1 Larapinta Drive, Glenhaven

Vegetation Management Plan

ICONFM Australia Pty Ltd

4 July 2019

Final

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The preparation of this report has been in accordance with the brief provided by the Client and has relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or commendations contained within the report are based only on the aforementioned circumstances. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Cumberland Ecology.

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Approved by:	David Robertson
Position:	Director
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1. Introduction

1.1. Purpose

Cumberland Ecology has been commissioned by ICONFM to prepare a Vegetation Management Plan (VMP) for a site at 1 Larapinta Drive, Glenhaven NSW, comprised of Lot 7 DP249716 (the 'subject land'). This VMP is being prepared in conjunction with the Biodiversity Development Assessment Report prepared by Cumberland Ecology ('the BDAR') (Cumberland Ecology 2019) that is for the proposed construction of a Mosque and associated infrastructure (the 'Project').

The purpose of this VMP is to guide the management of the vegetation to be managed as an Asset Protection Zone (APZ) within the subject land, located outside of the development envelope in areas referred to in the BDAR as PCT1083_Moderate_Good. This VMP refers to this area as the 'VMP area', (**Figure 1)**. The primary focus of the VMP is the ongoing management of the vegetation present in the VMP area in order to maintain the ecological values of the subject land over time. This VMP also provides detailed specifications for management actions to be undertaken in the development site to minimise the impacts of vegetation clearance. This includes specifications for fencing of clearing areas, pre-clearance surveys and clearance supervision.

1.2. Background

1.2.1. Location

The Project is located at 1 Larapinta Place, Glenhaven, NSW. It is approximately 5.2 km to the east of the Rouse Hill Town Centre, 4.6 km to the northwest of the Castle Hill Town Centre and is located within The Hills Shire Local Government Area (LGA).

The Project is located on Lot 7 DP 249716 covering an approximate area of 2.03 hectares (ha) (hereafter referred to as the "subject land"). Of this area, approximately 1.17 ha is proposed to be impacted by the Project.

The subject land is generally bounded by residential lots to the east, Glenhaven road to the south, Larapinta Place to the west and a partially cleared residential lot to the north containing remnant vegetation. The subject land is zoned as RU6 – Transition under *The Hills Shire Council Local Environment Plan 2012*

The location of the subject land and VMP area is presented in **Figure 1**.

1.2.2. Identification of the Development Site Footprint

The layout of the Project is shown in **Figure 2**. The development site footprint comprises the area of land directly impacted by the Project including the development envelope and the APZ. The operational and construction footprint for the Project are considered to be the same and will be referred to hereafter as the "development site".

1.2.3. Vegetation

The vegetation within the subject land is comprised of a combination of exotic garden vegetation, exotic lawns and remnant native vegetation including scattered trees along the southern boundary and a large patch extending out from the northern boundary into contiguous vegetation outside of the subject land (**Figure 3**). The remnant native vegetation within the subject land has been mapped as Sandstone Ridgetop Woodland

under the remnant vegetation mapping for the Cumberland Plain: Western Sydney (OEH 2013a), and as a combination of Sandstone Gully Forest and Sandstone Heath under The Hills Shire Council Interactive Mapping portal (The Hills Shire Council 2019). Surveys by Cumberland Ecology have identified the remnant vegetation of the subject land to conform to the 1083 Plant Community Type (PCT), aligning most with the Remnant Vegetation mapping of the Cumberland Plain (OEH 2013a).

The vegetation of the subject land has been subject to historical clearing relating to the rural residential development, common throughout the surrounding area. It is considered that the cleared portions of the land would have likely once been composed of similar vegetation to PCT 1083.

2. Methodology

2.1. Literature Review

The preparation of this VMP involved a literature review to determine the most up to date methods of weed control for the exotic species recorded by Cumberland Ecology (Cumberland Ecology 2019) . This literature review involved a variety of sources including government fact sheets and websites. Cumberland Ecology staff with expertise in bushland maintenance were also consulted on current best practice methods and techniques.

In order to prepare the VMP, the following documents were reviewed:

- Recovering Bushland on the Cumberland Plain (DEC (NSW) 2005);
- Atlas of NSW Wildlife (OEH 2019);
- Biodiversity Development Assessment Report – 1 Larapinta Place, Glenhaven (Cumberland Ecology 2019); and
- Darwinia biflora Myrtaceae Recovery Plan – Approved Recovery Plan (DEC (NSW) 2004).

2.2. Flora Surveys

The preparation of this VMP has relied on descriptions of vegetation and flora species lists for the site provided by the FFA prepared by Cumberland Ecology for the subject site. Details of the flora surveys are provided in the sections below.

Flora surveys were undertaken by Cumberland Ecology on 14 June 2019. Surveys included vegetation mapping, plot-based vegetation survey and threatened flora surveys. The survey design consisted of random meander searches as well as plot based surveys and was guided by the following:

- NSW Government (2017): Biodiversity Assessment Method; and
- NSW Government (2016): NSW Guide to Surveying Threatened Plants.

2.2.1. Vegetation Mapping

Previous broad-scale mapping of the Cumberland Plain by the Office of Environment and Heritage (OEH 2016) and The Hills Shire Council (OEH 2013b) was reviewed prior to the survey in order to determine vegetation communities that could be present within the subject site. The vegetation within the subject site was ground-truthed by Cumberland Ecology to examine and verify the existing mapping including the condition and extent of the different vegetation communities. Where vegetation community boundaries were found to differ from the existing mapping, records were made of new boundaries using a hand-held Global Positioning System (GPS) and marked-up on aerial photographs. The data collected was analysed and the resultant information was synthesised using a Geographic Information System (GIS) to create a spatial database to produce a vegetation map of the subject site.

