

Arboriculture Impact Assessment Report

Scots College – Glengarry Campus

369 Jacks Corner Road, Kangaroo Valley, NSW

10/10/2024

Prepared for

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Definitions of terms and abbreviations

Title / Abbreviation	Description
APZ	Asset Protection Zone
DBH	Trunk diameter measured at 1.4 metres above ground level
DRB	Diameter at root base measured just above the buttress flare
Height	Height of tree measured using a Lazer range finder from the ground level to the highest visible point in the canopy
Crown Spread	Average diameter spread of the canopy from outer tips of branches
TPZ	Tree Protection Zone - The recommended setback is declared a TPZ where construction, trenching, soil level changes and use of machinery should be excluded
SRZ	Structural Root Zone - The area required for stability; a far larger area is necessary to maintain a viable tree
ULE	Useful Life Expectancy. The approximate timeframe that the arborist has determined that the tree will provide safe amenity value to the area.
STARS	Significance of a Tree Assessment Rating System. See Appendix 2 for more details
Tree Retention Value	Retention value of a tree determined by combining ULE and STARS classifications within a matrix (see Appendix 2) developed by IACA 2010. Retention values classification is used to determine the priority for tree retention or removal on a development site.
IACA	Institute of Australian Consulting Arborists
Set back	Distance from the centre of the tree base to the outside limit of the construction footprint.
Non-Destructive Excavation	Excavation methods that do not damage tree roots such as vacuum excavation, hand tools, or air spade.

Quality Information

Document:	Arborist Impact Assessment – Scots College, Glengarry Master Plan, Kangaroo Valley
Date of Assessment:	1 st – 19 th August 2024
Prepared by:	Roger Uebe
Client Contact:	Leith Schmidt
Date sent to Client:	10 th October 2024
Report Timeframe:	3 years from date of assessment

1. Summary

Gummifera has been commissioned by Baxter and Jacobson Architects on behalf of The Scots College to conduct an Arboriculture Impact Assessment (AIA) for trees located at The Scots College Glengarry Campus in Kangaroo Valley, NSW within the Shoalhaven Local Government Area (LGA). This assessment is part of a planned development within the campus, which involves demolishing old buildings, constructing new dormitories and educational facilities, upgrading the vehicular access road, and creating pedestrian pathways.

1.1. Development Overview

The development will be executed in two phases:

- **Stage 1 (Current Development Application):** This includes the construction of dormitories (D1, D2, and D3), a maintenance building (M1), an Outdoor Education facility (OE), upgrades to the vehicle access road, and new pedestrian paths.
- **Stage 2 (Future Development Application):** This phase involves the construction of additional buildings (H1 to H5) and extensions to the pedestrian pathways.

An extension to the existing Asset Protection Zone (APZ) to the west of the campus has been planned and assessed prior to this AIA, in accordance with bushfire safety regulations.

1.2. Assessment Purpose

The primary aim of this Arboriculture Impact Assessment report is to evaluate the impact of the proposed developments on existing trees, providing recommendations for their retention or removal. This includes assessing trees within the current APZ and the proposed extended APZ to align with NSW RFS requirements.

1.3. Assessment findings

- The site assessment took place between 1st of August and 9th of August, 2024, encompassing both the current and proposed APZ areas, facilitated through GIS mapping.
- A total of 401 trees were assessed:
- 217 trees in the current APZ.
- 184 trees in the proposed extended APZ.
- The current development plans (Stage 1) will impact 38 trees:
- 17 trees will need to be removed due to significant encroachment into their Tree Protection Zone (TPZ) or Structural Root Zone (SRZ).
- 21 trees can be retained, provided the recommended actions are implemented.

1.4. Recommendations

- **Engineering Consultation:** Engage with engineering specialists and the NSW RFS to explore the possibility of altering the road alignment to avoid the removal of four priority retention trees located near the GYM and D1 buildings, emphasizing their ecological and landscape value.
- **Tree Protection Plan:** Hire a project arborist to develop a detailed tree protection plan for the trees designated for retention and to oversee construction activities that may impact their TPZ.
- **Tree Removals:** A total of 63 trees are recommended for removal within the proposed extended APZ to ensure compliance with bushfire safety standards.

This assessment underscores the significance of careful planning and management to preserve valuable trees while facilitating necessary development for The Scots College.

2. Purpose

This Arborist Impact Assessment (AIA) report evaluates the impact of the proposed development at Scots College, Glengarry Campus, located at 369 Jacks Corner Road, Kangaroo Valley, NSW. The report includes:

1. Identification and details of all trees within the current Asset Protection Zone (APZ), including species, location, size dimensions, and characteristics.
2. An evaluation of each tree's retention value according to the guidelines set by the Institute of Australian Consulting Arborists (IACA 2010).
3. The calculated dimensions of the Tree Protection Zone (TPZ) and Structural Root Zone (SRZ) for each tree, assessing potential impacts from the development.
4. Recommendations for tree removal or adjustments to plans when tree viability cannot be ensured due to development impacts.
5. Guidance for protecting the health and structure of retained trees during and after construction.
6. Information on trees within the proposed extended APZ, including species, locations, and retention value.
7. Recommendations for tree retention or removal to facilitate the extension of the APZ.

All findings are based on site assessments, data collection, literature review, and adherence to IACA and AS4970-2009 standards.

The client is encouraged to share this report with all relevant stakeholders to ensure compliance with the guidelines and recommendations before commencing any works.

3. Consulting Arborist

Roger Uebe is an accomplished AQF Level 8 Consulting Arborist with extensive expertise and a commitment to excellence in tree management. Holding a Bachelor of Applied Science in Agriculture and Horticulture along with a Post Graduate Certificate in Arboriculture, Roger has been a significant contributor to the arboriculture industry since 1997.

In 2015, Roger transitioned to consulting arborist, leveraging his deep knowledge and experience to provide expert advice and assessments. His dedication to unbiased and independent consultancy led him to establish Gummifera Tree Consulting in 2020.

