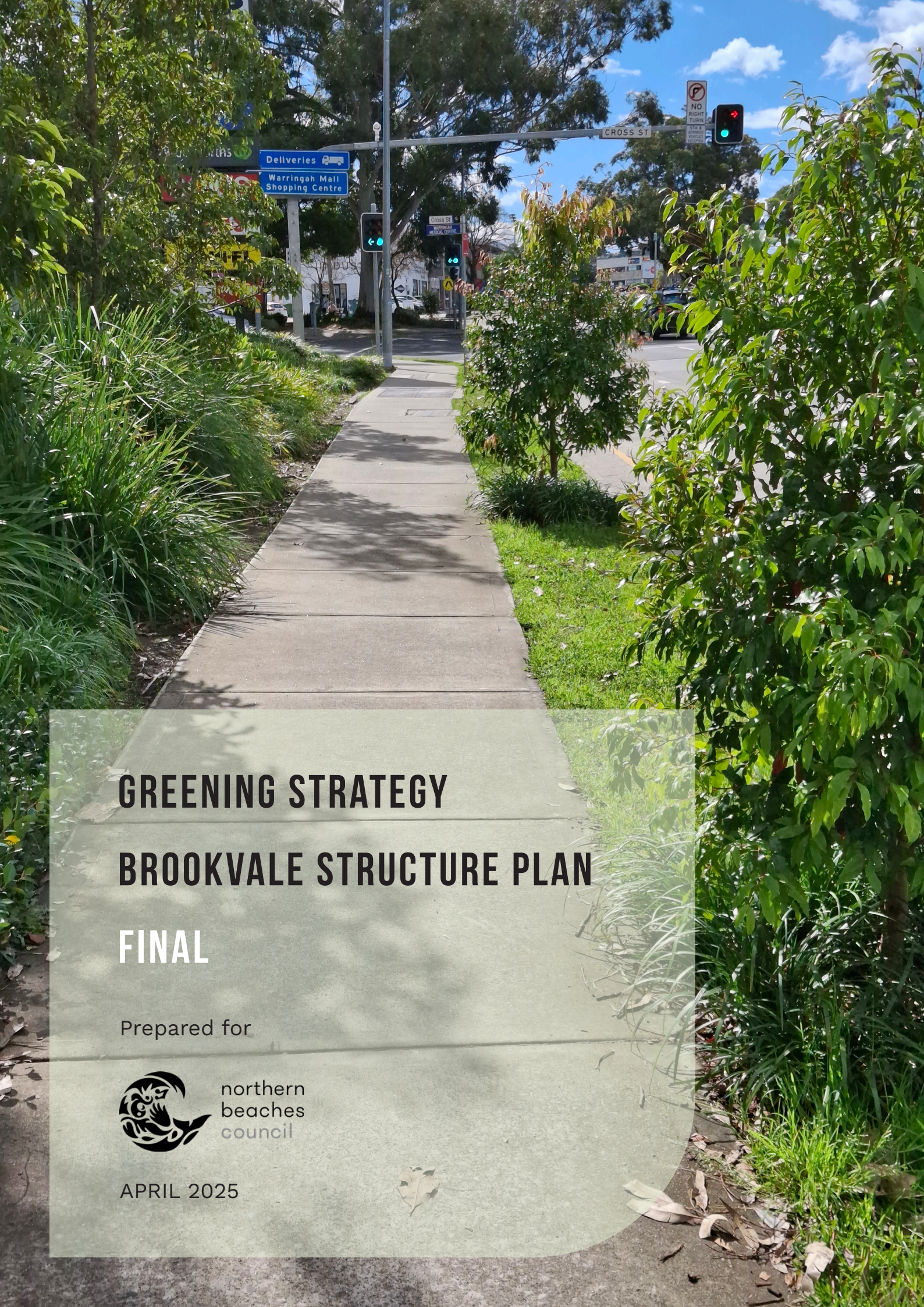




GREENING STRATEGY

BROOKVALE STRUCTURE PLAN

FINAL

Prepared for



northern
beaches
council

APRIL 2025

GREENING STRATEGY

BROOKVALE STRUCTURE PLAN

Prepared for Northern Beaches Council by SMM

Rev	Status	Date	By	Checked
A	Draft	04/02/2025	BK	MS
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DISCLAIMER

Despite making every reasonable effort to ensure the accuracy of this document at the time of printing, SMM acknowledges its reliance on significant third-party information and absolves itself of any responsibility or liability for any actions taken or not taken by any individuals based on the entirety or any portion of this document.





*We acknowledge the traditional owners of this
land and elders past, present and future.
We recognise Aboriginal people as the original
custodians of the Northern Beaches.*

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TERMS AND ABBREVIATIONS

BSP

Brookvale Structure Plan

NBC

Northern Beaches Council

DCP

Development Control Plan

Deep Soil is an area of a site which has no above ground level or subterranean development within it

LGA

Local Government Area

LEP

Local Environment Plan

PSVDG

Northern Beaches Public Space Vision and Design Guidelines

SCN

Northern Beaches Safe Cycle Network

UHI

Urban heat Island effect

WSROC

Western Sydney Regional Organisation of Councils'

WSUD

Water Sensitive Urban Design

1. EXECUTIVE SUMMARY



1.1 KEY FINDINGS AND RECOMMENDATIONS

Brookvale is one of five key strategic centres within the Northern Beaches local government area (LGA). In November 2023, the Brookvale Structure Plan (BSP) was adopted which positioned Brookvale for substantial population and jobs growth over the next 15 years. Council is now commencing work on implementing the BSP which involves several technical studies, including this Greening Strategy.

CURRENT CANOPY LEVELS

Brookvale has an overall tree canopy coverage of 18%, which is well below the 40% target set for Greater Sydney suburbs within the Draft Greener Places Design Guide (GANSW, 2020). Private land occupies 74% of the suburb and has only 12% canopy cover, whilst public land occupies 26% of the suburb and has approximately 36% canopy cover. The private domain is a major contributor of low levels of canopy across the suburb. The lack of canopy cover is also exacerbating the urban heat island (UHI) effect in Brookvale, where temperatures can be 9°C hotter than vegetated areas.

CANOPY TARGETS

Numerous state and local government policy documents have been reviewed in relation to green infrastructure and canopy cover. These policies provide best practice guidance on urban greening strategies and targets within the public and private domain of Greater Sydney. The canopy cover targets proposed within this document have been informed by these best practice guides, in conjunction with a detailed analysis of the unique characteristics of Brookvale.

TREE AUDIT FINDINGS & OPPORTUNITIES

A tree audit was conducted for nominated Green Link Streets within Brookvale. Of the trees surveyed, 73% are classed as “mature”, 50% are relatively small (less than 10m in height) and 53% of surveyed trees were *Lophostemon confertus* (Queensland Brush Box).

Introducing a broader species and age mix will help to build a more resilient urban forest within Brookvale, whilst also supporting and enhancing biodiversity. Planting larger tree species and minimising pruning around powerlines (by transitioning to Aerial Bundled Cables) will assist in making streets shadier, cooler and more inviting. Proactive succession planting should also be implemented to minimise gaps in the urban canopy over time as trees mature and senesce.

HEAT BENCHMARKING STUDY

The Heat Benchmarking Study (Appendix 1: Microclimates of Brookvale, WSU, 2025) has found a high variability in microclimates across streets, and those with greater levels of green infrastructure generally offer cooler microclimates. Furthermore, Brookvale has a major cooling asset that should be harnessed - the coastal sea breeze which provides cooling through the industrial area, east of Pittwater Road.

GREEN LINK STREET CONDITIONS & OPPORTUNITIES

A detailed analysis of Green Link street conditions has been conducted. It highlights that the design of these streets prioritises cars and car parking over green infrastructure and the comfort and well-being of street users such as pedestrians and cyclists. There are large expanses of verge space with no street tree plantings, and many street trees are not growing to their full potential due to substantial pruning under powerlines. In some instances, a lack of adequate setbacks for buildings and awnings also constrains the planting of trees.

At present, Brookvale streets have an average of 13% canopy cover, however by adopting the strategies outlined within **Section 5**, canopy cover could be increased to a minimum of 40-50% depending on individual street conditions. These strategies promote reallocating space within the road reserve, enabling the incorporation of additional green infrastructure and re-balancing the needs of all street users.

DCP OPPORTUNITIES

A review of the Warringah DCP 2011 (refer **Section 6**) has found that opportunities exist to strengthen clauses relating to green infrastructure. In particular, this includes clauses that relate to setting minimum landscape areas, minimum tree requirements by lot size, deep soil volumes, tree preservation and tree replacement offsets. Furthermore, urban heat provisions should be incorporated within relevant sections of the DCP to encourage cooler, energy efficient buildings and materials being adopted in both the public and private domain.

NEXT STEPS

Many opportunities exist to improve green infrastructure across Brookvale, however it will be important to bring the community on the journey to successfully “green up” the suburb. To assist in taking this journey forwards, a summary of high level actions are provided in **Section 6.5**.

2. INTRODUCTION

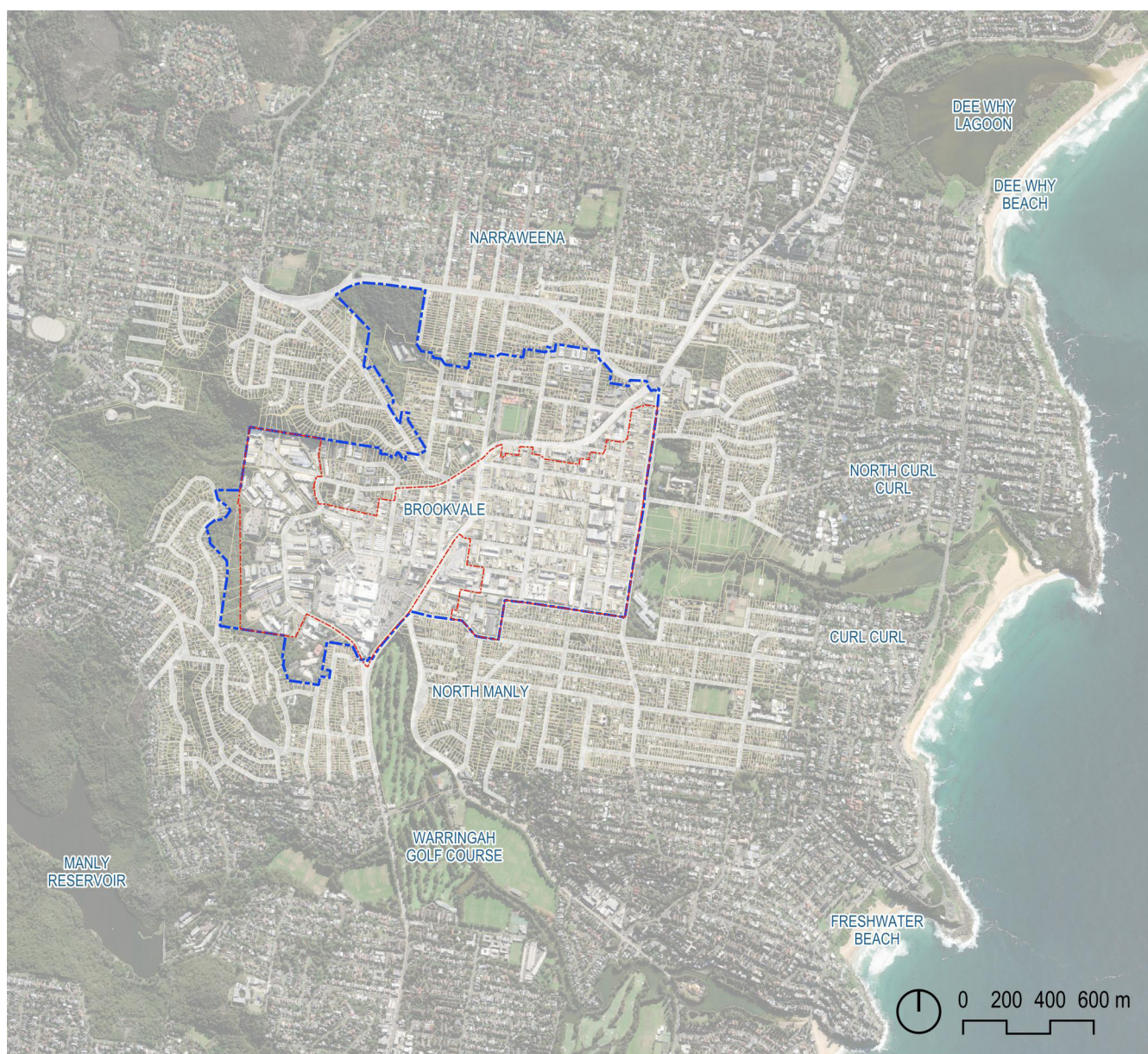


2.1 PROJECT BACKGROUND

2.1.1 LOCATION CONTEXT

The Northern Beaches LGA resides in the north-eastern area of Greater Sydney. It encompasses more than half of all beaches in Sydney, and extends from Palm Beach through to Manly. The area is renowned for its beautiful and pristine beaches, headlands and lookouts, as well as extensive areas of National Park such as Kuringgai Chase National Park, Garigal National Park and Sydney Harbour National Park.

Brookvale is one of five key strategic centres within the LGA. Brookvale is located south of Dee Why and north of Manly and is approximately 2km from the coast (**Figure 1**). The suburb supports the highest proportion of jobs on the Northern Beaches and hosts the largest area of industrial land in Northern Sydney. Brookvale also provides one of the largest retail areas in Greater Sydney - Warringah Mall, along with other community facilities such schools, a TAFE campus, Brookvale Oval and green spaces.



Legend

 Brookvale Boundary BSP Study Area

Figure 1 . Brookvale Location

2.1.2 DRIVERS FOR CHANGE

In 2023, the Brookvale Structure Plan (BSP) was adopted and sets the land use planning vision and priority projects for the suburb over the next 15 years. The BSP positions Brookvale for population, housing and jobs growth. There will be a new and vibrant town centre, rezoning of land to support sustainable future development, additional investments in public and active transport, as well as various street revitalisations.

A series of Green Link Streets have been defined within the BSP. Green link streets will be redesigned to incorporate additional green and blue infrastructure and to provide shadier, cooler connections between green spaces and popular community facilities, whilst also enhancing biodiversity. Green Link streets must also support and prioritise active transport modes, namely walking and cycling.

Like many industrial and commercial areas around Sydney, Brookvale's streetscape is highly prone to the urban heat island effect. The 2016 Urban Heat Island effect (UHI) data shows that the dominance of grey infrastructure is already increasing temperatures to 9 degrees or higher than vegetated areas (**Figure 2**).

Tree canopy cover is also low across the suburb (approximately 18%) and could be substantially improved to assist in UHI mitigation. In response, the Northern Beaches Tree Canopy Plan (NBC, 2023) flags Brookvale as a priority suburb for a location specific canopy strategy.

This Greening Strategy has been prepared in response to these drivers for change.

