

# Bushland Management Plan

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## Gosnells Golf Course Bush Forever Site 467



A REPORT BY:  
IRONBARK ENVIRONMENTAL AND  
REGEN4 ENVIRONMENTAL SERVICES  
FOR THE  
CITY OF GOSNELLS

May 2010



The Gosnells Golf Course Bushland (Bush Forever Site 467) Bushland Management Plan was adopted by the Council of the City of Gosnells at its 25 May 2010 Ordinary Meeting – Resolution 236.

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- Wayne van Lieven, Environmental Coordinator, City of Gosnells
- Greg Bremner, Principal Coordinator Environmental Operations, City of Gosnells

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This report has been prepared for the City of Gosnells by Ironbark Environmental and Regen4 Environmental Services. Every effort has been taken to ensure that the recommendations made in this report are based on current best practice for management of bushland and environmental weed control.

Ironbark Environmental and Regen4 Environmental Services accept no responsibility for the implementation of this report's recommendations or the implementation of the recommended weed control program. The City of Gosnells and Gosnells Golf Club are advised to ensure that all weed control contractors working on the Site are experienced and qualified to control weeds in a bushland setting and manage natural areas. It is recommended that where possible, all contractors working in the bushland are members of the Australian Association of Bush Regenerators.

Author: Del Marco A, Ironbark Environmental & Bright D. Regen4 Environmental Services, Perth, 2008.

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## **Abbreviations and Acronyms**

BF	Bush Forever
DEC	Department of Environment and Conservation
DPI	Department for Planning and Infrastructure
GPS	Global Positioning System
PBP	Perth Biodiversity Project

# Summary

Ironbark Environmental and Regen4 Environmental Services have been commissioned by the City of Gosnells to prepare this Bushland Management Plan for the Gosnells Golf Course bushland. The Site (Figure 1) is located on the southern portion of the Golf Course, Crown Reserve 24862 and bounded by Ranford and Campbell Roads and the thirteenth fairway. Reserve 24862 is vested in the City and leased to the Club.

The Site is s predominantly bushland and has been recognised for its regionally significant ecological values in the State Government’s Bush Forever initiative as Site 467. The Bushland has also been ranked by the City through its Biodiversity Planning Project (in progress) as being in the top 5 local reserves in the City in respect to ecological value. Currently the Site is not the subject of any active management by either the City or the Golf Club. There is however, a need to actively manage the Site for conservation to counter-act the isolation, disturbances and increased pressures placed on all urban bushland.

This is a draft plan whose prime objective is to bring about improved management of the Site. Through the plan’s development and implementation, it is expected to engender and facilitate a working relationship between the City and Club, and more widely with the relevant State agencies to achieve this objective.

The Site has at least 111 different native plant species and four recognisable vegetation communities. This is exceptional given that there are only about 7.4 ha of bushland remaining on the 10 ha Site.

Bushland condition mapping undertaken in this study has assessed that 37% or 3.8 ha of the Site is in an Excellent or better condition. A further 31% of the site is in Very Good or Good condition. This indicates that almost 70% of the Site has vegetation in a healthy state or able to be restored to a near natural state with a reasonable level of management inputs. This is a promising feature for the Site’s long-term viability and health. The site’s weed characteristics are also a promising feature, with only half of the Site having a low level of veldt grass infestation (low grass levels are classed as below 5% of the ground cover).

Less positive is the edge/area ratio of the Site’s bushland areas. The Site has an edge/area ratio of 0.06 which is well above acceptable levels recommended for conservation areas. This reflects the often highly irregular shape of the Bushland’s perimeter and has implications for management resources.

Acknowledging the Bushland’s condition and importance, the current absence of management resources applied by the City and the Golf Club, and the finite resources of both parties, a staged management approach is proposed which involves:

- Focusing active conservation efforts on a core management area in the short to medium term (next 5 years). This core management area is described as Management Area A in this Plan and Figure 22.

