City of Melville

Attachment 6

Tree Canopy Impact Assessment

Summary Sheet

Tree Canopy Impact Assessment

Why was this study done?

This study was done to better **understand how redevelopment affects trees and canopy cover** and to help guide future planning decisions.

With very little undeveloped land in Melville, building more dwellings requires more efficient use of land. This creates conflict with existing trees that are often removed to make way for more housing.

The City and our community values trees and the benefits they bring, specifically how they...

- ✓ Keep neighbourhoods cooler
- ✓ Support wildlife
- ✓ Improve air quality
- ✓ Make streets more attractive and liveable.

Therefore the City wants to understand how different approaches to infill might preserve more tree canopy on private land.

What did the study look at?

The study analysed:

- Existing tree canopy across the City
- What happens to trees when properties are redeveloped
- Differences between **lower-density infill** (e.g. single houses) and **higher-density infill** (e.g. townhouses or apartments)

It focused particularly on:

- **R20 (lower density)**
- **R40 and R60 (medium density)**

Using specialist imaging tools and spatial datasets, consultants ArborCarbon analysed how the redevelopment of sites impacted on the existing tree stock.

Very few trees on private land survive redevelopment

The study found that most redevelopments leads to major tree loss, regardless of the housing density.

- Typically, over **90% of tree canopy is lost** when a site is redeveloped.
- **Both low and high density developments result in similar levels of tree loss.**

In the aerial imagery modelling, tree canopy that appears to remain after redevelopment are:

- Street (verge) trees.
- Tree canopy from trees on neighbouring properties which overhang boundary lines.
- Trees from part of the original house that wasn't redeveloped.

Does higher density mean more tree loss?

Any density code will result in tree canopy loss.
But when you look at it differently (per dwelling)...
Higher density development actually performs more efficiently:

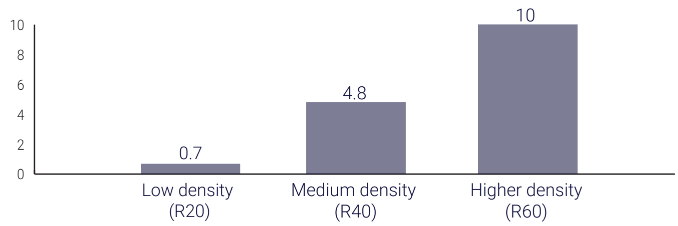
- Fewer trees are lost per home created
- Less canopy is lost per dwelling.

Low density (R20)	Medium density (R40)	Higher density (R60)
		
49 m² of canopy lost per dwelling	**31 m²** of canopy lost per dwelling	**30 m²** of canopy lost per dwelling

This means:

- Higher density housing produces **more homes for a similar level of tree loss**
- Lower density requires **more sites to be rezoned and redeveloped,** which can spread tree loss across more lots.

Dwellings gained per tree lost:



Why does this matter for the future?

To meet housing targets, the City has two broad choices:

Option 1: Lower-density redevelopment

- Requires more properties to be redeveloped meaning more trees at risk
- Spreads tree loss across a larger area

Option 2: Higher-density redevelopment

- Requires fewer sites overall
- Concentrates development (and tree impact) in key areas
- Delivers more housing with less tree loss per home

The key takeaway is: **Tree loss is likely to happen either way, but how it's distributed across the City is different**.

Tree loss not unique to the City of Melville

A review of development sites in nearby Local Government Areas (Town of Cambridge, City of South Perth, and Town of Victoria Park) revealed **similar development and tree loss patterns**.

This issue is not unique to the City of Melville.

What needs to change?

The report makes it clear that **changing density alone will not protect trees**.

Instead, a **combined approach** is needed:

1. Smarter density planning

- Use medium to higher densities in appropriate areas
- This allows more homes to be delivered with less impact per dwelling

2. Stronger tree protection measures

To actually improve tree outcomes, planning rules need to:

- Require developers to identify important trees early
- Design buildings and driveways around trees where possible
- Explain why trees are being removed
- Include replacement planting and greening

3. Better design of redevelopment sites

- More compact building layouts (building “up” rather than out)
- Smarter placement of access ways and open space
- Protection of street trees and neighbouring canopy

Creating Sustainable Ecosystems

Tree Canopy Impact Assessment

City of Melville

Report No. 24103

22nd May 2026

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ArborCarbon acknowledges the Traditional Owners and Custodians of the land on which we live and work and pays respect to Elders past, present and future.

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Executive Summary

The City of Melville engaged ArborCarbon to provide an evidence-based assessment of tree canopy impacts associated with residential redevelopment in the City of Melville. The assessment has been prepared to support the ongoing review of Local Planning Scheme No.6 (LPS6) and the City's requirement to accommodate approximately 14,000 additional dwellings by 2050. Using high-resolution airborne ArborCam® imagery, spatial datasets and subsequent analysis, this study examined how canopy loss, tree retention and dwelling yield vary across selected residential R-Code contexts. The assessment focused particularly on redevelopment outcomes in the R20, R40, and R60 residential code areas, which are relevant to the City's proposed planning scheme changes.

The main findings of this assessment are:

- redevelopment across R20, R40 and R60 sites was associated with substantial canopy loss, typically exceeding 90% of pre-development canopy;
- mature tree retention on private land was uncommon, with most redevelopment sites undergoing near-complete clearing prior to construction;
- apparent post-development canopy was often attributable to verge trees, neighbouring vegetation, or partial retention of original site condition, rather than deliberate retention of mature trees within the redevelopment footprint;
- canopy loss is driven primarily by the redevelopment process itself, rather than by the development intensity alone;
- when assessed on a per-dwelling basis, higher-density (R40 and R60) redevelopment generally resulted in lower canopy loss and fewer trees removed per dwelling than lower-density (R20) development;
- when redevelopment outcomes were standardised to an equivalent 1,000 m² land area, the analysis showed that tree loss per additional dwelling decreased substantially as development density increased;
- higher-density development can achieve greater dwelling yield for a comparable level of tree and canopy impact;
- achieving dwelling targets through lower-density redevelopment would require a larger number of redevelopment sites, potentially increasing cumulative canopy loss across the City;
- higher-density redevelopment may reduce the number of sites required to accommodate housing growth, thereby concentrating canopy impacts within planned redevelopment areas; and
- efficient density settings and stronger tree retention frameworks should operate together as a dual planning response to support the required urban infill while improving canopy outcomes.

Overall, the assessment finds that canopy loss from infill development is common under current development practices and is unlikely to be resolved through density settings alone. However, higher-density redevelopment provides a more efficient pathway to meeting housing targets when canopy impact is considered relative to dwelling yield.

To better align urban growth with environmental and liveability objectives, future planning should combine appropriate density settings with clear, enforceable requirements for tree retention, site responsive design, replacement planting and urban greening. This would allow the City to support infill housing delivery while improving the prospects for mature tree retention and long-term canopy recovery.

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1 Introduction

This assessment has been prepared to help inform the City of Melville's review of Local Planning Scheme No. 6 (LPS6) in the context of State-led infill targets and the need to accommodate substantial additional housing within an already urbanised municipality. As part of the review, the City is considering proposed changes to residential R-codes in selected areas and requires an evidence-based understanding of how redevelopment intensity may affect tree retention and canopy loss, as well as the relationship between these factors and dwelling yield. This report addresses that need by examining the relationship between redevelopment and canopy outcomes within the City of Melville.

Project context

The City of Melville is planning for substantial residential growth, aiming to accommodate 14,000 additional homes by 2050. Given the limited availability of greenfield land, much of this growth will need to be delivered through urban infill and redevelopment of existing residential land. Urban infill is therefore central to the City's long-term growth strategy; however, it also has direct implications for the retention of existing tree canopy, particularly where redevelopment occurs on established private lots that currently contain mature vegetation.

