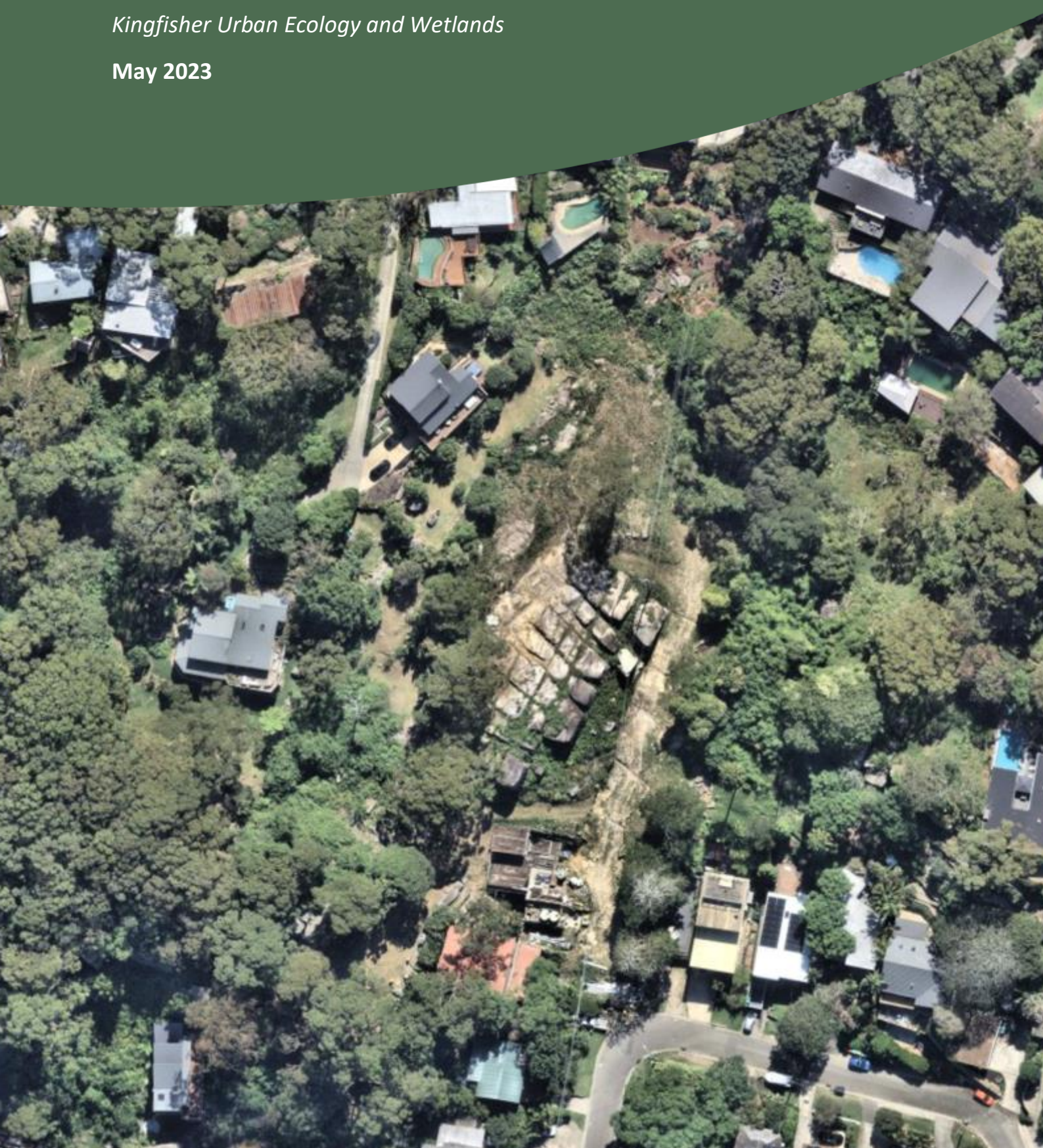
Landscaping Plan for Sydney Coastal Sandstone Foreshores Forest

14 Mirrool St, North Narrabeen

Prepared by Ecological Consultants Australia Pty Ltd TA

Kingfisher Urban Ecology and Wetlands

May 2023



About this document

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Statement of Authorship

This study and report were undertaken by Ecological Consultants Australia for the client. The author of the report is Geraldene Dalby-Ball with qualifications BSc majoring in Ecology and Botany with over 25 years' experience in this field.

Limitations Statement

Information presented in this report is based on an objective study undertaken in response to the brief provided by the client. Any opinions expressed in this report are the professional, objective opinions of the authors and are not intended to advocate any particular proposal or pre-determined position.

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Geraldene Dalby-Ball – Director of Ecological Consultants Australia

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1 Introduction

Ecological Consultants Australia (ECA) trading as Kingfisher Urban Ecology and Wetlands has been contracted by Eva Wykrota to prepare a **Landscaping Plan** for the Sydney Coastal Sandstone Foreshores Forest at 14 Mirrool St, North Narrabeen NSW 2101 within the Northern Beaches Council LGA (see **Figure 1.1** and **Figure 1.2**).

This plan is intended to guide landscaping works for areas being disturbed by the proposed development. The proposal includes the development of an access driveway and associated engineering and stormwater management (see **Figure 2.1**).

This plan is consistent with the *Pittwater 21 Development Control Plan* (DCP) *D11.11 Landscaped Area – Environmentally Sensitive Land*. The site is within Area 1 of the Landscaped Area Map (see **Figure 1.3**). The vegetation is partially mapped within the Sydney Coastal Sandstone Foreshores Forest (see **Figure 1.4**).

Outcomes of the Pittwater 21 DCP D11.11

- *Achieve the desired future character of the Locality. (S)*
- *The bulk and scale of the built form is minimised. (En, S)*
- *A reasonable level of amenity and solar access is provided and maintained. (En, S)*
- ***Vegetation is retained and enhanced to visually reduce the built form. (En)***
- ***Conservation of natural vegetation and biodiversity. (En)***
- *Stormwater runoff is reduced, preventing soil erosion and siltation of natural drainage channels. (En)*
- ***To preserve and enhance the rural and bushland character of the area. (En, S)***
- *Soft surface is maximised to provide for infiltration of water to the water table, minimise run-off and assist with stormwater management. (En, S)*

Controls of the Pittwater 21 DCP D11.11

- *The total landscaped area on land zoned R2 Low Density Residential or E4 Environmental Living shall be 60% of the site area.*
- *The use of porous materials and finishes is encouraged where appropriate.*
- *Any alterations or additions to an existing dwelling shall provide a minimum 60% of the site area as landscaped area.*

Figure 1.1. Site of proposed landscaping works. Source: *Nearmap.* Date accessed: 11/04/2023.

