

Construction Impact Assessment and Management Plan



Cranbrook Senior School

Prepared For: Architectus Design Studio.

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Construction Impact Assessment and Management Plan for Cranbrook Senior School.*

Table of Contents

1. SUMMARY	3
2. BACKGROUND	3
3. AIMS	4
4. METHODOLOGY	4
5. OBSERVATIONS	4
6. TREE DATA	4
7. DISCUSSION	8
8. TREE PROTECTION PLAN	10
9. DEFINITIONS.....	14
10. PICTURES	16

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1. Summary

1.1 This report has been requested by Cranbrook School to better understand the arboricultural implications associated with the Hordern Oval Precinct Redevelopment. This is a major redevelopment involving the demolition of the War Memorial Hall and Mansfield Buildings, as well as the excavation of the Oval to provide the ongoing potential to fulfil the School's Mission to become a world class school, encouraging the development of generations of student's contribution to the betterment of society.

1.2 A total of fifty nine (59) trees have been individually assessed for the purpose of this report. These are located within 15m of the proposed construction footprint. Additional trees not formally assessed include- the stand of mature Brush Box on the site's northern boundary, being over 20m from the proposed Construction Impact Zone (CIZ).

1.3 There are four (4) historically significant trees documented within this portion of the school grounds. It should be noted that one of these has entered a cycle of decline and is being recommended for removal irrespective of this development. The remaining historically significant Norfolk Island Pines and Kauri Pine have been documented as essential for retention and will be preserved through out the construction process.

1.4 The proposed development will require the removal of thirty eight (38) trees. Of these five (5) have been recognised as high value trees and are required for removal to allow the proposed development. The Brush Box and Jacaranda documented as Trees 16, 17, 18 and 19 are required for removal to allow vehicular access, while the Brush Box documented as Tree 38 is required for removal to allow an alternative fire exit and pedestrian access. The Port Jackson Fig tree documented as Tree 26 is required for removal to allow adjacent ground level changes to occur.

1.5 There are three (3) trees located adjacent to the proposed excavation that will require ongoing arboricultural consideration to ensure their retention. These include the Phoenix palm documented as Tree 13, the historically significant Bunya Pine documented as Tree 39 and the mature Black Bean documented as Tree 36.

1.6 Preservation recommendations have been made based on *Australian Standard AS4970 for the Protection of Trees on Development Sites* and will be implemented accordingly. All tree pruning recommendations will be made based on *AS4373 for the Pruning of Amenity Trees* and will be undertaken where appropriate.

2. Background

2.1 The School's Mission Statement makes an ongoing commitment to lead its students to discover and make the most of their talents. The proposed development extends this commitment and it is hoped will enable the School to continue to become a world leader in education.

2.2 The proposed works will better utilise the building footprints currently occupied by the War Memorial Hall and the Mansfield Buildings, as well as the subterranean space under Hordern Oval.

3. Aims

3.1 The aims of this report are to;

- Review Council Policies for applicable conditions regarding the site and documented trees;
- Conduct a visual assessment of the documented trees and their growing environment;
- Provide a detailed list of Tree Preservation Recommendations aimed at preserving those trees documented for preservation.

3.2 There is no warranty or guarantee, expressed or implied that health, pests, disease, deficiencies, decay or any structural failures may occur at any time following documentation. Information contained in this report covers only the documented trees and reflects their health and condition at the time of inspection.

4. Methodology

4.1 A Visual Tree Assessment (VTA) was performed from ground level and consideration was given to the overall health of each tree, percentage of canopy, epicormic growth, deadwood and form for this species. The tree heights and canopy spreads have been estimated and where relevant the orientation of the canopy spread noted. The trunk diameters of each tree has been estimated at breast height of 1.4meters (DBH) and measured with a diameter tape where required to calculate Tree Protection Zones. The site was originally inspected by consulting arborist George Palmer in October, 2017.

5. Observations

5.1 The site area extends over a significant portion of the school grounds. Horden Oval occupies the northern extension of this, as well as a significant portion of its western boundary. The stand of mature Brush Box trees on this western boundary adjacent to the site's New South Head Road frontage are set well back from the proposed works.

5.2 The Oval and existing building footprints have limited the arboricultural impacts of the proposed works to those trees located adjacent to these. These include some well established and mature trees that provide a significant arboricultural amenity contribution. Removal recommendations have not been made without due consideration and only trees required for removal have been recommended for removal.

6. Tree Data

6.1 A total of fifty nine (59) trees have been individually assessed for the purpose of this report. These range in significance from original plantings of *Araucaria heterophylla* and, *Agathis robusta* to Olive and Hackberry trees, that would be recommended for removal irrespective of the proposed development.

6.2 The site's most arboriculturally significant trees have been seen as essential for retention and the proposed construction set back to allow for this. There is one (1) tree of high environmental significance that is however required for removal. This is a mature *Ficus rubiginosa*, or Port Jackson Fig tree (Tree 26). Additional significant trees required for removal include the *Lophostemon confertus*, or Brush Box trees (16, 17, 18 and 19) located on the Rose Bay Avenue boundary. These are of moderate to high significance.

6.3 The embankment on the eastern side of Horden Oval has been planted out with ten (10) *Jacaranda mimosifolia* trees, with five (5) requiring removal (Trees 1, 2, 14, 15 and 17). These Jacarandas, proposed for removal are all poorly formed with multiple leaders and associated inclusions.

6.4 The Jacaranda trees 1, 2 and 3 are more recent plantings that have grown to a height of less than 7m and are supported on trunks of less than 50cm in diameter, while the remaining Jacarandas are all over 50cm in diameter and are clearly part of an earlier planting. Trees 1 and 2 are required for removal to allow for suitable access grades to be met for the adjacent driveway. Tree 3 is located outside the proposed construction footprint and has been documented for retention.

