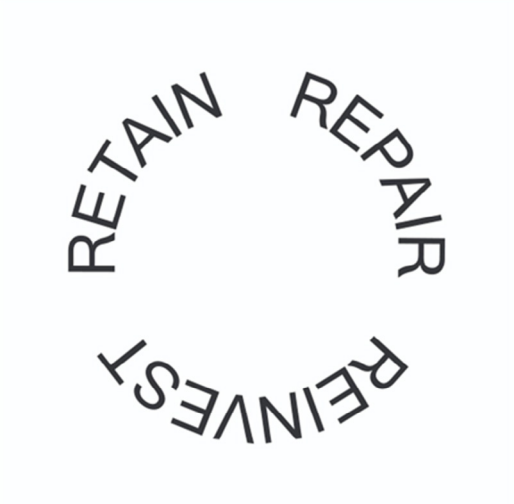

Retain Repair Reinvest

Waterloo Estate (North and Central)
Feasibility Study and Alternative Design Proposal

OFFICE

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OFFICE is a charitable not-for-profit design and research practice based in Melbourne, Australia. It is a group of architects, landscape architects, urban designers and researchers who assist community groups in advocating for better outcomes within the built environment.

Report prepared by OFFICE

16th July 2025

Acknowledgements

The project team would like to acknowledge the Traditional Owners of the land on which this research has been conducted. We pay our respects to Elders past, present and emerging. It always was, always will be, Aboriginal Land.

This project is a self-initiated research report and design study, conducted independently and is not politically affiliated with any party. The project is underpinned by a commitment to ensure housing as a basic human right.

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Executive Summary Retain, Repair, Reinvest

Render of the retrofitted towers and slabs and with new infill envelopes in white. Image by OFFICE.

Governments across Australia are grappling with the challenge of ageing public housing estates that no longer meet modern living standards and have high maintenance costs. These challenges are compounded by the fast growing waitlist of priority communities in need of suitable housing.

This report reimagines how estate regeneration and increased public housing provision can be planned and delivered over the next decade. Given HomesNSW's significant housing portfolio, there is an opportunity for a different approach to estate renewal to address the persistent shortage of genuinely affordable housing in major urban areas across the state.

Retain, Repair, Reinvest (RRR) is a site-specific strategy for evaluating the refurbishment potential of existing public housing stock, developed by the design and research practice OFFICE. At its core is the retention of public housing with the commitment to ensuring housing as a basic human right. The approach has three key objectives:

- Retain existing communities by not relocating residents,[1]
- Repair existing buildings to reduce environmental impacts of construction,
- Reinvest savings to improve comfort and upgrade public housing.

[1] This iteration of RRR at Waterloo advocates for temporary resident relocation within the estate, in order to retrofit the dwellings. However, residents would not be required to move beyond the estate and their communities (refer to Section 8.1 for further details).

This strategy was initially developed in response to the Victorian Government's demolition and rebuild approach to renewing ageing public housing estates in Melbourne, however it has relevance and application across Australia. To date OFFICE have undertaken three case studies using a RRR approach: Ascot Vale Estate, Barak Beacon Estate, Flemington Estate all of which found refurbishment to be a viable alternative.

In this report, OFFICE have applied the RRR approach to the renewal of the North and Central zones of Waterloo Estate in Sydney NSW. There is also future opportunity for the strategy to be applied to housing estates across the HomesNSW portfolio to assess renewal feasibility and accurately determine the viability of refurbishment rather than demolition and rebuild.

This report compares the RRR strategy with the NSW government's previous renewal approach under Communities Plus which follows a process of tenant relocation, demolition, and rebuild. This process begins from the NSW government rationale that refurbishment is not a viable option - despite no feasibility studies for the renovation of the estates being available to the public.

The objective of Retain, Repair, Reinvest is to understand whether it is both technically and economically feasible to retain the existing public housing via refurbishment and, where appropriate, to advocate for retrofit and infill development to provide greater social and environmental benefit. Key to the RRR studies are the uncaptured costs which make up these complex renewal projects. Working with SGS Economics and Planning, the team have been able to quantify the health, wellbeing and educational costs of relocating residents as well as the direct cost of housing tenants during the construction period. OFFICE argue that these are part of the total project delivery and should be factored in when determining the feasibility of redevelopment.

RRR identifies the uncaptured costs associated with the redevelopment of Waterloo North and Central and proposes to redirect these savings into the refurbishment of existing public housing stock and new infill development. These costs include the relocation of existing tenants, significant disruption of communities and demolition of existing buildings.

This Retain, Repair, Reinvest report attempts to address all of the objectives of developments undertaken by HomesNSW - including contemporary livability standards, ageing buildings, unit size and types, and additional housing capacity through infill. This report has found that, compared to a demolition and rebuild approach, the RRR model of refurbish, retrofit and infill will result in a net positive improvement to economic, social and environmental outcomes for the redevelopment of Waterloo North and Central. The RRR approach would deliver an estimated:

- **$76 million in savings from health, education and relocation costs,** by limiting the disruption and distress in the lives of residents who would otherwise be relocated from their homes for years during the demolition and rebuild process
- **Increased comfort, livability and energy bill cost savings through an average of 83% reduction in energy demand** across the 30-storey towers and 20-storey blocks. This is due to an increase from an average of 2.2 to 7.8 NatHERS rating.
- **$290 million in construction costs savings by refurbishing instead of demolishing and rebuilding the same number of existing dwellings**.

In total, it is estimated over $700 million in reduced costs can be achieved if the RRR model's refurbish, retrofit and infill approach is implemented in Waterloo North and Central instead of a demolition and rebuild approach.

This report also advocates for a reduction of 766 dwellings proposed, 2478 new dwellings to 1712, as proposed by the NSW Government's 2019 Preferred Master Plan, and an increase in green open space.[2] This reflects the same reduction in dwelling numbers in the approved 2022 Waterloo South Planning Proposal[3] compared to the 2019 Preferred Master Plan, and responds to residents' concerns about loss of public space, significant existing trees and excessively high density.

Render of the new landscaped ground plan with retrofitted buildings. Image by OFFICE.

Background

This report presents an alternative strategy for the renewal and expansion of public housing in NSW. Until recently, large-scale public housing estate renewal in NSW has been delivered under the Communities Plus program. Announced as part of the Future Directions for Social Housing policy in January 2016 by the previous NSW State government, the Communities Plus program was led by the Land and Housing Corporation (LAHC), a government-owned corporation which owned and managed all NSW public housing land and housing. The Homes for NSW Plan will be released in July 2025, and will replace Future Directions.

Waterloo Estate is one of the Communities Plus sites, and is separated into three precincts of Waterloo North, Central and South. In late 2024, a contract was awarded to the Stockland-led

[2] NSW Land and Housing Corporation, *Waterloo Estate Preferred Masterplan,* 2019.
[3] NSW Planning, Industry and Environment, *Waterloo South Planning Proposal,* 2022.

consortium for the redevelopment of Waterloo South for the approximate value of $4 billion. While there have been many iterations of plans for the entire estate, only Waterloo South has been finalised - with the existing 749 properties to be demolished and replaced with 1000 community housing dwellings, 600 affordable homes and approximately 1500 private dwellings.[4]

This RRR report presents a feasibility study and design strategy for Waterloo North and Central and expands on work having already been undertaken on the site from both LAHC and the City of Sydney. The report compares the impacts and benefits of a retrofit and infill strategy for Waterloo North and Central with a demolition and rebuild approach. In the absence of definitive plans for the North and Central sites, the RRR report uses the 2019 Preferred Master Plan as a point of comparison.[5] In acknowledgement that these plans will likely change, it is referred to as the 'demolition and rebuild strategy' throughout the RRR report.

The contract for the Waterloo South redevelopment is not publicly available, and there are no accessible details of the public-private-partnership financing and development model. As such, this report focused on the possibility of retaining the existing communities and buildings of Waterloo North and Central, by accurately determining the viability of refurbishment - but it does not examine the requisite financing and delivery mechanisms, beyond an assumption of the land remaining publicly owned.

RRR: Waterloo North and Central questions the rationale for demolition, quantifies the uncaptured costs and value-loss of the real estate-led model, and calculates the savings that can be achieved through refurbishment and infill. These costs and disbenefits of the developer-led model include:

- The direct financial costs of relocating residents during construction
- The social and health impact of relocating residents
- Environmental costs of demolition and new materials for development

This document demonstrates the value of a refurbishment and infill approach by comparing the delivery of the developer-led approach with the RRR strategy.

[4] The planning proposal that has been approved does not require this social mix, however these are the numbers that have been released via NSW government press releases. See: NSW Government, Ministerial Release, *Waterloo renewal reaches new milestone to deliver Australia's largest social housing project.* April 2025.
[5] NSW Land and Housing Corporation, *Waterloo Estate Preferred Masterplan,* 2019.

Key Findings

This study demonstrates how a Retain, Repair, Reinvest strategy can address the key objectives of the previous Communities Plus model and the NSW Land and Housing Corporation (LAHC), and key objectives of HomesNSW for estate renewal without requiring demolition and rebuilding. The RRR approach shows it is possible to retrofit the existing public housing in Waterloo North and Central, and deliver improved living conditions for residents, reduce social and environmental impacts, and create possible financial savings for the NSW Government. These findings are presented under the three impacts of Retain, Repair and Reinvest.

Retain

A refurbishment and infill proposal would significantly limit disruption and distress in the lives of residents who would otherwise be relocated from their homes for years during a demolition and rebuild process. We have estimated that 10% of existing residents will need to be housed in head lease arrangements.[6]

In addition to the social and wellbeing experiences of residents, the health costs, education costs and relocation costs have been valued at over $76 million for Waterloo Central and South.[7]

Table 1: The uncaptured social costs associated with the relocation of residents.

Social Costs associated to relocation of Waterloo North and Central Residents	
Health Cost (1751 people)	$4,062,000
Education Cost (54 children)	$590,400
Relocation Costs	$72,243,638
Total Social Costs	**$76,896,038**

[6] We have estimated that 10% of existing residents will need to be housed in head lease arrangements, based on comparable findings from relocations at Ivanhoe Estate, as detailed in Sisson, A., & Ruming, K. (2024). Calculating the system-wide supply impacts of social housing estate renewal: New measures and methods. *Housing Studies*, ahead of print, 1–25. https://doi.org/10.1080/02673037.2024.2378852
The method for determining the relocation costs is detailed in Section 2.5 of this report.

[7] The RRR approach supports residents who do not want to remain in Waterloo to take opportunities for other social housing during the redevelopment process - and research by UNSW shows that approximately 35% of Waterloo residents would prefer to move off the estate. RRR shows that for residents who wish to remain on the estate, that it is feasible and possible. See UNSW Centre for Primary Health Care and Equity, *Waterloo Public Housing Tenants Survey Report,* 2024.

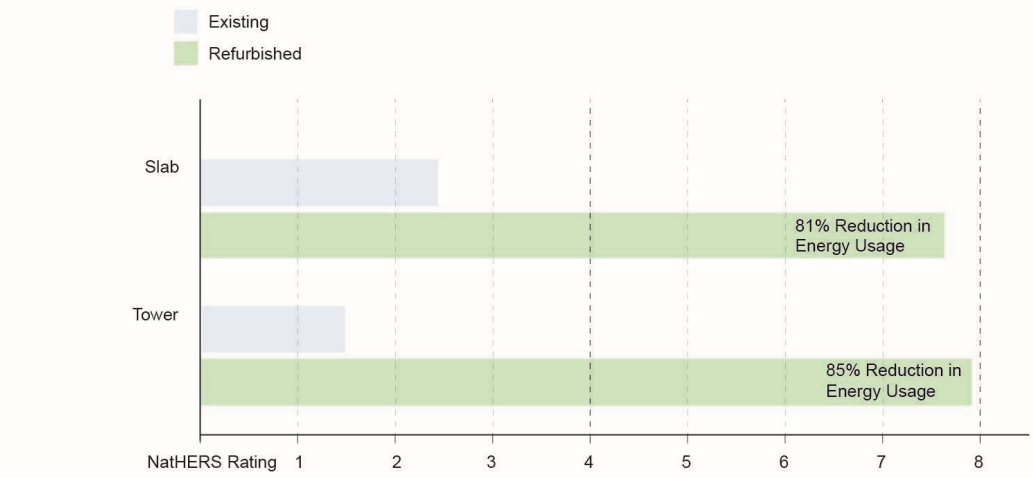
Repair

Through a retrofit approach, the RRR approach can achieve a 85% reduction in energy demand for the 30-storey towers in Waterloo North, and 81% reduction of the energy for the smaller slab buildings. Refurbishment will also improve the NatHERS ratings of both apartment types in the towers (an average 6 star increase across the towers to an average 8 star rating) and an improvement from a 2.4 rating to 7.7 star average for the slab buildings.

These upgrades, combined with enhanced accessibility and improved apartment standards, will greatly increase comfort and livability for existing residents – as well as bill reduction and energy savings.

The RRR model also has a Global Warming Potential saving of 33%, compared with the CO2e associated with a demolition and new build strategy.

Figure 1: NatHERS energy rating comparisons between existing and RRR refurbishment



Reinvest

The average cost to refurbish a dwelling is $246,000 (43%) less than the price of a new build. Refurbishing the 1176 units instead of demolishing and rebuilding them would save an estimated $290 million across Waterloo North and Central. RRR also presents opportunities for site-sensitive infill of new housing.

In addition to refurbishing the existing dwellings, RRR proposes a sensitive infill approach to assist in addressing the housing waitlist in NSW. Based on the density calculations informed by LAHC's 2019 plan, the demolition and rebuild approach would have seen 3,900 units constructed in the North and Central precincts. However, based on our community engagement and collaborative design sessions with residents, it was apparent a more sensitive and contextually responsive approach to the site was required to respond to their valued open space, community garden and established trees.

As a result, the RRR proposal achieves a total of 3,034 dwellings, comprising a mix of refurbished and infill units. While a decrease from the initial LAHC plans for 3900 dwellings, it offers a higher density than the City of Sydney proposal of approximately 2250 units,[8] while retaining open green space and public amenity.

Figure 2 demonstrates the $702 million cost savings achieved through a RRR approach for Waterloo North and Central, however this does not reflect the delivery of fewer dwellings than the original LAHC 2019 plan. To give a more accurate comparison of cost savings, Figure 3 demonstrates the cost per dwelling of each renewal type, as a clear point of comparison. It is clear that refurbishment and upgrading of the existing buildings is the most cost effective approach. Construction costs are $288,000 per-dwelling for the towers and $360,000 for the slabs, compared to $570,000 for each new unit when undertaking a demolition and rebuild approach.

Figure 2: Project cost comparisons between the RRR refurbishment and infill approach, with the demolition and rebuild model.

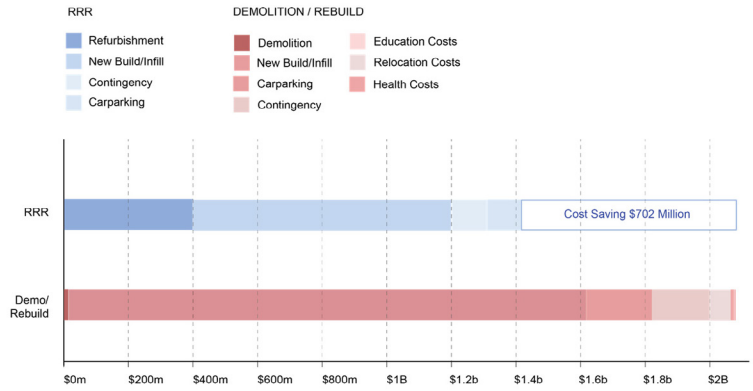
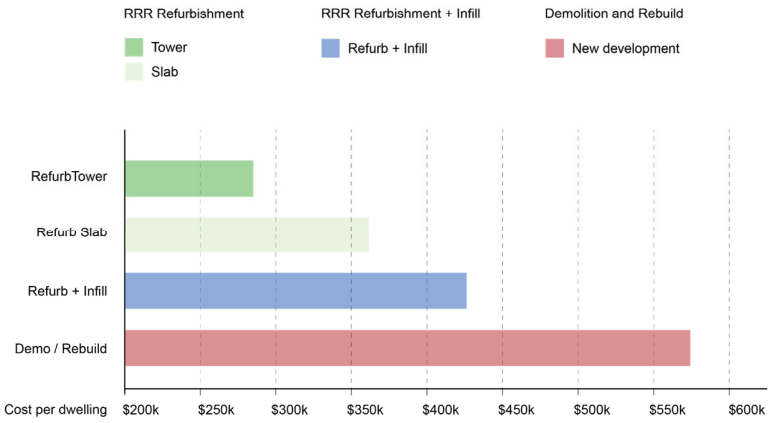


Figure 3: Cost per dwelling comparisons between; refurbishment of the slab buildings, refurbishment of towers, slabs and additional infill; and demolition and rebuild.



[8] City of Sydney, *Urban Design Study Part 2, Waterloo Estate (South),* Attachment A1(b), 2019.

Overall findings

While the renewal of Waterloo North and Central is not scheduled for another decade, there is significant value in exploring alternative approaches to renewing the estate now. Energy modelling conducted as part of the ESD analysis has shown that the existing buildings are performing extremely poorly, and residents have raised concerns about ongoing maintenance issues. Strategic initiatives can be introduced in the short term to address these issues and improve the living conditions for residents. This would allow for meaningful improvements to be made while longer-term plans for the broader site are developed collaboratively with residents over the coming decade.

Table 2 below provides a full overview of the benefits and savings of the RRR retrofit approach compared with a demolition and rebuild strategy.

Table 2: Comparison of costs between demolition and rebuild approach and RRR: Waterloo North and Central proposal.

	Demo/Rebuild	**RRR**
RETAIN		
Increasing housing	Using the density numbers from the LAHC proposals we estimate 3800 dwellings to be delivered. This is an increase in **2478** dwellings (187%)	Retain, Repair, Renew increases the number of dwellings by **1712** through refurbishment and infill. This is an increase in **1712** dwellings (129%) **While the RRR approach provides a smaller overall uplift than LAHC 2019 plans, this responds to resident concerns about loss of public space, overly high density – and is more in line with the approved Waterloo South plans which has reduced dwelling numbers from earlier plans.**

External Relocation costs	The total relocation costs of existing tenants during construction is estimated to be **$72.24 million**.	Relocation fees for RRR are $0 due to the staging of works. There would be a budget for a small removalist fee from relocating residents within the Estate during the new build and refurbishment. **The RRR strategy saves $72.24 million in State Government financing.**
Health and wellbeing cost	The cost to health and wellbeing is estimated at **$4.01 million** for relocated residents.	By retaining community, there are no health and wellbeing impacts through relocation. **The RRR strategy has no health and wellbeing cost.**
Education costs	The cost of interruption to education during this period is estimated at **$590,400** for relocated residents.	By retaining the existing community, there are no educational impacts through relocation. **The RRR strategy has no educational impact cost.**
REPAIR		
Financial Investment	The construction costs to replace the existing units with the same amount of new dwellings would be **$670 million or $570,000 per dwelling.**	Existing buildings can be refurbished for an average cost of **$380 million or $324,000 per dwelling** **The RRR refurbishment cost is therefore $290 million less than a demolition and rebuild approach.**

LAHC/HomesNSW Objectives (Lifts, Energy Efficiency, Accessibility)	Addressed through demolition, relocation and rebuild.	Addressed through refurbishment and infill. **The RRR refurbishment strategy can meet all objectives, for a lower financial investment.**
LAHC/HomesNSW Objectives (Apartment and design standards)	Addressed through demolition, relocation and rebuild.	Addressed through refurbishment and infill. **The RRR refurbishment strategy can meet the majority of the apartment and design standards, for a lower financial investment.**
Life Cycle Assessment	The total Global Warming Potential to demolish and build the new housing is calculated at **315,000 tonne CO2e**	The total Global Warming Potential of the refurbishment and infill proposal is **212,000 tonne CO2e** **The RRR model has a Global Warming Potential saving of 33%.**
REINVEST		
Overall cost savings	The full costs for demolition, relocation and construction of the new housing under is calculated at $2.15 billion	The RRR strategy would see Waterloo North and Central refurbished and infill housing developed, without displacing communities or demolishing buildings, for $1.46 billion. **The overall construction cost of the development would be $700 million less than the existing renewal scheme.**

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Acronyms and Definitions

ADG	Apartment Design Guide
Affordable housing	Affordable housing is for very low to moderate income households. Under NSW planning policy and legislation, affordable housing is priced so that a households are spending no more than 30% of gross income on rent.
Community housing	Community housing refers to dwellings that are managed and / or owned by private non-profit community housing organisations (CHOs). Tenants pay 25% percent of income in rent and 100% of their CRA, and the tenure i is less secure. While public housing prioritises people in greatest need, CHO greatest need allocations were 76.6% in 2022-23.
CoS/the City	City of Sydney
CRA	Commonwealth Rent Assistance
LAHC	Land and Housing Corporation NCC
NCC	National Construction Code
PPP	Public Private Partnership
Public housing	Public housing is owned and managed by the NSW government. Public housing caps rents at 25% of tenants' income, provides secure tenure, and prioritises people in greatest need.
RRR	Retain, Repair, Reinvest
SDA	Specialist Disability Accommodation
Social housing	The term social housing is an umbrella category referring to a range of non-market forms of housing including both public and community housing.
the Estate	Waterloo Estate

The existing 30 storey tower at Waterloo North is one of six high-rise buildings that make up North and Central. Surrounded by mature trees and open green space. Photo by OFFICE

1. Introduction

1.1 Overview

This report presents an alternative approach for the estate renewal of the Waterloo North and Central - comprising the Matavai and Turanga towers, along with the Solander, Marton, Cook and Banks slab buildings. The report considers an alternative to the recently contracted demolition and rebuild approach of Waterloo South, and demonstrates the technical viability, as well as the economic, social and environmental benefits of retrofitting the public housing. The feasibility study and design proposal also includes infill housing, increasing the density of the estate and providing an opportunity for additional social housing on the site.

Since 2006 the entire Waterloo Estate precinct (North, Central and South) has been earmarked for redevelopment. Over this time, a series of alternative proposals have been put forward by NSW Government's Land and Housing Corporation (LAHC)[9] and Redfern Waterloo Authority (a re-configured demolition and rebuild) and the City of Sydney (partial demolition, refurbishment and infill).[10] These proposals have informed this report in demonstrating the possibility of alternative approaches for the site. In 2019 it was announced that Waterloo South would undergo an estate renewal through demolition and rebuild, while Waterloo North and Central are slated for redevelopment within the next 10-15 years.

The Waterloo Estate is made up of a collection of brick walk-ups and the larger concrete tower and slab buildings which are a point of reference within the suburb. Photo by OFFICE

[9] NSW Land and Housing Corporation, *Waterloo Estate Preferred Masterplan,* 2019.
[10] City of Sydney, *Urban Design Study Part 2, Waterloo Estate (South),* Attachment A1(b), 2019.

1.2 Objectives and Scope

LAHC Masterplan

City of Sydney Masterplan

The LAHC preferred masterplan stated to deliver 6800 dwellings across the whole estate. With the announcement that Waterloo South will deliver 3000 dwellings, OFFICE have assumed that 3800 dwellings would be delivered in North and Central.

The report compares the impacts and benefits of a retrofit and infill approach for Waterloo North and Central with a demolition and rebuild strategy. In the absence of definitive plans for the North and Central sites, the RRR report uses the 2019 Land and Housing Corporation (LAHC) plans for the site. In acknowledgement that these plans will likely change, it is referred to as the 'demolition and rebuild strategy' throughout the RRR report.

RRR: Waterloo North and Central assesses whether a Retain Repair Reinvest refurbishment strategy can achieve the same objectives for North and Central while avoiding the demolition of any public housing and avoiding the relocation of residents, while also addressing broader HomesNSW property standards. The report demonstrates the economic, environmental and social value of the RRR approach, as well as capturing the disbenefits of demolition and rebuilding.

The case study of Waterloo North and Central presented in this report is specific to the conditions and particularities of the housing's design, site condition and community values. However, the challenges faced by governments in addressing estate renewal and the unaccounted environmental and resident relocation costs are relevant across Australia.

As the biggest public housing estate in Australia, Waterloo provides an opportunity to demonstrate best practice for estate renewal. Through applying the RRR model to a tower and slab typology, we can bolster the case for a reappraisal of the current demolish and rebuild approach to public housing. RRR offers an adaptable model of capturing true costs of relocation, demolition and rebuild alongside conducting a thorough feasibility study for retrofit, that is replicable for other government owned sites nationally.

1.3 Previous Iterations of RRR

RRR: Ascot Vale

In May 2022, OFFICE applied the RRR strategy to a public housing estate in Ascot Vale which has been identified as a site for renewal by Homes Victoria. The Estate, designed in the 1940s by modernist architect Best Overend, consists of 47 three storey walk-ups and is estimated to be at 80% occupancy. Along with residents, the design team identified an empty block of flats, at 42 Ascot Street, to conduct the RRR study on, by comparing the outcomes to part of the Estate that had already been demolished and redeveloped as part of the Public Housing Renewal Program (PHRP).

The RRR study established that refurbishment could achieve the PHRP program objectives of accessibility, liveability and energy requirements without requiring the relocation of existing communities. The design proposal incorporated a new lift, an allocation of Specialist Disability Apartments (SDA), heating and cooling upgrades (7.4 NaTHERS and 38% energy use reduction), and a redesign of the communal rooftop. A direct construction cost saving of $281,838 per dwelling was identified through the RRR refurbishment proposal, compared with the PHRP demolition and rebuild.

Refurbishment works at the case study site of 42 Ascot Street were recently completed by Homes Victoria who confirmed that the block will be retained as public housing. Construction began two months after the release of the RRR: Ascot Vale feasibility study, having been vacant for over two years. These works recognise the potential of refurbishment as an alternative renewal strategy and hopefully one that will be adopted in other ageing public housing estates.

Photo of the refurbishment works in process at Ascot Vale, and the rendered proposal produced as part of RRR: Ascot Vale. Photo by Ben Hosking (left). Image by OFFICE (right).

RRR: Barak Beacon

In November 2022, OFFICE undertook a second RRR feasibility study and design proposal on the Barak Beacon Estate in Port Melbourne. The estate was identified under the Big Housing Build (BHB), and was financed through a new Ground Lease Model (GLM) which enables the government to retain ownership of the land, with a 40 year lease provided to Community Housing Providers to deliver social housing. Similarly to the PHRP, the GLM continues the approach to estate upgrades through tenant relocation, demolition, and new build through a private-public-partnership model. The feasibility study and design proposal found that a RRR strategy could address all of the objectives of the BHB and GLM, and deliver improved living conditions for significantly lower direct financial investment from the government. The RRR model also proposed strategic infill on the site to increase new homes during a housing crisis. The report found that the GLM did not provide financial, social or environmental benefit, and improved outcomes could be delivered for significantly less government and private sector investment.

In November 2023, the Barak Beacon public housing was demolished, and the Building Communities Consortium was selected to deliver the new social and private housing.

Barak Beacon Estate was demolished in 2023 as part of the Big Housing Build despite resistance from residents and advocates. Photo by OFFICE.

RRR: Flemington

In September 2023, then-Premier Daniel Andrews announced that all 44 high-rise towers in Melbourne would be demolished and replaced with social housing. OFFICE worked closely with residents of the first tranche of towers slated for demolition at Flemington and North Melbourne estates to assess the feasibility of refurbishing the high-rise flats as an alternative to full-scale demolition.

Key design elements of the RRR proposal include infill housing on underused parking areas to increase site density, integrated underground parking, and a revitalised landscape with community spaces and recreational areas. A central green space will foster community engagement, and 65% of mature trees will be preserved for environmental benefits. The plan also includes a focus on energy efficiency, with double-glazed windows, photovoltaic cells, and water conservation systems.

The retrofit aims to meet contemporary standards for accessibility, energy efficiency, and structural integrity, while enhancing the building's aesthetic with new facades, private balconies, and improved communal areas. The RRR proposal has been costed at $320,459 per dwelling, significantly lower than the cost of demolition.

Despite opposition from Homes Victoria, which has dismissed the RRR proposal, the study has gained political attention. In November 2023, the Victorian Legislative Council debated the merits of the RRR approach, with members urging the government to reconsider demolition and explore all refurbishment options. There are also legal proceedings led by residents challenging the demolition plans. These discussions underscore the need for a thorough, transparent evaluation of refurbishment alternatives before making decisions about the future of the Flemington Estate and other high-rise public housing across Melbourne.

The Flemington Estate is full of established trees and communal facilities, although car parks dominate the current ground plane. Photo by Ben Hosking.

1.4 Objectives and Scope

Objectives and rationale for redevelopment

This report integrates the objectives and intended outcomes of the previous proposals for Waterloo North and Central (LAHC and CoS) and provides an alternative where all existing buildings are retained and tenants avoid relocation.

The analysis identifies how the RRR proposal addresses the program objectives of NSW Government using Waterloo South development as a benchmark. Based on the draft 2024 Waterloo South People and Place Plan,[11] the six key objectives of Waterloo South are to deliver:

- New and better social housing
- Positive outcomes for residents
- Outcomes for Aboriginal people
- An authentic sense of place
- Environmental sustainability
- Strong collaboration

This report will also address with 2019 City of Sydney's 'Alternative Approach' objectives, as outlined in their Waterloo Urban Design Approach for Waterloo South[12]:

- Providing services and social infrastructure to meet people's changing needs
- Fostering healthy, creative, culturally rich and socially connected communities
- Providing housing supply, choice and affordability, with access to jobs, services and public transport
- Creating and renewing great places and local centres, and respecting the District's heritage
- Increasing urban tree canopy cover and delivering Green Grid connections
- Delivering high quality open space
- Reducing carbon emissions and managing energy, water and waste efficiently
- Adapting to the impacts of urban and natural hazards and climate change

In 2025, the NSW Government signed a contract with a consortium led by Stockland for Waterloo South. The outcomes of the Waterloo South (draft) plan[13] aim to deliver:

- Over 3000 new homes, of which 1000 are social homes[14] (an approximate 15% uplift from 749 public homes to 1000 social dwellings)
- 600 will be set aside as affordable housing.
- 20% of social and 15% of affordable homes will be dedicated to Aboriginal residents[15]

[11] HomesNSW, *Waterloo South People and Place Plan,* April 2024.
[12] City of Sydney, Urban Design Study Part 2, Waterloo Estate (South), Attachment A1(b)
[13] Land and Housing Corporation, *Waterloo.* Available online: https://www.dpie.nsw.gov.au/land-and-housing-corporation/greater-sydney/waterloo
[14] NSW Government, Ministerial media release. *Waterloo Renewal reaches new milestone to deliver Australia's largest social housing project,* April 2024.
[15] Ibid

- 3000 new homes overall (including social, affordable and private homes)
- Target of a minimum 7 Star NatHERS rating
- Silver Level Liveable Communities Design Standard (and some Gold Level standards)
- 6-star Green Star communities rating accreditation across the precinct[16]

The rationale for the demolition and rebuild of Waterloo South is detailed by the NSW LAHC as:

- Buildings are aged between 40-70 years old and nearing the end of their intended lifespan
- Buildings do not meet the changing needs of current tenants
- Many homes do not meet the contemporary accessibility and sustainability standards
- Buildings are increasingly difficult and expensive to maintain
- Increasing housing supply[17]

The feasibility study primarily focuses on how equivalent built outcomes - by both retaining the existing public housing and increasing dwellings though social housing infill - can meet the NSW government objectives for housing, as well as provide lower environmental, social and economic costs. While the RRR approach does not include financial modelling for subsidising the renewal of public and social housing, the report findings highlight huge potential cost savings to the government, and social and environmental benefits for everyone. In the absence of details for the Stockland-led contract, this RRR report demonstrates the cost-savings available but cannot provide a direct comparison with how the approximately $4 billion contract for Waterloo South will fund the demolition and rebuild of social and private housing.

1.5 Report Scope

The RRR refurbishment and infill proposal for Waterloo North and Central integrates the previous proposals for the estate and responds to the stated objectives of both the HomesNSW plan for Waterloo South and the previous City of Sydney plans, as well as the specific rationale for the Estate's demolition and rebuild. It is also informed by resident enthusiasm to retain their homes and existing communities.

The RRR proposal focuses on how to best meet the objective of estate renewal with minimal financial, environmental, and social costs. The findings from this feasibility study demonstrate the value of refurbishing the Estate, and as such advocates for retaining the existing buildings on Waterloo North and Central as public housing with the proposed infill supplied as public and community housing, acknowledging the role of Community Housing Providers (CHPs) and other social housing models in the provision of homes for NSW residents.

The report identifies how the RRR approach can address the key objectives of HomesNSW and Waterloo precinct redevelopment rationale. Through an accurate understanding of the existing

[16] Land and Housing Corporation, *Waterloo.* Available online: https://www.dpie.nsw.gov.au/land-and-housing-corporation/greater-sydney/waterloo

[17] NSW Government, Ministerial media release, *Waterloo South social and affordable housing boosted to 50%.* August 2023.

sites and buildings, these cost savings could be used to fund the construction of new dwellings and result in a similar outlay for the government. RRR: Waterloo North and Central demonstrates that alternative approaches to demolition and rebuild are both possible and cost effective, while also having a lower impact on the environment and the health and wellbeing of current residents.

1.6 Report Structure

This report provides three key elements:

1. The Retain Repair Reinvest Strategy

   The report establishes the Retain, Repair, Reinvest strategy by documenting and providing contextual information about the disbenefits and uncaptured costs of the NSW Government's approach to the renewal of Waterloo South.

2. The Waterloo North and Central Case Study

   The report introduces Retain, Repair, Reinvest: Waterloo North and Central - a specific feasibility case study of Waterloo North and Central. Through a comparative analysis of previous case studies for the site and the NSW Government's approach to the renewal of Waterloo South and a proposed RRR approach; the feasibility of the alternative model to estate renewal is demonstrated.

3. Waterloo North and Central Design Proposal

   The final section of the report presents a design proposal for Waterloo North and Central, demonstrating the technical and financial viability of refurbishment and infill.

1.7 Approach

To meet the objectives and scope of this feasibility study, the approach involved the following components:

- Developing a research plan
- Document review and analysis - this included, but was not limited to
    - publicly available reports
    - submissions
    - academic literature
    - government plans and policies
- Three community engagement sessions with Waterloo North residents
- Analysis of public housing resident feedback
- Commissioned reports from a Structural Engineer, Quantity Surveyor and Environmental Consultant
- Consultation with housing researchers, academics and economists
- Presentation of preliminary designs to Waterloo North and Central residents
- Revision of design based on feedback
- Final report (this document)

1.8 Limitations

This report is based on data, budgets, reports and findings that are publicly available. To OFFICE's knowledge, previous refurbishment studies conducted on the Waterloo estate do not include economic, sustainability and community outcomes outlined in this report.

The limited access to the buildings to undertake structural surveys and destructive testing to ensure structural integrity must be considered when assessing the refurbishment schemes. The structural reports procured for the creation of this report are limited by data from existing structure drawings and visual inspections.

The commercial nature of the Waterloo South developer-led contract means there is no public information of the financing or budgets for the demolition, resident relocation or development of social or public housing. As such this RRR report shows the savings possible through a retrofit approach, but does not frame them in direct relation to the specifics of the developer-led contract.

Residents playing a game of chess in the community room of Matavai. Photo by OFFICE

2. Overview of NSW approach to Estate Refurbishment

2.1 NSW Future Directions for Social Housing

In 2016, the NSW Government announced a ten-year strategy for social housing titled *Future Directions for Social Housing in NSW (Future Directions)*.[18] The Communities Plus model was developed under this strategy, a $22 billion initiative involving the redevelopment of several existing housing estates and their replacement with a mix of private, affordable and social housing. Communities Plus was designed to deliver 23,000 new and replacement social housing dwellings, 500 affordable housing dwellings and 40,000 private dwellings in NSW with a targeted mix of 70% market and affordable and 30% social housing dwellings per site. Future Directions was announced under the previous government and will be replaced in July 2025 with the Homes for NSW Plan. An overview of Future Directions has been provided below as the policy included the renewal of Waterloo Estate and has influenced planning thus far.

The NSW Government's *Future Directions for Social Housing in NSW* (2016) set out the previous NSW Government's vision for social housing, with a 10-year plan to drive better social housing outcomes. The vision states that over the next 10 years the Department of Family and Community Services (now the Department of Communities and Justice), will:

> (a) work with the non-government and private sector to deliver 23,000 new and replacement social homes through the Communities Plus program, with an additional 40,000 new private market homes also delivered through the program;
> (b) transfer management of government-owned homes to the non-government sector, moving from around 18 per cent to 35 percent of all social housing in NSW being managed by the Community Housing sector; and
> (c) continue to introduce measures to make sure social housing meets the changing needs of tenants.

This vision was a response to the NSW Auditor General's 2013 report, *Making the best use of public housing*[19]*,* which outlined the NSW housing authority's inability to meet need and deliver adequate maintenance due to declining rental revenues and lack of Commonwealth and State Government funding. While HomesNSW faces similar challenges today, significant new funding streams have emerged in the past three years. These include the NSW Government's $6.6b Building Homes for NSW program[20], the Commonwealth Government's $500m per annum

[18] NSW Government, *Future directions for Social Housing in NSW,* 2016.
[19] NSW Auditor-General's Report, Performance Audit, *Making the best use of public housing,* Housing NSW, Land and Housing Corporation
[20] NSW Government, *Building Homes for NSW*, 2024. .

Housing Australia Future Fund[21], $2b Social Housing Accelerator Fund[22], and $1b National Housing Infrastructure Facility Social and Affordable Housing.[23]

Future Directions established the Communities Plus program as the mechanism by which LAHC properties will 'renew and grow supply' of social housing. The Program leveraged the value of LAHC's existing portfolio by engaging private sector developers and community housing providers (CHPs) to design, fund, build and manage social (affordable rental) and private housing. Most, although not all, projects involved the demolition and redevelopment of existing public housing sites.

Large redevelopments generally targeted a 70:30 ratio of private to social housing, the requirement that there would be no net loss of social housing and an increase where practicable. As such, the program was oriented towards sites that could accommodate a significant uplift in density: sites with good transport connections, near education and employment opportunities, and often aligned with wider urban renewal strategies.[24] Major redevelopment projects included estates in Macquarie Park (Ivanhoe estate, now Midtown Mac Park), Arncliffe, Telopea, Riverwood and Waterloo. No allowance was initially made in the Communities Plus program for the provisions of affordable housing, although it has been included as a small proportion of some projects.

The Social Sustainability Report, prepared by Elton Consulting (on behalf of LAHC and appended to the 2020 planning proposal request submitted to the City of Sydney), found that redeveloping estates will offer tenants better quality social housing in mixed communities, with a combination of social housing and private rental tenants living in the same area.[25] It also found that redeveloped properties will ensure new and improved housing that is better designed to suit tenants' needs and will be close to amenities, transport, education and employment.

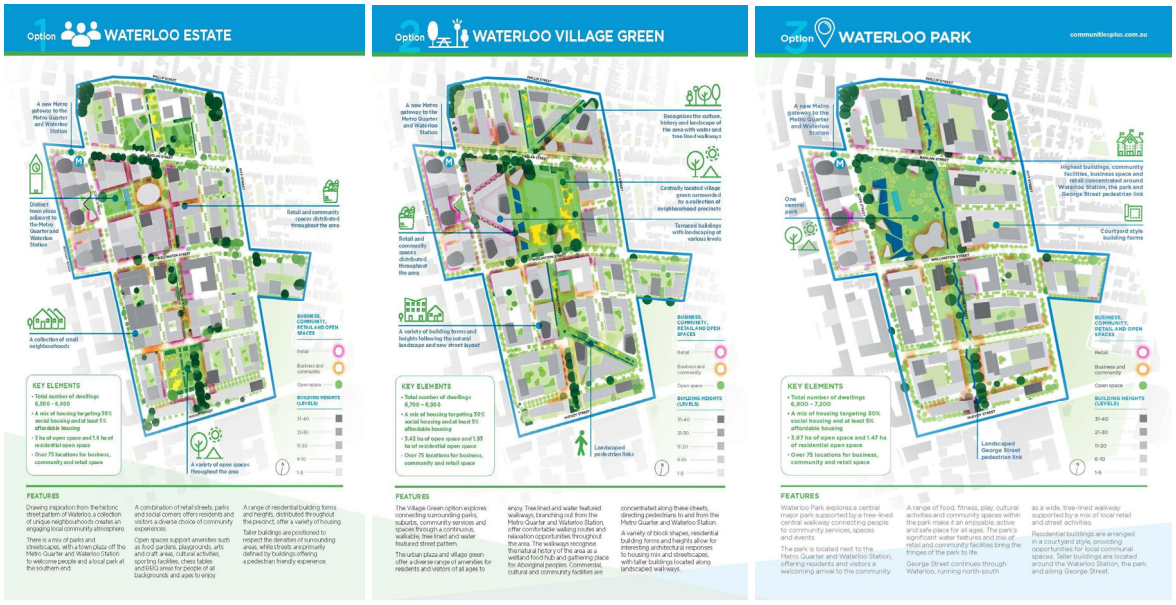
2.2 Communities Plus in Waterloo

The Communities Plus plan for the entire Waterloo Estate, announced in December 2015, proposed to redevelop the entire estate with 7000-8000 new dwellings over the total 19-hectare area, with a target of 30% social housing. A period of engagement, consultation, and masterplanning took place over 2016-2019, and in 2018, the Waterloo Metro Station precinct was removed from this process to enable accelerated planning of the over-station development.

[21]Housing Australia, *Housing Australia Future Fund Facility and Housing Accord, 2024.*
[22] The Treasury, Australian Government, *Social Housing Accelerator:* available https://treasury.gov.au/policy-topics/housing/social-housing-accelerator
[23] Housing Australia, *National Housing Infrastructure Facility (NHIF).*
[24] Sisson, A., & Ruming, K. (2024). Calculating the system-wide supply impacts of social housing estate renewal: New measures and methods. *Housing Studies*, ahead of print, 1–25. https://doi.org/10.1080/02673037.2024.2378852
[25] Elon Consulting, commissioned by the NSW Land and Housing Corporation, *Waterloo South Social Sustainability Report,* 2020.

Community consultation for the rest of the Waterloo estate included an Options Testing process, with three options released for community input in 2018. The Waterloo Estate, Waterloo Village Green and Waterloo Park options involved various master plan layouts, yields, building heights, public space locations and street grids. Each included 75 locations for businesses, community and retail space, and dwelling numbers ranging from 6700 to 7200. Under this proposal, the most social housing uplift that could have been delivered would have been 148 dwellings, and the least possible would be a decrease of 62 units.

A preferred Master Plan was released by LAHC in January 2019, which would deliver approximately 6800 new homes, 35% of which were to be social and affordable housing. This included six 32-40 storey towers and eleven 16-32 storey towers (in addition to the Waterloo Metro Quarter towers). The block bounded by Cope, Raglan, Wellington and George Streets would be converted to a large 'Village Green'.