2.2.2. Plot-based Floristic Survey

Plot-based floristic surveys were undertaken within the subject site. Although the Project is not required to be assessed under the BOS, three BAM plots were conducted. The survey was conducted in accordance with the BAM and included establishment of a 20 m x 50 m plot within which the following data was collected:

- Composition for each growth form group by counting the number of native plant species recorded for each growth form group within a 20 m x 20 m plot;
- Structure of each growth form group as the sum of all the individual projected foliage cover estimates of all native plant species recorded within each growth form group within a 20 m x 20 m plot;
- Cover of 'High Threat Exotic' weed species;
- Assessment of function attributes within a 20 m x 50 m plot, including:
    - Count of number of large trees;
    - Tree stem size classes, measured as 'diameter at breast height over bark' (DBH);
    - Regeneration based on the presence of living trees with steams <5 cm DBH;
    - The total length in metres of fallen logs over 10 cm in diameter;
- Assessment of litter cover within five 1 m x 1 m plots evenly spread within the 20 m x 50 m plot; and
- Number of trees with hollows that are visible from the ground within the 20 m x 50 m plot.

All vascular plants recorded or collected were identified using keys and nomenclature provided in PlantNET (Botanic Gardens Trust 2018)

2.2.3. Threatened Flora Species Searches

Targeted threatened flora surveys were undertaken in conjunction with collection of floristic plot data. Surveys were targeted towards threatened species known to occur in the locality of the development site and were conducted in areas considered to provide potential habitat for these species. Surveys involved foot traverses, and where threatened flora species were observed, the location was recorded with a handheld GPS.

2.2.4. Data Analysis

2.2.4.1. Plant Community Types

The primary nomenclature used within this report is locally defined map units that were determined following field investigations within the subject site. Where relevant, the locally defined map units were matched with the equivalent Plant Community Types (PCTs).

Identification of the PCTs occurring within the subject site was guided by the findings of the floristic survey. The data collected during surveys of the subject site was analysed in conjunction with a review of the PCTs held within the VIS Classification Database. Consideration was given to the following:

- Occurrence within the Sydney Basin Interim Biogeographic Regionalisation for Australia subregion and Hawkesbury Nepean management area;
- Vegetation formation;
- Alignment with TECs;
- Landscape position;
- Associated upper stratum species; and
- Upper, mid and ground strata species.

Where locally defined map units were not readily able to be matched to PCTs, best-fit communities were selected, or noted as unassigned if comprised of planted or exotic vegetation.

2.2.4.2. Classification of Threatened Ecological Communities

Following review of potentially occurring TECs, the vegetation communities identified within the subject site were examined against the listings of TECs under the BC Act and EPBC Act.

For TECs listed under the BC Act, vegetation communities were examined against the final determinations for potentially occurring TECs. A component of this analysis was to compare the species recorded during the field surveys with the species lists provided in the final determinations. Additional information such as location and biophysical aspects of each final determination were also taken into account in the assessment.

For TECs listed under the EPBC Act, vegetation communities were examined against the DoEE Species Profile and Threats Database and any associated documentation, such as listing advice and policy statements.

3. Vegetation Management Zones

The VMP Area is approximately 0.38 ha in area and is to be managed according to the specifications in this VMP. The VMP area to be managed will help to suppress weeds within the APZ throughout the monitoring period, maintaining its vegetation integrity over time.

Two management zones have been established within the VMP Area based on current vegetation mapping, and threatened species locations consisting of the following:

- Zone 1 - APZ; and
- Zone 2 – Darwinia biflora Exclusion Zone.

Each zone has been established to collectively represent the management of the APZ and the protection of *Darwinia biflora* – listed as Vulnerable under both the NSW *Biodiversity Conservation Act 2016* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* within the VMP area. The management zones within the VMP area are shown in **Figure 3** and are discussed in more detail below.

3.1. Zone 1 - APZ

Management zone 1 covers 0.36 ha and comprises an APZ, to be established at the perimeter of the development envelope and extends to cover the entirety of the subject land on the eastern, southern and western boundaries. To the north, the APZ extends approximately 85 m from the edge development envelope. The APZ will be required in order to comply with the requirements for bushfire protection.

Vegetation removal will comply with the Bushfire Assessment prepared for the Project (Australian Bushfire Protection Planners PTY Limited 2019). As such management of management zone 1 shall comply with the following:

- Minimal fine fuel loading at ground level;
- Fuels are discontinuous to avoid transfer of fire to the development from bushfires burning in the adjoining vegetation;
- Shrubs/landscaping shall occupy no more than 15 - 20% of the area of the Inner Protection Area and be discontinuous;
- Trees shall be spaced to provide a discontinuous canopy, (minimum crown separation of 2 metres); and
- Tree canopies shall be located a minimum of five (5) metres from the roof of a building and located away from the building to minimise radiant heat and direct flame attack.

3.2. Zone 2 - Darwinia biflora Exclusion Zone

Management zone 2 covers 0.2 ha and comprises areas of the APZ that have the threatened species; *Darwinia biflora* identified as part of the preparation of the BDAR (Cumberland Ecology 2019). The zone includes the location and a 5 m buffer around each individual creating an exclusion zone that will be managed separately to the remaining APZ (zone 1) (**Figure 4**). Under the project Bushfire Assessment(Australian Bushfire Protection Planners PTY Limited 2019), 20% of the APZ can have a retained, discontinuous shrub layer. The retention of

the 5m buffers around the *Darwinia biflora* will not result in more than 20% of the APZ having a continuous shrub layer, and therefore these areas will not need to be managed for bushfire reasons. The areas will be managed under this VMP. Management includes the removal of woody weeds within the buffer. The buffer will be demarcated with fencing along the boundary of the zone to ensure that there will be no access to areas containing *Darwinia biflora* within the development site. This zone will be managed to comply with the requirement of the Bushfire Assessment(Australian Bushfire Protection Planners PTY Limited 2019).

4. Vegetation Clearing Protocols

This chapter outlines the protocols to be adhered to during clearing of vegetation within the development site further to the protocols outlined in the BDAR to minimise the impacts on resident native flora and fauna within the subject site and adjoining areas.

4.1. Marking Limits of Vegetation Clearing

As all vegetation is likely to be removed from the development envelope, the following is relevant only in areas where there is a risk for retained vegetation on adjoining areas to the subject land being damaged during construction.

