Alexandrina's Township Greening

Setting Canopy Targets – a 'Greenprint' for Success

Alexandrina Council

February 25, 2026

Alexandrina Council does not warrant or make any representation regarding the use, or results of the use, of the information contained in this report as regards to their correctness, accuracy, reliability, currency or otherwise. The Council expressly disclaims all liability or responsibility to any person using or relying on information contained in the reports and associated documents.

Alexandrina's Township Greening

Setting Canopy Targets –

a 'Greenprint' for Success

Prepared for

Alexandrina Council

Prepared by

Arran Provis
Grad Cert Env, BSc, AdvDipHort (Arb)

and

Simon Strauss
BAppSc (with distinction)

25 February 2026

Alexandrina Council does not warrant or make any representation regarding the use, or results of the use, of the information contained in this report as regards to their correctness, accuracy, reliability, currency or otherwise. The Council expressly disclaims all liability or responsibility to any person using or relying on information contained in the reports and associated documents

1. Executive summary and canopy cover target recommendation

One of Alexandrina's key community-identified visions is to increase township greening and tree planting for canopy cover (Alexandrina 2040 Liveable Green Connected, Alexandrina Council 2020). The objective of this Study was to work with Council to develop an evidence-based canopy targets for each township – ambitious though realistic – with recommended annual planting programs to help achieve equitable access to trees and green spaces for Alexandrina's communities.

This work goes a step further than the overarching Greening Our Townships Strategy and builds on the 2022 Tree Canopy Benchmark Study and Thermal Imaging Report (the "Tree Canopy Report") that investigated the tree canopy baseline for Alexandrina's 11 townships, its urban 'heat island' effect across each, and canopy cover by landholder. The 2022 baseline study showed that Alexandrina's total canopy cover averaged 17.6% across the townships, ranging from 11.7% (Milang) to 49.3% (Ashbourne). It also showed that much of Alexandrina's canopy cover is located on private land - 78%. In comparison, Council managed land has 21% canopy cover, and 1% of canopy cover is on Crown Land.

Addressing the challenges associated with urban greening, canopy cover expansion, and biodiversity protection requires a coordinated, place-based and future-oriented approach. There is no one-size-fits-all solution as municipalities such as Alexandrina face unique environmental, social, spatial and governance contexts. However, a suite of complementary strategies can guide more effective planning, design and implementation to help navigate structural, ecological and social challenges.

Hence, the outcomes of this Study equip Alexandrina to lead and manage its township targets and plans with evidence-based decision-making information including consideration for:

- Opportunities for street scape plantings (Council led);
- Biodiversity plantings in township reserves (Council and/or community);
- Community plantings supported by Council (e.g. Adopt a Tree / Adopt a Park, revegetation); and
- Climate ready tree species

to guide strategic planning and budgeting as part of part of a suite of documents supporting Council's Greening Our Townships Strategy.

1.1. Street scape plantings (Council-led)

The value of knowing when and how much to plant

The body of this Study is large and complex. In addition to space and budget considerations, it models seven planting scenarios for each township (eight for Milang); 79 scenarios in total. These scenarios are important to evaluate different approaches for achieving urban canopy targets, including various planting rates, financial profiles and canopy outcomes to 2055. Tree-related factors, social and economic benefits were also modelled to identify areas of greatest impact. It also incorporates findings from research on best practice and management solutions to assist effective and efficient implementation.

Identifying minimum canopy cover targets

Of the 79 scenarios modelled and inputs considered, the minimum target canopy cover results per township are outlined in Table 1 (Scenario 1). This is based on doubling the current planting regime to 591 trees annually up to 2055. The minimum overall 2055 targets are:

- 18.6 % total canopy cover on all land (tenures) across all townships,
  an increase of 1.0% from the benchmark of 17.6%.
- 24.9% canopy cover on Council-controlled land across all townships,
  an increase of 5.9% from the benchmark of 19.0%.

It has the lowest canopy cover increase of all scenarios modelled. Over-achievement of these targets is possible through community contribution on private land, through front-loading (Scenarios 3-5), and increased up-front funding (refer to Table 2). Hence, Scenario 1 is recommended as the minimum target at both township and overall levels.

Table 1: Presentation of current (2025) township canopy cover and expected increase of canopy cover by 2055 under Scenario 1 – modelling for total canopy cover and for canopy cover on Council land. Total canopy cover increases by 1%, from 17.6% to 18.6%, and on Council land canopy cover increases by 5.9%, from 19% to 24.9% by 2055.

Township (Scenario 1)	2025[1] Total Canopy Cover[2]	2055 Total Canopy Cover	2025[1] Council Canopy Cover[3]	2055 Council Canopy Cover	Trees per year[4]
Across all townships	17.6%	**18.6%**	19.0%	**24.9%**	591
Ashbourne	49.3%	**49.3%**	70.2%	**70.2%**	0
Clayton Bay	14.3%	**17.3%**	10.8%	**22.8%**	100
Goolwa	14.3%	**15.7%**	16.0%	**21.4%**	200
Hindmarsh Island	19.9%	**20.0%**	11.7%	**12.9%**	20
Langhorne Creek	19.9%	**20.8%**	26.5%	**31.8%**	10
Middleton	14.1%	**16.2%**	11.6%	**17.3%**	65
Milang	11.7%	**14.1%**	20.2%	**28.5%**	75
Mount Compass	23.4%	**23.5%**	25.9%	**26.5%**	6
Port Elliot	13.9%	**14.3%**	16.4%	**18.0%**	60
Strathalbyn	19.4%	**19.6%**	26.6%	**28.0%**	50
Woodchester	13.1%	**13.6%**	11.2%	**19.3%**	5

[1] *The 2025 township canopy cover extent is based on Alexandrina's 2022 Tree Canopy Report as no other canopy data was available and it was deemed a reasonable estimate for the purpose of this Study*

[2] *Total Canopy Cover = Canopy cover percentage of townships by 2055 across all tenures (Council, Crown, and private)*

[3] *Council Canopy Cover = Canopy cover percentage of townships by 2055 on Council land*

[4] *Trees per year = Trees to be planted annually up to 2055*

Table 2: Summary of Scenarios 1-5. Outcomes of the modelling shows that the more trees are planted earlier, the quicker the canopy cover is achieved. Front-loading planting requires initially a higher upfront expense but overall less budget and fewer trees over the 30 year planting horizon (2025-2055). Costing excludes future CPI indexing, land acquisition or repurposing, or the administrative and staffing costs that would be required to deliver and manage a program at this scale.

Scenario	Description	2055 Total Canopy Cover[1]	Canopy description 2055	Planting Profile	Total Trees Planted	Total Cost[2] (Planting + Maintenance)	Year 1 Cost[3] (Planting + Maintenance)	Key Benefits	Key Challenges
Scenario 1 Minimum Target	Doubling current planting approach	18.6%	Modest increases (varies by township)	Even, steady planting to 2055	17,730	$23.94M	$384K	Lowest annual resourcing demand	Least canopy improvement, highest long-term maintenance and total costs
Scenario 2 Targeted Equity[4]	Even canopy distribution focus	19.3%	~20%+ (varies)	Steady planting to 2055	19,915	$26.89M	$1.40M	Addresses township canopy disparity	Higher total cost, slower delivery
Scenario 3 Front-loaded – 20% Reduction	Equitable canopy distribution	19.6%	~25%+	High, then 20% annual reduction, ends ~2050	15,506	$20.93M	$2.36M	Earlier canopy benefits, significant savings	Higher upfront costs, delivery pressure in early years
Scenario 4 30% Council canopy by 2050	Ambitious canopy target	20.0%	30% cover on Council land	High, then 20% annual reduction, ends ~2050	18,018	$24.32M	$2.74M	Gold-standard target, early outcomes, climate resilience	High upfront costs, complex logistics
Scenario 5 30% Council canopy by 2050 – Accelerated	Fastest delivery model	20.1%	30% cover on Council land	High, then 33% annual reduction, ends ~2050	16,487	$22.26M	$3.93M	Fastest canopy delivery, lowest total trees, largest lifecycle savings	Very high upfront cost, highest early delivery burden

[1] *Total Canopy Cover = Canopy cover percentage of townships by 2055 across all tenures (Council, Crown, and private)*

[2] *Total Cost covers the 2025 to 2055 timeframe and includes tree stock, planting and maintenance (e.g. watering) for 3 years to ensure establishment (based on current Council costs) but excludes future CPI indexing, land acquisition or repurposing, or the administrative and staffing costs*

[3] *Year 1 costs excludes future CPI indexing, land acquisition or repurposing, or the administrative and staffing costs*

[4] *Targeted equity means equitable planting approach to address canopy disparities between townships to ensure fair distribution of new street plantings across all townships*

The advantages of planting early

One surprising outcome from this Study was the potential for large monetary savings by planting trees as early as practicable in the 30 year strategic time horizon – the "front-loaded" scenarios (Scenarios 3-5). **Why? Because trees are natural assets and grow.** The longer they are in the ground, the quicker they provide shade and the greater the services they provide at the target end date. Simply put, for a given canopy target at a given date, less trees in total are required when more are planted early.

Using Clayton Bay as an example, modelled to achieve a 3% canopy cover increase by 2055 using a constant planting rate (Figure 1a) compared to early plantings (Figure 1b), cost savings of >25% and >40% reduction in planting sites, are achievable.

Figure 1a: 'Constant planting rate' outputs.

Canopy projection model:	Clayton Bay			
	2025	2030	2043	2055
Total Canopy %	**14.3%**	**14.3%**	**15.3%**	**17.3%**
% T = 100.0 Canopy Ha	33.7	33.8	35.8	40.7
Private Canopy %	15.4%	15.4%	15.4%	15.4%
% T = 74.9 Canopy Ha	27.2	27.2	27.2	27.2
Council Canopy %	10.8%	11.0%	14.5%	22.8%
% T = 25.0 Canopy Ha	6.4	6.5	8.6	13.4
Trees planted in year	-	100	100	100
Average plantings	-	100	100	100
Cumulative plantings	-	500	1,800	3,000
Annual P&W cost	$ 135,000	$ 135,000	$ 135,000	$ 135,000

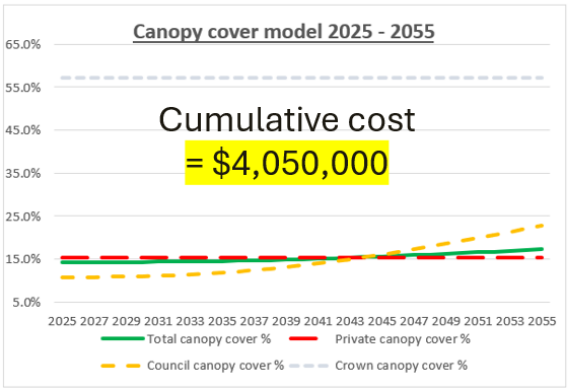
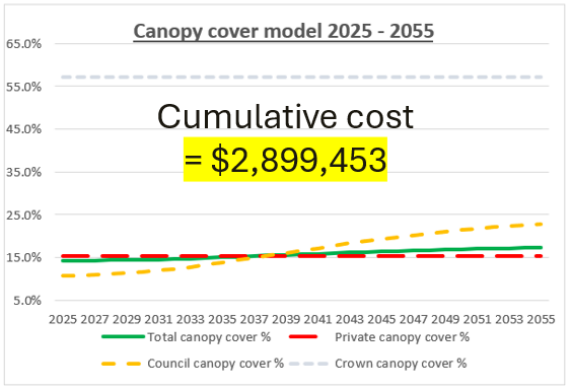


Figure 1b: 'Planting more trees early' outputs.

Canopy projection model:	Clayton Bay			
	2025	2030	2043	2055
Total Canopy %	**14.3%**	**14.5%**	**16.1%**	**17.3%**
% T = 100.0 Canopy Ha	33.7	34.1	37.8	40.8
Private Canopy %	15.4%	15.4%	15.4%	15.4%
% T = 74.9 Canopy Ha	27.2	27.2	27.2	27.2
Council Canopy %	10.8%	11.6%	17.7%	22.8%
% T = 25.0 Canopy Ha	6.4	6.9	10.5	13.5
Trees planted in year	-	114	1	0
Average plantings	-	296	95	57
Cumulative plantings	-	1,478	1,708	1,709
Annual P&W cost	$ 761,400	$ 221,857	$ 1,216	$ 10



The front-loading results show that planting a higher number of trees earlier and over a short timeframe (Scenarios 3-5) require a higher upfront investment initially but, importantly, achieves canopy targets faster while having earlier environmental benefits, long-term cost savings and stronger resilience to inflation. For example, Scenario 5 achieves the 30% canopy target on Council land faster and more cost efficiently compared Scenario 1 or a steady planting of trees over a longer timeframe (Scenario 2). Table 2 below provides an overview of the outcomes and costs for all five scenarios.

Are state-developed canopy cover targets achievable?

At the commencement of this Study, the draft Greater Adelaide Regional Plan (draft GARP) proposed canopy targets of 30% canopy cover by 2055 for metropolitan Adelaide, with an interim target of a 2% canopy increase by 2030 for rural councils. Council wanted to understand if these targets are achievable for Alexandrina.

Hence, Scenarios 6 and 7 were developed in response to these specifications. The results of the Study demonstrate that such goals are unachievable for Alexandrina without significant contributions from private land based on two fundamental criteria:

- A 2% increase of canopy cover across Alexandrina by 2030 would incur a cost of $73 million to Council (Scenario 6);
- Unavailability and capacity of Council-controlled space and associated resources. For example, Woodchester does not have enough public land to achieve 30% canopy cover across the township.

These results show that without appropriate modelling, strategy and planning, such canopy cover targets, are aspirational. Hence, this Study enables Alexandrina to make informed decisions.

Tube stock plantings

Scenario 8 evaluates tube stock planting in Milang specifically as a lower-cost option. The results indicate that community-led tube stock plantings are likely to play a cost-effective role in parks, reserves, and open spaces where conditions are more favourable for establishment. However, for urban streetscapes, high-traffic areas, and constrained environments, advanced tree stock should remain the preferred method due to its higher survival rates, lower maintenance demands and ability to deliver faster canopy outcomes.

Recommendations to Council

24 key recommendations are made to help ensure Council investment results in the expected outcomes (section 9). They are summarized as:

- Adopt township-specific canopy targets based on Scenario 1 as a minimum.
- Ensure no net loss of tree canopy on private land.
- Where-ever practical, plant trees early to maximise their canopy and minimise overall costs.
- Regular canopy mapping and progress reporting is essential to monitor outcomes, identify underperforming areas, and guide continuous improvement.

- Where additional resources become available, the canopy targets based on Scenario 1 should be reset at increased levels.
- Maintain an adaptive, iterative approach to help ensure the achievement of the long-term urban canopy targets.

Collectively, the modelling scenarios presented in this Study (Table 2) provide evidence to inform realistic, cost-effective, and impactful greening decisions. There is no one-size-fits-all solution for Alexandrina's townships. However, a suite of complementary strategies derived from this Study can guide more effective planning, design and implementation to help navigate structural, ecological and social challenges.

1.2. Township reserves to promote biodiversity and community plantings (Council and/or community led)

Tree planting within parks and reserves presents a valuable opportunity for community engagement through Council-led planting programs. To prioritise parks for strategic tree planting, several criteria were modelled, including location and functional use of each park; the urban heat island exposure; existing canopy cover and planting potential; equity; and accessibility (300m threshold under the 3–30–300 rule). The results and maps for each township are shown in Section 6 of the Study.

Establishing even small-scale reserves or green corridors could provide measurable benefits to community wellbeing, climate resilience and biodiversity. Exploring partnerships with private landholders, schools, or state agencies may also support the delivery of green infrastructure in the short, medium and long term.

1.3. Planning for the future – climate-ready tree species

Climate-ready tree species are those identified as resilient to the projected impacts of climate change, including increased average temperatures, reduced and irregular rainfall, more frequent heatwaves, and extended periods of drought. For Alexandrina, the strategic selection and planting of these species is essential to ensuring the long-term health, functionality, and sustainability of the urban forest, as well as achieving canopy cover targets. Section7 of this Study shows suitable tree species based on modelling of future climate projections.

DOCUMENT CONTROL

Document	Alexandrina's Township Greening: Setting Canopy Targets – a 'Greenprint' for Success
Status	Final Draft
Project manager	Arran Provis (Senior Consulting Arborist)
Assisting Staff	Tim Fischer (Consulting Arborist); Simon Strauss (Chief Growth Officer)
Mapping	Arran Provis (Senior Consulting Arborist)
File name	Greenprint final draft 20260211.docx
Client	Alexandrina Council

VERSION CONTROL

Report versions	Comments	Report authored by:	Reviewed by:	Date submitted
Draft version 1	Submitted to Simon Strauss for review	AP		28/06/2025
Draft version 2	Updated to respond to comments provided by SS, submitted to Alexandrina Council	AP	SS	30/06/2025
Draft version 3	Updated to respond to comments provided by Alexandrina Council	AP/SS	MR	15/10/2025
Final Draft	Updated to respond to comments provided by Alexandrina Council	AP/SS	KW/MR	11/02/2026

Contents

1. Executive summary and canopy cover target recommendation 3

1.1. Street scape plantings (Council-led) 4

1.2. Township reserves to promote biodiversity and community plantings (Council and/or community led) 9

1.3. Planning for the future – climate-ready tree species 9

2. Introduction and background 15

2.1. Tree planting scenarios 17

2.2. Assumptions, planting considerations & strategic implications 18

2.3. Climate-ready tree species 19

2.4. Bushfire risk and powerline impacts 19

2.5. Planning, development and tree retention 20

2.6. Vegetation quality, design and urban canopy outcomes 21

2.7. Developer-planted trees in new developments 22

2.8. Tree asset management system and tree valuation 22

2.9. Green infrastructure as a valued asset and budget funding 23

2.10. Review and refinement 24

3. Modelling considerations 25

3.1. Modelling increased canopy cover 25

3.2. Prior learning on canopy cover strategy and targets 25

3.3. LGA canopy cover benchmarking 28

3.4. Fair and equitable access to urban green space 31

3.5. Targeted street tree planting for urban heat island (UHI) 33

4. Modelling canopy cover targets by 2055 36

4.1. Methodology – Canopy cover scenarios 36

4.2. Methodology – Tree categories 37

4.3. Methodology – Model attributes and execution 41

4.4. Results – Canopy cover by 2055 44
4.4.1. Scenario 1 –Doubling of Council's current planting program: 2055 total canopy cover @18.6% 44
4.4.1. Scenario 2 – Council proposed planting program: 2055 total canopy cover @19.3%47
4.4.2. Scenario 3 – Equitable tree distribution proposal: 2055 total canopy cover @19.6% 50
4.4.3. Scenario 4 – Equitable canopy cover proposal: 2055 total canopy cover @20.0%.... 54
4.4.4. Scenario 5 – Equitable canopy cover proposal: 2055 total canopy cover @20.1%.... 58
4.4.5. Summary – Scenarios 1-5 62
4.4.6. Discussion – Comparing Scenarios 1-5 62
4.4.7. Scenario 6 – Modelling 2% total canopy cover increase by 2030 64
4.4.8. Scenario 7 – Modelling 30% total canopy cover increase by 2055 66
4.4.9. Scenario 8 – Milang tube-stock 68
4.4.10. Underlying assumptions and considerations in calculating canopy cover 69
4.4.11. Ground-truthing planting opportunities - Ashbourne case study 70
5. Prioritised tree planting locations: Fair and equitable access to urban green spaces 74
5.1. Methodology – Prioritised tree planting 74
5.2. Results: Milang – Recommended strategic planting locations 77
6. Park Priority Selection (for urban greening initiatives) 81
6.1. Methodology – Park priority selection 81
6.2. Results – Park priority selection 85
6.2.1. Ashbourne – Park priority selection 85
6.2.2. Clayton Bay – Park priority selection 87
6.2.3. Goolwa – Park priority selection 90
6.2.4. Hindmarsh Island – Park priority selection 93
6.2.5. Langhorne Creek – Park priority selection 96
6.2.6. Middleton – Park priority selection 98

6.2.7. Milang – Park priority selection 101
6.2.8. Mount Compass – Park priority selection 104
6.2.9. Port Elliot – Park priority selection 107
6.2.10. Strathalbyn – Park priority selection 111
6.2.11. Woodchester – Park priority selection 114
7. Climate ready tree species 116
7.1. Methodology - CAT Assessment and climate scenarios 116
7.2. Results - CAT Assessment and climate scenarios 118
7.3. Discussion - Climate suitability of Alexandrina Council preferred species 126
7.3.1. Other considerations for Alexandrina Council preferred species 128
8. Discussion 129
8.1. Community engagement and role 129
8.1.1. Planting framework considerations 129
8.1.2. Community planting and tube stock 129
8.1.3. Tube stock suitability for streetscapes 130
8.1.4. Biodiversity 131
8.2. Council tree and canopy cover management considerations 132
8.2.1. Carbon sequestration in urban and street trees 132
8.2.2. Bushfire risk zones and powerline impact on tree planting 133
8.2.3. Powerline clearance 133
8.2.4. Canopy cover risk and benefit 136
8.2.5. Planning and development - Tree retention and removal 139
8.2.6. Current tree protections in Alexandrina 139
8.2.7. Heritage and urban tree canopy overlays 140
8.2.8. Public tree management 142
8.2.9. Potential future changes 143
8.2.10. Implications and recommendations 143

8.2.11. Planning design and vegetation quality for canopy cover 144
8.2.12. Conservation design over conventional design 147
8.2.13. *Seachange* – Goolwa 148
8.2.14. *Beyond* – Chiton 150
8.2.15. New developments and developer-planted trees 154
8.2.16. Tree management system/Tree asset register 155
8.2.17. Tree valuation 157
8.2.18. Tree valuation using AANZAA-Value 158
8.2.19. Budgeting for green infrastructure as valued assets 159
8.2.20. Grant funding 161
8.2.21. Review, refinement and iteration 163
8.2.22. Iterative implementation and continuous improvement 163
9. Conclusion and key recommendations 164
10. Reference list 168

2. Introduction and background

Alexandrina Council is committed to enhancing its urban forest and green spaces through a coordinated, multi-faceted planting approach, aligned with the community's vision in the for a "green" and "liveable" future (Alexandrina Council 2020).

Alexandrina's Township Greening: Setting Canopy Targets – a '**Greenprint**' for Success (the Study) is a technical, tree management document underpinning Alexandrina's "Greening Our Township Strategy" (Greening Strategy) which sets out Alexandrina Council's vision for protecting, managing, and increasing Alexandrina's urban tree canopy and greening.

The Greening Strategy identifies the objectives of Council and its community as to how Council intends to enhance urban greening and increase its tree canopy cover against its baseline from the 2022 Tree Canopy Report. This Study serves as a framework to guide the Greening Strategy's implementation through:

- Evidence-based canopy cover targets tailored for each township.
- Annual planting rates, to achieve these targets efficiently.
- Increased resilience of urban greening initiatives through climate-ready species selection.
- Equitable access to trees and green spaces across all communities.
- Biodiversity enhancement across public and community-managed spaces.
- Council and/or community-driven biodiversity plantings in township reserves.
- Community-supported planting initiatives (e.g. *Adopt a Tree*, *Adopt a Park*, and local revegetation projects).
- Best practice and location suitability guidelines.
- Examples (for Milang) demonstrating the above principles, of:
    - A prioritised annual planting program.
    - Strategic, Council-led streetscape planting opportunities.

Strategic analysis, including GIS mapping and prioritisation, using the '3-30-300 Rule' (Konijnendijk 2023), has informed the spatial planning of planting efforts. Internal Council strategies and reports were reviewed to ensure alignment, while input from relevant departments and committees was incorporated. Supporting academic literature and benchmarking against other jurisdictions have guided the formulation of targets and methods.

Together, these actions provide a clear and coordinated pathway for Alexandrina Council to strengthen its urban forest, promote climate resilience and ensure that green space benefits are equitably distributed across all townships now and into the future.

Council can achieve this through three key delivery streams:

1. **Council-led streetscape planting programs**. Council delivers an annual street tree and amenity park planting program with a focus on enhancing canopy cover, particularly in low-canopy townships. Key components will include:
    - Prioritisation: Planting guided by Council's Tree Canopy Baseline Study and Climate Emergency & Environment Committee recommendations.
    - Equity: Ensures fair distribution of new plantings across all townships.
    - Species Suitability: Utilisation of a locally adapted preferred species list.
    - Community Engagement: Residents can request verge trees, which are planted and maintained for 12 months by Council.
    - Internal Nursery: A Council-managed nursery grows semi-advanced trees from local tube stock to improve survival and performance.
2. **Biodiversity-focused plantings (Council and/or community)** in reserves and public land, using local provenance species and collaborating with conservation groups, supported by community environment grants. Council actively protects and restores biodiversity assets across urban and peri-urban reserves through targeted planting and revegetation.
   Key features will include:
    - Habitat Restoration: Establishment of ecological buffers, corridors, and functional habitat patches.
    - Local Provenance: All plantings utilise locally indigenous species to support biodiversity and resilience.
    - Partnerships: Delivery is supported by partnerships with conservation groups, agencies and landholders.
    - Grant Support: Community Environment Grants fund site preparation, propagation and planting projects.
3. **Community-supported greening** initiatives. Council supports and will continue to empower community participation in greening and canopy enhancement including:
    - One Million Trees Project: A regional campaign encouraging schools, residents and groups to collectively plant one million native trees by 2030 (Alexandrina Council. n.d. b).
    - Greening & Wildlife Project: A collaboration with Second Nature Conservancy to distribute subsidised native plant packs and provide workshops (Second Nature Conservancy. n.d.).

- Verge Planting Opportunities: Residents may undertake verge plantings aligned with the Alexandrina Township Verges Planting Guide (Alexandrina Council. n.d. c).
- "Adopt a Tree" Program: Engages residents in the care and stewardship of new street trees.
- Community Nurseries: Council supports local nurseries that propagate native seedlings for public and private planting projects.

2.1. Tree planting scenarios

This Study explores seven planting scenarios for each township (eight for Milang) which evaluate different approaches for achieving urban canopy targets. Scenarios 1–5 model various planting rates, financial profiles and canopy outcomes to 2055. **Results show that front-loaded models (Scenarios 3–5, with higher upfront investment) deliver earlier environmental benefits, long-term cost savings and stronger resilience to inflation, with Scenario 5 achieving the 30% canopy target fastest and most efficiently.**

Scenarios 6 and 7, based on whole-of-land canopy targets, demonstrate that such goals as originally outlined in the Draft Greater Adelaide Regional Plan (draft GARP) are unachievable without significant contributions from private land which is beyond this Study's scope.

Scenario 8 specifically evaluates tube stock planting in Milang as a lower-cost option. However, its use is limited in urban streetscapes due to establishment challenges.

Collectively, these models provide evidence to inform realistic, cost-effective, and impactful greening decisions (Table 2).

Trends across scenarios:

- Consistent leaders

Goolwa and Port Elliot show large absolute gains in every scenario, reflecting strong baseline capacity and urban greening opportunities.

- Improving equitability

Scenarios 3–5 show substantial improvements in historically low-growth townships like Hindmarsh Island, Langhorne Creek and Woodchester.

- Distribution matters

While total canopy increases are important, equitable gains across urban, rural, and peri-urban areas are critical to addressing urban heat and social vulnerability.

- The advantage of planting early - front-end loading of tree planting rates

There are significant benefits associated with front-loaded programs including economies of scale in planting and maintenance, improved contract efficiencies for spatially proximate plantings, and greater cost certainty (by mitigating exposure to future stock price volatility and CPI increases). Using Clayton Bay as an example, modelled to achieve a 3% canopy cover increase by 2055 using a constant planting rate (Figure 1a), compared to early plantings (Figure 1b), cost savings of >25%, and >40% reduction in planting sites, are achievable.

2.2. Assumptions, planting considerations & strategic implications

This section outlines the critical assumptions, constraints and strategic considerations shaping the canopy modelling and township greening approach. Existing canopy cover is assumed to remain static, without net change, requiring immediate or advanced replacement of any removed public trees as a minimum. **However, private land - that is largely outside Council control - plays a decisive role in township-wide canopy outcomes. Even a modest 0.5% annual change on private land can shift total canopy outcomes by up to 12%,** highlighting the importance of landholder engagement and vegetation protection measures.

Ground-truthing canopy distribution and planting opportunities of each township is vital. The case study of Ashbourne (Section 4.4.11) reveals limitations in the interpretation of aerial canopy data, reinforcing the value of field inspections and one advantage of having a detailed tree inventory to guide long-term planning. Strategic tree planting on Council-managed land remains essential for achieving defensible, resilient and equitable canopy gains, particularly in low canopy cover townships.

Various public plantings within Alexandrina may provide limited canopy benefit due to species traits, planting arrangement or performance issues. To address this, Council should prioritise broad-canopied and climate-resilient species where possible, supported by targeted infill planting, and the removal and replacement of underperforming trees. Site-specific planting density and soil conditions must also be factored into design decisions, to support long-term canopy viability.

Community-led planting, especially in parks and reserves using tube stock, offers biodiversity and stewardship benefits though streetscape plantings are better suited to advanced nursery stock due to survival and establishment challenges. Biodiversity outcomes are strengthened by community participation and understorey diversity while tree planting also contributes to carbon sequestration, aligned with Alexandrina's climate goals.

Finally, this Study identifies strong alignment with grant funding opportunities across South Australia. By leveraging existing modelling, cost-benefit analysis and strategic targets, Alexandrina is

well-positioned to secure external funding and partnerships to support ongoing greening, biodiversity and climate resilience objectives.

2.3. Climate-ready tree species

To ensure long-term canopy resilience in the face of climate change, this Study has assessed Alexandrina's preferred tree species list using the Climate Assessment Tool (CAT). This analysis supports the strategic selection of climate-ready species that can withstand projected increases in temperature, reduced rainfall and more extreme weather events.

Under a 2050 emissions-limited scenario, most preferred species show good climate suitability, from the inclusion of native and climate-adapted exotic species. However, under a 2090 trajectory (under Scenario 1), suitability declines sharply, particularly for cooler-climate exotics such as *Fraxinus*, *Ulmus*, and *Acer ×freemanii*, highlighting the urgent need to diversify the species palette.

The CAT results provide guidance and not absolute predictions. Therefore, it should be considered alongside other key factors such as drought and salt tolerance, soil type and local microclimates. A diversified planting approach supported by local trials, monitoring and integration into asset management systems is essential to build climate resilience into Alexandrina's urban forest.

2.4. Bushfire risk and powerline impacts

Tree planting for canopy coverage in Alexandrina is constrained by bushfire risk classifications and vegetation clearance regulations around powerlines. Clearance requirements under the *Electricity (Principles of Vegetation Clearance) Regulations 2021* limit the use of large-canopy species under overhead lines, especially in bushfire-prone areas. Approved species lists focus mostly on small, shrub-like species under 4 m in height, restricting canopy potential.

These constraints present significant challenges to achieving canopy cover targets without strategic planning or exemptions. Comparative regulations in Victoria suggest less restrictive approaches may be possible, raising the opportunity for review and collaboration with SA Power Networks (SAPN), including development of a Memorandum of Understanding (MOU). GIS tools and desktop analysis can help identify feasible planting locations that balance risk, compliance and canopy objectives.

Bushfire risk and powerline impacts on canopy - risks versus benefits

Current powerline clearance regulations and bushfire risk controls appear to prioritise the reduction of vegetation-related hazards without fully accounting for the broader public health and environmental benefits that trees provide. While it is essential to mitigate bushfire ignition risks

from powerline contact, the existing restrictions limit opportunities for meaningful canopy cover and associated climate resilience benefits.

The risk of fire from vegetation contact is real but statistically rare, with electricity-related ignitions reportedly accounting for 2.7% of bushfires nationally. In contrast, heat-related deaths and melanoma rates in South Australia are significantly higher and ongoing public health challenges. Large-canopy trees play a critical role in reducing urban heat and UV exposure, helping prevent heat stress, skin cancers and other heat-related illnesses.

This suggests the need for a balanced risk-benefit framework and is supported by academics. A more nuanced approach, potentially supported by a Memorandum of Understanding (MOU) between Council and SA Power Networks, could enable greater flexibility in species selection while maintaining safety. Strategic planting, guided by risk-aware design and supported by GIS tools, can help reconcile vegetation management obligations with canopy targets and public health objectives.

Clearances around buildings for bushfire safety also results in clearing and limits new planting site options. The Planning Development and Infrastructure Act 2016 provides exemptions for the removal of any tree located within 10m of a dwelling within a high or medium risk bushfire area.

2.5. Planning, development and tree retention

Tree protection and retention through regulation within Alexandrina Council is limited due to the constraints of the application of relevant Overlays through the Planning and Design Code (the P&D Code). The Regulated and Significant Tree Overlay do not currently apply to the Alexandrina Local Government Area (LGA), noting that State Government is currently reviewing applying the application of these Overlays more broadly to townships in Greater Adelaide. The only current protection of trees applicable in the Alexandrina LGA is via the Native Vegetation and the State Significant Native Vegetation Overlays of the P&D Code together with a requirement for clearance approval to clear any trees that are defined as ‘native vegetation’ under the Native Vegetation Act 1991. Other overlays, such as the Urban Tree Canopy Overlay which require trees to be planted for new allotments, are only currently applicable in two locations across the Council district (the Master Planned Township zoned land at Middleton and an area of Neighbourhood zoned land on the western side of Strathalbyn. Council continues to advocate for the application of the Urban Tree Canopy Overlay to new Master Planned Township zones. Development pressures continue to threaten tree canopy, particularly on private land which makes up the majority of the council area. Current regulations do not fully account for the high socio-ecological/amenity value of mature trees. Councils Tree Management Procedure outlines tree valuation per the City of Melbourne method;

however, a 75% reduction factor is applied where tree removals are approved and there does not appear to be any precedent or justification for applying this.

Stronger regulatory and financial incentives/penalties, such as amenity-based valuation fees, are required to provide a strong deterrent – or revenue stream for Council - to offset against the loss of community benefit for the loss of trees.

Council's Tree Management Policy and Tree Management Procedure govern the removal and replacement of public trees but lacks transparency on how replacement plantings compensate for canopy loss in terms of age, form and Useful Life Expectancy. The Urban Tree Canopy Overlay also provides for replacement of large trees with smaller trees which do not offer equivalent environmental returns compared to mature specimens (Noting that this policy is set at the State level).

To address this, stronger planning protections, integrated data systems and improved valuation methods are recommended. A comprehensive tree inventory and canopy monitoring program would strengthen planning outcomes, inform offsets and support more effective urban forest management. Should the Regulated and Significant Tree Overlay be extended to Alexandrina, it may offer a valuable mechanism for improving tree retention outcomes on private land.

2.6. Vegetation quality, design and urban canopy outcomes

Achieving the most impactful urban canopy outcomes in Alexandrina also requires an evolution in focus from canopy *quantity* alone to include *quality*, species performance and landscape function. Tools such as Leaf Area Index (LAI) and Green Plot Ratio (GnPR) have been applied in global contexts like Singapore. These may offer valuable frameworks to assess vegetation health, maturity and ecological impact to highlight the superior performance of large, mature trees over smaller or narrow-canopied species.

In terms of development planning, Conservation Design offers a high-impact opportunity to retain existing vegetation during subdivision and construction, preserving mature canopy and natural assets, reducing clearance pressure and lowering long-term replanting costs. In contrast to Conventional Design where lot yield and access is prioritised, Conservation Design integrates canopy and ecological features into early site planning.

To embed this approach, Alexandrina Council may benefit from introducing formal development and best practice guidelines, overlay provisions and public education campaigns. These measures will strengthen alignment between urban greening goals, biodiversity outcomes and climate resilience, while ensuring that canopy cover is delivered equitably across communities.

This reflects the broader challenge of balancing high land values and the desire to maximise built form against Conservation Design and retention/enhancement of vegetation. As demonstrated, developments are typically reliant on canopy cover and cooling benefits derived from adjacent public open spaces or larger neighbouring properties.

2.7. Developer-planted trees in new developments

Tree planting by developers is a key mechanism for greening new subdivisions, yet its long-term effectiveness is often compromised by poor species selection, substandard planting practices and inadequate maintenance. These shortcomings can result in premature decline, structural issues or tree failure by the time of Council handover. This undermines both canopy growth and community confidence in greening outcomes.

To address this, Alexandrina Council should strengthen governance through clear planting specifications, performance benchmarks and post-installation monitoring. All trees should be entered into a tree asset management/inventory system at the time of planting to support transparent lifecycle tracking and ensure compliance at handover. Poor-performing trees should be replaced or funded for replacement as a condition of acceptance.

Reinvesting offset funds from tree removals into localised planting using a proposed benchmark of 10 trees per removal may help maintain canopy equity and neighbourhood-scale resilience.

The introduction of South Australia's draft Design Standard 1 in 2025 provides a timely opportunity to embed consistent expectations for street trees and landscape infrastructure across new developments. However, successful delivery still depends on robust Council oversight, data integration and enforcement of standards to ensure these assets meaningfully contribute to long-term canopy targets.

2.8. Tree asset management system and tree valuation

Implementing a Tree Asset Register and Management System (TMS) is a critical step in professionalising urban forest management and maximising the value of Alexandrina Council's green infrastructure. Such a system supports a shift from reactive tree care to strategic, data-informed decision-making, with wide-ranging benefits across operational efficiency, environmental performance, financial planning and community engagement.

A well-functioning TMS enables comprehensive tree inventories, facilitates proactive maintenance, enhances risk and liability management, and improves workflow efficiency through digital integration and GIS mapping. It provides essential metrics for tracking canopy cover, monitoring

biodiversity, informing climate resilience strategies and delivering long-term urban greening goals such as the 2055 canopy cover target.

From a sustainability perspective, a TMS can support carbon sequestration monitoring, air quality improvement analysis and stormwater management, helping to reduce reliance on grey infrastructure. Economically, it allows Council to identify cost-saving opportunities, increase transparency around development offsets, and even link healthy tree canopies to property value uplift and enhanced public realm appeal.

In parallel, tree valuation transforms individual trees and collective canopy into infrastructure assets with a quantified value. By assigning monetary values to trees through methods such as the City of Melbourne's model or Arboriculture Australia's standardised national method (AANZAA-Value), Council can better justify investment, articulate and communicate the benefits of trees in relatable terms, and enforce accountability in development or damage contexts.

Valuation also underpins offset fee structures, informs cost-benefit analysis for removals and replacements and supports financial planning. Alexandrina currently applies a valuation method based on the City of Melbourne model, though a review of the Base Value (BV) is recommended to ensure currency and consistency with inflation. Alternatively, AANZAA-Value could be adopted.

Together, a modern TMS and tree valuation framework reposition Alexandrina's urban forest from a perceived 'cost' to a strategic, multi-functional asset, unlocking long-term returns in environmental health, liveability, climate resilience and community wellbeing.

2.9. Green infrastructure as a valued asset and budget funding

Recognising green infrastructure like trees, wetlands, rain gardens and green roofs as essential assets on par with traditional 'grey' infrastructure is critical for climate resilience, health and liveability. **Traditional infrastructure contributes to 70% of global emissions whereas green infrastructure delivers low-cost, long-term services including community health and wellbeing, flood mitigation, cooling and biodiversity support. However, it is frequently undervalued and underfunded in asset management and financial planning.**

To address this, the Institute of Public Works Engineering Australasia (IPWEA) and partners have led a South Australian project to embed green infrastructure into standard asset management frameworks. Their 2025 published Green Infrastructure Management Manual provides best-practice guidelines and training for councils, engineers and arborists, and covers asset treatment and management, valuation, condition assessment, lifecycle costing and risk management. Quantifying green asset values enables more balanced, informed investment decisions.

The planting and establishment of long-lived, canopy-forming trees represent enduring community infrastructure and should be funded, at least in part, through capital budgets. Many Australian councils including Melbourne, Brisbane, Surf Coast, Glen Eira, and Hobsons Bay already allocate capital funds for strategic tree planting as part of climate adaptation and urban forest strategies.

While operational budgets remain important for routine maintenance and small-scale planting, securing capital investment through a planting master plan and business case would ensure greater funding certainty and flexibility, better accountability, and long-term success of greening initiatives across Alexandrina Council.

2.10. Review and refinement

Achieving long-term urban canopy targets requires an adaptive and iterative approach. Regular canopy mapping and progress reporting will be essential to monitor outcomes, identify underperforming areas, and guide continuous improvement through appropriate and consistent decision-making. Where challenges to canopy growth arise, such as Council land sales or infrastructure constraints, these should be factored into future scenario modelling. Conversely, where targets are being exceeded, programs may be refined to optimise resources, including exploring engineered solutions such as soil vaults within heat-prone sites such as car parks and roads to facilitate tree planting and canopy cover.

A structured review and refinement cycle will ensure planting strategies remain effective, efficient, and aligned with Alexandrina's canopy cover and climate resilience goals. These cycles should be 5 years at a maximum but ideally every 2 years.

3. Modelling considerations

3.1. Modelling increased canopy cover

Council's tree planting over the past decade has been inconsistent rather than part of a sustained program. At the time of this Study, Council had an historic planting rate averaging 260 trees per year across a ten-year period (varying from 68 to 500 trees annually). To consider if and how much to increase the benchmark tree canopy cover, Council required an understanding of whether and how that might be achieved including consideration of:

- Which tree species
- How many of each
- Annual planting rates
- Available land
- Cost projections.

By modelling various scenarios, assuming planting locations on Council land (i.e. areas of greatest control), evidence-based canopy targets for each of Alexandrina's townships could be interrogated and dimensioned, informing recommendations and decision-making.

3.2. Prior learning on canopy cover strategy and targets

Addressing the challenges associated with urban greening, canopy cover expansion, and biodiversity protection requires a coordinated, place-based and future-oriented approach. There is no one-size-fits-all solution as municipalities such as Alexandrina face unique environmental, social, spatial and governance contexts. However, a suite of complementary strategies can guide more effective planning, design and implementation to help navigate structural, ecological and social challenges.

Integrated Urban Forest Strategies and Tree Protection Policies

Developing and implementing a robust urban forest strategy is foundational to increasing canopy cover and sustaining green infrastructure. This includes:

- Setting clear canopy targets (e.g. 18.6% by 2055) and identifying priority zones for intervention based on UHI, socioeconomic equity, and public health outcomes.
- Embedding tree protection regulations within development controls to reduce unnecessary removal of mature trees and ensure the retention of vegetation during construction.
- Requiring green offset mechanisms, such as "planting-to-removal" ratios and/or financial compensation, when vegetation loss is unavoidable.

These strategies must also account for climate-resilient species selection, emphasising trees and understory plants suited to projected heat and rainfall conditions through to 2040 and beyond.