The three masterplan options that were a part of the 2018 Waterloo Redevelopment Options Brochure.

The 2019-approved concept plan for the Waterloo Metro station precinct included three high-rise and two mid-rise buildings including approximately 500 units (70 social housing and 5% affordable housing) in addition to retail and office space. These plans subsequently underwent several modifications, most recently to incorporate student housing and co-living in the place of a (previously scaled-up) commercial office tower. The social and affordable housing components have remained the same.

LAHC's preferred masterplan was criticised by the City of Sydney, with Lord Mayor Clover Moore describing them as a 'planning disaster' and a 'significant threat to Sydney's future economic growth and liveability.[26] In March 2019, the City of Sydney presented an Alternative Approach to

[26] Josh Harris, *Ghettos of the future: Waterloo housing proposal slammed*, Architecture Au, 2018.

the redevelopment scheme for Waterloo which aimed to improve urban, community, affordability, sustainability and social outcomes.The plan encompassed 5300 homes made up of a larger number of smaller-scale residential and mixed-use buildings, up to 13 storeys, with 45% to be social and affordable housing. Notably, the City's plan retained and refurbished the Matavai, Turanga, Marton and Solander buildings. In November 2019, the then-Minister for Planning and Public Space made the City of Sydney the plan-making authority for the Waterloo project, meaning any proposal by LAHC would require the City's approval.

The CoS model of the planning envelopes (left) in the LAHC preferred masterplan (right). This demonstrates an extreme density and no retention of existing buildings. Source: City of Sydney

It was in this context that the project was split into three stages: Waterloo South (749 dwellings, encompassing all but the towers and slabs) would move to planning proposal stage, while planning for Waterloo North (Matavai, Turanga, Solander and Marton buildings) and Waterloo Central (Cook and Banks buildings) would be finalised at a later date. LAHC lodged a proposal with the City of Sydney in May 2020, and the City of Sydney prepared an alternative planning proposal for Waterloo South.

Consistent with their previous plans for the estate, LAHC's plan for Waterloo South was for approximately 3000 homes in total, with 28% (847) social housing and 7% affordable housing. The City of Sydney's plan was for 920 social housing dwellings and 20% affordable housing in perpetuity, including more housing for Aboriginal and Torres Strait Islander people. With LAHC and the City unable to come to an agreement, the Minister called planning authority back into the Department in March 2021, establishing a three-person Independent Advisory Group to work through the disagreements. The final plan for Waterloo South incorporated many of the City's built form recommendations but retained LAHC's tenure mix. This plan was exhibited in March-April 2022 and approved in November 2022, effective February 2023. A tender process began in July 2022, with a shortlist of four consortia announced in November 2022.

Table 3: Breakdown of unit numbers and tenure types of previous masterplans for Waterloo Estate

Waterloo Redevelopment					
	date	dwellings	social	affordable	private
Existing **Whole Estate**		2021			
Existing **Waterloo South**		869	749 (public)		120
LAHC[27] 3 options **Whole estate**	Aug 2018	7,200	30%	5%	65%
LAHC Preferred **Whole estate**	Jan 2019	6,800	30%	5%	65%
CoS Preferred masterplan **Whole estate**	Late 2019	5,000-5,300	30%	20%	50%
CoS Preferred masterplan **South**	Late 2019	3,050[28]	915	610	1,525
LAHC Revised **South**	March 2022	Approx 3050	762[29]	153	2136

In March 2023 there was a change of government in NSW, with Labor returning to power. In August 2023, the Waterloo South redevelopment was revised by LAHC to incorporate more social and affordable housing: 30% would be social housing (approximately 900 dwellings) and 20% affordable housing (approximately 600 dwellings). These figures represent the number of dwellings, rather than the Gross Floor Area, so it is likely that there will be smaller units for community housing residents compared with private residents in the new development.[30] Residents were informed that relocations would be delayed until mid-2024, and ultimately commenced in early 2025.

Two of the four shortlisted consortia dropped out of the tender process following the changes to tenure mix. In August 2024, a consortium of Stockland, Link Wentworth Housing, Birribee

[27] City of Sydney, *Waterloo Urban Design Report,* 2021, p. 40.
[28] Cameron Murray and Peter Phibbs, *Reimagining the economics of public housing at Waterloo,* Shelter NSW, 2021.
[29] City of Sydney Submission, *Waterloo Estate South (1)*
[30] http://www.redwatch.org.au/RWA/Waterloo/lahc22-23/230821redw

Housing and City West Housing was announced as the preferred proponent. The contracts were finalised in April 2025. Social housing will be managed by Link Wentworth, Aboriginal Housing by Birribee, and affordable housing by City West.

It has been noted that once the renewal of Waterloo South begins, HomesNSW will collaborate with Stockland, the Department of Planning, Housing and Infrastructure, and the City of Sydney to develop future plans for Waterloo Central and Waterloo North.[31]

2.2.1 Refurbishment proposals 2015-2025

LAHC Options Testing (August 2018) - Redevelopment Option 1 in the Options Testing process included the retention and refurbishment of Matavia and Turanga towers with the addition of infill around the tower footprints. However, the retention and refurbishment of Matavai and Turanga towers was not included in the final preferred masterplan.

In 2020, a spokeswoman for the then Housing Minister, Melinda Pavey, said ‘’retention and refurbishment’ of the Matavai and Turanga towers ‘will be explored in consultation with the City of Sydney as part of future planning proposals.’[32] No additional public information on the viability of the retention of the towers has been released by the NSW Government.

City of Sydney Alternative Approach - Waterloo Urban Design Report (March 2019) - The City of Sydney’s independently tested Alternative Approach to the redevelopment of the estate included the retention and renovation of the existing social housing towers and slab including Matavai, Turanga, Marton and Solander buildings. New builds were proposed to replace Cook and Banks as part of the alternative masterplan. The Urban Design Report argued that this would lead to better sustainability, community and economic outcomes

Aerial render of the City of Sydney’s scheme which shows the retention of the buildings in Waterloo North. Image from the City of Sydney

[31] NSW Government, Land and Housing Corporation, *Frequently Asked Questions.*

[32] Megan Gorrey, Future of Waterloo’s public housing towers unclear as revamp powers on*, The Sydney Morning Herald*, June 15, 2020. https://www.smh.com.au/national/nsw/future-of-waterloo-s-public-housing-towers-unclear-as-revamp-powers-on-20200602-p54yv2.html

The refurbishment approach to Matavai and Turanga extends upon the existing crucible style floorplate with an additional bedroom and private outdoor space to convert existing studios to 1-bedroom apartments. The design permits adequate solar access through the provision of additional glazing to the living area as well as improved cross flow ventilation.

The slab blocks were redesigned by splitting the massing of the building in two to increase cross ventilation and solar access. Additional vertical circulation was added through lifts and upgraded stair cores. The refurbishment approach extended the floorplate to increase the number of dwellings to include additional 1 and 2 bedroom apartments as well as additional outdoor private spaces to all apartments.

University of Sydney 'Living in the City' (2021-2023) - One highly celebrated and pioneering example of social housing refurbishment is by French architects Anne Lacaton and Jean-Phillipe Vassal (Lacaton and Vassal Architects). They were particularly celebrated for their 'never demolish' approach and refurbishment of the Cite du Grand Parc social housing towers in Bordeaux, which occurred without displacing any residents and retained the community who lived in the buildings.

The duo were inaugural co-chairs of the Rothwell Chair Program at the University of Sydney, and in 2023 delivered a series of design studio, seminars and public talks that promoted retrofitting of public housing - including the Waterloo towers. Alongside Dr Hannes Frykholm, the design studios with masters level architecture students developed a series of refurbishment methodologies for the renewal of the Waterloo Housing Estate. Lacaton and Vassal promoted an approach that could extend the life of the public housing on Waterloo Estate by 50 years, at a third of the cost of a knockdown rebuild. The approach also ensured tenants would not be moved out, and more space would be provided.[33]

2.3 Emerging Policy Context

Slated for release in mid-2025, The Homes for NSW Plan[34] is a 10-year policy platform to succeed Future Directions for Social Housing in NSW. The plan will outline the strategies of the current NSW Government to improve outcomes for people in need of social housing and homelessness assistance.

While this plan is unreleased at the time of writing, the HomesNSW Discussion Paper suggests that new approaches to the estate renewal and refurbishment are being considered. Released in December 2024 to gather input from stakeholders, the paper outlines strategic alternatives to major redevelopment as a key consideration of HomesNSW in provision of new social housing, including refurbishment and in-fill of existing estates. It states that 'Not all areas need to be subject to large-scale renewal, demolition and redevelopment. We can broaden thinking around estate management to include community development work, upgrades and in-fill developments.'[35]

[33] Julie Power, The French solution for Sydney's apartment blocks, The Sydney Morning Herald, August 2023.
[34] Homes NSW, *Homes NSW Discussion Paper: To inform the Homes for NSW Plan,* December 2024.
[35] Ibid, p.17.

The paper notes the importance of including residents in estate renewal decision making processes, considering their priorities, preferences and locals needs, as well as extending the timeframe of renewals in order to reduce disruptions and enable communities to remain in place. The inclusion of ‘upgrades and in-fill developments' as an alternative to full-scale renewal signals a positive shift toward incorporating refurbishment into future development projects by HomesNSW.

The commitment to refurbishment is further demonstrated through the NSW Government’s recent announcement to restore the ‘Three Sisters’ also known as the Wade Street Towers in Telopea. The refurbishment of the towers was a departure from earlier plans under the Communities Plus program, which involved an agreement with Frasers Property Australia to redevelop the Telopea Estate. This agreement was mutually terminated in October 2024, and in response, HomesNSW initiated the refurbishment of the towers to provide immediate housing solutions. This will breathe new life into nearly 150 vacant public housing units that were originally set for demolition under the former Government.[36]

Aerial view of the three towers at Telopea which are currently undergoing refurbishment. Image HomesNSW

The NSW Government also launched a $1 billion *Repair and Restore Maintenance Blitz* in July 2024 to address critical maintenance needs in over 30,000 public housing homes. This initiative, the largest investment in public housing maintenance in NSW history, aims to improve living conditions and make homes safer for tenants. The program includes the launch of a new Maintenance Hub to better manage tenant repair requests and bring maintenance services back under public control.[37] In May 2024, the New South Wales Government had restored 277 homes, including 165 cottages, 30 townhouses, 7 villas and 75 units, with Commonwealth funding.[38]

[36]Ministerial media release, *Construction commences to bring vacant public homes back into use to house people in need,* NSW Government, February 2025.
[37] Land and Housing Corporation, *Back in control: Launching our new maintenance service as the first 750 homes set to be revamped,* 2024. Available: https://www.dpie.nsw.gov.au/land-and-housing-corporation/news/back-in-control-launching-our-new-maintenance-service-as-the-first-750-homes-set-to-be-revamped2
[38] Treasury NSW, Media Release: *Hundreds more homes for NSW residents,* May 2024.

2.4 Refurbishment and Environmental Impact

The environmental impact of demolition and rebuild is well documented. 40% of the world's extracted materials are used in the built environment, with waste from demolition and construction representing the largest waste stream in many countries.[39] The building and construction industry is accountable for 39% of the world's carbon emissions - 28% relating to the operation of the buildings and the remaining 11% resulting from the manufacturing of new materials such as steel, cement and glass.[40]

The NSW Government has set ambitious carbon emission reduction targets enshrined in the Climate Change (Net Zero Future) Act 2023. These targets include a 50% reduction on 2005 emissions by 2030, a 70% reduction by 2035, and reaching net zero emissions by 2050. To meet these ambitious net zero emission targets, it will be essential that construction practices change and buildings reduce their environmental impact.

The refurbishment and retrofit of existing dwellings aligns with the key environmental policy framework of HomesNSW. The Environmental Sustainability Strategy 2024-2026 establishes the environmental strategic priorities, vision and actions for the Land And Housing Corporation (HomesNSW). The strategy document outlines the key environmental sustainability priorities over the next three years, including:

- improve the energy and water efficiency of new and existing social housing
- implement programs to reduce carbon emissions
- improve thermal comfort and indoor air quality
- reduce environmental risks and continually improve environmental performance
- recognise and support Aboriginal and Torres Strait Islander people
- integrate circular economy opportunities
- adapt to climate change

The vision of the strategy positions Homes NSW as a leader in the reduction of carbon emissions, adapting to climate change and driving innovation to improve resilience and prosperity for social housing residents. The renovation of existing dwellings is a key strategy to enable the delivery of sustainable environmental outcomes, with a commitment to, ‘optimising lifecycle costs by adopting resilient and sustainable housing design, and retrofit programs for existing dwellings, to adapt to future climate conditions.’[41]

The potential of refurbishment as an alternative to demolition for improved social, environmental and economic outcomes is well established internationally in both estate renewal projects and other infrastructure upgrades.

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[39] Cheshire, D. and Burton, M. *The carbon business case for choosing refurbishment over new build*, AECOM.https://aecom.com/without-limits/article/refurbishment-vs-new-build-the-carbon-and-business-case/

[40] United Nations Environmental Program*, 2019 Global Status Report for Buildings and Construction Sector, 2019 Global Status Report for Buildings and Construction Sector* | UNEP - UN Environment Programme

[41] Department of Planning and Environment, *NSW Land and Housing Corporation, Environmental Sustainability Strategy 2024-2026.*

2.5 Financing and the Private Public Partnership Model

There is limited information available about the financing approach for Waterloo redevelopments, or other Communities Plus sites. The Communities Plus model awards contracts through Project Delivery Agreements (PDA)[42], and Waterloo is a public private partnership.[43] In other PDA's, partners are paid through an Incentivised Target Cost (ICT) payment mechanism, however the details of the contract awarded to the Stockland-led consortium for Waterloo South are not available. The Communities Plus delivery of other social housing renewal structured the PDA so LAHC retained the land ownership throughout the delivery of the project, with the proponent required to deliver an agreed number of social housing dwellings with rights to sell or retain the private or affordable housing.[44]

In a report commissioned by Shelter NSW, the economic model for the LAHC's proposed redevelopment of the Waterloo Estate is reassessed in order to produce a better outcome for public housing residents.[45] This report demonstrates the possibility of alternative approaches to estate redevelopment.

The report details the market value of the site as approximately $1 billion, part of LAHC's $54 billion asset portfolio. For context, this property portfolio is five times larger than the market capitalisation of the largest listed developer (and consortium lead for the Waterloo South development) Stockland, and nine times larger than major developer Lendlease.

The 2021 Shelter NSW report reframes public housing as an asset that generates a return over time through rental income and capital gains, rather than merely a cost. The report demonstrates the possibility of redeveloping the site with 50% public housing dwellings, 25% retained by LAHC as build-to-rent at market prices, and 25% sold to the private market. The report found that 'at face value, the LAHC proposal seems to offer surprisingly little public value in the form of an expanded public housing stock.'[46]

However, this alternative framing was not taken up and, in August 2024, Stockland along with Link Wentworth Housing, City West Housing and Birribee were announced as the preferred partners for the Waterloo South redevelopment.[47] The contract was described as 'the most complex property deal done by the government in recent times.'[48] The Waterloo South development has a $1.7 billion construction budget, and is valued at $4.4 billion in total. The

[42] Land and Housing Corporation, *Communities Plus, Industry Briefing,* February 2018.
[43] Benedict, R., Gurran, N., Gilbert, C., Hamilton, C., Rowley, S. and Liu, S. (2022) Private sector involvement in social and affordable housing, AHURI Final Report No. 388, Australian Housing and Urban Research Institute
[44] Savills News, *Villawood renewal sees boost in Sydney's social housing,* 2017.
[45] Shelter NSW, *Reimagining Economics of Public Housing at Waterloo,* November 2021.
[46] Ibid.
[47] Ministerial media release, *Next step complete for Australia's largest housing build,* August 2024. https://www.nsw.gov.au/media-releases/next-step-complete-for-australias-largest-social-housing-build
[48]Michael Bleby, *Mirac, Lendlease, Stockland, Frasers in race for $4b Waterloo South,* Financial Review, 2022. https://www.afr.com/property/commercial/mirvac-lendlease-stockland-frasers-in-race-for-4b-waterloo-south-20221115-p5byez

contract with the Stockland consortium is designed to provide a 'partnering approach' to 'more equitably and affordably manage risk over the likely 30-year lifespan of the full project.'[49]

In addition to the renewal of the Waterloo Estates (North, South and Central), the precinct upgrade is linked with the Waterloo Quarter Metro development. The Waterloo Station Significant Precinct is a transit-oriented development including the $900 million Waterloo Quarter over-station development by Mirvac which will consist of office space, apartments and student accommodation.[50] The development will include 70 social housing dwellings and 435 student accommodation rooms. Miral and John Holland committed to investing $20 million in contacts with First Nation-owned enterprises.[51]

2.6 Tenant relocation costs

While LAHC have detailed the rationale for the demolition of the Waterloo estate, and contracted the Stockland-led consortium for delivering the Waterloo South redevelopment for approximately $4 billion, there are a range of uncaptured costs that should also be considered. In addition to the environmental and health costs (detailed in Section 4.2), tenant relocations are a significant uncaptured cost.

There are no publicly available NSW costings for tenant relocations. Tenant relocation costs in Victoria have been reported as a daily rate of $150 per dwelling during the demolition and refurbishment process.[52] Based on the percentage of headleased homes required for relocating tenants for the renewal of Ivanhoe estate, we have estimated 10% will be required for Waterloo North and Central.[53] We have also made a conservative estimate that demolition and rebuild will take five years before residents have the right to return. This puts the estimated relocation costs at $72.2 million.

Additionally, Victorian data shows that the workforce budget expenditure for the Homes Victoria workgroup that includes the relocations team, property acquisition and divestment and leasing staff was $4 million in 2022-23 and $4.1 million in 2023-24.[54] While there is no available relevant data for LAHC, People and Place Plan for dealing with additional needs due to relocations and development has not responded to community concerns.'[55]

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[49] Ibid.

[50] Ted Tabet, *Mirvac, John Holland Win Approval for $900m Waterloo Quarter,* The Urban Developer, August 2021.

[51] Ibid. -approval

[52] These costs are based on DHHS daily rates per dwelling of $150, and managerial cost of 1.5% of construction costs as provided in the Supreme Court hearing NO. SCI 2020 02563 by Jamin Ben Crawley government representative.

[53] Alistair Sisson and Kristian Ruming, 'Calculating the system-wide supply impacts of social housing estate renewal: new measures and methods.' *Housing Studies,* 2024.

[54] Parliament of Victoria Legislative Assembly, *Questions on Notice: 1569,* 60 Parliament First Session. Available: https://www.parliament.vic.gov.au/parliamentary-activity/questions-database/question-details/26343

[55] The South Sydney Herald, *Waterloo South relocation update,* March 1 2025. Available: https://southsydneyherald.com.au/waterloo-south-relocation-update/

2.7 Maintenance

In 2016, the Public Accounts Committee undertook an Inquiry into the Management of NSW Public Housing Maintenance Contracts. The Inquiry found that the (then) Department of Family and Community Services (FACS) is responsible for maintaining 130,000 properties which resulted in over 500,000 requests for maintenance annually. While FACS undertook thorough Property Assessment Surveys, tenants reported that no subsequent maintenance or repair work was carried out. The Inquiry also found that tenants frequently waited longer than 20 days to receive urgent requests, and repairs often were 'band aid' solutions rather than addressing structural problems. Furthermore, the report found the government's insufficient maintenance budget were being addressed through a strategy of managed decline:

> In order to close the widening gap between the increased costs of maintaining public housing and reduced rental income, the Government has increasingly been selling existing stock and delaying maintenance, upgrading and capital building programs.[56]

Future Directions was published before the final report of the inquiry and included the Asset Maintenance Services Contract for external maintenance service providers. This was intended to improve tenant experience, provide value for money, and deliver better maintenance services. In 2018, the Productivity Commission Report on Government Services found that one in four public housing properties were in an 'unacceptable condition',[57] the highest percentage of unacceptable homes in the country. Between 2016/17 and 2019/20 the LAHC repair and maintenance budget on residential properties had decreased by $101,410,000.[58]

In November 2023, the NSW government announced an overhaul of how social housing maintenance is conducted, including a 2024-25 budget allocation of $810 million for critical public housing maintenance - the largest investment in public housing maintenance in the state's history. After the privatisation of housing maintenance under the previous government, the new NSW government committed to establish a 'Maintenance Hub' to streamline requests, with tenants able to track their requests through a Maintenance App.[59] This shift from outsourcing maintenance saw 750 public homes repaired at the cost of $1 billion after waiting for urgent maintenance on lists for years.[60] However in August 2024, ABC News reported urgent repair requests from vulnerable tenants were being left unaddressed.[61] HomesNSW acknowledge 'we know current response times on maintenance requests have deteriorated.'[62]

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[56] Parliament of Australia, *The Worsening Rental Crisis in Australia: Chapter 2 – Boosting the stock of social and affordable housing.* Available online: https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Community_Affairs/Worseningrentalcrisis/Final_Report/Chapter_2_-_Boosting_the_stock_of_social_and_affordable_housing

[57] This was defined as having less than four working facilities, for washing people, washing clothes/bedding, storing/ preparing food and removing sewerage, and more than two major structural problems.

[58] Legislative Assembly of NSW, *Follow-up Review of the Management of NSW Public Housing Maintenance Contracts,* Public Accounts Committee, 2021.

[59] Red Watch, *Back to basics: social housing maintenance call centre back in public lands.* 2023. Available online: http://www.redwatch.org.au/RWA/Waterloo/lahc22-23/231113homesnsw

[60] Alexandra Smith, *NSW's new maintenance system will see 750 homes revamped with thousands to follow,* The Sydney Morning Herald. July 2024.

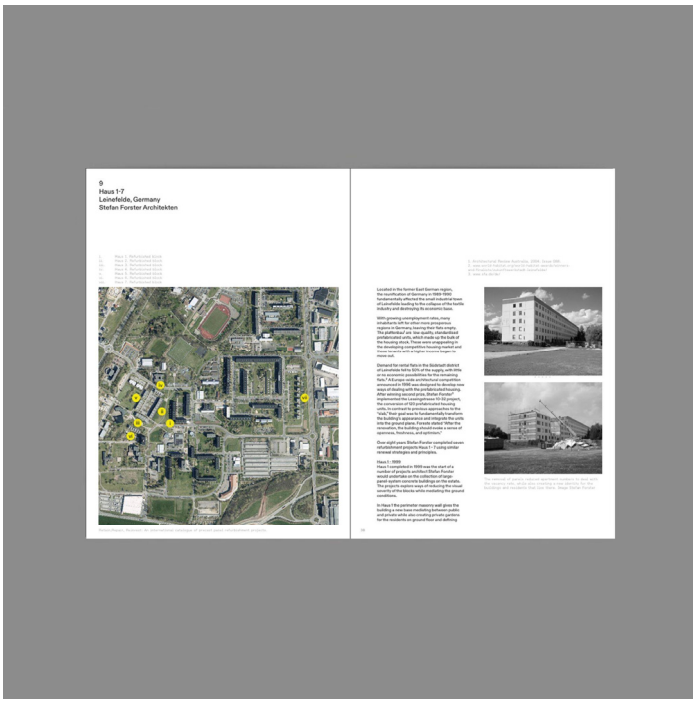
[61] Sarah Gerathy and Millie Roberts, *NSW social housing residents say maintenance requests slipping through the cracks,* ABC news, June 2024.

[62] Ibid.

3. Precedents: Refurbished Case Studies

Several exemplary international tower refurbishment projects have been visited and documented by OFFICE as part of an Alastair International Research Grant. Titled *Retain, Repair, Reinvest: An International Study of Exemplary Public Housing Tower Refurbishment Projects,* the study tour incorporated 23 projects across nine countries. The case studies below are particularly relevant for the Waterloo proposal and demonstrate the potential of refurbishment as a viable option:

- Cedar Court demonstrates the ability for large panel system towers to undergo significant refurbishment works.
- Telli Row foregrounds tenant participation and the addition of balconies with integrated service risers.
- Plantensiedlung incorporates the use of prefabrication units to reduce risk and speed up construction times.



Retain, Repair, Reinvest: An International Study of Exemplary Public Housing Tower Refurbishment Projects, the study tour incorporated 23 projects across nine countries. 2024.

3.1 Cedar Court, Glasgow, Scotland - Collective Architecture

Photo of the refurbished towers at Ceder Court Estate in Glasgow. Photo by OFFICE.

Designed by Boswell Mitchell and Johnston (BMJ Architects) in the 1960s, the three 23-storey towers - Torridon Court, Lorne Court, and Katrine Court - are located in the Red Road Estate in the northern part of Glasgow. While the original duplex apartments featured thoughtful designs, the Bison Manufacturing large panel system resulted in poor insulation and inadequate soundproofing due to thin internal partitions.

As time passed, the buildings' exterior deteriorated, and all three towers were eventually marked for demolition, reflecting a broader trend in Glasgow where nearly a third of the city's tower blocks were demolished over the past 15 years. However, the decision to demolish the Cedar Court towers was reversed as the city adopted a more progressive approach to its high-rise housing. After years of neglect, the Estate was transferred to Queens Cross Housing Association (QCHA), which then engaged Collective Architecture to conduct a study on the future of the towers, with a focus on resident input. The refurbishment plan included entrance and ground-level improvements, enhanced energy efficiency, and minimal disruption to existing residents. Collective Architecture held community workshops and interviews to develop a detailed report proposing a retrofit solution.

Prior to the project commencing a structural investigation of the existing towers was undertaken. While there were some signs of structural deterioration, such as cracking and spalling, were observed, particularly on exposed elements. None of these were deemed to be beyond repair and, overall, the towers were in good structural condition given their age.[63]

Throughout the retrofit, the towers remained occupied, which required careful scheduling and site management to minimise disruption for residents. The retrofit strategy included enclosing balconies into winter gardens, adding insulation, and eliminating thermal bridging. New entrances with dual access were added at the base of each tower, along with internal gardens, community meeting rooms, children's play areas, and art studio spaces. New lifts were also installed. Externally, the buildings were wrapped in insulation and existing windows were replaced with triple-glazed units. The retrofit, guided by Passivhaus principles, achieved an 80% reduction in heating demand, and significantly reduced fuel poverty for 1,000 residents.

[63] Alan Dunlop, 'Getting warmer: Collective Architecture upgrades Glasgow tower blocks', *Architects Journal*, November 2019.

3.2 Telli Row B and C, Aarau, Switzerland - Meili, Peter and Partner Architekten

The prefabricated concrete balconies integrate into the existing building fabric while giving the façade a refresh. Photo by OFFICE.

The Telli Housing Estate consists of four housing blocks, built between 1971-91. The Estate is made up of 1,258 apartments, designed in blocks which have 6-8 floors at the ends, stepping up to 19 floors in the centre. The Estate is mostly car-free, with underground parking on the perimeter. Open spaces, communal facilities, and views of nearby mountains characterise the site.

In 2015, AXA began refurbishing Blocks B and C (581 apartments) to improve energy efficiency and replace outdated gas heating. Architects Meili, Peter & Partner were tasked with implementing the renovation without relocating residents. Key goals included improving energy performance, achieving Swiss sustainability certification, and keeping residents in place.

The renovation involved replacing the front facades with larger prefabricated balconies and wall linings that matched the original design. Improved ventilation, upgraded insulation, triple glazing reduced the heating demand by 62%. Seismic upgrades were made to the prefabricated stair course through the introduction of steel plates tying it back to the main building, along with fire safety upgrades.

Keeping residents on-site was a priority, minimising relocation costs and disruption. A prototype balcony was installed in 2018 and helped to test and refine methods. Tenants were temporarily relocated for 10 days while work was completed. During this time, new balconies were introduced which increased living space by 90 cm and included features like thermal breaks, riser cupboards for exhaust ducts, and retractable louvres.

Rent increases were offset by energy savings, and overall living quality improved with larger balconies, better insulation, and stairwell upgrades. Open communication with residents ensured minimal disruption, and most rental contracts remained unchanged, reflecting the success of this careful and socially considerate renovation.

3.3 Platensiedlung Frankfurt, Germany Stefan Forster Architekten

Line in the facade shows the addition of two floors on top off the existing buildings and infill housing to the site. Communal areas above the belowground carparks are landscaped carefully to blur the public and private edge. Photos by OFFICE.

The Platensiedlung in Frankfurt's Ginnheim district, originally built in the 1950s for US Army families, was repurposed after the American military withdrew in the 1990s. It was acquired by the municipal developer ABG Frankfurt Holding, which launched a large-scale refurbishment and densification project in 2017. The aim was to modernize the ageing housing estate, address its reputation as a 'problem district', and significantly increase housing capacity without building on new land.

Under the direction of architect Stefan Forster, the project nearly tripled the estate's housing stock. This was achieved by adding 1,102 modular timber units and constructing 15 new infill buildings, resulting in 26,525 m² of additional living space. Existing three-storey buildings were extended to five storeys using prefabricated wooden modules placed on reinforced structures. A high-pressure injection (HDI) technique strengthened the foundations, allowing the addition of new floors without demolition. Flat, green roofs replaced the original gabled ones to support the new levels.

Throughout the construction, all 342 existing apartments were retained and upgraded, including new windows, insulation, facades, stairwells, heating systems, and outdoor areas. Importantly, residents remained in their homes during the renovations. ABG maintained close communication with tenants, offering rent reductions during noisy periods and setting up an on-site information office. Residents also participated in courtyard design and were regularly consulted about ongoing works.

To reduce environmental impact and construction time, ABG used a nearby 'field factory' to produce timber modules, enabling fast assembly - 20 apartments in just 20 weeks - while minimising dust and noise. The modular, prefabricated approach kept costs down and significantly shortened the project timeline.

The Platensiedlung redevelopment demonstrates how urban densification can be achieved affordably, sustainably, and with minimal disruption. A study by the Technical University of Darmstadt suggests that similar strategies applied to postwar residential buildings could yield up to 1.5 million new housing units in Germany, making this project a potential model for cities across Europe and beyond.

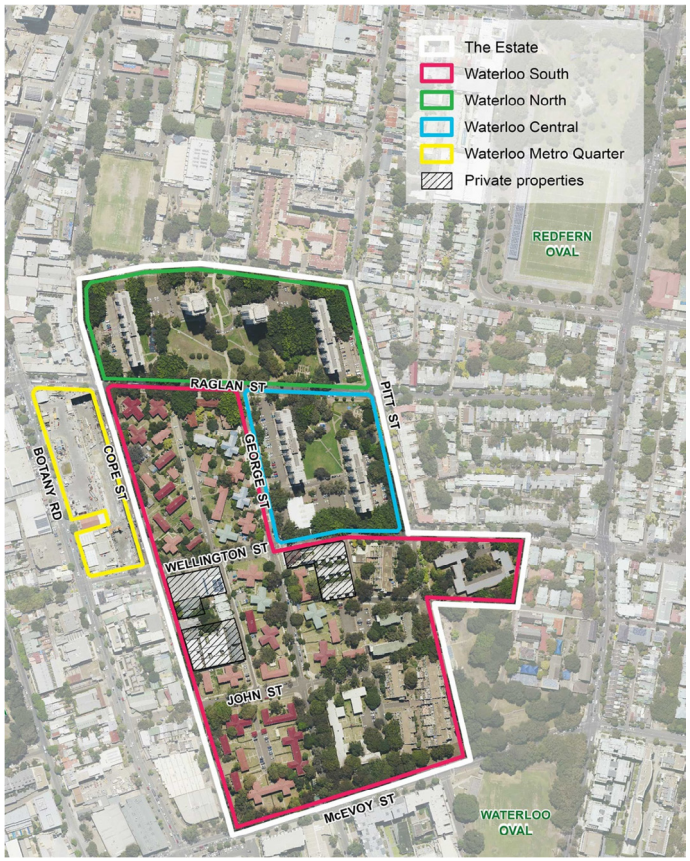
4. Waterloo Estate

4.1 History of Waterloo Estate

Estate overview

The Waterloo Estate is an area of approximately 18ha of primarily government owned land containing low, medium and high rise public housing.[64] The Estate comprises 2,012 dwellings within a mix of single storey cottages, low to medium rise walk-ups (two to three storeys in height), medium rise apartment buildings (four to seven storeys in height), four high rise apartment buildings (17-storeys in height, known as Marton, Banks, Cook and Solander) and two tower apartment buildings (30-storeys in height, known as Matavai and Turanga). Collectively, the four 17-storey high-rise buildings and two 30-storey buildings form the 'Endeavour Estate'.

This RRR study focuses on Waterloo North and Central, and compared a retrofit approach to the demolition and rebuild strategy being employed at Waterloo South.



[64] One site is owned by AusGrid and there are several privately owned sites.

Site history

The site was initially granted to former convict William Hutchingson in 1823, and developed into a ‘working-class suburb’ into the 20th century. The site was developed with poor quality housing (small cottages and terraces) with a lack of running water and rubbish which saw an outbreak of bubonic plague in 1900, and the suburb declared a slum by City Commissioners in 1928.

The first development at present-day Waterloo Estate commenced in 1948, and grew quickly as the state government pushed to deliver more homes. In the early 1960s further land was acquired and apartment buildings were designed with new open-plan living rooms and balconies. In the 1970s the Housing Commission began to develop larger-scale estates (e.g.,William McKell Place in Redfern), which soon arrived at Waterloo with the 17-story high rise buildings in the Endeavour Estate.

Matavai and Turanga

The two 30-storey towers of Matavai and Turanga in Waterloo North were constructed between 1973-76, designed in late 20th century International Style by Stafford, Moor & Farrington. The towers were purpose built for aged tenants and can house up to 522 people. The towers were designed to be a focal point for the estate and a South Sydney landmark, and each consist of 203 dwellings. There are also four lower-rise apartments that were part of this development - Solander, Marton, Cook and Banks. Matavai is named after a harbour in Tahiti that Captain Cook visited in 1770 and Turanga after the Maori word for ‘landing place’. Murals and decorative details on each floor referenced Captain Cook.

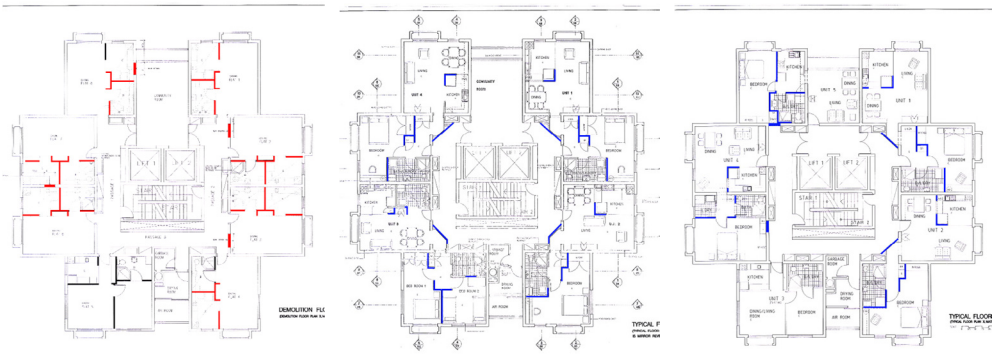
The interior of a one-bedroom unit within Matavai Tower, 2024. Photo by OFFICE

Tower Refurbishment Works - Matavai and Turanga

In the mid-1990s, the Department of Housing carried out refurbishment works on a number of units within both the Matavai and Turanga towers. However, there is no publicly available information explaining why only some units were refurbished, or if these works were part of a broader program.

Construction drawings and site visits to the refurbished flats reveal that the intent was to convert studio dwellings into one-bedroom units by creating openings in the adjoining walls and combining two units. The kitchens and wet areas were also replaced, and bulkheads were installed to accommodate new services.

These works demonstrated the feasibility of adapting the existing floor plans of the towers, and the capacity of the building's structure to support new openings and configurations.



Department of Housing construction drawings showing the demolition works (red) and two proposed plans for both Matavai and Turanaga. Dated 11/1996.

Urban renewal at Waterloo

In the 1970s-90s, the estate underwent urban renewal processes of renovating and upgrading existing housing, as well as the delivery of low-rise infill housing. In 2005, a structural report on the integrity of the 30-storey towers rated them as 'in sound structural condition.' A report by the City of Sydney 'Draft Built Environment Plan 2' in 2011 reads 'The case for retention is strong (sic) in the case of the two 30 storey slimline towers Matavai and Tauranga which were specifically designed for elderly tenants.'[65]

Resident demographics

There are currently 3205 residents living across the Waterloo Estate. Waterloo North is home to 1178 residents, Central to 573, and South to 1454. Residents report ancestry from 66 countries, with significant representation of Chinese, Irish, Russian, Scottish and Aboriginal Australian, Ukrainian, German, Filipino, Vietnamese, Italian, Greek and Indian ancestries. Of the 3205 residents, 1281 (40%) were born overseas and 1112 (34%) speak a language other than English at home. 353 residents are aged 0-24 (11%), 678 are aged 25-39 (21%), 812 are 40-59 (25%), and 1345 were aged over 60 (42%).[66]

[65] City of Sydney (2011) Submission to Redfern-Waterloo Authority 'Redfern-Waterloo Draft Built Environment Plan 2 [BEP2].

[66] Data taken from the 2021 census.

4.2 Costings

While official plans and costings for the original 2019 LAHC plans are not available, Tables 4, 5 and 6 outline the key development costs associated with the demolition, resident relocation and rebuild for Waterloo North and South.

These calculations aim to capture the true cost of the renewal program, which are often not included in estate renewal budgets. The rationale for the costings is based on previous RRR reports (adjusted to be site specific for Waterloo Estate) and the methods have been peer reviewed by SGS Economics and Planning in earlier studies.

The below construction costs have been calculated on approximate Gross Building Area (GBA) basis for the delivery of the assumed 3800 dwellings.

Table 4: New construction costs for 3800 dwellings

Demolition and Rebuild Construction Costs		
Total Building Costs (including demolition)	$1,623,901,500	($430,000 / dwelling)
Car Parking	$278,251,050	
Contingencies (10%)	$190,135,255	
Total Construction Cost (3800 dwellings)	$2,091,487,805	($550,000 / dwelling)

Table 5: Relocation costs for 132 dwellings, this is 10% of the total amount of dwellings[67]

Demolition and Rebuild Relocation Costs	
Existing Resident Relocation Costs[68]	$43,723,350
Relocation Managerial Costs	$28,520,288
Total Relocation Costs (for 132 dwellings)[69]	$72,243,638

[67] 10% has been chosen as a conservative estimate of the people who will be relocated to non LAHC housing for the duration of the demolition and rebuild, for an estimated period of five years.

[68] In the absence of relevant NSW data, these costs are based on Victorian daily rates per dwelling of $150, and managerial cost of 1.5% of construction costs as provided in the Supreme Court hearing NO. SCI 2020 02563 by Jamin Ben Crawley government representative.

[69] Ibid.

As outlined in Table 6 below, the full costs for demolition, relocation and construction of the 3800 new private and community housing using the developer-led model is calculated at $2.16 billion.

Table 6: Demolition and Rebuild total construction and relocation costs under the LAHC proposal for Waterloo North and Central

Demolition and Rebuild Construction and Relocation Costs	
Total Construction Costs	$2,091,487,805
Total Relocation Costs	$72,243,638
Total Costs exc Fees	$2,163,731,443 ($570,000 / dwelling)

This cost per new community housing dwelling represents the direct financial costs associated with demolition, relocation and rebuilding of the demolished public housing. In Section 5.2, this feasibility study introduces previously uncaptured value loss and project costs relating to social impact.

5. Retain, Repair, Reinvest: Waterloo

This report examines the feasibility of applying the Retain Repair Reinvest strategy to Waterloo North and Central.

The entire Waterloo Estate will be redeveloped over the next 20 years, with an approximately $4 billion contract for the demolition and redevelopment of Waterloo South already awarded. The broad rationale for the Estate renewal is outlined in Section 1.4, however there has been no specific details about the planned redevelopment of Waterloo North and Central. This feasibility study aims to determine if Waterloo North and Central can be retrofitted, and capture any economic, wellbeing and environmental benefits of this approach.

While there is no clear rationale for the demolition of Waterloo North and Central, the following justification was provided for the demolition of Waterloo South, and we understand that similar conditions are relevant across the entire Estate.

- Buildings are aged between 40-70 years old and nearing the end of their intended lifespan
- Buildings do not meet the changing needs of current tenants
- Many homes do not meet the contemporary accessibility and sustainability standards
- Buildings are expensive to maintain

It is unclear if an approach of upgrading or renovating all buildings within Waterloo North and Central as part of the Estate-wide renewal was ever evaluated in detail by the government, despite the belief that age and condition of the flats meant upgrading was not possible. However, there have been previous studies on the condition of the two 30-storey towers, which found that Matavai tower was in sound structural condition and did not require any major structural repairs.[70] This RRR report builds on these previous studies to provide a current condition report, as well as designs for how to improve thermal comfort, contemporary living standards and energy efficiency to the Waterloo North dwellings.

Section 7 identifies how the Retain, Repair, Reinvest model can deliver against all key Waterloo South objectives, while also providing improved economic, social, and environmental outcomes.

[70] Nick Harb Structural and Civic Engineering, *Matavai – 3 Philip Street Waterloo, Structural Condition Report,* NSW Department of Commerce, 2005.

5.1 Resident Feedback

The design for the Retain, Repair, Reinvest proposal is also informed by resident feedback. The research team held three consultations and one presentation of initial design strategies with residents of the tower and slab buildings to discuss the research proposal, and gain insights regarding resident sentiments about living on the Estate.

RRR team undertaking community consultation with Waterloo Estate residents, 2024. Image by OFFICE

OFFICE held community engagement sessions on 2/11/2024, 7/12/2024 and 5/3/2025 and asked Waterloo North residents for feedback about what they liked about living in the Estate, as well as what could be improved; in order to inform the design proposal.

Out of 20 participants, residents reported valuing living on the estate for its

- Location (proximity to the city, public transport, doctors, services such as OZ Harvest) (50%)
- The existing community (30%)
- Diverse culture (10%)
- Trees and green spaces on the Estate (25%)
- Security (15%)
- Views (5%)

Figure 4: Resident responses to survey questions about what needed improvement at the Estate.