At Gummifera, Roger offers objective tree consultancy services, free from affiliations with tree trimming or removal companies, ensuring that all advice is impartial and focused solely on the best interests of his clients.

With a reputation for thorough analysis and ethical practices, Roger Uebe is dedicated to delivering insightful, reliable, and conflict-free recommendations to meet the diverse needs of his clients.

4. Methodology

4.1. Documentation Provided

The following documentation have been provided by the client and reviewed by the author.

4.1.1. File Name: 101811 UPDATE DETAIL-050924

Title: Sketch plan showing detail at the Scots College, Glengarry Camups

Drawn by: SET Consultants

Dated: 6th September 2024

Reference: Lot 27 DP 881838 & Lot 1 DP1261829 - Jacks Corner Rd, Kangaroo Valley

Reference No. 101811/20

Drawing No's: Sheets 1 – 7

4.1.2. File Name: 433.02 TSC GG MP SET

Title: The Scots College Glengarry Campus Master Plan

Drawn by: Baxter & Jacobson Architects

Dated: 1st October 2024

Reference: 369 Jacks Corner Rd, Kangaroo Valley

Drawing No's: MP0.000, MP 1.01, MP 1.0,2 MP 1.03, MP 1.04, MP 1.05, MP 1.06, MP 1.07, MP 2.01, MP 3.01, MP 3.02

4.2. Site Assessment

4.2.1. Assessment Process

A site assessment was conducted between August 1 and 19, 2024, to visually inspect all trees within the campus grounds and the extended Asset Protection Zone (APZ) area. The field assessment process included the following steps:

1. Review of development planning documents provided by the client to understand project scope and requirements.
2. Visual assessment of all trees within the Glengarry Campus APZ managed area (refer to Figure 1).
3. Data collection for trees within the current APZ to determine tree retention value, Tree Protection Zone (TPZ), Structural Root Zone (SRZ) radius, and potential development impacts.
4. Visual assessment of all trees within the proposed extended APZ area.
5. Data collection for trees in the proposed extended APZ to determine retention value and provide recommendations for retention or removal.
6. Photographs of each tree were taken to support the assessment.
7. Tree locations were plotted using ArcGIS field mapping software.

4.2.2. Tools used:

- Diameter tape / measuring tape
- True Pulse 200L Laser Range Finder
- Field Map for ArcGIS application for data collection and photos

4.3. Data analysis and recommendations

4.3.1. For all trees assessed

Botanical names of all trees were identified using leaf and seed samples, with verification through Google Images and tree identification references.

Useful Life Expectancy (ULE) was assessed using a ULE rating system (see Appendix 1).

A Significance of a Tree Assessment Rating System (STARS) was established to evaluate each tree's contribution to the landscape and its retention value (refer to Appendix 2).

Tree retention value was determined using a matrix developed by the Institute of Australian Consulting Arborists (IACA, 2010), which combines ULE and STARS ratings (see Appendix 2).

4.3.2. For trees within the current APZ managed area

The Australian Standard AS-4970-2009, "Protection of Trees on Development Sites," was used to calculate Tree Protection Zone (TPZ) and Structural Root Zone (SRZ) dimensions and to recommend management actions for each tree. The following reviews were conducted:

- Site survey details provided by SET consultants to confirm the exact location of each tree.
- Glengarry Campus Master Plan drawings (MP 1.05, MP 1.06, MP 1.07) to assess the proposed development's impact on each tree.
- Evaluation of TPZ and SRZ to determine each tree's viability during and after construction.

4.3.3. For trees within the proposed extended APZ area

The following assessments were made:

- Review of standards for clearing asset protection zones (NSW Rural Fire Service, undated).
- GIS mapping with tree locations overlaid and color-coded according to their Tree Retention Value.
- Manual selection of low-value trees for removal where canopy density exceeds the maximum allowable limit.

4.4. Exclusions

The following activities were not included in the field assessment:

- Assessment of tree canopies using aerial assessment techniques such as climbing, use of elevated work platform or drone photography.
- Evaluation of root systems below ground; no excavation or ground-penetrating radar was employed to map or assess tree root zones.

4.5. Limitations of the above methodology

The information presented in this report relies on publicly available databases, which may contain inaccuracies and have not undergone independent verification. Consequently, the reliability of the data cannot be guaranteed.

Species identification of the trees is based on observable characteristics available during the assessment. While every effort is made to correctly identify the botanical names, the limitations of these characteristics mean that accuracy cannot be ensured.

Additionally, Gummifera has not conducted the following assessments that could affect tree health:

- Soil analysis
- Below-ground root analysis
- Aerial tree inspections

These omissions may impact the overall understanding of tree health and condition.