At the same time, urban tree canopy forms an important part of the City's broader environmental and liveability objectives. Tree canopies provide important urban infrastructure benefits, including urban cooling, biodiversity habitat, stormwater management, visual amenity, and improved community well-being. In an already urbanised municipality, understanding the relationship between housing growth and canopy loss is therefore important to ensuring that future development supports both urban consolidation and environmental performance.

Local Planning Scheme No. 6 review context

This assessment forms part of the City's current review of LPS6, which includes consideration of residential density provisions and proposed R-code changes in selected locations. Consistent with the City's broader strategic planning framework, the review seeks to direct additional housing to areas best suited to accommodate redevelopment, including locations near activity centres, transport corridors and other urban infrastructure.

A key issue arising from the review is whether different forms and intensities of redevelopment result in materially different canopy outcomes. Community concern has focused on the potential loss of mature trees on private land under higher-density development. However, lower-density redevelopment may also involve substantial site clearing and would likely require more sites to be redeveloped to achieve the same dwelling yield. In this context, the relevant planning question is not simply whether canopy loss occurs, but how canopy impacts vary across redevelopment forms and how those impacts compare with housing delivery outcomes.

This study provides evidence to inform that question by assessing canopy and tree-retention outcomes across selected redevelopment contexts within the City of Melville.

Study purpose and objectives

The purpose of this study is to quantify the impact of residential redevelopment on tree canopy within the City of Melville and to assess how canopy retention outcomes vary across different residential coding and redevelopment contexts. In particular, the assessment examines the relationship between redevelopment intensity, canopy loss, tree retention and dwelling yield, including whether higher- or lower-intensity redevelopment results in greater canopy loss per additional dwelling.

The objectives of the assessment are to:

a) provide an evidence-based comparison of redevelopment outcomes across selected residential R-code contexts;

b) quantify key canopy and tree-retention metrics relevant to the City's decision-making;

c) identify patterns and site characteristics associated with tree retention or removal during redevelopment; and

d) inform the LPS6 review by providing practical findings and recommendations to assist the City in balancing housing delivery with canopy retention outcomes.

2 Scope and Key Questions

This section defines the scope of the assessment by outlining the key questions addressed, the study area used for analysis, the comparison framework applied, and the main assumptions and limitations relevant to interpreting the findings.

Assessment questions

The assessment examines how residential redevelopment influences tree canopy outcomes across different residential R-code contexts within the City of Melville. In particular, it considers whether redevelopment intensity is associated with different levels of canopy loss and tree removal and how these outcomes compare when assessed against dwelling yield.

The key questions addressed by this assessment are:

a) how does tree canopy change following residential redevelopment;
b) does canopy loss vary across different residential R-Code and redevelopment contexts;
c) how do canopy loss and tree retention outcomes compare relative to the number of dwellings delivered;
d) are higher-intensity redevelopment outcomes associated with greater or lesser canopy loss per additional dwelling; and
e) what site or redevelopment characteristics appear to influence whether mature trees are retained or removed.

Study area

The study focuses on residential areas within the City of Melville where redevelopment activity and residential coding provide a suitable basis for comparative analysis. Within this broader municipal context, the assessment draws on selected redevelopment sites and coding areas relevant to the LPS6 review.

These include locations where proposed R-code changes and recent redevelopment patterns allow comparison of canopy outcomes across different development settings. The study area therefore reflects both the planning context of the LPS6 review and the availability of suitable examples for redevelopment analysis.

Density typologies and case-study categories

To support consistent comparison, the analysis is structured around selected residential coding categories and associated case-study redevelopment contexts. These are centred on the R-code settings most relevant to the LPS6 review and the available redevelopment sample.

The case-study framework allows canopy loss, tree retention and dwelling yield to be compared across lower-, medium- and higher-intensity development outcomes. This approach provides a practical basis for assessing whether different redevelopment forms result in materially different canopy impacts, both in absolute terms and relative to housing delivery.

Assumptions and limitations

The assessment is based on the 2026 airborne ArborCam® imagery, spatial datasets and redevelopment records. It is therefore limited to observable redevelopment outcomes within the selected study context and to the accuracy, resolution and timing of the available data.

The analysis focuses on canopy and tree-retention outcomes associated with recent and completed redevelopment. It does not assess future planting, long-term canopy establishment, tree health, landscape maintenance, or the broader lifecycle performance of new landscaping. As a result, the findings should be interpreted as an evidence-based assessment of observed redevelopment outcomes, rather than a prediction of longer-term canopy change.

The assessment also does not seek to evaluate the full range of planning, design, economic or social factors that influence redevelopment feasibility. Its purpose is to provide targeted evidence on the relationship between redevelopment intensity, tree retention, canopy loss and dwelling yield to support the City's consideration of residential coding and canopy outcomes through the LPS6 review.

3 Methods

3.1 Analysis overview

The assessment was undertaken in three main analytical stages.

1. An internal baseline analysis was completed to characterise existing canopy, tree stock and dwelling patterns across existing residential coding contexts within the City of Melville.
2. A redevelopment-specific analysis was undertaken to quantify canopy and tree-retention outcomes at completed redevelopment sites and compare these against key metrics relevant to the LPS6 review.
3. Selected case-study and pattern-based analyses were used to examine how tree-retention outcomes varied across redevelopment forms, density contexts and site-design conditions.

Together, these analytical stages provide the basis for the results, discussion and recommendations presented in Sections 4 to 6.

3.2 Data acquisition and processing

High-resolution airborne multispectral imagery was acquired over the City of Melville on 29 January 2026 under cloud-free conditions. Imagery was captured using a proprietary 11-band multispectral sensor array ArborCam® system from an altitude of 10,000 ft above ground level, with a ground sample distance (GSD) ranging from 10 cm to 30 cm depending on spectral band. Figure 1 shows the extent of imagery capture across the City of Melville.

Figure 1. Aerial overview of the ArborCarbon RGB output layer across the City of Melville, showing the extent of ArborCam image capture (green hatching).

The airborne ArborCam datasets were geometrically corrected and orthorectified using client-provided 2020 Landgate aerial imagery and the Geoscience Australia 5 m LiDAR-derived Digital Terrain Model. A Digital Surface Model was then generated for the full extent of the City of Melville to support vegetation height stratification. Vegetation was classified into five height categories: turf, 0–3 m (excluding turf), 3–10 m, 10–15 m, and >15 m. For the purposes of this assessment, all vegetation exceeding 3 m in height was classified as canopy.

A tree inventory dataset was also derived from the processed imagery to support the assessment of changes in tree numbers across the City. These processed spatial outputs formed the basis for subsequent analysis of canopy extent, tree retention and redevelopment outcomes.

Leveraging ArborCam datasets analysed through proprietary AI-based detection models, ArborCarbon was able to generate a building footprint dataset across the entire City of Melville. The AI model was able to segment and classify roof structures with high precision, even in complex urban or vegetated environments throughout the city.

Additional datasets generated as part of the 2026 acquisition, including land surface temperature, false colour composite and vegetation condition index outputs, were not used in this assessment.

3.3 Data sources

In addition to the 2026 airborne ArborCam imagery, ArborCarbon used a range of spatial datasets supplied by the City of Melville to support the assessment. These included the Property Boundary, Development Area, Local Planning Scheme No. 6 Proposed Changes (2025), Local Planning Scheme No. 6 zoning, Subdivision Clearances, and Current Dwelling Counts datasets.

ArborCarbon also leveraged historical imagery datasets captured in 2022 and 2016 to further inform the assessment and provide analysis within a time-series context. These datasets enabled comparison of pre-development, transitional and post-development canopy conditions across redevelopment sites within the City of Melville.

Together, these datasets enabled redevelopment sites to be identified, parent lots to be reconstructed, sites to be classified by residential coding, and canopy and tree-retention outcomes to be compared against dwelling yield.

3.4 Definitions

For the purposes of this assessment, a site is defined as a redevelopment unit corresponding to a parent lot that has undergone complete development.

A parent lot is defined as the grouping of current City of Melville property boundaries that, together, represent the original lot configuration prior to subdivision and complete redevelopment. Figure 2 illustrates this relationship by showing the reconstructed parent lot in relation to the current property boundary pattern.