Prior to the commencement of vegetation clearing within the development site, the edge of the vegetation to be cleared is to be clearly delineated. In particular, appropriate tree protection measures should be installed around all trees to be retained (if relevant) to prevent damage during adjacent cut and fill works.

Clearing limits can be marked with high visibility tape, temporary fencing, or other appropriate boundary markers. To avoid unnecessary damage to vegetation or inadvertent habitat removal, disturbance is to be restricted to the delineated area. No stockpiling of equipment, soils, or machinery will occur beyond the boundary.

The person responsible for the clearance activities will be responsible for ensuring that the boundary markers are installed to enable the suitable environmental and technical inspections of the proposed disturbance to be undertaken.

4.2. Weed Management during Construction

Prior to clearing, all plant equipment entering the site will be inspected and washed down (in designated wash down areas) if required to ensure weed material from offsite locations does not establish or spread into the subject land and nearby retained vegetation, located downslope to the north.

Any weed materials present in the development site will be carefully removed off site in a manner appropriate to the species or at the direction of the ecologist or bush regeneration contractor (BRC) and following The Hills Council guidelines so as to prevent the spread of propagules to uncleared areas of native vegetation, both on and off site.

Machinery involved in weed management will also be washed down prior to removal from site to prevent weeds from spreading into offsite areas.

After construction is complete, a final inspection will be undertaken by the ecologist to check that weeds and weed propagules have been contained so as to prevent weed spread.

5. Weed Management Plan

5.1. Introduction

5.1.1. Species Lists

Under the NSW *Biosecurity Act 2015*, state listed Priority Weeds have specific legal requirements for management and have higher management priorities. State listed Priority Weeds recorded within the subject site are listed in **Table 1** below. These species are also listed as Weeds of National Significance (WoNS) under the National Weed Strategy.

Table 1: Priority weeds within the subject land

Scientific Name	Common Name	Status	WoNS
Asparagus aethiopicus	Asparagus Fern	SP	Yes
Ochna serrulata	Mickey Mouse Plant	OWRC	No
Asparagus asparagoides	Bridal Creeper	SP	Yes
Acetosa sagittata	Rambling Dock	OWRC	No
Eragrostis curvula	African Lovegrass	OWRC	No
Cestrum parqui	Green Cestrum	RP	No
Rosa rubiginosa	Sweet Briar	OWRC	No
Agapanthus praecox subsp. *orientalis*		OWRC	No
Hedychium gardnerianum	Ginger Lily	OWRC	No
Ligustrum sinense	Small-leaved Privet	OWRC	No
Lantana camara	Lantana	SP	Yes
Andropogon virginicus	Whisky Grass	OWRC	No

Key: SP = State Priority, RP = Regional Priority, OWRC = Other Weeds of Regional Concern, and WoNS = Weeds of National Significance.

5.1.2. Best Management Practice

The entire VMP Area is to undergo weed management by a Bushland Regeneration Contractor (BRC) prior to rehabilitation works commencing.

Contractors for weed removal within the VMP Area will have regard to the following, to minimise impacts upon existing vegetation and habitats:

- The principles of the Bradley Method of bush regeneration, i.e. not over-clearing (remove only targeted species), employment of minimal disturbance techniques to avoid soil and surrounding vegetation disturbance, and replacement of disturbed mulch/leaf-litter;

- Sweep from one end of the weeding zone to the other. During this sweep regrowth individuals of harder to manage weeds that require other techniques such as sawing, digging, drilling etc. should be targeted;
- Removal of fruiting/seeding parts of weeds carefully, to minimise spread of plant propagules;
- Spot spray weeds in open areas with no natives with herbicide. Use of chemicals and sprays only during suitable weather conditions (i.e. not during wet or windy conditions), and only during appropriate seasons;
- All equipment should be thoroughly cleaned prior to entering the site to minimise contamination;
- Proximity to watercourses and swampy areas;
- Presence of native fauna or nesting/breeding sites; and
- Bag and remove weed material from the VMP Area.

5.1.3. Weed Control Methods

Bush regeneration weed control is to be implemented over the entire VMP Area. All weed removal works should be approached using the strategies outlined below. Further information on effective methods for controlling specific weed species present within the subject site is included in **Appendix A**.

5.1.3.1. Manual Weed Removal

Manual removal, or hand weeding, is an effective form of weed control when all viable parts of the plant are removed from the soil (roots, fruiting material and rhizomes) and site. All weeds removed by hand will be handled according to best practice bush regeneration techniques to prevent subsequent seed set from the removed weeds.

5.1.3.2. Use of Herbicides

All herbicides should be used according to recommendations on the herbicide label. Appropriate Personal Protective Equipment (PPE) should be worn and consideration given to time of day, likelihood of rainfall, wind direction and likely impact on native species as per guidelines on the label. Use of glyphosate will be appropriate for most species. Glyphosate is the preferred herbicide for use in environmentally sensitive areas as it is rapidly broken down by microbes in the soil so residue is short lived and will not affect remnant native individuals in the long term following application. Due to the proximity of the VMP Area to a watercourse that runs northward out of the subject land, an appropriate form of the herbicide should be used to minimise impact to aquatic life and amphibians. Herbicide use should be avoided within 2 m of the riparian zone of this creek. Examples of appropriate herbicide forms are Roundup Biactive and Clearup Bio 360 which have surfactants that are formulated to minimise harm to amphibians. As runoff is a likely way for herbicide residue to enter watercourses, chemical treatment should be avoided prior to or directly after rains.

It is important to note that there can be legal restrictions and permit requirements for use of specific herbicides for specific plants, and chemical labels and permit requirements always need to be researched prior to herbicide application. While the recommended methods for weed treatment detailed in **Appendix A** are effective, some will require a permit to be undertaken. The relevant permit numbers are PER9907, and PER11916. These permits need to be obtained from the Federal Government body, the Australian Pesticides

and Veterinary Management Authority. All chemical treatment should be carried out according to best practice guidelines.