6.5 The Jacarandas documented as Trees 4 and 5 are larger although appear to be in fair health only. Both are again located outside the construction impact zone and are documented for preservation. Tree 6 is a co dominant Jacaranda that can be estimated to have been one of the earlier plantings given its size.

6.6 Tree 7 is a multi trunked *Agonis flexuosa*, or Western Australian Peppermint located under the canopy of Tree 6. It is located outside the CIZ but should be considered for removal to maintain horticultural continuity.

6.7 Tree 8 is a well established and mature *Lophostemon confertus*, or Brush box located adjacent to Rose Bay Avenue. The tree is structurally sound and part of the earlier planting works. It is documented for retention.

6.8 Tree 9 is a mature Jacaranda and is another significant example of the species. This tree has reached a height of over 14m and is supported on multiple leaders. Although poor structure has been noted, the tree holds a high retention value and has been documented for retention.

6.9 The *Ficus microcarpa* var. *Hillii*, or Hills Weeping Fig tree has been documented as Tree 10. This is one of the site's more significant trees. This tree is over 16m in height with an even broader canopy spread. This is supported on multiple leaders, all of which remain clear of decay or defects.

6.10 The *L. confertus*, or Brush box adjacent to Tree 10 has been documented as Tree 11. This tree has been partially suppressed by the Ficus. The tree remains in good health and condition and has been recommend for retention throughout the construction.

6.11 Tree 12 is another of the earlier Jacaranda plantings. This tree has grown to a height of approximately 12m and is supported on a pair of co dominant trunks 45cm in diameter. These do not look to be included and should remain structurally sound, with some Ficus surface root development noted over this union.

6.12 The *Phoenix canariensis*, or canary Island Date palm on the upper embankment has been documented as Tree 13. This is a well established and mature example of the species that will tolerate a broad range of construction impacts due to its fibrous root system and its ability to absorb soil moisture and nutrients from its entire length - rather than simply through its fine feeder roots. This tree is located adjacent to the proposed construction and has been documented for retention.

6.13 Trees 14 and 15 are well established but poorly structured Jacaranda trees located on the lower embankment. These have both developed with multiple leaders and inclusion. Both trees are clearly structurally compromised and would require significant remedial pruning. Both are located within the construction impact zone and are required for removal.

6.14 Tree 16 is another well established and mature *Lophostemon confertus*, or Brush Box tree located adjacent to the Rose Bay Avenue boundary line and is required for removal to allow appropriate vehicular access.

6.15 Tree 17 is a less well established Jacaranda that has developed on the upper embankment. The tree is supported on multiple leaders from its base. There is also a small Bottle Brush that has grown adjacent to its base. Neither is of any real arboricultural significance and both are required for removal. .

6.16 Trees 18 and 19 are both mature Brush Box trees located adjacent to Rose Bay Avenue and are similarly required for removal to allow underground vehicular access.

6.17 The semi mature Jacaranda, located within the bin storage area has been documented as Tree 20. This is a well established tree with multiple sections of visible surface decay below the tree's main canopy. This tree is again required for removal to allow construction to occur.

6.18 Tree 20a is a semi mature *Brachychiton acerifolia*, or Illawarra flame tree. This tree is again located within the proposed construction footprint and is required for removal.

6.19 Trees 21 - 35 are all located on the embankment on the southern side of the War Memorial Hall and are required for removal. Tree 21 is another semi mature *Lophostemon confertus* that is in fair health. This tree has previously declined and been allowed to regrow.

6.20 Trees 22, 24 and 29 are all *Olea europea*, or African Olives. These are an exempt "weed" species under Woollahra Council's Tree Preservation Legislation and can be removed without further consideration.

6.21 Tree 23 is a semi mature *Melia azedarach*, or White Cedar. This tree will have self seeded in this location, is of limited arboricultural amenity and is required for removal.

6.22 Tree 25 is a mature *Celtis sinensis*, or Hackberry tree located on the embankment. This is a well recognised, environmental weed species that should have been removed prior to becoming so well established. This tree is over 20m in height and is supported on a trunk of over 75cm in diameter. These trees are exempt from Woollahra Council's Tree Preservation Legislation where the example is less than 10m in height.

6.23 The most significant of these is the *Ficus rubiginosa* documented as Tree 26. This is a well established and fully mature example of the species that is over 20m in height and supported on a trunk of over 90cm in diameter. The tree has an extended section of visible surface decay from its base. This decay runs for over 6m up the tree's trunk and will affect the tree's structural integrity. This decay has failed to compartmentalise and the tree is likely to continue to be affected by this. Epicormic shoots are a clear indication of stress and are evident throughout the tree, particularly on the tree's trunk and adjacent to this split.

6.24 Tree 27 is a semi mature *Banksia integrifolia*, or Coastal Banksia. This is a locally native tree species that will have been planted here within the previous twenty (20) years. The tree provides a limited amenity contribution and is required for removal.

6.25 Tree 28 is *Glochidion ferdinadii*, or Cheese tree. This is another locally native species that has been planted less than fifteen (15) years ago and provides a limited amenity contribution. It is required for removal.

6.26 Tree 30 is a small *Ficus microcarpa* var. *Hillii* or Hills Weeping Fig tree. This tree will have been planted within the previous fifteen (15) years and should be removed irrespective of the proposed development.

6.27 Tree 31 is the mature *Cypress sempervirens* located on the upper forecourt. While this tree is a well established and mature example of the species, it is out of context within this landscape setting and should not be considered for retention, irrespective of the proposed.