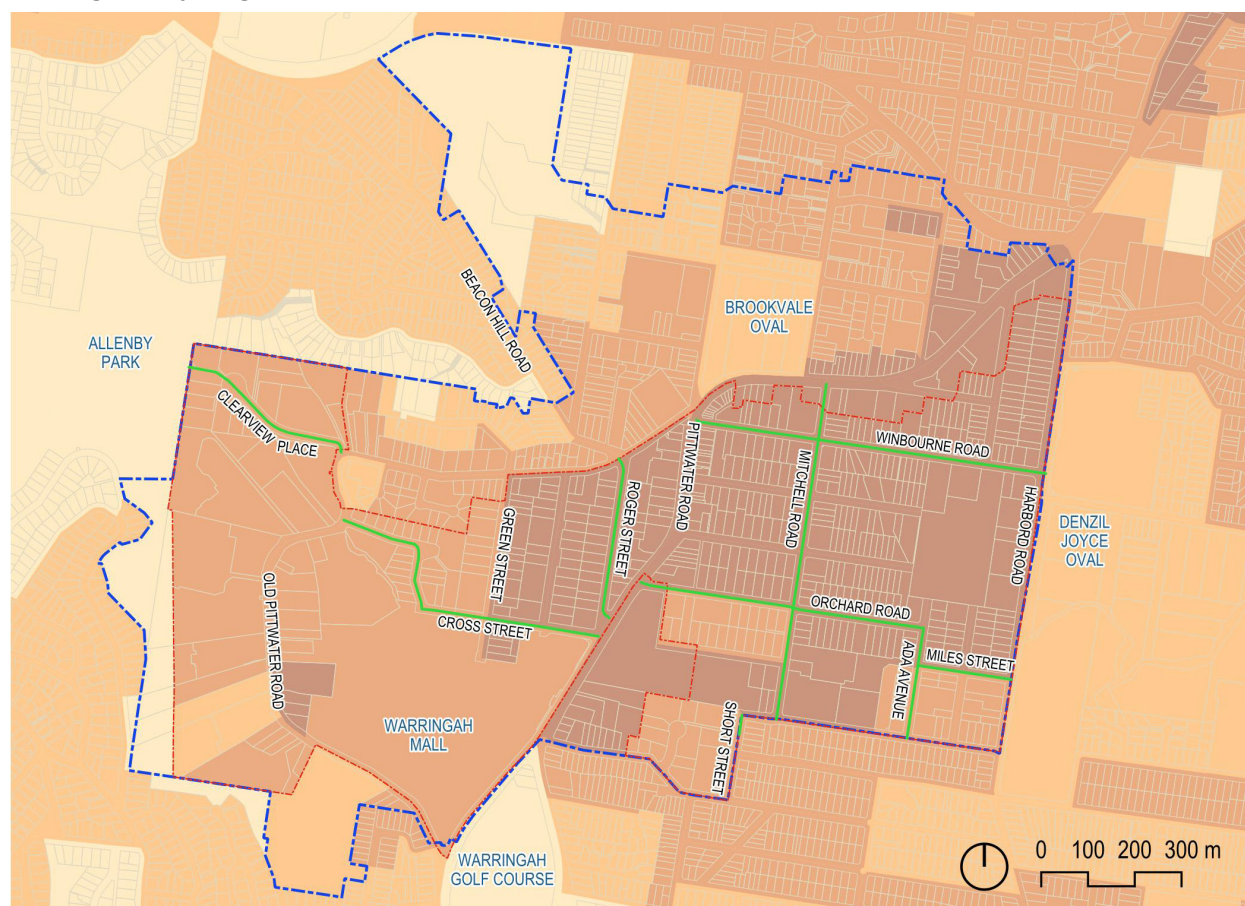


Figure 2 . Brookvale Urban Heat Island Temperatures

2.1.3 METHODOLOGY

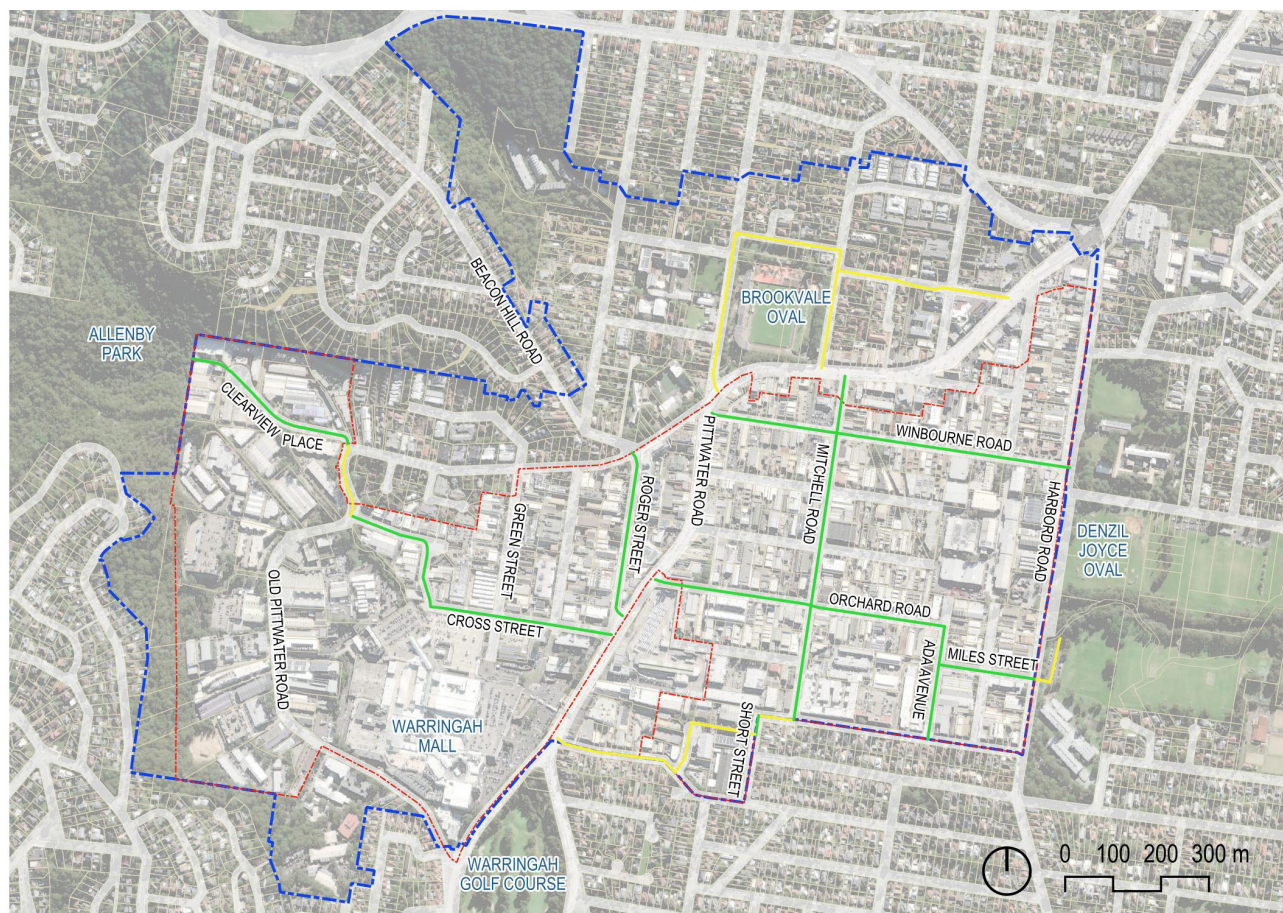
Given the strategic importance of Brookvale and planned future growth, this is a crucial time to review and assess how the suburb can be improved to build resilience against warming temperatures and urban heat.

The following methodology will be adopted:

- Formulate an understanding of existing policies and strategies in relation to tree canopy within the Brookvale precinct
- Conduct analysis of tree canopy coverage within the suburb and provide detailed canopy analysis within nominated Green Link streets
- Conduct a heat benchmarking exercise within nominated Green Link streets, which will serve as baseline dataset for future temperature measurement

- Develop a set of tree canopy targets for Brookvale
- Develop a series of street typologies for Green Link streets with recommendations to enhance canopy cover and green infrastructure
- Review existing statutory planning controls that relate to tree canopy and provide recommendations to improve these controls.
- Present these findings within a report that will support future strategic planning work for Brookvale.

Council has nominated nine of the Green Link Streets from the BSP to be the primary focus of this Greening Strategy: Roger Street, Cross Street, Clearview Place, Winbourne Road, Orchard Road, Short Street, Mitchell Road, Ada Avenue and Miles Street. These Green Link streets are shown in **Figure 3**.



Legend

- | | | |
|--|--------------------|--|
| Brookvale Boundary | Green Link Street: | Nominated Green Link |
| BSP Study Area | | Other Green Link |

Figure 3 . Study Area and 9 Nominated Green Link Streets

2.2 THE VALUE OF GREENING

“An increase in the volume of understorey from 10-30% can have a 30-120% increase in species such as native birds, bats and insects” (Biodiversity in Place, GANSW, 2024)

2.2.1 WHAT IS GREEN INFRASTRUCTURE?

Green infrastructure typically relates to vegetation such as trees, understorey and midstory plantings and the soils upon which they live. It also incorporates Water Sensitive Urban Design (WSUD) elements that support the sustainable management of water, including rain gardens, biofiltration gardens, wetlands, swales and other elements. Green infrastructure can also include man-made materials such as permeable paving and other permeable surfaces to enhance water absorption and retention in soil.

2.2.2 THE VALUE OF TREES

Trees play a vital role in urban environments, providing a multitude of benefits which include:

- **Urban Heat Reduction:** Trees help to reduce urban heat, by shading hard/impervious surfaces and reducing the amount of heat they absorb. In addition, the process of evapotranspiration from vegetation and soil helps to cool the air with the release of water vapour
- **Aesthetic Appeal:** Trees enhance the beauty of streets and neighbourhoods, making areas more inviting and pleasant to live in
- **Air Quality:** Trees improve air quality by absorbing pollutants and producing oxygen
- **Biodiversity:** Trees provide habitat and food sources for various species, supporting urban wildlife and contributing to biodiversity
- **Stormwater Management:** Trees help absorb rainwater, reducing runoff and minimising the risk of flooding while improving water quality
- **Soil Health:** Trees roots help to stabilise soils and reduce erosion by acting as a binding agent. Deep rooted trees also protect against rising salinity levels in soils.
- **Noise Reduction:** Trees can act as natural sound barriers, absorbing and deflecting noise from traffic and other urban activities
- **Community Health:** Green spaces and trees promote community interaction and improve mental health, encouraging people to spend time outdoors

- **Shade and Comfort:** Trees provide shade for pedestrians, making walking and outdoor activities more comfortable, especially during hot weather.
- **Economic Benefits:** Well-landscaped streets with trees can increase property values and attract businesses, boosting local economies. Studies show that “a 10 per cent increase in tree canopy cover on adjacent streets, parks, and reserves adds about A\$14,500 to a property’s value” (GANSW, 2020)

Overall, trees are essential for creating sustainable, liveable urban spaces that benefit both the environment and the community.

2.2.3 UNDERSTOREY VEGETATION

In addition to trees, understorey plants are also vital contributors to healthy and resilient ecosystems. Within an urban setting, understorey plants play an essential role in supporting biodiversity. They attract pollinators and offer habitat, food and shelter to native fauna species. Studies show that “an increase in the volume of understorey from 10-30% can have a 30-120% increase in species such as native birds, bats and insects” (GANSW, 2024). Understorey vegetation also plays an important role in stormwater management and soil health, by aiding water infiltration into soils and by adding organic matter to soil.

2.2.4 WSUD

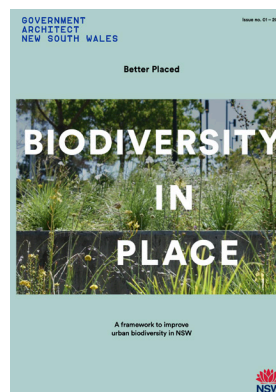
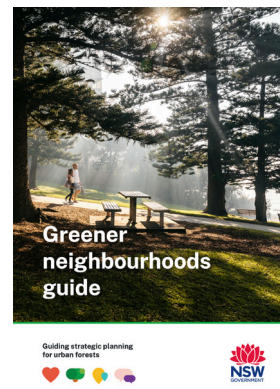
Water Sensitive Urban Design (WSUD) is a holistic approach that integrates water management with urban design, enabling the sustainable use and management of water. The adoption of WSUD techniques can improve water quality in our waterways, support stormwater management, help mitigate flooding, passively irrigate vegetation within urban landscapes and improve biodiversity. In addition, the incorporation of WSUD techniques in urban areas can provide local temperature cooling through evaporation.

2.3 POLICY DOCUMENT REVIEW

Several key state and local government planning documents provide guidance in relation to canopy cover or green infrastructure. A summary of these documents is provided in this section.

A “10% increase of canopy in Sydney can reduce land surface temperatures by more than 1 °C during summer mornings”.

*Greener Neighbourhoods Guide
(NSW Government, 2021)*



Brookvale Structure Plan
November 2023

**Northern Beaches
Public Space Vision
& Design Guidelines**

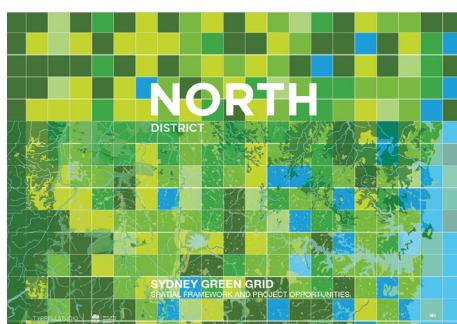


Figure 4 . Key Policy and Planning Documents

2.3.1 STATE GOVERNMENT

NORTH DISTRICT - SYDNEY GREEN GRID (GOVERNMENT ARCHITECT NSW, 2017)

- The Sydney Green Grid provides strategic opportunities in relation to establishing a cohesive green infrastructure network across the Sydney region, factoring in existing hydrological, recreational and ecological elements
- The main opportunity identified for Brookvale includes improving connections between Brookvale and Curl Curl Lagoon. This opportunity has been incorporated into the Northern Beaches Safe Cycle Network (SCN).

DRAFT GREENER PLACES DESIGN GUIDE (GOVERNMENT ARCHITECT NSW, 2020)

- The Draft Greener Places Design Guide offers a framework to guide the design and implementation of green infrastructure across NSW. Within the framework, a section details the importance of urban tree canopy, and provides a series of indicative tree canopy targets for the Greater Sydney Region
- Key tree canopy strategies include preserving existing tree canopy, in addition to increasing canopy with new plantings
- An overarching tree canopy target of 40% has been set for the Greater Sydney Region. A series of indicative place-based targets based on land use are also defined and shown below:
 - » CBD target > 15%
 - » Medium to high density target > 25%
 - » Low density target > 40%
- The commercial and industrial areas within Brookvale's core would sit within the Medium-to-high-density targets.

GREENER NEIGHBOURHOODS GUIDE (NSW GOVERNMENT, 2021)

- This guide introduces the concept of an Urban Forest, which “comprises all trees and vegetation – and the soils and water that support them – in an urban area. These components are strategically planned, designed, and managed to support resilience and wellbeing”

- The guide outlines the many benefits associated with an urban forest, and in particular, it notes that “10% increase of canopy in Sydney can reduce land surface temperatures by more than 1 °C during summer mornings”
- The guide also provides guidance on tree canopy targets for different land uses, both public and private. It includes canopy and deep soil targets for business parks, industrial lots, carparks, residential lots and streets. These targets have informed the target recommendations for Brookvale which are outlined in **Section 4.2** and detailed further in **Section 6.3.2**.

BIODIVERSITY IN PLACE (GOVERNMENT ARCHITECT NSW, 2024)

- The Biodiversity in Place guide is a recent publication from the Government Architect NSW and responds to the urgent need to address biodiversity loss
- It highlights that an “increase in the volume of understorey from 10-30% can have a 30-120% increase in species such as native birds, bats and insects.” However, whilst increasing the volume of understorey is important, diversity of understorey species is paramount to the approach
- The guide discusses opportunities to enhance a variety of urban typologies. The typology “Roads, Streets and Laneways” is most relevant to the Green Link Streets within this Greening Strategy. However many other typologies exist and opportunities to enhance biodiversity exist within the private domain of Brookvale, such as private gardens, parks, shopping plazas, carparks and private/commercial building exteriors
- Key opportunities for Green Link Streets include increasing areas for planting understorey, incorporating a broad range of diverse understorey species, and integrating WSUD within the street to manage stormwater.

2.3.3 NORTHERN BEACHES COUNCIL

NORTHERN BEACHES TREE CANOPY PLAN 2023 (NORTHERN BEACHES COUNCIL, 2023)

- Brookvale is identified as a hot spot, with urban heat island effects increasing temperatures by up to 9 degrees
- Overall canopy cover in Brookvale was around 21% based on 2019 LIDAR data. More recent data from 2022 (included within this report) indicates that canopy cover is closer to 18%.
- The Northern Beaches LGA has a target to plant 100,000 trees by 2038
- The Tree Canopy Plan has five focus areas. These are:
 - » Manage public trees as essential assets to maintain canopy across public lands - streets and parks.
 - » Increase the capacity of the community to participate and engage in public tree canopy and greening projects.
 - » Monitor losses and gains in the canopy across the LGA and support the community to retain and protect canopy
 - » Strengthen the local planning framework (e.g. LEP and DCP) to support retention, protection, replacement, and growth of private trees.
 - » Enforcement and investigation of unauthorised tree removal/clearing as a priority.

BROOKVALE STRUCTURE PLAN (NORTHERN BEACHES COUNCIL, 2023)

- The Brookvale Structure Plan outlines the future vision and goals for Brookvale, as it expands to support population and jobs growth. It establishes a series of character precincts within Brookvale, and nominates a number of streets as Green Links
- Green Link streets will be re-imagined and redesigned to provide high levels of canopy cover along with green infrastructure, improving the visual appeal and thermal comfort for pedestrians and active transport users
- The following 9 Green Link Streets are the primary scope of this document: Roger Street, Cross Street, Clearview Place, Winbourne Road, Orchard Road, Short Street, Mitchell Road, Ada Avenue, Miles Street
- **Figure 5** highlights that all of the 9 nominated Green Link Streets are current or proposed cycle routes, as outlined in the Northern Beaches Bike Plan 2020. It also shows that buses run along Winbourne Road and Cross Street (east of Green Street) Urban greening strategies within this document must increase canopy cover and green infrastructure whilst also supporting active transport modes on Green Link Streets.

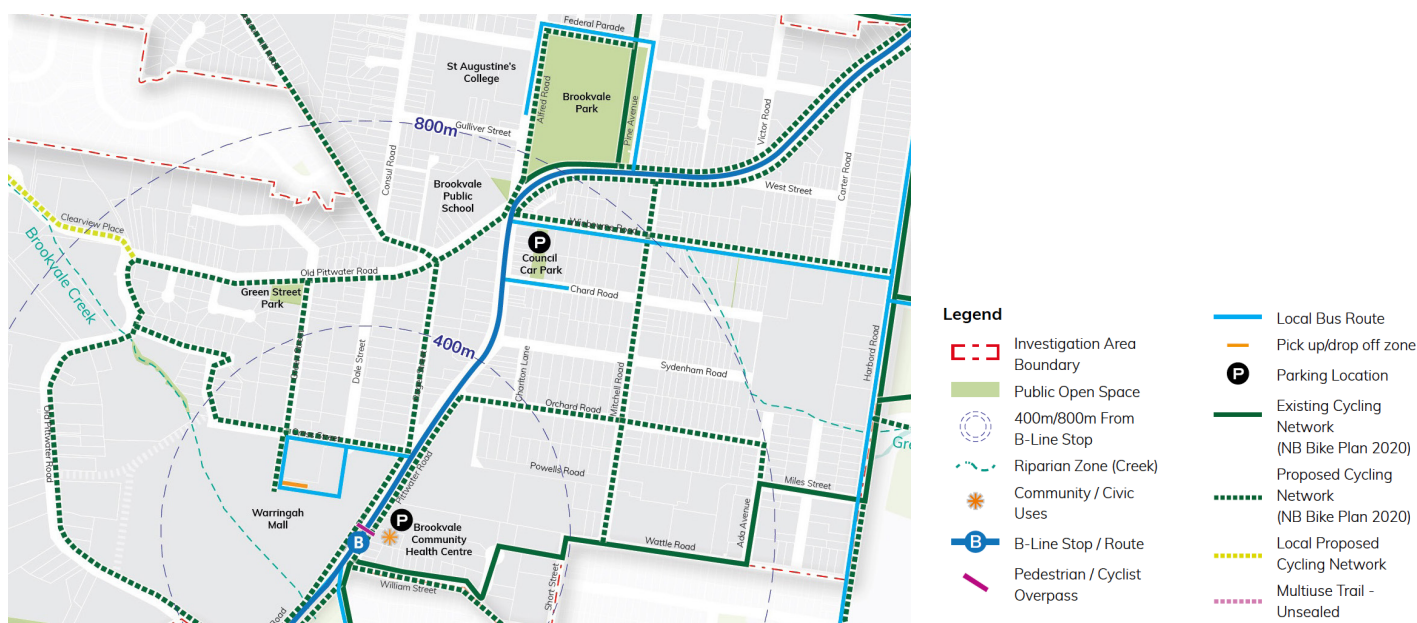


Figure 5 . Existing and Proposed Transport Routes

Source: Brookvale Structure Plan (NBC, 2023)

NORTHERN BEACHES PUBLIC SPACE VISION & DESIGN GUIDELINES (ASPECT STUDIOS, 2020)

- The Northern Beaches Public Space Vision and Design Guidelines (PSVDG) provides a unified approach to designing in the public domain for all wards within the Northern Beaches LGA. This includes a vision and set of objectives for designing in the public domain within the LGA
- A street typology assessment within the PSVDG categorises all of the Green Link streets in scope as “Industrial Streets”, with the exception of Orchard Road which is deemed a “Local/Collector Street” and Roger Street which is deemed a “High Street”. Design guidance is provided for each street typology in terms of how the road reserve should be organised and this guidance has helped to inform the street design recommendations within this document
- The PSVDG proposes canopy targets and permeable surface targets for each street typology within the Northern Beaches LGA, some of which are summarised in **Table 1**. Typical plan and section diagrams are provided for each street typology demonstrating how canopy, permeable surfaces, active transport and road infrastructure should be accommodated. Green Link Street typologies are discussed further in **Section 5** and recommendations have been informed by the PSVDG

Table 1 . Northern Beaches Street Types and Targets

	Industrial Street	Collector Street	High Street
Canopy	50%	40%	45%
Permeable surface cover	50%	50%	35%
Permeable surface cover with cycle facility	45%	35%	35%

- The PSVDG also proposes a street tree palette and materials palette for particular street types which have also informed the proposed street tree palette for Brookvale.