Planting should not occur within 10 days of herbicide application.

5.1.3.3. Types of Weed Control

This section provides information on the types of weed control that will be undertaken in the VMP Area. Further information on effective methods for controlling specific weed species present within the subject site is included in **Appendix A**.

i. Primary Weeding

Primary weeding is the first stage of bushland regeneration. Primary weeding may involve techniques such as:

- The selective spraying of large weed infestations of weeds or cleared areas with no natives present, with selective and non-selective herbicides;
- Cutting/scraping/drilling deep rooted woody weeds and climbers with hand tools, chainsaws and brush cutters and painting cut stumps and scraped surfaces, or filling drilled holes with herbicides containing Glyphosate or Picloram; and
- Selective hand removal of weeds and wicker wiping of tall herbaceous weeds in situations where damage to proximate, low growing native plants can be avoided.

ii. Maintenance Weeding

After primary weeding has been completed, maintenance weeding is to be undertaken throughout the entire VMP Area to treat any regrowth of woody weeds.

Maintenance weeding involves the selective removal or treatment of weeds, whilst allowing regenerating native plants to increase in size, abundance and percentage cover. All species of weeds should be targeted during maintenance weeding. The maintenance weeding bushland regeneration works are likely to be required at least every month until weeds are at negligible levels. Site visits may be more frequent if it is determined necessary.

It is recommended that any woody weeds, climbers, and key herbaceous weeds identified are subject to a programme of intense follow up weeding around any patches of retained and regenerating native herbaceous plants to encourage the spread of the native plant species.

Follow-up weeding will be implemented for the duration of this VMP, a minimum period of five continuous years, upon the completion of the initial works. After the five-year follow-up and maintenance period has been completed, a review should be conducted to determine on-site maintenance requirements.

5.2. Weed Management within the VMP Area

5.2.1. Site Preparation

5.2.1.1. Sediment Fencing

As the VMP Area is upslope of a watercourse on the northern boundary of the subject land, temporary silt sediment fencing should be used to prevent runoff into the watercourse. The fencing should be installed above the water line and remain in place during all works in which any areas of soil are un-vegetated and exposed.

5.2.1.2. Primary Weeding

Primary weeding will be undertaken throughout the entirety of the VMP Area. This will involve the removal of all woody weeds, major infestations of herbaceous species, and targeting all Priority Weeds.

Use of herbicide on weeds will be restricted to direct application to weeds only within Management Zone 1 (i.e. no herbicide spraying will be undertaken). This is to avoid the potential for off-target impacts to the threatened species *Darwinia biflora*.

5.2.2. Ongoing Weed Maintenance

Ongoing weed maintenance will complete following the completion of primary weeding throughout the VMP Area. The most cost and time effective method of controlling weed regrowth will be by spraying a non-selective Glyphosate herbicide however this is only appropriate for large infestations in areas in which there is no potential for off-target impacts to native species . If targeting individual weeds then wick wiping/direct press techniques are advisable. A list of effective methods for control of weeds on site is found in **Appendix A**.

Ongoing maintenance of the VMP Area should occur for a five year period by the contracted bushland regeneration company, and the VMP Area should be covered in its entirety once every month, to diminish the soil seed bank of exotic weed species present on site. In order to eliminate the occurrence of these species they need to be controlled before they have a chance to set seed, otherwise progress on the site will not be made.

The following sequential steps are recommended to manage each area of the site effectively for each site visit:

1. Initially the bushland regeneration team visiting the site should sweep from one end of the VMP Area to the other. During this sweep weeds present should be removed by hand and any weed occurring within a patch of dominant native plants (such as a patch of grasses).

2. A member of the team should then sweep the entire VMP Area, spraying all regrowth weeds in open areas with herbicide, and spot spraying where possible in regeneration areas.

3. It is important during site visits for ongoing weed maintenance that as many weed species as possible are controlled. This will minimise maturity and set seed of weeds between site visits. Some weed species such as *Bidens pilosa* (Cobbler's Pegs) are prolific seeders, and many exotic plants can have seed that remains viable in the soil for long periods of time. In order to effectively diminish the soil seed bank occurrences of exotic species it is important that individuals are not allowed to set seed.

4. During site visits for weed control, Priority Weeds and WoNS (**Table 1**) must be prioritised for control. Individual plants of these species on site should not be allowed to achieve a reproductive stage in their life cycles.

5.3. Hygiene Protocols

To avoid the spread of *Phytophthora cinnamomi* and other soil borne pathogens, appropriate hygiene procedures and guidelines described in Best Practice Management Guidelines for *Phytophthora cinnamomi* within the Sydney Metropolitan Catchment Management Authority Area (Botanic Gardens Trust 2008) will be followed.

This will involve the disinfection of all machinery, clothing (such as boots and gloves), and tools which have been in contact with soil with a spray prior to entering and leaving the site.

Recommended disinfectant products include:

- Non corrosive disinfectants including Coolacide®, Phytoclean®, or Biogram® which can be for cleaning footwear, tools, tyres, machinery and other items in contact with soil;
- 70% Methylated spirits solution in a spray bottle which is suitable for personal use (clothing); and
- Sodium Hypochlorite 1%, which is effective, but can damage clothing and degrades rapidly in light.

The disinfectant used should also be suitable for killing Chytrid fungus, a major amphibian pathogen associated with decline in frog populations across Australia and world-wide, due to areas within the subject land that comprise marginal areas of frog habitat. Phytoclean®, and 70% methylated spirits solution are both generally considered appropriate for controlling Chytrid fungus as well as *Phytophthora* (DECC (NSW) 2008).

Additionally, it is important to clean equipment and clothing prior to commencing work to prevent bringing weed propagules into the site, and after work to prevent transporting propagules off-site.

5.4. Signage

Signage will be installed at points along the boundary of the VMP Area to discourage access by the public and prevent damage to vegetation. **Figure 5** provides an indicative layout for signage. The aim of the signage is to inform residents, public or construction workers of the presence of environmentally significant vegetation.