Early integration into planning and infrastructure design

To overcome the competing demands of roads, housing, services and utilities, green infrastructure must be integrated from the earliest stages of land use and infrastructure planning. This includes:

- Ensuring adequate soil volume, root zones and water access in streetscapes and public open spaces.
- Applying design guidelines that mandate green infrastructure (e.g. tree-lined streets, vegetated verges) in new subdivisions and infill developments.
- Incorporating green infrastructure elements such as rain gardens, permeable pavements, and water-sensitive urban design to support both canopy health and stormwater management.

Proactive design ensures trees are not seen as competing with infrastructure but rather as integral assets that enhance its performance and longevity.

Equitable greening and spatial prioritisation

Investment in green space and canopy cover should be informed by equity indicators, such as the "Socio-Economic Indexes for Areas" (SEIFA) (Australian Bureau of Statistics 2021) and 300m access thresholds, to ensure that vulnerable or underserved communities benefit from improved environmental quality. This involves:

- Mapping and targeting areas with low canopy cover and high heat exposure.
- Aligning planting initiatives with health and wellbeing programs, particularly in areas with older populations, children, or people with chronic illness.
- Ensuring that parks in isolated or socially disadvantaged areas receive proportional greening investments, even if visitation is lower compared to prominent regional parks.

This equity lens helps address systemic imbalances in access to nature and climate resilience.

Community engagement and behavioural change

Long-term success requires strong community awareness, involvement, and ownership of urban greening initiatives. Councils can:

- Launch education campaigns to build understanding of the environmental and social value of trees, addressing concerns such as litter, allergies and view obstruction.

- Facilitate community planting days and “adopt-a-tree” programs that foster local stewardship.
- Provide tree guides and incentives for private landholders to plant suitable trees, particularly in low-canopy neighbourhoods.

Engaging with residents strengthens social agency and increases the likelihood of long-term tree retention and care.

Resilient and diverse planting approaches

Given increasing climate variability, planting strategies must be both adaptive and diverse. Solutions include:

- Selecting a diverse palette of native and non-invasive exotic species with tolerance to heat, drought, salinity, pests and diseases.
- Prioritising deep-rooted species that stabilise soil and reduce erosion, particularly in coastal or flood-prone areas.
- Applying succession planting models that ensure canopy continuity over time by integrating fast-growing and long-lived species together.

This resilience-based approach safeguards both social benefits and ecosystem services under future climate extremes.

Ongoing resourcing, maintenance, and monitoring

Planting trees is only the beginning. Program success depends on adequate maintenance and monitoring to ensure survival, health and long-term benefit. Councils must:

- Allocate long-term operational budgets for watering, pruning, pest management, and replacement planting.
- Use GIS and asset management tools to track canopy growth, tree health, and mortality rates.
- Develop partnerships with NGOs, local businesses and schools to support co-investment in greening initiatives.

Monitoring outcomes over time also allows councils to adjust strategies responsively and demonstrate return on investment.

Canopy cover targets for Councils throughout Australia is becoming an increasing focal point given the multitude of benefits canopy cover provides from social environmental and economic standpoints, and the climate change mitigating influence trees provide.

From a worldwide perspective, there have been numerous suggestions. The USA not-for-profit organisation American Forests recommends 40% canopy cover while a large UK study (Doick et al. 2017) suggests setting a benchmark of 20%. While the former was recognised as difficult to attain nationally due to the diversity of American cities and towns, it demonstrates a large disparity between suggestions.

Cities such as Barcelona (Ajuntament de Barcelona 2017), Bristol (Bristol Green Capital Partnership 2018), Canberra (Australian Capital Territory 2019), Seattle (Seattle Government 2016) and Vancouver (City of Vancouver 2020) have all set an ambitious 30% target in the coming decades.

This general canopy cover target of 30% is frequently mentioned in other Australian LGAs and seems the generally desired benchmark in the urban context (The Nature Conservancy and Resilient Melbourne, 2019). Konijnendijk (2023) supports a minimum 30% canopy cover at the neighbourhood level and recommends cities striving for even higher canopy coverage when possible as there can be further benefits from greater canopy cover.

As an example, Ziter et al. (2019) reviewed tree canopy cover over impervious surfaces cover and the effect on air temperature. The study found an average 3.5 °C (range of 1.1–5.7 °C) variability in daytime air temperature and that the greatest cooling occurred in a non-linear trend and when canopy cover exceeded 40%.

Konijnendijk (2023) makes a distinction that the 30% city scale reference point should not be used city-wide as this limits specificity for areas that may require more canopy, and that can lead to inequity of tree benefits.

The example used is that cities like Barcelona, Spain and Vancouver, Canada have canopy cover of around 20%; however, this value is comprised of one or more local large natural green spaces and the value of built-up areas is much lower. This highlights the importance of representing canopy cover values at local versus macro scales and in determining where improvements need to be made.

3.3. LGA canopy cover benchmarking

Existing canopy cover, canopy cover targets and the proposed timescale for achieving targets can vary markedly between LGAs, and even within municipalities. One size does not fit all. Alexandrina has differences to all other LGAs from environmental, land use and resourcing perspectives, and these must be considered in setting Alexandrina's targets.

In an ambitious proposal, the City of Sydney's Greening Sydney Plan outlines the vision for the City to increase current canopy cover by 50% by the year 2030 and by 75% by the year 2050. This represents 23% canopy cover by 2030 and 27% canopy cover by 2050 (City of Sydney 2021). To

facilitate this high expectation, their urban forest strategy is the foundational document at the heart of delivering the City's Sustainable 2030 vision and the Greening Sydney Plan.

The City of Melbourne, Victoria has a plan to increase tree canopy cover predominantly on public land from 22% to 40% by 2031, with a forecasted reduction of up to two degrees in average daytime summer temperature (City of Melbourne 2012).

Brisbane City Council, Queensland has a target to achieve 40% natural habitat cover on mainland Brisbane by 2031 and seeks to provide tree shade cover to 50% for footpaths and bikeways in residential areas by 2031 (Brisbane City Council 2023). Natural habitat is a collective term for all the native vegetation communities across Brisbane, at all levels of maturity and condition.

Bayside City Council, Victoria aims to achieve an increase in the municipal tree canopy cover from 16.01% to 30% by 2040, with the following outlining current benchmarks and desired targets on specific Council managed land: 20.3% to 30% in parks and reserves, 24% to 35% in roads and streets, 15.6% to 25% in car parks, and 17.4% to 30% foreshore and other areas (Bayside City Council 2022).

Hobsons Bay City Council, Victoria, proposes an overall increase in tree canopy to 30% by 2040 comprising 40% in parklands, 30% in streets and roads, and 20% in industrial areas (Hobsons Bay City Council 2020).

Banyule City Council, Victoria key targets of the Urban Forest Strategy includes 30% canopy cover across all suburbs by 2050 and 45% canopy cover across the footpath and local road network by 2050 with no canopy loss in either category where suburbs exceed the target, and 50% canopy cover across the open space shared path network and surrounding playgrounds by 2050 (Banyule City Council 2023).

Following research indicating a net canopy loss of 10% in the 4 years preceding 2019, the City of Whitehorse, Victoria is implementing a strategy which, over the next 10 years, will halt the loss in canopy cover and work towards achieving a target of 27% canopy cover by 2030, with 30% coverage by 2050 (Whitehorse City Council 2021).

Lake Macquarie, New South Wales are aiming to achieve a 10% canopy increase in suburbs vulnerable to urban heat by 2023 and seek similar canopy cover targets of: 30% in all residential zones, 25% in business zones, and 15% in commercial zones, with all these targets required for new developments (Lake Macquarie City 2022).

Orange City Council adopted a strategy to increase 2022 canopy cover benchmarks in their three key city areas to 2050 entire township (public and private) targets of:

- Orange - 17.3% to 20.0%
- Lucknow - 7.0% to 9.0%
- Spring Hill - 4.9% to 7.0%

In reviewing canopy targets closer to Alexandrina, the South Australian government Draft Greater Adelaide Regional Plan (GARP) set a target of 30% by 2055 across the Greater Adelaide metropolitan region and a target increase of 2% by 2030 for rural councils, although revision of the draft resulted in Alexandrina Council no longer being bound to any such requirement. As the modelling in the Study showed, to implement a 2% increase canopy cover by 2030 across Alexandrina Council, it would have required a budget of approximately $73 million.

Neighbouring regional LGAs of Victor Harbor, Yankalilla, Onkaparinga, Mount Barker and Murray Bridge all have a focus on tree management and environmental protection through their various strategic documents and policies with general commitments to:

- Increasing tree cover through planting programs in townships, streetscapes, parks and reserves.
- Protecting and enhancing existing trees and native vegetation for biodiversity, environmental benefits and amenity.
- Addressing urban heating through tree planting.

While these sentiments are echoed between LGAs, only the Rural City of Murray Bridge was found to explicitly state a quantifiable percentage tree canopy target. Under their Environment Management Plan 2020-2024 (Rural City of Murray Bridge 2021) Action E4.2 notes an “aim to increase tree cover and shade to improve liveability” through “achieving 20% increase in tree cover based on tree canopy study” as an ongoing project until 20% coverage is achieved.

Another example comes from the Department for Infrastructure and Transport (Department for Infrastructure and Transport 2025) where the landscaping plan for the Adelaide Road roundabout project in Mount Barker aims to increase tree canopy cover by over 20% within the project, which is in line with the Department’s commitment.

Based on these examples and trends towards increased canopy cover targets per the GARP, a canopy cover target for each of the 11 townships within Alexandrina of 20% or greater by 2055 seems appropriate. Scenario 3 generally facilitates this objective and outlines expected budget and timeframes for completion.

3.4. Fair and equitable access to urban green space

Equitable access to urban green space is increasingly recognised as a critical public good and a central policy objective across local, national, and global frameworks. This is clearly reflected in the United Nations Sustainable Development Goal 11, Target 11.7, which calls for universal access by 2030 to safe, inclusive, and accessible green and public spaces; particularly for women, children, older persons, and individuals with disabilities (United Nations 2022).

However, disparities in access and canopy distribution remain a challenge. The Alexandrina Council Tree Canopy Report highlights this inequity, showing a stark contrast in canopy coverage across townships such as 11.7% in Milang to 49.3% in Ashbourne (Alexandrina Council 2022). These variations reflect not only environmental differences but also planning legacies, socioeconomic conditions and levels of public investment in greening initiatives.

Access to urban nature is now viewed as an essential public service and a basic human right (Miles 2022). This view is realised in part through tree visibility, with the proposal (the "3–30–300 Rule", below) that every person should be able to see at least three trees from their home, workplace or educational setting. Given that public trees are often located on road verges or in open spaces, local governments play a vital role in enabling this access.

Importantly, the quality of trees matters. Chi et al. (2022) found that exposure to fewer, well-established large trees can have greater mental health benefits than many smaller or immature trees. This finding reinforces the need to prioritise planting for size and longevity, rather than simply volume or density.

In line with the World Health Organization's (WHO) recommendations, every resident should have access to a large green space of at least 1 hectare within 300 metres of their residence - equivalent to a 5-minute walk (WHO 2017). Larger green spaces are associated with higher recreational value, greater ecological complexity and increased usage (Cohen et al. 2010, Nielsen et al. 2014). While this benchmark is desirable, it poses significant challenges in high-density or established urban areas where retrofitting such spaces requires innovative solutions and multi-agency coordination.

A framework known as the "3–30–300 Rule" has gained international traction to guide equitable urban forestry planning (Konijnendijk 2023). This guideline recommends:

- A minimum of 3 visible trees from every home, school, and place of work;
- 30% tree canopy cover in every neighbourhood; and
- 300 metres maximum distance to the nearest public green space (UNECE 2022) (Figure 2).



Figure 2: Image demonstrating the 3-30-300 rule and how it would apply in a residential setting (UNECE 2022).

Adoption of a framework like the '3–30–300 rule' guidelines for urban forestry could support equitable access to trees and green spaces, and their benefits, and may benefit Alexandrina in the development of planting programs and tree retention procedures.

It should be noted that the '3–30–300 rule' is intended as a guideline to best practice based on research rather than an absolute. The 300m may be more readily followed in some areas, whereas other locations may require further assessment and pragmatic modification. As an example, the existing DSS requires a local park within 400m of each lot for greenfield developments. This existing framework provides a mechanism by which new developments can provide amenity and public open space, with the proximity and size of local parks potentially acceptable for Alexandrina residents.

It is expected additional investigation would be required for existing neighbourhoods that don't meet the 3-30-300 targets to identify retrofitting capability. This may include land use repurposing, Council buyback schemes or road modification/lane closures. The later has been particularly successful in the City of Melbourne where micro-parks and linear reserves have been created within the heavily built city environment (City of Melbourne 2012).

In terms of design, preference should be provided to endemic and native species as these will be better suited to the local environment and provide greater ecological function to the area. A biodiverse species palette should also be a key consideration as this enhances ecological function, provides resilience to the system, and improves mental, physical, and social dimensions of health and well-being. These themes tie in well with strategic priorities of the Alexandrina Environmental Action Plan 2030 (2023c) and development of new neighbourhoods that are liveable and leafy and supporting urban biodiversity.

Studies such as Watkins and Gerrish (2018) and Shiraishi (2022) show that marginalised populations often live in neighbourhoods with lower urban tree canopies. The recent study by Zhou et al. (2021)

also demonstrates that socially vulnerable urban populations typically live in hotter city areas with fewer trees. While the IRSD (Index of Relative Socio-economic Disadvantage) data for Alexandrina generally demonstrates the greatest disadvantage within the centre of townships (Australian Bureau of Statistics 2021), this is not necessarily where the hottest areas are located or the locations where canopy cover is more required (Alexandrina Council 2022).

Given the rural nature of Alexandrina and large and farming properties in many locations, the 300m rule may be challenging. Consideration of an alternative metric or quantum, appropriate to Alexandrina, and flexible to be useful to future planning and development situations, may be appropriate.

3.5. Targeted street tree planting for urban heat island (UHI)

A key driver for increasing canopy cover across Alexandrina Council is the anticipated rise in average temperatures and the intensification of the Urban Heat Island (UHI) effect (Alexandrina Council 2022a, Alexandrina Council 2022b, Alexandrina Council 2023c). Alexandrina Council is committed to climate adaptation, urban greening and enhancing liveability as outlined in various documents including the Tree Management Policy (Alexandrina Council 2023a), Alexandrina 2040 Liveable Green Connected (Alexandrina Council 2020), Environmental Action Plan 2030 (Alexandrina Council 2023c) amongst many others. Trees and associated vegetation are viewed as essential public assets, delivering ecosystem services such as cooling, shading and visual amenity across streetscapes, activity centres and parklands.

Tree canopy cover is among the most cost-effective strategies to mitigate UHI effects, with well-positioned shade trees significantly reducing surface and air temperatures. Evapotranspiration provided by tree canopies also contributes significantly to reduced ambient temperatures. According to Osmond and Sharifi (2017), this cooling effect can lessen dependence on energy-intensive air-conditioning systems, offering an indirect yet impactful emissions reduction benefit. Research by Norton et al. (2015) and Coutts and Tapper (2017) has shown that strategically planted urban trees can lower road surface temperatures by over 25°C and reduce household energy demand by 2–5%. Figure 3 illustrates a thermal imaging example from central Melbourne, clearly demonstrating temperature differences between shaded and unshaded sections of roadways (Nogrady 2017).

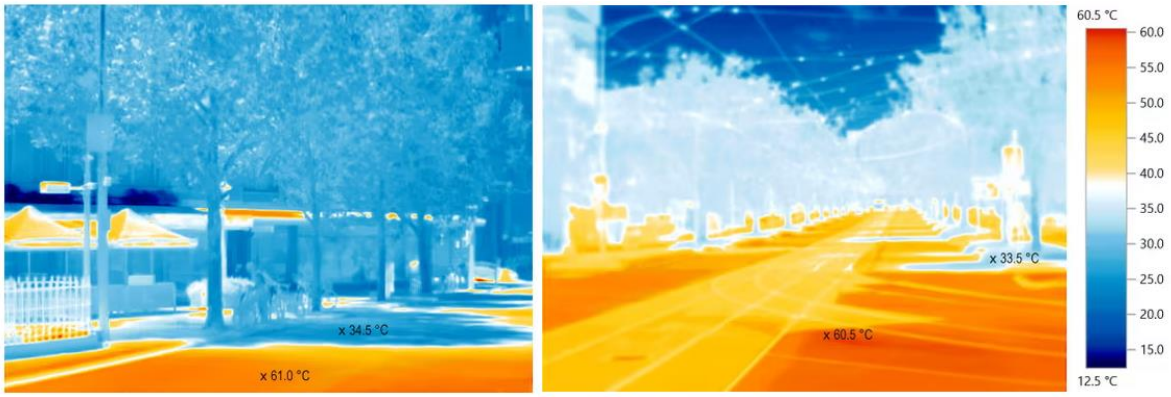


Figure 3: Thermal image from January 2017 demonstrating shaded and non-shaded sections of Elizabeth Street (left) and Royal Parade (right), near the Queen Victoria Market, Melbourne, Victoria (Nogrady 2017).

While this may be the case, there are common urban development constraints that limit the ability to implement widespread verge tree planting. Amongst these are narrow verges resulting from increasing dual occupancy development and vertical lot orientations, both which reduce available planting space, soil volumes and increased hard surface coverage. As crossover density increases with infill and medium-density development, opportunities for verge greening diminish, exacerbating local heat retention and amplifying UHI impacts.

Tree health and infrastructure conflicts are other key considerations. When planted in constrained soil volumes, trees often extend root systems into adjacent private land or nearby infrastructure in search of water and nutrients, potentially causing damage to paths, roads and foundations. These issues underscore the need for properly designed planting zones with adequate space and soil quality to support long-lived, healthy trees.

In response, Alexandrina Council may consider incorporating design requirements in planning policy that allocate sufficient verge widths in new developments similar to those adopted in Canberra. Alternative engineering solutions such as soil vaults, structured soils and Water Sensitive Urban Design (WSUD) features can also support tree establishment in challenging environments and are usually part of retrofitting projects in prominent locations.

Safety and visibility considerations, such as sightlines and road safety, can be managed through species selection, staged planting, and initial road speed reductions where required. Mature tree benefits such as shade, evapotranspiration cooling and habitat far exceed those of smaller or recently planted trees, making early investment in appropriate planting design and infrastructure essential (Turner-Skoff & Cavender, 2019).

To optimise outcomes, Alexandrina Council should adopt a planting prioritisation framework, such as that supplied within this Study, that maps heat hotspots, considers tree equity, high use zones, and

targets locations with the highest potential for canopy gain (e.g. wide verges, underutilised reserves). Complex zones such as those impacted by underground infrastructure or powerlines may require more detailed assessment and engineered interventions. Any planting program should include a robust monitoring and evaluation framework, allowing for adaptive management in response to environmental, economic and social shifts over time.

A holistic approach to heat mitigation should also consider complementary strategies including cool pavements, green roofs and walls, and retention of existing vegetation. Where bushfire risk coexists with UHI exposure, detailed risk-benefit analyses should be conducted, comparing public health impacts of extreme heat (e.g. heat stress, skin cancer) against bushfire hazards, supported by State guidance and departments such as the Country Fire Service (CFS).

Tree planting along road reserves is a key opportunity. Preliminary reviews of selected road segments have shown limited shading coverage, confirming the need for targeted action. Strategic street design that reserves the north side for tree planting and locates infrastructure on the south side will optimise shade, enhance canopy coverage, support pedestrian comfort and reduce long-term management costs.

Finally, broader integration with Council's existing greening programs could deliver compounding benefits. For example, Moreton Bay Regional Council increased its tree planting budget by 30% in 2022–23 and aligned this with land buyback and habitat enhancement programs (Moreton Bay Regional Council 2022). Similar integration within Alexandrina's programs could support biodiversity corridors, stepping stone connectivity and ecosystem resilience.

An integrated planning approach is essential to achieving urban forest goals, climate adaptation, and resilient urban design.

4. Modelling canopy cover targets by 2055

4.1. Methodology – Canopy cover scenarios

This Study explores seven planting scenarios for each township (eight for Milang) which evaluate different approaches for achieving urban canopy targets by 2055. Comparative analysis of the first five planting scenarios highlights varying approaches in balancing canopy cover targets, upfront costs, and long-term financial efficiency.

An overview of the eight Scenarios is provided as follows:

- **Scenario 1** (18.6% total canopy cover in 2055) - represents a steady planting model, doubling current planting rates while delivering modest canopy increases. It requires a lower demand for operational resources (such as staff resources) but results in the least canopy change by 2055.
- **Scenario 2** (19.3% total canopy cover in 2055) - builds on Scenario 1 by applying a more targeted, equitable planting approach to address canopy disparities between townships. However, it carries a higher total cost and longer delivery timeframe.
- **Scenario 3** (19.6% total canopy cover in 2055) - introduces a front-loaded planting model with high initial planting rates reduced by 20% annually and low or replacement-only plantings from 2050 to 2055. This facilitates earlier canopy benefits, reduced maintenance costs over time, and total program savings compared to Scenarios 1 and 2.
- **Scenario 4** (20.0% total canopy cover in 2055) - further escalates the front-loaded approach with higher-again initial planting rates reduced by 20% annually. This achieves 30% canopy cover target on Council-managed land by 2050, delivering substantially early outcomes but at a higher total program cost.
- **Scenario 5** (20.1% total canopy cover in 2055) - adopts the most aggressive front-loading strategy, with a 33% annual planting reduction, achieving the 30% canopy target fastest, delivering the earliest environmental and amenity benefits, and offering the largest life-cycle savings despite the highest upfront costs.
- **Scenario 6** - models a target of a 2% total canopy cover increase across all land by 2030.
- **Scenario 7** - models a 30% total canopy cover increase across all land by 2055.

Scenarios 6 and 7 demonstrate that achieving these targets is not feasible when relying solely on Council-managed land and Council budgets. Although the 2% target were initially considered within the draft GARP for regional councils, it has since been removed from the scope.

While the draft GARP may have intended to encourage programs that support total canopy growth, including contributions from private land, this responsibility is outside the scope of this Study and is no longer a formal requirement for regional councils. However, it is acknowledged that canopy cover on private land has the most significant influence - both positive and negative - on total canopy outcomes, as private land constitutes the majority land area within Alexandrina. This highlights the importance of considering land clearing practices associated with private development and land use. At the same time, complementary initiatives such as free tree giveaways or tube stock distribution to residents could enhance private land contributions to total canopy cover.

- **Scenario 8** - has been developed exclusively for tree planting in Milang using tube stock to examine the viability and costs of this approach, offering an alternative to the traditional, advanced tree planting models.

As discussed in Section 8.1.3 Tube stock suitability for streetscapes, the use of tube stock in urban streetscapes has generally resulted in poor establishment outcomes and is generally not recommended. Park planting may be a suitable alternative and allow for engagement with the community.

4.2. Methodology – Tree categories

As part of this Study, achieving the canopy cover target is primarily focused on tree planting within Council-managed land such as streets and public open spaces, where Councils greatest level of control exists. Tree species selection is guided by the specific characteristics and conditions of each planting location. To support effective modelling, planning and monitoring, species are grouped into four categories based on general growth characteristics:

- Coastal
- Large
- Ornamental
- Narrow / Powerline-compatible

This categorisation enables more accurate forecasting of canopy growth and ensures species are appropriately matched to their planting context.

1. Coastal category

This category includes vegetation and tree species, both native and exotic, that are suitable for planting in coastal environments but can also be planted in the other townships. These species vary in size ranging from small to large, and must exhibit resilience to coastal conditions including the key characteristics of:

- Tolerant to harsh coastal conditions such as salt exposure, wind and sandy soils.
- Includes both native and exotic species.
- Variable size (small to large).
- Long-lived (ULE 40–75 years).

Example Species:

- *Araucaria heterophylla* — Norfolk Island Pine (height to 50 m) (Figure 4)
- *Banksia integrifolia* — Coastal Banksia (height to 15 m)
- *Banksia marginata* — Silver Banksia (height to 10 m)



Figure 4: Example of Araucaria heterophylla at Goolwa Wharf

2. Large category

This category comprises native and exotic tree species that are iconic in stature and typically used as feature or avenue trees. These trees are often planted as single species in formal arrangements along streets or within parks where their form, canopy spread and visual prominence contribute significantly to the urban landscape. They offer high amenity value and are selected for their long-term contribution to canopy cover and character.

Key Characteristics:

- Native or exotic feature trees.
- Iconic form, often planted as avenues or focal points.
- Defined by broad canopy spread and amenity value.
- Suitable for parks, streets, and large open spaces.

- Useful Life Expectancy (ULE): 40–75 years
- Example: *Ficus hillii* avenue planting along Cadell Street.

Example Species:

- *Brachychiton acerifolius* — Illawarra Flame Tree (height to 20 m)
- *Eucalyptus leucoxylon* ssp. *leucoxylon* — South Australian Blue Gum (height to 20 m) (Figure 5)
- *Eucalyptus fasciculosa* — Pink Gum (height to 15 m)



Figure 5: Example of Eucalyptus leucoxylon at Hindmarsh Island.

3. Ornamental category

This category includes both native and exotic species that are small to medium in size and offer high amenity value. Ornamental trees are well-suited to constrained planting environments, such as verges with limited in-ground space or areas around urban infrastructure. They are commonly used in residential streetscapes and can be tailored to suit specific design themes or development contexts. These trees often form part of developer landscaping contributions and are selected for their visual appeal and adaptability.

Key Characteristics:

- Native and exotic species.
- Small to medium size with high amenity value.
- Narrower canopy spread, suited to constrained sites.
- Suitable for verge planting and around infrastructure.

- Commonly used in development contexts.
- Useful Life Expectancy (ULE): 25–40 years.

Example Species:

- *Eucalyptus cladocalyx* 'Nana' — Dwarf Sugar Gum (height to 8 m) (Figure 6)
- *Hibiscus tiliaceus* 'Rubra' — Cottonwood (height to 8 m)
- *Ulmus parvifolia* 'Todd' — Chinese Elm (height to 10 m)



Figure 6: Example of Eucalyptus cladocalyx 'Nana' in Elizabeth, SA.

4. Narrow / Powerline-compatible category

This category includes native and exotic tree species that would be selected for planting beneath or adjacent to overhead powerlines and within narrow urban corridors. These trees are typically small to narrow in form, with a modified or compact canopy structure that aligns with clearance requirements outlined in the Office of the Technical Regulator (OTR) Lists 1 and 2, where applicable. While generally offering moderate amenity value, these species are essential for greening constrained sites without compromising infrastructure safety.

Key Characteristics:

- Includes species from OTR Lists 1 and 2 (where applicable).
- Native and exotic varieties.
- Small or narrow form with compact canopy.
- Suitable for planting under powerlines and in tight spaces.

- Moderate amenity value.
- Useful Life Expectancy (ULE): 25–40 years.

Example Species:

- *Lagerstroemia indica* var. 'Tuscarora' — Crepe Myrtle (to 6 m) (Figure 7)
- *Eucalyptus leucoxylon* 'Euky Dwarf' / 'Goolwa Gem' — Dwarf SA Blue Gum (to 8 m)
- *Sophora japonica* 'Princeton Upright' — Pagoda Tree (to 12 m)



Figure 7: Example of Lagerstroemia indica var. 'Tuscarora' Callington Road, Strathalbyn

4.3. Methodology – Model attributes and execution

The model is built in an Excel workbook using the following inputs:

- Tree categories (up to 4).
    - ULE
    - Average growth rate (24 calendar years after planting)
    - Mortality rate (first 3 years, then ongoing)
- Tree planting rates.
- Landholders apportioned to Council controlled, Private and Crown.
- Baseline canopy cover change per landholder (Tree Canopy Report 2022).

The tree category metrics above were separately processed to establish their life cycle growth (and decline) characteristics using an iterative process. The form of these curves is based on scientific literature and is non-linear. This rigour results in the most accurate life-cycle canopy forecast per

tree category practical. From this, canopy areas are calculated and referenced by the model for each tree category and each year of growth in each year forecast based on the time since planting.

Model dashboard and outputs

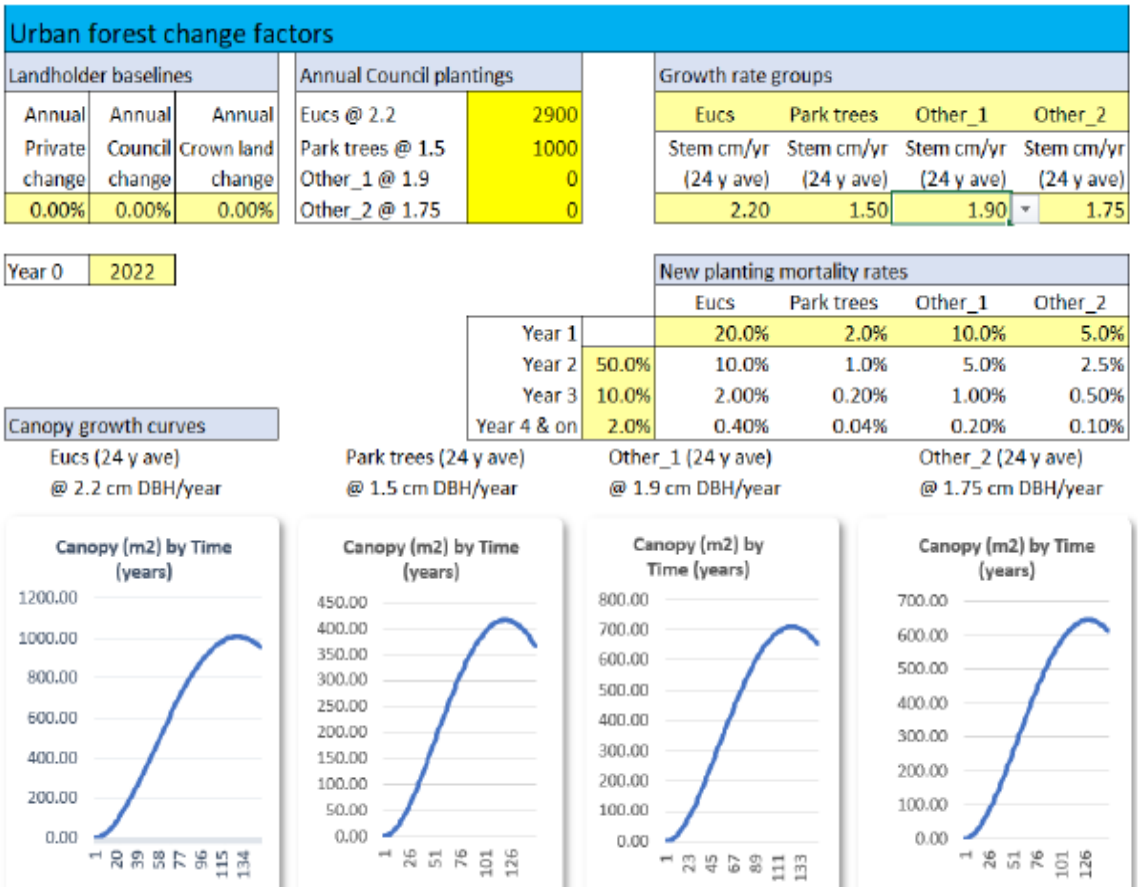


Figure 8: Canopy model dashboard part showing input factors. From Orange City Council.

Figure 8, above, shows part of the Canopy model dashboard with input factors:

- Landholder baselines.
- Growth rate groups (categories) with 24-year average growth rate selected.
- Annual plantings per Growth rate group (category).
- Mortality rates per Growth rate group for Years 1 – 3 and 4 and onwards.
- Category life-cycle canopy area curves per Growth rate group versus Year.
- [Input elsewhere is the annual planting rate reduction percentage if applicable.]

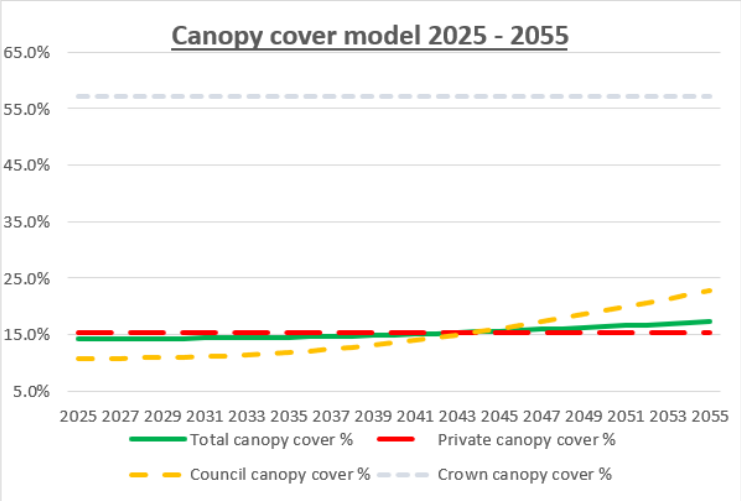
Figure 9, below, shows part of the Canopy model dashboard with output information:

- Total canopy area for year indicated in % and Ha.
- Private and Council canopy areas for year indicated in % and Ha.
- Proportions of Private and Council land as a percentage of total (T).

- Trees planted in year indicated and average trees planted up to that year.
- Cumulative planting numbers in year indicated.
- Annual planting and watering (P&W) cost at year indicated
- Cumulative P&W costs are tabulated elsewhere in the model.
- Time series showing percentage canopy cover per landholder.

Figure 9: Canopy model dashboard part showing output factors. Calyton Bay Scenario 1 output.

Canopy projection model:	Clayton Bay			
	2025	2030	2043	2055
Total Canopy %	**14.3%**	**14.3%**	**15.3%**	**17.3%**
% T = 100.0 Canopy Ha	33.7	33.8	35.8	40.7
Private Canopy %	15.4%	15.4%	15.4%	15.4%
% T = 74.9 Canopy Ha	27.2	27.2	27.2	27.2
Council Canopy %	10.8%	11.0%	14.5%	22.8%
% T = 25.0 Canopy Ha	6.4	6.5	8.6	13.4
Trees planted in year	-	100	100	100
Average plantings	-	100	100	100
Cumulative plantings	-	500	1,800	3,000
Annual P&W cost	$ 135,000	$ 135,000	$ 135,000	$ 135,000



78 versions of the model were created for each Scenario and Township with results tabulated and presented in Section 4, with the 79th used in the Executive Summary (Figure 1b) to demonstrate the cost effectiveness of early ("front-loaded") planting.

4.4. Results – Canopy cover by 2055

4.4.1. Scenario 1 –Doubling of Council's current planting program: 2055 total canopy cover @18.6%

This scenario doubles current planting rates to 591 trees annually - on Council-managed land. This Scenario predicts a 5.9% canopy cover on Council land and an overall increase of the total canopy cover (all land, all townships) of 1.0% - from 17.6% to 18.6% (Table 1 and Table 3).

Table 3: Scenario 1 Canopy hectare changes for Council land in townships and Total Canopy Cover change across all land.

Locality	Hectares						% Change (Council land)
	All Land	Total canopy cover with change on Council land only					
		2025	2030	2043	2055	2025-2055 Change	
Ashbourne	75.31	37.12	37.12	37.12	37.12	0.00	**0%**
Clayton Bay	235.90	33.67	33.79	35.84	40.74	7.07	**12%**
Goolwa	1160.77	166.02	166.30	172.32	190.41	24.39	**15%**
Hindmarsh Island	739.72	146.89	146.91	147.43	148.98	2.10	**1%**
Langhorne Creek	85.49	17.02	17.04	17.35	18.31	1.29	**8%**
Middleton	260.12	36.55	36.65	38.73	45.37	8.82	**24%**
Milang	313.20	36.71	36.81	38.54	42.74	6.03	**16%**
Mount Compass	594.41	139.15	139.16	139.40	140.10	0.95	**1%**
Port Elliot	967.49	134.54	134.63	136.62	142.68	8.15	**6%**
Strathalbyn	2003.48	388.29	388.38	390.37	396.00	7.71	**2%**
Woodchester	104.50	13.71	13.72	13.97	14.72	1.01	**7%**
TOTAL	6,540.39	1,149.66	1,150.52	1,167.69	1,217.17	67.50	**5.9%**

Council Planted Canopy Cover change over All Land	Hectares	Increase %
	67.50	**1.03%**

Scenario 1 used a consistent annual planting rate, with no front-end loading or phased reductions over time. Instead, planting continues annually at the base rate through to 2055 as outlined in Table 4, Column A (below).

This approach results in modest council canopy increases across most townships with the exception of Ashbourne where no plantings are currently planned due to its already high canopy cover.

All other townships show increased canopy cover due to modelled Council planting activity. The percentage impact varies depending on the starting canopy cover percentage, Council land area in absolute terms along with the planting numbers per species group and mortality rates specified.

Projected costs to Council

Financially, the program incurs:

- Over the life of the program, a total of 16,198 trees planted at a cumulative cost of $21,867,300 (excluding consumer price index (CPI) adjustments and future cost escalations).
- A typical annual budget for Scenario 1, factoring 591 new plantings and maintenance of previous two years plantings, would be $797,850 ($177,300 [planting] + (3 x $206,850) [watering]).
- Year 1 is adjusted to account for lower watering costs as pervious plantings were not considered.

Table 4 (below) outlines the estimated costs associated with Scenario 1 for each township, with the percentage of canopy cover change on Council land detailed in Column I and the percentage of total canopy cover on all land in Column J. It shows planting and maintenance costs for Year 1 only (Columns B and C), with maintenance costs for trees planted in previous years (2023 and 2024) also considered (Column D) and cumulative results for 2025-2055 in Columns E and F.

Additional assumptions

- No tube stock or volunteer effort is included in this Scenario.
- Council supplied costs used were:
    - Stock and planting - $300/tree.
    - Watering - $350/year for 3 years.
- No CPI adjustments for future years.
- No change in 2022 benchmark data which is assumed as the 2025 benchmarks.
- Township boundaries of Hindmarsh Island are the western parts of the island only.

Table 4: Scenario 1 – Planting status quo with expected canopy coverage outcomes and budget costs.

	A	B	C	D	E	F	G	H	I	J
Locality	**Year 1 Planting no.**	**Year 1 $ - Planting only**	**Year 1 $- Planted maintenance only**	**Year 1 $ – all planting & maintenance**	**2055 – Total Planting no.**	**2055 - Total Project Cost**	**2025 – Council Canopy**	**2055 - Council Canopy**	**Council Canopy % Change**	**2055 – Total Canopy %**
Ashbourne	-	$-	$-	$-	0	$-	70%	70%	0%	49%
Clayton Bay	100	$30,000	$35,000	$135,000	3000	$4,050,00	11%	23%	12%	17%
Goolwa	200	$60,000	$70,000	$270,000	6000	$8,100,000	16%	24%	8%	16%
Hindmarsh Island	20	$6,000	$7,000	$27,000	600	$810,000	12%	13%	2%	20%
Langhorne Creek	10	$3,000	$3,500	$13,500	300	$405,000	27%	36%	9%	21%
Middleton	65	$19,500	$22,750	$87,750	1950	$2,632,500	12%	18%	6%	16%
Milang	75	$22,500	$26,250	$101,250	718	$969,578	20%	27%	7%	14%
Mount Compass	6	$1,800	$2,100	$8,100	180	$243,000	26%	27%	2%	24%
Port Elliot	60	$18,000	$21,000	$81,000	1800	$2,430,000	16%	20%	3%	15%
Strathalbyn	50	$15,000	$17,500	$67,500	1500	$2,025,000	27%	29%	2%	20%
Woodchester	5	$1,500	$1,750	$6,750	150	$202,500	11%	26%	15%	14%
TOTAL	**591**	**$177,300**	**$206,850**	**$797,850**	**16,198**	**$21,867,300**				

4.4.1. Scenario 2 – Council proposed planting program: 2055 total canopy cover @19.3%

This scenario models increased and more equitable 2055 canopy cover, compared to Scenario 1, using a proposed, front-end loaded approach for townships with low starting canopy cover. In this scenario, Year 1 planting numbers are generally doubled (from Scenario 1), then reduced over time. It predicts a 9.5% canopy cover on Council land and an overall increase (all land, all townships) of 1.7% - from 17.6% to 19.3% (Table 5).

Table 5: Scenario 2 Canopy hectare changes for Council land in townships and Total Canopy Cover change across all land.

Locality	Hectares						% Change (Council land)
	All Land	Total canopy cover with change on Council land only					
		2025	2030	2043	2055	2025-2055 Change	
Ashbourne	75.31	37.12	37.13	37.53	38.60	1.48	**4%**
Clayton Bay	235.90	33.67	33.93	37.96	46.03	12.36	**37%**
Goolwa	1160.77	166.02	166.53	174.53	190.40	24.38	**15%**
Hindmarsh Island	739.72	146.89	146.93	147.37	147.97	1.08	**1%**
Langhorne Creek	85.49	17.02	17.05	17.25	17.50	0.48	**3%**
Middleton	260.12	36.55	36.78	41.93	58.66	22.11	**60%**
Milang	313.20	36.71	36.91	40.38	48.78	12.07	**33%**
Mount Compass	594.41	139.15	139.18	139.77	141.52	2.38	**2%**
Port Elliot	967.49	134.54	134.72	138.71	150.83	16.30	**12%**
Strathalbyn	2003.48	388.29	388.48	392.46	403.71	15.42	**4%**
Woodchester	104.50	13.71	13.73	14.09	15.12	1.41	**10%**
TOTAL	6540.39	1149.66	1151.39	1181.99	1259.11	109.46	**9.5%**

Council Planted Canopy Cover change over All Land	Hectares	Increase %
	109.46	**1.7%**

In Scenario 2, Clayton Bay, Goolwa, Hindmarsh Island, and Milang experience a gradual reduction of 10% in planting numbers over time whilst starting from higher initial number. Langhorne Creek receives planting only in Year 1, with no further planting in subsequent years.

Table 6 (below) outlines the estimated costs for each township, with the percentage of canopy cover change on Council land detailed in Column I and the percentage of total canopy cover on all land in Column J. It shows planting and maintenance costs for Year 1 only (Columns B and C), with maintenance costs for trees planted in previous years (2023 and 2024) also considered (Column D) and cumulative results for 2025-2055 in Columns E and F.

This approach proposes a higher number of trees planted in a more targeted manner, aiming to achieve a more equitable distribution of council-managed canopy cover by 2055. Under this scenario, most townships are projected to achieve canopy cover greater than 20% (Column H), with the exception of Hindmarsh Island at 13%. Several townships are expected to achieve double-digit increases in canopy cover (Column I), reflecting an intentional effort to balance the disparity in current canopy cover percentages (Column G) between townships. This outcome broadly translates to prioritising planting in areas with lower existing canopy to support township equity.

Projected costs to Council

Financially, the program incurs:

- Over the life of the program, a total of 19,684 trees planted at a cumulative cost of $26,572,834 (excluding consumer price index (CPI) adjustments and future cost escalations). (Scenario 1 was 16,198 trees and $21,867,300 achieving a 0.6% lower total canopy cover).
- A Year 1 planting cost of $378,000 and a Year 1 maintenance cost of $441,000 (for 1,260 new trees) – total $819,000.
- Previous years' plantings still requiring watering need to be added to provide a Year 1 budget. This is estimated at $1,397,000.