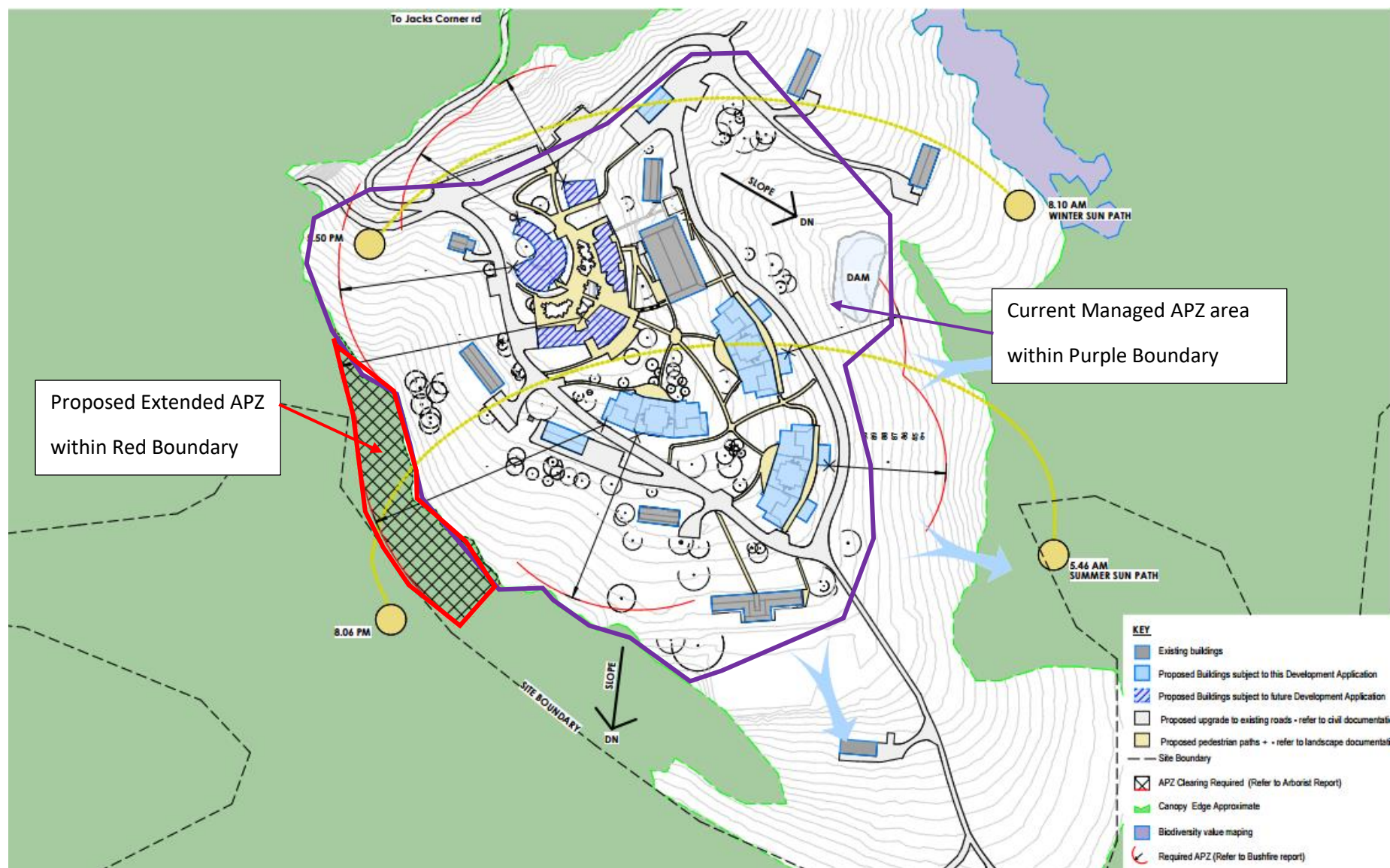


Figure 1: Extract from Glengarry Master plan, drawing number MP 1.04 highlighting the two areas of assessment.

5. Observations

5.1. The Site

Refer to Glengarry Campus Master Plan 1st October 2024 Drawing number MP 1.01, MP 1.02 and MP 1.03 for details of the site location and characteristics.

The client has instructed Gummifera to assess all trees located within the current APZ managed and the proposed extended APZ area. Refer to figure 1 describing the two areas of assessment.

5.2. The Trees

A total of 401 trees were assessed on site, 217 trees within the current APZ managed area and 184 trees within the proposed extended APZ area.

For details of all trees within the current APZ managed area refer to “[Attachment A Glengarry_AIA_Current APZ_Final](#)”.

For details of all trees within the proposed extended APZ area refer to “[Attachment B Glengarry_AIA_Extended APZ_Final](#)”.

5.3. Tree Locations

The location of each tree has been plotted on a GIS map and can be viewed by following the URL links below.

- The number label on each tree point matches the Tree ID field in the data sheet.
- Tree points within the map are colour coded by their tree retention value, refer to section 6.1.
- Click on the legend button to reveal the map legend.
- To view the details of a tree, click on the tree point to open a pop-up displaying tree attributes and photos.
- Use the search function to find a specific TREE ID.

5.3.1. For trees within current APZ managed area

<https://gumi.maps.arcgis.com/apps/instant/atlas/index.html?appid=31c0d434a0bb490faed01b94f8587c6d>

5.3.2. For tree within proposed extended APZ area

<https://gumi.maps.arcgis.com/apps/instant/atlas/index.html?appid=d74647603e0d4672953602159b2d6d18>

6. Discussion

6.1. Tree Retention Value and Landscape Significance

It is possible to determine a tree's retention value based upon several factors including size, condition and maturity coupled with the methodologies Significance of a Tree Assessment Rating System (STARS) and Useful Life Expectancy (ULE). For definitions and details of the determination of ULE, STARS and Retention value refer to Appendix 1 and 2. The matrix in Appendix 2 is used to cross reference ULE with STARS to determine the tree's retention value. There are 4 classifications for tree retention value; Trees to prioritise for retention (high), Trees to consider for retention (medium), trees to consider for removal (low) and trees to prioritise for removal.

6.1.1. Trees to Prioritise for Retention (High)

“These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by the Australian Standard AS4970 Protection of trees on development sites. Tree sensitive construction measures must be implemented e.g., pier and beam etc if works are to proceed within the Tree Protection Zone” (IACA 2010).

6.1.2. Trees to Consider for Retention (Medium)

“These trees may be retained and protected. These are considered less critical; however, their retention should remain priority with removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted” (IACA 2010).

6.1.3. Trees to Consider for Removal (Low)

“These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention” (IACA 2010).

6.1.4. Trees to Prioritise for Removal

“These trees are considered hazardous, or in irreversible decline, or weeds and should be removed irrespective of development” (IACA 2010).

The tree retention value for each tree assessed can be found within Attachment A and Attachment B, refer to the “Tree Retention Value” field. Alternatively refer to the web map URL links above in section 5.3 to review tree retention values in the GIS format. Figure 2 is a screenshot of the legend used within the web map.