Signs will be made of a durable material, have a minimum size of A4 (210 mm x 297 mm) and contain the following permanent and legible wording:

"*The vegetation within this conservation area is protected. Activities such as firewood collection, picking of native flowers, and dumping of garden waste are prohibited.*"

6. Monitoring and Reporting

It is recommended that a project manager/supervisor with the BRC be assigned to co-ordinate, supervise and manage all works and correspondence with respect to managing the VMP Area. The project manager must be available for the duration of the project and become familiar with the site and progress of all aspects of works undertaken.

The project manager will be responsible for allocation of maintenance tasks to personnel in response to establishment issues and other factors as monitoring results are reported (e.g.: plant losses/re-planting, weed control, irrigation). Regular monitoring and feedback from personnel will assist in the allocation of labour relative to available funds.

6.1. Monitoring Program

The following activities are to be conducted as part of the monitoring program:

- Establish a series of fixed monitoring points within the VMP Area covering each management zone. Additional points can be established over the life of the VMP for areas with particular weed problems;
- Take photographs annually from each monitoring point. Compare photographs to previous years;
- Use the photograph point to form a corner of a 20 x 20 m quadrat. Note any weeds occurring in the quadrat and state relative abundance of weed species (using an appropriate scale), as well as projective foliage cover of native species in each stratum; and
- Note any other weed outbreaks in the VMP Area. This can be done while walking between monitoring points.

Indicative locations of where monitoring plots are to be established within the VMP Area are identified in **Figure 6**. The co-ordinates for final locations should be recorded at establishment of the monitoring site and documented in the annual report.

An initial monitoring visit should be conducted before weed control commences. Following this, monitoring will be conducted every three months for the first year, then every six months after that for the life of the VMP.

During the period of six-monthly monitoring, if maintenance weeding is conducted, each patch of land where weed control has occurred should be checked approximately a month afterwards, or after rain, in order to determine whether more weeding is required.

6.2. Reporting

A brief and concise report should be prepared every 12 months for the life of the VMP. This report will be forwarded to relevant authorities (Council) and will provide a record of the implementation of the VMP. The report will:

- State the findings of the monitoring activities including results and analysis of the performance criteria;
- Discuss any problems encountered in implementing the VMP; and
- Recommend any adaptations or additions to the VMP.

The report should contain the photographs, as well as a short description of weeds in each quadrat and a short comparison of the photographs to the previous years. Any other notable occurrences of weeds should also be reported. The report should also recommend and prioritise areas where weed control should be targeted and replanting should occur, based on the performance criteria.

7. Timing and Responsibilities

The VMP Area is to be managed in a series of phases as follows:

- Phase 1 – Site Preparation;
- Phase 2 – Restoration Works Commence;
- Phase 3 – Maintenance; and
- Phase 4 – Monitoring and Reporting

Timing and responsibilities at each phase of management within the VMP Area are shown within **Table 2**. This table assigns each activity within the VMP Area to those responsible.

Table 2: Timing and responsibilities for VMP work within management zones

Action	Responsibility	Performance Criteria	Performance Measure	Action Required if Performance Criteria is Not Met	Timing
Phase 1 Site Preparation					
Delineation of clearing boundary	Property Owner or Subcontractor	Marking using GPS and high visibility tape, fencing and boundary markers.	All clearing boundaries have been clearly marked and photographs taken for documentation.	Delineate all clearing boundaries.	Before construction works commence
Establish fixed monitoring points	Bush Regeneration Contractor or Ecologist	Using star pickets and GPS establish a series of monitoring sites that can be used for photograph comparison, measuring weed and plant retention.	All monitoring points have a star picket installed and photographs taken for documentation.	Install star picket at all monitoring points.	Prior to commencement of weeding works
Installation of signage	Property Owner or Subcontractor	All areas adjacent development envelope.	Signs have been installed and locations documented.	Install signs in appropriate area.	Prior to commencement of Phase 2
Implementation of appropriate sediment/ erosion controls	Property Owner or Subcontractor	Adequate controls are implemented so no erosion or sedimentation into surrounding areas	Photograph at each monitoring point.	Installation of additional sediment/erosion controls and/or fix existing controls	Prior to any vegetation clearing
Phase 2 - Restoration Works Commence					
Fixed Point Monitoring.		Photographs of fixed monitoring sites before initial weeding	Photographs have been taken	Take photographs.	Prior to commencement of restoration works

Action	Responsibility	Performance Criteria	Performance Measure	Action Required if Performance Criteria is Not Met	Timing
Carry out primary weeding.		Main weed infestations, woody weeds, Priority weeds and WoNS removed - Reproductively mature plants absent from site.	Primary weeding completed and documented.	Targeted weeding	First month of restoration works
Fixed Point Monitoring.		Photographs of fixed monitoring sites prior to weeding each month.	Photographs have been taken.	Take photographs.	Once a month for duration of VMP restoration works
Phase 3 – Maintenance					
Carry out maintenance weeding throughout the VMP Area		Priority weeds are less than 2% cover	Monitoring plot 20x20 m quadrat data results.	Undertake maintenance weeding.	Monthly for the duration of 5 year maintenance period under VMP
		Non-Priority weeds are less than 4% cover	Monitoring plot 20x20 m quadrat data results.		
		No new weed species or infestations, including the encroachment of exotic lawn/vegetation into area of bush land regeneration	Monitoring plot 20x20 m quadrat data results.		