6.28 Tree 32 is a semi mature *Schefflera actinophylla* or Umbrella tree. This is another exempt environmental weed species that should be removed irrespective of the proposed development.

6.29 Tree 33 is a *Viburnum tinus*. This is an exotic shrub, less than 4m in height and should not be considered as a material constraint to this or any proposed development.

6.30 Tree 34 is a mature *Archontophoenix cunninghamiana*, or Bangalow palm and is a well established example of the species. This, and the remaining stand of less mature Bangalow palm trees located on the adjacent embankment have all been recommended for removal. Consideration has been given to the relocation of these via transplantation. Both site constraints and limited planting space have impacted on this, and all have been documented for removal.

6.31 The adjacent *Raphiolepis indica*, or Indian hawthorn has been documented as Tree 35. This is another mature example of this species. The tree remains less than 6m in height with extensive decay noted on both of its co dominant leaders. It is required for removal.

6.32 Tree 36 is the *Castanospermum australe*, or Black Bean tree. This tree will likely have been one of the site's earlier plantings and has been affected by the adjacent building works. This has limited its access to adequate soil moisture and nutrient availability reducing its vigour. The tree is located outside the theoretical CIZ and will be preserved. Surrounding level changes will be made to allow the retention of the surrounding permeable soil surface.

6.33 Tree 37 is a mature *Camellia sasanqua* tree of less than 6m in height. While well established, the tree remains of limited retention value and is located within the CIZ and required for removal.

6.34 The adjacent *L. confertus*, or Brush box (Tree 38) is another mature and well established example of the species. This tree has affected the adjacent retaining wall and slab in front of the canteen. It was hoped that construction of the canteen and Wall Memorial Hall footings will have affected the tree's root spread and development allowing for retention. Alternative fire access requirements have however extended the CIZ to within 1m of the tree's base. This is well within the tree's Structural Root Zone (SRZ) as outlined and has lead to a requirement for the tree to be documented for removal.

6.35 The neighbouring *Agathis robusta*, or Queensland Kauri (Tree 39) is a historically significant tree and essential for retention. The proposed works are over 8m from the tree's base. This is however within a 12m theoretical Tree Protection Zone and ongoing arboricultural consideration will need to be made.

6.36 Tree 40 is a mature *Stenocarpus sinuatus*, or Queensland Fire Wheel tree. Previous pruning has removed much of the tree's lower canopy. This has limited its practical amenity contribution. The tree is located outside the CIZ and is documented for preservation.

6.37 The *Podocarpus elates*, or Plum Pine documented as Trees 41 and 42 are both well established and mature example of this species. They have broad canopies being supported on trunks of over 1m. Again, these trees are located well outside the CIZ and will be preserved.

6.38 Tree 43 is one of three historically significant *Araucaria heterophylla*, or Norfolk Island Pine trees. These were planted in the 1880's as part of the original landscape works following the original construction. This tree has however entered a documented cycle of decline and has been proposed for removal irrespective of the proposed works.

6.39 The remaining Norfolk Island Pines documented as Trees 44 and 45 retain their good health and have been documented as essential for retention. Both are located well outside the CIZ and will be preserved.

6.40 The stand of well established Brush Box trees adjacent to the properties northern boundary with New South Head Road are all located over 20m from the CIZ and will not require direct arboricultural consideration to ensure their retention.

6.41 Tree 45a is a well established and mature *Celtis sinensis*, or Hackberry tree located on the front verge. This tree is a well recognised environmental weed species and has been recommended for removal to limit the impact that its retention will have on our urban forest. The tree is however located well outside the CIZ and is not required for removal to allow the proposed construction to occur.

6.42 Tree 46 is the last of the Podocarpus trees on the New South Head Road verge. This tree is a well established and mature example of the species located well outside the CIZ and will not be affected by the proposed works.

6.43 Tree 47 is a co dominant and included *L. confertus*. The tree has an extensive section of visible decay noted and should not be considered for retention.

6.44 Tree 48 is a well established and mature *Brachychiton acerifolius*, or Illawarra Flame tree. These are a well suited species although located within the CIZ and required for removal.

6.45 Trees 49, 50, 51, 52, 56 and 57 are all *Callistemon viminalis*, or Bottle Brush trees. These are all well established but less than 7m in height and provide a limited arboricultural amenity contribution and one that can readily be replaced. All have been recommended for removal to allow for the construction.

6.46 Trees 53, 54 and 55 are all *Castanospermum australe*, or Black Beans. These have all been heavily reduction pruned and are poorly structured, semi mature examples of their species. They are required for removal.

7. DISCUSSION

7.1 The proposed development will require the excavation of large quantities of sand and soil. The execution and retention of this soil profile adjacent to the construction will be an exercise in itself. It is hoped that the edge of the documented construction remains the edge of the CIZ and that these works do not indirectly, or directly affect adjacent trees through compaction, the severing of larger diameter tree roots or via required pruning works.

7.2 As noted, the excavation and construction works are adjacent to Trees 13, 36 and 39. These are important for retention for a broad range of reasons. These trees will require ongoing arboricultural consideration to allow for their preservation. This will be the focus of tree management throughout the construction process and will involve the implementation of a range of tree preservation measures. These are based on guidelines outlined within Australian Standard AS4970 *for the Protection of Trees on Development Sites*.