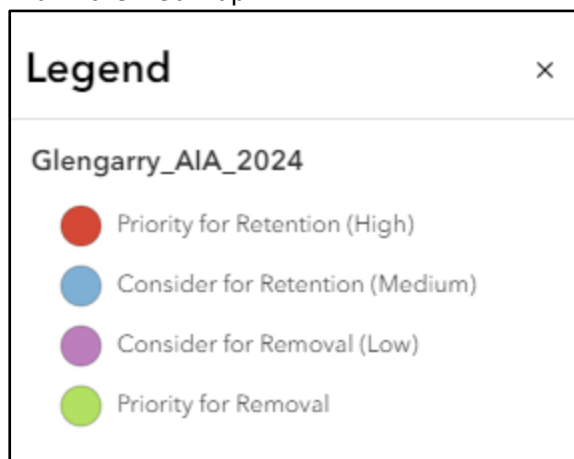


Figure 2: Screenshot of legend used in the web map

Table 1 provides a summary of the total number of trees within each tree retention value category.

Table 1: Summary of tree retention value

Tree Retention Value	Current APZ	Extended APZ	Total
Priority for Retention (High)	118	78	196
Consider for Retention (Medium)	83	52	135
Consider for Removal (Low)	5	13	18
Priority for Removal	11	41	52

6.2. AS4970-2009 Protection of trees on development sites

Australian Standard 4970-2009, Protection of trees on development sites, was established to provide appropriate guidelines to ensure the long-term viability and stability of trees to be retained on development sites.

Tree Protection Zones (TPZ) are based on the diameter of the tree measured at 1.4 metres above ground level x 12 (refer to Table 3 below for calculated TPZ's). The TPZ is measured from the centre of the tree's trunk to the proposed edge of excavation/development works. The recommended setback is declared a TPZ where construction, trenching, soil level changes and use of machinery should be excluded.

The Structural Root Zone (SRZ) is the area required for stability; a far larger area is necessary to maintain a viable tree. Therefore, no excavation or construction shall encroach within the SRZ (refer Table 3 for calculated SRZ's). The SRZ is determined adopting the formula from AS4970-2009 where the SRZ radius = $(D \times 50) 0.42 \times 0.64$. Where D = trunk diameter, in m, measured above the root buttress.

Under AS4970-2009 a minor encroachment of 10% of the TPZ area is allowable, provided this is compensated for elsewhere and contiguous to the TPZ. Should more than a 10% encroachment occur then the Project Arborist must demonstrate the tree can be protected and remain in a viable state.

The TPZ radius, TPZ area and SRZ radius values have been calculated for all trees impacted by the proposed development and have been used to determine level of encroachment of the TPZ. Refer to Attachment A to view the TPZ radius, TPZ Area and SRZ radius values for each tree. Alternatively, these values can be viewed in the web map by opening the following URL link. Open the details pop up by clicking on a tree point and scroll down to TPZ radius (m), see figure 3 for an example.

<https://gumi.maps.arcgis.com/apps/instant/atlas/index.html?appid=31c0d434a0bb490faed01b94f8587c6d>

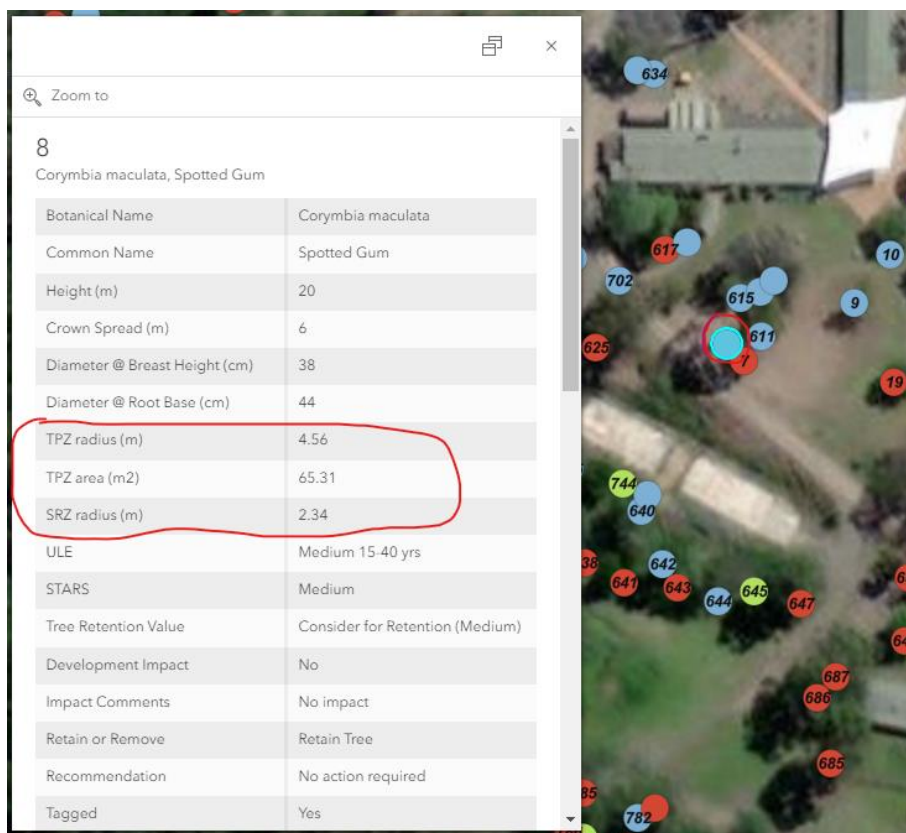


Figure 3: Screenshot of tree details pop up with TPZ radius, TPZ area and SRZ radius highlighted

6.3. Proposed Development Impacts

6.3.1. Current APZ managed area (tree impacts from proposed demolition and construction)

Details of the proposed development plans are provided within the Glengarry Master Plan architectural drawings supplied by Baxter and Jacobson Architects. Figure 2 is a screen shot from Drawing number MP 1.06. It describes the developments that will be included within the current development application.