Action	Responsibility	Performance Criteria	Performance Measure	Action Required if Performance Criteria is Not Met	Timing
Phase 4 - Monitoring and reporting					
Biannual inspection of VMP Area completed as outlined in **Chapter 6**		Survival rate of retained vegetation is 100%	Monitoring plot 20x20 m quadrat data results.	Undertake monitoring.	Every 6 months for 5 year maintenance period of VMP
		Priority weeds to be less than 2% cover.	Monitoring plot 20x20 m quadrat data results.	Targeted weeding.	
		Non-Priority weeds to be less than 4% cover.	Monitoring plot 20x20 m quadrat data results.	Targeted weeding.	
		Native species diversity and density equal to or greater than previous inspection.	Monitoring plot 20x20 m quadrat data results.	Undertake replanting and/or plant additional species.	
		No erosion or sedimentation in VMP Area	Photographic evidence	Installation of further sediment/erosion controls.	
Progress report preparation.		Annual Report prepared on progress of restoration works including all data collected in biannual inspections.	Results of data analysis of all data collected in biannual inspections.	Undertake corrective measures including: targeted weeding, replanting or additional species plantings and install additional sediment/erosion controls.	Once a year for the 5 year maintenance period of VMP
Final Inspection of VMP Area carried out at		Survival rate of retained vegetation is 100%	Monitoring plot 20x20 m quadrat data results.	Extend life of VMP until performance criteria is met.	After 5 years of maintenance under VMP

Action	Responsibility	Performance Criteria	Performance Measure	Action Required if Performance Criteria is Not Met	Timing
completion of VMP.					
		Priority weeds to be less than 2% cover.	Monitoring plot 20x20 m quadrat data results.	Extend life of VMP until performance criteria is met.	
		Non-Priority weeds to be less than 4% cover.	Monitoring plot 20x20 m quadrat data results.	Extend life of VMP until performance criteria is met.	
		Species diversity and density equal to or greater than previous inspection.	Monitoring plot 20x20 m quadrat data results.	Extend life of VMP until performance criteria is met.	
		No encroachment of exotic lawn/vegetation into area of bush land regeneration	Monitoring plot 20x20 m quadrat data results.	Extend life of VMP until performance criteria is met.	
Final Report.		Final report detailing success of restoration or outlining further works needed.	Results of data analysis of all data collected for the life of the VMP.	Extend life of VMP until performance criteria are met.	After 5 years of maintenance under VMP

8. Costing

Cost estimates for implementation of the management directions under this VMP are included in **Table 3**. The estimates provided are approximate only and accurate costing must be obtained by putting the project to tender with bushland regeneration companies (BRC). Quotes will vary between companies. The following should be noted regarding the approximate nature of the cost estimates provided:

- These estimates have been amended from an estimate for a different 1 ha site by a single BRC to reflect the area of the VMP Area;
- Cost estimates are for works undertaken by the BRC only;
- Cost estimate do not include works prior to the commencement of the restoration works (site visits for translocation of native flora, seed collection etc.); and

Due to the small area of the site it is assumed that each site visit after the initial weed treatment (which will be a full day site visit by a team of 4), will be a full day visit by a team of 2, with time spent on site decreased after year three when weed coverage is diminished.

Table 3: Indicative costing associated with the VMP

Task	Establishment	Year 1	Year 2	Year 3	Year 4	Year 5	Yearly after year 5
Site Preparation (Initial Weeding) 2 days @ $2500 per day	$5,000.00						
0.36 ha Jute matting (if used) – Zone 1	$25,900.00						
2 Star Pickets (Photo reference points)	$35.76						
Sediment Fence (~150 m)	$1,650.00						
Maintenance Visits Weeding, photo monitoring, and reporting		$25,920.00	$26,697.60	$27,498.53	$13,749.26	$14,161.74	$2,360.29
Total Establishment Costs	$32,585.76	12 Visits	12 Visits	12 Visits	12 Visits	12 Visits	2 visits

9. References

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APPENDIX A :
Weed Control Methods

Table 4: Weed control methods

Family	Species Name	Common Name	Status	Treatment Methods
Alliaceae	*Agapanthus praecox subsp. orientalis*	African Lily	OWRC	- Plant is resistant to herbicide - Needs to be dug out with a mattock, or hand mattock, with care taken to remove all rhizomes (rhizomes should be bagged and removed from site)
Anthericaceae	*Chlorophytum comosum*	Spider Plant		- Hand Weed ensuring to remove all tuberous roots
Araceae	*Monstera deliciosa*	Fruit Salad Plant		- Saw trunk back to ground level and apply undiluted glyphosate - Cut any regrowth foliage off in subsequent months with loppers and apply undiluted glyphosate - Bag and remove vegetative material from site to prevent resprouting from trunk segments
Araucariaceae	*Araucaria heterophylla*	Norfolk Island Pine		- Hand weed juveniles - Drill holes with power drill with thick drill bit into mature trees, around base of trunk and fill holes with undiluted glyphosate. Once glyphosate has been absorbed refill holes with undiluted glyphosate several times. - Cut shrub and mature individuals as close to ground as possible with loppers or hand saw (or chainsaw) and treat stump with undiluted glyphosate

Family	Species Name	Common Name	Status	Treatment Methods
				- Spray juveniles and regrowth foliage of cut and painted individuals with glyphosate 10mL/1L
Asparagaceae	*Asparagus aethiopicus*	Sprenger's Asparagus	SP	- Any branches profuse with fruit should be cut with secateurs and bagged to prevent further spread of species by birds - Juvenile plants can be eased out of soil with a trowel or knife - care should be taken to remove below ground plant material - For large, mature plants the woody crown at the base can be cut around with a sharp knife, or hacked out with a mattock or peter lever and removed - it is easiest to cut all branches off near the base with secateurs prior to removing crown - plant will not resprout from water storing tubers or roots below ground so these can be left to rot to reduce soil disturbance. - Spray mature and juvenile plants with metsulfuron methyl 6g/100mL + surfactant
Asparagaceae	*Asparagus asparagoides*	Bridal Creeper	SP	- Dig out with hand tools - Care needs to be taken to remove all tuberous masses and rhizomes. Tuberous masses need soil excavation around and careful levering with hand tools to remove without leaving plant material behind to resprout. - July-September - Spray foliage with glyphosate 10mL/1L + surfactant - May to June - Spray foliage with metsulfuron