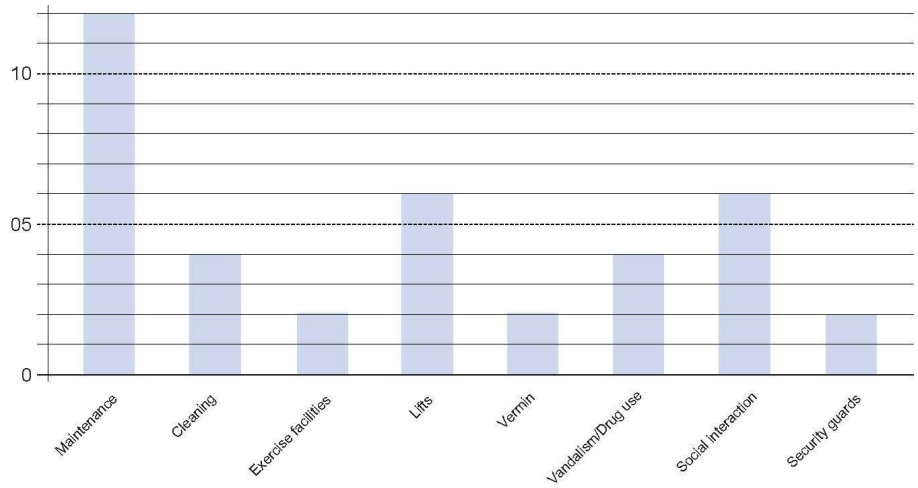


Figure 5: Resident responses to survey questions about what they liked about the Estate.

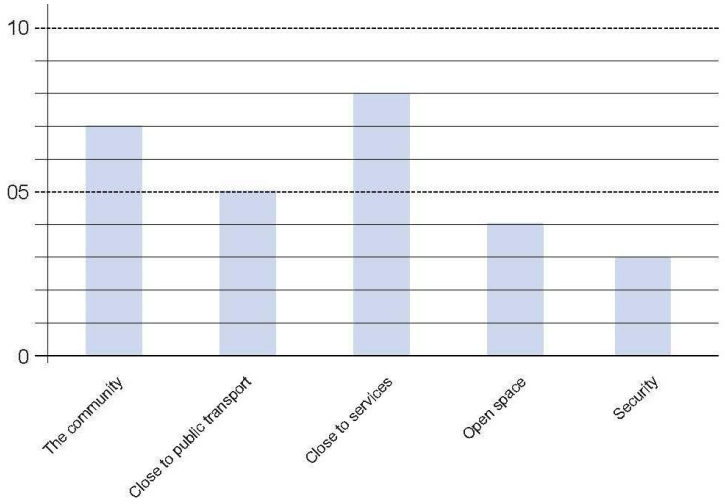
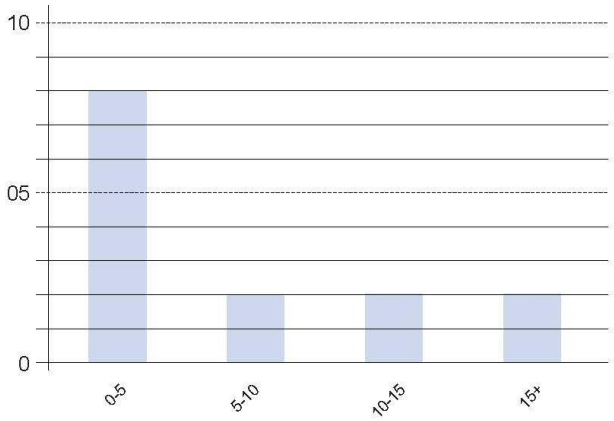


Figure 6: Resident responses to survey question about how many years have you lived on the Estate.



Residents also reported a range of improvements that could be made to the Estate:

- Maintenance and cleaning (45%)
- Lifts (10%)
- Better community spaces (15%)
- Support for isolated/elderly people (10%)
- Pest control (rats, cockroaches) (5%)

Of the responding participants, residents had lived in Waterloo North and Central for between 20 years and 3 months.[71]

5.2 Social impact of relocation

Relocation notifications were sent to Waterloo South residents in March 2025, informing tenants of 150 properties that they had six months to relocate for the redevelopment. These relocations were originally planned for mid-2024 but were delayed. There are limited details of the relocation strategy and details, however the FAQ page of the LAHC Waterloo website details that 'all tenants have a right to return to the Waterloo estate once the redevelopment is complete' and that 'if you wish to stay in the Waterloo area you will be able to do that.'[72] Residents of Waterloo North and Central are expected to receive relocation letters in the next decade.

There has been no publicly available social impact analysis conducted to measure the potential impact of the demolition, relocation and rebuild of the Waterloo Estate.[73] However, we can draw upon evidence from comparable renewal programs, and economic data on the health and education impacts of temporary displacement and interruption to community networks and connections to indicate some of the costs associated with the planned developer-led model at Waterloo.

Evidence from previous estate renewals include the findings from the Kensington Estate, which saw only 20% of residents return to the newly built dwellings. While there were a number of reasons for this - including residents being happy with their alternative accommodation - research also highlights that others did not return out of a 'desire to avoid the disruption of a second relocation, the time taken for new units to become available, and the reconfiguration of dwelling styles on the redeveloped Estate' which meant not all households were able to be re-accommodated. Research in Australia has identified the loss of social and community networks and sense of place, anxiety, stress, and other forms of psychological distress.[74] Furthermore, while tenants may be promised a 'right to return', they are not likely to see the benefits of

[71] 1-5 years: 7 residents
6-10 years: 3 residents
11- 20 years: 1 resident
Over 20 years: 1 resident

[72] Land and Housing Corporation, *Waterloo: Frequently Asked Questions.* Available online: https://www.dpie.nsw.gov.au/land-and-housing-corporation/greater-sydney/waterloo/faqs

[73] A health impact assessment was undertaken, however the outcomes were never released.

[74] See Arthurson 2002; Crawford & Sainsbury, 2017; Porter et al., 2023; Stubbs et al., 2005; Pinnegar et al., 2013; Morris, 2018).

redevelopment unless redevelopment and relocations are staged such that tenants move directly into a newly developed home. Three major projects in Victoria had a 13.5% rate of return,[75] and one major project in Sydney had an 11% rate of return.[76]

Table 7: Health and Education costs of relocation costs at Waterloo North and Central under a demolition and rebuild model

Demolition/ Rebuild Social Costs (1322 Dwellings)	
Health Cost (1751 people)	$4,062,000
Education Cost (54 children)	$590,400
Total Social Costs	**$4,652,400**

Internationally, there is evidence to suggest that the relocation of residents as part of urban renewal schemes comes at a cost with detrimental impacts on physical and mental health, as well as impacts of 'families, friends and communities' who are 'all impacted as the social, economic and health effects of those displaced ripple out.'[77] For further discussion of the impact of relocation during estate renewal on social wellbeing and health of residents from international case studies, see the previous RRR: Ascot Vale and RRR: Flemington reports.

Additionally, large-scale estate redevelopment also has a negative impact on the availability of social housing in general, as relocation processes absorb many of the limited number of vacancies in the social housing system.[78] Analysis of estate regeneration relocations in NSW between 2016-2018, with replacement social housing delivered in early 2024, saw 527,793 nights of social housing were devoted to relocated tenants rather than those allocated off the housing register.[79]

[75] Thompson, 2025
[76] Sisson, pers comm.
[77] Porter, et al, *Victoria's Housing Statement: A Critical Explainer,* RMIT University Centre for Urban Research, 2023.
[78] For instance, the redevelopment of the Ivanhoe estate in Macquarie Park led to 211 social housing properties being used for relocated tenants, with 24 moving to headleased dwellings and 23 other forms of accommodation (Sisson and Ruming 2024).
[79] Ibid.

Table 8: Waterloo North and Central demo/rebuild strategy total project costs

Demolition / Rebuild Total Project Costs	
Construction Costs	$2,091,487,805
Relocation Costs	$72,243,638
Displacement Health Costs	$4,062,320
Displacement Education Costs	$590,382
Total Project Cost (3800 dwellings)	**$2,168,384,145**

One way to mitigate this harm is through greater resident involvement in estate redevelopments. RRR advocates for greater centering of resident expertise, experiences and wishes in any redevelopment proposal. As detailed in the *Compact for Renewal* document from UNSW and Shelter NSW,[80] as well as the Greater London Authority's Principles for Estate Renewal,[81] there are great benefits to all parties by meaningfully consulting with and centering resident voices - including savings to government in relation to consultants and staff - and most significantly, better outcomes for the impacted community.

[80] Shelter NSW and Tenants Union of NSW, *A Compact for Renewal: What tenants want from Renewal,* 2017.
[81] Greater London Authority, *Better Homes for Local People - The Mayor's Good Practice Guide to Estate Regeneration,* 2018.

6. Retain, Repair, Reinvest Design Proposal for Waterloo North and Central

A feasibility study has been conducted into the refurbishment of all existing buildings and proposed infill development on the site.

The feasibility study contains:

- Architectural Drawing Set
- Site Masterplan
- Structural Engineer Report (visual inspection)
- Ecologically Sustainable Development Assessment Report (existing buildings)
- Cost Plan Report

View from Solander across to Banks above the significant tree canopy of the community garden. Photo by OFFICE

6.1 Existing Buildings at Waterloo North and Central

The Waterloo North and Central Estate consists of two 30 storey towers (Matavai and Turanga towers), along with four 17 storey slab buildings (Solander, Marton, Cook and Banks).

Matavai and Turanga - Towers
Built in 1976, Matavai and Turanga are two identical 30-story residential high-rises situated within the Waterloo Estate in Sydney. Designed by Stafford, Moore and Farrington Architects in collaboration with the Housing Commission's Architects, the towers embody the Brutalist architectural style and modernist ideals of mass housing. Each tower contains 203 units, comprising mostly studios and one-bedroom apartments, along with a few two-bedroom units. Turanga and Matavai serves as a visual gateway to the estate and helps frame the adjacent Waterloo Green. The tower's architecture emphasizes verticality through repetitive floor plates, facades of concrete and pebblecrete, and vertically aligned windows. Curved window edges soften the otherwise rigid geometry.

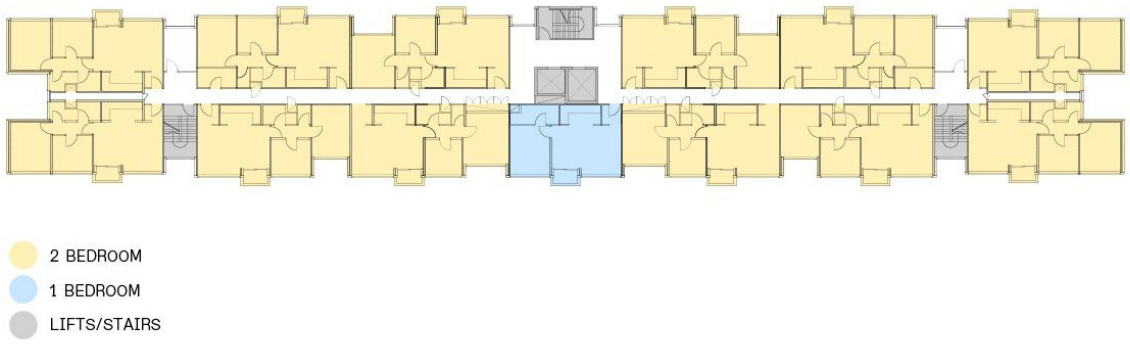
Internally, apartments are arranged around dual central lift cores with communal passageways and shared spaces, including a foyer, garden, library, and community room. The towers are specifically reserved for residents aged 55 and older and have been designed with elderly tenants in mind. Matavai includes accessibility features such as slow-moving lift doors, emergency call systems, non-slip shower bases, and communal drying areas. While structurally sound, the tower does face some design challenges with many units performing poorly thermally, outdated joinery and fixtures, and studio apartments. Nonetheless, resident satisfaction is generally high, particularly regarding natural light and safety improvements following the introduction of a concierge. Despite its imposing scale and minimal engagement with the public realm, the towers are seen as a robust, egalitarian symbol of social housing and remains a significant architectural and social landmark in Sydney.

Figure 7: There are two typical floor plans replicated throughout the tower with a conversion of some of the studios into one-bedrooms in the 90s (Typical 2).

Solander, Marton, Cook and Banks - Slabs

The four slab buildings - Marton, Solander, Banks, and Cook - were constructed between 1971 and 1974. Oriented north–south, each building features a double-loaded corridor with units facing either east or west. The corridor doglegs around a central lift core, obstructing direct sightlines from the lift to apartment entrances. Additional vertical circulation is provided by three evenly spaced staircases along the façade. The buildings each contain a total of 227 units, comprising 17 one-bedroom and 210 two-bedroom apartments. While the east–west orientation maximizes solar exposure, it also exposes west-facing units to intense afternoon heat and overheating.[82] End units were not given north- or south-facing windows, and no apartments benefit from effective natural cross-ventilation. At each end of the floor plate, laundry and garbage chutes offer shared amenity. Internally, kitchens and bathrooms are typically placed along the back wall of each unit, relying entirely on mechanical ventilation and artificial lighting. Bedrooms include wide windows with high sills and low head heights - possibly intended to enhance the feeling of safety at height, though they compromise natural light and outlook. Living areas open onto small, square balconies via tall sliding glass doors, but visual access to the outdoors is limited by solid balustrades.

Figure 8: The existing floor plans show a double loaded corridor off a central lift core. The dog leg around the lift core creates issues of safety.



[82] Michael Zanardo, Alistair Sisson, Cameron Logan & Rebecca McLaughlan, 'Wilful ignorance at Waterloo: public housing quality and political stigma in Sydney's largest estate renewal', *Planning Perspectives,* 2024, p. 1219.

6.2 Design Proposal

The design team's approach to the feasibility study is to Retain, Repair and Reinvest.

- Retain existing communities by not relocating residents,
- Repair existing buildings to reduce environmental impact,
- Reinvest savings to improve comfort and upgrade public housing.

The Retain Repair Reinvest design proposal brings the existing housing blocks up to contemporary standards of living - in line with LAHC/HomesNSW objectives and environmental standards - while retaining the existing community. Retention is achieved through the staging of new works first to housing the existing residents or sequential refurbishment works within the existing buildings. (refer to 8.1)

The design has been informed by;

- Existing Waterloo Estate resident feedback
- Existing proposal for Waterloo North and Central (LAHC and CoS)
- Architectural and landscape architectural input
- Environmental and sustainability design solutions
- Structural Inspection
- Energy performance targets
- Quantity surveyor costings

As there are no clearly stated objectives for the Waterloo South development publicly available we have assumed that they follow the LAHC Design Requirements[83] and LAHC Dwelling Requirements[84] which stipulate the requirements for all new social housing developments.

Overall, the RRR response can address the majority of HomesNSW requirements with minimal intervention. Items that are not addressed would require significant structural interventions, which are beyond the scope of this proposal or realistic outcomes for the buildings. However, the RRR proposal demonstrates that through a retrofit approach, refurbishment can enhance the livability, thermal efficiency, comfort and quality of life for residents, and address the majority of HomesNSW requirements for new builds.

[83] NSW Land and Housing Corporation Design requirements. Available online: LAHC-Design-Requirements.pdf

[84] NSW Land and Housing Corporation Dwelling Requirement. Available online: LAHC-Dwelling-Requirements_September-2020_Access.pdf

Table 9: RRR tower refurbishment study addressing key objectives of HomesNSW developments

Tower Buildings (Matavai and Turanga)	
HomesNSW Requirements	**Synopsis of Proposed RRR Response**
NSW Apartment Design Guidelines	The RRR proposal meets the majority of the AGD recommendations. The items it does not meet are listed below : 4A-1 Solar and Daylight Access 4C-1 Ceiling Heights 4D-1 Apartment Size and Layout 4D-3 Minimum Bedroom Sizes Minimum Lounge Room Sizes 4E-1 Minimum Balcony Sizes 4F-3 Max apartments sharing a single lift (See Appendix 11 for full details)
LAHC Dwelling Requirements[85]	The RRR proposal meets the majority of the AGD recommendations. The items it does not meet are listed below : - Minimum Apartment Sizes - Minimum Ceiling Heights - Room widths - Minimum Balcony Sizes - Cross ventilation (See Appendix 5 for full details)
LAHC Design Requirements[86]	The RRR proposal meets all design requirements. (See Appendix 6 for full details)
Increase housing numbers	The proposed infill housing in combination with the newly refurbished dwellings will achieve an increase in 1712 dwellings (129%) across Waterloo North and Central

[85] NSW Land and Housing Corporation Dwelling Requirements.
[86] NSW Land and Housing Corporation Design Requirements.

Table 10: RRR slab refurbishment study addressing key objectives of HomesNSW developments

Slab Buildings (Marton, Solander, James Cook, Joseph Banks)	
HomesNSW Requirements	**Synopsis of Proposed RRR Response**
NSW Apartment Design Guidelines	The RRR proposal meets the majority of the AGD recommendations. The items it does not meet are listed below : 4A-1 Solar and Daylight Access 4C-1 Ceiling Heights 4D-1 Apartment Size and Layout 4D-3 Minimum Bedroom Sizes (See Appendix 11 for full details)
LAHC Dwelling Requirements[87]	The RRR proposal meets the majority of the AGD recommendations. The items it does not meet are listed below : - Require a percentage of Gold standard dwellings as per the development brief. - Minimum Apartment Sizes - Minimum Ceiling Heights - Room widths - Cross ventilation (See Appendix 5 for full details)
LAHC Design Requirements[88]	The RRR proposal meets all design requirements. (See Appendix 6 for full details)
Increase housing numbers	The proposed infill housing in combination with the newly refurbished dwellings will achieve an increase in 1712 dwellings (129%) across Waterloo North and Central

[87] NSW Land and Housing Corporation Dwelling Requirements.
[88] NSW Land and Housing Corporation Design Requirements.

6.3 NSW Government Policy Alignment

The RRR proposal can also address key NSW policy objectives in relation to housing. Table 11 provides an overview of this alignment.

Table 11- RRR addressing NSW policy objectives

NSW Government Policy	Synopsis of Proposed RRR Response
Building Homes for NSW	The RRR proposal will achieve targets under the Building Homes for NSW policy by: - Delivering 1,858 of the 6,200 targeted new social homes on existing government land - Repair 1,176 homes of the 33,500 target within the Waterloo Estate
NSW Social Housing Energy Performance Initiative (SHEPI)	The RRR proposal will achieve targets under the SHEPI policy by: - Delivering energy performance upgrades to 1,176 of the 24,000 targeted social homes within the Waterloo Estate to improve liveability and save tenants money
LAHC Environmental Sustainability Strategy 2024-2026	The RRR proposal will help achieve the following objectives of LAHC Environmental Sustainability Strategy: - Under Priority 1 to improve the energy and water efficiency of new and existing social housing; 1.1, 1.2 and 1.3 - Under Priority 2 to reduce carbon emissions by 50% by 2030 (compared to FY19 baseline); 2.2, 2.3, 2.5, 2.6, 2.7 and 2.8 - Under Priority 3 to improve thermal comfort and indoor air quality; 3.1 - Under Priority 6 to integrate circular economy opportunities; 6.2 and 6.1
HomesNSW Component Requirements	The RRR proposal aims to meet all relevant component requirements as set out in the policy.
HomesNSW Asset Performance Standards	The RRR proposal meets and exceeds all Basic Provision Standards for existing dwellings
HomesNSW Heating and Cooling Policy	The RRR proposal meets the following relevant requirements of the HomesNSW Heating and Cooling Policy: - 5.1 Air Conditioners and Solar Systems - 5.2 Ceiling Insulation and Draught Proofing

6.3 Community Design Consultation

In addition to understanding what residents valued about living on the Estate, OFFICE also asked for feedback, insights and suggestions about the design, layout and functionality of their existing homes. In total 20 residents provided feedback.

When asked about their flat, residents reported that they valued:

- The layout of the space (20%)
- Well designed kitchen (10%)
- Good light and orientation (10%)
- Enough space (15%)
- Good airflow and ventilation (15%)

Suggested improvements to the flats included:

- Better heating and cooling options (25%)
- Inefficient hot water system (15%)
- Needs exhaust in bathroom (5%)
- Free WIFI for residents (5%)
- Sound insulation (5%)
- Larger spaces (5%)

Figure 7: Resident responses to survey question: What works well in your flat?

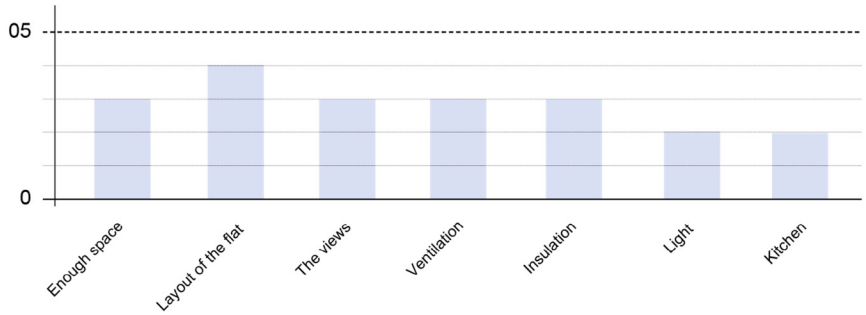
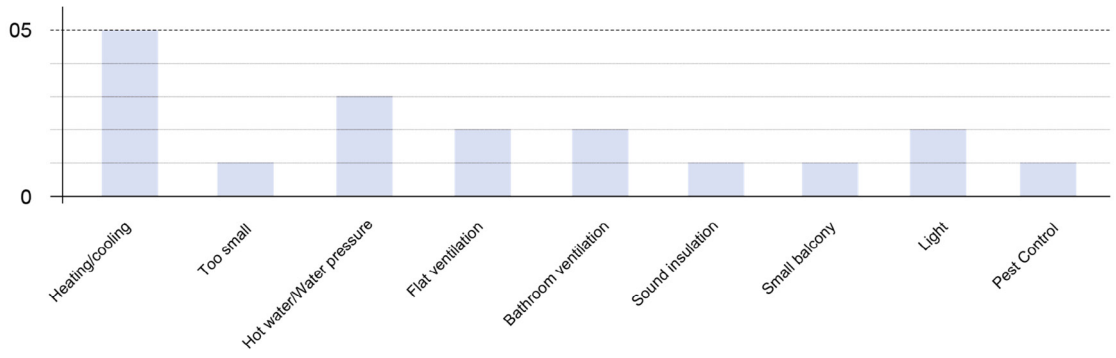


Figure 8: Resident responses to survey question: What needs to be improved on your flat?



While residents reflected that they ‘felt lucky to live here’ and didn’t want to see Waterloo North demolished, they had strong visions for how the Estate could be improved to better meet community needs.

Prior to the RRR project commencing, initial consultations were undertaken by Less Stress Studio with nine participants and found that

- The was a general sentiment of wanting to stay and refurbish the towers
- Matavai was described as a nice place to live with a strong sense of community
- There was a sense that lack of maintenance had led to damage but they were overall in good condition and could be made beautiful again

Design elements raised by residents included

- A desire for private outdoor space
- Operational windows for cross ventilation, double glazing
- Overall refurbishment of interiors

Residents and members of the community also felt they have been overlooked in the planning process and were concerned about the ‘social mix’ of 70% private to 30% community housing in the new proposed development. This community feedback is aligned with insights from LAHC’s own community engagement sessions.

Elton Consulting, on behalf of the Department of Family and Community Services, conducted consultations with residents regarding the entire proposed Waterloo precinct redevelopment in 2019, including ‘options testing’ about the future of the site. Over 100 members of the community participated in the consultation, and five key themes emerged from the options testing.

1. Culture and community life. There was a strong connection to both the estate and local area, and sense of community and belonging.
2. Transport, streets and connections. The precinct should offer easy access to a range of transport options.
3. Housing and neighbourhood design. Many people expressed a desire for a lower density that the proposal has outlined, and some did not support the redevelopment of Waterloo. Some discussed the need for a higher number of social and affordable housing if the redevelopment is to occur.
4. Community facilities, services and shops. A desire for bringing people together and providing a place to share culture and provide educational and employment services.
5. Environment and open space.

6.4 First Nations Community

The project team has met and presented to the Inner Sydney Aboriginal Interagency Network (ISAIN) on two occasions to share the ambitions of the Waterloo renewal and to listen to feedback from Aboriginal and Torres Strait Islander community representatives. These meetings highlighted the community's deep and ongoing connection to the area, and a strong desire to see Aboriginal and Torres Strait Islander culture meaningfully embedded in the redevelopment process. ISAIN emphasised the importance of preserving and strengthening ties to Country, identity, and community throughout the renewal. Concerns were raised about the risk of cultural erasure and the need for dedicated efforts to ensure Aboriginal and Torres Strait Islander people are not displaced or excluded. Key design considerations that have come up through these meetings:

- Caring for Country - Retention of significant trees throughout the estate
- Allocation of affordable housing for Aboriginal key workers
- Allocation of public housing for Aboriginal people
- Provision of key services (health, community, legal)

Table 12: Key First Nations design considerations

Key Design Considerations	RRR Proposal
Caring for Country - Retention of significant trees throughout the estate	565 (82%) trees are retained
Allocation of affordable housing for Aboriginal key workers Allocation of public housing for Aboriginal people	Following the objectives of Waterloo South there will be an allocation of 20% of the new social homes and 15% of the affordable homes will be prioritised for Aboriginal people.
Provision of key services (health, community, legal)	Allocation of ground floor tenancies within the new developments to key First Nation services.

6.5 Structural Assessment

The Waterloo North and Central Estate consists of two 30 storey towers (Matavai and Turanga towers), along with four 17 storey slab buildings; (Solander, Marton, Cook and Banks.) While all the buildings are made from concrete the structural systems differ based on building type.

Matavai and Turanga - Towers
Both towers are constructed using prefabricated large panel concrete walls with in-situ concrete floors at each level. Although the structural documentation includes two flooring options - prefabricated floor panels and in-situ concrete - construction photos indicate that in-situ concrete was the preferred method. The wall panels were craned into place and fixed using bolts through the floor slab into the panel above, a typical detail of large panel construction systems of the period. The wall panels are 200mm thick, while the in-situ floors are documented as 150mm thick.

Figure 9: (left) Plan showing the wall panel connections joins. (right) Section showing the wall panel bolted connection through the floor slab.

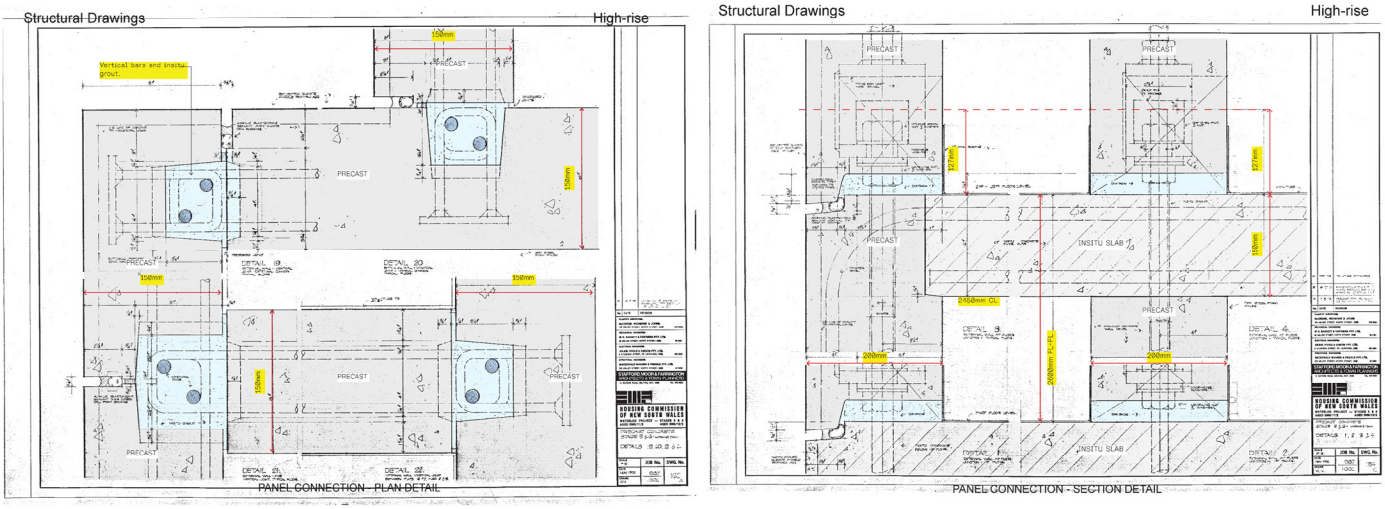
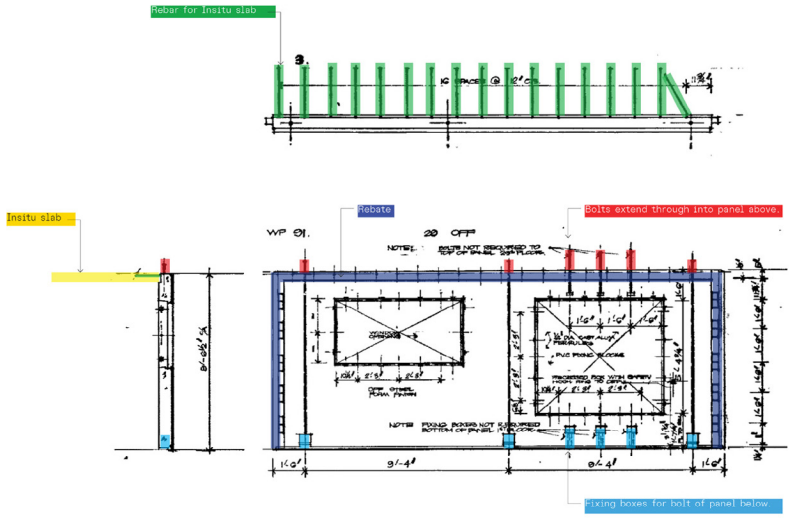


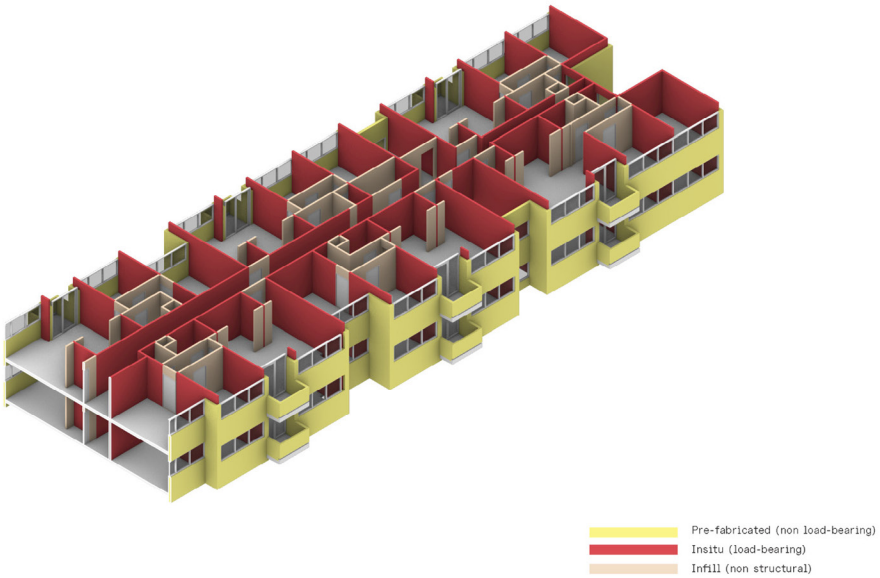
Figure 10: Diagram showing a typical *structural wall pane* and connection types.



Slab Buildings (Marton, Solander, James Cook, Joseph Banks)

While the slab buildings may appear similar in construction to the towers - suggesting a large panel system - they are in fact built with in-situ concrete walls and floors, with prefabricated non-structural panels attached to the facades. The load-bearing walls run east–west along the length of the buildings, creating a rigid structural system. The facades being non-loadbearing, making it possible to remove them and attach prefabricated balconies in their place.

Figure 11: Diagram showing the structural system of the slab building.



Structural engineers, Witt Consulting undertook a Structural Condition Assessment at both Central and North Waterloo. To assess the typical condition of each building type, two buildings were selected for inspection: Matavai (a 30-storey tower) and Daniel Solander (a 17-storey building). Refer to Appendix 7

As part of the structural condition assessment Witt Consulting undertook visual inspections of the exterior of the buildings and internal common areas. The visual inspection of the external surfaces of the buildings was made from the ground. On the basis of this preliminary structural condition assessment, it is the opinion that 'based on their current condition, we expect the structures to remain serviceable for an extended period, likely exceeding 100 years.'[89] Further inspection and testing would be required to confirm this preliminary assessment.

Key Findings:

- No major structural defects were identified; both buildings are structurally sound.
- Minor issues were observed in building services, particularly leaking or corroded pipes causing water ingress.
- The buildings are expected to remain structurally serviceable for 100+ years.

[89] See Appendix 7

6.6 Building Surveyor

Although a dedicated building survey was not conducted specifically for the RRR Waterloo study, advice from the previous RRR report on the Flemington Estate - a 20-storey public housing tower built in the 1960s - has been referenced to identify and address similar concerns in the current design. This list is not exhaustive, rather an indication of some of the key requirements.

Table 13: RRR approach to addressing NCC compliance issues.

NCC Compliance Issues	RRR Approach
Sprinklers are required to all balconies.	Existing fire sprinklers are retained with extension to new balconies.
Stairs are required to be in a fire-enclosed stairway achieving 90min FRL with -/60/30 fire doors.	New fire-enclosed stairs in slab building. There are no new stairs proposed for the tower buildings and a performance solution would need to be sought.
Buildings with an effective height exceeding 25 meters (or 20 meters in specific cases) are subject to the two-exit requirement.	New fire-enclosed stairs in slab building providing two-exits per core. There are no new stairs proposed for the tower buildings and a performance solution would need to be sought.
The concrete floor slab is approximately 150mm thick in both building types. A 200mm thick slab, acoustic underlay to floor finishes and/or acoustic insulation within the ceiling space are needed to provide the required acoustic and fire rating between floors.	New ceiling lining and insulation foam fixed to soffit with carpet and acoustic underlay to floors to achieve required acoustic and fire rating.

The structure needs to comply with the current earthquake code.	Structural seismic studies would need to be undertaken to understand the performance of each building.
Stairs are also required to be pressurised with mechanical ventilation in accordance with AS1668.	Windows have been removed in existing slab buildings making it an open stair and avoiding the need for pressurisation. Fire engineer performance review required. New stairs would be pressurised.
Hydrant Coverage and location is required to be confirmed for compliance	Existing hydrants are assumed to be compliant as buildings were recently upgraded with sprinklers.
NBS Comment: NCC 2022 requires the following for liveable housing requirements: ● 820mm clear front entry doors ● 1200mm x 1200mm clearance from front entry door ● Internal corridors to be provided with 1000mm clear width. ● Minimum One closet pan shall have a clear space of 1200mm x 900mm clear space in front of the closet pan ● Shower in the same bathroom shall be provided with a step free entrance (hobless)	All requirements are satisfied. (Refer to architectural plans.)

6.7 Architectural Design

Render view towards Matavai and Turanga showing retrofitted balconies with sun shading and louvres. Image by OFFICE.

Refurbishment

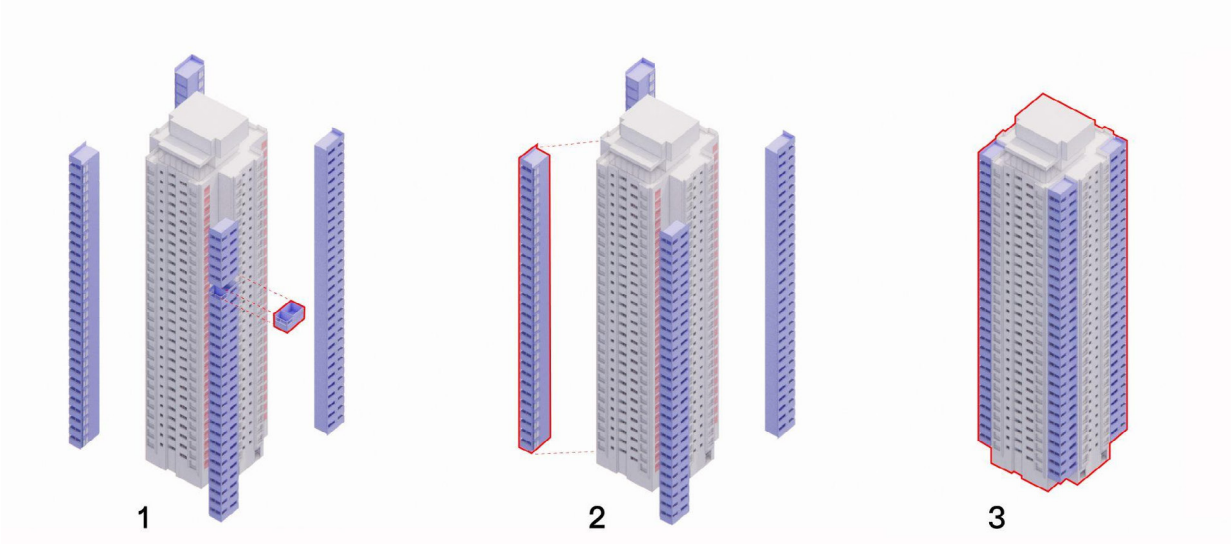
The design of the refurbished public housing integrates feedback from current estate residents while aligning with the policy objectives of LAHC and HomesNSW. The architectural intent is to respect the original buildings, applying a range of design strategies to bring them up to contemporary standards. Although the buildings differ in layout and structural systems, the refurbishment approaches share common goals and guiding principles.

Key goals and principles of the design are:

- Respect the heritage significance of the buildings
- Increase thermal performance
- Heating and cool upgrades
- Addition of new balconies
- Upgrades services
- Achieve Silver LHDG and ADG standards where possible

Matavai and Turanga – Towers

Figure 12: Prefabricated modules containing a bedroom and balcony are retrofitted to each corner of the tower.



Key elements of the design are:

- The incorporation of new bedrooms and balconies to exterior of the building
- Inclusion of a high needs SDA unit to multiple floors
- Upgrades to thermal performance (double glazed windows, insulation)
- Heating and cooling upgrades

The main design strategy of the tower's refurbishment centres on the addition of a bedroom and balcony to each of the four corners. These standardised, prefabricated units are self-supporting and fixed back to the building, rather than being supported by it. The new bedrooms allow for the conversion of bedsits into one-bedroom apartments and existing one-bedroom units into two-bedroom apartments - each now with private external open space.

Figure 13: Typical plan of the tower highlighting the addition of a replicable bedroom and balcony module. This prefabricated addition turns the studio apartments into one-bedders.

Internally, interventions are minimal. Wet areas and kitchens are rearranged and new joinery units installed. All external and partition walls are upgraded with new linings (fireproofed to partition walls) and insulation; this provides an opportunity for extensive caulking and sealing of panel joins and junctions. A new ceiling with acoustic insulation is added to the soffits.

New riser ducts run through the prefabricated modules, connecting exhaust systems, plumbing, and electrical services. Each unit is also fitted with an individual air conditioning unit serving the living area.

In total, 42 high-needs Specialist Disability Accommodation (SDA) apartments are included in the refurbishment. These units include an additional room for a support worker or overnight carer. Photovoltaic cells and water harvesting are retrofitted to the building and communal areas remain on the ground floor.

Figure 14: Typical plans of the proposed refurbishment. A combination of one, two and three-bedroom units. Gold Standard units with guest rooms are also incorporated into the plan.

Figure 15: Table comparing the tower units existing vs proposed.

Tower	Studios	1B	2B	3B	Total
Existing	147	49	6	0	202 Units
RRR Proposed	0	115	39	6	160 Units
Difference	-147	+66	+33	+6	-42 Units

Figure 16: Demolition plans (above) and proposed plans (below) of the two typical floor plates within both towers.

