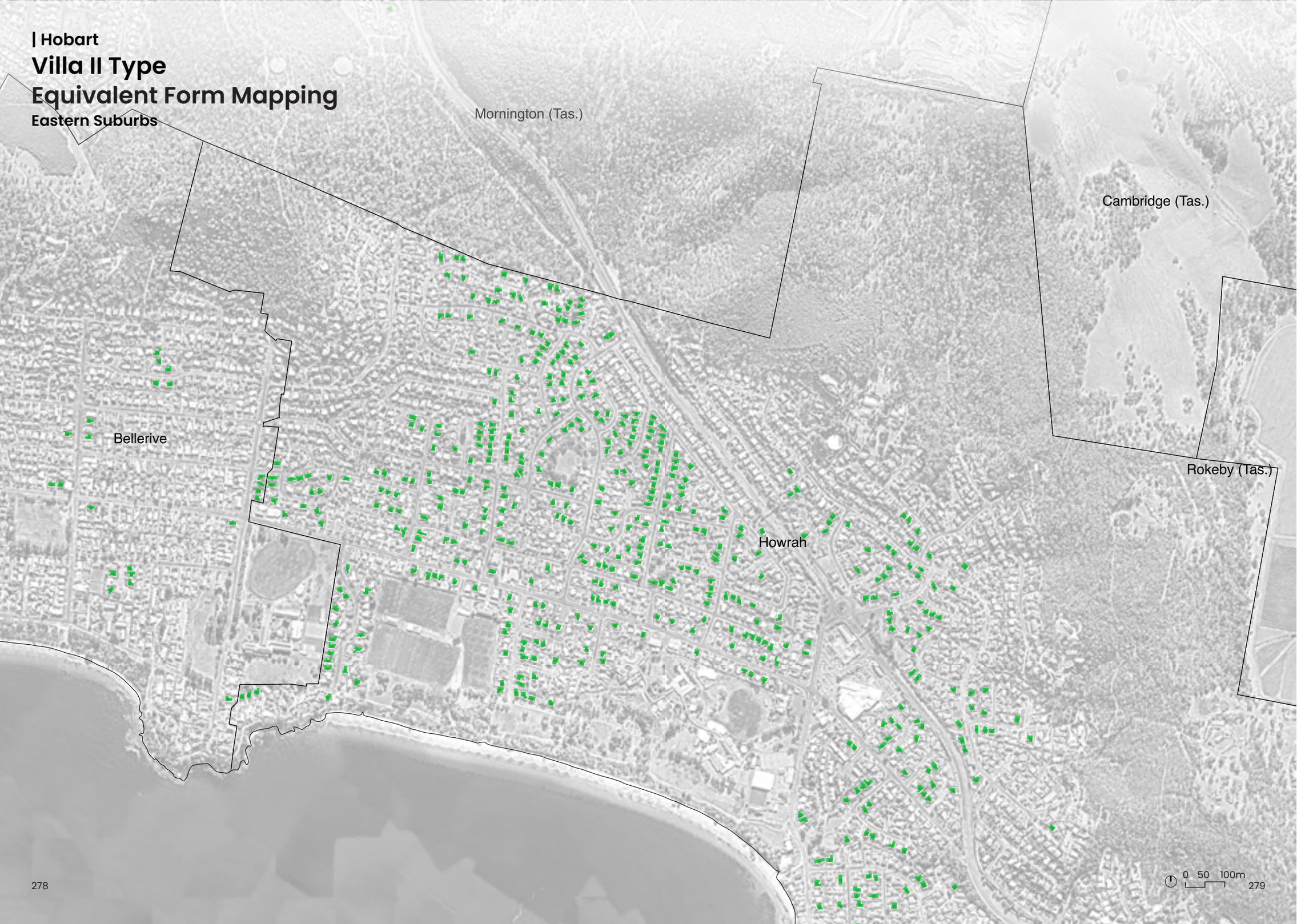
Example Precinct: Howrah



| Hobart

Villa II Type
Equivalent Form Mapping

Eastern Suburbs

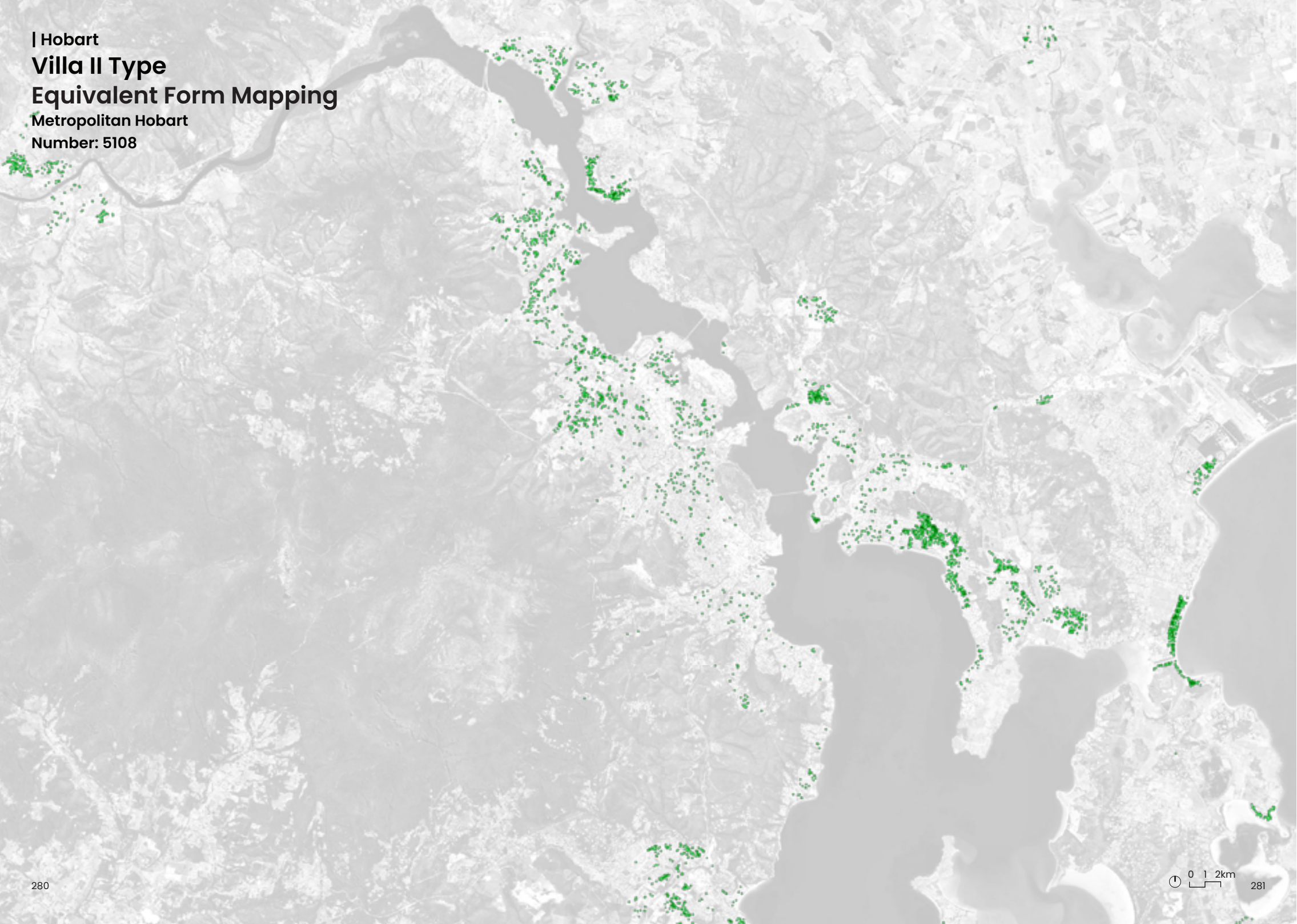


Villa II Type

Equivalent Form Mapping

Metropolitan Hobart

Number: 5108



| Hobart

Villa Cluster
1970s-Ongoing



0 0.5 1km

Block Plan



Street Elevation

0 2.5 5m

Villa Cluster Description

When
The clustered villa appeared in the 1970s and continues to be built today.

Why
Originally linked to small-scale infill subdivision, the type gained appeal as a culturally acceptable downsizing option for older residents – a palatable alternative to flats. It now also appears in greenfield subdivisions as a tool for intensifying land use within the city's revised planning scheme.

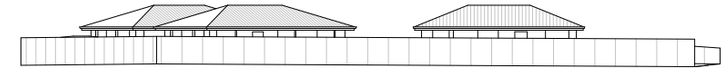
Where
As a consequence, the clustered villa has become Greater Hobart's most pervasive form of medium-density infill development, found across established suburbs, older subdivisions, and greenfield sites. Lot sizes vary widely – 545–1,290 sqm – depending on subdivision type and cluster arrangement. Site organisation typically follows one of two approaches: subdivision of an existing cottage or villa yard in a battle-axe pattern; or a new development arranged either as a mini cul-de-sac around a central shared driveway, or as a conga line of units off a driveway running along one boundary. In all cases, car access and parking are the paramount consideration.

Characteristic detail
Individual villas are single-storey and configured similarly to a villa with grouped bedrooms, a bathroom, and a conjoined kitchen-dining area. Unlike cottages, villa units often include a carport or car bay, and are never built individually.

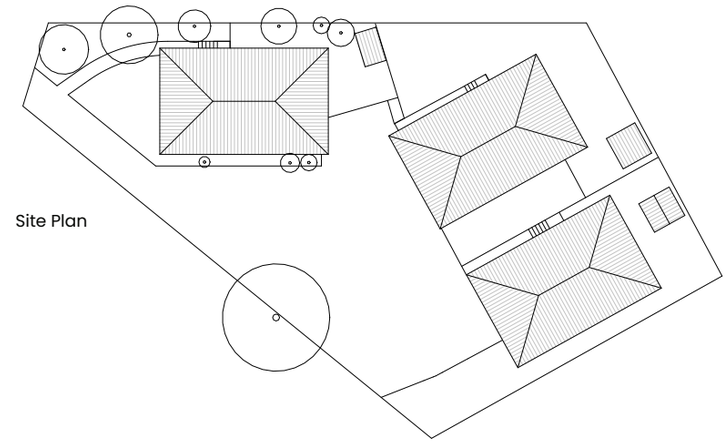
Construction logic
Typically constructed of brick with sheet metal or tiled roofs, the clustered villa's style tends to mirror the prevalent aesthetic of its era of construction – ranging from modernist 1950s forms through to double-fronted and detached townhouse configurations in the contemporary period.



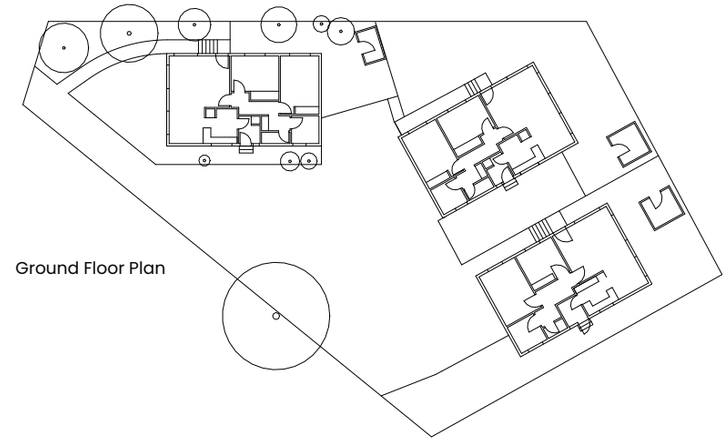
Elevation



Elevation



Site Plan

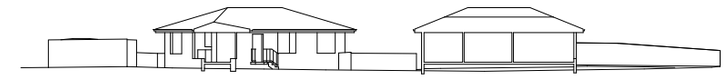


Ground Floor Plan

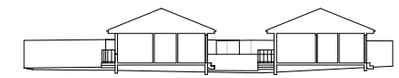
Lot Area
953.8m^2

Site Dimensions
6 x 39m

Floor Area
225m^2



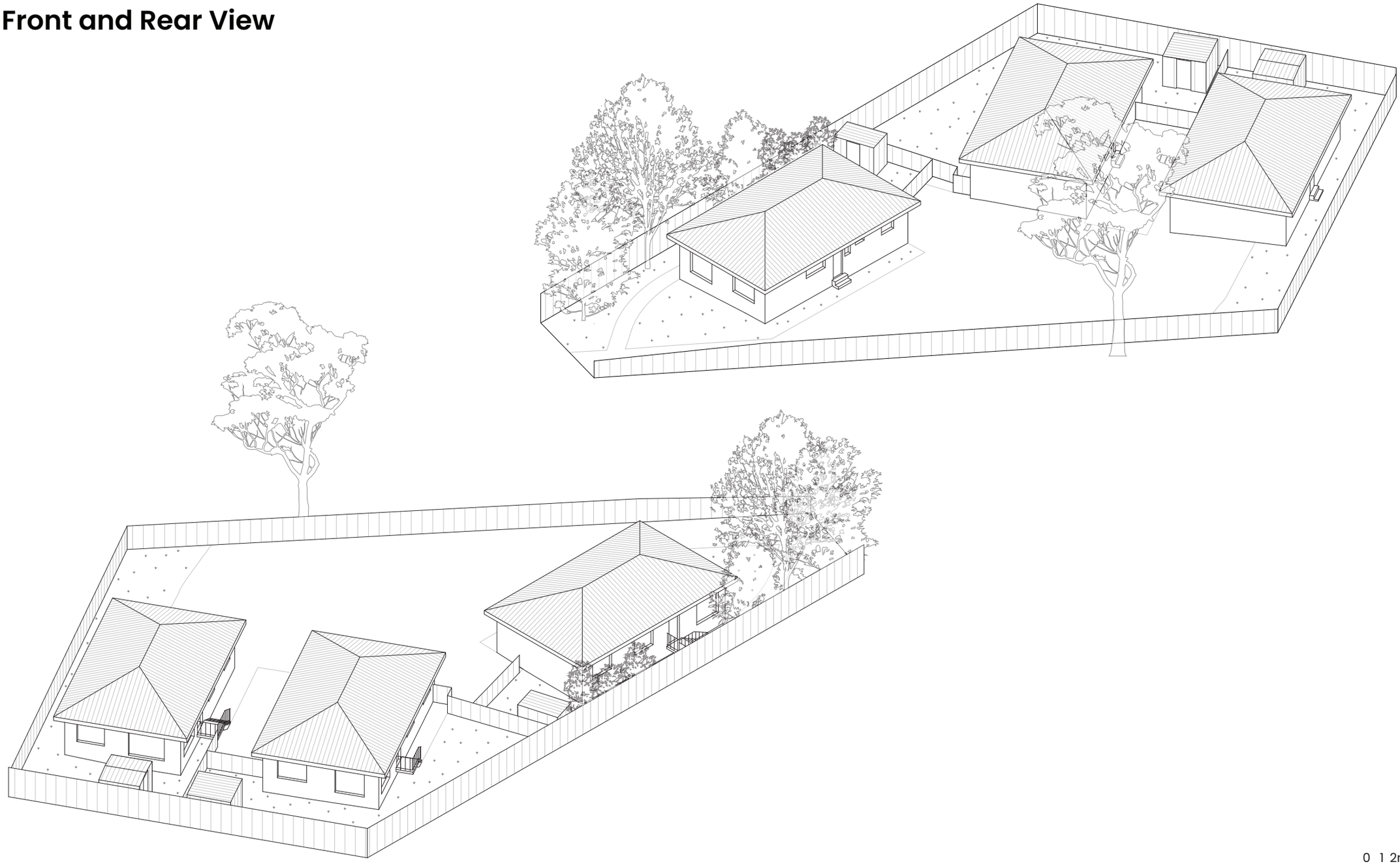
Section



Section

0 2.5 5m

Villa Cluster
Front and Rear View



0 1 2m

| Hobart

Villa Cluster Type Equivalent Form Mapping

Example Precinct: West Moonah



| Hobart

Villa Cluster Type
Equivalent Form Mapping

North-Western Suburbs



Villa Cluster Type
Equivalent Form Mapping

Metropolitan Hobart

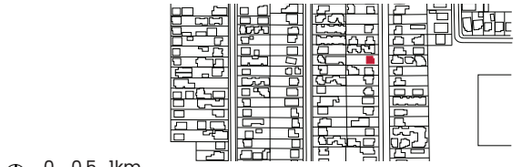
Number: 552

(Average 4 per Cluster)



| Melbourne

Cottage
1940s-1960s



0 0.5 1km

Block Plan



Street Elevation

0 2.5 5m

| Melbourne

Cottage Description

When
Melbourne's cottages, which are detached houses, were widely constructed from the 1940s to the 1960s.
While there are earlier versions from the 1930s, this period is outside the scope of this study.

Why
The typology was a response to Melbourne's rapidly growing population and a changing social preference that recognised the desirability of life in a suburban context.

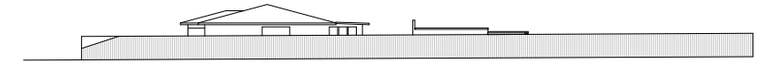
Where
Cottages are predominantly found in middle-ring suburbs, such as Box Hill, Reservoir, Moorabbin, Sunshine and Heidelberg West, where large tracts of affordable land were released for new housing estates during post-war expansion.

Characteristic detail
Variations on the standard typology include single, double and triple frontage homes on generous 600-800 sqm blocks, with deep setbacks from the street and stepped front entries. Typically, they include a detached single-car garage at the rear, accessed via a hardscape, side driveway and often accompanied by a backyard shed. Original internal layouts usually feature a stepped, narrow entry and central hallway separating bedrooms on one side; and living/dining rooms, a kitchen, a bathroom and a separate WC on the other.

Construction logic
The cottages adopt timber construction on concrete or brick stumps, forming a raised ground floor with lightweight cladding and timber subfloors, that make retrofit alterations relatively feasible. Tiled, hipped roofs, steel framed or timber casement windows, and simple eaves are typical. The house width and large block sizes provide opportunities for a variety of retrofit opportunities, including the activation of the side garden. The freestanding garage offers potential for retrofitting, many cottages are at risk of demolition due to the large block size, which attracts dual occupancy redevelopment.



Elevation

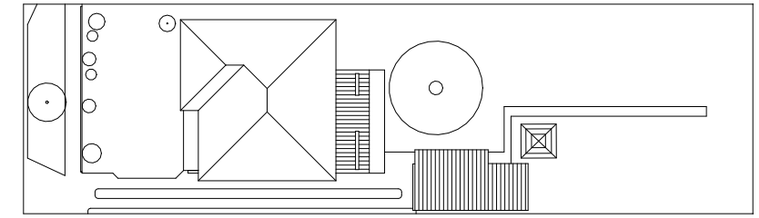


Elevation

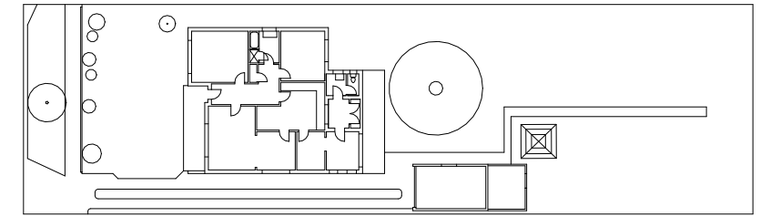
Lot Area
743.6m^2

Site Dimensions
15.3 x 48.6m

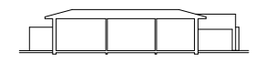
Floor Area
118.5m^2



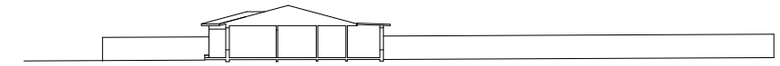
Site Plan



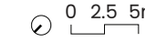
Ground Floor Plan



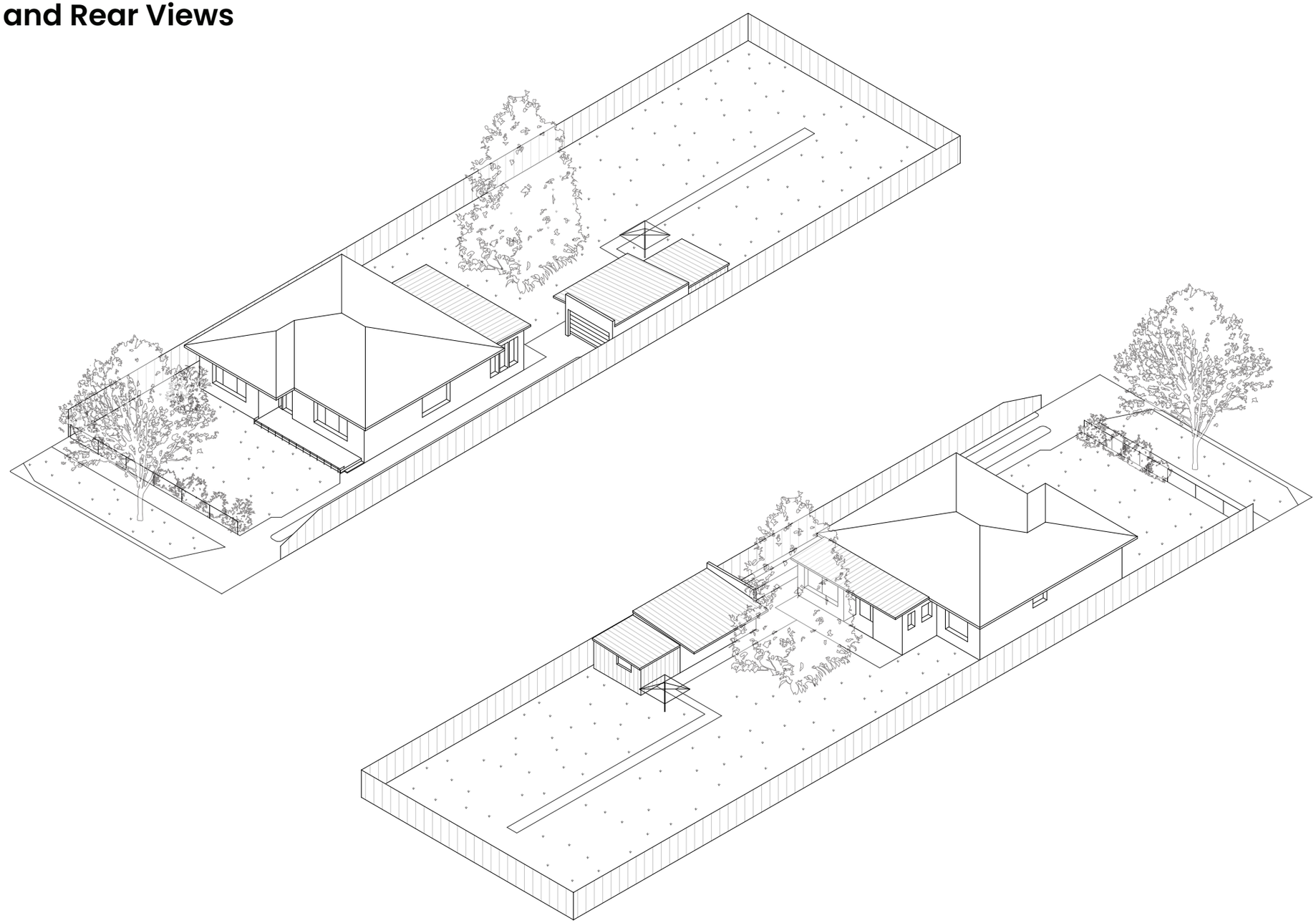
Section



Section



Cottage
Front and Rear Views



0 1 2m

| Melbourne

Cottage Type Equivalent Form Mapping

Example Precinct: St Albans



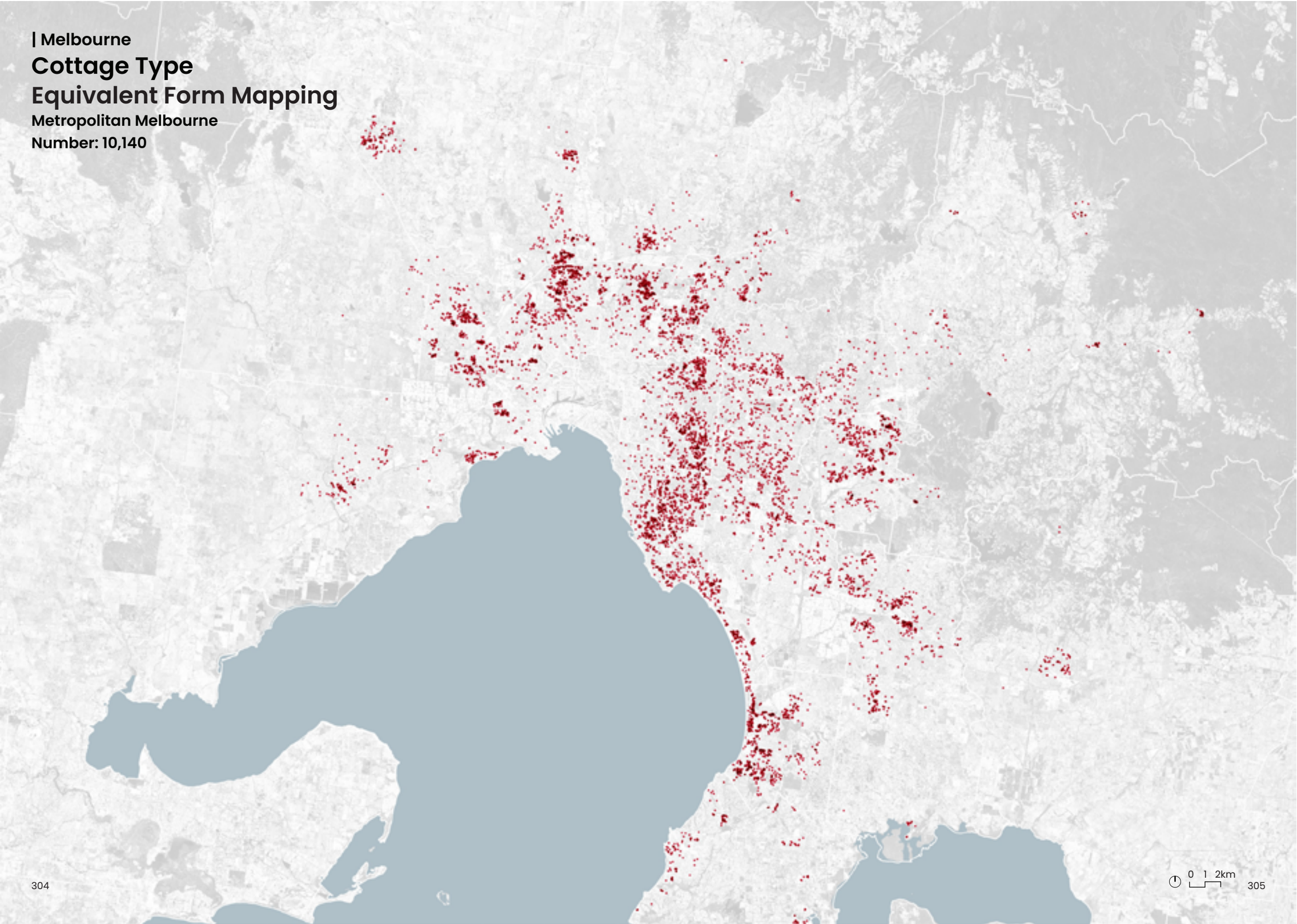
Cottage Type
Equivalent Form Mapping
North-Western Suburbs



Cottage Type
Equivalent Form Mapping

Metropolitan Melbourne

Number: 10,140



| Melbourne

Walk-Up Flats
1960s-1970s

0 0.5 1km



Block Plan



Street Elevation

0 2.5 5m

Walk-Up Flats Description

When
Walk-up flats proliferated in the 1960s and 1970s as a new infill type of multi-storey masonry apartments, dubbed the “six pack.” By the mid-1980s, new planning codes, streetscape and setback requirements made the characteristically singular rectangular volumes with highly efficient plans difficult or impossible to achieve.

Why
The Strata Titles Act (Victoria) of 1967 allowed this form of market housing development, where the external landscape at ground level is largely common property. Parking requirements of one car per dwelling produce an almost entirely concreted ground plane on single suburban allotments.

Where
Located in inner to middle suburbs, walk-ups are generally well serviced by transport. Melbourne’s north-east suburbs like Richmond, North Fitzroy, Brunswick and Hawthorn have numerous examples; large concentrations also exist in 20th-century southern bayside suburbs such as Highett and Hampton.

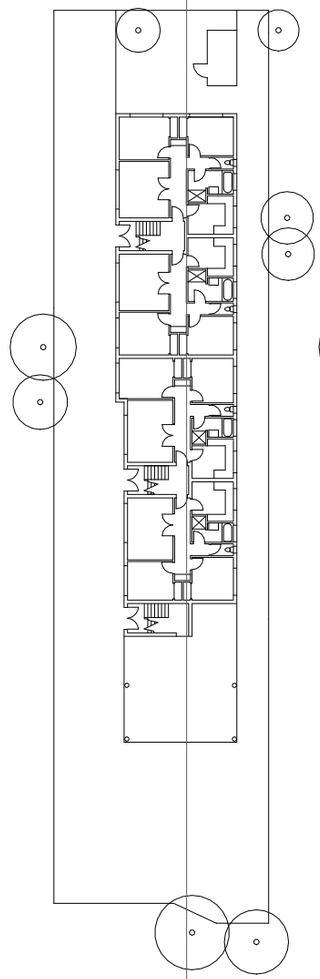
Characteristic detail
Served by a hardscape driveway aligned with the long boundary, and car parking at the side and rear of the block, the shorter facade is usually street-facing. Generally rectilinear in volume, modernist details include punched window openings in double-brick loadbearing walls; sometimes ‘window walls’ to living rooms and balconies are present.
Depending on lot sizes and siting, walk-up flats can suffer from poor orientation and a lack of privacy. Accessibility challenges for this type include their multiple storeys without lifts, and compact internal layouts. However, their square plans and general amenity for light and air enable efficient and high-quality retrofit opportunities.

Construction logic
Walk-up flats are characterised by a long, rectilinear plan, single flat or hip roofs of steel sheet or tiles, and internal or external circulation organised as open concrete stairs with shared walkways and open-air stairwells. Generally, they are double-brick construction with suspended concrete floors, timber roof framing, and minimum floor-to-floor heights (2400 ceilings internally).

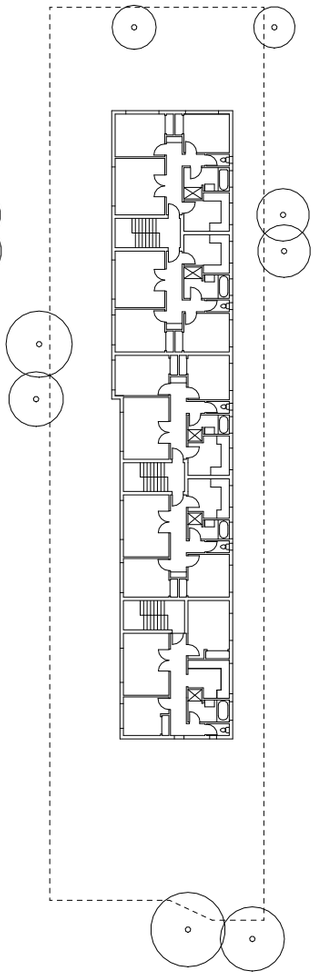
Lot Area
1015m^2

Site Dimensions
16 x 65m

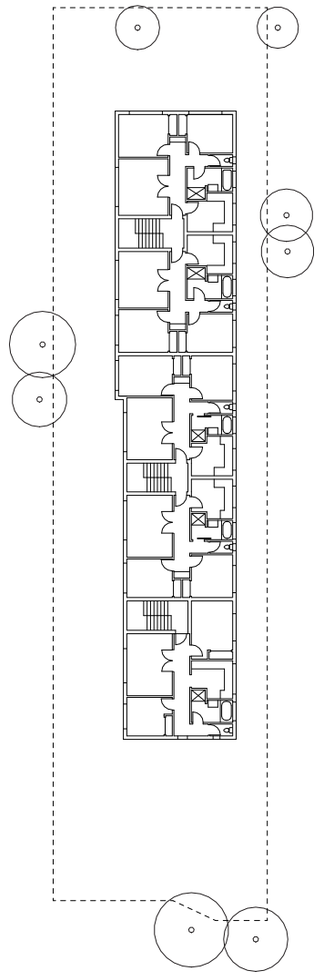
Floor Area
1085m^2



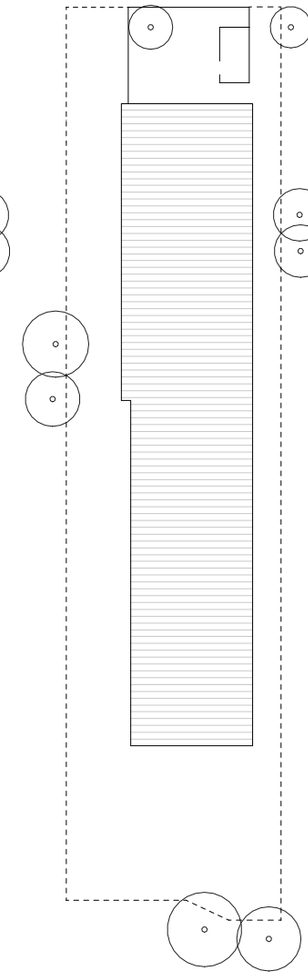
Ground Floor Plan



Level 1 Floor Plan



Level 2 Floor Plan



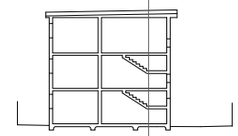
Site Plan



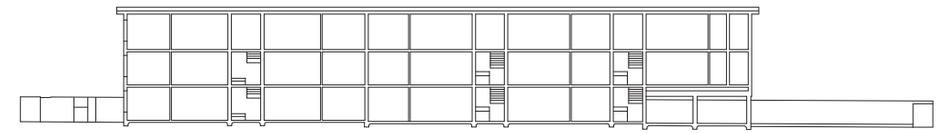
Elevation



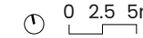
Elevation



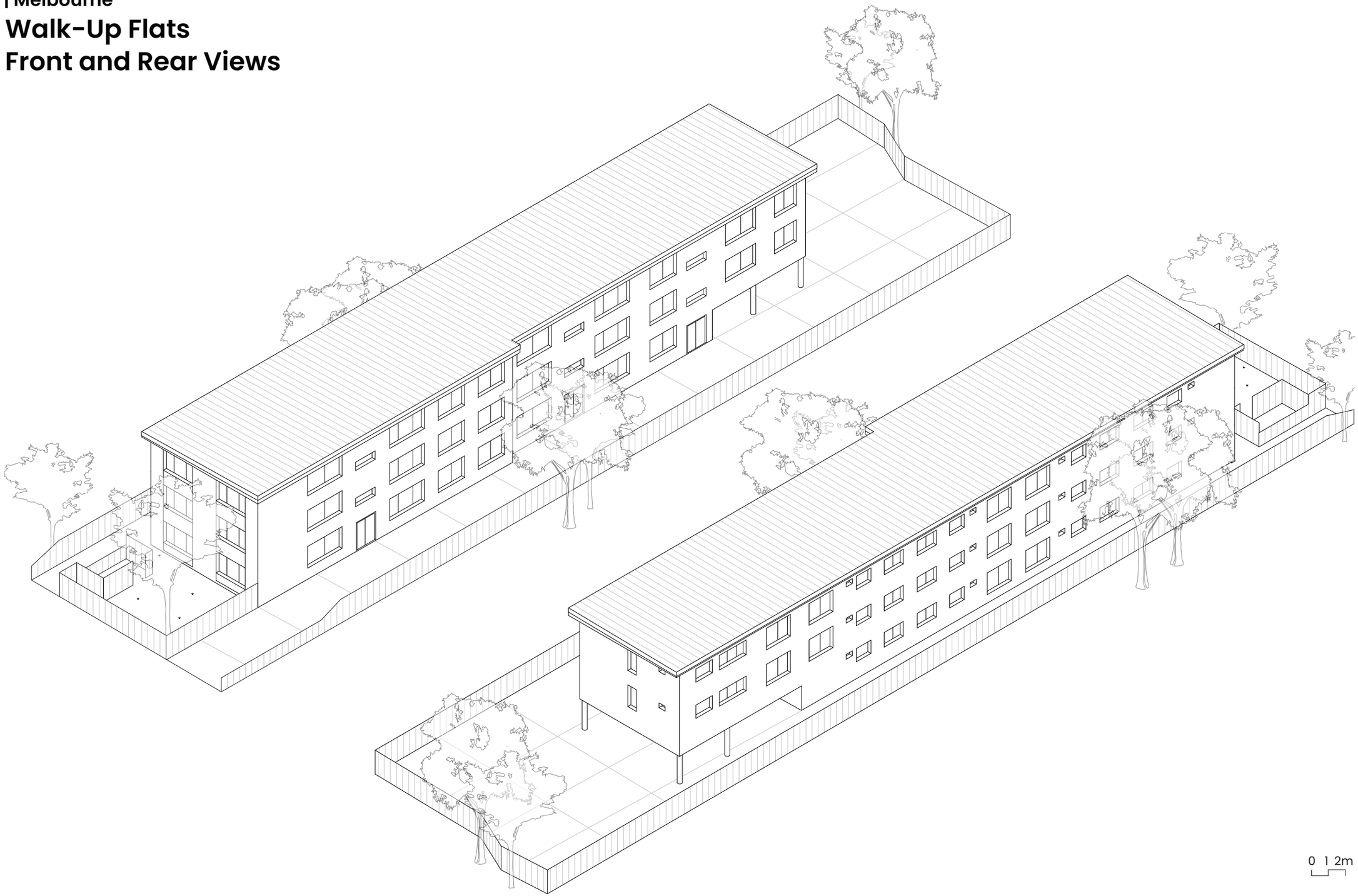
Section



Section



Walk-Up Flats
Front and Rear Views



Walk-Up Flats Type Equivalent Form Mapping

Example Precinct: Hawthorn



Walk-Up Flats Type
Equivalent Form Mapping
Eastern Suburbs

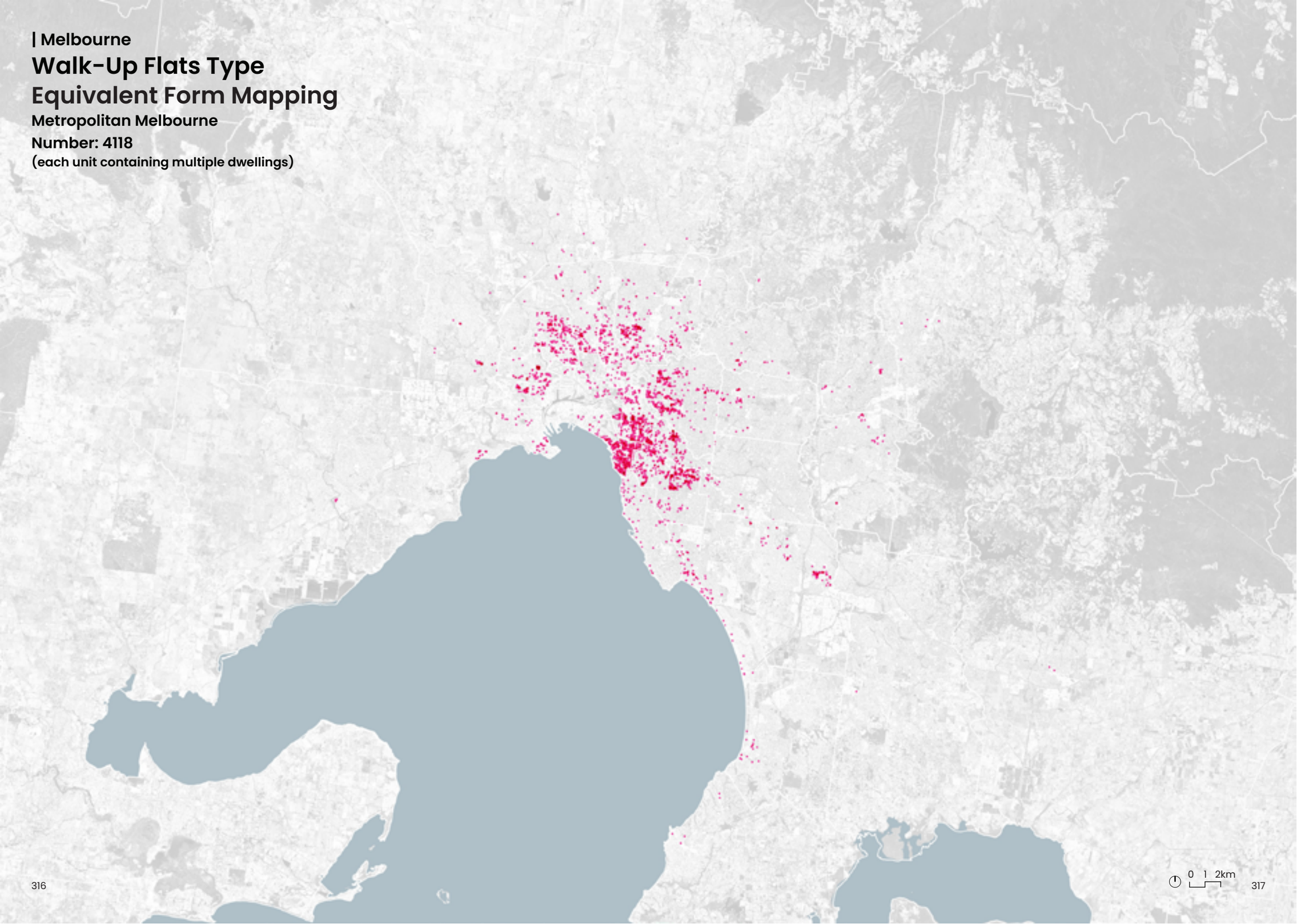


Walk-Up Flats Type
Equivalent Form Mapping

Metropolitan Melbourne

Number: 4118

(each unit containing multiple dwellings)



| Melbourne

Villa Cluster
1970s-2000s

0 0.5 1km



Block Plan



Street Elevation 0 2.5 5m

Villa Cluster Description

When
Melbourne's villa cluster developments have occurred since the 1970s and are predominantly second-generation suburban infill development, continuing as a common market type to the present day.

Why
This form of development and densification is made possible by current planning regulations, as the density increase is largely hidden from street view. Single-storey construction typical in the 1980s and 1990s, and detached building forms set back from side and rear boundaries are economical for small-scale developers to deliver using standard suburban construction techniques. In recent decades double-storey versions have become popular, yielding larger individual dwellings.

Where
Typically these occur in established middle-outer suburbs, where blocks are sufficiently large and housing demand is high. A single suburban allotment can yield three to four villa units. Suburbs such as Burwood and Dandenong in Melbourne's East have large quantities of villa clusters.

Characteristic detail
Essentially, this typology is a compressed version of the typical suburban standalone villa. Each dwelling typically has an integrated double garage; the requirement for vehicular access to each dwelling unit means that large areas of the site are taken up by driveways, reducing overall landscape permeability. Minimal private open space is residual and often poorly-oriented.