2.3.4 OTHER NBC DOCUMENTS

In addition to the Northern Beaches Council policies outlined in **Section 2.3.3**, the following council guides and studies have also been reviewed.

- Northern Beaches Bike Plan (NBC, 2020)
- Brookvale Structure Plan – Bush Fire Advice Report (Meridian Urban, 2024)
- Brookvale Structure Plan – Indigenous and Non-Indigenous Heritage Report (GML, 2024)
- Brookvale Structure Plan Analysis Report (Ethos Urban, 2022)
- Let’s Play – Northern beaches Open Space and Outdoor Recreation Strategy and Action Plan (NBC, 2022)
- Protect. Create. Live. Northern Beaches Environment and Climate Change 2040 (NBC, n.d.)
- Northern Beaches Resilience Strategy (NBC, n.d.) - Priority item 6 “Invest in urban heat mitigation programs to cool homes, streets and public spaces”.

2.3.5 WESTERN SYDNEY GUIDES

The following two guides (whilst written for the context of Western Sydney) provide valuable information in relation to urban heat mitigation strategies and street design strategies that can be applied more broadly across Greater Sydney.

WSROC URBAN HEAT PLANNING TOOLKIT
(WSROC, 2021)

- The WSROC Urban Heat Planning Toolkit was established to support local governments (particularly in Western Sydney) in preparing and amending planning and design controls. Emphasis is given to recommendations on LEP and DCP clauses that aid in urban heat mitigation
- The toolkit provides design strategies to combat urban heat, and suggests how urban areas such as cities, outdoor spaces and homes can be designed to be cooler. It outlines how the public domain can be made cooler by increasing vegetated surface areas and decreasing hardscaped areas. An increased tree canopy provides greater shade and evaporative cooling.

Introducing water into the landscape also increases evaporative cooling. The use of cool materials is also recommended, such as cool paving, permeable paving, cool carparks, cool roofs and other strategies

- The toolkit also provides detailed guidance on DCP and LEP clauses, providing councils with guidance on how their key planning instruments can be improved to support urban heat mitigation. These recommendations have helped to inform the review of DCP clauses relevant for Brookvale within **Section 6**.

WESTERN SYDNEY STREET DESIGN GUIDELINES
(ASPECT STUDIOS, 2020)

- These guidelines were written to support the design of new streets within greenfield development in areas of Western Sydney. However, they may be relevant to other areas of Sydney undergoing significant change
- The guidelines also provide a series of street typologies with recommended design strategies for each type, resulting in specific levels of hardscaped, softscaped areas and canopy cover
- The tree canopy targets defined within this document are ambitious, with tree canopy cover for most street types set at 70%, and permeable surface covers ranging 20-35% for the three relevant typologies, as shown in **Table 2** below.

Table 2 . Western Sydney Street Design Guidelines - Targets

	Industrial Street	Collector Street	High Street
Canopy	70%	70%	70%
Permeable surface cover	35%	35%	20%



3. CANOPY, VEGETATION & HEAT ANALYSIS



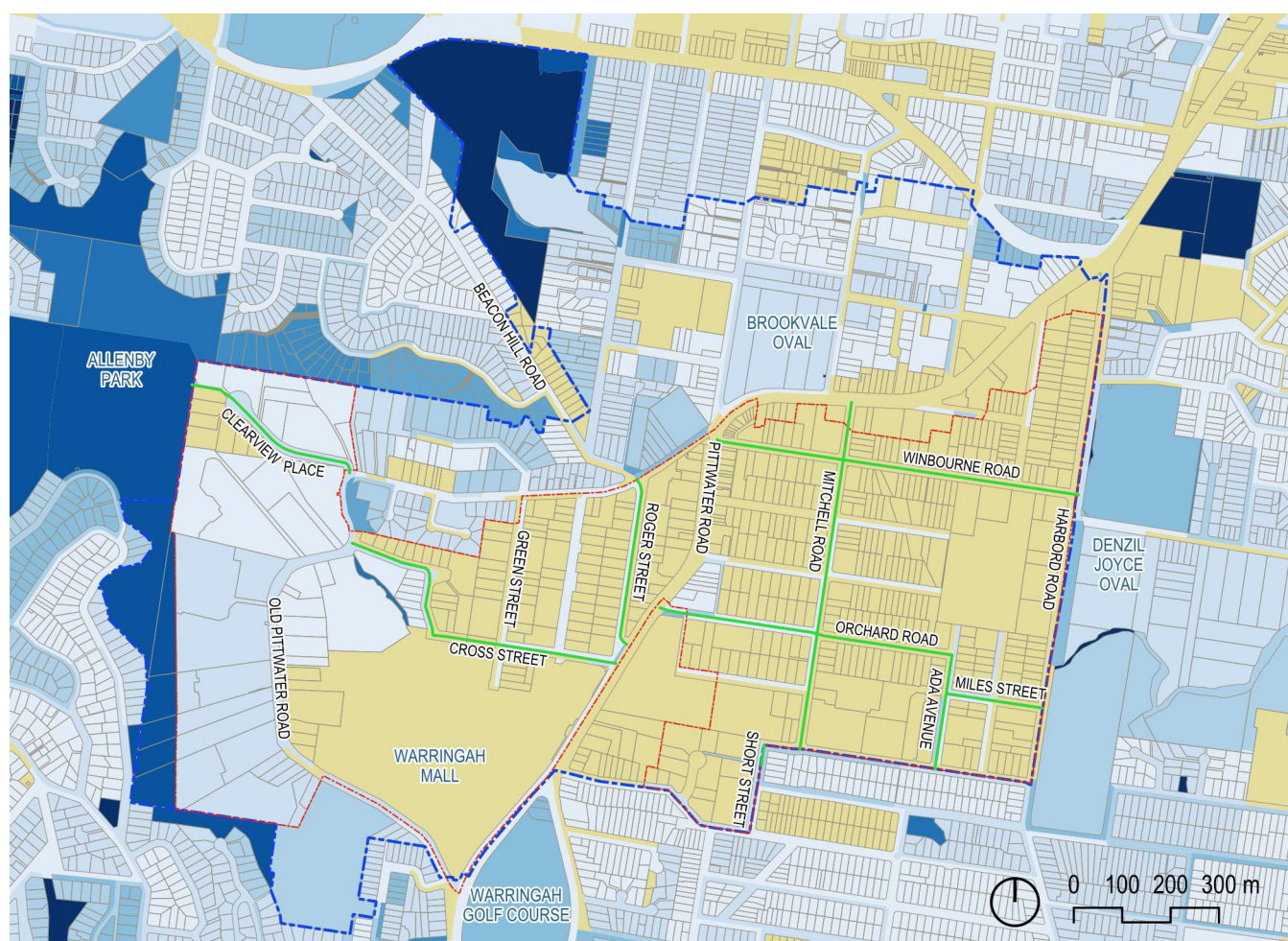
3.1 BROOKVALE CANOPY COVER

The suburb of Brookvale has an overall tree canopy coverage of around 18%. This is well below the 40% target set for Greater Sydney suburbs within the Draft Greener Places Design Guide (GANSW, 2020). Brookvale is also one of the suburbs within the Northern Beaches LGA with the lowest levels of canopy cover. For this reason, the Tree Canopy Plan (NBC, 2023) identifies Brookvale as a priority suburb for a location specific tree canopy strategy.

Within the study area, **Figure 6** shows that much of the BSP Study Area including industrial land east and west of Pittwater Road has less than 10% canopy cover. The situation improves in the northern and western areas of the suburb.

Green Link streets range broadly in their canopy cover as described below:

- Winbourne Road: 2% - 7%
- Mitchell Road: 2% - 16%
- Orchard Road: 9% - 44%
- Ada Avenue: 7% - 32%
- Miles Street: 4% - 20%
- Short Street: 14% - 32%
- Cross Street: 0% - 23%
- Clearview Place: 24%



Legend

 Brookvale Boundary	Tree Canopy Cover (%):	 0 - 10	 30 - 40	 60 - 70	 90 - 100
 Study Area		 10 - 20	 40 - 50	 70 - 80	
 Green Link Street		 20 - 30	 50 - 60	 80 - 90	

Figure 6 . Tree Canopy Coverage (2022)

GIS Data Source: Greater Sydney Region Tree Canopy to Modified Mesh Block 2022

3.2 CANOPY BY LAND OWNERSHIP

Figure 10 illustrates how tree canopy cover is distributed across Brookvale in terms of public versus privately owned land.

Table 3 . Brookvale Land Ownership and Canopy Cover

	% Land Area	% Canopy Cover
Private Land	74%	12%
Public Land	26%	36%
Totals	100%	18%

3.2.1 PRIVATE LAND

As outlined in **Table 3**, private land which occupies around 74% of the suburb, has only 12% canopy cover overall. A further breakdown of canopy cover for private land uses is shown in **Table 4**.

Table 4 . Brookvale Private Land Canopy Cover

	% Land Area	% Canopy Cover
Commercial (includes Retail)	16%	4%
Industrial	38%	8%
Residential	20%	25%

These figures indicate that tree canopy across the private domain is the primary contributor to low levels of canopy across the suburb. Improvements to planning regulations to assist in increasing canopy cover within the private domain or Brookvale are outlined in **Section 6**.

3.2.2 PUBLIC LAND

Public land occupies 26% of the suburb and has approximately 36% canopy cover. Canopy cover across public land use is detailed further in **Table 5**. Environmental conservation land in the north of the suburb provides most of this canopy cover, whilst roads have approximately 13% canopy cover across the suburb. Recreational spaces have 55% canopy cover, however this statistic is heavily skewed by the southern areas of Allenby Park which is largely bushland. Parks such as Green Street Park and Brookvale Oval have 25% and 20% canopy cover respectively, which could be improved.

Table 5 . Brookvale Public Land Canopy Cover

	% Land Area	% Canopy Cover
Recreational	6%	55%
Roads	15.5%	13%
Environmental	4.5%	90%

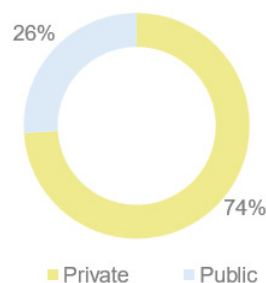


Figure 7 . Brookvale Land Ownership Ratios

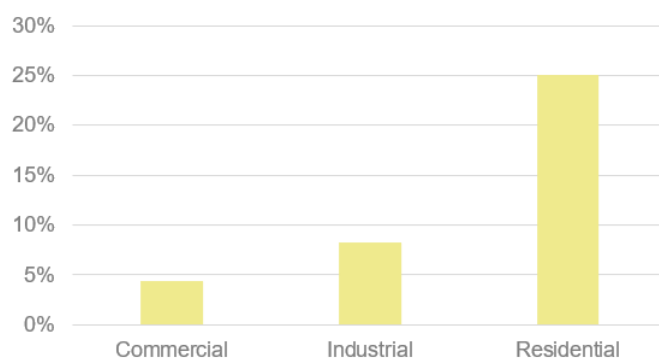


Figure 8 . Canopy Cover By Private Land Ownership

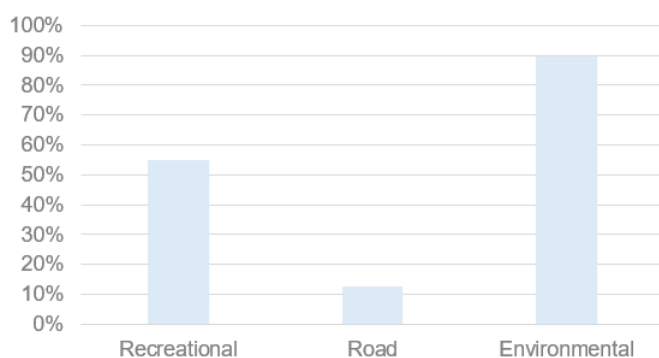
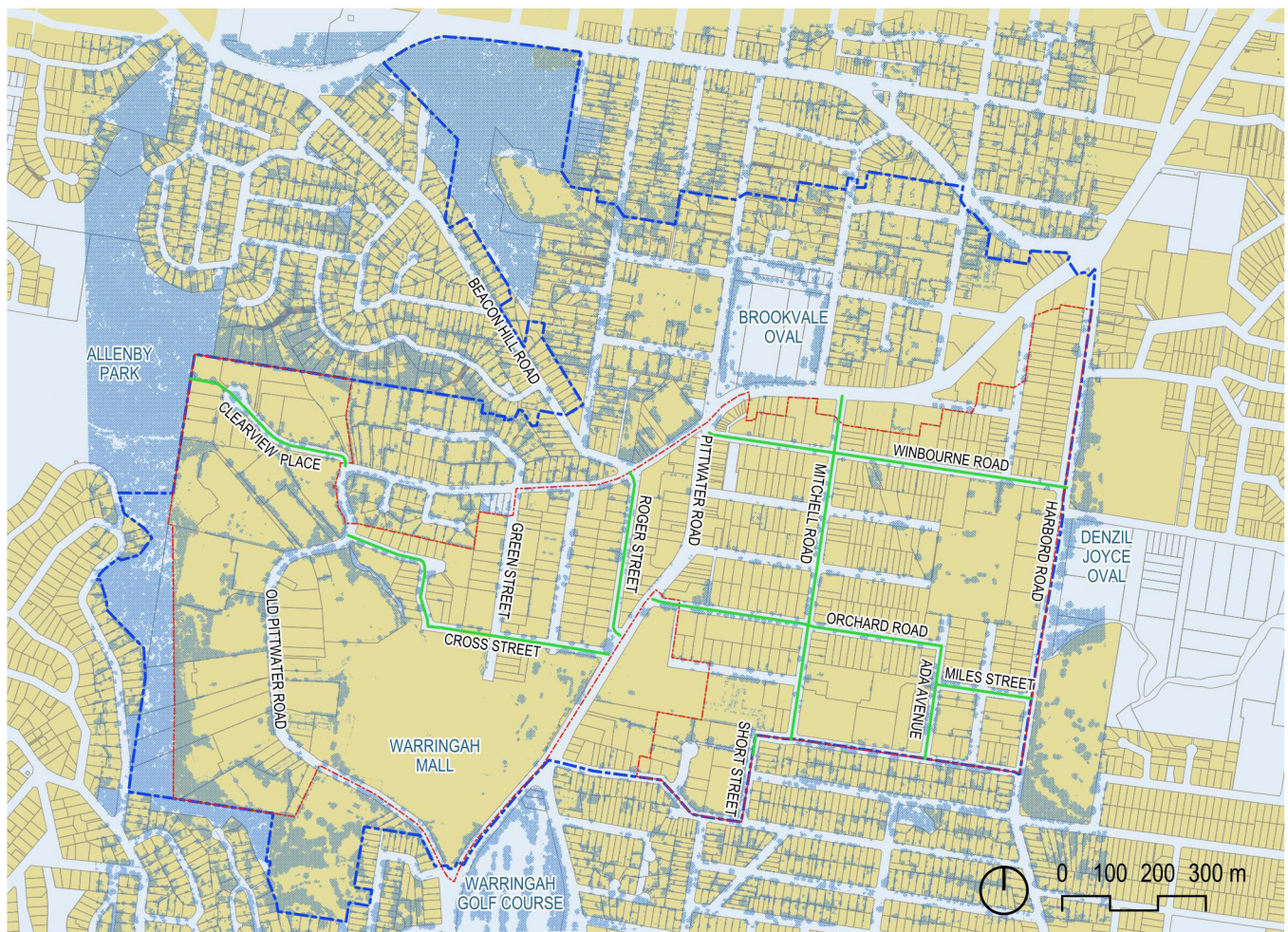


Figure 9 . Canopy Cover by Public Land Ownership

“Private land which occupies around 74% of the suburb, has only 12% canopy cover overall”.



Legend

- Brookvale Boundary
- BSP Study Area
- Green Link Street
- Tree Canopy
- Land Ownership:
- Private Land
- Public Land

Figure 10 . Brookvale Tree Canopy by Land Ownership

GIS Data Source: Greater Sydney Region Tree Canopy to Modified Mesh Block 2022

3.3 GREEN LINK TREES BY AGE

A tree audit has been recently conducted for the nominated Green Link streets. It reveals that 73% (Figure 12) of the tree population surveyed has an age classification of “mature”. One tree surveyed had senesced and one was considered “over-mature”. The distribution of trees by age across Green Link Streets is shown in Figure 11.

RECOMMENDATIONS

Given the maturity of the many trees surveyed, it is recommended that a succession planting plan is devised for Brookvale in the near term. It is also recommended that implementation of the succession planting plan commences in the near term, to mitigate the risk of trees senescing without replacements in place that are already semi-mature and able to fill the void left in the urban canopy.

Senesced or over-mature trees should be assessed to determine if they pose a risk to public safety and if so, they will require removal.