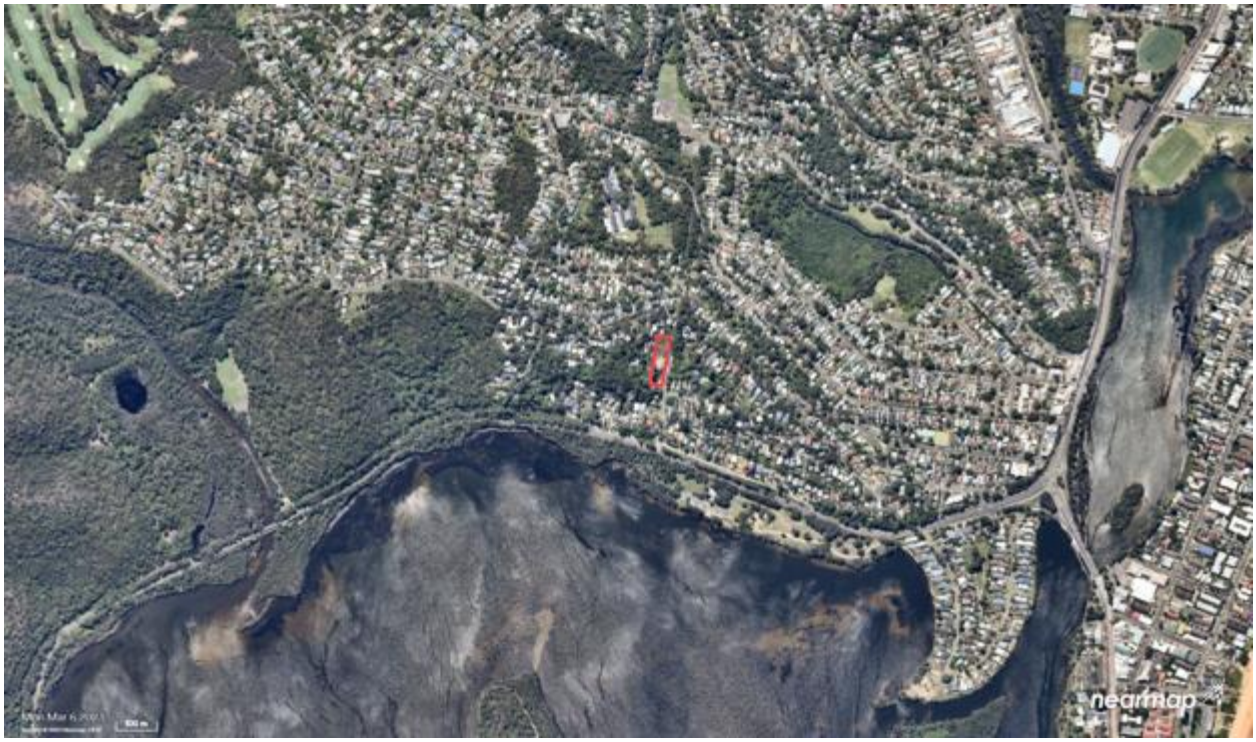


Figure 1.2. Location of the site of proposed landscaping works. Source: *Nearmap.* Date accessed: 11/04/2023.

Figure 1.3. Site within Area 1 of the Landscaped Area Map. Source: *Northern Beaches Council.* Date accessed: 22/05/2023.

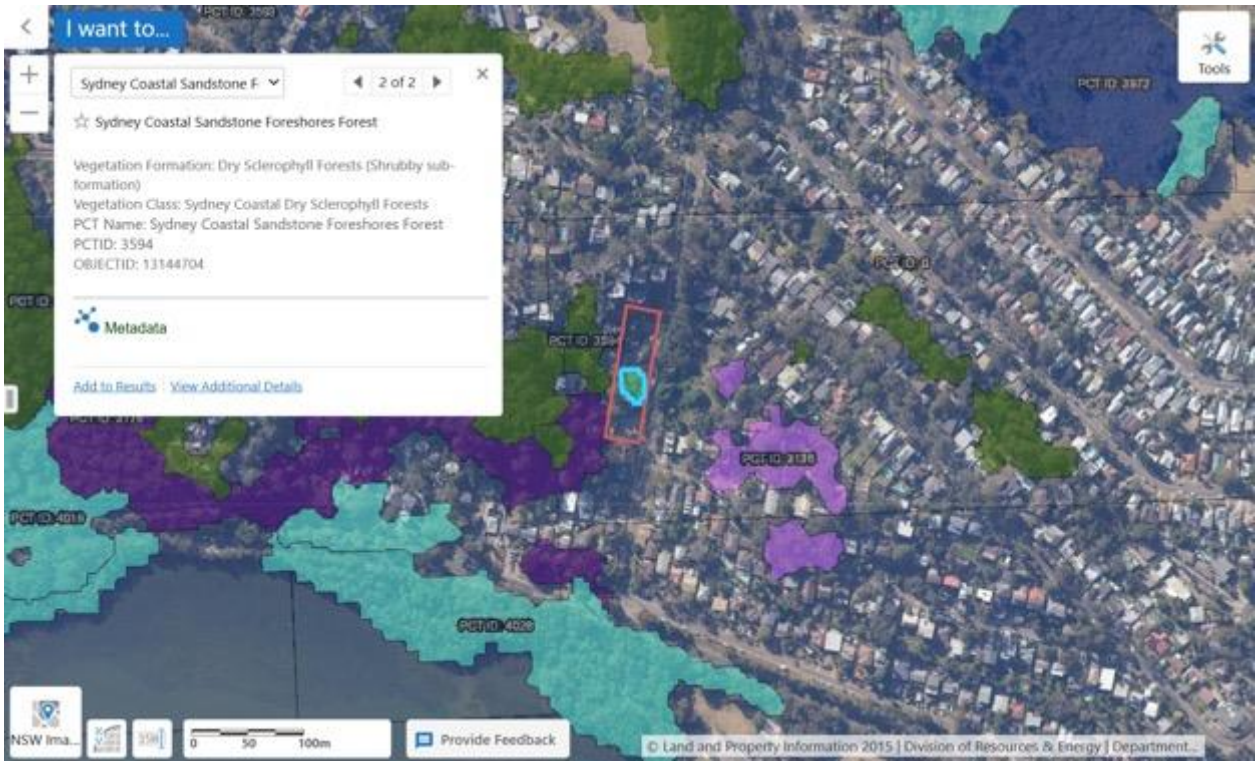


Figure 1.4. Site of proposed landscaping works relative to the occurrence of Sydney Coastal Sandstone Foreshores Forest. Source: *SEED NSW State Vegetation Type Map*. Date accessed: 11/04/2023.