Complete development is defined as a parent lot that has undergone subdivision or consolidation, removal or replacement of previously built form, and the new development appears to be complete.

Figure 2. Visual representation of the complete development of a site within the City of Melville, and the subsequent parent lot identification derived from ArborCarbon analysis. The green boundary on the left (2016 imagery) represents the analysed parent lot area, with the red boundaries on the right (2026 imagery) representing the City's current property outline dataset.

3.5 Analytical approach

The analytical approach aimed to measure canopy and tree-retention results resulting from residential redevelopment in the City of Melville, and to compare these outcomes across different residential coding contexts relevant to the review of Local Planning Scheme No. 6 (LPS6).

Analysis was undertaken at the parent-lot level. Results were then summarised by residential coding and broader density typologies to enable comparison of redevelopment intensity, canopy loss, tree retention and dwelling yield.

3.5.1 Site selection and parent lot reconstruction

Eligible redevelopment sites were first identified from the City of Melville's Subdivision Clearances dataset. Sites were excluded when complete redevelopment had not occurred, including lots with no apparent change, sites under construction, and sites cleared but not yet redeveloped.

Complete development was determined through review of available cadastral and imagery time-series data. This review was used to confirm subdivision or consolidation, replacement of previously built forms, and apparent completion of new development.

For each eligible site, parent lot boundaries were reconstructed by grouping current property boundaries to represent the pre-development lot configuration. This step was undertaken using the available cadastral and redevelopment information and was supported by manual quality assurance to confirm parent lot identification and ensure that all relevant properties were captured in the analysis.

Parent lots were used as the principal unit of analysis to enable comparison of redevelopment outcomes with those of the original development parcel.

3.5.2 Tree, canopy and metric derivation

Tree and canopy features within each parent lot were derived from the processed imagery using ArborCarbon analytical workflows. Canopy extent was quantified from the derived vegetation-height data, with all vegetation taller than 3 m classified as canopy. Individual trees greater than 3 m in height were also identified to support the comparison of changes in tree numbers over time. These datasets enabled assessment of both canopy area and tree-retention outcomes associated with redevelopment.

Spatial metrics were generated for each analysed parent lot, including property count, lot area, canopy area (m^2), canopy cover (%), tree count, building count, building area, dwelling count and canopy area per dwelling. Figure 3 provides an example of these derived spatial outputs, showing identified tree locations, vegetation-height classes, turf and building footprints within a residential area of the City of Melville.

For the purposes of this assessment:

a) **property count** refers to the number of individual property polygons within the analysed dataset;

b) **canopy area** refers to the area, in square metres, occupied by vegetation greater than 3 m in height;

c) **canopy cover** refers to canopy areas expressed as a proportion of total site area;

d) **tree count** refers to the number of vegetation features greater than 3 m in height identified as individual trees; and

e) **building count** refers to the number of identifiable buildings, excluding shed-like structures.

These outputs were used to support the baseline characterisation of existing residential coding contexts and the redevelopment-specific analysis presented in Section 4.1. Additional redevelopment metrics derived from these outputs included canopy change, canopy retained, canopy loss per dwelling, trees retained, lots retaining trees, trees lost per site and trees lost per dwelling.

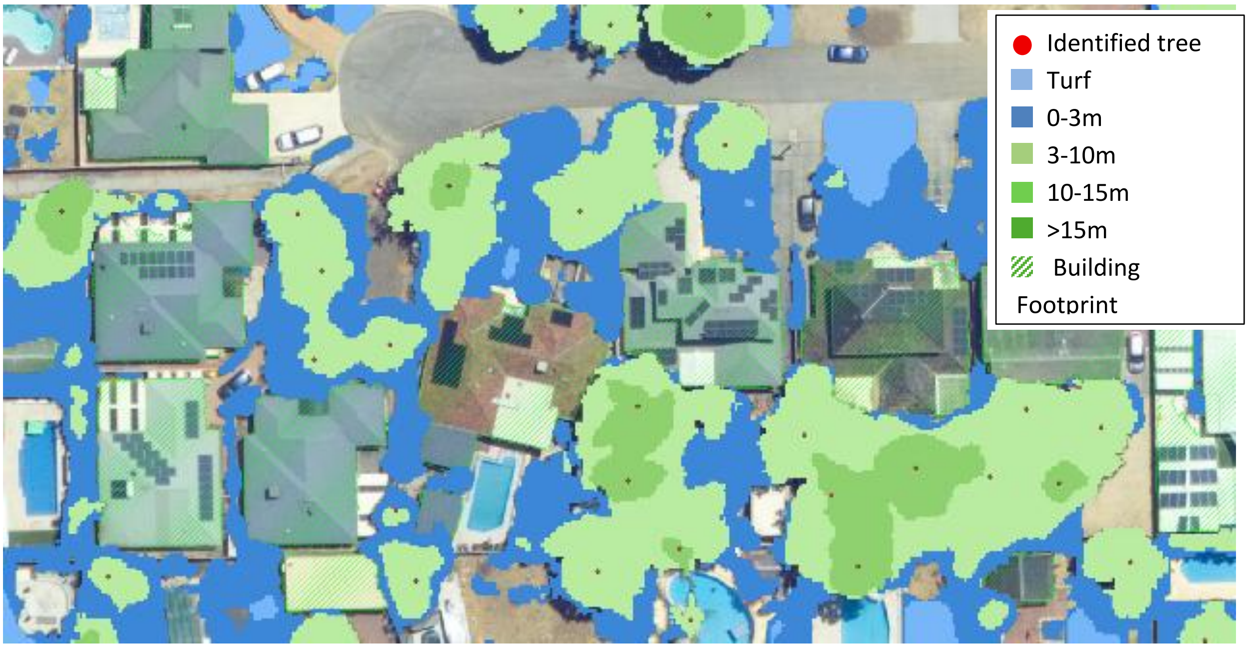


Figure 3. Aerial snapshot of a random cluster of properties within the City of Melville showcasing several key metrics: building identification (green hashing), canopy cover (green shading), and tree identification (red points). Dark blue and light blue shading represent vegetation below 3m in height, and turf, respectively.

3.5.3 Comparative framework

Analytical outputs were summarised at two levels: by individual residential R-code and by broader density typology. Broader density typologies were established to support higher-level comparison across the City and were informed by the structure of the Western Australian Residential Design Codes and the available analytical sample.

Residential R-Codes are used in Western Australia to identify the density of residential development that may be considered on a site. Because these codes are familiar to planners but less intuitive for general readers, Table 4 (Appendix A) summarises the R-Codes relevant to this assessment and the associated site-area requirements set out in the WA Residential Design Codes. The table is provided as a planning context only and is used to explain the density groupings adopted in this assessment.

For the purposes of analysis, high-density zones of R80, R100 and R-AC0 were merged due to limited sample size.

Categories with limited sample sizes or mixed coding characteristics were excluded from the comparison, as they were not considered analytically robust. This was due to their potential to skew results, either because of their non-linear coding relationships or because the available sample size was too small to support a reliable comparison.

This framework was used to compare canopy provision and redevelopment outcomes across broader density settings, while retaining the capacity to report results at the individual R-code level where appropriate.

A detailed redevelopment assessment was undertaken for selected focus R-codes. R20, R40 and R60 were adopted as focus categories due to their relevance to the proposed LPS6 changes and their analytical usefulness within the available redevelopment sample.

Although R50 was identified in the RFQ as a relevant coding context, it was not retained as a focus category for detailed assessment due to the limited number of eligible redevelopment sites. The selected focus categories were used to examine redevelopment outcomes in greater detail, particularly in relation to canopy loss, tree retention and dwelling yield.

3.5.4 Case-study and pattern-based review

In addition to the quantitative analyses presented in Section 4.1 and the normalised lot analysis presented in Section 4.3. Selected case studies and pattern-based observations were used to examine how redevelopment form and site layout influenced canopy-retention outcomes, in Section 4.2.