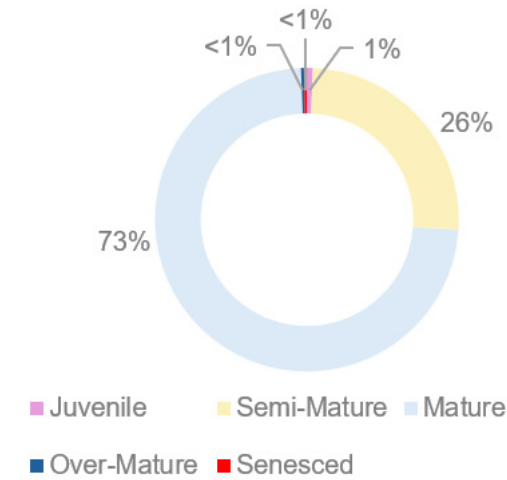


Figure 12 . % Trees Surveyed By Age

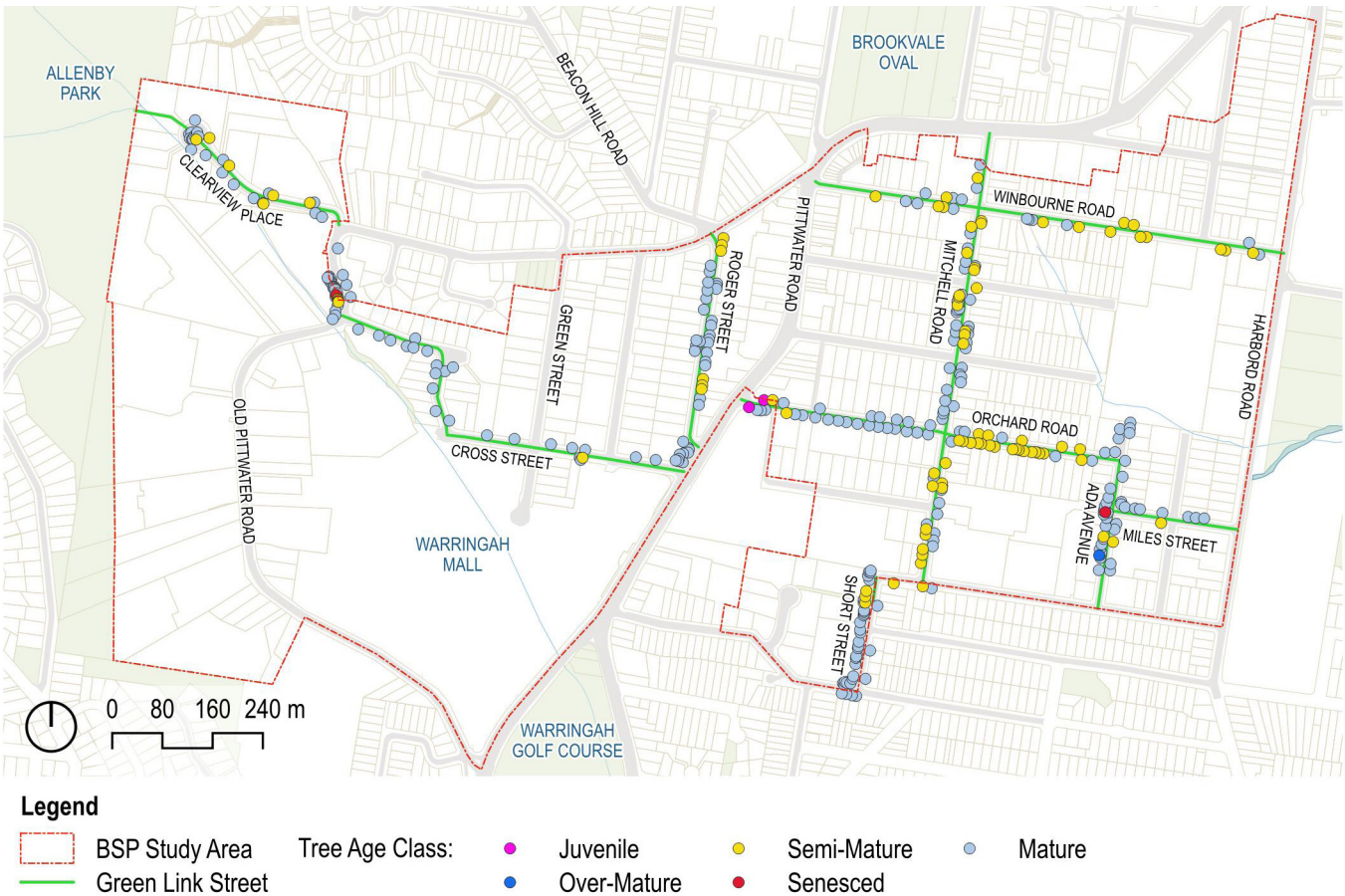


Figure 11 . Green Link Trees by Age

3.4 GREEN LINK TREES BY ORIGIN

The tree audit highlights that 73% of trees surveyed are native, 21% are locally indigenous and 6% are exotic (**Figure 14**). The distribution of trees by their species origin is shown in **Figure 13**.

RECOMMENDATIONS

There are biodiversity benefits associated with incorporating local indigenous species within the streetscape, particular near wildlife corridors and areas with greater vegetation cover. Streets near Allenby Park and the conservation area to the north of Brookvale could be enhanced with a greater proportion of indigenous species that can tolerate urban street condition. Within the industrial areas of Brookvale where hardscaping dominates the ground plane and the UHI impacts are already high, larger exotic deciduous species with broad leaf surfaces could be incorporated to increase evapotranspiration rates and cooling rates during summer, whilst allowing more sunlight into the street during winter.

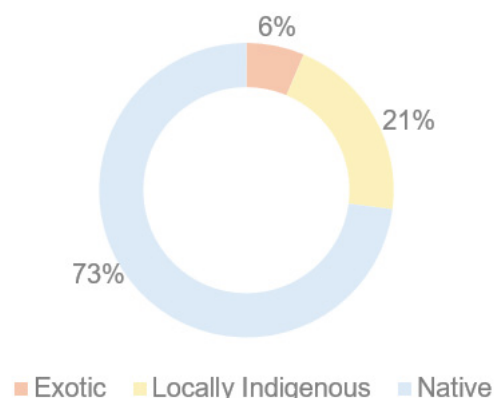


Figure 14 . % Trees Surveyed By Origin



Figure 13 . Green Link Trees by Species Origin

3.5 GREEN LINK TREES BY HEIGHT

Figure 15 shows the distribution of trees surveyed by height. Around 50% of trees surveyed are relatively small and less than 10m in height, whilst 47% of trees surveyed are medium to large, ranging 10-20m in height (**Figure 16**). Considering that 73% of the population surveyed is fully grown and mature (as outlined in **Section 3.3**), it signals that a high proportion of trees are both mature and small simultaneously.

RECOMMENDATIONS

As such, there is an opportunity to plant larger canopy trees across Brookvale streets to help provide shade and mitigate the urban heat island effect. In addition, as over 50% of the tree population surveyed are Queensland Brush Box trees which typically grow to around 15-20m high, these figures also suggest that tree pruning under powerlines is also contributing to smaller trees within the streetscape.

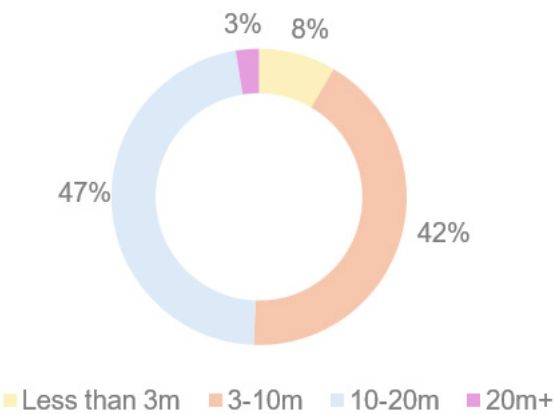


Figure 16 . % Trees Surveyed By Height



Figure 15 . Green Link Trees by Height

3.6 GREEN LINK TREES BY SPECIES

As shown in **Figure 17**, a high proportion (54%) of street trees surveyed were *Lophostemon confertus* (Queensland Brush Box). A high dominance of individual species can result in broad scale tree losses due to introduced pests and diseases.

RECOMMENDATIONS

A broader species mix is also beneficial in enhancing local biodiversity. As such, it is recommended that individual tree species should be limited to less than 25% of the tree composition on each street.

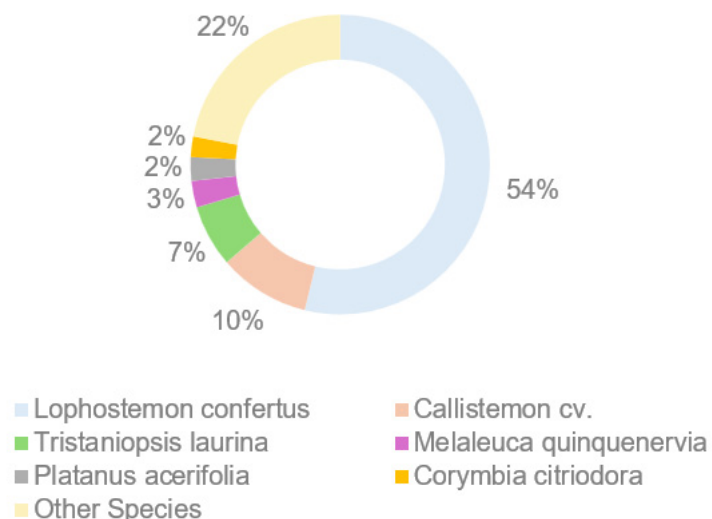


Figure 18 . Green Link Trees by Species

3.7 GREEN LINK TREE STATUS

Of the trees surveyed, there is a *Syzygium paniculatum* (Magenta Cherry) on Cross Street which is a local indigenous species that has a status of endangered. There are also 4 *Phoenix canariensis* (Canary Island Date Palm) trees on the corner of Cross Street that have a heritage status.

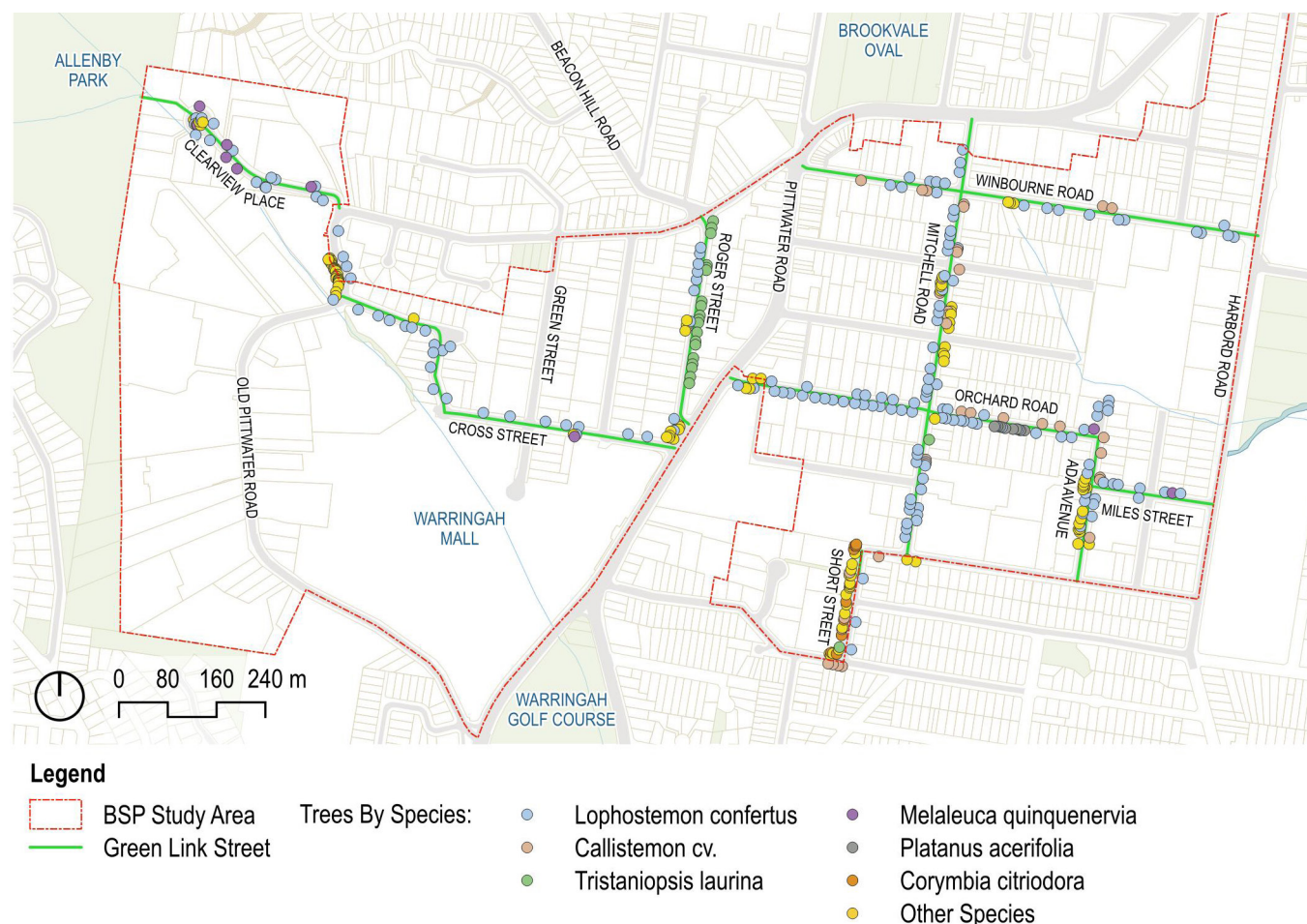


Figure 17 . Green Link Trees by Species Type

3.8 BIODIVERSITY

Much of the native vegetation within the Brookvale Structure Plan study area has been cleared (shown in **Figure 19**). Small patches of remnant vegetation such as Sydney Coastal Sandstone Gully Forest and Sydney Coastal Sandstone Bloodwood Shrub Forest remain with Allenby Park and surrounds to the west. Some pockets of Estuarine Swamp Oak Twig-rush Forest occur near Warringah Golf Course in the south and Greendale Creek in the east.

Some threatened fauna sightings have also occurred in the area, including threatened birds, bats and amphibians.

RECOMMENDATIONS

Overall, there is a significant opportunity to increase the biodiversity across Brookvale. As outlined in the Biodiversity in Place guide (GANSW, 2024), an “increase in the volume of understorey from 10-30% can have a 30-120% increase in species such as native birds, bats and insects.”

Section 5 provides strategies to increase planting zones within the streetscape which will provide greater understorey plantings to support biodiversity. A broad diversity of tree species has also been recommended to support a variety of fauna species.

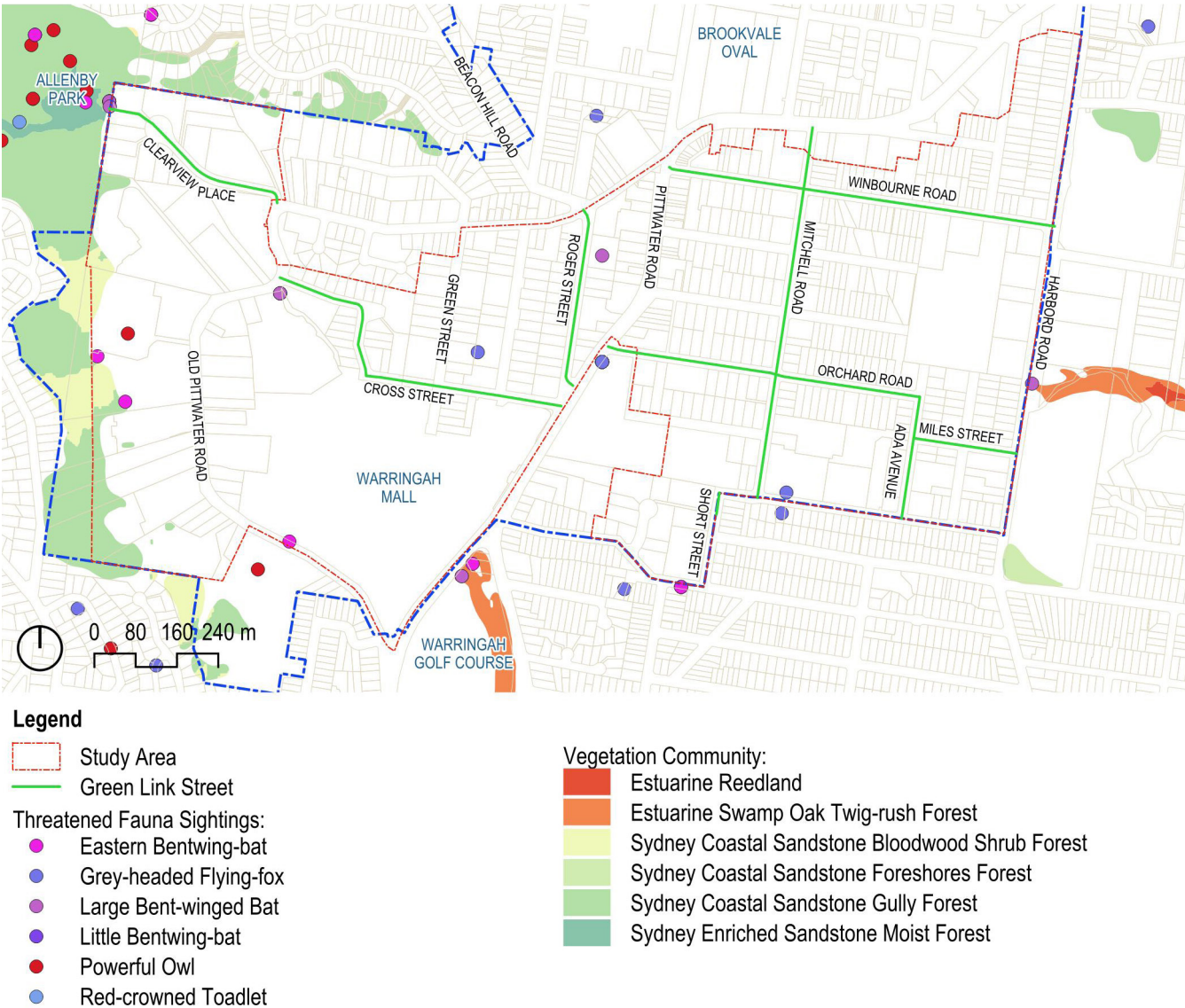


Figure 19 . Biodiversity

3.9 HEAT BENCHMARKING STUDY

The Heat Benchmarking Study (Appendix 1: Microclimates of Brookvale, WSU, 2025) has found a high variability in microclimates across Brookvale streets. Local temperatures varied by around 1.5°C across benchmarked streets, with Dale Street having the highest mean air temperature of 23.9°C whilst Clearview Place had the coolest mean temperature of 22.6°C. The mean summer temperatures are relatively mild given Brookvale's proximity to the coast and the prevalence of coastal sea breezes that provide a cooling effect from an easterly direction.

The benchmarking study (**Figure 20**) found that warmer locations were generally located in the eastern and central parts of Brookvale, where densely built up industrial and commercial areas exist and tree canopy is sparse. Cooler locations were found in the north-western part of the precinct adjacent to the extensive vegetation within Allenby Park, and where canopy cover within streets was also higher.

The highest street temperature of 43.7°C was recorded on Mitchell Road, near the intersection of Pittwater Road. At this location, the maximum temperature was almost 5°C hotter than on Ada Avenue, which had the lowest Tmax temperature and much higher levels of canopy cover.

Given the small spatial scale of this study, these temperature variations highlight the impact of grey and green infrastructure in the urban environment and the critical role they play in increasing and decreasing temperatures respectively.

The study also highlights the important role that open and green spaces play in terms of cooling the suburb and channelling coastal breezes. The green spaces of Curl Curl Lagoon and Greendale Creek to the east of study area allow sea breezes to infiltrate the industrial area to the east of Pittwater Road, and this cooling effect was carried through east-west oriented streets with higher levels of green infrastructure and canopy cover.