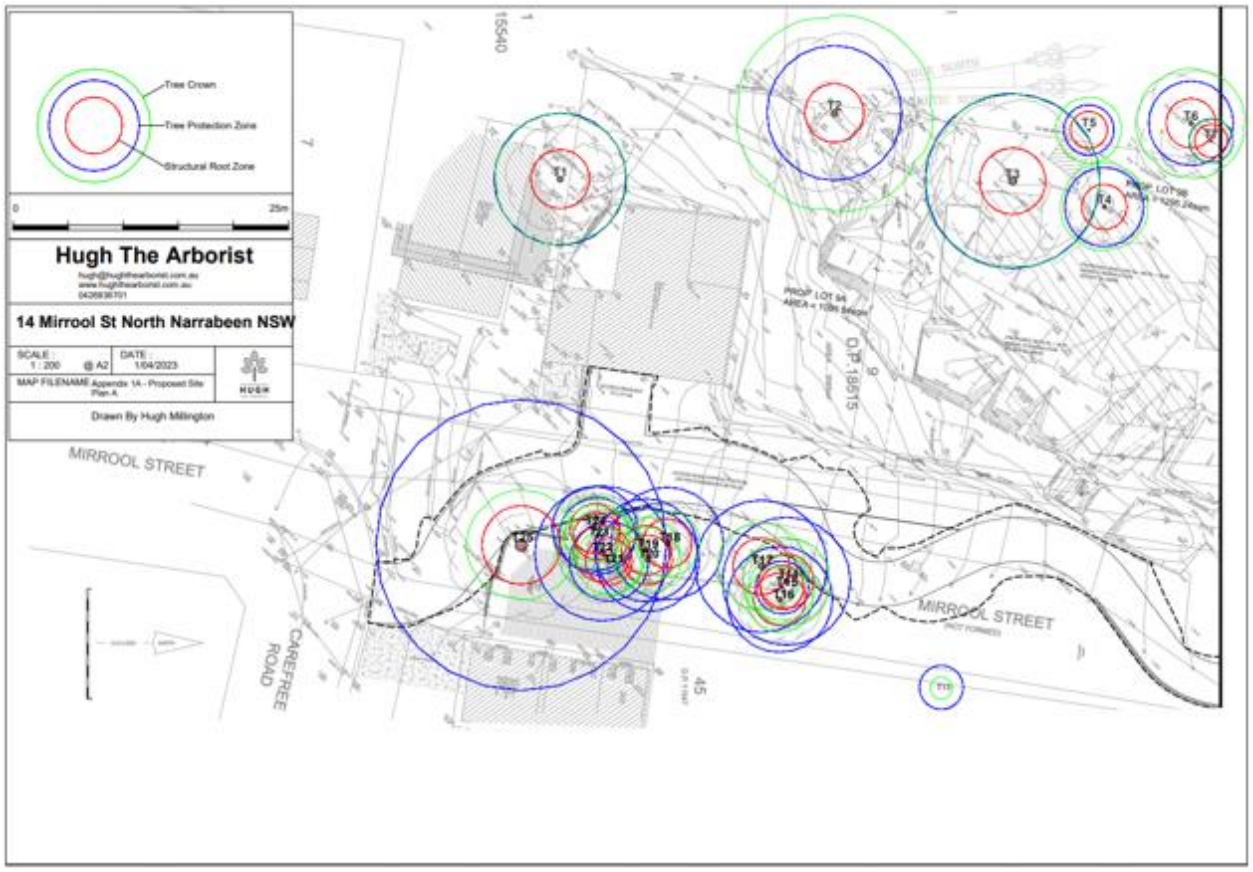


Figure 1.5. Extract – Appendix 1A – Proposed Site Plan A. Source: *Arboricultural Impact Assessment Report*. Hugh the Arborist. 1/04/2023.

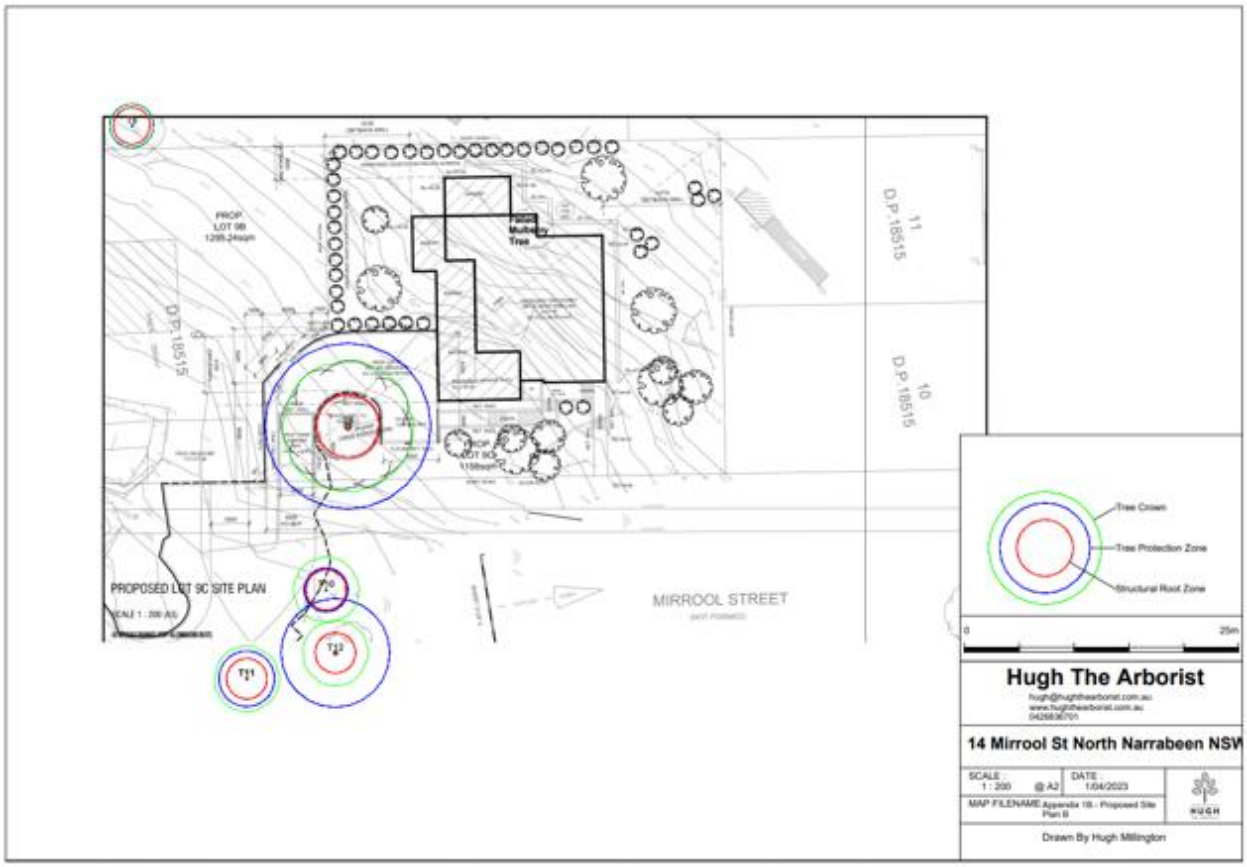


Figure 1.6. Extract – Appendix 1B – Proposed Site Plan B. Source: *Arboricultural Impact Assessment Report*. Hugh the Arborist. 1/04/2023.

