Preliminary Design Review Report – Revision 2

Woodside Care Precinct Upgrade

May 2022

Prepared for:

HALL & PRIOR
Health & Aged Care Group

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May 2022
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1. Purpose of this Report

At the request of Donald Cant Watts Corke/Hall & Prior, Arbor Centre has been engaged to undertake an Arboricultural design review of proposed landscape and preliminary construction design for Woodside Care Precinct Site. This report has been commissioned to investigate how the trees identified for retention may cope with the proposed design and works associated with construction of the proposed buildings and proposed Basement alignments. This Design Review process considers alternative design options, and/or works methodologies, that may be applied to avoid (where possible) and minimise (where unavoidable), project related impacts and allow modification (where approved) to the Tree Protection Zones (TPZs) for the trees identified for retention.

Figure 1. *Satellite image showing area of assessment within Woodside Health Care Precinct Upgrade, in East Fremantle, Western Australia. Image Source – www.NearMap.com , Image date 5th of April 2022*

2. Background

2.1 Previous Arboricultural Reports Undertaken for The Woodside Site

For Preliminary detail regarding tree relocations proposed for the site refer:-

- Arbor Centre *'Preliminary Tree Transplant and Relocation Considerations Report'* Woodside Care Precinct Upgrade July 2020
- Arbor Centre *'Preliminary Design Review Report'* Woodside Care Precinct Upgrade June 2020
- Arbor Centre *'Preliminary Design Review Report – Revision 1'* Woodside Care Precinct Upgrade September 2020

For Preliminary detail surrounding tree data for the site refer:-

- Arbor Logic – *'Arbor Logic' – Assessment of Trees at Woodside Residence, 18 Dalgety Street, East Fremantle;* November 2019;

Note: *For consistency and ease of interpretation, the tree identification numbers, used in Arbor Centres reporting have been adopted from Arbor Logic's 2019 report.*

2.2 Drawings and Documentation Supplied to Arbor Centre

- Kerry Hill Architects, 2020. *'PRESENTATION No .2 to THE STATE DESIGN REVIEW PANEL 28 04 2020'* ('200428_WCP_SDRP presentation 2) April 2020
- Hassell Drawing *'Landscape Plan'* Woodside Health Care Precinct - refer Appendix A
- Hassell Drawing *'Tree Species'* Woodside Health Care Precinct - refer Appendix A
- Hassell Drawing *'Hassell Landscape Schematic Design Plan _ Lower Level'* Woodside Health Care Precinct - refer Appendix A
- Hassell Drawing *'Hassell Landscape Schematic Design Plan _ Ground Level'* Woodside Health Care Precinct - refer Appendix A
- Hassell Drawing *'Existing Trees'* Woodside Health Care Precinct - refer Appendix A
- Hassell, 2020. '*Landscape Schematic Design Report*' (014757_Landscape Irrigation DA Report) September 2020
- Hassell, 2022, 'Landscape Schematic Design Report' Woodside Care Precinct, May 2022

2.3 Limitations of this Report

Arbor Centre undertook an Arboricultural assessment of the trees situated within Woodside Care Precinct on the 29th of April 2020. The assessment was a visual tree inspection undertaken from ground level and did not incorporate any form of below ground or aerial inspection of the trees.

The information contained within this Design Review Report, is not intended, or suitable to be used as a final 'Tree Management Plan' for the subject trees. Further Arboricultural inputs will be required in developing tree and site-specific tree protection specifications, based on the final design and agreed works methodologies for the project.

3. Overview of the Proposed Trees

A total of x 72 trees have been assessed by Arbor Logic in November 2019 for the Woodside project. Preliminary landscape and tree retention concepts have been developed by Hassell for the project – refer figure 2 and Appendix A – for further detail.

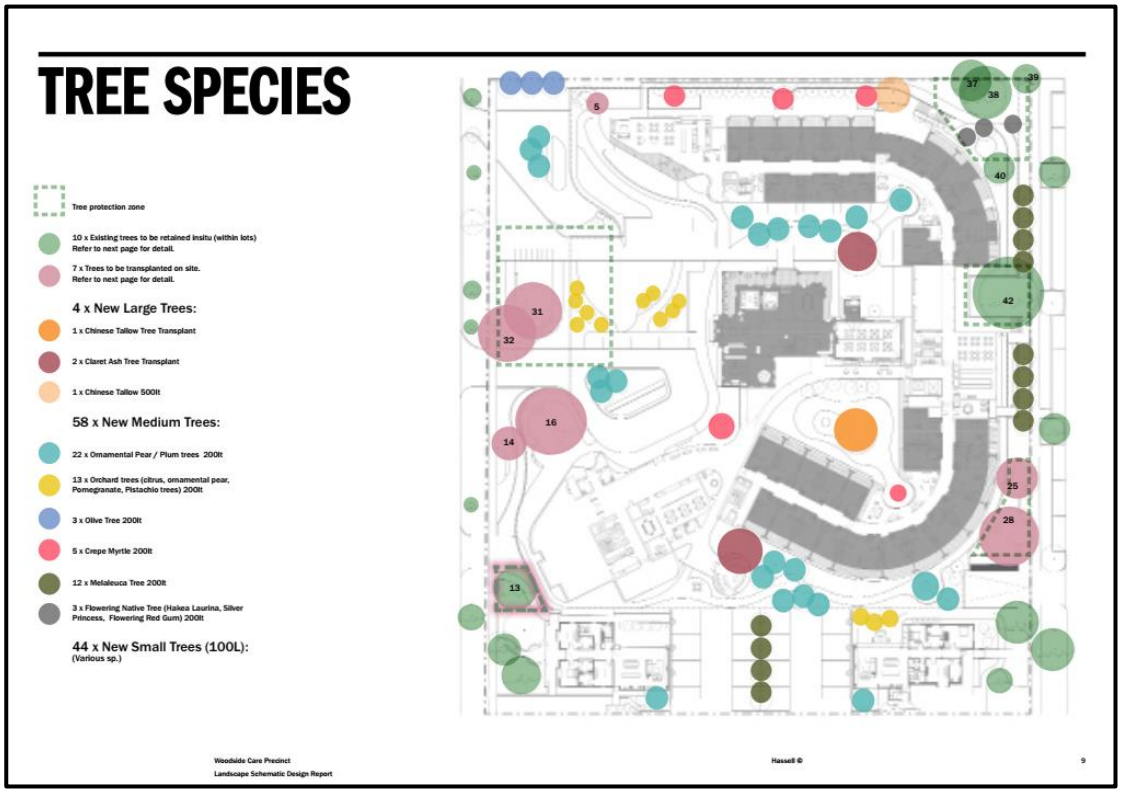


Figure 2. *Hassell Drawing 'Tree Species' Woodside Health Care Precinct. Image Source Hassell Studio*

The breakdown of tree requirements for the site is as follows (refer figure 2 for detail):-

- **Trees to be retained and protected (outlined green) – and include tree numbers:**
  - 13, 42, 40, 37, 39, 38, & Various Verge Street Trees (Fortescue and Dalgety Streets)
- **Trees To be transplanted (from within the Site) (highlighted Pink) – and include tree numbers:**
  - 32, 31, 5, 14, 25, 16, & 28 – refer Arbor Centre *'Preliminary Tree Transplant and Relocation Considerations Report'* for further detail
- **Trees To be Removed and include;**
  - 303, 302, 9, 15, 27, 18, 19, 1210, 2111, 1154, 1155, 1156, 22, 21, 20, 3, 4, 180, 2241, 2208, 2210, 17, 49, 44, 2211, 2213, 43, 30, 29, 5021,35, 1, 2, 10, 33, 6, 34, 11, 12, 24 & Various Trees in rear of 26 Dalgety Street and 29 Fortescue Street

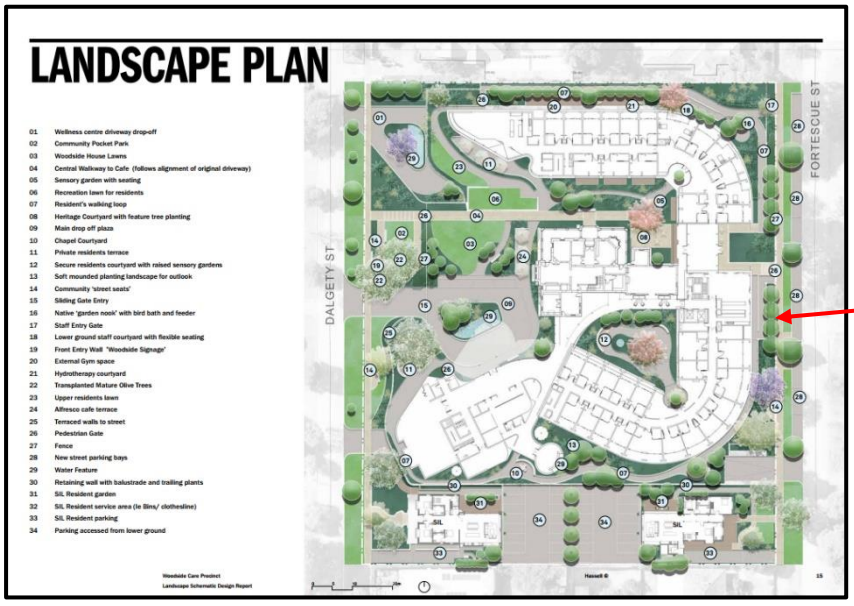
4. Preliminary Arboricultural Design Comments

4.1 Overview

Root zone impacts (and associated root loss) can often negatively affect tree health (and stability) immediately and/or many years after the event.