Additional assumptions

- No tube stock or volunteer effort is included in this Scenario.
- Council supplied costs used were:
    - Stock and planting - $300/tree.
    - Watering - $350/year for 3 years.
- No CPI adjustments for future years.
- No change in 2022 benchmark data which is assumed as the 2025 benchmarks.
- Township boundaries of Hindmarsh Island are the western parts of the island only.

Table 6: Scenario 2 – Planting following Council proposed planting rate with expected canopy coverage outcomes and budget costs.

	A	B	C	D	E	F	G	H	I	J
Locality	**Year 1 Planting no.**	**Year 1 $ - Planting only**	**Year 1 $- Planted maintenance only**	**Year 1 $ – all planting & maintenance**	**2055 - Total Planting no.**	**2055 - Total Project Cost**	**2025 - Council Canopy**	**2055 - Council Canopy**	**Council Canopy % Change**	**2055 - Total Canopy %**
Ashbourne	10	$3,000	$3,500	$6,500	300	$405,000	70%	91%	21%	51%
Clayton Bay	200	$60,000	$70,000	$165,000	1915	$2,585,543	11%	32%	21%	20%
Goolwa	400	$120,000	$140,000	$400,000	3830	$5,171,087	16%	24%	8%	16%
Hindmarsh Island	50	$15,000	$17,500	$46,500	152	$204,544	12%	13%	1%	20%
Langhorne Creek	50	$15,000	$17,500	$39,500	50	$67,500	27%	30%	3%	20%
Middleton	155	$46,500	$54,250	$146,250	4650	$6,277,500	12%	34%	22%	23%
Milang	150	$45,000	$52,500	$150,000	1436	$1,939,157	20%	34%	13%	16%
Mount Compass	15	$4,500	$5,250	$13,950	450	$607,500	26%	30%	4%	24%
Port Elliot	120	$36,000	$42,000	$162,000	3600	$4,860,000	16%	20%	3%	15%
Strathalbyn	100	$30,000	$35,000	$100,000	3000	$4,050,000	27%	31%	4%	20%
Woodchester	10	$3,000	$3,500	$13,500	300	$405,000	11%	32%	21%	14%
TOTAL	**1260**	**$378,000**	**$441,000**	**$1,397,000**	**19,684**	**$26,572,834**				

4.4.2. Scenario 3 – Equitable tree distribution proposal: 2055 total canopy cover @19.6%

This scenario features an 2025-2055 cumulative budget forecast slightly lower than Scenario 1 whilst achieving a higher 2055 canopy cover result than Scenarios 1 and 2. To do this, it uses a heavily front-end loaded approach where Year 1 planting numbers are initially six times current and then reduced over time. It predicts a 11.5% canopy cover on Council land and an overall increase (all land, all townships) of 2.0% - from 17.6% to 19.6% (Table 7).

Table 7: Scenario 3 Canopy hectare changes for Council land in townships and Total Canopy Cover change across all land.

Locality	Hectares						% Change (Council land)
	All Land	Total canopy cover with change on Council land only					
		2025	2030	2043	2055	2025-2055 Change	
Ashbourne	75.31	37.12	37.23	38.65	40.79	3.67	**10%**
Clayton Bay	235.90	33.67	34.02	38.36	45.28	11.61	**34%**
Goolwa	1160.77	166.02	166.67	174.88	188.82	22.81	**14%**
Hindmarsh Island	739.72	146.89	147.37	153.54	164.42	17.53	**12%**
Langhorne Creek	85.49	17.02	17.08	17.83	19.07	2.05	**12%**
Middleton	260.12	36.55	37.12	44.58	58.08	21.53	**59%**
Milang	313.20	36.71	37.01	42.22	51.49	14.78	**40%**
Mount Compass	594.41	139.15	139.33	141.47	144.62	5.47	**4%**
Port Elliot	967.49	134.54	135.29	144.68	159.71	25.18	**19%**
Strathalbyn	2003.48	388.29	388.52	391.35	395.30	7.01	**2%**
Woodchester	104.50	13.71	13.75	14.18	14.86	1.14	**8%**
TOTAL	6540.39	1149.66	1153.38	1201.73	1282.44	132.78	**11.5%**

Council Planted Canopy Cover change over All Land	Hectares	Increase %
	132.78	**2.03%**

Scenario 3 has high initial plantings in Year 1 followed by a 20% annual reduction in planting numbers. Program plantings (other than replacements) are completed around 2050. The objective is to accelerate canopy growth early in the program, maximising amenity, shade and biodiversity benefits as trees mature over the next 30 years. The model adopts the same targeted planting approach as Scenario 2, focusing on available planting space and achieving equitable council-managed canopy cover by 2055.

Table 8 (below) outlines the estimated for each township, with the percentage of canopy cover change on Council land detailed in Column I and the percentage of total canopy cover on all land in Column J. It shows planting and maintenance costs for Year 1 only (Columns B and C), with maintenance costs for trees planted in previous years (2023 and 2024) also considered (Column D) and cumulative results for 2025-2055 in Columns E and F.

Under this scenario, all townships are projected to achieve approximately 25% or greater canopy cover (Column H) by 2055. Most townships are expected to meet a 30% increase on their existing canopy cover, consistent with the Draft GARP targets (for example, an existing canopy cover of 16% would increase to 20.8%). Mount Compass and Strathalbyn achieve slightly lower increases of 27% and 26% respectively, reflecting their higher benchmark canopy levels (Column G) and the model's focus on balancing distribution between townships.

While this model requires higher upfront planting and maintenance costs, it has the potential to deliver significant long-term savings by reducing the cumulative costs of establishment and maintenance. This is particularly relevant where future plantings may be consolidated into a single planting event, rather than staggered over multiple years. This approach offers further efficiencies through economies of scale in planting and maintenance contracts, particularly where spatial proximity allows for reduced servicing costs. Additionally, the front-loaded model provides greater financial certainty by mitigating risks associated with input cost increases and stock price escalations in later years.

Projected costs to Council

Financially, the program incurs:

- Over the life of the program, a total of 15,506 trees planted at a cumulative cost of $20,932,804 (excluding consumer price index (CPI) adjustments and future cost escalations). (Scenario 1 was 16,198 trees and $21,867,300 achieving a 0.9% lower total canopy cover).
- A Year 1 planting cost of $1,051,500 and a Year 1 maintenance cost of $1,226,750 (for 3,505 new trees) – total $2,272,250.

- Previous years' plantings still requiring watering need to be added to provide a Year 1 budget. This is estimated at $2,361,950.

While upfront costs are higher, this scenario facilitates the completion of the planting program between 2045 and 2050 (depending on the township) and is estimated to deliver total program savings of between $900,000 and $5.5 million when compared with Scenario 1 and Scenario 2 respectively.

Additional assumptions

- No tube stock or volunteer effort is included in this Scenario.
- Council supplied costs used were:
    - Stock and planting - $300/tree.
    - Watering - $350/year for 3 years.
- No CPI adjustments for future years.
- No change in 2022 benchmark data which is assumed as the 2025 benchmarks.
- Township boundaries of Hindmarsh Island are the western parts of the island only.

Table 8: Scenario 3 – Front end loaded program planting for completion by 2050 (20% annual planting reduction), revised planting numbers for township tree distribution and Equity.

	A	B	C	D	E	F	G	H	I	J
Locality	**Year 1 Planting no.**	**Year 1$ - Planting only**	**Year 1$- Planted maintenance only**	**Year 1$ – all planting & maintenance**	**2055 - Total Planting no.**	**2055 - Total Project Cost**	**2025 - Council Canopy**	**2055 - Council Canopy**	**Council Canopy % Change**	**2055 - Total Canopy %**
Ashbourne	75	$22,500	$26,250	$48,750	375	$505,623	70%	100%	51%	54%
Clayton Bay	300	$90,000	$105,000	$265,000	1498	$2,022,493	11%	30%	20%	19%
Goolwa	600	$180,000	$210,000	$460,000	2996	$4,044,986	16%	24%	8%	16%
Hindmarsh Island	450	$135,000	$157,500	$306,500	2247	$3,033,739	12%	27%	15%	22%
Langhorne Creek	50	$15,000	$17,500	$39,500	250	$337,082	27%	41%	15%	22%
Middleton	465	$139,500	$162,750	$347,750	2322	$3,134,864	12%	33%	22%	22%
Milang	280	$84,000	$98,000	$234,500	1398	$1,887,660	20%	37%	16%	16%
Mount Compass	120	$36,000	$42,000	$82,200	599	$808,997	26%	35%	9%	24%
Port Elliot	590	$177,000	$206,500	$425,500	2946	$3,977,569	16%	26%	10%	17%
Strathalbyn	550	$165,000	$192,500	$132,500	749	$1,011,246	27%	29%	2%	20%
Woodchester	25	$7,500	$8,750	$19,750	125	$168,541	11%	28%	17%	14%
TOTAL	**3,505**	**$1,051,500**	**$1,226,750**	**$2,361,950**	**$15,506**	**$20,932,804**				

4.4.3. Scenario 4 – Equitable canopy cover proposal: 2055 total canopy cover @20.0%

This scenario features an accelerated, front-end loaded approach, delivering 20% total canopy cover in 2055, with incremental plantings complete by 2050 after reducing initially high planting rates over time. It predicts a 13.7% canopy cover on Council land and an overall increase (all land, all townships) of 2.4% - from 17.6% to 20.0% (Table 9).

Table 9: Scenario 4 Canopy hectare changes for Council land in townships and Total Canopy Cover change across all land.

Locality	Hectares						% Change (Council land)
	All Land	Total canopy cover with change on Council land only					
		2025	2030	2043	2055	2025-2055 Change	
Ashbourne	75.31	37.12	37.19	38.09	39.43	2.31	**6%**
Clayton Bay	235.90	33.67	34.00	38.20	45.07	11.40	**34%**
Goolwa	1160.77	166.02	167.10	181.34	207.69	41.67	**25%**
Hindmarsh Island	739.72	146.89	147.45	154.85	168.63	21.74	**15%**
Langhorne Creek	85.49	17.02	17.04	17.23	17.52	0.50	**3%**
Middleton	260.12	36.55	37.05	43.46	55.13	18.58	**51%**
Milang	313.20	36.71	36.94	39.98	45.62	8.91	**24%**
Mount Compass	594.41	139.15	139.23	140.21	141.85	2.70	**2%**
Port Elliot	967.49	134.54	135.54	148.39	170.54	36.00	**27%**
Strathalbyn	2003.48	388.29	388.68	393.42	400.48	12.19	**3%**
Woodchester	104.50	13.71	13.75	14.24	15.00	1.29	**9%**
TOTAL	6540.39	1149.66	1153.97	1209.43	1306.95	157.29	**13.7%**

Council Planted Canopy Cover change over All Land	Hectares	Increase %
	157.29	**2.4%**

In Scenario 4, all township plantings are scheduled to be completed by approximately 2050. The objective is to rapidly accelerate canopy growth, maximising the environmental, amenity, shade and biodiversity benefits as trees mature over the next 30 years. This scenario is the more ambitious than the previous ones, proposing an equitable canopy distribution where all townships achieve 30% canopy cover on Council-managed land by 2055 with the exception of Ashbourne which remains an outlier at ~100% canopy cover due to existing private tree contributions.

Achieving this target requires a significant initial planting effort, with 3,610 trees planted in Year 1, progressively reducing each year. The planting effort is distributed based on canopy deficits and township size. For example, Goolwa requires highest planting numbers with 975 trees in Year 1 (4,869 total), and Langhorne Creek is the lowest with 12 trees in Year 1 (60 total). Other notable townships include Port Elliot with 800 trees in Year 1 (3,995 total), Hindmarsh Island with 520 trees in Year 1 (2,597 total), and Middleton with 405 in Year 1 (2,022 total). This targeted distribution reflects the greater need for canopy expansion in larger or lower-covered townships.

As with Scenario 3, while this model involves higher upfront costs, it generates long-term savings by reducing the number of trees planted and cumulative maintenance burden associated with an extended planting timeline. Specifically, it provides an estimated $ $2,404,040 in life-cycle savings compared to Scenario 2. There is also flexibility to consolidate future plantings; for instance, 765 outstanding plantings identified in 2040 could be delivered in a single event followed by three years of maintenance, enhancing efficiency.

This front-loaded approach offers further advantages, including economies of scale for both planting and maintenance contracts, improved cost certainty by mitigating exposure to CPI increases and stock price fluctuations, and greater agility to identify and address program gaps through periodic spatial canopy assessments. This adaptive capacity allows for responsive program adjustments over time.

Projected costs to Council

Table 10 (below) outlines the estimated costs associated with Scenario 4 for each township, with the percentage of canopy cover change on Council land detailed in Column I and the percentage of total canopy cover on all land in Column J. It shows planting and maintenance costs for Year 1 only (Columns B and C), with maintenance costs for trees planted in previous years (2023 and 2024) also considered (Column D) and cumulative results for 2025-2055 in Columns E and F.

Financially, the program incurs:

- Over the life of the program, a total of 17,903 trees planted at a cumulative cost of $24,323,851 (excluding consumer price index (CPI) adjustments and future cost escalations).
- A Year 1 planting cost of $1,083,000 and a Year 1 maintenance cost of $1,263,500 (for 3,610 new trees) – total $2,346,500.
- Previous years' plantings still requiring watering need to be added to provide a Year 1 budget. This is estimated at $2,728,550.

While this scenario carries higher total costs than Scenarios 1 and 3, it achieves the most ambitious canopy outcome and still delivers significant life-cycle savings when compared with Scenario 2.

Additional assumptions

- No tube stock or volunteer effort is included in this Scenario.
- Council supplied costs used were:
    - Stock and planting - $300/tree.
    - Watering - $350/year for 3 years.
- No CPI adjustments for future years.
- No change in 2022 benchmark data which is assumed as the 2025 benchmarks.
- Township boundaries of Hindmarsh Island are the western parts of the island only.

Table 10: Scenario 4 – Front end loaded program planting for completion by 2050 (20% annual planting reduction), with 30% change in Council canopy coverage outcomes and budget costs.

	A	B	C	D	E	F	G	H	I	J
Locality	**First Year Planting no.**	**Year 1 - Planting only costs**	**Year 1 - Planted maintenance only**	**Year 1 - all planting & maintenance**	**2055 - Total Planting Numbers**	**2055 - Total Project Cost**	**2025 - Council Canopy**	**2055 - Council Canopy**	**Council Canopy % Change**	**2055 - Total Canopy %**
Ashbourne	75	$22,500	$26,250	$32,500	250	$337,082	70%	100%	32%	52%
Clayton Bay	285	$85,500	$99,750	$220,250	1423	$1,921,368	11%	30%	19%	19%
Goolwa	975	$292,500	$341,250	$773,750	4869	$6,573,102	16%	30%	14%	18%
Hindmarsh Island	520	$156,000	$182,000	$352,000	2597	$3,505,654	12%	30%	19%	23%
Langhorne Creek	12	$3,600	$4,200	$14,800	60	$80,899	27%	30%	4%	20%
Middleton	405	$121,500	$141,750	$312,250	2022	$2,730,365	12%	30%	19%	21%
Milang	200	$60,000	$70,000	$182,500	999	$1,348,328	20%	30%	10%	15%
Mount Compass	50	$15,000	$17,500	$36,700	250	$337,082	26%	30%	4%	24%
Port Elliot	800	$240,000	$280,000	$562,000	3995	$5,393,315	16%	30%	14%	18%
Strathalbyn	260	$78,000	$91,000	$204,000	1298	$1,752,827	27%	30%	3%	20%
Woodchester	28	$8,400	$9,800	$37,800	140	$188,766	11%	30%	19%	14%
TOTAL	**3,610**	**$1,083,000**	**$1,263,500**	**$2,728,550**	**17,903**	**$24,168,793**				

4.4.4. Scenario 5 – Equitable canopy cover proposal: 2055 total canopy cover @20.1%

This scenario is the most heavily front-loaded tree planting program modelled, followed by a 33% annual reduction in planting numbers after Year 1. It predicts a 14.0% canopy cover on Council land and an overall increase (all land, all townships) of 2.5% - from 17.6% to 20.1% (Table 11). The 2025-2055 cumulative spend is similar to Scenario 1 but resource availability would be challenging.

Table 11: Scenario 4 Canopy hectare changes for Council land in townships and Total Canopy Cover change across all land.

Locality	Hectares						% Change (Council land)
	All Land	Total canopy cover with change on Council land only					
		2025	2030	2043	2055	2025-2055 Change	
Ashbourne	75.31	37.12	37.18	37.82	38.63	1.52	**4%**
Clayton Bay	235.90	33.67	34.12	38.66	44.99	11.32	**34%**
Goolwa	1160.77	166.02	167.43	182.68	208.32	42.30	**25%**
Hindmarsh Island	739.72	146.89	147.60	155.27	168.36	21.47	**15%**
Langhorne Creek	85.49	17.02	17.57	19.56	22.25	5.23	**31%**
Middleton	260.12	36.55	37.19	43.98	54.94	18.39	**50%**
Milang	313.20	36.71	37.01	40.23	45.72	9.00	**25%**
Mount Compass	594.41	139.15	139.26	140.39	141.90	2.76	**2%**
Port Elliot	967.49	134.54	135.92	149.99	170.33	35.79	**27%**
Strathalbyn	2003.48	388.29	388.82	394.00	400.46	12.17	**3%**
Woodchester	104.50	13.71	13.77	14.30	14.99	1.28	**9%**
TOTAL	6540.39	1149.66	1155.87	1216.88	1310.89	161.23	**14.0%**

Council Planted Canopy Cover change over All Land	Hectares	Increase %
	161.23	**2.5%**

Table 12 outlines the likely costs associated with Scenario 5 for each township, with the percentage of canopy cover change on Council land detailed in Column I and the percentage of total canopy cover on all land in Column J.

It shares the same target as Scenario 4, aiming to achieve 30% canopy cover on Council-managed land by 2055, with Ashbourne again an outlier at 91% canopy cover, primarily due to the influence of significant private tree cover within the township. This approach delivers the highest upfront planting volume and costs but achieves the fastest realisation of canopy coverage, alongside the associated benefits of shade, amenity and biodiversity gains.

To achieve this target, 5,502 trees are planted in Year 1, with planting numbers decreasing significantly in subsequent years. While this represents a logistical and budgetary challenge, particularly in the early years of the program, it offers the highest level of cost certainty and the earliest delivery of environmental outcomes among all scenarios. Additionally, it may be more competitive for external funding opportunities, including grants aligned with State government urban greening and climate resilience targets, as discussed in Section 8.2.20 Grant funding.

This scenario can also factor variations in land use across different zones such as residential, commercial, town centres, and parklands and delivers the lowest total number of plantings (16,487) of all five scenarios. This may become a significant consideration should future constraints limit the availability of Council-managed land for planting.

The planting effort is distributed based on canopy deficits and township size. For example, Goolwa requires highest planting numbers with 1,450 trees in Year 1 (4394 total) with Langhorne Creek the lowest with 19 trees in Year 1 (58 total). Other notable townships include Port Elliot with 1,320 trees in Year 1 (4000 total), Hindmarsh Island with 720 trees in Year 1 (2182 total) and Middleton with 620 in Year 1 (1879 total). This targeted distribution reflects the greater need for canopy expansion in larger or lower-covered townships.

Consistent with Scenarios 3 and 4, while this model carries higher upfront costs, it yields significant long-term savings by reducing the cumulative costs associated with ongoing establishment and maintenance. This includes an estimated $2,069,957 in savings compared to Scenario 4 and $4,473,877 compared to Scenario 2. It also offers the potential to finalise planting even earlier, with 473 outstanding plantings identified as early as 2035, which could be delivered in a single event followed by three years of maintenance.

All additional benefits associated with front-loaded programs apply, including economies of scale in planting and maintenance, improved contract efficiencies for spatially proximate plantings, and greater cost certainty by mitigating exposure to CPI increases and future stock price volatility.

Furthermore, this approach allows for early identification of program gaps or delivery constraints through periodic spatial canopy analysis, enabling adaptive management throughout the program lifespan.

Projected costs to Council

Financially, the program incurs:

- Over the life of the program, a total of 16,370 trees planted at a cumulative cost of $22,098,957 (excluding consumer price index (CPI) adjustments and future cost escalations)
- A Year 1 planting cost of $1,650,900 and a Year 1 maintenance cost of $1,925,700 (for 5,502 new trees) – total $3,576,600.
- Previous years' plantings still requiring watering need to be added to provide a Year 1 budget. This is estimated at $3,916,000.

Additional assumptions

- No tube stock or volunteer effort is included in this Scenario.
- Council supplied costs used were:
    - Stock and planting - $300/tree.
    - Watering - $350/year for 3 years.
- No CPI adjustments for future years.
- No change in 2022 benchmark data which is assumed as the 2025 benchmarks.
- Township boundaries of Hindmarsh Island are the western parts of the island only.

Table 12: Scenario 5 – Front end loaded program planting for completion by 2050 (33% annual planting reduction), with expected canopy coverage outcomes and budget costs.

	A	B	C	D	E	F	G	H	I	J
Locality	**First Year Planting no.**	**Year 1 - Planting only costs**	**Year 1 - Planted maintenance only**	**Year 1 - all planting & maintenance**	**2055 - Total Planting Numbers**	**2055 - Total Project Cost**	**2025 - Council Canopy**	**2055 - Council Canopy**	**Council Canopy % Change**	**2055 - Total Canopy %**
Ashbourne	150	$45,000	$52,500	$32,500	152	$204,544	70%	91%	21%	51%
Clayton Bay	430	$129,000	$150,500	$314,500	1303	$1,759,080	11%	30%	19%	19%
Goolwa	1,450	$435,000	$507,500	$1,082,500	4394	$5,931,782	16%	30%	14%	18%
Hindmarsh Island	720	$216,000	$252,000	$482,000	2182	$2,945,436	12%	30%	18%	23%
Langhorne Creek	19	$5,700	$6,650	$19,350	58	$77,726.80	27%	30%	4%	21%
Middleton	620	$186,000	$217,000	$448,500	1879	$2,536,348	12%	30%	19%	21%
Milang	290	$87,000	$101,500	$241,000	879	$1,186,356	20%	30%	10%	15%
Mount Compass	80	$24,000	$28,000	$56,200	242	$327,270	26%	30%	4%	24%
Port Elliot	1,320	$396,000	$462,000	$900,000	4000	$5,399,967	16%	30%	14%	18%
Strathalbyn	380	$114,000	$133,000	$282,000	1152	$1,554,536	27%	30%	3%	20%
Woodchester	43	$12,900	$15,050	$58,050	130	$175,908	11%	30%	19%	14%
TOTAL	**5,502**	**$1,650,600**	**$1,925,700**	**$3,916,600**	**16,370**	**$22,098,957**				

4.4.5. Summary – Scenarios 1-5

Comparative analysis of the first five planting scenarios highlighting varying approaches in balancing canopy cover targets, upfront costs, and long-term financial efficiency. Key findings are summarised in Table 13. The full comparative analysis and summary of tree planting Scenarios 1-5 are shown in Table 2 in the Executive Summary.

Table 13: Total canopy growth by 2055 (All townships combined) – Scenarios 1 to 5. Comparing outcome of canopy cover increase by 2055 for five Scenarios modelled for total canopy cover across all land tenures and for Council land only. The canopy cover baseline showed that Alexandrina's total canopy cover averaged 17.6% across the 11 townships with an average of 19% on Council land. Most of the land in townships is privately owned.

Scenario	2055 Total Canopy Cover[1]	Total Canopy Change	2055 Council Canopy Cover[2]	Council Canopy Change	Key Features
Scenario 1	18.6%	+1.0%	24.9%	+ 5.9%	Low growth, limited interventions, minimal gains in small towns.
Scenario 2	19.3%	+1.7%	28.5%	+9.5%	Moderate growth, early signs of improved distribution.
Scenario 3	19.6%	+2.0%	30.5%	+11.5%	Strong gains, especially in underperforming areas like Hindmarsh Island.
Scenario 4	20.0%	+2.4%	32.7%	+13.7%	Accelerated growth with more balanced spatial outcomes.
Scenario 5	20.1%	+2.5%	33%	+14.0%	Most ambitious and equitable scenario; highest total increase.

[1] *Total Canopy Cover = Canopy cover percentage of townships by 2055 across all tenures (Council, Crown, and private)*

[2] *Council Canopy Cover = Canopy cover percentage of townships by 2055 on Council land*

4.4.6. Discussion – Comparing Scenarios 1-5

The first five Scenarios present different pathways for canopy cover change over the 30-year period from 2025 to 2055. Each reflects varying degrees of planting ambition, management intensity, and spatial distribution.

Scenario 1 represents an approach with small canopy gains and unoptimised distribution. Scenarios 2 and 3 reflect stepped increases in ambition and benefit distribution, with Scenario 3 showing a key shift in previously low canopy cover townships.

Scenarios 4 and 5 deliver the most substantial outcomes in terms of canopy cover increases. While both achieve strong results, Scenario 5 is the most comprehensive, combining:

- The highest total canopy gain (161.23 ha or an extra 2.5% overall).

- The lowest total number of trees planted (16,487) due to the efficacy of early establishment and its focus on long-term maintenance reduction.
- Broad geographic benefit across all townships, especially low canopy cover townships.
- Meaningful improvements in disadvantaged or heat-exposed localities like Langhorne Creek, Milang and Hindmarsh Island.
- Demonstrate greater financial efficiency over time, stronger resilience to inflation, and earlier realisation of biodiversity, shade, and urban cooling benefits, albeit with higher early-year investments and logistical requirements. These scenarios may better suit capital budget rather than operational budget expenditure.

Recommendation to Council

Where budget allows, front-end loaded scenarios such as Scenarios 2, 3, 4 or 5 should be prioritised if the Council seeks to deliver maximum environmental, health, and climate adaptation benefits through a regionally coordinated and equitable greening strategy.

Every front-loaded scenario demonstrates greater cost efficiency compared to Scenario 1 - constant planting rates - in achieving 2055 canopy cover targets as less trees are ultimately required. Further savings through smaller township final years' plantings consolidations are possible as these scenarios have reduced planting rates towards the end of the strategic time horizon (Table 14, below).

Table 14: Outstanding tree numbers for Scenario 4 and Scenario 5 to facilitate early planting completion.

Location	Scenario 4 Outstanding Plantings		Scenario 5 Outstanding Plantings	
	Year		Year	
	2040	2045	2035	2040
Ashbourne	11	3	5	1
Clayton Bay	61	19	36	5
Goolwa	208	65	120	17
Hindmarsh Island	112	35	60	9
Langhorne Creek	8	3	24	5
Middleton	87	27	52	7
Milang	34	14	24	3
Mount Compass	11	4	7	1
Port Elliot	171	53	109	15
Strathalbyn	56	21	32	5
TOTAL	765	246	473	69

4.4.7. Scenario 6 – Modelling 2% total canopy cover increase by 2030

Scenario 6 was developed in response to earlier specifications contained within the Draft Greater Adelaide Regional Plan (GARP). This initially proposed a 2% increase in total canopy cover (across all land types) by the year 2030 for rural councils. It is important to note that this specification has since been removed.

This scenario models the implementation of planting exclusively on Council-managed land as this Study does not currently extend to formalised private land contributions. As such, the burden of delivering a region-wide canopy increase falls solely on Council assets, despite the fact that Council-managed land represents a relatively small proportion of the overall land area across the Alexandrina district.

Preliminary analysis indicates that to achieve a 2% increase in total canopy cover across the entire region (inclusive of both public and private land), Council would be required to plant an unrealistically high volume of trees, concentrated almost entirely on its limited landholdings. Based on canopy modelling inputs and projected canopy growth dynamics, this would require an initial planting volume in excess of 100,000 trees. Many of these would need to be advanced, large-growing species to realise any meaningful canopy expansion within the short timeframe to 2030.

Consequently, the Year 1 delivery cost alone is estimated at approximately $73 million, based on advanced tree stock pricing, site preparation, planting, watering, and establishment maintenance (Table 15). This estimate excludes CPI indexing, contractor availability constraints, land preparation limitations, and any expansion of operational capacity required to deliver such a program at scale. Even under ideal conditions, this rate of planting is neither logistically nor financially feasible within existing Council frameworks.

Furthermore, even if such a program were funded and initiated, it would carry substantial risks in relation to:

- Long-term tree survivability and establishment rates
- Maintenance resourcing and spatial constraints
- Uncertainty around urban development pressures and climate variability
- The inability to address the vast contribution of private land in total canopy dynamics

For these reasons, Scenario 6 is presented as a hypothetical reference case only. It demonstrates that a region-wide canopy target based solely on public land particularly over a short timeframe is not achievable without integrated policy, planning, and funding mechanisms that include private land contributions.

This reinforces the importance of cross-sectoral programs and incentives that engage private landholders, developers, and institutions in the delivery of long-term urban greening outcomes. It also underscores the need for pragmatic, scalable canopy cover targets that reflect both the available land base and the capacity for ongoing investment.

Table 15: Planting rate data for all townships for 2% total canopy cover Increase by 2030 (yearly planting rate reduction of 33%)

Locality	First year planting #.	First year cost	2055 Council Canopy %	2055 Total Canopy %
Ashbourne	1,100	$715,000	500.1%	90.2%
Clayton Bay	4,400	$2,860,000	218.2%	66.2%
Goolwa	20,200	$13,270,000	215.2%	64.7%
Hindmarsh Island	17,000	$11,064,000	324.4%	69.4%
Langhorne Creek	1,400	$917,000	434%	87%
Middleton	5,550	$3,653,000	140.2%	63.1%
Milang	5,900	$3,887,500	231.4%	72.7%
Mount Compass	8,550	$5,561,700	473.5%	69.6%
Port Elliot	15,700	$10,247,000	197.7%	63.4%
Strathalbyn	29,000	$18,885,000	271.2%	62.9%
Woodchester	1,600	$2,160,000	661.2%	55.5%
TOTAL	**108,800**	**$73,220,200**		

4.4.8. Scenario 7 – Modelling 30% total canopy cover increase by 2055

Scenario 7 was developed, similarly to Scenario 6, to ascertain if the 30% tree canopy cover by 2055, as required in the Greater Adelaide Regional Plan (GARP) for metropolitan Adelaide, would be feasible for Alexandrina Council.

While this Scenario is less cost-prohibitive than Scenario 6, it remains unachievable within the current strategic, operational, and financial scope of Council if approached through planting solely on Council-owned land. It is worth noting that a 30% target aligns with canopy cover targets commonly adopted by local governments elsewhere, accounting for varied contributions from different land use zones including residential, parklands, commercial and town centres (see Section 3.3 for examples from other LGAs). However, these targets are rarely, if ever, supported by planned planting programs.

To reach a 30% increase in canopy cover across the entire Alexandrina region, the modelling assumes a planting and growth trajectory that would require tens of thousands of large-canopy trees to be planted and successfully established across public land assets. This would need to occur at a sustained and intensive rate over a 30-year period. Even with a generous lead-in time and front-loaded planting schedule, this level of expansion would far exceed the practical land availability, planting capacity, and maintenance resources currently available to Council.

The first-year cost estimate for this scenario exceeds $20 million, inclusive of advanced tree stock procurement, planting, establishment watering, contractor management, and support infrastructure. Importantly, this figure does not include future CPI indexing, land acquisition or repurposing, or the administrative and staffing costs that would be required to deliver and manage a program at this scale (Table 2 and Table 16).

Moreover, the modelling assumes ideal survival rates and optimal conditions for growth, which do not adequately account for:

- Mortality due to heatwaves, drought, pests, or limited establishment care.
- Competing land uses and development activity on Council reserves.
- Social and political constraints related to amenity expectations, land access, and resourcing priorities.

Scenario 7 underscores a critical planning consideration: that broad regional canopy cover targets must be aligned with the actual distribution of land ownership and control. Given that the vast majority of land in Alexandrina's townships is privately owned, a total canopy cover increase of this magnitude can only be realistically achieved through multi-sectoral strategies that involve both

public and private stakeholders. This includes the adoption of policies and programs that encourage tree retention and planting on private land, incentives for developers, protection of existing vegetation, and community greening initiatives.

As with Scenario 6, Scenario 7 is provided for reference and comparative purposes only, to highlight the limitations of Council-only planting models when applied to whole-of-region canopy objectives. Its inclusion is intended to inform future discussions around the need for integrated greening frameworks that leverage all land tenures and contributors rather than placing unrealistic expectations solely on local government assets.

Table 16: Planting rate data for all townships for 30% total canopy cover increase by 2055 (yearly planting rate reduction of 33%)

Locality	First year planting #.	First year cost[1]	2055 Council Canopy %	2055 Total Canopy %
Ashbourne	10	$6,500	72%	49%
Clayton Bay	1,400	$945,000	74%	30%
Goolwa	8,100	$5,405,000	78%	30%
Hindmarsh Island	3,300	$2,159,000	76%	30%
Langhorne Creek	295	$198,750	88%	30%
Middleton	1,350	$923,000	53%	30%
Milang	1,660	$1,117,500	84%	30%
Mount Compass	1,220	$797,200	90%	30%
Port Elliot	5,200	$3,422,000	75%	30%
Strathalbyn	6,900	$4,520,000	86%	30%
Woodchester	560	$756,000	271%	30%
TOTAL	**29,995**	**$20,249,950**		

[1] *Costs do not include future CPI indexing, land acquisition or repurposing, or the administrative and staffing costs that would be required to deliver and manage a program at this scale*

4.4.9. Scenario 8 – Milang tube-stock

This scenario explores an alternative planting model for Milang where tube stock is used instead of advanced tree stock, diverging from Alexandrina Council's standard planting program. The scenario mirrors the structure of Scenario 4, with a 20% annual planting reduction from an initially high planting number and a target of 30% canopy cover over Council-managed land by 2055.

To achieve this, the program requires 500 tube stock plantings in Year 1, with a total of 2,497 tube stock planted over the program's lifespan. The scenario incorporates an assumed 40% mortality rate over the establishment period, consistent with published literature (see Section 8.1.2).

Two delivery methods are assessed:

- Method A – Community Volunteer Delivery, where costs include $3 per tube stock, $2.50 per tree guard, and $350 for contractor watering in Year 1 only.
- Method B – Full Contractor Delivery, where costs include $6 per tube stock (purchase and planting), $2.90 per tree guard (purchase and install), and the same $350 for Year 1 watering.

Under Method A, the first-year budget is $230,250, which is higher than Scenario 4 for Milang ($182,500) despite the lower per-unit stock costs. This is attributed to the larger planting volume needed to compensate for higher expected mortality and the requirement for establishment watering in the first year.

Over the life of the program, Method A results in a total program cost of $992,650, compared to $1,339,227 for Milang under Scenario 4, indicating potential for substantial cost savings when scaled across a broader planting program. Method A outcomes are provided in Table 17.

For Method B, the first-year budget is slightly higher at $231,950, with a total program cost of $1,001,139, reflecting increased costs associated with contractor-led planting and tree guard installation.

It is important to note that Scenario 8 does not account for formative pruning, which is typically undertaken during the nursery growth phase of advanced stock in 30L pots. Additionally, it does not fully capture the increased mortality risks associated with tube stock in urban streetscape settings, which are discussed in Section 8.1.3.

This scenario indicates that there is likely to be a cost-effective role for community-led tube stock planting (Method A) within parks, reserves and open space where conditions are more favourable for establishment. However, for urban streetscapes, high-traffic areas, and constrained

environments, advanced tree stock should remain the preferred method due to its higher survival rates, lower maintenance demands and ability to deliver faster canopy outcomes.

Table 17: Scenario 8 Method A - canopy cover rates, planting numbers and anticipated planting and watering costs

Canopy projection model: Scenario 8 – Milang Tube stock				
Year	2026	2030	2043	2055
Total Canopy % (All land)	11.7%	11.8%	12.8%	14.5%
Canopy Hectares	36.7	36.9	39.6	45.3
Canopy % (Council land)	20.2%	20.5%	23.5%	29.7%
Canopy Hectares	18.3	18.5	21.2	26.9
Trees planted in year	500	205	6	0
Cumulative plantings	-	1,681	1,375	1,398
Annual P&W cost	$230,250	$72,806	$2,383	$164

4.4.10. Underlying assumptions and considerations in calculating canopy cover

Under the scenario modelling it is assumed that base canopy cover percentages across Council landholding in the townships remains static, i.e. starting canopy cover is maintained at a constant level throughout the projection period. This requires that any canopy loss due to tree decline or removal is offset immediately through replacement planting or compensated for by canopy growth from existing trees to preserve baseline conditions at the local level. Considering this and where feasible, replacement planting should be undertaken in advance of tree removal to allow for early establishment and minimise the lag time in restoring canopy cover.

The model assumes no change in canopy cover across Crown land or privately owned land, which may be unrealistic. Historically, tree retention during development has been limited, primarily due to pressures to maximise land yield and reduce construction costs. Tree removals are often undertaken to facilitate easier site access and lower overall development expenses for clients.

With this in mind, while the modelling highlights that Council-led planting efforts provide a consistent uplift across all locations, private landholders play a decisive role in determining the total canopy outcome.

As an example, a modest 0.5% annual change in canopy cover on private land (either positive or negative) can significantly alter township canopy cover results by as much as 12%, indicating the importance of incentivising private landholders for retention and enhancement of tree canopy cover.

While all models see all townships canopy improvements overall, Council land contributes disproportionately to total canopy in some smaller townships, highlighting opportunities for impact through focused investment on public land.

Achieving targets in low-canopy cover towns such as Milang, Port Elliot and Clayton Bay may require additional focus through both public greening initiatives and engagement with residents to reach more equitable shade and microclimate outcomes.

High baseline figures for Ashbourne lead to a specific review of opportunities for canopy cover there which are outlined in the following section.

4.4.11. Ground-truthing planting opportunities - Ashbourne case study

A review of canopy distribution and potential planting opportunities was conducted across Alexandrina townships by a drive-through field inspection led by Ian Brett (Alexandrina Council) and Tim Fischer (AGS) on 25 April 2025.

In several locations, initial impressions from canopy mapping (Tree Canopy Report 2022) suggested limited planting opportunities on Council-managed land. However, the drive-through inspection showed that ground-truthing is important to confirm and interpret aerial mapping data, especially in high canopy cover areas.

To explore this issue in greater depth, Ashbourne was used as a case study due to its high total township canopy cover recorded at 49.3%, the highest among the 11 townships assessed. Ground-truthing was conducted along Bull Creek Road, a key thoroughfare through Ashbourne, including intersections such as Henry Martin Road and the vicinity of 1266 Bull Creek Road (Figure 10). Although existing canopy mapping indicates both sides of the road are well covered in these cases (Figure 11 & Figure 13), the field inspection and accompanying Google Street View analysis confirmed that opportunities for new Council plantings still exist within the road reserve (Figure 12 & Figure 14).

This highlights the importance of ground truthing to identify potential planting sites and review the quality and expected longevity of surrounding vegetation. For example, there may be extensive canopy cover, but this may be from trees that are in decline where there is opportunity for succession planting in nearby areas to account for loss of canopy cover when these trees senesce or are ultimately removed.

In this regard, a comprehensive tree inventory is essential for understanding the current condition, species composition and spatial distribution of individual trees within the landscape. It provides a foundational dataset that informs not only the present status of the urban and peri-urban forest but also supports evidence-based decision-making for the future. Furthermore, as part of a tree risk management strategy, is may be able to serve as a record for risk assessment and amelioration.

By capturing detailed information such as tree health, structure, age, size (e.g. DBH, height) and life expectancy, a tree inventory enables Councils and land managers to assess the long-term viability of existing canopy cover and identify areas at risk of decline. It also allows for the modelling of future scenarios, including canopy loss due to senescence, development pressure, or climate stress and guides strategic planning to ensure sustainable canopy outcomes. This is described further in section *8.2.16 Tree management system/Tree asset register*.

Importantly, the inventory supports prioritisation for tree maintenance, replacement and planting programs, ensuring that limited resources are allocated effectively to maximise environmental, social and economic returns. In the context of climate resilience, biodiversity conservation and urban heat mitigation, such an inventory is a critical tool for achieving long-term green infrastructure goals at both local and regional scales.



Figure 10: Trees viewed from aerial mapping along Bull Creek Road near Henry Martin Road intersection.



Figure 11: Extensive canopy cover mapping along Bull Creek Road near Henry Martin Road intersection.



Figure 12: Street view looking south on Bull Creek Road adjacent Henry Martin Road intersection demonstrating tree planting potential for Council road reserve.



Figure 13: Extensive canopy cover mapping near 1266 Bull Creek Road.



Figure 14: Street view of 1266 Bull Creek Road showing tree planting potential on Council road reserve.

5. Prioritised tree planting locations: Fair and equitable access to urban green spaces

5.1. Methodology – Prioritised tree planting

The Prioritised Planting approach used in this Study is a data-driven approach used to strategically guide urban tree planting to maximise environmental, social and economic benefits. This methodology integrates multiple spatial and demographic datasets to identify and prioritise areas where urban greening will have the greatest impact. The analysis for this project considered the following key layers:

1. High public use zones

Areas with high pedestrian activity such as town centres, transport hubs, schools, aged care facilities, sporting fields and main streets are targeted to provide shade, comfort and aesthetic improvements. Increasing canopy in these zones supports active transport, encourages outdoor activity, and improves urban liveability and safety.

2. Urban Heat Island (UHI) mapping

Heat mapping identifies neighbourhoods that experience elevated land surface temperatures due to a lack of vegetation and a high proportion of heat-absorbing materials (e.g. asphalt, concrete). These UHI zones are prioritised for tree planting as increasing canopy cover is one of the most effective interventions for cooling ambient temperatures, mitigating heat-related health risks, and enhancing thermal comfort.

3. Existing canopy cover mapping

Baseline tree canopy data is used to identify canopy deficits and opportunities for densification or gap-filling. Areas with <10% canopy cover are typically flagged for urgent greening, while medium-canopy areas may be targeted to help achieve municipal canopy goals (e.g. 20–30% cover by 2055).

4. Equity

Equity of canopy cover was assessed using the Index of Relative Socio-economic Disadvantage (IRSD) as a measure of socio-economic conditions. The IRSD provides a summary measure of the socio-economic status of different regions by combining various census data, including income, education, employment and occupation. The index helps identify areas that are relatively disadvantaged compared to others. The IRSD is part of the Socio-Economic Indexes for Areas (SEIFA), compiled by the Australian Bureau of Statistics (ABS).

There is evidence in Australia and overseas that neighbourhoods identified as socially disadvantaged are more vulnerable to climate impact and have historically lower tree canopy cover. This part of the analysis used the IRSD as a GIS layer to help assess whether areas were receiving equitable access to the health, environmental and economic benefits of urban canopy cover.

5. Available planting space/biodiversity outcomes

This category relates to the amount of available space for tree root and canopy growth and development. Narrow verges that contain hard infrastructure or those sites adjacent buildings generally attain a lower rating that those sites that allow for success as the tree matures and is able to meet full dimensions and expected longevity.

