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Conservation Areas Management Plan

CSR Hebel Site
98 - 112 Wisemans Ferry Road, Somersby

November 2016

Conservation Areas Management Plan

CSR Hebel Site
98 - 112 Wisemans Ferry Road, Somersby

Kleinfelder Document Number: NCA16R45361
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Prepared for:

CSR HEBEL
C/O CATALYST PROJECT CONSULTING
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1. INTRODUCTION

1.1 BACKGROUND AND SITE DESCRIPTION

Kleinfelder were engaged by Catalyst Project Consulting on behalf of CSR Hebel to review and update a Conservation Areas Management Plan (CAMP) for lands located at 98 - 112 Wiseman's Ferry Road, Somersby, New South Wales (NSW) (**Figure 1**). The site is located within the Somersby Industrial Park, to the west of Gosford.

The subject site is comprised of two lots with varying uses (**Figure 2**):

- Lot 1 (DP 816083) occurs on the northern part of the site and contains the existing CSR Hebel factory.
- Lot 22 (DP 873845) occurs on the southern part of the site and is divided into two parts (east and west) that are separated by Lot 23 DP 873845 (Piles Creek and associated riparian vegetation; owned by Gosford City Council).
    - The western part of Lot 22 consists of an approved construction area for future extension of the CSR Hebel facility, and the Somersby Mintbush Conservation Area (SMCA) and 'link' area along the southern boundary. The SMCA and 'link' are a total of 0.677 hectares (ha) and contain most of the known habitat for the threatened flora species (Somersby Mintbush and Spreading Guinea Flower) within the conservation areas. The 'link' parcel of land provides a vegetation corridor between the SMCA and Piles Creek.
    - The eastern part of Lot 22 is 1.42 ha in size and forms one of the conservation areas.

The SMCA, the 'link' and the eastern part of Lot 22 are the conservation areas that have been placed under a public positive covenant as per the conditions of the court order approval from the NSW Land and Environment Court (case number 10454/2009). The conditions require that the conservation areas are to be managed in perpetuity by the land owner through implementation of the approved CAMP (prepared by Whelans Insites 2009) for the conservation of all identified threatened species. The conservation areas are collectively referred to hereafter as 'the site'.

1.2 SCOPE

Section 6 of the existing CAMP prepared by Whelans Insites (2009) states that the CAMP is to be reviewed every five years to ensure that the goals of enhancing habitat for, and maintaining or increasing the population of, Somersby Mintbush and the Spreading Guinea Flower are being met, and to incorporate new information or management regimes. This review is permitted under condition 2.12 of the court order approval.

Kleinfelder conducted a review of the CAMP and associated documentation. A site inspection was also conducted on 12 August 2016 to assess the current condition of native vegetation and fauna habitat values, evaluate the status of previously identified management issues, and identify any new management issues to be addressed in the updated CAMP. This updated CAMP has been prepared in accordance with Section 6 of the existing CAMP.

1.3 ECOLOGICAL VALUES

1.3.1 Vegetation Communities

Three native vegetation types were identified on the site by Whelans Insites (2009):

- Dry Heathland (0.39 ha);
- Woodland with Dense Understorey (eastern woodland) (0.94 ha);
- Xeric Scribbly Gum Woodland (heathy woodland) (0.76 ha);

Dry Heathland makes up the majority of the vegetation within the SMCA and is the community in which the Somersby Mintbush and the Spreading Guinea Flower are most commonly found (based on the records in Figure 4 from the previous CAMP). The tree canopy in this community is generally sparse with dense shrub and groundcover layers.

The Xeric Scribbly Gum Woodland is found in the 'link' and the northern section of the eastern part of Lot 22. This is a dry woodland community dominated by a mixture of Eucalypt trees and a heathy understorey. The Woodland with Dense Understorey is located in the southern section of the eastern part of Lot 22. It is dominated by Eucalyptus trees and a thick, dense understorey of native ferns.

The distribution of vegetation types across the site are shown in **Figure 3**. Descriptions of each vegetation type on the site (from the previous CAMP [Whelans Insites 2009]) are provided in **Table 1**. A full list of species previously recorded on the site is provided in the previous CAMP (Whelans Insites 2009).

Table 1 Vegetation community descriptions (sourced from Whelans Insites 2009)

Vegetation Community	General Description
Dry Heathland	Characterised by a shrub layer up to three metres in height and dominated by *Leptospermum, Allocasuarina*, *Banksia, Hakea* and G*revillea* species. The groundcover consists of native sedges and grasses.
Xeric Scribbly Gum Woodland	A heathy woodland community dominated by *Eucalyptus haemastoma* (Broad-leaved Scribbly Gum), *Eucalyptus sieberi* (Silvertop Ash) and *Corymbia gummifera* (Red Bloodwood). The heathy midstorey layer is generally dominated by *Acacia, Banksia, Boronia, Grevillea* and *Leptospermum* species*.* The groundcover layer is dominated by native sedges and grasses.
Woodland with Dense Understorey	Characterised by *Eucalyptus piperita* (Sydney Peppermint), *Eucalyptus haemastoma* and *Corymbia gummifera.* The midstorey layer is dominated by *Banksia* and *Allocasuarina* species, and the groundcover is dominated heavily by *Gleichenia dicarpa* (Coral Fern).