7.3 Tree 13 is a well established *Phoenix canariensis*, or Canary Island Date Palm. These, and all monocotyledons are supported with a fibrous root system allowing them to absorb both soil moisture and nutrients from throughout their length, as opposed to the fine fibrous roots of the other dicotyledons documented. As such, this tree will cope with a broad range of potential construction impacts and should provide an appropriate edge to the development. The excavation will however require the piling rig to work within 2m of this tree's base. This is well within its theoretical TPZ and will require ongoing consideration. Work this close to the tree's base will require canopy pruning to allow access and will also lead to the removal of a portion of the tree's fibrous root network. The mature age and nature of the tree species will however limit the impact of this on its structural integrity. Compensatory watering and appropriate mulching will theoretically provide appropriate soil improvements therefore limiting the impact of this portion of the construction on this tree.

7.4 Vehicular access requirements have lead to the removal recommendation for Trees 16, 17 and 18. These are well established trees that provide a significant amenity contribution to the site and this recommendation has not been made without due consideration. The Jacarandas documented as Trees 1 and 2 have similarly been required for removal to allow this portion of the construction to occur. These are however part of more recent planting works and are less significant here.

7.5 Although both Trees 20 and 20a are located outside the direct CIZ, access and associated works will be required within several meters of these and a removal recommendation has been made.

7.6 All trees located on the embankment to the south of the War Memorial Hall are required for removal to allow the construction to occur. As previously noted, the most significant of these is Tree 26. This is a mature *Ficus rubiginosa*, or Port Jackson Fig tree that can be estimated to be over one hundred (100) years of age. The tree has however affectively split with a section of visible surface decay that extends for over 8m from the tree's base. This is a significant structural fault. The tree's mature age and limited vigour will mean that this is unlikely to adequately compartmentalise this, and decay will continue to spread. The continued spread of this decay will likely lead to the failure of the tree in time.

7.7 As noted, consideration has been given to the re location via transplantation of all of the Bangalow and odd Kentia palms located on this embankment. These along with the Bangalow palm documented as Tree 34 have however been documented for removal, due to site constraints and limited options for relocation.

7.8 The mature *Castanospermum australe*, or Black bean documented as Tree 36 is located within Camellia Court. While the bulk of the proposed construction is over 12m from the tree's base and outside its theoretical TPZ, level changes are proposed. These will need to consider the tree and its long term environmental requirements. The structure should be constructed in such a way as to avoid directly affecting larger diameter roots within 6m of the tree's base. Level changes should also maintain air and water flow to the soil surface. As noted, the tree is in fair condition only with limited access to soil moisture and nutrients due to existing environmental constraints.

7.9 The mature Camellia documented as Tree 37 is a well established example of the species located adjacent to the War Memorial Hall. While this is outside the CIZ, the works required to sucure the adjacent soil profile will require construction impacts to come within 1m of the tree's base. As such, a recommendation for removal has been made.

7.10 Tree 38 is the mature *Lophostemon confertus* located between the historically significant Kauri Pine (Tree 39) and the War Memorial Hall. This tree was recommended for retention to both maintain amenity and to provide a practical edge between the construction and the Kauri Pine. The construction footprint has however been required to extend to within 1m of this tree's base. This is within the tree's structural root zone and will require its removal.

7.11 A removal recommendation has been made for the mature *Celtis sinensis*, or Hackberry tree documented as Tree 45a. This tree is located on the front verge and well outside the ClZ. This removal recommendation has been made to eliminate the affect that this tree has on the urban forest and to provide better continuity of planting on this verge. This is however outside the scope of this report and the scope of works and will be retained throughout the construction process.

Retention Value 1 High- Essential		Retention Value 2 Moderate		Retention Value 3 Low		Retention Value 4 Remove	
Retain	Remove	Retain	Remove	Retain	Remove	Retain	Remove
8, 10, 11, 12, 13, 36, 39, 41, 42, 43, 44, 45, 45a, 46	16,18,19 26, 38	3, 4, 5, 6, 7, 9, 40,	1, 2, 14, 15, 21, 27, 31, 34, 37, 48		17, 20, 20a, 22, 23, 24, 25, 28, 29, 30, 32, 33, 35, 45a, 47, 49, 50, 51, 52, 53, 54, 55, 56, 57.		
Total: 14	Total: 5	Total: 7	Total: 10	Total: 0	Total: 24	Total: 0	Total: 0

8. Tree Protection Plan

8.1 This report will recommend the retention of Trees 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 36, 39, 40, 41, 42, 43, 44, 45, 45a and 46. These will be retained via the implementation of the following list of recommendations. These have been based on our national standard for the *Protection of Trees on Development Sites AS4970*.

8.2 Removal recommendations have been made for the following trees based their location in relation to the construction. Additional removal recommendations have been made based on poor species characteristics and structure. These include Trees 1, 2, 14, 15, 16, 17, 18, 19, 20, 20a, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 37, 38, 45a, 47,48, 49, 50, 51, 52, 53, 54, 55, 56, 57.

8.3 All construction works should be done from within the construction impact zone to limit the indirect impacts of the development process. No works are to be undertaken outside those detailed here. All Tree Protection Zones will be fenced off, marked as a Tree Protection Zone (TPZ) and mulched in accordance with the following conditions.

8.4 This impacts of the proposed development on Trees 13, a mature *Phoenix canariensis*, a semi mature Jacaranda documented as Tree 20, as well as a heritage listed Kauri Pine documented as Tree 39 will need ongoing consideration.

8.5 All documented trees have been assessed to identify construction impacts on adjacent and affected trees to assess both the health and condition, determine landscape significance and life expectancy. A determination for preservation, removal or transplantation will then be made based on sustainability and suitability within the setting. For the purpose of this report *Botanics* has assessed the likely impacts that the proposed development will have on the subject trees. This report has then provided recommendations in relation to the management of these, in accordance with Australian Standard (AS) 4970 for the Protection of Trees on Development Sites. Pruning and removal works will be based on AS4373 for the Pruning of Amenity trees where applicable.