- Active management efforts in Management Area A to remove incompatible land uses and activities that have a negative impact on adjoining bushland and initiate works programs which favours the rehabilitation and restoration of both vegetation and habitat.
- Consideration by the Golf Club and City in the short to medium term to:
  - Phase out use of the sand quarry, located within the Bushland, and obtaining sand from alternative sources;
  - Removing or intensively managing the bund around the Ranford Road service area (Management area A); and
  - Restricting use of the track from the Ranford Road service entrance to the turf nursery.

In the long term, it is recommended that the Golf Club and the City give serious consideration to the relocation of the service entry and hardstand area off Ranford road to a site further south-east along Ranford Road on the edge of the bushland area. This would remove the direct negative impact of machinery and organics storage on the bushland currently in best condition.

It is important that the implementation of these recommendations is negotiated by the City and Club so that a partnership can be formed to bring together the necessary resources. To support this approach, this plan recommends defining a number of management areas to which specific management actions apply. This framework will allow a strategic and staged approach to be adopted towards management.

## Summary of management actions

Table 1 is a summary of the management actions described in Sections 5.3 and 5.4 of the Plan. The table uses the following prioritisation of actions: H = High Priority/undertake in short-term, M= Medium priority, L= low priority or long-term action). These recommended actions should be discussed and negotiated as part of the finalisation of the Plan.

It is recommended that the Golf Club and the City formally commit to management priorities and actions based on Management Actions provided in this document.

**Table 1: Summary of Management Actions recommended in this Plan.**

No	Management Action	Priority (H, M, L)
<b>OVER-ARCHING ACTIONS</b>		
<b>Support for plan implementation</b>		
5.3.1.1	Undertake process to get City and Golf Club's endorsement of this plan and the Action Plan. This includes endorsement of the proposed Management Areas shown in Figure 22.	H
5.3.1.2	Identify key Golf Club personnel and City staff to work together on the implementation of this plan.	H
5.3.1.3	Provide copy of plan to the Department for Planning and Infrastructure (Bush Forever Unit) and Department of Environment and Conservation (Swan Coastal District).	H
<b>Reduce risk and impact of fire on Site</b>		
5.3.2.1	Remove weeds and isolated native plants which are growing between the fire access track and Campbell and Ranford Road verges.	H
5.3.2.2	Make minor improvements to the track on the Campbell and Ranford Roads frontages to upgrade the track to all-weather surface (minor widening on corner and resurface with crushed limestone) <sup>1</sup> . A drain crossing on the track near the Campbell Road/Chatsworth Gate intersection should also be considered.	M
5.3.2.3	Ensure Action 5.3.2.2 is implemented with support of the City's Risk and Emergency Management Coordinator and the Fire and Rescue Service.	H
5.3.2.4	Develop a simple Fire Management/Response Plan in Consultation with the City's Risk and Emergency Management Coordinator and Fire and Rescue Service, which incorporates the above.	M

<sup>1</sup> The widening on the corner of Campbell and Ranford can be undertaken at relatively little expense, but care must be taken to minimise disturbance to native vegetation. Re-surfacing with limestone may be more expensive, and would need to be a new capital expense.

Table 1: Summary of Management Actions recommended in this Plan (continued)