Kilometres
0 0.25 0.5 1 1.5 2

N

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DATA SOURCE:
LPI - 2015

Locality

CSR Hebel
Conservation Areas Management Plan
CSR Hebel Site
98 – 112 Wisemans Ferry Road, Somersby

FIGURE:

1

L:\GIS FOLDER\00 CLIENT FILES\125677_CatalystProjectConsulting\20171728_Somersby_CSR_Hebel_Line2Extension\Mapping\20171728_Fig1_Locality.mxd

Legend

- Subject Site
- Conservation Area Boundaries
- Lot Boundaries
- Watercourse
- Major Roads

Metres
0 10 20 40 60 80 100
N

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Subject Site

CSR Hebel
Conservation Areas Management Plan
CSR Hebel Site
98 – 112 Wisemans Ferry Road, Somersby

FIGURE:
2

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Legend

- Subject Site
- Conservation Area Boundaries

Vegetation Communities

- Dry Heathland
- Woodland with Dense Understorey
- Xeric Scribbly Gum Woodland

Metres
0 10 20 40 60 80 100
N

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Vegetation Communities

CSR Hebel
Conservation Areas Management Plan
CSR Hebel Site
98 – 112 Wisemans Ferry Road, Somersby

FIGURE:
3

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1.3.2 Threatened Flora Species

1.3.2.1 Somersby Mintbush (*Prostanthera junonis*)

The Somersby Mintbush is listed as endangered under both the *Threatened Species Conservation* (TSC) *Act 1995* and the *Environment Protection and Biodiversity Conservation* (EPBC) *Act 1999*. It is a low- spreading shrub with dull-green, oval leaves and white flowers in spring/summer (NSW Bionet, 2016b). It has a very limited range of approximately 19 kilometres along the Somersby Plateau (NSW Bionet, 2016b). This species has previously been identified on the site and surrounds with sixteen individuals located in 2001 in the south-western corner of the site (Whelans Insites, 2009). Kleinfelder undertook targeted surveys for this species on the site in December 2015 and one individual was located on the southern boundary of the SMCA (refer to Kleinfelder 2015).

1.3.2.2 Spreading Guinea Flower (*Hibbertia procumbens*)

The Spreading Guinea Flower is listed as endangered under the TSC Act and is known to occur in the locality. It is a prostrate, spreading shrub with narrow, linear leaves and yellow flowers (NSW Bionet, 2016a). It typically occurs within *Banksia ericifolia* scrub-heath (NSW Bionet, 2016a) and has previously been recorded on the site with eight individuals located in 2001 surveys; seven individuals within the SMCA and one individual on the eastern part of Lot 22 (Whelans Insites, 2009). It is noted that this species was not identified on the site during targeted surveys undertaken by Kleinfelder in October 2015.

1.3.3 Fauna Habitat Values

The site would provide valuable habitat for a variety of native fauna species as a range of fauna habitat values were noted during the site inspection. In particular, hollows of varying sizes were observed that would provide suitable nesting and sheltering habitat for a range of hollow-dependant fauna including arboreal mammals, woodland birds and microchiropteran bats. Similarly, the Eucalypt and other native species on site provide feeding resources for a range of insect and nectar-feeding birds and mammals. The native vegetation also contains areas of dense groundcover and fallen timber that can be utilised as shelter, as well as areas of rocky ground that is typically favoured by reptiles. The site is also considered to contain suitable habitat for a number of threatened fauna species (primarily microchiropteran bats) due to the availability of roosting habitats and open flyways suitable for feeding.

1.3.4 Aboriginal Heritage

No items of Aboriginal heritage have been located on the site to date. Furthermore, title searches undertaken by CSR Hebel during the development process did not identify any sites of Aboriginal heritage significance. Should any items of Aboriginal heritage significance be identified on the site at any stage, the NSW Office of Environment and Heritage (OEH) should be notified immediately.

2. MANAGEMENT OBJECTIVES AND ZONES

2.1 MANAGEMENT ISSUES

Key management issues identified on the site that are addressed in this CAMP include:

- Weeds impacting on native vegetation and threatened species habitat;
- Edge effects from the adjacent industrial estate;
- Unauthorised access to the conservation areas;
- Sedimentation and stormwater run-off from the adjacent development site; and
- Inappropriate fire regimes.

2.2 MANAGEMENT OBJECTIVES

This CAMP is a practical document which aims to provide management actions for implementation to protect and maintain the ecological values within the site. The objectives of this CAMP include:

- Protect and enhance existing native vegetation and fauna habitats on the site;
- Improve and maintain habitat for threatened flora species (Somersby Mintbush and Spreading Guinea Flower) known to occur on the site;
- Identify target weed species and provide suitable management strategies to remove and/or control them;
- Identify areas requiring the installation of fencing and/or other land management works, and prescribe techniques and timing for their implementation;
- Define a maintenance and monitoring program for a five-year period; and
- Define performance measures that management actions shall aim to achieve over the five-year program.

2.3 MANAGEMENT ZONES

Each of the conservation areas (SMCA, 'link' and the eastern part of Lot 22) has been designated as a separate management zone for the purposes of this CAMP (**Figure 4**). Identification of these different management zones will allow specific actions to be prescribed

to achieve the intended objectives of each zone. These management zones are defined as follows:

- **Management Zone 1**: the SMCA (0.47 ha).
- **Management Zone 2:** the 'link' (0.21 ha).
- **Management Zone 3**: the eastern part of Lot 22 (1.42 ha).