To achieve tree success, appropriate tree protection and remedial measures must be factored into design refinements and works methodologies; appropriately implemented and; specific remedial measures actioned and appropriately supervised throughout the project.

This current proposal will require collaboration between Arbor Centre, Hall & Prior, Hassell and the design team, to review and in some instances modify the proposal in order to successfully retain the subject trees. Where encroachment (demolition, construction, excavation, landscaping or otherwise) into the nominal AS 4970 Tree Protection Zones is required (refer Appendix B for detail), further Arboricultural input will be necessary to assess the extent of potential impact that may occur and if required, provide Arboricultural measures that can be taken to enable modification of the nominal TPZ and allow root zone encroachment to occur.



Arboricultural inputs will be required into developing tree sensitive designs and work methodologies; for works that are proposed within the TPZ radius (refer Appendix B) of trees identified for retention: Works within TPZs requiring arboricultural inputs will include, but may not be limited to –

- *Relocation of amenable trees;*
- *Site access and egress and machinery working rooms*
- *Vehicular parking on site*
- *Placement of site offices and amenities (and associated services);*
- *Site Hording/fencing alignment and installation methods;*
- *Installation Of Shoring/Shuttering for basement construction (Excavation Minimisation Measures)*
- *Any further retaining wall construction.*
- *Any below ground services – Demolition/decommissioning, upgrades or installation (including entry/exit pits and tie in take off points)*
- *Construction of any structures that may interfere with tree root zones and or canopies.*
- *Any further demolition structures*
- *Any potential soil level and/or grade changes.*
- *Path construction*
- *Hard and/or soft Landscaping works (including the installation of irrigation).*

Figure 3. *Hassell Drawing 'Landscape Plan' Woodside Health Care Precinct. Image Source Hassell Studio*

4.2 Tree Relocation Considerations

Further specialist Arboricultural inputs will be required from Arbor Centre Transplant Division in identifying, preparing, relocating and re-establishing trees that are proposed for potential relocation within and/or externally to the development site. refer Arbor Centre 'Preliminary Tree Transplant and Relocation Considerations Report' for further detail.

4.3 Site and Tree Geo Location Validation

Validation of the sites survey data should be undertaken to ground truth location of trees in relation to the proposed structures and works. This will ensure that any issues regarding alignments in conflict with TPZs are addressed in the design stages for the project.

4.4 Relocation of Works Beyond TPZ Projections (where Possible)

To enable greater retention of tree root mass and lessen root zone encroachment, consideration should be given to relocating/diverting any construction works beyond the TPZ projections –refer *Appendix B AS 4970* for detail. Where diversion of works/impacts to beyond the TPZ is not possible/practicable, site assessment and exploratory excavations may need to be undertaken by Arbor Centre to quantify potential root loss, limit (additional) unnecessary root damage/impact; and/or provide possible remedial measures necessary to offset potential root loss. Furthermore, exploratory excavations can provide a better understanding of development and depths of roots and if descending/oblique (anchorage) roots are present (or otherwise).

4.4.1 Below Ground Installations (or upgrade works)

Where redirection/relocation isn't possible/practical and below ground installation works (including entry and exit pits and take off and tie in points) are proposed to pass through/adjacent the TPZs, prior consultation with Arbor Centre is required to develop and specify root sensitive installation methodologies that avoid damage to tree roots e.g. subterranean boring; Air knife and industrial Vac truck; hand digging under the guidance of the Arbor Centre.

Realignment and/or redesign of types and locations of footings that encroach into the TPZs should be considered to avoid and/or minimise impact with roots within the TPZ e.g. consideration given to screw-piles or; pillar and panel and or bridging over roots as a 'more tree sensitive' alternative to continuous strip footings – allowing existing ground levels to be maintained and greater root mass within these areas to be retained.

Note: *Final design and installation methodologies that are proposed to be undertaken within the nominal TPZs are to be determined in conjunction with Arbor Centre.*

4.5 Soil Levels

Where possible, modification of existing soil levels is to be avoided within TPZ areas. Moderate raising of soil levels may be considered within/adjacent the TPZ area instead of cutting/lowering existing levels (i.e. omitting "boxing outs" for roads, paths, footings, retaining walls, paving etc...)

Note: *Any proposed modification of soil levels within the TPZs is to be determined in conjunction with Arbor Centre prior to being undertaken.*

4.6 Alternative Design Methodologies - Road & Path Construction Modifications

Arbor Centre recommends that root sensitive options be investigated/ implemented for the installation of paths and roadways as to limit root loss (from box outs and grade changes); soil compaction and rutting, improve distribution of loading and to ensure that overall root disturbance can be properly quantified and managed. Preferred options include:-

4.6.1 Water Sensitive Urban Design (WSUD) and Permeable Paving

Water Sensitive Urban Design (WSUD) and Permeable Paving installations within the TPZ's of the retained trees (where plausible) – Refer *Appendix D – Road and Path Construction Modifications* for further detail.

4.6.2 Surface Protection and Stabilisation Measures

Where Installation of surface protection and/or trunk and branch protection measures may need to be considered for the site (where identified by Arbor Centre and if required) to enable vehicle/machinery movement within the TPZ's - The installation of a *"Geoweb"* system https://www.geofabrics.co/products/geoweb%C2%AE refer Appendix D (or approved equivalent) on top of current ground level (i.e. no box outs or excavations for installation) should be considered as alternative ground protection measure. The *Geoweb* system is typically installed on top of a geotextile layer and filled with washed and screened aggregate (as to limit leaching and soil contamination).

4.6.3 Level and Grade Changes

Consideration could be given to the moderate raising of soil levels within/adjacent the TPZ areas instead of cutting/lowering existing levels, however, the utilisation of aeration layers and further discussion with Arbor Centre will be required prior to the raising of soil levels in the TPZ's.

4.7 Alternative Design Methodologies - Back of Kerb Treatments (Asset Protection)

Where applicable consideration should be given to the integration of assets (kerbs, bitumen, parking, paths, etc.) and the existing trees being retained (and new plantings). Arbor Centre recommends root sensitive treatments are installed for the asset protection – Refer *Appendix E* for further detail.

4.8 Proactive and Reactive Remediation Works

The contractors/responsible party should make appropriate provision for supplementary watering of the retained and new trees, rates and frequencies of watering are subject to the amount of potential root loss sustained & seasonal variation. These watering requirements will be specified further in *Arbor Centre's Stage 3 Tree Retention Specification* and ongoing review of required remediation will be undertaken throughout the development (by the Project Arboriculturist in conjunction with the Superintendent).

Note: *Potential further remedial measures for both canopy and root zone (i.e. root zone coring, soil wetting agents and liquid organic soil drenching) may be required subject to approval from Arbor Centre.*

4.9 Demolition & Forward Works

Arboricultural input should be included in determining methodologies and specifications prior to the commencement of any Demolition and Forward Works in the work specific TPZ's.

Note: *Demolition methodologies that are proposed to be undertaken within the nominal TPZs are to be determined in conjunction and with the approval of the Arbor Centre.*

4.9.1 Installation Of Shoring/Shuttering (Excavation Minimisation Measures)

Where excavations are proposed to occur within or adjacent TPZ areas, installation of Box/ Sheet pile Shoring or grout injection will need to be considered to prevent soil collapse and associated root zone impacts. ***Note:*** *Shoring types and installation methodologies that are proposed to be undertaken within the nominal TPZs are to be determined in conjunction with Arbor Centre.*

4.9.2 Selection and placement of construction machinery

Types and locations of machinery; construction methodologies and; site access/egress need to recognise the existing dimensions of the trees canopies (noted low spread of some trees on site) and root systems and that the implementation of protective measures may be required prior to the commencement of works.

Note: *Final design and installation methodologies that are proposed to be undertaken within the nominal TPZs are to be determined in conjunction with Arbor Centre.*

4.10 Hard and Soft Landscaping

Arboricultural inputs will be required to review contractor works methods to ensure works are implemented and undertaken in a tree sensitive manner.