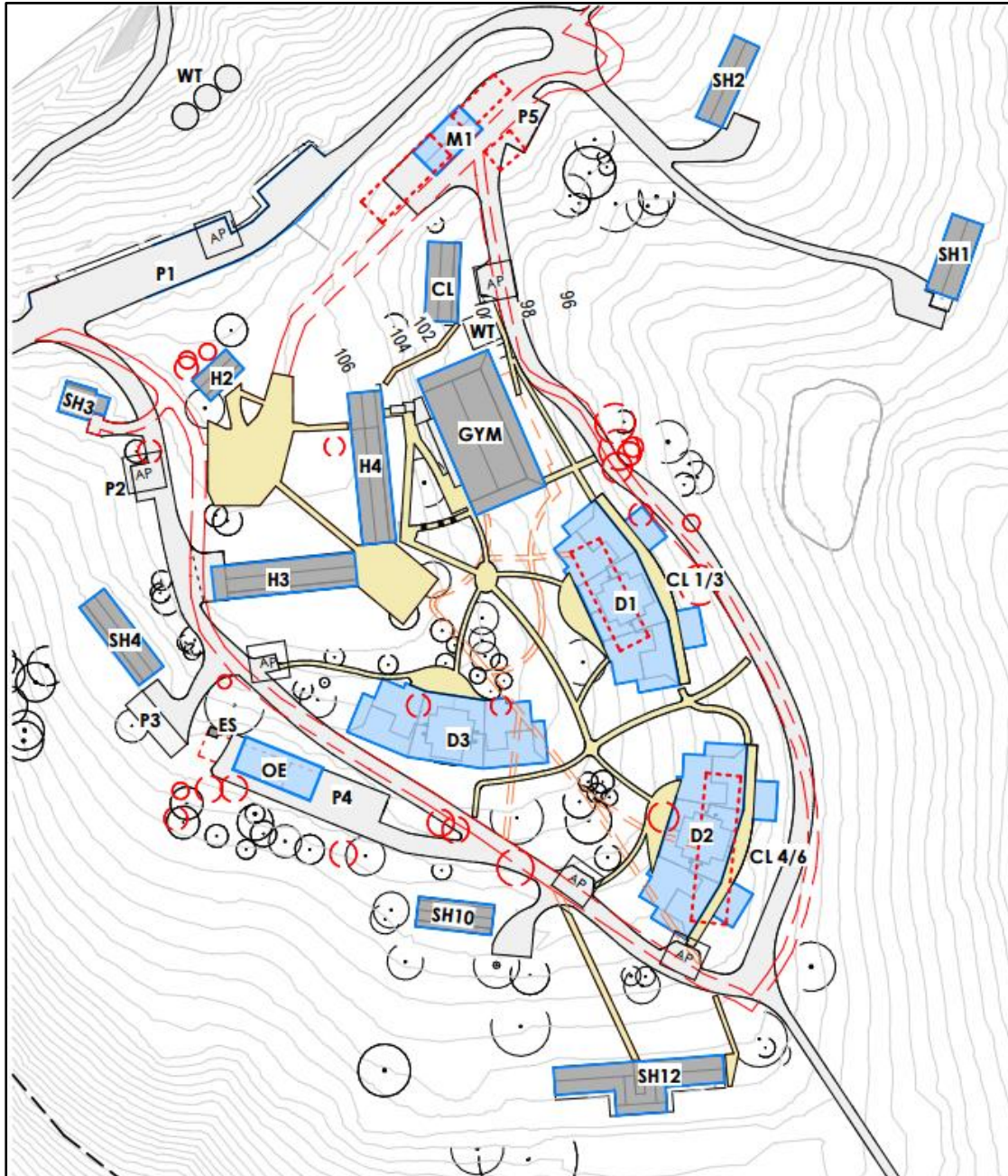


Figure 4: Extract from Glengarry Master Plan, drawing number MP 1.06 - Stage 1 Current DA. For key to map features refer to Glengarry Master Plan MP 1.06.

The proposed development will include:

1. Demolition of existing D1 and D2 dormitory buildings.
2. Demolition of existing H1 and M1 buildings.

3. Construction of new M1 maintenance facility.
4. Construction of new D1, D2 and D3 dormitory buildings
5. Construction of new OE Outdoor Education building
6. Upgrade of existing vehicle access roads, to 6-meter width
7. Inclusion of new vehicle parking bays, AP, P1, P2, P3 & P4, throughout the campus grounds
8. Demolition of existing walkways throughout campus grounds
9. Construction of new pedestrian paths throughout the campus grounds

The proposed development will encroach the TPZ area of 38 trees throughout the campus grounds, within the current APZ managed area. Refer to Table 2 for a summary of the trees impacted indicating number of trees within each tree retention classification.

Table 2: Number of trees impacted by the Current Development Plans. Table indicates how many trees require removal and how many can be retained by tree retention value classification

Trees impacted by the development	Recommendation		
Tree Retention Value	Remove Tree	Retain Tree	Total
Priority for Retention (High)	10	7	17
Consider for Retention (Medium)	5	13	18
Consider for Removal (Low)		1	1
Priority for Removal	2		2
Grand Total	17	21	38

17 impacted trees have a priority for “retention (high)” classification and 18 have a “consider for retention (medium)” classification.

Under the current plans a total of 17 trees will require removal as the development significantly encroaches the TPZ area or the tree is directly within the footprint of the proposed construction.

The remaining 21 trees can be retained under the current development plans provided the client follows the recommended actions provided within this report, refer to section 7.

Refer to the following URL link of a GIS map to view details of trees impacted by the development. Details and photos for each tree can be viewed by clicking on a tree point and opening the pop up. Only trees impacted by the development are visible on this map and trees points are colour coded by remove (red) or retain (green).

<https://gumi.maps.arcgis.com/apps/instant/atlas/index.html?appid=d27ba34446e84513b0be1a6adeaada5f>

6.3.2. Extended APZ area (tree removal required to extend APZ area)

The proposed new buildings within the campus grounds require an extension to the existing APZ managed area. This will require additional tree canopy and undergrowth clearing of the forest area to the west of the campus grounds as shown in figure 1 in section 5.1. of this report.