Section 3 of this CAMP provides specific details on the management strategies and procedures to be implemented within each management zone. **Section 4** details the monitoring methods, performance targets and reporting requirements. **Section 5** provides a summary of management actions to be undertaken across the site over the next five years, including the location(s), timing/priority and indicative costings of each action.

Legend

- Subject Site
- Lot Boundaries
- Watercourse

Management Zone

- Zone 1
- Zone 2
- Zone 3

Metres

0 10 20 40 60 80 100

N

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Management Zones

CSR Hebel
Conservation Areas Management Plan
CSR Hebel Site
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FIGURE:

4

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3. MANAGEMENT STRATEGIES AND PROCEDURES

3.1 WEED CONTROL

3.1.1 Target Weed Species

Weeds recommended for removal in this plan (i.e. target weed species) are those listed under the *Noxious Weeds Act 1993* or identified as a Weed of National Significance (WoNS) under the National Weeds Strategy and/ or are environmental weeds which represent major infestations within the site. A total of five weed species were identified on the site during the site inspection; three of these species are considered target weed species for the purposes of this plan (**Table 2**). The other two weed species recorded on the site (**Table 2**) are not considered target weeds due to their low abundance within the site and as they currently represent a low threat to the threatened flora species and native vegetation within the site. Detailed procedures of the recommended control methods for each target species are provided in **Appendix 1**.

Indicative locations of target weed species on the site are shown on **Figure 5**. The most abundant target weed species on the site are *Lantana camara* (Lantana) and *Pinus radiata* (Radiata Pine), and are present in all management zones.

Table 2: Target weed species requiring control within the site

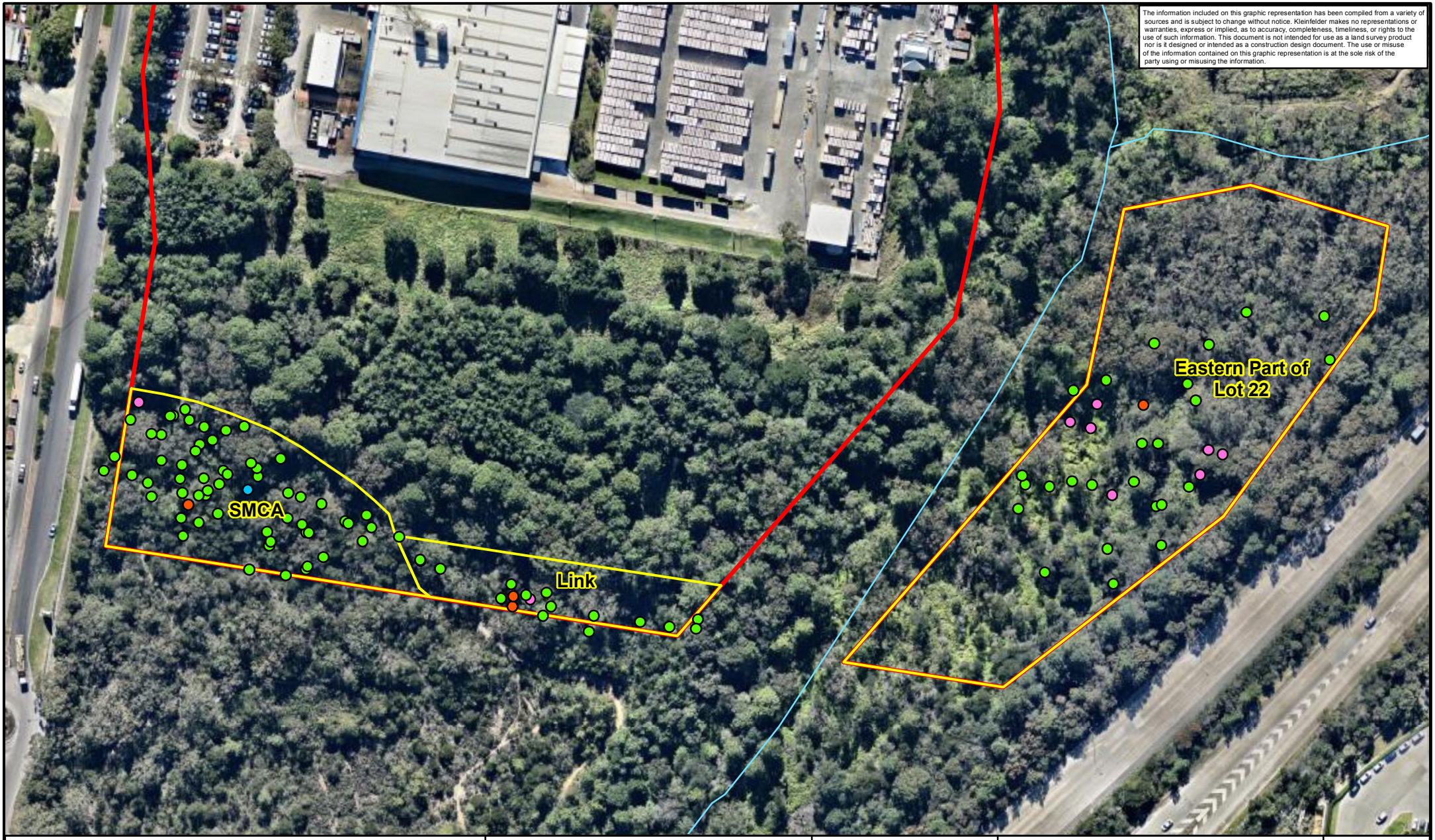
Scientific Name	Common Name	Noxious Weed (NW Act)	WoNS
Target Weed Species			
Cinnamomum camphora	Camphor Laurel	Class 4*	-
Lantana camara	Lantana	Class 4*	✓
Pinus radiata	Radiata Pine	-	-
Other Weed Species			
Andropogon virginicus	Whisky Grass	-	-
Pennisetum clandestinum	Kikuyu	-	-