Additionally, large space is generally ascribed to wider open space such as reserves or parklands where Existing biodiversity programs may have occurred. Further tree planting integration with initiatives such as the Second Nature Revegetation / Restoration Action Plans for Milang Common is encouraged to enhance biodiversity outcomes.

Each of the criteria outlined above has been assigned a weighted score to form a composite prioritisation index (Table 18). This scoring framework enables each potential planting site to be ranked and then thematically mapped, visually distinguishing highest priority- locations from those of lower urgency. The resulting GIS overlay not only guides phasing of the planting program but also supports clear communication of priorities to stakeholders and the community.

Outcome and applications

In combining these factors, Prioritised Planting Maps have been developed that spatially identify target planting locations with the highest need and benefit. This approach supports:

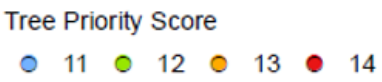
- Efficient allocation of greening budgets and resources.
- Achievement of urban canopy cover targets.
- Integration into climate adaptation, health, and equity strategies.
- Enhanced funding applications and investment planning.
- Transparent and evidence-based urban forestry decisions.

Table 18: Prioritised tree planting framework

Criteria	High Priority (3 pts)	Medium Priority (2 pts)	Low Priority (1 pt)
Public Use / Activity Zones	Schools, transport stops, town centres, main pedestrian corridors	Local parks, community facilities, residential verges	Low-use verges or infrastructure zones
Urban Heat Island (UHI)	High-intensity UHI hotspot	Moderate UHI exposure	Low or negligible UHI effect
Existing Canopy Coverage	<10% canopy cover	10–20% canopy cover	>20% canopy cover
Equity	IRSD score in lowest 20th percentile	IRSD score in middle 40–60th percentiles	IRSD score in upper 20th percentile
Available Planting Space	Large verge or open public land	Moderate verge width or partial suitability	Narrow verges or highly constrained space

Tree planting site prioritisation and application examples

The points from the table above can sum to a range of 5 to 15. In calibrating and colourising geospatial maps, this may be automated based on software but typically follows a “heat map” style. An example of these manifests as:



and can be seen in the legend of Figure 15 below.

5.2. Results: Milang – Recommended strategic planting locations

As the township with the lowest canopy cover recorded in 2022 (Tree Canopy Report), Milang has been used to undertake a full assessment of potential strategic planting locations available in both streetscape and park locations based on the principles and recommendation of this Study. The Milang tree planting analysis provides 575 prioritised planting sites consisting of 345 roadside locations with 230 of these within or adjacent to parks (Figure 15). These locations have been selected through a GIS-based mapping assessment that considers canopy gaps, urban heat island (UHI) intensity, location type and site constraints such as powerlines.

This total of 575 prioritised planting sites provides a suitable buffer to support a range of planting programs over multiple years while accounting for feasibility constraints (e.g. sites that may ultimately prove unsuitable for planting).

It is sufficient to deliver Scenario 2, which requires 516 trees over four years, support a three-year program under Scenario 4, which calls for 488 trees in total or, alternatively, support the first year and part of Year 2 of Scenario 8 (the Milang tube stock scenario) . The number of sites ensures operational flexibility and strategic coverage as part of a staged implementation plan.

Location and heat mapping insights

Of the 575 planting locations:

- 328 sites (57%) fall within high UHI zones, indicating a strong emphasis on mitigating localised heat impacts.
- 139 locations (24%) are within medium UHI areas, while only 108 (19%) are in low UHI zones.

This data reinforces that planting priorities have been guided by the goal of achieving measurable reductions in urban heat, particularly along exposed roads and open reserve networks.

Key streets and reserves

Priority roads such as Daranda Terrace and Woodrow Drive have been selected due to their high public use and exposure to sunlight, offering an opportunity to reduce surface temperatures and improve pedestrian amenity. Similarly, Macdonald Street, with north-east plantings for residential properties, has been highlighted for its exposure to heat and limited shade, with powerline-compatible species selected where infrastructure constraints are present.

Parks and Reserves have also been strategically selected as follows:

- Daranda Terrace Reserve and Swamp Reserve are both higher-order parks with path connections to the town centre, water frontage, and heritage areas. They currently lack sufficient canopy cover and have been prioritised accordingly.
- Jupiter Lyon Reserve while lower in the park hierarchy is located within a high heat exposure zone. Enhancing canopy cover here will not only support recreational use by providing shaded pathways but also contribute to biodiversity outcomes by extending existing habitat plantings.

Equity considerations and community engagement

Milang exhibits relatively consistent IRSD values across the township. While not a primary driver of site selection in this instance, equitable access to green infrastructure has been maintained by ensuring distribution of plantings across residential frontages and public reserves. Community planting opportunities have been identified particularly in parks and along walking routes where social engagement and stewardship can be fostered.

Strategic planting focus

The planting strategy places particular emphasis on:

- Northerly aspects and prominent public interfaces, where shading can deliver the greatest cooling and amenity benefits.
- High-use public zones, such as school precincts and central streets.
- Sites where planting complements existing pathways and community infrastructure, facilitating improved thermal comfort and walkability.

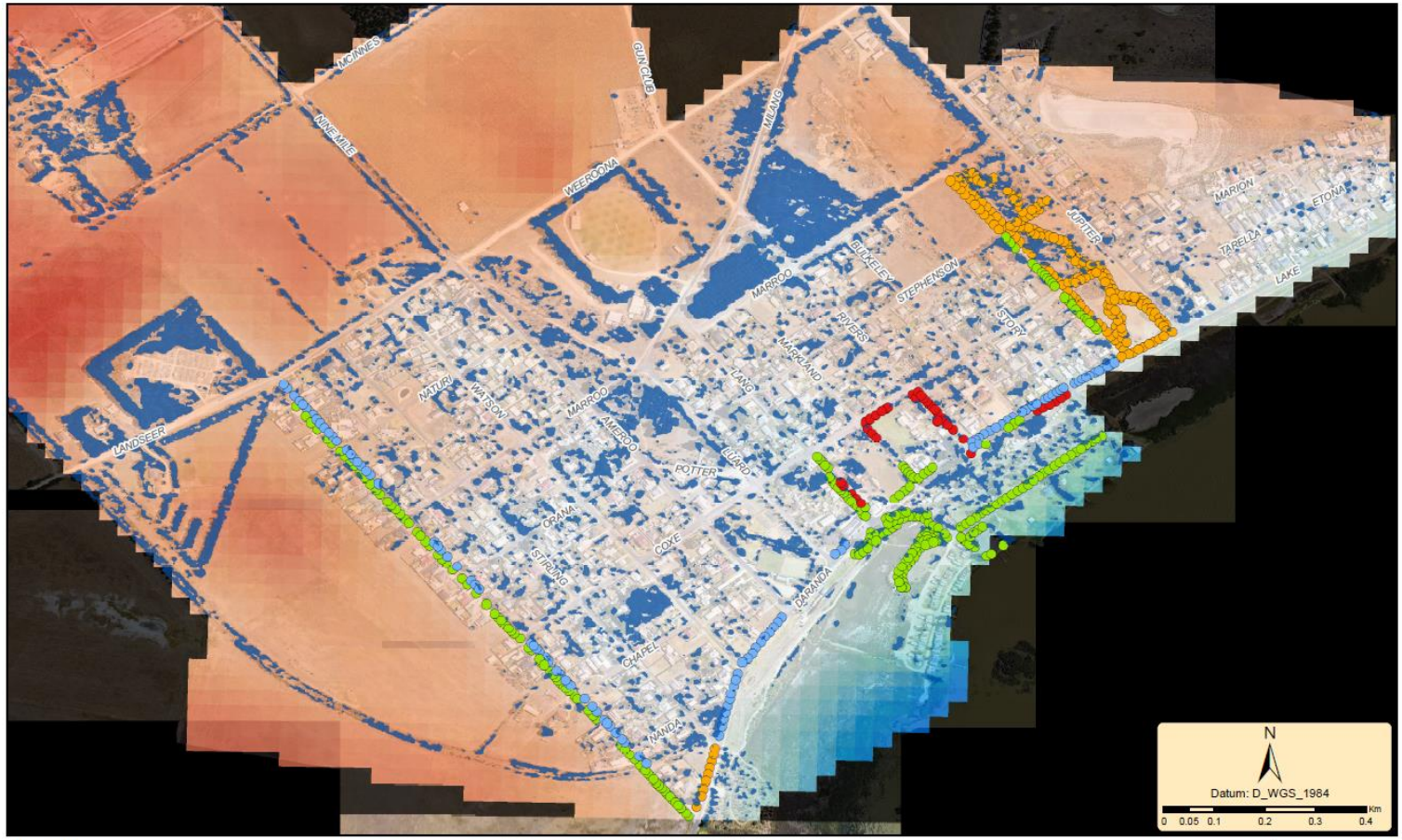
This integrated approach ensures the dual outcomes of urban cooling and biodiversity enhancement, while aligning with both Council's greening strategy and broader community values.

Tree category distribution (**Figure 16**)

The species selection includes a range of tree types tailored to site conditions and canopy objectives:

- 316 Large Canopy Trees (55%) have been prioritised to maximise long-term shade and cooling benefits.
- 163 Powerline-compatible or narrow canopy Trees (28%) have been designated for constrained sites, particularly along streets with overhead infrastructure.
- 96 Coastal Trees (17%) are included where local soil or exposure conditions require increased resilience, particularly in parks and reserves near the waterfront.

Figure 15: Milang Priority Tree Mapping - planting map.



Legend

Tree Priority Score

11 12 13 14

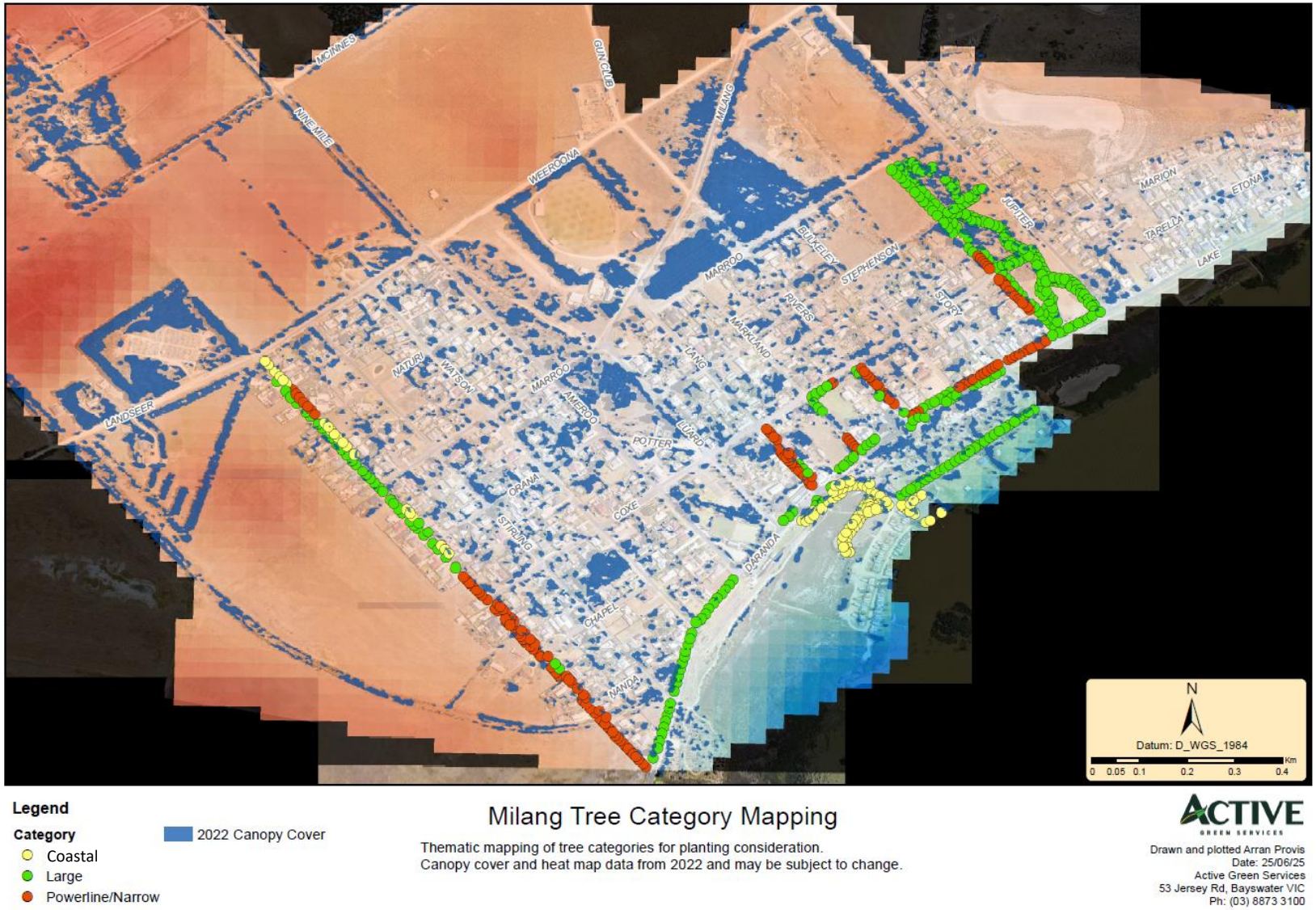
2022 Canopy Cover

Milang Priority Tree Mapping

Thematic mapping of tree priority for planting consideration,with highest scores considered more important.
Canopy cover and heat map data from 2022 and may be subject to change.

Drawn and plotted Arran Provis
Date: 25/06/25
Active Green Services
53 Jersey Rd, Bayswater VIC
Ph: (03) 8873 3100

Figure 16: Milang Tree Category Mapping - thematic map.



(For detail on the tree "Category" legend see section 6.4.2.1., above).

6. Park Priority Selection (for urban greening initiatives)

6.1. Methodology – Park priority selection

Tree planting within parks and reserves presents a valuable opportunity for community engagement through Council-led planting programs. These initiatives not only foster a sense of ownership, stewardship, and connection between the community and the local environment but also play a critical role in achieving broader biodiversity objectives. By prioritising biodiversity-focused plantings within these spaces, Council can deliver multiple benefits, including:

- Enhancement of local habitat for native flora and fauna.
- Strengthening of ecological corridors within urban and peri-urban landscapes.
- Contribution to climate resilience through increased canopy cover, shading, and cooling.
- Support for community education on the importance of biodiversity, urban ecology, and sustainable land management.

The methodology utilised the following five criteria to prioritise parks for strategic tree planting and canopy enhancement. Each category was assigned a weighted score to support the development of a clear hierarchy, enabling sites to be thematically mapped and ranked for action across short- and long-term programs. See Table 19, below, for hierarchy.

1. Location and functional use

Parks located in high-use zones, such as township centres, school precincts, or areas with high pedestrian activity, were given higher priority. Emphasis was placed on sites with existing recreational infrastructure such as playgrounds, seating areas, or exercise stations where improved shade and amenity will benefit a broad demographic, including children, families and older adults.

This typically aligned with the Alexandrina Council Park Hierarchy (A–D), with higher-tier parks (A and B) receiving greater priority in this category due to their role in serving larger or more diverse community functions.

2. Urban Heat Island (UHI) exposure

Urban heat mapping data was used to identify localised heat hotspots within and surrounding parks. Parks located in areas with high UHI intensity were prioritised to support cooling interventions through increased canopy cover. Strategic planting in these areas is expected to mitigate extreme temperatures, create more liveable public spaces, and improve thermal comfort for adjacent residential areas.

3. Existing canopy cover and planting potential

Baseline canopy cover data (sourced from the 2022 canopy layer) was analysed for each park and expressed as a percentage of the total park area. Parks with limited existing canopy were prioritised to enable significant shade gains and expand urban forest benefits.

A canopy scoring scale was applied:

- 0–20% cover = Score 4 (highest priority)
- 20–30% cover = Score 3
- 30–60% cover = Score 2
- 60–100% cover = Score 1 (lowest priority)

This approach differs slightly from the broader street tree planting framework by using park-specific area data (m^2) to determine proportional canopy cover. Additional consideration was given to planting feasibility like potential to establish shade over hard surfaces (e.g. paths, car parks) that exacerbate heat retention.

4. Equity

To ensure equitable outcomes, IRSD data (Australian Bureau of Statistics 2021) was used to identify communities with higher levels of social disadvantage. Parks located in or adjacent to these areas were given higher priority, recognising the role of green space in improving physical and mental health outcomes and reducing environmental inequality. While this criterion was weighted alongside others, it reinforced Council's commitment to fairness and inclusion in urban greening.

5. Accessibility – 300m threshold under the 3–30–300 rule

Consistent with the '3–30–300 rule' urban greening principle, the analysis included proximity mapping to identify households with limited access to public green space within 300 metres. A buffer analysis was conducted for all parks in the Council-supplied layer. Parks were then prioritised based on their spatial isolation, using the number of overlapping 300m park buffers as a proxy for proximity to alternative green space.

The scoring system was as follows:

- Buffer Score 3 (highest priority): The park had 9 or fewer other parks within the 600m buffer zone.
- Buffer Score 2: The park had 10–20 other parks within the 600m buffer zone.
- Buffer Score 1 (lowest priority): The park had more than 20 overlapping buffers, indicating greater access to alternative green spaces nearby.

While some smaller parks in this dataset (e.g. road verges or infrastructure-dominated parcels) were captured in the buffer analysis, each site was cross-checked against aerial imagery to confirm its suitability in supporting canopy objectives (e.g. biodiversity, amenity, recreation). This ensured that parks were not only selected for their proximity relevance but also their functional value.

It is important to note that while this accessibility metric focused on spatial equity, Category 1 (High Use Zones) captures actual user demand and visitation pressure, allowing the framework to balance both use-driven and access-driven priorities.

Based on the assessment criteria outlined the following selection of parks and reserves have been identified as priorities for tree planting across each of the 11 townships. For each site, a rationale is provided to explain its selection, including key considerations such as urban heat mitigation, biodiversity enhancement, and community benefit.

Potential challenges and constraints such as site conditions, community sensitivities, land use limitations, or maintenance requirements are noted to inform implementation strategies and guide future planning.

Assessment of hierarchy

In order to prioritise public parks based on the criteria outlined above, scoring was undertaken using a scoring range for each of the five criteria (Table 19). This resulted in colourising geospatial maps, that typically follows a “heat map” style, with higher numbers indicating higher priorities . An example of these manifests as:

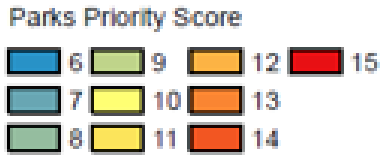


Table 19: Scoring hierarchy for planting priority identification.

Criterion	Scoring Range	Score Description
1. Location and Functional Use	High-use park (Hierarchy A/B)	3 – Park in township centre, near schools, or with high pedestrian activity and recreational infrastructure (e.g. playgrounds, exercise equipment).
	Moderate-use park (Hierarchy C)	2 – Park in local residential area with moderate community use or limited facilities.
	Low-use park (Hierarchy D)	1 – Isolated or passive open space with minimal infrastructure or usage.
2. Urban Heat Island (UHI)	High UHI zone	3 – Located within or adjacent to mapped high surface temperature area.
	Medium UHI zone	2 – Moderate heat exposure based on mapping.
	Low UHI zone	1 – Low surface temperature area.
3. Existing Canopy Cover	0–20% canopy cover	4 – Very limited shade, high potential for greening and environmental benefit.
	20–30% canopy cover	3 – Low existing shade, room for significant improvement.
	30–60% canopy cover	2 – Moderate shade, some opportunities for gap planting.
	60–100% canopy cover	1 – High shade coverage; low planting potential or priority.
4. Equity	High disadvantage (IRSD lowest quintile)	3 – Located in area with high relative disadvantage.
	Moderate disadvantage	2 – Some indicators of disadvantage.
	Low disadvantage	1 – Located in area with low relative disadvantage.
5. Accessibility (300m Proximity)	1–9 other parks within 600m buffer	3 – Isolated access, limited nearby alternatives, higher priority for equitable access.
	10–20 other parks within 600m buffer	2 – Moderate access, some nearby alternatives available.
	>20 other parks within 600m buffer	1 – High access, many overlapping buffers indicating good park proximity coverage.

6.2. Results – Park priority selection

6.2.1. Ashbourne – Park priority selection

Based on the spatial data layers and asset mapping provided, there are currently no Council-managed parks or reserves located within the township of Ashbourne. This presents a challenge in meeting the 300-metre proximity component of the '3-30-300 rule', which advocates for all residents to have access to a quality public green space within a 300-metre radius of their home.

While the total tree canopy cover in Ashbourne is comparatively high, reflecting the rural and vegetated character of the area, there remains a gap in formalised recreational open space. The absence of designated parks and reserves limits opportunities for structured recreation, passive use, and community gathering, particularly for vulnerable groups such as children and older adults who may have limited mobility.

Opportunities may exist to explore strategic acquisition or co-management of land for the purpose of establishing public green space in Ashbourne. Such sites could be targeted based on the following criteria:

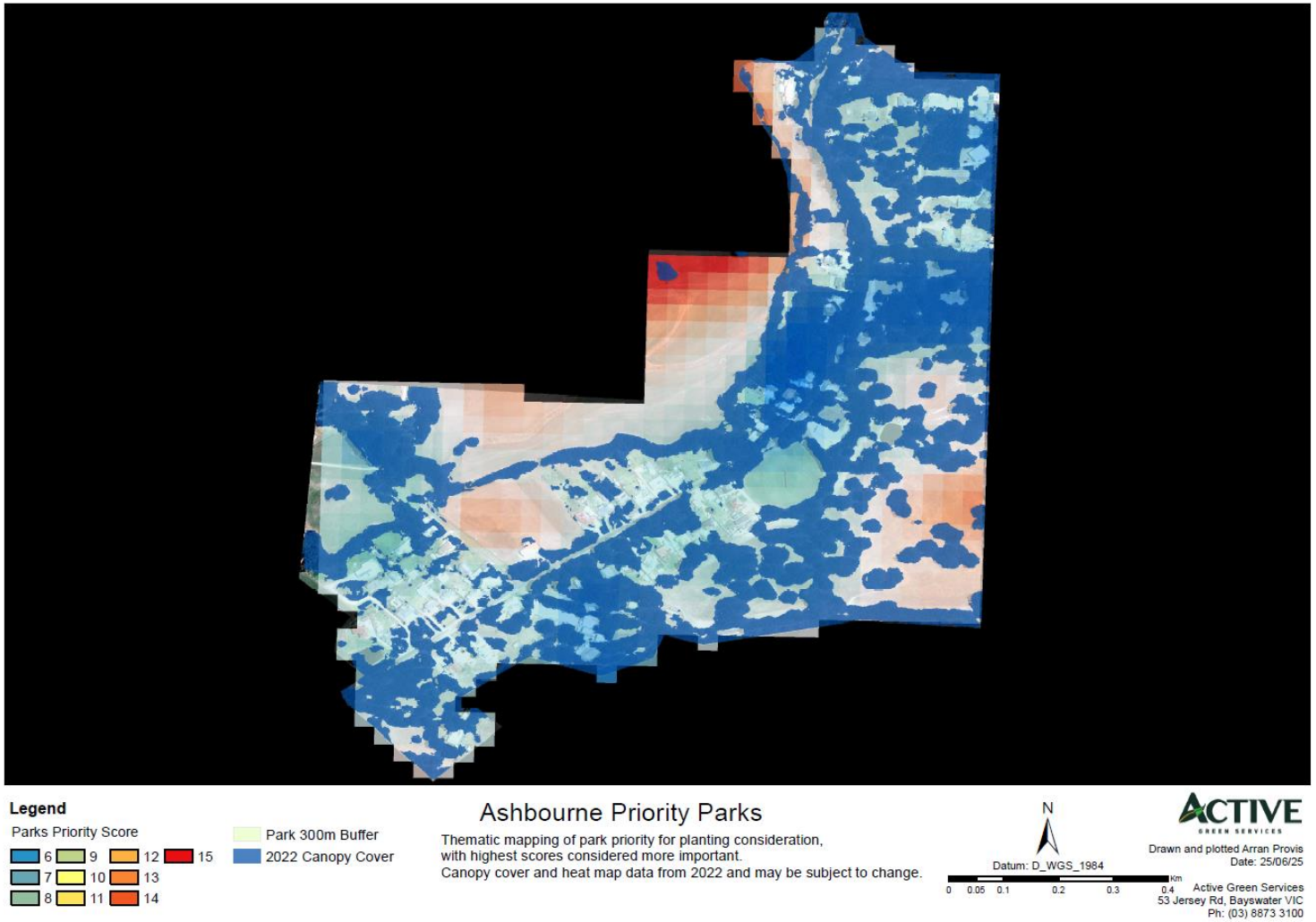
- Identified hotspots from thermal mapping, particularly where hard surfaces or built form contribute to elevated temperatures (Figure 17).
- Community need or expressed demand for recreational space or nature-based play.
- Land use compatibility and feasibility for park development or revegetation.

Exploring partnerships with private landholders, schools, or state agencies may also support the delivery of green infrastructure in the short to medium term. Establishing even small-scale reserves or green corridors could provide measurable benefits to community wellbeing, climate resilience and biodiversity.

It is also noted that Ashbourne has potential planting sites available on road verges as detailed in Section 4.4.11 - Ashbourne case study.

A tailored approach is, therefore, recommended for Ashbourne, recognising both its high canopy baseline and the current lack of accessible public open space.

Figure 17: Ashbourne Priority Parks [nil] - priority map featuring hot spots from thermal mapping.



6.2.2. Clayton Bay – Park priority selection

A number of key sites have been identified in Clayton Bay for targeted greening interventions based on a combination of urban heat mapping, existing canopy cover, anticipated public use, and landscape prominence. These sites represent important opportunities to enhance the township's resilience to heat, improve liveability and support biodiversity outcomes. See Figure 18.

Clayton Bay Entrance Reserve

Located at the primary entry point to the township, this reserve exhibits very high surface temperatures and has minimal existing canopy cover. Its prominent position offers a strategic opportunity for feature streetscape planting, improving both visual amenity and the thermal comfort of residents and visitors alike. Large-canopy street trees in this location would establish a clear sense of arrival to reflect the township's identity as a nature-based destination and support tourism and commerce.

Gilbert Street Reserve and Pearce Road Reserve

Both of these reserves are located within the residential heart of Clayton Bay and are characterised by very high urban heat levels and low canopy coverage. Their proximity to housing and high pedestrian activity makes them strong candidates for intensive shade planting and greening treatments. Enhancements to these parks would provide direct health and wellbeing benefits to local residents, while also supporting cooler, more comfortable neighbourhood environments.

Alexandrina Drive Reserve

Situated on the southern side of the township, this reserve includes a walking track that serves as a key link between the Clayton Bay Foreshore Reserve and the Caravan Park area. Although not identified as an extreme heat hotspot, the existing canopy cover along this corridor is limited. Given the pathway's high potential for community use and active transport, targeted shade tree planting would significantly enhance user comfort, promote walking and cycling, and support ecological connectivity. Opportunities for community-led biodiversity planting could also be explored to strengthen local stewardship and engagement.

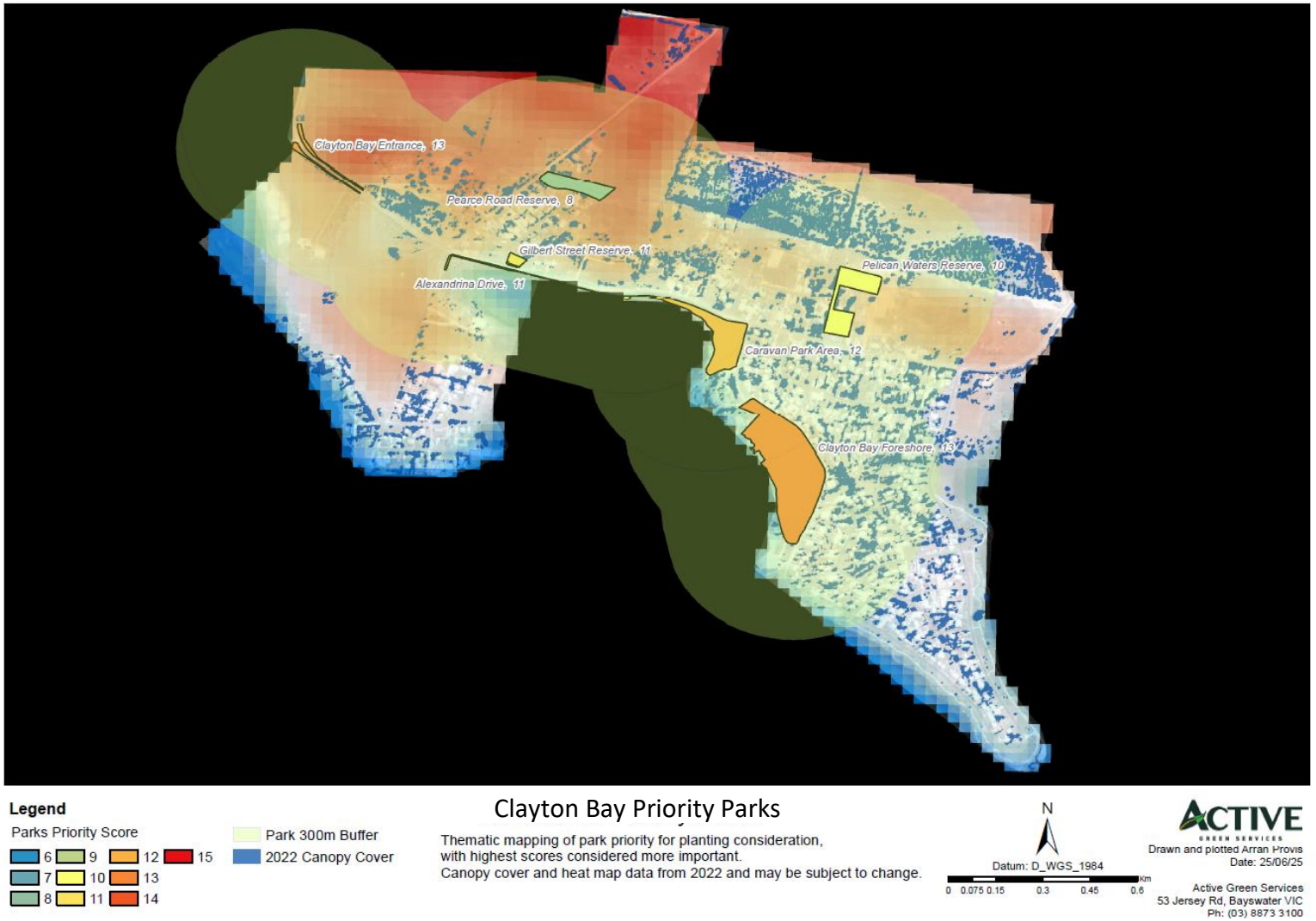
Island View Drive

Strategic verge planting along Island View Drive has been identified as a means to reduce heat absorption on road surfaces and mitigate localised heat island effects. However, the success of this intervention will depend on community consultation and support, particularly due to potential concerns over obstructing scenic views along the "Island View" corridor. A sensitive planting design that balances shade provision with view preservation is recommended.

Pelican Waters Reserve

This reserve is located within a high heat area where significant clearing has occurred in recent years to accommodate new development. As such, it presents a critical site for canopy restoration, biodiversity enhancement, and future open space provision. Establishing a well-shaded, multi-functional park in this area will not only help offset the impacts of recent vegetation loss but also provide long-term amenity for the growing residential population.

Figure 18: Clayton Bay Priority Parks - planting priority map.



6.2.3. Goolwa – Park priority selection

The township of Goolwa presents multiple opportunities for targeted canopy enhancement to improve community wellbeing, address urban heat hotspots and support biodiversity. Priority reserves have been identified based on a combination of factors including socio-economic need, current canopy gaps, heat mapping, recreational demand and alignment with the '3-30-300 rule' urban greening principle. See Figure 19, below.

Heinicke Avenue Reserve

Located within an IRSD Level 1 area, Heinicke Avenue Reserve serves a relatively disadvantaged community. Despite being classified as a low-hierarchy park via the Parks Priority Score, it is a large reserve with very limited canopy cover, particularly along its street frontages. This contributes to the formation of a significant heat hotspot in the area. Greening this reserve offers critical social equity benefits by improving liveability, reducing heat stress, and enhancing local amenity for vulnerable populations.

Bradford Road Reserve

Bradford Road Reserve is a sizeable park with existing recreational use and moderate canopy cover. There is considerable scope to further increase shade, particularly over play areas and high-use spaces. In addition, roadside plantings can help to mitigate adjacent road surface heat hotspots. The reserve's 300-metre catchment area complements that of Heinicke Avenue Reserve, providing strategic connectivity in green infrastructure across Goolwa's residential areas.

Kightley Reserve

Kightley Reserve is one of the last major reserves before the beachfront, currently featuring minimal vegetation cover. While the coastal location benefits from natural sea breezes that moderate temperatures, the reserve plays a vital role in delivering accessible public open space within the '3-30-300 rule' framework. Due to its size, Kightley Reserve offers an opportunity to contribute significantly to local canopy targets and provides a valuable site for community-driven biodiversity planting.

Murray Smith Reserve and Neighbour Reserve (Goolwa Oval Precinct)

Surrounding the Goolwa Oval sporting complex, these reserves are located within an important active transport corridor in the town centre. Current vegetation levels appear limited, offering substantial opportunity for increased canopy cover. Enhancing shade in this precinct will not only support sporting and recreation activities but also improve comfort and usability for pedestrians and cyclists moving through the area.

Goolwa Skate Park and Recreation Centre

Both facilities are situated within identified heat hotspots. The Goolwa Skate Park, in particular, would greatly benefit from the introduction of large-canopy trees to provide shade for users, who are often exposed to prolonged periods of sun on hard concrete surfaces. Tree planting here will directly support youth wellbeing and active recreation while contributing to broader urban cooling outcomes.

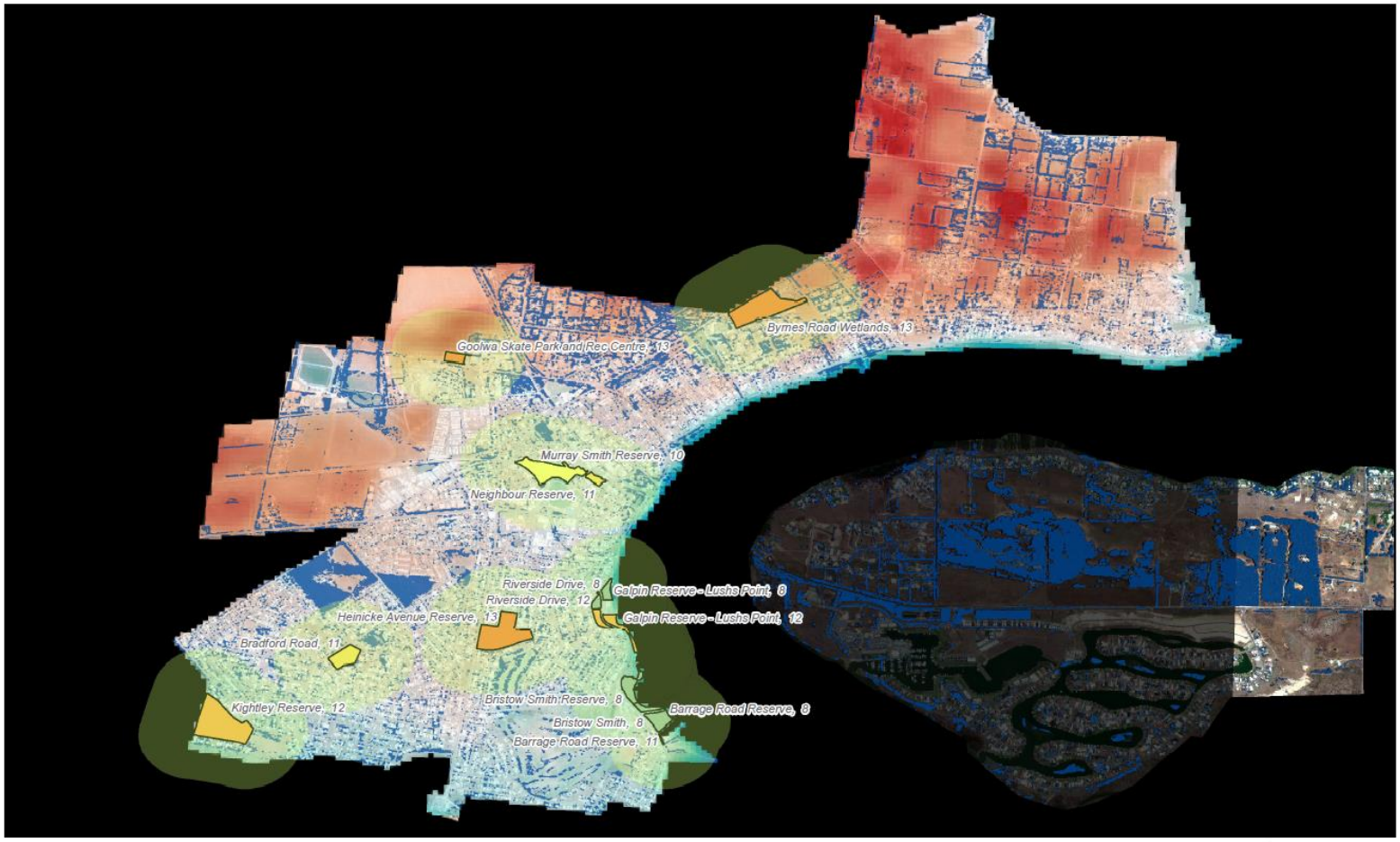
Byrnes Road Wetlands

Byrnes Road Wetlands represents one of the last remaining large reserves leading towards North Goolwa, an area characterised by significant heat hotspots and limited council-managed open space. The reserve offers excellent potential for canopy enhancement combined with biodiversity restoration, capitalising on its natural wetland features. Given the scarcity of formal parkland in North Goolwa, consideration should also be given to strategic land acquisition and intensive street tree planting to address the growing demand for green space.

Riverside Corridor – Key Future Focus Area

Through analysis the riverfront reserves from Riverside Drive Reserve to Barrage Road Reserve has been identified as high-priority zones for future greening. Despite their prominent location along the river, these reserves currently exhibit very low canopy cover. Given the increasing importance of this corridor as an active transport route for pedestrians and cyclists, enhancing shade provision is critical. Tree planting with large-canopy or coastal-appropriate species will help reduce heat exposure, improve user comfort, and contribute to the scenic and ecological value of the riverfront.

Figure 19: Goolwa Priority Parks - planting priority map.



6.2.4. Hindmarsh Island – Park priority selection

Hindmarsh Island exhibits a significant urban heat island (UHI) profile, as evidenced by heat mapping analysis. Residential development is predominantly clustered along the island's perimeter, particularly adjacent to riverfronts and within the Coorong Quays marina precinct. Notably, much of the island's residential area falls outside the 300-metre proximity requirement of the '3-30-300 rule', highlighting a clear gap in accessible public open space that should be addressed in future open space planning and policy. See Figure 20, below.

A targeted approach focused on infill planting within existing parks, succession planning for aging trees, and strategic open space acquisition in underserved areas will provide Hindmarsh Island with the greatest return on investment in terms of urban heat mitigation, amenity improvement, and biodiversity outcomes.

The following reserves have been identified as priority locations for tree planting, primarily aimed at enhancing public amenity, shade provision, and microclimate cooling. While the primary focus is on community use and comfort, biodiversity outcomes can also be achieved through appropriate species selection and planting design.

Valmai Terrace Reserve

A largely open and minimally vegetated space with high potential for canopy enhancement. Despite its proximity to the waterfront, this reserve functions as the primary open space for both the immediate residential catchment and surrounding neighbourhoods, some of which are located up to 700 metres away. Increasing canopy cover here will provide essential shade, improve thermal comfort, and enhance recreational amenity.

Barker Road Reserve

This reserve shares similar characteristics with Valmai Terrace, with slightly higher existing vegetation cover. However, much of the tree stock appears to be mature and aging. A program of succession planting will support the long-term sustainability of this space, improve shade coverage and preserve its ecological and recreational functions.

Coorong Quays Reserves – Queen Court, Shannon Place, and Excelsior Parade (Riverfront)

Located within the Coorong Quays residential marina, these reserves are currently characterised by limited shade and minimal canopy cover. Targeted planting within these spaces will improve thermal comfort for users, enhance local amenity, and contribute to the island's broader canopy targets. However, given the riverfront orientation and premium on open water views, it will be essential to engage with the local community to address potential concerns regarding views preservation.

Thoughtful species selection and strategic planting design can balance the need for shade with maintaining desirable sightlines.

Captain Sturt Parade Reserve

A linear reserve complex that separates residential properties from the river frontage, this contains vegetation where infill is appropriate to enhance canopy cover. The site appears to have frequent use for car parking and river access, with tree plantings on the southern side facilitating shade of the roadside and local hot spots. There are limited other reserves within the residential area, indicating that this may be opportunity for enhancement for use.