8.6 Tree 13 is a monocotyledon and therefore is supported via a network of fibrous roots that can absorb both soil moisture and nutrients from throughout their length. This allows them to cope with a broad range of construction impacts, including transplantation. The removal of significant (10%+) volumes of roots can be suitably compensated for with the implementation of temporary irrigation.

8.7 The proposed construction adjacent to this tree (Tree 13) will be within 1.5m of its base. This is within its theoretical Structural Root Zone (SRZ) and will require arboricultural consideration to ensure its long term viability. The recommendation for the retention of this tree has been made despite the theoretical significance of the impacts of the construction to both maintain its amenity contribution and to ensure that the accumulative impacts of the construction do not extend further north.

8.8 Trees 20 and 20a are again both located outside the construction impact zone. The Jacaranda is a poorly structured tree with a relatively broad and low canopy. Access and construction requirements will however affect these trees and their viability here. Deep soil planting opportunities will allow replacement to maintain arboricultural amenity.

8.8 Tree 38 is the mature *Lophostemon confertus*, or Brush Box on the southern embankment. This is a mature and significant tree. Pedestrian access requirements have lead to a recommendation for removal along with the well established Camellia documented as Tree 37.

8.9 Arguably, the most significant tree on site is the Kauri Pine documented as Tree 39. The proposed landscaping works to its north have been designed to limit ground level changes and maintain water infiltration volumes. Existing construction works and site topography will have affected the spread and development of tree roots beyond these areas. The proposed works will see the previously mention pedestrian access cover the area currently occupied by Tree 38 and will have a limited practical impact on this remaining Kauri Pine.

8.10 All other trees documented for removal has been done to allow both the proposed works to occur and provide the opportunity for more appropriate replanting.

8.11 Any roots located in the excavation process will be cut cleanly at the edge of the proposed construction to limit the spread of decay and their exposure to the air and atmosphere.

8.12 All trees documented for preservation will be preserved with the implementation of the following list of *Tree Preservation Recommendations*. These have been based on our *National Standard for the Protection of Trees on Development Sites* AS4970 and should be implemented during the construction process, where applicable.

8.13 Appointment of Site Arborist

A site arborist shall be appointed prior to the commencement of work on site. The Site Arborist shall clearly mark out all trees to be removed and ensure that all trees documented for retention are preserved with the implementation of the following tree protection measures. The Site Arborist shall have a minimum qualification equivalent to a NSW TAFE Certificate Level 5 or above in Arboriculture.

8.14 Inspection Points

Give 5 working days notice to allow inspections to be undertaken at the following stages;

Inspection Point	Inspection Personnel
Installation of Tree Protection Zones including Tree Protection Fencing, Silt Fencing and Signage	Site Arborist
Modification of the Tree Protection Zone	Site Arborist
Works within the Tree Protection Zone	Site Arborist
Completion of Construction Works	Site Arborist Site Supervisor.

8.15 Education

Contractors and site workers shall receive a copy of these specifications prior to the commencement of work. Contractors and site workers undertaking any works within a TPZ shall sign the site log to confirm that they have read and understand these specifications prior to their undertaking.

8.16 Tree Protection Zones

Where applicable, all trees to be retained through the construction process shall be protected from mechanical damage and the indirect impacts of the construction process with the installation of Tree Protection Zones. Unless otherwise stated, the following activities must not be carried out within a TPZ;

- modification of existing soil levels
- excavation or trenching
- cultivation of soil
- mechanical removal of vegetation
- movement of natural rock
- storage of materials, plant or equipment
- erection of site sheds
- affixing signage or hoarding to trees
- disposal of chemical waste or construction material
- any activity that may directly or indirectly affect the health of these or surrounding trees.

Note: If access to a TPZ is required as part of the approved development, prior authorisation is required by the Site Arborist.

8.17 Tree Protection Fencing

Tree Protection Fencing shall be installed at the perimeter of the TPZ. As a minimum the Tree Protection Fencing shall be 1.8 meters high temporary chain supported by steel stakes. This shall be fastened and supported to prevent sideways movement. The trees woody roots shall not be damaged during the installation of this Tree Protection Fencing. This Tree Protection Fencing shall be erected prior to the commencement of works on site and shall be maintained for the duration of the construction process.

8.18 Signage

Tree Protection Signage shall be attached the the PTZ and displayed in a prominent location. These signs shall be repeated in 10m intervals or closer where the fence changes direction. These shall be a minimum of a 72 font size and each sign at least 600 x 500mm.

8.19 Mulching

The area within the TPZ shall be mulched and maintained with 80mm of leaf litter mulch for the duration of the construction process. This mulch shall be spread by hand to limit the impact on underlying roots and shall be installed prior to the commencement of works on site.

8.20 The Site Arborist shall inspect and approve the TPZ including mulching, signage, Tree Protection Fencing, Silt fencing and Signage prior to the commencement of works on site.

8.21 Site Management

Materials and waste storage, site sheds and temporary services shall not be located within the TPZ unless specified. Storage points shall be covered when not in use and be no greater than 2m in height.

8.22 Works within the TPZ

The TPZ may need to be modified during the works to allow access between the protected tree and the proposed construction. The TPZ shall remain as specified and only those works detailed in the proposed construction undertaken.

8.23 Completion of Works within specified TPZ

Upon the completion of works within a TPZ the protective fencing shall be reinstated as specified. Where the construction of new structures does not allow for the reinstallation of fencing the TPZ shall be modified by the Site Arborist.



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Associate Diploma Horticulture- Landscape.