** Species listed under the NW Act but not applicable to GCC control area.*

3.1.2 Prioritisation and Timing

Treatment of target weed species within MZ 1 should be undertaken as the first priority as this zone contains the most records and habitat for threatened flora species, as well as the highest densities of *Pinus radiata* on the site (see **Figure 5**). Treatment of target weed species within MZs 2 and 3 should then be undertaken.

Two weed control events are recommended for the first year of CAMP implementation, including primary control and a follow-up control event after six months. After the first year, weed control should occur annually for the remaining four years of the program, with any seedlings or regrowth of *Pinus radiata* or *Lantana camara* targeted. These weed control events should also pay particular attention to any weeds establishing along the northern edge of MZ 1 and MZ 2 from the adjacent construction area.



Legend

- Subject Site
- Conservation Area Boundaries
- Watercourse

Weed Location

- Camphor Laurel
- Lantana
- Pinus radiata
- Whisky Grass

Metres
0 10 20 40 60 80 100
N

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Weed Locations

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FIGURE:
5

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3.2 FENCING

As the development adjoining MZs 1 and 2 is currently in the construction phase, parts of the permanent security fencing and the temporary construction fencing have been erected. In accordance with Conditions 3.5 of the *Consent*, a security fence two metres in height must be installed along the western and northern boundaries of the SMCA. This fence was in place at the time of inspection and protects the vegetation in the SMCA from disturbance.

A retaining wall is scheduled for construction along the northern boundary of MZ 2. Upon completion of this wall and in accordance with Condition 3.6 of the *Consent*, the existing security fence will be extended along the northern boundary of MZ 2 and the western boundary of Lot 23. This will protect the vegetation within the 'link' from disturbance and unauthorised access.

As the industrial land to the south of MZ 1 and 2 is vegetated, no boundary fencing is considered necessary at this stage. Clearing vegetation for any type of fencing construction would be detrimental to the conservation areas, and it is considered unlikely that any unauthorised access will occur as this area is heavily vegetated. Should this lot to the south be cleared for development in the future, a security fence will be erected along the southern boundary of MZ 1 and 2 at this time. Existing and proposed fencing, both permanent and temporary, is shown on **Figure 6**.

Legend

- Subject Site
- Conservation Area Boundaries
- Existing Security Fence (Permanent)
- Security Fence to be Installed (Permanent)
- Temporary Construction Fence
- Lot Boundaries
- Watercourse
- Major Roads

Metres
0 10 20 40 60 80 100
N

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Fencing

CSR Hebel
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CSR Hebel Site
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FIGURE:
6

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3.3 SEDIMENTATION AND STORMWATER CONTROL

The proposed management of stormwater on the adjoining construction site to the north of MZ 1 and 2 includes:

- A large detention basin is to be constructed on the eastern boundary of Lot 22 so that stormwater on the site can be collected and stored. This water will then be re-used by CSR for concrete manufacture and/or landscaping purposes;
- Retention of stormwater from periods of heavy rainfall to avoid the entry of sedimentation and stormwater discharge into MZ 1 and 2; and
- The installation of erosion and sediment controls such as silt fencing and detention ponds for runoff from the construction area.

Currently, no areas of erosion or sedimentation have been identified within the site. However, erosion issues should continue to be assessed during monitoring events (see **Section 4**), particularly during the construction phase.

3.4 VERTEBRATE PEST MANAGEMENT

No evidence of vertebrate pests was observed during the site inspection. Monitoring events will note any evidence of vertebrate pest activity and management measures will be recommended as necessary.

There are several vertebrate pest species that have the potential to occur and impact the biodiversity values within the site, including the European Rabbit (*Oryctolagus cuniculus*), Black Rat (*Rattus rattus*) and European Red Fox (*Vulpes vulpes*) If evidence of these species is recorded on the site during monitoring, management measures such as baiting, trapping, installation of additional fencing, and/or destruction of rabbit warrens should be undertaken by a qualified pest control contractor.

3.5 ECOLOGICAL BURN

Targeted searches for the threatened flora species known from the site (Somersby Mintbush and Spreading Guinea Flower) were undertaken in 2015 by Kleinfelder. One individual Somersby Mintbush was located on the southern boundary of the SMCA during these surveys in December. As the Somersby Mintbush can be very difficult to detect when not flowering, and as the flowering period for this species can vary depending on prevailing climatic conditions, it is possible that more individuals of the species are present but not detected during the surveys. As such, it is recommended that targeted searches be undertaken as part of monitoring events during the Somersby Mintbush flowering period (Sept-Nov) to determine the presence/absence

and abundance of these species on the site. These monitoring events should be conducted annually for the first two years, and then once every five years thereafter.