Ferryman's Reserve

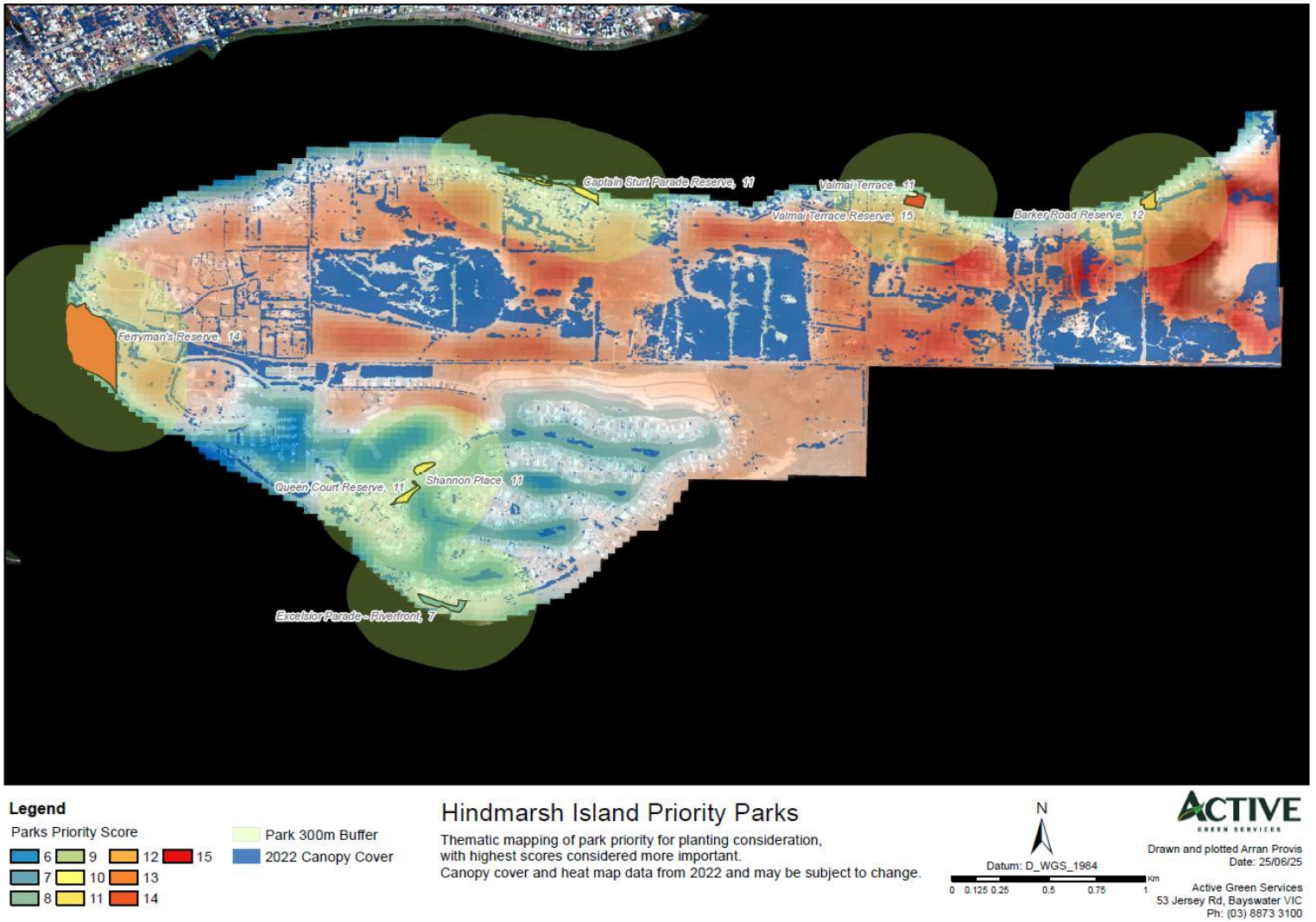
Ferryman's reserve is adjacent to Kumerangk Hindmarsh Island Landcare Group Nursery and a site that has been restored by the group following its historic use as a stock hold waiting for the ferry. The reserve is now a large public space that doubles as a seed orchard for Hindmarsh Island species and also rare species from the Fleurieu Peninsula. The site features walking tracks through the natural area that appear largely uncovered as the site contains minimal canopy cover.

It provides a great opportunity for planting with coastal species to increase the total canopy cover for Council managed land on Hindmarsh Island, which is significantly lower than canopy cover from private land.

Constraints and Considerations:

- A significant proportion of Hindmarsh Island's open space consists of riparian zones, floodplains, or wetland ecosystems, which are either already vegetated or require species with tolerance to such coastal environments where broad-scale canopy planting is considered.
- Community expectations, particularly regarding unobstructed waterfront views, may influence planting design in certain locations.
- Future urban development on the island presents an opportunity to integrate new open space provisions that align with the 300-metre proximity principle and support canopy expansion.

Figure 20: Hindmarsh Island Priority Parks - planting priority map.



6.2.5. Langhorne Creek – Park priority selection

Langhorne Creek is a small township with comparatively high existing canopy cover relative to other settlements in the region. As such, the greening focus for Langhorne Creek is directed toward infill planting, aimed at enhancing shade over community facilities, pathways and adjacent roadsides, rather than large-scale new canopy establishment. See Figure 21, below.

Langhorne Creek Primary School Reserve

This smaller reserve, which includes play equipment and high-use recreation areas, presents an opportunity for targeted planting to improve shade and comfort, particularly during the hotter months. Currently, the reserve contains several large ornamental trees concentrated along the southern boundary, which do not provide effective shade for the playground and key use areas.

- Planting along the northern boundary with larger, broad-canopy trees would significantly improve sun protection for the play area.
- Selection of deciduous ornamental species would align with the existing landscape character, offering summer shade while allowing for winter sun, enhancing year-round usability and comfort.

Alfred Langhorne Park

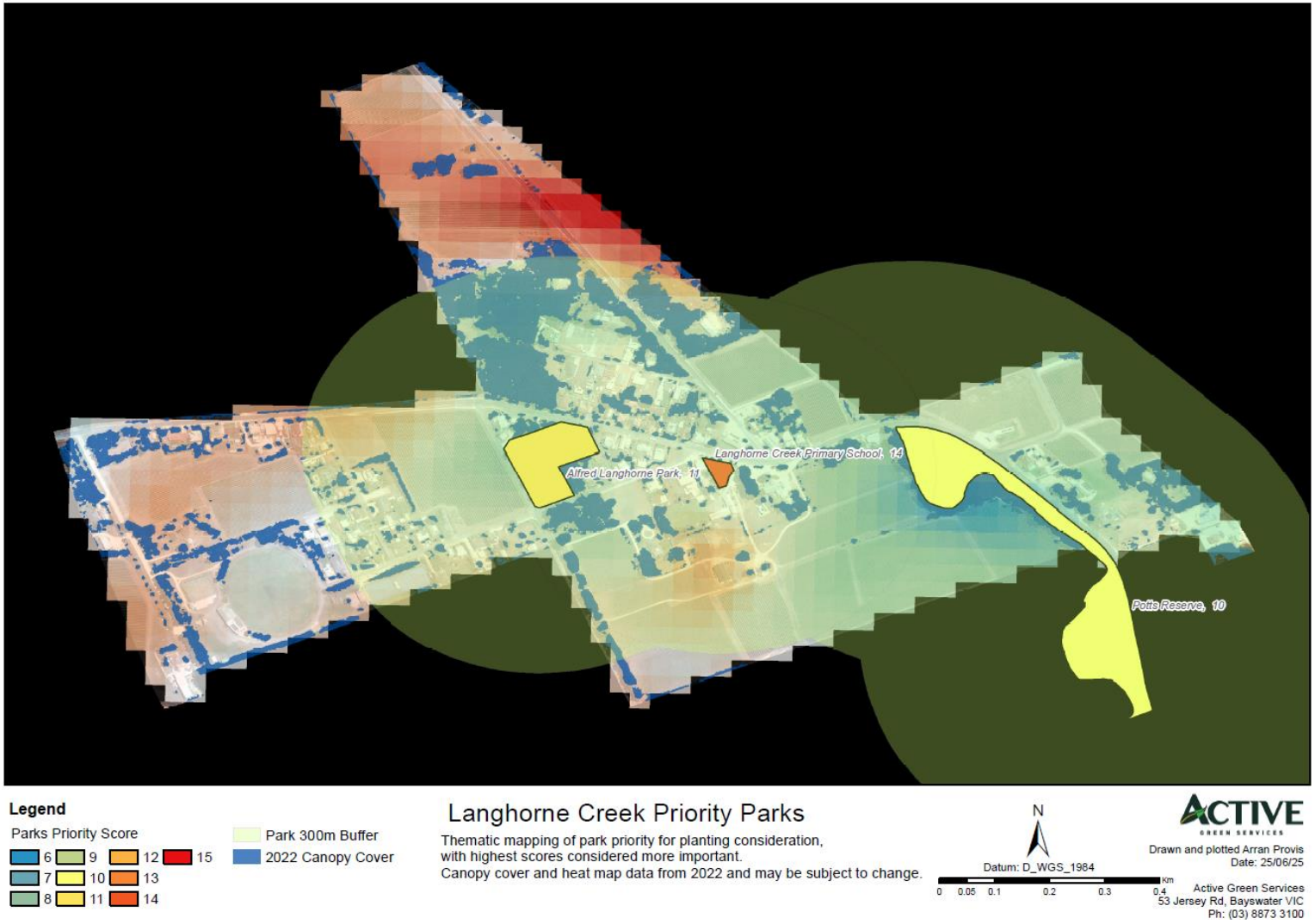
This park features moderate canopy cover, with potential for minor infill planting, particularly along road verges, pedestrian paths, and seating areas. Enhancing tree cover in these locations will improve both the amenity and microclimate of the park, benefiting regular users and contributing to town-wide heat mitigation.

Potts Reserve

Potts Reserve is a mature, heavily treed park, offering significant shade and habitat benefits. However, there is potential for additional planting along the northern roadside boundary, where existing vegetation is sparse. This area is currently characterised by limited tall vegetation, likely influenced by powerline constraints.

Where feasible, planting with indigenous, powerline-compatible species or the use of offset plantings (set back from the powerlines) could provide valuable roadside shade without conflicting with infrastructure. This approach may be coordinated with the broader roadside planting program, particularly where gaps exist in the township's canopy network adjacent to residential properties.

Figure 21: Langhorne Creek Priority Parks - planting priority map.



6.2.6. Middleton – Park priority selection

Middleton presents a range of opportunities for targeted canopy enhancement that balances the needs of climate resilience, active transport support, and public amenity with the unique sensitivities of coastal landscapes. The township's exposure to urban heat hotspots, particularly along road corridors and high-use recreation areas, highlights the need for strategic tree planting despite potential community concerns views preservation. See Figure 22, below.

- Focus on foreshore and road-adjacent reserves to maximise cooling and shade outcomes.
- Balance community concerns around views preservation with the need for urban heat mitigation and active transport support.
- Prioritise linear reserves such as Padman Crescent, Offshore Drive, and Surfers Parade Reserves for immediate canopy expansion.
- Leverage existing vegetation in reserves like Middleton Shores, Abbotts Reserve, and Middleton Creek Reserve with complementary planting strategies.
- Use resilient, coastal-tolerant species that provide effective canopy without compromising long-term maintenance or survival.

Foreshore Reserves

The primary opportunity for significant canopy enhancement lies along the Middleton foreshore, stretching from Surfers Reserve East to Set Road Reserve South. These reserves currently feature scattered, low-density vegetation, particularly where they interface with roads and footpaths. Increased planting along these corridors would serve a dual purpose of mitigating roadside heat hotspots by shading road surfaces and enhancing the amenity and comfort of the foreshore's walking paths and recreation areas.

While the introduction of large-canopy trees offers substantial benefits in terms of cooling and urban greening, it is acknowledged that this may be contentious due to concerns over obstructed coastal views. Additionally, coastal soil conditions and salt exposure will limit the planting palette to robust, salt-tolerant species. Nonetheless, from an environmental, recreational, and liveability perspective, the foreshore remains the highest priority for tree planting in Middleton, subject to careful community engagement and sensitive design solutions that balance shade provision with view corridors.

Offshore Drive Reserve

This long, linear reserve has a north-facing orientation and is located within a significant heat hotspot. The reserve features minimal existing canopy cover, particularly over the adjacent road surface, which contributes to heat retention. This location is highly suitable for tree planting aimed at reducing road surface temperatures, improving comfort along the roadside for both pedestrians and cyclist and contributing to township-wide canopy targets. Given its linear form and exposure, planting design here should focus on consistent spacing and species that are resilient to local coastal conditions.

Middleton Shores Reserve

Middleton Shores is a neighbourhood-scale reserve that accommodates walking tracks and exercise equipment. While parts of the reserve are densely vegetated, the primary high-use activity zones are poorly shaded, primarily due to the prevalence of dispersed Araucaria plantings, which offer a strong architectural character but limited canopy coverage. Strategic infill planting with broad-canopy species could significantly improve shade provision for users, enhancing the comfort and functionality of this popular community space.

Surfers Parade Reserves (Twin Reserves)

Located slightly inland from the foreshore, these twin reserves along Surfers Parade are currently underutilised in terms of canopy cover, presenting clear opportunities for planting. Their positioning away from direct foreshore view corridors makes them well-suited for large-canopy trees, providing shade for recreational users and mitigating nearby heat hotspots without the view constraints associated with beachfront reserves.

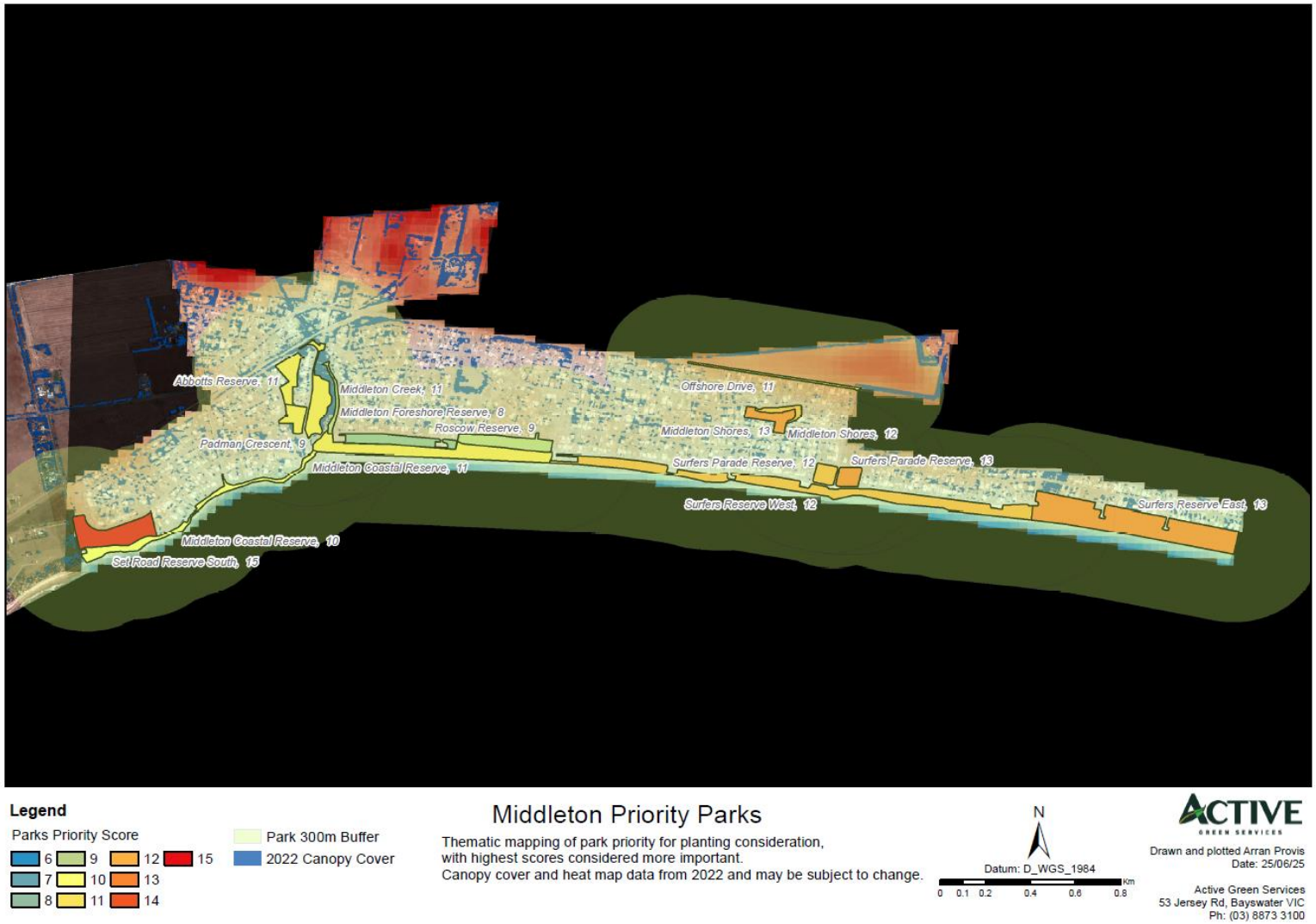
Padman Crescent Reserve – High Priority for Active Transport Shading

Padman Crescent Reserve is a long, linear reserve adjacent to a heavily exposed roadside and shared user path. This corridor experiences extensive sun exposure that likely create uncomfortable conditions for pedestrians and cyclists. It represents a high-priority site for canopy planting, particularly in providing shade for the footpath, cool the adjacent road surface and improve overall streetscape amenity for local residents. Given alignment with sustainable transport goals, this reserve should be a focal point for the next phase of Middleton's urban greening program.

Abbotts Reserve and Middleton Creek Reserve

These reserves share similar characteristics to Padman Crescent, featuring elongated forms adjacent to key road corridors. While both have a greater degree of existing vegetation, opportunities remain for supplementary planting, especially along road edges to reduce surface heat, over hardstand areas within the reserves to increase shaded recreation spaces and for biodiversity outcomes through species diversity and habitat creation.

Figure 22: Middleton Priority Parks - planting priority map.



6.2.7. Milang – Park priority selection

The urban greening priorities for Milang are primarily focused on increasing canopy cover along road corridors and in high-use pedestrian zones, where additional shading will deliver the greatest benefits in terms of urban heat island (UHI) reduction, road surface cooling, and community wellbeing. The Index of Relative Socio-Economic Disadvantage (IRSD) values are relatively consistent across Milang and therefore not a major determinant in prioritisation. Selections have been informed by factors including heat mapping, park hierarchy, community use, and biodiversity outcomes. See Figure 23, below.

Daranda Terrace Reserve

This reserve, which serves as a connector to the Swamp Reserve, is a key focus area due to its strategic location and linkage function. While not requiring heavy internal planting, the reserve's Daranda Terrace frontage will be enhanced with canopy trees that contribute to roadside cooling in conjunction with the broader street planting program.

Swamp Reserve and Daranda Terrace Walkway

These connected reserves serve as high-use pedestrian corridors with currently limited canopy cover. Enhancing shade along the walkway network will improve comfort for walkers and cyclists, encourage increased recreational use, and support active transport within the township.

Stirling Street Stormwater Retention Basin

This reserve has been selected primarily for its function within the '3-30-300 rule' urban greening guideline, addressing a critical gap for residents in the McDonald Street area who would otherwise fall outside the 300-metre proximity to a neighbourhood park or reserve. Planting here transforms the retention basin into a multi-functional green space, offering both environmental services (stormwater management) and recreational value.

Jupiter Lyon Reserve and Milang Commonage

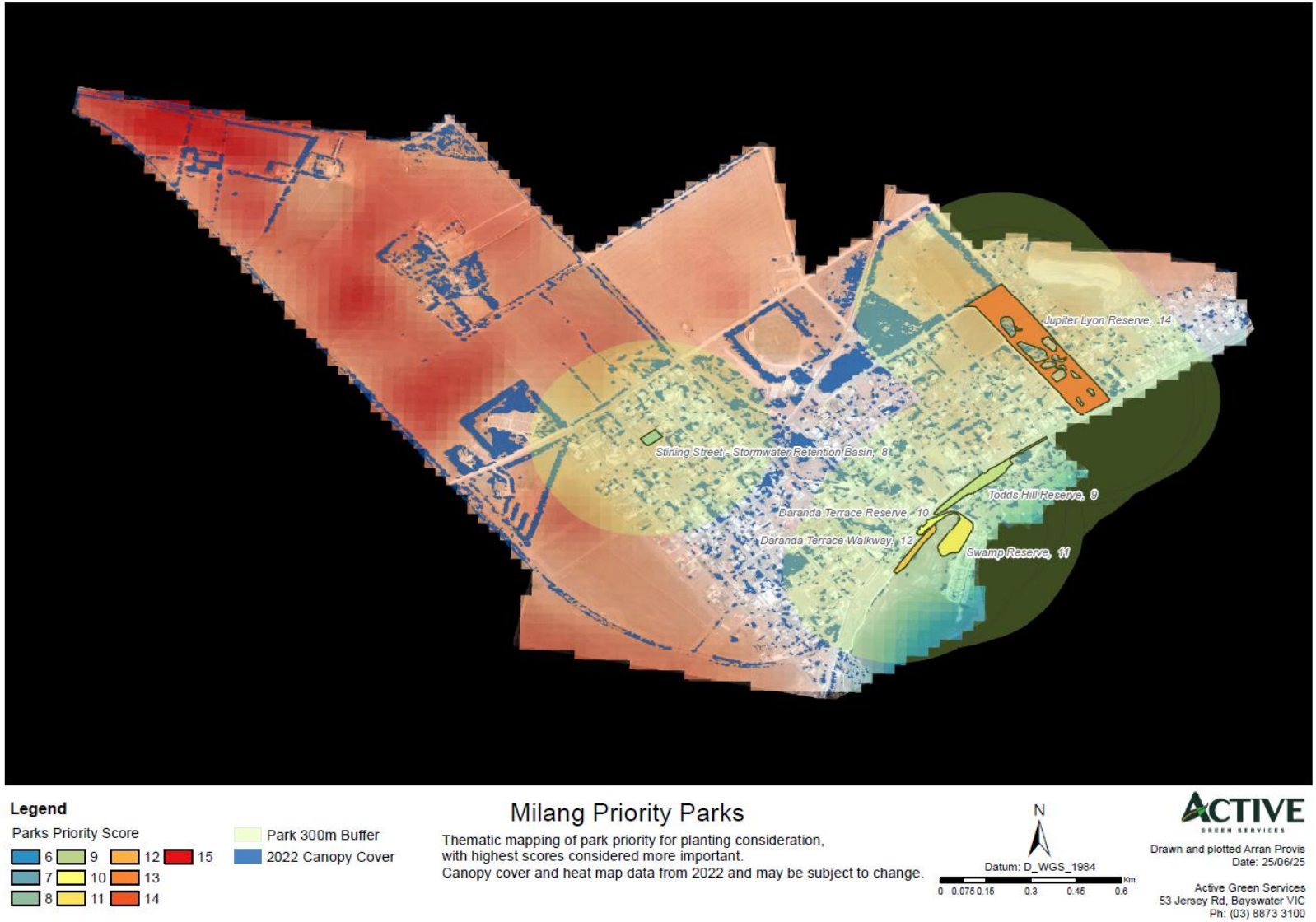
These sites are situated within identified heat hotspot zones in Milang. The reserves currently include some biodiversity-focused plantings, which will be enhanced by additional canopy trees, particularly adjacent to pathway networks. This will improve shade for users, increase the appeal of the reserves for walking and passive recreation, and strengthen biodiversity outcomes through habitat connectivity.

Road corridors – targeted street tree planting

Key road corridors have been identified where tree planting will significantly contribute to reducing UHI impacts and improving amenity for both residents and visitors. These include:

- Daranda Terrace – As the main road through Milang, this corridor experiences high levels of use and significant sun exposure. A coordinated approach combining roadside plantings and park edge canopy cover will help cool this thoroughfare, improve visual amenity, and support pedestrian comfort.
- Woodrow Drive – Another priority location where increased street tree planting will assist in mitigating heat impacts and improving the streetscape experience.

Figure 23: Milang Priority Parks - planting priority map.



6.2.8. Mount Compass – Park priority selection

Mount Compass displays a mosaic of heat and cool zones, as revealed by urban heat mapping. These patterns closely correlate with recent land clearing and development activities, contributing to heat hotspots, while areas with retained vegetation offer cooler microclimates.

The township's existing park network is primarily concentrated within the eastern portion of Mount Compass, servicing high-use areas such as the retail precinct and school zones. In contrast, there are limited public open spaces within the rural living areas, industrial precinct, and mining zones, which impacts accessibility to green space in accordance with the '3-30-300 rule'. See Figure 24, below.

Basin Reserve

Basin Reserve is a multi-functional, three-part park that includes the Mount Compass Recreation Park and forms part of an active transport corridor, linking residential areas with Burgess Oval and the broader school complex around Mount Compass Oval.

Although recent plantings have occurred within the reserve, there is a strong case for densifying the canopy, particularly to offset ongoing vegetation loss from adjacent private development, including areas like 31–33 Slater Avenue, which have experienced significant clearing (Figure 25 & Figure 26). As a heat hotspot, Basin Reserve represents a high-priority site where expanded planting will deliver immediate benefits for urban cooling, recreation amenity and biodiversity support.

George Francis Drive Precinct

This residential area lacks access to formal parks or reserves within 300 metres, although it benefits somewhat from adjacent golf course vegetation and quarry easement plantings. However, these do not function as accessible public open space. This area would benefit from a targeted roadside planting program, particularly to address roadside heat hotspots and improve shade for the rural residential interface.

Sand Mine Road – Industrial Estate

While the industrial estate sits within a relatively cool microclimate, the absence of formal green space remains notable. Although the immediate priority for this area is lower compared to residential zones, strategic streetscape planting should still be considered to support worker wellbeing, improve amenity, and contribute to the township's total canopy targets.

Figure 24 Mount Compass Priority Parks - planting priority map

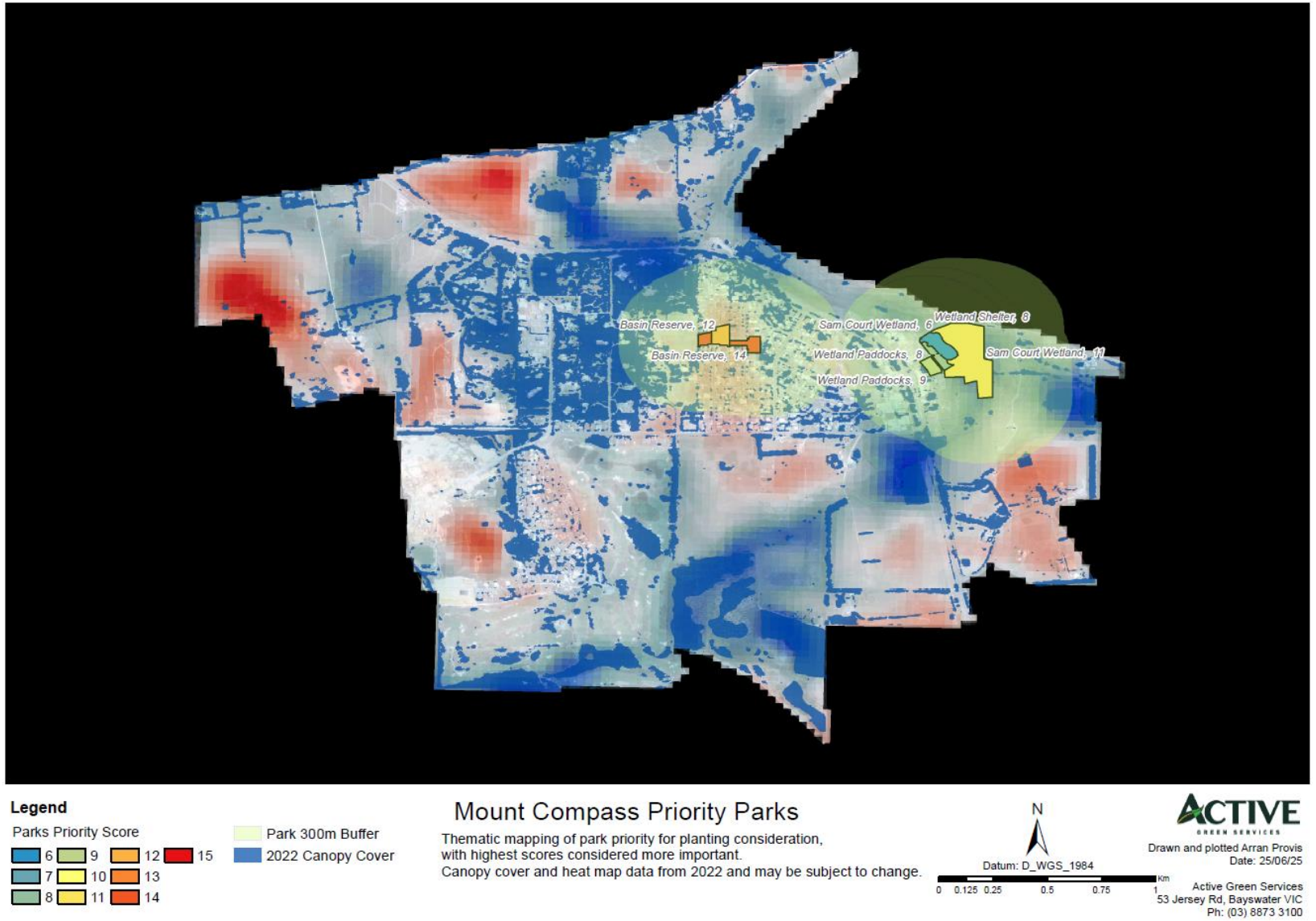




Figure 25: Vegetation cover at 31–33 Slater Avenue pre 2022 canopy cover audit (image MetroMaps)

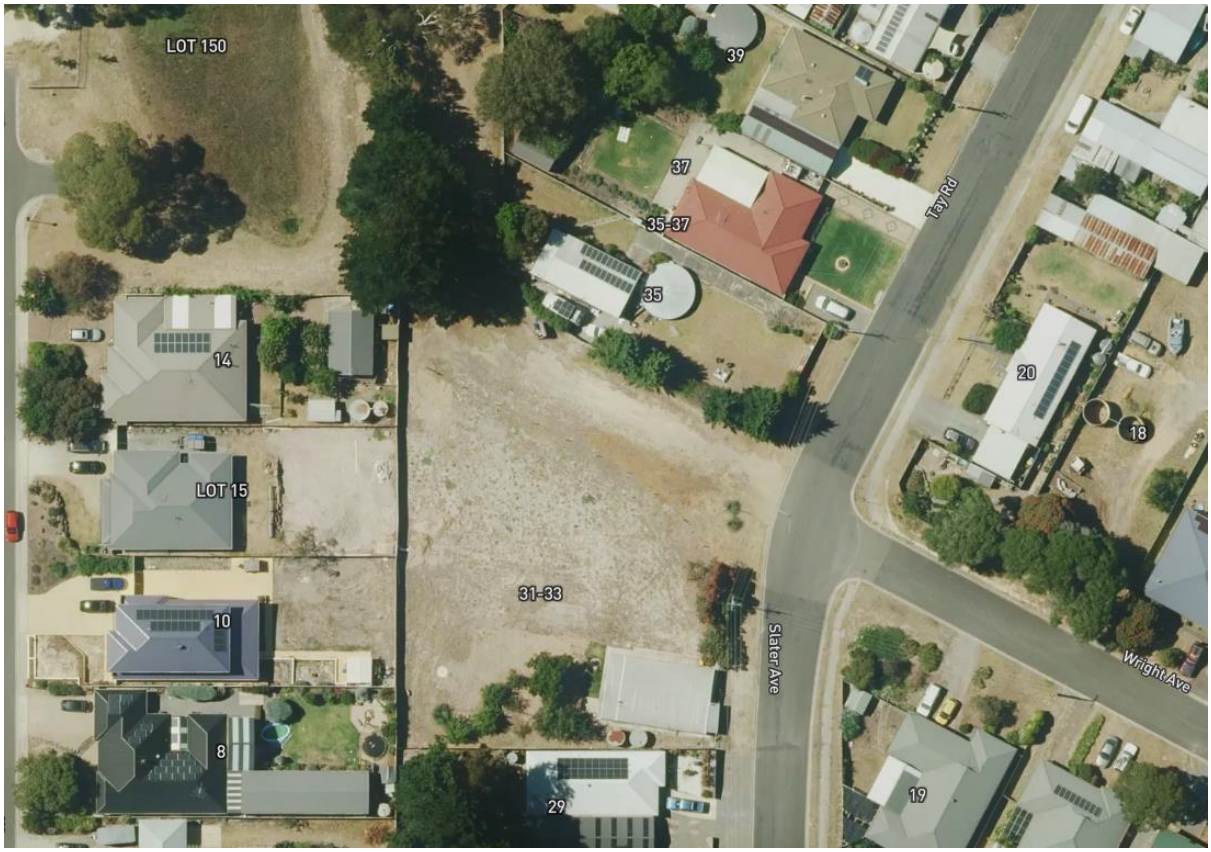


Figure 26: Vegetation clearing at 31–33 Slater Avenue post 2022 canopy cover audit (image MetroMaps)

Wetland Paddocks – future opportunity area

The wetland paddocks adjacent to Sam Court and the retail/commercial precinct represent a significant opportunity for proactive canopy cover development.

Despite being within a currently cooler area, the lack of existing vegetation means this site has the potential to become a future heat hotspot, particularly if earmarked for commercial expansion or urban development. Integrating canopy cover into any future land use changes in this area is essential to ensure that urban heat mitigation, biodiversity, and public amenity are embedded into future growth plans.

Compass Crescent – high priority roadside planting

The Compass Crescent area currently lacks parkland within a 300-metre radius and coincides with an identified urban heat hotspot. This location should be prioritised within the roadside planting program, not only to address road surface heat but also to provide shade and visual amenity for the surrounding rural acreage lots, helping improve the liveability of this low-density area.

Although not designated a park, the existing Tookayerta Wetlands area that extends through Mount Compass could benefit from additional planting/revegetation.

6.2.9. Port Elliot – Park priority selection

Port Elliot shares similarities with Middleton in its coastal township setting but is differentiated by a larger commercial footprint, more extensive agricultural hinterland, and higher concentrations of urban heat hotspots, as indicated by heat mapping analysis. This is further compounded by generally lower IRSD values and greater Socio-economic Disadvantage within Port Elliot's urban areas, highlighting the importance of addressing both climate resilience and social equity through targeted urban greening initiatives. See Figure 27, below.

The combination of limited canopy cover, larger areas of sealed surfaces, and increased community vulnerability underlines the urgency to expand the tree canopy within both public open spaces and streetscapes across Port Elliot.

Port Elliot Show Grounds and Port Elliot Primary School Precinct

This precinct represents a high-priority location, situated within a notable urban heat hotspot and an area of relative social disadvantage. While the Show Grounds are heavily utilised during major events, the area remains underutilised and sparsely vegetated for the majority of the year. There is significant opportunity to introduce strategically placed canopy trees that provide shade and cooling while respecting event space requirements and infrastructure clearances.

This would deliver dual benefits of improved amenity for the local community year-round and enhanced comfort during event periods.

Bayview Estate Reserves

A network of small to medium neighbourhood reserves adjacent to the Show Grounds. These spaces are currently underutilised for canopy planting, despite being situated in a confirmed heat hotspot. Focused planting, particularly along road frontages and within passive recreation areas, will significantly contribute to heat mitigation and improved neighbourhood amenity.

Cinema Court Reserve

A neighbourhood-level reserve adjacent to community gardens within a residential area it provides an excellent opportunity for extensive tree planting, as current canopy cover is negligible. This reserve functions as a buffer to nearby heat hotspots and would benefit from shade trees.

Commodore Reserve and Commodore Gardens

Commodore Reserve is a premier open space under Alexandrina's park hierarchy, serving both residents and visitors. It forms a key connection between the Port Elliot Caravan Park and the foreshore, offering a refuge for those seeking open green space and ocean views, without accessing the beach directly. The north side contains Araucaria plantings, but the central reserve offers scope for diversified canopy expansion, particularly with coastal-tolerant species.

Commodore Gardens, which adjoins the reserve, is largely devoid of planting and presents a valuable opportunity to introduce shade trees for the adjacent car park and Port Elliot Bowls Club. Car park design adjustments would be needed to allow for adequate soil preparation, root space and long-term tree health.

Harbour Master Reserve and Continental Park

Both are designated as premier parks but are currently lacking significant vegetation coverage. As such there is substantial scope for introducing canopy cover along walking paths, road frontages and passive recreation nodes.

Additionally, the nearby Freemans Knob Reserve could benefit from supplementary coastal tree planting, where appropriate, to reinforce shade and habitat values.

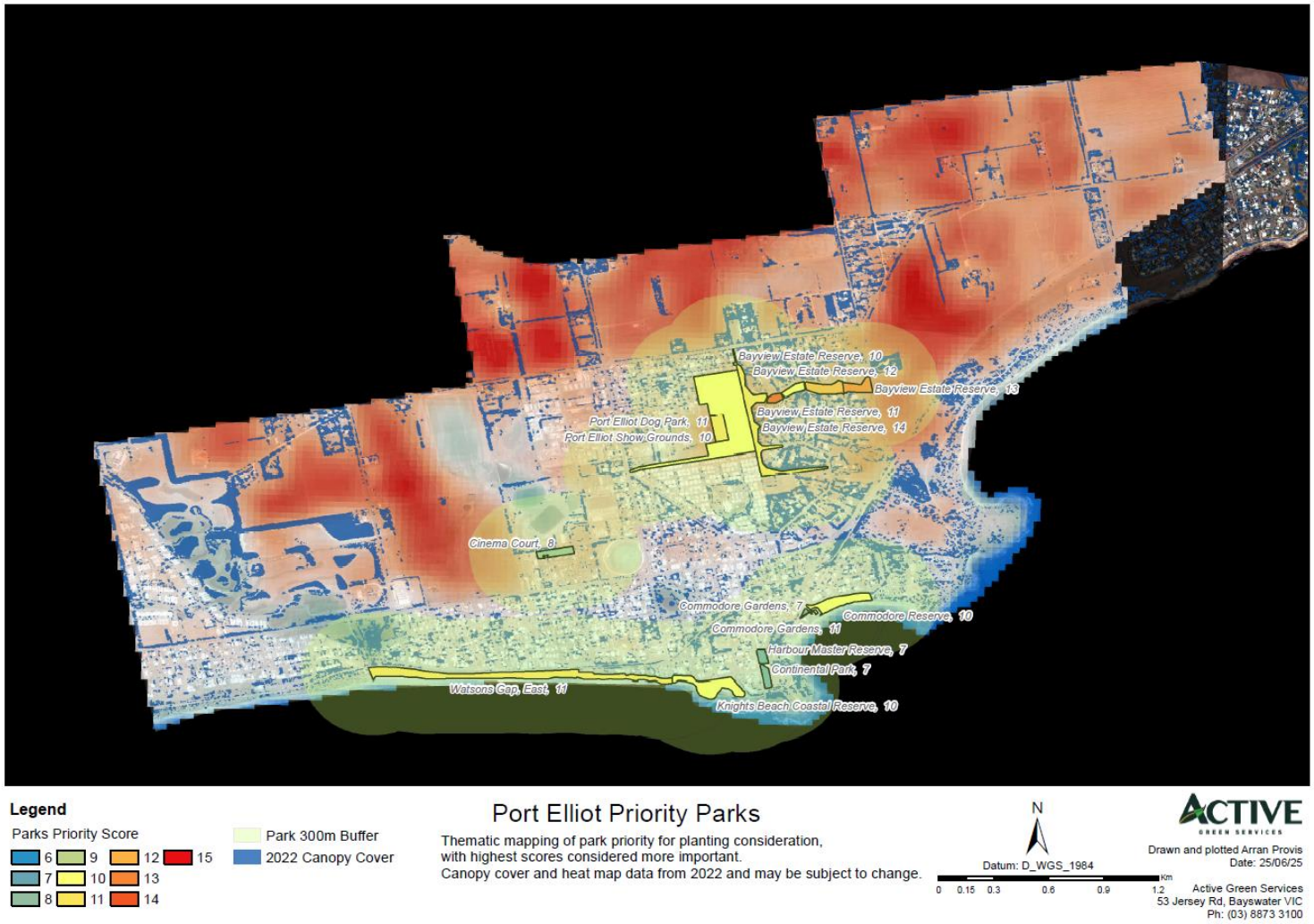
Knights Beach Coastal Reserve and Watsons Gap (East)

These foreshore reserves are coastal areas characterised by open dune ecotones and sparse low-lying vegetation, with residential dwellings immediately behind this area.

Despite natural ocean cooling, the infrastructure adjacent these such as roads, footpaths, and the trainline are localised hotspots due to their exposed surfaces. Targeted tree planting in these areas would achieve surface temperature reduction along roads and pathways and improved biodiversity and amenity.

The design challenge here will be balancing canopy cover and shade provision with consideration of coastal view corridors, which is often a community concern and community engagement will be critical. This will also need to address the limitations of coastal soil conditions, salt exposure, and wind, requiring the use of hardy, salt-tolerant coastal species.

Figure 27: Port Elliot Priority Parks - planting priority map.



6.2.10. Strathalbyn – Park priority selection

Heat mapping for Strathalbyn demonstrates a distinct pattern of cooler areas aligned with river corridors and creek lines, particularly around the town centre where dense vegetation is already present. Conversely, areas dominated by agricultural land, large-lot rural subdivisions, and the racecourse exhibit significant urban heat island (UHI) effects.

Socio-economic analysis highlights that Strathalbyn contains the broadest range of IRSD values. While some outer areas are relatively advantaged, the most socio-economically disadvantaged populations are concentrated within the central township area, amplifying the importance of equitable greening strategies.

An additional challenge is the limited distribution of neighbourhood-scale parkland outside the township core, with larger reserves or open spaces often serving broader landscape functions but providing less direct community access for daily recreation. See Figure 28, below.

Many parcels captured in the supplied reserve dataset contain easements, drainage corridors, and roadside landscapes which may not meet the usable open space for recreation intent of the 300-metre principle. This has implications for how canopy targets are applied spatially within Strathalbyn.

There is a critical need to balance biodiversity planting with user amenity and it is recommended that tree placement prioritises:

- Playgrounds
- Seating areas
- Walking and cycling paths
- Gathering spaces
- As well as habitat corridors where appropriate.

Areas to the south of the cemetery and racecourse demonstrate significant canopy deficits. Given the absence of conventional reserves in these rural-fringe zones, a focus on road corridor greening becomes the primary mechanism for delivering shade, cooling and visual amenity.

Strathmont Drive Reserve (S-Bend) & Strathmont Drain/Cemetery Precinct

Strathmont Drive Reserve has minimal existing vegetation but is well-positioned to serve the surrounding residential catchment as a neighbourhood-scale park. The Strathmont Drain and Cemetery Precinct presents a unique opportunity for greening, albeit with considerations around burial space requirements. The lack of canopy cover around burial plots contributes to heat exposure, impacting visitors and staff.

A review of historical cemetery planting practices could introduce a more contemporary approach. For example, a “memorial tree” program akin to that used at Glenmorus Memorial Park in Albury, NSW, allows families to select memorial trees for departed ones, enhancing the site's amenity and providing shaded spaces for reflection.

The township areas south of the cemetery are characterised by significant heat hotspots and limited park infrastructure. These may want to be considered as part of prioritised roadside tree planting given the constraints around park establishment on large rural lots.

Ferguson Road Reserve & Wolf Avenue Reserve

Both are situated within residential neighbourhoods adjacent to confirmed heat hotspots with Ferguson Road Reserve having capacity for extensive tree planting to create a biodiverse, shaded parkland suitable for passive recreation. Wolf Avenue Reserve appears to function as a pedestrian thoroughfare, offers an excellent opportunity for linear canopy planting along pathways to improve thermal comfort for walkers and cyclists.

Sisson Road Reserve & Formby Court Reserve

These paired reserves serve the northern residential catchments, currently providing important, albeit underutilised, contributions toward the 300-metre accessibility rule. Both reserves lack significant canopy and would benefit from the introduction of large canopy trees, providing shade over open spaces and potential future amenities (playgrounds, seating, paths). A review of current and future recreation needs is recommended to determine whether infrastructure upgrades should accompany greening initiatives.