Construction logic
Commonly the villa cluster is constructed with brick-veneer walls, slab-on-ground foundations, and minimal eaves, adopting conventional timber stud framing and roof trusses. Timber or aluminium domestic windows and door frames feature, and roof tiles. Versions from the 2000s onward will often have rendered lightweight facades (fibre-cement sheet, polystyrene panels or Hebel aerated concrete panels) rather than face brick; and Colorbond metal sheet roofing in lieu of tiles.

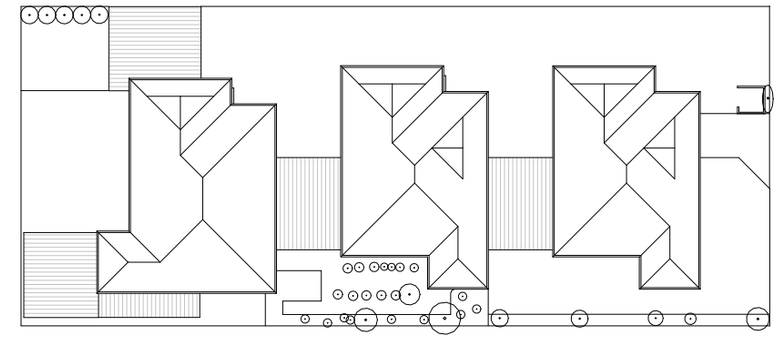
Lot Area
1260m^2

Site Dimensions
23.2 x 54.4m

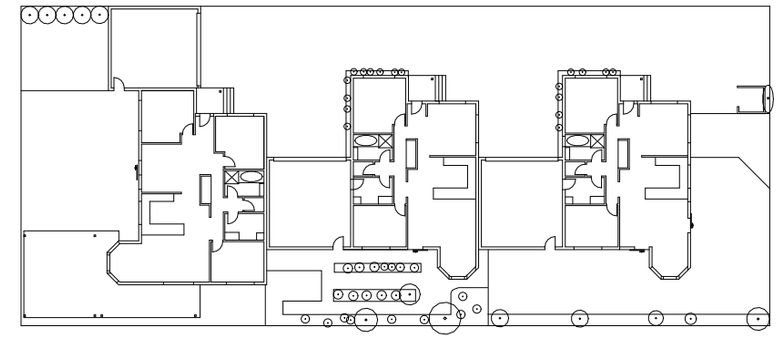
Floor Area
478m^2



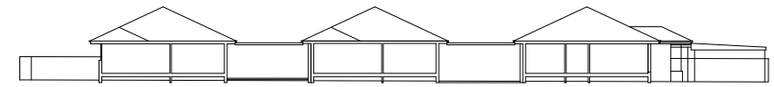
Elevation



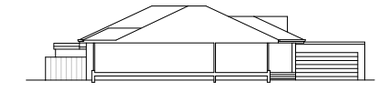
Site Plan



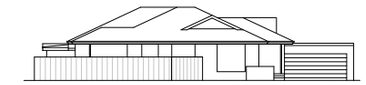
Ground Floor Plan



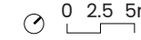
Section



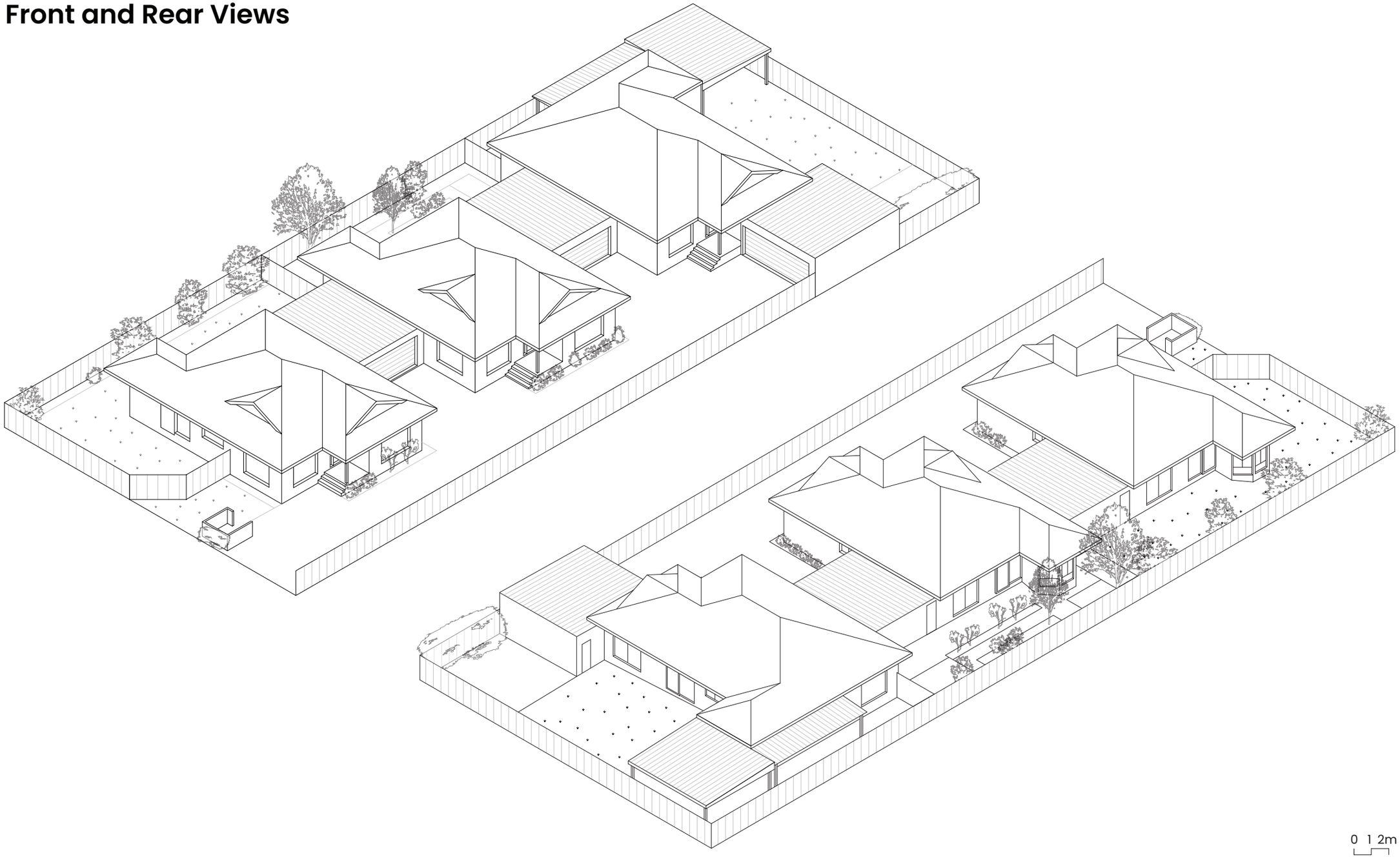
Section



Elevation



Villa Cluster
Front and Rear Views



Villa Cluster Type Equivalent Form Mapping

Example Precinct: Noble Park



Villa Cluster Type
Equivalent Form Mapping
South-Eastern Suburbs

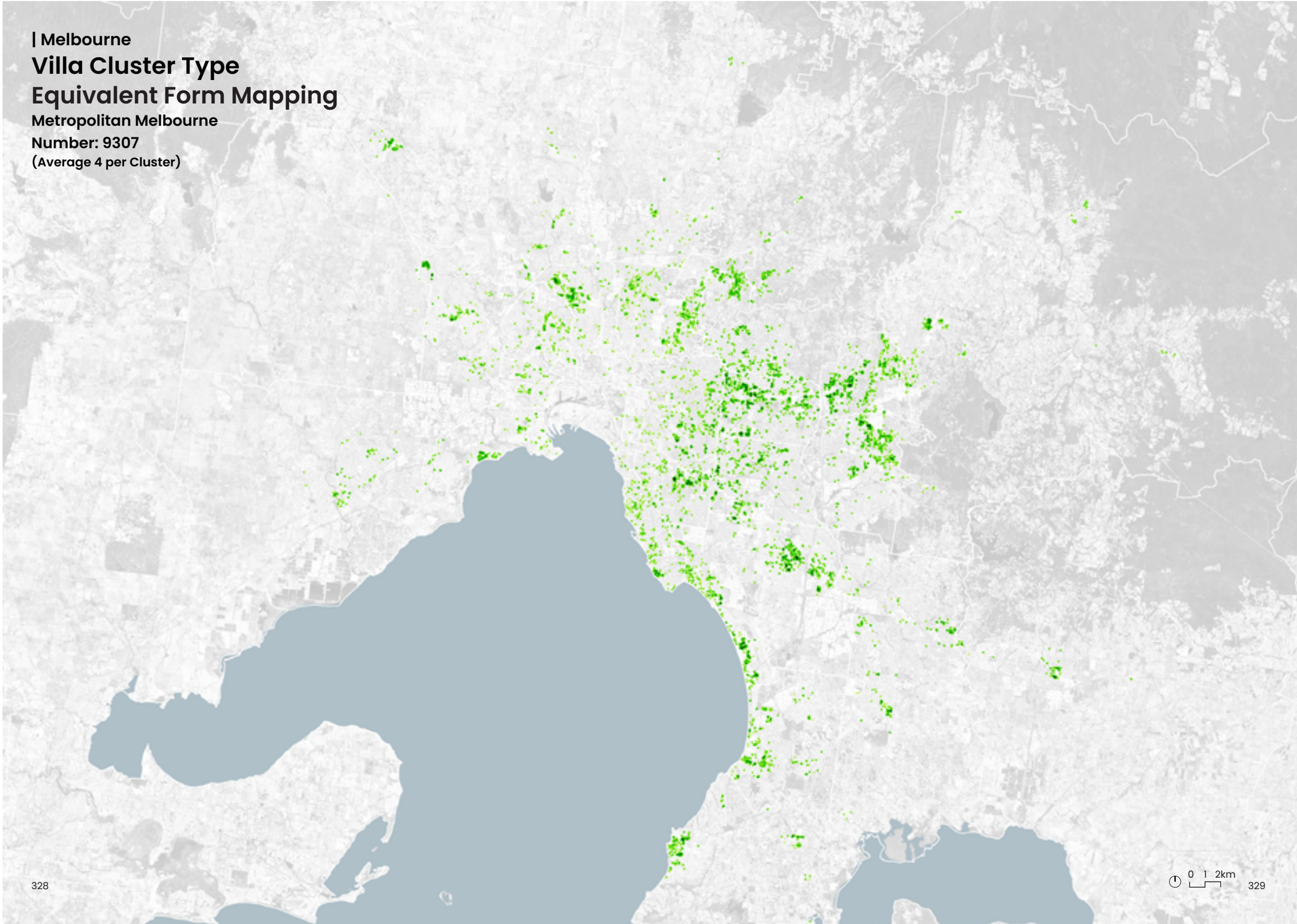


Villa Cluster Type
Equivalent Form Mapping

Metropolitan Melbourne

Number: 9307

(Average 4 per Cluster)



| Melbourne

Townhouse
1980s-2000s



0 0.5 1km

Block Plan



Street Elevation 0 2.5 5m

Townhouse Description

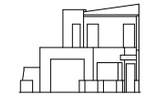
When
Townhouses were developed in Melbourne from the 1980s and continue as an identifiable type today. They usually divide a standard single suburban allotment into two attached dwellings, each with street frontage.

Why
Echoing Victorian terraces, this compact, infill house type addressed the need for affordable, higher density housing to accommodate the growing population in established suburbs. Planning regulations allowing two-for-one development encourage this typology as a form of infill densification on standard suburban blocks.

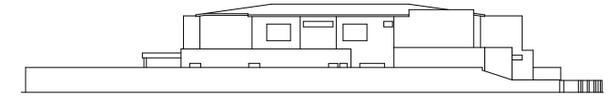
Where
The type is often found in established middle-outer suburbs, where blocks are sufficiently large and demand for housing is high. A single suburban allotment can yield two townhouse units. New townhouses are also being built in outer suburban greenfield subdivisions, however these typologies are dimensionally different, and often incorporate rear laneway vehicle access.

Characteristic detail
Townhouse cloor plans are narrow and long with private outdoor spaces at the front and back. Some have double access with a rear lane and garage, but commonly the garage is at the front, beside a porch/ portico that forms part of the entry. Two or three bedrooms are generally on the upper level with a living and WC on the ground floor; larger types also include a bedroom and bathroom on the ground floor. Due to the narrow block width, carparking generally dominates street frontage.

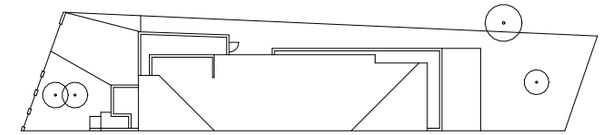
Construction logic
The typology is characterised as sets of dwellings with at least one attached wall on subdivided blocks. They encompass a variety of compositions, such as double-storey and semi-detached houses. The prevailing construction is a combination of brick-veneer and rendered lightweight walls with slab-on-ground foundations, and minimal eaves. The typology adopts conventional timber stud framing and roof trusses. Timber or aluminium domestic window and door frames, Colorbond metal sheet roofing are all characteristic details. Facades occasionally include ‘feature’ brick panels or rendered fibre-cement sheet, polystyrene panels or Hebel aerated concrete panels.



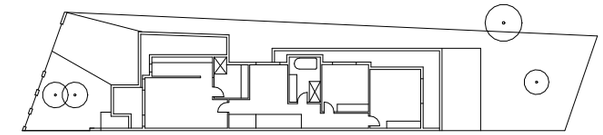
Elevation



Elevation



Site Plan

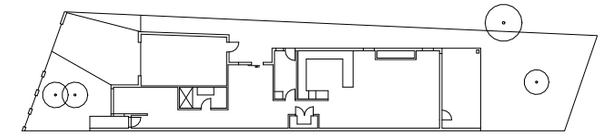


Level 1 Floor Plan

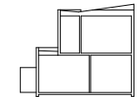
Lot Area
305.2m^2

Site Dimensions
9.1 x 38.7m

Floor Area
235.8m^2



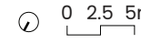
Ground Floor Plan



Section

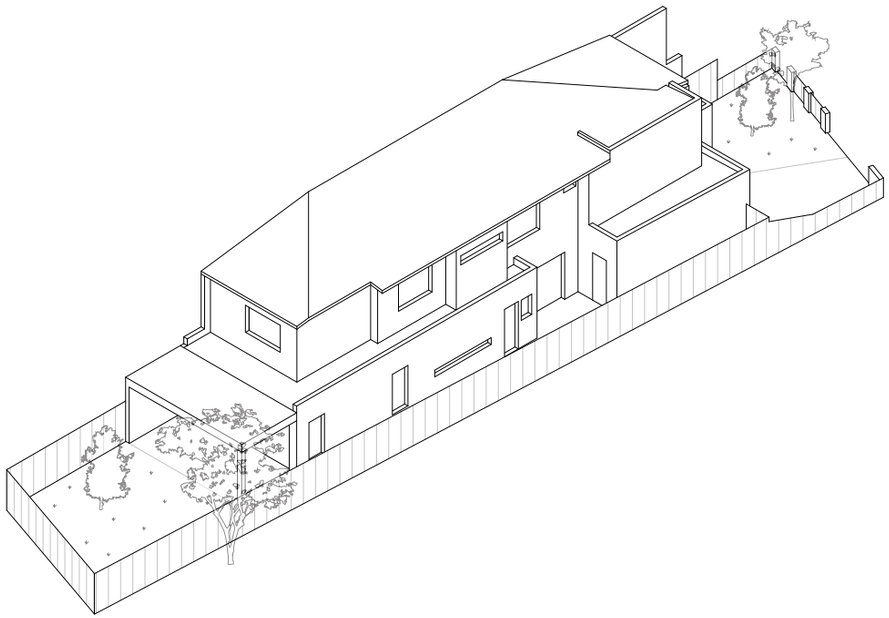


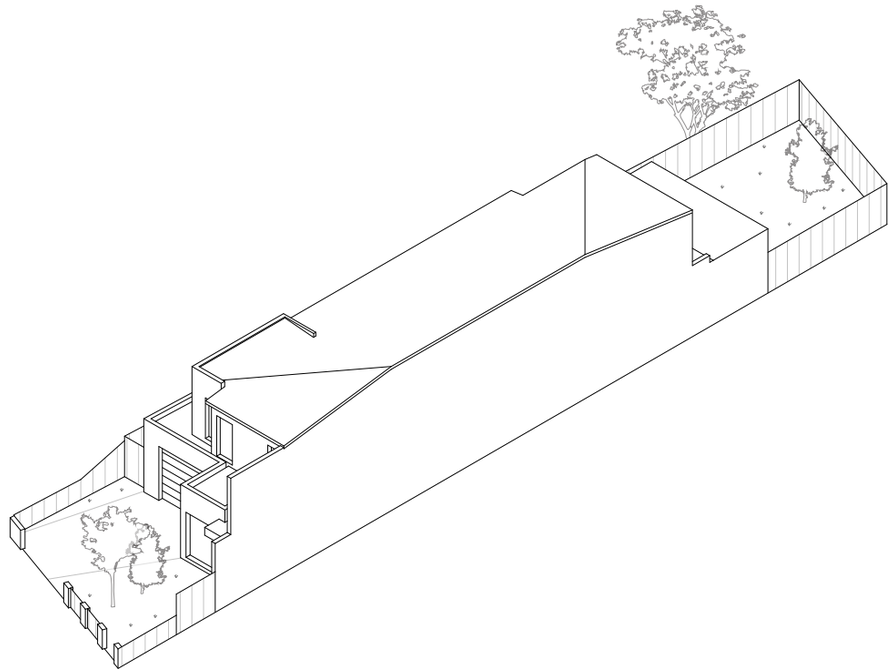
Section



| Melbourne

Townhouse
Front and Rear Views





0 1 2m

Townhouse Type Equivalent Form Mapping

Example Precinct: Kensington



Townhouse Type
Equivalent Form Mapping

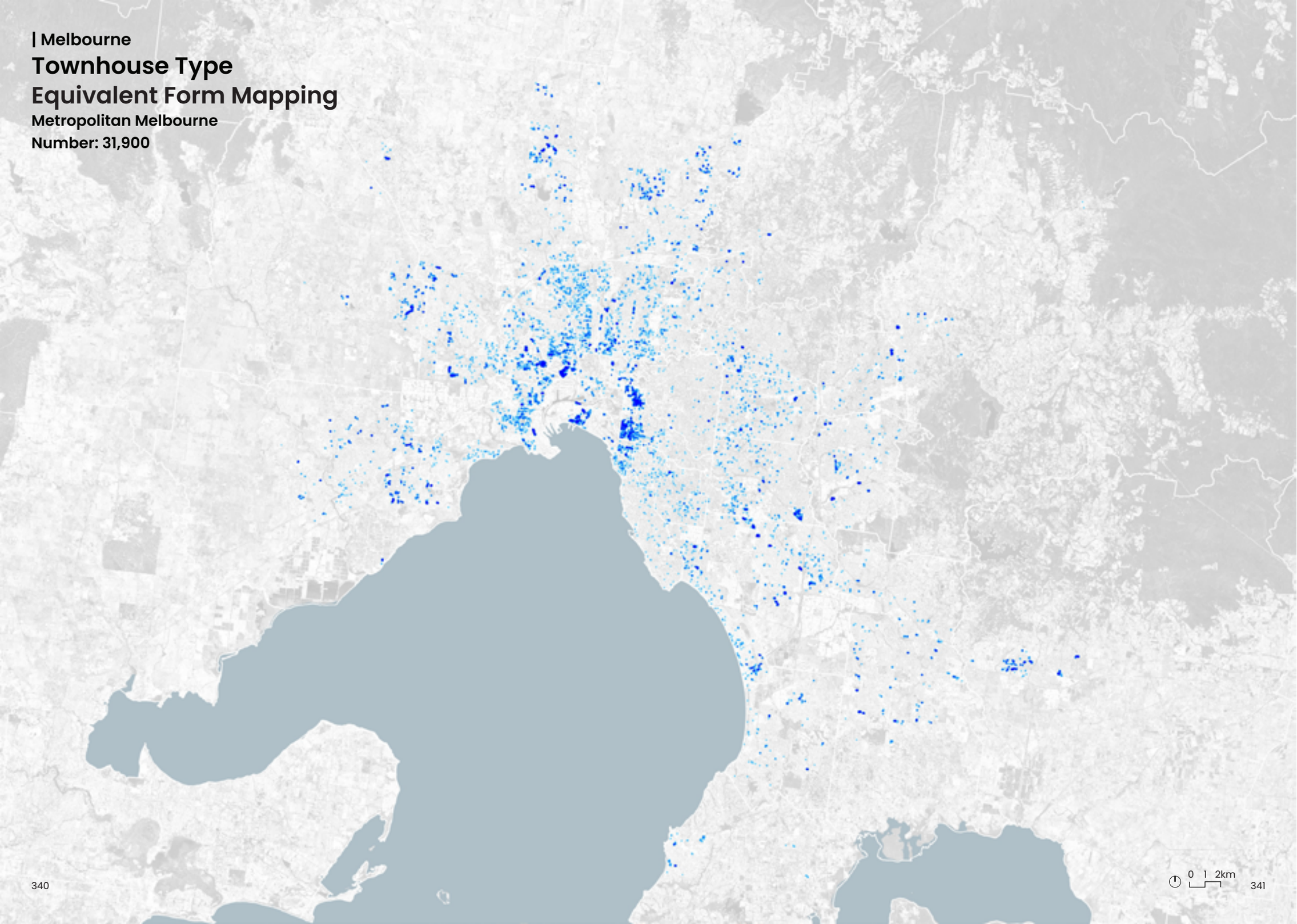
Inner City Suburbs



Townhouse Type
Equivalent Form Mapping

Metropolitan Melbourne

Number: 31,900



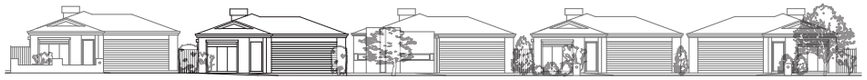
| Melbourne

Garage House
2000s

0 0.5 1km



Block Plan



Street Elevation 0 2.5 5m

| Melbourne

Garage House Description

When
One- or two-storey garage houses have been developed since the 2000s and are volume-built, project homes. Their dominant standard-sized, double-car garages are integrated into the main building, often comprising a large proportion of the building's street frontage.

Why
A desire for security and privacy has produced the type, which allows direct entry to the dwelling interior via an engaged garage with remote control roller door access. This means that occupants rarely need to enter through the front door on foot. Smaller block sizes and frontages in new subdivisions mean that garages occupy a larger proportion of the house compared to earlier suburban villas.

Where
This is the prevailing house type in 'greenfields' suburbs on the edge of the city. The pronounced garage of the house frontage is both a symbolic and practical reference to the car as the primary mode of transport in these areas, which are not typically serviced by reliable public transport.

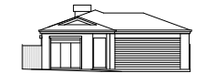
Characteristic detail
Single or double fronted, this house type is usually set back from the street by around 6 metres with direct hard surface driveway access. Floor plans include a stepped entry that leads to a hallway with the garage on one side and a 'formal' living or master bedroom on the other side. Living/kitchen/dining rooms are often arranged as an open plan area at the rear with a small 'al fresco' external private open space/ entertainment area. Most homes accommodate three or four bedrooms, multiple bathrooms and a dedicated laundry. Two-storey models separate living areas downstairs and bedroom zones above. Landscaping is minimal, with lawn or artificial grass to front setbacks and paving to rear al fresco courtyards.

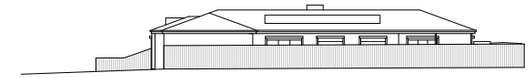
Construction logic
The type combines brick-veneer and rendered lightweight walls with slab-on-ground foundations, minimal eaves. Timber or aluminium domestic window and door frames and Colorbond metal sheet roofing is typical. Conventional timber stud framing and roof trusses predominate. Facades have occasional 'feature' brick panels or render over fibre-cement sheet, polystyrene panels or Hebel aerated concrete panels.

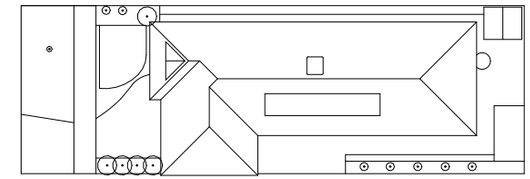
Lot Area
382.2m^2

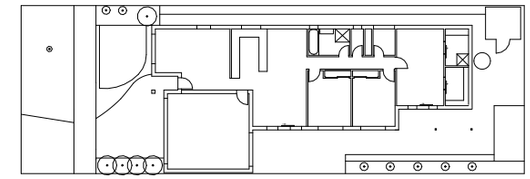
Site Dimensions
12.3 x 31m

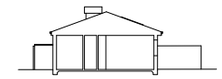
Floor Area
185m^2

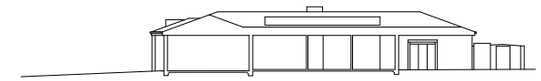

Elevation

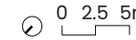

Elevation


Site Plan


Ground Floor Plan

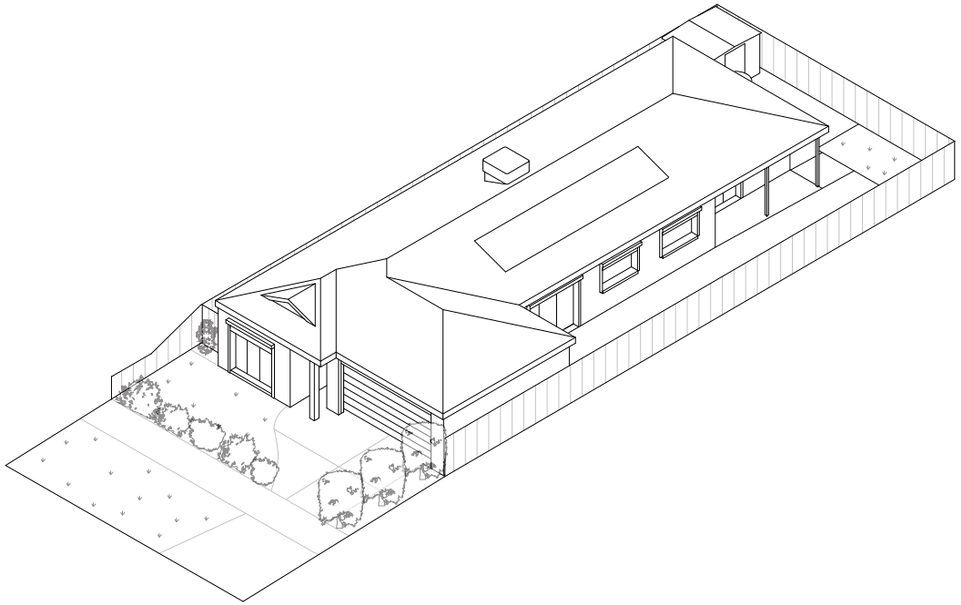

Section

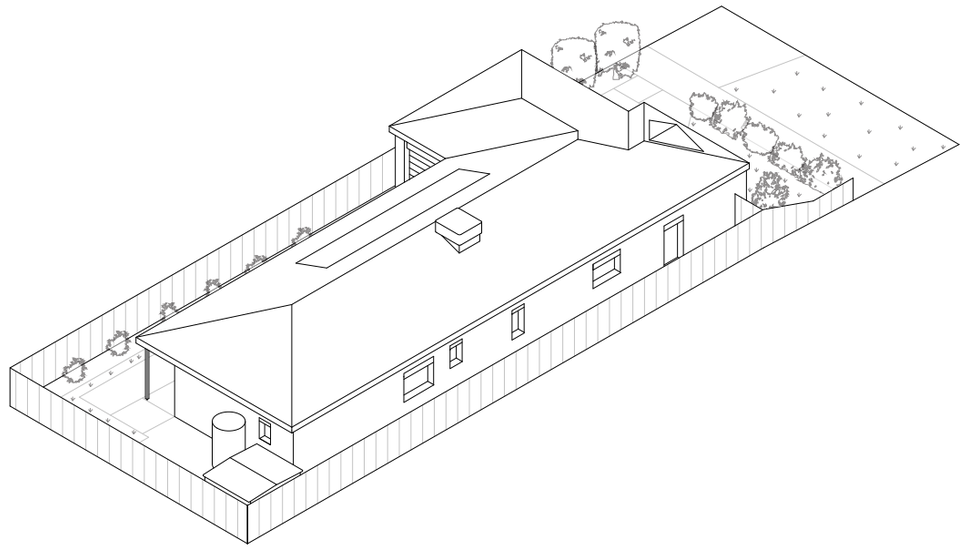

Section



| Melbourne

Garage House
Front and Rear Views





0 1 2m

Garage House Type Equivalent Form Mapping

Example Precinct: Cranbourne



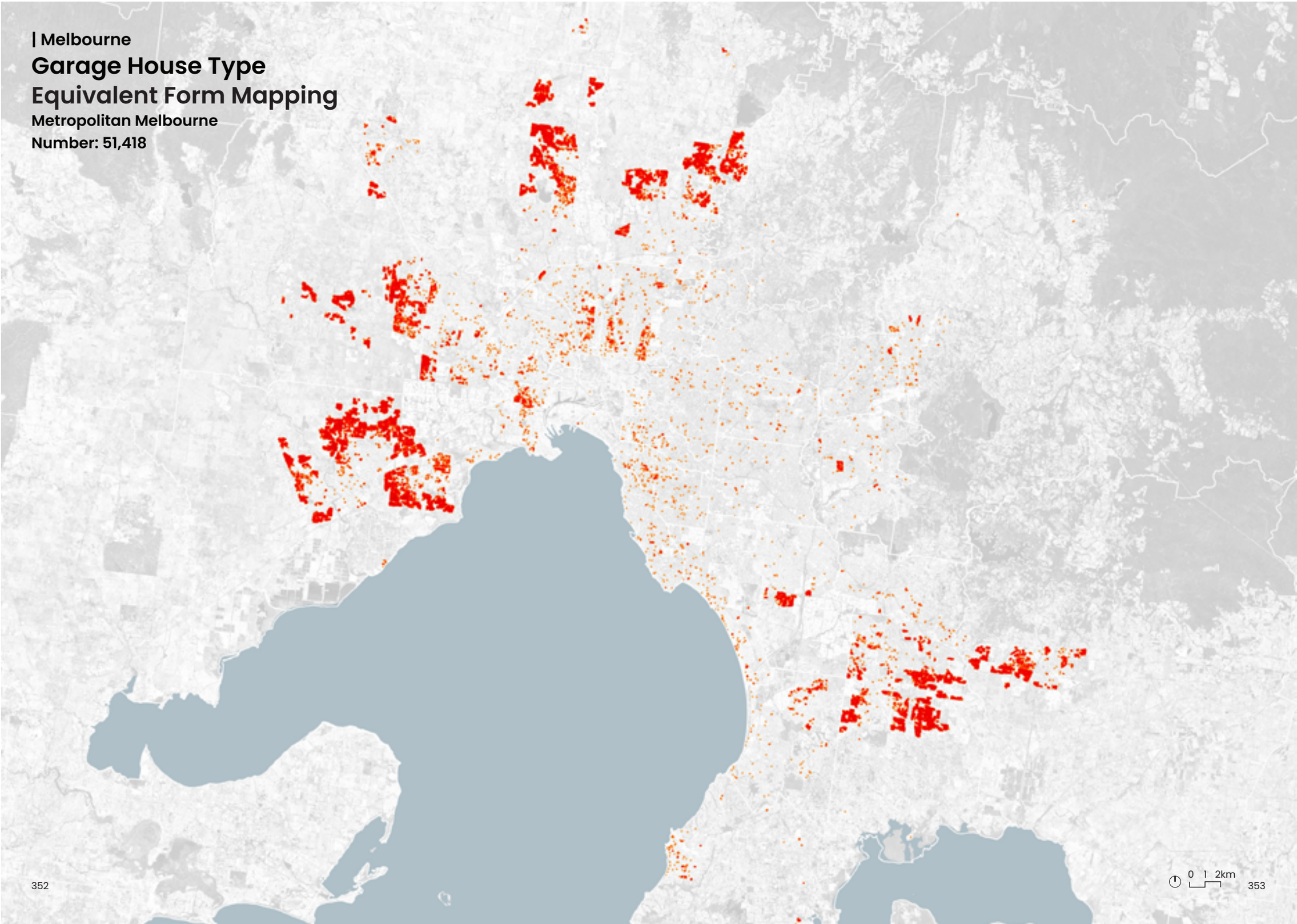
Garage House Type
Equivalent Form Mapping
South-Eastern Suburbs



Garage House Type
Equivalent Form Mapping

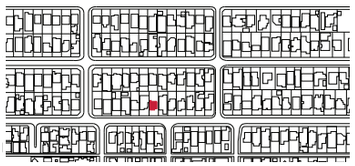
Metropolitan Melbourne

Number: 51,418



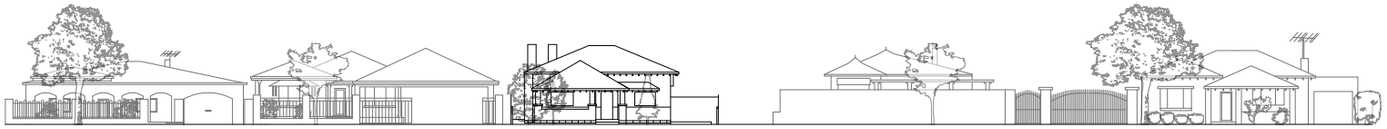
| Perth

Cottage 1940s-1960s



0 0.5 1km

Block Plan



Street Elevation

0 2.5 5m



| Perth

Cottage Description

When
The detached brick house dominated Perth's post-war housing landscape; larger variants of the type occurred into the 1960s, reflecting the state's fiscal recovery.

Why
Cottages were underpinned by the State Housing Commission (SHC) and the 1944 Commonwealth State Housing Agreement. Their sheer quantity was significant: 20,000 homes were delivered by the SHC between 1946–56, representing more than 40% of all dwellings built in Western Australia during that period. Prescribed 'brick areas' designated across many districts further cemented double brick as the construction standard.

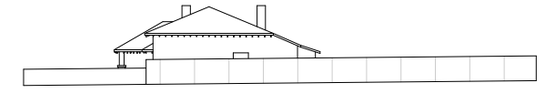
Where
New housing in the post-war era was concentrated in suburbs including Floreat Park, Bedford, Scarborough, Melville, Applecross, and Yokine, with homes sited centrally on lots of around 800 sqm. Subsequent developments extended into the fast-growing areas of Belmont and Canning.

Characteristic detail
Material shortages and post-war austerity produced utilitarian homes of sparse decoration: typically two bedrooms, one bathroom, and a simple square plan. A front porch and enclosed rear lean-to sleepout provided access to the laundry and a single external WC, with rear yards reached through a central kitchen.

Construction logic
Perth's stable, sandy soils allowed for limestone perimeter footings with timber stumps, double brick cavity walls, and Western Australian hardwood (Jarrah, Marri, Karri) structural timber were standard. Suspended timber floors sat a few steps above grade. Early variants feature tiled hip roofs; concrete 'Andray' tiles appeared from the 1950s, alongside modest fluted porch columns as material shortages eased.



Elevation

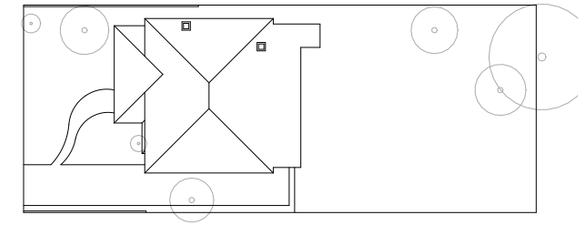


Elevation

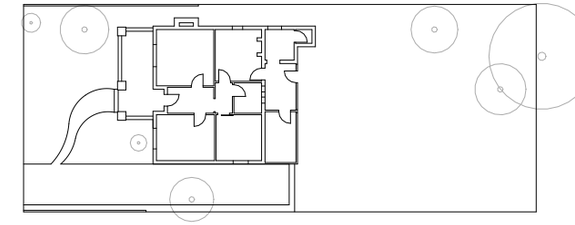
Lot Area
562m^2

Site Dimensions
15 x 37.2m

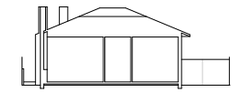
Floor Area
122m^2



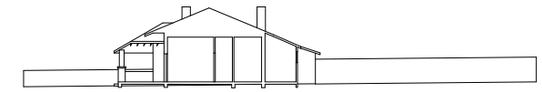
Site Plan



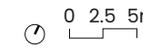
Ground Floor Plan



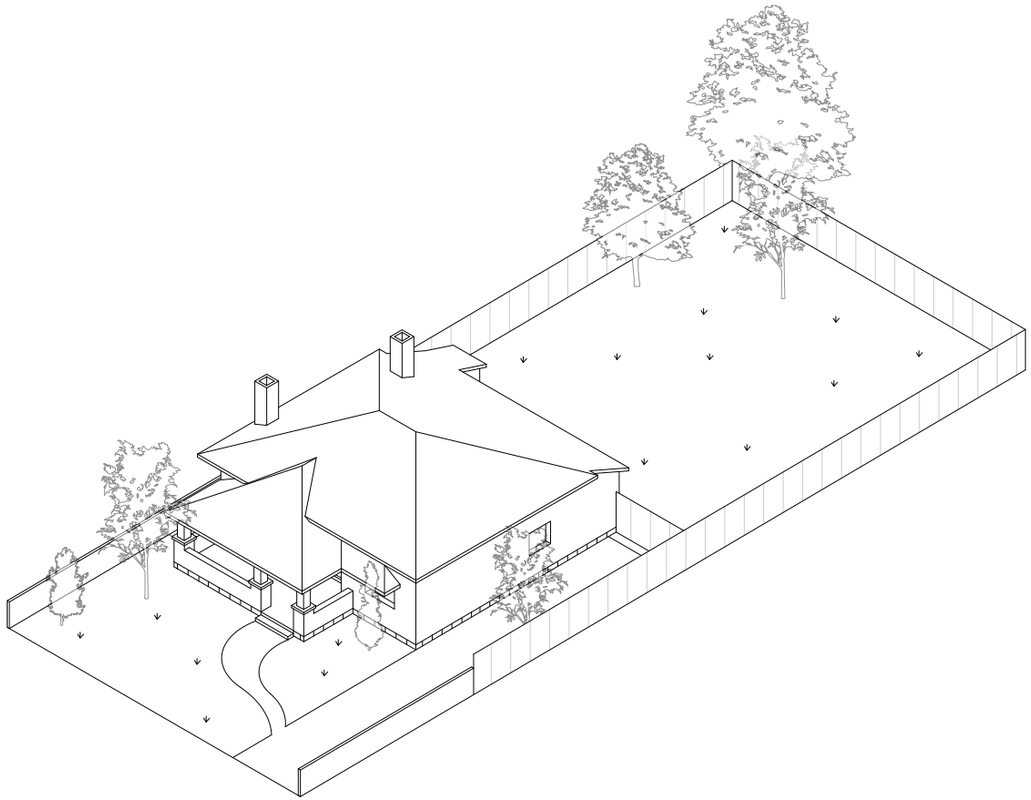
Section

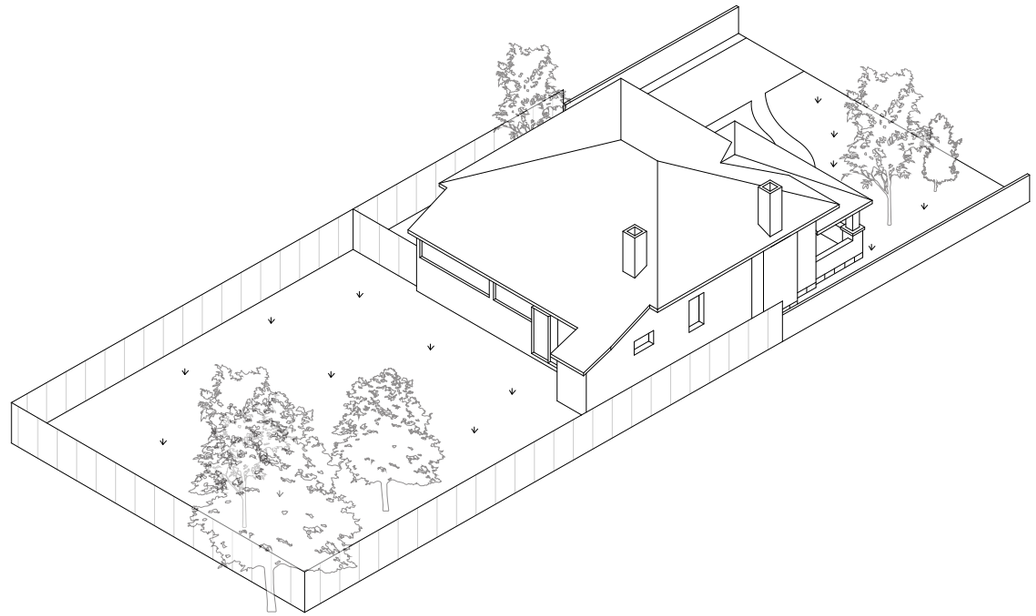


Section



Cottage
Front and Rear Views





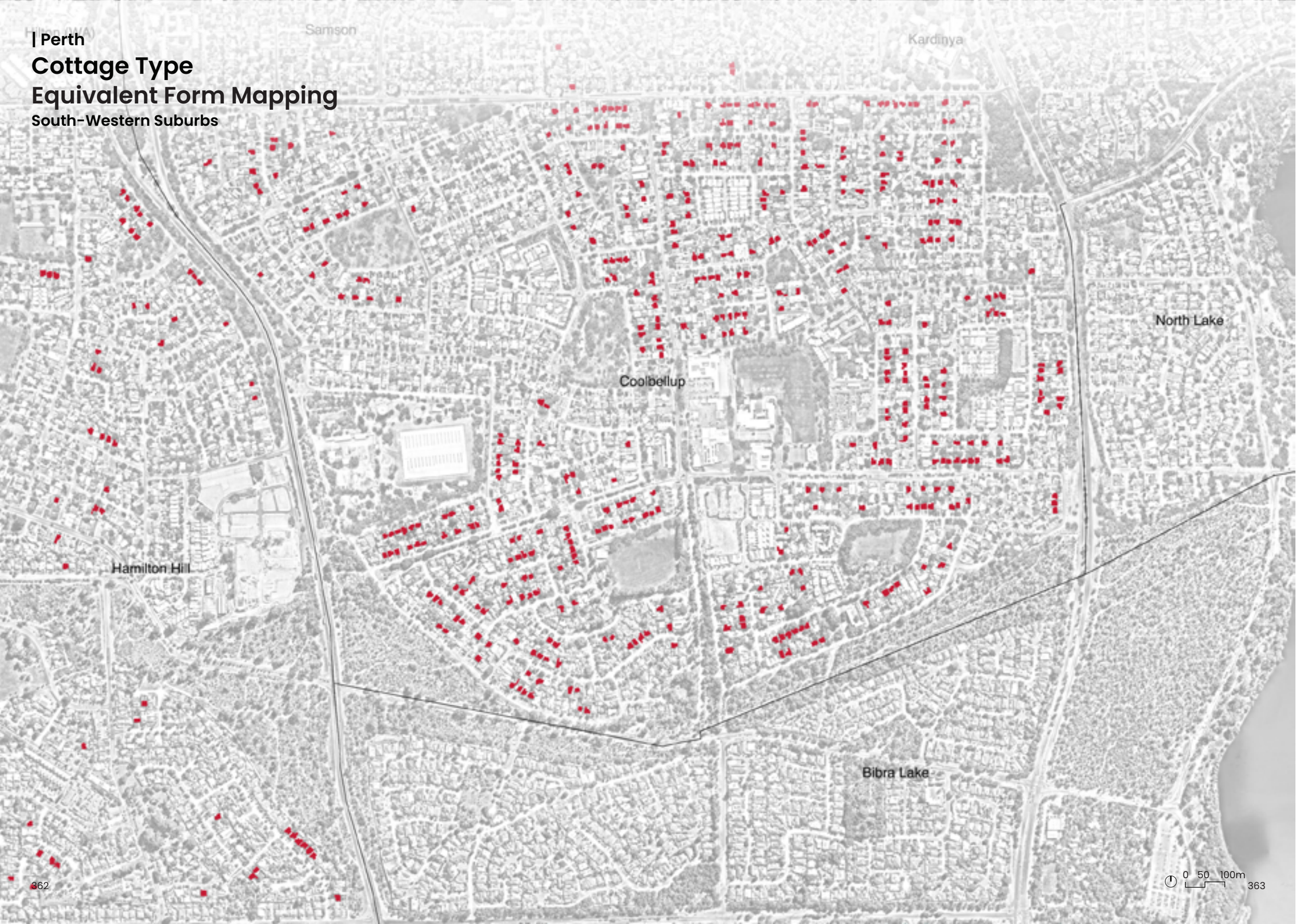
0 1 2m

Cottage Type Equivalent Form Mapping

Example Precinct: Coolbellup



Cottage Type
Equivalent Form Mapping
South-Western Suburbs

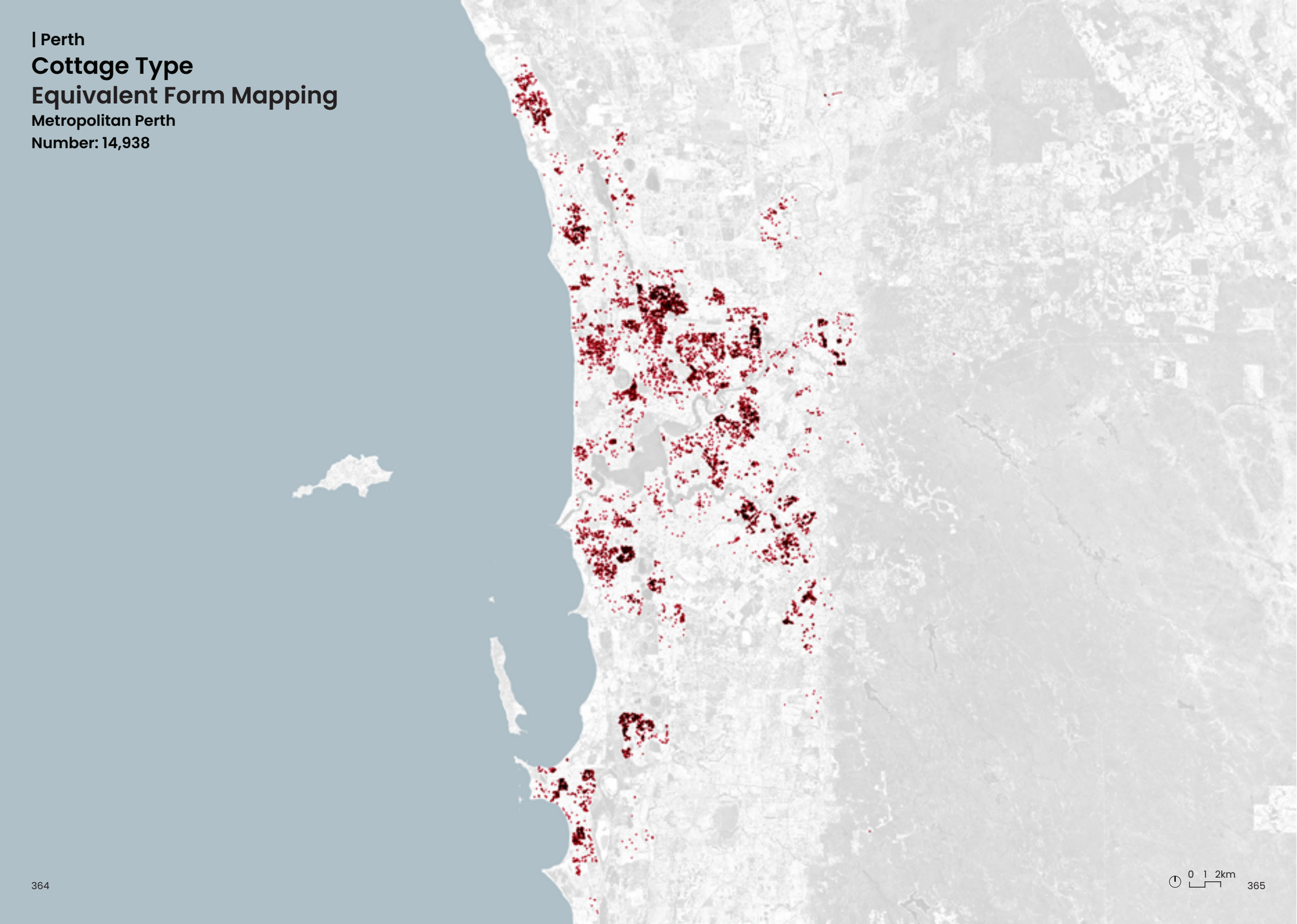


Cottage Type

Equivalent Form Mapping

Metropolitan Perth

Number: 14,938



| Perth

Walk-Up Flats
1960s-1970s



Street Elevation 0 2.5 5m

Walk-Up Flats Description

When
Walk-up flats of two to four storeys proliferated during Perth's mineral boom to accommodate the state's rapid population growth.