It is possible that the reduced extent of these species on the site is due to lack of recent fire. Fire is a recurrent form of disturbance in Australian landscapes and a major evolutionary pressure in shaping the ecology of plant assemblages. For many ecosystems, regular fire is necessary for maintaining relatively high floristic diversity as life cycle processes of many component species are often fire-dependent (e.g. breaking seed dormancy to facilitate germination) (NSW Biodiversity Strategy 2003). However, individual species within a given plant community vary in their capacity to tolerate and/ or recover from fire. Hence, there is typically a theoretically optimum fire regime for different vegetation types required to maintain maximum floristic diversity, in which fire intervals permit enough time for component plant species to complete their life cycle but are sufficiently frequent to stimulate germination of new seedlings before loss of seed viability (Bellingham and Sparrow, 2000).

The Spreading Guinea Flower is capable of resprouting following fire and has a persistent soil-stored seed bank (NSW Bionet, 2016a).

The exact response of Somersby Mintbush to fire is unknown. The Somersby Mintbush is reported to have been found at both recently burnt sites, and sites that have not experienced fire for at least 20 years; as such, the recruitment of individuals in the absence of fire cannot be ruled out (NSW NPWS 2003). Adult plants lack obvious mechanisms to survive and resprout after fire (such as lignotubers) and thus are likely to be killed by fire, although there has been no empirical data collected to confirm this. No evidence was found of resprouting in sites that had been relatively recently burnt. Other *Prostanthera* spp. have been reported to be killed by fire, and as being capable of resprouting in some situations (NSW NPWS 2003). There is some evidence that seed dormancy may be broken by smoke; however, there is some uncertainty as to the occurrence of a perennial soil seed bank (Tierney 1994; Tierney 1996; NSW NPWS 2003).

The Somersby Mintbush Recovery Plan (NSW NPWS 2003) indicates that given the lack of understanding of the species' response to fire, the general guidelines for fire management of sandstone vegetation communities should be followed for this species (Appendix 3 of the recovery plan). In addition, to avoid high frequency fire, these guidelines also indicate that fire intervals should not exceed 30 years. Based on site observations and available fire history records, it is considered likely that the site has not been burnt for at least 20 years and possibly more than 30 years.

If no additional specimens of the Somersby Mintbush or Spreading Guinea Flower are located after three consecutive years of targeted searches (i.e. following 2017 monitoring), it is recommended that a prescribed ecological burn be implemented on the site in 2018. As a minimum, it is recommended that a prescribed burn of MZ 1 be undertaken.

The feasibility of implementing a prescribed burn on the site will be assessed (if it is deemed necessary) following the annual monitoring, and should be considered in consultation with GCC, OEH and the NSW Rural Fire Service (RFS). If the prescribed burn is deemed to be unsuitable for the site, other options for encouraging seed germination of these species will be investigated at this time.

Should the implementation of a prescribed burn at the site be considered feasible by all relevant authorities, a *Prescribed Burn Plan* would be developed and implemented for the site in 2018 including specific measures to mitigate potential smoke hazards. This plan would also outline all other requirements such as notification of adjacent land holders, appropriate season and weather conditions, control lines, and emergency procedures. The plan should be prepared in consultation with GCC, OEH and RFS.

4. MONITORING AND REPORTING

4.1 MONITORING

A monitoring program shall be implemented to evaluate the effectiveness of the management actions against the performance targets set out in **Section 4.2**, and to inform and provide clear direction for subsequent maintenance activities. The following parameters shall be monitored:

- Target weed areas;
- Vegetation condition;
- Threatened flora species;
- Condition of existing or new areas of erosion; and
- Boundary fencing condition.

Furthermore, in accordance with the court order, Council or its nominee are permitted to enter and inspect the site and carry out any works required under the CAMP at the cost of CSR Hebel.

Monitoring of all management zones is proposed to be conducted in accordance with the following methods on an annual basis for the first two years, and then once at the end of the five-year program. The following information will be collected during each monitoring event through a site inspection.

Weeds

The extent of target weed species shall be mapped during each monitoring event through inspection of each of the management zones. The cover/ abundance of target weeds within each management zone will also be assessed. The monitoring will assess the effectiveness of ongoing weed control works and whether the target weed species are being eradicated and controlled at an appropriate rate. In addition, these monitoring events will identify any new significant weed species present on the site and recommend appropriate management procedures for these species.

Vegetation Condition

During the inspection a walk over of the site will be conducted to assess vegetation health and condition. This will include a qualitative assessment of vegetation condition in each management zone, and identification of any areas that are undergoing degradation from disturbances such as dumping, recreational activities, vertebrate pests, removal of timber and bush rocks, or fire.

Photo Monitoring Points

Three photographic monitoring locations (one in each management zone) have been established on the site (see **Figure 7**). Photographs will be taken from the same location and bearing during each subsequent monitoring event to provide a comparison of vegetation from

year to year. It is noted that photo monitoring point 1 appears to be outside the site in **Figure 7** as the cadastre data used does not correspond to the surveyed boundary.