No	Action	Priority (H, M, L)
<b>Management of Phytophthora Dieback Disease</b>		
5.3.3.1	Undertake dieback disease mapping and interpretation over the Site	H
5.3.3.2	Ensure movement and import of machinery, soils and organic materials occurs so as not to risk introduction or spread of dieback.	H
5.3.3.3	Restrict use of the track between Management Area D and the Turf nursery, not only to reduce risk of introducing dieback disease into the bushland in best condition, but also the deposition of weed seed. It is recommended that a lockable gate be installed to achieve this.	H
<b>Raise Club Member and Local Community awareness of Site's ecological value</b>		
5.3.5.1	Consider publication of a pamphlet or poster to raise Club Members' awareness and understanding of the ecological values of the Bush Forever Site. This could be linked to a broader environmental pamphlet for the Course.	M
5.3.5.2	Consider holding an event, such as a guided wildflower walk through the Site for members and the local community.	M
<b>Site delineation, access control and signage</b>		
5.3.6.1	Consider delineation of bushland from Management Areas C and D as described in Section 5.4 (See also Actions 5.4.3.1 and 5.4.4.3). This delineation should take the form of bollards and a 3 – 4 metre cleared track inside the bollards. The track should be maintained weed-free through sensitive herbicide applications.	M
5.3.6.2	Consider erection of two or three interpretative signs on the edge of the thirteenth fairway to signal to golfers that the Bushland is a significant area and that ground disturbance is prohibited.	M
<b>Environmental Weed control</b>		
5.3.7.1	Implement all components (1 to 4) of the environmental weed control program described in Section 5.3.8. The highest priority is Component 1 of the program, but all components are necessary in the long-term.	H
5.3.7.2:	Establish photo monitoring points to record changes in bushland condition and effectiveness of weed control in at least five points across the site. Take photos at each of the points every year at approximately the same time (such as, in late winter for the flowering of annual grasses).	

Table 1: Summary of Management Actions recommended in this Plan (continued)

<b>MANAGEMENT AREA ACTIONS</b>		
<b>Management Area A</b>		
5.4.1.1	Develop a plan for the closure of the sand quarry in Sub Area 1. An implementation timeframe of 3 years is suggested.	H
5.4.1.2	Plan and action the sensitive removal of the two bush sand mounds in the bushland near corner of Campbell and Ranford Roads.	M
5.4.1.3	Focus environmental weed control efforts on Management Area A, as discussed in Section 5.3.7. This includes weed control in the two wood heaps shown in Figure 8.	H
5.4.1.4	Plan and action the sensitive removal of all building material and rubbish from Management Area A, into Management Area D or off-Site.	L
5.4.1.5	Plan and action the sensitive removal of white and yellow sand mounds (near southern track to Maintenance Depot) from Management Area A.	M
5.4.1.6	Consider creation of a non-irrigated buffer between the turf nursery/practice green and bushland. The buffer should be a 3–4 metre wide bare-earth zone, which is maintained weed free through regular herbicide applications. Bollards should also be installed between this track and the bushland.	M
<b>Management Area B</b>		
5.4.2.1	Undertake control of woody weeds as a priority	H
5.4.2.2	Ensure that any offset that may be required in the context of any approvals associated with the potential realignment of the thirteenth tee be directed towards active conservation management (e.g. environmental weed control) in high priority locations in Management Area A.	H
<b>Management Area C</b>		
5.4.3.1	Consider delineation of this Management Area to ensure surrounding bushland is not impacted by movement of machinery. This should involve creation of a 3 -4 metre wide track inside a bollarded area. Bollards should also be used to identify the area of Good condition bushland inside Management Area C.	M
<b>Management Area D</b>		
5.4.4.1	Implement one of the options suggested in Section 5.4.4 to manage the spread of weeds from the bunded area into Management Area A.	M
5.4.4.2	Remove stored building materials and sand piles which occur on the edge of Management Area D in amongst native vegetation. The location of these is shown in Figure 8. They often occur on the interface between Management Areas A and D. Ensure this work is undertaken in accordance with dieback hygiene management procedures and minimises ground disturbance.	H
5.4.4.3	Delineate the interface of Management Area A and D with bollards. Control access on the track between the two areas by installing a lockable gate.	M
5.4.4.4	In the long-term, consider shifting the Course service entry and hardstand area off Ranford Road to a location (or an existing gate) further south-east on Ranford Road on the edge of the bushland area.	L

# 1. Background information

Ironbark Environmental and Regen4 Environmental Services were engaged by the City of Gosnells to develop a management plan for the bushland area within the Gosnells Golf Course. The purpose of the plan is to gather technical information on the Site's characteristics and advise what can be done to conserve the bushland into the future.