Why
The 1966 Strata Titles Act, which enabled individual unit ownership for the first time, gave further impetus to the type. Architectural firm Krantz and Sheldon, operating through investment syndicates, is estimated to have produced 90% of all walk-up flats built in Perth between the 1930s and 1970s.

Where
Most flats occupy well-located inner and middle-ring suburbs such as West Perth, Inglewood, Mt Lawley, Maylands, Claremont, Applecross, Como, and Scarborough. Lots average around 1,600 sqm, though sizes vary considerably.

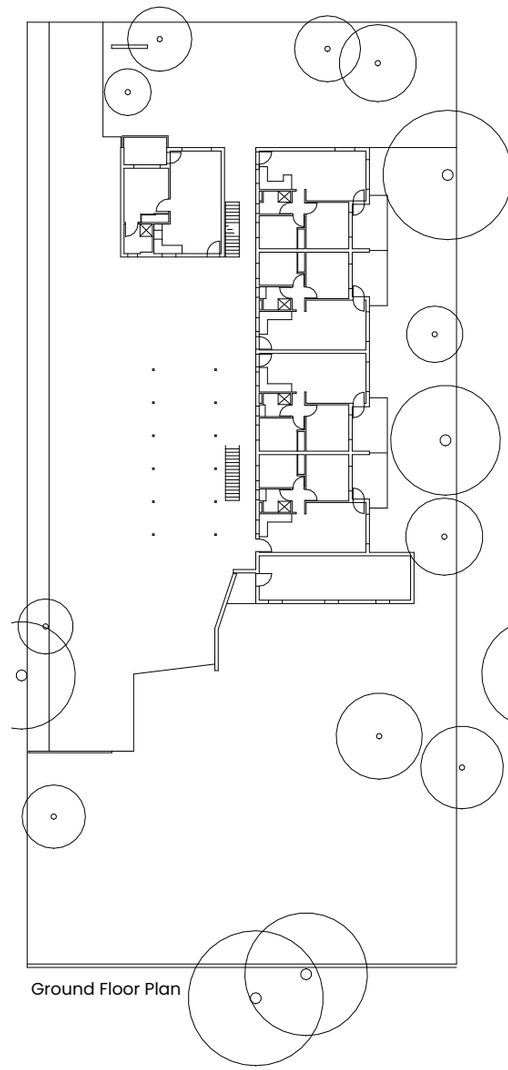
Characteristic detail
Walk-up flats are predominantly arranged in straight runs down the length of the site, accessed via a shared hardscape driveway with detached carports to the rear. Units are typically one or two bedrooms with a small entrance kitchen, 2.4m ceilings, and painted face brick interiors. Living spaces often open to a private balcony or shared walkway; communal laundry facilities are also common.

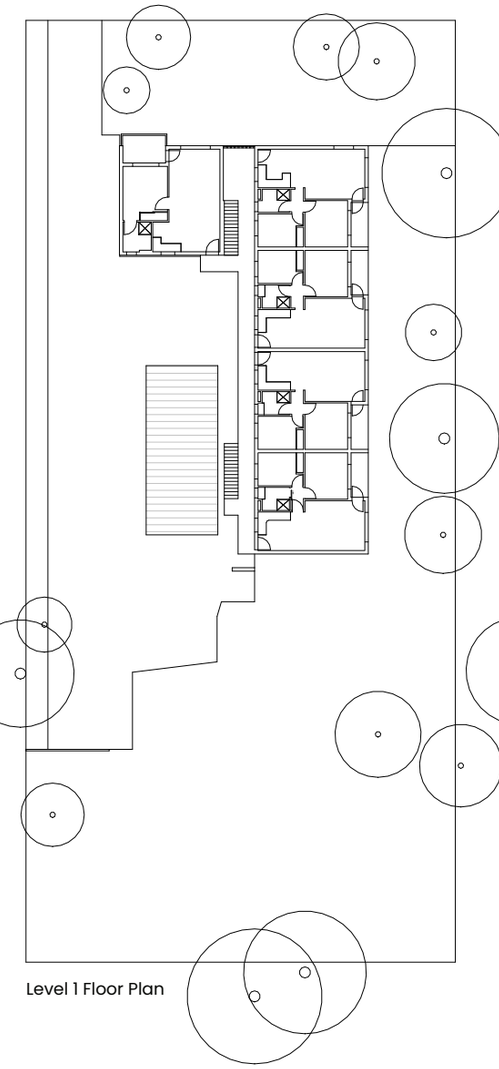
Construction logic
This typology adopts double brick on a concrete slab-at-grade, with tiled or asbestos gable or simple hip roofs and lightweight or full brick gable ends. Upper floors are suspended two-course concrete slabs with concrete balconies and brick or steel balustrades. Stair arrangements vary, with L-shaped configurations between two blocks or consolidated stairwells accessing shared walkways both common solutions.

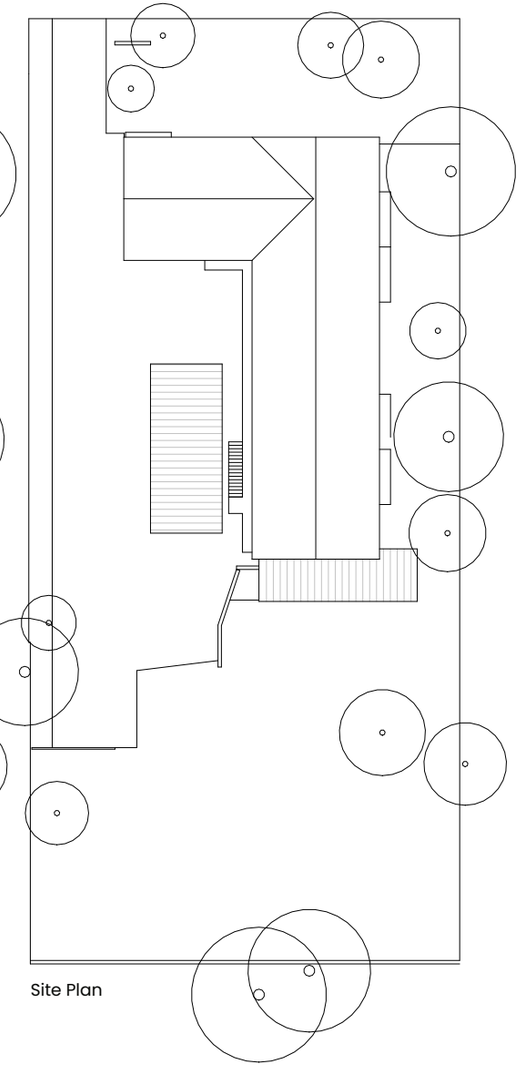
Lot Area
2134.75m^2

Site Dimensions
31.2 x 68.3m

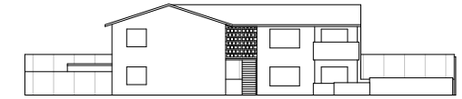
Floor Area
692m^2

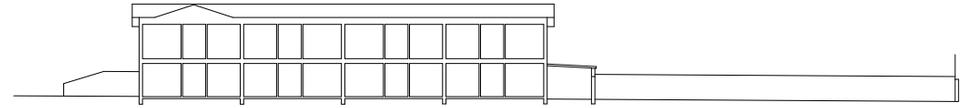

Ground Floor Plan

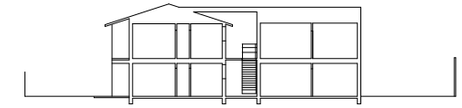

Level 1 Floor Plan

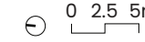

Site Plan


Elevation

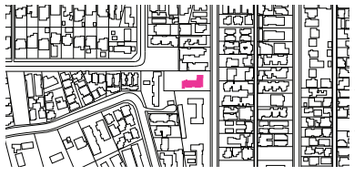

Elevation


Section


Section



Walk-Up Flats
Front View

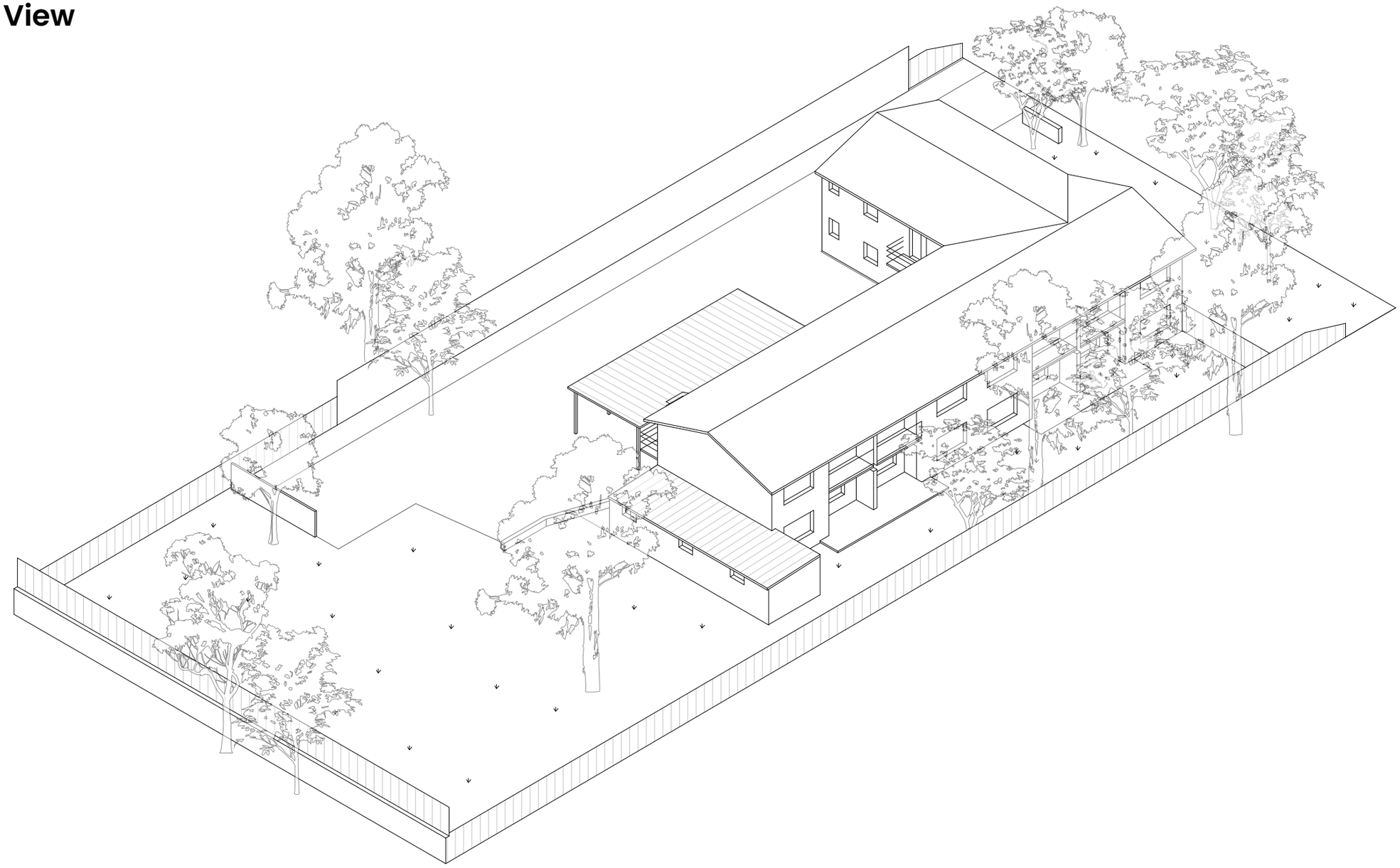


0 0.5 1km

Block Plan

0 1 2m

Walk-Up Flats
Rear View



0 1 2m

Walk-Up Flats Type Equivalent Form Mapping

Example Precinct: Victoria Park



Walk-Up Flats Type
Equivalent Form Mapping
Inner City Suburbs



| Perth

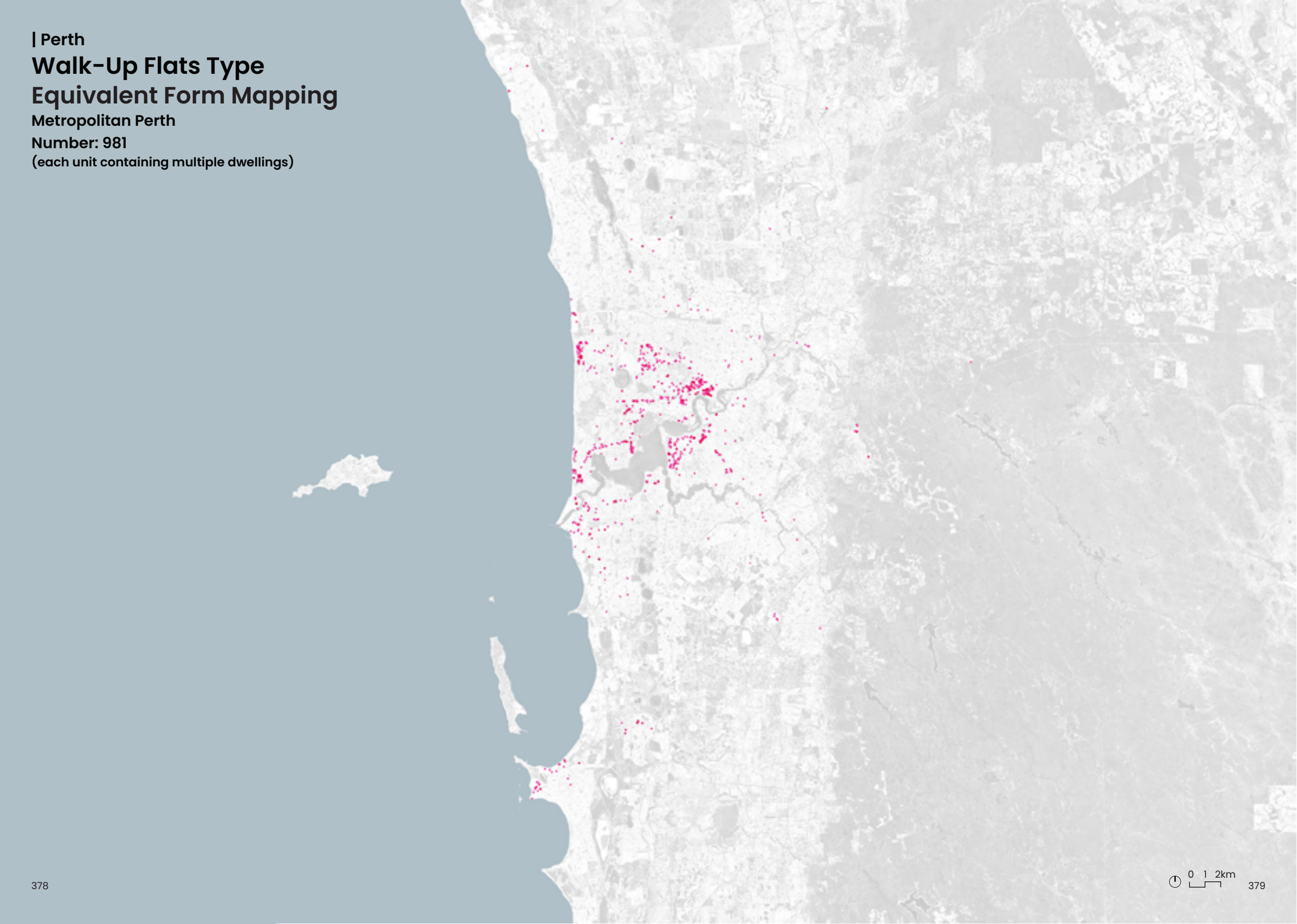
Walk-Up Flats Type

Equivalent Form Mapping

Metropolitan Perth

Number: 981

(each unit containing multiple dwellings)



| Perth

Villa

1970s-Ongoing



0 0.5 1km

Block Plan



Street Elevation 0 2.5 5m

| Perth

Villa Description

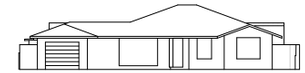
When
Mass-market project housing emerged in the 1970s and gained prevalence through the 1990s: it continues to be Perth's dominant house type.

Why
Driven by the state's mineral boom and a growing appetite for larger homes with greater amenities, the villa is also supported by Perth's reliance on private car transport, coupled with volume builder dominance in suburban expansion.

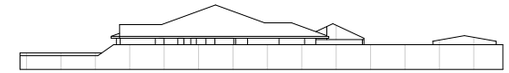
Where
The villa epitomises Perth's prevailing suburban form and is found city-wide. Typical lot sizes have shrunk from around 600 sqm to 350 sqm over time, while floor areas have grown, reducing open outdoor space proportionally. Sites are typically benched flat with little regard for topography.

Characteristic detail
Dedicated spaces for entertainment, theatre rooms, multiple living areas and master en-suites became mainstream from the 1990s. The enclosed garage, now expanded to double width as standard, dominates the street elevation. Master bedrooms are zoned away from secondary rooms; lightweight patio additions are common given minimal side setbacks and little integrated shading.

Construction logic
Drawing on local geology, a concrete slab-on-grade with strip footings on compacted yellow sand fill is standard. Earlier examples use double brick with exposed internal and external faces; later variants adopt rendered, plastered, and painted cavity walls. Ceiling heights of approximately 2.4m, boxed eaves, aluminium joinery, and hollow-core steel-framed internal doors are characteristic throughout.



Elevation

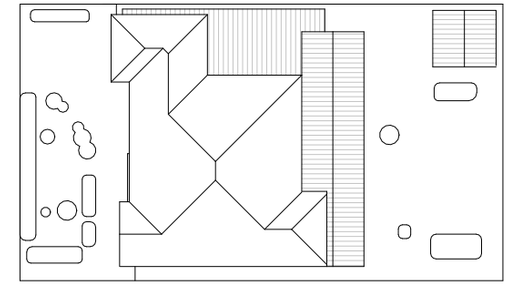


Elevation

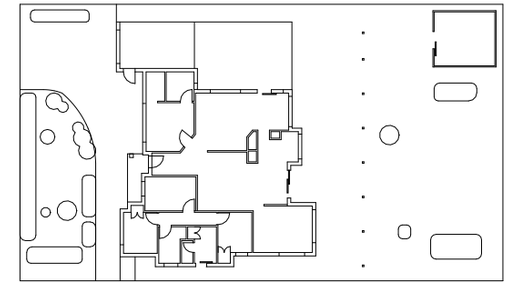
Lot Area
700m^2

Site Dimensions
20 x 35m

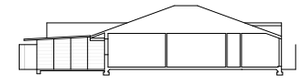
Floor Area
155m^2



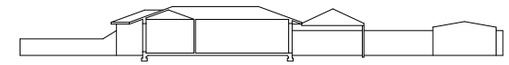
Site Plan



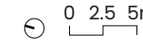
Ground Floor Plan



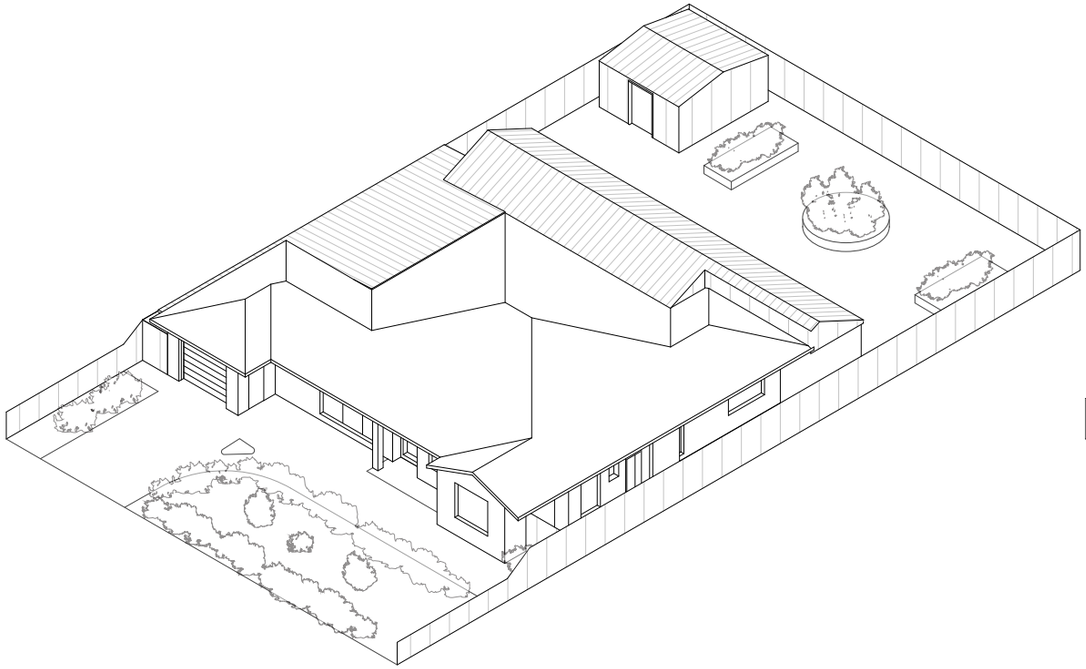
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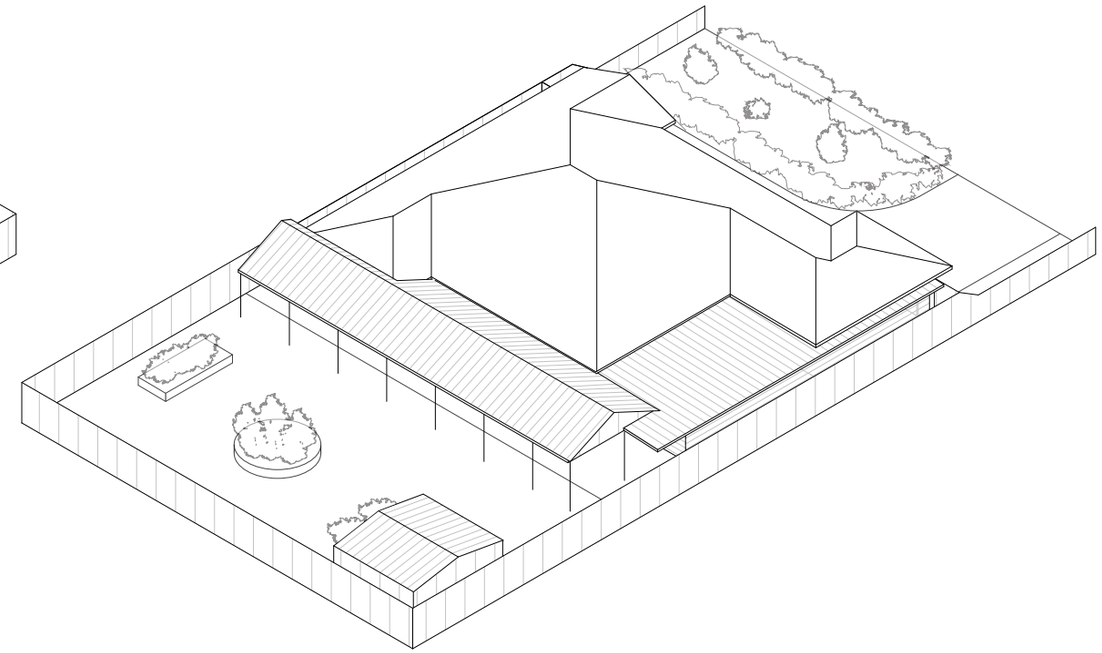


Section



Villa
Front and Rear Views





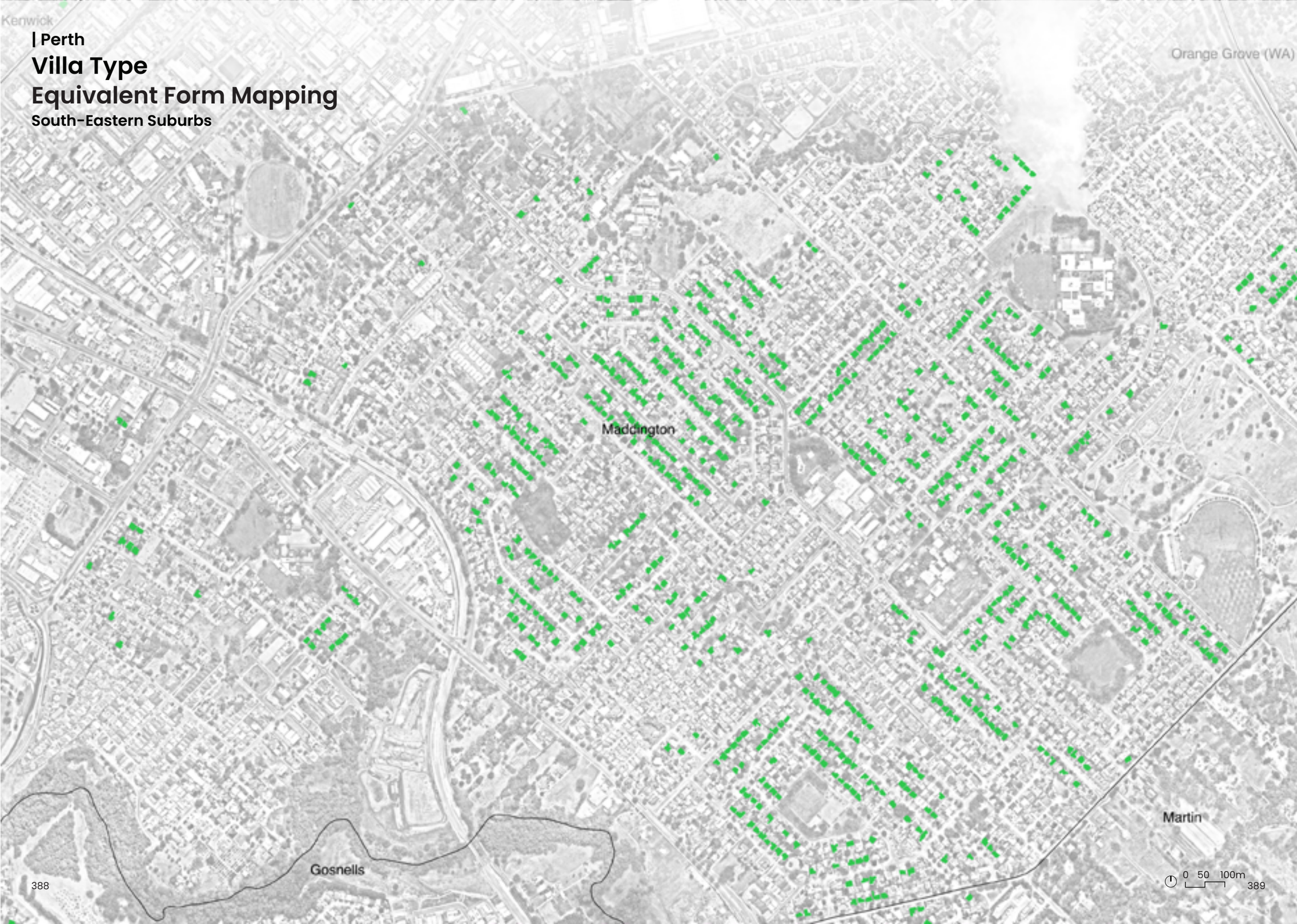
0 1 2m

Villa Type Equivalent Form Mapping

Example Precinct: Maddington



Villa Type
Equivalent Form Mapping
South-Eastern Suburbs

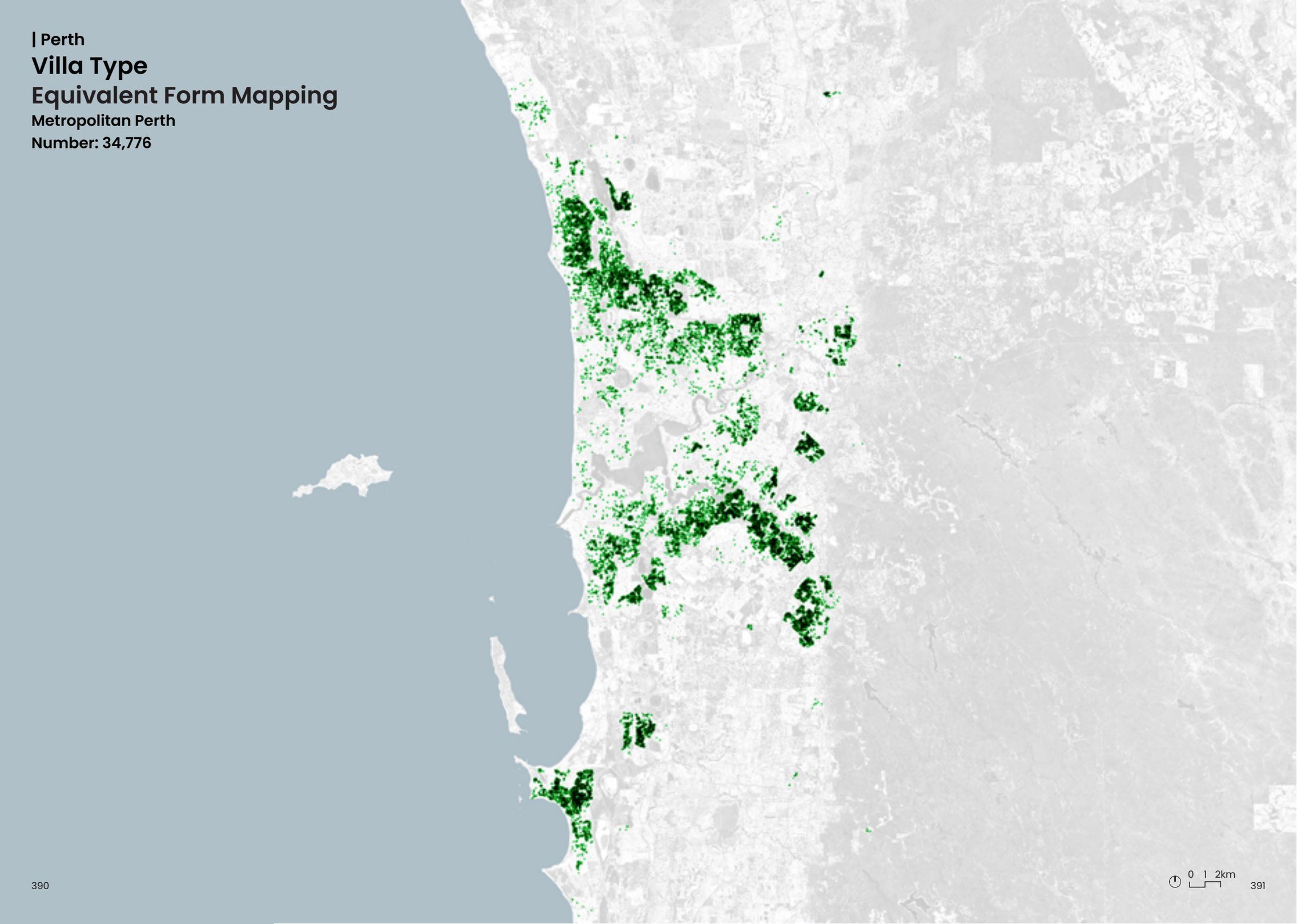


Villa Type

Equivalent Form Mapping

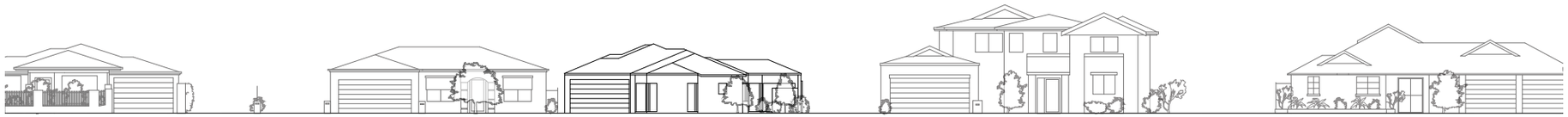
Metropolitan Perth

Number: 34,776



| Perth

Villa Cluster
1980s-Ongoing



0 2.5 5m
Street Elevation

Villa Cluster Description



0 0.5 1km

Block Plan

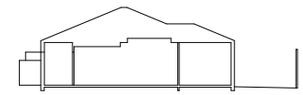
When
The grouped villa has been a fixture of Perth's housing landscape since the 1985 State Residential Design Codes, which established minimum lot sizes for dwellings.

Why
Successive code revisions have reduced these minimums, enabling greater density in established suburbs. Smaller than a project home, the villa offers strong yields for small-scale developers and remains a popular entry-level option for first-home buyers.

Where
Typically subdivided from 700–1,200 sqm detached house lots, grouped villas are found across Perth wherever R30 or R40 zoning applies. High concentrations occur in suburbs such as Scarborough, Doubleview, Innaloo, Joondanna, Tuart Hill, and Coolbellup.

Characteristic detail
Dwellings are arranged in clusters along long side boundaries, separated by party walls and accessed via a shared hardscape driveway. This arrangement leaves little room to retain deep soil zones or mature trees. Homes typically provide two to three bedrooms, one bathroom, a compact open-plan living room, and a small outdoor area with an open carport or single garage.

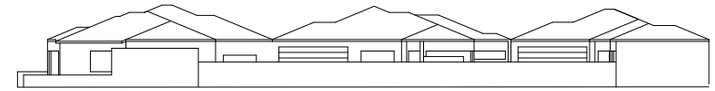
Construction logic
Clustered villas are closely related to the project home in approach, with slab-on-grade, double brick walls, 2.4m ceilings, tiled roofs, and aluminium joinery. Internal finishes tend toward the utilitarian: painted brick walls, tiled floors, and hollow-core doors. Private outdoor spaces are often poorly oriented, and pushed to 'leftover' block edges between the dwelling and the boundary.