9 trees are proposed to be retained and protected:

- T1 – *Angophora costata* (Sydney Red Gum)
- T2, T6, T9 – *Eucalyptus botryoides* (Bangalay)
- T5 – *Allocasuarina torulosa* (Forest Oak)
- T7 – *Pittosporum undulatum* (Sweet Pittosporum)
- T8 – *Ligustrum sinense* (Small-leaved Privet) – **Weed MUST be removed to avoid spread DO NOT retain and protect.**
- T12 – *Ficus rubiginosa* (Port Jackson Fig)
- T13 – *Livistona australis* (Cabbage Tree Palm)

16 trees are proposed to be removed:

- T3, T4 – *Eucalyptus botryoides* (Bangalay) (2) – **permission for removal granted by DA 336/09 currently under construction.**
- T10, T11 – *Ligustrum lucidum* (Broad-leaved Privet) (2) – Weed
- T14 – T25 – *Erythrina x sykesii* (Coral Tree) (12) – Weed

2 Landscaping Recommendations

This Landscaping Plan applies to the whole property with an emphasis on screening from neighbours and weed removal along the sandstone rock scarp and immediately in front of it. Canopy trees are already present and of large size. Ten additional canopy trees are to be planted to assist the long-term tree canopy cover (assuming six to maturity).

Bush regeneration activities are recommended across the whole property. Weed removal and planting are recommended in all management zones (see **Figure 3.1**).

The Site Plan shows the layout of the proposed development (see **Figure 2.1**).

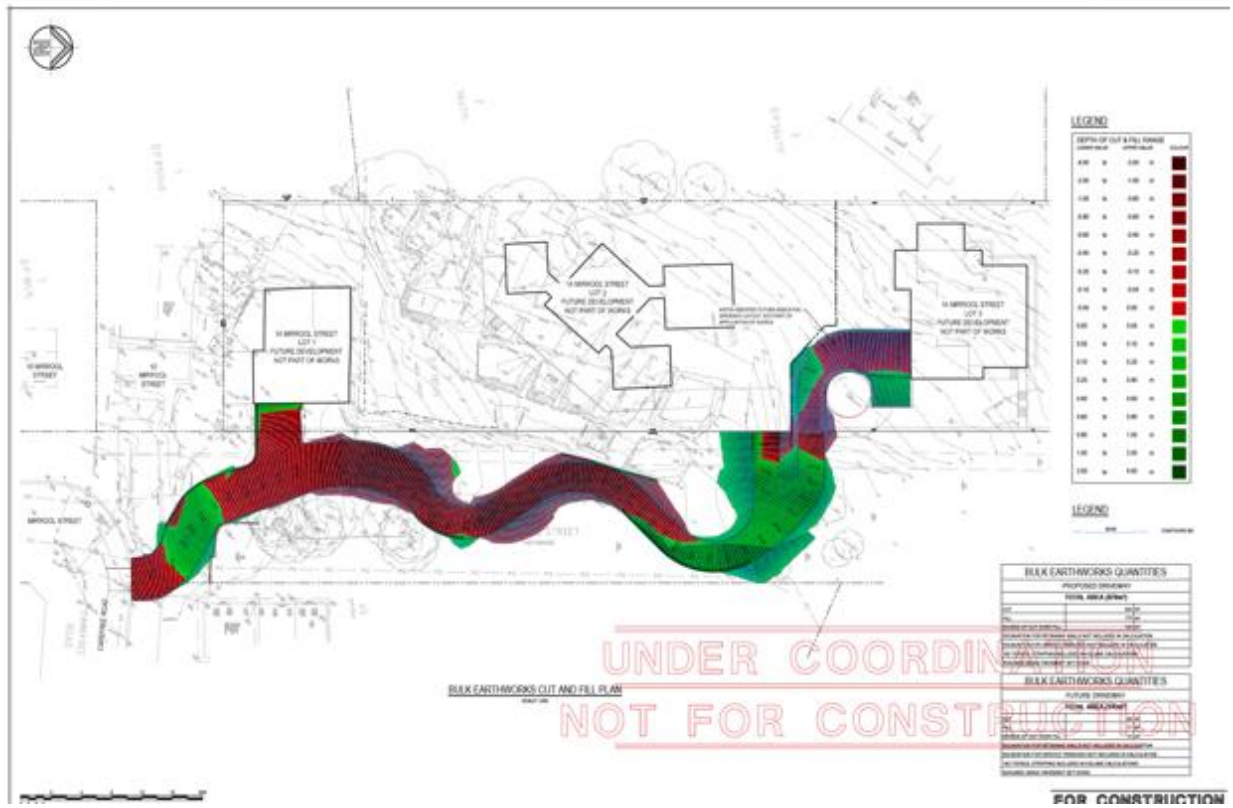


Figure 2.1. Site plan. Source: *Henry and Hymas* Revision C 19.01.2023.

3 Management Zones

The site has been divided into three management zones due to the differences in native plant composition and canopy covers. These management zones aim to restore and return the site to its original state which reflects the Sydney Coastal Sandstone Foreshores Forest (SCSFF) community by providing separate recommendations for each area.

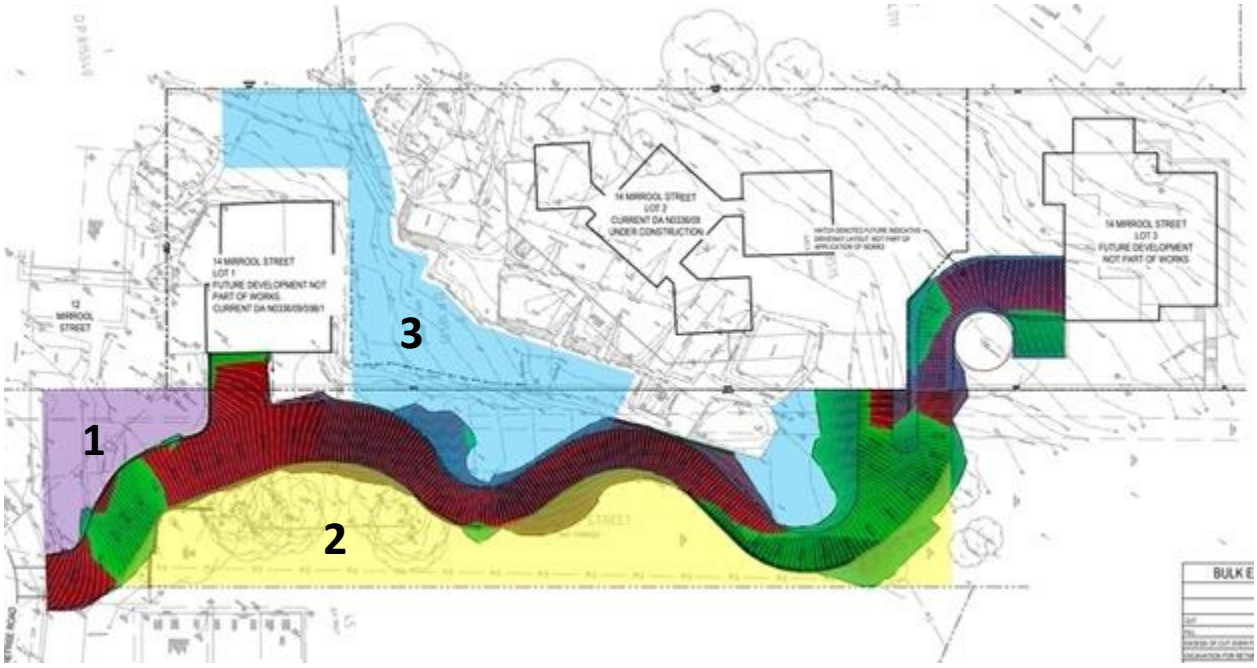


Figure 3.1. Summary of management zones.