This component of the assessment involved a qualitative review of representative redevelopment sites across focus-density contexts. This included a comparison of pre- and post-development imagery, along with consideration of site characteristics associated with tree retention, tree removal, verge canopy persistence, and retained canopy extending from adjacent land.

This analysis was used to identify recurring redevelopment patterns and practical site-design implications relevant to canopy retention.

4 Results

4.1 Redevelopment-specific analysis

This section presents the redevelopment-specific component of the assessment. The analysis focuses only on sites that underwent complete redevelopment between 2016 and 2026, and compares canopy area, canopy cover, tree count and dwelling outcomes across the analysed redevelopment sites.

The purpose of this section is to quantify canopy and tree outcomes on completed redevelopment sites and compare these outcomes against key metrics relevant to the Local Planning Scheme No. 6 review. These metrics include canopy loss, canopy retention, and tree retention relative to dwelling yield.

4.1.1 Redevelopment outcomes by focus R-code

A detailed redevelopment analysis was undertaken for the focus R-codes R20, R40 and R60, consistent with the focus-category selection outlined in Section 3.5.3. These categories were selected because they are directly relevant to the City's proposed LPS6 changes and provide a suitable basis for comparing redevelopment outcomes across lower-, medium- and higher-intensity residential settings.

Table 1 summarises the redevelopment metrics for completed development sites within these focus categories.

A 'HIGH' category is also shown as an additional higher-density benchmark where relevant. This category comprises amalgamated redevelopment sites with R80, R100 and R-AC0 residential coding areas. It is provided for contextual comparison only and is not treated as a core focus R-Code in the detailed interpretation below.

Table 1. Results of key metric analysis conducted on completed redevelopment sites within the analysed focus R-code contexts in the City of Melville, including canopy cover (area and %), canopy change, canopy retained, canopy loss per dwelling, tree count, trees retained, proportion of lots retaining trees, trees lost per site, trees lost per dwelling, building count and dwelling count.

R-Code	Canopy (m2)			Canopy Cover (%)			Canopy Change %	Canopy retained %	Canopy loss per dwelling (m2)	Tree Count			Trees Retained %	% Lots retaining trees	Trees lost per site	Trees lost per dwelling	Dwelling Count
	2016	2022	2026	2016	2022	2026				2016	2022	2026					2026
R20	97,638.4	18,456.3	9,345.2	23.9	4.5	2.3	-90.43	9.57	48.7	808	295	108	13.37	17.48	1.63	0.39	1,813
R40	28,480.5	4,794.6	2,157	22.2	3.7	1.7	-92.43	7.57	30.97	224	73	22	9.82	11.11	1.32	0.24	850
R60	4,374.9	599.5	284.7	19.3	2.7	1.3	-93.49	6.51	29.64	34	21	8	23.53	28	1.04	0.19	138
HIGH	5,172.8	1,106.1	1,146.5	10.8	2.3	2.4	-77.84	22.16	2.77	47	12	6	12.77	15.38	1.58	0.03	1,451

Across the three focus R-codes, completed redevelopment resulted in substantial canopy loss between 2016 and 2026. Average canopy loss was high across all categories, ranging from -90.43% in R20 sites to -92.43% in R40 sites and -93.49% in R60 sites.

As a result, the proportion of canopy remaining after redevelopment was low at 9.57% in R20, 7.57% in R40, and 6.51% in R60 sites. These results indicate that extensive clearing of parent lots was common across the redevelopment sample, regardless of redevelopment intensity.

Tree retention was also limited. Tree numbers declined sharply across all focus R-codes, and the proportion of redeveloped lots that retained trees remained low. Overall, these patterns suggest that completed redevelopment often involved removing most existing trees, with the retained canopy typically representing only a small residual portion of the original condition.

4.1.2 Key redevelopment findings

Three main findings emerge from the redevelopment-specific analysis.

1. Canopy loss associated with completed redevelopment was consistently high across all analysed focus R-codes.
2. Tree retention was generally limited, indicating that most completed redevelopment sites retained little of their pre-development on-site tree stock.
3. The most meaningful difference between redevelopment intensities was observed not in whether canopy loss occurred, but in how that loss related to dwelling yield.

On this basis, canopy loss per dwelling and trees lost per dwelling are more decision-relevant indicators for the LPS6 review than site-level canopy loss alone.

When redevelopment outcomes are viewed relative to dwelling yield, a clearer pattern emerges. As shown in Table 1, canopy loss per dwelling declined from 48.7 m^2 in R20 redevelopment sites to 30.97 m^2 in R40 sites and 29.64 m^2 in R60 sites. A similar trend is evident for trees lost per dwelling, which decreased from 0.39 in R20 to 0.24 in R40 and 0.19 in R60.

These results indicate that, although higher-intensity redevelopment did not avoid substantial site-level canopy loss, it delivered additional dwellings with lower canopy and tree loss than lower-intensity redevelopment.

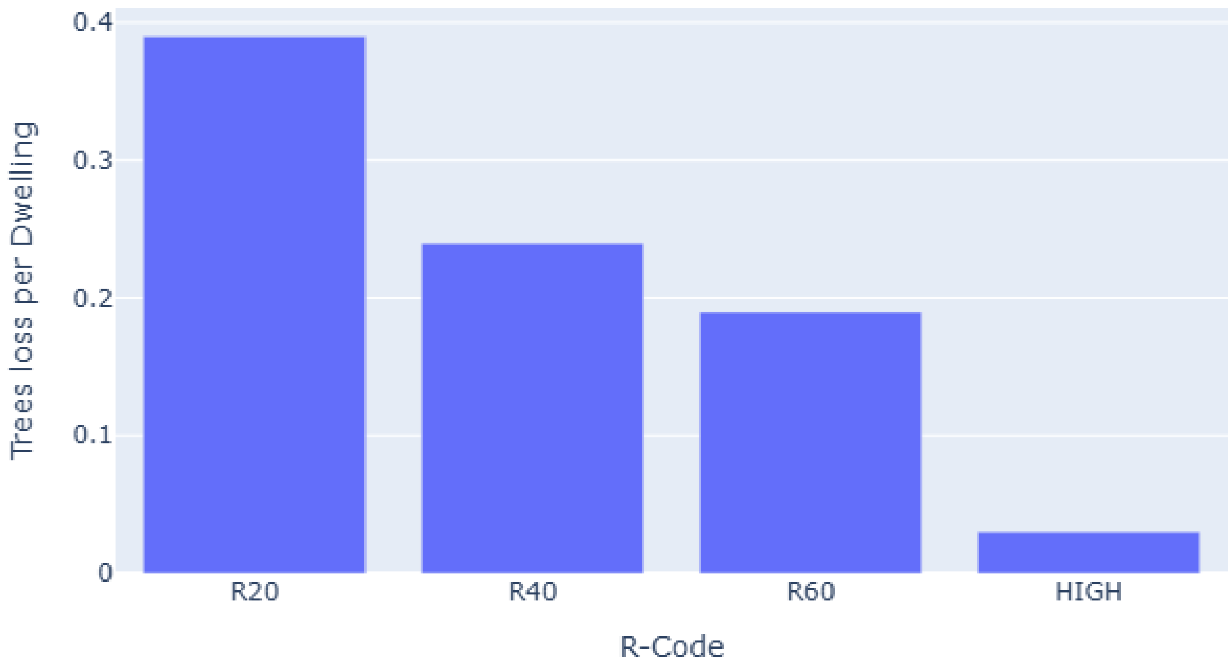


Figure 4. Trees lost per dwelling across completed redevelopment sites within the analysed focus R-code contexts (R20, R40 and R60), with HIGH shown as a higher-density benchmark where included.

These findings do not suggest that higher-intensity redevelopment has a lower overall impact on canopy cover. Rather, they indicate that under current redevelopment patterns, substantial canopy removal occurs across all analysed redevelopment intensities.

The principal distinction between categories lies in the relative efficiency with which additional dwellings are delivered. This provides the basis for the more detailed qualitative assessment presented in Section 4.2.