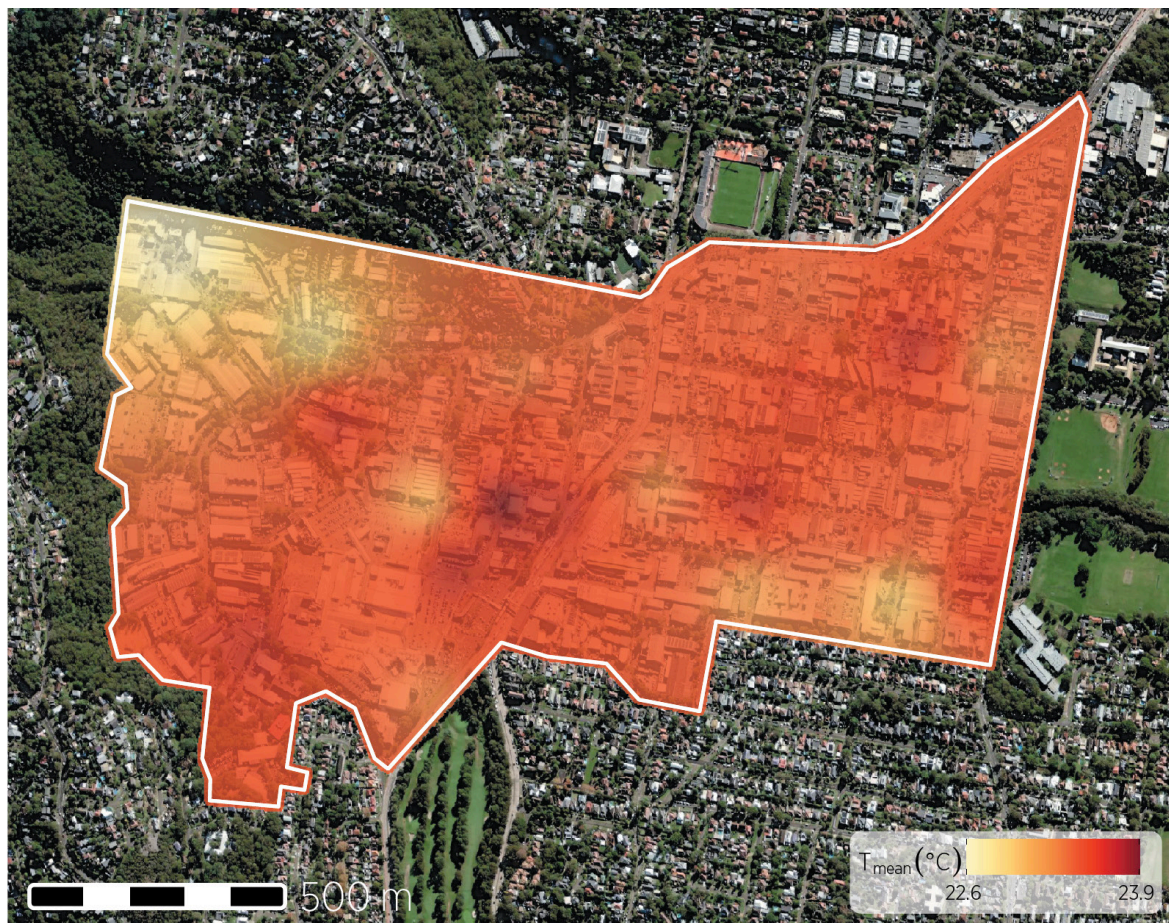


Figure 20 . Mean summer air temperature (Tmean, °C) across Brookvale (01/12/24 - 15/02/2025)

Source: Appendix 1: Microclimates of Brookvale, WSU, 2025

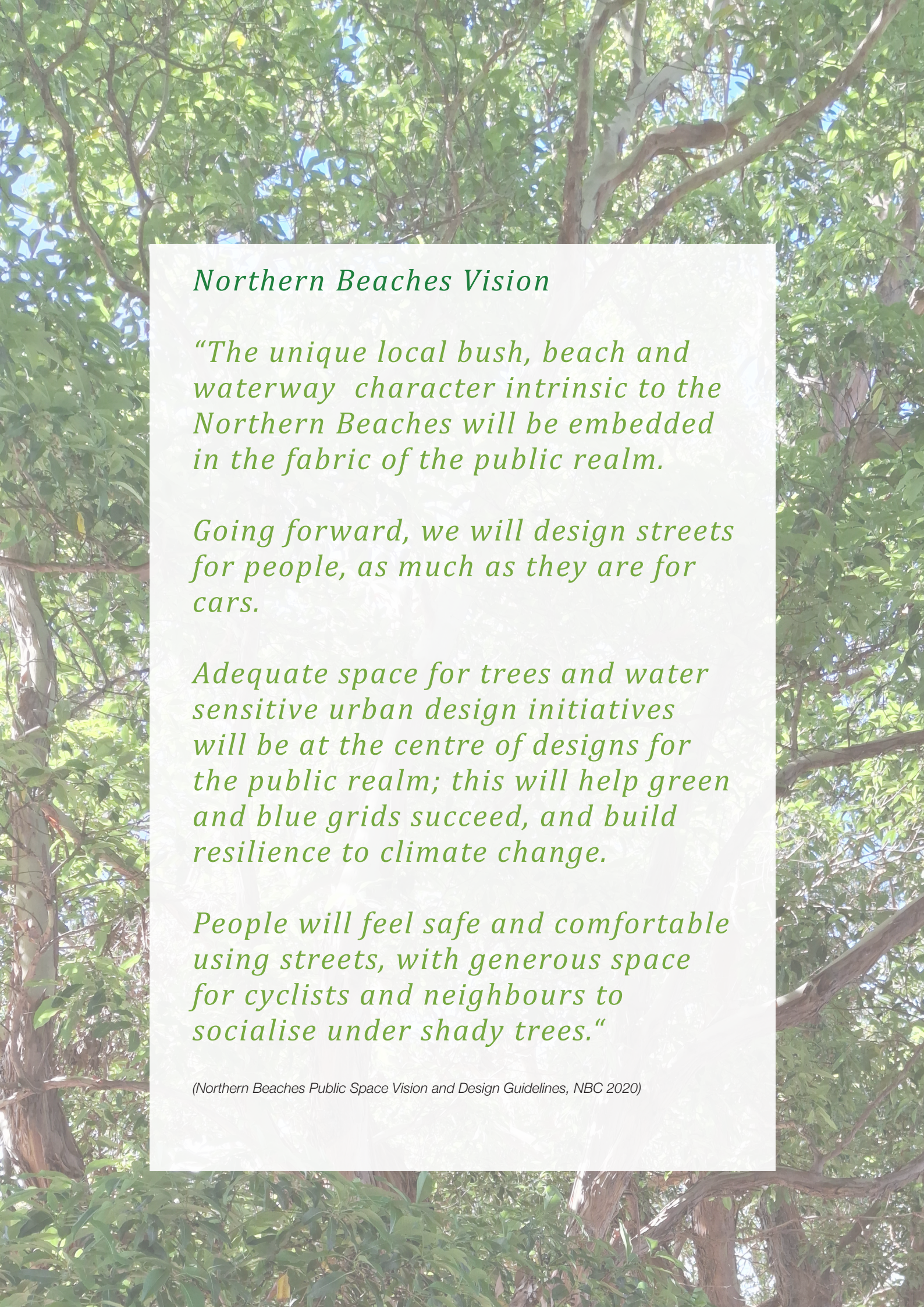
Similarly, the large vegetated area of Allenby Park in the north-west of the study area also provides a cooling effect to surrounding streets.

RECOMMENDATIONS

The Heat Benchmarking Study provides a series of recommendations in relation to planning for and responding to urban heat. These recommendations have informed the Greening Strategy, particularly in relation to the selection of large canopied tree species that provide high levels of shade (refer **Section 5.11**), and increasing the ratio of green to grey infrastructure within the streetscape through a variety of design strategies (refer **Section 5**). The Heat Benchmarking Study has also informed recommendations provided within **Section 6 - Planning Recommendations**.

4. VISION & CANOPY TARGETS





Northern Beaches Vision

“The unique local bush, beach and waterway character intrinsic to the Northern Beaches will be embedded in the fabric of the public realm.

Going forward, we will design streets for people, as much as they are for cars.

Adequate space for trees and water sensitive urban design initiatives will be at the centre of designs for the public realm; this will help green and blue grids succeed, and build resilience to climate change.

People will feel safe and comfortable using streets, with generous space for cyclists and neighbours to socialise under shady trees.”

(Northern Beaches Public Space Vision and Design Guidelines, NBC 2020)

4.1 NORTHERN BEACHES VISION

The Northern Beaches Public Space Vision and Design Guidelines (PSVDG) sets the vision for the Northern Beaches, which seeks to maintain the unique qualities and environmental character of the LGA and embed these within all public realm. Emphasis is placed on street design that incorporate blue and green infrastructure, and are cool and comfortable for pedestrians.

This Greening Strategy aligns with the Vision for the Northern Beaches and in particular, contributes towards two key objectives for the public domain, including:

- **Objective 5:** Integrate water sensitive urban design into streets and open spaces
- **Objective 6:** Increase tree canopy, green cover and landscaping.

4.2 CANOPY TARGETS

Setting canopy targets can help to provide councils with ambitious and realistic goals in relation to enhancing their urban tree population. If accepted and adopted, these targets should be reflected within relevant planning instruments and strategic plans to support their uptake and implementation. In addition, regular performance monitoring and measurement should be conducted to assess progress and shortfalls, with corrective actions taken to achieve the targets.

A range of tree canopy targets were identified during the policy document review and these were summarised in **Section 2.3**. These policy guidelines, in conjunction with the tree canopy analysis performed, have guided the recommendations within this section.

4.2.1 CANOPY TARGETS BY PRECINCT

It is recommended that canopy targets for Brookvale are set by precinct type (or land use), given the high level of industrial and commercial land compared with residential. This will also help to that ensure that both the public and private domain are contributing adequately towards canopy cover across the suburb.

As outlined in the Draft Greener Places Design Guide (GANSW, 2020), the following general targets are recommended for urban areas:

- CBD target > 15%
- Medium to high density target > 25%
- Low density target > 40%

The Greener Neighbourhoods Guide (NSW Government, 2021) provides a more detailed set of tree canopy targets by precinct type (or land zoning) that are summarised in **Table 6**. It is recommended that these precinct canopy targets are adopted for Brookvale to aid in increasing canopy cover and to enable ongoing performance measurement at a precinct level.

Table 6 . Recommended Canopy Targets by Precinct

Precinct Type	Minimum Canopy Target
Residential Zoned Land (R1,R2,R3,R4)	40%
Industrial Zoned Land (IN1,IN2)	25%
Business Zoned Land (B5,B6,B7)	35%
Open Space (RE1)	45%

Whilst the above targets are intended to also include streets within each zoning type, the PSVDG provides more ambitious targets for street types within the Northern Beaches LGA. The PSVDG tree canopy targets for different street types are listed in **Table 7** and it is recommended that all streets in Brookvale adopt these targets over time.

Table 7 . Recommended Canopy Targets for Streets

Street Type	Canopy Target
Local Street	40%
Industrial Street	50%
Collector Street	40%
High Street	45%
Laneway	45%

4.3 BROOKVALE FUTURE CANOPY

Given the current distribution of land uses across Brookvale and the current canopy cover, **Table 8** shows the uplift in canopy cover required to achieve the proposed targets.

Achieving the targets would result in an increase of canopy from around 40.5 hectares at present, to 82.1 hectares overall, assuming that Environmental and Recreational land retain their current canopy levels, which meet the proposed precinct targets when aggregated together (note however, that Green Street Park and Brookvale Oval do not currently meet the proposed 45% target when considered in isolation and additional canopy should be introduced in these parks).

This would create an overall canopy cover of 37% for the suburb of Brookvale.

Significant work will be required to achieve these targets, particularly in the private domain. Action plans to increase the canopy in each precinct should be developed in the short-term, with tree planting commencing immediately where ever feasible.

To support action planning, **Section 5** provides a series of design strategies and recommendations to increase canopy and green infrastructure in Green Link Streets, whilst **Section 6** provides recommendations to improve the Warringah DCP 2011 in relation to canopy and green infrastructure across the public and private domain.

Table 8 . Resulting Canopy Cover When Targets are Achieved

Ownership	Land Use	Proportion of Brookvale Land %	Current Canopy Cover (Ha)	Current Canopy Cover %	Proposed Canopy Target	Canopy Uplift Required %	Resulting Canopy Cover (Ha)
Private	Commercial	16%	1.6	4%	35%	↑ 31%	12.6
Private	Industrial	38%	7.0	8%	25%	↑ 17%	21.1
Private	Residential	20%	11.4	25%	40%	↑ 15%	18.2
Public	Recreational	6%	7.4	55%	45%	ACHIEVED	7.4
Public	Roads	15.5%	4.3	13%	40%	↑ 27%	13.8
Public	Environmental	4.5%	8.8	90%	45%	ACHIEVED	8.8
TOTALS		100%	40.5	18%	37%	↑ 18%	82.1

NOTE: The proposed MU1 areas in the Brookvale Structure Plan are included within the Commercial category above.

5. GREEN LINK STREETS - DESIGN STRATEGIES



5.1 GREEN LINK STREET ANALYSIS

5.1.1 GREEN LINK STREET ATTRIBUTES

A detailed analysis of Green Link Streets has been carried out and a summary of street attributes is shown in **Table 9**.

Each Green Link Street has been assigned a street typology (informed by the street hierarchies provisioned in the PSVDG and shown in **Figure 21**).

However, in contrast to the PSVDG, Orchard Road has been deemed an Industrial Street and Short Street has been deemed a hybrid between a Local Street and Industrial Street, based on their surrounding land uses.

Table 9 . Green Link Street - Attribute Summary

	Green Link Streets								
	Clearview Place	Winbourne Road	Orchard Road	Short Street	Mitchell Road	Ada Avenue	Miles Street	Roger Street	Cross Street
PSVDG Typology	Industrial Street (with Cycle Facility)	Industrial Street (with Cycle Facility)	Industrial Street^ (with Cycle Facility)	Local & Industrial Street	Industrial Street	Industrial Street (with Cycle Facility)	Industrial Street (with Cycle Facility)	High Street (with Cycle Facility)	Industrial Street (with Cycle Facility)
Current Zoning***	IN1	IN1, E3	IN1, E3	IN1, R2	IN1, E3	IN1	IN1	E3	IN1, E2, E3
BSP Character Precinct	Industrial West	Industrial East	Industrial East	Industrial East	Industrial East	Industrial East	Industrial East	Roger Street	Industrial West
SCN Cycle Facility Type	Shared Path	Shared Path	Separated Cycleway	On-Road	On-Road	Shared Path	Shared Path	Shared Path	Shared Path
Bus Route		Yes							Partial
Parallel Parking	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Partial
Road Corridor Width*	20m	20m	20m	20m	20m	20m	20m	20m	20m
Carriageway Width*	12m	12m	12m	12m	12m	12m	12m	12m	12m
Verge Width*	2.8-5.2m	4.5m	4.5m	4.5m	4.5m	4.0m	4.5m	4.5m	4.5m
Footpath Widths*	1.2m	1.2m	1.2m	1.2m	1.2m	1.2m	1.2-2.4m	1.2m	1.2m
Building Set Back Distances*	1.0-5.0m	2.0-32.0m	0.5-18.0m	2.0-6.0m	0.5-18.0m	1.5-13.0m	0.5-3.0m	0.5-40.0m	0.5-11.0m
Powerline Locations**	Northern Side	Northern Side	Northern Side	Eastern Side	Eastern Side	Eastern Side	Southern Side	Eastern Side	Varies

NOTE * Dimensions are approximations based on satellite imagery

NOTE ** Represents the predominant location of powerlines, however they may also cross over the road in some instances

NOTE *** Some areas will be rezoned to MU1 (Mixed Use) in the future. This includes Roger Street, Cross Street between Pittwater Road and Dale Street, as well as small segments of Winbourne Road and Orchard Road near Pittwater Road.

NOTE ^ THE PSVDG classifies Orchard Road as a Local/Collector Street, however it is deemed an Industrial Street within this Greening Strategy based on its surrounding land uses.

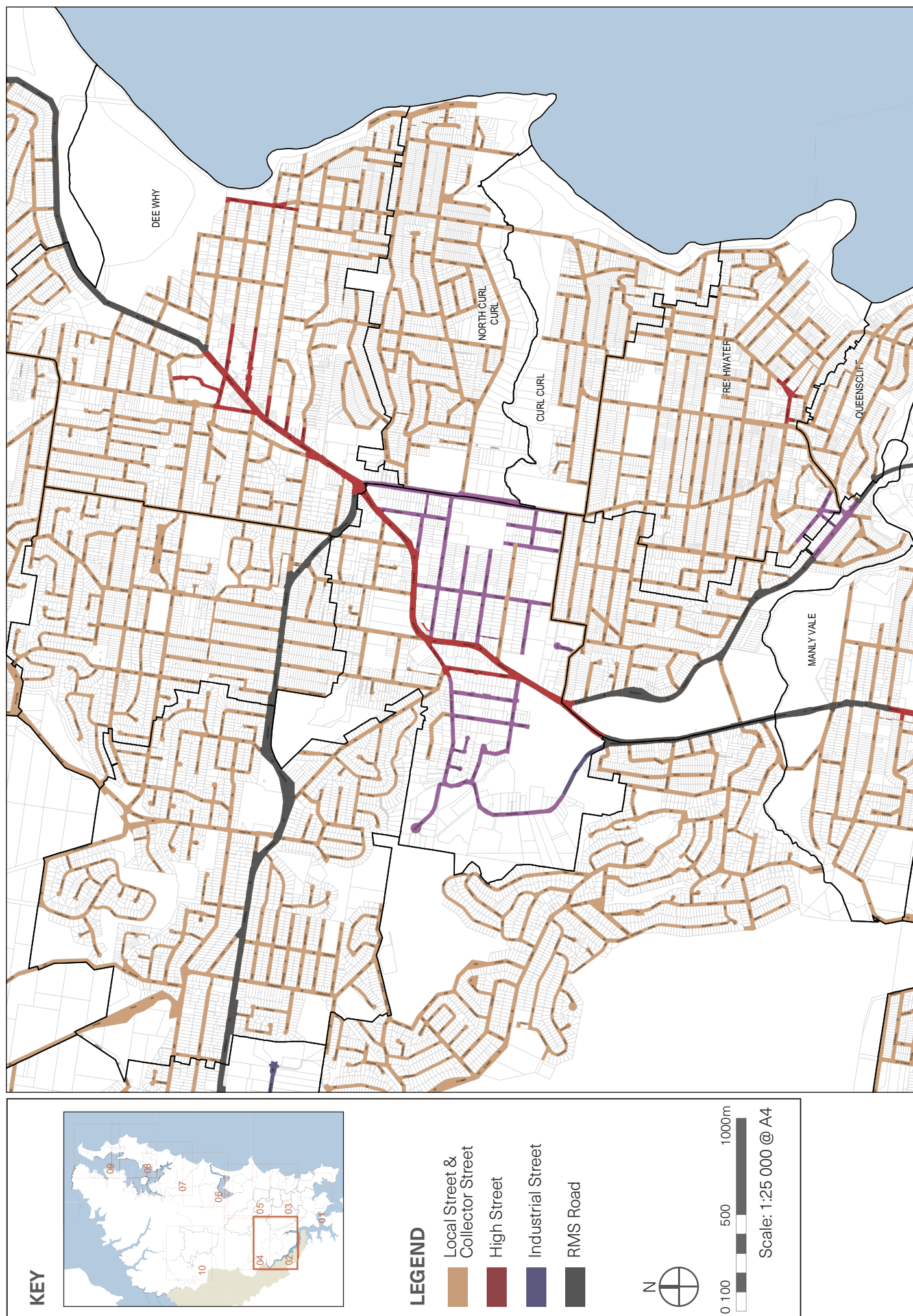


Figure 21 . Brookvale and Surrounds - Street Hierarchy

Northern Beaches Public Space Vision and Design Guidelines (Aspect Studios, 2020)

5.1.2 GREEN LINK STREET CONDITIONS

Some common Green Link Street conditions, including issues and opportunities are summarised below and detailed in **Figure 22**.