Family	Species Name	Common Name	Status	Treatment Methods
				methyl (e.g. Brush Off) 5g/100L + non-ionic surfactant
Asteraceae	*Bidens pilosa*	Cobbler's Pegs		- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Asteraceae	*Conyza bonariensis*	Flaxleaf Fleabane		- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Asteraceae	*Hypochaeris microcephala var. albiflora*	White Flatweed		- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Asteraceae	*Hypochaeris radicata*	Catsear		- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Asteraceae	*Soliva sessilis*	Bindyi		- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Bromeliaceae	*Aechmea gamosepala*			- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Caryophyllaceae	*Polycarpon tetraphyllum*	Four-leaved Allseed		- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Fabaceae (Faboideae)	*Lotus uliginosus*	Greater Bird's Foot Trefoil		- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Iridaceae	*Gladiolus undulatus*	Wild Gladiolus		- Dig out with hand tools - Care needs to be taken to removal all small cormels present under the main corm - May require bagging and removal of soil around the main corm to remove all cormels - Spray regrowth seedlings with glyphosate 10mL/1L

Family	Species Name	Common Name	Status	Treatment Methods
Lamiaceae	*Plectranthus verticillatus*			- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Myrtaceae	*Corymbia citriodora*	Lemon-scented Gum		- Hand weed juveniles - Drill holes with power drill with thick drill bit into mature trees, around base of trunk and fill holes with undiluted glyphosate. Once glyphosate has been absorbed refill holes with undiluted glyphosate several times. - Cut shrub and mature individuals as close to ground as possible with loppers or hand saw (or chainsaw) and treat stump with undiluted glyphosate - Spray juveniles and regrowth foliage of cut and painted individuals with glyphosate 10mL/1L
Ochnaceae	*Ochna serrulata*	Mickey Mouse Bush	OWRC	- Stems of all juvenile and mature plants should be scraped and painted with undiluted glyphosate - follow up treatment may be needed on regrowth stems around base of plant in following monthly site visits - Mature fruits on plants should be bagged and removed from site
Oleaceae	*Ligustrum sinense and Ligustrum lucidum*	Small-leaved Privet and Broad-leaf Privet	OWRC	- Hand weed juveniles - Drill holes with power drill with thick drill bit into mature trees, around base of trunk and fill holes with undiluted glyphosate. Once glyphosate has been absorbed refill holes with undiluted glyphosate several times.

Family	Species Name	Common Name	Status	Treatment Methods
				- Cut shrub and mature individuals as close to ground as possible with loppers or hand saw (or chainsaw) and treat stump with undiluted glyphosate - Spray juveniles and regrowth foliage of cut and painted individuals with glyphosate 10mL/1L
Orchidaceae	*Epidendrum ibaguense*			- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Pinaceae	*Pinus elliottii*	Slash Pine		- Hand weed juveniles - Drill holes with power drill with thick drill bit into mature trees, around base of trunk and fill holes with undiluted glyphosate. Once glyphosate has been absorbed refill holes with undiluted glyphosate several times. - Cut shrub and mature individuals as close to ground as possible with loppers or hand saw (or chainsaw) and treat stump with undiluted glyphosate - Spray juveniles and regrowth foliage of cut and painted individuals with glyphosate 10mL/1L
Plantaginaceae	*Plantago lanceolata*	Lamb's Tongues		- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Poaceae	*Andropogon virginicus*	Whisky Grass	OWRC	- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Poaceae	*Axonopus fissifolius*	Narrow-leafed Carpet Grass		- Hand Weed - Spot Spray - Glyphosate 10mL/1L

Family	Species Name	Common Name	Status	Treatment Methods
Poaceae	*Ehrharta erecta*	Panic Veldtgrass		- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Poaceae	*Eragrostis curvula*	African Lovegrass	OWRC	- Any seed heads present on mature individuals should be cut from plants with secateurs and bagged and removed from site - Dig large individuals out with a mattock - Juvenile individuals can be dug out using hand tools or spot sprayed using glyphosate 10mL/1L - Spot spraying with glyphosate 10mL/1L is effective during the growth period during Spring and Summer - During this period large individuals can be mown or brushcut to the ground level and regrowth foliage sprayed with glyphosate - Spot spraying the herbicide Fluoroborate (745g/L formulation) at 3mL/1L concentration (as per label) is effective at eradicating African Lovegrass and will kill any seedling regrowth for up to 4 years as the herbicide may remain active in the soil for this time period. This time period exceeds the length of time African Love Grass seed remains viable in the soil so will eradicate the grass in areas where it is sprayed. The herbicide is taken up through the roots of the plants following rain and it may take up to 3 months for plants to yellow, and 18 months for them to die back. As the herbicide will inhibit regrowth of native grasses for up to 4 years and

Family	Species Name	Common Name	Status	Treatment Methods
				may harm other native plants through ground water movement it is not recommended for use in bushland remnant or revegetation areas, though is the most effective herbicide for controlling African Love Grass in nearby flat areas from which the weed may spread into bushland areas. Many native grasses such as *Microlaena stipoides* and *Themeda australis* are extremely sensitive to this herbicide. If applied before heavy rain the herbicide may be removed from the area of soil around the root zone of targeted weeds before uptake through plant roots, and may harm nearby native grasses. This herbicide should not be used on slopes (> than 10 degrees) as it is transported through groundwater and may accumulate at the base of slopes. It should not be used in close proximity to water bodies of any kind. The herbicide remains in clay soils such as the shale soils on the Cumberland Plain for longer time periods than in well-drained soils (for a period of up to 800 mm of accumulated rain fall).
Poaceae	*Setaria parviflora*	Pigeon Grass		- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Polygonaceae	*Acetosa sagittata*	Turkey Rhubarb	OWRC	- Bag and remove seed present on mature plants - Cut vines close to the ground and dig out as much as of root system and tubers as possible - Juvenile plants growing from seed can be dug