The client has engaged a bushfire consultant to determine the distance from the nearest proposed buildings to the outer limit of the extended APZ. NSW RFS standards for asset protection zones requires that tree canopies are maintained at 2 -5 meters apart from one another and lower branches should be maintained at least 2 meters up from the ground level. Ground vegetation or understory

plants should be removed where possible however, some ground cover should be retained to prevent erosion.

The assessment within the proposed extended APZ focused on trees taller than 5 meters with a trunk DBH of greater than 20 cm. Tree retention value was assessed for each of the 184 trees. Table 2 below provides details of the tree retention value findings.

Using the GIS map I have prioritised the removal of trees classified as “Consider for Removal (low)” and “Priority for Removal” to thin out the density of trees. Some trees classified as “Consider for Retention (medium)” will also require removal where the canopy density could not be thinned effectively by just removing lower value trees. Table 2 provides the number of trees to remove and retain for each tree retention value classifications.

Table 3: Number of trees to remove and retain by tree retention value classification.

Tree Retention Value	Remove Tree	Retain Tree
Priority for Retention (High)	1	77
Consider for Retention (Medium)	14	38
Consider for Removal (Low)	12	1
Priority for Removal	36	5
Total	63	121

Refer to the URL link below for an interactive GIS map showing each tree within the proposed extended APZ area colour coded by tree removal (red) or retention (green).

<https://gumi.maps.arcgis.com/apps/instant/atlas/index.html?appid=a79cccca1192461cb338bf9afe3c15d5>

7. Recommendations

7.1.1. Current APZ managed area

Recommendations for each of the 38 trees impacted by the proposed development have been provided within Attachment A and the GIS web map.

In summary I recommend the following actions for trees directly impacted by the current development plans:

- For trees classified as “priority for retention (high)” consider altering the engineering designs or consulting with a Level 5 project arborist to implement mitigation measures to avoid removing these trees. In particular tree numbers 20, 26, 24 and 740 could be retained if the width of the proposed access road was reduced for a short section beside these trees.
- Engage a project arborist to develop a tree protection plan for all impacted trees that can be retained. The project arborist will provide input into the construction plan to eliminate potential harm to retained trees
- Implement the recommended tree protection plan actions including installation of tree protection fencing and ground protection boards to minimise soil compaction within the TPZ area of retained trees.
- Where excavation is required within the TPZ engage a project arborist to supervise the works and confirm the viability of tree health and structure.

Section 8 below provides guidelines for the protection of trees to be retained on development sites.

7.2. Trees within the proposed extended APZ area

Recommendations have been provided to remove 63 trees within the proposed extended APZ area based on data collected on site and GIS mapping of tree locations. Refer to Attachment B for details of trees to be removed within the extended APZ area.

Tree removal has been targeted at trees classified as “consider for removal (low)” and “priority for removal”. However, due to the density of trees in some locations and additional 14 trees classified as “consider for retention (medium)” may also require removal. The team responsible for implementing this removal plan should consider these recommendations as guidelines to achieve the most effective outcome without over-clearing. During the process, if it is identified that a tree recommended for removal can be retained then retention should be given priority.

8. Arboriculture Method Statement

8.1. Pre-commencement and Arboriculture Hold Points

- 8.1.1. Prior to demolition and construction works, a Project Arborist shall be appointed to supervise all tree protection procedures detailed in this statement. The Project Arborist shall have a minimum level 5 AQF qualification in Arboriculture.
- 8.1.2. A pre-commencement site meeting shall take place between the Site Supervisor and the Project Arborist, the meeting is to take place before any development activity to determine specific arboriculture inspections and required tree protection.
- 8.1.3. Development Stage, this stage is subject to site monitoring by the Project Arborist at intervals as agreed at the pre-commencement site meeting. These visits are to ensure the protection measures are maintained in good order and works within the Tree Protection Zone (TPZ) meet with this Arboriculture Method Statement and AS4970.
- 8.1.4. It is the responsibility of the developer/site supervisor to provide a minimum 3 days' notice to the Project Arborist for the pre-determined witness points.
- 8.1.5. Any breaches to the Arboriculture Method Statement shall be reported immediately.
- 8.1.6. The following pre-determined stages are hold points and requires the attendance of the Project Arborist to document the works and demonstrate an inspection has taken place.

Table 4: Hold Points for Project Arborist Inspections

Hold Point	Action	Project Arborist Supervision
Tree Protection	The Site Arborist shall inspect the Tree Protection Fencing complies with Appendix A Tree Protection Zones and Figure 3, page 16 AS4970.	Inspected, documented & certified by Project Arborist
Machinery Access	An access route for machinery shall be determined prior to construction works. Any temporary ground protection within the Tree Protection Zones shall be undertaken as per Figure 4, page 17 of AS4970.	Inspected, documented & certified by Project Arborist
Earth Works	The Site Arborist to monitor any earthworks within the TPZ's. Note these works must be undertaken by hand or with an air knife.	Inspected, documented & certified by Project Arborist

Practical Completion	The Site Arborist to inspect and assess the trees condition and provide certification of tree protection at all the above-mentioned Hold Points.	Inspected, documented & certified by Project Arborist
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8.2. Tree Protection – to be installed prior to commencement of works

- 8.2.1. Tree Protection Fencing shall be installed prior to commencement of works and be maintained in a good condition during the construction processes.
- 8.2.2. Tree Protection shall consist of a 1.8m high chain link temporary fencing erected at the distances nominated in Appendix F - Tree Protection Plan.
- 8.2.3. Weatherproof signage indicating the area is a Tree Protection Zone (TPZ) shall be displayed on the fence line at 10m intervals.
- 8.2.4. Signage shall be a minimum A4 and shall state No Access – Tree Protection Zone and include the contact details of the Site Foreman and Project Arborist.
- 8.2.5. Once erected, the TPF shall be regarded as sacrosanct and shall not be removed or altered without prior agreement of the project arborist.
- 8.2.6. Attention shall be given to ensuring the TPZ remains rigid and complete and excludes all construction activity and storage of materials.
- 8.2.7. If works are to occur within the TPZ the Project Arborist shall determine if appropriate ground protection is required. Should ground protection be necessary then the ground surface within the TPZ shall be protected with a geotextile overlaying the existing mulch. Thick recycled railway ballast shall be placed over the geotextile in accordance with Figure 4 of AS4970.