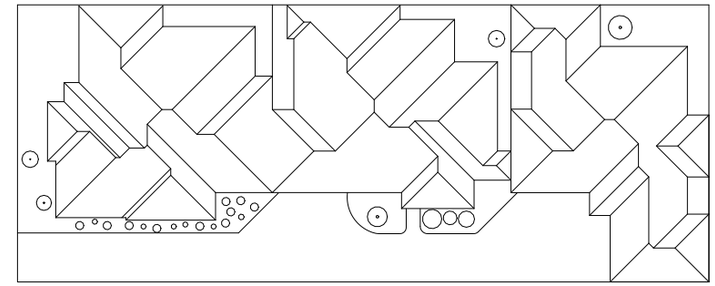
Section



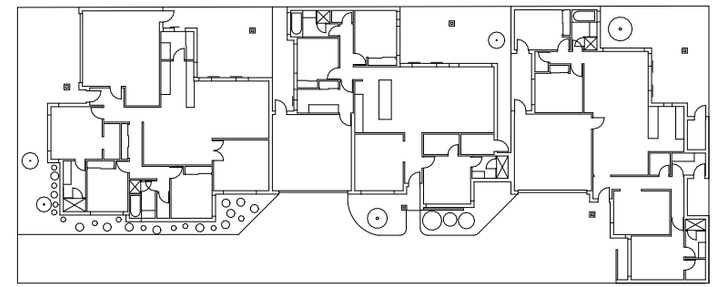
Elevation



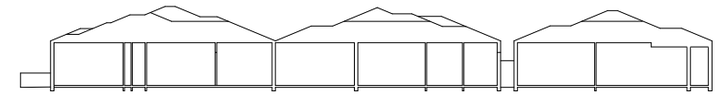
Elevation



Site Plan



Ground Floor Plan



Section

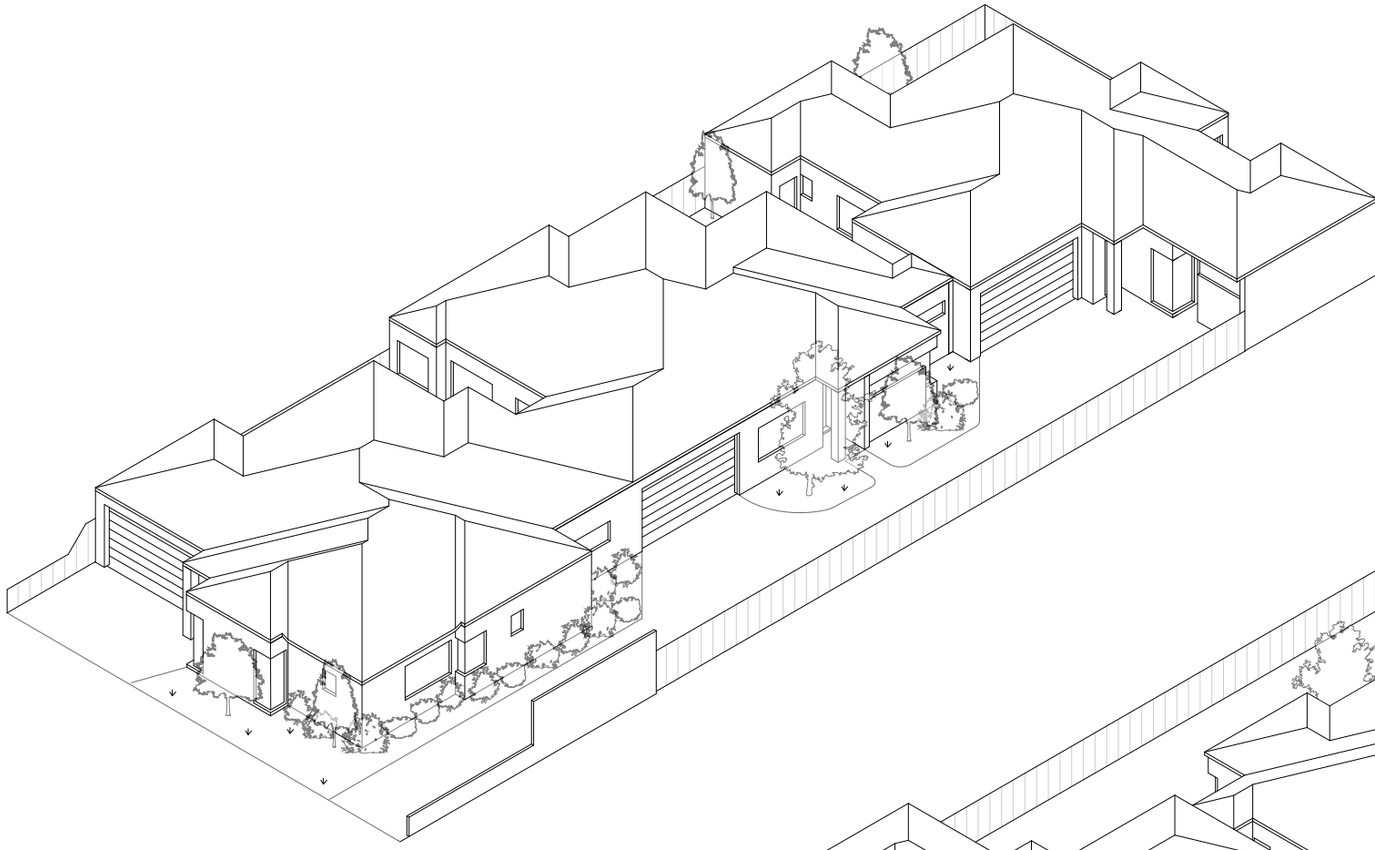
Lot Area
1016.3m²

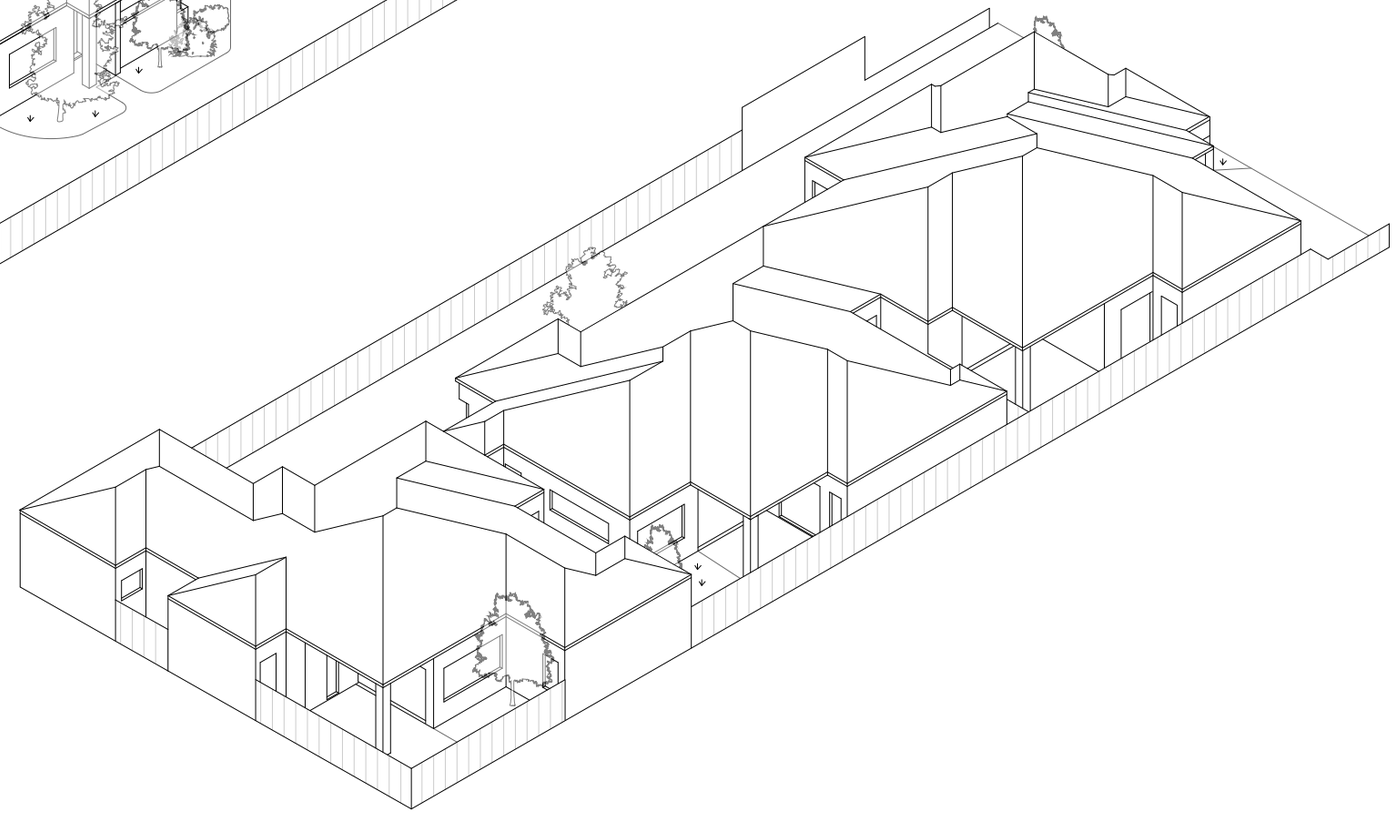
Site Dimensions
20.2 x 50m

Floor Area
565m²

0 2.5 5m

Villa Cluster
Front and Rear Views





0 1 2m

Villa Cluster Type Equivalent Form Mapping

Example Precinct: Carlisle



| Perth

Villa Cluster Type Equivalent Form Mapping

South-Eastern Suburbs



| Perth

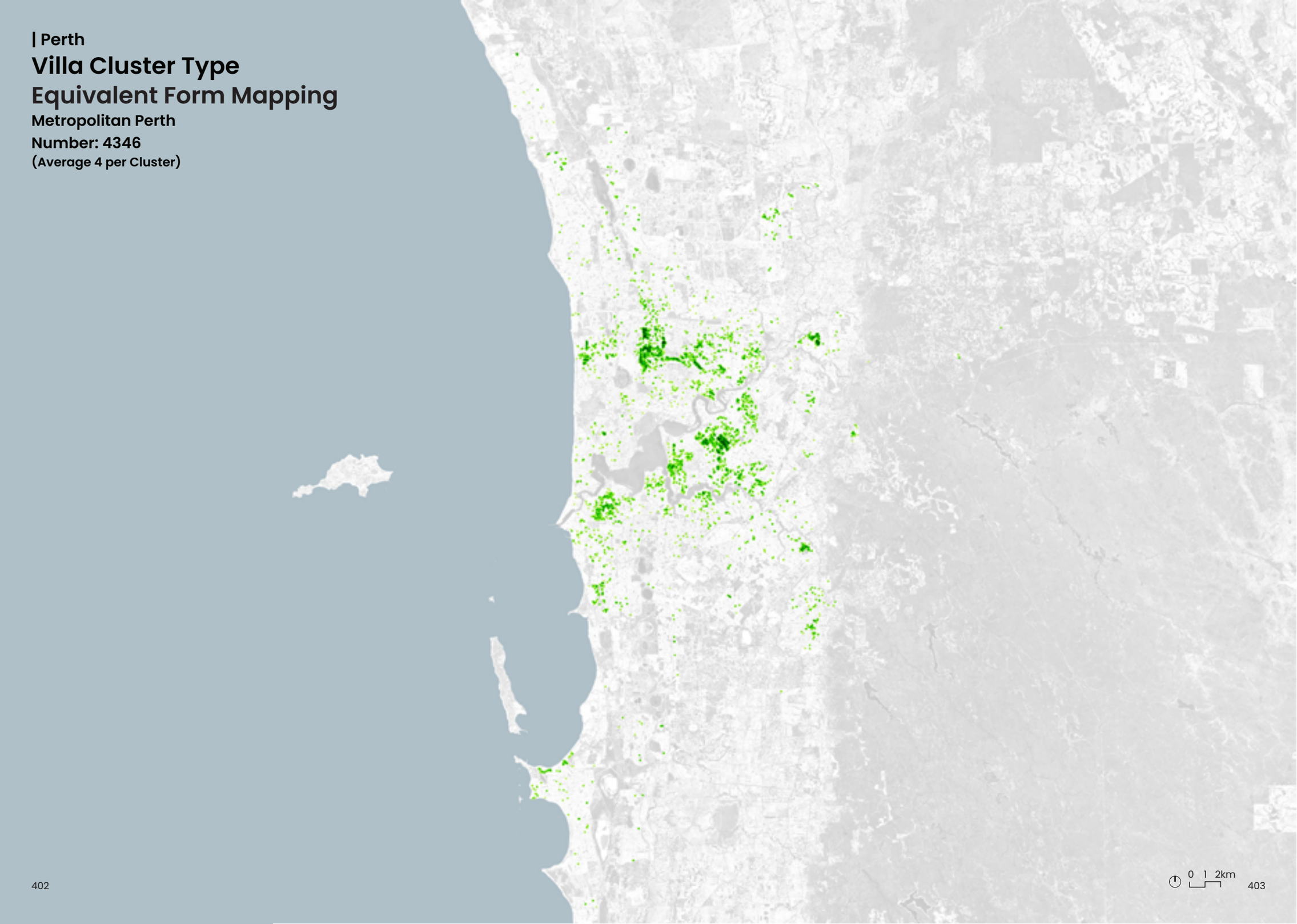
Villa Cluster Type

Equivalent Form Mapping

Metropolitan Perth

Number: 4346

(Average 4 per Cluster)



| Sydney

Bungalow
1930s-1940s

0 0.5 1km



Block Plan



Street Elevation

0 2.5 5m

Bungalow Description

When
The bungalow is the predominant suburban house type in Sydney during the interwar period.

Why
Derived from the Hindi 'bangla' – a modest home of straw or bamboo – the Anglo-Australian interpretation offered a simple, practical and affordable housing alternative to the preceding ornament and expense of the Victorian house style.

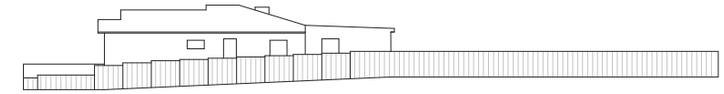
Where
The semi-detached version is common in the inner and middle-ring suburbs, where housing lots are long and narrow, and cars are typically parked out the front or on the street: this provides the potential to create second entrances for increased internal flexibility. Typically they feature an entry positioned centrally (which was not possible in earlier fully-attached terraces) with side entrances, accessed from pedestrian pathways to the backyard, allowing for efficient internal subdivisions.

Characteristic detail
The type includes single-fronted, double-fronted, semi-detached and freestanding dwellings that are characterised by floor levels raised above the ground to allow for the negotiation of slope, and generally feature four or five steps up to a recessed entry or covered front porch. These spaces offer refuge from and prospect to the street.

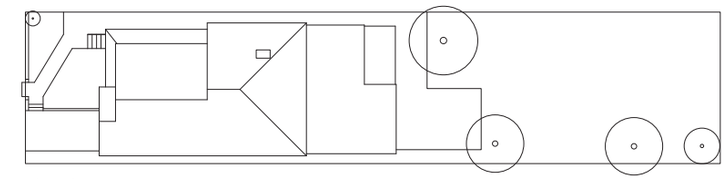
Construction logic
Bungalows are robust and cellular with linear proportions of double-brick construction, timber floors, tiled roofs and expressed gable ends. They offer a range of options for the addition of independent sub-dwellings, home offices or semi-independent flats, with minimal disruption to existing streetscapes. Established trees and gardens can be enhanced with additional planting throughout the site.



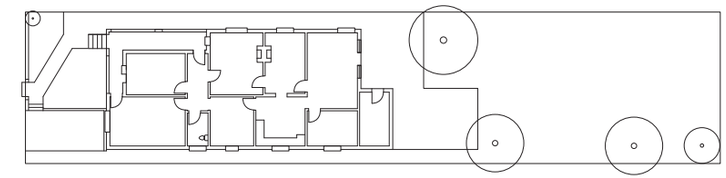
Elevation



Elevation



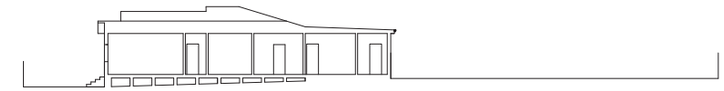
Site Plan



Ground Floor Plan



Section

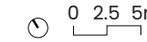


Section

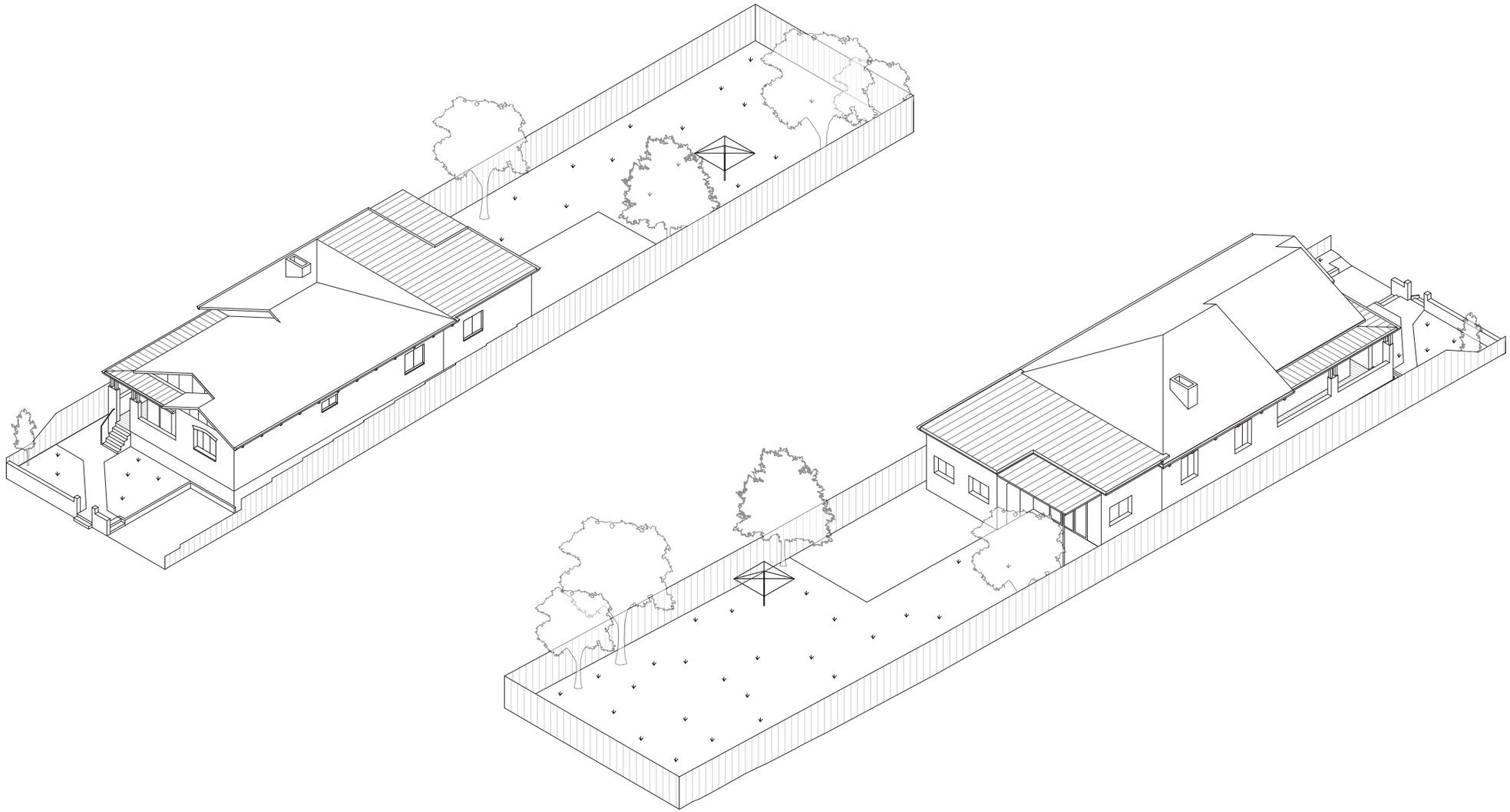
Lot Area
536.8m^2

Site Dimensions
11 x 48.8m

Floor Area
151m^2



Bungalow
Front and Rear Views



0 1 2m

Bungalow Type Equivalent Form Mapping

Example Precinct: Lakemba



| Sydney

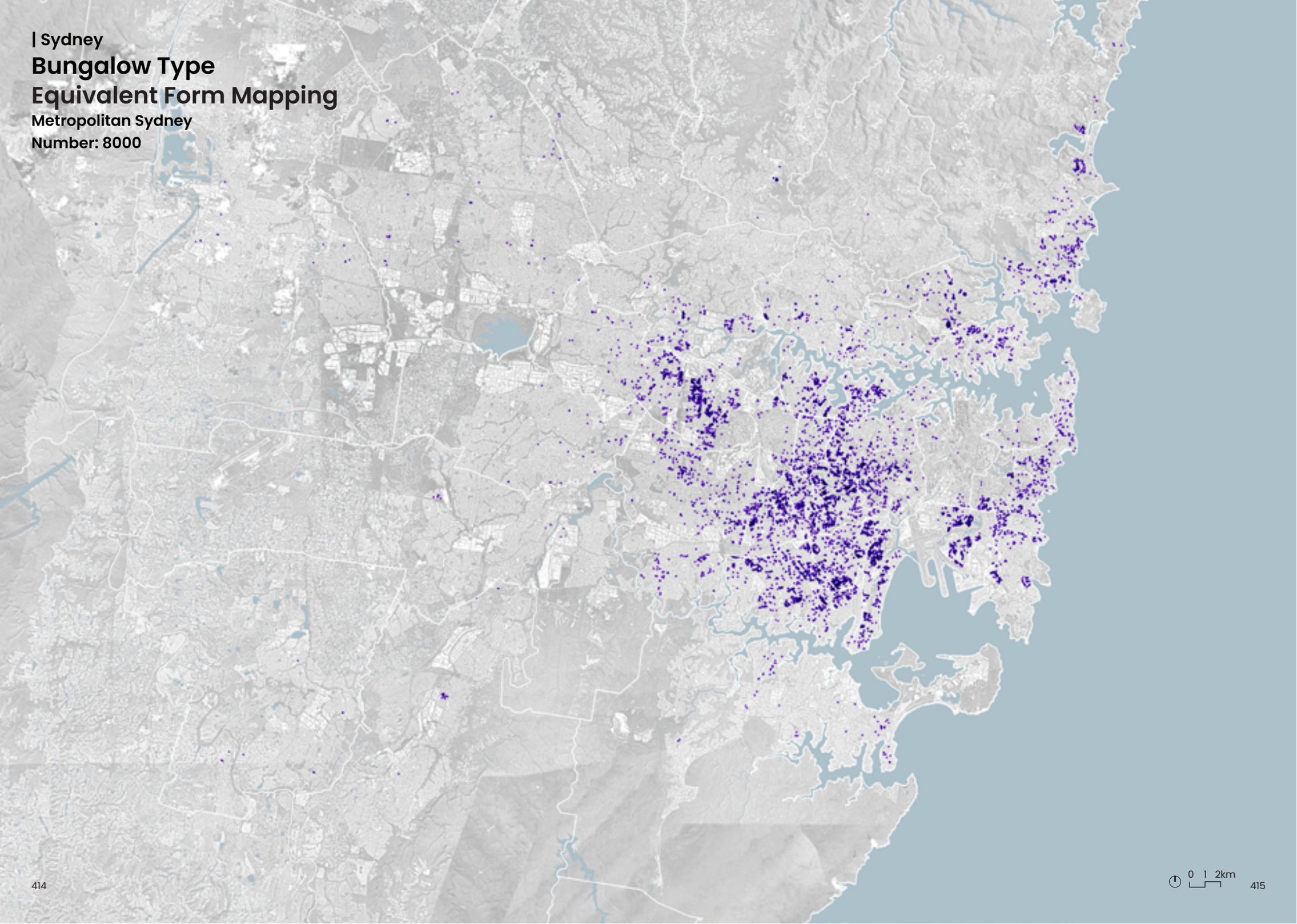
Bungalow Type
Equivalent Form Mapping
South-Western Suburbs



| Sydney

Bungalow Type
Equivalent Form Mapping

Metropolitan Sydney
Number: 8000



| Sydney

Cottage
1940s-1950s



0 0.5 1km

Block Plan



0 2.5 5m

Street Elevation

| Sydney

Cottage Description

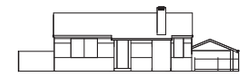
When
Once known as ‘austerity cottages’ these simple dwellings prevailed in the post-war period.

Why
Small and single-storey, this type of housing is a product of post-war material shortages and was a means to quickly and economically house the growing population during that era.

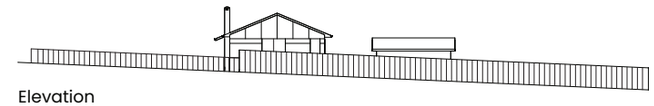
Where
Situated on generous plots of land, cottages are now comparatively modest houses relative to the scale of their larger neighbours, making them ripe for knock-down and rebuild development. However, if viewed strategically, the small footprint of these houses in relation to lot sizes offers the opportunity for more subtle, staged increases of density as well as dwelling diversity.

Characteristic detail
Cottages usually have highly efficient, cellular floor plans with a central entrance hall opening to a sitting-dining room and a separate kitchen at the rear, sometimes with an enclosed laundry adjacent. A two- or three-bedroom cluster sits beside a single bathroom with WC. Laundry lines and separate sheds are common additions to the rear of homes, as are garages or car ports beside the main dwelling, accessed from hardscape driveways. Established trees and gardens are also typical.

Construction logic
Cottages are usually built with lightweight timber construction and feature tiled hip or gable roofs and timber sash windows. Their materiality and highly efficient compact floor plan allows for the adoption of a ‘village’ plan that enables separate volumes added to the lot – each with an independent entrance and shared amenity. This additional dwelling can create several small structures across one or more adjacent sites to form a cohousing-type development model.



Elevation

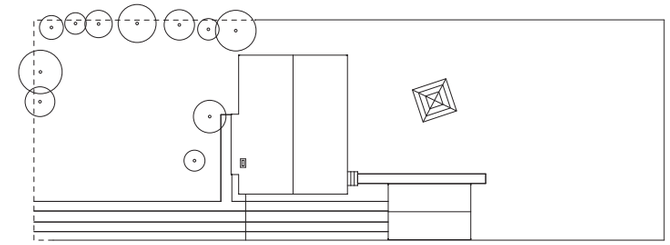


Elevation

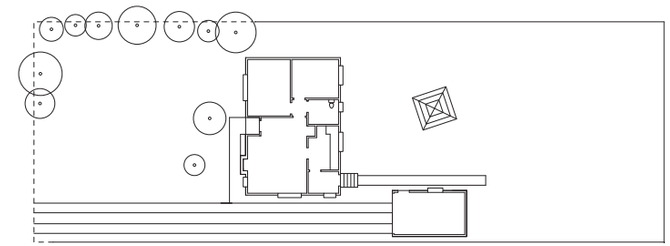
Lot Area
720m^2

Site Dimensions
16 x 45m

Floor Area
75m^2



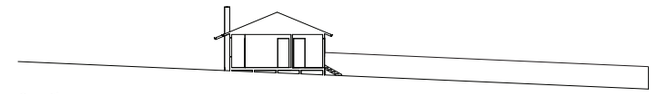
Site Plan



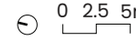
Ground Floor Plan



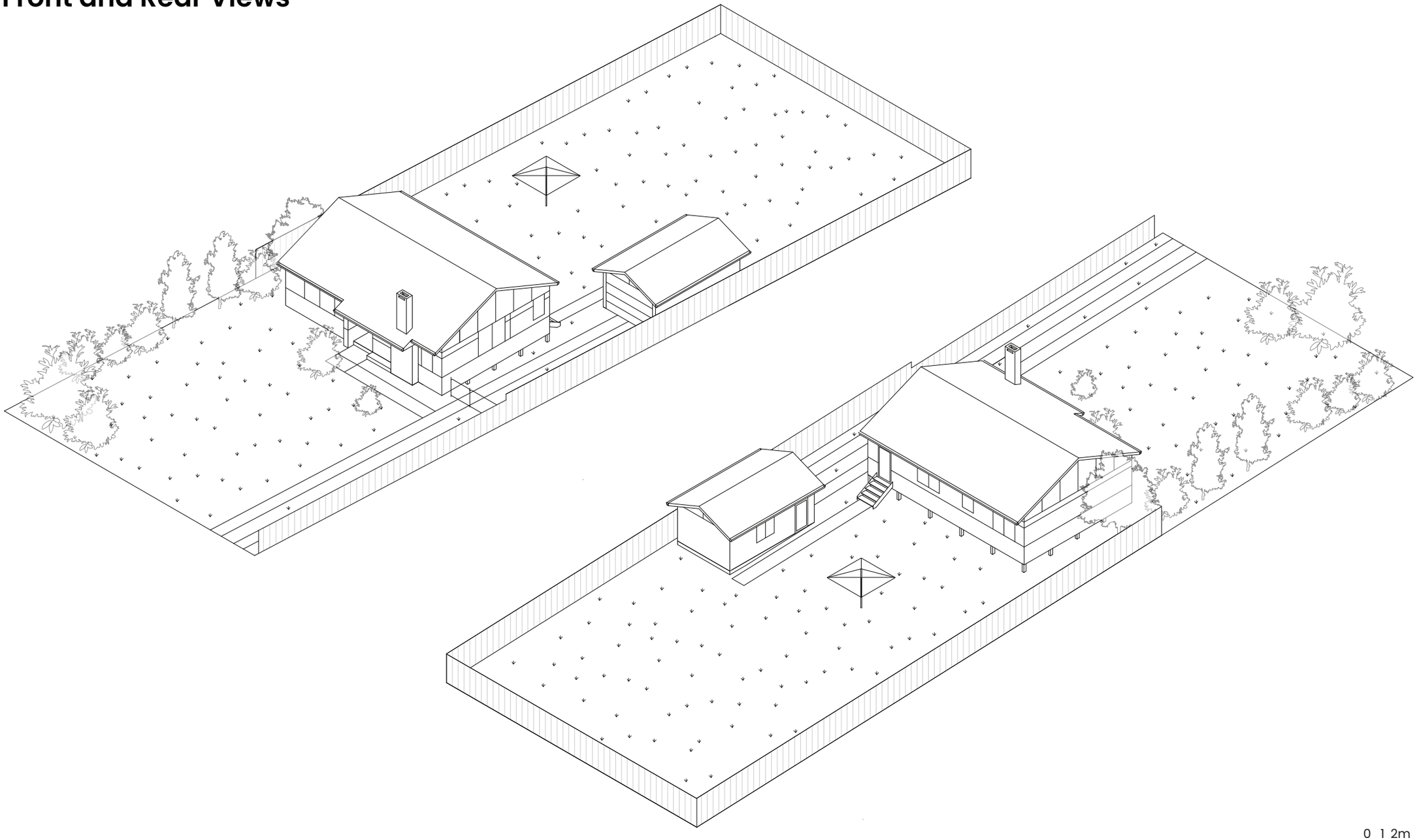
Section



Section



Cottage
Front and Rear Views



0 1 2m

Cottage Type Equivalent Form Mapping

Example Precinct: Seven Hills



Cottage Type
Equivalent Form Mapping
Western Suburbs



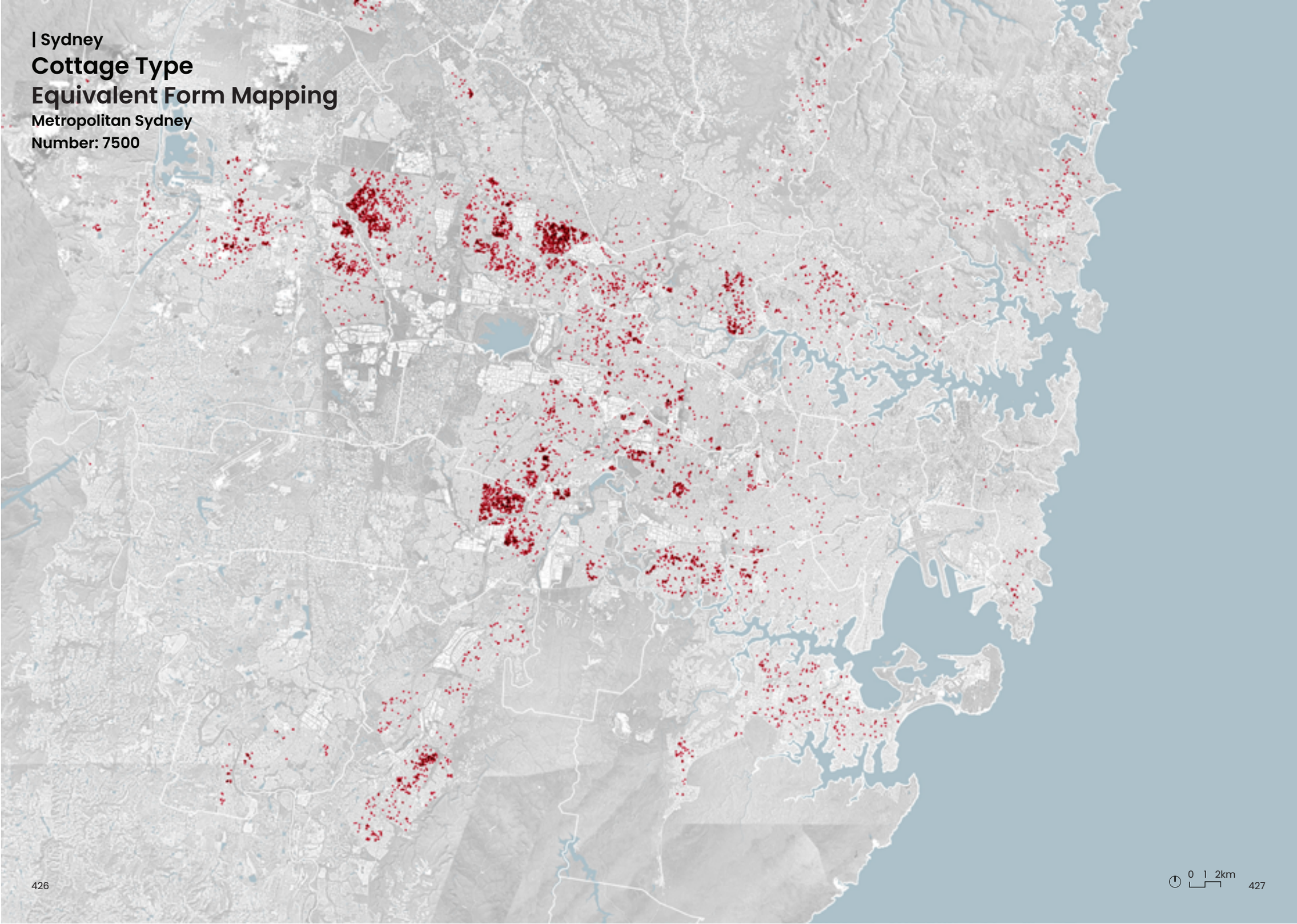
| Sydney

Cottage Type

Equivalent Form Mapping

Metropolitan Sydney

Number: 7500



| Sydney

Walk-Up Flats
1960s-1970s

Block Plan

0 0.5 1km





Street Elevation

0 2.5 5m

Walk-Up Flats Description

When
The result of late 1950s changes to Stage Government planning controls and medium-density suburban development, this typology delivered efficient housing.

Why
The proliferation of walk-up flats is testament to the historical profitability of this model, which responded to the demand for more affordable housing options in inner- and middle-suburban locations that were otherwise dominated by freestanding 'family' homes.

Where
Developed for common, single suburban allotments, the compact walk-up apartment building is often located in established suburbs that are close to services and public transport. This supports the reduction of parking allocation and the release of land for other uses. An advantage of their comparatively small size is that agreement and cooperation across the group of strata title owners (usually between six to eight) generally presents fewer logistical hurdles than larger body-corporate structures.

Characteristic detail
Walk-up flats are typically organised over two levels; sometimes this increases to three or four on sloping sites or where local council controls were more lenient. Their stretched horizontal forms are sometimes elevated on piloti, and almost all walk-ups include concrete surface parking and driveways. Designed to provide economical rental accommodation, their modest stretched horizontal forms and floor plans gave each dwelling a small kitchen, living-dining room and bedroom, often with the bathroom ensuite.

Construction logic
Extremely basic and lacking in external landscape amenity, this common type nevertheless offers considerable potential for sustainable uplift, as they generally feature solid construction, efficient internal floor plans, good surface area and cross ventilation. Retrofitting opportunities include increasing landscape amenity, enabling site permeability, and adding a lift for universal accessibility.

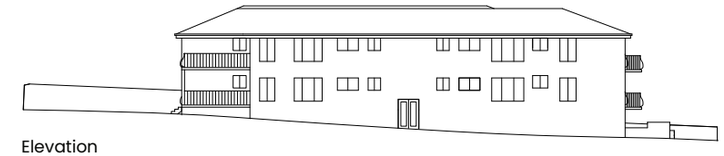


Elevation

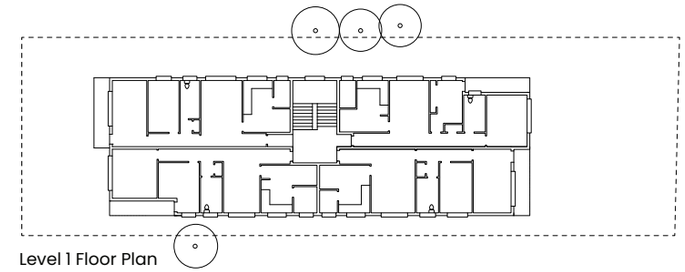
Lot Area
750m^2

Site Dimensions
50 x 15m

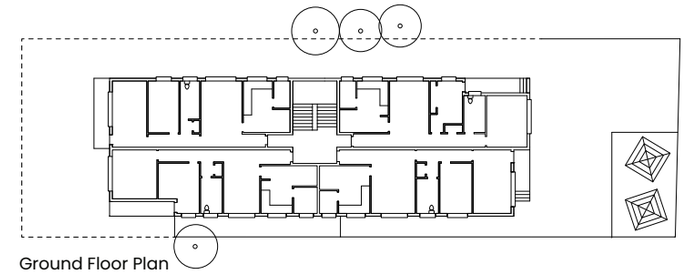
Floor Area
335m^2



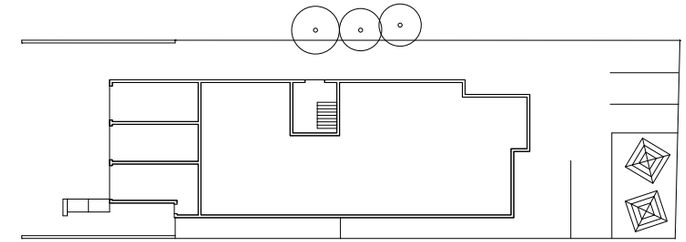
Elevation



Level 1 Floor Plan



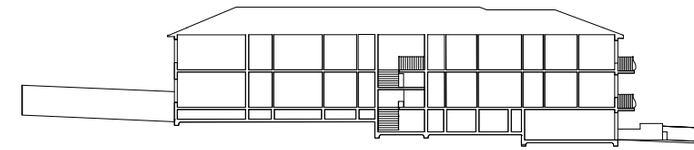
Ground Floor Plan



Basement Floor Plan



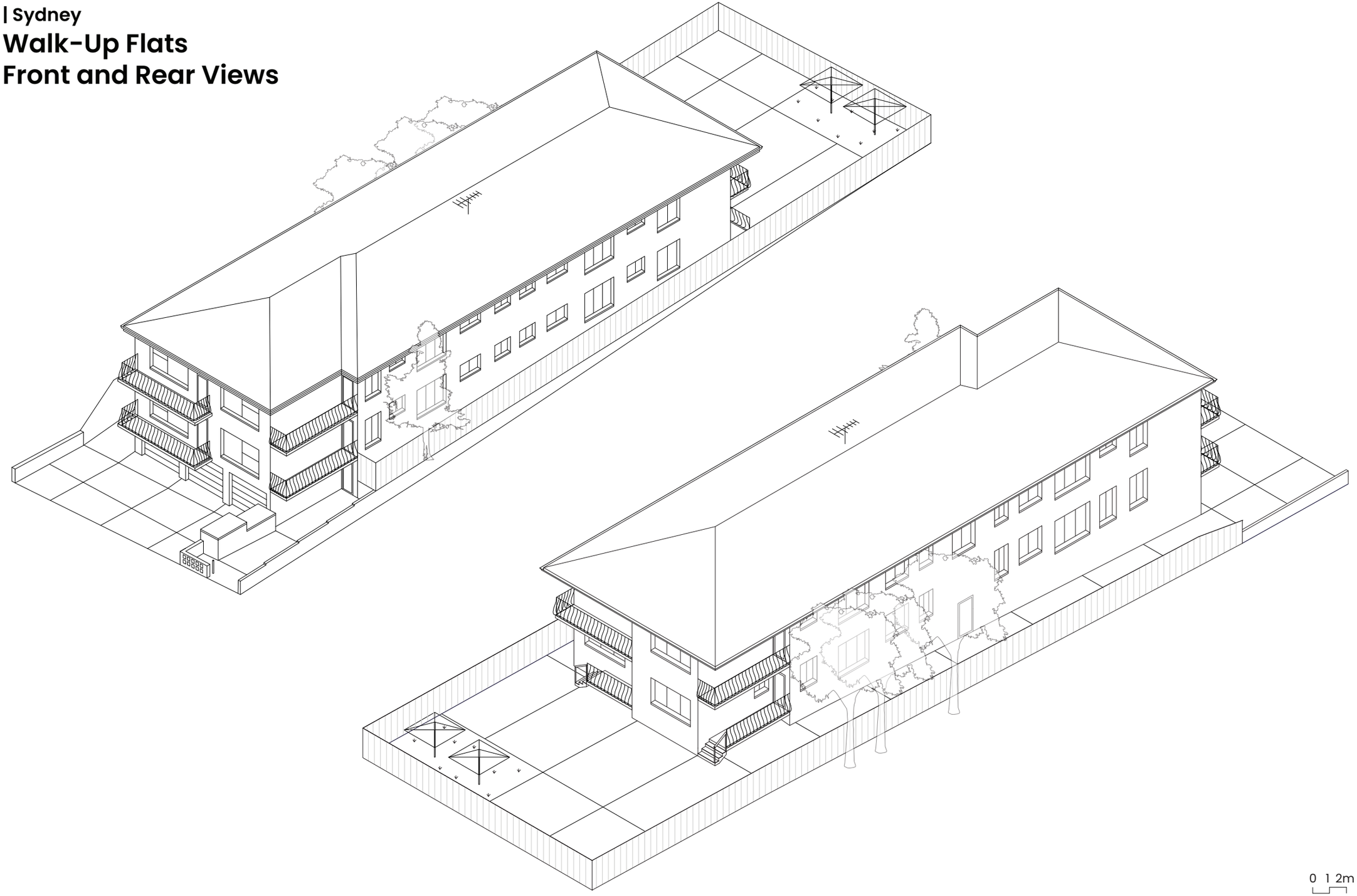
Section



Section

0 2.5 5m

Walk-Up Flats
Front and Rear Views



0 1 2m

Walk-Up Flats Type Equivalent Form Mapping

Example Precinct: Wiley Park



| Sydney

Walk-Up Flats Type
Equivalent Form Mapping

South-Western Suburbs



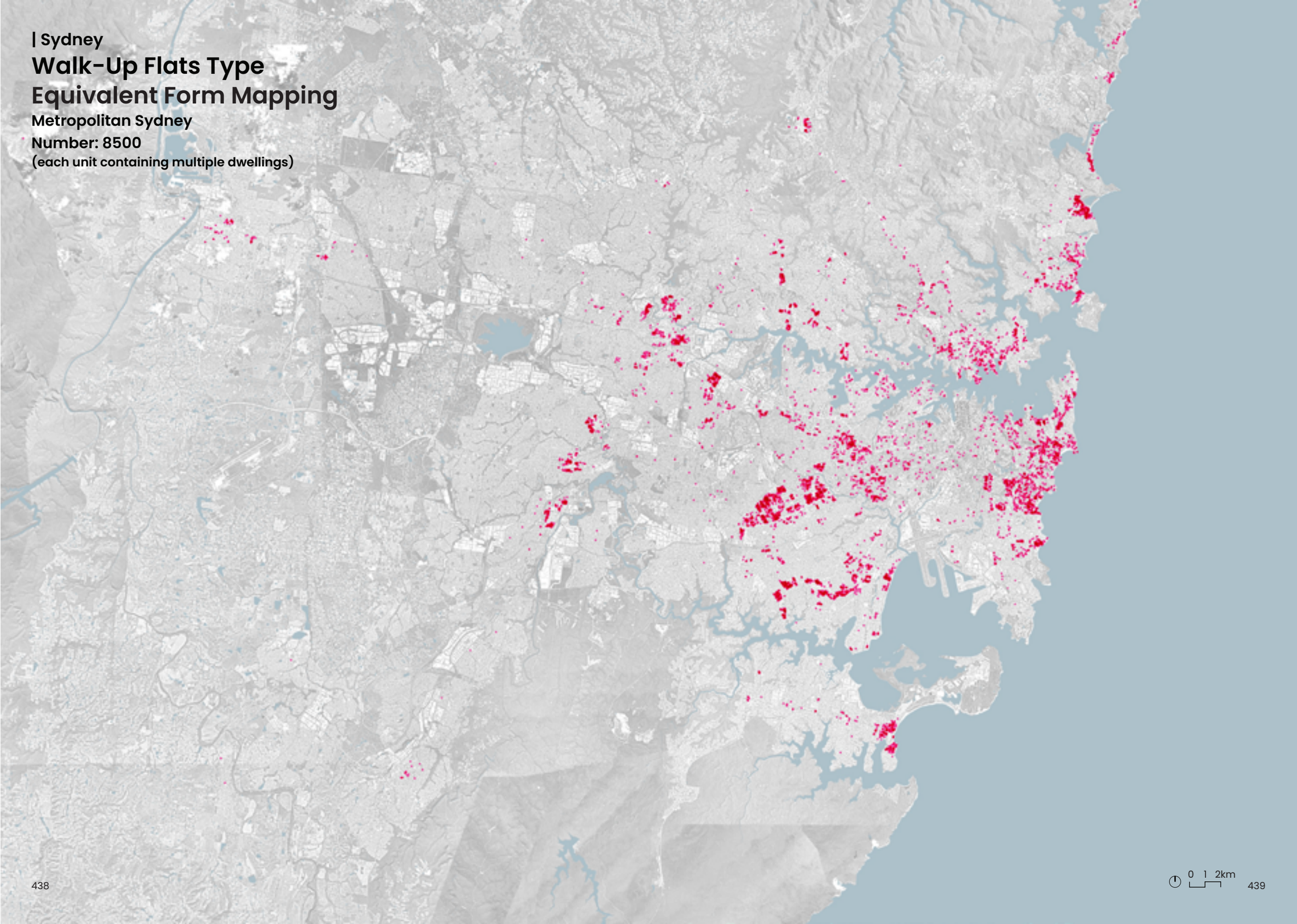
| Sydney

Walk-Up Flats Type
Equivalent Form Mapping

Metropolitan Sydney

Number: 8500

(each unit containing multiple dwellings)



0 1 2km

| Sydney

Villa
1960s-1970s

Block Plan



0 0.5 1km



Street Elevation

0 2.5 5m

Villa Description

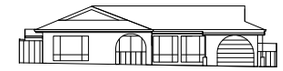
When
This archetypal detached suburban home proliferated from the 1960s to the late 1970s across Sydney.