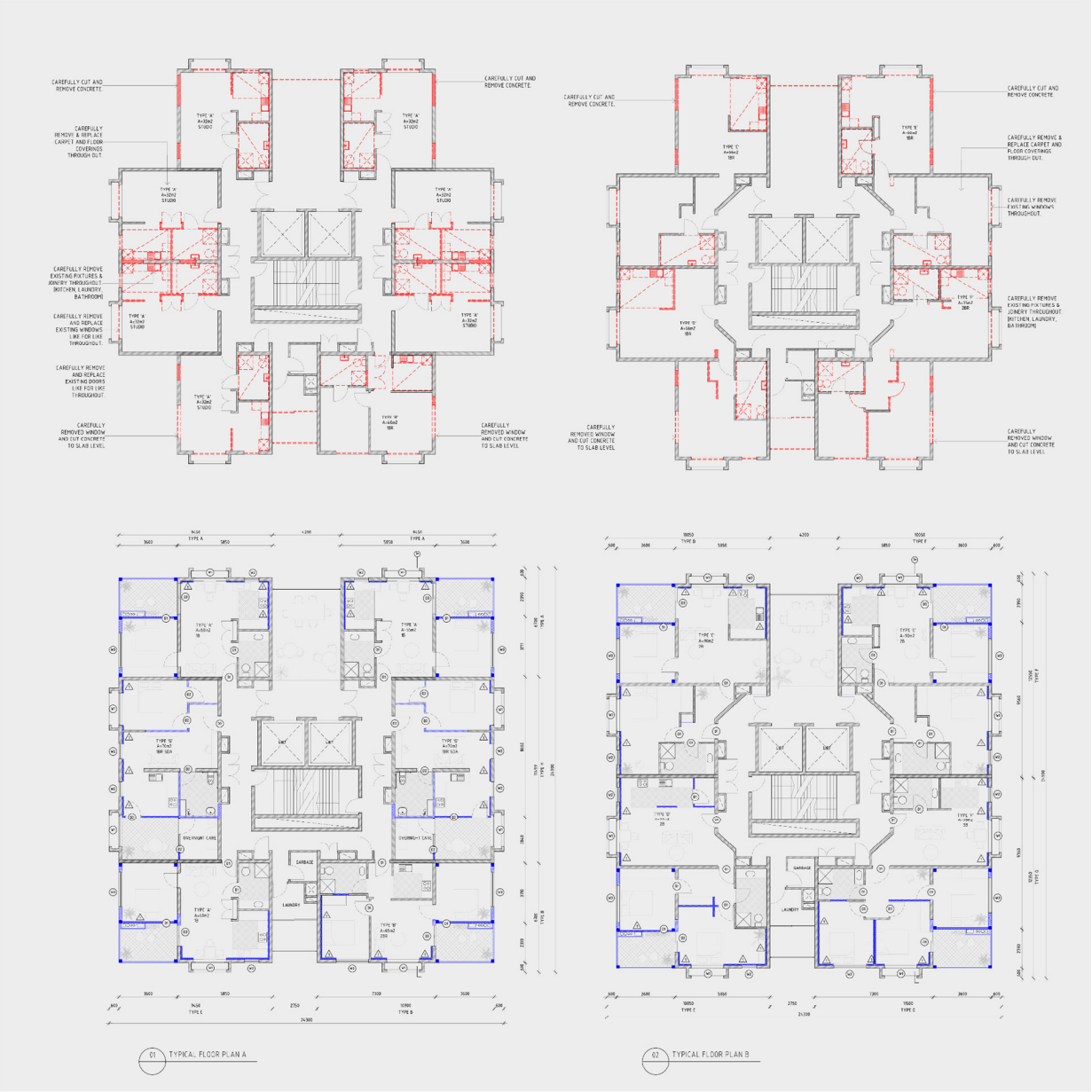
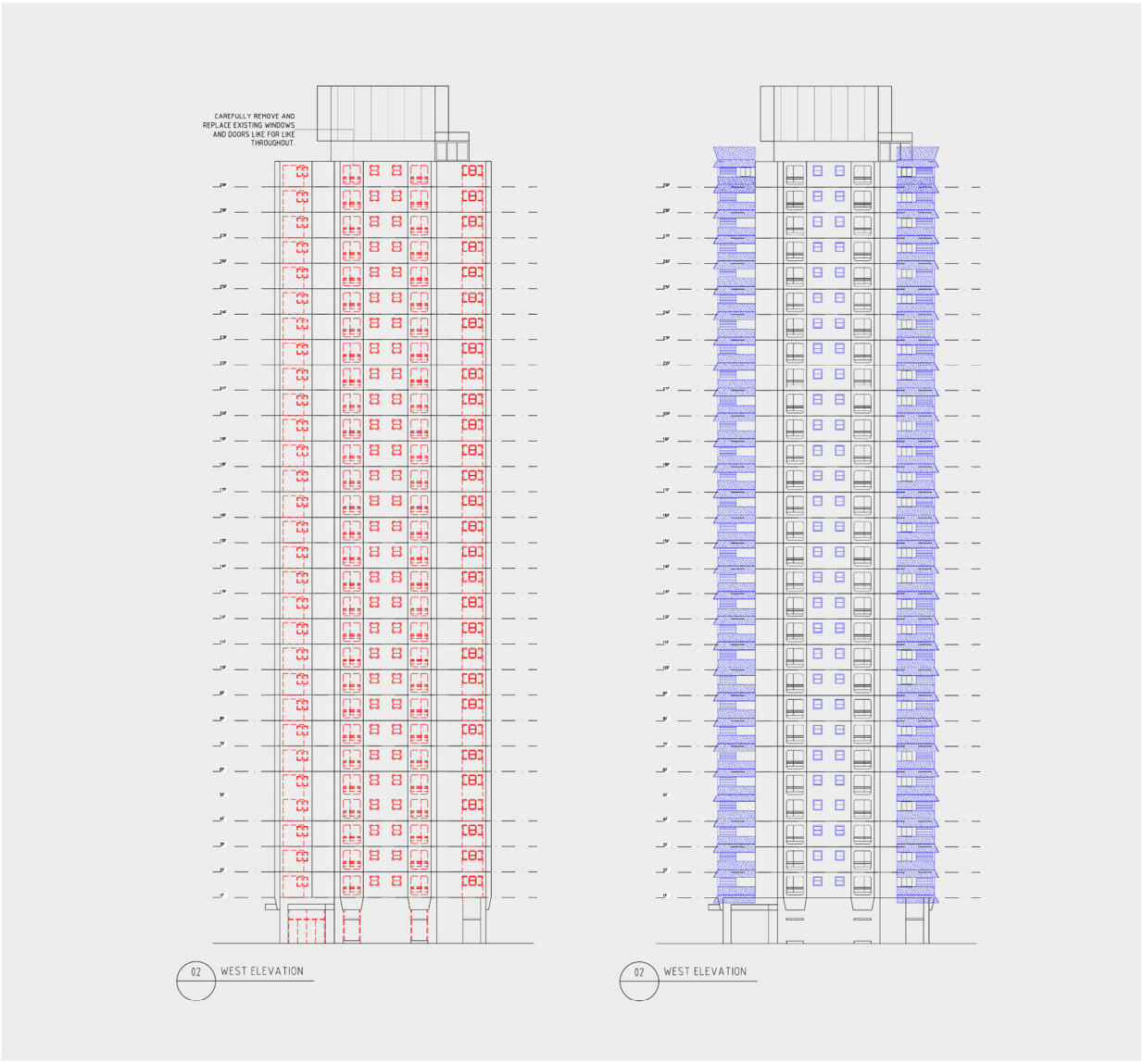
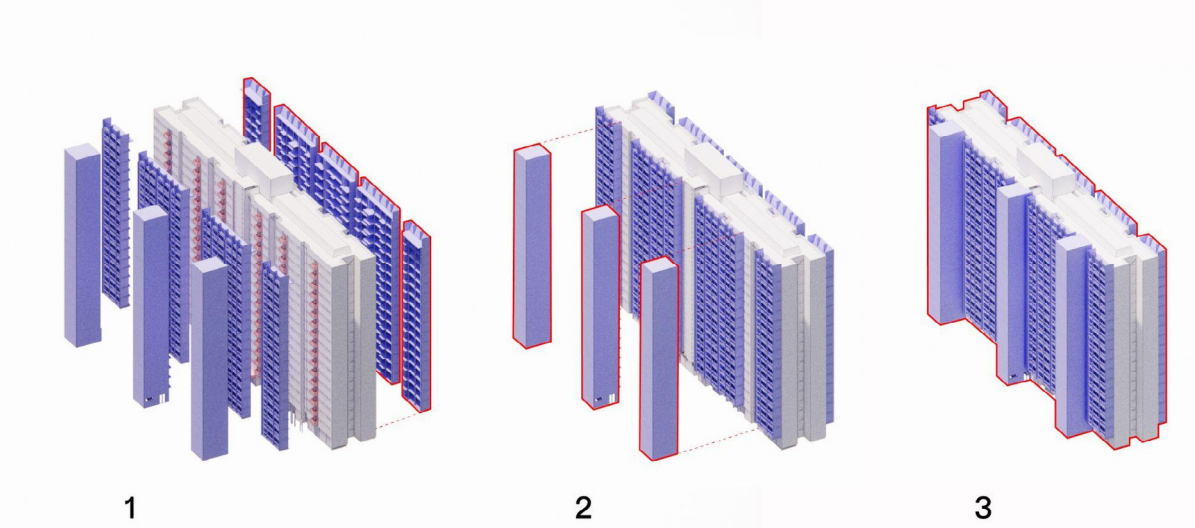


Figure 17: Demolition elevation (left) and proposed elevation (right) showing the replacement of windows and addition balconies to the corners.



Solander, Marton, Cook and Banks - Slabs

Figure 18*: New balconies are added to both facades with three new lift cores.*



Key elements of the design are:

- The incorporation of new balconies to exterior of the building
- The inclusion of two new vertical circulation cores
- Re-orientation of the central apartments
- Upgrades to thermal performance (double glazed windows, insulation)
- Heating and cooling upgrades

Figure 19: By including new lift cores the building can be divided into three blocks, removing the long central corridor which has caused safety concerns for the residents.

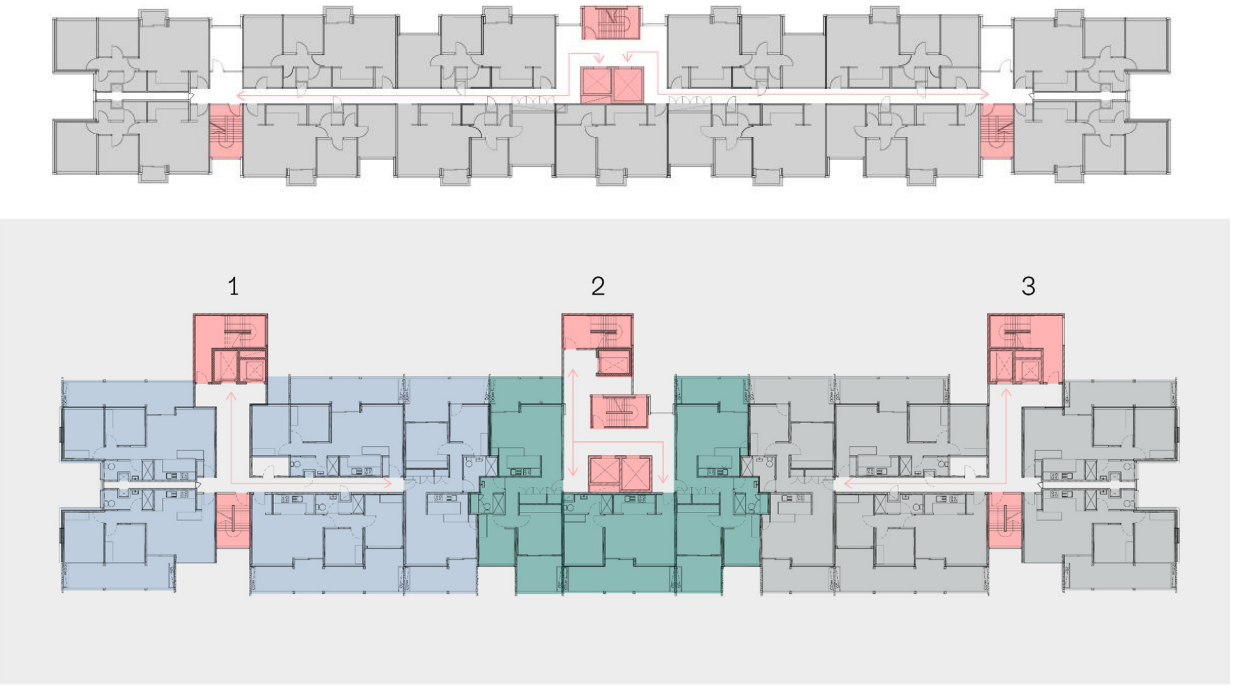
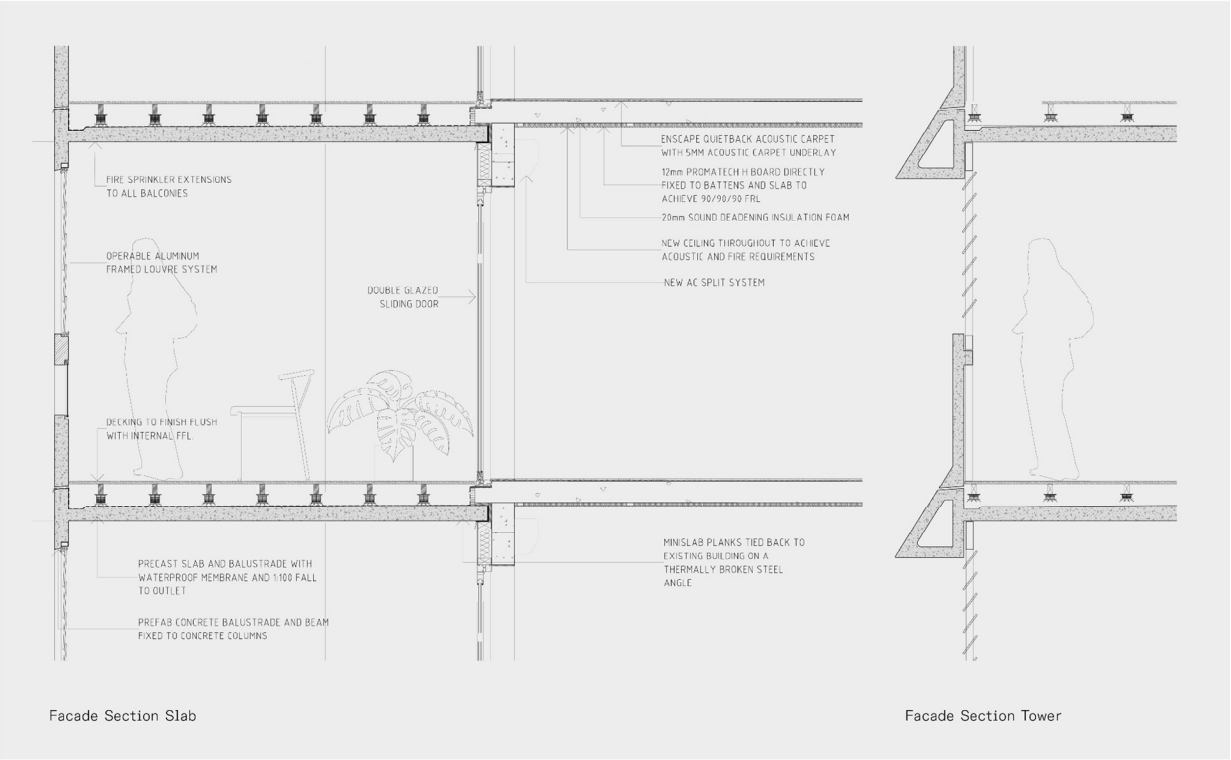


Figure 20: Sectional detail of the new balconies and building fabric upgrades.



The key drivers behind the slab building redesign are to reduce the number of units serviced by a single lift core, increase private open space, and improve facade shading. This has been achieved by inserting two new lift cores at either end of the building, along with an additional stretcher lift supplementing the existing lifts. By dividing the building into three distinct cores, we eliminate the need for a central corridor, which previously presented accessibility and safety concerns. The two central units have been reoriented to provide dual outlook and cross-ventilation. All wet areas, kitchens, and joinery are being fully replaced. New acoustic carpeting will be installed in bedrooms and living areas, and all windows and doors will be upgraded to double-glazed units. All external walls are upgraded with new linings and insulation. A new ceiling with acoustic insulation is added to the soffits. Photovoltaic panels and water harvesting systems are also being retrofitted, ensuring the project meets high energy efficiency standards.

Figure 21: The central units are reorientated to eliminate the central corridor and provide the dwellings with dual outlooks and cross ventilation.

Externally, the key design intervention is the inclusion of new prefabricated concrete balconies. Paying respect to the original construction type of the prefabricated panel system, the new balconies follow the same structural logic and layout, redefining the facades and providing additional outdoor living areas. These balconies are enclosed with operable louvres,and also contain new service risers. Fabricated off-site, these balconies are self-supported and tied back to the existing building increasing efficiencies in installation and minimising disturbance to the existing building structure.

Figure 22*: Typical plan showing the unit types for the refurbished block OFFICE*

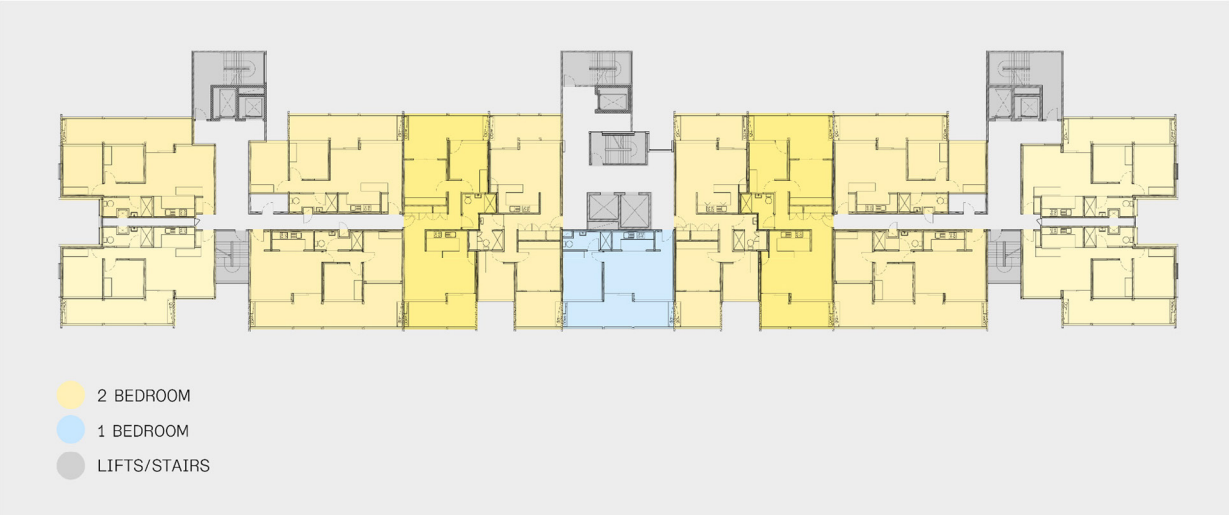
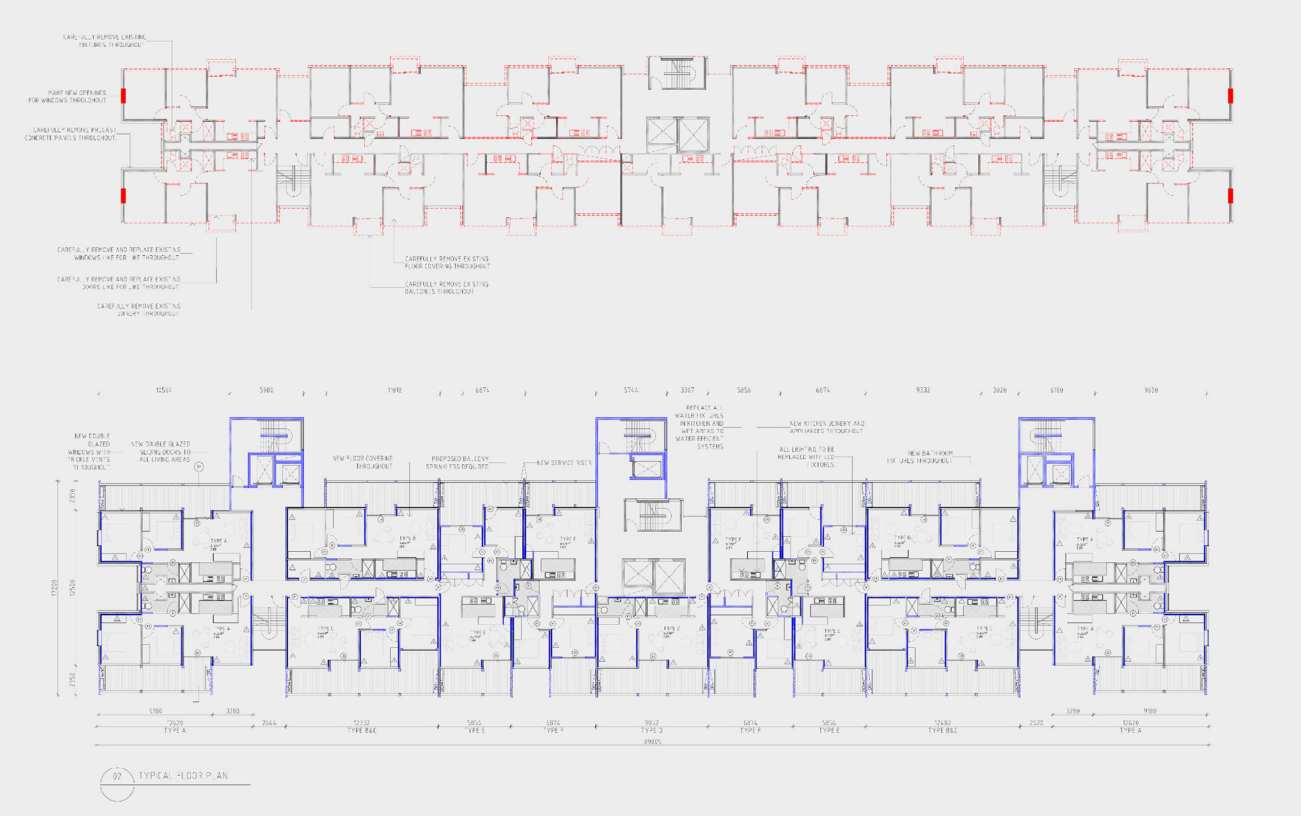


Table 14: Table comparing the tower units existing vs proposed.

Slab	Studios	1B	2B	Total
Existing	0	16	198	214 Units
RRR Proposed	0	16	198	214 Units
Difference	0	0	0	0 Units

Figure 23:Demolition (top) and proposed (bottom) typical plans for the slab building.

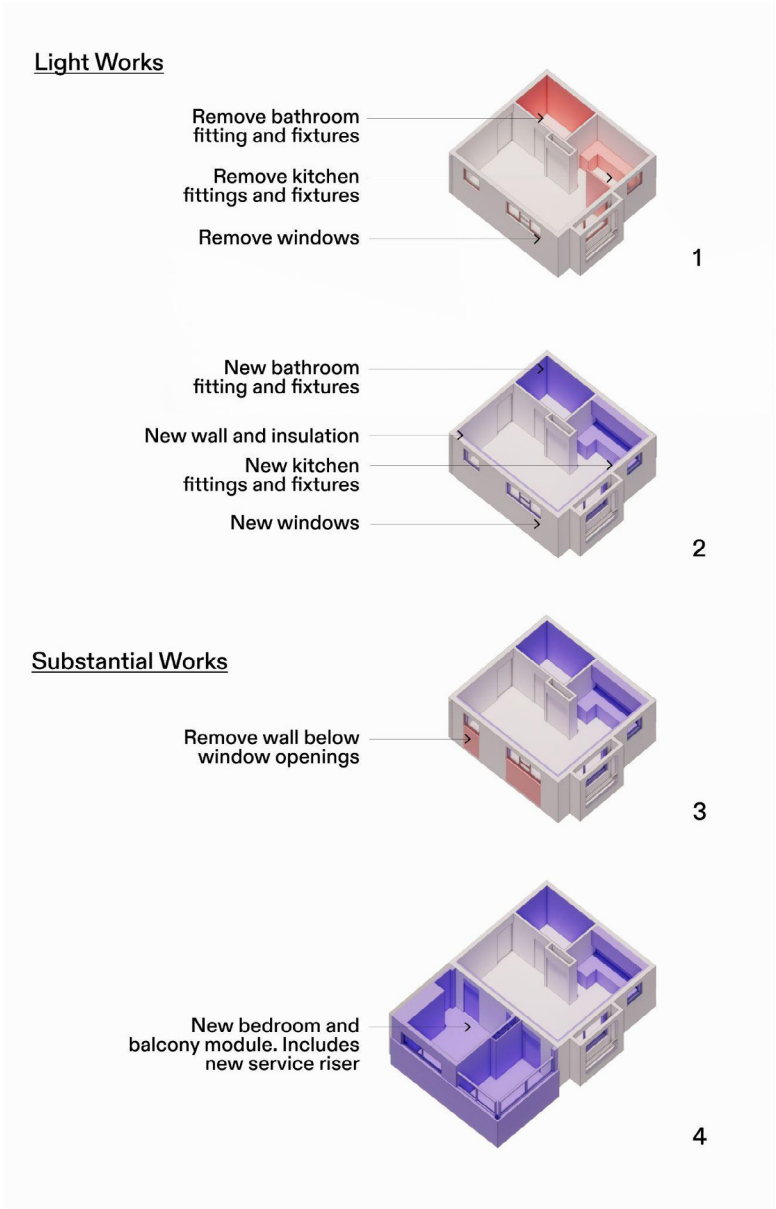


Render of the retrofitted slabs facing the new park to the west. To maintain this outlook for residents, three storey townhouses have been proposed along the street edge. Image by OFFICE.

Levels of Refurbishment: Light works to substantial retrofit

The project team acknowledges that the level of refurbishment can be tailored to the immediate needs of residents while plans for the estate are developed over the next decade. Given the poor thermal performance of the existing buildings, there is an opportunity to carry out a light scope of works, including the replacement of windows, the addition of insulation to all exterior walls, selective internal wall upgrades, and new joinery, fixtures, and fittings. These straightforward interventions would significantly improve the thermal performance of both the tower and slab buildings, while long-term plans for the estate are developed over the next decade.

Figure 24: Level of refurbishment works starting from light at the top to more significant retrofit at the bottom.

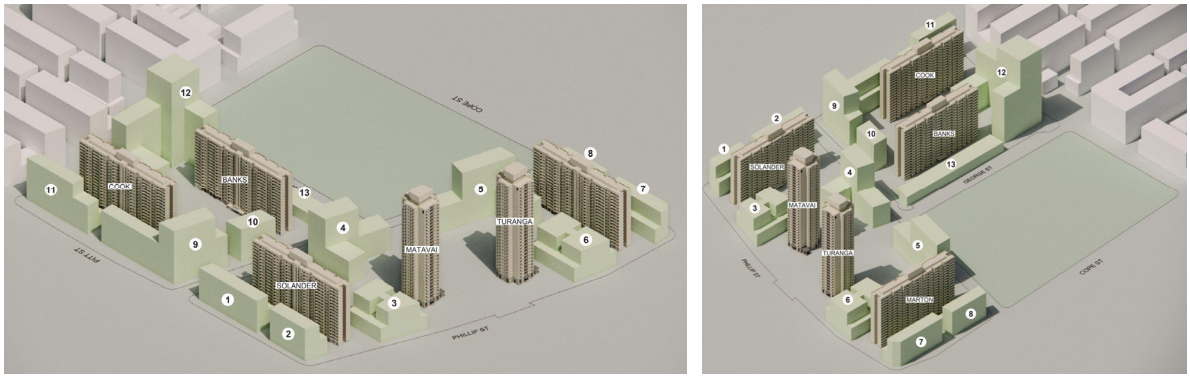


Infill

The approach to infill development has been shaped by both community consultation and a close analysis of the site. Several areas within Waterloo North and Central, such as the community garden, the Green, and the open space between Banks and Cook - which hosts various community events - are highly valued by residents. These significant spaces, along with the mature trees, have been retained as part of the proposal.

New infill development is instead concentrated on existing car parks, with replacement parking integrated into the basements of the new buildings. The creation of a new central public park as part of the Waterloo South development also prompted careful consideration of its interface with the surrounding neighbourhood; in particular, a new edge along Raglan Street has been designed to provide residents with a sense of privacy from what is expected to become a well-used public space.

Figure 25: Infill envelopes shown in green with the retention of the existing stock. OFFICE



Render of the retrofitted towers and slabs and with new infill envelopes in white. Image by OFFICE.

Taking cues from the City of Sydney master plan, the RRR proposal has also developed an approach that avoids concentrating most dwellings in excessively tall high-rise towers. Instead, the majority of homes are proposed in buildings of similar height and floorplate - typically between seven and nine storeys. Smaller, more regular building envelopes allow for greater flexibility in staging and reduce the complexity of each development phase. Building heights along the perimeter of the estate are generally limited to eight storeys, with taller towers positioned to the south of the Green and south of Banks. A row of townhouses is proposed along George Street, offering residents of Banks visual access to the new park and reinforcing a finer-grain, residential character along this edge.

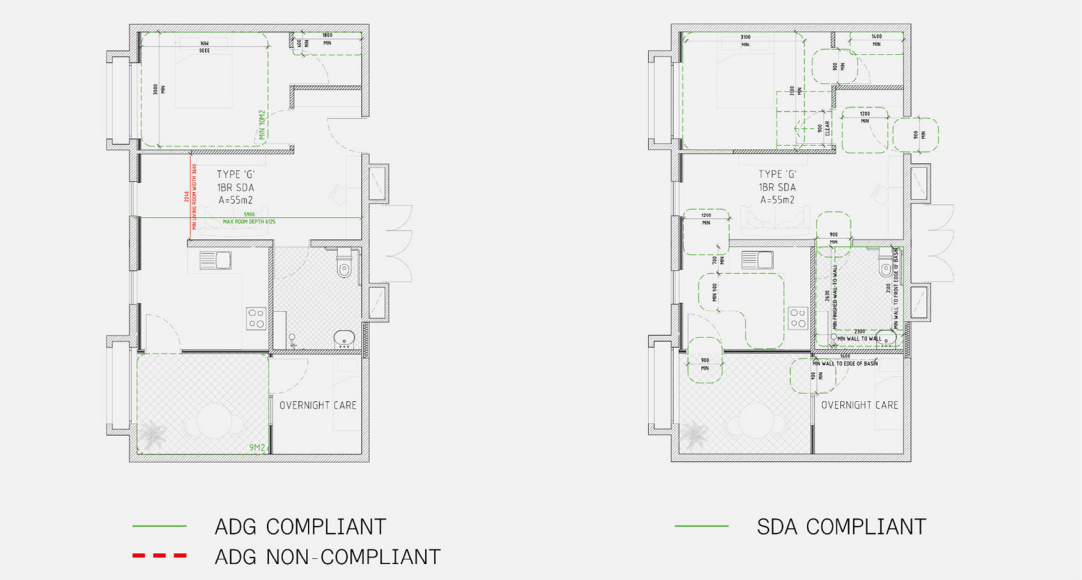
As with the refurbishment works, flexibility has been built into the infill strategy. A collection of smaller, autonomous buildings has been proposed, allowing the development to be delivered in stages. If some of these buildings are not constructed, the existing buildings and broader site can still function effectively.

6.8 Access and Livable Housing Guidelines

Tower Buildings (Matavai and Turanga)
The central circulation core will be retained and provide access to all levels. Internal layouts of each apartment will be reconfigured to meet Silver level SDA standards. 42 units will be fully accessible Gold level SDA for high needs residents, with a spare room dedicated for support staff or overnight care.

Slab Buildings (Marton, Solander, James Cook, Joseph Banks)
Access to the refurbished flats will be provided through the installation of new lifts and stairwells across three separate cores. The new lift cores will also include a lift sized appropriately to accommodate a stretcher in the case of emergency. This reconfiguration of vertical circulation eliminates the security and safety concerns associated with the previous dog-legged corridor layout, while also reducing the number of units serviced per floor. All dwellings are designed to meet Silver level Specialist Disability Accommodation (SDA) standards, ensuring improved accessibility and inclusivity for residents.

Figure 21: Proposed Type G unit layout showing full compliance with Gold level SDA requirements.



6.9 Apartment Design Guide

Tower Buildings (Matavai and Turanga)

The proposed RRR retrofit of Matavai and Turanga towers generally aligns with the objectives and key provisions of the Apartment Design Guide (ADG), with some standards already met through the existing apartment layouts. Notable upgrades include the introduction of private open space via new semi-enclosed balconies, addressing a significant design shortfall, and improvements to accessibility, such as widened doorways and corridors. The proposal does not meet some ADG recommendations due to the nature of a retrofit scheme and layout of the existing floorplan.

Ceiling Height and Apartment/Room Minimums

The internal spatial limitations have resulted in minor shortfalls in minimum internal room dimensions and a proposed typical ceiling height of 2.5 metres, which is below the ADG's preferred minimum of 2.7 metres. Despite this variance, the proposed ceiling height remains compliant with the National Construction Code (NCC). The units and habitable rooms are shallow in depth and the ceiling height allows for adequate natural ventilation and daylight access.

The proposed one-bedroom apartments range in size from 46m² to 55m². The largest one-bedroom unit includes a dedicated bedsit area intended for overnight care, enhancing its functionality and adaptability as seniors housing. The smallest one-bedroom apartment, at 45m², falls 5m² below the ADG's minimum area requirement of 50m². Despite this shortfall, these units represent a substantial improvement over the existing 32m² studio apartments, which do not meet ADG recommendations. The majority of two-bedroom units are 80m², exceeding the ADG requirement by 10m², with only apartment type (Type B [2b]) not meeting guideline recommendations by 17m². The three-bedroom apartments are 87m² and do not meet the guideline recommendations by 3m².

The only other notable spatial non-adherence to the ADG relates to the area of some bedrooms and minimum width of the primary living area, which have both been constrained by the limitations of the existing floorplate.

The apartments are well designed and demonstrate usability and functionality, which is outlined in the ADG 4D-1 as a merit based criteria for assessing units with smaller areas and room dimensions. There is ample space for circulation around furniture and generous, well defined programmatic allocations, including adjoining kitchen, living and dining areas for ergonomic use of space.

Private Outdoor Space

The proposed refurbishment of the towers introduces larger private outdoor spaces to all residential units, addressing the deficiency in the existing building layout. The majority of balconies are directly accessible from primary living areas and meet the ADG's minimum depth requirements. Due to spatial constraints and limited capacity for internal reconfiguration, some of the balcony areas fall marginally below the minimum ADG recommendations. The bed-sit one-bedroom apartment balconies are ADG compliant at 9m². The other one-bedroom balconies are 7.5m², with a shortfall of 0.5m² against ADG minimums. The two-bedroom balconies measure between 7m² - 7.5m², with a shortfall of 2–2.5m² for two-bedroom against ADG minimums. All balconies fit a table and 2-4 chairs and satisfy the design intent of minimum areas for 1 and 2-bedroom unit private open space.

The design incorporates operable louvres to all new balconies, consistent with ADG recommendations, and are intended to mitigate heat gain to external walls and wind, improve cross ventilation and maintain solar access in winter months. The inclusion of the balconies means 76% of units are now adequately cross ventilated, a 35% improvement on the existing unit cross ventilation, and 16% above the ADG recommendations. The semi-enclosed balconies have been designed to offer a flexible second indoor-outdoor living area. Despite minor non-adherences to the ADG, the private open spaces provide a significant improvement over the existing floorplan, in which no private outdoor space is available.

Solar Access

Regarding solar access, the ADG requires that a minimum of 70% of apartments in a development receive at least 2 hours of direct sunlight to living rooms between 9:00 am and 3:00 pm at mid-winter. The refurbishment proposal achieves 64% of apartments receiving 2 hours, representing a minor non-adherence to the guidelines. It is noted that 100% of apartments receive at least some direct sunlight during this period, exceeding ADG recommendations, and 100% of private outdoor spaces receive a minimum of 2 hours of direct sunlight at mid-winter. The RRR proposed infill elements were included in the modelling for solar access calculations.

Lift Core

The design achieves a maximum allocation of 6 apartments per lift core per floor, aligning with the ADG maximum of 8. For buildings of ten storeys and above, the ADG outlines that no more than 40 apartments should share a single lift. The proposed retrofit includes that each lift will service 76 apartments each, which exceeds this guideline. Given the constraints of the existing building structure, introducing additional lift shafts to fully meet the ADG lift-sharing recommendation would incur substantial costs and would result in only marginal improvements for vertical access and resident amenity.

Figure 26: Proposed Tower Type E unit layout showing full compliance with ADG except for the balcony size and living room width.

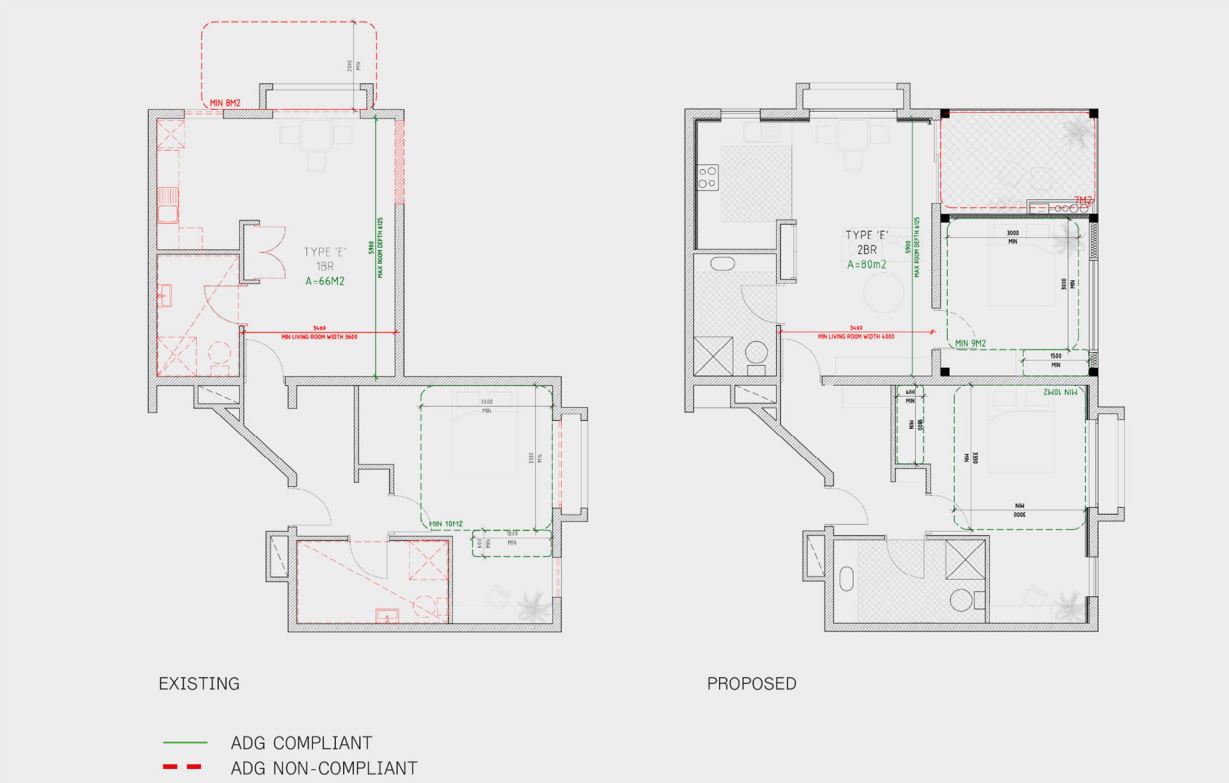
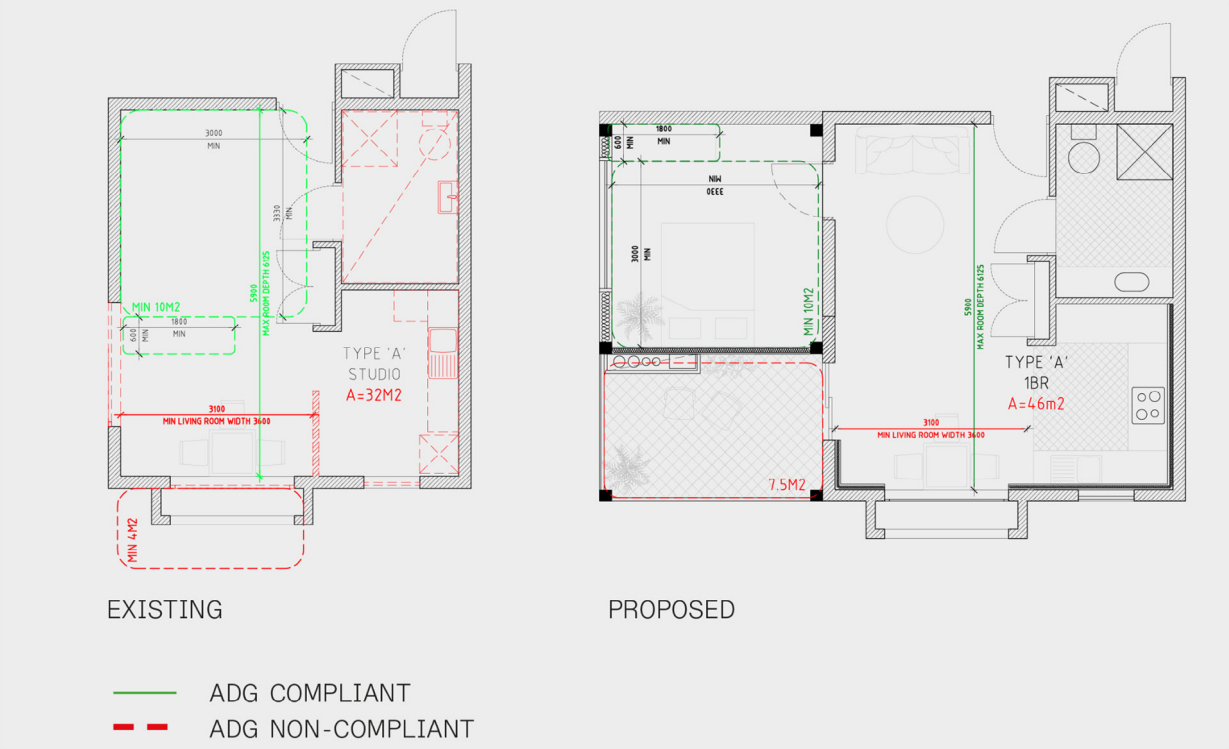


Figure 27*: Proposed Tower Type A unit layout showing full compliance with ADG except for the balcony size and living room width.*



Slab Buildings (Marton, Solander, James Cook, Joseph Banks)

As with the Matavai and Turanga towers, the proposed RRR retrofit of the slab buildings generally aligns with the objectives and key provisions of the ADG. To address similar design shortfalls, the retrofit incorporates a range of upgrades including the provision of private open space through new semi-enclosed balconies, widened doorways and corridors to improve accessibility, and internal reconfigurations to increase cross ventilation. As with the towers, the shortfalls in meeting the ADG are predominantly due to the nature of a retrofit scheme and layout of the existing floorplan.

Ceiling Heights and Internal Apartment Dimensions

Internal spatial limitations have resulted in minor shortfalls in minimum internal room dimensions and a proposed typical ceiling height of 2.5 metres, which is below the ADG's minimum of 2.7 metres. Despite this variance, the proposed ceiling height remains compliant with the National Construction Code (NCC). The units and habitable rooms are shallow in depth and the ceiling height allows for adequate natural ventilation and daylight access.

All proposed one-bedroom apartments achieve the ADG minimum internal area of 50m². The existing floorplan provides 64m² to all two-bedroom apartments, 6m² short of the ADG minimum. Within the refurbishment scheme, the floorplate has been maximised with two-bedroom apartments now ranging from 64m² to 75m². The smallest units still fall short of the 70m² minimum, however, 64 apartments now exceed the ADG minimum by approximately 3-5m². Minor non-adherence to guidelines are also noted in the width and area of selected bedrooms, again as a result of the existing floorplans.

The apartments are well designed and demonstrate usability and functionality, which is outlined in the ADG 4D-1 as a merit based criteria for assessing units with smaller areas and room dimensions. There is ample space for circulation around furniture and generous, well defined programmatic allocations, including adjoining kitchen, living and dining areas for ergonomic use of space.

Private Open Space

The existing balconies measure approximately 3m², representing a 70% shortfall for two-bedroom apartments against ADG requirements and offering limited amenity. In response, the retrofit delivers significantly enhanced private outdoor spaces, with new semi-enclosed balconies ranging between 17m² and 29m². This achieves a minimum exceedance of 112% for one-bedroom units and 70% for two-bedroom units relative to the ADG requirements.

The size of the balconies is a key design feature to improve amenity of the apartments, and incorporate operable louvres, consistent with ADG recommendations. Balconies have been provided on both aspects for 64 of the apartments to increase solar access and maximise the usable floorplate. Overall, the proposed private open spaces offer a substantial uplift in amenity compared to the existing condition and enhance environmental performance by reducing reliance on mechanical heating and cooling systems.