Management Zone 1 (Purple)

- Regeneration back to native grasses (currently bare ground and exotic grasses) – planting of groundcovers to not obstruct the view from the driveway to the road and vice versa.

Management Zone 2 (Yellow)

- Bush Regeneration, weed removal and replanting of trees, shrubs and grasses – planting of trees and shrubs to provide screening from neighbours.

Management Zone 3 (Blue)

- Bush Regeneration, weed removal, weed removal along the sandstone rock scarp and replanting of shrubs and grasses – no planting along sandstone rock scarp.

3.1.1 Management Zone 1

Management Zone 1 is located on the south side of the property between the proposed driveway and existing dwelling No 12 (see **Figure 3.1**). This area shows evidence of previous modification due to activities such as vegetative stripping and the creation of building foundations. As a result, this area is highly disturbed and has been unable to return to its natural state. This area has minimal to no natives present and instead is covered with the regeneration of exotic grasses.

The current condition of the vegetation in Management Zone 1 is poor and does not reflect the natural conditions of the SCSFF community. Planting of native groundcover species is recommended for this area to not obstruct the view from the driveway to the road and vice versa.

Plate 1. Disturbed bare ground to be revegetated with native grasses.

Plate 2. Disturbed bare ground to be revegetated with native grasses.

3.1.2 Management Zone 2

Management Zone 2 is located on the east side of the property between the proposed driveway and neighbouring property (see **Figure 3.1**). This area shows evidence of previous disturbance and modification due to the high abundance of weed species.

As a result, this area is highly disturbed and has been unable to return to its natural state. Coral trees are present within this area and proposed for removal. Bamboo and Broad-leaf Privet are encroaching onto the site through the neighboring property.

The current condition of the vegetation in Management Zone 2 is poor and does not reflect the natural conditions of the SCSFF community. Planting of native species is recommended to increase biodiversity values on site, improving the conditions of the SCSFF community and available habitat for local fauna.

Development of the driveway has been proposed for this area, leaving some designated areas for a garden and landscaping. This area also shows evidence of disturbance and modification and as a result, the vegetative condition is poor and has been unable to return to a state that represents that of the SCSFF community. This area has minimal to no natives present and instead is covered with the regeneration of exotic grass and weed species.

Initial bush regeneration followed by the planting of natives will improve the vegetative condition of this area. Bush regeneration should take place first to remove the presence of any exotic grass and weed species which currently dominate the ground-story cover. This should be followed by the planting of

natives belonging to the SCSFF community, with intentions to develop the ground-story and mid-story cover currently absent. The planting of 10 individual trees should also take place within Management Zone 2 to assist with long-term top-story canopy cover and provide screening from neighbours. The planting of native plants within this area will significantly improve and restore the vegetation on site to conditions pre-development. This will benefit the local and surrounding area by strengthening connectivity and habitat availability. The proposed area of focus for landscaping is highlighted in **Figure 3.1**.

Plate 3. Coral trees to be removed by Arborist.

Plate 4. West side of proposed driveway. Area to be weeded and requires native species planting including trees, shrubs and groundcovers.

Plate 5. Bamboo to be removed by Bush Regenerators. Area to be weeded and requires native species planting including trees, shrubs and groundcovers.

Plate 6. Bamboo, Broad-leaf Privet and Crofton Weed to be removed by Bush Regenerators. Area to be weeded and requires native species planting including trees, shrubs and groundcovers.

3.1.3 Management Zone 3

Management Zone 3 is located on the west side of the proposed dwelling No 14 extending around the northern side of No 14 to the western edge of the proposed driveway (see **Figure 3.1**). This area shows evidence of previous modification due to activities such as vegetative stripping and the creation of building foundations. As a result, this area is highly disturbed and has been unable to return to its natural state. A single *Eucalyptus botryoides* is present within this area. This area is also narrow and restricted in space due

to the presence of a sandstone rock scarp to the north. Thus, tree planting is not recommended for this area and to not obstruct view on the driveway. This area, however, does not have adequate mid-story or ground-story cover due to the absence of native shrubs and groundcovers. Additionally, due to the high modification and disturbance of the area, the presence of exotic weed species is high.

To improve the vegetative conditions of this area on site, it is recommended that bush regeneration and native planting of shrubs and groundcovers occurs in all areas that are being retained.

Bush regeneration will successfully remove the presence of exotic weed species which are currently prohibiting the success on any native species present. Additionally, the planting of natives in the disturbed areas will strengthen the condition of the area. This includes mid-story and ground-story cover. The proposed area of focus within Management Zone 3 is highlighted in **Figure 3.1**.

Plate 7. North of proposed dwelling No 14A. Area to be weeded and requires native species planting including shrubs and groundcovers.

Plate 8. Rocks north proposed dwelling No 14A. Area to be weeded by Bush Regenerators. Lantana and Crofton Weed present throughout rock crevices. No planting within rock outcrop.

Plate 5. Crofton Weed and Green Cestrum to be removed by Bush Regenerators. Area to be weeded and requires native species planting including shrubs and groundcovers.

Plate 6. Crofton Weed and Green Cestrum to be removed by Bush Regenerators. Area to be weeded and requires native species planting including shrubs and groundcovers. Regeneration back to native grasses.

4 Landscape Species

Landscaping will included species known to the Sydney Coastal Sandstone Foreshores Forest and consistent with the assemblage of species listed on pages 15-16.

Species included in the landscaping plan can only be changed for like species and the plan must follow the below requirements (see Table 4.1).

Management Zone 1 ~ 100 m^2 ~ 100 groundcovers

Management Zone 2 ~ 800 m^2 ~ 10 trees, 400 shrubs for screening, 700 groundcovers

Management Zone 3 ~ 500 m^2 ~ 150 shrubs, 400 groundcovers

Table 4.1. Landscaping plan requirements.

Stratum (layer)	Minimum number of species (No more than 50% from any one species)	Minimum total number of plants (Tube-stock)
Groundcover	6	1200
Shrubs	4	550
Trees	2	10 to be planted (6 at least to grow to maturity)
Total		1760 plants

Average of 4 plants per m^2.

Minimum at least 1 shrub per 4 m^2.

Areas for screening (between site and neighbours) at least two shrubs/small trees per m^2.

Disturbance areas are to be planted with 100% Sydney Coastal Sandstone Foreshores Forest species (species listed on pages 15-16 are considered suitable. An area of 1,450 m^2.

Other areas of the property will have a mix of current landscaping being retained (where not environmental weeds) and additional planting of Sydney Coastal Sandstone Foreshores Forest species.