Why
Post-war immigration and the baby boom gave rise to a multicultural city: Sydney was home to more than 20% of Australia's population by the early 1960s. Patterns of settlement were shaped by cultural and economic considerations, with many villas built on what were then the outskirts of the metropolitan area.

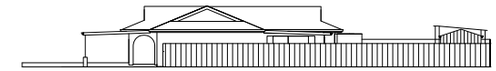
Where
The freestanding brick-veneer villa still dominates many suburban streetscapes: what were outer suburbs in the 1960s are now middle suburbs with comparatively high amenity. Without heritage protection, these dwellings are vulnerable to demolition as land values rise.

Characteristic detail
These homes often appear grander than they are: brick arches and Italianate balustrades belie a comparatively modest scale by current standards. Most houses contain three bedrooms and a single bathroom. Typically single-storey, though double-storey examples exist, they are set on generous allotments and are often well-oriented with large windows.

Construction logic
Simple volumes and generous site setbacks allow for easy retrofitting, while slab-on-ground construction provides good accessibility for ageing in place. The type offers strong potential for extension and remodelling to support multi-generational living, shared households, and supported living arrangements on a single suburban site. Brick garages present opportunities for simple independent accessible units, with parking relocated to new lightweight structures or shared at the front of the site. Increased landscaping can further enhance accessibility and provide outdoor spaces suited to both private and communal use.



Elevation

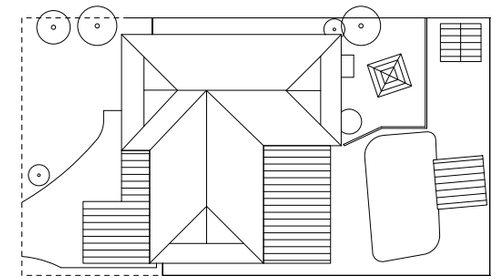


Elevation

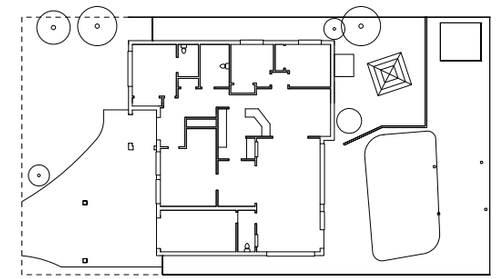
Lot Area
647.5m^2

Site Dimensions
18.5 x 35m

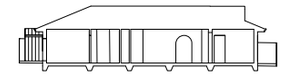
Floor Area
242m^2



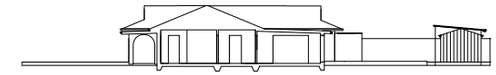
Site Plan



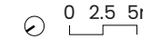
Ground Floor Plan



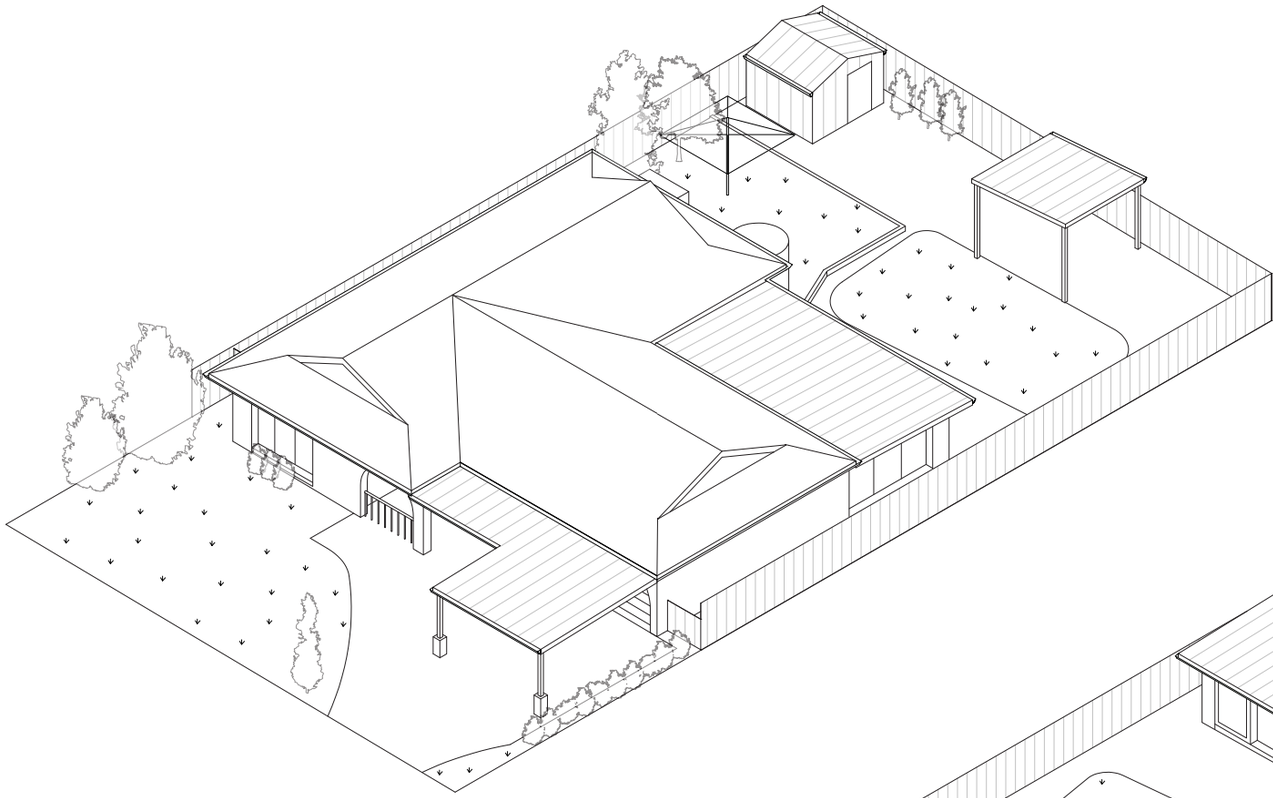
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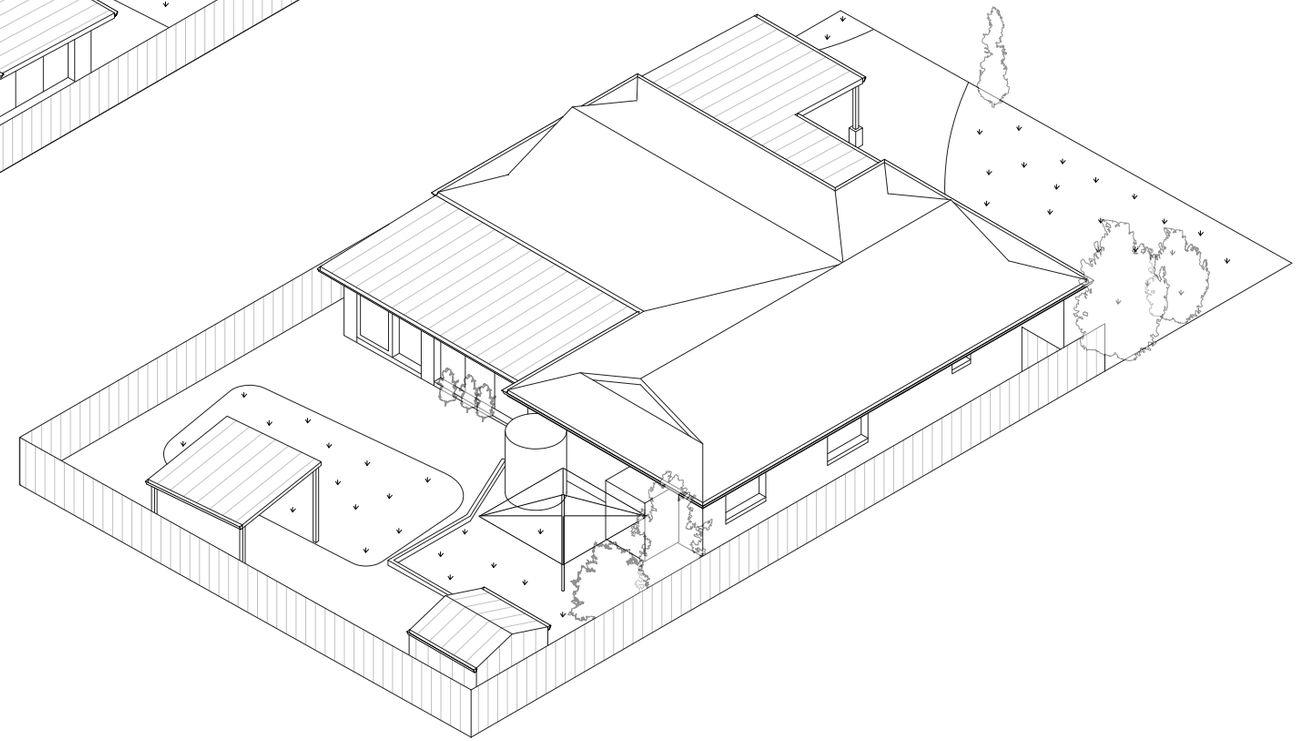


Section



Villa
Front and Rear Views





0 1 2m

Villa Type Equivalent Form Mapping

Example Precinct: St Clair



Villa Type
Equivalent Form Mapping
Western Suburbs



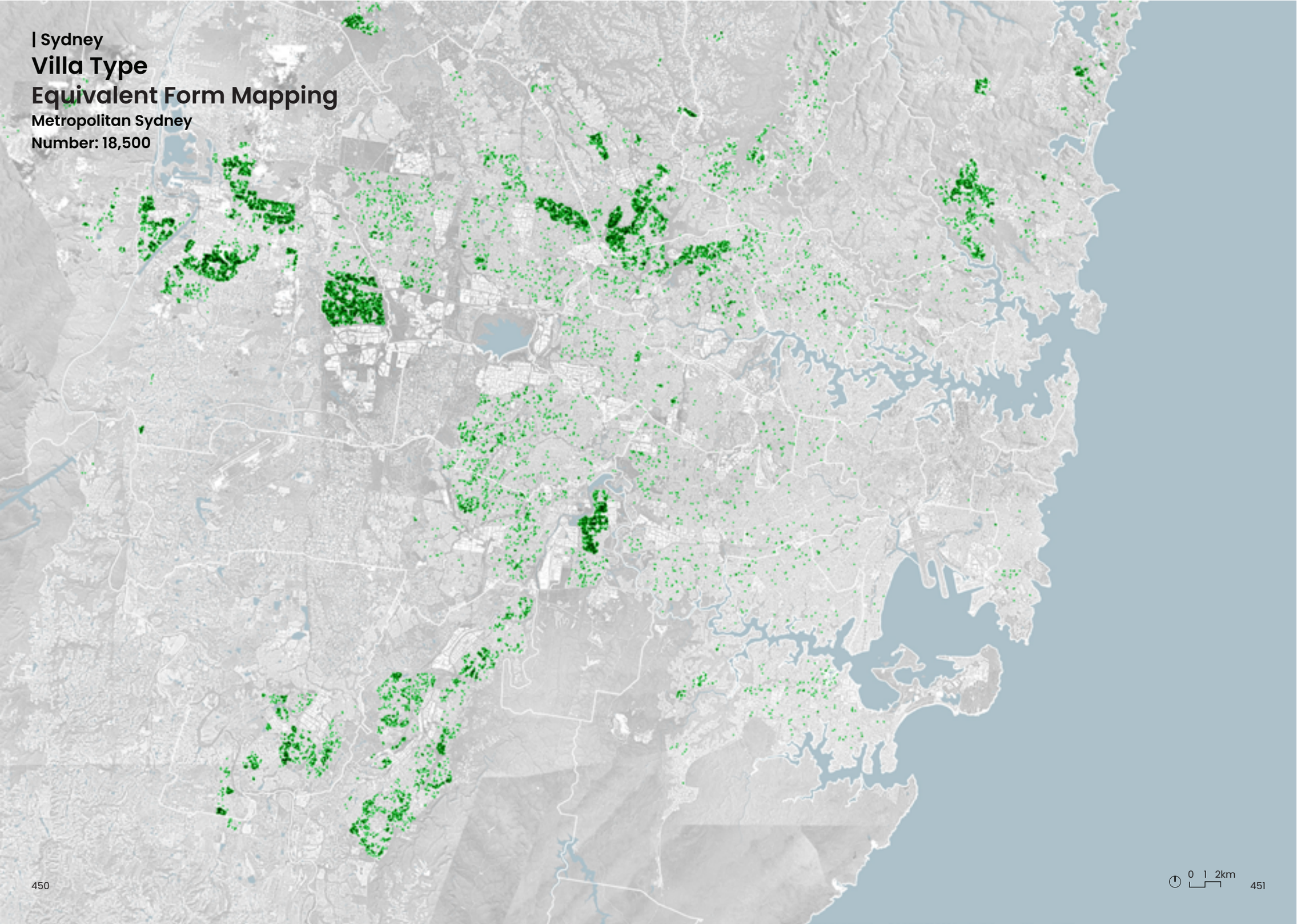
| Sydney

Villa Type

Equivalent Form Mapping

Metropolitan Sydney

Number: 18,500



| Sydney

Mansion
1990s-Ongoing

0 0.5 1km

Block Plan





Street Elevation

0 2.5 5m

Mansion Description

When
The rise of the mansion house from the early 1990s is a consequence of changes to residential land zoning and the expansion of suburban sprawl in Australian cities.

Why
Constrained land availability of inner and middle-ring suburbs led to increases in greenfield residential development, giving rise to sites that are largely reliant on private vehicle transport and are underserved by local services and amenities.

Where
Compared to the suburbia of the 1960s and 1970s, most dwellings built in the decades since 1990 on greenfield estates are large and aspirational, earning them the derogatory nickname 'McMansions'. The footprint of these suburban houses have steadily increased in size while being sited on increasingly smaller plots of land, resulting in narrow side and rear setbacks with building dimensions that are more urban than 'suburban'. In other words, the built form is the prevailing streetscape, rather than green leafy outlooks that are associated with suburbia.

Characteristic detail
The mansion typology is typically one or two storeys, with a double garage that dominates the street frontage. Most homes accommodate at least four bedrooms and two bathrooms, including a dedicated master suite with self-contained bath, wardrobe and 'retreat' area. At ground level, multiple living areas will often include kitchen, dining, sitting, family, media room and home offices, and a separate WC or bathroom.

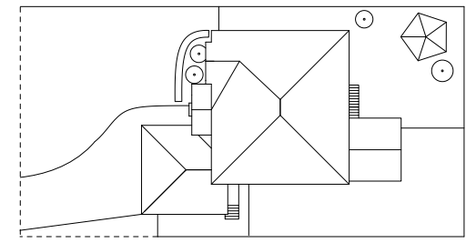
Construction logic
Built with lightweight board or masonry, or combinations of these, homes are typically concrete slab on ground, with timber-framed roofs and timber internal walls. The standardised double-garage dimensions, large internal floor area and building-in-the-round qualities lend themselves to many types of internal retrofit, by which density and diversity can be increased without dramatic formal or visual changes to the exterior.



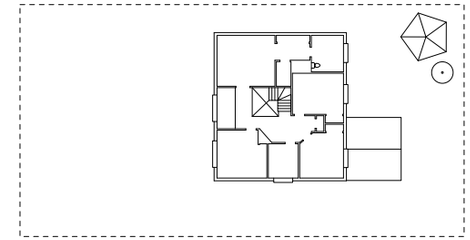
Elevation



Elevation



Site Plan

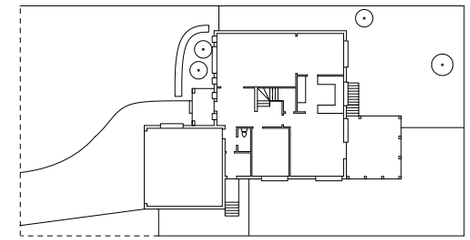


Level 1 Floor Plan

Lot Area
504m2

Site Dimensions
15.75 x 32m

Floor Area
297m2



Ground Floor Plan



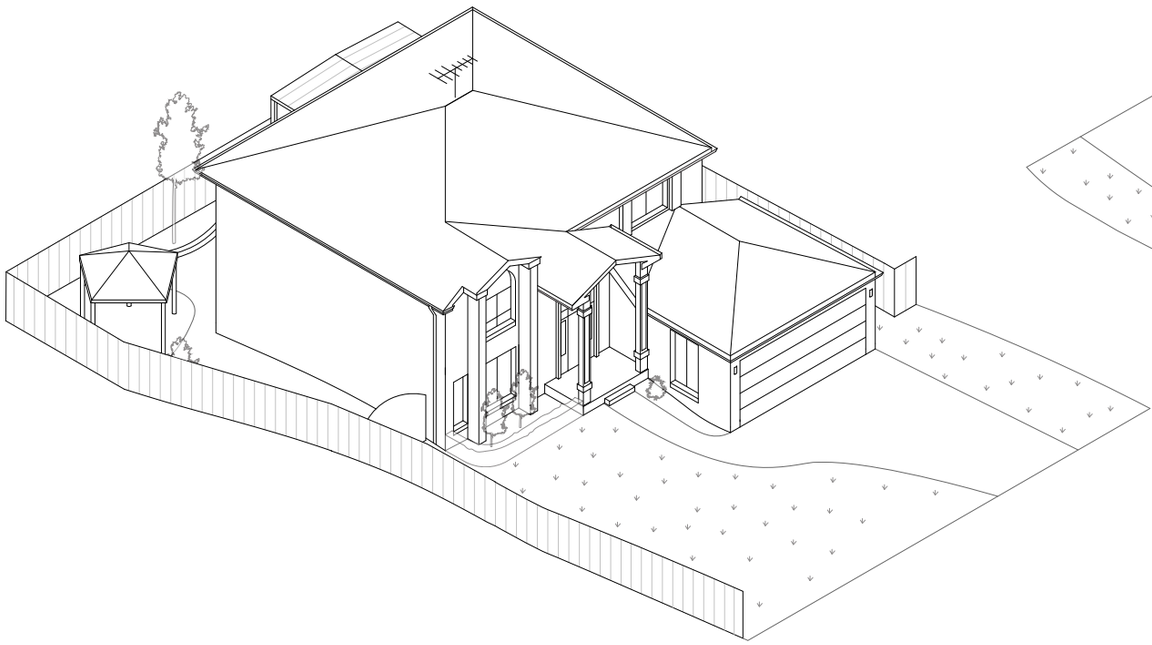
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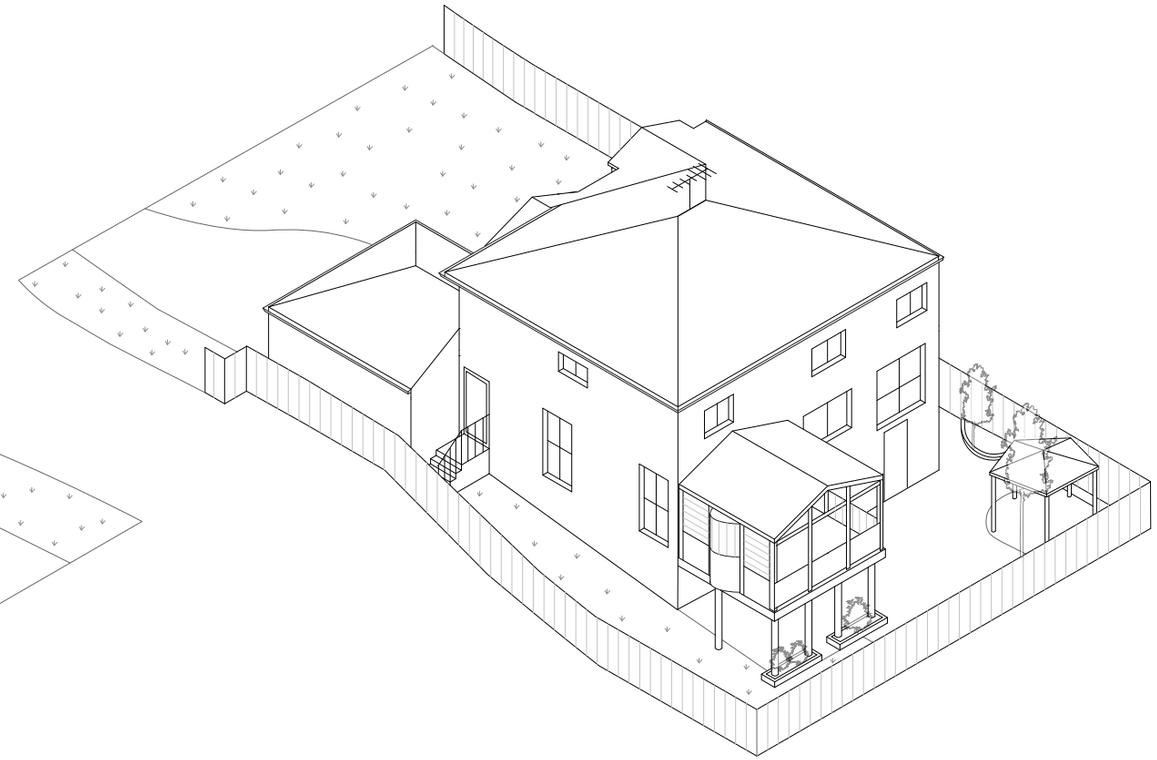


Section

0 2.5 5m

Mansion
Front and Rear Views





0 1 2m

Mansion Type Equivalent Form Mapping

Example Precinct: Cherrybrook



| Sydney

Mansion Type
Equivalent Form Mapping
North-Western Suburbs

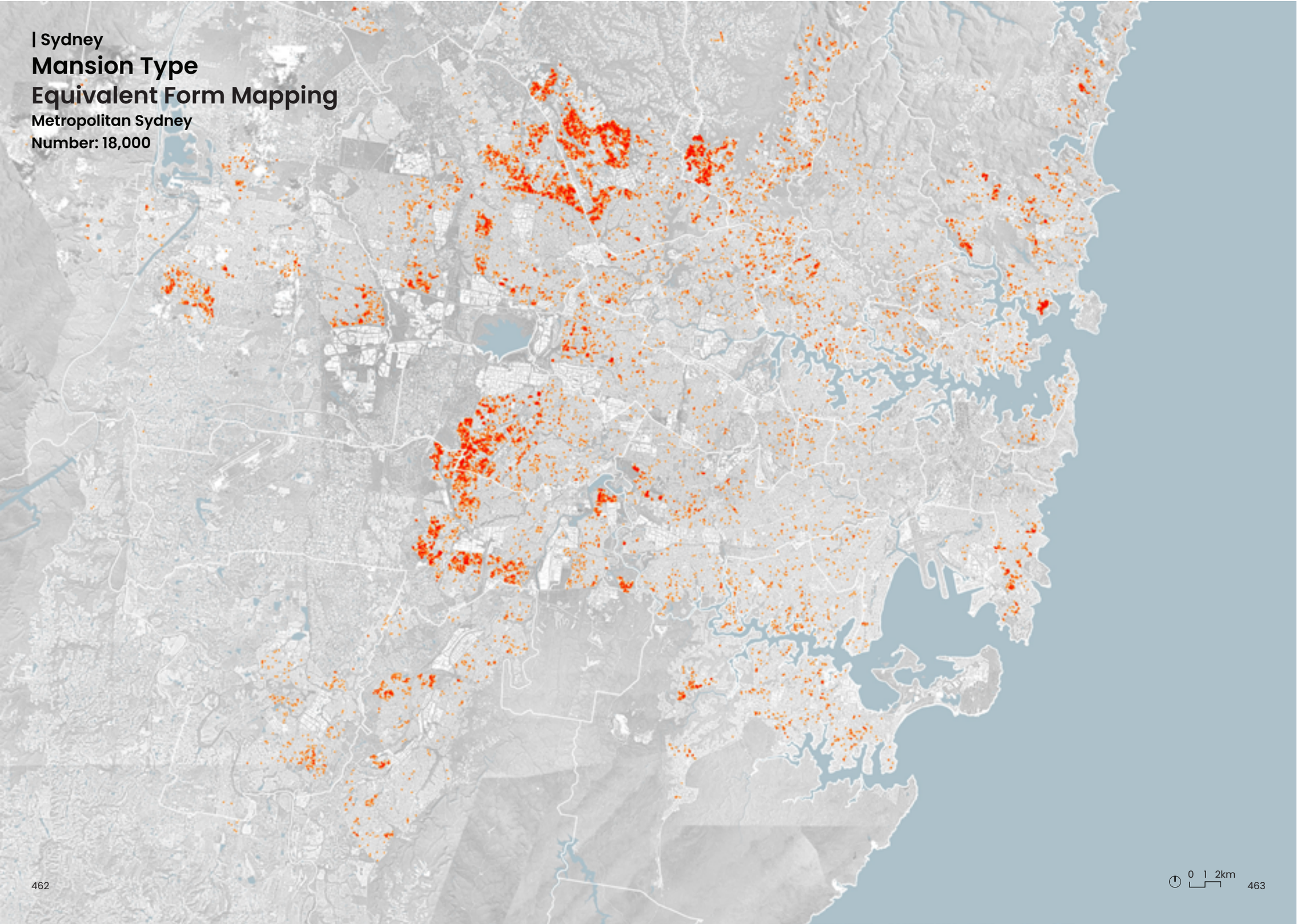


Mansion Type

Equivalent Form Mapping

Metropolitan Sydney

Number: 18,000



Actions + Impacts

Actions + Impacts

Retrofit and greening actions

Retrofit actions were developed through design research tests across a range of typological scenarios. This process built on the preceding GANSW report to reconfigure, subdivide or extend existing dwellings through addition or subdivision. Suitable actions depended on common housing characteristics such as plot size, dwelling footprint and building form.

The design testing sought to retain and improve common housing stock through the use of standard construction materials and systematic retrofit approaches. Where possible, these approaches were aligned with MMC and designed for application across multiple typologies to achieve increased density and diversity at scale.

The testing produced two retrofit actions:

Modular addition: a new room, component or whole building that can occur at different scales and provide different functions depending on the dwelling type.

Soft subdivision: an internal or external delineation of dwellings to increase flexibility and density, without the burden of legal subdivision. This action enables a single dwelling to become multiple dwellings with individual entries. Examples include a dual-key property, multigenerational home, or home-and-income scenario.

Each retrofit action is illustrated through detailed design drawings that show the dimensional and construction logic of the intervention. In each case, schematic designs demonstrate how the approach could be applied across multiple housing types to form a family of retrofit actions.

Greening actions complemented the retrofit actions. These strategies promote the essential role of trees and greenery to protect against urban heat gain, biodiversity loss and poor public health outcomes, as well as promoting biophilic benefits of green environments. Actions to achieve greening include increasing planting and tree canopy cover, protecting existing lots with deep soil zones, and redistributing the quantity and location of hardscape surfaces, such as concrete driveways to enable more permeable ground.

These design propositions are drawn diagrammatically to scale, enabling estimated increases in greening across a range of dwelling and allotment scenarios. This approach is illustrated in this section using four Sydney-based typologies.

Definitions

In relation to the retrofit actions outlined, a set of working definitions underpins this study. Defining these terms ensures that density, diversity and greening are assessed consistently across all housing types and retrofit scenarios. These definitions establish the analytical framework through which the project measures spatial, social and environmental outcomes. They include:

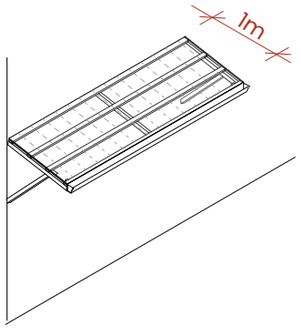
Density, as adopted in this study, refers to the effective quantity of households that could be delivered at site and urban scales through retrofit actions. Actions may range from modular studio units to entire apartments and houses. Density is measured through the uplift in independent households, noting that regulatory, planning and financial frameworks will determine the extent to which these households can exist as independent legal assets that are capable of being sold separately. Increasing effective household density enables more people to be accommodated on each site by providing additional building area and greater dwelling diversity.

Diversity, as adopted in this study, refers to dwellings that support a wider range of inhabitants, household structures and uses. This includes multigenerational living, co-living, ageing in place, affordable small-footprint dwellings, home-and-income arrangements, live-work uses and dual-key configurations. The diversity impact is determined by the increased range of dwelling types and use scenarios that are made possible through retrofit.

Greening, as adopted in this study, refers to the estimated increase in vegetation achieved by retaining and/or planting trees, and by converting hardscape surfaces to porous alternatives where possible. Greening is measured by the potential canopy increase per square metre, as established through design testing. Because canopy trees require minimum deep soil areas to support viable root structures, this requirement has been factored into the retrofit design proposals.

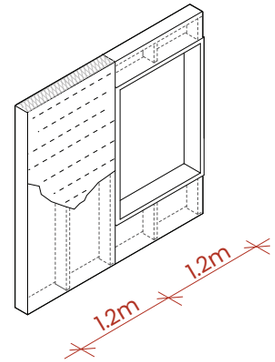
Modular Addition Element

Modular building elements for efficient adaptation of existing dwellings and integration in new secondary buildings



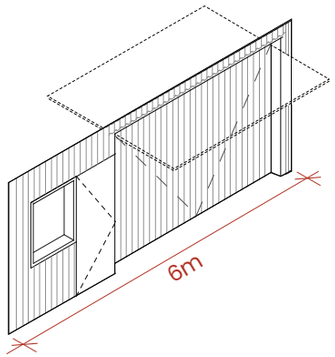
Canopy

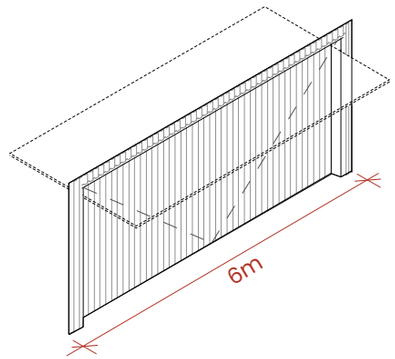
Canopy for plug-in external cover at window, door or veranda



Wall Panel & Window

Modular wall and window panel with standard dimensions





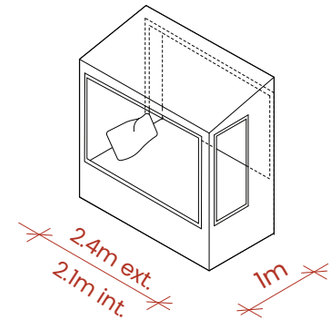
Garage Door Types

Variety of garage door types to fit standard garage opening

- Tilt panel + door/ window, for adaptation to accommodate new functions (studio, workspace)
- Tilt panel, for flexible use

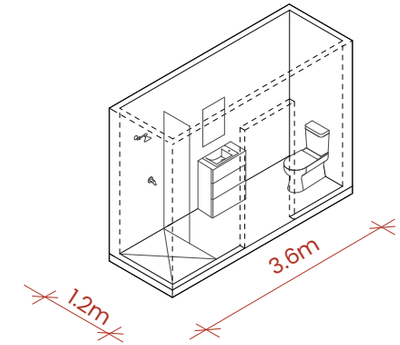
Modular Addition Spatial Unit

Modular spatial units for efficient adaptation or integration into new secondary buildings



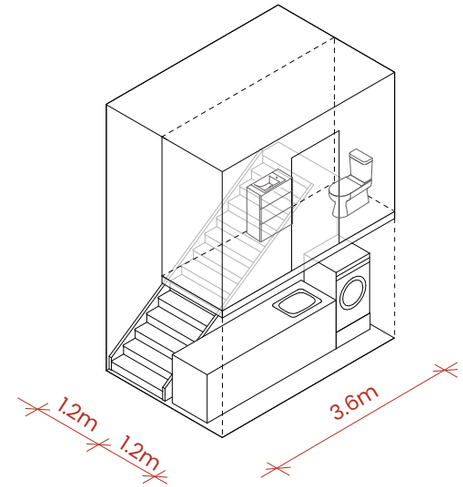
Bay Window or Covered Balcony

Additional space for indoor/ outdoor uses



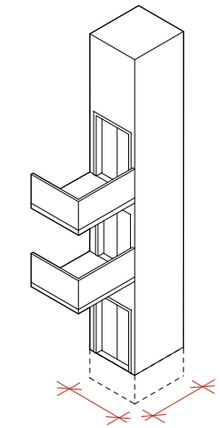
Bathroom

Linear arrangement of shower, basin, toilet for efficient floor plan



Stair, Laundry, Bathroom

Two storey spatial unit in efficient linear arrangement to provide laundry, stair and bathroom

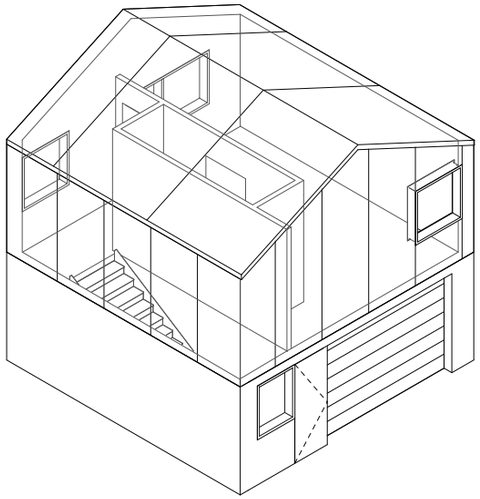


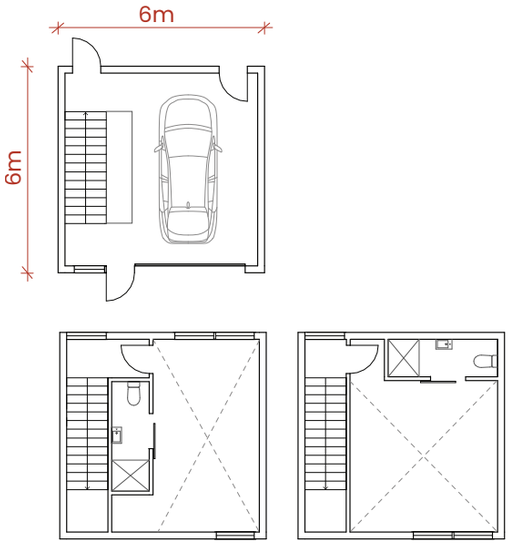
Elevator + Balcony

Integrated elevator shaft and balcony for accessibility and added amenity for walk-up flats and formal equivalents

Modular Addition Building

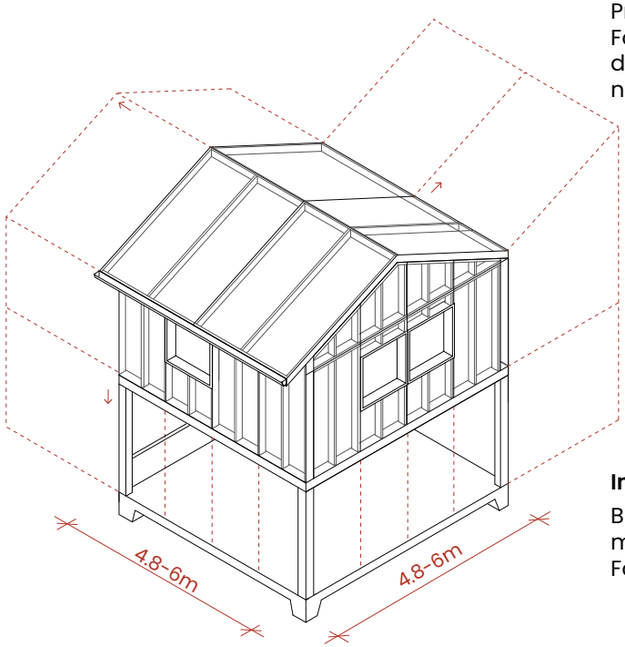
Building system suitable to mass-timber, CLT, or cassette-type low-carbon prefabrication





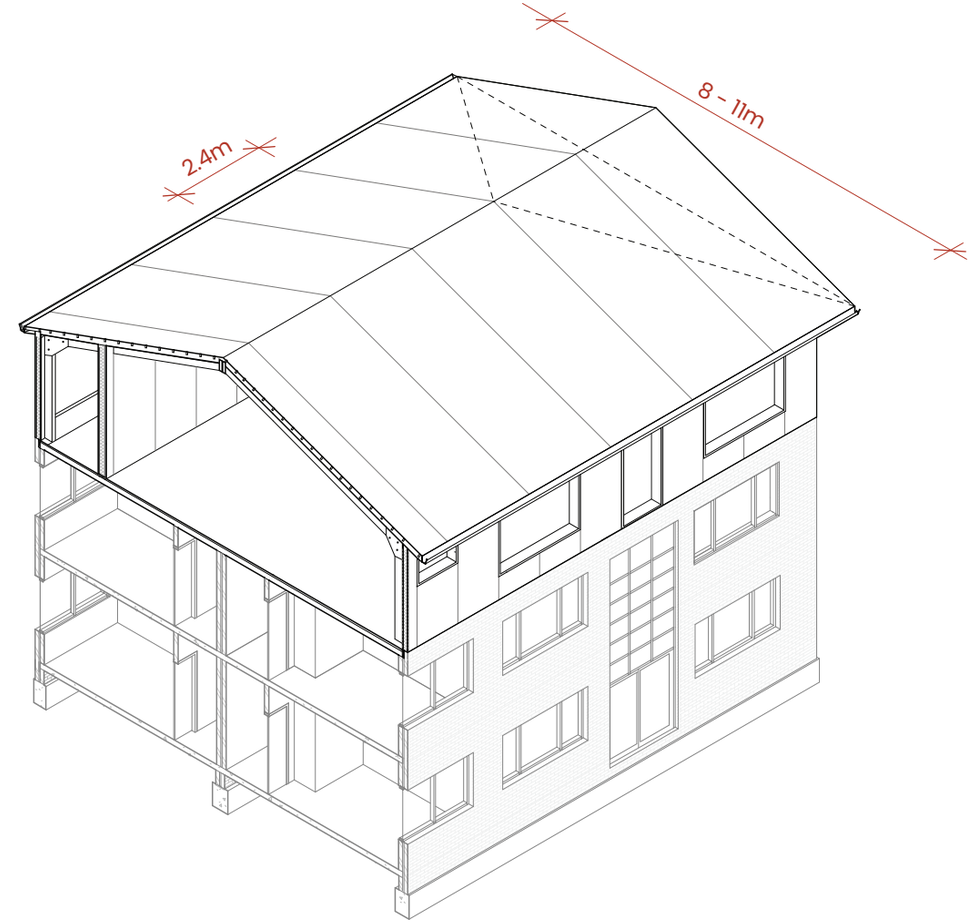
Garage + Studio

Prefabricated studio addition. For application above existing double garages, and as part of new carport additions.



Independent Secondary Buildings

Building modules, in panelised lightweight modular and expandable construction. For a variety of applications.



Additional Level

New level and roof in prefabricated and panelised lightweight modular construction, applicable to walk-up flats and formal equivalents.

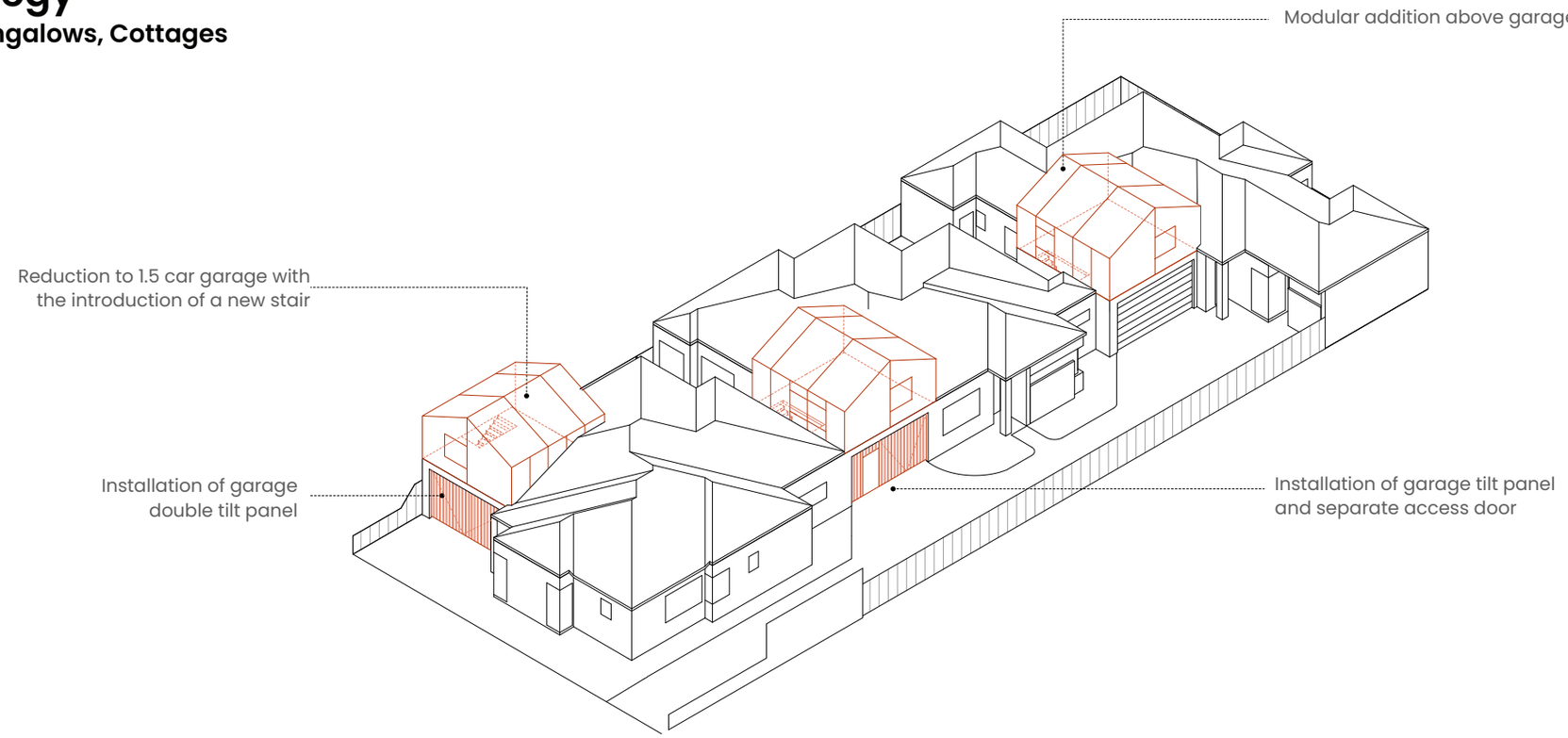
Garage - Studio Module
Modular Addition Strategy

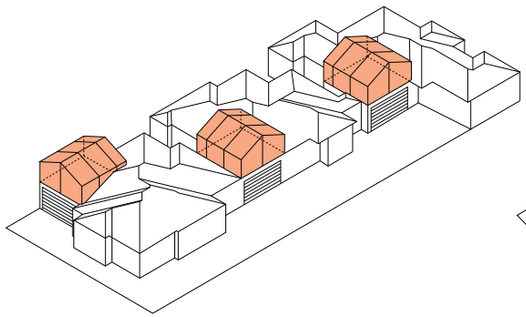
Applies to: Villa Clusters, Villas, Bungalows, Cottages

A standardised lightweight addition to existing garages or carports serves as an independent living or working space with an integrated bathroom, kitchenette, and laundry. This strategy is suited to villa clusters, and other housing with independent garages.