Figure 5: Example of Tree Protection Fencing during construction. (Image by Hire Rite Temporary Fence)

8.3.Restricted Activities

8.3.1.The following activities are restricted within the Tree Protection Zone;

- Parking of vehicles or plant
- Installation of temporary site offices or amenities.
- Wash down areas
- No mechanical excavation
- Preparation of chemicals including paint, cement or mortar.
- Vehicular movement
- Pedestrian access
- Excavation, trenching or tunnelling unless under the supervision of the Project Arborist
- No ground level changes are permitted

8.4.Installation of Services

8.4.1.Where feasible, all underground services will be routed & installed beyond the identified TPZ's. Where it is impossible to divert services beyond the TPZ's, detailed plans showing the proposed routing will be drawn in conjunction with advice from an AQF Level 5 Arborist.

8.4.2.The method for trenching within a TPZ shall either be by hand methods e.g. hand digging with a spade or trowel or an air spade. Trenchless technology such as directional underground boring shall be considered in the first instance.

8.4.3.Topsoil and subsoil excavated from the trench shall be deposited into separate piles and kept apart and covered until required for backfilling.

8.4.4.No roots > 30mm in diameter are to be severed without prior agreement with the Project Arborist.

8.4.5.In cases of extreme heat or unless the trench is to be backfilled within the same day, all exposed roots > 30mm in diameter shall be wrapped with damp hessian to prevent drying out.

8.4.6.Where it is necessary to sever any woody roots, they shall be clean cut with secateurs or a pruning saw.

8.4.7.The underground services shall be positioned below the network of protected roots without causing damage to roots > 30mm in diameter. The hessian shall be removed prior to backfilling.

8.5.Back filling

8.5.1.Once works have been completed, backfilling shall be undertaken by hand using the subsoil first. The subsoil shall be filled into the trench in layers of no > 20cm and each layer shall be gently consolidated. Once the subsoil has reached the level of the existing subsoil, the topsoil shall be placed on top until the original levels are reached.

8.6.Soft and Hard Landscaping

8.6.1.Installation of soft or hard landscaping including paving, turf or plant material within the TPZ shall be undertaken by hand.

8.6.2.Planting holes are to be hand dug with a shovel or garden trowel.

8.7.Breach of tree protection

8.7.1.Any above or below ground damage (including soil compaction) to a protected tree shall be reported to the Project Arborist immediately.

8.7.2. Where activities occur, which breach the tree protection measures, the Project Arborist shall be advised immediately and work within the TPZ be halted until an assessment has been made and any mitigation measures deemed necessary have been undertaken.

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11. Appendices

11.1. Appendix 1

11.1.1. Abbreviation Definitions

Title / Abbreviation	Description
DBH	Trunk diameter measured at 1.4 metres above ground level
DRB	Diameter at root base measured just above the buttress flare
Height	Height of tree measured using a Lazer range finder from the ground level to the highest visible point in the canopy
Crown Spread	Average diameter spread of the canopy from outer tips of branches
TPZ	Tree Protection Zone - The recommended setback is declared a TPZ where construction, trenching, soil level changes and use of machinery should be excluded
SRZ	Structural Root Zone - The area required for stability; a far larger area is necessary to maintain a viable tree
ULE	Useful Life Expectancy. The approximate timeframe that the arborist has determined that the tree will provide safe amenity value to the area.
STARS	Significance of a Tree Assessment Rating System. See Appendix 2 for more details
IACA	Institute of Australian Consulting Arborists
Set back	Distance from the centre of the tree base to the outside limit of the construction footprint.
Non-Destructive Excavation	Excavation methods that do not damage tree roots such as vacuum excavation, hand tools, or air spade.
HDD	Horizontal Directional Drilling. Recommended to be used when installing underground utilities within the TPZ.

11.1.2. Tree Age Classification

Age Classification	Description
Juvenile	Young tree, recently shoot from seed or planted
Semi-mature	Tree that is growing towards mature height however less than 20% through its expected life expectancy
Mature	Tree that has reached mature height expectancy however is continuing to increase in biomass and is greater than 20% and less than 80% through its life expectancy
Senescent	Tree that is no longer increasing in biomass and is starting to or is in advanced decline. Usually greater than 80% through its life expectancy

11.1.3. Tree Health Classification

Health Classification	Description
Good	90 – 100% canopy density, little or no dieback or other problems
Fair	60 – 90% canopy density, some twig dieback, minor signs or symptoms of disease or pests.
Average	40 – 60% canopy density, twig and branch dieback, signs or symptoms of disease or pests easily identifiable from ground inspection.
Poor	< 40% canopy density, severe dieback throughout tree, major signs or symptoms of disease or pest activity
Dead	No living tissue in tree