4.1.1 Plant species and supply

The required tube-stock and the list on the following pages can be provided to any of the local native supply nurseries such as Indigo Native Plant Nursery in Ingleside. The nurseries know which are ground, shrub, small trees, and trees, and can provide what is available and in keeping with the table above for total numbers and ratios. Copy of purchase of locally native plants must be provided to council with certification pre-OC. Those outlined are the priority species from each layer – tree, shrub, and groundcover, forb, vine/other.

Note that nursery should be contacted at least 6 months prior to needing tube-stock.

Tree	Shrub
• *Glochidion ferdinandi* (Shrub to medium-sized tree) • *Angophora costata* (Tree) • *Notelaea longifolia* (Tree to 9 m high) • *Banksia integrifolia* (Tree 5-25 m high) • *Ficus rubiginosa* (Small to large spreading tree) • *Eucalyptus botryoides* (Tree to 40 m high) • *Banksia serrata* (Shrub or tree to 16 m high) • *Corymbia gummifera* (Tree to 30 m high) • *Eucalyptus piperita* (Tree to 20 m high) • *Acmena smithii* (Shrub or tree) • *Ceratopetalum gummiferum* (Tall shrub or small tree) • *Eucalyptus pilularis* (Tree to 70 m high) • *Angophora floribunda* (Tree to 30 m high) • *Endiandra sieberi* (Small to medium-sized tree) • *Eucalyptus robusta* (Tree to 25 m high) • *Melaleuca quinquenervia* (Tree usually 10–15 m high) • *Acacia parramattensis* (Erect shrub or tree 2–15 m high) • *Brachychiton acerifolius* (Tree to 35 m) • *Corymbia maculata* (Tree to 45 m high)	• *Pittosporum undulatum* • *Elaeocarpus reticulatus* • *Dodonaea triquetra* • *Breynia oblongifolia* • *Acacia longifollia* • *Monotoca elliptica* • *Polyscias sambucifolia* • *Kunzea ambigua* • *Platysace lanceolata* • *Pittosporum revolutum* • *Acacia suaveolens* • *Epacris longiflora* • *Acacia ulicifolia* • *Crowea saligna* • *Acacia terminalis* • *Homalanthus populifolius* • *Grevillea linearifolia* • *Myrsine variabilis* • *Dillwynia retorta* • *Melaleuca nodosa*

Example of potential species to include in plantings.

Banksia serrata

Epacris longifolia

Angophora costata

Grevillea linearifolia

Acacia longifolia 	*Melaleuca quinquenervia* 
Breynia oblongifolia 	

Groundcovers

Grasses	Forbs	Vines/other
• *Lomandra longifolia* • *Entolasia stricta* • *Microlaena stipoides* • *Lepidosperma laterale* • *Imperata cylindrica* • *Poa affinis* • *Entolasia marginata* • *Themeda trianda* • *Oplismenus aemulus* • *Padpalidium distans* • *Oplismenus imbecillis* • *Gahnia clarkei* • *Lomandra filiformis* • *Digitaria parviflora* • *Lomandra obliqua* • *Lomandra multiflora* • *Eragrostis brownie* • *Echinopogon caespitosus* • *Digitaria didactyla* • *Lomandra glauca*	• *Dianella caerulea* • *Gonocarpus teucrioides* • *Commelina cyanea* • *Dianella revoluta* • *Pomax umbellate* • *Operacularia aspera* • *Xanthosia pilosa* • *Actinotus helianthi* • *Xanthosia tridentata* • *Cryptostylis subulata*	• *Smilax glyciphylla* • *Pandorea pandorana* • *Eustrephus latifolius* • *Cassytha pubescens* • *Billardiera scandens* • *Calochlaena dubia* • *Hibbertia dentata* • *Hibbertia scandens* • *Xanthorrhoea arborea* • *Kennedia rubicunda*

Example of potential species to include in plantings.

Themeda triandra 	*Lomandra longifolia* 
Xanthorrhoea arborea 	*Dianella caerulea* 
Eustrephus latifolius 	*Smilax glyciphylla* 
Lomandra multiflora 	*Pandorea pandorana* 

5 Recommendations

5.1.1 Mitigation Measures

Pre and during works:

- Tree protection measures to be installed including fencing and signage.
- Effective site management to ensure any polluted water and/or sediment doesn't leave the site.
- Removal of weed species to prevent spread of seed.
- Bush hygiene protocols should be followed to prevent the spread of pathogens including *Phytophthora*.
- Patch removal of weed shrub species, with replanting with native shrubs, to ensure habitat remains on-site during works.

After completion of works and on-going:

- Management of weeds within planting areas.

5.1.2 Delineation of work areas

During the development, impacts to the site and the vegetation to be retained should be minimized by the delineation of work areas. Access to the site would be best restricted to the development footprint only. An exclusion zone will be established for the vegetation outside the work areas. See Arboricultural Impact Assessment for details on tree protection.

5.1.3 Landscaping and planting natives

The Landscaping Plan is to be implemented. Any changes must be approved by Ecologist with experience in Sydney Coastal Sandstone Foreshores Forest.

Weed management is required. Planting locally native species to increase the habitat value of the site.

5.1.4 Erosion and runoff

Where required, sediment controls will be put in place. These will include, but not limited to sediment fencing, jute mating, crushed sandstone, and coir logs. Sediment controls will be revised during site inspections and/or after significant rainfall (more than 10 mm in 24 hours resulting in site runoff). Sediment and erosion control measures must ensure that no settlement of sediment or silt is to occur within areas of vegetation to be retained. All sediment fences should be retained for as long as practical. If removed, then monitoring is required to ensure flows do not concentrate and cause further erosion. If concentrated flows do occur and/or erosion gullies develop then coir logs baffles are required.

5.1.5 Weed Removal Techniques

Weeds are present on site and must be appropriately managed to ensure they do not spread. Weed removal proposed for the site will consist of hand removal techniques, manual/mechanical removal using bush regenerator tools. This approach will reduce the amount of herbicide used and reduce the amount of off-target damage through spot on application. There must be continuous maintenance of the vegetation onsite otherwise increased weed growth may result, exacerbated by the high abundance of weeds present pre-

works. Weeds will colonize and pioneer on any cleared grounds, therefore must be managed during works as well as ongoing post-works. It is recommended that seed heads are removed prior to commencement of primary works. This would be best performed carefully by hand with secateurs with the aim of avoiding the spread flowers or seeds into planting areas. See Appendix I for further details.

All bush regeneration activities requiring the use of chemicals must be performed in accordance with the NSW Pesticides Act 1999. Herbicides must not be applied whilst exotic plants are setting seed. The weed removal program aims to be broad in approach and sustained in application to provide the best possible conditions for natural regeneration and to control weeds within the site.

Although soil-borne pathogens have not been identified as a Key Threatening Process, the accidental spread of pathogens can occur at any time. To prevent the introduction of pathogens, Bushland Hygiene Protocols outlined in Appendix II must be followed. Hydrological conditions may promote the spread of Phytophthora (a group of fungus-like diseases affecting plants) due to moist soil and proximity to water. It is recommended that Bushland Hygiene Protocols be followed closely.