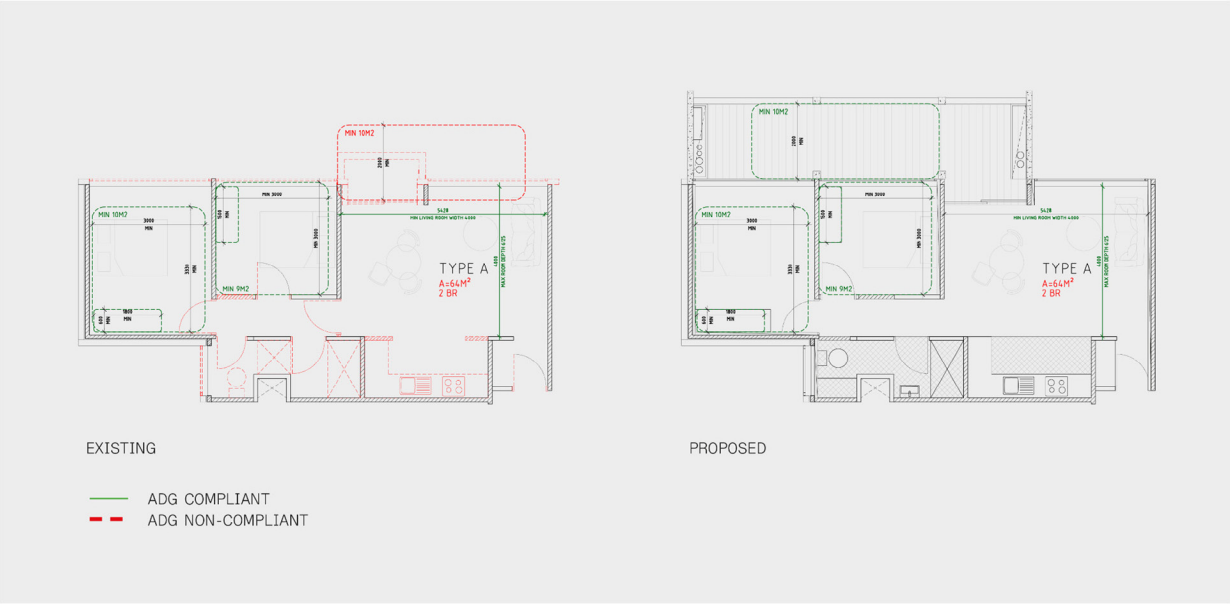
Solar Access and Cross Ventilation

At present, none of the existing slab building apartments are naturally cross-ventilated. The retrofit improves this significantly, with 61% of units now achieving natural cross ventilation, meeting the ADG's 60% benchmark.

Regarding solar access, the ADG requires that at least 70% of apartments receive a minimum of two hours of direct sunlight to living room windows between 9:00 am and 3:00 pm in mid-winter. While this target is not fully met due to the introduction of balconies and lift cores, in three of the slabs (Solander, Marton and Banks) 70–76% of balconies receive at least two hours of direct sunlight during this period. Only one slab building (Cook) falls slightly short at 64%, resulting in a 6% deviation from the ADG recommendation. Between 85–92% of apartments within the four slab buildings receive some level of direct sunlight throughout the day, meeting ADG minimums. The largest impact on solar access was a result of the overshadowing from new liftcores located on the facade of the building. These cores are designed to be BCA and NCC compliant and their inclusion is a result of consultation with HomeNSW on desired design outcomes. The lift cores also help meet recommendations in other areas of the ADG. The RRR proposed infill elements were included in the modelling for solar access calculations.

Although the semi-enclosed balconies contribute to overshadowing living areas, the overall benefit to liveability and environmental performance is substantial.The existing balconies, at approximately 3m², are significantly under the ADG minimum recommendations, and fail to provide usable private outdoor space. The balconies transform previously underperforming outdoor spaces into flexible indoor-outdoor living areas that extend the usable floor area of each unit, improve thermal comfort and reduce energy demand. By treating the balconies as integral extensions of the apartments, the design delivers a meaningful uplift in resident amenity and aligns with the broader intent of the ADG.

Figure 28: Proposed Slab Type A unit layout showing full compliance with ADG except for the unit size.



6.10 Environmental and Sustainability Upgrades

Makao undertook the Environmental Sustainable Design and assessments on each building typology: a tower (Matavai) and a slab (Solander). The assumption is that these findings can be applied to the other towers and slabs on the estate.

The project's design prioritises best-practice energy performance, with NatHERS development averages of 7.7 to 8.3 stars across both buildings. At Solander (slab) , a 7.7-star average represents an increase of 5.32 stars per unit and an 81% reduction in heating and cooling demand. Matavai (tower) demonstrates similarly strong results: Type A apartments achieve a 7.7-star average (6.36-star increase, 87% reduction in energy use), while Type B reaches an 8.3-star average (5.36-star increase, 82% reduction in energy use). Many units will now maintain thermal comfort without requiring mechanical heating or cooling. These gains are achieved through extensive upgrades to the building envelope, including new insulation, double glazing, external shading, and passive design features.

Figure 29: NatHERS energy rating comparisons between existing and RRR refurbishment

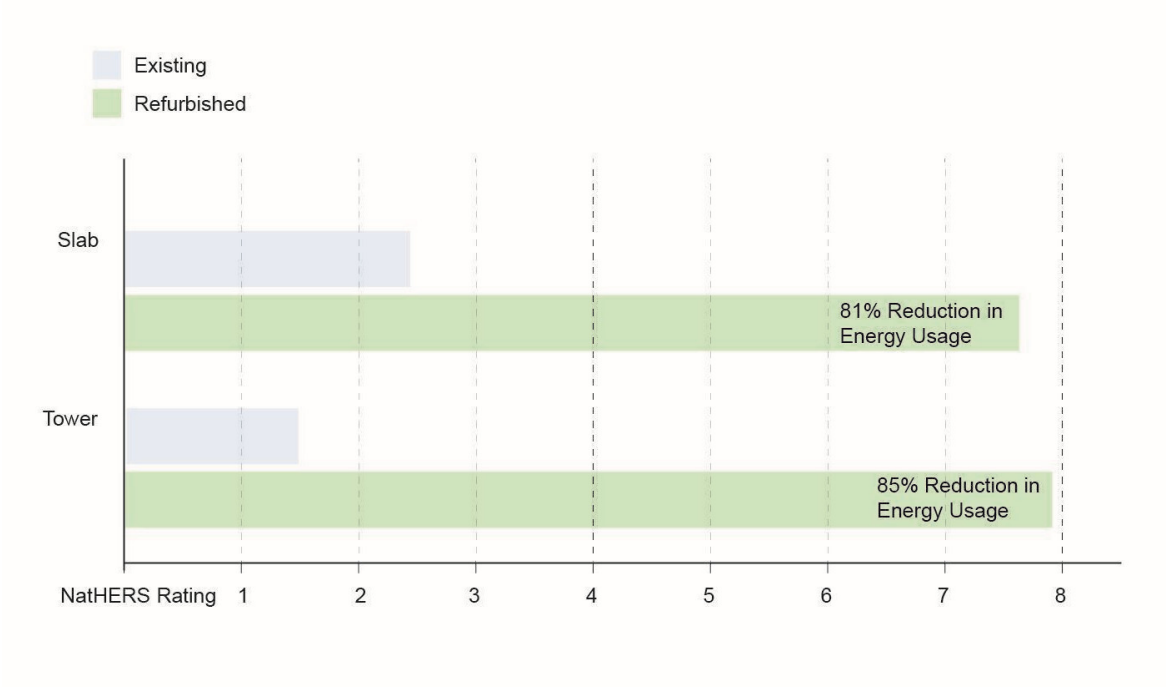
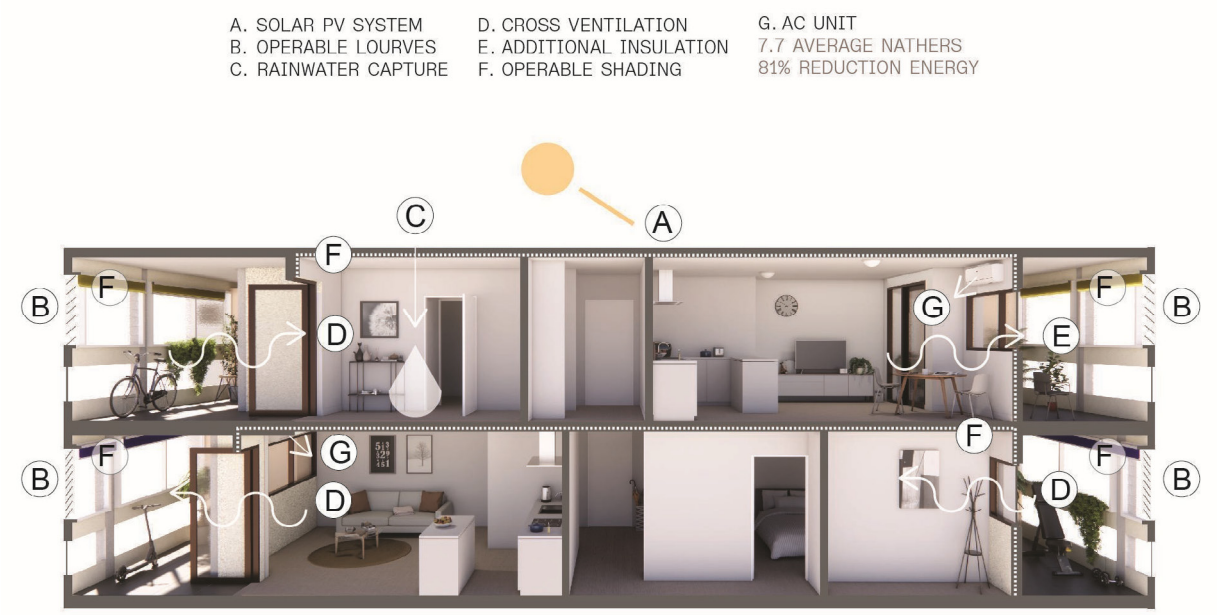


Figure 30: Sectional study of the proposed RRR design with integrated ESD initiatives. Image by OFFICE.



Beyond energy, the refurbishment ensures full BASIX compliance, exceeding required targets across thermal comfort, energy, and water categories. This includes the elimination of gas infrastructure, the installation of a 16.2kW rooftop solar PV system, and a shift to all-electric systems for hot water, heating, and cooking. High-performance water fixtures, rainwater harvesting, and sustainable landscaping further enhance efficiency while reducing ongoing utility costs and environmental impacts.

Waste reduction across the Estate is another key benefit of the RRR model. By avoiding demolition, the project diverts thousands of tonnes of potential construction waste from landfill, significantly reducing the environmental footprint. Materials that must be removed will be assessed for reuse or recycling, contributing to a circular economy and maximising the value of retained components. The retention of the original structural frame allows for phased, minimally disruptive installation of new services - avoiding major interventions and maintaining building integrity throughout.

The project also enhances indoor environmental quality and liveability. Natural ventilation, access to daylight, visual connections to green spaces, and rearranged internal layouts create healthier and more comfortable living conditions. Common areas and community facilities could also be upgraded using reinvested capital achieved through RRR savings, creating better shared amenities and improving social outcomes.

As outlined in the performance summary, the refurbishment exceeds all contemporary sustainability benchmarks. It delivers dual carbon benefits - both operational (through significant energy efficiency gains) and embodied (by avoiding the emissions of new construction).

6.11 Landscape Architecture

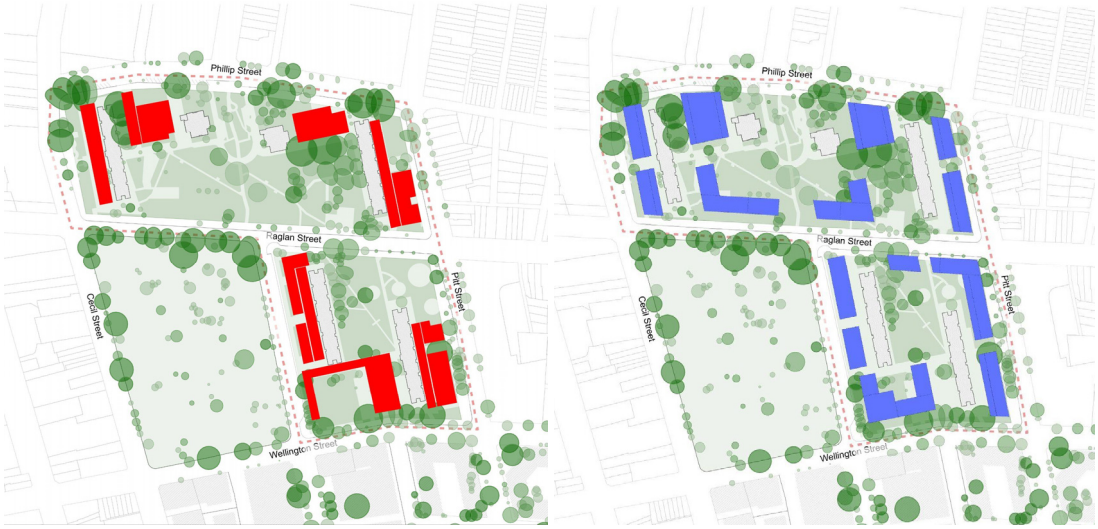
The existing ground plane of Waterloo North and Central is typical of many modernist planned estates ‘towers in the park’ approach, this means that though there is a good provision of open space, this is poorly designed and lacks a human scale. The existing site is also dominated by cars, with 20% of the ground plane being roads and parking. The new proposal seeks to overcome this through the planned infill housing and landscape design, creating a walkable ground plane with a range of smaller neighbourhood scale spaces through the site. These neighborhood scale spaces offset the large public park proposed by the state government in Waterloo Central.

The RRR landscape architecture approach mirrors the architectural response in being founded in a respect for the existing qualities of the Estate. The design focuses on the retention of mature trees and the creation of neighborhood scale public open space, while retaining the character of the Waterloo Estate. While respecting the character of the site, the new design provides an increased amenity, retention of informal surveillance, and passive cooling through increased vegetation.

Figure 31: Landscape architecture plan for the RRR proposal.

The key design move is the construction of infill housing on the currently underutilised surface car parking, this allows increased density on the site whilst retaining the existing buildings and communities. New below ground car parking can be built in the infill housing, while some surface car parking is retained to allow for deliveries, drop off, and supporting universal access.

Figure 32*: Existing carparks (red) make up a significant portion of the site. By locating new infill (blue) in these areas with carparking below existing trees and open space can be retained.*



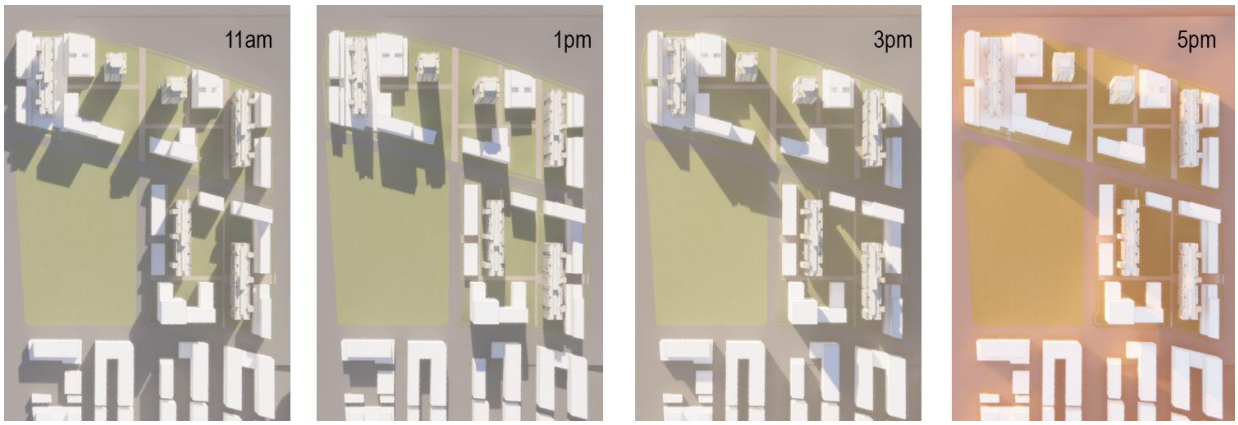
The orientation of the proposed buildings allows for light to the majority of the public spaces. 64% of the site is open space in the RRR proposal, exceeding the minimum 15% outlined in the *City of Sydney Open Space and Recreation Needs Study*.[90] All the public open space on the ground plane is located on deep soil areas, allowing for healthier trees and vegetation providing adequate growing room for larger trees between buildings, and reduction of urban heat island effect, supporting the passive energy strategies throughout the buildings. The landscape strategy retains 82% of the mature trees on site, while ensuring that underground car parking is located underneath infill buildings.

Figure 33: RRR proposal retains 82% of existing trees onsite. The red depicts trees that would have to be removed.

[90] City of Sydney, *Open Space, Sports and Recreation Needs Study,* Volume 1, 2016.

Sun studies have been undertaken on the proposal to ensure that well over 50% of the public park areas receive at least four hours of sunlight at the winter solstice (June 22).[91]

Figure 34: Sun studies showing the shadows of the RRR proposed infill.



The planting and material selection will aim to create a low cost, low maintenance and high-quality landscape. Low ongoing maintenance is key to ensure that the landscape remains at a high-quality throughout the life of the buildings. By increasing native vegetation, ongoing maintenance of the landscape will be reduced while providing higher quality amenity and greater biodiversity. The planting design allows for the vertical layering of native vegetation which will greatly increase biodiversity. Planting focuses on native vegetation, embedding Country within the groundplane, which is essential in such an important site to First Nations communities in Sydney.

All dwellings on the ground floor have private open spaces with the edge between public and private being mediated by planting and low fences providing privacy whilst still retaining site lines throughout the estate. This active ground plane creates strong connections to the wider landscape and provides visual amenity to all dwellings.

1207 car parks have been provided predominantly underground, with some carparking being retained at grade to allow for easy pick/drop off zones for residents. This car parking provision has been calculated on the requirements under State Environmental Planning Policy (Housing) 2021 for infill affordable housing, as well as replacement of the existing car parks on site.[92] Underground car parking is consolidated underneath the infill buildings to free up the ground plane and minimise crossovers, while also ensuring that the majority of the site has deep soil for vegetation. Active transport linkages and walkability have been prioritised in a site that is well serviced by public transport including the newly completed Waterloo Station.

[91] City of Sydney, *Waterloo Estate Redevelopment – A Better Way for the Community.* Extraordinary Council Meeting, March 2019.
[92] NSW Government Legislation, *State Environmental Planning Policy (Housing),* 2021. Available: https://legislation.nsw.gov.au/view/html/inforce/current/epi-2021-0714

Table 15: Area calculations of current condition and the RRR proposal.

	Current % of site	RRR Proposed % of site	Difference
Total area	69,020m2 (100%)	69,020 (100%)	0%
Existing towers/slabs	5,500M2 (8%)	6,600m2 (10%)	+1,100m2 (+2%)
On street parking and roads	14,095m2 (20%)	585m2 (1%)	-13,510m2 (-19%)
Open space	49,425m2 (44%)	44,362m2 (64%)	-5,063m2 (-7%)
Infill housing	0 (0%)	17,473m2 (25%)	+17,473m2 (+25%)
Trees Retained	691 (100%)	565 (82%) retained	-126 (18%) 13 high value, 21 medium value, 92 low value

6.12 Life Cycle Assessment

A life cycle assessment for the RRR proposal for refurbishment and infill, and the demolition and rebuild approach was conducted. The assessment found that the RRR refurbishment created 33% less global warming potential than a demolition and new build strategy, when comparing the strategies based on the delivery of the same dwelling density in the site. The land use necessary in the production of building materials reduced by 65% through the refurbishment of the buildings

Global warming is caused by an increase of greenhouse gases in the earth's atmosphere. Global Warming Potential is expressed in equivalent greenhouse gasses released, measured in tonneCO2e.

Land Use is measured in years of use of arable land (m2.year). This describes the area and time land is occupied by production systems both natural and industrial to produce the building materials but not the occupation of the building itself.

For summaries of the life cycle assessment see Appendix 10.

Table 16: Life cycle assessment outcomes

Life Cycle Assessment	Global Warming* Potential (tonne CO2e)	Land Use*** (m^2 .year arable)
Demolition and Rebuild	315,000	24,280
RRR Refurbishment	212,000	8,530
Reduction achieved by RRR	103,000 (33%)	15,750 (65%)

6.13 Design Costings

A detailed cost plan was prepared for the proposed refurbishment of a tower and slab building by Melbourne Quantity Surveyors. The cost plan itemises the construction costs for all works to be carried out within the refurbishment of each building. These costings have been multiplied across the other buildings. For costing details see Appendix 9.

As outlined in Table 17 the existing public housing could be refurbished and brought up to HomesNSW environmental and apartment standards, without displacing communities or demolishing – for the cost of $288,000 per tower dwelling and $360,000 per slab dwelling in Waterloo North and Central.

Table 17: RRR Refurbishment costs to the towers and slab buildings

RRR Refurbishment Costs		
	Per Dwelling	Total
Tower (Matavai, Turanga)	$288,000	$92,176,200
Slab (Solander, Marton, Cook and Banks)	$360,000	$307,850,000

Table 18: RRR Waterloo North and Central proposed costs for Refurbishment and Infill

RRR Project Cost	
Refurbishment (1176 dwellings)	$400,026,200 ($340,000 per dwelling)
Infill (1858 dwellings)	$793,024,128 ($427,000 per dwelling)
Car Parking	139,416,200
Contingency (10%)	133,246,653
Total Costs (excluding fees)	$1,465,713,181 ($485,000 / dwelling)

In combining the total cost of refurbishment and infill of 3034 dwellings within the RRR: Waterloo North and Central project is $1.46 million or $485,000 per dwelling.

7. Comparative Demolition and Rebuild vs RRR Financial Findings

Overall, this feasibility study demonstrates the economic, social, environmental benefits and viability of applying a Retain, Repair, Reinvest refurbishment and infill approach to Waterloo North and Central.

The below tables combine all of these values in financial terms, and compare the costs and benefits of the Retain, Repair, Reinvest approach with demolition and rebuild.

As outlined in Table 15, the total construction cost for the RRR refurbishment and infill proposal is $1,465,713,181. When compared to Table 17, the total construction cost of a demolition and rebuild approach, which includes the relocation costs of the existing tenants and cost to the economy it totals $2,168,384,145. Through applying a strategy of refurbishment, we are able to achieve a saving of **$702,670,964.**

Figure 35: *LAHC's 2019 plan North and Central precincts (left) estimated 3,900 units. Following community engagement and design collaboration, a more sensitive and responsive approach was adopted by OFFICE (right)*

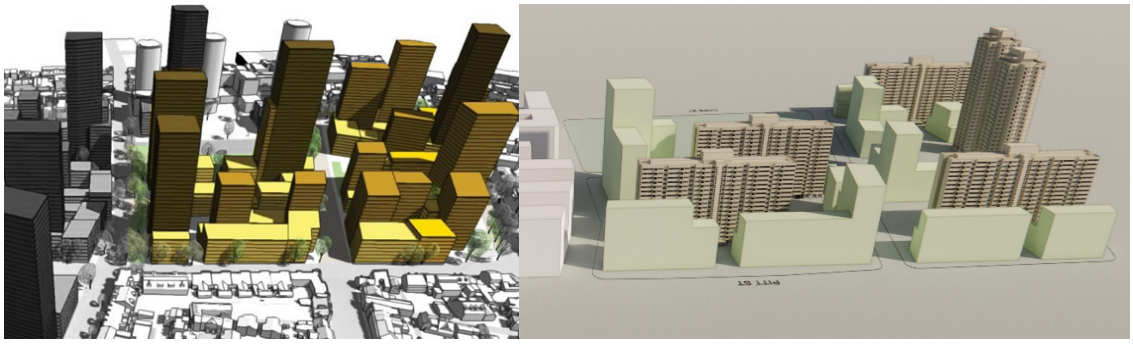


Table 17: Comparison of total project costs

Demo/rebuild	
Total Project Cost (3800 dwellings)	$2,168,384,145
RRR	
Total Project Cost (3034 Dwellings)	$1,465,713,181
Difference	**$702,670,964**

Table 18: Cost comparison between RRR and Demo / Rebuild

Cost comparison between a RRR and Demo Rebuild Approach		
	Total	Per Dwelling
Total Demo/Rebuild (3800 dwellings)	$2,168,384,145	$570,000
Total RRR Refurbishment Costs (1176 dwellings)	$400,026,200	$340,000
Total RRR Costs Infill + Refurb (3034 dwellings)	$1,465,713,181	$485,000

Table 19: Comparison of costs between Demo/Rebuild approach and RRR: Waterloo North and Central.

	Demo/Rebuild	**RRR**
RETAIN		
Increasing housing	Using the density numbers from the LAHC proposals we estimate 3800 dwellings to be delivered this is an increase to be **2,478** dwellings This is an increase in **2478** dwellings (187%)	Retain, Repair, Renew increases the number of dwellings by **1712** through refurbishment and infill. This is an increase in **1712** dwellings (129%) **While the RRR approach provides a smaller overall uplift than LAHC 2019 plans, the strategy responds to resident concerns about loss of public space and excessively high density, and is more in line with the approved Waterloo South plans which reduced dwelling numbers from earlier plans.**

External Relocation costs	The total relocation costs of existing tenants during construction is estimated to be **$72.24 million**.	Relocation fees for RRR are $0 due to the staging of works. There would be a budget for a small removalist fee from relocating residents within the Estate during the new build and refurbishment. **The RRR strategy saves $72.24 million in State Government financing.**
Health and wellbeing cost	The cost to health and wellbeing is estimated at **$4.01 million** for relocated residents.	By retaining community, there are no health and wellbeing impacts through relocation. **The RRR strategy has no health and wellbeing cost.**
Education costs	The cost of interruption to education during this period is estimated at **$590,400** for relocated residents.	By retaining the existing community, there are no educational impacts through relocation. **The RRR strategy has no educational impact cost.**
REPAIR		
Direct Financial Investment	The construction costs to replace the existing units with the same amount of new dwellings would be **$670 million or $570,000/dwelling.**	Existing buildings can be refurbished for an average cost of **$380 million or $324,000/dwelling** **The RRR refurbishment cost is therefore $290 million less than a demo/rebuild approach.**

LAHC/HomesNSW Objectives (Lifts, Energy Efficiency, Accessibility)	Addressed through demolition, relocation and rebuild.	Addressed through refurbishment and infill. **The RRR refurbishment strategy can meet all objectives, for a lower financial investment.**
LAHC/HomesNSW Objectives (Apartment and design standards)	Addressed through demolition, relocation and rebuild.	Addressed through refurbishment and infill. **The RRR refurbishment strategy can meet the majority of the apartment and design standards, for a lower financial investment.**
Life Cycle Assessment	The total Global Warming Potential y to demolish and build the new housing is calculated at **315,000 tonne CO2e**	The total Global Warming Potential of the refurbishment and infill proposal is **212,000 tonne CO2e** **The RRR model has a Global Warming Potential saving of 33%.**
REINVEST		
Overall cost savings	The full costs for demolition, relocation and construction of the new housing under is calculated at $2.15 billion .	The RRR strategy would see Waterloo North and Central refurbished and housing infill without displacing communities or demolishing buildings for $1.46 billion. This provides a reduced construction cost of over $700 million.

8. Future of the Waterloo Estate

While the renewal of Waterloo North and Central is not scheduled for another ten years, there is value in exploring alternative approaches to renewing the estate now. Energy modelling conducted as part of the ESD analysis has shown that the existing buildings are performing extremely poorly, and residents have raised ongoing concerns about maintenance issues. If refurbishment is to be considered a viable option and committed to by the state government, strategic initiatives could be introduced in the short term to address these issues. This would allow for meaningful improvements to be made now, while longer-term plans for the broader site are developed collaboratively with residents over the coming decade.

The findings of this feasibility report into the refurbishment potential of Waterloo North and Central show there is demonstrable capacity to undertake the proposed infill and refurbishment work within the same timeline without relocating tenants.

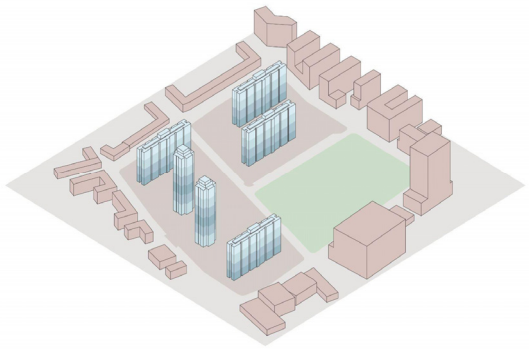
8.1 Staging of Refurbishments

Staging of retrofit

While there are a number of different methodologies to enable the refurbishment of the buildings to take place, the following three approaches have worked successfully overseas in exemplar refurbishment projects.

To ensure a successful renewal and refurbishment approach, methodology and process should be communicated clearly to residents and their input factored into the most appropriate pathway.

1. Stage refurbishment of inhabited tower. Refurbishment works would occur five floors at a time with residents of those floors relocated during the works. Once completed to those floors tenants would move back, and construction would continue to the five floors above until the tower was fully refurbished.



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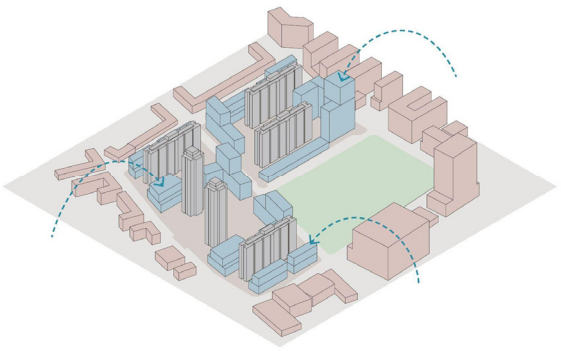

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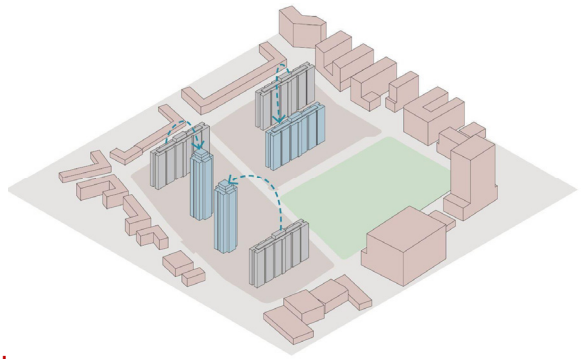
2. Stage refurbishment of uninhabited tower. Due to some tenants preferring to be relocated off the estate, a building could be completely emptied and refurbished. This could happen sequentially across the Estate with the infill occurring at the same time.



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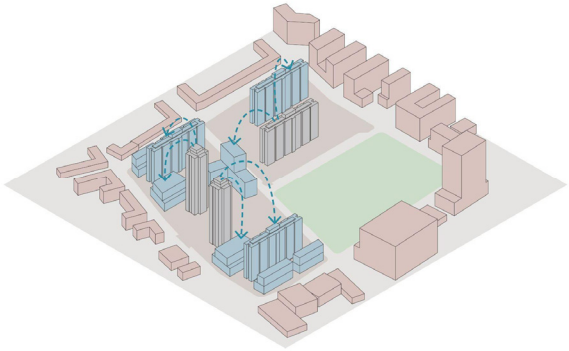

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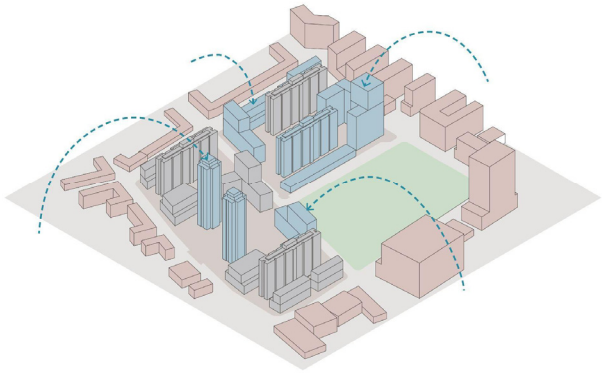

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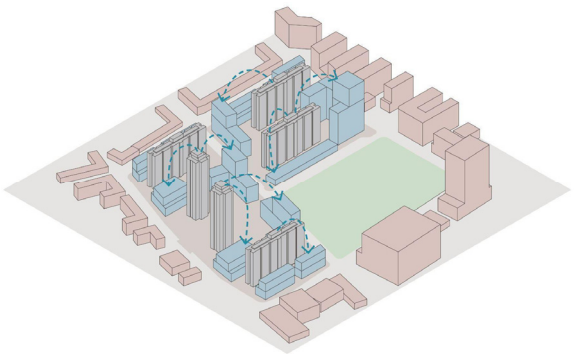
3. Infill developments are completed first. The infill units are completed around the existing buildings and house the existing residents while the buildings are refurbished. The residents could then decide if they wanted to remain in the new builds or return to their refurbished flat.



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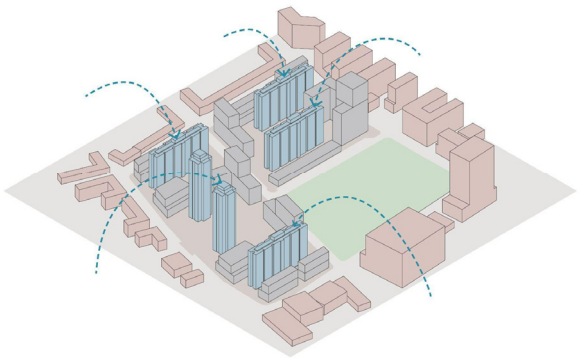

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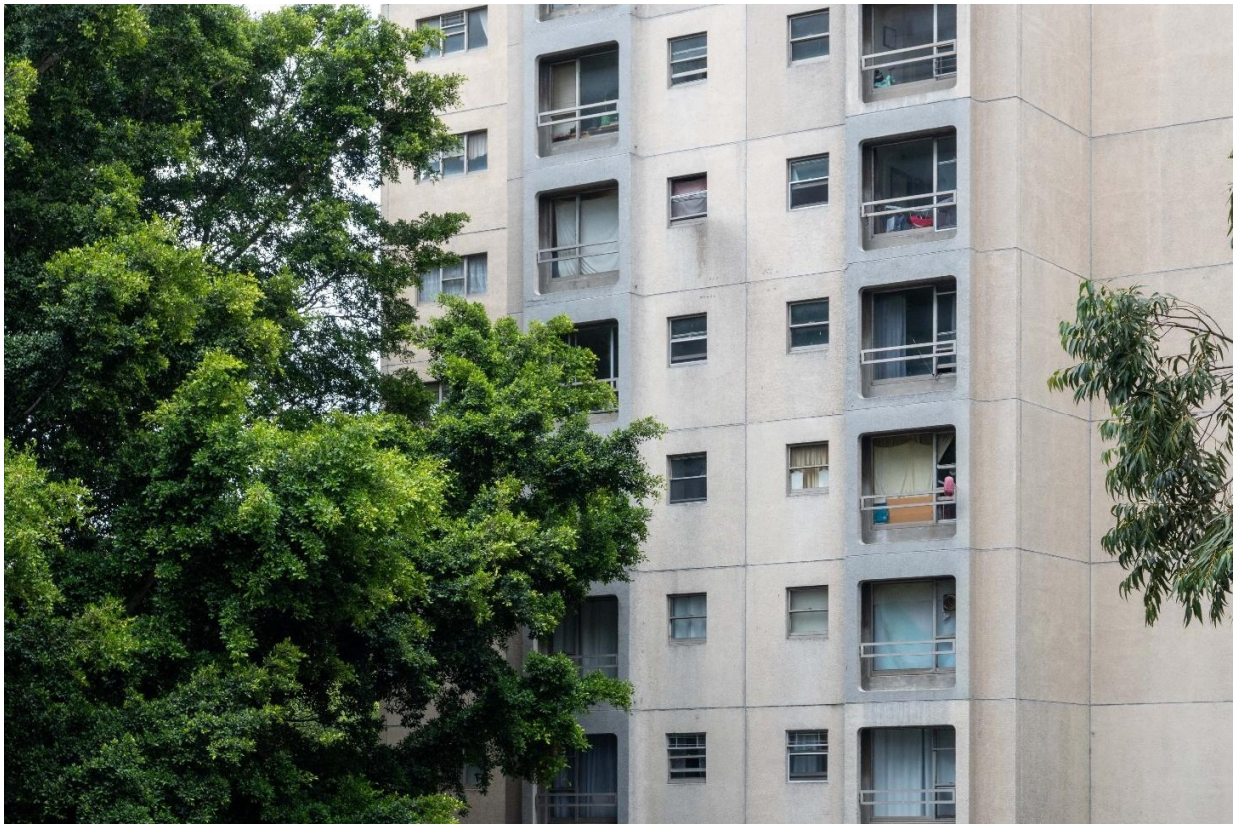
9. Future Opportunities

Governments across Australia are grappling with the challenge of ageing public housing estates that no longer meet modern living standards and have high maintenance costs, alongside a growing waitlist of people from priority communities in need of suitable housing.

How might we think creatively at a 10+ year plan aimed at revitalising and increasing public housing provision while being targeted with our efforts? HomesNSW's significant portfolio provides an opportunity to address the persistent shortage of genuinely affordable housing in major urban areas across the state. The complexity and cost of demolition, relocation of residents and rebuild, as well the negative impacts on health, education and social outcomes can be avoided through careful, considered, refurbishment and infill working closely with communities.



Retain, Repair, Reinvest is a strategy for evaluating the refurbishment potential of existing public housing stock both locally and nationally. It is the intention of the design team that this strategy be undertaken on other housing estates to accurately determine the viability of refurbishment rather than demolition and rebuild.

The Audit Office of NSW is currently undertaking a review of whether social housing is effectively and efficiently prioritised to meet the needs of vulnerable households, and whether social

housing tenants are effectively supported to establish and sustain their tenancies.[93] The need to re-evaluate government policy on social housing and housing assistance, including estate redevelopment, is also highlighted in the NSW Government's Homelessness Strategy and key discussion papers.[94] While in some instances the government is currently following the developer-led approach of demolition, this Retain, Repair, Reinvest strategy offers an alternative approach to ensure households of residents from priority communities are supported through avoiding relocation, as well as providing cost-savings to the government. By alternative renewal feasibility studies into these sites significant social impact and environmental damage can be avoided.

We suggest that any renewal feasibility studies include not just a cost-benefit analysis through a real-estate model, but also captures:

- The full costs of relocation
- Social impact on residents
- Environmental impact of demolition
- Other site-specific elements

Future research should establish a robust social impact assessment framework to capture the full extent of the cost of relocation on residents and the surrounding community, as well as an environmental impact assessment to determine the ecological footprint of the proposed development.

This model also provides opportunities for the savings made through a Retain, Repair, Reinvest approach to be re-invested in the building of new social and affordable housing at other government owned sites.

By making these findings public we hope that this study can be used to advocate for the retention of the existing public housing and the communities that inhabit them.

[93] Audit Office of NSW, *Social housing 2024-25.*
[94] See NSW Government, *NSW Homelessness Strategy 2025-2035* and the *Homes for NSW discussion paper.*

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Appendix

1. Resident relocation costs

Due to the lack of publicly available information on relocation rates within NSW we have used figures from the Victorian State Government. The relocation costs for the previous tenants at Waterloo North and Central have been calculated using daily rates per dwelling of $150 as provided in the Supreme Court hearing NO. SCI 2020 02563 by Jamin Ben Crawley government representative as well as managerial fees of 1.5% of the construction cost also provided in the Supreme Court Hearing.[95]

Figure 36: Total relocation cost associated with a demolition and rebuild approach.

Relocation Costs						
*We have accounted for 10% dwellings to be relocated to priavte rentals	Relocation fee per dwelling @ $150/day * The proposed construction period will last for 1825 days, with 132 existing flats requiring relocation.	1825 days x 132 (10%) dwellings = 240,900	$150			$36,135,000
	Inflation 21% from 2020					$7,588,350
	Relocation Managerial Costs					$28,520,288
	Total Relocation Costs					$72,243,638

[95] Supreme Court of Victoria, 'Affidavit of Jamin Ben Crawly' in Case NO. SCI 2020 02563 between Timothy Hames Sowden and the Director of Housing.

2. Education and health impact costs

The Education and Health impact costs of relocation have been calculated with the assistance of SGS Economics and Planning, based on their previous economic modelling of the identified benefits of increasing the supply of beds. This work was published in *The Case for Investing in Last Resort Housing* for the University of Melbourne's Sustainable Society Institute.[96]SGS Economics and Planning quantified the economic, social and cultural benefits of addressing the failing supply of last resort housing, with significant positive impacts on both government administration and the community.

While this study aimed to qualitatively assess the value of a businesses case for reducing homelessness via a cost benefit analysis, a workshop with SGS Economics and Planning suggested this report take a 50% approach, through considering how temporary relocation would impact residents' health and education outcomes.

Health cost savings were calculated by SGS Economics and Planning based on The Cost of Youth Homelessness in Australia by MacKenzie et al.[97]

The education figures presented by SGS reflect findings from The drivers of high health and justice costs among a cohort young homeless people in Australia[98] and The Social Value of Community Housing in Australia.[99]

The breakdown of costs can be seen in Figure 7, as provided by SGS Economics and Planning. Figure 8 shows how this model has been applied to the specific conditions of Waterloo Estate, including inflation and education impacts based on demographic knowledge of families having 1.6 children across the Estate.

Figure 37: SGS Analysis of household types and benefit categories

HOUSEHOLD TYPE	BENEFIT CATEGORIES						
	Health cost savings	Reduced domestic violence	Reduced costs of crime	Enhanced human capital	Enhanced labour market productivity	Education benefits	Improved community diversity
Homeless	$8,429	$19,000	$6,182	$4,236	Not relevant	Not relevant	No data found to support monetisation
	MSSI (2017)	Flatau (2020)	MSSI (2017)	ABS (2016)			
Very low income household	$640	$47,220	No data found to support monetisation	Not relevant	Not relevant	Not relevant	No data found to support monetisation
	Net Balance (2010)	Flatau (2020)					
Low income household	$1,872	$19,000	No data found to	$17,784	$8,199	$3,016	No data found to
	Net Balance (2018)	Flatau (2020)	support monetisation	Ravi and Reinharr (2010)	SGS (2021)	Ravi and Reinharr (2010)	support monetisation

[96] Witte, E. 'The case for investing in last resort housing', *MSSI Issues Paper No. 10*, (Melbourne, Melbourne Sustainable Society Institute, The University of Melbourne, 2017).

[97] MacKenzie, D, et al., *The Cost of Youth Homelessness in Australia: Research Briefing* (Swinburne University Institute for Social Research, the University of Western Australia and Charles Sturt University, 2016). www.swinburne.edu.au/news/ latest-news/2016/04/the-cost-of-youth-homelessness-in-australia-.php.

[98] Flatau, P., et al., (2020). 'The drivers of high health and justice costs among a cohort young homeless people in Australia'. *Housing Studies*, (35)4, 648-678.

[99] Ravi, A., & Reinhardt, C. (2011). The Social Value of Community Housing in Australia. Melbourne: Net Balance.