4.10.1 Site Preperation and Tree Selection

Trees require structurally sound root systems to establish into the landscape and thrive over the long term; this can be supported by ensuring trees are produced in accordance with the Australian Standard *AS 2303 'Tree Stock for Landscape Use' 2015*. Tree stock strategies can be developed to find the best possible outcome for the landscaping locations throughout the Woodside Care Precinct (i.e. Root bole investigations, growing trees from onsite sources, Arbor Centre Civic Tree options (refer Appendix F), Arbor Centre Tree Supply options, etc.). *refer Appendix B - Overview of Australian Standards AS 2303 'Tree Stock for Landscape Use' 2015.*

4.11 TPZs and Tree Protection Fencing

The implementation of work specific Tree Protection Zones (TPZ's) and the erection of approved protective fencing and identification signage is to be installed prior any further commencement of works at the delineation of the TPZs identified for every stage of the redevelopment

- During Demolition;
- During Forward Works;
- During Construction; and
- During Landscaping Works (Both hard and soft landscaping).

(refer *Appendix B Overview of Australian Standards AS 4970* for a high level overview of the tree retention process).

4.12 TPZ Usage and Restrictions

The Work Specific Tree Protection Zones to be retained for the duration of the construction period and should not be modified without prior approval from Arbor Centre. Contractors at each stage of development to be made aware of the Tree Protection Zone's within their site's works area, and that only pre-approved works (approved by Arbor Centre) are to occur within this area.

For example: -

- Traversing and/or Parking of plant machinery or vehicles where root protection measures have not been implemented – refer point 4.6.2;
- Storage for construction or deleterious materials where root protection measures have not been implemented – refer point 4.6.2;
- Unauthorised removal of vegetation;
- Unprotected vehicle refuelling;
- Preparation of chemicals and concrete washout;
- Areas to dump construction and general waste where root protection measures have not been implemented – refer point 4.6.2;
- Unauthorised wash down or cleaning of any kind;
- Locations for site offices or toilets where root protection measures have not been implemented – refer point 4.6.2;
- Unauthorised excavation activities;
- Pruning of the tree's canopies – refer Appendix B *Overview of Australian Standards AS4373* for further detail;
- Pruning of roots (subject to Arbor Centre approval) where proposed works may encroach into the TPZ area(s), will need to be undertaken by and under the supervision of Arbor Centre; and
- Any other activity that may harm or injure the tree above or below ground.

4.13 Other TPZ Works Considerations

- Refinement and further specialist Arboricultural input will be required in determining construction methodologies and specifications prior to finalising and implementing a design; to ensure minimal tree root and canopy impact can be designed into the project.

- Ongoing Arboricultural inspections &/or supervision during the construction/works period by Arbor Centre will be critical in ensuring tree welfare is preserved.

References: AS 4373 2007, AS 4970 2009, AS 2303 2015,

5. Conclusions

Further consultation with Arbor Centre will be required regarding:

- Further inputs into the relocation of the amenable specimens;
- How best to limit demolition and construction impact during and after the construction and development phase;
- The type of works being proposed around the trees and their associated methodologies and the impact these works may have on the trees;
- The development of Tree Preservation Specifications for the project (Arbor Centres Stage 3 *Tree Preservation Specifications*);
- The modification of the nominal TPZs to site specific TPZs.

Refer to Point 6. Recommendations for further detail.

Consideration needs to be given to the specialised nature of the tree management works contained within this report which; if undertaken or specified incorrectly, may have a negative effect on tree health and/or structure. It is imperative that only arboricultural organisations with staff suitably qualified and experienced in tree management and/or tree preservation or relocation are engaged in monitoring, maintaining, and managing the trees into the future.

Any works undertaken to the subject trees are to be approved by Arbor Centres Arboricultural Consultants (in collaboration with the design team) prior to their commencement and; undertaken by Arbor Centre's qualified Arboriculturist's and/or Arborists.

It is important to recognise that the successful preservation of existing, mature trees through a development project requires a proactive approach to the tree preservation process.

Reactive works, which attempt to repair damaged trees, are generally more costly/problematic in the long term than adopting a preventative approach. Achieving the successful preservation & protection of the assessed trees will require specialist and timely Arboricultural input into the development of construction specifications and drawings.

6. Recommendations

6.1 Site and Tree Geo Location Validation

That validation of the sites survey data should be undertaken to ground truth location of trees in relation to the proposed structures and works.

6.2 Relocation of Identified trees

Consideration should be given to the relocation of identified trees where construction may not enable successful in situ tree retention.

6.3 Develop Tree Retention Specifications

That Tree and site specific retention specifications be developed by Arbor Centre for the proposed construction and implemented on ground to the necessary standards throughout the duration of the project.

6.4 Ongoing Arboricultural Inputs into the Project to Achieve Successful Tree Retention

- That the *"Tree Protection Notes for Incorporation into Construction Drawings*" identified in Appendix C are included into construction and landscape drawings as an immediate reference for contractors working on site – Refer Appendix C for further detail;
- That an ongoing, collaborative Arboricultural review and refinement of the proposed design and work methodology(s) is undertaken by Arbor Centre in conjunction with other parties, to develop and implement further tree sensitive designs which are proposed to occur and/or encroach within the TPZ's of the subject trees identified for retention.

6.5 Ongoing Arboricultural Management

- That any further recommendations made for the subject trees be specified by Arbor Centre in keeping with the Australian Standards (refer Appendix B for further detail) :-
    - *AS 4970 'Protection of Trees on Development Sites' 2009;*
    - *AS 4373 'Pruning of Amenity Trees' 2007*
    - *AS 2303 'Tree Stock for Landscape Use' 2015*

  and; be approved prior to commencement by Arbor Centre.

7. References & Reading

Arbor Centre *'Preliminary Tree Transplant and Relocation Considerations Report '* Woodside Care Precinct Upgrade July 2020

Arbor Centre '*Preliminary Design Review Report'* Woodside Care Precinct Upgrade June 2020

Arbor Centre '*Preliminary Design Review Report – Revision 1'* Woodside Care Precinct Upgrade September 2020

Arbor Logic – *Assessment of Trees at Woodside Residence, 18 Dalgety Street, East Fremantle;* November 2019;

Cronin, L, .C. 2000. Key guide to Australian trees. 1st ed. Australia: Envirobook.

Geoweb via https://www.geofabrics.co/sites/default/files/brochures/Geoweb-General-Brochure-M056-10-14NZ.pdf (accessed May 2022)

Hassell Studios Drawing *'Existing Trees* Woodside Health Care Precinct

Hassell Studios, 2020. '*Landscape Schematic Design Report'* (014757_Landscape Irrigation DA Report) Woodside Health Care Precinct September 2020

Hassell Studios, 2022. '*Landscape Schematic Design Report'* Woodside Health Care Precinct May 2022

Hassell Studios Drawing *'Landscape Plan'* Woodside Health Care Precinct

Hassell Studios Drawing *'Landscape Schematic Design Plan _ Lower Level'* Woodside Health Care Precinct

Hassell Studios Drawing *'Landscape Schematic Design Plan _ Ground Level'* Woodside Health Care Precinct

Hassell Studios Drawing *'Tree Species'* Woodside Health Care Precinct

Harris, R., Clarke, J., & Matheny, N,.2004, *Arboriculture – Integrated Management of Landscape Trees, Shrubs and Vines*, 4th ed, Prentice-hall inc, New Jersey

Kerry Hill Architects, 2020. *'PRESENTATION No .2 to THE STATE DESIGN REVIEW PANEL 28 04 2020'* ('200428_WCP_SDRP presentation 2) April 2020

Le Roux, D. S Et Al 2014, *'The Future of Large Old Trees in Urban Landscapes'* The Fenner School of Environment and Society, the Australian National University, Canberra, Australia

Lonsdale, D., 1999, *Principles of Hazard Tree Assessment and Management,* The Stationary Office, Norwich, UK

Mattheck, C.& Breloer, H.,1999, *The Body Language of Trees -A handbook for failure analysis*, The Stationary Office, Norwich, UK

NearMap Aerial Imagery, via http://www.nearmap.com/photomaps/ (accessed May 2022)

Powell, R., 1990, *Leaf and Branch – Trees & Tall Shrubs of Perth*, Department of Conservation & Land Management, Australia

Standards Australia, 2007, *Australian Standard AS4373: Pruning of amenity trees*, Standards Australia, Sydney, Australia

Standards Australia, 2009, *Australian Standard AS4970: Protection of Trees on Development Sites*, Standards Australia, Sydney, Australia

Standards Australia, 2015, *Australian Standard AS2303: 'Tree Stock for Landscape Use*, Standards Australia, Sydney, Australia