Family	Species Name	Common Name	Status	Treatment Methods
				out or hand pulled - Tuber at base of plant needs to be removed - On individuals with deep and difficult to remove tubers, stems can be scraped on one side with a blade for a length of 45cm and scraped area painted with undiluted glyphosate - This treatment may need to be repeated on subsequent site visits - On plants with difficult and deep to remove tubers the tubers close to the surface can also be scraped and painted with undiluted glyphosate
Rosaceae	*Rosa rubiginosa*	Sweet Briar	OWRC	- Hand Weed Spot Spray - Glyphosate 10mL/1L
Solanaceae	*Cestrum parqui*	Green Cestrum	RP	- Hand weed juveniles - Scrape stem and paint with undiluted glyphosate - Cut all above ground suckering individuals with loppers or saw and paint stumps with undiluted glyphosate - Spray regrowth foliage with glyphosate 10mL/1L
Verbenaceae	*Lantana camara*	Lantana	SP	- Hand weed juveniles and regrowth from small pieces - Spot spray with glyphosate 10mL/1L - Slash using brushcutter, or hand cut with loppers, and spray regrowth foliage with glyphosate 10mL/1L

Family	Species Name	Common Name	Status	Treatment Methods
				- Cut near ground level and paint with undiluted glyphosate - Some individuals will have stumps which will still regrow foliage, spray regrowth foliage with glyphosate 10mL/1L
Zingiberaceae	*Hedychium gardnerianum*	Ginger Lily	OWRC	- Cut, bag, and remove mature seed heads from plants - Dig up with mattock or hand pull mature plants, taking care to remove all fleshy rhizomes - Rhizomes need to be removed from site, or crushed and piled on site to rot (monitor for regrowth) - Cut plant as close to rhizome as possible and treat with undiluted metsulfuron methyl at 6g $^{-1}$ L (winter) or 1g $^{-1}$ L (summer)

FIGURES

Legend

- VMP Area
- Subject Land
- Development Site

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2019
Dated: 20190407

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
The Hills Shire LGA

cumberland ecology

0 50 m

I:\...\18010\Figures\RP2\20190701\Figure 1. Location_subject land_VMP area

Figure 1. Location of the subject land and VMP area

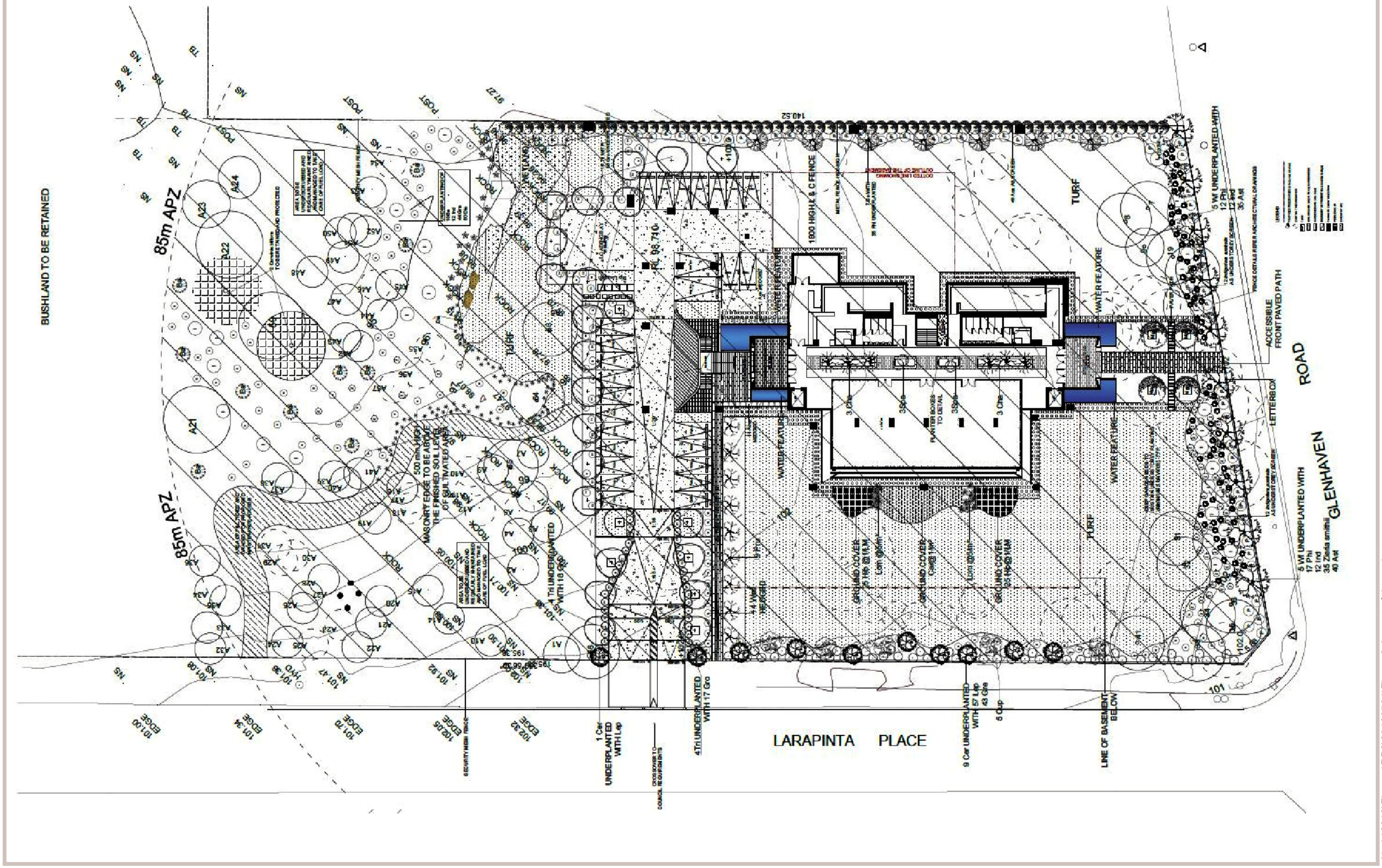

Figure 2. Layout of the project

Image Source: Earth Matters Consulting 2019

I:\...\18010\Figures\RP2\20190701\Figure 2. Layout of the project

Figure 3. Vegetation communities within the subject land

Figure 4. Vegetation management zones

Figure 5. Indicative locations of signage to be installed

Figure 6. Indicative locations of monitoring points