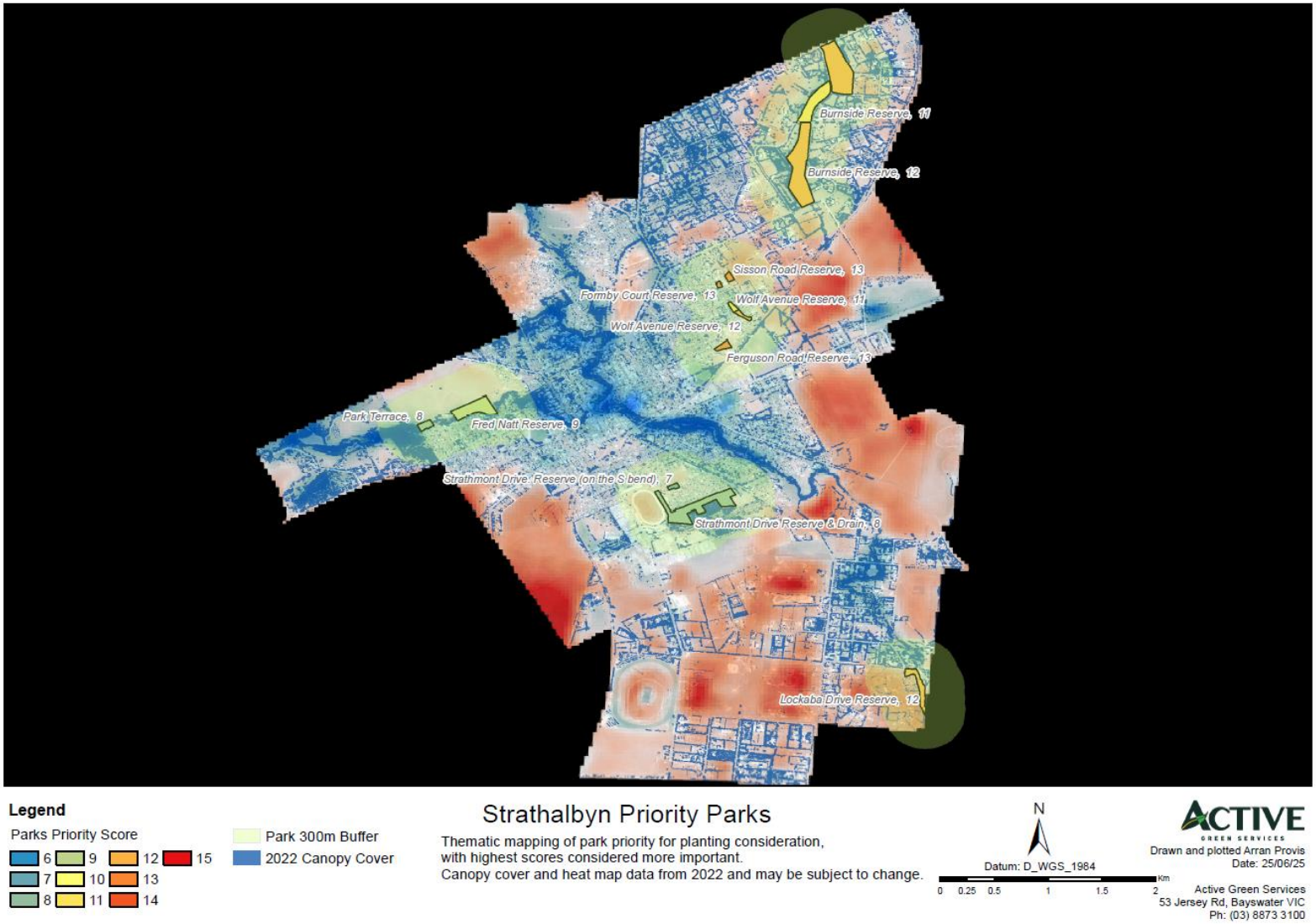
Fred Natt Reserve & Park Terrace Reserve

These reserves primarily function as bushland or biodiversity reserves, but there is clear potential for boundary-edge planting, especially where neighbouring properties are cleared, to enhance canopy and buffer microclimates. Roadside planting around these reserves would further contribute to heat mitigation and urban amenity while supporting ecological connectivity.

Burnside Reserve (Linear Park)

Burnside Reserve benefits from existing canopy cover along its central spine; however, northern and southern sections are more open and exposed. There is scope for supplementary large tree planting to increase shade coverage, biodiversity-focused planting, especially in under-vegetated areas. Roadside planting along the reserve boundaries to mitigate road surface heat sinks and improve the reserve’s microclimate for users.

Figure 28: Strathalbyn Priority Parks - planting priority map



6.2.11. Woodchester – Park priority selection

Based on the spatial data layers and asset mapping provided, there are no Council-managed parks or reserves currently located within the township of Woodchester. Similarly to Ashbourne, this presents a significant challenge in meeting the 300-metre proximity component of the '3-30-300 rule', which is critical for ensuring equitable access to green space.

Unlike Ashbourne, however, Woodchester has a relatively low canopy cover, largely a result of historical and ongoing land clearance for agricultural purposes. This lack of vegetation cover is further compounded by the absence of formal recreational open space, limiting opportunities for structured recreation, passive use and informal gathering or nature-based play and community wellbeing. See Figure 29, below.

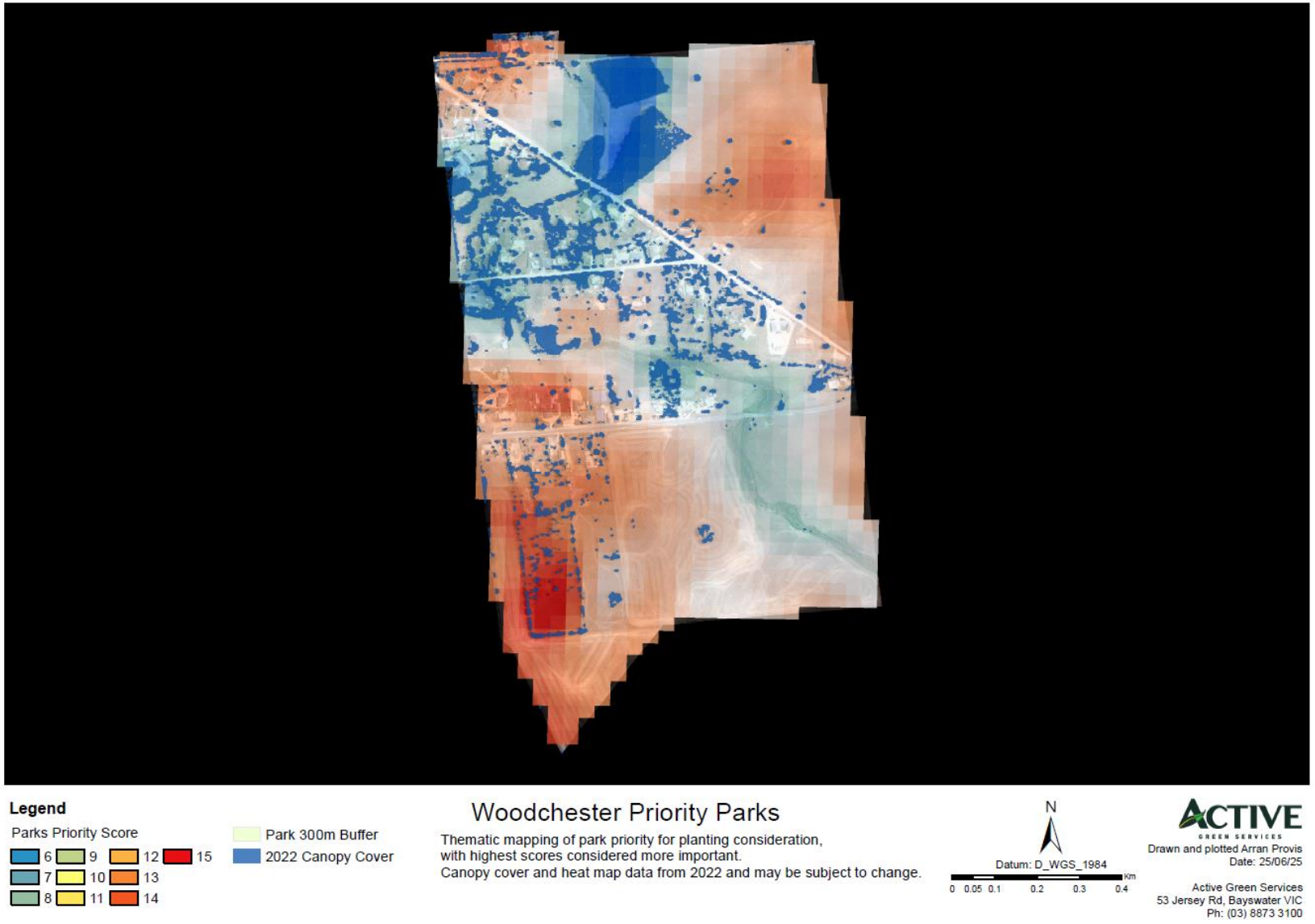
This may be particularly impactful for vulnerable community members, such as children, older adults, and those with mobility constraints, who have limited ability to access green spaces outside the township. There is a clear opportunity to address this gap through the strategic identification, acquisition, or co-management of land suitable for the creation of public green spaces within Woodchester. Site selection should be guided by the following criteria:

- Thermal Hotspot Mitigation: Target areas identified in heat mapping where hard surfaces or built form contribute to elevated surface temperatures.
- Community Need and Demand: Prioritise locations where there is demonstrated or emerging demand for recreational space, passive open space, or nature-based play.
- Land Use Compatibility: Focus on parcels where existing land use supports the feasibility of park development, revegetation, or establishment of biodiversity corridors.

Additionally, there is scope to explore partnership models involving private landowners interested in stewardship or shared-use arrangements. State government agencies may hold underutilised land suitable for conversion to community open space, while landcare groups or community associations may be able to support revegetation and maintenance programs.

Addressing the green space deficit in Woodchester is seen as a priority for enhancing community wellbeing, improving climate resilience, and supporting biodiversity outcomes. Even modest investments in strategically located green spaces can deliver measurable benefits to the health, liveability, and environmental performance of the township.

Figure 29: Woodchester Priority Parks - planting priority map



7. Climate ready tree species

Climate-ready tree species are those identified as resilient to the projected impacts of climate change, including increased average temperatures, reduced and irregular rainfall, more frequent heatwaves, and extended periods of drought. For Alexandrina, the strategic selection and planting of these species is essential to ensuring the long-term health, functionality, and sustainability of the urban forest, as well as achieving canopy cover targets.

Climate-ready species will continue to deliver critical ecosystem services including shade provision, urban cooling, stormwater regulation, habitat for biodiversity and community amenity, while also helping to reduce maintenance costs and mitigate risks associated with tree decline or failure under a changing climate. Integrating these species into planning frameworks, greening strategies and streetscape design is key to building more resilient and liveable communities.

To assess climate suitability, Alexandrina Council's preferred species list was evaluated using the Climate Assessment Tool (CAT) developed by Botanic Gardens Conservation International (BGCI) as part of the Climate Change Alliance of Botanic Gardens (2025).

7.1. Methodology - CAT Assessment and climate scenarios

Geographic coordinates for Milang (Latitude -35.4062, Longitude 138.9702) were used as a representative location for the region. The Alexandrina Council preferred species list was initially assessed using the CSV upload function within the Climate Assessment Tool (CAT), which included all nominated species.

Where results were not returned, species names were verified and cleaned (e.g. correction of spelling errors, removal of cultivar identifiers) and re-run using the Single Taxon method.

While the Single Taxon and CSV upload methods may yield slightly different risk codes, the results are complementary and were aligned using colour-coded classifications for interpretation, as illustrated in Figure 30 and Figure 31.



Figure 30: Climate Assessment Tool climate risk code categories from CSV method (colour stylised by author).

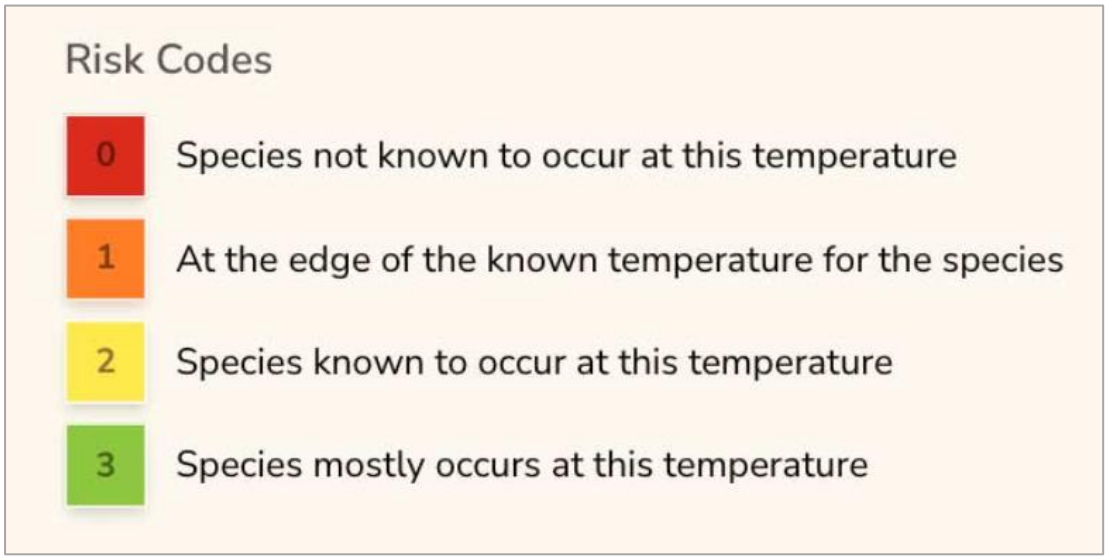


Figure 31: Climate Assessment Tool climate risk code categories from Single Taxon method (colour from webpage)

In cases where these methods did not return results, a "Taxon Not Found" result was returned. This outcome may be due to one or more of the following reasons:

- The species is not classified as a "tree" in the reference databases.
- The species lacks records within the databases used by the tool.
- An infraspecific name was entered (e.g. *var.*, *aff.*, *subsp.*, *f.*, cultivar or common names), which are not recognised under CAT's taxonomic criteria.

Where a "Taxon Not Found" result occurred, the species was retained within the spreadsheet, but the corresponding data row was left blank.

Two climate scenarios were applied in the assessment:

- Emissions limited: Based on the SSP2 / RCP4.5 scenario as outlined by the Intergovernmental Panel on Climate Change (IPCC), this model projects the 2050 climate assuming moderate global efforts to limit emissions.
- Scenario 1: Based on the SSP3 / RCP7.0 scenario, this model projects the 2090 climate assuming no significant action is taken to reduce emissions, representing a worst-case scenario.

7.2. Results - CAT Assessment and climate scenarios

Results from both scenarios were compiled and are presented in Table 20 and highlighted using the thematically colour-coded based on their climate risk rating.

Table 20: Analysis of Alexandrina Council preferred species list assessed with CAT for projected climate in the years 2050 and 2090.

	Alexandrina Council Preferred Species	Taxon within CAT	Emissions Limited 2050		Scenario 1 2090	
			Projected Temperature, °C	Climate Rating	Projected Temperature, °C	Climate Rating
*	*Acacia argyrophylla*					
	Acacia melanoxylon	*Acacia melanoxylon*	17.7	6	19.7	6
	Acacia pendula	*Acacia pendula*	17.7	11	19.7	5
	Acacia pycnantha	*Acacia pycnantha*	17.7	9	19.7	6
	Acer buergerianum	*Acer buergerianum*	17.7	5	19.7	5
	Acer freemanii	*Acer ×freemanii*	17.7	0	19.7	0
	Acer negundo 'sensation'	*Acer negundo*	17.7	5	19.7	5
	Agathis robusta	*Agathis robusta*	17.7	9	19.7	11
	Allocasuarina verticillata	*Allocasuarina verticillata*	17.7	6	19.7	3
	Angophora costata	*Angophora costata*	17.7	11	19.7	5
	Angophora hispida	*Angophora hispida*	17.7	6	19.7	2
	Araucaria heterophylla	*Araucaria heterophylla*	17.7	11	19.7	8
^	*Araucaria heterophylla hawaiian*					
	Banksia integrifolia	*Banksia integrifolia*	17.7	11	19.7	8
	Banksia marginata	*Banksia marginata*	17.7	5	19.7	2
^	*Banksia ornata*					
	Brachychiton acerifolia	*Brachychiton acerifolius*	17.7	11	19.7	6
	Brachychiton bidwillii	*Brachychiton bidwillii*	17.7	9	19.7	11

	Alexandrina Council Preferred Species	Taxon within CAT	Emissions Limited 2050		Scenario 1 2090	
			Projected Temperature, °C	Climate Rating	Projected Temperature, °C	Climate Rating
	Brachychiton populneus	*Brachychiton populneus*	17.7	8	19.7	5
	Brachychiton rupestris	*Brachychiton rupestris*	17.7	9	19.7	11
	Callistemon citrinus var.	*Melaleuca citrina*	17.7	6	19.7	3
^	*Callistemon rugulosus*					
	Callistemon viminalis 'captain cook'	*Melaleuca viminalis*	17.7	11	19.7	11
	Callitris glauca syn. C columellaris	*Callitris columellaris*	17.7	11	19.7	9
^	*Callitris gracilis*					
	Calodendron capense	*Calodendrum capense*	17.7	11	19.7	8
	Cassia fistula	*Cassia fistula*	17.7	9	19.7	9
*	*Ceanothus papillosus 'pacific blue'*	*Ceanothus caeruleus*	17.7	2	19.7	1
	Celtis occidentalis	*Celtis occidentalis*	17.7	5	19.7	2
	Cercis canadensis 'forrest pansy'	*Cercis canadensis*	17.7	11	19.7	5
	Cercis chinensis var "avondale"	*Cercis chinensis*	17.7	8	19.7	5
	Cercis siliquastrum	*Cercis siliquastrum*	17.7	5	19.7	3
^	*Chamelaucium uncinatum*					
	Corymbia citriodora	*Corymbia citriodora*	17.7	11	19.7	11
^	*Corymbia citriodora 'lemon squash'*					
	Corymbia ficifolia	*Corymbia ficifolia*	17.7	8	19.7	5
^	*Corymbia ficifolia 'wild fire'*					

	Alexandrina Council Preferred Species	Taxon within CAT	Emissions Limited 2050		Scenario 1 2090	
			Projected Temperature, °C	Climate Rating	Projected Temperature, °C	Climate Rating
	Corymbia maculata	*Corymbia maculata*	17.7	11	19.7	5
^	*Corymbia maculata 'lowanna'*					
	Cupaniopsis anacardioides	*Cupaniopsis anacardioides*	17.7	9	19.7	11
*	*Dodonea viscosa ssp. Spatulata*	*Dodonaea viscosa*	17.7	3	19.7	2
^	*Elaegnus x ebbingerii*					
	Elaeocarpus reticulatus	*Elaeocarpus reticulatus*	17.7	9	19.7	6
	Eremophila bignoniflora	*Eremophila bignoniiflora*	17.7	9	19.7	11
	Eremophila longifolia	*Eremophila longifolia*	17.7	11	19.7	11
^	*Eremophila sturtii*					
	Eucalyptus arenacea	*Eucalyptus arenacea*	17.7	2	19.7	2
	Eucalyptus camaldulensis	*Eucalyptus camaldulensis*	17.7	11	19.7	9
	Eucalyptus cladocalyx	*Eucalyptus cladocalyx*	17.7	6	19.7	3
^	*Eucalyptus cladocalyx nana*					
	Eucalyptus cneorifolia	*Eucalyptus cneorifolia*	17.7	6	19.7	2
	Eucalyptus diversifolia	*Eucalyptus diversifolia*	17.7	6	19.7	3
	Eucalyptus eremophila	*Eucalyptus eremophila*	17.7	8	19.7	6
	Eucalyptus erythronema	*Eucalyptus erythronema*	17.7	11	19.7	6
	Eucalyptus fasciculosa	*Eucalyptus fasciculosa*	17.7	6	19.7	3
	Eucalyptus gillii	*Eucalyptus gillii*	17.7	11	19.7	8

	Alexandrina Council Preferred Species	Taxon within CAT	Emissions Limited 2050		Scenario 1 2090	
			Projected Temperature, °C	Climate Rating	Projected Temperature, °C	Climate Rating
	Eucalyptus leucoxylon 'euky dwarf' 'goolwa gem'	*Eucalyptus leucoxylon*	17.7	9	19.7	6
^	*Eucalyptus leucoxylon species*					
^	*Eucalyptus leucoxylon ssp leucoxylon*					
	Eucalyptus macrocarpa	*Eucalyptus macrocarpa*	17.7	11	19.7	8
	Eucalyptus odorata	*Eucalyptus odorata*	17.7	6	19.7	3
	Eucalyptus porosa	*Eucalyptus porosa*	17.7	5	19.7	2
	Eucalyptus tetragona	*Eucalyptus pleurocarpa*	17.7	9	19.7	6
	Eucalyptus tetraptera	*Eucalyptus tetraptera*	17.7	6	19.7	6
	Eucalyptus torquata	*Eucalyptus torquata*	17.7	11	19.7	5
	Eucalyptus Viminalis ssp cygnetensis	*Eucalyptus viminalis*	17.7	6	19.7	3
	Eucalyptus websteriana	*Eucalyptus websteriana*	17.7	11	19.7	8
	Eucalyptus youngiana	*Eucalyptus youngiana*	17.7	9	19.7	11
	Ficus microcarpa var 'hillii' 'flash'	*Ficus microcarpa*	17.7	9	19.7	9
	Ficus palmata	*Ficus palmata*	17.7	11	19.7	11
	Ficus rubignosa	*Ficus rubiginosa*	17.7	11	19.7	8
	Fraxinus angustifolia 'raywoodii'	*Fraxinus angustifolia*	17.7	5	19.7	3
	Fraxinus excelsior 'aurea'	*Fraxinus excelsior*	17.7	3	19.7	2
*	*Fraxinus griffithsii*	*Fraxinus griffithii*	17.7	3	19.7	3
	Fraxinus ornus 'meczek'	*Fraxinus ornus*	17.7	3	19.7	2

	Alexandrina Council Preferred Species	Taxon within CAT	Emissions Limited 2050		Scenario 1 2090	
			Projected Temperature, °C	Climate Rating	Projected Temperature, °C	Climate Rating
*	*Geijera parvifolia*	*Geijera parviflora*	17.7	3	19.7	2
*	*Ginko biloba*	*Ginkgo biloba*	17.7	2	19.7	1
*	*Gleditsia tricanthos var 'shademaster'*	*Gleditsia triacanthos*	17.7	2	19.7	1
	Grevillea robusta	*Grevillea robusta*	17.7	11	19.7	11
	Hakea francisiana	*Hakea francisiana*	17.7	11	19.7	8
	Harpephyllum caffrum	*Harpephyllum caffrum*	17.7	11	19.7	8
^	*Hibiscus hybrids*					
	Hibiscus tiliaceus rubra	*Hibiscus tiliaceus*	17.7	9	19.7	9
	Hymenosporum flavum	*Hymenosporum flavum*	17.7	11	19.7	8
	Jacaranda mimosifolia	*Jacaranda mimosifolia*	17.7	11	19.7	9
*	*Juniper virginiana 'skyrocket'*	*Juniperus virginiana*	17.7	2	19.7	1
*	*Koelreutaria paniculata*	*Koelreuteria paniculata*	17.7	1	19.7	1
*	*Laegestromia indica var 'tuscarora' etc*	*Lagerstroemia indica*	17.7	3	19.7	2
*	*Leucopogon parvifolius*	*Leucopogon parviflorus*	17.7	1	19.7	0
	Lophostemon conferta	*Lophostemon confertus*	17.7	11	19.7	8
	Magnolia grandiflora 'little gem' & 'kay parris'	*Magnolia grandiflora*	17.7	11	19.7	11
	Malus floribunda	*Malus floribunda*	17.7	3	19.7	2
	Melaleuca brevifolia	*Melaleuca brevifolia*	17.7	6	19.7	2
	Melaleuca decussata	*Melaleuca decussata*	17.7	6	19.7	3

	Alexandrina Council Preferred Species	Taxon within CAT	Emissions Limited 2050		Scenario 1 2090	
			Projected Temperature, °C	Climate Rating	Projected Temperature, °C	Climate Rating
	Melaleuca halmaturorum	*Melaleuca halmaturorum*	17.7	6	19.7	3
	Melia azedarach 'elite'	*Melia azedarach*	17.7	11	19.7	8
*	*Metrosideros thomasii*	*Metrosideros excelsa*	17.7	2	19.7	1
^	*Myoporum deserti*					
	Myoporum insulare	*Myoporum insulare*	17.7	6	19.7	5
	Myoporum platycarpum	*Myoporum platycarpum*	17.7	11	19.7	9
*	*Pistachia chinensis*	*Pistacia chinensis*	17.7	3	19.7	2
	Pittosporum angustifolium	*Pittosporum angustifolium*	17.7	11	19.7	9
	Pittosporum crassifolium	*Pittosporum crassifolium*	17.7	5	19.7	3
	Prunus cerasifera	*Prunus cerasifera*	17.7	3	19.7	3
^	*Prunus x blireana*					
	Pyrus calleryana var 'mrs bradford' & 'capital'	*Pyrus calleryana*	17.7	8	19.7	5
*	*Pyrus usuriensis*	*Pyrus ussuriensis*	17.7	0	19.7	0
	Quercus ilex	*Quercus ilex*	17.7	5	19.7	3
	Quercus palustris	*Quercus palustris*	17.7	3	19.7	2
	Quercus suber	*Quercus suber*	17.7	5	19.7	3
	Santalum acuminatum	*Santalum acuminatum*	17.7	11	19.7	8
	Sapium sebiferum	*Triadica sebifera*	17.7	11	19.7	11
	Sophora japonica 'princeton upright'	*Styphnolobium japonicum*	17.7	5	19.7	5

	Alexandrina Council Preferred Species	Taxon within CAT	Emissions Limited 2050		Scenario 1 2090	
			Projected Temperature, °C	Climate Rating	Projected Temperature, °C	Climate Rating
*	*Syzygium 'aussie southern'*	*Syzygium australe*	17.7	3	19.7	3
	Tristaniopsis laurina	*Tristaniopsis laurina*	17.7	11	19.7	6
	Ulmus glabra leutescens	*Ulmus glabra*	17.7	2	19.7	2
	Ulmus parvifolia 'murray's form'	*Ulmus parvifolia*	17.7	11	19.7	8
^	*Ulmus parvifolia 'todd'*					
	Ulmus procera	*Ulmus minor*	17.7	3	19.7	2
	Zelkova serrata var 'green vase'	*Zelkova serrata*	17.7	8	19.7	5

Legend

Climate Rating

0	Not known and not likely	6	Shoulder of BG range
1	Not known but possible	7	Shoulder of urban range
2	Not known but likely	8	Shoulder of natural range
3	Near edge of BG range	9	Middle of BG range
4	Near edge of urban range	10	Middle of urban range
5	Near edge of natural range	11	Middle of natural range

Risk Codes

0	Species not known to occur at this temperature
1	At the edge of the known temperature for the species
2	Species known to occur at this temperature
3	Species mostly occurs at this temperature

7.3. Discussion - Climate suitability of Alexandrina Council preferred species

The analysis indicates that the majority of Alexandrina Council's preferred tree species exhibit good climate suitability under the 2050 emissions-limited scenario. This is largely attributed to the inclusion of numerous native and indigenous species, as well as exotic species originating from regions with comparable climatic conditions. Species situated at the 'edge of their climatic range are typically exotics from cooler climates, such as Fraxinus spp. and Ulmus spp. Notably, *Acer ×freemanii* and *Pyrus ussuriensis* are considered unlikely or unsuitable under this scenario.

Under the 2090 Scenario 1, climate suitability declines for many species, with a shift towards the 'edge' or 'shoulder' of their viable range. An increase in species classified as 'Not known but likely' is also observed, although some of these may be inferred from their marginal viability under the 2050 emissions-limited scenario.

This scenario highlights the significant challenges associated with maintaining a viable urban forest under a continued high-emissions trajectory. Should this pathway persist, the existing species palette would become increasingly constrained, necessitating the consideration of alternative species. These alternatives may include a higher proportion of exotic or currently underutilised species, some of which may presently be considered undesirable or invasive.

When species are rated as medium or high risk under future climate scenarios, a decision-making framework should be used to assess their inclusion, replacement or monitoring in urban and landscape plantings with CAT suggesting a management response decision tree for those species proposed or in use that are not considered suited to future climate scenarios (Figure 32).

After finalising this Study on climate suitability of Alexandrina's preferred species, the *'Predicting climate impacts on Adelaide's urban trees through expert elicitation'* report from the University of Adelaide was published. It is recommended for Council to review the outcomes of this Study with outcomes of the Adelaide metropolitan study, noting the differences of the microclimate and ecosystems between Adelaide and Alexandrina.

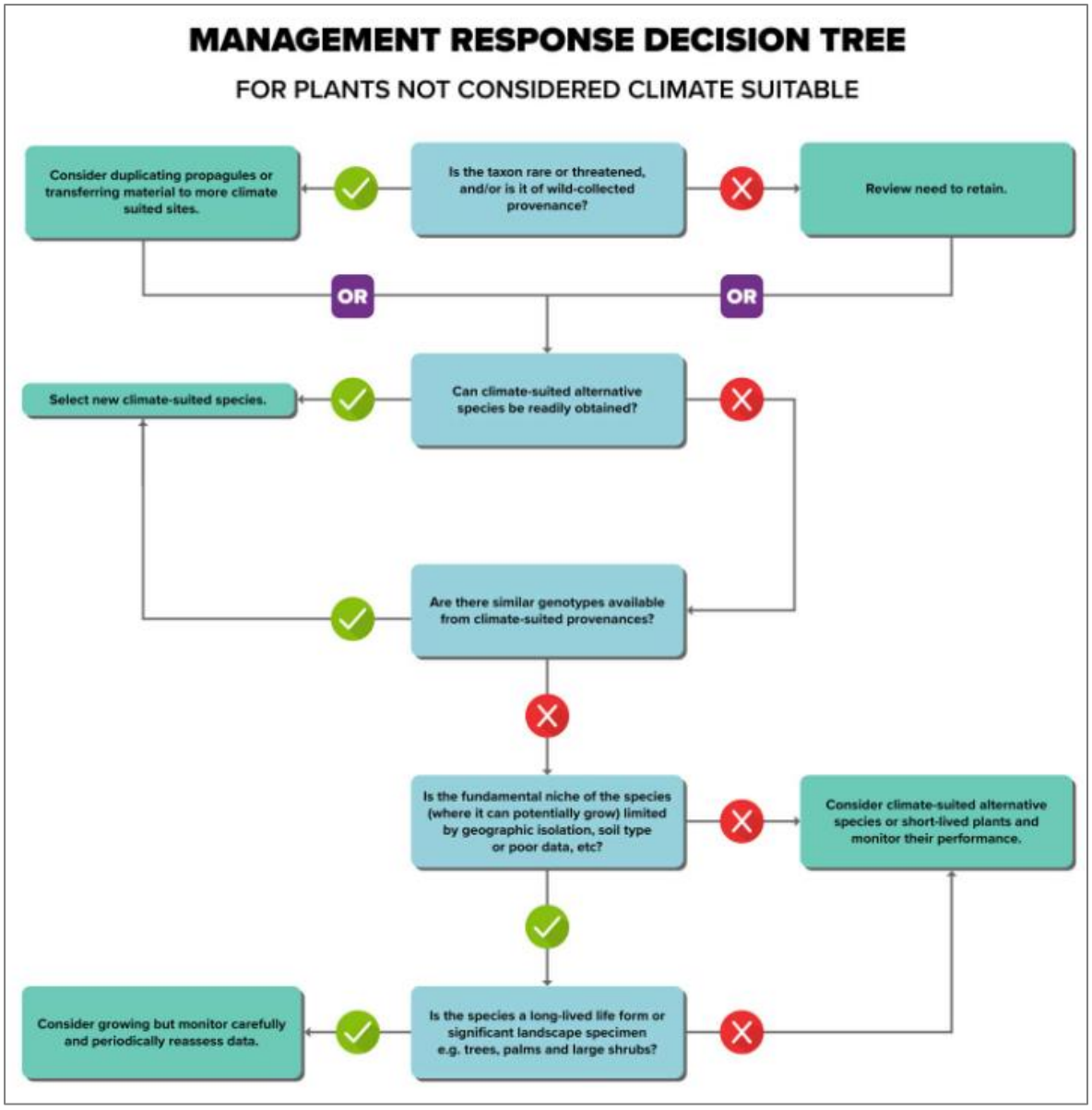


Figure 32: CAT suggested management tree for medium and high risk taxa (Climate Change Alliance of Botanic Gardens 2025).

7.3.1. Other considerations for Alexandrina Council preferred species

It is important to note that the Climate Assessment Tool is a guidance resource and not definitive. Its predictions are based on robust scientific data and global databases (e.g. GBIF, PlantSearch) and estimate which plant species are more likely to suit future climates; however, not all tolerances are documented.

While this modelling demonstrates predicted heat tolerance, there are other key considerations to species suitability that include:

- Drought or humidity tolerance.
- Salt tolerance.
- Response to climate extremes (e.g. heatwaves, frost).
- Local soil (particularly limestone rich).
- Niche climate patterns.

In general, the temperature ranges are more reliable indicators than precipitation for future survival, as irrigation can offset water stress (assuming available water and not drought conditions), but temperature extremes are harder to manage.

Another consideration is that plant success outside predicted ranges may result from:

- Natural genetic variability or adaptive capacity.
- Limited distribution data.
- Unique provenances adapted to warmer climates.
- Physical barriers restricting species range.
- Cultivation bias in certain climates.

This suggests that while CAT provides good insight into reducing climate-related risks in landscapes and green infrastructure, the information should be used in conjunction with other key considerations and factors to help guide diversification in plant selection. On-ground trialling with data recording and analysis is needed and should be continued and can be captured within a tree asset management system.

8. Discussion

8.1. Community engagement and role

8.1.1. Planting framework considerations

Successful tree planting programs rely not only on environmental planning but also on community support. A socially informed planting framework ensures that trees are valued, protected and maintained over time. Community consultation should inform township selection and planting locations. Areas where residents actively support greening efforts through participating in watering or local planting days offer greater potential for long-term success. In contrast, areas with past resistance to planting, like the removal of Araucarias in Middleton, highlight the risk of misalignment between species selection and community preferences.

Whilst outside the scope of this Study, planting plans and activity may want to consider early prioritisation for communities demonstrating strong stewardship. These areas are more likely to achieve successful establishment and broader community ownership. Townships less supportive may require further engagement or deferment until stronger alignment can be achieved.

To avoid costly removals or neglect, species and planting design must be context sensitive. Selecting appropriate species and engaging communities early in the process can ensure plantings are both ecologically beneficial and socially accepted.

8.1.2. Community planting and tube stock

Community planting initiatives are an effective means of fostering local engagement, enhancing biodiversity, and supporting Alexandrina Council's broader urban greening and climate resilience objectives. Within open space areas such as parks and reserves, community participation is both appropriate and highly beneficial, offering opportunities for environmental education, stewardship and tangible contributions to local biodiversity and amenity.

Members of Council's Section 41 Climate Emergency and Environment Advisory Committee (CEEAC) have expressed strong interest in facilitating community-led planting activities, particularly through the use of tube stock within parks and reserves. This approach is well supported in the literature as an effective means of fostering community ownership and contribution while delivering environmental benefits.

A study by the Arthur Rylah Institute (Jellinek, O'Brien, & Bennett, 2020) assessed the survival rates of tube stock plantings across Victoria. It found that, following the first summer, tube stock achieved an average survival rate of 61%, a figure consistent with comparable studies in rural and peri-urban

contexts. Notably, this Study included plantings undertaken without ongoing maintenance beyond the initial establishment.

Further evidence from the Australian Capital Territory during the millennium drought (2006–2009) demonstrated first-year survival rates of 56–66%. In wetter periods (2010–2012), survival improved significantly to 74–88%, with eucalypt species performing markedly better than shrub species (Hnatiuk et al., 2020). The study also noted that mortality was highest in the first year but declined in subsequent years, with an overall five-year survival rate of approximately 49%.

While these results are not specific to urban streetscapes, they provide a useful benchmark. In municipal open space settings where minimal watering, mulching or basic maintenance is provided, it is reasonable to anticipate tube stock survival rates between 50–70% over several years. Given Alexandrina's climate is characterised by declining and inconsistent rainfall, and the uncertainty around Council-funded watering programs, a conservative survival rate of 60% over four years has been applied to tube stock plantings in Milang (Scenario 8).

8.1.3. Tube stock suitability for streetscapes

While community planting is highly suitable for open spaces, it presents significant challenges within streetscapes. Targeted street tree planting is essential for addressing the Urban Heat Island (UHI) effect, improving local amenity and increasing canopy in areas of highest need. However, streetscapes pose substantial Occupational Health and Safety (OHS) risks to volunteers including traffic hazards and damage to underground and overhead services.

Urban environments differ significantly from parklands in terms of soil health, water availability, and exposure to human activity. This often results in lower survival rates and suboptimal growth for tube and small stock unless intensive care is provided.

Tube stock, due to its small size and limited root development, is particularly vulnerable to damage and removal. Additionally, smaller plantings may be perceived as temporary or insignificant, reducing public deterrence against removal or vandalism.

The use of tube stock in urban streetscapes generally results in poor establishment outcomes. Common issues include:

- Vandalism and accidental damage (e.g. from vehicles).
- Deliberate removal by residents opposed to planting locations.
- Poor root establishment due to compacted or highly modified soils lacking supportive microbiota and adequate drainage.

Given these constraints, streetscape plantings should be delivered primarily through professional contractors using advanced nursery-grown stock, in accordance with AS 2303:2018 – *Tree Stock for Landscape Use*. This ensures trees are structurally sound, resilient, and have a higher likelihood of successful establishment in challenging urban conditions.

8.1.4. Biodiversity

Community-led planting initiatives such as the Second Nature Revegetation / Restoration Action Plans for Milang Common play a significant role in enhancing biodiversity. Within parkland and open space environments these programs can contribute to biodiversity outcomes in several key ways:

1. **Species diversity and habitat complexity**

Community programs often focus on planting a mix of indigenous trees, shrubs, grasses and groundcovers. This increases plant species diversity, leading to more structurally complex habitats that support a wider range of wildlife, including insects, birds and small mammals.

Tube stock planting is particularly effective for understorey vegetation, which is often underrepresented in urban landscapes but critical for ecosystem function.

2. **Habitat restoration and connectivity**

Community plantings contribute to restoring degraded sites and improving ecological connectivity between fragmented habitats. This is especially important in semi-rural and peri-urban areas like Alexandrina, where patches of natural habitat are dispersed.

Well-planned plantings increase food resources, shelter and breeding sites for native fauna, supporting local ecological networks.

3. **Resilience to climate change and localised threats**

Increasing vegetation diversity through community planting enhances ecosystem resilience. Diverse plantings are better able to withstand pests, diseases and climate extremes compared to monocultures or heavily modified landscapes.

A greater variety of plant species also supports a more resilient pollinator and soil microbe community, further strengthening ecological stability.

4. **Community stewardship improves biodiversity outcomes**

When the community participates in planting, they are more likely to develop stewardship behaviours including informal monitoring, supplementary watering and protection against vandalism. This increases the survival rates of plantings and ensures that biodiversity benefits are realised over the long term.

Ongoing community involvement also encourages awareness of local ecosystems, fostering support for biodiversity-friendly management practices in the future.

5. **Complementing formal biodiversity programs**

While council-led ecological restoration typically focuses on high-conservation-value sites, community planting expands this effort into parks, reserves, and buffer zones. This creates semi-natural habitats that complement conservation efforts in remnant vegetation and formal reserves.

In summary, community planting programs within parks and reserves can directly contribute to increased canopy cover and improved biodiversity from increased species richness, enhanced habitat quality and through fostering ecological resilience. While tube stock overall survival rates may be lower than advanced stock, the cumulative effect of regular, well-supported community plantings contributes meaningfully to Alexandrina Council's canopy cover, biodiversity, climate resilience, and community engagement objectives (e.g. Alexandrina Council n.d b, Alexandrina Council n.d d). Scenario 8 demonstrates that overall cost savings may be available with such programs due to stock cost and ongoing management reductions.

8.2. Council tree and canopy cover management considerations

8.2.1. Carbon sequestration in urban and street trees

Urban and street trees play a critical role in climate change mitigation through carbon sequestration - the process by which trees absorb atmospheric carbon dioxide (CO_2) and store it as biomass. This natural function significantly contributes to the reduction of urban greenhouse gases.

Despite often being planted in constrained spaces and compacted soils, street trees continue to sequester carbon throughout their lifespan. Larger, mature trees provide exponentially greater carbon storage, making their preservation especially valuable. In addition to their role in carbon storage, urban trees offer numerous co-benefits, including improved air quality, reduced urban heat island effects, stormwater management and enhanced community wellbeing.

Maximising the carbon sequestration potential of the urban forest requires strategic species selection, favouring trees with high growth rates, long life expectancy, and structural resilience. Integrating these considerations into streetscape design, urban planning and asset management ensures that the climate mitigation benefits of urban trees are fully realised over time.

Alexandrina Council's Carbon Neutral Plan (Alexandrina Council 2022 b) explicitly recognises the value of urban greening as a carbon abatement strategy. The plan acknowledges that the sequestration potential of trees depends on species type, local growing conditions and individual tree longevity. Based on a scenario where 365 trees are planted each year from 2022 to 2039,

Council projects the potential to sequester approximately 1,401 tonnes of CO_2-e by 2040, which is a significant offset against its residual emissions profile.

Beyond carbon abatement, tree planting supports broader social and environmental objectives. In this context, urban greening not only supports Alexandrina Council's pathway to carbon neutrality but also helps build more resilient, liveable and ecologically vibrant communities for current and future generations.

8.2.2. Bushfire risk zones and powerline impact on tree planting

A limiting factor in achieving canopy cover within Alexandrina is the influence of Bushfire Risk Zones on species selections for planting and the impact of powerlines on tree canopies. Designated bushfire risk zones range from *Fire Risk*, *Prescribed No Fire Risk*, and *No Fire Risk* across Alexandrina's 11 townships, with these classifications informing the applicable vegetation clearance regulations around powerlines and the types of trees that may be planted near electricity infrastructure.

The Office of the Technical Regulator (OTR) provides two lists of approved species deemed suitable for planting under or near powerlines, considering their typical growth form and crown spread. The aim of these lists is to minimise long-term powerline clearance issues by selecting shrubs and trees based on their mature height and proximity to powerlines.

An issue with these lists is that they are not conducive to larger trees and those that provide significant canopy, with most species on the list being under 4m in height and generally classified as shrubs rather than trees. While exemptions may be sought from the OTR, this is a generally prohibitive approach to enhancing canopy cover. This is further complicated by clearance zones required around powerlines and the management of vegetation around these as described below.