11.1.4. Tree Structure Classification

Structure Classification	Description
Good	Tree form is typical for the species, even weight distribution of canopy, sound primary and secondary branch attachments, tension and compression wood sufficient for weight distribution, visible buttress, root plate has 90 - 100% natural soil coverage, no signs of root plate heaving or lifting.
Fair	Tree form is typical or atypical for the species, slightly asymmetric weight distribution of canopy, acute angled primary and secondary attachments however no bark inclusions, bifurcations in main trunk however no bark inclusion, tension and/or compression wood slightly insufficient for weight distribution, visible mechanical or biological damage to trunk with good responsive growth, buttress partially covered in soil, root plate has 70 – 90% natural soil coverage, no signs of root plate heaving or lifting.
Average	Tree form is atypical for the species, acutely asymmetric weight distribution of canopy, acute angled primary and secondary branch attachments with bark inclusions, bifurcation in main trunk with bark inclusion, tension and/or compression wood insufficient for weight distribution, visible mechanical or biological damage to trunk with some responsive growth, buttress fully covered in soil, root plate has 50 – 70% natural soil coverage, no signs of root plate heaving or lifting.
Poor	Tree form is atypical for the species, significant unnatural lean and uneven weight distribution of tree canopy, acute angled primary and secondary branch attachments with bark inclusions and swelling, bifurcation in main trunk with bark inclusion and swelling, tension and/or compression wood insufficient for weight distribution, mechanical or biological damage to trunk with no responsive growth, buttress fully covered in soil, root plate has 50 – 70% natural soil coverage, no signs of root plate heaving or lifting.
Hazardous	Tree form is atypical for the species, significant unnatural lean and uneven weight distribution of tree canopy, acute angled primary branch attachments with bark inclusions and swelling, cracking and/or splitting, bifurcation in main trunk with bark inclusion and swelling, cracking and/or splitting. Splitting or cracking along trunk or primary branches, significant mechanical or biological damage to trunk with no responsive growth, buttress fully covered in soil, root plate has < 50% natural soil coverage, signs of root plate heaving or lifting.

11.1.5. ULE Classification:

Useful life expectancy adapted from Barrell J 2001

ULE Classification	Description
Long ULE	Trees that appear to be retainable at the time of assessment for more than 40 years
Medium ULE	Trees that appear to be retainable at the time of assessment for more than 15-40 years
Short ULE	Trees that appear to be retainable at the time of assessment for more than 5-15 years
Remove	Trees that should be removed within the next 5 years
Small, young or regularly pruned	Small trees less than 5 Metres in height or young trees less than 15 years old but over 5 metres in height.

11.2.

Appendix 2: IACA Significance of a Tree, Assessment Rating System (STARS)© (IACA 2010)©

In the development of this document IACA acknowledges the contribution and original concept of the Footprint Green Tree Significance & Retention Value Matrix, developed by Footprint Green Pty Ltd in June 2001.

The landscape significance of a tree is an essential criterion to establish the importance that a particular tree may have on a site. However, rating the significance of a tree becomes subjective and difficult to ascertain in a consistent and repetitive fashion due to assessor bias. It is therefore necessary to have a rating system utilising structured qualitative criteria to assist in determining the retention value for a tree. To assist this process all definitions for terms used in the *Tree Significance - Assessment Criteria* and *Tree Retention Value - Priority Matrix*, are taken from the IACA Dictionary for Managing Trees in Urban Environments 2009.

This rating system will assist in the planning processes for proposed works, above and below ground where trees are to be retained on or adjacent a development site. The system uses a scale of *High*, *Medium* and *Low* significance in the landscape. Once the landscape significance of an individual tree has been defined, the retention value can be determined. An example of its use in an Arboricultural report is shown as Appendix A.

Tree Significance - Assessment Criteria

1. High Significance in landscape

- The tree is in good condition and good vigour;
- The tree has a form typical for the species;
- The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of substantial age;
- The tree is listed as a Heritage Item, Threatened Species or part of an Endangered ecological community or listed on Councils significant Tree Register;
- The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape due to its size and scale and makes a positive contribution to the local amenity;
- The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values;
- The tree's growth is unrestricted by above and below ground influences, supporting its ability to reach dimensions typical for the taxa *in situ* - tree is appropriate to the site conditions.

2. Medium Significance in landscape

- The tree is in fair-good condition and good or low vigour;
- The tree has form typical or atypical of the species;
- The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area
- The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street,
- The tree provides a fair contribution to the visual character and amenity of the local area,
- The tree's growth is moderately restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa *in situ*.

3. Low Significance in landscape

- The tree is in fair-poor condition and good or low vigour;
- The tree has form atypical of the species;
- The tree is not visible or is partly visible from surrounding properties as obstructed by other vegetation or buildings,
- The tree provides a minor contribution or has a negative impact on the visual character and amenity of the local area,
- The tree is a young specimen which may or may not have reached dimension to be protected by local Tree Preservation orders or similar protection mechanisms and can easily be replaced with a suitable specimen,
- The tree's growth is severely restricted by above or below ground influences, unlikely to reach dimensions typical for the taxa *in situ* - tree is inappropriate to the site conditions,
- The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms,
- The tree has a wound or defect that has potential to become structurally unsound.

Environmental Pest / Noxious Weed Species

- The tree is an Environmental Pest Species due to its invasiveness or poisonous/ allergenic properties,
- The tree is a declared noxious weed by legislation.

Hazardous/Irreversible Decline

- The tree is structurally unsound and/or unstable and is considered potentially dangerous,
- The tree is dead, or is in irreversible decline, or has the potential to fail or collapse in full or part in the immediate to short term.

The tree is to have a minimum of three (3) criteria in a category to be classified in that group.

Note: The assessment criteria are for individual trees only, however, can be applied to a monocultural stand in its entirety e.g., hedge.

Table 5: Tree Retention Value - Priority Matrix.

		Significance				
		1. High	2. Medium	3. Low		
		Significance in Landscape	Significance in Landscape	Significance in Landscape	Environmental Pest / Noxious Weed Species	Hazardous / Irreversible Decline
Estimated Life Expectancy	1. Long >40 years					
	2. Medium 15-40 Years					
	3. Short <1-15 Years					
	Dead					
<u>Legend for Matrix Assessment</u> 						
		Priority for Retention (High) - These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by the Australian Standard AS4970 <i>Protection of trees on development sites</i> . Tree sensitive construction measures must be implemented e.g. pier and beam etc if works are to proceed within the Tree Protection Zone.				
		Consider for Retention (Medium) - These trees may be retained and protected. These are considered less critical; however their retention should remain priority with removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.				
		Consider for Removal (Low) - These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.				
		Priority for Removal - These trees are considered hazardous, or in irreversible decline, or weeds and should be removed irrespective of development.				