ISSUES

- Car movement, car parking and driveways are consuming much of the space in the road reserve
- Large gaps in tree plantings exist throughout street verges
- The pruning of trees under powerlines is significantly impacting street tree size, reducing shade potential and cooling opportunities
- Short segments of Mitchell Road and Cross Street have no parallel parking within the road reserve, limiting the ability to introduce planted blister cells within the edges of the carriageway
- A high proportion of street trees are *Lophostemon confertus* and most verges are planted with turf, which is limiting biodiversity within the streetscape
- Inadequate setbacks of buildings or awnings prevents the planting of trees in some areas.

OPPORTUNITIES

- Most streets have a 20m wide road reserve with parallel parking on both sides of the street. Locating trees within parking lanes or where space allows, within central medians, can help to reduce conflicts with building awnings and utility services, provides greater solar access and conditions for trees to grow and reach their optimal form, shading larger areas of road pavement.
- Transitioning to Aerial Bundled Cables (ABC) can assist in limiting the amount of tree pruning required below and around powerlines. This will enable street trees to grow closer to their full potential. Undergrounding powerlines is recommended in High Streets to provision enough pedestrian and cyclist space as well as green infrastructure
- Where large gaps exist in street tree plantings, an immediate opportunity exists to plant new trees in these areas. Existing street trees are also often widely spaced, leaving gaps in the canopy. Planting trees closer together (maximum 10m spacing) should be adopted to provide continuous canopy along verges
- Increasing the diversity of tree species and incorporating a diverse mix of understorey plants within selected verge locations will help to improve biodiversity
- Incorporating WSUD elements will help to retain water in soils, enhance street tree health and improve stormwater management overall. This could include techniques such as passive irrigation of street trees, incorporating rain gardens in verges and within planted blister cells in carriageways, along with maximising permeable surfaces where ever possible
- Utilising larger growing tree species will also help to maximise the shade and cooling impacts they provide within the streetscape
- Provisioning adequate awning setbacks (as outlined in the PSVDG) and minimum building setbacks will also assist in ensuring that verges can support large and tall canopy trees
- Encourage private land owners to incorporate planting areas and green walls adjacent to street edges where street tree planting opportunities are limited.



Source: Google Street View (2024)

Narrow set backs and shop awnings overhanging the footpath (Winbourne Road)



Cross Street (east of Green Street) has no parallel parking, restricting new trees to the verge only



Source: Google Street View (2024)

Tree pruning below powerlines is reducing the shade and heat mitigating potential of trees (Winbourne Road)



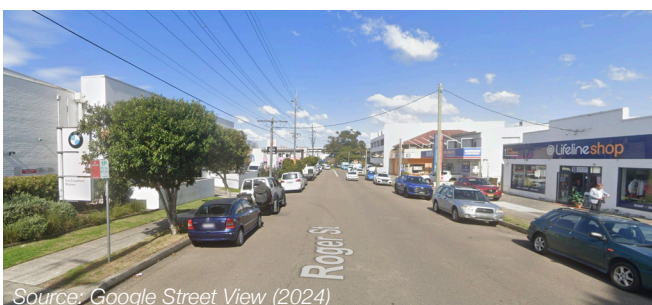
Where verge space is limited, private green walls can play a role in greening the street (Cross Street)



Large, mature canopied trees provide substantial shade whilst improving street appeal (Orchard Road)



Large stretches of verge without street trees, despite there being no overhead powerlines (Mitchell Road)



Source: Google Street View (2024)

Parallel parking and wide carriageways allows for planted blister areas within the road (Roger Street)



Source: Google Street View (2024)

Powerlines potentially discouraging new tree plantings (Clearview Place)

Figure 22 . Green Link Street conditions

5.2 GREEN LINK - INDUSTRIAL STREETS

Industrial Streets should strive for a minimum of 50% canopy cover

The PSVDG provides guidance on the design of industrial streets. It proposes a 50% canopy cover target and a 45% (with active transport) to 50% (without active transport) permeable surface target for all industrial streets.

The following Green Link streets are deemed Industrial Street types.

- Clearview Place
- Winbourne Road
- Orchard Road
- Mitchell Road
- Ada Avenue
- Miles Street
- Cross Street (note the Eastern portion is subjected to the Brookvale Structure Plan)

These streets traverse through industrial or commercial land. They typically have a 20m road reserve with 12m carriageway and parallel parking on both sides of the street. There are a high frequency of driveways that vary in width to support small or heavy vehicle access. Parking dominates the streetscape as many streets allow 8 hour parking intervals. Many businesses also provide private parking within their lot boundaries, resulting in a high proportion of ground space being allocated to car parking overall. All of these conditions result in large expanses where street trees are absent. Furthermore, pruning under powerlines has greatly restricted the growth of many trees that are present.

5.2.1 GREEN LINK INDUSTRIAL STREET RECOMMENDATIONS

Green Link Streets are intended to offer shady, cool, green and comfortable corridors for people, cyclists and wildlife, whilst continuing to support the industrial precinct and the industrial activities occurring there. In light of this, the Greening Strategy proposes that Green Link Industrial Streets can meet and potentially exceed the 50% canopy target outlined in the PSVDG.

To achieve this outcome, the following recommendations apply to Green Link Industrial Streets (also shown in **Figure 24** and **Figure 25**):

- Transition powerlines to Aerial Bundled Cabling (ABC) to allow street trees to grow larger and closer to their full potential
- Where possible, consolidate driveways and parking areas to free up space for pedestrians, cyclists and green infrastructure
- Create a flexible zone along each kerb, in which some parking space is reallocated to incorporate planted blister areas
- Provide a continuous avenue of street trees, with maximum 10m spacing (excluding driveways)
- Employ a diverse mix of primarily large street trees with broad canopies to maximise shade and cooling. Deciduous species could be utilised to improve solar access in winter
- Within flexible zones and planting zones, incorporate mass planting areas and/or WSUD rain gardens to enhance biodiversity and stormwater infiltration
- Adopt porous and permeable materials to reduce stormwater run-off
- Provide unobstructed footpaths on both sides of the street with a minimum 1.5m width
- Shared paths should have a minimum width of 2.5m, and preferably 3-4m where space allows.
- Ensure adequate building and awning setbacks to allow street trees to grow to their full potential
- Consider reducing parking interval times to encourage the use of active and public transport.



Winbourne Road



Orchard Road



Source: Google Street View (2024)

Ada Avenue

Figure 23 . Industrial Street Examples

5.3 INDUSTRIAL STREET - TYPICAL PLANS

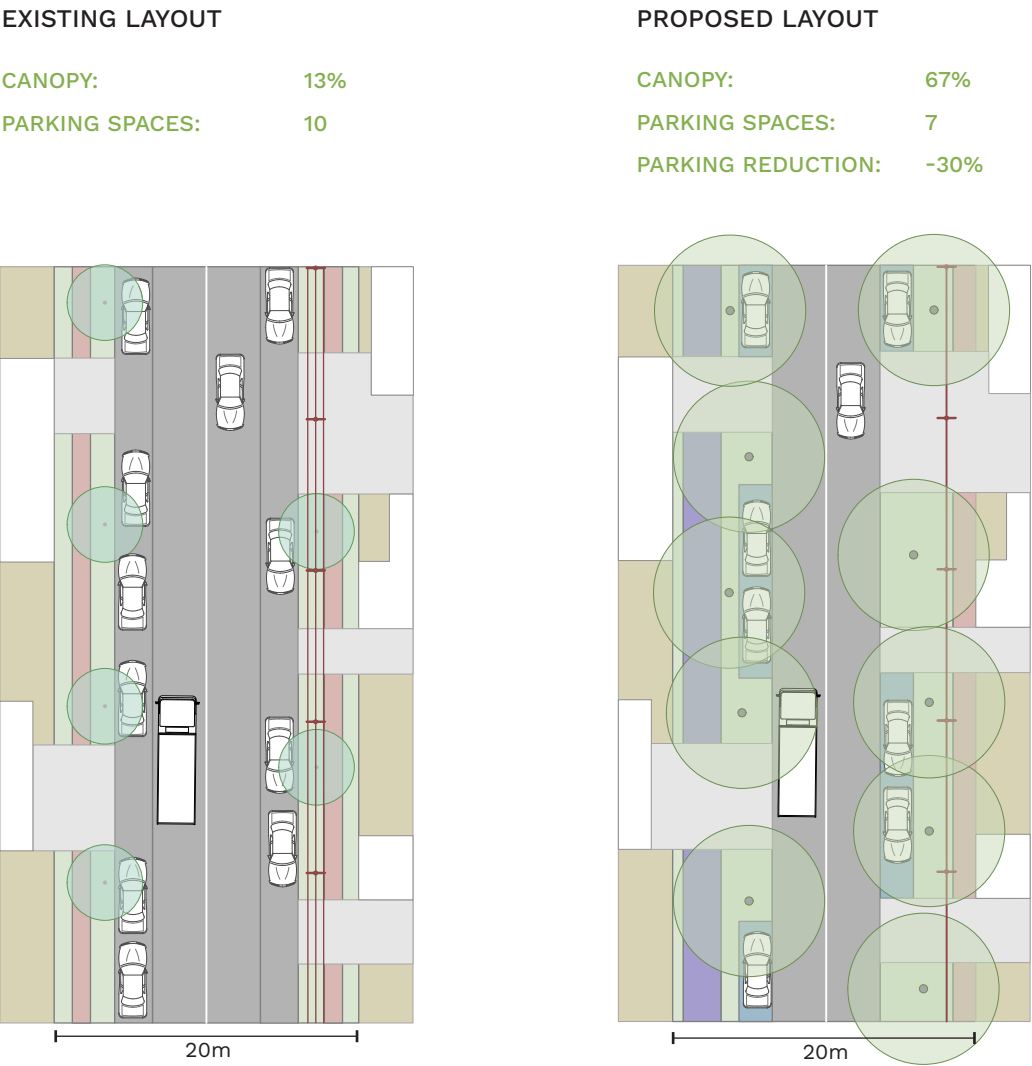


Figure 24 . Green Link Industrial Street - Typical Plans

- Legend**
- Planting Zone
 - Pedestrian Zone
 - Shared Path Zone
 - Flexible Zone
 - Road Carriageway
 - Driveway
 - Building
 - Private Land

Figure 24 and **Figure 25** demonstrate how space could be reorganised in a typical Industrial Green Link Street. It shows that a 30% reduction in parallel parking, combined with ABC powerlines and continuous plantings of large canopied trees, could achieve 67% canopy cover.

NOTE: The final resulting canopy will be heavily dependent on the frequency of driveways and their widths, the proportion of parking space that council wishes to re-purpose into planting space and building setbacks.

5.4 INDUSTRIAL STREET - TYPICAL SECTIONS

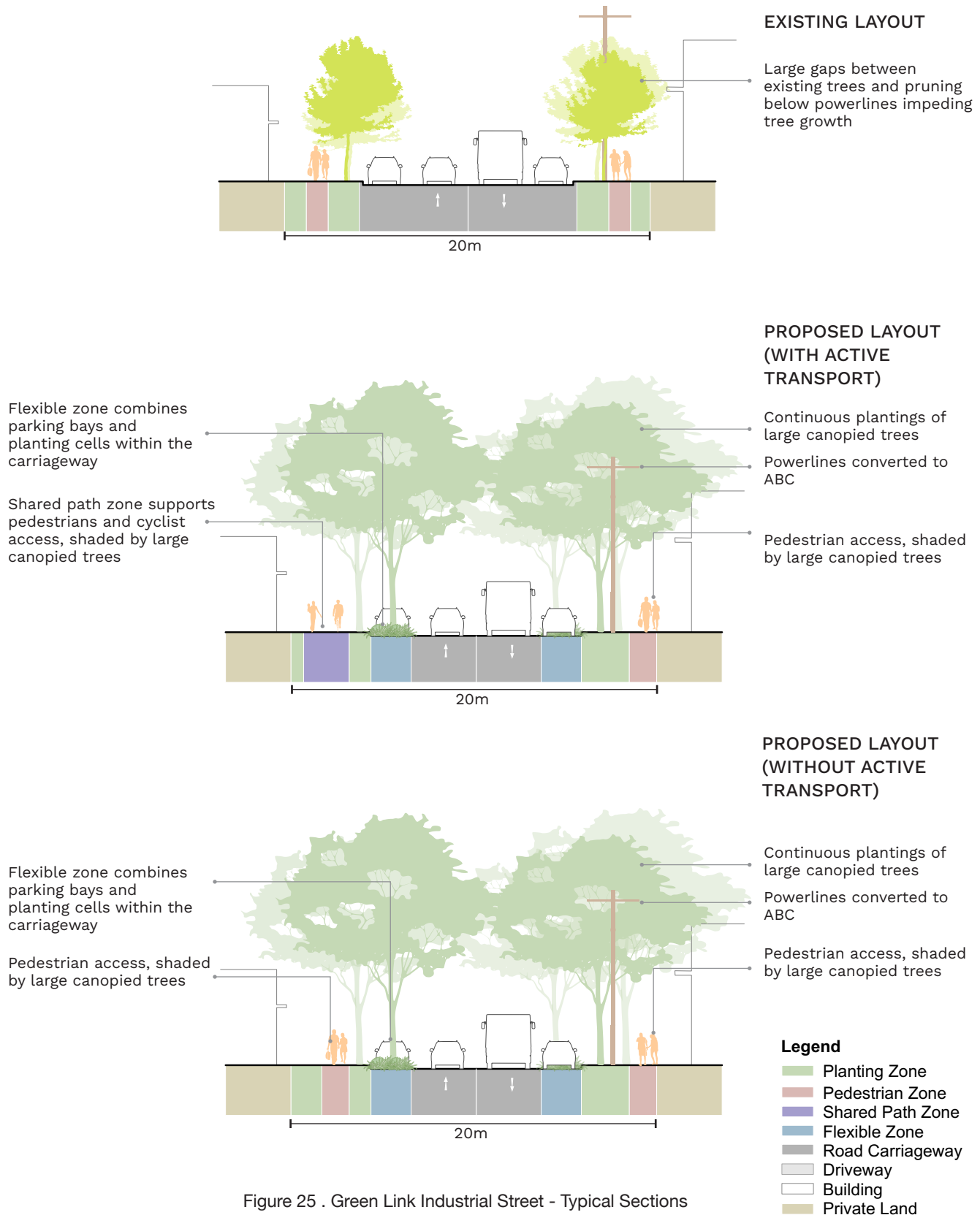


Figure 25 . Green Link Industrial Street - Typical Sections

5.5 GREEN LINK - HIGH STREETS

*High Streets should strive
for a minimum of 45%
canopy cover*

The PSVDG provides guidance on the design of High Streets. It proposes a 45% canopy cover target and a 35% permeable surface target for High Streets.

The following Green Link street is deemed a High Street.

- Roger Street

Roger Street is a unique character precinct within the Brookvale Structure Plan. It is intended that Roger Street will retain a light industrial character which includes several motor vehicle sales outlets. However, a broad range of other enterprises will also be present. Buildings of up to 8 storeys in height will be permitted, and residential apartments will reside on upper floors.

At present, Roger Street has a 20m road reserve with 12m carriageway and parallel parking on both sides of the street. There are a high frequency of driveways that vary in width to support a diverse range of businesses. Parking dominates the streetscape. These conditions are accompanied by sporadic street tree plantings. Street trees below the powerlines on the eastern side of the road have been heavily pruned and are relatively small.

NOTE: Dale Street (whilst not a Green Link Street) could also be redesigned as shown within this section, however there will be no residential uses on Dale Street.

5.5.1 GREEN LINK HIGH STREET RECOMMENDATIONS

As Roger Street is also a Green Link Street, this Greening Strategy proposes that it can meet and potentially exceed the 45% canopy cover targets outlined in the PSVDG.

To achieve this outcome, the following recommendations apply to Roger Street (also shown in **Figure 28** and **Figure 29**):

- As recommended within the PSVDG, widen the road reserve from 20m to 26m to create adequate space for all users
- Powerlines will need to be relocated underground to generate enough space for wide, unobstructed pedestrian footpaths and separated cycleways
- Where possible, consolidate driveways and parking areas to create longer spans of tree plantings and greater shade
- Create a flexible zone along each kerb, in which some parking space is reallocated to incorporate planted blister areas
- Provide a continuous avenue of street trees, with maximum 10m spacing (excluding driveways)
- Employ a diverse mix of medium and large sized street trees. Deciduous species could be utilised to improve solar access in winter
- Within flexible zones and planting zones, incorporate mass planting areas and/or WSUD rain gardens to enhance biodiversity and stormwater infiltration
- Adopt porous and permeable materials to reduce stormwater run-off
- Provide wide (minimum 2.5m) pedestrian zones on both sides of the street
- Ensure adequate building and awning setbacks to allow street trees to grow to their full potential.