Appendix A – Supplied Drawings

Hassell Landscape Plan

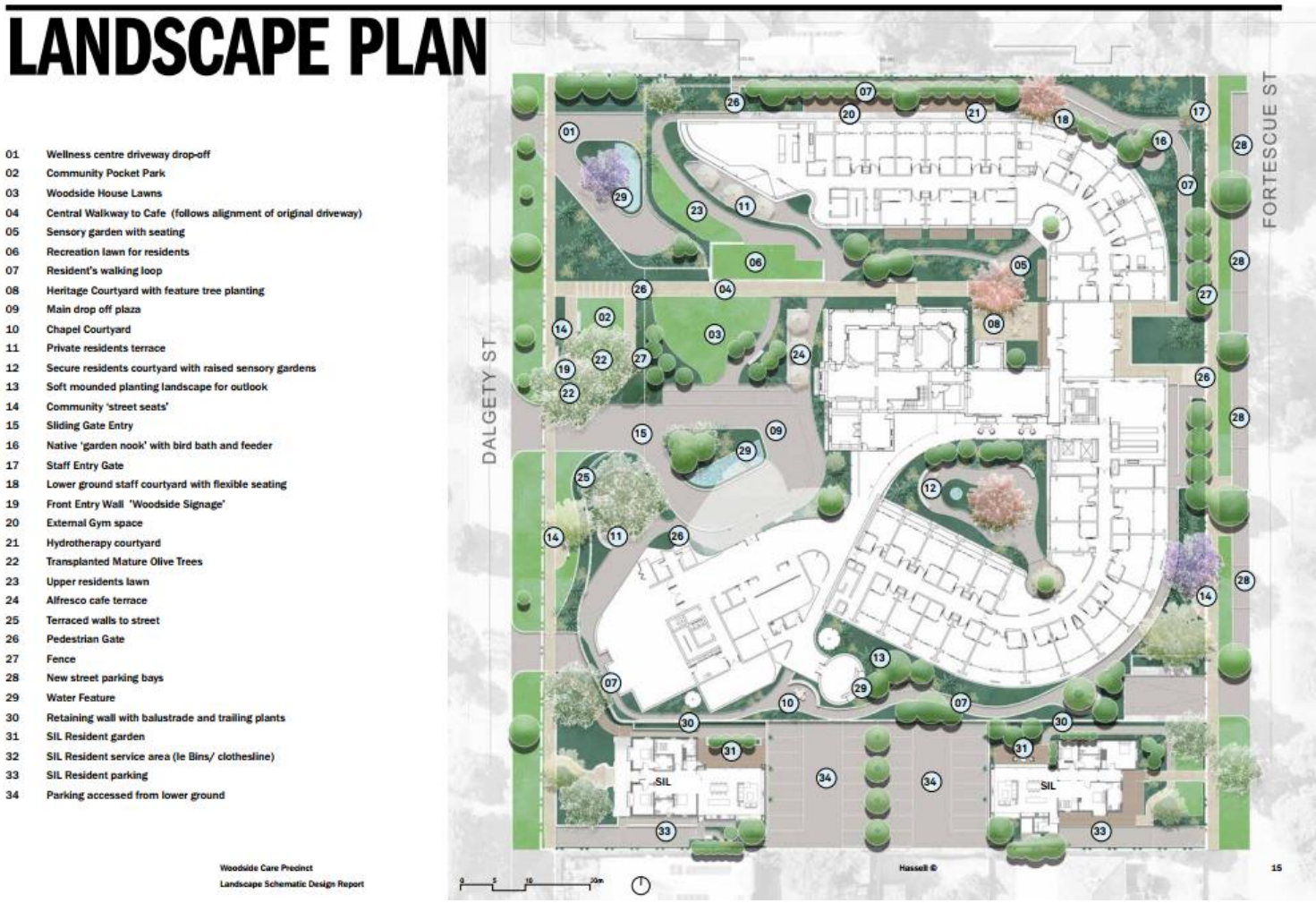


Figure 4. *Hassell Drawing 'Landscape Plan' Woodside Health Care Precinct. Image Source Hassell Studio*

Hassell Tree Species

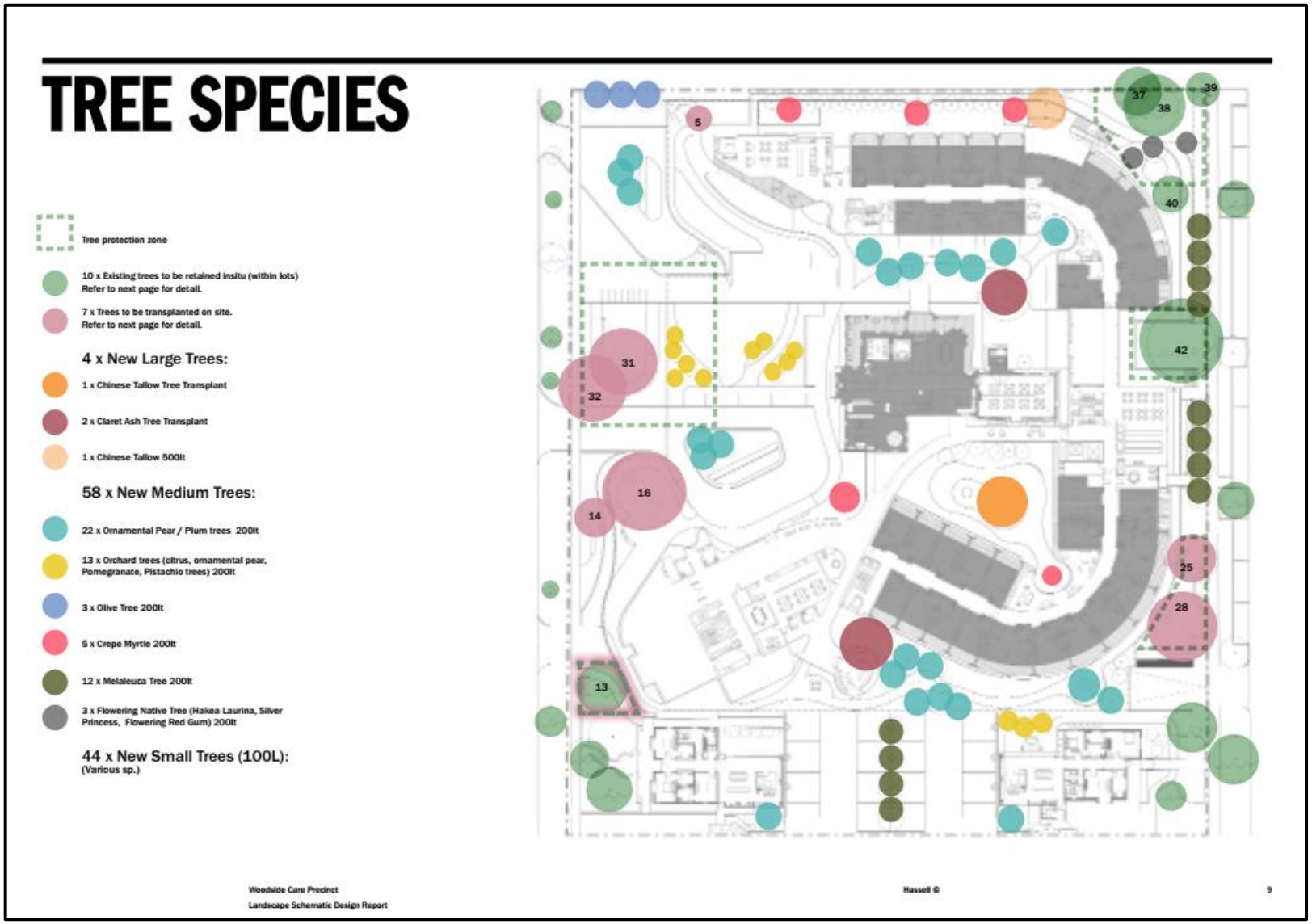


Figure 5.
Hassell Drawing 'Tree Species' ; Woodside Health Care Precinct. Image Source Hassell Studio