4.2 Case-study and pattern-based analysis

This section draws on selected case studies and broader pattern-based observations to examine how canopy retention outcomes varied across redevelopment forms, density contexts and site-design conditions.

While Section 4.1 presents quantitative results at the R-code and parent-lot scales, this section provides a more detailed qualitative understanding of how redevelopment outcomes unfolded on the ground. In particular, it considers the circumstances under which mature trees were retained or removed.

4.2.1 Comparative patterns across redevelopment contexts

A review of redevelopment sites across the analysed codes indicates that substantial canopy loss was common across R20, R40, R60 and the higher-density benchmark contexts. This qualitative pattern is consistent with the redevelopment-specific findings presented in Section 4.1 and suggests that, across the analysed sample, redevelopment typically involved broad clearing of the parent lot rather than site layouts deliberately configured to retain existing on-site canopy.

More favourable outcomes were observed in some lower-density contexts where redevelopment involved only partial change to the original parent lot, such as subdivision outcomes that retained an existing dwelling on part of the site while introducing a new dwelling elsewhere. Figure 5 provides an example of this type of R20 redevelopment outcome, where partial retention of the original site condition appears to have contributed to greater canopy retention than was typical across the broader redevelopment sample.

In these cases, canopy retention often reflected persistence of part of the original site condition rather than a comprehensive redevelopment outcome in which all or most of the existing canopy was removed.

Figure 5. An example of an R20-code development that has retained a disproportionate amount of its existing canopy compared to other developments of its kind. This figure demonstrates canopy retention by way of partial/complete original footprint retention.

By contrast, where lower-density redevelopment involved complete clearing of the parent lot and replacement of the existing built form, canopy outcomes were generally similar in character to those observed under more intensive redevelopment settings.

Canopy cover declined markedly across the analysed redevelopment contexts between 2016 and 2026 (Figure 6). Although outcomes varied between individual sites, the overall pattern reinforces the conclusion that canopy removal was typically extensive across redevelopment sites, regardless of density category. Selected case-study examples illustrating how these outcomes occurred at the site scale are presented in Section 4.2.2.

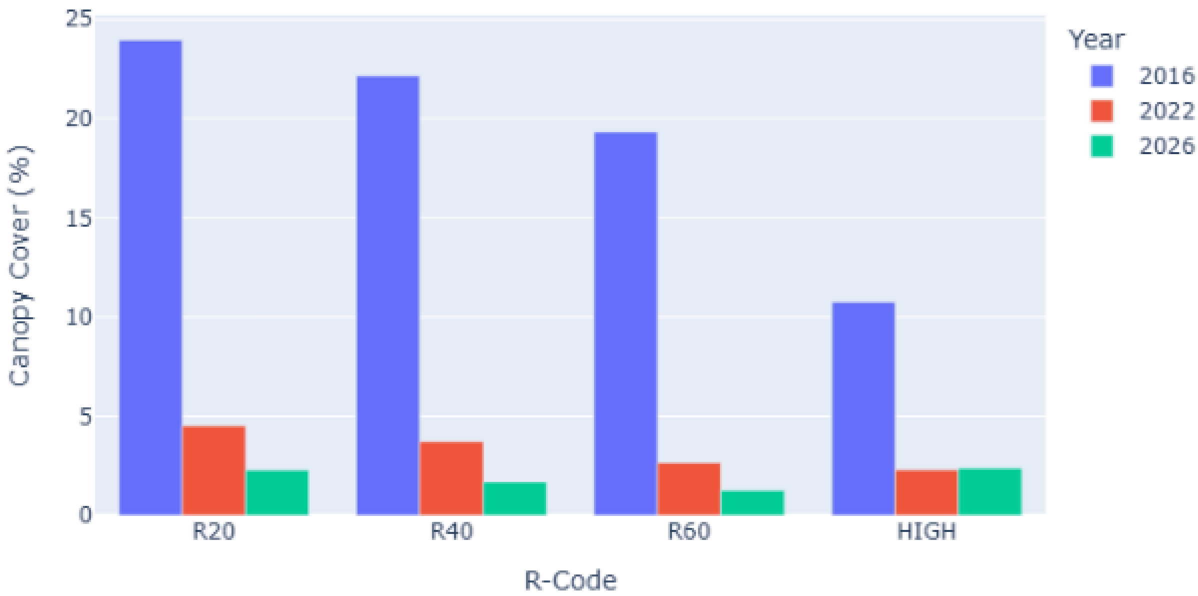


Figure 6. Visualisation of canopy cover percentage (%) of total land area in 2016, 2022 and 2026 across redevelopment sites within R20, R40, R60 and HIGH (R80, R100 and R-AC0) codes.

4.2.2 Case-study observations

Selected case studies were reviewed to illustrate how redevelopment outcomes varied between sites and to identify recurring characteristics associated with tree retention and removal across the analysed redevelopment contexts. The examples include redevelopment of R20, R40, and R60 lots, as well as a higher-density benchmark example (HIGH). These are presented as site-based illustrations of broader patterns observed across the dataset rather than as a statistically representative sample (Table 2).

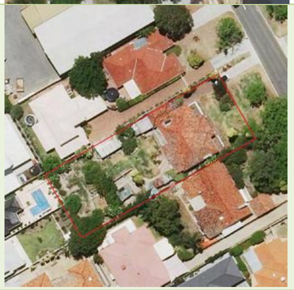
Across the case-study examples, genuine retention of established trees within completed redevelopment sites was limited. In most cases, redevelopment was associated with substantial site clearing prior to construction of the new built form.

Where canopy appears to persist after redevelopment, this often reflects one of three conditions:

a) retention of part of the original development footprint;
b) persistence of verge trees beyond the redevelopment site’s control; or
c) canopy extending into the site from adjoining land.

As a result, visible post-development canopy should not always be interpreted as deliberate retention of mature trees within the development envelope.

Table 2. Case-study examples of redevelopment outcomes across R-codes within the City of Melville for 2016, 2022 and 2026.

R-Code	Suburb	Redevelopment Yield	2016	2022	2026	Comments
R20	Melville	3 single-storey dwellings				• Existing verge trees remain, however not within property boundary. • Some neighbouring canopy in north-east corner contributes to post-development canopy 'retention'.
R40	Melville	3 single-storey dwellings. Otherwise capable of 6 apartments.				• No verge canopy. • Neighbouring tree canopy along western boundary contributes marginally toward canopy 'retention'.
R60	Mount Pleasant	6 two-storey grouped dwellings. Otherwise capable of 12 apartments.				• Wholesale lot clearance with only single verge tree retained.
R-AC0	Mount Pleasant	235 apartments, 20 storeys.				• Wholesale lot clearance. • Offsetting rooftop vegetation does not contribute to canopy retention as is not preexisting

Where more favourable retention outcomes were observed, these were generally associated with redevelopment forms that avoided complete site reconfiguration, retained part of the original dwelling footprint, or concentrated new built form in a way that left some existing canopy undisturbed. However, such outcomes appeared relatively uncommon, particularly in more intensive redevelopment settings.

4.2.3 External Observations

As part of the assessment criteria, ArborCarbon was asked to identify external areas suitable for benchmark analysis and subsequent comparison. By leveraging previously acquired ArborCam data within the Perth and Peel regions, the intent was to identify areas with concentrations of higher-density development, as well as individual redevelopment sites that demonstrated comparatively strong canopy-retention outcomes.

The purpose of this external comparison was to provide supplementary analysis across coding types that are underrepresented in the City of Melville, particularly in high-density residential settings. While development centres such as the Canning Bridge cluster include examples of larger-scale development, these forms of development are not yet sufficiently widespread within Melville to provide a robust comparative baseline.

Interstate examples were also considered; however, ArborCarbon was hesitant in this approach due to potentially inconsistent state planning codes, government targets, and design codes.