Disclaimer

All care has been taken to assess potential hazards, but trees are inherently dangerous. This assessment was carried out from the ground, and covers what was reasonable to be assessed at the time of inspection. No aerial or underground inspections were carried suability is accepted for damage or injury caused by trees and no responsibility is accept if the recommendations in this report are not adhered to. Limitations on the use of this report. This report is to be utilised in its entirety only. Any written or verbal submission that includes statements taken from this report may only be used where the whole report is referenced. Assumptions Care has been taken to obtain accurate information from reliable sources. Botanics can neither guarantee nor be responsible for the accuracy of information provided by others.

DEFINITIONS

COMMON NAME/GENUS SPECIES CULTIVAR – Common names can vary with selected texts. Where species is unknown, “sp.” indicated after genus. Where cultivar is unknown “cv” indicated after species. The number in brackets e.g. (x9) after the species indicates the number of trees in this tree group.

DBH – Diameter at Breast Height. Tree trunk diameter measured at breast height (1.4 metres above ground level). Fabric diameter tape is used which assumes a circular cross section. Multiple measurements indicate multiple trunks. More than three trunks are indicated as “multi”. Where DBH measurement cannot be taken at 1.4m the height at which it has been taken is indicated in the Comments column.

CANOPY SPREAD RADIUS – Average canopy radius (widest + narrowest 2). Circular canopy depictions on Tree Plan/Survey are indicative only. Where canopy spread was significantly skewed, all four cardinal point measurements were recorded.

AGE CLASS – Immature (IM), Semi-mature (SM), Mature (M), Over-mature (OM). Assessment of the tree's current Age. A Mature (M) tree has reached a near stable size (biomass) above and below ground. Trees can have a Mature age class for >90% of life span. Over-mature (OM) trees show symptoms of irreversible decline and decreasing biomass.

VIGOUR–Good(G),Fair(F)orPoor(P). The general appearance of the canopy/foilage of the tree at the time of inspection. Vigour can vary with the season and rainfall frequency. A tree can have Good vigour but be hazardous due to Poor condition. A tree in Good vigour has the ability to sustain its life processes. Vigour is synonymous with health.

CONDITION – Good (G), Fair (F) or Poor (P). The general form and structure of the trunk/s and branching. Trunk lean, trunk/branch structural defects, canopy skewness or other hazard features are considered.

SRZ RADIUS – Structural Root Zone. The area around a tree required for tree stability. Earthworks should be prohibited within the SRZ.. The area is calculated from the formula and graph at Figure 1 of AS4970-2009. The SRZ graph has been adapted from the work of Claus Mattheck (1994). DBH has been used instead of stem diameter above root buttress in the calculation of SRZ. 0.1m has been added to SRZ to allow for minor increases in stem diameter.

TPZ RADIUS – Tree Protection Zone. Radial offset (m) of twelve times (12X) trunk DBH measured from centre of trunk (for trees less than 0.3 metre DBH minimum TPZ is 2.0 metres). To satisfactorily retain the tree construction activity (both soil cut and fill) must be restricted within this offset. TPZ offsets are rounded to the nearest 0.1 metre. Existing constraints to root spread can vary TPZ. Generally an area equivalent to the TPZ should be available to the tree post development. Encroachment occupying up to 10% of the TPZ area is

acceptable without detailed root zone assessment. Encroachments greater than 10% require specific arboricultural assessment.

SULE – Safe Useful Life Expectancy. A systematic pre-development tree assessment procedure developed by Jeremy Barrell, Hampshire, England. The SULE method used in this assessment has been adapted for simplified use within the field. It gives a length of time that the Arborist feels a particular tree can be retained with an acceptable level of risk based on the information available at the time of the inspection. SULE ratings are Long (retainable for 40 years or more with an acceptable level of risk), Medium (retainable for 16-39 years), Short (retainable for 5-15 years) and Removal (tree requiring immediate removal due to imminent hazard or absolute unsuitability).

RECOMMENDATIONS – Retain (R), Retain Plus (R+), Transplant (T) or Remove (Rm).

COMMENTS – Comments relating to the location, surroundings and hazard potential of the trees at the time of inspection and where applicable the reason for removal.