Hassell Landscape Schematic Design Plans

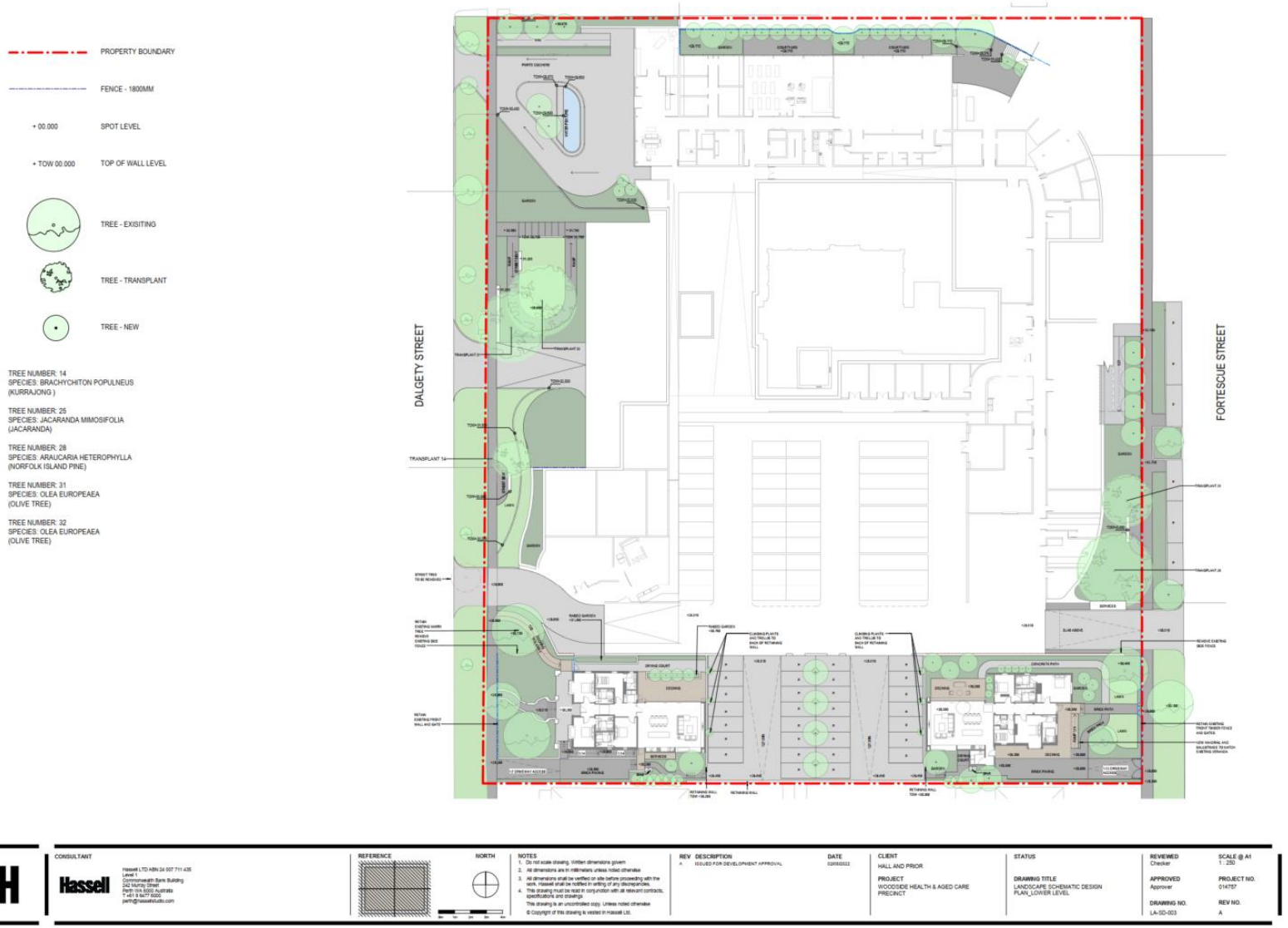
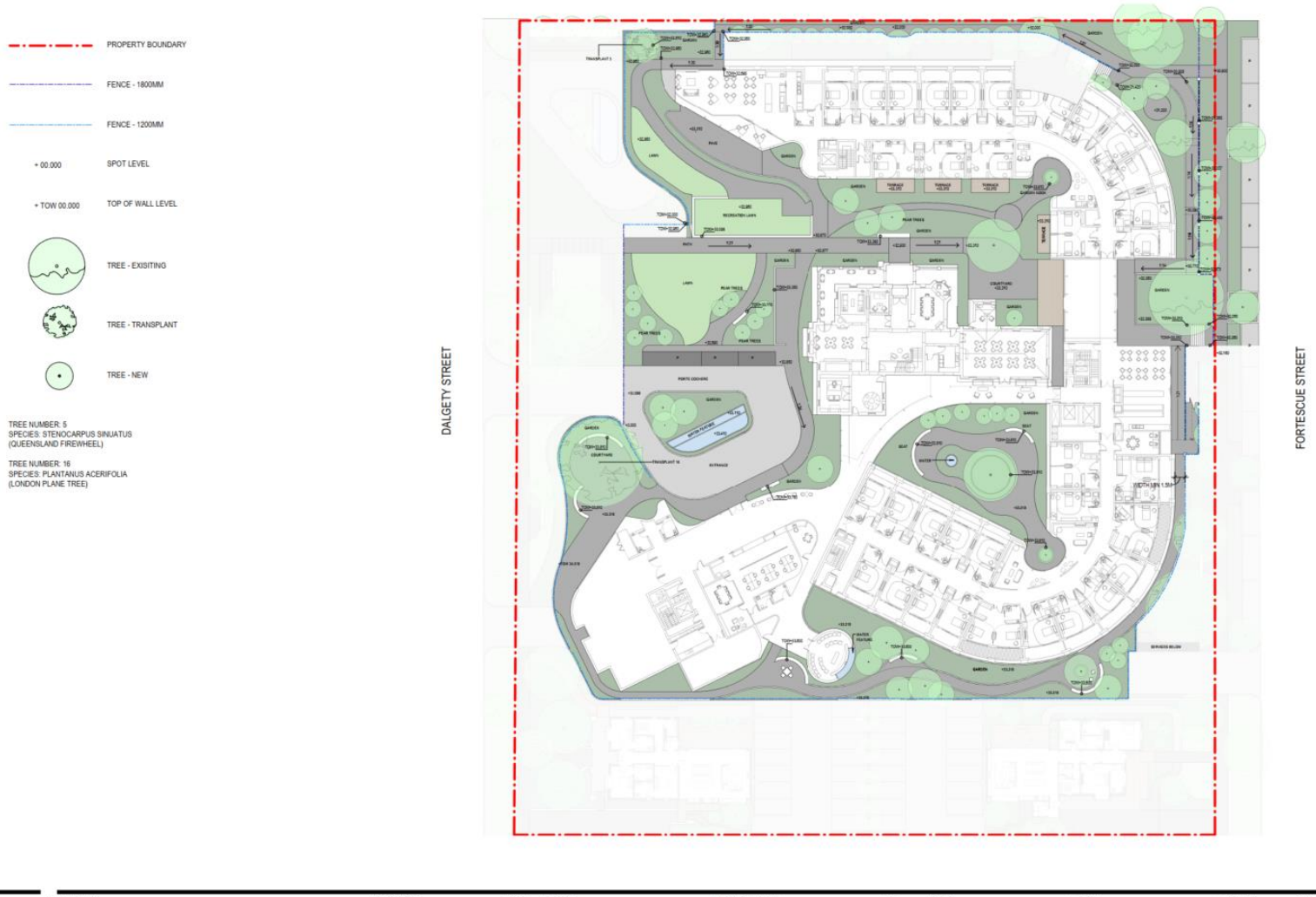


Figure 6. *Hassell Drawing 'Landscape Schematic Design Plan _ Lower Level' Woodside Health Care Precinct. Image Source Hassell Studio*

Figure 7. *Hassell Drawing 'Landscape Schematic Design Plan _ Ground Level' Woodside Health Care Precinct. Image Source Hassell Studio*