External observations and analysis would also provide the City with additional insight into development trends within other Western Australian localities, highlighting development sites with outlying canopy retention. Where found, these sites would allow ArborCarbon to identify trends in building footprints, driveway layouts and/or development designs that are conducive to canopy retention.

4.2.3.1 High-Density Benchmark

An external high-density benchmark was not calculated as part of this assessment due to several key limitations affecting its reliability and relevance.

First, across the analysed LGAs the available time-series datasets often did not capture the full redevelopment lifecycle. This limited the ability to consistently compare pre- and post-development canopy conditions and may have produced incomplete or potentially skewed canopy outcomes.

Second, the sample size of comparable high-density sites within historical ArborCam datasets was limited. As a result, an external benchmark would not have provided a meaningful improvement in statistical robustness over the existing benchmark dataset within the City of Melville.

Third, the inclusion of an external benchmark is also of limited practical value in this context, as it does not directly align with or inform the City’s proposed zoning changes, which are more deeply concerned with R40, R40/50, and R60 zoning.

Despite the analysis not progressing toward a dataset output, several external high-density development sites were observed as part of the initial analysis process. These developments are highlighted in Figure 7, and do allow for some face-value analysis of the various building trends outside the City of Melville.

a.
b.
c.

Figure 7. ArborCam Imagery above several RAC-0 zoned development sites within The City of South Perth showing clear site-wide tree removal prior to building development.

Figure 7 shows examples of redevelopment patterns which are characteristic of external sites within High-Density zoning (RAC-0). In each example, pre-development conditions show established vegetation distributed across front, side and rear setback areas, contributing to meaningful on-site canopy cover.

Once redevelopment commences, however, the examples show a consistent pattern of extensive canopy removal within the identified development parcels. These site-wide clearing patterns are broadly consistent with observations from comparable high-density contexts within the City of Melville.

On this basis, the external examples provide qualitative support for the finding that high-density redevelopment, where not specifically designed to retain mature trees, is commonly associated with near-total removal of existing on-site canopy. They do not provide evidence of widespread development practices that successfully integrate substantial mature-tree retention within high-density redevelopment footprints.

4.2.3.2 External observations of focus R-Codes

In addition to the observation of an external high-density benchmark, development sites falling within the assessed 'Focus' R-Codes (key densities of R20, R40 and R60) were identified for individual analysis. Similar to the high-density benchmark, sites experiencing complete development were rare throughout historical ArborCam datasets due to a variety of factors. Firstly, the City of Melville, being a relatively large LGA, contains more than double the land area of the next-largest relevant ArborCam dataset. This provides a greater opportunity for a larger quantity of applicable development lots. The City is also unique in its standing with ArborCarbon in that a 10-year time-series dataset is held, providing a much broader sample of lots for analysis, compared to shorter time-series datasets of 2-4 years in other Perth LGAs. Subsequently, ArborCarbon refrained from progressing with output analysis due to the statistical irrelevance of the limited external development dataset. Instead, ArborCarbon were able to draw upon commonplace trends derived from visual analysis of both partially and fully developed external sites, shown in Figure 8 (R20), Figure 9 (R40), and Figure 10 (R60).

a.

b.

c.

Figure 8. ArborCam Imagery R20 zoned development sites within the Town of Cambridge (a) and the City of South Perth (b) & (c) showing common development patterns (a) and (b) and an example of constructive tree retention (c).

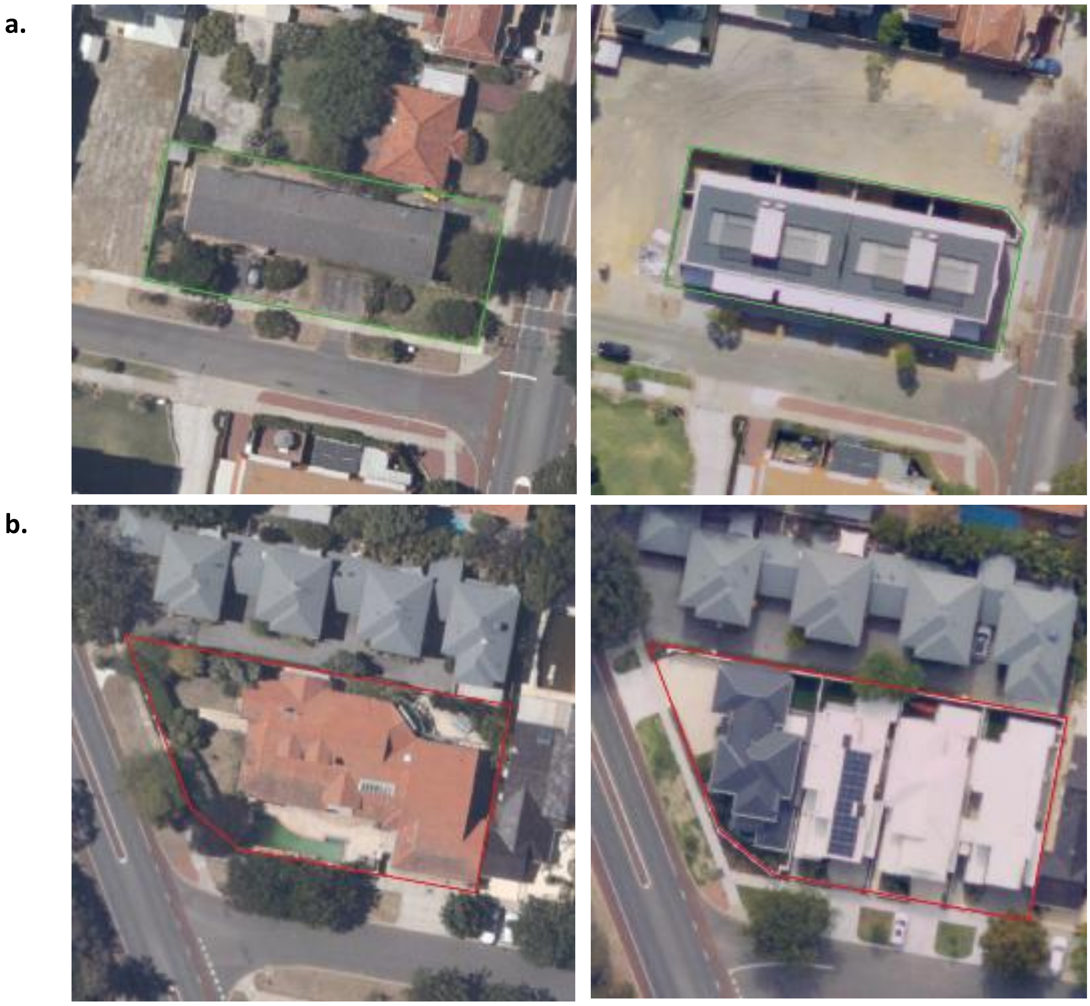


Figure 9. ArborCam Imagery of R40-zoned development sites within the City of South Perth, showing common development patterns exhibited across external sites.

a.

b.

Figure 10. ArborCam Imagery of R60 zoned development sites within the Town of Victoria Park (a) and the City of South Perth (b), showcasing broader development trends across external study areas.

The review of the various external development sites identified throughout the neighbouring LGAs of Cambridge, South Perth and Victoria Park supports the conclusion that canopy trends resulting from redevelopment impacts follow a broadly consistent trajectory, regardless of development intensity. As is the case with external high-density developments, sites across the R20, R40, and R60 zones all exhibit a fair dispersion of mature canopy across and within lot boundaries, before site-wide clearing eliminates almost all canopy prior to construction.

The case studies show that whilst higher-density zones (R40 and above) typically deliver greater dwelling yield, the redevelopment process itself often follows a similar pattern across density contexts. This commonly involves extensive site preparation, removal of existing vegetation, simplified ground conditions, and standardised access arrangements such as centralised or rear-loaded driveways.

The minimal variation in pre-development clearing patterns between lower and higher-density sites reinforces the finding that canopy loss is not entirely a function of residential density. Rather, it is strongly influenced by the redevelopment process itself and by whether site planning and design actively accommodate existing mature trees.