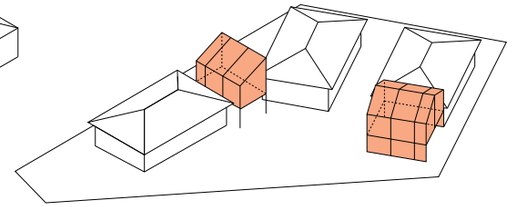
Alterations can be made to the garage itself through new components that increase their range of uses, such as a shopfront door that converts the garage into a commercial space.

A similar strategy can be adopted for cottages and bungalows; their variation in size allows for single or multiple additional dwelling units to the rear of plots.

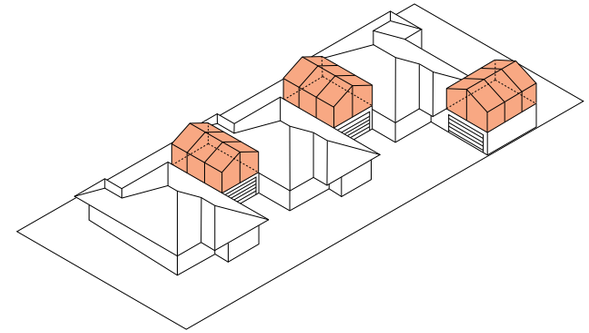




Perth Villa Cluster
Modular Addition



Hobart Villa Cluster
Modular Addition

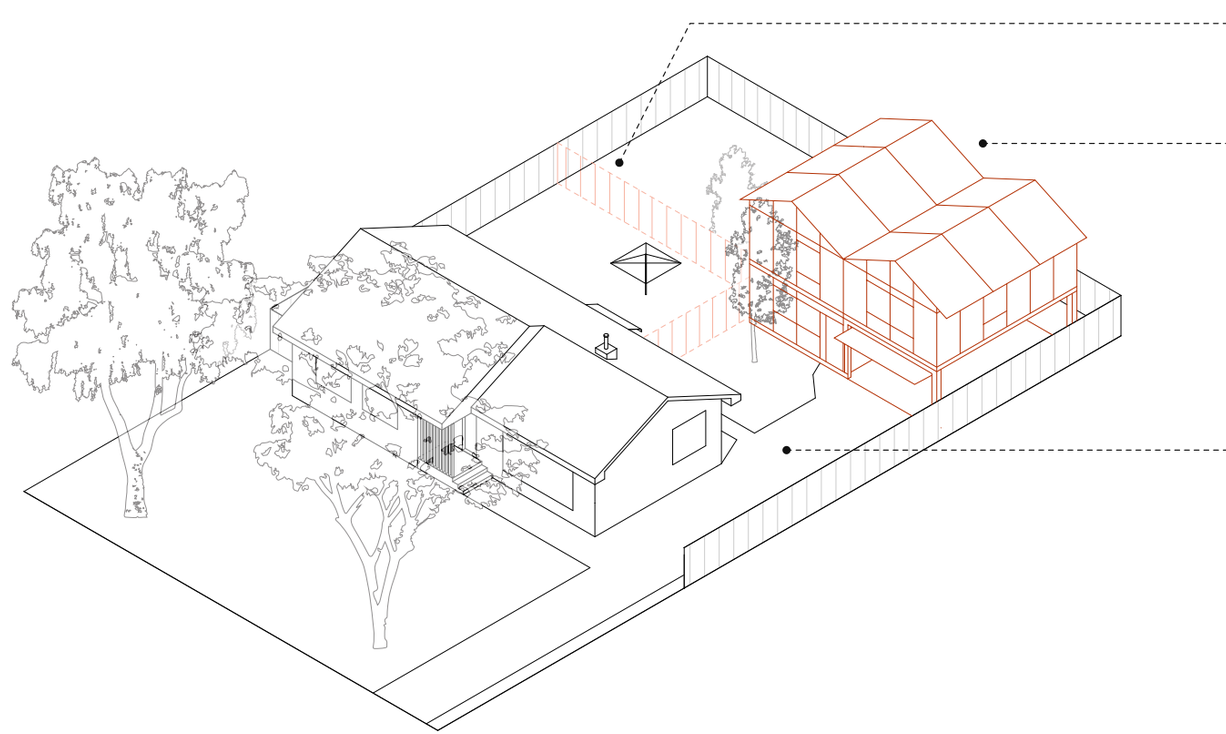


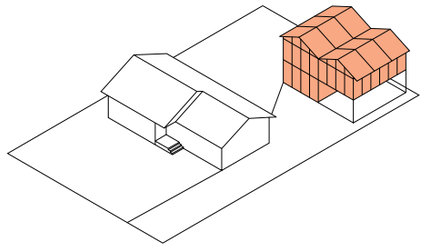
Melbourne Villa Cluster
Modular Addition

Secondary Building Modular Addition Strategy

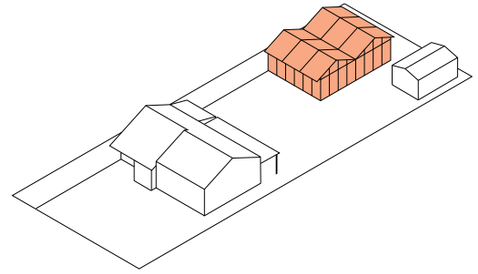
Applies to: Bungalows, Cottages

On larger cottage sites which typically have small footprint buildings, independent ancilliary buildings can be provided to increase flexibility of use. Shown here are modular additions combined in different ways. Emphasising small footprint efficiency maintains adequate area for canopy trees and private outdoor space. Car parking can be integrated as either enclosed or covered external areas.

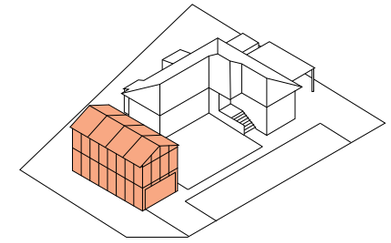




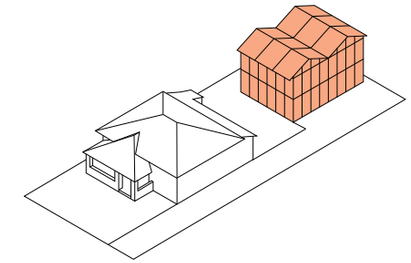
Canberra Cottage
Modular Addition



Adelaide Cottage
Modular Addition



Brisbane Cottage
Modular Addition

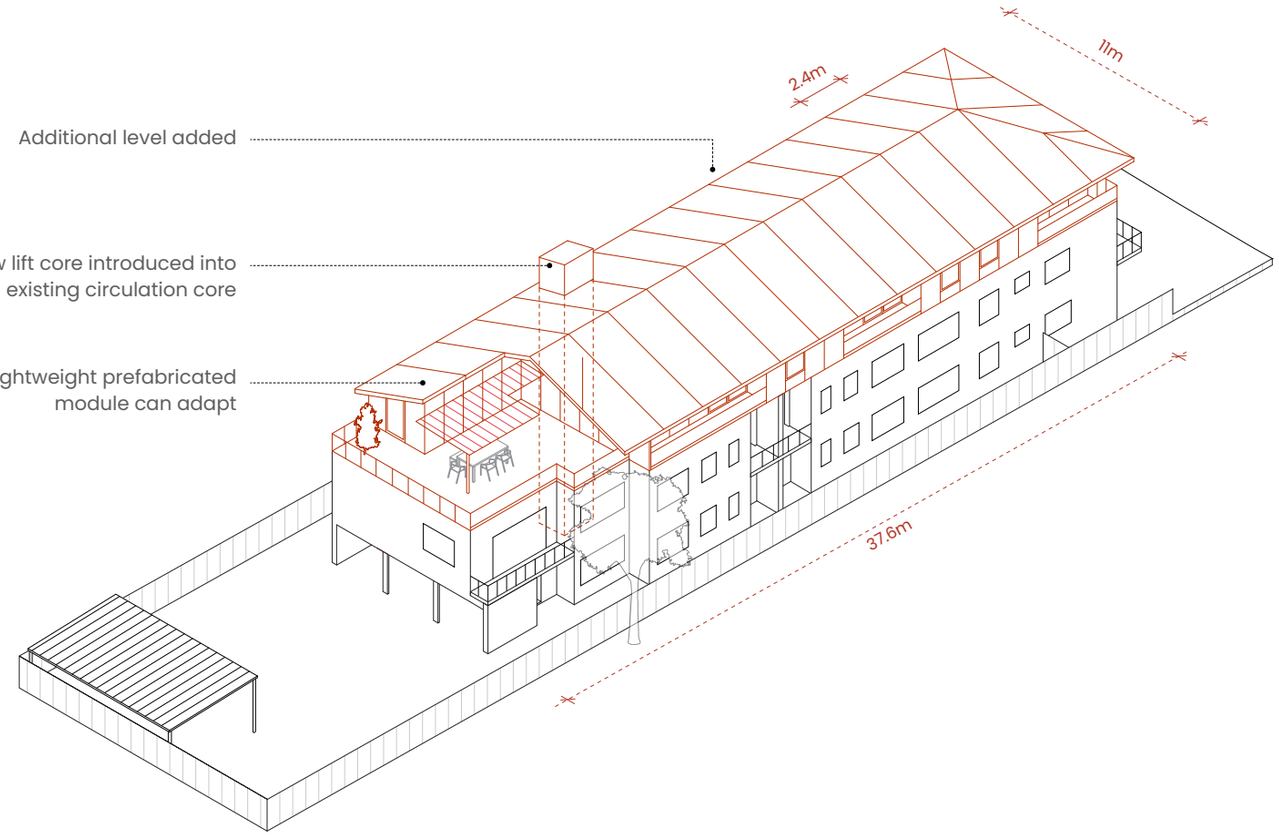


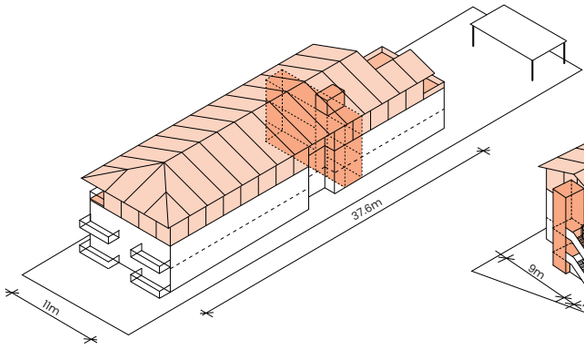
Perth Cottage
Modular Addition

Additional Level Modular Addition Strategy

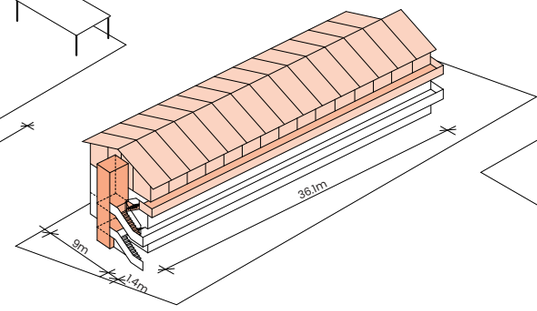
Applies to: Walk-Up Flats

Robust construction of walk-up flats allows for the addition of a lightweight floor level of four to six additional flats. An integrated or plug-in lift added to the existing circulation increases accessibility and allows for the building type to accommodate aging-in-place.

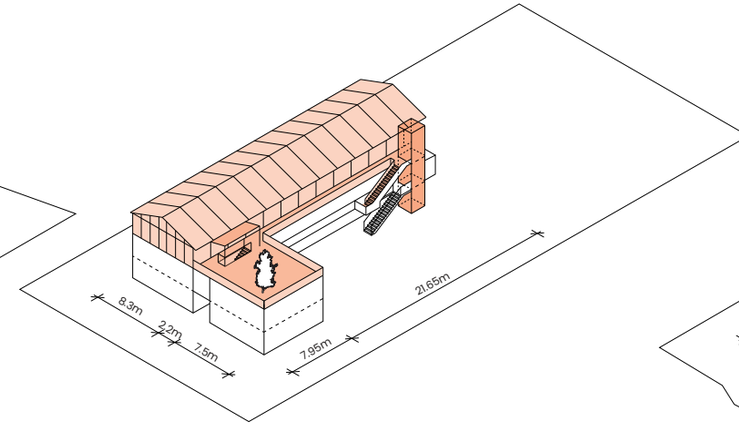




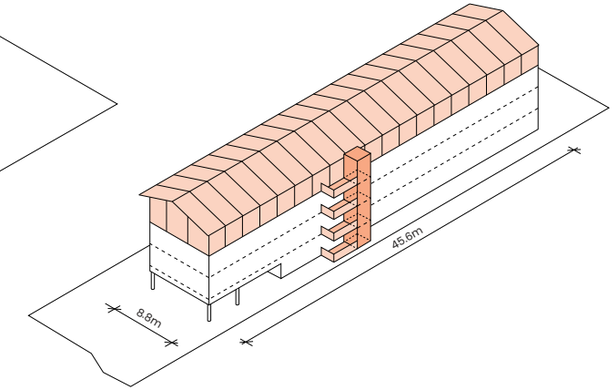
Sydney Walk-Up Flats
Modular Addition



Adelaide Walk-Up Flats
Modular Addition



Perth Walk-Up Flats
Modular Addition

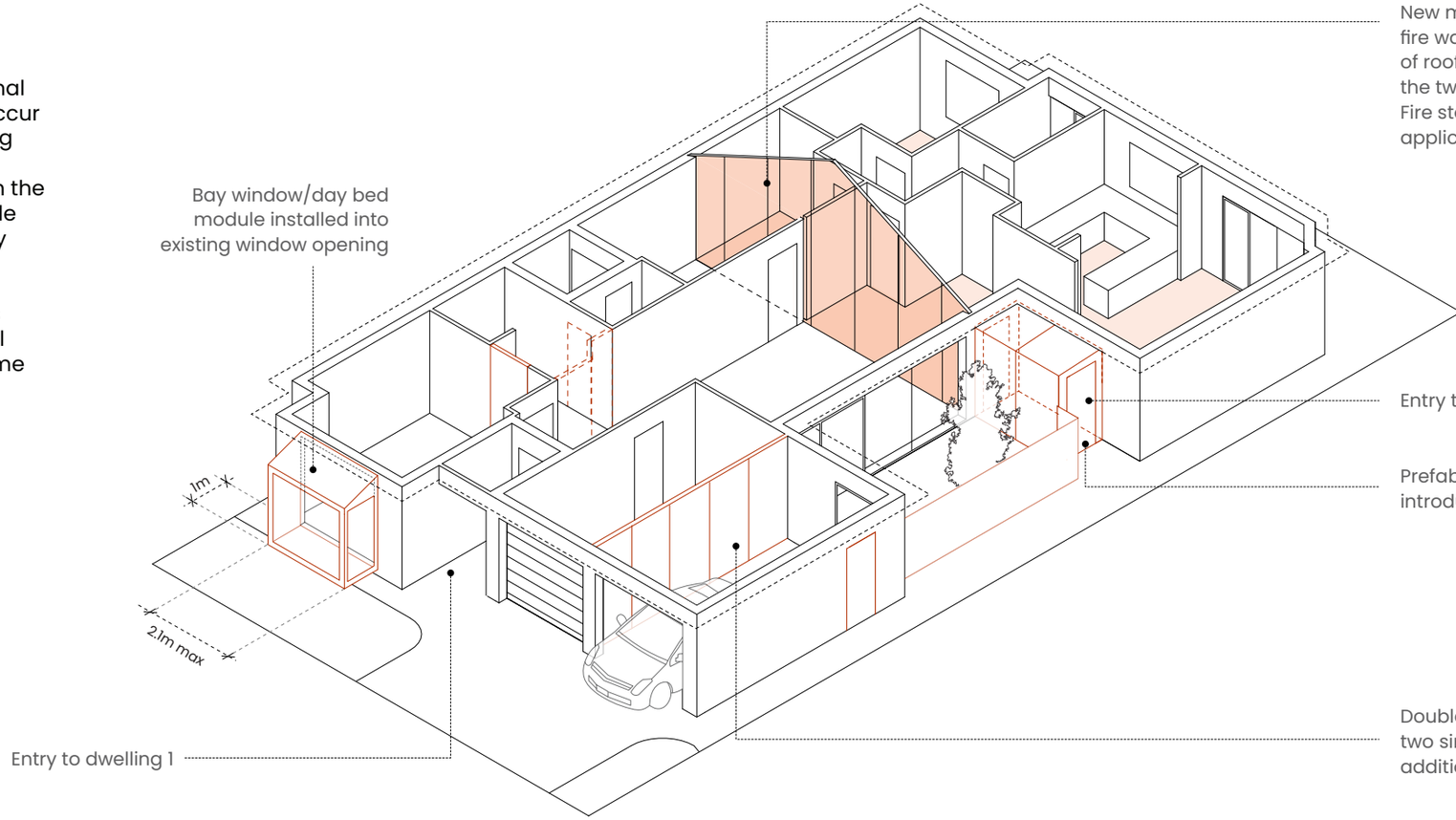


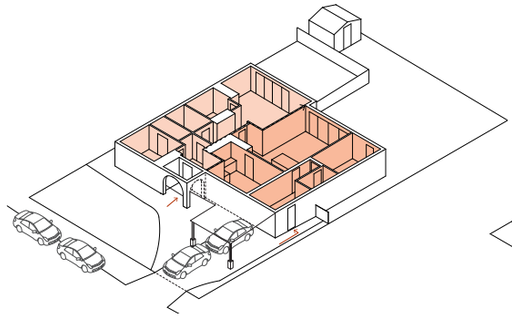
Melbourne Walk-Up Flats
Modular Addition

Soft Subdivison Strategy

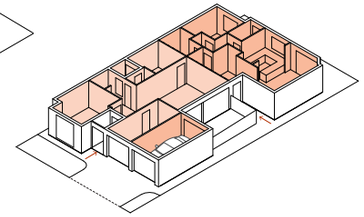
Applies to: Villas, Garage Houses, Mansions

The villa provides options for internal reconfiguration. Separation can occur horizontally or vertically, depending on the scale and height of homes. Subdivision allows new units within the larger property to occur, so multiple households can live independently within one building. Small-scale additions such as bay windows, entrance lobbies and kitchenettes accommodate multi-generational living, co-living or home and income scenarios. The garage also offers the potential for conversion into a multipurpose space.

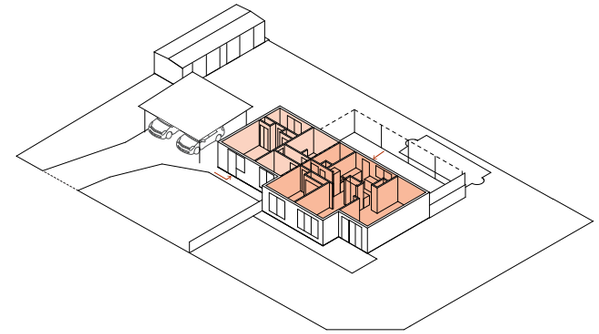




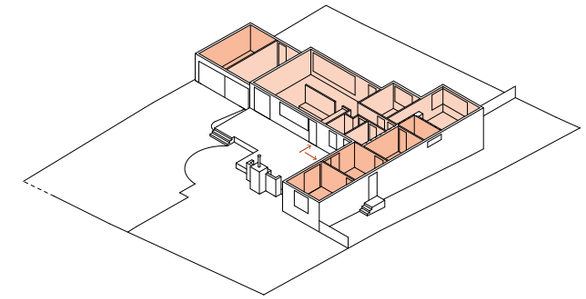
Sydney Villa
Soft Subdivision



Adelaide Villa
Soft Subdivision



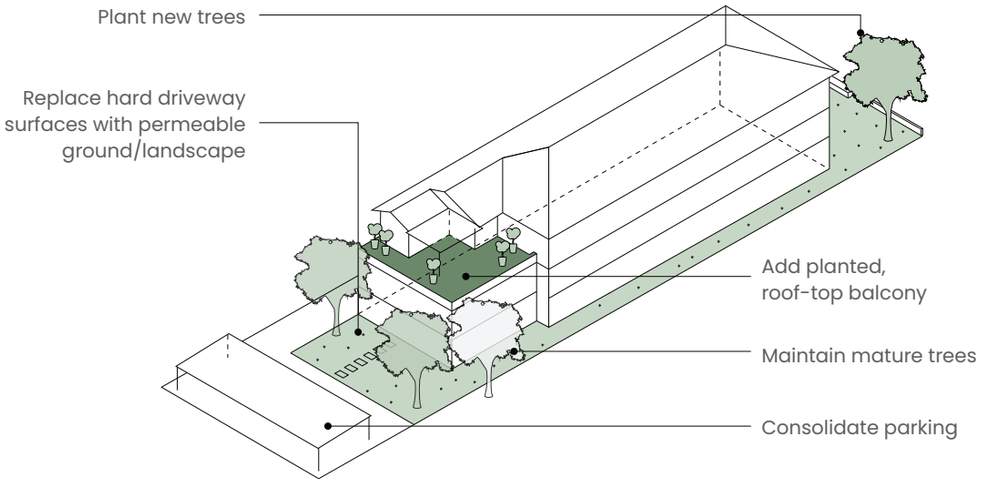
Darwin Villa
Soft Subdivision



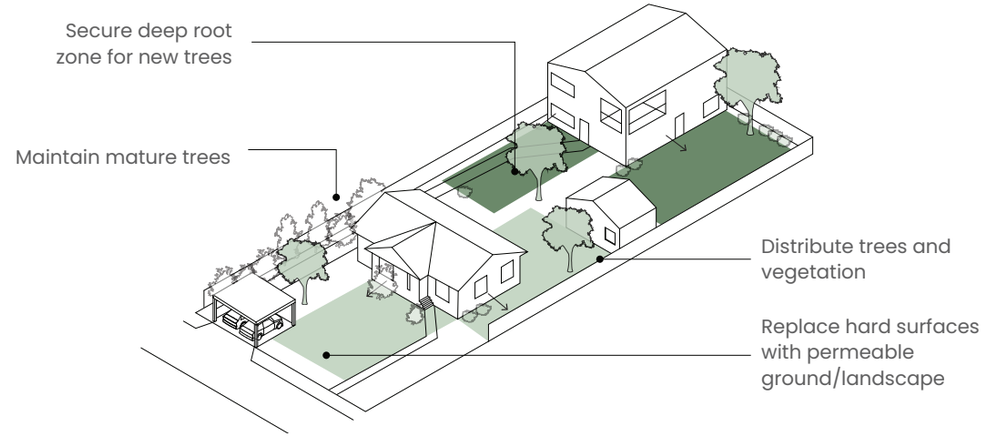
Canberra Villa
Soft Subdivision

Greening Actions

Increased greening for walk-up flats and cottages reduces urban heat gain, and improves biodiversity and resident amenity. This is supported by maintaining existing mature trees, providing deep root zones for new trees, and replacing hard driveways with permeable surfaces. Walk-ups also gain a planted rooftop balcony.



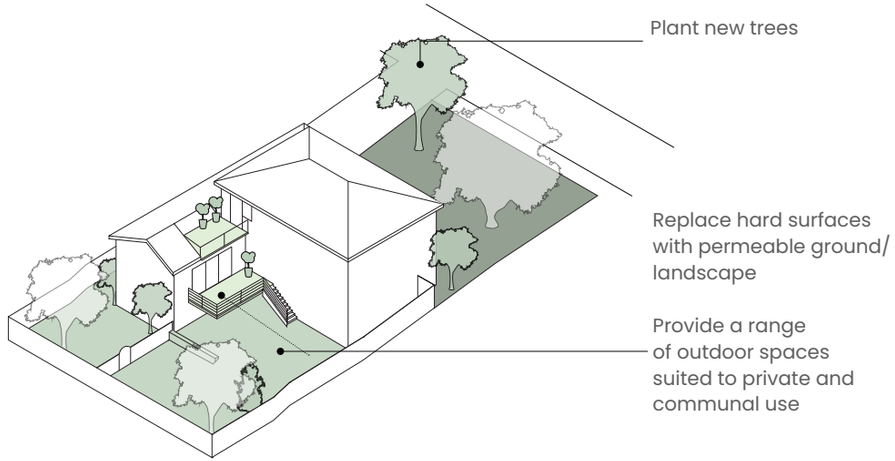
Sydney Walk-Up Flat Greening Action
Modular Addition (new level)
Estimated canopy increase: 24m²



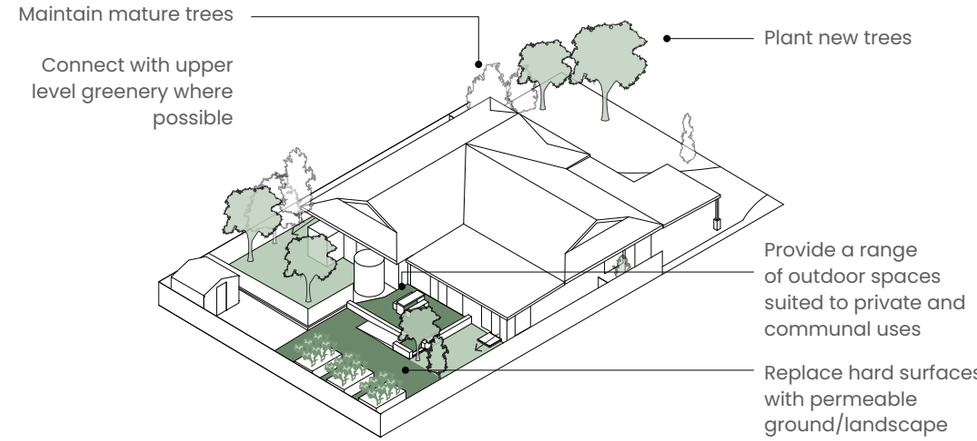
Sydney Cottage Greening Action
Modular Addition (independent secondary building)
Estimated canopy increase: 21m²

Greening Actions

For subdivided homes on smaller lot sizes of around 300-500sqm, increased greening gives protection from urban heat, assists biodiversity and privacy, and provides varied outdoor areas for private or shared use. This strategy distributes new trees, gardens and terraces across the site for use by the two households and maintains existing mature trees.



Sydney Mansion Greening Actions
Soft Subdivision (Dual Key)
Estimated canopy increase: 14m^2



Sydney Villa Greening Actions
Soft Subdivision (Dual Key)
Estimated canopy increase: 16m^2

Potential Impacts

A key value of this study lies in how the proposed retrofit actions could be adopted across widely occurring housing types nationally. To evaluate this potential, the study uses the hypothetical assumption of 100% uptake in each capital city and communicates the results through three measures: increases in effective household density; gains in housing diversity; and added tree canopy. While comprehensive adoption is unlikely, the argument remains compelling: even if a small percentage of these retrofit adaptations were taken up, the cumulative gains for housing diversity, density and greening would be significant.

The following pages illustrate four possible scenarios where these retrofit actions could be applied to a range of housing types and achieve different effective densities. These scenarios are meant to be understood as indicative only and point to the fact that many other scenarios and combinations thereof can be achieved.

Further, as noted earlier in this report, the selection and mapping of common housing types in this study does not constitute a comprehensive national survey. While some typologies were documented at the national scale, others were captured only in selected cities. However, the analysis suggests that the approach has broad applicability across metropolitan and regional areas due to the recurring development patterns of Australian cities. The potential impact communicated here should therefore be understood as a partial estimate rather than a precise nationwide calculation.

Effective household density

The projected increase in effective household density was calculated across a range of settings. In some applications the retrofit actions would enable additional dwellings with independent strata title, while in others the subdivision would remain under the same title with potential for future subdivision subject to regulatory change. The range of effective density also varies according to these settings: from an average additional dwelling of 1 for a secondary building on a bungalow, cottage, villa, mansion or garage site, to an average addition of 4 dwellings for walk-up flats; studio-like additions register as a 0.5 average additional dwelling for villa, villa cluster and garage houses.

The illustrated scenarios that follow also have implications for car parking. In some examples, existing car parking would be reduced in the trade-off for increasing accommodation. Nevertheless, resulting car parking provision ratios are in general alignment with settings for higher density residential precincts.

The table below captures the variations of retrofit actions and their implications.

Retrofit Action	Effective household density	Legal status	Use definition	Notes
Secondary building (modular addition)	Additional separate household/ multi-generational	Single title or strata-title	Able to be used independently or rented out	Future title subdivision possible subject to independent parking and access
Additional level to walk-up flats (modular addition)	Additional independent households	Strata-title	Fully independent assets	Extension of existing strata subdivision. Parking provision ratio reduced from 1.0 or 0.6 nom., with active transport plan (location dependent)
Dual-key access (internal subdivision)	Additional separate household/ multi-generational	Single title or strata-title	Able to be used independently or rented out	Future title subdivision possible subject to independent parking and access (location-dependent)
Dual-key / secondary building to garage (modular addition)	Additional separate household/ multi-generational/ home office	Single title	Able to be used independently or rented out	Future title subdivision would be difficult due to size

Potential Impact

Bungalow
Count: 10,997

Cottage
Count: 50,990

Walk-Up Flats
Count: 16,854

Townhouse
Count: 41,537

Villa
Count: 118,688

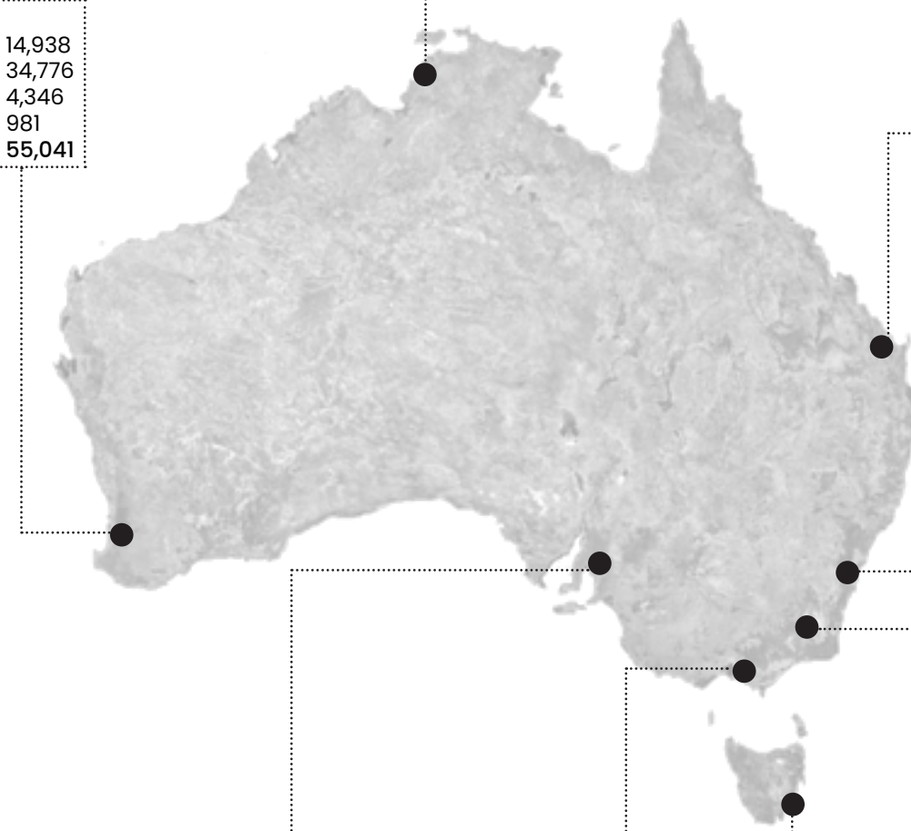
Villa Cluster
(Average 4 dwellings per cluster)
Count: 17,275

Mansion / Garage House
Count: 69,418

Regional Types
Count: 4,655

Total of all Types
Count:
330,414

10,000 occurrences



Darwin	
Villa	3,668
Elevated House	919
Elevated House (Split Level)	1,804
Walk-Up Flats	310
Total count:	**6,701**

Perth	
Cottage	14,938
Villa	34,776
Villa Cluster	4,346
Walk-Up Flats	981
Total count:	**55,041**

Brisbane	
Cottage	9,713
Bungalow	2,997
Villa	21,100
Townhouse	3,070
Walk-Up Flats	1,940
Total count:	**38,820**

Sydney	
Cottage	7,500
Bungalow	8000
Villa	18,500
Mansion	18,000
Walk-Up Flats	8,500
Total count:	**60,500**

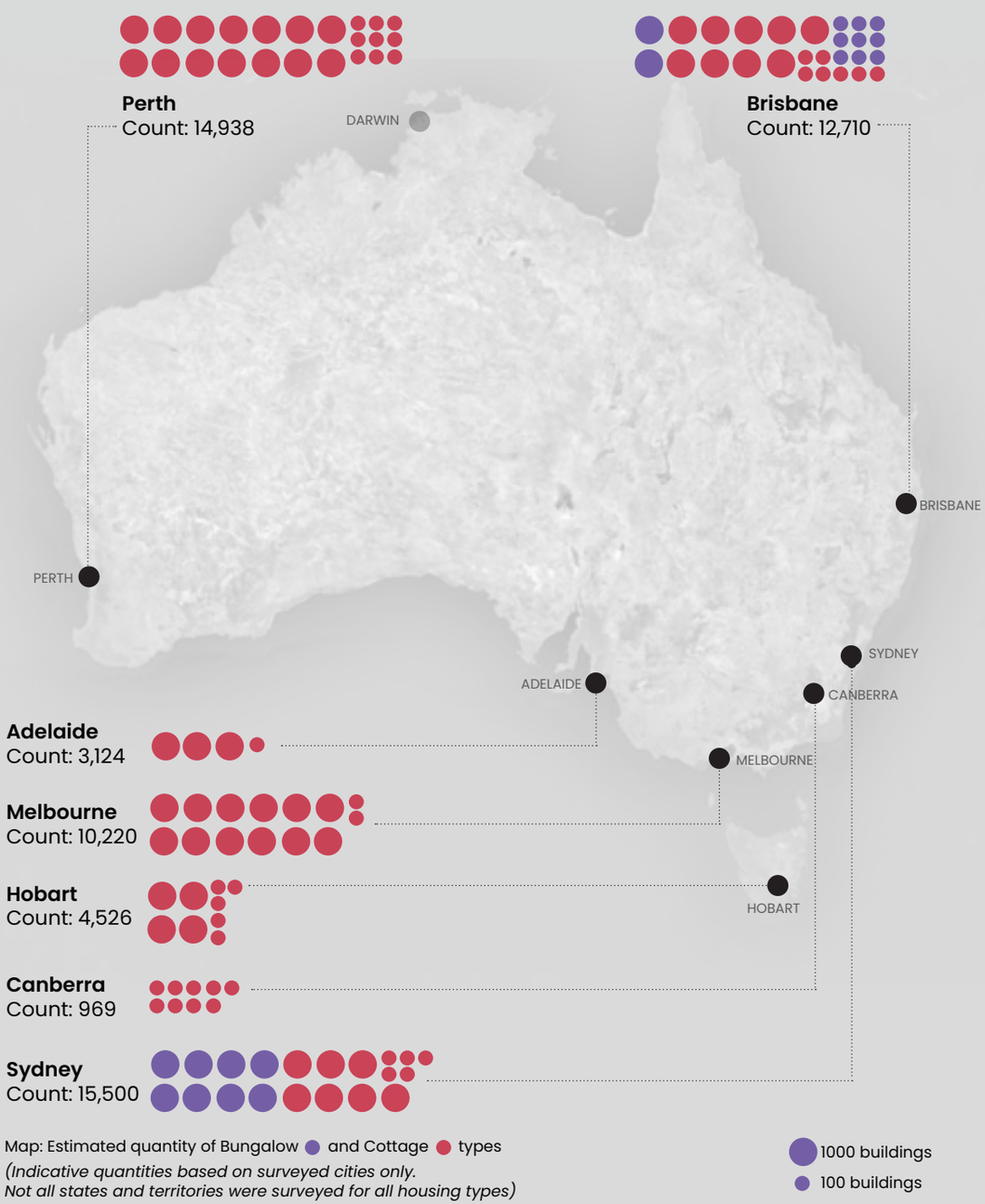
Canberra	
Cottage	969
Villa	19,566
Townhouse	9,637
Total count:	**30,172**

Adelaide	
Cottage	3,124
Villa	13,589
Single Storey Flats	1,932
Walk-Up Flats	1,005
Total count:	**19,650**

Melbourne	
Cottage	10,220
Garage House	51,418
Villa Cluster	9,307
Townhouse	31,900
Walk-Up Flats	4,118
Total count:	**106,963**

Hobart	
Cottage	4,526
Villa	7,489
Villa Cluster	552
Total count:	**12,567**

Bungalow and Cottage Types
Estimated Quantity

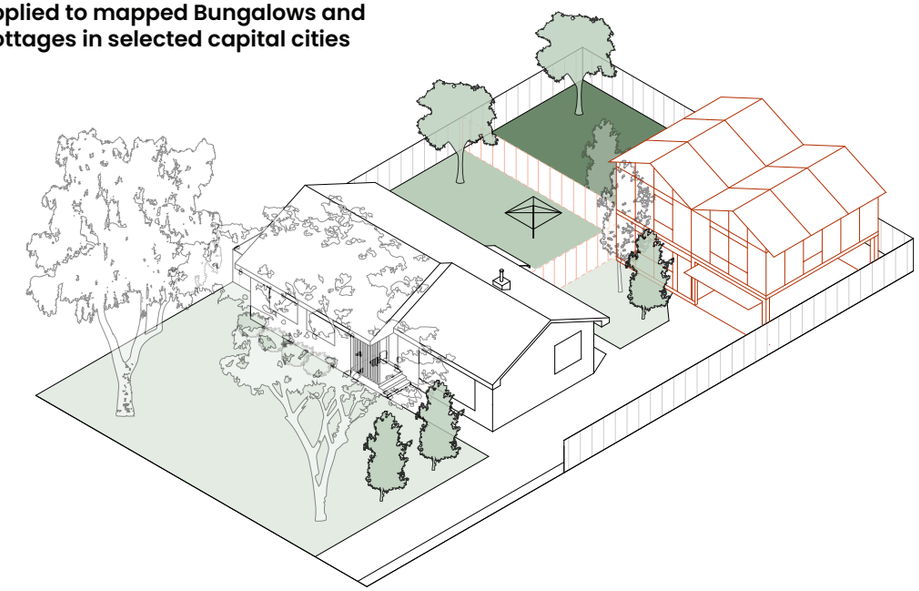


Map: Estimated quantity of Bungalow ● and Cottage ● types

(Indicative quantities based on surveyed cities only.
Not all states and territories were surveyed for all housing types)

Secondary Building
Modular Addition

Applied to mapped Bungalows and Cottages in selected capital cities



Effective Density Uplift
Density increase: 1 dwelling

Greening Uplift
Average canopy increase
Bungalow: 13 m²

Average canopy increase
Cottage: 21 m²

Diversity Benefits:
- Multigenerational Home
- Co-living
- Home and Income
- Ageing in Place
- Affordability

Market + Industry Applications:
- Replicable, MMC
- Government Incentivisation
- Bespoke regulatory framework

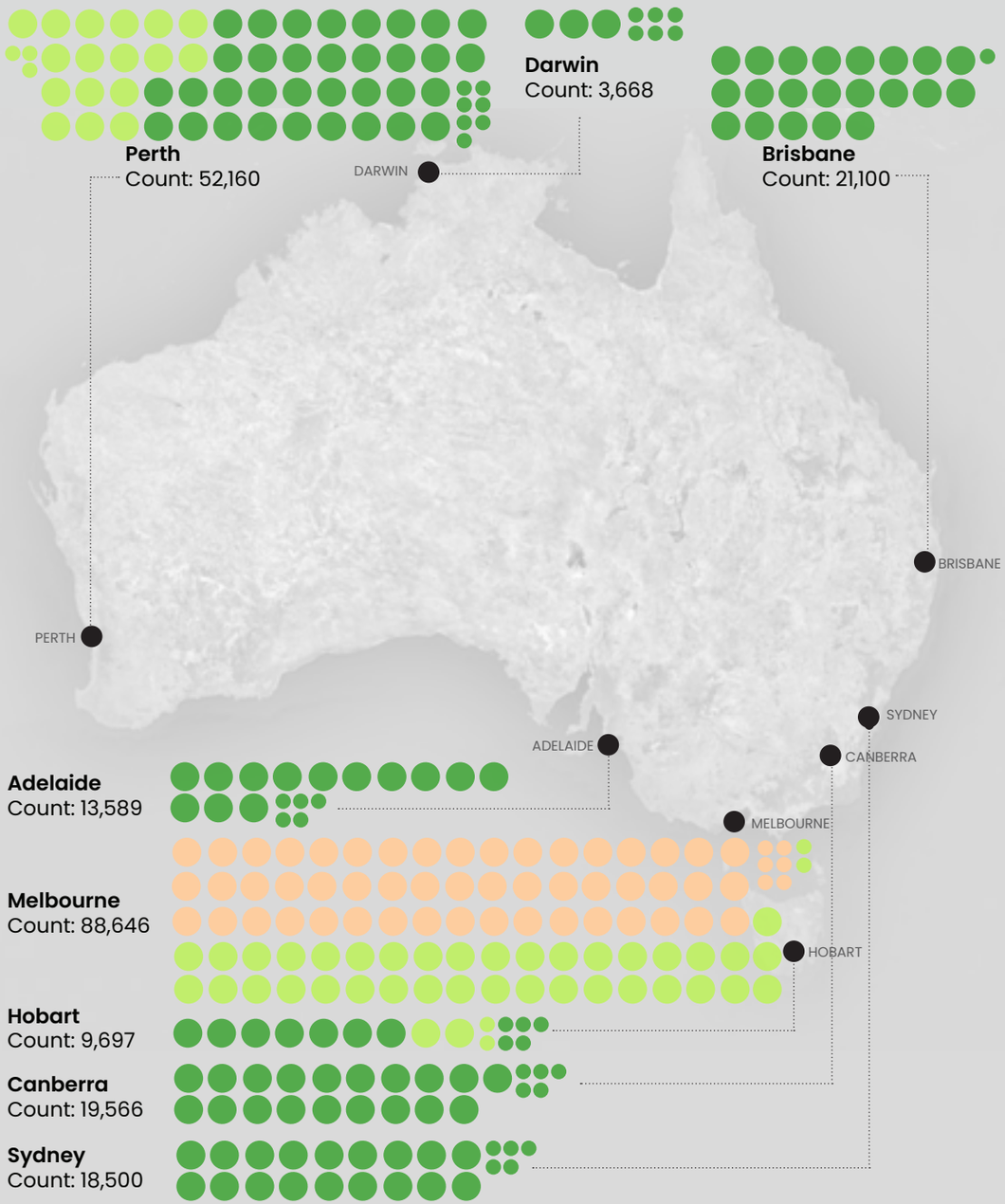
Effective Density Uplift at Scale:
Potential impact at metropolitan scale based on hypothetical 100% uptake of proposal

Adelaide	3,124 new dwellings
Brisbane	12,710 new dwellings
Canberra	969 new dwellings
Hobart	4,526 new dwellings
Melbourne	10,220 new dwellings
Perth	14,938 new dwellings
Sydney	15,500 new dwellings
	61,987 new dwellings

Greening
Canopy increase at scale based on hypothetical 100% uptake of proposal

Bungalow (Sydney + Brisbane)	**142,961 m² canopy increase**
Cottage (all capital cities except Darwin)	**1,070,790 m² canopy increase**

Villa Cluster, Villa and Garage Houses Estimated Quantity



Map: Estimated quantity of Villa Clusters* , Villa and Garage House types

1000 buildings
100 buildings

(Indicative quantities based on surveyed cities only.
Not all states and territories were surveyed for all housing types.
Estimated dwelling count assumes an average of four existing villas per villa cluster.)