Hassell Existing Trees

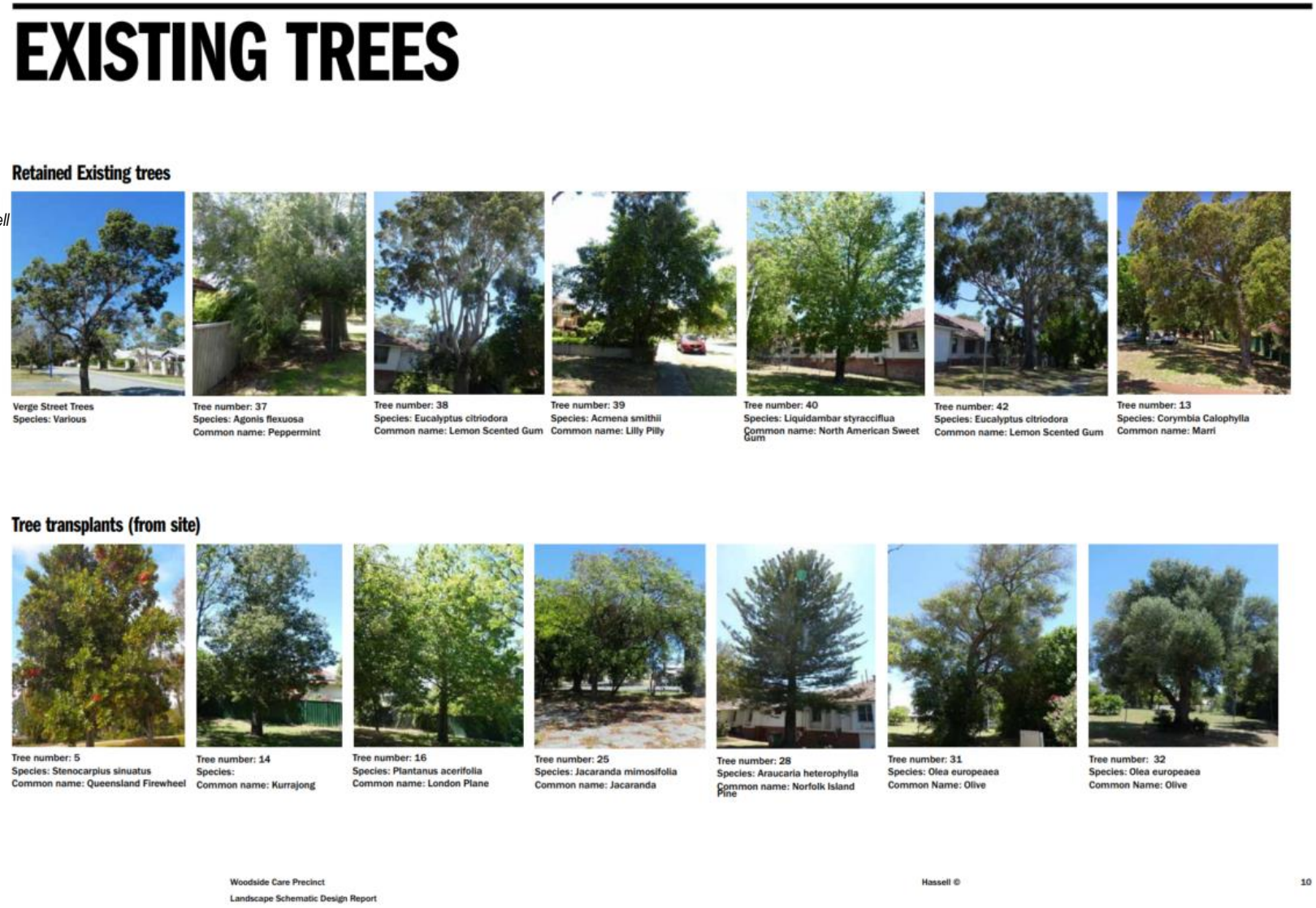


Figure 8. *Hassell Drawing 'Existing Trees' Woodside Health Care Precinct. Image Source Hassell Studio*

Appendix B – Overview of AS 4970, AS 4373 & AS 2303

AS 4970 'Protection of Trees on Development Sites' 2009

To successfully incorporate trees into the urban environment, careful consideration, planning and protection should be afforded to both above and below ground parts of the tree - leaves, branches, stems of the above ground parts and; below ground, absorbing roots and structural roots.

The operations and activities associated with the construction and development process can have adverse effects on tree health and stability. Those activities that can potentially impact on the tree(s) will require remedial measures to be taken prior to, during and post development to ensure that all reasonable measures are taken to offset such damage.

Damage to tree roots is often irreversible and a common cause of tree decline and/or death following the construction and development phase. The implementation of a Tree Protection process will help lessen the impact that proposed development will have on the root zone (resulting from grade changes, excavations, soil compaction, mechanical damage etc...) and enable timely remedial action to help the tree to retain enough root mass for the continuation of natural growth and development.

Australian Standards have created AS 4970 'Protection of Trees on Development Sites' 2009 that addresses many of the issues that construction and development can have on trees and provides a guide only on how to avoid unnecessary damage and outlines a process that will protect tree welfare during the construction and development phase.

To calculate the minimum area required to be protected during construction, development or during any activities that may cause harm or injure the tree and its parts, the formula 12x the trunk Diameter at Breast Height* (DBH) is used. For Example - if trunk diameter of the tree in question is 500mm – 12 x 500mm = 6 meter TPZ which is measured in meters as a radius and taken from the centre of trunk.

Note: - **Accurate measurement of trunk diameter(s) in millimetres - Typically measured at 1.4 meters above ground level for single stemmed trees; at the narrowest point of trunk for co dominant specimens or; at ground level for (low) multi stemmed form. - TPZ to not be <2 meters or >15 meter in diameter.*

Where encroachment (building, construction, excavation, landscaping or otherwise) into the Tree Protection Zone is required, Arboricultural input will be necessary to assess the extent of potential impact that may occur and if required, provide Arboricultural measures that can be taken to enable modification of the TPZ and allow root zone encroachment to occur.

Any tree preservation recommendations made for the subject trees need to recognise that the Australian Standards do not consider the individual tree characteristics and tolerances that the species possess or; the soil type and other environmental conditions or circumstances that the subject trees are currently growing in.

It is important to recognise that the estimated TPZ shown in this report are simply an indication of a boundary around the tree beyond which disturbance is considered inconsequential and is unrestricted. However; the main purpose is to identify that any change or disturbance within the TPZ boundary will require Arboricultural input and approval. This includes activities such as (but not limited to:): soil level changes and excavations, demolition and/or removal of infrastructure, installation of paths & below ground services (including irrigation) hard and soft landscaping and; activities that could impact on tree canopy i.e. cranage, vehicular/machinery movement etc.

Any tree preservation and/or protection specifications/recommendations made should be specified by an (minimum) Australian Qualification Framework Level 5 Arborist (AQF 5 – Diploma in Arboriculture); in keeping with the Australian Standards AS 4970 'Protection of Trees on Development Sites' 2009 and be undertaken under the direction of the Arboriculturist.

Any pruning works undertaken to the assessed trees should be specified by a (minimum) Australian Qualification Framework Level 5 Arborist (AQF 5 – Diploma in Arboriculture); comply with the Australian Standards AS 4373 'Pruning of Amenity Trees' 2007 and be undertaken by suitably trained and qualified Arborists with a minimum AQF Certificate 3 in Arboriculture under the supervision of the Arboriculturist.

AS 4373 'Pruning of Amenity Trees' 2007

AS 4373 'Pruning of Amenity Trees' 2007 has been developed to provide a guide on tree pruning procedures and practices to limit poor or deleterious type pruning being unnecessarily inflicted onto amenity trees.

The result of incorrect pruning of a tree is often irreversible, can negatively impact its health and structure and create unnecessary hazards within and surrounding the trees.

Correct tree pruning practices can reduce the likelihood of branch failures, limit pest and disease infestations, improve site safety and tree amenity, encourage sound structural development and extend tree longevity.

Arbor Centre Note:- Any pruning works undertaken to the assessed trees should be:-

- *Specified by Arbor Centres AQF Level 8 Arboricultural Consultants (AQF 8 –Melbourne University Graduate Certificate in Arboriculture);*
- *Be undertaken by Arbor Centres trained, experienced and qualified Arborists (min AQF Certificate 3 in Arboriculture);*
- *In keeping with the Australian Standards AS 4373 'Pruning of Amenity Trees' 2007 and;*
- *Undertaken under the direction and supervision of Arbor Centres Australian Qualification Framework Level 5 Arborists (AQF 5 – Diploma in Arboriculture).*

AS 2303 'Tree Stock for Landscape Use' 2015

It is essential that the tree specimens selected for planting are fit for planting, in good condition and not compromised at the time of planting.

This includes -

- Appreciating that the investment in a tree is in the root system that it needs to sustain itself through to maturity; not the size of the canopy mass as a seedling or sapling or as a semi mature tree.
- Trees require structurally sound root systems to establish into the landscape and thrive over the long term. This can be supported by ensuring trees are produced in a manner such that the tree's root system is reasonably free of root entanglement and; that the ratio of above ground dynamic (canopy) mass is proportional to a healthy below ground dynamic (root) mass. AS 2303 Tree stock for landscape use; is an Australian Standard that provides guidance in achieving this by providing quantifiable tree performance measures that can be used as KPI's for the contract growing of trees. Management of tree production using Australian Standard AS2303 should be exercised by a suitably qualified Arboriculturist/Horticulturists.
- Recognizing the importance of maintaining stock quality, despite potential changes to planting dates and timeframes, (as this is not covered under Australian Standards) – i.e. that the holding of stock beyond the time when it was selected and approved for planting, may require re-potting or other treatment (to avoid irreversible root entanglement, that compromises the capacity of the tree to perform to expectations in the longer term).
- Ensure trees receive appropriate and sufficient preparation prior to planting and after care post planting.

References: AS 4373 2007, AS 4970 2009; AS 2303 2015, Harris et.al 2004

Appendix C – Tree Protection Notes for Incorporation into Construction Drawings

Incorporating the below Tree Protection notes onto demolition, construction, service, landscape etc. Drawings as an immediate tree protection reference point would be beneficial for contractors (and subcontractors) reading drawings specific to their works.