Figure 38: SGS Analysis applied to Waterloo North and Central Estate residents

Waterloo N + C Redevelopment	*Relocation period 5 years						
		Qty	Rate	Impact	Years	Total	Notes
Displacment Health Costs							
	Health Cost-Saving Loss for 1751 People on very low income	1751	640	0.5	5	$2,801,600	
	Inflation 45% from 2010					$1,260,720	Inflation Calculator | RBA
	Total					$4,062,320	
		Qty	Rate	Impact	Years	Total	Notes
Displacment Education Costs							
	Education Cost-Saving Loss for 54 children.	54	3016	0.5	5	$407,160	
	Inflation 45% from 2010					$183,222	Inflation Calculator | RBA
	Total					$590,382	

3. Architectural Drawings

MATAVAI & TURANGA TOWERS, WATERLOO, NSW 2017

A00	COVER PAGE	NTS
A01	EXISTING SITE PLAN	1:1500
A02	DEMOLITION FLOOR PLANS	1:150
A03	DEMOLITION FLOOR PLANS	1:150
A04	DEMOLITION ELEVATIONS&SECTION	1:400
A05	PROPOSED FLOOR PLANS	1:150
A06	PROPOSED FLOOR PLANS	1:150
A07	DEMOLITION ELEVATIONS&SECTION	1:400
A08	PROPOSED COMPLIANCE STUDY	1:100
A09	PROPOSED COMPLIANCE STUDY	1:100
A10	PROPOSED COMPLIANCE STUDY	1:100
A11	PROPOSED COMPLIANCE STUDY	1:100

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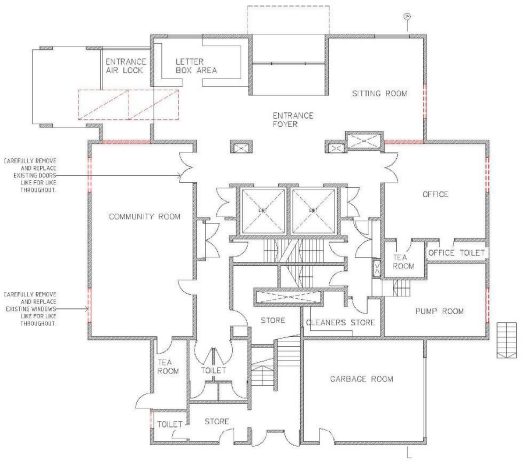
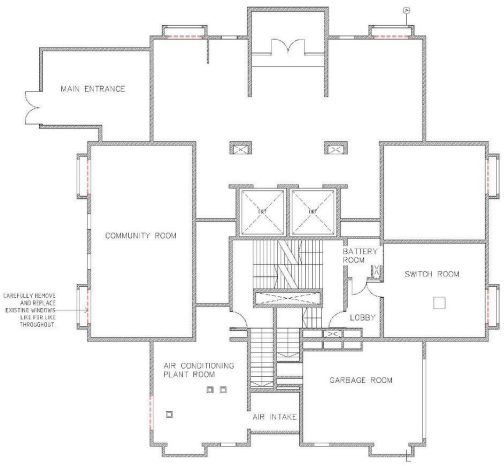


01 GROUND FLOOR PLAN



02 MEZZANINE FLOOR PLAN

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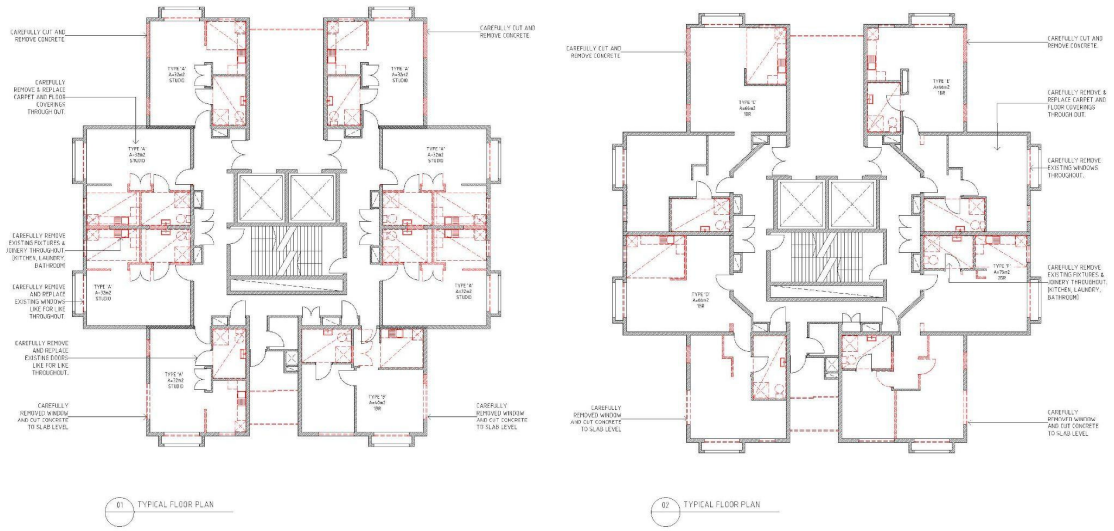

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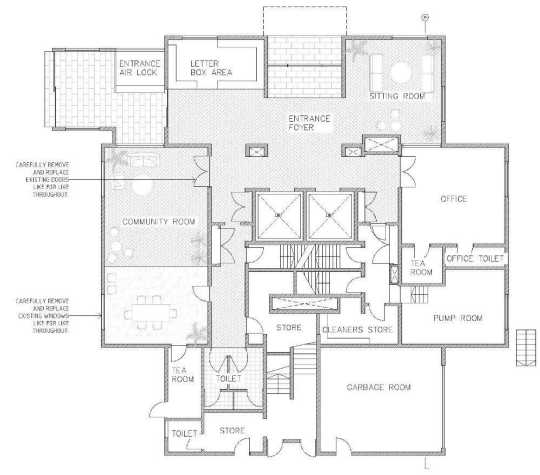

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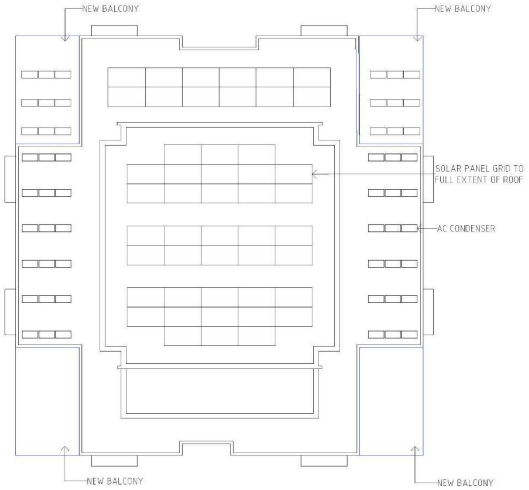

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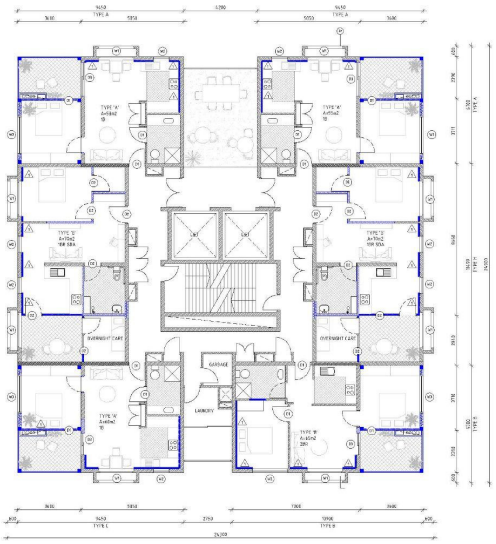

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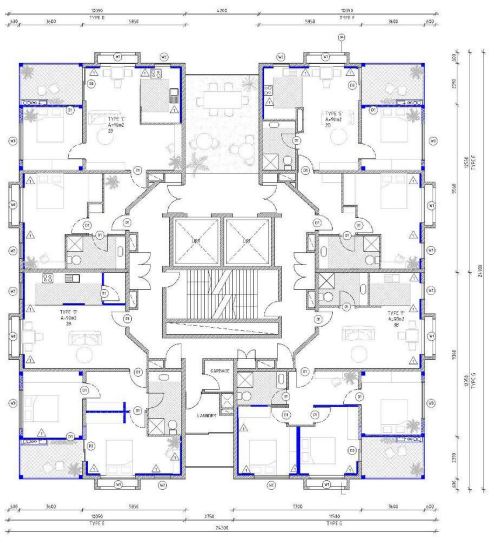

02 TYPICAL FLOOR PLAN B

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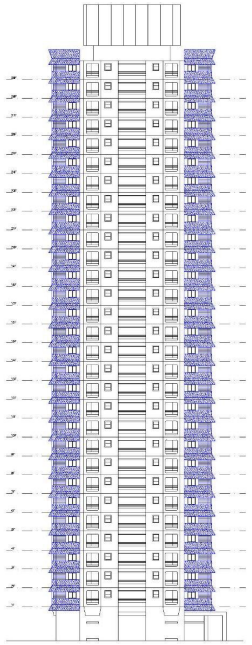

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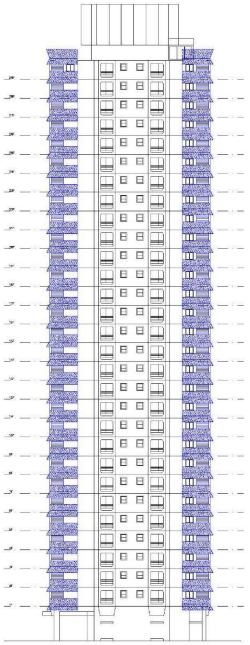

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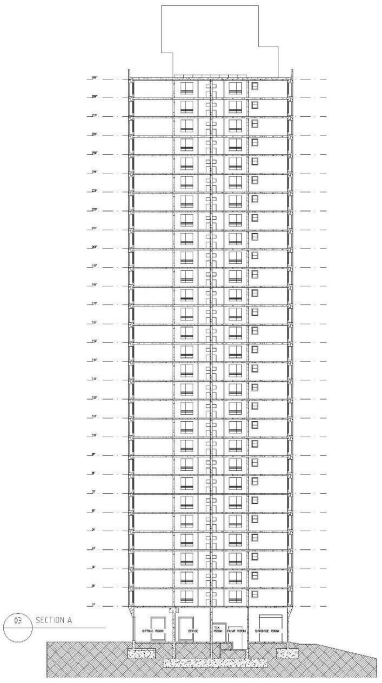

03 SECTION A

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SCALE 1:100 @ A3
0 5 10 20m

STATUS: SKETCH DESIGN
CLIENT:

DRAWING: PROPOSED ELEVATIONS & SECTION
SHEET SIZE: A3
DRAWING NO.: A-07
ISSUE: -

NSW APARTMENT DESIGN GUIDELINES

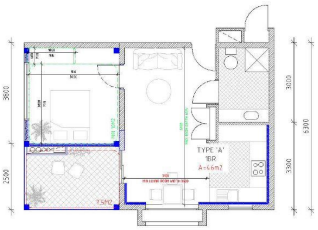
APARTMENT AREAS
STUDIO - MIN 35M2
1B - MIN 50M2
2B - MIN 70M2

ROOM DEPTH
HABITABLE ROOM - MAX 6125MM
OPEN PLAN - MAX 8000MM

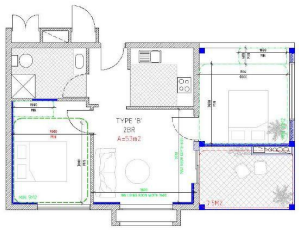
LIVING ROOM WIDTH
STUDIO&1B - MIN 3600MM
2B - MIN 4000MM

BALCONY
STUDIO - MIN 4M2
1B - MIN 8M2
2B - MIN 10M2

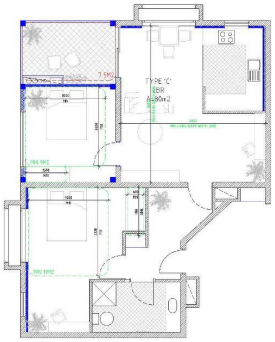
STORAGE
(EXCL KITCHEN, BATHROOM&BEDROOM)
1B - MIN 3M3
2B - MIN 4M3



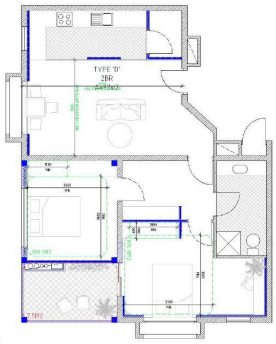
01 TYPICAL TYPE A



02 TYPICAL TYPE B



03 TYPICAL TYPE C



04 TYPICAL TYPE D

NOTES
SERVICES SHOWN ON THIS DRAWING ARE APPROXIMATELY ONLY. THE EXACT LOCATION IS TO BE CONFIRMED ON SITE BY CONTRACTOR PRIOR TO COMMENCEMENT WORK.

VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE ARCHITECT PRIOR TO THE COMMENCEMENT OF WORK ON SITE. READ ONLY FIGURE DIMENSIONS - DO NOT SCALE

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+61 492 262 201

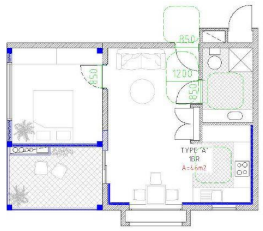
REV	ISSUE	DATE
-	-	-

RESEARCH PROPOSAL

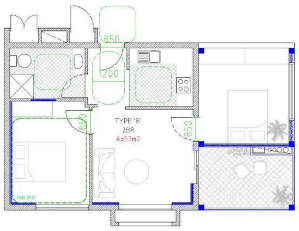
DRAWING SCALE
SCALE 1:100 @ A3
0 1 3 5m

STATUS: SKETCH DESIGN
CLIENT:

DRAWING: PROPOSED APARTMENT COMPLIANCE ADG
SHEET SIZE: A3
DRAWING NO.: A-8
ISSUE: -



01 TYPICAL TYPE A



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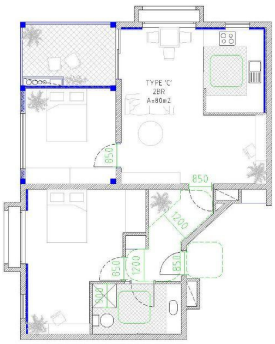

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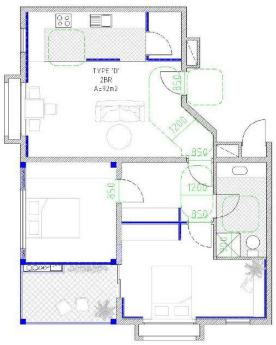

04 TYPICAL TYPE D

NOTES:
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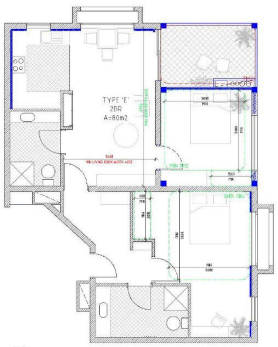
REV | ISSUE | DATE

RESEARCH PROPOSAL

DRAWING SCALE
SCALE 1:100 @ A3
1 0 1 2 5m

STATUS: SKETCH DESIGN
CLIENT:

DRAWING: PROPOSED APARTMENT COMPLIANCE LHDG
SHEET SIZE: A3
DRAWING NO.: A-9
ISSUE: -



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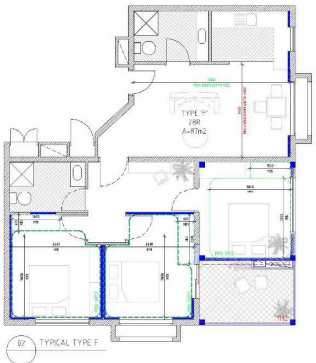

02 TYPICAL TYPE F

03 TYPICAL TYPE G (SDA)

NOTES:
SERVICES SHOWN ON THIS DRAWING ARE DIAGRAMMATICALLY ONLY. THE EXACT LOCATION IS TO BE CONFIRMED ON SITE BY CONTRACTOR PRIOR TO COMMENCEMENT WORK.

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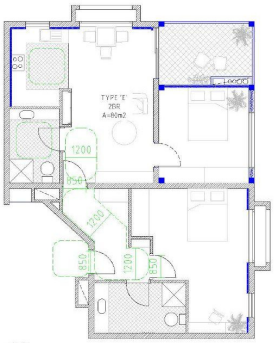
REV | ISSUE | DATE

RESEARCH PROPOSAL

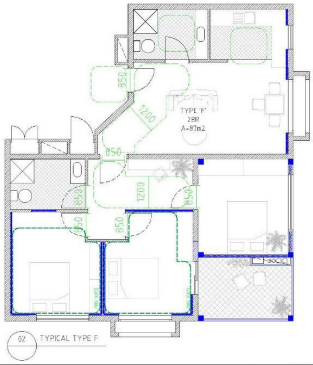
DRAWING SCALE
SCALE 1:100 @ A3
1 0 1 2 5m

STATUS: SKETCH DESIGN
CLIENT:

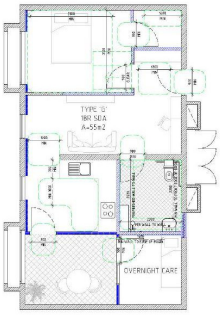
DRAWING: PROPOSED APARTMENT COMPLIANCE ADG
SHEET SIZE: A3
DRAWING NO.: A-10
ISSUE: -



01 TYPICAL TYPE E



02 TYPICAL TYPE F



03 TYPICAL TYPE G (GOLD)

NOTES
SERVICES SHOWN ON THIS DRAWING ARE APPROXIMATELY ONLY. THE EXACT LOCATION IS TO BE CONFIRMED ON SITE BY CONTRACTOR PRIOR TO COMMENCEMENT WORK.

VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE ARCHITECT PRIOR TO THE COMMENCEMENT OF WORK OR SITE READING'S FIGURE DIMENSIONS – DO NOT SCALE.

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REV	ISSUE	DATE
-	-	-

RESEARCH PROPOSAL

DRAWING SCALE
SCALE 1:100 @ A3
1 0 1 2 5m

STATUS
SKETCH DESIGN

CLIENT

DRAWING
PROPOSED APARTMENT COMPLIANCE LHDG

SHEET SIZE
A3

DRAWING NO. A-11

ISSUE -

MARTON & SOLANDER TOWERS, WATERLOO, NSW 2017

A00	COVER PAGE	NTS
A01	DEMOLITION FLOOR PLANS	1:250
A02	DEMOLITION ELEVATION	1:250
A03	DEMOTION ELEVATION & SECTION	1:250
A04	PROPOSED FLOOR PLANS	1:250
A05	PROPOSED ROOF PLAN	1:250
A06	PROPOSED ELEVATION	1:250
A07	PROPOSED ELEVATION & SECTION	1:250
A08	PROPOSED COMPLIANCE STUDY	1:100
A09	PROPOSED COMPLIANCE STUDY	1:100
A10	PROPOSED COMPLIANCE STUDY	1:100
A11	PROPOSED COMPLIANCE STUDY	1:100

NOTES
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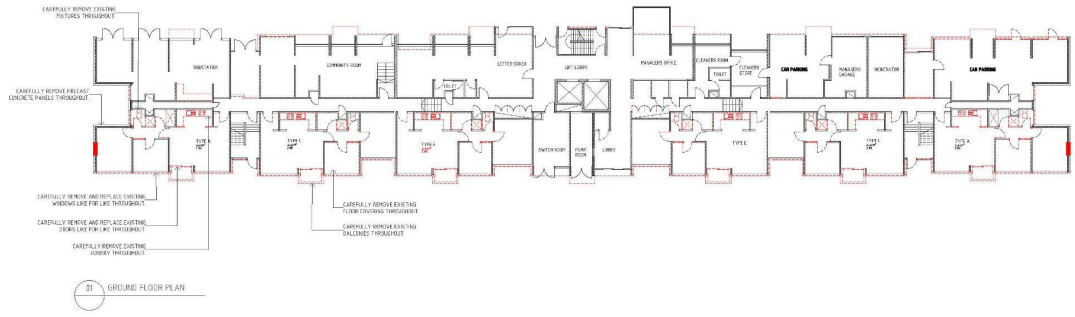
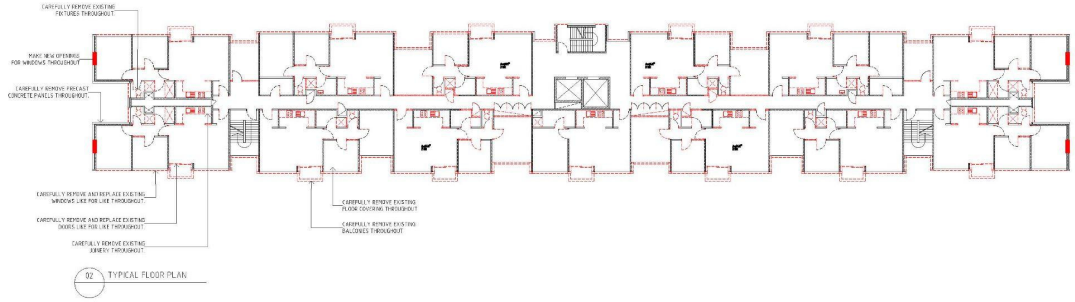
REV	ISSUE	DATE
-	-	-

RESEARCH PROPOSAL

STATUS	SKETCH DESIGN
CLIENT	
DRAWING	COVER PAGE
SHEET SIZE	A3
DRAWING NO.	A-00
ISSUE	-
DRAWING SCALE	N.T.S



01 GROUND FLOOR PLAN



02 TYPICAL FLOOR PLAN

NOTES
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-	-	-

RESEARCH PROPOSAL

STATUS	SKETCH DESIGN
CLIENT	
DRAWING	DEMOLITION FLOOR PLANS
SHEET SIZE	A3
DRAWING NO.	A-01
ISSUE	-
DRAWING SCALE	SCALE 1:250 @ A3

2.5 0 2.5 5 12.5m

01 WEST ELEVATION

NOTES
SERVICES SHOWN ON THIS DRAWING ARE APPROXIMATELY ONLY. THE EXACT LOCATION IS TO BE CONFIRMED ON SITE BY CONTRACTOR PRIOR TO COMMENCEMENT WORK.

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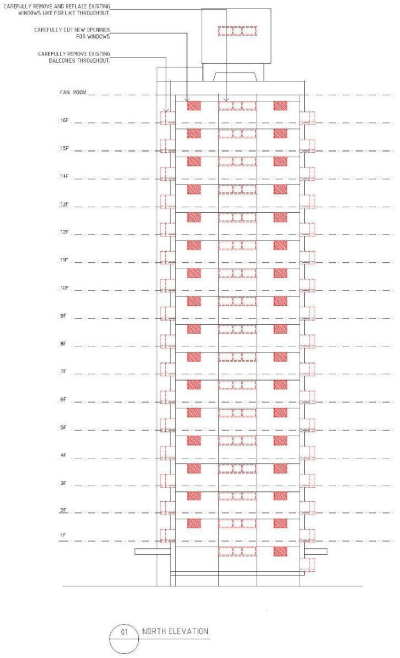
REV	ISSUE	DATE
-	-	-

RESEARCH PROPOSAL

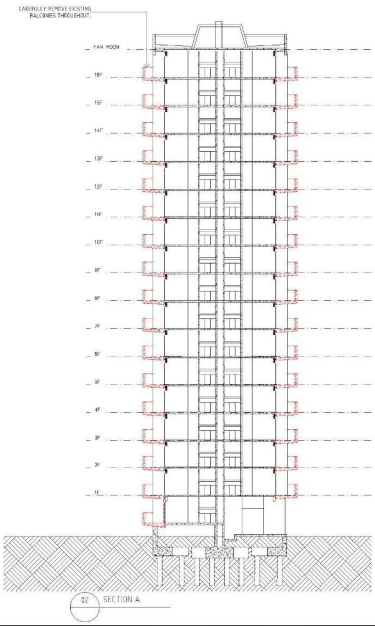
DRAWING SCALE
SCALE 1:250 @ A3
2.5 0 2.5 5 12.5m

STATUS: SKETCH DESIGN
CLIENT:

DRAWING: DEMOLITION ELEVATION
SHEET SIZE: A3
DRAWING NO.: A-02
ISSUE: -



01 NORTH ELEVATION



02 SECTION A

NOTES
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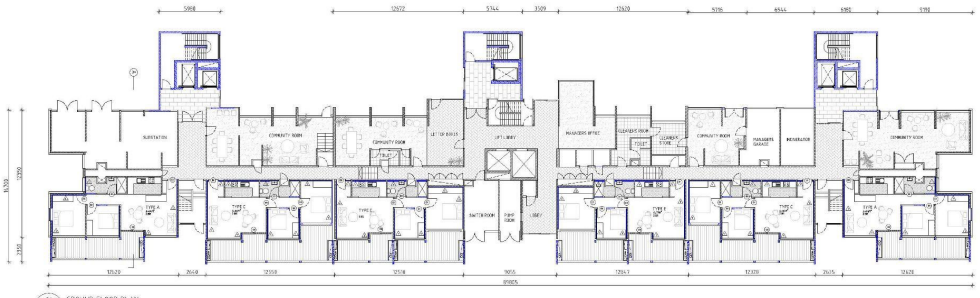
REV	ISSUE	DATE
-	-	-

RESEARCH PROPOSAL

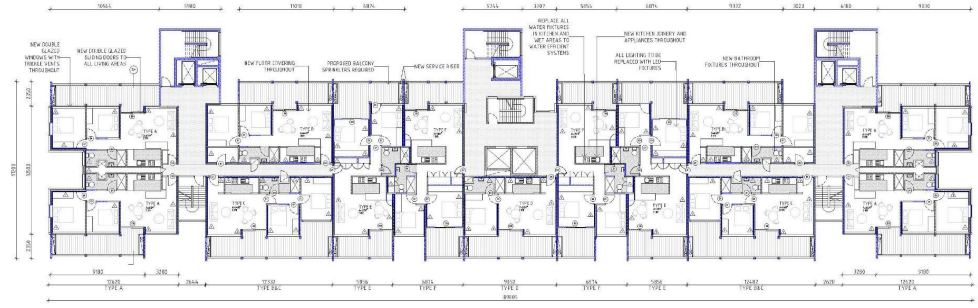
DRAWING SCALE
SCALE 1:250 @ A3
2.5 0 2.5 5 12.5m

STATUS: SKETCH DESIGN
CLIENT:

DRAWING: DEMOLITION ELEVATION & SECTION
SHEET SIZE: A3
DRAWING NO.: A-03
ISSUE: -



01 GROUND FLOOR PLAN
PLAN – SCALE 1:250 @A3



02 TYPICAL FLOOR PLAN
PLAN – SCALE 1:250 @A3

NOTES
SERVICES SHOWN ON THIS DRAWING ARE APPROXIMATE ONLY. THE EXACT LOCATION IS TO BE CONFIRMED ON SITE BY CONTRACTOR PRIOR TO COMMENCEMENT WORK.
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NEW	ISSUE	DATE
-	-	-

RESEARCH PROPOSAL

DRAWING SCALE
SCALE 1:250 @ A3
2.5 0 2.5 5 12.5m

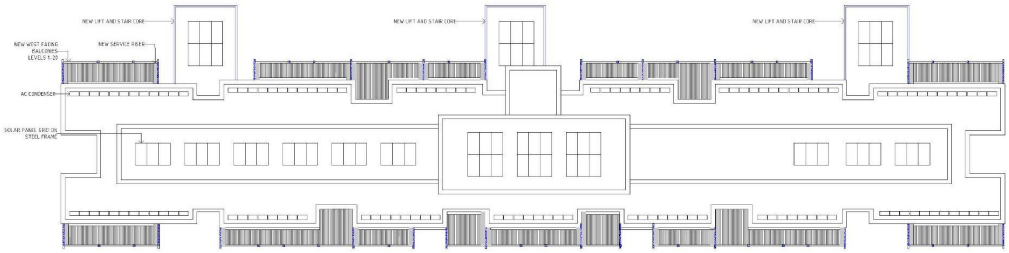
STATUS
SKETCH DESIGN

CLIENT

DRAWING
PROPOSED FLOOR PLANS

SHEET SIZE
A3

DRAWING NO. A-04
ISSUE -



01 ROOF PLAN
PLAN – SCALE 1:250 @A3

NOTES
SERVICES SHOWN ON THIS DRAWING ARE APPROXIMATE ONLY. THE EXACT LOCATION IS TO BE CONFIRMED ON SITE BY CONTRACTOR PRIOR TO COMMENCEMENT WORK.
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NEW	ISSUE	DATE
-	-	-

RESEARCH PROPOSAL

DRAWING SCALE
SCALE 1:250 @ A3
2.5 0 2.5 5 12.5m

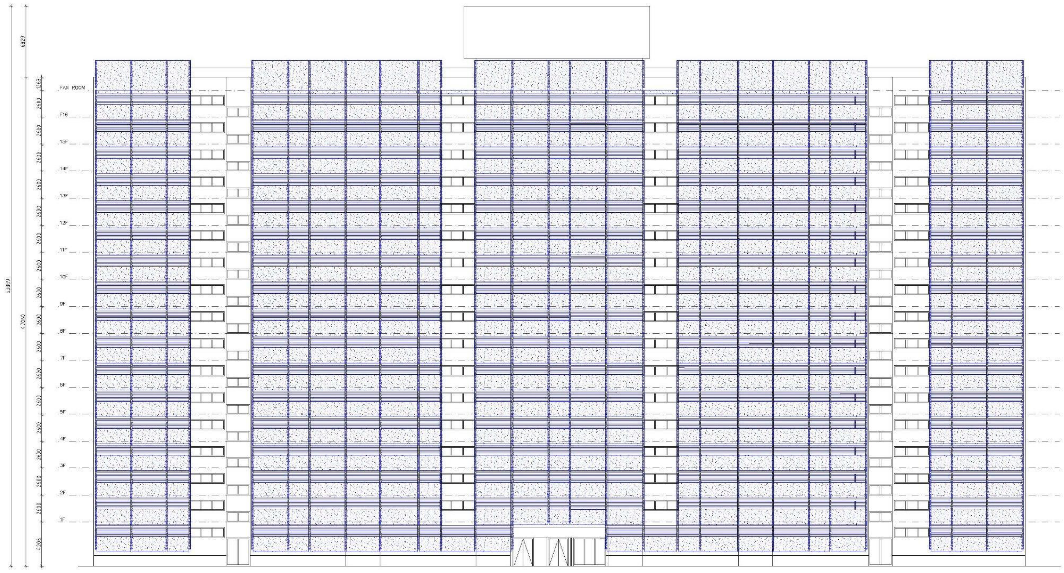
STATUS
SKETCH DESIGN

CLIENT

DRAWING
PROPOSED ROOF PLAN

SHEET SIZE
A3

DRAWING NO. A-05
ISSUE -



01 WEST ELEVATION

NOTES
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REV	ISSUE	DATE
-	-	-

RESEARCH PROPOSAL

DRAWING SCALE
SCALE 1:250 @ A3
2.5 0 2.5 5 12.5m

STATUS
SKETCH DESIGN

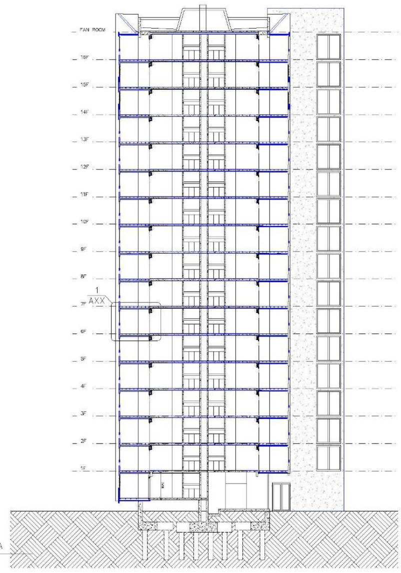
CLIENT

DRAWING
PROPOSED ELEVATION

SHEET SIZE
A3

DRAWING NO. A-06
ISSUE -

01 NORTH ELEVATION



02 SECTION A

NOTES
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REV	ISSUE	DATE
-	-	-

RESEARCH PROPOSAL

DRAWING SCALE
SCALE 1:250 @ A3
2.5 0 2.5 5 12.5m

STATUS
SKETCH DESIGN

CLIENT

DRAWING
PROPOSED ELEVATION & SECTION

SHEET SIZE
A3

DRAWING NO. A-07
ISSUE -

NOTES
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RESEARCH PROPOSAL

DRAWING SCALE
SCALE 1:100 @ A3
1 0 1 2 5m

STATUS: SKETCH DESIGN
CLIENT:

DRAWING: PROPOSED APARTMENT COMPLIANCE SDA
SHEET SIZE: A3
DRAWING NO.: A-8
ISSUE: -

NSW APARTMENT DESIGN GUIDELINES

APARTMENT AREAS
STUDIO – MIN 35M2
1B – MIN 50M2
2B – MIN 70M2

ROOM DEPTH
HABITABLE ROOM – MAX 8125MM
OPEN PLAN – MAX 8000MM

LIVING ROOM WIDTH
STUDIO&1B – MIN 3600MM
2B – MIN 4000MM

BALCONY
STUDIO – MIN 4M2
1B – MIN 8M2
2B – MIN 10M2

STORAGE
(EXCL KITCHEN, BATHROOM&BEDROOM)
1B – MIN 3M3
2B – MIN 4M3

NOTES
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REV	ISSUE	DATE
-	-	-

RESEARCH PROPOSAL

DRAWING SCALE
SCALE 1:100 @ A3
1 0 1 2 5m

STATUS: SKETCH DESIGN
CLIENT:

DRAWING: PROPOSED APARTMENT COMPLIANCE ADG
SHEET SIZE: A3
DRAWING NO.: A-9
ISSUE: -

SDA DESIGN STANDARDS - SILVER STANDARD

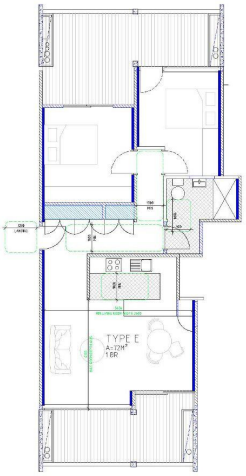
4.1 - Requirements for dwelling entrance and other external doorways

5 - Corridors

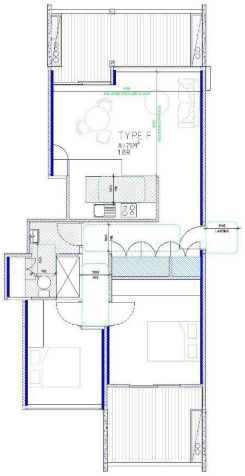
7 - Sanitary facilities

8 - Kitchen

9 - Laundry



01 FLAT TYPE E



02 FLAT TYPE F

NOTES
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REV	ISSUE	DATE
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RESEARCH PROPOSAL

DRAWING SCALE
SCALE 1:100 @ A3
1 0 1 2 5m

STATUS: SKETCH DESIGN
CLIENT:

DRAWING: PROPOSED APARTMENT COMPLIANCE SDA
SHEET SIZE: A3
DRAWING NO.: A-10
ISSUE: -

NSW APARTMENT DESIGN GUIDELINES

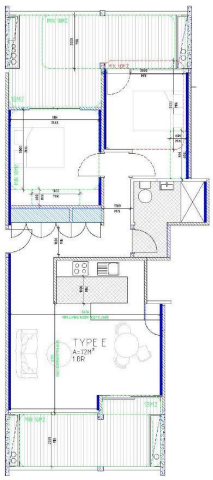
APARTMENT AREAS
STUDIO – MIN 35M2
1B – MIN 50M2
2B – MIN 70M2

ROOM DEPTH
HABITABLE ROOM – MAX 612SMM
OPEN PLAN – MAX 8000MM

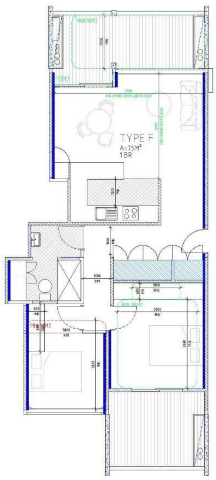
LIVING ROOM WIDTH
STUDIO&1B – MIN 3600MM
2B – MIN 4000MM

BALCONY
STUDIO – MIN 4M2
1B – MIN 8M2
2B – MIN 10M2

STORAGE
(EXCL KITCHEN, BATHROOM&BEDROOM)
1B – MIN 3M3
2B – MIN 4M3



01 FLAT TYPE E



02 FLAT TYPE F

NOTES
SERVICES SHOWN ON THIS DRAWING ARE APPROXIMATELY ONLY. THE EXACT LOCATION IS TO BE CONFIRMED ON SITE BY CONTRACTOR PRIOR TO COMMENCEMENT WORK.

VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE ARCHITECT PRIOR TO THE COMMENCEMENT OF WORK ON SITE. READ ONLY FIGURE DIMENSIONS - DO NOT SCALE

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REV ISSUE DATE
- - -

RESEARCH PROPOSAL

DRAWING SCALE
SCALE 1:100 @ A3
1 0 1 2 5m

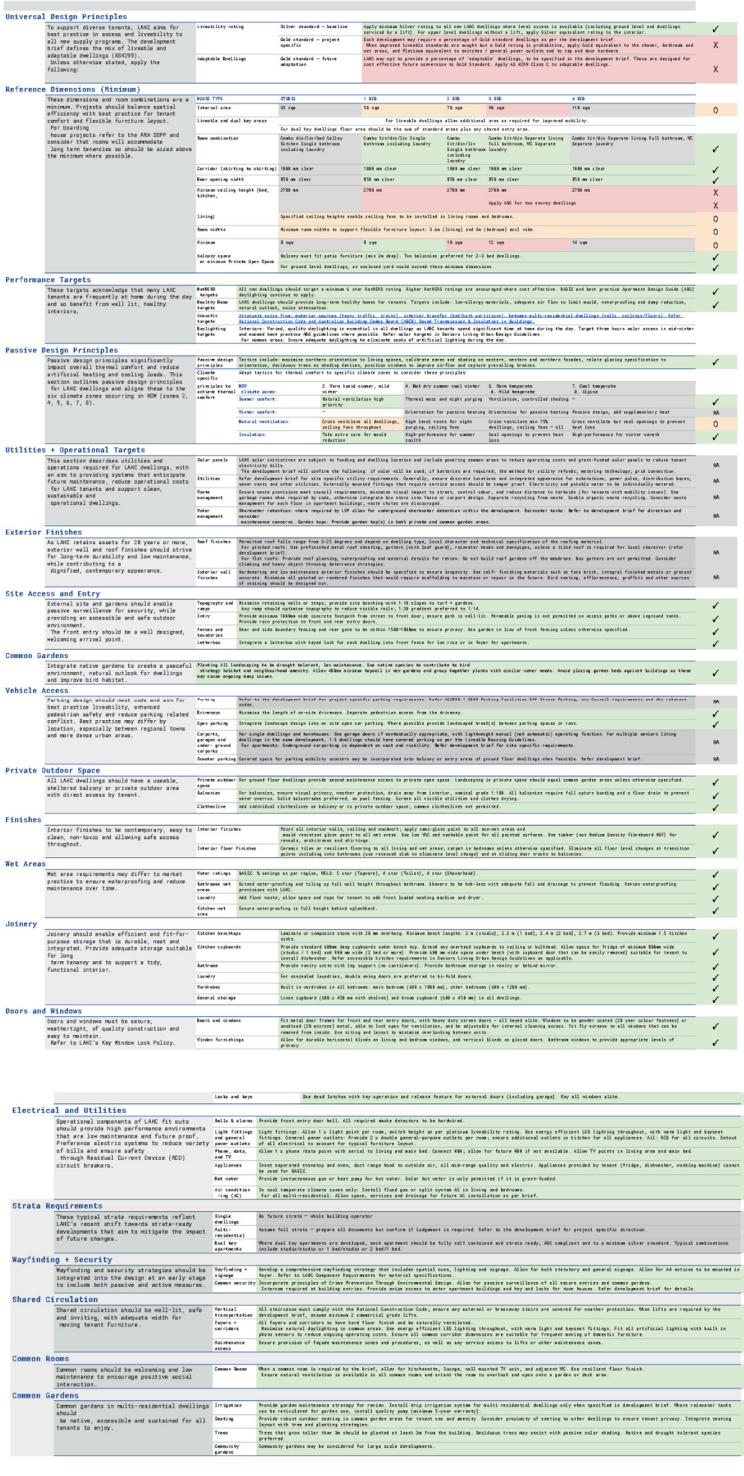
STATUS: SKETCH DESIGN
CLIENT:

DRAWING: PROPOSED APARTMENT COMPLIANCE ADG
SHEET SIZE: A3
DRAWING NO.: A-11
ISSUE: -

5. LAHC Dwelling Requirements

The LAHC Dwelling Requirements have been assessed by the design team with all dwellings meeting the majority of applicable areas as shown in the attachments.

Tower Buildings (Matavai and Turanga)



Slab Buildings (Marton, Solander, James Cook, Joseph Banks)

Universal Design Principles

To support diverse tenants, LAHC aims for best practice in access and liveability to all new supply programs. The development brief defines the mix of liveable and adaptable dwellings (AS4299). Unless otherwise stated, apply the following:	Liveability rating	Silver standard – baseline	Apply minimum Silver rating to all new LAHC dwellings where level access is available (including ground level and dwellings serviced by a lift). For upper level dwellings without a lift, apply Silver equivalent rating to the interior.	✓
		Gold standard – project specific	Each development may require a percentage of Gold standard dwellings as per the development brief. When improved liveable standards are sought but a Gold rating is prohibitive, apply Gold equivalent to the shower, bathroom and wet areas, and Platinum equivalent to switches / general power outlets and to tap and door hardware.	X
	Adaptable Dwellings	Gold standard – future adaptation	LAHC may opt to provide a percentage of 'adaptable' dwellings, to be specified in the development brief. These are designed for cost effective future conversion to Gold Standard. Apply AS 4299 Class C to adaptable dwellings.	X

Reference Dimensions (Minimum)

These dimensions and room combinations are a minimum. Projects should balance spatial efficiency with best practice for tenant comfort and flexible furniture layout. For boarding house projects refer to the ARH SEPP and consider that rooms will accommodate long term tenancies so should be sized above the minimum where possible.