Garage-Studio Addition: Dual-Key Access Modular Addition

Applied to mapped Villa Clusters, Villas and Garage Houses in selected capital cities



Effective Density Uplift

Household unit increase:
1 studio (average) equal to 0.5 dwelling

Greening Uplift

None

Diversity Benefits:

- Affordability
- Work-home
- Multigenerational
- Home and income

Market + Industry Applications:

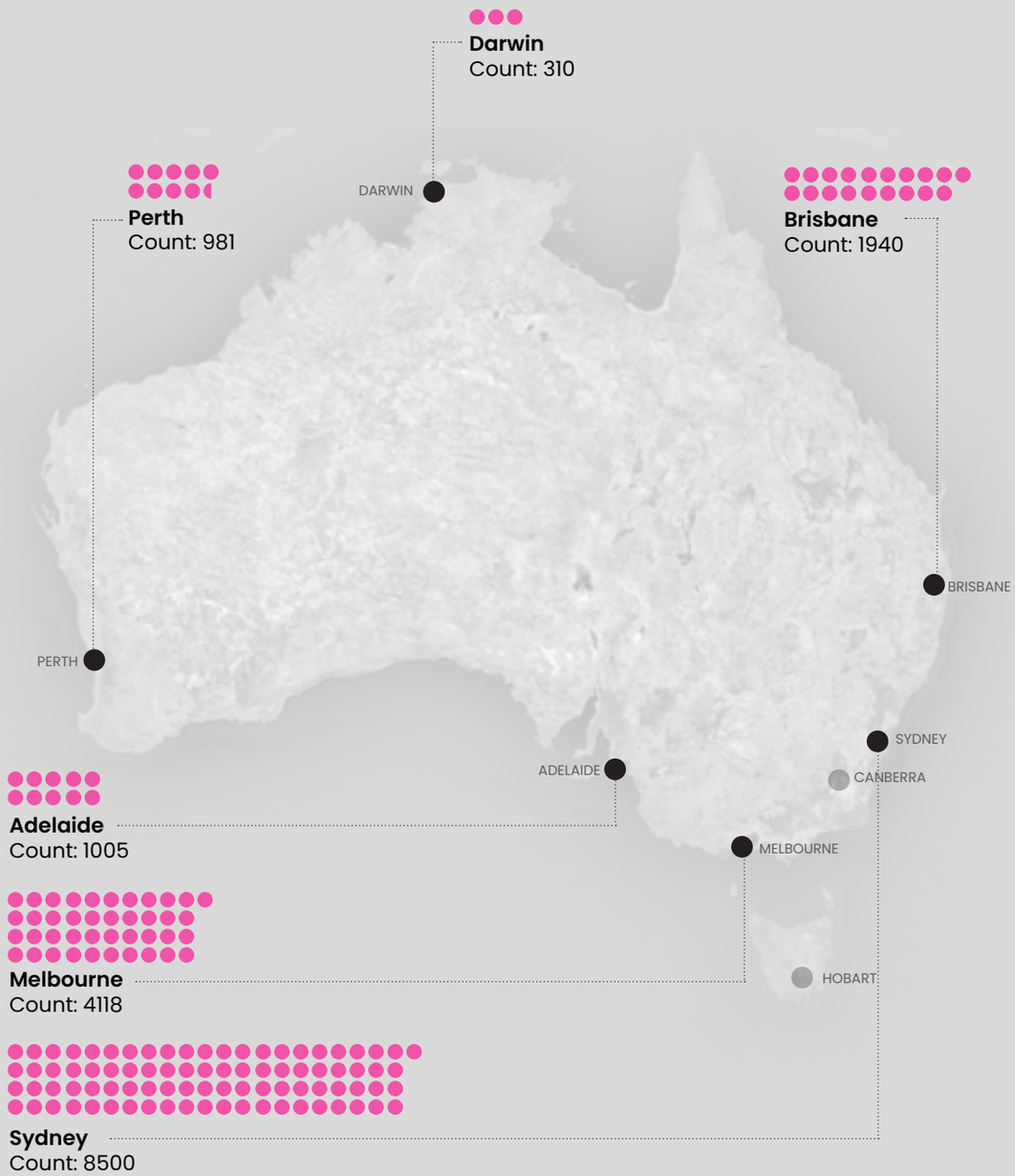
- Replicable, MMC
- Government Incentivisation
- Bespoke regulatory framework

Effective Density Uplift at Scale:
Potential impact at metropolitan scale based on hypothetical 100% uptake of proposal

Adelaide	13,589 new studios
Brisbane	21,100 new studios
Canberra	19,566 new studios
Hobart	9,697 new studios
Melbourne	88,646 new studios
Perth	52,160 new studios
Sydney	18,500 new studios
	223,256 new studios
	Equivalent to 111,628 new dwellings

Note: Estimated figures for studio additions to villa clusters assume an average of four existing villas per villa cluster, supporting four new studios.

Walk-Up Flats Type Estimated Quantity



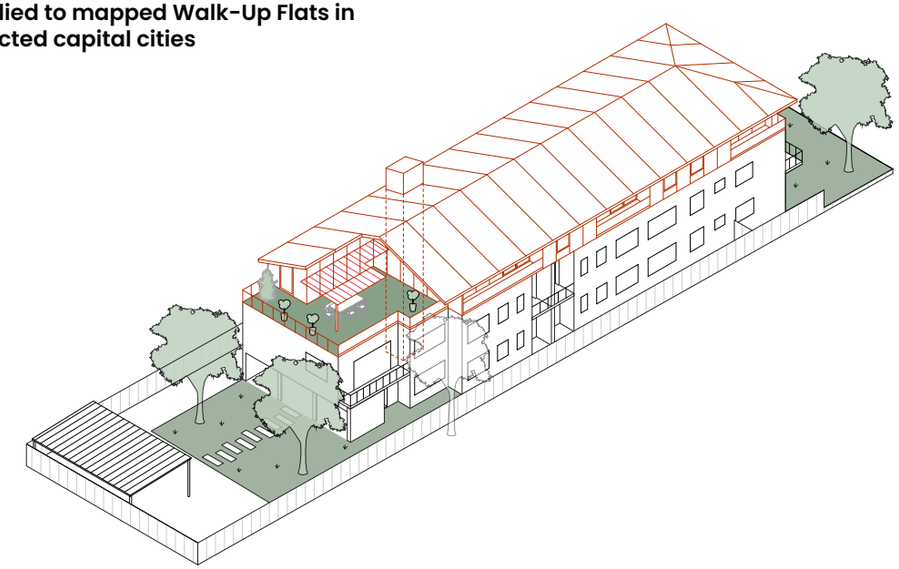
Map: Estimated quantity of Walk-Up Flats type

(Indicative quantities based on surveyed cities only. Not all states and territories were surveyed for all housing types)

100 buildings

Additional Level Modular Addition

Applied to mapped Walk-Up Flats in selected capital cities



Effective Density Uplift
4 flats per floor (average)

Greening Uplift
Average canopy increase: 24m²

Diversity Benefits:

- Ageing in Place
- Affordability
- Accessibility

Market + Industry Applications:

- Replicable, MMC
- Government Incentivisation
- Bespoke regulatory framework

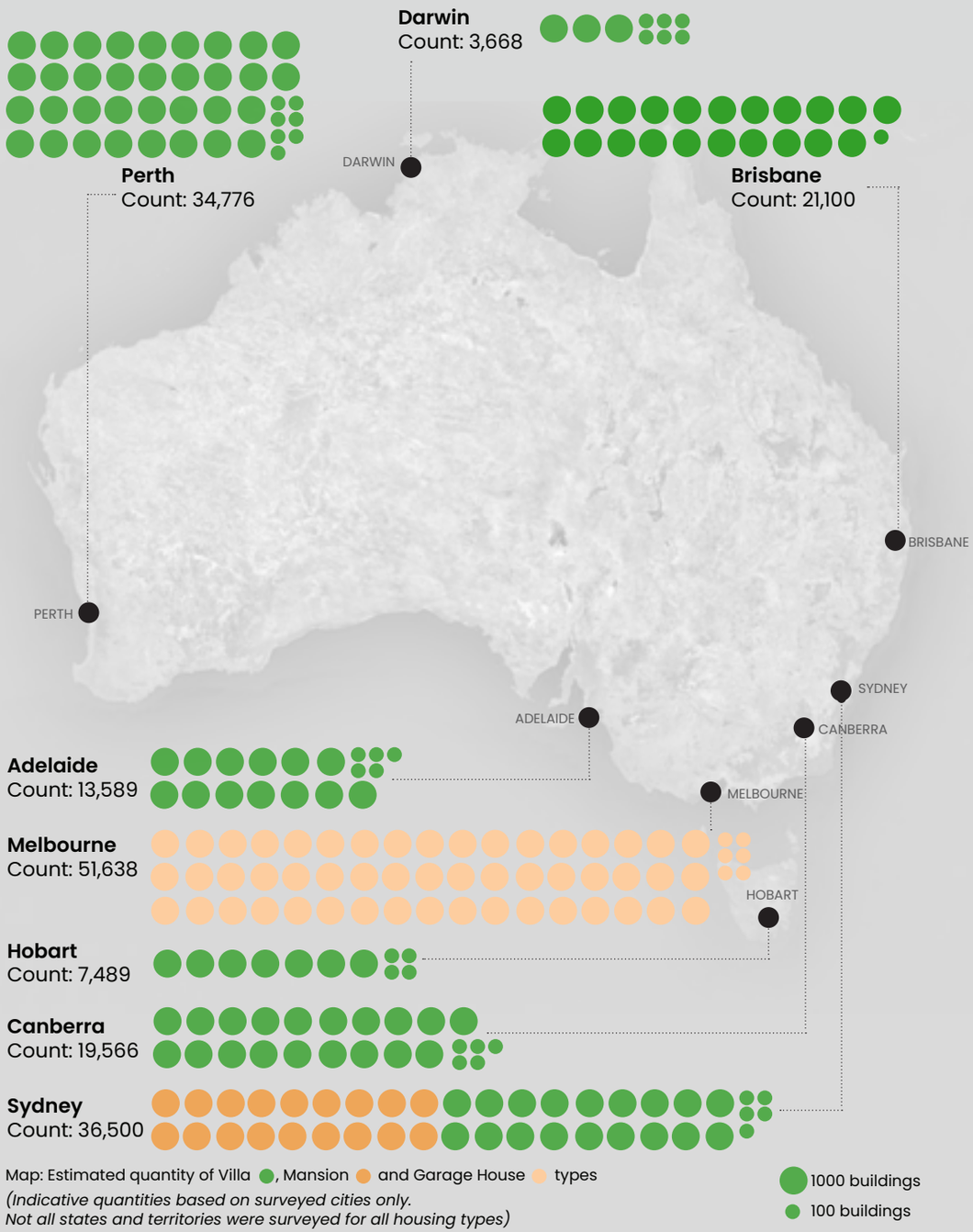
Effective Density Uplift at Scale:
Potential impact at metropolitan scale based on hypothetical 100% uptake of proposal

Adelaide	4,020 new flats
Brisbane	7,760 new flats
Darwin	1,240 new flats
Melbourne	16,472 new flats
Perth	3,924 new flats
Sydney	34,000 new flats
	67,416 new flats

Greening
Canopy increase at scale based on hypothetical 100% uptake of proposal

All capital cities	**404,496m² canopy increase**

Villa, Mansion and Garage Houses Estimated Quantity



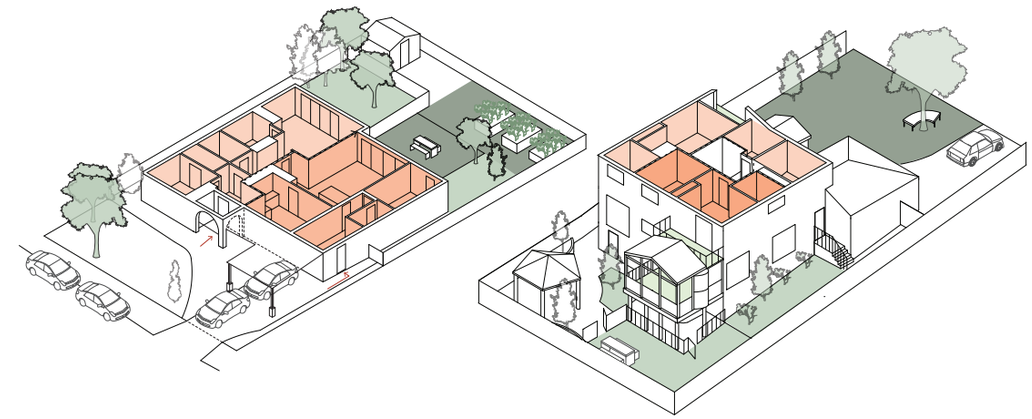
Map: Estimated quantity of Villa, Mansion and Garage House types

(Indicative quantities based on surveyed cities only.
Not all states and territories were surveyed for all housing types)

1000 buildings
100 buildings

Internal Subdivision: Dual-Key Access Soft Subdivision

Applied to mapped Villas, Mansions and Garage Houses in selected capital cities



Effective Density Uplift
Household unit increase:
One household unit on average

Greening Uplift
Average canopy increase: 15m²

Diversity Benefits:
- Multigenerational living
- Co-living
- Ageing in place
- Family-friendly
- Home and income

Market + Industry Applications:
- Replicable, MMC
- Bespoke regulatory framework

Effective Density Uplift at Scale:
Potential impact at metropolitan scale based on hypothetical 100% uptake of proposal

Adelaide	13,589 new dwellings
Brisbane	21,100 new dwellings
Canberra	19,566 new dwellings
Darwin	3,668 new dwellings
Hobart	7,489 new dwellings
Melbourne	51,418 new dwellings
Perth	34,776 new dwellings
Sydney	36,500 new dwellings
	188,106 new dwellings

Greening
Canopy increase at scale based on hypothetical 100% uptake of proposal

All captial cities	**2,821,590m² canopy increase**

Section 3:
Contribution + Future Research

Building 4.0 CRC seeks to leverage the outcomes of our projects for the greatest national impact. We see no better example than the opportunity for Project #58 to provide a significant resource that can inform design and construction practices aimed at decarbonising our built environment while also addressing the urgent need for housing availability as Australia grows in the coming decades. The Retrofit Housing Catalogue *demonstrates, with simplicity and clarity, the inherent value of our existing housing stock and its potential to be understood as a resource to enable diverse housing solutions across the country. We sincerely hope participants from all corners of the industry take advantage by accessing this research.*

Professor Chris Knapp, 2026

This section summarises the project's key contributions: expert informed typological documentation of common Australian housing; systematic mapping of housing types, quantities and locations; demonstration of retrofit potential for density, diversity and greening; and relevance to policy, industry and Building 4.0 CRC objectives. It then identifies future research pathways needed to support retrofit at scale, including the publication and digital dissemination of the *Catalogue*, and three industry-led research streams: a regulatory retrofit framework, retrofit education and apprenticeship training, and a retrofit feasibility matrix.

Contribution

The research findings make a significant contribution to knowledge about Australia's common housing stock by documenting its typological patterns, mapping its distribution, and demonstrating its adaptive potential for retrofit at scale. These contributions are achieved through six areas: typological documentation, expert-informed national analysis, systematic mapping, retrofit design testing, potential to assist Australia's housing crisis, and relevance to policy, industry and Building 4.0 CRC objectives.

Unprecedented contextual overview and documentation of Australian common housing

The first contribution of this research is the development of an overview of Australia's common housing stock through a typological approach. These dwellings constitute a substantial proportion of established suburbs, yet knowledge about their form, distribution and adaptive potential has remained fragmented, inconsistent or assumed. The *Catalogue* collates this information in a clear, structured and accessible format, making visible the strategic value of these overlooked housing types. In doing so, it demonstrates that common dwellings are a significant national asset that could be leveraged to improve housing supply and diversity, increase tree canopy and reduce carbon consumption. The identification, documentation and evaluation of the common Australian house is therefore a significant contribution in itself.

National housing analysis informed by expert knowledge

The second contribution is the *Catalogue*'s national analysis informed and tested through local expert knowledge. The *Catalogue* selects and documents common housing types since the 1940s, across major Australian capital cities, revealing both regional variation and strong common patterns in the production of Australian housing over time. The research is grounded in local spatial, historical and construction knowledge, and has been developed through engagement with practitioners and academics with deep expertise in their respective cities. Expert input strengthens the credibility of the analysis and demonstrates the relevance of the research methodology beyond a single location.

Systematic mapping of housing typologies, quantities and locations

The third contribution is the systematic mapping of common housing typologies and their formal equivalents, including their locations, distribution and quantities. This is an important methodological shift. Mapping and quantifying these types provides evidence to understand and demonstrate the potential scale for retrofit that has not previously been available. Many housing types identified through the research have existed for decades: they are likely to remain part of Australia's urban fabric for decades to come. The research therefore reframes common housing types as a long-term national opportunity for housing transformation. From an industry and Building 4.0 CRC perspective, this visibility urges consideration for the related commercial opportunities: repeatable approaches, standardised retrofit actions and efficient delivery methods, rather than the prevailing tactic of one-off retrofits.

Demonstration of the adaptive potential of common housing types to deliver density, diversity and greening

The fourth contribution is the demonstration of feasible retrofit strategies for adapting common housing types. By closely examining the characteristics of common housing types, the *Catalogue* documents their untapped capacity for transformation. This reveals the potential for retrofit actions to support additional dwellings, increase diversity in household types and improve environmental performance through greening. The suite of retrofit actions demonstrates how specific housing types can be adapted in practical and replicable ways, drawing on prevailing construction practices, standard material systems and MMC where possible. For industry partners and Building 4.0 CRC, this shows that retrofit is a realistic approach grounded in the conditions of existing housing stock.

Assisting National Housing Accord targets

The fifth contribution is the potential housing uplift available through common house retrofits. Australia's housing crisis demands efficient delivery to meet the National Housing Accord's 1.2 million target, yet current new-build reliance is estimated at a 130,000 shortfall (ABS, June 2026). The research project found that at least 330,000 homes are suited to modular or subdivided retrofit. This could yield a (hypothetical) contribution of 540,765 effective increased homes: 67,416 flats, 61,987 secondary buildings, 223,256 studios and 188,106 subdivided dwellings. Even if only half this total were realised, the roughly 270,000 new homes would equal about 22.5% of the Accord's target. Compared with knock-down-rebuild (KDR) retrofits also reduce carbon waste and have the potential to be delivered faster, with less resident disruption.

Relevance to policy, industry, and Building 4.0 CRC objectives

The final contribution is the relevance of the research to current policy, industry and Building 4.0 CRC objectives. National pressures around housing supply, housing diversity, climate adaptation, emissions reduction and affordability are increasingly converging, creating an urgent need for scalable alternatives to BAU housing delivery. While interest in retrofit is growing, there remains limited guidance on how it can be systematically applied to common housing stock at scale. The Catalogue addresses this gap by providing a practical and enabling framework that links typological knowledge, spatial data, design testing and industry engagement. It also identifies three critical pathways for enabling industry change towards retrofit at scale, outlined in Section 3: Contribution + Future Research.

Future Research

This research offers a clear pathway for further work that can extend its national relevance and practical application. By establishing a detailed understanding of Australia's common housing types, the project provides a foundation for future research that can translate this knowledge into scalable tools, resources and industry partnerships. The next stage offers the opportunity to consolidate the Catalogue into a searchable digital platform linking housing types with retrofit actions, and to develop new frameworks that support regulatory reform, workforce training and feasibility assessment. Together, these future research directions position the project to inform policy and guide industry towards implementation.

Design research potential

A key future opportunity lies in making this work readily accessible and actionable for a wide range of users. The *Catalogue* process has generated a searchable matrix of common housing types and their corresponding retrofit actions, providing a strong foundation for a digital platform. Developing this into an open, user-friendly online resource would allow industry, practitioners, policymakers, researchers and the public to explore housing types, understand their spatial and construction logics, and identify suitable retrofit strategies. A digital interface of this kind would position the research as a nationally significant reference point, supporting informed decision-making, and creating a shared evidence base for future research, collaboration and innovation across the housing, planning and construction sectors.

Future industry potential

As the statistics in 'Section 1: Rationale + Methodology' highlight, the needs of contemporary housing to address sole-occupancy, multigenerational homes, an ageing population, housing affordability, and the rise of hybrid working provide urgency – at scale – to supply more, and more diverse housing. The industry partner engagement highlighted three new, next-stage industry-led research streams that would support the delivery of systematic, widespread retrofits. These include:

Regulatory retrofit framework

A bespoke regulatory framework is essential to incentivise retrofit at scale. Aligned with state housing densification and sustainability policies (e.g. VicGov, GANSW), the framework could adopt a risk-based, whole-of-building approach – enabling graduated levels of retrofit, performance-based National Construction Code 2022 compliance flexibility, and reasonable partial modifications rather than full upgrades. It could leverage emerging opportunities in policy, carbon and energy performance incentives, and innovations in modular construction and scanning technology to optimise cost efficiency and relevance to current building advances. Addressing these opportunities alongside the barriers of regulatory complexity, economic viability, and entrenched new-build culture could establish retrofit as a viable housing choice.

Retrofit education and apprenticeship training

A new apprenticeship and training framework for retrofit could integrate cross-disciplinary skills across building construction, including ecology and landscape. Qualifications could embed knowledge of MMC, the impacts of sustainability measures on building performance – including moisture and condensation – and the value of embodied carbon. A real-scale pilot project would anchor the new framework and attract broad industry support through multiple benefits: workforce upskilling, social impact, and proof of concept for replicable, technology-led retrofit at scale.

Retrofit feasibility matrix

A bespoke feasibility matrix could assess the cost-benefit of systematising retrofit solutions across common housing typologies, accounting for variable state and territory policy settings, and comparative costs against new build or knock-down-rebuild, maintenance, combustibility, compliance, and the potential value uplift of retrofitted homes. Critical technical factors include prefabrication tolerances, modular systems such as Cross Laminated Timber (CLT) cassettes, site logistics, and innovations such as plug-and-play cabling and QR-coded cable mapping. Cross-industry collaboration will be an essential factor, as no single company handles complete retrofits. Future-proofing for solar adoption, gas phase-out, and electrical infrastructure upgrades also presents significant and immediate opportunities for feasibility analysis.

Conclusion

Conclusion

The Retrofit Housing Catalogue positions Australia's everyday suburban fabric as a strategic national resource. Through typological documentation, spatial analysis and design-led testing, the project makes visible the scale, consistency and latent capacity of common housing types across all capital cities. In doing so, it reframes the ordinary dwelling not as an obstacle to housing supply or climate action, but as a repeatable system capable of delivering density, diversity and greening without demolition.

Typology, mapping and design operate here as an integrated tools The typological work – informed by 16 state and territory experts – identifies recurring spatial and material logics across nine overarching types and 35 representative examples. These shared characteristics reveal an architectural affordance: robust structures, adaptable layouts, generous plots and established landscapes that can support systematic retrofit. Regional variations shaped by policy, construction practices and migration histories enrich this picture, yet the underlying patterns remain sufficiently consistent to support a coordinated national approach.

Mapping extends this logic to the metropolitan scale. By identifying the location, frequency and concentration of these types across Australian cities, the *Catalogue* demonstrates the cumulative potential of retrofit. This spatial evidence shifts retrofit from a series of isolated architectural interventions to a scalable urban strategy, capable of contributing meaningfully to national housing, climate and greening targets. It allows the Catalogue to operate simultaneously at the scale of the dwelling, the neighbourhood and the city.

Design strategies complete the methodological triad. Through modular additions, soft subdivision and greening actions aligned with MMC, the Catalogue shows how modest, standardised interventions can incrementally intensify housing, expand household diversity and increase canopy cover while significantly reducing embodied carbon. These are not speculative propositions; they are practical, repeatable actions that respond directly to contemporary household structures – from single-person living to multigenerational arrangements – and support ageing in place, affordability and social continuity.

The research also identifies the systemic conditions required for retrofit to become a mainstream housing pathway. Insights from 18 partners from Building 4.0 CRC highlight the need for enabling retrofit frameworks including a bespoke regulatory framework to remove barriers and give clarity; an apprenticeship and training framework to build workforce capability; and a feasibility matrix to support commercial decision-making. Together, these interventions offer a credible pathway for governments, developers and industry to shift from demolition-led redevelopment to adaptive, lower-carbon forms of housing delivery. They also align directly with the objectives of Building 4.0 CRC, supporting new markets, new skills and new efficiencies.

Ultimately, the *Catalogue* proposes a new architectural ethic for Australian cities: one grounded in care, precision and continuity. By re-reading the existing suburban fabric typologically and spatially, and by demonstrating practical strategies for change, the Catalogue equips architects, planners, builders and policymakers to act decisively on the housing and climate challenges of our time. It positions retrofit not as an exception, but as a systematic, scalable and nationally significant mode of city-making.

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Glossary + Image Credits

Glossary

Battle-axe subdivision A colloquial description for a L- or T-shaped subdivision where the front section is split by an access driveway to reach the rear dwelling/s.

Business as usual (BAU) Housing development, that comprises new-build homes, which represent around 30% of Australia's residential market.

Cross-laminated timber (CLT) A strong engineered product created by gluing alternating layers of timber at 90 degrees

Commonwealth and State Housing Agreement Act A 1945 Federal act that supported the delivery of rental housing projects nationwide through financial contributions to losses incurred, stimulating construction of Australia's rental housing market.

Density Defined in this research as the effective quantity of households that could be delivered at site and urban scales; in this report, we examine density achieved through retrofit actions

Diversity Defined in this research as dwellings that support a wider range of inhabitants, household structures and uses than the preceding 'typical' nuclear family unit, couples, singles etc.

Government Architect New South Wales (GANSW) The NSW body for strategic design leadership, and commissioned the first Retrofit Housing survey for that state.

Geographic information system (GIS) A computer-based technology to capture and analyse complex spatial relationships between geographic phenomena, to create specific knowledge of interrelated digital factors.

Greenfield housing Planned or realised new suburbs on undeveloped 'green' land, often former agricultural or rural areas on a city's outskirts. Unrestricted greenfields development is seen as undesirable due to the reduction in arable land, biodiversity and the relative inaccessibility to public transport that forces residents to rely on car-based travel.

Greening Defined in this research as estimated increase in vegetation achieved by retaining and/or planting trees, and by converting hardscape surfaces to porous alternatives, measured in this research by canopy increase per sqm.

Knock-down redevelopment (KDR) A prevailing small-scale development pattern in inner and middle-ring metropolitan locations whereby a single house is razed and replaced by several townhouses/apartments. Usually, all existing vegetation and mature trees are removed, and replaced by hardscape driveways and small shrub-like gardens.

McMansion A perjorative term to describe large, market-driven, volume houses built since the 1990s, often on greenfield sites. Homes typically have a large footprint, leaving little proportional space on the site for greening.

Menzies Development Plan A series of initiatives led by the Menzies Government when it was returned to power in 1954 to continue its focus on raising Australian home ownership. Its four main measures assisted this: partnership with lending institutions; housing advances; authorising ex-servicemen to buy Housing Agreement homes, and non-service personnel to buy such homes with a 10% minimum deposit.

Modern methods of construction (MMC) New building systems that adopt newly available methods, such as modular dwellings, kit-of-parts, and prefabricated elements to plan, design and construct.

National Capital Development Commission (NCDC) A Federal agency that planned, designed and constructed Canberra as the national seat of government from 1958 until the ACT was established in 1989

National Housing Accord (NHA), also, 'Accord' An Australian Government initiative to build 1.2 million new, well-located homes by mid-2029, in agreement with all states and territories, as well as local government, investors and the construction sector. https://treasury.gov.au/policy-topics/housing/accord

Queensland Housing Commission (QHC) A state body established in 1945 to deliver post-war housing, supported by the Commonwealth.

Residential Zones (RZ1, RZ2 / R-codes) Primary planning controls used across Australian suburbs that enable low-to-medium density development. Typically, these zones occur in suburban settings and allow low- to medium-density development.

Image Credits

The *Catalogue* integrates original illustrations that consistently map the research findings through three main image types: case study measured drawings, local and metropolitan mapping, and schematic design interventions. These original works constitute all images on pages 36–463; 468–495; and endpapers: this material has been produced solely for Building 4.0 CRC Project 58.

Within the page ranges above, the exceptions are base map imagery, which form the only secondary sources used, located on the following pages:

Sentinel-2 cloudless mapping: 50-51; 62-63; 74-75; 86-87; 98-99; 110-111; 122-123; 134-135; 146-147; 158-159; 170-171; 182-183; 194-195; 206-207; 218-219; 230-231; 244-245; 256-257; 268-269; 280-281; 292-293; 304-305; 316-317; 328-329; 340-341; 352-353; 364-365; 378-379; 390-391; 402-403; 414-415; 426-427; 438-439; 450-451; 462-463.

Nearmap Australia: 40-41; 46-49; 52-53; 58-61; 64-65; 70-73; 76-77; 82-85; 88-89; 94-97; 100-101; 106-109; 112-113; 118-121; 124-125; 130-133; 136-137; 142-145; 148-149; 154-157; 160-161; 166-169; 172-173; 178-181; 184-185; 190-193; 196-197; 202-205; 208-209; 214-217; 220-221; 226-229; 232-233; 240-243; 246-247; 252-255; 258-259; 264-267; 270-271; 276-279; 282-283; 288-291; 294-295; 300-303; 306-307; 312-315; 318-319; 324-327; 330-331; 336-339; 342-343; 348-351; 354-355; 360-363; 366-367; 374-377; 380-381; 386-389; 392-393; 398-401; 404-405; 410-413; 416-417; 422-425; 428-429; 434-437; 440-441; 446-449; 452-453; 458-461.

Appendix I:
Typology Mapping Parameters

Typology Mapping Parameters

The following pages outline the mapping parameters that determined each typology, in each major Australian city.

ADELAIDE	Cottage	Single Storey Flats	Villa	Walk-Up Flats
Property Width (m)	17 - 20		8 - 12.5	210 - 400
Property Area (m2)	730 - 825		225 - 560	
Building Area (m2)	130 - 205	300+	145 - 285	
Rear Setback (m)			5 - 13.5	
Building Height (m)				6.25 - 14.0
	• Checks that there is minimal (< 75m2) other development on site	• Checks that building footprint cross 5+ strata lots • Checks that sum of addresses is greater than 5 • Checks that building is single-storey		• Checks for multiple addresses (4+) • Checks that form is rectangular • Checks that footprint overlaps strata parcel (4-10 parcels)

BRISBANE	Bungalow	Cottage	Villa	Villa Cluster	Walk-Up Flats
Property Width (m)	14 - 18	10 - 18	14 - 18	14 - 18	14 - 18
Property Area (m2)	650 - 750	350 - 450	450 - 650	1500 - 4500	760 - 1400
Building Area (m2)	95 - 165	80 - 165	80 - 165	80 - 325	300 - 450
Setback (m)	> 7.5	> 2	> 2		
	• Checks that form is single-storey • Excludes property prefixes that denote strata properties	• Checks that form is single-storey • Excludes property prefixes that denote strata properties	• Checks that form is single-storey • Excludes property prefixes that denote strata properties	• Includes property prefixes that denote strata properties • Includes properties with a subdivision count > 2	• Checks that form is multi-storey and less than 14m high • Excludes property prefixes that denote horizontal strata properties • Includes properties with a subdivision count > 2

CANBERRA	Cottage	Townhouse II	Townhouse I	Villa
Property Width (m)	18 - 23	90+	120 - 235	16 - 25
Property Area (m2)	650 -850		80 - 140	550 - 1100
Building Area (m2)	80 - 140			200 - 410
Setback (m)	> 5		> 5	2.5 - 12.5
	• Checks that the form is simple - less than 10 Vertices • Checks that there are no significant additional building footprints on site	• Checks that property is flagged as 'horizontal strata' • Checks that address count or total number of strata parcels > 8 • Checks that footprint is zoned Residential	• Checks that address count is exactly 2 • Checks that there are no significant additional building footprints on site • Checks that building crosses two property parcels	• Checks that footprint does not correspond to denser/smaller recent development

DARWIN	Walk-Up Flats	Villa	Elevated II	Elevated I
Property Width (m)	22 - 44	20 - 35	15 - 35	15 - 35
Property Area (m2)	800 - 2200	800 - 1100	700 - 1200	700 - 1200
Building Area (m2)	260 - 880	150 - 260	150 - 260	80 - 175
	• Checks for multiple addresses (4+) • Checks that form is rectangular • Checks that form is multi-story	• Checks that form is single-storey	• (PDC) Checks that form has 2 x indentations • (Grollo) Checks that form is oriented directly N-S • -Checks that form is multi-storey	• Checks that form is single-storey • Excludes PDC + Grollo Split Levels

HOBART	Villa Cluster	Villa I	Villa II	Cottage
Property Width (m)	30- 45	18 - 30	18 - 30	18 - 24
Property Area (m2)	400 - 550	300 - 850	550 -700	600 - 875
Building Area (m2)	90 - 150	150 - 230	140 - 250	100 - 155
Subdivision	3 - 12			
Road Distance (m)		2.5 - 12.5	5.0 +	5.0 - 12.5
	• Checks that is horizontal strata	• Checks site fall is *l*ess than 4 metres across site	• Checks site fall is more than 4 metres across site • Checks that roof/ridge line height exceeds 7m	

MELBOURNE	Villa Cluster	(Double-Barreled)	Cottage	Garage House	Walk-Up Flats	(Development)	(Paired)
Property Width (m)	14- 25	20 - 35	15 - 18	12- 17	14 - 25		< 10
Property Area (m2)	900 - 1450	1450 - 2450	650 - 900	325 - 450	850 - 1450	< 250	
Building Area (m2)	< 525	< 525	120 - 180	215 - 325	160 - 280		
Roof Height (m)					> 6.25	> 6.5	
	• Checks that 3-5 strata titles exist on the lot • Checks that there is at least 300-650m2 of total building on lot	• Checks that 5-12 strata titles exist on the lot • Checks that there is at least 300-950m2 of total building on lot	• Checks that there are no significant additional building footprints on site • Checks that the form is *simple* - less than 8 Vertices	• Checks that the form is *simple* - less than 10 Vertices • Checks zone + overlay	• Checks for multiple addresses • Checks that form is rectangular	• Building form overlaps with 3+ other adjacent properties • Checks zone • Checks outside heritage overlay	• Checks persistent feature identifier (PFI) for adjacent parcels with common update schedule • Checks address count < 2 • Checks zone + overlay

PERTH	Villa	Cottage	Villa Cluster	Walk-Up Flats
Property Width (m)	18.5 - 21.5	14 - 18.5	20 - 40	
Property Area (m2)	675 - 880	540 - 880	1000 - 2100	760 - 1550
Building Area (m2)	135 - 285	125 - 235	120 - 325	250 - 500
Setback (m)	> 7.5	> 5		
Building Height (m)				6.5 - 14
	• Checks that form is single-storey	• Checks that form is single-storey	• Checks for multiple addresses (3-6) • Checks that total area of all built fabric exceeds 485m2	• Checks for multiple addresses (6+)

SYDNEY	Bungalow	Cottage	Walk-Up Flats	Villa	Mansion
Property Width (m)	6 - 15	15 - 20	12 - 25	15 - 25	15 - 25
Property Area (m2)	400 - 550	555 -720	500 - 1200	625 - 740	500 - 750
Building Area (m2)	90 - 150	80 - 115	220 - 600	160 - 280	140 - 300
	• Checks that total building footprint (including outbuildings) does not exceed twice the area of main building • Checks that building is within 5m setback from street • Employs Deposited Plan Number to identify parcels surveyed before the 1971 re-cataloguing of registered plans.	• Checks that total building footprint (including outbuildings or secondary • dwellings) does not exceed 100m2 above area of main building • Checks that building has at least 5m setback from street	• Checks that building is taller than 2 storeys • Checks that building contains multiple addresses • Checks that building does not exceed 90% site coverage • Checks that there is not significant additional built form on the site • Eliminates complex forms	• Checks that building height is single storey • Checks that building has at least 5m setback from street • Checks proportions of overall lot	• Checks that total building footprint (including outbuildings) does not exceed 100m2 above area of main building • Checks that building height is 2+ storeys • Checks that building has at least 5m setback from street • Checks that there are not multiple addresses in building and that it is not strata title • Employs Deposited Plan Number to identify parcels surveyed after the 1971 cataloguing of registered plans.

Appendix II: Building 4.0 CRC Partner Engagement

Summary of retrofit opportunities and barriers

Building 4.0 CRC Project 58 Industry Partner Engagement
Retrofit Housing Catalogue: Workshop 2
Roundtable All-partner Discussion
29 May 2025, online

Participants	
Monash University	Professor Nigel Bertram, Professor Maryam Gusheh, Associate Professor Catherine Murphy, Dr Rebecca Roke
Building 4.0 CRC	Professor Chris Knapp, Research Director
Industry Partners	
AG Coombs	Russell Yarnton, DfMA and Buildability Leader
BlueScope Steel	Tom Tyndall, Market Innovation Manager
Building and Plumbing Commission (BPC)	Samantha Adrichem, Manager Research and Evaluation; Roni Parlindungan, Senior Researcher
Holmesglen	Henry Pook, Director of Applied Research
Master Builders Victoria	Philip Alviano, Sustainable Building Advisor
Sumitomo Forestry	Ryotaro Kaburagi, Senior Manager

Meeting Summary: CRC Partner Responses
Summary responses from CRC industry and research partners following Monash University's presentation of the retrofit research programme (Part One of workshop).

Russell Yarnton – AG Coombes

AG Coombs primarily operates in medium-to-high density residential and commercial-scale building services, including hospital HVAC systems. The company is also involved in ongoing maintenance, which means that installation decisions have downstream implications for servicing – a circular relationship that informs their approach to electrification.

Key observations:

- Circular economy and electrification represent a growing share of commercial-scale work.
- At the residential scale, the core challenge is how to move from individual retrofits to mass-scale delivery – productising the electrification offering.
- Environmental performance must be considered broadly: operational carbon is a central concern.
- The transition from gas to electric raises spatial challenges, particularly across multiple dwellings. Systems moving from inside to outside require careful coordination. The lack of 'junk' space in tight sections compounds this.
- Centralised versus individual plant configurations offer different retrofit solutions and could be explored.
- There is potential to integrate services with access infrastructure, such as shared plant rooms.

Recommendation: Further individual discussion with Russell Yarnton regarding scaled heating and cooling water systems.

Chris Knapp - Building 4.0

Chris Knapp identified synergy between this research project and AG Coombs' current project delivering services to 95 social housing dwellings. AG Coombs is in the process of developing a dedicated service module for six-storey residential structures.

Recommendation: Explore whether a systematised service approach from this project can be applied to the retrofit typology scope under investigation.

Ryotaro Kaburagi – Senior Manager, Sumitomo Forestry

Ryotaro Kaburagi expressed strong interest in the concept of mass-produced garage homes and the retrofit renovation market more broadly, while raising important questions about scalability and market readiness.

Key observations:

- The retrofit market has significant potential but may be ahead of public understanding; knock-down-rebuild remains the default expectation for many consumers.
- The research pathway from methodology through design to product delivery is compelling and worth pursuing.
- Marketability and public acceptance are critical variables: renovation concepts are familiar, but residents' willingness to invest financially is shaped by locality, market conditions, and perceived value.
- Richer suburbs are more likely to accept retrofit investment; at lower price points the business case becomes harder to make.
- Value creation is key; for example, additional dwellings that could generate rental or Airbnb income.
- 20-year-old garage house projects represent a potential area of focus: plot-to-house ratios from the 1990s–2010s differ significantly, and there is often underutilised land available.
- Retrofit avoids displacement of residents, preserving community connections and minimising personal disruption.
- Subcategories of garage house typology across decades (1990s, 2000s, 2010s) will be important to understand.

Recommendation: Identify the most popular garage house types by decade and market segment. Pursue collaboration with Sumitomo on targeted retrofit for the 20-year garage house typology.

Thomas Tyndall – Market Innovation Manager, BlueScope

BlueScope is a steel manufacturer supplying materials primarily used in cladding (façade and roof) and steel framing. While the retrofit market is not currently a dominant segment for BlueScope – given that existing residential stock is predominantly timber-framed – there are clear areas of application.