Figure 26 . Roger Street current setting



Figure 27 . Roger Street future setting

Source: Brookvale Structure Plan, NBC 2023

5.6 HIGH STREET - TYPICAL PLANS

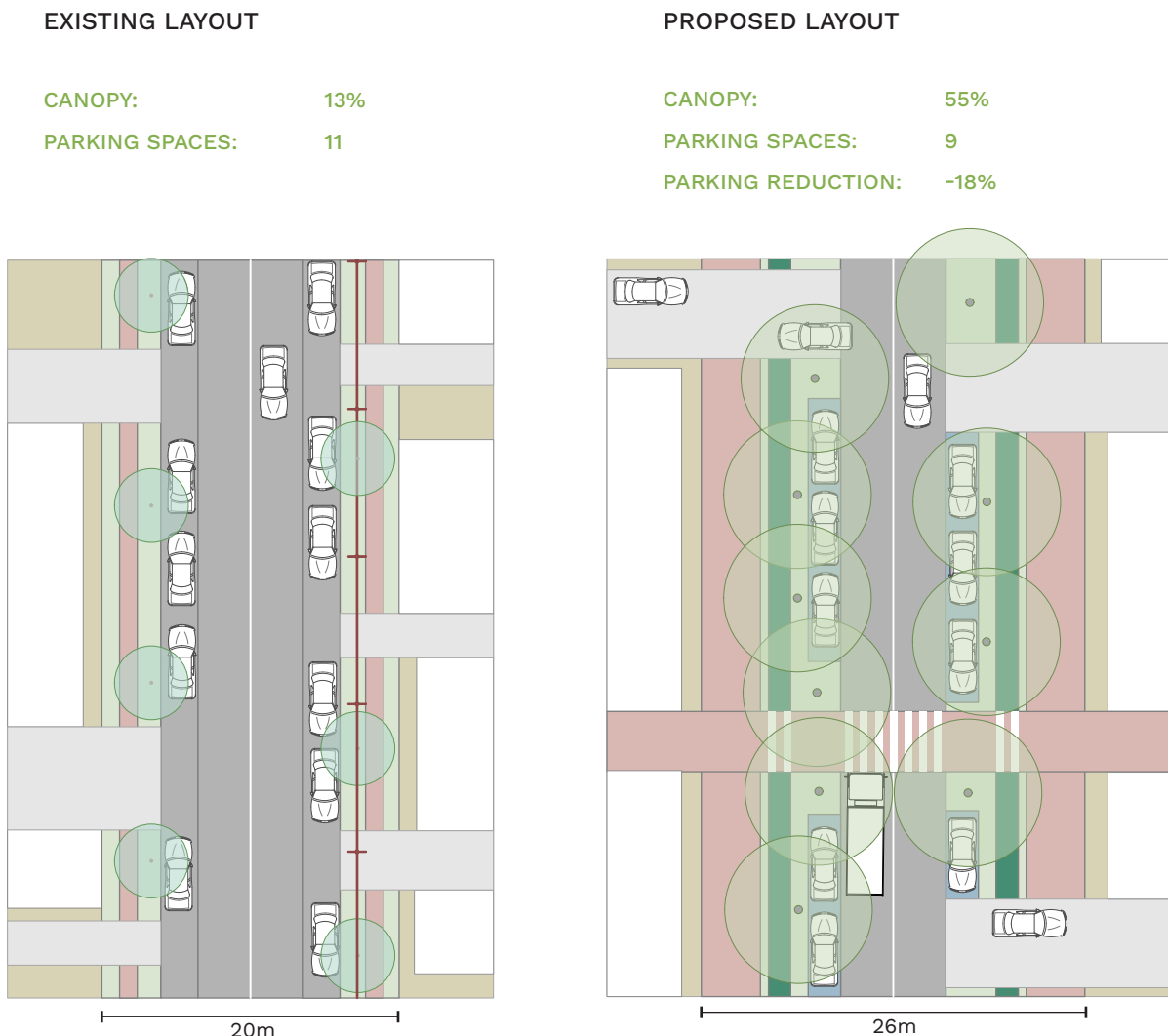


Figure 28 . Green Link Industrial Street - Typical Plans

Legend

- Planting Zone
- Pedestrian Zone
- Cycle Zone
- Flexible Zone
- Road Carriageway
- Driveway
- Building
- Private Land

Figure 28 and **Figure 29** demonstrate how space could be reorganised in a typical Green Link High Street. A 55% canopy cover could be achieved with the following street design changes implemented:

- Road reserve widened to 26m
- Powerlines under-grounded
- 18% reduction in car parking space
- Some consolidation of driveways
- Allocation of space for wide pedestrian zones and separated cycleways
- Flexible zone with planted cells and car parking

NOTE: The final resulting canopy cover will be heavily dependent on the frequency of driveways and their widths and the proportion of parking space that council wishes to re-purpose into planting space.

5.7 HIGH STREET - TYPICAL SECTIONS

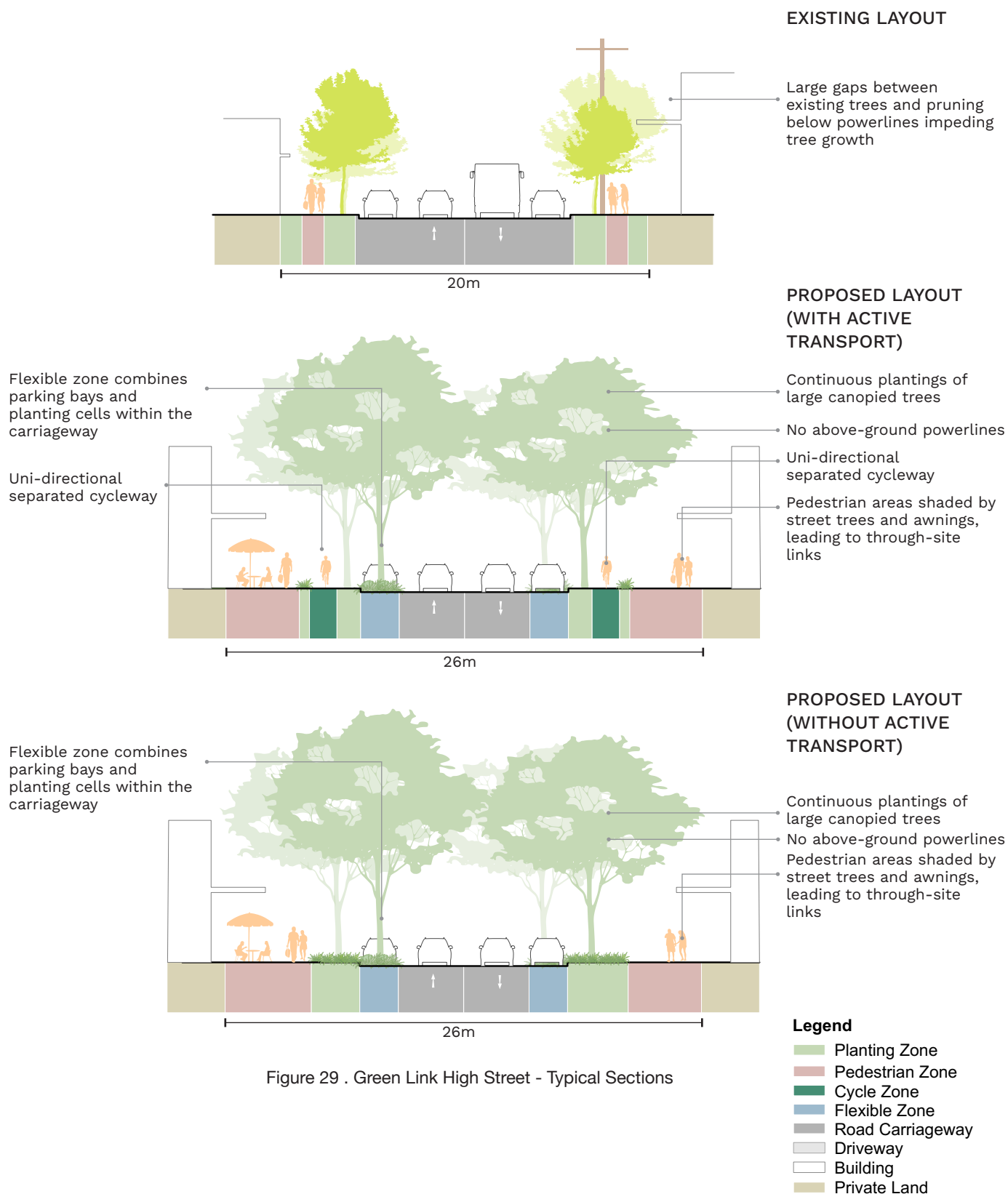


Figure 29 . Green Link High Street - Typical Sections

5.8 GREEN LINK - SHORT STREET

*Short Street should strive
for a minimum of **40-
50%** canopy cover*

Short Street has industrial lots on the western side of the road and residential lots on the eastern side of the road. Therefore, it is a hybrid of two street typologies - Industrial Street and Local Street.

The PSVDG provides guidance on the design of both Local Streets and Industrial Streets. Local Streets should achieve 40% canopy cover, whilst Industrial Streets should achieve 50% canopy cover. A hybrid of the two street types has been developed within this Greening Strategy to demonstrate how canopy cover could be improved on Short Street.

Short Street has a 20m road reserve with 12m carriageway and parallel parking on both sides of the street. Driveway widths vary on the industrial side of the street, whilst residential driveways are typically narrow and more uniform. Streets trees are dotted along the street, with some larger trees providing canopy on the western side of the street. The eastern side of the street has several street trees and most are heavily pruned below the powerlines.

5.8.1 RECOMMENDATIONS FOR SHORT STREET

The Greening Strategy proposes that Short Street can meet and potentially exceed the 40-50% canopy targets outlined in the PSVDG.

To achieve this outcome, the following recommendations apply to Short Street (also shown in **Figure 31** and **Figure 32**):

- Transition powerlines to Aerial Bundled Cabling (ABC) to allow street trees to grow larger and closer to their full potential on the eastern side of the street
- Where possible, consolidate driveways and parking areas to free up space for pedestrians, cyclists and green infrastructure
- Create a flexible zone along each kerb, in which some parking space is reallocated to incorporate planted blister areas
- Provide a continuous avenue of street trees, with maximum 10m spacing (excluding driveways)
- Employ a diverse mix of primarily large street trees with broad canopies to maximise shade and cooling. Deciduous species could be utilised to improve solar access in winter
- Within flexible zones and planting zones, incorporate mass planting areas and/or WSUD rain gardens to enhance biodiversity and stormwater infiltration
- Adopt porous and permeable materials to reduce stormwater run-off
- Provide unobstructed footpaths on both sides of the street with a minimum 1.5m width
- Shared paths should have a minimum width of 2.5m, and preferably 3-4m where space allows.
- Ensure adequate building and awning setbacks to allow street trees to grow to their full potential.

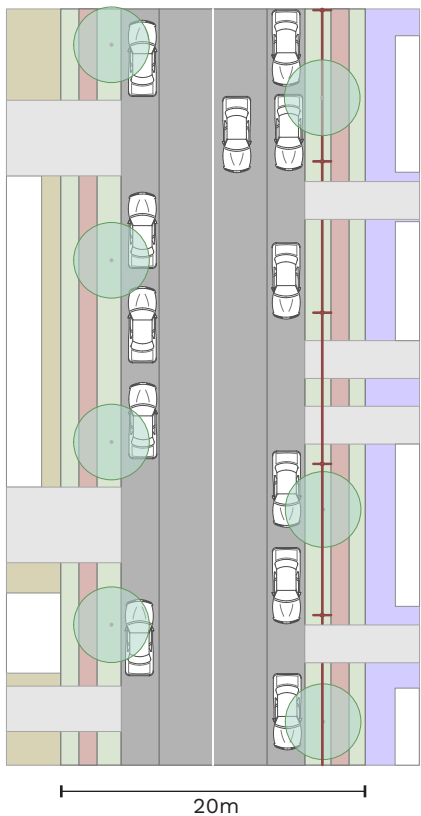


Figure 30 . Short Street

5.9 SHORT STREET - TYPICAL PLANS

EXISTING LAYOUT

CANOPY: 13%
PARKING SPACES: 11



PROPOSED LAYOUT

CANOPY: 67%
PARKING SPACES: 8
PARKING REDUCTION: -27%

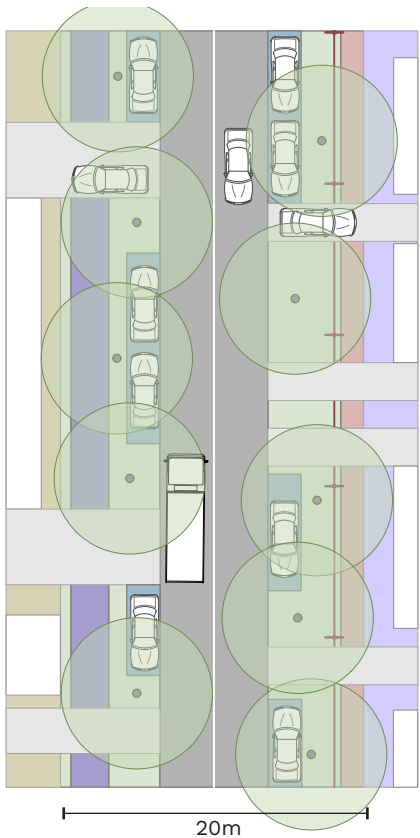


Figure 31 . Green Link Industrial Street - Typical Plans

Legend

- Planting Zone
- Pedestrian Zone
- Shared Path Zone
- Flexible Zone
- Road Carriageway
- Driveway
- Building
- Private Land (Industrial)
- Private Land (Residential)

Figure 31 and **Figure 32** demonstrate how space could be reorganised in Short Street. It shows that a 27% reduction in parallel parking, combined with ABC powerlines and continuous plantings of large canopied trees, could achieve 67% canopy cover.

NOTE: The final resulting canopy cover will be heavily dependent on the frequency of driveways and their widths and the proportion of parking space that council wishes to re-purpose into planting space.

5.10 SHORT STREET - TYPICAL SECTIONS

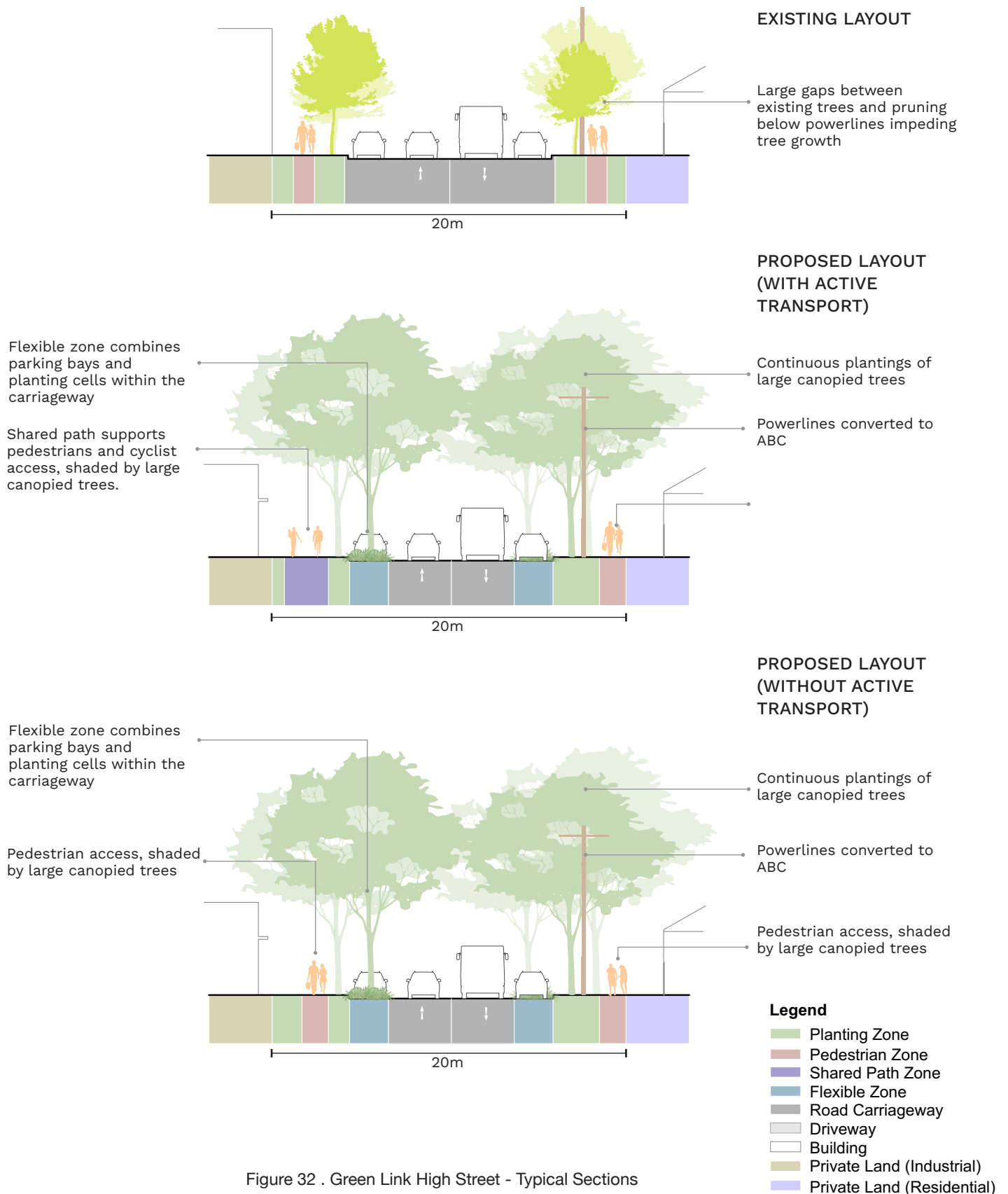


Figure 32 . Green Link High Street - Typical Sections

5.11 TREE SPECIES SELECTION

The PSVDG provides an indicative tree species list for specific street types along with open spaces within the LGA, however this does not include Industrial Streets. Furthermore, to meet the tree canopy targets outlined within this Greening Strategy, a higher proportion of large and medium size trees will need to be planted within Brookvale streets. The tree audit also highlighted that a greater diversity of species should be planted in each street. As such, a tailored tree species list has been developed for Brookvale and shown in **Table 10**, noting which species have been adopted from the PSVDG species list.

5.11.1 SPECIES SELECTION CRITERIA

In developing the tree species list for Brookvale, the following selection criteria were applied:

- Incorporate suitable tree species from the PSVDG list
- Utilise a diverse mix of locally indigenous, native and exotic species
- Include a high proportion of medium to large trees which offer greater shade and cooling benefits
- Opt for trees that have a moderate to high level of reliability growing in Sydney streetscapes, including moderate to high levels of drought tolerance and that are relatively long lived
- Select species that are likely to be climate resilient to 2070 based on species information within the “Which Plant Where” tool. The majority of trees within the list are considered climate resilient within the Brookvale area to 2070.