HOUSE TYPE	STUDIO	1 BED	2 BED	3 BED	4 BED	
Internal area	35 sqm	50 sqm	70 sqm	90 sqm	110 sqm	O
Liveable and dual key areas	For liveable dwellings allow additional area as required for improved mobility.					
	For dual key dwellings floor area should be the sum of standard areas plus any shared entry area.					
Room combination	Combo din/liv/bed Galley Kitchen Single bathroom including laundry	Combo kit/din/liv Single bathroom including laundry	Combo kit/din/liv Single bathroom including laundry	Combo kit/din Separate living Full bathroom, WC Separate laundry	Combo kit/din Separate living Full bathroom, WC Separate laundry	✓
Corridor (skirting to skirting)	1000 mm clear	1000 mm clear	1000 mm clear	1000 mm clear	1000 mm clear	✓
Door opening width	850 mm clear	850 mm clear	850 mm clear	850 mm clear	850 mm clear	✓
Minimum ceiling height (bed, kitchen,	2700 mm	2700 mm	2700 mm	2700 mm	2700 mm	X
				Apply ADG for two storey dwellings		X
living)	Specified ceiling heights enable ceiling fans to be installed in living rooms and bedrooms.					O
Room widths	Minimum room widths to support flexible furniture layout: 3.6m (living) and 3m (bedroom) excl robe.					O
Minimum	8 sqm	8 sqm	10 sqm	12 sqm	14 sqm	O
balcony space or minimum Private Open Space	Balcony must fit patio furniture (min 2m deep). Two balconies preferred for 2-3 bed dwellings.					✓
	For ground level dwellings, an enclosed yard would exceed these minimum dimensions.					✓

Performance Targets

These targets acknowledge that many LAHC tenants are frequently at home during the day and so benefit from well lit, healthy interiors.	NatHERS targets	All new dwellings should target a minimum 6 star NatHERS rating. Higher NatHERS ratings are encouraged where cost effective. BASIX and best practice Apartment Design Guide (ADG) daylighting continue to apply.	✓
	Healthy Home targets	LAHC dwellings should provide long-term healthy homes for tenants. Targets include: low-allergy materials, adequate air flow to limit mould, waterproofing and damp reduction, natural outlook, noise attenuation.	✓
	Acoustic targets	Attenuate noise from: exterior sources (heavy traffic, trains), interior transfer (bed/bath partitions), between multi-residential dwellings (walls, ceilings/floors). Refer National Construction Code and Australian Building Codes Board (ABCB) Sound Transmission & Insulation in Buildings.	
	Daylighting targets	Interiors: Varied, quality daylighting is essential in all dwellings as LAHC tenants spend significant time at home during the day. Target three hours solar access in mid-winter and exceed best practice ADG guidelines where possible. Refer solar targets in Seniors Living Urban Design Guidelines. For common areas: Ensure adequate daylighting to eliminate costs of artificial lighting during the day.	

Passive Design Principles

Passive design principles significantly impact overall thermal comfort and reduce artificial heating and cooling loads. This section outlines passive design principles for LAHC dwellings and aligns these to the six climate zones occurring in NSW (zones 2, 4, 5, 6, 7, 8).

Passive design principles	Tactics include: maximise northern orientation to living spaces, calibrate eaves and shading on eastern, western and northern facades, relate glazing specification to orientation, deciduous trees as shading devices, position windows to improve airflow and capture prevailing breezes.				✓
Climate specific principles to achieve thermal comfort	Adapt tactics for thermal comfort to specific climate zones to consider these principles:				
NSW climate zones:	2. Warm humid summer, mild winter	4. Hot dry summer cool winter	5. Warm temperate 6. Mild temperate	7. Cool temperate 8. Alpine	
Summer comfort:	Natural ventilation high priority	Thermal mass and night purging	Ventilation, controlled shading	–	✓
Winter comfort:	–	Orientation for passive heating	Orientation for passive heating	Passive design, add supplementary heat	NA
Natural ventilation:	Cross ventilate all dwellings, ceiling fans throughout	High level vents for night purging, ceiling fans	Cross ventilate min 75% dwellings, ceiling fans – all	Cross ventilate but seal openings to prevent heat loss	O
Insulation:	Take extra care for mould reduction	High-performance for summer coolth	Seal openings to prevent heat loss	High-performance for winter warmth	✓

Utilities + Operational Targets

This section describes utilities and operations required for LAHC dwellings, with an aim to providing systems that anticipate future maintenance, reduce operational costs for LAHC tenants and support clean, sustainable and operational dwellings.	Solar panels	LAHC solar initiatives are subject to funding and dwelling location and include powering common areas to reduce operating costs and grant-funded solar panels to reduce tenant electricity bills. The development brief will confirm the following: if solar will be used; if batteries are required; the method for utility refunds; metering technology; grid connection.	NA
	Utilities	Refer development brief for site specific utility requirements. Generally, ensure discrete locations and integrated appearance for substations, power poles, distribution boxes, sewer vents and other utilities. Externally mounted fittings that require service access should be tamper proof. Electricity and potable water to be individually metered.	NA
	Waste management	Ensure waste provisions meet council requirements, minimise visual impact to street, control odour, and reduce distance to kerbside (for tenants with mobility issues). Use garbage rooms when required by code, otherwise integrate bin store into fence or carport design. Separate recycling from waste. Enable organic waste recycling. Consider waste management for each floor in apartment buildings; waste chutes are discouraged.	NA
	Water management	Stormwater retention: where required by LEP allow for underground stormwater detention within the development. Rainwater tanks: Refer to development brief for direction and consider maintenance concerns. Garden taps: Provide garden tap(s) in both private and common garden areas.	NA

Exterior Finishes

As LAHC retains assets for 20 years or more, exterior wall and roof finishes should strive for long-term durability and low maintenance, while contributing to a dignified, contemporary appearance.	Roof finishes	Permitted roof falls range from 3-25 degrees and depend on dwelling type, local character and technical specification of the roofing material. For pitched roofs: Use prefinished metal roof sheeting, gutters (with leaf guard), rainwater heads and downpipes, unless a tiled roof is required for local character (refer development brief). For flat roofs: Provide roof planning, waterproofing and material details for review. Do not build roof gardens off the membrane. Box gutters are not permitted. Consider climbing and heavy object throwing deterrence strategies.	NA
	Exterior wall finishes	Hardwearing and low maintenance exterior finishes should be specified to ensure longevity. Use self- finishing materials such as face brick, integral finished metals or precast concrete. Minimise all painted or rendered finishes that would require scaffolding to maintain or repair in the future. Bird nesting, efflorescence, graffiti and other sources of staining should be designed out.	NA

Site Access and Entry

External site and gardens should enable passive surveillance for security, while providing an accessible and safe outdoor environment. The front entry should be a well designed, welcoming arrival point.	Topography and ramps	Minimise retaining walls or steps; provide site benching with 1:10 slopes to turf + gardens. Any ramp should optimise topography to reduce visible rails; 1:20 gradient preferred to 1:14.	✓
	Entry	Provide minimum 1000mm wide concrete footpath from street to front door; ensure path is well-lit. Permeable paving is not permitted on access paths or above inground tanks. Provide rain protection to front and rear entry doors.	✓
	Fences and boundaries	Rear and side boundary fencing and rear gate to be within 1500–1800mm to ensure privacy. Use garden in lieu of front fencing unless otherwise specified.	✓
	Letterbox	Integrate a letterbox with keyed lock for each dwelling into front fence for low rise or in foyer for apartments.	✓

Common Gardens

Integrate native gardens to create a peaceful environment, natural outlook for dwellings and improve bird habitat.	Planting All landscaping to be drought tolerant, low maintenance. Use native species to contribute to bird strategy habitat and neighbourhood amenity. Allow 400mm minimum topsoil in new gardens and group together plants with similar water needs. Avoid placing garden beds against buildings as these may cause ongoing damp issues.	✓

Vehicle Access

Parking design should meet code and aim for best practice liveability, enhanced pedestrian safety and reduce parking related conflict. Best practice may differ by location, especially between regional towns and more dense urban areas.	Parking	Refer to the development brief for project specific parking requirements. Refer AS2890.1 2009 Parking Facilities Off Street Parking, any Council requirements and the relevant codes.	NA
	Driveways	Minimise the length of on-site driveways. Separate pedestrian access from the driveway.	✓
	Open parking	Integrate landscape design into on site open car parking. Where possible provide landscaped break(s) between parking spaces or rows.	✓
	Carports, garages and under- ground carparks	For single dwellings and townhouses: Use garage doors if contextually appropriate, with lightweight manual (not automatic) operating function. For multiple seniors living dwellings in the same development, 1:5 dwellings should have covered parking as per the Liveable Housing Guidelines. For apartments: Underground carparking is dependent on cost and viability. Refer development brief for site specific requirements.	NA
	Scooter parking	Covered space for parking mobility scooters may be incorporated into balcony or entry areas of ground floor dwellings when feasible. Refer development brief.	NA

Private Outdoor Space

All LAHC dwellings should have a useable, sheltered balcony or private outdoor area with direct access by tenant.	Private outdoor space	For ground floor dwellings provide second maintenance access to private open space. Landscaping in private space should equal common garden areas unless otherwise specified.	✓
	Balconies	For balconies, ensure visual privacy, weather protection, drain away from interior, nominal grade 1:100. All balconies require full upturn bunding and a floor drain to prevent water overrun. Solid balustrades preferred, no pool fencing. Screen all visible utilities and clothes drying.	✓
	Clothesline	Add individual clotheslines on balcony or in private outdoor space; common clotheslines not permitted.	✓

Finishes

Interior finishes to be contemporary, easy to clean, non-toxic and allowing safe access throughout.	Interior finishes	Paint all interior walls, ceiling and woodwork; apply semi-gloss paint to all non-wet areas and mould resistant gloss paint to all wet areas. Use low VOC and washable paint for all painted surfaces. Use timber (not Medium Density Fibreboard MDF) for reveals, architraves and skirtings.	✓
	Interior floor finishes	Ceramic tiles or resilient flooring to all living and wet areas; carpet in bedrooms unless otherwise specified. Eliminate all floor level changes at transition points including into bathrooms (use recessed slab to eliminate level change) and at sliding door tracks to balconies.	✓

Wet Areas

Wet area requirements may differ to market practice to ensure waterproofing and reduce maintenance over time.	Water ratings	BASIX: % savings as per region, WELS: 5 star (Tapware), 4 star (Toilet), 4 star (Showerhead).	✓
	Bathrooms wet areas	Extend water-proofing and tiling up full wall height throughout bathroom. Showers to be hob-less with adequate fall and drainage to prevent flooding. Review waterproofing provisions with LAHC.	✓
	Laundry	Add floor waste; allow space and taps for tenant to add front loaded washing machine and dryer.	✓
	Kitchen wet area	Ensure waterproofing is full height behind splashback.	✓

Joinery

Joinery should enable efficient and fit-for-purpose storage that is durable, neat and integrated. Provide adequate storage suitable for long term tenancy and to support a tidy, functional interior.	Kitchen benchtops	Laminate or composite stone with 20 mm overhang. Minimum bench lengths: 2 m (studio), 2.2 m (1 bed), 2.4 m (2 bed), 2.7 m (3 bed). Provide minimum 1.5 kitchen sinks.	✓
	Kitchen cupboards	Provide standard 600mm deep cupboards under bench top. Extend any overhead cupboards to ceiling or bulkhead. Allow space for fridge of minimum 800mm wide (studio / 1 bed) and 900 mm wide (2 bed or more). Provide 600 mm wide space under bench (with cupboard door that can be easily removed) suitable for tenant to install dishwasher. Refer accessible kitchen requirements in Seniors Living Urban Design Guidelines as applicable.	✓
	Bathroom	Provide vanity units with leg support (no cantilevers). Provide bathroom storage in vanity or behind mirror.	✓
	Laundry	For concealed laundries, double swing doors are preferred to bi-fold doors.	✓
	Wardrobes	Built in wardrobes in all bedrooms: main bedroom (600 x 1800 mm), other bedrooms (600 x 1200 mm).	✓
	General storage	Linen cupboard (600 x 450 mm with shelves) and broom cupboard (600 x 450 mm) in all dwellings.	✓

Doors and Windows

Doors and windows must be secure, weathertight, of quality construction and easy to maintain. Refer to LAHC's Key Window Lock Policy.	Doors and windows	Fit metal door frames for front and rear entry doors, with heavy duty screen doors - all keyed alike. Windows to be powder coated (20 year colour fastness) or anodised (20 microns) metal, able to lock open for ventilation, and be adjustable for internal cleaning access. Fit fly screens to all windows that can be removed from inside. Use siting and layout to minimise overlooking between units.	✓
	Window furnishings	Allow for durable horizontal blinds on living and bedroom windows, and vertical blinds on glazed doors. Bathroom windows to provide appropriate levels of privacy.	✓
	Locks and keys	Use dead latches with key operation and release feature for external doors (including garage). Key all windows alike.	✓

Electrical and Utilities

Operational components of LAHC fit outs should provide high performance environments that are low maintenance and future proof. Preference electric systems to reduce variety of bills and ensure safety through Residual Current Device (RCD) circuit breakers.	Bells & alarms	Provide front entry door bell. All required smoke detectors to be hardwired.	✓
	Light fittings and general power outlets	Light fittings: Allow 1 x light point per room; switch height as per platinum liveability rating. Use energy efficient LED lighting throughout, with warm light and bayonet fittings. General power outlets: Provide 2 x double general-purpose outlets per room; ensure additional outlets in kitchen for all appliances. All: RCD for all circuits. Setout of all electrical to account for typical furniture layout.	✓
	Phone, data, and TV	Allow 1 x phone /data point with aerial to living and main bed. Connect NBN; allow for future NBN if not available. Allow TV points in living area and main bed.	✓
	Appliances	Inset separated stovetop and oven, duct range hood to outside air, all mid-range quality and electric. Appliances provided by tenant (fridge, dishwasher, washing machine) cannot be used for BASIX.	✓
	Hot water	Provide instantaneous gas or heat pump for hot water. Solar hot water is only permitted if it is grant-funded.	✓
	Air condition -ing (AC)	In cool temperate climate zones only: Install flued gas or split system AC in living and bedrooms. For all multi-residential: Allow space, services and drainage for future AC installation as per brief.	✓

Strata Requirements

These typical strata requirements reflect LAHC's recent shift towards strata-ready developments that aim to mitigate the impact of future changes.	Single dwellings	No future strata – whole building operator	NA
	Multi-residential	Assume full strata – prepare all documents but confirm if lodgement is required. Refer to the development brief for project specific direction.	NA
	Dual key apartments	Where dual key apartments are developed, each apartment should be fully self contained and strata ready, ADG compliant and to a minimum silver standard. Typical combinations include studio/studio or 1 bed/studio or 2 bed/1 bed.	NA

Wayfinding + Security

Wayfinding and security strategies should be integrated into the design at an early stage to include both passive and active measures.	Wayfinding + signage	Develop a comprehensive wayfinding strategy that includes spatial cues, lighting and signage. Allow for both statutory and general signage. Allow for A4 notices to be mounted in foyer. Refer to LAHC Component Requirements for material specifications.	✓
	Common security	Incorporate principles of Crime Prevention Through Environmental Design. Allow for passive surveillance of all secure entries and common gardens. Intercom required at building entries. Provide swipe access to enter apartment buildings and key and locks for town houses. Refer development brief for details.	✓

Shared Circulation

Shared circulation should be well-lit, safe and inviting, with adequate width for moving tenant furniture.	Vertical transportation	All staircases must comply with the National Construction Code; ensure any external or breezeway stairs are covered for weather protection. When lifts are required by the development brief, assume minimum 2 commercial grade lifts.	✓
	Foyers + corridors	All foyers and corridors to have hard floor finish and be naturally ventilated. Maximise natural daylighting in common areas. Use energy efficient LED lighting throughout, with warm light and bayonet fittings. Fit all artificial lighting with built in photo sensors to reduce ongoing operating costs. Ensure all common corridor dimensions are suitable for frequent moving of domestic furniture.	✓
	Maintenance access	Ensure provision of façade maintenance zones and procedures, as well as any service access to lifts or other maintenance zones.	✓

Common Rooms

Common rooms should be welcoming and low maintenance to encourage positive social interaction.	Common Rooms	When a common room is required by the brief, allow for kitchenette, lounge, wall mounted TV unit, and adjacent WC. Use resilient floor finish. Ensure natural ventilation is available in all common rooms and orient the room to overlook and open onto a garden or deck area.	✓

Common Gardens

Common gardens in multi-residential dwellings should be native, accessible and sustained for all tenants to enjoy.	Irrigation	Provide garden maintenance strategy for review. Install drip irrigation system for multi residential dwellings only when specified in development brief. Where rainwater tanks can be reticulated for garden use, install quality pump (minimum 5-year warranty).	✓
	Seating	Provide robust outdoor seating in common garden areas for tenant use and amenity. Consider proximity of seating to other dwellings to ensure tenant privacy. Integrate seating layout with tree and planting strategies.	✓
	Trees	Trees that grow taller than 3m should be planted at least 3m from the building. Deciduous trees may assist with passive solar shading. Native and drought tolerant species preferred.	✓
	Community gardens	Community gardens may be considered for large scale developments.	✓

6. LAHC Design Requirements

The LAHC Design Requirements have been assessed by the design team with all dwellings meeting the majority of applicable areas as shown in the attachments.

Tower Buildings (Matavai and Turanga)

Environmental performance principles

Passive design	Implement passive design techniques: maximise northern orientation to living spaces, calibrate eaves and solar shading on eastern, western and northern facades, relate glazing design to orientation, use deciduous trees for shading, and position windows to improve airflow and capture prevailing breezes.	✓
Net zero	Optimise roof design to accommodate solar panels. Preference electricity as the power source for all energy requirements associated with normal operations for both new projects and modifications. Aim for 'net zero ready' homes: high-performance homes with a level of energy efficiency that enables the annual energy consumption to be offset by a renewable energy system.	✓
NatHERS targets	Target minimum 7 Star NatHERS rating as an average within each new development, with a target for each dwelling of minimum 6 Star NatHERS rating for Class 2 and minimum 7 Star NatHERS rating for Class 1 and Class 1A. Higher NatHERS ratings are encouraged.	✓ 8 star average
BASIX	All new dwellings and significant modifications must comply with BASIX. Note tenant supplied appliances (fridge, dishwasher, microwave, washing machine and dryer) cannot be included in BASIX calculations.	✓
Healthy home targets	Use products that are low-VOC and low-allergenic with high recycled content. Ensure adequate air flow to limit mould, maximising the number of dwellings that are naturally cross-ventilated, i.e. dwellings where openings are in facades facing alternate aspects to maximise wind exposure. Include natural ventilation to wet areas where possible. Plan for retrofit of air conditioning (AC), where not installed from the outset.	✓
Daylighting targets	Varied, quality daylighting is essential in all dwellings to provide amenity. Apply ADG minimum solar access standards (i.e. 70% of dwellings receive a minimum of 2 hours solar access to living spaces and private open space), and exceed this standard where possible. Avoid any dwellings receiving less than 15 mins of solar access to living areas and private open space. Ensure adequate daylighting to common areas to eliminate artificial lighting during the day.	✓

Universal design principles

Baseline provision: general housing	Apply Liveable Housing Design Guidelines (LHDG) silver level to all new LAHC dwellings where level access is available, including at ground level and on floors serviced by a lift. For upper level dwellings without lift access, include silver-level features in each dwelling, to allow for future adaptation where a lift is retrofitted.	✓
Baseline provision: seniors housing	Housing SEPP Schedule 4 requirements apply to all new LAHC dwellings in seniors housing developments where level access is available, including at ground level and on floors serviced by a lift. For the upper level of 2-storey seniors housing developments without lift access, match arrangements on the ground floor, including latchside clearance, and ensure common circulation is designed in such a way that a lift can be retrofitted to access the upper level.	NA
Adaptable dwellings	Provide the percentage of adaptable dwellings required by local planning controls, at the standard defined by AS4299 Class C.	NA

External character

Site planning		
Context	Consider neighbouring buildings in the distribution of site density and open space, particularly for infill developments or where there is a change of use. Sensitive built form transitions contribute to placemaking and amenity for residents and neighbours.	✓
Site access and circulation	Use site planning, building design and landscaping to provide clear wayfinding, and legible and safe circulation. Building entries to be clearly defined and accessible. Consider direct street access for ground floor dwellings. Develop a comprehensive wayfinding strategy that includes spatial cues, lighting and signage. Avoid conflicts between pedestrian pathways and vehicle access and ensure good sightlines are available for safety. Minimise the length of on-site driveways.	✓
Topography and grades	Minimise retaining walls or steps, and target site benching with maximum 1:10 slopes to turf and garden beds. Where retaining walls are necessary, provide them at a suitable height to allow use as incidental seating. Avoid the requirement for fall protection on retaining walls.	✓
Parking	Provide parking in accordance with the development brief and applicable codes. Integrate landscape design with any surface car parking. Where possible provide landscaped break(s) and shade trees between parking spaces or rows, and between surface parking and adjacent built structures and site boundaries.	✓
Public and private space	Express the hierarchy of spaces in the design, ensuring clear separation of public, semi-public (communal) and private space. Incorporate crime prevention through environmental design (CPTED) principles and allow for passive surveillance of common circulation and gardens.	✓
OSD and stormwater	Comply with local planning controls in the management, storage, treatment and disposal of stormwater on site. Where on-site detention (OSD) tanks are required, consider location to avoid impact on deep soil, e.g. under surface car parking and driveway, or in a basement within the building footprint.	✓

Green infrastructure

Deep soil	Prioritise provision of appropriately sized and located deep soil, connected where possible to deep soil in the public domain or on neighbouring sites.	✓
Tree canopy	Retain existing healthy and well-structured established trees where possible and where beneficial to the project. Locate new trees at least 3 metres from built structures and major services, including on neighbouring properties, to avoid structural damage and reduce maintenance burden.	✓
Plant selection and landscape design	Provide landscaping that is low maintenance and drought tolerant. Select species that are appropriately scaled for the application. Preference endemic native species to contribute to fauna habitat and biodiversity, but use exotic planting if required to achieve neighbourhood character, or where specific qualities are required, such as deciduous shade trees. Plant out boundary setbacks to achieve amenity for neighbours and residents, for outlook and visual privacy. Provide planting in private open space equal in quality to common area planting. Where possible, screen private open space on street frontages with common area planting.	✓
Communal open space (COS)	Where communal open space (COS) is provided: -Maximise winter solar access. -Provide passive surveillance of COS from dwellings, common circulation or the public domain. -Integrated furniture is preferred, to reduce vandalism. -Locate COS to minimise impact of potential noise generation on residents and neighbours. -Community gardens may be considered for largescale developments.	✓
Private open space	All dwellings are to have a useable, weather-protected balcony or private outdoor area, associated with and accessed from the primary living area. Provide maintenance access where possible from common circulation to landscaped private open space, to avoid taking maintenance equipment through dwellings. Avoid small areas of turf in private open space and where regular lawn maintenance is not practical due to access or limited area for equipment storage.	✓

Exterior fixtures and finishes

Fences and boundary treatments	Ensure fences are provided to rear and side boundaries and private open space between 1.5 and 1.8 m high for privacy. Front fence height and design to be appropriate to the context; refer local council guidance. Use planting in addition to fencing to soften and screen.	✓
Roofs and rainwater goods	Permitted roof falls range from 3-25 degrees and depend on dwelling type, local character and roofing technical specification. Minimise use of box gutters and plan overflows for all gutters. Prefinished light-coloured metal roof sheeting and rainwater goods are preferred; use tile roofing where appropriate for the context or if required by the consent authority. For flat roofs, provide roof planning and waterproofing details for LAHC review.	✓
Walls	Use hard-wearing and self-finishing materials such as face brick, integral finished metals or precast concrete. Minimise painted or rendered finishes that will require scaffolding to maintain. Bird nesting, efflorescence, graffiti and other sources of staining to be designed out as much as possible.	✓
Doors and windows	Glazed doors and windows to be powder-coated or anodised aluminium, and be secure, weathertight, and easy for the tenant to clean. Provide fly screens to all openings, and security screens to any openings which can be accessed from ground level or from balconies or climbable elements. For carports and garages in single dwellings and townhouses, use garage doors if contextually appropriate. Use dead latches with key operation and release feature for external doors (including garage). Key all windows alike and ensure windows can be locked in minimum open position for secure natural ventilation.	✓
Balconies and screens	Fall balconies away from interiors, and include overflows. Floor wastes can be cast into balcony slabs, but avoid downpipes cast into structure. Integrate rainwater goods into design; avoid visible branch pipes. Design balconies, balustrades, privacy screening and solar shading to contribute to built form articulation. Screen visible utilities and clothes drying.	✓
Building entries and mailboxes	Common pathway to main entry minimum 1.2 m wide; wider for apartment buildings. Provide rain protection to building entries. Provide mail boxes for each dwelling in accordance with Australia Post's Point of Delivery Policy.	✓

Dwelling configuration

Refer to ADG

Common areas and entries

Common circulation	All foyers and corridors to have hard floor finishes and be naturally ventilated. Where possible, provide stormproof openings at either end of enclosed corridors to allow natural cross-ventilation. Maximise natural daylighting in common areas and install LED lighting with movement sensors to reduce operating costs. Ensure common corridors are sized for easy movement of furniture. Ensure any external or breezeway stairs and corridors are covered for weather protection.	✓
Communal indoor space	Where common rooms are required by codes or the LAHC development brief: -encourage positive social interaction through the design of the space -maximise amenity and outlook by locating common rooms near any communal open space -provide natural cross-ventilation and daylighting.	✓
Common entries	Refer to the LAHC development brief for secure entry and intercom requirements for apartment buildings. Where the development does not have an intercom system, each dwelling entry is to be fitted with a hard-wired door bell and door viewer.	✓

Interior fitout and finishes

Finishes generally	Unless noted otherwise in the development brief, all living areas are to have tiled floors or resilient flooring, and all bedrooms carpet. Ensure threshold transitions comply with LHDG or AS1428.1 where dwellings are required to be adaptable or accessible, including to access the private open space.	✓
Kitchens	Benchtops to be laminate or composite stone, with 20 mm overhang to cupboard fronts. Island benches with sinks must be 800 mm deep or include a splashback. Refer to the LAHC development brief for detail on minimum bench lengths and other provisions. Allow fridge space minimum 800 mm wide (studio / 1 bed) and 900 mm wide (2 bed+), 600 mm wide pantry (studio/1B underbench, 2B+ full height), minimum 450 mm wide drawer unit, and include removable 600 mm wide dummy cupboard adjacent to sink cupboard, with tiled floor under, and GPO/stopcocks in sink cupboard, suitable for tenant-supplied dishwasher.	✓
Bathrooms	Unless noted otherwise in the development brief, floors and walls to be fully tiled, including behind any storage units. Provide vanity units with leg supports (no cantilevers) and bathroom storage in vanity or behind mirror. Showers to be hobless. Review waterproofing extent and details with LAHC.	✓
Laundries	Floors tiled, as well as walls around tub and machine. Where laundry is separate to bathroom, provide dedicated floor waste in front of space for washing machine, and exhaust fan linked to GPO that will be used for tenant-supplied dryer. Provide minimum 35 L tub with integrated cabinet and bypass in all dwellings. Any doors to laundry cupboards are to be hinged not bifold.	NA
Storage	Provide linen cupboard (600 x 450 mm with shelves) and broom cupboard (600 x 450 mm) in all dwellings. All bedrooms to have built-in wardrobes with 0.6 m minimum depth and 2.4 m minimum height, 1.8 m wide to primary bedroom and 1.5 m wide to all other bedrooms, fitted with shelf and rail at minimum.	✓
Window furnishings	Provide internal window furnishings for privacy and glare control to all windows and doors, except for bathrooms, where translucent glass is preferred.	✓

Generally

Services integration	All services and utilities, including substations (kiosk or chamber), power poles, distribution boxes, sewer vents, hydrants, plumbing and drainage and communications infrastructure, are to be integrated into the overall design and located to be as unobtrusive as possible. Accessible externally mounted fittings and fixtures should be tamper proof.	✓
Metering	Electricity, gas and potable water are to be individually metered to each dwelling as the tenant is responsible for utility costs, unless otherwise noted in the LAHC development brief.	✓
Safety in design	There are a number of hold points in the design and construction program for key reviews, including statutory 'safety in design' reviews. Refer to the LAHC development brief for details.	✓
Maintenance	Provide a detailed maintenance and access plan for discussion with LAHC during design development. Service access to lifts and other equipment, as well as facade, roofs, landscaping etc, to be carefully considered to avoid unauthorised access, fall from heights and other hazards. Include this as part of mandatory safety in design reviews at key milestones.	✓

Hydraulic services

Water service	Provide garden tap(s) in both private and common garden areas, including upper balconies. Avoid situations where a hose would need to cross common pathways, driveways or on-grade car parking. Irrigation systems are not to be installed.	✓
Rainwater tanks	Rainwater tanks and rainwater re-use to be incorporated only when required by BASIX.	✓
Pits and pipes	All grates in trafficable areas to be fitted with antislip heelguard. Infill on blind pit covers to match surrounding material.	✓
Hot water service	Install heat pumps for hot water wherever possible, otherwise provide individual instantaneous gas HWU located within each dwelling's private open space, with concealed pipework and recessed box surround, finished to match adjacent surfaces. Refer LAHC development brief for arrangements for apartments.	✓

Mechanical services

Air conditioning (AC)	AC is to be provided, with solar power, for certain climate zones, refer LAHC Heating and Cooling Policy. For all other dwellings, make provision for AC to be installed by the tenant. Ensure condensate drains are provided to appropriate locations and drained using falls to tundish over sewer service (no pumps). Detail facade penetrations to retain facade weathertightness. Refer to the LAHC Specification for further detail.	✓
Exhaust fans	Provide externally ducted exhaust fans to bathrooms, WCs and laundry rooms, fitted with humidity sensors or linked to light switch or dryer GPO in accordance with the LAHC Specification.	✓
Car park exhaust	Wherever possible, design basement car parking to allow for natural ventilation. If mechanical ventilation is required, preference plenums over jet fans.	✓

Electrical services

Photovoltaic (PV) arrays	Required provision of solar systems, extent of service and metering conditions are set out in the LAHC Heating and Cooling Policy and LAHC development brief.	✓
Boards and subboards	All dwellings to be protected by residual current devices (RCDs). Where dwellings are LHDG silver level, seniors housing or are adaptable, locate distribution boards in a cupboard at an accessible height.	✓
Appliances	Provide electric cooktop, wall oven and externally ducted rangehood, refer to the LAHC specification.	✓
Light fittings and ceiling fans	Allow at least one surface-mounted light point per room and per balcony to suit furniture layout, fitted with LED lamp. Provide LED strip lights to underside of overhead kitchen cupboards, switched with abovebench GPO. All LED lighting to be 3000°K (warm white). Ceiling fans to be provided to living areas and bedrooms in line with LAHC Heating and Cooling Policy.	✓
Switches and general power outlets (GPOs)	All light switches to be 1000 mm above finished floor level (AFFL) (± 100 mm) and aligned with door handle. GPOs to be located between 600-1100mm AFFL. Provide 2 x double 10-A GPOs per room; with additional outlets in kitchen and laundry where required for appliances.	✓
Comms (data + TV)	Provide NBN network termination device (NTD) in each dwelling. Install data point and TV point in living room and main bedroom	✓
Security + CCTV	Provide CCTV, intercom and access control only when required by LAHC development brief. Strategic use of external LED lighting with movement sensors to be discussed with LAHC during design development.	✓
Smoke alarms	All required smoke detectors to be hard-wired.	✓

Vertical transportation

Lifts	Refer to the LAHC Lift Policy for appropriate lift type, numbers and minimum dimensions for the range of LAHC developments. Provide redundancy for developments 4 storeys or greater.	NA

Waste services

	Waste Provide waste facilities in accordance with local servicing council requirements and to ensure waste can be and collected within council's regular service. Allow for source separation of waste from recycling, including facilities organic (green and food) waste recycling. Plan waste storage to minimise amenity impacts (odour, acoustic) on neighbours, residents and communal space. Minimise the visual impact to the street through careful integration, and consider accessibility for tenants with mobility issues. Waste chutes are appropriate for developments of 4 storeys or greater. Avoid E-diverter chutes which can cause maintenance issues when misused.	✓

Slab Buildings (Marton, Solander, James Cook, Joseph Banks)

Environmental performance principles

Passive design	Implement passive design techniques: maximise northern orientation to living spaces; calibrate eaves and solar shading on eastern, western and northern facades; relate glazing design to orientation, use deciduous trees for shading, and position windows to improve airflow and capture prevailing breezes.	✓
Net zero	Optimise roof design to accommodate solar panels. Preference electricity as the power source for all energy requirements associated with normal operations for both new projects and modifications. Aim for 'net zero ready' homes: high-performance homes with a level of energy efficiency that enables the annual energy consumption to be offset by a renewable energy system.	✓
HotHERS targets	Target minimum 7 Star HotHERS rating as an average within each new development, with a target for each dwelling of minimum 6 Star HotHERS rating for Class 2 and minimum 7 Star HotHERS rating for Class 1 and Class 1A. Higher HotHERS ratings are encouraged.	✓ 7.7 star average
BASIX	All new dwellings and significant modifications must comply with BASIX. Note tenant supplied appliances (fridge, dishwasher, microwave, washing machine and dryer) cannot be included in BASIX calculations.	✓
Healthy home targets	Use products that are low-VOC and low-allergenic with high recycled content. Ensure adequate air flow to limit mould, maximising the number of dwellings that are naturally cross-ventilated, i.e. dwellings where openings are in facades facing alternate aspects to maximise wind exposure. Include natural ventilation to wet areas where possible. Plan for retrofit of air conditioning (AC), where not installed from the outset.	✓
Daylighting targets	Varied, quality daylighting is essential in all dwellings to provide amenity. Apply ADG minimum solar access standards (i.e. 70% of dwellings receive a minimum of 2 hours solar access to living spaces and private open space), and exceed this standard where possible. Avoid any dwellings receiving less than 15 mins of solar access to living areas and private open space. Ensure adequate daylighting to common areas to eliminate artificial lighting during the day.	✓

Universal design principles

Baseline provision: general housing	Apply Livable Housing Design Guidelines (LHDG) silver level to all new LAHC dwellings where level access is available, including at ground level and on floors serviced by a lift. For upper level dwellings without lift access, include silver-level features in each dwelling, to allow for future adaptation where a lift is retrofitted.	✓
Baseline provision: seniors housing	Housing SEPP Schedule 4 requirements apply to all new LAHC dwellings in seniors housing developments where level access is available, including at ground level and on floors serviced by a lift. For the upper level of 2-storey seniors housing developments without lift access, match arrangements on the ground floor, including latchside clearance, and ensure common circulation is designed in such a way that a lift can be retrofitted to access the upper level.	NA
Adaptable dwellings	Provide the percentage of adaptable dwellings required by local planning controls, at the standard defined by AS4299 Class C.	NA

External character

Site planning		
Context	Consider neighbouring buildings in the distribution of site density and open space, particularly for infill developments or where there is a change of use. Sensitive built form transitions contribute to placemaking and amenity for residents and neighbours.	✓
Site access and circulation	Use site planning, building design and landscaping to provide clear wayfinding, and legible and safe circulation. Building entries to be clearly defined and accessible. Consider direct street access for ground floor dwellings. Develop a comprehensive wayfinding strategy that includes spatial cues, lighting and signage. Avoid conflicts between pedestrian pathways and vehicle access and ensure good sightlines are available for safety. Minimise the length of on-site driveways.	✓
Topography and grades	Minimise retaining walls or steps, and target site benching with maximum 1:18 slopes to turf and garden beds. Where retaining walls are necessary, provide them at a suitable height to allow use as incidental seating. Avoid the requirement for fall protection on retaining walls.	✓
Parking	Provide parking in accordance with the development brief and applicable codes. Integrate landscape design with any surface car parking. Where possible provide landscaped break(s) and shade trees between parking spaces or rows, and between surface parking and adjacent built structures and site boundaries.	✓
Public and private space	Express the hierarchy of spaces in the design, ensuring clear separation of public, semi-public (communal) and private space. Incorporate crime prevention through environmental design (CPTED) principles and allow for passive surveillance of common circulation and gardens.	✓
OSD and stormwater	Comply with local planning controls in the management, storage, treatment and disposal of stormwater on site. Where on-site detention (OSD) tanks are required, consider location to avoid impact on deep soil, e.g. under surface car parking and driveway, or in a basement within the building footprint.	✓

Green infrastructure

Deep soil	Prioritise provision of appropriately sized and located deep soil, connected where possible to deep soil in the public domain or on neighbouring sites.	✓
Tree canopy	Retain existing healthy and well-structured established trees where possible and where beneficial to the project. Locate new trees at least 3 metres from built structures and major services, including on neighbouring properties, to avoid structural damage and reduce maintenance burden.	✓
Plant selection and landscape design	Provide landscaping that is low maintenance and drought tolerant. Select species that are appropriately scaled for the application. Preference endemic native species to contribute to fauna habitat and biodiversity, but use exotic planting if required to achieve neighborhood character, or where specific qualities are required, such as deciduous shade trees. Plant out boundary setbacks to achieve amenity for neighbours and residents, for outlook and visual privacy. Provide planting in private open space equal in quality to common area planting. Where possible, screen private open space on street frontages with common area planting.	✓
Communal open space (COS)	Where communal open space (COS) is provided: -Maximise winter solar access. -Provide passive surveillance of COS from dwellings, common circulation or the public domain. -Integrated furniture is preferred, to reduce vandalism. -Locate COS to minimise impact of potential noise generation on residents and neighbours. -Community gardens may be considered for largescale developments.	✓
Private open space	All dwellings are to have a useable, weather-protected balcony or private outdoor area, associated with and accessed from the primary living area. Provide maintenance access where possible from common circulation to landscaped private open space, to avoid taking maintenance equipment through dwellings. Avoid small areas of turf in private open space and where regular lawn maintenance is not practical due to access or limited area for equipment storage.	✓

Exterior fixtures and finishes

Fences and boundary treatments	Ensure fences are provided to rear and side boundaries and private open space between 1.5 and 1.8 m high for privacy. Front fence height and design to be appropriate to the context; refer local council guidance. Use planting in addition to fencing to soften and screen.	✓
Roofs and rainwater goods	Permitted roof falls range from 3–25 degrees and depend on dwelling type, local character and roofing technical specification. Minimise use of box gutters and plan overflows for all gutters. Prefinished light-coloured metal roof sheeting and rainwater goods are preferred, use tile roofing where appropriate for the context or if required by the consent authority. For flat roofs, provide roof planning and waterproofing details for LAHC review.	✓
Walls	Use hard-wearing and self-finishing materials such as face brick, integral finished metals or precast concrete. Minimise painted or rendered finishes that will require scaffolding to maintain. Bird nesting, efflorescence, graffiti and other sources of staining to be designed out as much as possible.	✓
Doors and windows	Glazed doors and windows to be powder-coated or anodised aluminium, and be secure, weathertight, and easy for the tenant to clean. Provide fly screens to all openings, and security screens to any openings which can be accessed from ground level or from balconies or climbable elements. For carports and garages in single dwellings and townhouses, use garage doors if contextually appropriate. Use dead latchers with key operation and release feature for external doors (including garage). Key all windows alike and ensure windows can be locked in minimum open position for secure natural ventilation.	✓
Balconies and screens	Rail balconies away from interiors, and include overflows. Floor wastes can be cast into balcony slabs, but avoid downpipes cast into structure. Integrate rainwater goods into design; avoid visible trench pipes. Design balconies, balustrades, privacy screening and solar shading to contribute to built form articulation. Screen visible utilities and clothes drying.	✓
Building entries and mailboxes	Common pathway to main entry minimum 1.2 m wide; wider for apartment buildings. Provide rain protection to building entries. Provide mail boxes for each dwelling in accordance with Australia Post's Point of Delivery Policy.	✓

Dwelling configuration

Refer to ADG

Common areas and entries

Common circulation	All foyers and corridors to have hard floor finishes and be naturally ventilated. Where possible, provide stormproof openings at either end of enclosed corridors to allow natural cross-ventilation. Maximise natural daylighting in common areas and install LED lighting with movement sensors to reduce operating costs. Ensure common corridors are sized for easy movement of furniture. Ensure any external or breezeway stairs and corridors are covered for weather protection.	✓
Communal indoor space	Where common rooms are required by codes or the LAHC development brief: -encourage positive social interaction through the design of the space -maximise amenity and outlook by locating common rooms near any communal open space -provide natural cross-ventilation and daylighting.	✓
Common entries	Refer to the LAHC development brief for secure entry and intercom requirements for apartment buildings. Where the development does not have an intercom system, each dwelling entry is to be fitted with a hard-wired door bell and door viewer.	✓

Interior fitout and finishes

Finishes generally	Unless noted otherwise in the development brief, all living areas are to have tiled floors or resilient flooring, and all bedrooms carpet. Ensure threshold transitions comply with LHDG or AS1428.1 where dwellings are required to be adaptable or accessible, including to access the private open space.	✓
Kitchens	Benchtops to be laminate or composite stone, with 20 mm overhang to cupboard fronts. Island benches with sinks must be 900 mm deep or include a splashback. Refer to the LAHC development brief for detail on minimum bench lengths and other provisions. Allow fridge space minimum 900 mm wide (studio / 1 bed) and 900 mm wide (2 bed+), 600 mm wide pantry (studio/1B underbench, 2B+ full height), minimum 450 mm wide drawer unit, and include removable 600 mm wide dummy cupboard adjacent to sink cupboard, with tiled floor under, and GPO/s+spoocks in sink cupboard, suitable for tenant-supplied dishwasher.	✓
Bathrooms	Unless noted otherwise in the development brief, floors and walls to be fully tiled, including behind any storage units. Provide vanity units with leg supports (no cantilevers) and bathroom storage in vanity or behind mirror. Showers to be hobless. Review waterproofing extent and details with LAHC.	✓
Laundries	Floors tiled, as well as walls around tub and machine. Where laundry is separate to bathroom, provide dedicated floor waste in front of space for washing machine, and exhaust fan linked to GPO that will be used for tenant-supplied dryer. Provide minimum 35 L tub with integrated cabinet and bypass in all dwellings. Any doors to laundry cupboards are to be hinged not bifold.	NA
Storage	Provide linen cupboard (600 x 450 mm with shelves) and broom cupboard (600 x 450 mm) to all dwellings. All bedrooms to have built-in wardrobes with 0.6 m minimum depth and 2.4 m minimum height, 1.2 m wide to primary bedroom and 1.5 m wide to all other bedrooms, fitted with shelf and rail at minimum.	✓
Window furnishings	Provide internal window furnishings for privacy and glare control to all windows and doors, except for bathrooms, where translucent glass is preferred.	✓

Generally

Services integration	All services and utilities, including substations (kiosk or chamber), power poles, distribution boxes, sewer vents, hydrants, plumbing and drainage and communications infrastructure, are to be integrated into the overall design and located to be as unobtrusive as possible. Accessible externally mounted fittings and fixtures should be tamper proof.	✓
Metering	Electricity, gas and potable water are to be individually metered to each dwelling as the tenant is responsible for utility costs, unless otherwise noted in the LAHC development brief.	✓
Safety in design	There are a number of hold points in the design and construction program for key reviews, including statutory 'safety in design' reviews. Refer to the LAHC development brief for details.	✓
Maintenance	Provide a detailed maintenance and access plan for discussion with LAHC during design development. Service access to lifts and other equipment, as well as facade, roofs, landscaping etc, to be carefully considered to avoid unauthorised access, fall from heights and other hazards. Include this as part of mandatory safety in design reviews at key milestones.	✓

Hydraulic services

Water service	Provide garden tap(s) in both private and common garden areas, including upper balconies. Avoid situations where a hose would need to cross common pathways, driveways or on-grade car parking. Irrigation systems are not to be installed.	✓
Rainwater tanks	Rainwater tanks and rainwater re-use to be incorporated only when required by BASIX.	✓
Pits and pipes	All grates in trafficable areas to be fitted with antislip heelguard. Infill on blind pit covers to match surrounding material.	✓
Hot water service	Install heat pumps for hot water wherever possible, otherwise provide individual instantaneous gas HWU located within each dwelling's private open space, with concealed pipework and recessed box surround, finished to match adjacent surfaces. Refer LAHC development brief for arrangements for apartments.	✓

Mechanical services

Air conditioning (AC)	AC is to be provided, with solar power, for certain climate zones, refer LAHC Heating and Cooling Policy. For all other dwellings, make provision for AC to be installed by the tenant. Ensure condensate drains are provided to appropriate locations and drained using falls to tundish over sewer service (no pumps). Detail façade penetrations to retain façade weathertightness. Refer to the LAHC Specification for further detail.	✓
Exhaust fans	Provide externally ducted exhaust fans to bathrooms, WCs and laundry rooms, fitted with humidity sensors or linked to light switch or dryer GPO in accordance with the LAHC Specification.	✓
Car park exhaust	Wherever possible, design basement car parking to allow for natural ventilation. If mechanical ventilation is required, preference planums over jet fans.	✓

Electrical services

Photovoltaic (PV) arrays	Required provision of solar systems, extent of service and metering conditions are set out in the LAHC Heating and Cooling Policy and LAHC development brief.	✓
Boards and subboards	Devices (RCDs). Where dwellings are HDG silver level, seniors housing or are adaptable, locate distribution boards in a cupboard at an accessible height.	✓
Appliances	Provide electric cooktop, wall oven and externally ducted rangehood. refer to the LAHC specification.	✓
Light fittings and ceiling fans	Allow at least one surface-mounted light point per room and per balcony to suit furniture layout. fitted with LED lamp. Provide LED strip lights to underside of overhead kitchen cupboards, switched with above-bench GPO. All LED lighting to be 3000°K (warm white). Ceiling fans to be provided to living areas and bedrooms in line with LAHC Heating and Cooling Policy.	✓
Switches and general power outlets (GPOs)	All light switches to be 1000 mm above finished floor level (AFFL) (± 100 mm) and aligned with door handle. GPOs to be located between 600–1200mm AFFL. Provide 1 x double 10-A GPOs per room; with additional outlets in kitchen and laundry where required for appliances.	✓
Comms (data + TV)	Provide NBN network termination device (NTD) in each dwelling. Install data point and TV point in living room and main bedroom	✓
Security + CCTV	Provide CCTV, intercom and access control only when required by LAHC development brief. Strategic use of external LED lighting with movement sensors to be discussed with LAHC during design development.	✓
Smoke alarms	All required smoke detectors to be hard-wired.	✓

Vertical transportation

Lifts	Refer to the LAHC Lift Policy for appropriate lift type, numbers and minimum dimensions for the range of LAHC developments. Provide redundancy for developments 4 storeys or greater.	NA

Waste services

	Waste Provide waste facilities in accordance with local servicing council requirements and to ensure waste can be and collected within council's regular service. Allow for source separation of waste from recycling, including: facilities organic (green and food) waste recycling. Plan waste storage to minimise amenity impacts (odour, acoustic) on neighbours, residents and communal space. Minimise the visual impact to the street through careful integration, and consider accessibility for tenants with mobility issues. Waste chutes are appropriate for developments of 4 storeys or greater. Avoid E-diverter chutes which can cause maintenance issues when misused.	✓

WITT Consulting

Confluence ID: 705659419

Witt Consulting Pty Ltd
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44 City Road Chippendale NSW 2008

Version	Prepared By	Approved By	Date	Change Summary
1.0	SHAN	RW	14 May 2025	

Re: Waterloo Refurbishment Study - Central and North Buildings
Advice Reference: WittC-OFFICE Architects-BJL-2-L-1.0

Attention **Alex Jones**
alexjonesarch@gmail.com

1. Overview

At the request of Alex Jones for OFFICE Architects, Witt Consulting have prepared this structural condition assessment that is representative of the central and northern buildings. The brief, fee acceptance and completed scope of works are summarised below in Table 1.