Threatened Species

Targeted searches for the Somersby Mintbush and Spreading Guinea Flower should be conducted annually on the site for the first two years between September - November, when these species are most readily identified. If possible, a known Somersby Mintbush population in the area should be checked prior to undertaking the searches to confirm that the species is flowering in the locality. If these species are identified on the site, their location should be recorded using a hand-held Global Positioning System (GPS), and their general health should be evaluated during each subsequent annual monitoring event. If these species remain absent at the end of the 2017 monitoring event, an ecological burn shall be considered (see **Section 3.5**) and subsequent monitoring of the burned areas for threatened flora seedlings will be undertaken.

Erosion and Sedimentation

Any areas of active erosion or sedimentation will be identified and mapped during each monitoring event. Appropriate mitigation measures will be recommended as necessary.

Fencing

Inspections of the boundary fencing will be undertaken as part of monitoring to identify maintenance requirements and condition of fencing. The effectiveness of fencing in excluding unauthorised access will also be evaluated during monitoring and any additional controls will be identified if required.

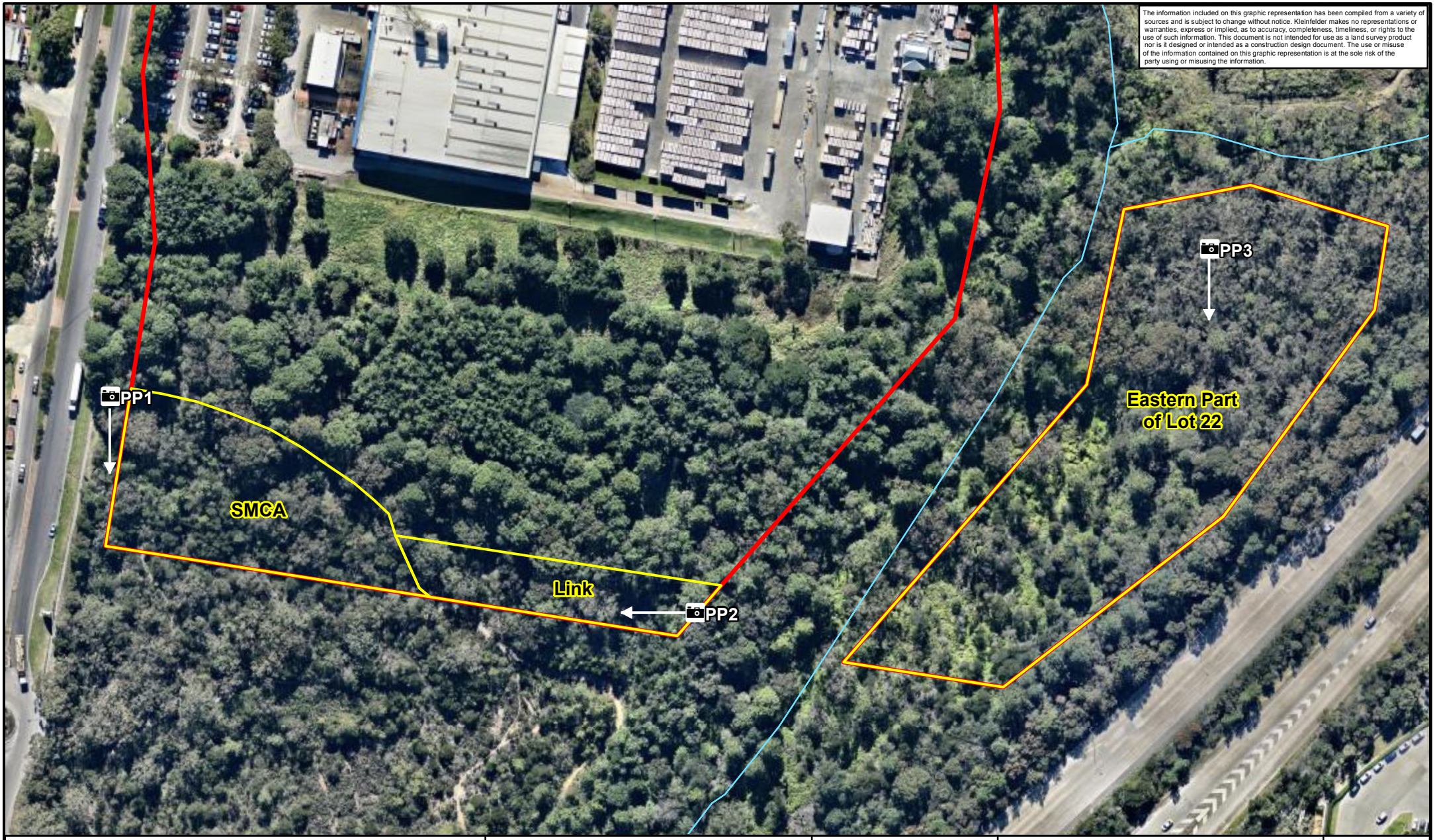
4.2 PERFORMANCE TARGETS

Performance targets for the management of the site are outlined in **Table 3**. The performance targets are provided to measure the effectiveness of the management actions, and determine if additional management is required. When performance targets are not met, potential causes will be identified. Actions required to meet the targets and/ or justification why targets have not been achieved would be provided as part of the reporting.

Table 3: Performance criteria

Parameter	Monitoring Method	Target/ Criteria
Weed regrowth and outbreaks.	Weed mapping and qualitative assessment	Year 1: treat all *Pinus radiata* and *Cinnamomum camphora* trees taller than 2 metres, and treat all patches of Lantana. Years 2-5: Maintain cover of target weed species to less than 5% in each management zone through follow-up control of seedlings and regrowth.