Clearances around buildings for bushfire safety also results in clearing and limits new planting site options. Current exemptions apply for any tree located within 20m of a dwelling (even proposed) within a high or medium risk bushfire area. Currently, the only mechanism Council has available is, in collaboration with the Country Fire Service (CFS), to require retention of the tree via a Land Management Agreement (LMA) that is registered on the Certificate of Title.

8.2.3. Powerline clearance

In the Alexandrina Council region, vegetation management around powerlines is regulated under the *Electricity (Principles of Vegetation Clearance) Regulations 2021*. These regulations establish mandatory vegetation clearance and buffer zones to ensure public safety, reduce fire risk, and maintain reliable power supply.

- For Aerial Bundled Cables (ABC), a minimum 0.1 m clearance from poles and conductors is required in all directions, plus a 2.0 m buffer zone, creating a total pruning envelope of 2.1 m.
- For Low Voltage (LV) non-insulated lines, clearances are 0.1 m in non-bushfire risk areas and 0.5 m in bushfire risk areas, with a 2.0 m buffer zone resulting in total envelopes of 2.1 m and 2.5 m respectively.
- High Voltage (HV) non-insulated lines require 1.5 m clearance in non-bushfire risk areas and 2.5 m in bushfire risk areas, each with a 3.0 m buffer, resulting in total pruning envelopes of 4.5 m and 5.5 m (Table 21).

Table 21: Simplified clearance and buffer zone requirements for vegetation around powerline types within designated areas.

Powerline Type	Area Type	Clearance Zone	Buffer Zone	Total Pruning Envelope*
Aerial Bundled Cables (ABC)	All Areas	0.1m	2.0m	2.1m
LV Non-Insulated Lines	Non-Bushfire Risk	0.1m	2.0m	2.1m
	Bushfire Risk	0.5m	2.0m	2.5m
HV Non-Insulated Lines	Non-Bushfire Risk	1.5m	3.0m	4.5m
	Bushfire Risk	2.5m	3.0m	5.5m

* Noting that the span length of powerlines (distance between poles) may impact clearance requirements as longer spans typically require larger clearance zones due to conductor sag and movement.

In reviewing these clearance specifications on the ground, it can be seen that this has marked implications on canopy form and heights (Figure 33). This regular deforming of canopy may impact on Alexandrina achieving the desired canopy cover targets. While species selections that follow OTR guidelines may assist in reduced cutting, their smaller size does not assist in providing meaningful canopy cover. Given these competing objectives a review of vegetation clearance regulations with bespoke management plans and a Memorandum of Understanding (MOU) may be required. Without this, opportunities to plant larger-canopy or longer-lived species will remain constrained in bushfire designated areas with overhead powerlines.



Figure 33 : Example of heavy cutting impacting on tree form for insulated powerline clearance within Ashbourne.

It is also worth noting the variation in regulatory approaches across states in Australia. As example under the Electricity Safety (Electric Line Clearance) Regulations (2019), Victoria requires less overall clearance area when considering buffer zones; for instance, a 30 cm clearance zone around insulated cables within low bushfire risk areas (LBRA) which is less restrictive than South Australia's 2.1 m total zone (Table 22).

While both regulations aim to minimise fire risk and maintain public safety, this disparity raises valid questions regarding the rationale for differing buffer distances for fully insulated lines and may warrant further review and dialogue with SA Power Networks (SAPN). This may facilitate exploration of local flexibility opportunities and development of a Memorandum of Understanding (MOU) between Council and SAPN to achieve both outcomes.

Advanced GIS mapping tools may be useful in visually representing vegetation constraints, helping to guide decision-making in species selection and planting placement through desktop analysis and AI modelling. Risk versus benefit should also be a key consideration as part of this decision-making process as described in greater detail in the following section.

Table 22: Simplified clearance zone requirements for vegetation around powerline types within designated areas contrasted between South Australia and Victoria (not considering variance due to span distances)

Powerline Type	Area Type	South Australia (Alexandrina)	South Australia (with buffer)	Victoria Minimum Clearance
Insulated Cable	All Areas	0.1m	2.1m	0.3m
Low Voltage (LV) Non-Insulated	Non-Bushfire Risk	0.1m	2.1m	0.3m
	Bushfire Risk	0.5m	2.5m	0.5m
High Voltage (HV) Non-Insulated	Non-Bushfire Risk	1.5m	4.5m	1.5m
	Bushfire Risk	2.5m	5.5m	2.5m

8.2.4. Canopy cover risk and benefit

Risk is a big factor in all aspects of human life, and in today's modern society there is a general trend to eliminating risk, minimising the risk of harm to humans, and to personal and economic loss. Often a risk framework looks at the risk item/event unilaterally, without considering the benefits the source of the risk may provide.

This is often the case for trees which are frequently inspected and recorded for their risk factors such as limb failures but rarely for their benefits; and when a tree or tree part does fail, it is often sensationalised. This tends to lead to an overprescription of works, e.g. tree removals, or constraints to eliminate perceived risk.

Tree conflict with powerlines is an example where trees are constrained via a highly limited list of small-growing species. The Office of the Technical Regulator (OTR) prescribes the rules for planting new trees near power lines and within Bushfire risk areas (Office of the Technical Regulator (OTR) n.d). It is arguable that the constraints may be excessively conservative under certain scenarios.

There is no debate that vegetation contacting powerlines, particularly exposed high voltage lines can result in combustion leading to bushfires (Energy Networks Australia 2020; Australian Climate Service n.d.). It is also appreciated that while there may only be a low percentage of total bushfires

started from powerline contact (Energy Networks Australia (2020) indicated that 2.7% of bushfires were ignited by electrical faults), these have the potential for catastrophically destructive outcomes.

As a result, the OTR provides Approved Species Lists (List 1 and List 2) of trees that can be planted within certain distances of powerlines, which are generally small shrubs with limited canopy size that limits contribution to canopy cover and associated benefits. Councils can seek exemptions from the OTR for planting trees not on the approved list, although these generally have the same characteristics as those from the lists in that they will not grow into the prescribed clearance zone at maturity. Buffer Zones are also required around powerlines as described in Section 8.2.3 *Powerline clearance,* which further impacts upon tree form, longevity and potential for contributing meaningful canopy cover at maturity.

While this may factor the impact of vegetation on powerlines and reduce the likelihood of bushfires occurring from vegetation/powerline conflicts, it is unclear whether the constraints stipulated put sufficient weight on the benefits of tree canopy to the community, particularly in light of predicted climate change.

Between 2000 and 2018, extreme heat events led to at least 473 heat-related deaths in Australia, with approximately 25% occurring in South Australia. This equates to a fatality rate of approximately 0.31 per 100,000 people, among the highest in Australia (Coates et al. 2021 a, Coates et al. 2014, Herbst et al. 2014).

Melanoma incidence in South Australia is another significant public health concern (Preventive Health SA 2023), and in in 2019, 879 South Australians were diagnosed with melanoma (Preventive Health SA 2022).

Melanoma of the skin was the third most commonly diagnosed cancer in Australia in 2020, and in 2024 it is estimated that a person has a 1 in 17 (or 6.0%) risk of being diagnosed with melanoma of the skin by the age of 85, with1 in 14 (7.0%)for males and 1 in 21 (4.9%) for females (Cancer Australia 2025).

This underscores the pressing public health challenge posed by sun exposure and extreme heat in South Australia, highlighting the need for comprehensive strategies to mitigate exposure and heat-related risks.

In contrast, bushfire fatalities are episodic and relatively rare. This is further complicated in ascribing the cause of the fire directly to powerline vegetation contacts, with other ignition sources well documented (CFS South Australian Country Fire Service. n.d.).

Examples of bushfire fatalities in South Australia include

- Ash Wednesday (1983): 28 people died in SA as a result of the Ash Wednesday fires (Wikipedia n.d.; Australian Disaster Resilience Knowledge Hub n.d. a).
- Black Tuesday (2005, Eyre Peninsula): Resulted in 9 deaths (Climate Council n.d.).
- Kangaroo Island (2019-2020 Black Summer): 2 deaths (Australian Disaster Resilience Knowledge Hub n.d. b).
- Cudlee Creek (2019-2020 Black Summer): 1 death (Australian Disaster Resilience Knowledge Hub (b) n.d.). This was cause by a large tree falling in from outside the prescribed buffer zone.

The benefits of canopy cover for cooling effect are described, which may mitigate heat related deaths and illnesses within the general population. Shade is a highly effective and crucial strategy for preventing melanoma formation and other forms of skin cancer (Cancer Institute NSW 2025, Cancer Council n.d.). Melanoma is primarily caused by overexposure to harmful ultraviolet (UV) radiation from the sun, and shade directly reduces this exposure.

Shade significantly reduces exposure to UV radiation and, depending on the type and density of the shade, it can block anywhere from 50% to 95% of UV rays (Cancer Institute NSW 2025, Neale et al. 2023). These studies recognise that high-quality natural shade from dense tree canopies can block both direct UV exposure and where particularly where canopies are closer to the ground can reduce indirect UV exposure.

There are no national consensus or guidelines around vegetation-powerline clearances, and the topic is hotly debated.

Dr Greg Moore OAM, Senior Research Fellow at the University of Melbourne, has questioned the Victorian Government's recent dismissal of a unanimous recommendation from its own elected industry advisory group to reduce clearance space around low voltage (LV) conductors in low bushfire risk areas (LBRA) (Moore 2025). While he acknowledges that Energy Safe Victoria is right to consider the potential risks of electrocution and fire associated with conductors, Dr Moore highlights that there is no evidence linking such risks to LV conductors in LBRA.

Dr Moore observes that reducing powerline clearance distances would immediately support the retention of urban tree canopy—not only in metropolitan areas, but also in regional centres and country towns across Victoria. Given the ongoing decline in canopy cover nationwide, he emphasises that such a reform would deliver significant environmental, economic, and public health benefits, including improved resilience to heatwaves.

He contends that the Victorian Government's rejection of a well-supported, evidence-based proposal places disproportionate emphasis on a minimal fire or electrocution risk, while neglecting the far more certain and escalating threat of heat-related illness and mortality due to climate change. In this context, Dr Moore goes so far as to suggest that such inaction may constitute a form of negligence (Moore 2025).

This sentiment is echoed further in academic circles. Dr Thami Croeser from RMIT's Centre for Urban Research noted that "hard pruning for powerlines deprives communities of a proper urban forest" and may result in "trees providing less canopy cover, which become structurally imbalanced and lead to reduced lifespans" (Croeser 2025, pers. comm., 2 July).

With the potential for worsening climate conditions and increased heat-related morbidity, a comprehensive benefit-risk analysis should be undertaken to balance the risks of powerline damage and fires against the impacts of heat and sun exposure. This review may necessitate revisiting powerline clearance regulations and establishing a Memorandum of Understanding (MOU) between the Council and powerline service providers to better align vegetation management with broader environmental and community health objectives.

8.2.5. Planning and development - Tree retention and removal

Urban vegetation and green infrastructure are increasingly recognised for their contributions to healthier, more resilient communities. However, they remain under pressure from ongoing urban development and densification (Haaland & Bosch, 2015).

While recent reforms introduced on 16 May 2024 significantly updated the Regulated and Significant Tree Overlay for metropolitan Adelaide, these changes do not currently apply to the Alexandrina Council area (PlanSA, 2024, PlanSA. n.d.).

Notwithstanding this, it is understood that the State Government is reviewing the potential application of the Regulated and Significant Tree Overlay to townships within the Greater Adelaide region, including Alexandrina.

8.2.6. Current tree protections in Alexandrina

In the absence of the Regulated and Significant Tree Overlay, tree protection in Alexandrina is primarily governed by the *Native Vegetation Act 1991* (SA). Under the Planning and Design Code, development proposals that may result in the clearance of native vegetation are assessed against:

- The Native Vegetation Overlay; or
- The State Significant Native Vegetation Area Overlay.

If applicable, such proposals may be referred to the Native Vegetation Council (NVC) for assessment. However, not all clearance triggers referral. Referral is based on classification levels (Level 2, 3, or 4) and an assessment of the clearance against the principles of the Native Vegetation Act, including consideration of exemptions.

Referral triggers include:

- Area of clearance.
- Vegetation type and condition, including threatened ecological communities.
- Proximity to sensitive habitats.
- Purpose of clearance, such as firebreaks versus development.

Exemptions apply to certain types of clearance, including:

- Essential infrastructure works.
- Firebreaks (with conditions).
- Minor clearance for building footprints, setbacks or along property fence-lines.

(See PlanSA 2020 and Native Vegetation Council 2020 for examples).

In some instances, minor or exempt clearances may be handled directly by Council under delegated authority rather than requiring NVC referral.

8.2.7. Heritage and urban tree canopy overlays

Trees may also be protected where they form part of a Local Heritage Place or State Heritage Place, managed through the Local Heritage Place Overlay or the Heritage Adjacency Overlay. Protection requires development to respect the heritage values of the site. To specifically list a tree as a heritage place, a Code Amendment process must be completed under the Planning, Development and Infrastructure Act 2016 (SA).

The Urban Tree Canopy Overlay within the Code applies to limited locations in Alexandrina, including parts of Middleton and Strathalbyn (Figure 34 & Figure 35). This overlay mandates tree planting for new dwellings in designated greenfield areas or allows developers to contribute to the Tree Canopy Offset Fund as an alternative.



Figure 34: Urban Tree Canopy Overlay Middleton (yellow shaded).



Figure 35: Urban Tree Canopy Overlay Strathalbyn (yellow shaded).

However, the Overlay's design focuses primarily on lot-scale planting with smaller trees permitted for smaller lots and substitution of numerous smaller trees for larger trees. This does not fully address the disproportionate ecological benefits provided by mature trees. Research consistently demonstrates that large, mature trees provide exponentially greater benefits in terms of canopy

area, biodiversity, shade and ecosystem services compared to juvenile trees (Turner-Skoff & Cavender, 2019; Santin et al., 2023).

Substituting large trees with smaller species or juvenile stock results in a substantial loss of canopy volume, not always visible in plan-based assessments. This is a critical consideration for maintaining canopy quality, as discussed in Section 8.2.11 Planning design and vegetation quality for canopy cover.

8.2.8. Public tree management

The Tree Management Policy (Alexandrina Council 2023 a) and Tree Management Procedure (Alexandrina Council 2023 b) guide the protection, management, and removal of trees on Council-managed land such as streets, verges, parks, and reserves. While the Planning and Design Code discourages the removal of mature street trees, particularly for vehicle crossovers and new access points (DTS/DPF 3.5), tree removal may be considered as a last resort where no feasible alternative exists.

If removal is approved, fees are applied, including:

- Tree Removal Fee – Cost recovery basis if removed by Council, or at the applicant's cost with approval.
- Tree Replacement Fee – $750 (inc. GST) to contribute to Council's replacement planting program.
- Tree Valuation Fee – 25% of the tree's amenity value as calculated from the City of Melbourne Method, applied where a reasonable alternative to removal existed (e.g. design modification). This does not apply to pest species (described in the Tree Management Procedure (2023).

As an example, the Moreton Bay Fig at The Strand, Port Elliot has a Council calculated amenity value of $466,335 reflecting its amenity cultural and historical significance, which is effectively irreplaceable. Under the Tree Management Procedure (and if approved by Council) a tree valuation fee of $116,584 would be applicable which may not reflect the irreplaceable nature of this tree.

As further comparison, commonly observed street trees such as *Eucalyptus* species with a diameter at breast height (DBH) of 30–50cm generate amenity values ranging from $5,857 to $16,270, resulting in valuation fees of $1,464 to $4,068. This fee structure may not provide a sufficient deterrent against tree removal, particularly relative to the cost of development or driveway installation, which may run into tens or hundreds of thousands of dollars and provide lucrative

returns at point of sale or facilitate ease of use. There does not appear to be any precedent or justification for applying this 25% reduction value.

8.2.9. Potential future changes

If the Regulated and Significant Tree Overlay were to be extended to Alexandrina, it would introduce additional protections for trees meeting specific size and species criteria. Under this framework, removal of regulated or significant trees would trigger mandatory offset payments into a Council Fund (if established) or into the State Planning and Development Fund (Practice Direction 12 – Conditions 2020).

The March 2024 public agenda (Alexandrina Council 2024b) notes the possibility of pursuing the overlay's application to townships in the future, but as of October 2025 it still does not apply.

8.2.10. Implications and recommendations

Private land canopy loss has the greatest overall impact, as private holdings constitute the majority of land area in Alexandrina. Without stricter protections, there is a risk of cumulative canopy loss from piecemeal removal of public trees for access or development.

In the review of international approaches to protecting and retaining trees on private urban land, Barona et al. (2021) identifies that retention of trees on private land can only occur through the combined action of policies, planning schemes, local laws, and financial incentives with community engagement and stewardship.

The current valuation and fee structure may not adequately discourage tree removal nor compensate for the long-term loss of ecosystem services. The lack of clarity regarding replacement locations, tree age, Useful Life Expectancy (ULE), and canopy contribution raises concerns about whether lost canopy is genuinely replaced in the local context.

It is recommended that the 25% factor in tree value calculation for the Tree Valuation Fee is immediately withdrawn. It is also recommended that the AANZAA-Value method be considered to replace the City of Melbourne (CoM) method as the CoM calculation basis is several years old and, therefore, understated.

A comprehensive Council wide integrated tree inventory and canopy monitoring program would provide critical data to support better decision-making, strengthen urban greening outcomes, and improve future planning assessments. To facilitate tree inventory, risk and maintenance management, a TMS (tree management system) should be considered. The leading two systems in Australia are Forestree (SA based) and TreePlotter (US based).

8.2.11. Planning design and vegetation quality for canopy cover

In achieving urban canopy cover targets (particularly within areas of new development) it is essential to consider not only the quantity but also the quality of vegetation and the species selected. The effectiveness of canopy cover is influenced by factors such as tree maturity, structure, and ecological function, all of which impact the delivery of environmental benefits over time.

An internationally recognised example is Singapore, widely regarded as a global leader in urban greening. Between the mid-1980s and 2007, Singapore increased its vegetation cover from 35.7% to 46.5%, with Ong and Ho (2012) identifying the quality of vegetation as a critical factor in this transformation. To quantify and assess vegetation quality, tools such as the Leaf Area Index (LAI) and Green Plot Ratio (GnPR) were employed.

The Leaf Area Index (LAI) is a key ecological metric used to evaluate vegetation health. It measures the total leaf surface area per unit of ground area and is closely linked to the ecological functioning of vegetation, including photosynthesis, transpiration, and metabolic activity (Ong, 2002). LAI is also relative to tree height and volume, highlighting the superior performance of taller, mature trees in delivering canopy coverage and associated ecosystem services (see Figure 36).

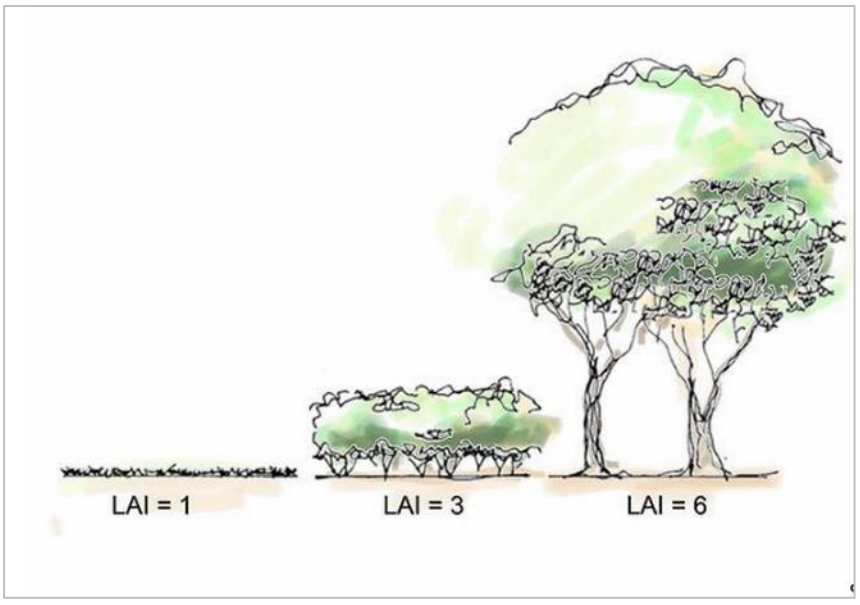


Figure 36: How LAI relates to height and volume, with larger height and volume attaining a higher LAI.

Research by Turner-Skoff & Cavender (2019) supports this approach, demonstrating that large trees provide exponentially greater environmental and social benefits than smaller trees. Similarly, Santin et al. (2023) found that taller trees deliver enhanced biodiversity outcomes, further reinforcing the importance of species selection and tree maturity in urban greening strategies.

The Green Plot Ratio (GnPR) complements LAI by providing a site-level measure of greening. It is calculated by dividing the total area of vegetated spaces such as parks, gardens, rooftop gardens, and vertical green walls by the total land area of a development (Ong & Ho, 2012; Figure 37). A higher GnPR reflects a more sustainable development with a stronger green infrastructure presence relative to built form, contributing to a more liveable and climate-resilient urban environment.

GnPR aims to mitigate the adverse impacts of urbanisation, including air pollution, the urban heat island effect, and biodiversity loss, by encouraging the integration of natural elements throughout the built environment. These include traditional green spaces as well as innovative features such as green roofs and vertical greening systems that provide both aesthetic value and ecological function.

Alexandrina may benefit from the adoption of tools like LAI and GnPR in providing a robust framework for guiding urban greening efforts and establishing clear, measurable targets for canopy cover in new developments. These tools can help ensure that urban forest strategies are not only focused on canopy percentage but also aligned with broader goals of climate resilience, biodiversity, and urban liveability.

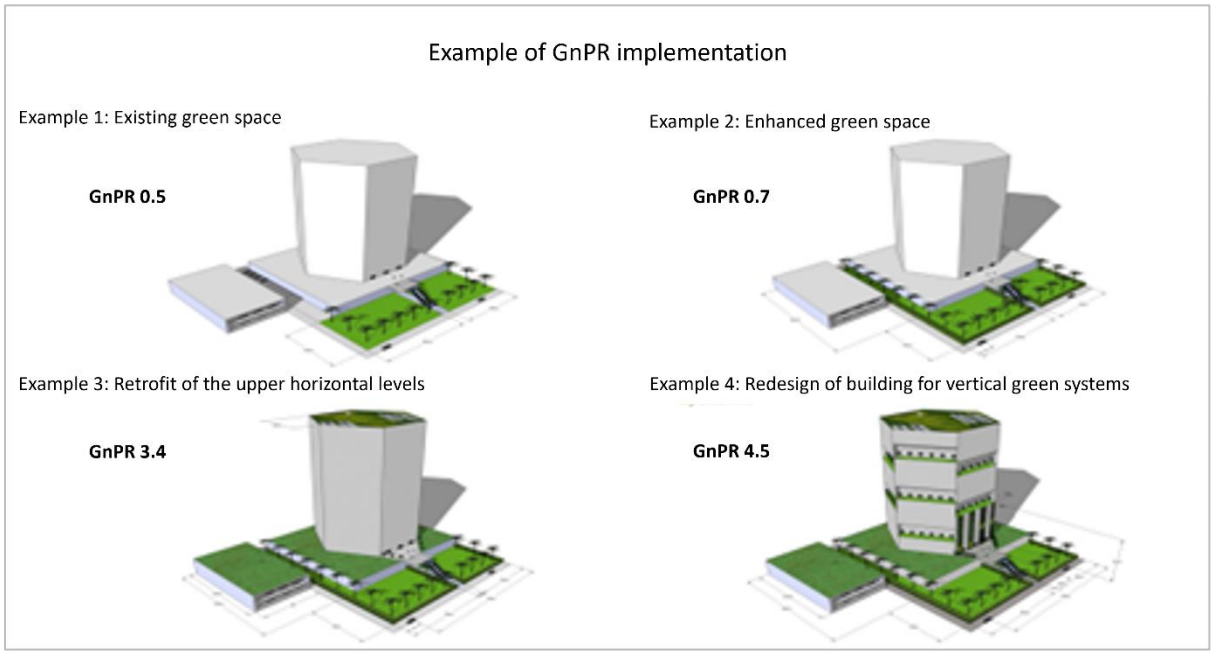


Figure 37: Example of GnPR values that incorporate LAI (Ong 2023).

An example of how this may apply to Council land is provided in Luard Street in Milang (Figure 38). The Norfolk Island Hibiscus (*Lagunaria patersonia*) on Council managed land provide limited canopy spread relative to what may be achievable to other urban tree species, which may constrain the effectiveness of the location in contributing to meaningful canopy cover.

To maximise canopy coverage and associated benefits at each location, it is useful to provide high planting densities for canopy maximisation and/or prioritising those with broad, well-structured canopies where space and site conditions allow while higher planting densities are limited.

In situations where narrow-canopied or low-performing species have been historically planted, supplementary infill planting may be required to improve canopy density and spatial distribution. In some cases, a targeted removal and replacement program may be warranted, particularly where long-term canopy outcomes can be significantly improved through the selection of higher-performing species.

Strategic species selection that aligns with site constraints, infrastructure proximity, soil volume and climate resilience considerations is fundamental to achieving optimal canopy outcomes and ensuring long-term urban forest sustainability.



Figure 38: Street view image of Luard Street in Milang with Norfolk Island hibiscus (Lagunaria patersonia) trees on Council managed land.

8.2.12. Conservation design over conventional design

The promotion of *Conservation Design* over *Conventional Design* represents a key opportunity for Alexandrina Council to better support canopy cover retention and the integration of existing vegetation within new development areas (see Figure 39). Conservation Design principles prioritise the preservation of existing natural assets such as mature trees, remnant vegetation, topography, and hydrological features during the subdivision and construction phases. In doing so, this approach allows for the strategic placement of public open space in areas where mature canopy already exists, thereby reducing the likelihood of vegetation clearance and minimising the impact of construction activities on ecological assets. This contrasts with conventional design approaches, which typically prioritise maximum lot yield and road access efficiency, often resulting in the removal of significant vegetation and fragmented open space of lower environmental value.



Figure 39: Conventional subdivision design (left) vs. Conservation subdivision design (Chester County Planning Commission n.d., accessed June 2024) https://www.chescoplanning.org/municorner/conservationsubdivision/Definition.cfm.

By integrating Conservation Design principles into development assessment and planning processes, Alexandrina Council can advance key objectives associated with urban greening, biodiversity protection and climate resilience. Importantly, Conservation Design can support the achievement of canopy cover targets in a cost-effective manner by retaining existing trees that would otherwise require decades to replace through new plantings. In parallel, it is essential that such designs still address tree equity by ensuring that shade provision and vegetative benefits are distributed throughout the development and not solely in isolated public reserves, so that all residents benefit from localised shade, thermal comfort and aesthetic value.

Tree retention strategies under Conservation Design must also consider infrastructure setbacks, soil volume requirements and the long-term viability of retained trees within urban environments. Establishing formal development and best practice guidelines, or overlay controls that support the implementation of Conservation Design, may help embed these principles into Council's broader planning framework. Additionally, public education and early engagement with developers and landowners will be critical in ensuring the successful uptake and long-term viability of these approaches.

Seachange and *Beyond* are residential developments provided below as case studies to contrast conservation vs conventional design and other planning implications on tree planting and canopy cover.

8.2.13. *Seachange* – Goolwa

The *Seachange Over 50s Lifestyle Community* in Goolwa serves as an example of poor planning and landscape design with respect to urban greening, shade provision, and heat mitigation. This is particularly concerning given its demographic of older adults who are disproportionately vulnerable to heat-related health issues.

Although the development includes a central spine aligned north–south, aerial imagery suggests that vegetation along this axis and throughout the development is dominated by low-growing shrubs, topiary species, or small ornamental trees. These plantings provide limited canopy cover, which is insufficient for shading hard surfaces such as roads, driveways, and footpaths, or for reducing radiant heat gain on buildings (Livesley, McPherson & Calfapietra 2016). As such, the site lacks functional vegetative infrastructure capable of significantly moderating urban heat.

Lot sizes within the development are compact, resulting in closely clustered housing with minimal spacing between properties (Figure 40) This configuration restricts available soil volume and root zones for larger tree establishment, which is a critical factor for healthy urban tree growth (Rahman et al. 2020). Additionally, the majority of frontages are dominated by impervious or semi-pervious surfaces (e.g. granitic gravel, concrete), often without street trees or any meaningful shading elements. These hardstand areas function as urban heat reservoirs, exacerbating surface and ambient temperatures during hot weather.



Figure 40: Aerial image of the Seachange development (image Metromaps 09/05/2025).

Such a design presents significant risks to older residents who are particularly susceptible to heat stress, heat stroke and related mortality. According to the Australian Medical Association (2023), elderly individuals account for the majority of heatwave-related deaths in Australia. Furthermore, during extreme heat events, increased reliance on air conditioning systems exacerbates localised warming through heat exchange, contributing to the urban heat island (UHI) effect and placing additional strain on energy infrastructure (Santamouris 2015). This has broader systemic implications, including energy demand spikes, power outages and economic disruption.

The absence of strategic canopy cover reflects a fundamental failure in climate-resilient design, especially for developments catering to vulnerable populations. While community members may express concern about the perceived risks of large trees, such as limb drop, root intrusion or maintenance burdens, the public health benefits of mature trees far outweigh these risks when

appropriately managed. Trees play a proven role in reducing ambient temperatures, improving air quality, and enhancing overall wellbeing (Norton et al. 2015, Nowak et al. 2014).

It is, therefore, essential that urban design frameworks for retirement and over-50s communities integrate large-canopy trees and vegetated open space to meet both environmental and health outcomes. Informed decision-making must be supported through community education, clearly articulating the risk-benefit trade-offs of vegetation versus heat exposure. This should include data on the statistical likelihood of injury from trees compared to heat-related health events, enabling residents to understand and participate meaningfully in planning discussions that affect their health and longevity.

8.2.14. *Beyond* – Chiton

In contrast to the *Seachange* development, the *Beyond* development located in Chiton on the border of Alexandrina Council and Victor Harbor Council (west of Port Elliot), is a residential development recognised for its high standard of environmentally sustainable design and biodiversity integration.

The subdivision was initiated by the original landholders, the Wright family, who retain ownership of the adjacent wetland to the east of the development. From the outset, the development was designed with the explicit objective of delivering strong environmental outcomes.

To achieve this, all allotments were sold with mandatory encumbrances governing both the design of dwellings and the approach to landscaping. These requirements were aimed at ensuring that the built form and surrounding environment contributed positively to climate resilience, sustainability and biodiversity.

Key development conditions included:

- Passive solar design to maximise energy efficiency.
- High insulation and building performance standards.
- Mandatory installation of solar energy systems.
- Landscaping focused on biodiversity, using predominantly native species.

The design of Beyond prioritises the integration of interconnected open space corridors, ensuring that all properties have either direct frontage to a reserve or are within close proximity to public open space (Figure 41). These reserves are purposefully landscaped and maintained to support local biodiversity, with a particular focus on providing habitat for the native skipper butterfly (*family Hesperiidae*), amongst other species.



Figure 41: Beyond development with lot sizes indicated (yellow); Council owned and managed reserves (red).

Several reserves also feature community-oriented infrastructure, including shared fruit orchards and communal open spaces, designed to enhance social cohesion while delivering environmental benefits. Many of these areas are actively maintained by local residents, reflecting a strong sense of community ownership and stewardship.

A significant environmental asset within the development is the stormwater management system, which comprises multiple treatment basins connected by vegetated swales and weirs. This system is designed to effectively manage stormwater while simultaneously providing high-value habitat for native fauna. Notably, these stormwater basins have been successfully utilised for the conservation breeding and management of three endangered freshwater fish species, namely:

- Purple Spotted Gudgeon (*Mogurnda adspersa*)
- Murray Hardyhead (Craterocephalus fluviatilis)
- Southern Pygmy Perch (*Nannoperca australis*)

The success of these conservation outcomes highlights the capacity for urban infrastructure to deliver dual ecological and functional outcomes when appropriately designed.

For the past seven years, a resident volunteer group operating under the Alexandrina Council volunteer framework, has provided active assistance with the maintenance of these reserves. This includes weed management, pruning, revegetation, and general care of the biodiversity assets within the subdivision.

Despite the significant environmental achievements of Beyond, there are ongoing challenges associated with:

- Balancing community expectations regarding the appearance and use of naturalised open spaces.
- Maintaining an appropriate understanding of the ecological maintenance requirements amongst both residents and stakeholders.
- Managing the program within the constraints of available maintenance budgets and operational resources.

In summary, *Beyond* represents a strong and well-executed example of environmentally integrated residential development, demonstrating the feasibility of combining biodiversity conservation, sustainable urban design, and active community stewardship.

A critique of the development relates to dwelling footprints, which in many cases occupy the entire allotment width - similar although not as extreme in the layout observed in the *Seachange* development. Buildings are often constructed in close proximity to one another, which significantly limits opportunities for tree planting on private land and reduces the potential for canopy cover immediately adjacent to residences (Figure 42).



Figure 42: Example of close proximity buildings within the Beyond development.

The absence of proximate canopy contributes to a range of issues as previously described, including diminished cooling through shade and evapotranspiration, increased reliance on mechanical cooling, elevated energy demand, and associated increases in household energy costs.

Lot orientation is typically vertical to the road, with most property frontages measuring 13–15 metres; with larger frontages (around 20 metres) present but less common. Narrower lot widths reduce the capacity to accommodate adequate soil volumes necessary for the establishment of large trees, especially where dual driveways, footpaths, and underground services are present, compounding the risk of infrastructure conflict.

This reflects the broader challenge of balancing high land values and the desire to maximise built form against Conservation Design and retention/enhancement of vegetation. As demonstrated, developments are typically reliant on canopy cover and cooling benefits derived from adjacent public open spaces or larger neighbouring properties.

In some instances, this can result in a 'free rider' effect where private property owners benefit from shade provided by trees planted on surrounding parcels while being reluctant or unable to contribute to broader urban greening efforts themselves.

Despite these limitations, *Beyond* remains an important precedent, offering valuable lessons for the planning and design of future developments that aim to address climate resilience, urban biodiversity, and community liveability objectives across Alexandrina and comparable regional contexts.

8.2.15. New developments and developer-planted trees

Tree planting within new developments is often carried out by developers to satisfy streetscape and landscape design requirements. However, the long-term success and performance of these plantings are frequently variable and, in many instances, suboptimal. Common concerns include the selection of inappropriate species, poor-quality nursery stock, inadequate planting techniques, and insufficient maintenance during the critical establishment period (Moore, 2009; Hitchmough, 2017). At the point of handover to Council or the community, many trees already exhibit signs of stress, dieback or poor structural development, suggesting that survivability and canopy growth potential were not adequately considered during design or implementation (Saunders & Barclay, 2022).

To improve outcomes, stronger governance is needed over planting standards and developer obligations. This includes the integration of clear performance benchmarks, structured monitoring requirements and post-handover maintenance expectations. Newly planted trees should be entered into the Council's tree management system from the point of installation. Doing so enables effective condition monitoring and ensures that assets are either accepted into Council ownership or replaced/funded accordingly if they do not meet standards upon assessment (IPWEA, 2023).

Without these measures, the contribution of new development areas toward achieving long-term urban canopy targets remains limited. Moreover, poor establishment often results in higher replacement costs and diminished public trust in greening outcomes.

To support canopy continuity at the neighbourhood scale, Alexandrina Council is investigating mechanisms to reinvest offset funds collected from private tree removals into localised infill planting, thereby ensuring that replacement canopy is delivered within the same or adjacent areas. This approach promotes equitable access to urban shade, biodiversity, and heat mitigation benefits. A benchmark of ten replacement trees per removal has been proposed, which appears proportionate and practical in urban contexts (Alexandrina Council 2024).

In July 2025, the South Australian Government introduced the draft Design Standard 1 – Engineering Requirements for Land Division, as part of its Housing Roadmap to streamline development assessment and enable faster housing delivery (South Australian Government 2025). This standard applies particularly to larger developments in Master Planned Zones that involve public road construction or infrastructure vesting in Councils. It outlines consistent requirements across a range of infrastructure elements, including:

- Pavement design
- Stormwater and WSUD systems
- Road and corridor layout

- Service coordination
- Street landscaping, including trees.

The standard is supported by a draft technical manual and standard drawings, which aim to improve design consistency and reduce delivery costs. While these guidelines may assist with defining planting specifications and associated infrastructure design, it remains critical that all proposed trees for Council handover be recorded within a tree asset management system, ensuring transparent tracking, monitoring and accountability over the asset's life cycle.

8.2.16. Tree management system/Tree asset register

Many Councils across Australia are implementing Tree Asset Registers and Tree Management Systems (TMS) as a crucial part of their urban forest management. The value of this for council's is substantial, encompassing a wide range of environmental, economic, social and operational benefits. It's not just about knowing where the trees are; it's about strategically managing and accounting for vital living assets, identifying and quantifying these benefits, and determining how this informs policy and objectives at the wider Council level and action plan. The following provides a list of the functions and benefits a TMS can provide.

- **Enhanced asset management and operational efficiency**
  - Comprehensive Tree Inventory: A detailed and accurate database captures essential information for each public tree street trees, parkland trees and reserve trees, including species, age, health status, size, location (via GIS) and maintenance history.
  - Proactive Maintenance Planning: Enables strategic scheduling of pruning, watering, pest and disease management and nutrient application. This transition from reactive to proactive tree care significantly reduces emergency maintenance costs and disruptions.
  - Risk Management: Facilitates early identification of hazardous trees (e.g. diseased, dead, or structurally unstable), allowing councils to prioritise remediation or removal, thereby minimising public liability and the potential for injury or property damage.
  - Optimised Resource Allocation: Supports data-driven decision-making for the allocation of budgets, personnel, and equipment by highlighting areas of highest need based on tree condition and council priorities.
  - Improved Workflow Efficiency: Digital data collection in the field integrates directly into the system, streamlining work order management for arborists and reducing administrative overhead.

- Performance Monitoring: Tracks and evaluates tree maintenance activities, associated costs, and outcomes over time, enabling continuous improvement and evidence-based reporting.

- **Supporting environmental and sustainability goals**
  - Canopy Cover Tracking: Provides precise metrics on current tree canopy coverage, enabling councils to monitor progress toward targets (e.g. achieving 20% canopy cover by 2055) and to identify priority planting zones.
  - Biodiversity Enhancement: Informs species selection strategies to improve biodiversity, resilience to pests and diseases, and the provision of habitat for native fauna.
  - Climate Change Adaptation:
    - *Urban Heat Island Mitigation*: Identifies areas with low canopy density to prioritise shade tree planting, reducing ambient temperatures and decreasing energy consumption for cooling.
    - *Stormwater Management*: Tracks the role of trees in intercepting rainfall and reducing runoff, potentially lowering reliance on hard infrastructure.
    - *Carbon Sequestration*: Quantifies the volume of carbon stored by the urban forest, contributing to council-wide emissions reduction goals.
  - Air Quality Improvement: Assists in estimating the role of trees in removing airborne pollutants, thereby improving public health outcomes.

- **Economic and financial benefits**
  - Cost Reduction:
    - Decreases emergency response costs through proactive risk identification.
    - Increases operational efficiency through planned maintenance schedules.
    - Reduces residential and commercial energy costs via shading.
    - Minimises damage to infrastructure such as footpaths and underground utilities through appropriate species selection and root management.
    - Lowers capital expenditure on stormwater infrastructure by leveraging trees for natural water management.
  - Increased Property Values: Healthy, well-maintained urban forests enhance property values by 5–15% or more, which may also result in increased council rate revenue.
  - Economic Development and Tourism: Green public spaces attract visitors, residents, and businesses, encouraging economic activity and improving public realm appeal. Studies show people spend more time and money in treed commercial areas.

- Urban Tree Valuation: Supports the calculation of amenity, ecosystem service, and replacement values of trees. This is vital for development offset policies, insurance, and advocating for budgetary support.
- Return on Investment (ROI): Tree Management Systems (TMS) help councils identify planting opportunities and justify investment in urban forestry. Research indicates every $1 invested in urban trees yields between $1.88 and $12.70 in benefits.

- **Community engagement and public relations**
  - Transparency and Accountability: Offers open access to urban forest data and management plans, fostering public trust and support.
  - Community Involvement: Enables local engagement initiatives such as "Adopt-a-Tree" and community planting events, enhancing civic pride and stewardship.
  - Enhanced Liveability: Contributes to a more aesthetically pleasing, healthy, and comfortable living environment, directly impacting resident wellbeing.
  - Informed Public Decision-Making: Provides councils with the evidence required to balance diverse community priorities, such as consideration of views, safety, and green coverage, while making fair and consistent planning decisions.

In essence, a Tree Asset Register and Management System transforms urban trees from simple landscape features into valuable, quantifiable infrastructure assets that deliver a multitude of benefits to the community and the environment. It allows councils to manage their urban forest strategically, proactively, and sustainably for long-term well-being.

8.2.17. Tree valuation

Tree valuation is the “...the process of allocating a monetary value to trees”….[and] …. “ where a valuation method has been accepted for commercial or legislative use and that method fosters good management of trees, that is laudable irrespective of its origins or basis” (MIS506: Tree Valuation, Arboriculture Australia, 2024).

Tree valuation transforms the urban forest from a perceived maintenance liability into a measurable, multi-functional asset that delivers substantial economic, environmental, and social returns. For local governments, adopting a robust tree valuation framework is key to informed decision-making, strategic investment, revenue raising and effective communication of the urban forest's true value.

A comprehensive valuation system enables councils to justify expenditure, allocate budgets more effectively, and demonstrate return on investment through quantifiable data. It can also be used to raise revenues when development requires the removal of Council trees. By capturing the value of ecosystem services including shade, cooling, air quality improvement, carbon sequestration, and

stormwater management, these elements of tree valuation can be articulated to the community to help build awareness and appreciation that trees are valued as important community assets. Integration into existing inventory/green infrastructure asset management systems supports long-term planning and risk mitigation.

Valuation data also plays a crucial role in preventing unnecessary tree/canopy loss by enabling cost-benefit analysis and providing an objective foundation for risk amelioration and dispute resolution, including insurance claims and legal matters. When councils can articulate the financial worth of their urban forest, it reinforces the message that trees are not merely ornamental, but essential infrastructure delivering measurable public benefit.

As outlined in the Tree Management Procedure (2023 b) tree values are calculated using the City of Melbourne Method, although a critical update of the Base value (BV) is required as it doesn't appear to have been adjusted for inflation since 2012. It is recommended that that Alexandrina reviews this and updates as required.

While this method is recognised and used by numerous Councils throughout Australia (predominantly Victoria), there are several methods used by councils around Australia e.g. City of Melbourne (VIC), Thyer (NSW), Burnley (VIC, QLD), i-Tree (US based, used in VIC) and Helliwell (UK based, used in WA)). In response to this situation and the conjecture around which was "best", Arboriculture Australia and the New Zealand Arboriculture Association developed a minimum industry standard, MIS506: Tree Valuation (Arboriculture Australia, 2024), and a new, nationally standardised method – AANZAA-Value (Arboriculture Australia, 2024).