NOTE: The “Which Plant Where” tool offers evidence based scientific advice in relation to plant species and their climate resilience within different locations across Australia.



Table 10 . Recommended Brookvale Public Domain Tree Species List

Botanical Name	Common Name	Listed in PSVDG	Native	Locally Indigenous	Exotic	Industrial Streets	Commercial/High Streets	Residential Streets	Parks/Open Spaces
Large Trees									
<i>Angophora costata</i>	Sydney Red Gum	•		•		•		•	•
<i>Angophora floribunda</i>	Rough Barked Apple	•		•		•		•	•
<i>Banksia integrifolia</i>	Coastal Banksia	•		•			•	•	•
<i>Eucalyptus microcorys</i>	Tallowood			•		•		•	•
<i>Eucalyptus haemastoma</i>	Scribbly Gum	•		•		•			•
<i>Eucalyptus robusta</i>	Swamp Mahogany	•		•		•			•
<i>Ficus macrophylla</i>	Moreton Bay Fig	•				•			•
<i>Ficus microcarpa</i> ‘Hillii’*	Hills Weeping Fig					•	•	•	•
<i>Fraxinus pennsylvanica</i>	Green Ash				•D	•	•	•	•
<i>Liquidambar styraciflua</i>	Liquidambar				•D	•			
<i>Lophostemon confertus</i>	Queensland Brushbox	•	•			•	•	•	
<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	•		•		•		•	•
<i>Platanus orientalis digitata</i>	Oriental Plane Tree				•D	•		•	
<i>Phoenix canariensis</i>	Canary Island Date Palm				•		•		
<i>Quercus palustris</i>	Pin Oak				•D	•	•	•	
<i>Ulmus parvifolia</i>	Chinese Elm				•D	•	•	•	
<i>Waterhousia floribunda</i>	Weeping Lillypilly	•	•					•	
Medium Trees									
<i>Elaeocarpus eumundi</i>	Smoothed Leafed Quandong	•	•				•	•	
<i>Harpullia pendula</i>	Tulipwood		•			•	•	•	
<i>Hymenosporum flavum</i>	Native Frangipani	•		•			•	•	•
<i>Jacaranda mimosifolia</i>	Jacaranda				•D	•		•	•
<i>Koelreutaria bipinnata</i>	Chinese Rain Tree				•D	•	•	•	
<i>Melaleuca bracteata</i>	Black Tea-tree			•				•	
<i>Melia azedarach</i>	White Cedar				•D	•	•	•	
<i>Magnolia grandiflora</i>	Bull Bay Magnolia				•		•	•	•
<i>Stenocarpus sinuatus</i>	Firewheel Tree	•	•				•	•	•
<i>Tristanopsis laurina</i>	Water Gum	•		•			•	•	
Small Trees									
<i>Buckinghamiana celsissima</i> *	Ivory Curl	•	•				•	•	
<i>Callistemon viminalis</i>	Bottlebrush	•					•	•	•
<i>Gordonia axillaris</i>	Fried Egg Plant				•D			•	
<i>Hibiscus tiliaceus</i> *	Native Hibiscus	•		•			•	•	•
<i>Lagerstroemia Indica</i>	Crepe Myrtle	•			•D		•	•	
<i>Melaleuca linariifolia</i>	Snow In Summer	•		•			•	•	•
<i>Syzygium paniculatum</i>	Magenta Cherry	•		•				•	•

NOTES:

- * Indicates that climate information for this tree species was not available in the ‘Which Plant Where’ tool
 •D indicates that this species is both exotic and deciduous

6. PLANNING RECOMMENDATIONS



6.1 INTRODUCTION

This section provides planning recommendations to enhance tree canopy and green infrastructure levels across the public and private domain of Brookvale.

The Northern Beaches Council has a number of Development Control Plan (DCP) instruments pertaining to different wards of the Northern Beaches. The DCP which currently covers the Brookvale area is the Warringah DCP 2011. Council is currently drafting a consolidated Northern Beaches DCP which will replace the Warringah DCP 2011 once adopted.

6.2 WARRINGAH DCP 2011

A review of the Warringah DCP 2011 document reveals the following opportunities in relation to improving tree canopy or green infrastructure:

- Side, front and rear boundary setbacks are stipulated (Sections B5/B7/B9) for various land zoning types, however there are no minimum requirements set for tree planting within these setback areas
- Landscaped Open Space and Bushland Setting (Section D1) provides landscape area ratios of 40% for typical residential lots. Notably, there are no minimum tree planting requirements provided within this section. Furthermore, this section does not provide guidance on landscape area ratios for industrial or commercial land
- Warringah Mall (Section G4) - incorporates some requirements to retain existing trees in certain locations within the Warringah Mall zone, however there are no minimum requirements for tree canopy cover overall
- Preservation of Trees or Bushland Vegetation (Section E1) - states that tree removals should be replaced with suitable compensatory planting, however the quantum of replacement trees is not specified. This section also stipulates that any tree listed within the Tree Exemption List (despite its age, size or habitat potential) can be removed without council permission.

6.3 DCP RECOMMENDATIONS

Recommendations to strengthen clauses relating to tree planting and landscaping within the Warringah DCP 2011 are outlined below. These will help to ensure that new developments are contributing to increased canopy and vegetative cover across the suburb.

6.3.1 LANDSCAPE DCP CLAUSES

TREE CANOPY AND DEEP SOIL REQUIREMENTS

Provision of minimum tree canopy cover, tree planting requirements and corresponding deep soil requirements for public and private land uses based on zoning type and lot size. These requirements should support achieving the overarching canopy targets outlined in **Section 4.2**.

Refer **Section 6.3.2** for site based canopy and deep soil targets for inclusion within the DCP.

TREE PRESERVATION

Large canopy trees (both native and exotic) play a major role in urban heat mitigation. Retaining existing trees, particularly medium to large canopy trees, should be a top priority for council, both in terms of achieving tree canopy targets but also to build climate resilience across Brookvale. As such, it is recommended that Council review the Tree Exemption List and provide additional clauses to minimise the loss of valuable shade and habitat trees. Applying additional clauses that consider tree height or canopy spread for specific species within the exemption list could help to ensure that fewer valuable trees are removed without seeking approval.

LANDSCAPED AREAS

Consider strengthening existing provisions by:

- Specifying minimum landscaped areas and deep soil areas for all land use types within the private domain, including commercial and industrial land

6.3.2 CANOPY AND DEEP SOIL TARGETS FOR DCP INCLUSION

The following tables provide guidance on recommended canopy and deep soil targets for private land and public land, for inclusion within the DCP.

Table 11 . Open Space Canopy Targets

Public Domain	
Open Space Category	Minimum Canopy Target
Open spaces (< 5 ha) without sports courts and fields	Minimum 45% canopy cover
Open spaces (< 5 ha) with sports courts and fields	Minimum 45% canopy cover. Target only applies to areas outside the courts and fields. Where possible, the remaining area should exceed the 45% minimum to compensate for any reduced canopy
Regional open space	Determined on a case-by-case basis. At a minimum, proponents should demonstrate no-net loss of canopy and a contribution to strategic canopy targets.

Target guidance sourced from the Greener Neighbourhoods Guide (NSW Government, 2021)

Table 12 . Street Canopy Targets

Public Domain		
Street Type	Minimum Canopy Target	Permeable Surface Target With/Without Active Transport
High Street	45%	35% / 35%
Collector Street	40%	35% / 50%
Local Street	40%	60% / 65%
Industrial Street	50%	45% / 50%
Commercial Laneway	45%	20%
Commercial Laneway Shared Zone	0%	100%

Target guidance sourced from the PSVDG (Aspect Studios, 2020)

Table 13 . Private Domain Canopy Targets

Private Domain			
Development Category	Tree canopy target (min % of site area)	Deep soil target (min % of site area)	Tree planting rate*
Detached dwellings^			
Less than 300 m ²	20%	20%	For every 200 m ² of site area, or part thereof at least one small tree
300 m ² -600 m ²	25%	25%	For every 250 m ² of site area, or part thereof at least one medium tree
Greater than 600 m ²	30%	30%	For every 350 m ² of site area, or part thereof at least 2 medium trees or one large tree
Attached dwellings^			
Less than 150 m ²	15%	15%	At least one small tree
150 m ² - 300 m ²	20%	20%	For every 200 m ² of site area, or part thereof at least one small tree
Greater than 300 m ²	25%	25%	For every 225 m ² of site area, or part thereof at least one medium tree
Development Category	Tree canopy target (min % of site area)	Deep soil target (min % of site area)	Tree planting rate*
Multi dwelling housing^			
Less than 1,000 m ²	20%	20%	For every 300 m ² of site area, or part thereof at least one medium tree
1000 m ² - 3000 m ²	25%	25%	For every 200 m ² of site area, or part thereof at least one medium tree
Greater than 3000 m ²	30%	30%	For every 350 m ² of site area, or part thereof at least two medium trees or one large tree

Development Category	Tree canopy target (min % of site area)	Deep soil target (min % of site area)	Tree planting rate*
Apartment Housing and Shop-Top^^ Housing			
Less than 650 m ²	15%	10%, minimum 3 m dimension	For every 350 m ² of site area or part thereof, at least one small tree is to be planted in the deep soil area
650 m ² - 1,500 m ²	20%	15%, minimum 3 m dimension	For every 275 m ² of site area or part thereof, at least one medium tree is to be planted in the deep soil area
1,500 m ² - 3,000 m ²	25%	20%. Minimum 3 m dimension with a wider contiguous portion that is a minimum 6 m wide and at least 25% of the minimum deep soil area.	For every 450 m ² of site area or part thereof, at least 2 medium trees or one large tree is to be planted in the deep soil area
Greater than 3,000 m ²	35%	25%. Minimum 3 m dimension, with a wider contiguous portion that is a minimum 6 m wide and at least 25% of the minimum deep soil area	For every 300 m ² of site area or part thereof, at least one large or 2 medium trees are to be planted in the deep soil area
Business Parks			
All lots	35%	25%	For every 300 m ² of site area, at least two medium trees or one large tree
Industrial			
All Lots	25%	15%	For every 400 m ² of site area or part thereof, at least 2 medium trees or one large tree
Bulky Goods			
All lots	25%	15%, minimum 6 m dimension	For every 400 m ² of site area or part thereof, at least 2 medium trees or one large tree
On grade carparking park associated with above development categories			
Development with 5 or more car spaces	One medium tree should be planted in every fifth car parking space provided. The tree is to be in a planted zone of 13 m ² – the equivalent of a car parking bay area. Trees should be evenly distributed in a chequerboard fashion to increase shading.		

Target guidance sourced from the Greener Neighbourhoods Guide (NSW Government, 2021)

NOTES:

- # Deep soil could be included in an LEP, and as a subset of landscaped area. Deep soil reflects the same aspects of a landscaped area, but also requires a minimum surface area, and to be unimpeded above and below ground.
- * The tree-planting rate: the number of trees that need to be planted within a deep soil area to achieve a set target. Tree size categories:
- Small tree – minimum 6 m mature canopy diameter
 - Medium tree – minimum 8 m mature diameter
 - Large tree – minimum 12 m mature diameter.
- ^ For these development types, the canopy and deep soil target are the same. In these situations, tree canopy will not cover the entire deep soil area. Proponents should meet the deep soil target as a priority and are encouraged to plant more trees than prescribed in the tree-planting rate, where possible.
- ^^ Shop-Top Housing is not specifically included within the Greener Neighbourhoods Target Guidance, however Northern Beaches Council wishes to utilise the same targets for both Apartment Housing and Shop-Top Housing.

6.3.3 URBAN HEAT DCP CLAUSES

Providing a specific section on Urban Heat within the DCP, or providing urban heat related objectives and principles within each development type, will also help to enhance climate resilience across Brookvale. Provisions could include requirements for cool/reflective roofing including green roofs and green walls on buildings, cool outdoor spaces and other mechanisms to aid in cooling down the suburb.

DESIGNING FOR THERMAL COMFORT

All buildings and private/public spaces should be designed to optimise thermal comfort for the users of the space. DCP clauses could include:

- Clauses to ensure that buildings are designed to achieve high passive thermal performance through their orientation, design and use of materials.
- Outdoor spaces such as private or public gardens, parks, streetscapes are design as cool spaces, which incorporate the use of cool materials, high levels of tree canopy cover for shade and permeable surfaces.

GREEN ROOFS / COOL ROOFS

Green roofs offer urban cooling benefits, however often come at a high cost to implement and maintain over time. As such, they should be encouraged whenever they are deemed appropriate and feasible. Cool roofs can overcome some of these challenges.

A green roof is a roof surface that is covered over with a waterproof membrane, and then planted over with soil and suitable vegetation. Generally, green roofs that are irrigated provide more cooling than those that rely on rainwater.

A cool roof is a roof surface that is designed to reflect more sunlight than a conventional roof. This is achieved through the use of materials or colours with high reflectivity or high thermal emittance.

DCP clauses in relation to green roofs and cool roofs could seek to:

- Encourage the use of green roofs on buildings where feasible. Offer incentives for green roofs that make them more appealing to developers and home owners.
- Ensure that when a green roof is not provisioned, a cool roof is implemented. Cool roofing can be

implemented for most other roofs (except in special circumstances such as heritage buildings or where other factors make it inappropriate).

COOL OUTDOOR SPACES

Areas with high pedestrian activity such as public plazas, parks, town centres should provide respite from urban heat. This can be achieved through the implementation of specific cooling measures. DCP clauses for cool outdoor spaces could include:

- Provisioning adequate shade, through the use of large canopy trees or shade structures
- Adoption of cool materials, such as cool/reflective pavements, green/cool roofs and green/cool walls.
- Incorporation of evaporative cooling measures, such as water sensitive urban design (WSUD) elements to capture and store water in the landscape, or through mechanical means such as misting fans.
- Maximising air flow and harnessing the easterly sea breezes that travel through Brookvale. This could include the provision of cross-site links in an east-west direction that encourage the movement of air through the suburb.

6.4 EXISTING PRIVATE LAND

Whilst DCP amendments will help to increase tree canopy cover across redeveloped sites, they will not address the shortage of canopy cover that exists on private land that is not being developed. Therefore, working with the local community to build awareness and education around the importance of trees and other green infrastructure will be paramount to the overall success of achieving the targets outlined within this Greening Strategy.

Opportunities to support and encourage community involvement in enhancing canopy cover and vegetation on private land could include:

- Provide educational material to land holders about the benefits of having more large trees on their land, such as reduced energy bills, increased property value, increased stormwater management, biodiversity benefits and well being benefits

-
- Run a community survey to understand what barriers may be preventing land holders from planting more trees and determine strategies that could help to overcome these barriers
 - Provide incentives for private land holders to plant more trees on their land. This could include free tree give-aways, or providing financial incentives where individual properties achieve or surpass their canopy targets
 - For commercial and industrial land owners, provide incentives for creating cooler carparks shaded by some tree canopy, or converting some of their hardscaped areas to softscaped areas to reduce local temperatures and provide shade on their premises.
 - Within Green Link Streets and other streets, commence filling planting gaps in verges where street trees are absent, or have a spacing of greater than 10m apart, ensuring appropriate deep soil volumes are available. This should also include succession planting for trees classified as “mature”. Prioritise streets that have an east-west orientation to optimise the cooling effect from the coastal sea breezes (refer Appendix 1: Microclimates of Brookvale, WSU, 2025).
 - Prepare Concept Designs and Detailed Designs for each Green Link Street, incorporating the final re-zoning of land and any consolidation of car parking and driveways that can be achieved on each street
 - Engage with Brookvale private land holders to identify a series of incentives to increase canopy cover and green infrastructure within private land.

6.5 NEXT STEPS

This Greening Strategy has explored the opportunities for enhancing canopy cover and green infrastructure across the public and private domain in Brookvale. A summary of recommended next steps and actions is provided below:

SHORT TERM ACTIONS (1-2 YEAR HORIZON)

- Build upon the Tree Survey conducted for Green Link Streets and audit all trees within the public domain of Brookvale. Prepare a Tree Asset Register for Brookvale, which can be utilised to measure gains and losses of canopy at an individual tree level. This register can also support improved tree maintenance and succession planting regimes
- Revise the Warringah DCP 2011 to ensure that new developments support the tree canopy targets established for Brookvale. Ensure the canopy targets are also reflected in any other relevant planning documents and strategic action plans
- Commence discussions with AUSGRID in relation to Aerial Bundled Cables (ABC) and under-grounding powerlines. Determine whether all Brookvale streets could shift to ABC or under-grounded powerlines and devise a timeline and plan to implement these changes

MEDIUM TERM ACTIONS (2-5 YEAR HORIZON)

- Develop and upgrade Green Link Streets according to their Detailed Design, including transitioning to ABC or under-grounded powerlines, establishing flexible zones with new street trees and dense understory vegetation or rain gardens. Prioritise streets that have an east-west orientation to optimise the cooling effect from the coastal sea breezes (refer Appendix 1: Microclimates of Brookvale, WSU, 2025)
- Implement incentives for private land holders to increase canopy and green infrastructure on private land.

ONGOING

- Conduct regular reviews of tree canopy levels across the suburb utilising LIDAR imagery. Measure increases or decreases in canopy by land use type and determine corrective actions where coverage is not improving
- Regularly engage with private land holders to assess the effectiveness of incentives to increase green infrastructure on private land. Where required, improve or adjust incentives to support their uptake and adoption
- As funds allow, progressively design and upgrade other Brookvale streets to align with the design strategies outlined within the PSVDG, including incorporating flexible zones, WSUD elements, active transport elements and greater permeable surface cover.

7. REFERENCES

- Biodiversity In Place (Government Architect NSW, 2024)
- Brookvale Structure Plan (Northern Beaches Council, 2023)
- Brookvale Structure Plan – Bush Fire Advice Report (Meridian Urban, 2024)
- Brookvale Structure Plan – Indigenous and Non-Indigenous Heritage Report (GML, 2024)
- Draft Greener Places Design Guide (Government Architect NSW, 2020)
- Greener Neighbourhoods Guide (NSW Government, 2021)
- Let's Play – Northern beaches Open Space and Outdoor Recreation Strategy and Action Plan (Northern Beaches Council, 2022)
- North District – Sydney Green Grid (Government Architect NSW, 2017)
- Northern Beaches Bike Plan (Northern Beaches Council, 2020)
- Northern Beaches Public Space Vision & Design Guidelines (Aspect Studios, 2020)
- Northern Beaches Tree Canopy Masterplan 2023 (Northern Beaches Council, 2023)
- Protect. Create. Live. Northern Beaches Environment and Climate Change 2040 (Northern Beaches Council, n.d.)
- WSROC Urban Heat Planning Toolkit (WSROC, 2021)
- Western Sydney Street Design Guidelines (Aspect Studios, 2020)



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