In several cases, the limited availability of post-development imagery constrained the ability to accurately assess final canopy outcomes or long-term success of replacement planting. However, the available data suggests that, without explicit planning mechanisms or design interventions, redevelopment across all zoning typologies and local government areas is likely to continue producing comparable canopy loss outcomes. The primary difference between redevelopment contexts is therefore reflected less in whether canopy loss occurs, and more in the housing yield achieved relative to that loss.

4.3 Normalised Lot Analysis

The analysis of developed sites within the City of Melville provides valuable insight into canopy and tree-retention outcomes across all R-Codes, with a particular focus on R-Codes that are most relevant to the proposed changes listed under the City's LPS6 Review.

At this stage, however, the findings do not account for two important factors: variation in lot size and whether each site has been developed to its full theoretical development potential. These factors are a result of both (a) natural variability in property boundaries before and after subdivision/amalgamation, and (b) housing market tendencies and desires across the City of Melville being less conducive to R40 and higher coded sites being developed to their maximum potential.

To address this variability within the redevelopment dataset, a normalised comparison was undertaken using a standardised 1,000m^2 development parcel. This approach applied the "Trees lost per site" metric from the redevelopment dataset in Table 1, adjusting it to a "Trees lost per 1000m^2" to be equalised with the normalised lot projections. This was done by taking total tree loss numbers from each focus R-Code and dividing that figure by the quotient of total development area and 1000m^2. This calculation is reflected in the equation below.

$$t = \frac{c_{2016} - c_{2026}}{\left(\frac{a}{1000}\right)}$$

where:

t = Trees Lost per 1000m^2

c = Tree Count

a = Developed Area

The resulting dataset is reflected in Table 3, more clearly highlighting the relative development efficiency of sites within various R-Codes when developed to their full potential. To calculate the 'Trees lost per additional dwelling' metrics, the 'Trees lost per 1000m^2' metric was divided by the 'Maximum additional dwellings (grouped dwellings per 1000m^2)' and 'Maximum additional dwellings (apartments per 1000m^2)' metrics, respectively. These latter metrics were provided by the City of Melville.

Table 3. Relative development efficiencies of sites within various R-Codes across the City of Melville, modelled off a normalised 1000m² lot.

R Code	Trees lost per 1000m²	Maximum additional dwellings (grouped dwellings per 1000sqm lot)	Extra dwellings gained for each tree lost	Maximum additional dwellings (apartments per 1000sqm lot)	Extra dwellings gained for each tree lost
R20	1.72	1.2	0.7	1.2	0.7
R40	1.60	3.5	2.2	7.7	4.8
R60	1.04	5.7	5.5	10.8	10

Table 3 applies empirically derived and normalised tree loss datasets from the redevelopment dataset to a controlled test scenario, alongside the maximum theoretical dwelling yield permitted under each R-Code, providing an indication of how efficiently each zoning category delivers housing relative to tree loss.

The normalised outputs demonstrate a clear and consistent trend across all analysed R-codes. While absolute tree loss per site remains relatively comparable, as visualised in Section 4.2, the number of additional dwellings that can be accommodated increases substantially with density.

As a result, tree loss per additional dwelling declines markedly with increasing development intensity. This indicates that, when assessed on an equivalent land-area basis, higher-density redevelopment can deliver greater dwelling yield for a comparable level of tree loss

At R20, redevelopment yields approximately 1.2 additional dwellings per 1,000m² of lot area, equating to approximately 1.43 trees lost per additional dwelling. By comparison, the R40 and R60 scenarios demonstrate significantly improved efficiency, with grouped-dwelling outcomes reducing tree loss per additional dwelling to approximately 0.46 and 0.18, respectively. This trend is further amplified under apartment-style development assumptions, where higher dwelling yields reduce the per-dwelling tree loss to as low as 0.10 in R60 contexts.

These results align with, but also clarify, the findings of the initial redevelopment analysis presented in Section 4.1. While earlier results show that canopy loss occurs consistently across all redevelopment intensities, the normalised framework demonstrates that higher-density development yields substantially more housing for a comparable level of canopy impact.

5 Discussion: Interpretation of findings

The redevelopment-focused analysis shows substantial canopy loss across all levels of redevelopment intensity. The findings do not indicate that development within a specific R-code consistently prevents canopy removal. Rather, the main difference among redevelopment types lies in how canopy loss relates to dwelling yield.

When assessed on a per-dwelling basis, higher-intensity redevelopment typically provides more housing with less canopy loss per dwelling and fewer trees removed per dwelling than lower-intensity redevelopment. This indicates that, with current redevelopment practices, the key issue is not simply whether canopy loss occurs, but how many dwellings are delivered relative to that loss.

The case study and pattern-based analysis reinforce the quantitative findings by showing that substantial canopy loss is not limited to a single redevelopment type. Instead, it is a common outcome across multiple redevelopment forms. At the site scale, completed redevelopment was frequently associated with extensive reconfiguration of the parent lot and the removal of most or all existing canopies. This suggests that current redevelopment practice often treats mature private-land trees as incidental to site planning, rather than as assets to be actively retained where feasible.

External observations, although based on a relatively small dataset, also support the findings from within the City of Melville. Across reviewed sites in neighbouring LGAs, redevelopment sites of all intensities showed site-wide tree removal prior to construction. These observations further support the relevance of the patterns identified in the Melville context.

The normalised analysis was introduced to account for several variability factors that existed within the initial redevelopment dataset. By normalising tree loss and development potential metrics to a $1000m^2$ lot, an efficiency calculation was produced, which demonstrated a more distinct difference between R-Code housing yields. This normalisation reinforced the central finding of this report: that redevelopment-driven canopy impacts are more related to the development process itself, as opposed to being a function of the R-Code in which the redevelopment is taking place. The normalisation crucially showed that development at a higher density offers a more efficient pathway to achieving dwelling targets with comparatively lower canopy impact per dwelling.

5.1 Trade-offs between yield and canopy retention

These results should be interpreted with caution. They do not indicate that higher-intensity redevelopment inherently results in low canopy impact, or that increasing density alone will lead to better canopy outcomes. Rather, they show that significant canopy removal is common across all types of redevelopment analysed.

The key policy consideration is therefore how dwelling yield is balanced against canopy loss. In this regard, medium- to high-intensity redevelopment may deliver more dwellings relative to canopy loss, particularly when compared with multiple rounds of lower-intensity subdivision that also cause extensive site clearing.

The case-study review also clarifies that a visible post-development canopy does not necessarily indicate successful on-site tree retention. In several situations, retained canopy appeared to be associated with verge trees, adjoining properties, or partial retention of the original site condition, rather than with the intentional incorporation of mature trees within the redevelopment layout itself.

5.2 Implications for LPS6 density changes

For the purposes of the LPS6 review, the findings suggest that the most relevant planning question is not whether redevelopment can occur without canopy impact, as this was not observed in the analysed sample, but how future density settings can better balance housing delivery with positive canopy retention outcomes.

In practical terms, this underscores the importance of closely considering R40 and R60 contexts. These coding categories are more directly aligned with the City's proposed planning changes and appear to yield more dwellings per unit of canopy loss than lower-intensity redevelopment

The case-study observations also indicate that canopy outcomes are influenced not only by density settings, but by the extent to which the planning framework shapes site layout, access design and tree-retention expectations. If substantial canopy loss continues across a wide range of redevelopment forms, improved short-term and retention outcomes are unlikely to be achieved through density provisions alone. This points to the need for complementary planning controls or assessment criteria that address the treatment of existing trees during redevelopment.

The results indicate that canopy outcomes are shaped not only by density settings, but by how redevelopment is physically arranged on each site. Observed redevelopment patterns commonly involved broad site clearing, expanded building footprints and access layouts that left limited opportunity for mature-tree retention. If additional dwelling targets and canopy objectives are to be achieved within the same neighbourhoods, the planning framework will need to guide redevelopment form more explicitly. This means encouraging compact built form, including building up rather than out where appropriate, while requiring key mature trees to be identified early and treated as design constraints rather than obstacles to be removed. The normalised analysis should not be interpreted as suggesting that high-density development is inherently canopy-sensitive, or that high-density zoning should be the only consideration. Rather, it highlights that density plays an important role in determining how widely canopy loss is distributed across the City as infill housing is delivered.