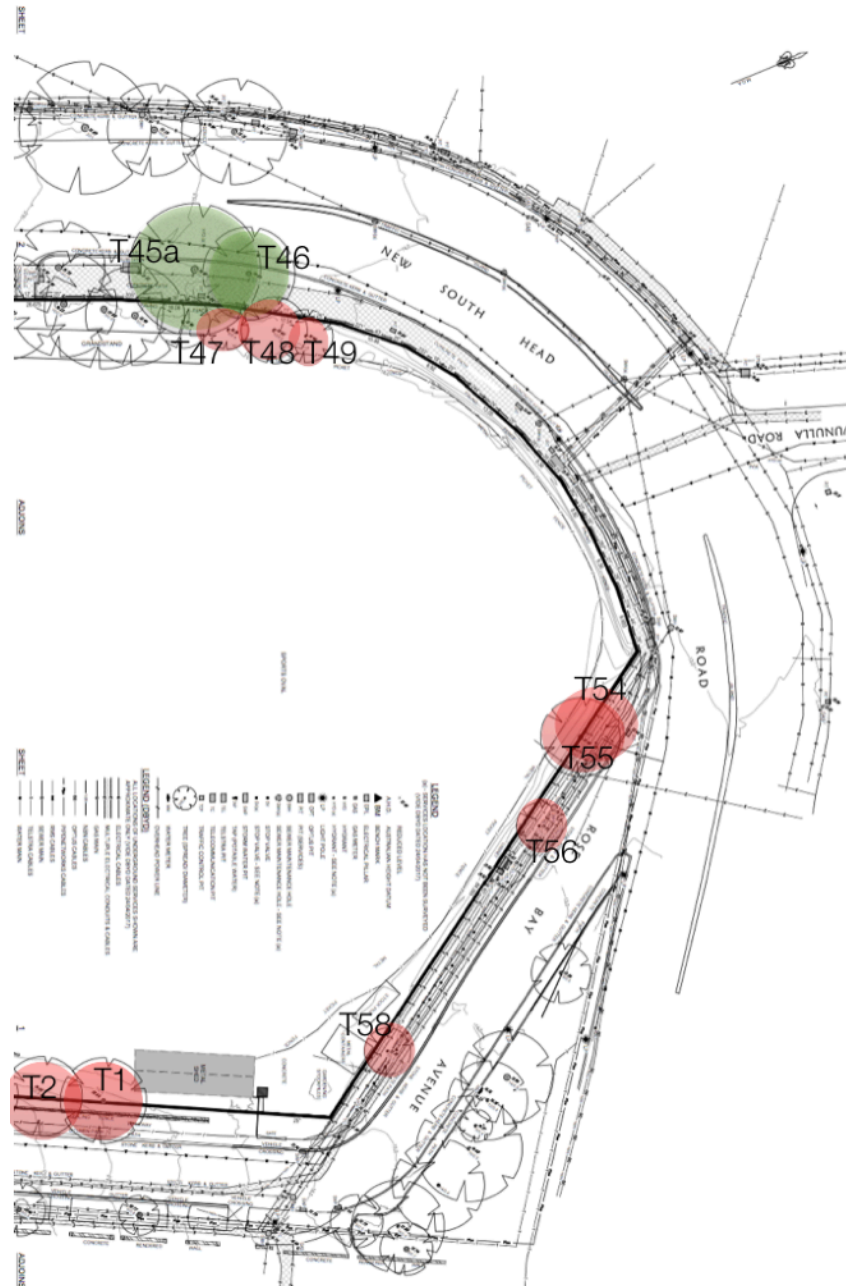


Figure 1 Shows the trees being retained and removed.

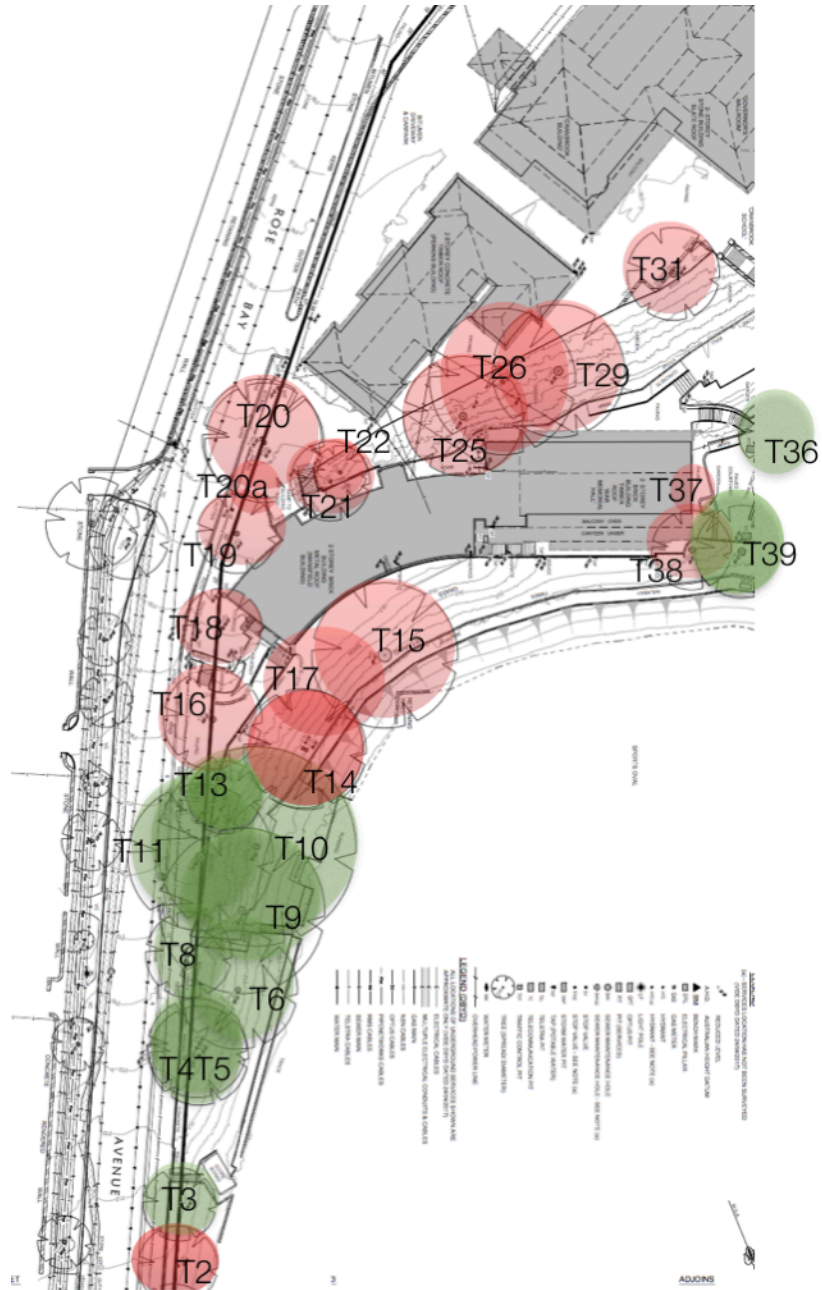


Figure 2 Shows the trees being retained and removed.