Client Name	OFFICE Architects
Project Name	Waterloo Refurbishment Study
Project Key	BJL
Design Item(s)	Waterloo Refurbishment Study - Central and North Buildings
Location	The location of the inspected items is shown in **Appendix A**.
Other Information Documents	• 241128_RRR Waterloo_Background.pdf
Work Order / Request to Commence Work	From Alex Jones via email, 8 May 2025
Fee Reference	WittC-OFFARCH-BJL-1-P-1
Scope of Works Completed	WSC1 and WSC2 from fee WittC-OFFARCH-BJL-1-P-1
Site Inspections	Scott Hansford attended site on 09 May 2025 in the company of Eddie Ma.

WITT Consulting

Confluence ID: 705659419

Document Ref: WittC-OFFICE Architects-BJL-2-L-1.0

List of Appendices	Appendix A - Site Location Appendix B - Photographic Record of Inspection

Table 1 - Brief

2. Inspection

Six reinforced concrete buildings are proposed for refurbishment—four of which are 17-storey structures, while the remaining two are 30-storey towers. To assess the typical condition of each building type, two buildings were selected for inspection: Matavai (a 30-storey tower) and Daniel Solander (a 17-storey building). The locations of these inspected buildings are provided in **Appendix A**.

2.1 Rationale

Given the repetitive nature of the buildings' design and the minimal variation in environmental conditions across locations, we consider the inspection of one building from each construction type (tower and slab block) to be a sufficient and representative sample of the six buildings in question.

Given that the buildings were occupied and fully fitted out at the time of inspection, the focus was placed on examining the concrete structural core located near the lift shafts and fire staircases. Structural defects (if any) would be most significant at the core.

The following conditions encountered imposed limitations on the inspection works undertaken which may affect what is documented:

- No alterations were made during the inspection, and no invasive investigations were undertaken.
  - Inspection of the exterior was undertaken from ground level.
  - No equipment, stored materials, signage, etc were moved or removed during the inspection.
  - The roof (internal or external) could not be inspected.
- All inspections were carried out visually and without the use of non-invasive equipment, such as GPR scanning.
  - Tap testing was undertaken on discrete locations of exposed concrete.

3. Investigation Findings

Structurally, the inspected buildings are in good condition, with no significant defects identified during the inspection that would require repair. However, we observed damaged services—primarily leaking or corroded pipes—that are contributing to water ingress within the structure.

Based on their current condition, we expect the structures to remain serviceable for an extended period, likely exceeding 100 years. See **Appendix B** for photographs taken during the inspection.

8. Environmentally Sustainable Design (ESD) Statement

The ESD statement was provided by Makao Sustainability with the executive suammary provided below.

makao

Solander & Mataval Towers, Waterloo, NSW 2017

1.0 Executive Summary

Makao has been engaged by OFFICE to undertake a sustainability study for the proposed works at Solander & Mataval Towers, Waterloo, NSW 2017, applying the Repair, Retain, and Reinvest model. This approach represents a paradigm shift in sustainable development: rather than demolishing existing structures, we retain significant portions of the envelope and structural elements, repair them to meet current code requirements, and reinvest the capital savings into broader community and public housing improvements.

1.1 THE RRR MODEL & DUAL CARBON BENEFITS

The carbon story of buildings has two parts, and we've grown rather good at addressing only one of them. We focus intently on operational emissions—the steady energy consumption over decades—whilst often ignoring the enormous carbon that comes with tearing things down and building them back up again.

The RRR model covers both:

1. **Repair work** dramatically improves operational energy performance and reduce ongoing emissions whilst maximising occupant comfort (over 80% in energy savings from space heating and cooling in some dwellings).
2. **Retention strategies** significantly reduce embodied carbon emissions—avoiding the substantial environmental cost of demolition and reconstruction, commonly referred to as Upfront Carbon.

The real value emerges from how these approaches support each other. Capital not spent on demolition and reconstruction becomes available for sophisticated building upgrades. Better-performing buildings, in turn, demonstrate the wisdom of retention over replacement—a logic that makes sense whether your priority is carbon reduction or cost management. As energy prices continue their upward trajectory and technology advances, the economic case for sophisticated energy efficiency measures has fundamentally shifted. Through NatHERS thermal performance modelling, Makao has identified solutions that deliver both environmental and financial returns, along with improved occupant comfort, enabling informed decision-making for the long-term performance of these refurbished towers.

FIGURE 1: LIFECYCLE STAGES
Datasource: BS EN 15978:2011

FIGURE 1: A BUILDING'S LIFECYCLE STAGES ALONG WITH THE EMBODIED CARBON. IMAGE: NEW BUILDINGS INSTITUTE.

https://office.org.au/
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makao

Solander & Mataval Towers, Waterloo, NSW 2017

1.2 KEY ESD COMMITMENTS:

These commitments reflect a considered balance between technical ambition and practical delivery. Each measure has been evaluated not merely for its environmental credentials, but for its contribution to a coherent building performance strategy that residents will actually experience as improved comfort, reduced costs, and reliable operation over decades of use.

1. **Building envelope improvements** incorporating energy-efficient fabric upgrades, external shading systems, and passive design principles to achieve a 7.0-star NatHERS development average whilst maximising natural ventilation and daylighting opportunities
   a. Solander Tower: 7.7-star development average. This represents an average 5.32-star increase per unit and **81% reduction** in heating/cooling energy demand.
   b. Mataval Tower Type A: 7.7-star development average. This represents a typical 6.36-star increase per unit and **87% reduction** in heating/cooling energy demand.
   c. Mataval Tower Type B: 8.3-star development average. This represents a 5.36-star increase per unit and **82% reduction** in heating/cooling energy demand. Many units will achieve comfort without needing mechanical heating or cooling.
   d. These result above is based on the building fabric assumptions outlined in this report (see preceding sections).
2. **Solar photovoltaic system** utilising the full extent of available roof area with flush-mounted high-efficiency panels (15.2kW initial capacity) to offset building energy consumption
3. **Individual heat pump systems** serving space conditioning and domestic hot water (DHW) for each unit, offering residents direct control over their comfort and energy costs whilst achieving superior seasonal efficiency compared to traditional gas and electric resistance system
4. **Comprehensive metering strategy** providing granular monitoring of water and electrical power across individual tenancies and common areas
5. **Modern building controls** through integrated LED or compact fluorescent lighting systems, incorporating presence sensors and/or daylight dimming
6. **Water management systems** (water efficient fixtures and fittings); and capturing rainwater from roof areas for site-wide irrigation and non-potable uses, reducing mains water demand
7. **All electric development** featuring electric power for space heating and cooling, hot water heating, and cooking appliances
8. **High-performance appliances** and systems including LED lighting throughout, induction cooktops and electric ovens, and appliances meeting specified BASIX star ratings

This project exemplifies how the RRR model can achieve superior sustainability outcomes whilst supporting broader housing objectives—demonstrating that retention and strategic reinvestment can outperform conventional redevelopment approaches both environmentally and economically. As a minimum standard, all residential units will meet or exceed BASIX requirements (energy, water and thermal performance). And non-residential spaces complying with relevant NCC 2022 Section J standards.

In summary, the proposed development will attain the required **BASIX scores** as follows:

TABLE 1: BASIX RESULTS SUMMARY

Description	Water	Thermal Comfort	Energy
Required BASIX score	40%	Pass	60%
Project score	57%	Pass	64%

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EXECUTIVE SUMMARY

Melbourne Quantity Surveyors

Proposed Apartment Compliance Study
Marton & Solander Towers,
Waterloo, NSW

Cost Plan No.1
Revision A
Feasibility

17 June 2025

BUILDING AREAS	AREA (m2)
Fully Enclosed Covered Areas (FECA)	19100 m²
Unenclosed Covered Areas (UCA)	5355 m²
Gross Floor Areas (GFA) (FECA + UCA)	24455 m²

INTRODUCTION

The Cost Plan is based on Feasibility documents from OFFICE.

DOCUMENTS

This Cost Plan is based on the following documents provided by OFFICE.

Architectural drawings dated 21st May 2025

TOTAL CONSTRUCTION COST ESTIMATE

The current anticipated Total End Cost is:

	Per Building	Both Buildings
Building Works	$76,292,500	$152,585,000
External Works and Services	$670,000	$1,340,000
Contingencies and Allowances	$15,394,000	$30,788,000
Fees, FFE, ITC and Other Client Items	$0	$0
Escalation	$7,757,000	$15,514,000
Sub-Total ex GST	**$100,113,500**	**$200,227,000**
GST	$10,011,350	$20,022,700
Total End Cost	**$110,124,850**	**$220,249,700**

Note:

The Cost Plan is based on preliminary information and therefore should be regarded as indicative only of the possible order of cost.
The cost of various components of the Cost Plan could vary significantly depending on the final design, materials selection and quality of the proposed building works.

We recommend that a detailed Cost Plan be prepared at Schematic Design stage to verify the anticipated total cost.

Refer to the attached Cost Plan No.1 for details.

Tuesday, 17 June 2025

Melbourne Quantity Surveyors

Proposed Apartment Compliance Study
Marton & Solander Towers,

Cost Plan No.1
Revision A
Feasibility

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EXECUTIVE SUMMARY

Melbourne Quantity Surveyors

Proposed Apartment Compliance Study
Marton & Solander Towers,
Waterloo, NSW

17 June 2025

Cost Plan No.1
Revision A
Feasibility

BUILDING AREAS	AREA (m2)
Fully Enclosed Covered Areas (FECA)	19100 m²
Unenclosed Covered Areas (UCA)	5355 m²
Gross Floor Areas (GFA) (FECA + UCA)	24455 m²

INCLUSIONS

The Cost Plan includes allowances for the following:

- Preliminaries
- Overheads and Profit
- Building works
- External works
- External Services
- Demolition
- Soft Landscaping
- GST
- Design contingencies
- Construction contingencies
- Cost escalation up to completion of construction June 2028
- Competitive Tendering
- Security and intercom system

EXCLUSIONS

The Cost Plan excludes the following:

- Hard Landscaping
- Design Consultants' fees
- Site and services infrastructure upgrades
- Automation, IT, AV and communications equipment
- Supply authority and headworks charges
- FF&E including loose furniture, window dressings & equipment etc
- Cost escalation after June, 2025
- Project management fees
- Building Permit, Council and sundry fees
- Environmentally sustainable design initiatives
- Disbursements
- Management support costs
- Decanting, relocation and temporary accommodation
- Rainwater harvesting
- Asbestos removal
- Rock excavation
- Site decontamination
- Adverse ground conditions
- Out of hours works

EXECUTIVE SUMMARY

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Marton & Solander Towers,
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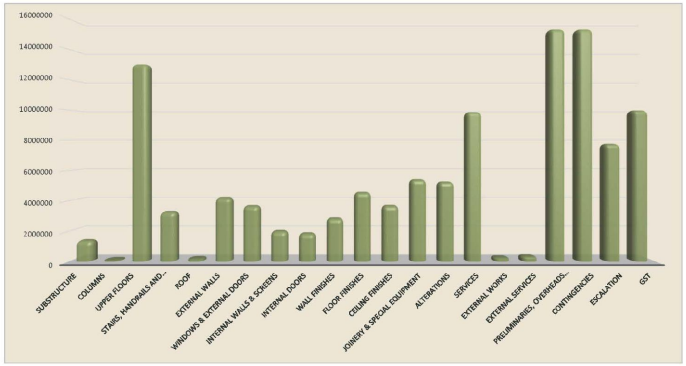
Gross Floor Areas (GFA) (FECA + UCA)	24455 m²

COST SUMMARY

	$/m² FECA	GFA $/m²	
TOTAL BUILDING COST (TBC) (June, 2025)	$3,135	$2,946	$76,292,500
TOTAL CONSTRUCTION COST (TCC) (June, 2025)	$4,323	$3,830	$92,356,500
TOTAL PROJECT COST (TPC) (June, 2025)	$4,323	$3,830	$92,356,500
TOTAL - END COST (TEC) (June, 2028)	$4,273	$4,039	$110,124,850

COST DISTRIBUTION



Melbourne Quantity Surveyors

Proposed Apartment Compliance Study
Matavai and Turanga Towers,
Waterloo, NSW

Cost Plan No.1
Revision A
Feasibility

16 June 2025

BUILDING AREAS	AREA (m2)
Fully Enclosed Covered Areas (FECA)	1291 m²
Unenclosed Covered Areas (UCA)	165 m²
Gross Floor Areas (GFA) (FECA + UCA)	1456 m²

INTRODUCTION

The Cost Plan is based on Feasibility documents from OFFICE.

DOCUMENTS

This Cost Plan is based on the following documents provided by OFFICE.

Architectural drawings dated 14th May 2025

TOTAL CONSTRUCTION COST ESTIMATE

The current anticipated Total End Cost is:

	Per Tower	Both Towers Total
Building Works	$45,656,100	$91,312,200
External Works and Services	$432,000	$864,000
Contingencies and Allowances	$9,218,000	$18,436,000
Fees, FFE, ITC and Other Client items	$0	$0
Escalation	$4,646,000	$9,292,000
Sub-Total ex GST	**$59,952,100**	**$119,904,200**
GST	$5,995,210	$11,990,420
Total End Cost	**$65,947,310**	**$131,894,620**

Note:

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The cost of various components of the Cost Plan could vary significantly depending on the final design, materials selection and quality of the proposed building works.

We recommend that a detailed Cost Plan be prepared at Schematic Design stage to verify the anticipated total cost.

Refer to the attached Cost Plan No.1 for details.

Monday, 16 June 2025

Melbourne Quantity Surveyors

Proposed Apartment Compliance Study
Matavai and Turanga Towers,
Waterloo, NSW

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- Preliminaries
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- Competitive Tendering
- Security and intercom system

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The Cost Plan excludes the following:

- External works
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- Design Consultants' fees
- Site and services infrastructure upgrades
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- Supply authority and headworks charges
- FF&E including loose furniture, window dressings & equipment etc
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- Building Permit, Council and sundry fees
- Environmentally sustainable design initiatives
- Disbursements
- Management support costs
- Decanting, relocation and temporary accommodation
- Prolongation and delay risk
- Rainwater harvesting
- Asbestos removal
- Rock excavation
- Site decontamination
- Adverse ground conditions
- Out of hours works

EXECUTIVE SUMMARY

Melbourne Quantity Surveyors

Proposed Apartment Compliance Study
Matavai and Turanga Towers,
Waterloo, NSW

Cost Plan No.1
Revision A
Feasibility

16 June 2025

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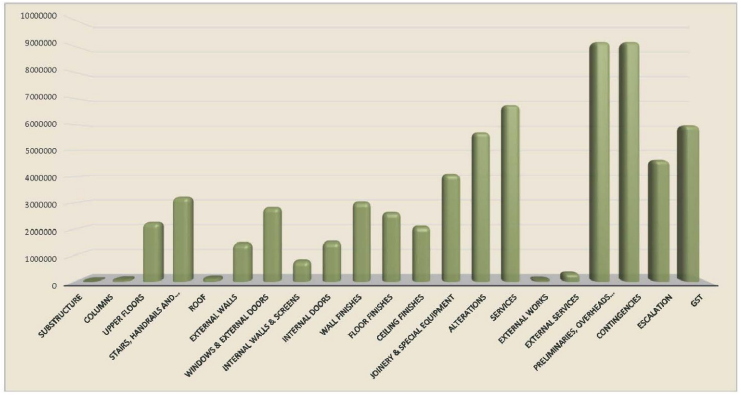
Fully Enclosed Covered Areas (FECA)	1291 m²
Unenclosed Covered Areas (UCA)	165 m²
Gross Floor Areas (GFA) (FECA + UCA)	1456 m²

COST SUMMARY

	$/m² FECA	GFA $/m²	
TOTAL BUILDING COST (TBC) (June, 2025)	$35,365	$31,357	$45,656,100
TOTAL CONSTRUCTION COST (TCC) (June, 2025)	$42,840	$37,985	$55,306,100
TOTAL PROJECT COST (TPC) (June, 2025)	$42,840	$37,985	$55,306,100
TOTAL - END COST (TEC) (June, 2028)	$51,082	$45,293	$65,947,310

COST DISTRIBUTION



Cerclos

Executive Summary

This Life Cycle Assessment has been completed for the Whole Building located at Waterloo Public Housing Estate. The lead author is Swaulinten of and an independent review has not yet been conducted. The goal of this study is to profile and improve the environmental performance of the construction works. The study has been conducted in accordance with ISO 14044 and EN15978.

About the Design

The focus design of the study is named Improved Design through the report and is an aspirational design including improvement strategies for consideration of the design team and other stakeholders.

Results

The results of the study are shown in the table below. The most significant life cycle stage for each environmental indicator is highlighted.

Characterised Impacts, Absolute (No Functional Unit), lifeTime Pole		Construction Phases	Use Phases	End of Life Phases	Benefits and Loads Beyond the System Boundary	Life Cycle
		A	B	C	D	A - D
Environmental Impacts						
Global Warming Potential Total, GWP	kg CO_2 eq	3.61E+6	1.45E+7	5.23E+5	-1.65E+6	2.00E+7
Ozone Depletion Potential, ODP	kg CFC-11eq	4.47E-1	1.47E2	1.31E-2	-4.60E-2	1.48E2
Acidification Potential for Soil and Water, AP	kg SO_2 eq	1.87E+5	4.37E+5	1.16E+5	-2.25E+5	8.04E+5
Eutrophication potential, EP	kg PO_4 eq	5.55E+3	1.63E+4	2.56E+3	-9.75E+3	1.85E+4
Photochemical Ozone Creation Potential, POCP	kg ethylene	2.23E+6	5.97E+6	7.93E+5	-2.63E+6	6.77E+6
Abiotic Depletion Potential - Elements, ADPE	kg antimony	4.91E+3	9.35E+3	2.15E+3	-2.73E+3	1.33E+4
Abiotic Depletion Potential - Fossil Fuels, ADPF	MJ	5.51E+7	2.13E+8	7.92E+6	-1.53E+8	2.92E+8
Additional Indicators						
Land Use	m^2.year arable	5.16E+5	2.03E+5	4.93E3	-7.51E+4	7.53E+5
Resource Use						
Net use of fresh water, FW	kg	1.24E+6	1.51E+7	2.71E+5	-4.03E+5	1.53E+7

Analysis

The report shows that the **Improved Design** has a total Global Warming Potential Total, GWP impact of **20170000.121 kg CO_2 eq overall**. The **Integrated Operational Energy (IO)**-GWP impacts are the most dominant life cycle module in the Improved Design design followed by the **Integrated Operational Energy and Other Operational Energy (IO+)** and then **Product Stage (A1A3)**.

further analysis reveals:

- The **Repair Processes** is the highest impact construction category;
- **Domestic Water Heating** is the highest operational impact by demand category;
- The **Electricity** is this highest impact operational impact by supply source;
- **Ceramics | Tiles | Ceramic Tiles** is the highest impact material category;
- **Electrical Equipment, Small with transport and treatment, Electricity** is the highest people and equipment impact

eTool

Cerclos

Executive Summary

This Life Cycle Assessment has been completed for the Whole Building located at Waterloo Public Housing Estate. The lead author is Steve Minten of and an independent review has not yet been conducted. The goal of this study is to profile and improve the environmental performance of the construction works. The study has been conducted in accordance with ISO 14044 and EN15978.

About the Design

The focus design of the study is named Business as Usual through the report and is an equivalent benchmark design (or weighted statistical mix of designs) with conventional products, construction methods and use patterns.

Results

The results of the study are shown in the table below. The most significant life cycle stage for each environmental indicator is highlighted.

Characterised Impacts Absolute (No Functional Unit), lifeTime Scale		Construction Phases	Use Phases	End of Life Phases	Benefits and Loads Beyond the System Boundary	Life Cycle
		A	B	C	D	A - D
Environmental Impacts						
Global Warming Potential Total, GWP	kg CO_2 eq	1.62E+7	1.45E+7	2.23E+5	-1.13E5	3.33E+7
Ozone Depletion Potential, ODP	kg CFC-11eq	1.49E2	1.32E2	2.31E-4	-1.27E-5	2.57E2
Acidification Potential for Soil and Water, AP	kg SO_2 eq	3.01E+5	3.06E+5	5.56E+3	-2.25E+3	1.54E+6
Eutrophication potential, EP	kg PO_4 eq	9.75E+3	1.40E+4	1.23E+3	-3.15E+3	2.65E+4
Photochemical Ozone Creation Potential, POCP	kg ethylene	6.47E+3	6.10E+3	4.10E+3	-1.47E+3	1.31E+4
Abiotic Depletion Potential - Elements, ADPE	kg antimony	1.03E3	1.42E+3	6.46E+1	0.00E+1	2.51E+3
Abiotic Depletion Potential - Fossil Fuels, ADPF	MJ	8.81E+5	1.46E+6	6.46E+3	1.06E+5	2.40E+6
Additional Indicators						
Land Use	m^2.year arable	3.62E+3	2.07E+3	2.15E+1	1.02E3	6.85E+3
Resource Use						
Net use of fresh water, FW	kg	6.01E+7	1.75E+7	1.23E+3	-2.25E+5	8.25E+7

Analysis

The report shows that the **Business as Usual** has a total Global Warming Potential Total, GWP impact of **33782431.331 kg CO_2 eq overall**. The **Product Stage (A1A3)**-GWP impacts are the most dominant life cycle module in the Business as Usual design followed by the **Integrated Operational Energy and Other Operational Energy (IO+)** and then **Replacements (R4)**.

further analysis reveals:

- The **Sub-structure** is the highest impact construction category;
- **Appliances | Entertainment** is the highest operational impact by demand category;
- The **Electricity** is this highest impact operational impact by supply source;
- **Concrete | Lime | Mortar | Portland Cement, Bulk | 40 MPa** is the highest impact material category;
- **Crane, Electric** is the highest people and equipment impact

eTool

Executive Summary

This Life Cycle Assessment has been completed for the Whole Building, located at Waterloo Public Housing Estate. The lead author is Steve Minkin of and an independent review has not yet been conducted. The goal of this study is to profile and improve the environmental performance of the construction works. The study has been conducted in accordance with ISO 14044 and EN15978.

About the Design

The focus design of the study is named Business as Usual through the report and is an equivalent benchmark design (or weighted statistical mix of designs) with conventional products, construction methods and use patterns.

Results

The results of the study are shown in the table below. The most significant life cycle stage for each environmental indicator is highlighted.

Characterised Impacts, Absolute (No Functional Unit), No Time Scale		Construction Phases	Use Phases	End of Life Phases	Benefits and Loads Beyond the System Boundary	Life Cycle
		A	B	C	D	A - D
Environmental Impacts						
Global Warming Potential Total, GWP	kg CO_2 eq	1.66E+7	3.63E+7	2.76E+5	-4.01E+5	5.53E+7
Ozone Depletion Potential, ODP	kg CFC-11 eq	1.73E0	2.74E0	[illegible]	[illegible]	[illegible]
Acidification Potential for Soil and Water, AP	kg SO_2 eq	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Eutrophication potential, EP	kg PO_4 eq	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Photochemical Ozone Creation Potential, POCP	kg ethylene	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Abiotic Depletion Potential - Elements, ADPE	kg antimony	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Abiotic Depletion Potential - Fossil Fuels, ADPF	MJ	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Additional Indicators						
Land Use	m^2.year arable	[illegible]	[illegible]	[illegible]	-7.48E+1	[illegible]
Resource Use						
Net use of fresh water, FW	kg	5.53E+7	2.71E+7	1.15E+7	[illegible]	[illegible]

Analysis

The report shows that the **Business as Usual** has a total Global Warming Potential Total, GWP impact of **[illegible] kg CO_2 eq overall**. The **Integrated Operational Energy (B6)** GWP impacts are the most dominant life cycle module in the Business as Usual Design followed by the **Integrated Operational Energy and Other Operational Energy (B6+)** and then **Product Stage (A1A3)**.

Further analysis reveals:

- The **Sub-structure** is the highest impact construction category,
- **Domestic Water Heating** is the highest operational impact by demand category,
- The **Electricity** is the highest impact operational impact by supply source,
- **Concrete | Unreinforced | Portland Cement Blends | 40 MPa** is the highest impact material category,
- **Electrical Equipment, Small with transport and treatment, Electricity** is the highest people and equipment impact

Executive Summary

This Life Cycle Assessment has been completed for the Whole Building, located at Waterloo Public Housing Estate. The lead author is Steve Minkin of and an independent review has not yet been conducted. The goal of this study is to profile and improve the environmental performance of the construction works. The study has been conducted in accordance with ISO 14044 and EN15978.

About the Design

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Characterised Impacts, Absolute (No Functional Unit), No Time Scale		Construction Phases	Use Phases	End of Life Phases	Benefits and Loads Beyond the System Boundary	Life Cycle
		A	B	C	D	A - D
Environmental Impacts						
Global Warming Potential Total, GWP	kg CO_2 eq	7.26E+6	3.63E+7	1.01E+5	-2.70E+5	4.33E+7
Ozone Depletion Potential, ODP	kg CFC-11 eq	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Acidification Potential for Soil and Water, AP	kg SO_2 eq	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Eutrophication potential, EP	kg PO_4 eq	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Photochemical Ozone Creation Potential, POCP	kg ethylene	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Abiotic Depletion Potential - Elements, ADPE	kg antimony	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Abiotic Depletion Potential - Fossil Fuels, ADPF	MJ	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Additional Indicators						
Land Use	m^2.year arable	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Resource Use						
Net use of fresh water, FW	kg	[illegible]	2.22E+7	[illegible]	[illegible]	[illegible]

Analysis

The report shows that the **Improved Design** has a total Global Warming Potential Total, GWP impact of **[illegible] kg CO_2 eq overall**. The **Integrated Operational Energy (B6)** GWP impacts are the most dominant life cycle module in the Improved Design Design followed by the **Integrated Operational Energy and Other Operational Energy (B6+)** and then **Product Stage (A1A3)**.

Further analysis reveals:

- The **Super structure** is the highest impact construction category,
- **Domestic Water Heating** is the highest operational impact by demand category,
- The **Electricity** is the highest impact operational impact by supply source,
- **Insulation | Blankets and Batts | Wool | Unspecified** is the highest impact material category,
- **Electrical Equipment, Small with transport and treatment, Electricity** is the highest people and equipment impact

Retain, Repair, Reinvest: Waterloo North and Central
Tower Buildings (Matavai and Turanga)
Apartment Design Guidelines
REV B - 30/06/25

Objective		Proposed Design	Type A (1b)	Type B (2b)	Type C (2b)	Type D (2b)	Type E (2b)	Type F (3b)	Type G (1b)(SDA)
4A-1	**Solar & daylight access**								
1	Living rooms and private open spaces of at least 70% of apartments in a building receive a minimum of 2 hours direct sunlight between 9 am and 3 pm at mid winter in the Sydney Metropolitan Area and in the Newcastle and Wollongong local government areas	N							
2	In all other areas, living rooms and private open spaces of at least 70% of apartments in a building receive a minimum of 3 hours direct sunlight between 9 am and 3 pm at mid winter	NA							
3	A maximum of 15% of apartments in a building receive no direct sunlight between 9 am and 3 pm at mid winter	Y							
4B-3	**Natural ventilation**								
1	At least 60% of apartments are naturally cross ventilated in the first nine storeys of the building. Apartments at ten storeys or greater are deemed to be cross ventilated only if any enclosure of the balconies at these levels allows adequate natural ventilation and cannot be fully enclosed.	Y							
2	Overall depth of a cross-over or cross-through apartment does not exceed 18m, measured glass line to glass line	Y							
4C-1	**Ceiling heights**								
1	Measured from finished floor level to finished ceiling level, minimum ceiling heights are								
	Habitable rooms: 2.7m		N	N	Y	Y	Y	Y	N
	Non-habitable: 2.4m		Y	Y	Y	Y	Y	Y	Y
	For 2 storey apartments: 2.7m for main living area floor 2.4m for second floor, where its area does not exceed 50% of the apartment area	NA							
	Attic spaces: 1.8m at edge of room with a 30 degree minimum ceiling slope	NA							
	If located in mixed used areas: 3.3m for ground and first floor to promote future flexibility of use								
4D-1	**Apartment size and layout**								
1	Apartments are required to have the following minimum internal areas: *Where minimum areas or room dimensions are not met apartments need to demonstrate that they are well designed and demonstrate the usability and functionality of the space with realistically scaled furniture layouts and circulation areas. These circumstances would be assessed on their merits*								
	Studio: 35m2	NA							
	1 bedroom: 50m2		N 44m²						Y 50m²
	2 bedroom: 70m2			N 59m²	Y 88m²	Y 103m²	Y 89m²		
	3 bedroom: 90m2							N 93m²	
	The minimum internal areas include only one bathroom. Additional bathrooms increase the minimum internal area by 5m2 each. A fourth bedroom and further additional bedrooms increase the minimum internal area by 12m2 each.	NA							
2	Every habitable room must have a window in an external wall with a total minimum glass area of not less than 10% of the floor area of the room. Daylight and air may not be borrowed from other rooms		Y	Y	Y	Y	Y	Y	Y
	Kitchens should not be located as part of the main circulation space in larger apartments (such as hallway or entry space)		Y	Y	Y	Y	Y	Y	Y
4D-2									
1	Habitable room depths are limited to a maximum of 2.5 x the ceiling height		Y	Y	Y	Y	Y	Y	Y
2	In open plan layouts (where the living, dining and kitchen are combined) the maximum habitable room depth is 8m from a window	NA							
	All living areas and bedrooms should be located on the external face of the building		Y	Y	Y	Y	Y	Y	Y
4D-3									
1	Master bedrooms have a minimum area of 10m2 and other bedrooms 9m2 (excluding wardrobe space)		Y	Y	Y	Y	Y	Y	Y
2	Bedrooms have a minimum dimension of 3m (excluding wardrobe space)		Y	N	Y	Y	Y	Y	Y
3	Living rooms or combined living/dining rooms have a minimum width of: - 3.6m for studio and 1 bedroom apartments - 4m for 2 and 3 bedroom apartments		N	Y	Y	Y	Y	Y	N
4	The width of cross-over or cross-through apartments are at least 4m internally to avoid deep narrow apartment layouts	NA							
	All bedrooms allow a minimum length of 1.5m for robes		Y	Y	Y	Y	Y	Y	Y
	The main bedroom of an apartment or a studio apartment should be provided with a wardrobe of a minimum 1.8m long, 0.6m deep and 2.1m high		Y	Y	Y	Y	Y	Y	Y
4E -1	**Private open space and balconies**								
1	All apartments are required to have primary balconies as follows: Studio apartments Min area: 4m2 Min depth: -	NA							
	1 bedroom apartments Min area: 8m2 Min depth: 2m		N 7.5m²						Y 9m²
	2 bedroom apartments Min area: 10m2 Min depth: 2m			N 7.5m²	Y 7.5m²	Y 7.5m²	Y 7m²		
	3+ bedroom apartments Min area: 12m2 Min depth 2.4m	NA						Y 7m²	
2	For apartments at ground level or on a podium or similar structure, a private open space is provided instead of a balcony. It must have a minimum area of 15m2 and a minimum depth of 3m	NA							
4F-1	**Common circulation and spaces**								
1	The maximum number of apartments off a circulation core on a single level is eight	Y							
2	For buildings of 10 storeys and over, the maximum number of apartments sharing a single lift is 40	N							
4G-1	**Storage**								
1	In addition to storage in kitchens, bathrooms and bedrooms, the following storage is provided: Studio apartments: 4m3	NA							
	1 bedroom apartments: 6m3		Y						Y
	2 bedroom apartments: 8m3			Y	Y	Y	Y		
	3+ bedroom apartments: 10m3	NA						Y	
	Note: At least 50% of the required storage is to be located within the apartment	NA							
4Q-1	**Universal design**								
	Developments achieve a benchmark of 20% of the total apartments incorporating the Livable Housing Guideline's silver level universal design features								

Retain, Repair, Reinvest: Waterloo North and Central
Slab Buildings (Hartree, Solander, James Cook, Joseph Banks)
Apartment Design Guidelines
REV B - 30/06/25

Objective		Proposed Design	Type A (2b)	Type B (2b) (SDA)	Type C (2b)	Type D (1b)	Type E (2b)	Type F (2b)
4A-1	**Solar & daylight access**							
1	Living rooms and private open spaces of at least 70% of apartments in a building receive a minimum of 2 hours direct sunlight between 9 am and 3 pm at mid winter in the Sydney Metropolitan Area and in the Newcastle and Wollongong local government areas	N						
2	In all other areas, living rooms and private open spaces of at least 70% of apartments in a building receive a minimum of 3 hours direct sunlight between 9 am and 3 pm at mid winter	NA						
3	A maximum of 15% of apartments in a building receive no direct sunlight between 9 am and 3 pm at mid winter	Y						
4B-3	**Natural ventilation**							
1	At least 60% of apartments are naturally cross ventilated in the first nine storeys of the building. Apartments at ten storeys or greater are deemed to be cross ventilated only if any enclosure of the balconies at these levels allows adequate natural ventilation and cannot be fully enclosed.	Y						
2	Overall depth of a cross-over or cross-through apartment does not exceed 18m, measured glass line to glass line		Y	Y	Y	Y	Y	Y
4C-1	**Ceiling heights**							
1	Measured from finished floor level to finished ceiling level, minimum ceiling heights are:							
	Habitable rooms: 2.7m		N	N	N	N	N	N
	Non-habitable: 2.4m		Y	Y	Y	Y	Y	Y
	For 2 storey apartments: 2.7m for main living area floor 2.4m for second floor, where its area does not exceed 50% of the apartment area	NA						
	Attic spaces: 1.8m at edge of room with a 30 degree minimum ceiling slope	NA						
	If located in mixed used areas: 3.3m for ground and first floor to promote future flexibility of use	NA						
4D-1	**Apartment size and layout**							
1	Apartments are required to have the following minimum internal areas: *Where minimum areas or room dimensions are not met apartments need to demonstrate that they are well designed and demonstrate the usability and functionality of the space with realistically scaled furniture layouts and circulation areas. These circumstances would be assessed on their merits*							
	Studio: 35m2	NA						
	1 bedroom: 50m2					Y 50m²		
	2 bedroom: 70m2		N 59m²	N 59m²	N 59m²		Y 72m²	Y 76m²
	3 bedroom: 90m2	NA						
	The minimum internal areas include only one bathroom. Additional bathrooms increase the minimum internal area by 5m2 each. A fourth bedroom and further additional bedrooms increase the minimum internal area by 12m2 each.	NA						
2	Every habitable room must have a window in an external wall with a total minimum glass area of not less than 10% of the floor area of the room. Daylight and air may not be borrowed from other rooms		Y	Y	Y	Y	Y	Y
	Kitchens should not be located as part of the main circulation space in larger apartments (such as hallway or entry space)		Y	Y	Y	Y	Y	Y
4D-2								
1	Habitable room depths are limited to a maximum of 2.5 x the ceiling height		Y	Y	Y	Y	Y	Y
2	In open plan layouts (where the living, dining and kitchen are combined) the maximum habitable room depth is 8m from a window		Y	Y	Y	Y	Y	Y
	All living areas and bedrooms should be located on the external face of the building		Y	Y	Y	Y	Y	Y
4D-3								
1	Master bedrooms have a minimum area of 10m2 and other bedrooms 9m2 (excluding wardrobe space)		Y	Y	Y	Y	Y	Y
2	Bedrooms have a minimum dimension of 3m (excluding wardrobe space)		Y	Y	Y	Y	N	N
3	Living rooms or combined living/dining rooms have a minimum width of: - 3.6m for studio and 1 bedroom apartments - 4m for 2 and 3 bedroom apartments		Y	Y	Y	Y	Y	Y
4	The width of cross-over or cross-through apartments are at least 4m internally to avoid deep narrow apartment layouts		NA	NA	NA	NA	Y	Y
	All bedrooms allow a minimum length of 1.5m for robes		Y	Y	Y	Y	Y	Y
	The main bedroom of an apartment or a studio apartment should be provided with a wardrobe of a minimum 1.8m long, 0.6m deep and 2.1m high		Y	Y	Y	Y	Y	Y
4E -1	**Private open space and balconies**							
1	All apartments are required to have primary balconies as follows: Studio apartments Min area: 4m2 Min depth: -	NA						
	1 bedroom apartments Min area: 8m2 Min depth: 2m					Y 15m²	Y	Y
	2 bedroom apartments Min area: 10m2 Min depth: 2m		Y 10m²	Y 10m²	Y 10m²		Y 21m²	Y 15m²
	3+ bedroom apartments Min area: 12m2 Min depth 2.4m	NA						
2	For apartments at ground level or on a podium or similar structure, a private open space is provided instead of a balcony. It must have a minimum area of 15m2 and a minimum depth of 3m	NA						
4F-1	**Common circulation and spaces**							
1	The maximum number of apartments off a circulation core on a single level is eight	Y						
2	For buildings of 10 storeys and over, the maximum number of apartments sharing a single lift is 40	Y						
4G-1	**Storage**							
1	In addition to storage in kitchens, bathrooms and bedrooms, the following storage is provided: Studio apartments: 4m3	NA						
	1 bedroom apartments: 6m3					Y		
	2 bedroom apartments: 8m3		Y	Y	Y		Y	Y
	3+ bedroom apartments 10m3	NA						
	Note: At least 50% of the required storage is to be located within the apartment		Y	Y	Y	Y	Y	Y

12. Total building costs of demolition and rebuild

The total construction costs for the demolition and rebuild case study have been calculated using area calculations from 2019 LAHC plan at a $5000/m2 construction estimate. The breakdown of costs can be found below in Figure 39 and 40

Figure 39: Total building costs of demolition and rebuild of HRRP Flemington Estate.

Demo/Rebuild Redvelopment		
Demolition	$1,200,000	-
New Build (3,800 dwellings)	$1,621,901,500	$426,816
Carparks	$278,251,050	-
10% Contingency	$190,135,255	-
Total Construction Costs	$2,091,487,805	$550,392

Figure 40: Total building project costs of demolition and rebuild of HRRP Flemington Estate.

Demo/Rebuild Redvelopment		
Demolition	$1,200,000	-
New Build (3,800 dwellings)	$1,621,901,500	$426,816
Carparks	$278,251,050	-
10% Contingency	$190,135,255	-
Total Construction Costs	$2,091,487,805	$550,392
Health Costs	$4,062,320	-
Education Costs	$590,382	-
Relocation Costs	$72,243,638	-
Total Uncaptured Costs	$76,896,340	-
Total Project Cost	$2,168,384,145	$570,627

13. Costings of refurbishment and infill proposal

Figure 41: RRR refurbishment and infill costs.

	Total	Average Per Dwelling
Retain, Repair, Reinvest		
Refubishment Tower (320 dwellings)	$92,176,200	$288,051
Refurbisment Slabs (856 dwellings)	$307,850,000	$359,638
Infill (1858 dwellings)	$793,024,128	$426,816
Carparks	$139,416,200	-
10% Contingency	$133,246,653	-
Total Construction Cost	$1,465,713,181	$483,096

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OFFICE is a charitable not-for-profit design and research practice based in Melbourne, Australia. It is a group of architects, landscape architects, urban designers and researchers who assist community groups in advocating for better outcomes within the built environment.