Parameter	Monitoring Method	Target/ Criteria
Threatened flora species	Targeted searches	If no additional threatened flora individuals are identified during monitoring in Years 1 and 2, conduct an ecological burn. Monitor for any regrowth following burn.
Vegetation condition	Qualitative assessment	No notable reduction in vegetation health or condition.
Erosion and sedimentation	Qualitative assessment	No areas of major active erosion or sedimentation from adjoining lands.
Fencing	Qualitative assessment	Fencing along northern boundary of MZ 2 to be completed by end of Year 1 (or within one month following construction of the retaining wall). All fencing damage or breaks repaired within one month of identification.



Legend

- Subject Site
- Conservation Area Boundaries
- Photo Monitoring Point - Location & Direction
- Watercourse

Metres
0 5 10 20 30 40 50

N

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PROJECT REFERENCE: 20171728
DATE DRAWN: 31/10/2016 15:06 Version 2
DRAWN BY: gjoyce
DATA SOURCE:
LPI - 2015
nearmap - 04/05/2016

Photo Monitoring Points

CSR Hebel
Conservation Areas Management Plan
CSR Hebel Site
98 – 112 Wisemans Ferry Road, Somersby

FIGURE:
7

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4.3 REPORTING

Monitoring

The findings of each monitoring event and subsequent recommended management actions will be documented through the preparation of a monitoring report. The report will provide details regarding the progress of the management actions within the site and will provide the guidance for future management and monitoring of the site. The monitoring report will include:

- Results of the inspection, including comparison to baseline data and performance targets;
- Locations and extent of new weed infestations;
- Effectiveness of any maintenance works conducted since the previous monitoring events; and
- Recommendations and management actions required to address any additional management issues identified within the site.

All monitoring reports shall be submitted to Gosford City Council. The outcomes of the CAMP would be reviewed at the end of the five-year program (2021) as a part of the scheduled update and review to the plan.

Management Activities

Land management contractors undertaking management activities shall produce daily activity reports recording the following information:

- Number of contractors and total number of person hours worked;
- Weed control methods used;
- Herbicide application including the type of chemical and quantity/volume used;
- Location of work performed (e.g. southern part of Management Zone 1);
- Weed species treated and approximate area (m^2) or % of weeds treated within each management zone; and
- Any other management activities conducted and their location (e.g. fencing maintenance).

5. ACTION PLAN

Table 4 provides a summary of CAMP management actions including location, timing, responsibilities and indicative cost of implementation over the five year period.

Table 4 Five-year action plan

Item	Management Issue	Activity	Location	Action Required	Timing and Frequency	Responsibility	Cost
Management Activities							
1.	Unauthorised access / disturbance	Completion of fencing	MZ 1	Install mesh security cyclone fencing along northern boundary of MZ 2.	Year 1 or following completion of the retaining wall	Landowner	$5,000
		Fencing maintenance	MZ 1 and 2	Maintain boundary fencing as directed by monitoring results.	Years 2-5 As required	Landowner	$1,000 (estimated $250/yr)
2.	Weeds	Weed Control (Primary)	MZ 1, 2 and 3	Removal / control of target weed species as per methods outlined in **Section 3.1** and **Appendix 1**. Estimated effort required: 64 hours (8 person days).	Year 1	Bush Regeneration Contractor	$3,200
		Weed Control (Year 1 follow-up)	MZ 1, 2 and 3	Removal/ control of target weed species as per methods outlined in **Section 3.1** and **Appendix 1**. Estimated effort required per follow-up: 32 hours (4 person days).	Year 1 At six months following primary control	Bush Regeneration Contractor	$1,600
		Weed Control (Years 2-5 follow-up)	MZ 1, 2 and 3	Follow-up removal/ control of target weed species and control of any other weed species, as per methods outlined in **Section 3.1** and **Appendix 1**. Estimated effort required per follow-up: 16 hours (3 person days) per monitoring event; total of 64 hours (8 person days).	Years 2-5 annually	Bush Regeneration Contractor	$3,200 ($800/yr)

Item	Management Issue	Activity	Location	Action Required	Timing and Frequency	Responsibility	Cost
3.	Fire regime	Prescribed ecological burn	MZ 1 as a minimum (MZ 2 and 3 if feasible)	Consult with relevant authorities (GCC, OEH and RFS) to determine if implementing a prescribed ecological burn on the site is feasible. If feasible, prepare and implement a Prescribed Burn Plan for the site in consultation with GCC and RFS.	If no threatened flora are recorded on the site following 2016 and 2017 monitoring	Landowner	$5,000
4.	-	Monitoring and reporting	All MZs	Monitoring of weeds, vegetation condition, erosion and sedimentation, and fencing through inspections as per the methods outlined in **Section 4.1**. Reporting to be undertaken in accordance with **Section 4.3**.	Annually for Years 1 and 2, and once at the end of Year 5	Project Ecologist	$10,080 ($3,360/ yr)
						Total	**$29,080**

Note: the above costing is a preliminary estimate only and is intended as a guide to assist with project budgeting. These estimates have not allowed for travel costs and other costs associated with additional equipment hire or materials which may be required to perform some of the tasks. These costs assume the works to be done by a company with similar cost profile as Kleinfelder, and do not exclude the landholder from conducting works.