8.2.18. Tree valuation using AANZAA-Value

While variability in valuation methods can create confusion regarding tree values and the preferred approach across local government areas, the more critical consideration is the adoption of a method that is both effective, efficient and yields outcomes that are broadly accepted. This challenge was acknowledged by volunteer technical experts, industry representatives, and independent reviewers, who collaborated to develop a minimum industry standard MIS506: Tree Valuation and AANZAA-Value which adopted and consolidated the best practice elements of the existing methods; elements such as habitat value and cultural value. The method is available free of charge from the Arboriculture Austria website (trees.org.au).

While the method accounts for numerous influencing factors, the valuation process can be summarised through a simplified formula:

Valuation = B x Z x S x Q

Where:

B = Market baseline value

Z = Land use factor

S = Social factor

Q = Quality factor

Assigning a monetary value to trees provides a tangible and easily understood metric that can be more effective than attempting to articulate the full range of environmental, social, and economic benefits trees provide. This valuation approach supports the establishment of financial bonds in development contexts and enables the recovery of costs where legislative provisions exist for damage or loss. At the individual level, attributing asset value helps to highlight significant, high-value trees, while at the broader asset management scale, it facilitates informed decision-making through cost–benefit analysis, strategic budgeting, and prioritisation of works.

8.2.19. Budgeting for green infrastructure as valued assets

Recognizing green infrastructure as equal in asset management status to traditional 'grey' infrastructure is critical to addressing climate impacts, especially given that grey infrastructure contributes to 70% of global emissions and significant resource consumption. Embedding nature-based solutions into asset management will help ensure they are adequately funded, maintained, and able to deliver long-term community benefits.

The Institute of Public Works Engineering Australasia (IPWEA) and project partners have recently (2025) led an Asset Management for Green Infrastructure project in South Australia, publishing their *Green Infrastructure management Manual*. This initiative addresses the gap in asset management by integrating green infrastructure like street trees, urban forests, wetlands, green roofs, mangroves, and rain gardens into mainstream financial and asset planning.

Green infrastructure delivers essential, cost-effective, and climate-resilient services including health and well-being benefits, carbon sequestration, flood mitigation, air and water purification, shading, cooling, and biodiversity support. Despite these benefits, it is often un- or under-valued in asset management, resulting in underfunding, degradation and loss.

This project will produce an industry best-practice guideline and an online training program for asset managers, engineers, local governments, arborists, and ecologists. It will cover valuation, condition assessment, service delivery, lifecycle analysis, risk management, costings, and decision-making tools.

As IPWEA's CEO, David Jenkins, states: "Applying proven asset management frameworks to green infrastructure provides practical steps, a shared language, and international relevance." Simon Strauss of Arboriculture Australia adds, "Quantifying green assets in financial terms enables balanced, long-term decision-making for societal benefit."

Planting long-lived, large-growing trees forms a key part of establishing council urban forests and represents an investment in community infrastructure to deliver long-term environmental, social, and economic benefits. As such, tree planting programs could and should be funded, at least in part, through capital budgets. Based on review of other LGAs, the following provides examples of where planting programs are covered under capital budget programs:

- Melbourne City Council (VIC): Funds tree planting through their capital budget in two streams - renewal and maintenance– depending on the nature of the planting and its location. There is some crossover between operational and capital budgets in relation to staff wages, with additional contracting staff also paid through capital budgets.
- Brisbane City Council (QLD): Explicitly allocates funds in its capital budget for tree planting initiatives. For example, their 2025-26 budget includes $1.9 million for a two-year Olympic Corridors tree planting program (Property Council Australia 2025).
- Swan Hill Rural City Council (VIC): Their 2025-26 Budget includes funding for "expanded tree planting" within their capital works program, which also covers roads, footpaths, and community facilities (Swan Hill Rural City Council 2025).
- Surf Coast Shire Council (VIC): Their draft 2024-25 Budget features an ambitious capital expenditure program that includes the inaugural year of the "$1m Growing Our Urban Forest program" over five years, specifically for tree planting and canopy cover to adapt townships to climate change (Surf Coast Shire 2024). This clearly indicates a capital investment over multiple years.
- Glen Eira City Council (VIC): Their 2024–2025 Budget and Financial Plan allocate funds for their climate emergency response, including "urban greening" and continued tree planting to increase canopy cover, funded through capital spending on infrastructure and asset renewal (Glen Eira City Council 2024).
- Hobsons Bay City Council (VIC): Their 2025-26 budget will deliver over $63 million in capital works projects, specifically mentioning "Planting an additional 5,000 trees in line with the current Urban Forest Strategy".
- Central Coast Council (NSW): Their 2025-26 Operational Plan and budget allocates $150,000 to a "tree planting pilot program" (Central Coast Council 2025)..

These examples suggest that a well-conceived planting master plan program will support capital budget expenditure through a business case to Council, which would allow for greater flexibility, resources and security in budget provision and accountability in expenditure reporting.

In contrast, operational budgets allow for routine maintenance and replenishment, the ongoing care, replacement of dead or diseased trees, and regular small-scale infill planting in existing parks, streetscapes, and open spaces are generally considered operational expenses. For example:

1. Salaries for arborists, tree crews, and technical officers, as well as the costs of equipment, fuel, and materials for pruning, pest/disease management, watering of newly planted trees, and emergency tree work.
2. Council operated nurseries will generally associate the costs with growing seedlings, propagating trees and maintaining nursery stock.
3. Smaller-Scale Planting Initiatives where residents can request a free tree for their verge or participate in community planting days.

8.2.20. Grant funding

Targeted grant funding will play a critical role in enabling Alexandrina to deliver tree planting for urban greening, biodiversity enhancement and climate resilience initiatives. There is opportunity for Alexandrina to leverage a wide array of grant programs to support tree planting and climate adaptation activities. The following examples demonstrate the types of funding mechanisms have been available in South Australia and may become available again or develop similar grant funding programs for the future.

Green Adelaide – Urban Greening Strategy & Cooler, Greener, Wilder Grants

In 2024, the South Australian Government launched a metropolitan-wide Urban Greening initiative for Greater Adelaide. Backed by an initial $1.5 million in grants that were matched by five metropolitan councils, the strategy aims to increase Adelaide's urban canopy from 17% to 30%, cool urban areas and improve biodiversity (Government of South Australia 2024).

Projects funded include tree planting and water-efficient landscaping in public spaces such as the Banksia Park Sports Area (City of Tea Tree Gully) and Symonds Reserve (City of Onkaparinga). The program is coordinated by Green Adelaide in partnership with a wide range of stakeholders.

Grassroots Grants – Landscape Boards SA and Green Adelaide

Both Green Adelaide and the Hills and Fleurieu Landscape Board offer Grassroots Grants annually. These grants support tree planting, biodiversity restoration and land stewardship projects by local councils, community groups and schools. Funding of up to $20,000 is available per project, with an

emphasis on community co-benefits and climate adaptation (Landscape SA 2024; Green Adelaide 2024).

LGA of SA – Coastal Hazard Adaptation Grants

Administered by the Local Government Association of South Australia, this program supports councils in planning for and adapting to coastal hazards arising from climate change. While not limited to vegetation, integrated responses such as nature-based solutions (e.g. dune revegetation or foreshore plantings) are eligible and relevant in coastal Alexandrina townships (LGA SA 2024 a).

Local Government Research and Development Scheme

This scheme provides funding for projects that improve local government planning and service delivery. Previous grants have supported climate resilience modelling, strategic tree asset planning, and green infrastructure trials. Projects aligned with long-term adaptation and canopy development may be eligible (LGA SA 2024b).

Landcare Australia – Urban Tree Planting Grants

In partnership with corporate sponsors (e.g. Bupa), Landcare Australia provides grants between $5,000 and $25,000 to councils and community groups for planting native trees and shrubs in urban and peri-urban areas. These projects improve local biodiversity, address urban heat and engage communities in stewardship (Landcare Australia 2024).

Given the alignment with previous funding initiatives and the profile of successful recipients, Alexandrina Council is competitively positioned to pursue coordinated and strategic funding opportunities to support urban greening. The SMART targets outlined in this Study, along with supporting cost-benefit analyses, canopy modelling data and asset-based recommendations for tree management and planting location identification, provide a strong, evidence-based foundation for grant applications.

This integrated approach enhances the Council's ability to demonstrate readiness, accountability and measurable outcomes, which are common requirements across a range of state and national grant programs. In having proactively aligned the canopy cover project to previously successful eligibility criteria, particularly those relating to climate resilience, urban cooling, biodiversity and community wellbeing, Alexandrina can maximise its competitiveness for funding.

Further strengthening future applications, the Council may consider advocating for matched funding models in collaboration with community organisations, environmental groups, or private industry partners. Such partnerships not only leverage additional resources but also demonstrate shared commitment, local engagement and co-investment factors that are increasingly valued in competitive grant assessment processes.

8.2.21. Review, refinement and iteration

To ensure the long-term success and delivery of the agreed canopy cover targets, ongoing monitoring and adaptive management will be critical. Regular canopy mapping and data analysis should be undertaken to track progress toward township-specific and regional canopy targets, evaluate program effectiveness and identify areas requiring refinement.

A structured review process should include:

- **Canopy cover trajectory assessment:** Spatial analysis to contrast previous canopy cover and determine whether canopy cover is increasing at the expected rate across each township and land use type, and where it is decreasing.
- **Gap identification and diagnostics:** Investigation of locations or scenarios where canopy targets are not being met, with consideration of contributing factors such as land sales, development approvals, climatic constraints and limited planting space.
- **Adaptive response:** Where barriers to canopy expansion are identified and cannot be easily mitigated, these should be factored into revised planting scenarios or alternative greening strategies. For example, if canopy loss is anticipated from Council land divestment, this should be accounted for in future modelling.
- **Optimising where gains exceed targets:** In areas where canopy targets are on track to be exceeded, planting programs may be revised to reallocate resources more efficiently. This could include higher-cost, higher-impact interventions such as retrofitting engineered solutions (e.g. soil vaults, permeable paving) into heat-affected urban zones like car parks.

8.2.22. Iterative implementation and continuous improvement

An iterative five-year review and implementation cycle is recommended to maintain program responsiveness and effectiveness. This approach allows Council to:

- Adjust to new data, regulatory changes, or emerging urban development trends.
- Update priority planting locations and techniques.
- Incorporate lessons learned into program design.
- Reassess cost-benefit scenarios as economic or climate conditions change.

This adaptive cycle should continue until either:

1. Canopy targets are achieved; or
2. Gains become marginal and resources can be more effectively applied elsewhere.

Through this repeat-and-optimise model, Alexandrina Council can ensure that its greening initiatives remain strategic, flexible and outcome-driven, thereby maximising long-term canopy benefits for current and future communities.

9. Conclusion and key recommendations

The "Alexandrina's Township Greening: Setting Canopy Targets –a 'Greenprint' for Success" presents a coordinated and evidence-based framework to protect, enhance and expand the region's urban forest through to 2055. Through spatial analysis, scenario modelling and policy review, the modelling undertaken in this Study identifies clear priorities for equitable greening, climate resilience and community wellbeing. It also recognises that urban canopy is not merely an amenity, but critical infrastructure that delivers measurable benefits across health, liveability, biodiversity, and economic value.

This Study highlights the challenges Alexandrina Council faces including climate change, development pressures and legislative limitations while also identifying practical and cost-effective solutions. These include data-driven prioritisation of planting, improved developer compliance, better integration with planning and infrastructure design, and enhanced investment in green assets.

Importantly, outcomes of this Study reinforce the urgent need for long-term thinking and planning. Achieving township-wide canopy targets will depend not only on planting volumes but also on species efficacy, stock quality, spatial equity, policy reform, private landholder engagement, and the formal recognition of green infrastructure as an asset class.

By embedding urban forest management into asset and operational planning, development frameworks and community initiatives, Alexandrina Council can lead a regional approach to climate adaptation and liveable neighbourhood design.

Achieving long-term canopy targets will require an adaptive, data-driven approach. Regular canopy mapping, review and refinement of planting programs guided by scenario modelling and on-ground realities will help ensure continuous improvement and consistent decision-making. By adopting a five-year iterative review cycle, Alexandrina Council can remain responsive to emerging challenges and opportunities, optimising greening outcomes across its townships.

To implement the recommendations of this Study and realise the vision of Council's Greening Strategy, the following actions are recommended:

Strategic and policy alignment

1. **Adopt township-specific canopy targets**. Adopt Scenario 1 as a minimum whilst noting that front-loading is more cost effective in the long-term. Table 2 provides an overview of the pros and cons of each canopy target identified in Scenarios 1-5.
2. **Private land canopy preservation and enhancement**, encourage and advocate for no net loss of tree canopy cover on private landholdings.
3. **Plant trees early** to optimise community value and benefits, where budgets allow.
4. **Embed urban greening provisions** into development assessment processes, including incentives for canopy retention, on-site greening and Conservation Design principles in new subdivisions.
5. **Advocate for inclusion in state-wide planning reforms** including extension of the Regulated and Significant Tree Overlay to Alexandrina.

Investment and resourcing

6. **Prepare a detailed planting master plan and business case** to secure capital and/or grant funding for large-scale planting programs across high-priority locations.
7. **Allocate a portion of capital works budgets** to fund strategic tree planting, aligning with best practice examples from other Australian LGAs.
8. **Establish a Greening Fund or offset reinvestment mechanism** to channel removal fees into local infill planting, targeting areas of low canopy or high vulnerability.

Implementation and governance

9. **Develop and maintain a Tree Asset Management System (TMS)** with associated tree inventory, tree risk management (assessment, recording, amelioration works and re-assessment) and tree valuation method to support proactive planning, governance (risk management), revenue (valuation), maintenance, customer relations and lifecycle management. Forestree or TreePlotter is recommended.
10. **Review and update Council's tree valuation method** ensuring alignment with the latest Minimum Industry Standard (MIS506) and inflation-adjusted base values. AANZAA-Value is recommended.
11. **Strengthen governance of developer-planted trees** by requiring pre-planting approvals, asset registration, post-installation audits, and enforcement of maintenance periods.

Design and technical guidance

12. **Prioritise planting of broad-canopied, climate-resilient species**, especially in low-canopy townships, and avoid narrow-canopied or short-lived trees where space allows.
13. **For streetscape plantings, preference advanced nursery stock** (not tube-stock) grown in accordance with *AS 2303:2018 – Tree Stock for Landscape Use* and planted to specification.
14. **Use tools such as LAI and GnPR** to assess vegetation performance and support the addition of quality-based canopy metrics.
15. **Collaborate with SA Power Networks** to explore improved planting outcomes under powerlines, including potential development of a local Memorandum of Understanding (MOU).
16. **Appropriate tree stock selection** considering Council preferred species, climate resilience and the use of advanced tree stock for urban streetscapes, high traffic areas and constrained environments.

Community and capacity building

17. **Support community planting programs** in parks, reserves, and nature strips, and provide resources for understorey and biodiversity planting through local groups.
18. **Undertake public education campaigns** to build awareness of the benefits of urban trees, encourage private land planting, and promote tree care and stewardship.
19. **Train Council staff and development stakeholders** in climate-ready species selection, green infrastructure integration and tree maintenance standards.

Review and refinement

20. **Implement Regular Canopy Monitoring,** measuring canopy cover by township and landholder every five years - ideally every two to three years - to track changes and inform strategic decisions.
21. **Analyse Constraints and Opportunities** to identify barriers to canopy growth (e.g. land sales, infrastructure limitations) and integrate these into scenario modelling where relevant.
22. **Refine Planting Programs Based on Data** and adjust planting strategies to address underperforming areas or optimise where targets are being exceeded, including consideration of engineered solutions in constrained sites.
23. **Adopt an Iterative 5 Year Review Cycle** to review, refine, and reimplement so as to support continuous improvement in achieving canopy cover objectives. (Align canopy monitoring timing to inform these reviews).

24. **Align Resource Allocation with Performance** so as to direct resources strategically, focusing on high-priority areas or interventions that yield the greatest canopy and climate resilience benefits.

10. Reference list

Alexandrina Council. (in prep.) *draft Greening our Township Strategy*. Alexandrina Council, South Australia.

Alexandrina Council. 2024b. *Public Agenda – Ordinary Meeting, 19 March 2024*. Alexandrina Council, South Australia.

Alexandrina Council. 2024c. *Climate Emergency and Environment Committee Agenda – 2 December 2024*. Alexandrina Council, South Australia.

Alexandrina Council. 2023a. *Tree Management Policy*. Alexandrina Council, South Australia.

Alexandrina Council. 2023b. *Tree Management Procedure*. Alexandrina Council, South Australia.

Alexandrina Council. 2023c. *Environmental Action Plan 2030*. Alexandrina Council, South Australia.

Alexandrina Council. 2023d. *Climate Emergency Action Plan: Working together to reduce emissions*. Alexandrina Council, South Australia.

Alexandrina Council. 2022a. *Tree canopy benchmark study & thermal imaging*. Alexandrina Council, South Australia.

Alexandrina Council. 2022b. *Climate Change Policy*. Alexandrina Council, South Australia.

Alexandrina Council. 2022c. *Carbon Neutral Plan*. Alexandrina Council, South Australia.

Alexandrina Council. 2020. *Alexandrina 2040 Liveable. Green. Connected. Our plan to thrive*. Alexandrina Council, South Australia.

Alexandrina Council. n.d. a. *Preferred tree species list for street planting*. Alexandrina Council, South Australia.

Alexandrina Council. n.d. b. *The One Million Trees Community Project*. Available at: https://www.alexandrina.sa.gov.au/connect/environment/natural-environment/trees-and-vegetations/one-million-trees [Accessed 19 June 2025].

Alexandrina Council. n.d. c. *Verge Plantings*. Available at: https://www.alexandrina.sa.gov.au/connect/environment/natural-environment/trees-and-vegetations/verge-plantings [Accessed 19 June 2025].

Alexandrina Council. n.d. d. *Biodiversity*. Available at: https://www.alexandrina.sa.gov.au/connect/environment/natural-environment/biodiversity [Accessed 19 June 2025].

Arboriculture Australia. 2024. MIS506 Tree Valuation, Industry Guidance on Tree Valuation Methodologies, Practices and Standards (2nd edition), Available at https://www.trees.org.au/minimum-industry-standards

Arboriculture Australia. 2025. AANZAA-Value tree valuation method, Available at https://www.trees.org.au/training-and-practitioner-resources

Australian Bureau of Statistics. 2021. Socio-Economic Indexes for Areas SEIFA, Australia, Statistical Area Level 1, Indexes, SEIFA 2021, Available at: https://www.abs.gov.au/statistics/people/people-and-communities/socio-economic-indexes-areas-seifa-australia/latest-release#interactive-maps [Accessed 5 May 2025]

Australian Climate Service. n.d., *Bushfires and powerlines*, Australian Government, viewed [insert date], https://www.acs.gov.au/.

Australian Disaster Resilience Knowledge Hub. n.d. a. *Ash Wednesday Bushfire - VIC/SA 1983*. Available at: https://knowledge.aidr.org.au/resources/bushfire-ash-wednesday-victoria-and-south-australia-1983/ [Accessed 26 June 2025].

Australian Disaster Resilience Knowledge Hub. n.d. b. *Black Summer bushfires, SA, 2019-20*. Available at: https://knowledge.aidr.org.au/resources/black-summer-bushfires-sa-2019-20/ [Accessed 26 June 2025].

Australian Capital Territory. 2019. Canberra's Living Infrastructure Plan: Cooling the City. ACT Government, Canberra.

Australian Standard AS 4373 2007. *Pruning of amenity trees*. Standards Australia.

Australian Medical Association AMA. 2023. *Climate Change and Health: Heatwaves*. [online] Available at: https://www.ama.com.au [Accessed 1 Jul. 2025].

Ajuntament de Barcelona. 2017. Trees for life: master plan for Barcelona's trees 2017–2037. Barcelona City Council

American Forests. 2021. Tree Equity Score: Ensuring tree cover in cities is equitably distributed. https://www.americanforests.org/tools-research-reports-and-guides/tree-equity-score/

Belder, R.L., Delaporte, K.D. & Caddy-Retalic, S. 2022. *Urban tree protection in Australia: Review of regulatory matters*, The University of Adelaide, Adelaide, SA. Available at: https://plan.sa.gov.au/__data/assets/pdf_file/0011/1087886/Urban_tree_protection_in_Australia.pdf

Brisbane City Council. 2025-26. *2025-26 Brisbane Budget*. Available at: https://www.brisbane.qld.gov.au/about-council/governance-and-strategy/annual-plan-and-budget/2025-26-brisbane-budget [Accessed 26 June 2025].

Banyule City Council. 2023. Urban Forest Strategy Overview 2023-2033. Banyule City Council

Barona, CO., Bush, J., Hurley, J., Livesly, SJ. 2021. International approaches to protecting and retaining trees on private urban land. *Journal of Environmental Management* 2852.

Bayside City Council. 2022. Urban Forest Strategy 2022-2040. Bayside City Council

Bratman, GN., Anderson, CB., Berman, MG. 2019. Nature and mental health: an ecosystem service perspective. *Science Advances* 57.

Brisbane City Council. 2023. Brisbane. Clean, Green, Sustainable. Brisbane City Council

Bristol Green Capital Partnership. 2018 New ambitious target launched to double city tree canopy cover by 2050. https://bristolgreencapital.org/new-ambitious-target-launched-double-city-tree-canopy-cover-2050/. Bristol Green Capital Partnership

Cancer Council. n.d. *Be SunSmart*. Available at: https://www.cancer.org.au/cancer-information/causes-and-prevention/sun-safety/be-sunsmart [Accessed 26 June 2025].

Cancer Institute NSW. 2025. *Shade and UV protection*. Available at: https://www.cancer.nsw.gov.au/prevention-and-screening/preventing-cancer/preventing-skin-cancer/shade-and-uv-protection [Accessed 26 June 2025].

Cancer Australia. 2025. *Melanoma of the skin statistics*. Available at: https://www.canceraustralia.gov.au/cancer-types/melanoma-skin/melanoma-skin-statistics [Accessed 26 June 2025].

Central Coast Council. 2025. *Council plans for a bright future*. Available at: https://www.centralcoast.nsw.gov.au/council/media-release/council-plans-bright-future [Accessed 26 June 2025].

CFS South Australian Country Fire Service. n.d. *Bushfire history*. Available at: https://www.cfs.sa.gov.au/about/about/bushfire-history/ [Accessed 26 June 2025].

Chi, D., Aerts, R., Van Nieuwenhuyse, A., Bauwelinck, M., Demoury, C., Plusquin, M., Nawrot, TS., Casas, L., Somers, B. 2022. Residential exposure to urban trees and medication sales for mood disorders and cardiovascular disease in Brussels, Belgium: an ecological study. *Environmental Health Perspectives*, 1305.

City of Melbourne. 2012. Urban Forest Strategy Making A Great City Greener 2012-2032. City of Melbourne.

City of Sydney. 2021. Greening Sydney strategy. City of Sydney.

City of Vancouver. 2020 Park Board achieves target to plant 150,000 trees by 2020, directs staff to increase tree canopy to 30% by 2050. https://vancouver.ca/news-calendar/park-board-achieves-target-toplant-150000-trees-by-2020.aspx. City of Vancouver.

Clarke, P. J. 2002. Experiments on tree and shrub establishment in temperate grassy woodlands: seedling survival. *Austral Ecology*, 27, 606-615

Climate Change Alliance of Botanic Gardens. 2025. *Climate Assessment Tool v1*. Botanic Gardens Conservation International, Richmond, U.K. Available at: https://cat.bgci.org Accessed 05/05/2025.

Climate Council. n.d., *Eyres Peninsula Fires Black Tuesday*, Climate Council of Australia, viewed [insert date], https://www.climateCouncilorg.au/.

Coates, L., van Leeuwen, J., Browning, S., Gissing, A., Bratchell, J., Avci, A. 2021. Heatwave fatalities in Australia, 2001-2018: an analysis of coronial records. *Int J Dis Risk Red* 67 (Jan 2022)

Coates, L, Haynes, K, O'Brien, J, McAneney, J & de Oliveira, FD. 2014. 'Exploring 20 years of heat-related fatalities in Australia: a report for emergency management and policy-makers', *Environmental Research*, vol. 196, 110387. https://doi.org/10.1016/j.envres.2021.110387

Cohen, D.A., Marsh, T., Williamson, S., Derose, K.P., Martinez, H., Setodji, C., McKenzie, TL. 2010. Parks and physical activity: why are some parks used more than others? *Preventative Medicine*, 501, 9-12.

Coutts, A., Tapper, N. 2017. Trees for a Cool City: Guidelines for optimised tree placement: The design of the public realm to enhance urban microclimates. Cooperative Research Centre for Water Sensitive Cities Ltd.

Department for Infrastructure and Transport. 2025. *Adelaide Road, Mount Barker Roundabout Upgrade: Vegetation Fact Sheet*. [pdf] Government of South Australia. Available at: https://dit.sa.gov.au/__data/assets/pdf_file/0008/1485503/PA_-_MBRA_-

Dobbs, C., Martinez-Harms, M.J., Kendal, D. 2017. *Ecosystem services*. In Routledge Handbook of Urban Forestry pp 51–64. Routledge.

District Council of Yankalilla. 2024. *Trees Management Policy* Version 3.0. Yankalilla, South Australia: District Council of Yankalilla. Available at: https://www.yankalilla.sa.gov.au/policies Accessed: 8 July 2025.

Energy Networks Australia. 2020, *Bushfire mitigation: Managing vegetation near electricity infrastructure*, Energy Networks Australia, viewed [insert date], https://www.energynetworks.com.au/.

Glen Eira City Council. 2024. *2024–2025 Budget*. Available at: https://www.gleneira.vic.gov.au/about-council/our-performance/budget [Accessed 26 June 2025].

Government of South Australia. 2024. *New Urban Greening Strategy to expand Adelaide's tree canopy and cool the metro*. [online] Available at: https://www.premier.sa.gov.au/media-releases/news-items/new-urban-greening-strategy-to-expand-adelaides-tree-canopy-and-cool-the-metro [Accessed 1 Jul. 2025].

Green Adelaide. 2025a. *Urban greening strategy for Metropolitan Adelaide: A resilient and liveable Adelaide for all 2025 to 2030*. South Australia: Green Adelaide. Available at: https://cdn.environment.sa.gov.au/greenadelaide/images/1076678-GA-Urban-Greening-Strategy-2025-V20 WEB.pdf? utm_source=web&utm_medium=download&utm campaign=launch&utm id=ugs Accessed: 8 July 2025.

Green Adelaide. 2025b. *Coastal gardens: A planting guide*. Department for Environment and Water, Green Adelaide, South Australia. Available at: https://www.greenadelaide.sa.gov.au/assets/Uploads/Coastal-Gardens-A-Planting-Guide.pdf Accessed: 8 July 2025.

Green Adelaide. 2024. *Grassroots Grants*. [online] Available at: https://www.greenadelaide.sa.gov.au [Accessed 1 Jul. 2025].

Haaland, C., Bosch, CKVD. 2015. Challenges and strategies for urban green-space planning in cities undergoing densification: a review. *Urban Forestry and Urban Greening* 144, 760–771.

Hnatiuk, S., Rayner, I., Brookhouse, M. & Freudenberger, D. 2020. Survival of native seedlings planted by volunteers: The Lower Cotter, ACT case study

Herbst, J., Mason, K.M., Byard, R. & Gilbert, J.D., 2014. Heat-related deaths in Adelaide, South Australia: Review of the literature and case findings – An Australian perspective. Journal of Forensic and Legal Medicine, 22, pp.73–78.

Hobsons Bay City Council. 2020. Hobsons Bay Urban Forest Strategy 2020. Hobsons Bay City Council

IPWEA. 2023. Practice Note 14: Urban Forest Asset Management. Institute of Public Works Engineering Australasia, Sydney.

Jasper, A. 2024. Achieving tree canopy cover targets – through modelling, systems and management. Arboriculture Australia conference presentation, Melbourne

Jellinek, S., O'Brien, T. and Bennett, A. 2020. Evaluating revegetation outcomes through community based monitoring. Arthur Rylah Institute for Environmental Research Technical Report Series No. 321. Department of Environment, Land, Water and Planning, Heidelberg, Victoria.

Jellinek, S., Tuck, J., Te, T. & Harrison, P. A. 2020. Replanting agricultural landscapes: How well do plants survive after habitat restoration? *Restoration Ecology*.

Kendal, D., Lee, K., Ramalho, C., Bowen, K. & Bush, J. 2016. *Benefits of urban green space in the Australian context: A synthesis review for the Clean Air and Urban Landscapes Hub*. Melbourne, VIC: The University of Melbourne. Available at: https://nespurban.edu.au/wp-content/uploads/2018/11/CAULHub_BenefitsUrbanGreeningReport_20160912.pdf Accessed: 8 July 2025.

Konijnendijk, CC. 2023. Evidence-based guidelines for greener, healthier, more resilient neighbourhoods: Introducing the 3–30–300 rule. *Journal of Forestry. Research*, 34, 821-830.

Lake Macquarie City. 2022. Urban Greening Strategy 2022-2032. Lake Macquarie City.

Landcare Australia. 2024 *Bupa Landcare Grants to Power Planting of 82500 Trees, Shrubs and Groundcovers Across Urban Australia*. Available at: https://landcareaustralia.org.au/media-release/bupa-landcare-grants-to-power-planting-trees-across-urban-australia/ [Accessed 26 June 2025].

Landscape SA. 2024. *Grassroots Grants – Hills and Fleurieu*. [online] Available at: https://www.landscape.sa.gov.au/hf/get-involved/grants-and-funding/grassroots-grants [Accessed 1 Jul. 2025].

LGA SA. 2024 a. *Coastal Hazard Adaptation Grants*. [online] Available at: https://www.lga.sa.gov.au/members/financial-sustainability/grants/coastal-hazard-adaptation-grants [Accessed 1 Jul. 2025].

LGA SA 2024b. *Local Government Research and Development Scheme*. [online] Available at: https://www.lga.sa.gov.au/members/services/research-and-publications [Accessed 1 Jul. 2025].

Leahy, I. 2017. Why we no longer recommend a 40% urban tree canopy goal. https://www.americanforests.org/article/why-we-no-longer-recommend-a-40-percent-urban-tree-canopy-goal/.

Livesley, S.J., McPherson, E.G. and Calfapietra, C. 2016. The urban forest and ecosystem services: Impacts on urban water, heat, and pollution cycles at the tree, street, and city scale. *Journal of Environmental Quality*, 451, pp.119–124.

Local Government Association of South Australia. 2025 *Local Government Research and Development Scheme Grant Guidelines 2025-26*. Available at: https://www.lga.sa.gov.au/__data/assets/pdf_file/0037/1284679/Research-and-Development-Scheme-Grant-Guidelines-2025-26.pdf Accessed: 8 July 2025.

Local Government Association of South Australia & Department for Environment and Water. 2024. *Coastal hazard adaptation planning guidelines: Draft for consultation*. Local Government Association of South Australia, South Australia. Available at: https://www.lga.sa.gov.au/assets/LGA-General/Environment-and-Sustainability/Climate-Ready-Coasts/DRAFT-FOR-CONSULTATION-Coastal-Hazard-Adaptation-Planning-Guidelines-August-2024.pdf Accessed: 8 July 2025.

Marselle, MR., Hartig, T., Cox, DTC, Bonn, A. 2021 Pathways linking biodiversity to human health: a conceptual framework. *Environment International* 150.

MacLachlan, A., Biggs, E., Roberts, G. & Boruff, B. 2017. Urbanisation-induced land cover temperature dynamics for sustainable future urban heat island mitigation. *Urban Science*, 11, p. 38. Available at: https://www.mdpi.com/2413-8851/1/1/38/pdf Accessed: 8 July 2025. doi:10.3390/urbansci1010038.

Miles, E. 2022. Nature is a human right: Why we're fighting for green in a grey world. Dorling Kindersley Limited, London.

MIS506. 2024. Minimum industry standard: Tree Valuation.

Moore, G. 2025, *Victoria needs better powerline clearance pruning regulations*, TreeNet, 24 February, viewed [16 June 2025], https://treenet.org/victoria-needs-better-powerline-clearance-pruning-regulations/.

Moore, G. 2009. People, Trees, Landscapes and Sustainability. In Proceedings of the 10th National Street Tree Symposium, University of Adelaide.

Moreton Bay Regional Council. 2022. Tree-mendous boost to green initiatives in 2022/23. https://www.moretonbay.qld.gov.au/News/Media/Going-green.

Native Vegetation Council. 2024. *Native Vegetation Council Strategic Plan 2024-26*. Government of South Australia, Department for Environment and Water. Available at:

https://www.environment.sa.gov.au/files/sharedassets/public/plants_and_animals/native_vegetation_council/native-vegetation-council-strategic-plan-2024-26.pdf Accessed: 8 July 2025.

Native Vegetation Council. 2024. *Submission on Urban Growth Management Strategy Consultation to City of Victor Harbor*. Adelaide, South Australia: Native Vegetation Council Available at: https://cdn.environment.sa.gov.au/environment/docs/Native-Veg/2024-12-11-NVC-Submission-Victor-Harbor-UGMS_Redacted.pdf Accessed: 8 July 2025.

Native Vegetation Council. 2020. *Tree management guidelines: Local councils and reserves under the National Parks & Wildlife Act*, guidelines under Regulations 86 and 1125 of the Native Vegetation Regulations 2017, Government of South Australia, July.

Neale, R.E., Lucas, R.M., Byrne, S.N., Hollestein, L., Rhodes, L.E., Yazar, S., Young, A.R., Berwick, M., Ireland, R.A. & Olsen, C.M. 2023, 'Ultraviolet radiation and shade: impacts on human health', *Journal of Photochemical and Photobiological Sciences*, 1 March, pp. 1–37, viewed [insert date], https://www.ncbi.nlm.nih.gov/.

Nicolle, D. 2022. *Open space and trees project - Part 1A Arborist review*. Prepared for Attorney General's Department, Planning and Land Use Services Division, Government of South Australia. South Australia. Available at: https://dit.sa.gov.au/__data/assets/pdf_file/0010/1087885/Open_Space_and_Trees_Project-_Arborist_Review.pdf Accessed: 8 July 2025.

Nielsen, A B., Bosch, V.D.M., Maruthaveeran, S., Bosch, V.D.K.C. 2014. Species richness in urban parks and its drivers: a review of empirical evidence. *Urban Ecosystems* 17, 305–327

Nogrady, B. 2017. Urban heat islands: cooling things down with trees, green roads and fewer cars. The Guardian. https://www.theguardian.com/sustainable-business/2017/feb/21/urban-heat-islands-cooling-things-down-with-trees-green-roads-and-fewer-cars

Norton, B.A., Coutts, A.M., Livesley, S.J., Harris, R.J., Hunter, A.M. and Williams, N.S.G. 2015. Planning for cooler cities: A framework to prioritise green infrastructure to mitigate high temperatures in urban landscapes. *Landscape and Urban Planning*, 134, pp.127–138.

Nowak, D.J., Hirabayashi, S., Bodine, A. and Greenfield, E. 2014. Tree and forest effects on air quality and human health in the United States. *Environmental Pollution*, 193, pp.119–129.

Office of the Technical Regulator OTR. n.d. *Vegetation management near powerlines*, Government of South Australia, viewed [insert date], https://www.energymining.sa.gov.au/industry/technical-regulation/electrical/installers/vegetation-clearance.

Ong, BL., Ho, A. 2012. Green Plot Ratio - Past, Present And Future. In International Network for Tropical Architecture [Symposium]. Singapore.

Ong, BL. 2023. The City as Ecosystem:Moving Beyond the Green Plot Ratio towards an Urban Ecological Index. In WALGA Urban Forest Conference [Symposium]. Western Australia.

PlanSA 2024. *Regulated and Significant Trees – Planning and Design Code Guidance*. Available at: https://plan.sa.gov.au [Accessed 17 June 2025].

PlanSA. 2020. *Planning and Design Code – General Development Policies*. [online] Government of South Australia. Available at: https://plan.sa.gov.au/__data/assets/pdf_file/0006/608820/Draft_Planning_and_Design_Code_Phase_Three_-_Development_Assessment_Scenarios.pdf [Accessed 17 Jun. 2025].

PlanSA. n.d. *Frequently asked questions: Protecting regulated and significant trees*. Government of South Australia, Department for Trade and Investment. Available at: https://cdn.plan.sa.gov.au/Protecting_regulated_and_significant_trees_factsheet.pdf Accessed: 8 July 2025.

Pollack, A., Henderson, J., Britt, H., & McGrath, M. 2014. 'Skin cancer by state and territory'. *Australian Family Physician*, 438, pp. 507-508. Available at: https://www.racgp.org.au/getattachment/104d5a4c-e7cb-490d-8411-c9efc4ff9c1c/Skin-cancer-by-state-and-territory.aspx

Preventive Health SA. 2023. *Skin Cancer Prevention Partnership - A Framework for Action 2023-28*. Adelaide: Preventive Health SA. Available at: https://www.preventivehealth.sa.gov.au/assets/downloads/skin-cancer/Skin-Cancer-Prevention-Partnership_-A-Framework-for-Action-2023-28.pdf [Accessed 26 June 2025].

Preventive Health SA. 2022. *Melanoma incidence statistics*, Government of South Australia, viewed [insert date], https://preventivehealth.sa.gov.au/.

Property Council Australia. 2025. *Brisbane City Council 2025-26 Budget*. Available at: https://www.propertyCouncilcom.au/qld/brisbane-city-council-2025-26-budget [Accessed 26 June 2025]

State Planning Commission. 2024. *Draft Greater Adelaide Regional Plan*. Government of South Australia, Department for Housing and Urban Development. Available at: https://plan.sa.gov.au/data/assets/pdf_file/0007/1425382/draft-Greater-Adelaide-Regional-Plan.pdf Accessed: 8 July 2025.

[updates available here] https://plan.sa.gov.au/resources/planning/regional_plans/greater-adelaide-regional-plan

Rural City of Murray Bridge Council. 2021. *Environment Management Plan 2020-2024: Inclusive of Climate Emergency Action Plan*. Rural City of Murray Bridge Council, South Australia. Available at: https://www.murraybridge.sa.gov.au/webdata/resources/files/Environmental-Management-Plan-endorsed-10-May-2021.pdf Accessed: 8 July 2025.

Second Nature Conservancy. n.d. *Alexandrina Greening and Wildlife Project*. Available at: https://www.secondnature.org.au/nature-projects-environmental-revegetation-adelaide/alexandrina-greening-and-wildlife-project [Accessed 19 June 2025].

Saunders, C. & Barclay, A. 2022. Tree Establishment and Management in Urban Developments. Urban Greening Review, 182, 34–41.

South Australian Government. 2025. Design Standard 1 – Engineering Requirements for Land Division Draft. Planning and Land Use Services, Department for Infrastructure and Transport.

Rahman, M.A., Moser, A., Rötzer, T. and Pauleit, S. 2020. Microclimatic differences and their influence on transpirational cooling of trees. *Agricultural and Forest Meteorology*, 291, p.108064.

Rural City of Murray Bridge. 2021. Environment Management Plan 2020–2024. [pdf] Rural City of Murray Bridge. Available at: https://www.murraybridge.sa.gov.au/__data/assets/pdf_file/0024/894111/Environmental-Management-Plan-endorsed-10-May-2021.pdf [Accessed 9 June 2025].

Santamouris, M. 2015. Regulating the damaged thermostat of the cities—Status, impacts and mitigation challenges. *Energy and Buildings*, 91, pp.43–56.

Santin, C. H., Amati, M., Bekessy, S., Desha, C. 2023. Integrating biodiversity as a non-human stakeholder within urban development. *Landscape and Urban Planning* 232, 1-13.

Seattle Government. 2016. Seattle's Canopy Cover. https://www.seattle.gov/trees/management/canopy-cover.

Shiraishi, K. 2022. The inequity of distribution of urban forest and ecosystem services in Cali. *Urban Forestry & Urban Green* 67. 127446.

South Australia. 2016. *Planning, Development and Infrastructure Act 2016 SA*. Adelaide: Government of South Australia.

South Australia. 1991. *Native Vegetation Act 1991 SA*. Adelaide: Government of South Australia.

South Australia. Department of Planning, Transport and Infrastructure. 2021. *Practice Direction 16 - Urban Tree Canopy Off-set Scheme 2021*. Adelaide: Department of Planning, Transport and Infrastructure. Available at: https://www.plan.sa.gov.au/__data/assets/pdf_file/0010/893921/Practice_Direction_16-_Urban_Tree_Canopy_Off-set_Scheme_2021.pdf [Accessed 17 June 2025].

Surf Coast Shire. 2024. *Council to consider draft 2024-25 Budget*. Available at: https://www.surfcoast.vic.gov.au/About-us/News-and-media/Latest-news/Council-to-consider-draft-2024-25-Budget [Accessed 26 June 2025].

Swan Hill Rural City Council. 2025. *Council adopts 2025-26 Budget*. Available at: https://www.swanhill.vic.gov.au/Our-Council/News-and-publications/News-and-public-notices/Council-adopts-Budget [Accessed 26 June 2025].

The Nature Conservancy and Resilient Melbourne. 2019. Living Melbourne: Our Metropolitan Urban Forest. The Nature Conservancy and Resilient Melbourne, Melbourne.

Townsend, J.B. & Barton, S. 2018. The impact of ancient tree form on modern landscape preferences. *Urban Forestry and Urban Greening* 34, 205–216.

Turner-Skoff, J.B., Cavender, N. 2019. The benefits of trees for livable and sustainable communities. *Plants People Planet* 1, 4, 323-335

United Nations. 2022. Sustainable Development Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable. United Nations Department of Economic and Social Affairs.

Walters, M. & Sinnett, D. 2021. *Achieving tree canopy cover targets: A case study of Bristol, UK.* Urban Forestry & Urban Greening, Volume 65, November 2021

Watkins, SL., Gerrish, E. 2018. The relationship between urban forests and race: a meta-analysis. *Journal of Environmental Management* 209 152–168.

Whitehorse City Council. 2021. Urban Forest Strategy2021-2031. Whitehorse City Council

Wikipedia. n.d. *Ash Wednesday bushfires*. Available at: https://en.wikipedia.org/wiki/Ash_Wednesday_bushfires [Accessed 26 June 2025].

Zhou, W., Huang, G., Pickett, STA. 2021. Urban tree canopy has greater cooling effects in socially vulnerable communities in the US. *One Earth* 412,1764–1775.

Zitera, CD., Pedersenb, EJ., Kucharikc,, CJ., Turnera, MG. 2019. Scale-dependent interactions between tree canopy cover and impervious surfaces reduce daytime urban heat during summer *Proceedings of the National Academy of Sciences*, 116 15, 7575–7580