Lower-density approaches may appear less intensive when considered at the individual site scale; however, if scaled up to meet the City's housing targets, they may require a larger number of redevelopment sites and therefore distribute canopy loss across a broader area. This reinforces the need to consider both site-level canopy outcomes and dwelling-yield efficiency when evaluating future residential density settings.

6 Conclusions & Recommendations

The findings suggest that changes to density settings alone are unlikely to materially improve canopy outcomes under current redevelopment patterns. Their main effect lies in determining how efficiently housing is delivered relative to canopy loss across the municipality.

The results therefore support a dual planning response.

First, density settings should be considered in terms of their efficiency in delivering dwellings relative to canopy loss. This is particularly relevant in R40 and R60 contexts, which are closely aligned with the proposed Local Planning Scheme No. 6 changes and appear to deliver more dwellings per unit of canopy loss than lower-intensity redevelopment.

Second, and critically, improved canopy outcomes will depend on complementary planning controls, design requirements, and assessment frameworks that actively prioritise tree retention within redevelopment sites. Without such measures, substantial canopy removal is likely to remain a common outcome across redevelopment contexts, regardless of R-code.

Tree retention in site planning

To improve retention of mature trees on private land, the City could consider strengthening redevelopment assessment requirements so that existing mature trees are identified at the start of the design process and assessed as part of site planning. This could include requiring proponents to show how building footprints, driveway alignments, crossover locations, open-space areas and construction methods have been considered in relation to retainable trees. Where tree removal is proposed, proponents could be required to demonstrate why retention is not reasonably achievable and what alternative design options have been considered. Alternatively, where tree retention is a feasible and considered aspect of site planning, the City could consider offering flexibility in design restrictions to encourage such efforts being made by the developing party.

Retainable tree assessment

Where mature trees are located in areas that could reasonably be integrated into redevelopment design, proponents should be required to demonstrate why retention is not feasible.

This would help shift tree retention from a discretionary or incidental outcome toward a more deliberate component of redevelopment planning. It would also provide the City with a clearer basis for assessing whether tree removal is genuinely necessary or primarily a result of standardised site layouts.

Verge and adjoining canopy protection

Because some apparent post-development canopy is associated with verge trees or canopy extending from neighbouring land, redevelopment assessment should also consider how crossover placement, access design and site works may affect trees beyond the immediate building footprint. Protecting these canopy assets is likely to be an important part of limiting broader canopy decline in redevelopment areas, particularly where on-site private-land tree retention remains limited.

Private land tree-retention policy

The findings support the value of a private land tree-retention policy or an equivalent assessment framework to guide the treatment of existing mature trees during redevelopment.

If mature trees on redevelopment sites are to be retained more consistently, the planning system will likely need to move beyond passive encouragement and require explicit consideration of whether existing trees can be reasonably accommodated through site planning, building placement and access design.

Integrating tree retention with density planning

If tree-retention policy settings unintentionally favour lower-density redevelopment, this may result in a greater number of sites needing to be redeveloped to meet housing targets, with the potential for larger cumulative canopy loss across the City. For this reason, density settings and tree retention requirements should be considered together. Medium and higher-density redevelopment may provide a more efficient pathway for accommodating housing growth, but this should be supported by stronger expectations for tree retention, replacement planting, urban greening and canopy offsets in areas of concentrated redevelopment.

A combined approach would allow the City to pursue efficient infill housing outcomes while also improving the prospects for mature-tree retention and future canopy growth.

Appendix A

Table 4. Residential R-Codes relevant to this assessment, showing site-area requirements derived from WA R-Codes Volume 1 Table D and City of Melville LPS6 context. Source: Western Australian Residential Design Codes Volume 1, Table D: Site area requirements; City of Melville Local Planning Scheme No. 6, clauses 25 and 26. Values shown are statutory site-area requirements and should be interpreted in light of the R-Codes, LPS6, the Scheme Map, relevant local planning policies, activity centre plans, and site-specific assessment.

R-Code	Group used in this report	Single house / grouped dwelling site area per dwelling	Multiple dwelling site area per dwelling	Minimum lot area / rear battleaxe	Minimum frontage	Notes
R12.5	Low	Min. 700 m²; avg. 800 m²	Avg. 800 m²	762.5 m²	17 m	Volume 1 Table D.
R15	Low	Min. 580 m²; avg. 666 m²	Avg. 666 m²	655 m²	12 m	Volume 1 Table D.
R17.5	Low	Min. 500 m²; avg. 571 m²	Avg. 571 m²	587.5 m²	12 m	Volume 1 Table D.
R20	Low	Min. 350 m²; avg. 450 m²	Avg. 450 m²	450 m²	10 m	Volume 1 Table D.
R20/60	Low / split-code context	Lower code generally applies unless LPS6 split-code requirements are met	Depends on applicable code and dwelling type	Depends on applicable code	Depends on applicable code	Treat cautiously; split coding is controlled through LPS6 and relevant scheme-map provisions.
R25	Low	Min. 300 m²; avg. 350 m²	Avg. 350 m²	425 m²	8 m	Volume 1 Table D.
R30	Not grouped/excluded where the sample is limited	Min. 260 m²; avg. 300 m² for single house; grouped dwelling also min. 260 m²; avg. 300 m²	Avg. 300 m²	410 m²	Not specified	Volume 1 Table D.
R30/40	Split-code context	Lower code generally applies unless LPS6 split-code requirements are met	Depends on applicable code and dwelling type	Depends on applicable code	Depends on applicable code	Treat cautiously due to mixed coding.
R35	Not grouped/excluded where the sample is limited	Min. 220 m²; avg. 260 m² for single house; grouped dwelling also min. 220 m²; avg. 260 m²	Avg. 260 m²	395 m²	Not specified	Volume 1 Table D.
R40	Medium	Min. 180 m²; avg. 220 m² for a single house / grouped dwelling	Avg. 115 m²	380 m² for a single house	Not specified	Key focus code in this assessment.
R40/60	Medium/split-code context	Lower code generally applies unless LPS6 split-code requirements are met	Depends on applicable code and dwelling type	Depends on applicable code	Depends on applicable code	In Willagee R40/60 areas, LPS6 applies the lower code unless the lot is at least 3,000 m², the proposal is for single or grouped dwellings only, and created lots are regular in shape with individual street frontage. (Western Australian Government)
R50	Medium	Min. 160 m²; avg. 180 m²	Avg. 100 m²	160 m²	Not specified	Volume 1 Table D.
R60	Medium	Min. 120 m²; avg. 150 m²	Avg. 85 m²	120 m²	Not specified	Key focus code in this assessment.
R80	High / benchmark	Min. 100 m²; avg. 120 m²	Refer to R-Codes Volume 2	100 m²	Not specified	Volume 1 Table D applies to single houses / grouped dwellings; multiple dwellings refer to Volume 2.

R-Code	Group used in this report	Single house / grouped dwelling site area per dwelling	Multiple dwelling site area per dwelling	Minimum lot area / rear battleaxe	Minimum frontage	Notes
R100	High / benchmark	R80 site-area requirements apply to single houses / grouped dwellings on lots coded R100, R160 and R-AC	Refer to R-Codes Volume 2	Not directly expressed as a standard R100 Table D row	Not specified	Use as benchmark only; apartment-style development is assessed under Volume 2.
R-AC0	High / activity-centre benchmark	R80 site-area requirements apply to single houses / grouped dwellings on R-AC lots	Refer to R-Codes Volume 2	Not directly expressed through Volume 1 Table D	Not specified	Activity-centre apartment coding; not directly comparable with low / medium R-Codes using Volume 1 site-area-per-dwelling values.