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APPENDIX 1: WEED CONTROL METHODS

Target Weed Species

Table 5: Target weed species requiring control within the site

Scientific Name Common Name	Noxious Weed (NW Act)	Control Methods	Location and Abundance
Cinnamomum camphora Camphor Laurel	*Class 4	Small plants may be removed by hand (**1b**). Large trees can be felled using a chainsaw (**1c**) (providing it is safe to do so and there is minimal risk of damaging native vegetation) or through chemical control via stem injection (**2g**).	One tree in MZ 1
Lantana camara Lantana	*Class 4	Small plants may be controlled via mechanical control (**1b**), while larger infestations may require chemical controls. The splatter gun technique should be used in areas where there is limited native understorey (**2f**). The cut-and-paint method (**2c**) is recommended in areas where native vegetation occurs and as a follow-up after splatter gun application. Treatment should be followed up removing vegetative material from the site or 'rafting' the Lantana above the ground to prevent re-sprouting.	Scattered occurrence in MZ 1 and 3
Pinus radiata Radiata Pine		Small plants may be removed by hand (**1b**). Large trees can be felled using a chainsaw (**1c**) (providing it is safe to do so and there is minimal risk of damaging native vegetation) or through chemical control via stem injection (**2g**).	Moderate density of trees in all zones

** Species listed under the NW Act but not applicable to NCC control area.*

Specific Weed Control Methods

Table 6: Description of weed control methods (referred to in Table 5)

No.	Control Methods
1a	**Mechanical control (Crowning):** Plants can be controlled through 'crowning', which removes all rhizomes (or central crown). Use a knife or sharp trowel under the base of the plants to lever up the crown and sever all roots. Crowns should not be left in contact with the soil as they can re-shoot. Plants/ crowns should be placed in black plastic (or similar) and removed from the subject site.
1b	**Mechanical control (Hand removal/ Excavation):** Small plants may be pulled out by hand and larger plants can be manually removed by excavation using hand tools (mattock and/ or shovel).
1c	**Mechanical control (Chainsaw):** Large trees may be more appropriately removed using a chainsaw.
2a	**Chemical control (Direct Spraying):** Targeted spray with herbicide such as glyphosate.
2b	**Chemical control (Slashing & Direct Spraying):** Larger infestations may be slashed preferably before seed set and follow up with herbicide application.
2c	**Chemical control (Cut-and-Paint):** Cut-and-paint involves cutting plant stems as close to the ground as possible, then applying herbicide to the cut surface immediately (within 15 seconds).
2d	**Chemical control (Scrape-and-Paint):** Using a knife, start at the base of the plant and scrape a 20 cm – 100 cm section of stem to expose the cambium layer (just below the bark), then apply herbicide to the scraped surface immediately (within 15 seconds).

No.	Control Methods
2e	**Chemical control (Basal Bark Spray):** Basal bark spray involves applying herbicide around the circumference of the lower sections of stems where they meet the crown.
2f	**Chemical control (Splatter Gun):** The splatter gun technique involves the application of a low volume of high concentration herbicide to the foliage of target species. This technique should only be used in areas where there is limited native understorey. This should be followed with manual removal of dead material. The cut-and-paint method is recommended in areas where native vegetation occurs and as a follow-up after splatter gun application.
2g	**Chemical control (Stem Injection):** This technique involves drilling downward-angled holes into the cambium layer of a large tree. The drill holes should be approximately 5 cm apart and cover the circumference of the tree. Drill holes should be filled with an appropriate herbicide immediately after drilling each hole.

General Weed Control Protocol

Weed control works will initially focus on removing the target weed species from the subject site. A qualified and experienced ecologist or bushland regenerator must supervise these works.

The Bradley method described by Buchanan (1999) is recommended for weed control within forest areas. This method aims to remove weeds with minimal disturbance and allow native species to re-establish naturally from the existing seed bank and rootstock. The following steps are to be followed when controlling weeds on the site:

(a) The weed removal team will require a site-specific induction to understand what weeds are to be controlled, the process of treatment/ removal, identification of native species, and the procedures to be followed;

(b) Manual weed removal. Where there is native understorey present, dominant weeds should be manually removed where possible;

(c) Weed vegetative material collected during weed control activities is to be taken offsite (where practical). This will stop weed material smothering native plants and prevent re-establishment. This material is to be taken to an appropriate waste disposal centre to prevent further weed spread in the locality;

(d) Chemical weed control. Chemical should be applied only where application to larger weeds can be isolated (i.e. no broad application). No spraying should be conducted in ecologically sensitive areas of the site (i.e. high potential of spraying native species).

For concentrations and dosage rates on targeted chemical control, refer to the ‘Noxious and Environmental Weed Control Handbook’ (Ensbey 2014). Any weed spraying should be conducted by an authorised person, having a Chemical Application Certificate or similar qualification. This would ensure that best practice is adhered to in consideration of the ecological sensitivities of the site.

APPENDIX 2: PHOTO MONITORING POINTS – AUGUST 2016

Photo point 1 (1): view south along western boundary of management zone 1 (SMCA)

Photo point 1 (2): view south-east of management zone 1 (SMCA)

Photo point 1 (3): view east along northern boundary of management zone 1 (SMCA)

Photo point 2: view west along northern boundary of management zone 2 (link)

Photo point 3: view south of management zone 3 (eastern part of Lot 22)