Including (but not limited to);

- THE NOMINATED PROJECT ARBORICULTURIST IS ARBOR CENTRE PTY LTD CONTACT No. 08-9359 9300.
- THE IDENTIFIED TREES ARE TO BE PROTECTED AND PRESERVED IN ACCORDANCE WITH THE SPECIFICATION FOR THE DURATION OF WORKS.
- THE TREES ARE TO BE FENCED AND SIGNED AT THE SPECIFIED TPZ DELINEATION IN ACCORDANCE WITH THE ARBORICULTURAL PROTECTION SPECIFICATIONS AND ADVICE FROM ARBOR CENTRE.
- NO UNAUTHORISED ACCESS OR WORKS ARE TO OCCUR WITHIN TPZ AREA WITHOUT PRIOR CONSULTATION AND FORMAL APPROVAL FROM ARBOR CENTRE.
- ARBOR CENTRE IS TO BE NOTIFIED A MINIMUM OF 5 WORKING DAYS PRIOR TO WORKS PROPOSED WITHIN THE TPZ.
- ANY WORKS WITHIN THE TREE PROTECTION ZONE ARE TO BE CARRIED OUT IN ACCORDANCE WITH ADVICE FROM AND UNDER THE SUPERVISION OF THE ARBOR CENTRE.

Appendix D – Road and Path Construction Modifications

Pervious paved surfaces

- The use of aggregate layer beneath **Pervious paved surfaces** (**Permeable &/or Porous type paving –** refer figure 9) provides benefit that include creating soil accessibility for tree roots, Soil moisture harvesting, Stormwater harvesting, and can help in mitigating pavement trip hazards.

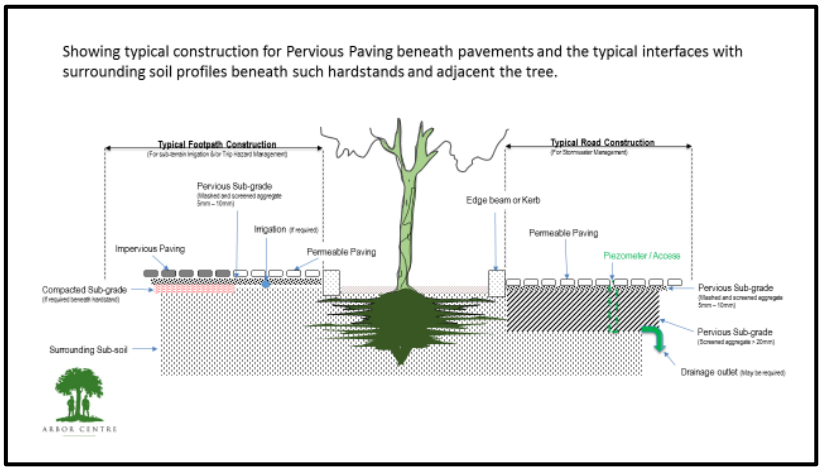


Figure 9. *Diagrammatic example of how pervious paving may be utilised within the landscape –-Image property of Arbor Centre*

Root canals

- The use of **root canals** (refer figure 10) utilizing secure areas near tree plantings for tree root development so as to minimize the need for rootable soil space immediately surrounding the tree.

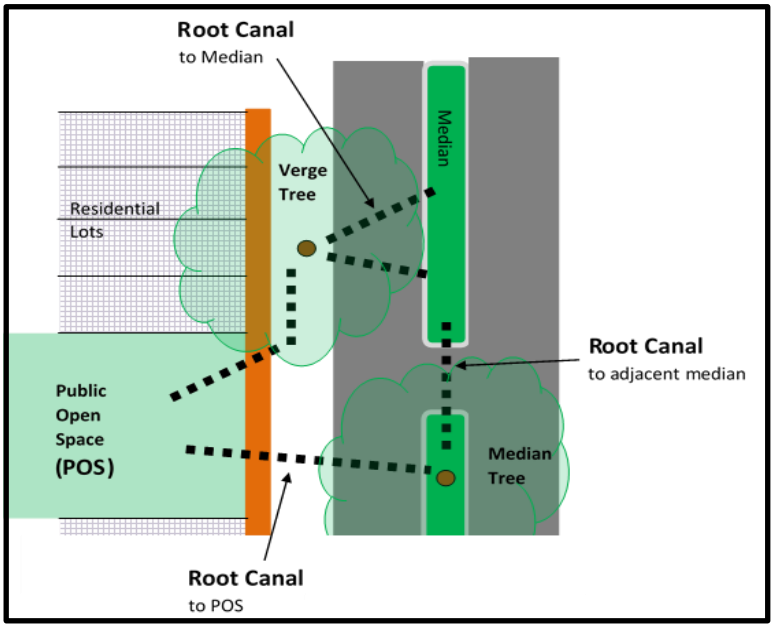


Figure 10. *Showing root canal possibilities to consider in urban design – image property of Arbor Centre*

Water Sensitive Urban Design (WSUD)

Consideration should be given to the Implementation of WSUD water harvest and storage strategies throughout the site to minimize storm water runoff and better utilize and manage water from rain events (refer figures 11 & 12).

Strategies may include (but may not be limited to);

1. Use of permeable and/or porous paving on roads, footpaths and parking bays etc.
2. Installation of below ground water storage cells.
3. Installation of rain gardens, swales etc...

Figure 11. *Water Sensitive Urban Design - Image Source –*https://www.watersensitivesa.com/aila-award-winning-projects-embrace-wsud/

Figure 12. *Permeable paving-. Image Source* https://treenet.org/wsud-research-applied-latest-addition-symposium-resources/

Geoweb Information

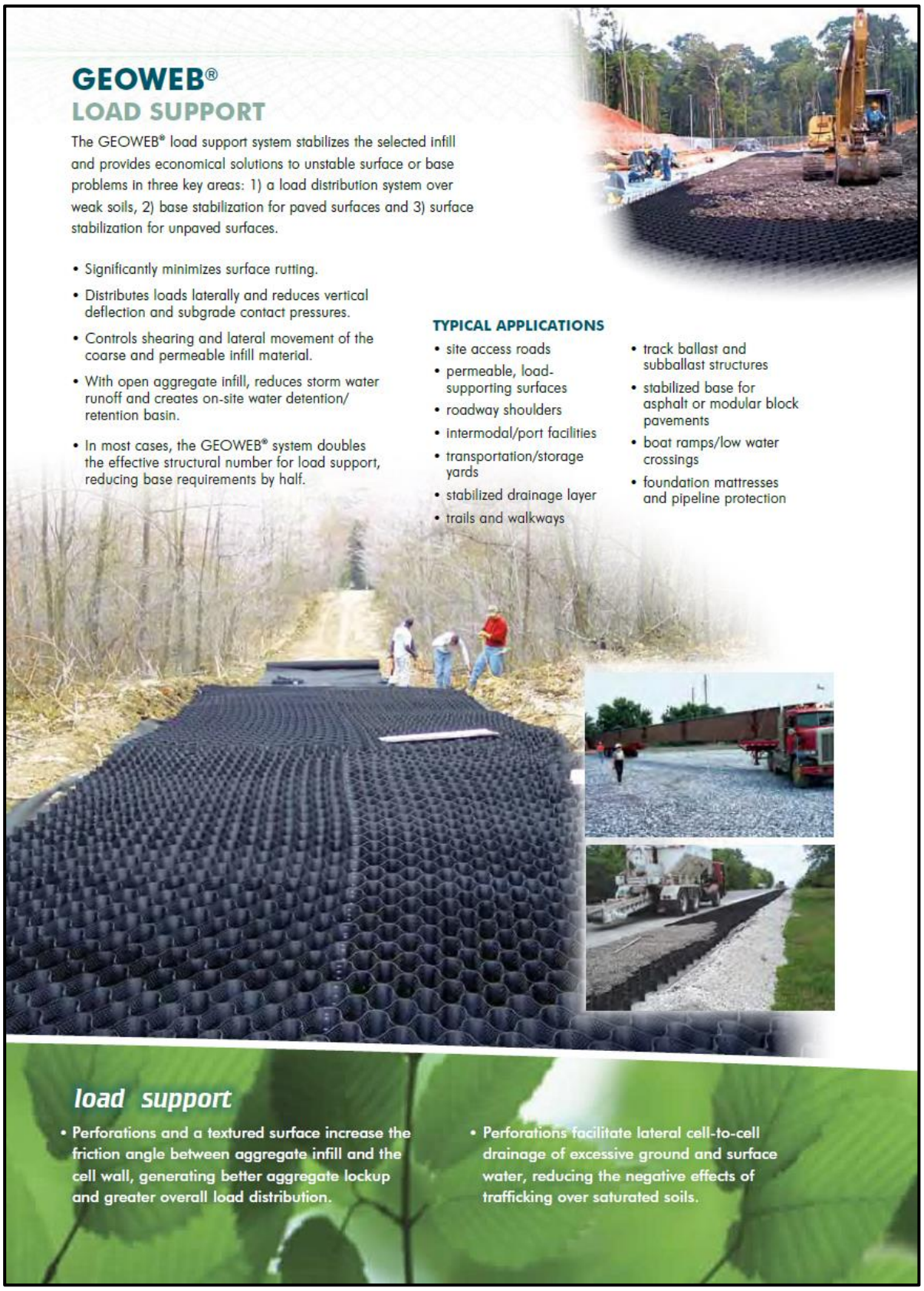


Figure 13 Example *of GeoWeb product – Image source* https://www.geofabrics.co/sites/default/files/brochures/Geoweb-General-Brochure-M056-10-14NZ.pdf