Key observations:

- Colorbond could be deployed for recladding applications, particularly where rendered finishes on 20-year-old homes are failing – it is cheaper and more durable than many alternatives.
- Structurally, BlueScope materials are most relevant when retrofits involve vertical expansion: lightweight upper storeys require non-combustible, lightweight construction.
- Class 2 buildings (e.g. walk-up apartments) require steel for upper levels to meet combustibility requirements.
- Prefabrication is well-suited to the retrofit approach, though relevance depends on the specific focus of the research.
- The research should address building systems holistically rather than single materials.
- Granny flats and separate dwellings on the same plot are among the most interesting application areas for BlueScope.
- Consumer decision-making is important: understanding what drives a homeowner to renovate versus sell ('Love it or List it') requires a clear picture of comparative cost, time, and disruption.

Recommendation: Develop building systems thinking that aligns with BlueScope product capability. Explore application scope for separate new dwellings on existing plots. Maintenance and combustibility warrant further individual discussion.

Samantha Adrichem – Manager Research and Evaluation, BPC

Samantha Adrichem raised important questions about workforce capability, regulatory change, and building performance, noting that the BPC is shortly to undergo a significant merger that will expand its regulatory powers.

Key observations:

- Current trade training is heavily oriented toward brick veneer on concrete slab construction. It is unclear whether existing tradespeople possess the skills required for retrofit work; carpentry graduates may be better placed.
- Condensation and water ingress are increasingly significant issues as homes become more airtight and energy efficient. The retrofit programme must address these risks rather than exacerbate them.
- Inspection and survey frameworks are largely designed for new builds, not retrofits. This will need to be rethought.
- Procurement complexity increases with the scale of intervention: while a heat pump installation is straightforward, more substantial retrofits raise layered questions of on-site versus off-site manufacturing, sign-off, and compliance.
- Compliance is increasingly onerous and acts as a structural barrier to retrofits. The absence of clear product pathways makes new builds comparatively attractive. New mechanisms for making, measuring, and complying with building codes are needed.

Recommendation: Further conversation with BPC regarding the workforce and institutional capacity required to deliver a new retrofit approach at scale.

Philip Alviano – Sustainable Building Advisor, Master Builders Victoria

Philip Alviano broadly endorsed Samantha's observations, adding further emphasis on the surveyor question and the systemic challenges facing retrofit delivery.

Key observations:

- Surveyors are typically risk-averse; the implications for them of approving retrofit work at scale need to be explicitly considered.
- The current prevalence of knock-down redevelopment is producing housing stock of notably lower quality than what it replaces – a strong argument for retrofit.
- Energy efficiency is important, but so is the broader challenge of compliance across renovation types. Bathrooms and kitchens are already problematic in terms of compliance, time, and cost.
- The research must clearly set out the thought process and variables involved: building systems, air quality, and other interdependencies.
- Getting builders and companies on board as delivery partners is essential.

Recommendation: Explore the case for systematising and pre-approving retrofit approaches at scale – making the process more 'IKEA' and less bespoke, while ensuring it is formally authorised.

Henry Pook – Director of Applied Research, Holmesglen

Henry Pook identified significant potential for this research to inform vocational and higher education programmes, and for education institutions to be genuine partners in the research process rather than recipients of its outputs.

Key observations:

- The project has scope to feed into diploma, degree, and trade programmes, including horticulture given landscape implications.
- There is an opportunity to make education and training an explicit deliverable of the research, not an afterthought.
- The 'acquisitive new house' mindset – where homeowners demolish functional existing homes for reasons of fashion or modernity – is a cultural challenge the research could address.
- Holmesglen has prior experience delivering retrofit training for a Victorian Government programme in Ashburton and Ashwood, with findings that may be directly relevant to this project.
- As graduates become licensed, there is an opportunity to equip them with transferable retrofit skills that can be adapted as market demand shifts.
- The research's success will depend on a combination of regulation, community awareness, and education working in concert. The focus on cities does not preclude later application to regional areas, where the same era-based building typologies also exist.

Recommendation: Discuss the Holmesglen retrofit training programme precedent: outcomes and learnings. Ensure that education is an explicit component of the research brief, with clear articulation of what retrofit skills are needed and how training can help deliver them.

Roni Parlindungan – Senior Researcher, BPC

Roni Parlindungan focused on compliance, data, and safety as the primary drivers shaping the retrofit landscape.

Key observations:

- Compliance is a central concern. Safety-focused retrofits, such as upgraded fire ratings, could be considered within the research scope.
- Increasing residential density through retrofit has physical consequences, including greater condensation risk. The research must account for this and avoid exacerbating existing problems. Condensation patterns vary significantly across Australian states and climates.
- The Catalogue could serve as a tool for identifying typologies and then examining how to manage associated risks such as condensation and fire safety.
- Life safety concerns sit at the top of the priority hierarchy and could be integrated into the research framework from the outset.

Recommendation: Initiate further discussion on retrofit data, compliance requirements, and safety as drivers for the research approach.

Final Summary: Key Areas of Building 4.0 CRC Partner Interest

Summary of each partner's concluding points following discussion:

Partner	Key Final Point
Russell Yarnton	Design for Manufacturing (DFM) and digitalisation of systems are a key underpinning. Tolerances require attention: which are fixed, which variable?
Ryotaro Kaburagi	Choosing not to demolish brings existing structural risks that must be named in the Catalogue (e.g. fire, moisture ingress). These need to be treated as part of the design problem.
Thomas Tyndall	As design thinking develops, test along the way. Proposals need to be validated through the process – confidence in the approach must be built iteratively.
Samantha Adrichem	All key points remain relevant; no additional observations.
Henry Pook	Education and training should not be left until the end. Holmesglen seeks to work alongside the research team throughout. Training must be kept in view as retrofit scenarios are developed.
Philip Alviano	Systematisation is essential to reduce compliance burden. The cost of redesigning each time is prohibitive; a pre-approved, replicable approach is needed.
Roni Parlindungan	Deliverables are clear, but metrics to evaluate impact are needed. A structured, accessible database should demonstrate how data can be used and tested, including comparability with existing urban planning platforms.

Building 4.0 CRC Project 58 Industry Partner Engagement
Retrofit Housing Atlas: Workshop 3
Policy and Regulations partners
23 July 2025, Online

Participants

Monash University	Professor Nigel Bertram, Professor Maryam Gusheh, Associate Professor Catherine Murphy, Dr Rebecca Roke
Building and Plumbing Commission (BPC)	Samantha Adrichem, Manager Research and Evaluation; Roni Parlindungan, Senior Researcher; Rufaro Chakaingesu, Building Compliance, Design; Colin McBurney; Ashok Kumar, Lead Modifications Officer; Brandon Kiem, Senior Regulatory Advisor; Thinh Tran, Principal Regulatory Advisor: Technical Strategy
Standards Australia	Levi Robinson
Utecture / Donovan Group	Gavin Tonnet

Meeting Summary: Policy and Regulations

This session brought together partners from building regulation, policy, and standards to discuss the regulatory and policy barriers to retrofit at scale. There was a particular focus on compliance pathways, the role of building surveyor discretion, and the potential for systematic approaches to known retrofit challenges. The central challenge was framed: how to apply a contemporary compliance lens to existing buildings while retaining as much of the existing built fabric as possible, in a context where demolition and rebuilding has historically been the path of least resistance?

Framing the problem

Nigel opened by recapping the key issues raised in the previous workshop: capacity and skills (how to train people, including building surveyors, to understand the complexities of retrofit); data needs (what evidence is needed to evaluate retrofit scenarios); and specific technical challenges such as condensation, which is new to the National Construction Code (NCC) but not new as a phenomenon.

Thinh Tran asked a foundational question: what is the underlying problem this research is trying to solve? Nigel clarified that the core issue is the complexity of retrofitting existing built fabric – there is always a junction between a certified system and an existing condition, requiring judgement and skills that the sector currently lacks. Compliance is often all-or-nothing, which discourages small-scale intervention.

Samantha Adrichem contextualised the issue from a government perspective: the Victorian Government's housing strategy requires significant density increases, and the question is whether this research can help demonstrate retrofit as a viable mechanism for achieving that density while also reducing carbon footprints. She framed it as both an environmental and social project.

Nigel agreed, noting the project's ambition is not simply to document individual retrofit projects but to understand how to achieve retrofit at scale – solving a problem once in a way that applies 10,000 times.

Regulatory barriers to retrofit

Compliance frameworks designed for new builds

Rufaro Chakaingesu noted that the NCC and its associated assessment framework – the Deemed-to-Satisfy (DTS) mechanism – is primarily designed for new construction. When applied to existing buildings undergoing retrofits, it can produce requirements that are impractical or disproportionate to the nature of the intervention. The assessment tool itself may be poorly suited to the problem.

Thinh confirmed that changes to building laws are generally not retrospective: they apply to new builds, and to existing buildings only when a building permit is triggered by significant alterations. The expectation has historically been that existing stock will gradually be upgraded over time as permits are triggered – but this is a slow and uneven process.

Performance solutions and building surveyor discretion

Ashok Kumar explained the two primary compliance pathways for existing buildings that cannot meet Deemed-to-Satisfy (DTS) requirements. First, a performance solution may be prepared and, if acceptable to the building surveyor, accepted without further escalation. Second, if the building surveyor is unwilling or unable to accept a performance solution, the matter can be referred to the Building Appeals Board (BAB) for a modification of the requirement. Colin McBurney confirmed that the BAB operates on a case-by-case basis – there is no mechanism for a generic or pre-approved performance solution to apply across a class of buildings.

Nigel raised the idea of standardising performance solutions for known and repetitive retrofit conditions – for example, access compliance in a 19th-century terrace being subdivided into two dwellings. Ashok noted that while performance solutions can be replicated across units within a single apartment building (where individual units share a common design), they cannot be standardised across separate allotments.

Colin noted that accreditation through the Building Regulations Advisory Committee is theoretically possible but unusual for matters involving existing buildings.

Repetition and the potential for group solutions

Rufaro observed from audit work that performance solutions for certain retrofit conditions are highly repetitive – the same problems recur across similar buildings and are resolved in substantially similar ways. He suggested there may be a case to bring this pattern to the Australian Building Codes Board (ABCB) as grounds for a code change, or to develop it into a standard or guide note for retrofitting. However, no formal mechanism currently exists for grouping individual performance solutions across separate buildings.

Specific technical barriers: practitioner experience

Gavin Tonnet shared experience from converting commercial buildings to residential use, identifying four categories of barriers that recur on almost every project:

- Fire egress: current travel distance and egress requirements differ significantly from those under which most existing buildings were designed. Meeting them in a retrofit almost always requires reconfiguring or adding fire stairs – costly, invasive, and structurally complex.
- Solar access and amenity: keeping the existing core in its current location – essential for economic retrofit – often makes it impossible to comply with current amenity provisions (natural light, ventilation, setbacks). Developers are sometimes forced to relocate lift shafts and services to satisfy planning requirements, at significant cost.
- Car parking and waste management: councils now require underground garbage truck access (clearances of approximately 3.64 metres in height) that is frequently impossible to retrofit into an existing building footprint.
- Structural adequacy of existing slabs: older slabs are often thinner than the 200 millimetre DTS requirement for acoustic and fire rating. While they may still comply through a performance solution, the process of certifying this adds cost, time, and often requires structural augmentation that cascades into column stiffening and further works.

Gavin noted that resolving even a handful of these issues would significantly improve the feasibility of existing building projects. He observed that in each case, the existing element performs adequately in practice – it is the compliance process, not the physical performance, that is the barrier.

Levi Robinson noted that the AS 3600 concrete structures standard is currently undergoing a major revision that will include a new section on assessing existing structures for structural integrity – a directly relevant development. He noted that the slab standard may follow a similar path. Whether these sections will be normative (compliance-triggering) or informative (guidance only) is yet to be determined.

Nigel pointed out that earthquake standards already contain separate provisions for existing versus new structures, and suggested this could serve as a model.

Emerging regulatory models and precedents

Compliance Tiers: Gold, silver, and bronze

Brandon proposed thinking about retrofit compliance in terms of three tiers. A bronze level would cover works that do not trigger a building permit and involve no formal compliance assessment. A silver level would involve partial compliance, with a justification case made to a building surveyor who has discretion to accept it. A gold level would mean full permit and full compliance with current regulations. He used the example of replacing old timber windows with higher-performance double-glazed aluminium units: this is likely a like-for-like replacement that would sit at the bronze level, but the line is not always clear.

Colin noted that the Livable Housing Australia standards had used a gold, silver, and bronze structure effectively – first as a voluntary industry guide endorsed by the Housing Industry Association (HIA), and ultimately (after uptake proved insufficient) adopted into the building code. He described this as an instructive model for how sector-wide change can occur: voluntary guidance, industry endorsement, and eventual codification.

Whole-of-home energy budget (NCC 2022 / Victoria 2024)

Thinh highlighted the 2024 Victorian implementation of the NCC 2022 residential energy efficiency requirements (seven-star standard). A key feature is a whole-of-home energy budget approach, which allows designers to trade off between elements – for example, compensating for an inability to insulate a cathedral roof by increasing insulation elsewhere. This flexibility has direct relevance to retrofit, where building-specific constraints may preclude compliance with individual DTS requirements but where the overall energy performance can still be met through compensatory measures.

Risk-based whole-of-building assessment

Rufaro proposed that the most appropriate regulatory lens for retrofit may be a risk-based, whole-of-building assessment – evaluating the building as a system rather than assessing each element against individual DTS requirements. This approach recognises that trade-offs are inherent in retrofit (a stair that cannot be widened may be offset by improved fire detection or other safety measures) and that the performance-based pathway in the NCC, properly applied, already requires consideration of the whole building. He drew an analogy with fire engineering performance solutions, which must account for the interaction between systems across the building.

He suggested the ABCB's performance-based code framing supports this approach, but that the sector – including building surveyors and designers – needs clearer guidance on how to apply it in retrofit contexts.

Cladding Safety Victoria precedent

Levi and others noted the Cladding Safety Victoria programme as a relevant precedent for risk-based triage of existing building compliance issues. Brandon explained that it likely operates as a tiered risk-based approach – highest-risk buildings are required to act, lower-risk buildings have strategies or timelines to manage the issue. Levi suggested this model – assessing the situation and calibrating the response to risk rather than applying binary compliance requirements – could be applicable to retrofit more broadly.

Embodied carbon caps: international precedents

Gavin noted that some Northern European countries – Denmark in particular – have introduced progressively tightening embodied carbon caps as part of their building approvals process. Starting from 2022 with a relatively light cap, the requirements become more stringent over time, forcing designers, developers, and supply chains to reduce embodied carbon in new construction. This mechanism indirectly incentivises the retention and reuse of existing buildings. Gavin proposed that Australia will need to engage with a similar policy direction, and suggested the Danish model as a case study for the research team.

European mixed-use and retrofit precedents

Gavin observed that European cities have enabled urban renewal and densification through decades of greater flexibility around mixed use, vertical extension (adding lightweight storeys to existing buildings), and a regulatory culture more comfortable with retrofit outcomes. He offered to connect the research team with Danish contacts from a recent CRC tour. He noted that for a 1960s brick apartment building, redevelopment is rarely financially viable – but adding a couple of lightweight storeys or a wing changes the economics substantially.

Standards development

Levi noted that standards development represents a potentially faster pathway to change than code amendment. He identified two immediate opportunities:

- AS 3600: already undergoing revision to include assessment of existing structures, and could provide normative or informative guidance on evaluating slabs and other structural elements in retrofit contexts.
- Slab standard: likely to follow a similar revision process.

He noted that Australia's earthquake standard already separates provisions for existing and new structures, suggesting a model for how other standards could create distinct pathways.

Rufaro suggested that aggregating repetitive performance solutions and presenting them to the ABCB could ultimately lead either to a code change or to a dedicated standard for retrofitting – a document that sets out recognised approaches to known conditions, reducing the need for individual performance solutions.

Historical precedents raised in discussion

Precedents identified as being directly relevant to the project's approach:

- Post-Black Saturday bushfire regulations (2009): Colin described how the VBA published online guidance modelling practical changes to typical dwelling types – brick veneer, timber construction, etc. – and indicative costs, without mandating compliance. This gave homeowners in bushfire zones a menu of voluntary improvements. Nigel noted this is closely analogous to the Retrofit Housing Catalogue approach: identify the stock, develop practical strategies by typology, communicate costs and benefits.
- City of Melbourne renovation guidelines (1970s–1980s): Colin noted that the City of Melbourne had published guidelines for renovating existing buildings, primarily focused on fire safety. These are likely out of date but could provide a historical basis for developing contemporary retrofit guidance for Class 2 buildings.
- Livable Housing Australia standards

Opportunities identified

- Develop a tiered retrofit compliance framework (bronze, silver, and gold) that provides clarity about what triggers a permit, when partial compliance is acceptable, and what constitutes full compliance – reducing uncertainty for homeowners, designers, and building surveyors.
- Aggregate repetitive performance solutions by building typology and present to the ABCB as the basis for code changes, guide notes, or a dedicated retrofitting standard.
- Engage with the AS 3600 revision process to ensure that the new provisions on existing structures address the conditions encountered in residential retrofit (slabs, columns, structural adequacy).
- Develop the bushfire guidance model as a template: for each typology in the Catalogue, provide a menu of practical interventions, indicative costs, and achievable performance improvements – without mandating compliance.
- Investigate Danish and other Northern European embodied carbon cap frameworks as a potential long-term policy model for incentivising retention over demolition.
- Explore planning mechanisms that would require developers to justify demolition, rather than treating it as a default – making the case for retention from the outset.

Actions

Gather research:

- Danish embodied carbon cap regulations: review the 2022 framework, subsequent tightening schedule, and any published assessment of effect on retrofit and reuse activity.
- AS 3600 revision: monitor progress of the existing structures section and engage with the committee through Levi to ensure residential retrofit considerations are represented.
- Cladding Safety Victoria: review the programme's risk-based assessment and tiering model as a potential template for retrofit compliance frameworks.
- City of Melbourne renovation guidelines (1970s–1980s): locate and review as a historical precedent for Class 2 building retrofit guidance.
- Livable Housing Australia standards: review the voluntary-to-mandatory pathway as a model for introducing tiered retrofit compliance into the NCC.
- European mixed-use and vertical extension precedents: pursue contacts from Gavin's CRC Europe tour, particularly in Denmark, for examples of regulatory frameworks enabling building extension and adaptive reuse.
- Earthquake standard (AS 1170.4 or equivalent): review provisions for existing versus new structures as a model for how building standards can create distinct pathways for retrofit.

Future Research to design:

- Develop a typology-by-typology compliance matrix: for each building type in the Catalogue, map the specific DTS requirements most likely to be non-compliant in a retrofit scenario and the available pathways (performance solution, BAB referral, exemption).
- Document repetitive performance solutions: in collaboration with Building and Plumbing Commission (BPC), identify and document the most common performance solutions applied in retrofit contexts, as the basis for a potential code change or guide note submission to the ABCB.
- Draft a tiered retrofit compliance model (bronze, silver, and gold): develop a working paper proposing how a tiered framework could be structured, drawing on the Livable Housing Australia precedent and the BPC team's regulatory knowledge.

Building 4.0 CRC Project 58 Industry Partner Engagement
Retrofit Housing Atlas: Workshop 4
Education, Training and Skills partners
25 July 2025, Online

Participants	
Monash University	Professor Nigel Bertram, Dr Rebecca Roke
Holmesglen	Henry Pook, Director of Applied Research
Master Builders Victoria	Philip Alviano, Sustainable Building Advisor; Corrie Williams, Chief of Public Affairs

Meeting Summary: Education, Training, Skills

The session focused on education, training, and skills development in the building industry as they relate to retrofitting at scale and MMC. Nigel Bertram opened by framing the discussion in the context of recent conversations with regulatory bodies about compliance for both new-build and retrofit situations. The central questions were: what are the needs, barriers, and opportunities for building industry capacity through education and professional development?

CRC Partner Responses

Henry Pook – Holmesglen

Henry Pook discussed existing training packages relevant to the building trades, noting their rigidity as a structural constraint but also their potential as a foundation for retrofit-related learning. He saw an opportunity to develop a more holistic stream; a dedicated industry direction that could draw together disciplines currently siloed: architectural design, horticulture, landscaping, and glazing, among others.

The new Holmesglen degree programme (pending approval) offers scope to embed these cross-disciplinary elements within the learning structure, and short courses or micro-credentials could provide a parallel pathway for practitioners already in the workforce.

Henry acknowledged that resistance to change among teachers and trainers is a real barrier, but argued that a live project – with concrete, assessable competency elements – could create conditions for change. The current competency framework is highly prescriptive; shifting it will require either a change of mindset or direct incentives for educators to engage with new material.

Philip Alviano – Master Builders Victoria

Philip Alviano drew attention to existing sustainability scorecards as a useful model: they provide a hierarchy of actions that could be adapted for housing retrofit contexts, offering a structured framework within which training content could be sequenced.

He emphasised the need for detailed, practical training on new sustainability performance requirements – wall construction, moisture management, condensation – and raised the question of how to communicate these effectively to tradespeople. What should a wall look like in this context? How do you convey the implications of airtightness, embodied carbon, and thermal bridging in ways that are legible on site?

Philip also pointed to international precedents – particularly projects in Germany – where scanning and reading existing building stock has enabled rapid adaptation of similar housing typologies using repeatable, prefabricated elements. This kind of approach, combining digital survey with standardised retrofit products, could offer a model for the Australian context.

Corrie Williams – Master Builders Victoria

Corrie Williams identified the need to refresh the current prescriptive training outcomes – including through Build Skills' qualification reform – as a prerequisite for meaningful change. She noted that Build Skills is currently running a CRC project (CRC 102/111) examining MMC and integrated qualification reform, which offers a potential point of connection with this research.

A central theme in Corrie's contribution was the importance of cross-functional team training and better risk allocation across trades and contracts. Current divisions in labour and siloed approaches to procurement create coordination failures in retrofit projects, where existing site conditions and latent defects require collaborative problem-solving across multiple disciplines. Training could be redesigned to foster this integration rather than reinforce separation.

Key areas Corrie identified for expanded or improved training:

- Assessment of latent conditions on existing sites, with collaborative approaches across trades to address what is found.
- Integrated horticultural and landscape training, covering the implications of deep-root trees and established understorey for retrofit works and footing selection.
- Service provider coordination, so that water, solar, and energy providers understand the constraints and opportunities presented by individual housing blocks – whether greenfield or brownfield.
- Building management systems literacy: awareness of how changes to the building envelope and wall construction affect mechanical performance, and vice versa.
- New products and techniques, including helical screw piles – lighter, smaller, and less disruptive to landscape than traditional excavation methods – as an example of the kind of emerging product knowledge that could be integrated into training for brownfield retrofit contexts.

Nigel Bertram – Monash University

Nigel drew attention to the relationship between embodied carbon and material value in retrofit buildings. The energy and materials already invested in existing building stock represent a form of value that is not currently well recognised by industry or captured in training. A shift in this thinking – treating existing materials as assets rather than liabilities – is important for making the case for retrofit over demolition.

Nigel proposed that student designers and tradespeople could collaborate on real retrofit problems during training, with pilot projects providing an integrated learning environment. Projects with a meaningful social impact dimension would be particularly effective: this factor is highly valued by new students and graduates, and could be leveraged to attract engagement with retrofit as a field of practice.

Recurring themes

- Qualification rigidity as a systemic barrier: current training packages and competency frameworks are too prescriptive to accommodate the cross-disciplinary, collaborative demands of retrofit work. Reform – whether through Build Skills' MMC project or new course structures at institutions like Holmesglen – is a prerequisite.
- Cross-disciplinary integration: retrofit projects draw together construction, landscape, services, and design in ways that current training structures do not reflect. All contributors saw this as an area requiring explicit attention.
- Learning by doing: real projects – whether pilot retrofits or live builds – were consistently identified as the most effective vehicle for embedding new competencies, particularly where they involve collaboration across disciplines and carry visible social value.
- New products and technologies: the pace of change in retrofit-relevant products – screw piles, prefabricated panels, modular systems – means that training will need to be continually updated; micro-credentials and short courses offer one pathway for this.
- Communication and legibility: a recurring concern was how to convey complex building performance concepts – airtightness, thermal bridging, condensation risk – in ways that are actionable for tradespeople on site.

Actions

Gather research:

- Build Skills CRC project (102/111): scope, findings, and opportunities for alignment with this research.
- Holmesglen retrofit training programme precedent (Ashburton/Ashwood): outcomes and learnings.
- German prefabricated retrofit case studies: approaches to scanning existing typologies and deploying repeatable panelised solutions.
- Sustainability scorecard frameworks (Master Builders Victoria): applicability to retrofit hierarchy of actions.
- Helical screw pile products and suppliers: relevant to brownfield retrofit footing design and landscape-sensitive installation.
- Explore potential for pilot projects with integrated student/apprentice collaboration across design and trades disciplines.

Building 4.0 CRC Project 58 Industry Partner Engagement
Retrofit Housing Catalogue: Workshop 5
Materials and Products
31 July 2025, Online

Participants	
Monash University	Professor Nigel Bertram, Dr Rebecca Roke
Apex Wiring Solutions	Simon Waldren, Director
BlueScope Steel	Thomas Tyndall, Market Innovation Manager
XLAM	Jin Ang, Business Development Manager

Meeting Summary: Materials and Products

The session focused on the materials and products dimensions of the Retrofit Housing Catalogue project, with input from representatives of the mass timber, steel, and modular wiring sectors. Nigel Bertram opened with a recap of the project's scope and purpose, before presenting three retrofit scenarios as a basis for discussion. The conversation explored supply chain considerations, construction logistics, compliance, and emerging product opportunities relevant to each scenario.

Project scope and retrofit scenarios

Nigel outlined the project's aim to map common post-war Australian housing types across all major capitals, identify how many of each type exist and how they vary by region, and then explore the retrofit needs and opportunities associated with each. Social housing is out of scope as a separate body of work. Three retrofit scenarios were presented to ground the discussion:

- Garage conversion: standardised double-garage dimensions make this a strong candidate for an off-the-shelf retrofit product – for example, converting to an accessible dwelling unit, with insulation, new door, shade, and veranda elements sized to plus-or-minus 300 millimetre tolerance.
- Panelised cladding system: for brick veneer, double brick, or weatherboard houses with space around them – a prefabricated panel incorporating airtightness, weatherproofing, insulation, and new windows that clips on externally, with old windows removed from inside.
- Vertical extension to walk-up flats: adding a storey to 1960s–1970s double-brick walk-ups to help fund a lift upgrade. Requires roof removal, crane-installed floor cassettes, and fire separation from the unit below, with a focus on minimising time on site.

A fourth scenario raised at a previous meeting was also noted: influencing new house design to pre-enable future retrofits – for example, building in structural or spatial optionality for subdivision or accessibility upgrades without requiring a building permit.

Thomas Tyndall – BlueScope Steel

Tom Tyndall emphasised that, for these solutions to succeed, they need to be grounded in commercialisation from the outset. Key supply chain questions – who installs, what capability they need, and what their incentive is – remain unresolved and require attention alongside the design work.

BlueScope's two most relevant products are Colorbond (cladding and roofing) and Truecore (steel framing). The retrofit market has not yet been a primary focus for the company, partly because bespoke solutions reduce market attractiveness; the project's systematised approach could change this calculus. Tom suggested that downstream customers – garage door manufacturers, Rondo (non-loadbearing partition walling) – may be better placed than BlueScope itself to provide product-specific input for some scenarios.

In the vertical extension scenario, Tom described a Melbourne precedent where six storeys were added to an existing building using prefabricated steel floor cassettes, chosen for their light weight relative to the existing foundations. The key challenge was tolerance: old buildings are not straight, and prefabricated steel is. This reinforced the importance of the project defining dimensional parameters for each building type so that solution providers can assess feasibility and develop appropriate detailing.

Tom also highlighted construction site access as a critical consideration – crane placement, truck access, materials storage, and the need for residents to remain in occupation during works. He noted this as a potential area for innovation in its own right, pointing to transport, materials handling, and lifting as interrelated challenges. Noise disruption was flagged as a further constraint.

Jin Ang – XLAM

Jin Ang introduced XLAM as a mass engineered timber (CLT/glulam) manufacturer, a subsidiary of the Hein Group. XLAM's products are most applicable to vertical extensions and new secondary dwellings rather than internal modifications, given the crane requirements associated with mass timber panels.

Jin confirmed that XLAM is currently engaged in vertical extension projects using a hybrid approach – steel columns with CLT floor plates spanning between them. The company is also developing a standardised CLT flooring system to be available through merchants as an off-the-shelf, lower-cost option; bespoke solutions remain possible but require volume to be cost-competitive.

The discussion identified two promising scenarios for CLT involvement: adding a storey to an existing apartment building (where building width parameters, once defined, would determine which CLT system applies), and constructing a prefabricated secondary dwelling in a large rear garden. For the latter, Nigel noted that screw pile footings – which minimise excavation and work around established root systems – are compatible with mass timber construction. Jin confirmed this is an established practice within XLAM's projects.

Jin shared technical documentation on XLAM's footing systems and current projects as useful reference material for the research team.

Apex Wiring Solutions (Simon Waldren)

Simon Waldren is currently working with Homes New South Wales on a CRC kit-of-parts programme in Sydney. Apex Wiring Solution's modular plug-and-play cabling system, an Australian standard that can also be produced by other manufacturers, has direct relevance both to retrofit scenarios and to the concept of designing new homes for future retrofit adaptability.

Key points raised by Simon:

- Gas-to-electric transition as an enabling trigger for cables: as gas is progressively removed from buildings, electrical pathways will need to be added or upgraded, particularly to kitchens and water heating systems. This creates a natural window for a broader re-cabling exercise.
- Recladding as a rewiring opportunity: a cladding retrofit provides access to wall cavities and can be used to introduce new wiring from the outside, with old wiring simply disconnected and left in situ rather than removed.
- Cable mapping and digital records: very few building owners know where cables run. Apex Wiring Solution's system can map and record cable locations from design through installation, accessible via QR code. This is becoming a more standardised expectation and has clear relevance to the project's digital documentation ambitions.
- 12V DC supply potential: buildings with solar panels have the option to run lighting and certain appliances on a 12V DC circuit, bypassing the need for inverters. Critically, low-voltage circuits below 48V do not require a licensed electrician to install, significantly reducing labour costs and enabling a wider pool of installers. New standards clarifying what can be self-installed are expected within 18 months.
- Modular system flexibility: Apex Wiring Solution's plug-and-play connectors allow sections of cable to be swapped, extended, or replaced without junction boxes; however, under current regulations, work on 240V circuits still requires a licensed electrician even for simple connector changes. Factory pre-assembly is an exception.
- Pre-enabling future retrofit in new homes: the principle of installing conduit with pull-through cord – used in earlier eras to allow later cable additions without opening walls – has a modern equivalent in Apex Wiring Solution's modular system, which can be designed with spare capacity for technologies not yet available.

Nigel noted that cabling is one of the most disruptive and costly elements of building retrofit, often requiring complete replacement because no one will certify existing wiring. Simon's input suggested that the combination of recladding, gas-to-electric conversion, and solar installation could create a bundled opportunity to address wiring holistically. Meter upgrades (required before photovoltaic systems can be installed in many cases) are another related trigger.

Recurring themes

- Defining parameters: the research team's work in mapping building typologies and establishing typical dimensions is the essential foundation for solution providers. Once parameters are known (width, window-to-wall ratio, typical setbacks etc.), manufacturers can assess which systems apply and at what cost.
- Systematisation vs bespoke: all three partners emphasised that cost-competitiveness depends on volume and repeatability. The project's approach – identifying typologies that occur at scale nationally – directly addresses this, but the design proposals will need to hold to that logic rather than drifting toward bespoke solutions.
- Resident occupation during works: scenarios could be designed with the assumption that residents remain in occupation. This has implications for access, sequencing, noise, and the proportion of work done offsite.
- Site access and logistics innovation: crane access, material delivery, and handling in constrained urban settings are genuine design problems. Compact equipment (spider cranes, small excavators) is increasingly available and should be assumed in scenario planning.
- Supply chain engagement: BlueScope and XLAM both noted that their role is as material suppliers, not installers. The research will need to identify the builders and solution assemblers who would sit between the manufacturers and the end product. Specialists in retrofit construction would be particularly valuable contacts.
- Regulatory triggers and co-benefits: gas-to-electric conversion, solar installation, and meter upgrades are emerging as natural triggers for broader retrofit action. Designing retrofit products that can be activated by these triggers – rather than requiring a standalone decision to retrofit – may significantly improve uptake.

Actions

Gather research:

- BlueScope: case studies of prefabricated vertical extension projects (including Melbourne precedent)
- XLAM: technical documentation on standardised CLT flooring system, screw pile footing details, and current vertical extension projects
- Apex Wiring Solutions: links to relevant projects, emerging standards on self-installation of low-voltage systems, and examples of solar/gas-to-electric conversion case studies
- Compact construction equipment: examples of spider cranes, small excavators, and other access innovations in retrofit and constrained-site contexts
- Identify retrofit-specialist builders for future engagement

Building 4.0 CRC Project 58 Industry Partner Engagement
Retrofit Housing Atlas: Workshop 6
Development and Building partners
7 August 2025, Online

Participants	
Monash University	Professor Maryam Gusheh, Dr Rebecca Roke
Breathe Architecture	Irma Del Valle Nachon, Circularity Lead
Fleetwood	Brendan Pope, Strategic Business Development Lead
PT Blink	Wayne Larsen, CEO
Sumitomo Forestry	Ryotaro Kaburagi, Senior Manager

Meeting Summary

The session brought together partners from the development, construction, and architectural sectors to discuss the barriers, opportunities, and practical realities of retrofit at scale. Maryam Gusheh opened with a presentation of the Retrofit Housing Catalogue project scope and methodology, drawing on an earlier study of common housing types in Sydney conducted with the New South Wales Government Architect. The discussion that followed was structured around two questions: why isn't retrofit more commonly attempted in Australia, and what directions would partners like to see the research pursue?

Regulatory compliance and cost

Wayne Larsen identified compliance as the primary barrier, particularly for slab-on-ground houses where subdividing an existing structure requires new services and plumbing at significant cost and complexity. He noted that older buildings frequently contain asbestos and outdated wiring, and that bringing them up to current NCC standards is a substantial undertaking in its own right.

Brendan Pope added that most retrofit interventions – apart from straightforward backyard subdivisions – trigger proportional compliance upgrade requirements for the existing dwelling the moment work begins. This makes even modest projects cost-prohibitive.

Default to demolition

Wayne observed that a persistent cultural and economic default towards demolition is difficult to shift. Clearing a block for $50,000 and starting fresh gives developers' certainty over structure, foundations, warranties, and defects liability. Retrofit introduces unknowns that are difficult to price and hard to insure against. As Wayne put it, the most sustainable building is the one you don't demolish – but the unknown of what lies behind a wall or beneath a slab makes that case hard to make commercially.

Irma Del Valle Nachon echoed this, noting that budget pressure consistently drives decisions toward demolition even among developers who advocate for retention. The status quo around retrofitting is deeply embedded and people remain uncomfortable with the uncertainty it involves.

Owner and occupant complexity

Irma highlighted that projects involving multiple owners – or bodies corporate – are significantly more difficult to deliver than those under single ownership. One of Breathe's most successful retrofit projects succeeded in large part because a single developer owned all affected properties. Brendan added that conversion to owner's corporation models introduces ongoing levies and shared governance that can deter residents even when the physical works are feasible.

Displacement during construction is another practical barrier: retrofit programmes frequently run over schedule, and the cost of alternative accommodation for residents during works adds materially to project budgets.

Scale and manufacturing economics

Brendan raised a manufacturing-side constraint that sits alongside the demand-side barriers: even where sufficient stock exists for a product to be considered 'at scale' from a research perspective, orders may arrive too infrequently and irregularly to justify continuous production tooling. Without a reliable pipeline of orders, the economies of industrialised construction – bulk purchasing, optimised labour, continuous workflow – cannot be realised. One-off production of even a standardised product loses most of the cost advantage.

Interface and geometric variability

Brendan and Wayne identified the interface between new prefabricated components and existing construction as a persistent design and cost problem. Even when a building type is well understood as a typology, individual examples will vary in materials, angles, and connection details, requiring customised interfacing on a case-by-case basis. Wayne noted that this effectively inverts the logic of mass customisation: the product can be standardised, but the interface must be customised to absorb the geometric irregularities of buildings that have moved and settled over decades. This is especially acute for fire and acoustic compartmentalisation when subdividing existing dwellings.

Adaptive reuse of commercial stock

Wayne noted that PT Blink is increasingly involved in adaptive reuse of commercial buildings – converting offices, hotels, and apartment buildings to different residential uses. These projects carry their own complexity: large floor plates make it difficult to achieve natural light and ventilation in habitable rooms, and getting services in and out of existing structures is consistently challenging. Even in this space, demolition often remains the easier option for developers seeking certainty.

Wayne also flagged an area not yet addressed in the research: the airspace above government utilities, church land, and similar assets that have an ongoing ground-level purpose but unused vertical potential. Developing this airspace offers a path to density without consuming new land.

Opportunities and emerging directions

Mass customisation

Ryotaro Kaburagi proposed mass customisation as the appropriate model for bridging the tension between standardisation and the variability of existing stock. Rather than attempting to accommodate every possible case, the approach involves reducing variation to a defined set of configurations – fixed structural and modular elements with a curated range of selections – that retain manufacturing efficiency while allowing for meaningful differentiation. He pointed to Japanese volume builders as a precedent, where industrialised housing systems offer customers choices within a tightly controlled modular framework. The catalogue structure of the research project – grouping typologies into families that can be addressed by a common system – directly supports this logic.

Scanning and diagnostic technology

Ryotaro highlighted the potential for improved scanning and radar technology to reduce the unknowns of existing construction without requiring demolition – identifying what lies behind walls, beneath slabs, and within service runs before work begins. He suggested this could represent a breakthrough for the sector if it can be developed to a level of reliability and cost that makes it practical at project scale.

Accessory dwelling units and planning reform

Irma noted that recent planning amendments in Victoria allowing secondary dwellings in backyards without planning approval have generated strong client interest, particularly because they offer an additional income stream through rental. Wayne observed that equivalent Accessory Dwelling Unity (ADU) provisions in New South Wales have been similarly significant, enabling productive use of large suburban blocks without the regulatory burden of full subdivision. Both saw this as a model for how planning reform can unlock retrofit activity that the market is already inclined toward.

Future-proofing new construction

Wayne proposed a structural design principle for new buildings that would make future retrofit far simpler: locating all gravity loads on the external envelope, with no load-bearing internal walls, and running services only through external walls rather than internal partitions. This would allow the interior of a building to be reconfigured freely – subdivided, consolidated, or adapted – as household needs change over time, and would facilitate vertical extension by keeping the structural logic clear. PT Blink is exploring this as a product direction, though Wayne acknowledged that shifting industry practice from established methods is a slow process.

Carbon credits and incentive mechanisms

Brendan suggested that retrofit projects could be made financially viable through a carbon credit mechanism: retaining an existing building rather than demolishing it could be recognised as a carbon-avoided asset, which homeowners or developers could trade or sell to greenfield developers needing to offset new construction. Wayne expanded on this, suggesting that life cycle assessment could establish a recognised carbon baseline for existing buildings – effectively treating a retained building as a zero-carbon asset – and that tradeable carbon certificates could be issued accordingly, providing an annuity to offset compliance costs.

Irma noted that the Green Building Council is developing a retrofit rating tool for commercial and fit-out contexts, and suggested that a residential equivalent could be valuable – offering homeowners a sense of achievement and legibility around their retrofit investment, even before any mandatory framework exists.

Intergenerational living

Irma observed a growing shift in client interest toward adapting existing homes for intergenerational living – accommodating multiple generations or family members within a reconfigured single dwelling or consolidated plot. This demand is beginning to animate the larger dwelling typologies shown in the Sydney study (villas and mansions) and offers a culturally resonant narrative for retrofit that goes beyond purely environmental or financial arguments.

Partner Research priorities

Rebecca invited partners to identify the aspects of the research they would most like to see developed. Key themes:

- Feasibility matrix: develop a matrix of retrofit strategies ranked by difficulty, cost, and impact across the typology genealogy, to identify 'low-hanging fruit' that can be prioritised for early action and product development.
- Modularised interior fit-out: develop a kit-of-parts approach to internal reconfiguration that simplifies the fit-out process and reduces the time and cost of subdividing or adapting existing dwellings.
- Infrastructure overlay: map retrofit opportunities against existing transport and road infrastructure, since densification strategies – particularly garage conversion – have direct implications for parking and street capacity that will affect community acceptance.
- Quantity surveyor input: pair the typology strategies with indicative cost estimates so that the research can speak directly to decision-making by homeowners and developers.
- Carbon and energy performance: quantify the energy performance improvement achievable through retrofit strategies for each typology, and the associated carbon savings, to provide a compelling financial and environmental case for retention over demolition.
- International precedents: investigate German and United Kingdom panelised retrofit systems applied to social and private housing stock, including Echoworks (Germany) – a company delivering modular wall systems to improve the energy performance of existing buildings, including additional floor provision. Zacqua Ventures (Collingwood office) was flagged as a relevant investor in this space. A United Kingdom social housing precedent involving full external retrofit without resident displacement was also noted for follow-up.
- Focus sharpening: Brendan suggested that early feasibility analysis may reveal that some typologies in the catalogue are less suitable for retrofit than initially assumed; identifying and setting these aside earlier would allow the research to concentrate effort where the potential is strongest.

Recurring themes

- Incentives as market activator: European experience – particularly in Germany and the Netherlands – consistently shows that retrofit markets open up when meaningful financial incentives are introduced. Identifying and advocating for equivalent mechanisms in the Australian context (carbon credits, planning concessions, grant programmes) is likely to be as important as the design strategies themselves.
- Precedent and confidence: alongside incentives, the absence of well-publicised precedent makes clients and developers reluctant to proceed. Building a body of documented case studies – Australian and international – is a priority.
- Townhousing as a practical pathway: Ryotaro noted that double- or triple-storey townhouses represent an effective middle ground for densification – less complex than mid-rise apartment construction, accessible to smaller builders, and achievable without triggering the union cost pressures and minimum volume thresholds associated with higher-density development.
- Services as the persistent design problem: routing new services – plumbing, electrical, gas-to-electric transition – through or around existing construction was consistently identified as the hardest and most costly element of retrofit. Design strategies that address this directly, and products that reduce the complexity of service integration, were seen as the highest-value research direction.

Actions

Gather research:

- Echoworks (Germany): panelised wall and floor retrofit system – review feasibility model, cost catalogue, and project examples
- Zacqua Ventures: construction-sector venture fund with Collingwood office – explore as a potential connection to international retrofit products and investment models
- United Kingdom social housing external retrofit precedent: identify programme (noted by Irma) and review approach to resident retention during works
- Green Building Council retrofit rating tool: review draft for commercial/fit-out contexts; assess applicability or adaptation for residential
- ADU planning provisions: compare New South Wales and Victorian frameworks for secondary dwellings without planning approval – implications for the research typologies
- Japanese mass customisation housing models: Sumitomo Forestry and comparable volume builders – review modular coordination and selection frameworks
- Develop feasibility matrix: rank retrofit strategies across typologies by difficulty, cost, and yield (dwellings, carbon, canopy)
- Engage quantity surveyor for indicative cost estimates against typology retrofit scenarios