5.1.6 Pathogen prevention

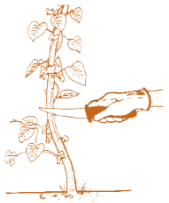
To prevent the introduction of pathogens, Bushland Hygiene Protocols outlined in Appendix II should be followed. The site is considered an area which may promote the spread of Phytophthora (a group of fungus-like diseases affecting plants) due to its moist soil and proximity to water. It is recommended that Bushland Hygiene Protocols be followed closely.

6 Appendices

6.1 Appendix I – Key Weed Removal Methods

Physical removal

Technique	Method	Equipment
Hand Removal 	Seedlings and smaller weed species where appropriate will be pulled out by hand, without risk of injury to workers. The size that this can occur varies throughout the treatment area. Generally, it ranges from post seed to approximately 300mm in height. Rolling and raking is suitable for larger infestations of Wandering Jew. The weed can be raked and stems and plants parts rolled. The clump of weed material can then be bagged and removed from site.	Tools: Gloves, Rakes, Knife and Weed Bags
Crowning 	Plants that possess rhizomes or bulbs might not respond to various removal techniques and may need to be treated with crowning. A knife, mattock or trowel is to be driven into the soil surrounding the bulb or rhizome at an angle of approximately 45 degrees with surrounding soil, so as to cut any roots that may be running off. This is to occur in 360 degrees around the bulb/rhizome. The rhizome or bulb is to be bagged and removed from the site and disposed of at an appropriate waste recycling facility Soil disturbance is to be kept to a minimum when using this technique.	Tools: Knife, mattock, trowel, impervious gloves, and all other required P.P.E.
Cut and Paint Stems 	Weed species deemed unsuitable for hand removal shall be cut. Those that have persistent of vigorous growth will be cut and painted with Roundup® Biactive Herbicide or equivalent. Juvenile and smaller weed species will be cut with secateurs at base of plant, and herbicide applied via applicator bottle. Stem to be cut horizontally as close to the ground as possible, using secateurs, loppers	Tools: loppers, secateurs, pruning saw, herbicide applicator/sprayer, impervious gloves, Roundup® Biactive

	or a pruning saw. Horizontal cuts to be made on top of stem to prevent the herbicide running off the stump. Apply herbicide to the cut stem immediately, within 10-20 seconds, before the plant cells close and the translocation of the herbicide is limited. Herbicide is not to reach sediment or surrounding non-targeting plants.	Herbicide and all other required P.P.E.
Scrape and Painting 	More resilient weed species, where other techniques are less reliable are to be scraped with a knife or chisel and painted with undiluted Roundup® Biactive Herbicide. Works to be carried out by a contractor with a current herbicide license. Weed species will be scraped with a knife or chisel up the length of the trunk, and herbicide applied via applicator bottle. Scrape the trunk from as close to the ground as possible to approximately ¾ of the plant height. Where trunk diameters exceed approximately 5 cm a second scrape shall be made on the other side of the trunk. Apply undiluted herbicide to the cut trunk immediately, within 10-20 seconds, before the plant cells close and the translocation of the herbicide is limited. All care must be taken by the contractor not to spill herbicide onto sediment or surrounding non-targeting plants. Follow up treatment may be required. If plants resprout, scrape and paint the shoots using the same method after sufficient regrowth has occurred.	Tools: knife, chisel, protective clothing, safety glasses herbicide applicator/sprayer, impervious gloves, Roundup® Biactive Herbicide, and all other required P.P.E.
Cut with a Chainsaw and Paint 	Larger size weed species, too large for cutting with hand tools, shall be cut with a chainsaw and painted with undiluted Roundup® Biactive Herbicide. Works to be carried out by a contractor with a current chainsaw and herbicide license. Larger weed species will be cut with a chainsaw at base of plant, and herbicide applied via applicator bottle. Cut the stem horizontally as close to the ground as possible, using the chainsaw. Remove upper branches to reduce bulk of plant.	Tools: chainsaw, ear muffs, protective clothing, safety glasses herbicide applicator/sprayer, impervious gloves, Roundup® Biactive

	If cutting at the base is impractical, cut higher to get rid of the bulk of the weed, then cut again at the base and apply herbicide. Make cuts horizontal to prevent the herbicide running off the stump. Apply undiluted herbicide to the cut trunk immediately, within 10-20 seconds, before the plant cells close and the translocation of the herbicide is limited. Ensure there is no runoff of poison. All care must be taken by the contractor not to spill herbicide into water, onto sediment, or surrounding non-targeting plants. Follow up treatment will be required. If plants resprout, cut and paint the shoots using the same method.	Herbicide, and all other required P.P.E.
Spot Spraying	Spot spraying involves spraying non-seeding annuals and grasses, and for regrowth of weeds once an area has been cleared or brushcut. Works to be carried out by a contractor with a current herbicide license. Herbicide will be mixed up according to the manufacturer's directions for the particular weed species being targeted. Mixed herbicide shall be applied to the targeted weed species with a backpack sprayer. All care must be taken by the contractor not to spill herbicide onto sediment or surrounding non-targeting plants.	Tools: protective clothing, safety glasses, herbicide sprayer, impervious gloves, Herbicide, and all other required P.P.E.

Flame Weeding

Thermal (flame) weeding is a method where high temperatures are applied to weeds, causing the plant to die. Thermal weeding is particularly useful in situations where conservation or health considerations are high and weed density is low such as waterways where herbicide use is not permitted.

While flame weeding is not suited to most streetscapes due to the fire hazard nor can it be used on materials such as soft fall and similar playground equipment it is noted that 'flame' weeding in waterways allows weed management in areas where herbicides are not permitted.

Also, for native vegetation areas thermal weeding, with a flame weeder, has been shown to stimulate germination of native plants while killing the seeds of annual weeds such as Devils Pitchfork, *Bidens pilosa*. Flame weeding is also effective in killing persistent weeds like

Mother of Millions.

Best results are obtained when follow up weed control is undertaken 4-6 weeks after treatment. In addition, weed control should be conducted periodically after that for example to control weeds over a period of a year it is likely that between 3-5 applications will be necessary, depending on rainfall and the extent of the weed seed bank. This method is most effective on young annual weeds and least effective on older perennial weeds. In some cases, control of perennial weeds will be ineffective however this depends on the species present and its age.

Flame weeding should be undertaken outside of the fire seasons. Flame weeding allows for the mimicking of a burn in areas where a control burn could not be undertaken. See native plants regenerating after flame weeding.