Figure 14. *Example of GeoWeb product being installed within Epsom Avenue , Belmont – Image source City of Belmont (WA)*

Appendix E – Back of Kerb Treatments

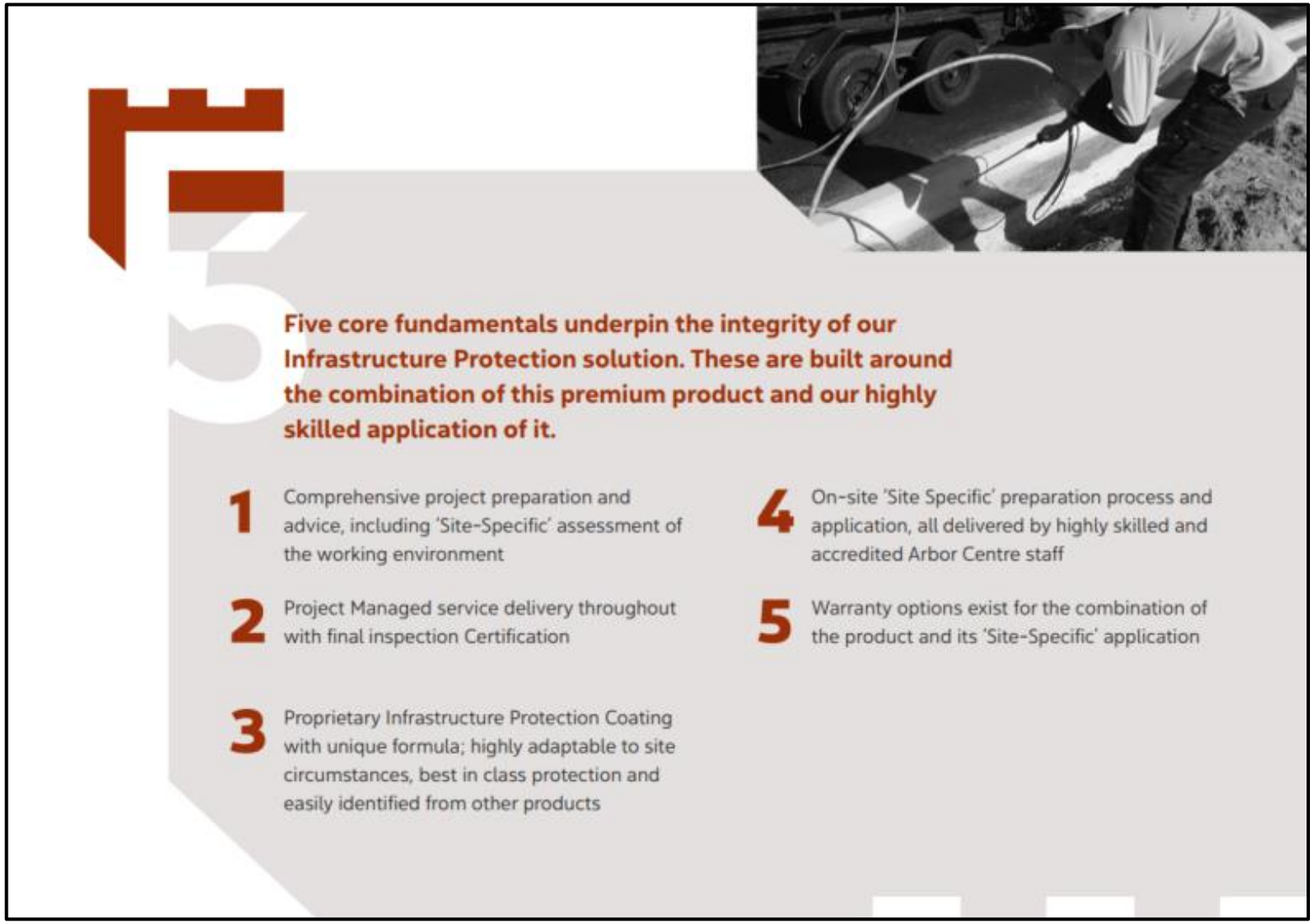


Figure 15. *Example of Fortress5 – Image source Arbor Centre*

Appendix F – Arbor Centres Civic Trees

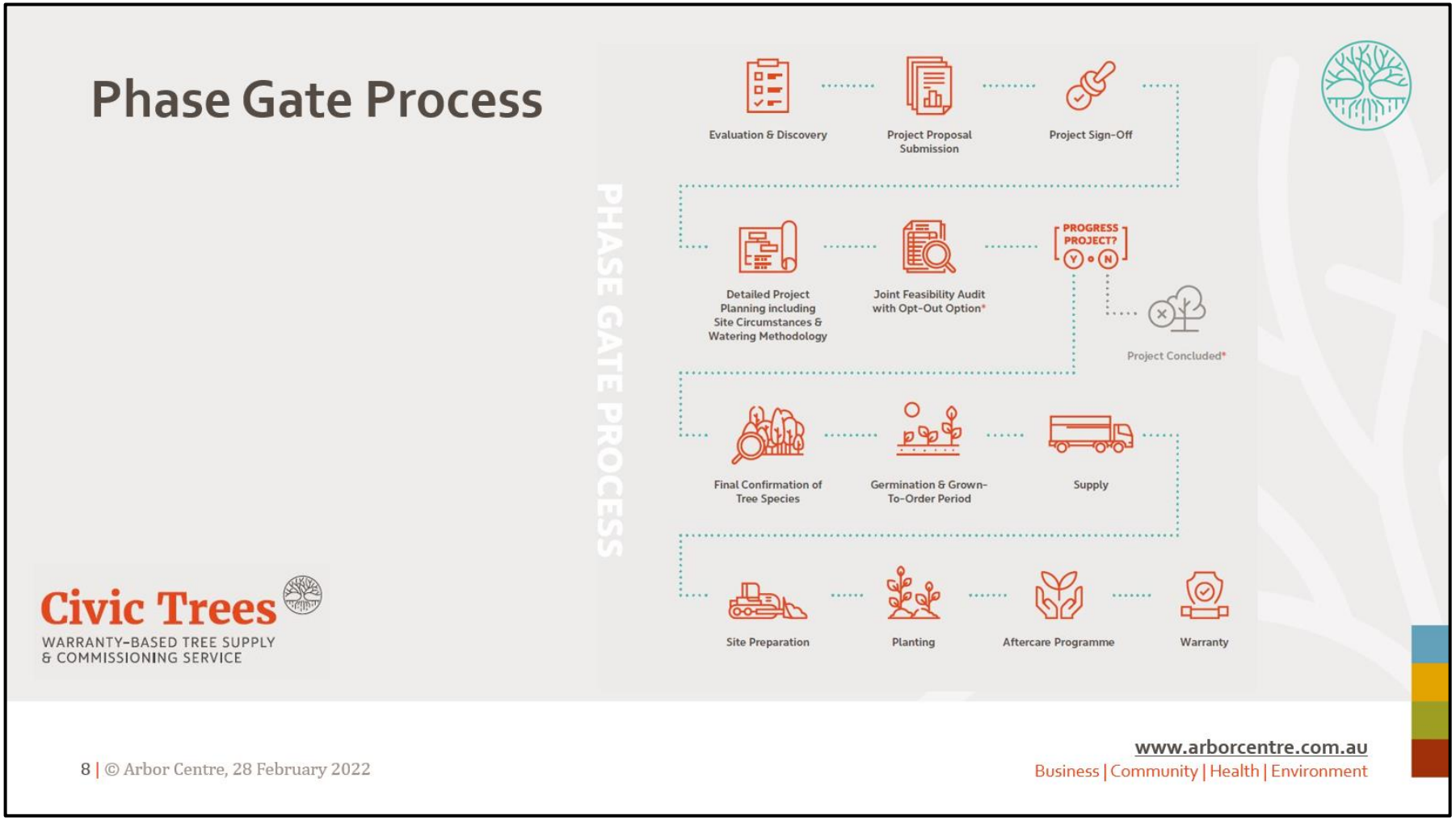


Figure 16. *Example of Civic Trees – Image source Arbor Centre*

If you have any queries or if we can be of further assistance, do not hesitate to call the Arbor Centre office on (08) 9359 9300.

Regards,

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