Figure 3 Shows the trees being retained and removed.

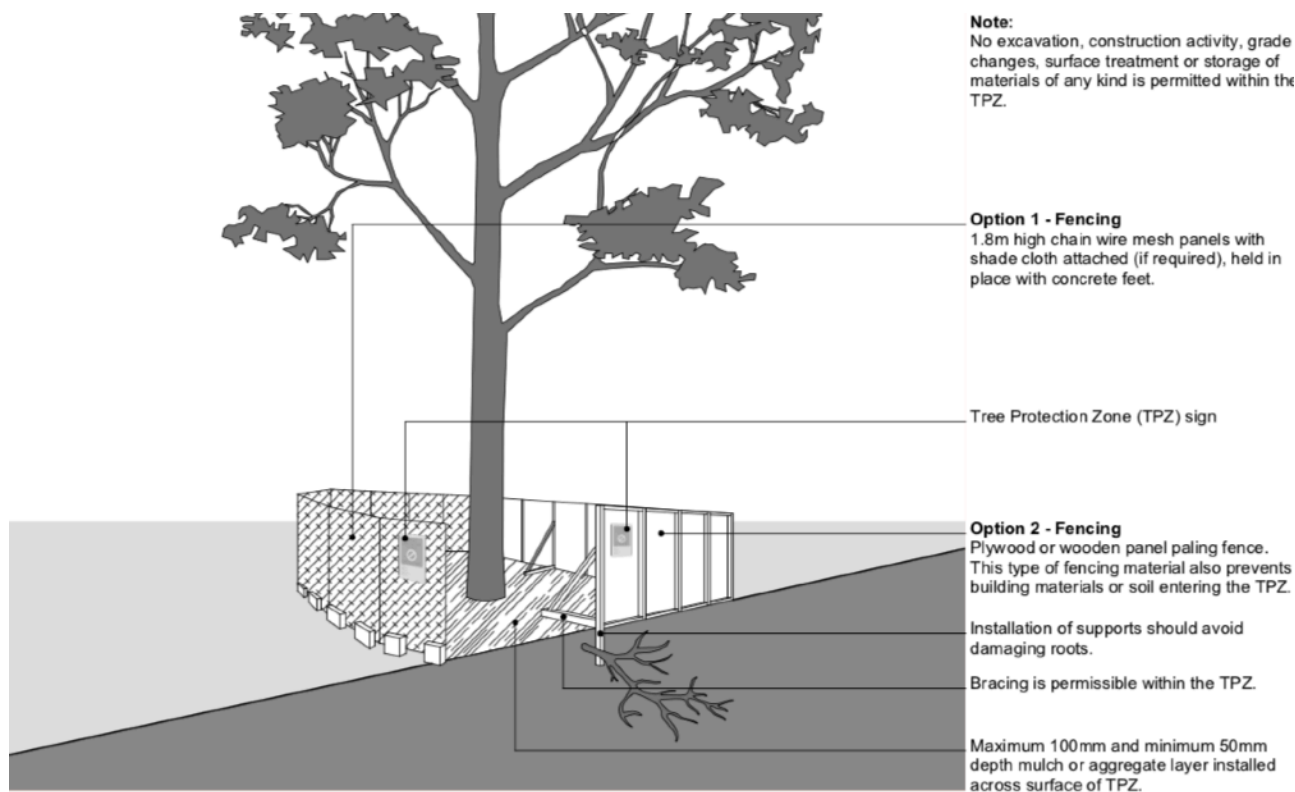


Figure 4 Shows the proposed installation detail for TPZ fencing.

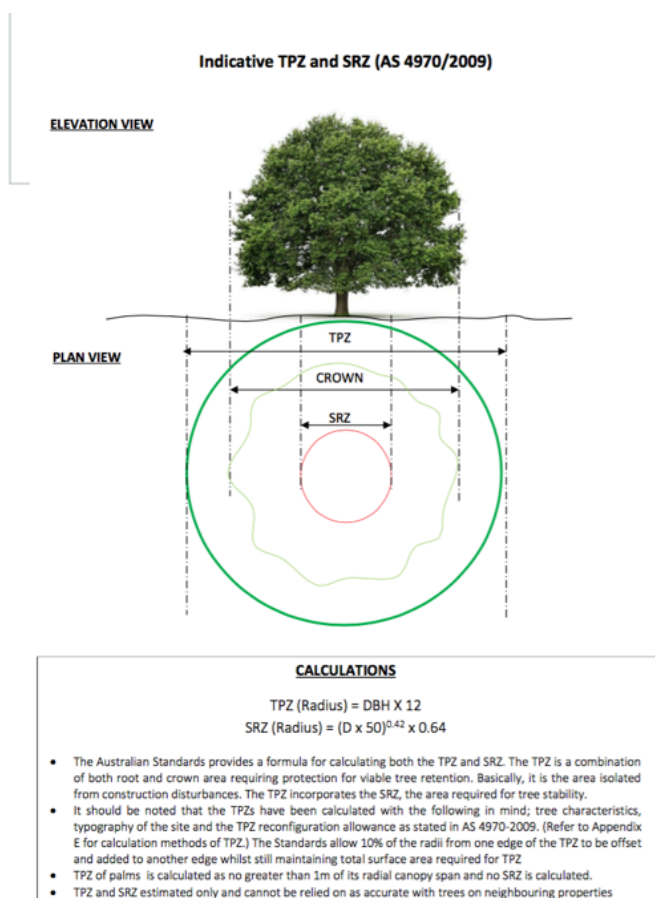


Figure 5 Shows the implications of the TPZ and SRZ calculations based on AS4970 standards.