Images provided by Dragonfly Environmental

6.2 Appendix II – Bushland Hygiene Protocols for Phytophthora (Hornsby Council Recommendations)

- Always assume that the area you are about to work in is free of the disease and therefore needs to be protected against infection.
- Always assume that the activity you are about to undertake has the potential to introduce the disease.
- Arrive at site with clean shoes, i.e.: no dirt encrusted on them.
- If you arrive with shoes that are encrusted with dirt, they will have to be completely soaked in metho or disinfectant and allow a few minutes to completely soak in. NEVER scrape untreated dirt off your shoes onto the ground.
- Before you move onto the site spray the bottom of your shoes with 70 % metho. Bleach solution (1% strength) or household/commercial disinfectant (as per label) are also suitable.
- Check all tools and
- Clean all tools at the end of each work session while still on site ensuring this is done away from drainage lines and adjacent work areas. Knock or brush off encrusted dirt and completely spray with 70 % metho. Replace in storage/transport containers.
- Preferably compost all weed material on site.
- Never drag vegetation with exposed roots and soil through bushland.
- When removing weeds from site, remove as much soil as possible from them in the immediate work equipment that comes in contact with soil are clean before entering the area (they should have been cleaned on site at the end of the previous work session). If there is any dirt on them, spray them with 70% metho.area and carefully place vegetative material into plastic bags.
- Try not to get the bag itself dirty; don't put it on/in a muddy area.
- Always work from the lower part of a slope to the upper part.
- Always work in areas known to be free of the pathogen before working in infected areas.
- Minimise activities wherever possible when the soil is very wet.
- Vehicles should not be driven off track or into reserves (unless vehicle decontamination is carried out before and after entering a single work site)
- Only accredited supplies of plants/mulch to be used.

Kit should contain: 1 bucket, 1 scrubbing brush, 1 spray bottle (metho 70% solution), 1 bottle tap water, 1 bottle methylated spirits. Contact Hornsby Bushcare if you require any refills or replacements of your Phytophthora Kits on 9484 3677 or bushcare@hornsby.nsw.gov.au

Facts about Phytophthora

Phytophthora cinnamomi (Phytophthora) is a microscopic, soil borne, water-mould that has been implicated in the death of remnant trees and other plants in Australian bushland. Phytophthora is not native to Australia. It is believed to have been introduced sometime after European settlement. Phytophthora is a national problem and is listed as a key threatening process under the Commonwealth's Environmental Protection and Biodiversity Conservation Act 1999.

Symptoms including Dieback

"Dieback" simply means dying or dead plants. There are many causes of dieback; Phytophthora is just one of them. Often dieback is the result of a combination of factors such as changed drainage patterns and nutrient loads (e.g.: increased stormwater run-off) or changed soil conditions (e.g.: dumped fill or excavation of/near root zone). Plants that are stressed are more vulnerable to Phytophthora.

Initial symptoms of Phytophthora include wilting, yellowing and retention of dried foliage, loss of canopy and dieback. Infected roots blacken and rot and are therefore unable to take-up water and nutrients. Severely infected plants will eventually die. Symptoms can be more obvious in summer when plants may be stressed by drought. If you suspect that Phytophthora is on your site, please contact the Bushcare team to collect a soil sample to be lab tested. This is usually done in the warmer months where conditions are optimum for the disease.

Infection

There is no way of visually telling if Phytophthora is present in the soil as its structures and spores are microscopic (invisible to the naked eye). Phytophthora requires moist soil conditions and warm temperatures for infection, growth, and reproduction. Spores travel through moist soil and attach to plant roots. Once Phytophthora has infected a host plant it can grow inside plant root tissue independent of external soil moisture conditions. After infection, Phytophthora grows through the root destroying the tissue which is then unable to absorb water and nutrients.

7 Expertise of authors

Geraldene Dalby-Ball
DIRECTOR

With over 25 years wetland and urban ecology experience, a great passion for what she does, and extensive technical and on-ground knowledge make Geraldene a valuable contribution to any project.

Geraldene has over 8 years local government experience as manager of environment and education for Pittwater Council. Geraldene presented papers on the topic at the NSW Coastal Conference, Sydney CMA and Hawkesbury Nepean forums. Geraldene is a Technical Advisor Sydney Olympic Park Wetland Education and Training (WET) panel.

Geraldene has up to date knowledge of environmental policies and frequently provides input to such works. Geraldene was a key contributor to the recent set of Guidelines commissioned by Southeast Queensland Healthy Waterways Water Sensitive Urban Design Guidelines. Geraldene's role included significant contributions and review of the Guideline for Maintaining WSUD Assets and the Guideline for Rectifying WSUD Assets.

Geraldene is a frequent contributor to many community and professional workshops on ecological matters particularly relating to environmental management. She is an excellent Project Manager.

Geraldene is a joint author on the popular book Burnum Burnum's Wildthings published by Sainty and Associates. Author of the Saltmarsh Restoration Chapter Estuary Plants of East Coast Australia published by Sainty and Associates (2013). Geraldene's early work included 5 years with Wetland Expert Geoff Sainty of Sainty and Associates. Geraldene is an expert in creating and enhancing urban biodiversity habitat and linking People with Place.

SPECIALISATIONS

- Urban Ecology – and habitat rehabilitation and re-creation.
- Urban waterway management – assessing, designing and supervising rehabilitation works
- Saltmarsh and Wetland re-creation and restoration – assessment, design and monitoring
- Engaging others in the area of environmental care and connection
- Technical Advisor – environmental design, guidelines and policies
- Sound knowledge and practical application of experimental design and statistics
- Project management and supervision
- Grant writing and grant assessment
- Budget estimates and tender selection
- Expert witness in the Land and Environment Court

CAREER SUMMARY

- **Director and Ecologist**, Ecological Consultants Australia. 2014-*present*
- **Director and Ecologist**, Dragonfly Environmental. 1998-*present*
- **Manager** Natural Resources and Education, Pittwater Council 2002-2010
- **Wetland Ecologist** Sainty and Associates 1995-2002

QUALIFICATIONS AND MEMBERSHIPS

- **Bachelor of Science with 1st Class Honors**, Sydney University
- WorkCover WHS General Induction of Construction Industry NSW White Card.
- Senior First Aid Certificate.
- **Practicing member and vice president** Ecological Consultants Association of NSW

Brooke Thompson

ECOLOGIST

Brooke is an ecologist with valuable on-ground experience working on bush regeneration projects throughout the Sydney region, including revegetation and weed management projects.

Brooke is passionate about conserving and restoring natural areas for native species to thrive.

Brooke completed her undergraduate Bachelor of Science degree majoring in Conservation Biology. Brooke has knowledge of experimental design and analysis, research and reports, geographic information systems (GIS), environmental legislation, and flora identification.

Brooke has experience working with conservation organisations, including Sea Shepherd Australia, helping to raise awareness around the destruction of habitats in the world's oceans. She has participated in the organisation and delivery of fundraising events around Sydney.

Brooke has exceptional communication and customer service skills and an extended client relations history.

SPECIALISATIONS

- Urban and Landscape Ecology
- Fauna and Flora Assessments
- Vegetation Management
- Habitat Tree Assessment, Marking and Mapping

CAREER SUMMARY

- **Ecologist**, Ecological Consultants Australia. 2022-*present*
- **Natural Area Specialist**, Dragonfly Environmental. 2022

QUALIFICATIONS AND MEMBERSHIPS

- **BSc Conservation Biology**, University of Wollongong.
- WorkCover WHS General Induction of Construction Industry NSW White Card.