## 1.1 Site description

The study area (the Site) for this management plan is shown in Figure 1. It is located on the southern portion of the Golf Course, Crown Reserve 24862 and bounded by Ranford and Campbell Roads and the thirteenth fairway. The study area is predominantly bushland, with cleared areas and weed-infested areas occurring in various locations. A vegetated wetland is located in the southern-most portion of the bushland.

Main access to the Site is from the Ranford Road entry to the maintenance facility. The Site is fenced on the boundaries with Ranford and Campbell Roads. Unrestricted access is possible from the thirteenth fairway. A fire access track is maintained on

the Ranford and Campbell Road boundaries and two main tracks allow vehicular movement through the bushland (Figure 1).



The bushland area is identified as Site 467 in the State Government's Bush Forever policy document. This recognizes the bushland's regional significance given the rarity of this type of vegetation within the Perth Metropolitan Region.

The boundary of the Bush Forever site is shown in Figure 1. The requirements of Bush Forever protect the native vegetation located within the Bush Forever site and the environmental integrity of the Site.

**Figure 1: Bushland Management Plan study area**

## 1.2 Current use and management arrangements

Reserve 24862, including the study area, is subject to a Management Order for the purposes of "Recreation Golf Course" and leased to the Gosnells Golf Club (Inc.) by the City under a long-term lease arrangement. The lease requires the Club to manage the 'premises', but no specific requirements are stipulated in regard to management of the ecological value of the bushland.

The Site has been used or managed in various ways in the past and continues to be used by the Club today as part of its course operations. Past usage has included rubbish disposal and clearing for a proposed fairway. These uses have impacted on the bushland, however there has been significant regeneration following the fairway clearing.

Present usage by the Golf Club includes:

- a) storage areas near the Ranford Rd entrance for woody debris, mulch and building materials used on the course;
- b) Sand quarrying and storage near the Ranford Road gate; and
- c) Storage of turf corings and clippings in the northern parts of the Study Area.

The sand quarry is used to excavate sand for use on site by golfers to fill divets as they play the course. Approximately 30 to 40 cubic metres of sand is taken from the quarry, usually in one operation per year (Brad Sofield, pers. comm.).

A turf nursery area and spare green are located between the bushland area and the thirteen fairway.

Perimeter access tracks are maintained annually by the Golf Club to comply with Section 33 of the Bushfires Act 1954 and enable access to fire control vehicles.

The Gosnells Golf Club Inc manages the course and Reserve 24862 in accordance with a lease from the City of Gosnells. The lease makes no reference to specific bushland management of the Bush Forever Site 467. The City has recently undertaken assessment of all natural areas in vested reserves, and this has shown that the Reserve's bushland is ranked in the top five site's for its ecological values. The City therefore considers that the Site needs to be actively managed to maintain its ecological values.

The Course Managers have recently become members of the 'e-par' environmental management program. E-par documents how the Club manages the course in an environmentally sensitive manner and covers issues such as water and fertilizer management and maintenance of the roughs and course surrounds. The Club's e-par program is still in preparation and it may be possible to include some actions recommended in this Bushland Management Plan into the e-par program.

The Course is also managed in accordance with a Rehabilitation and Landscaping Plan (RLP) which details the landscaping of roughs with local native plants (Siemon & May, 1999). The RLP is being actively used to revegetate Course roughs and includes many species which are found in the Bushland Site.

## 2. Management objective

This draft plan has been prepared with a view towards managing the entire 10.0 ha area for conservation in perpetuity. This overall goal should be supported by both the City and Golf Club as part of negotiations to implement this Plan.

As a working objective, this plan is based on the City and Club agreeing to:

Actively manage for conservation a core area of 7.8 ha, and carry out works in the balance of the 10.0 ha Site to support the core area's conservation values.

The reason for focusing attention on a core area, described as Management Area A in this Plan, is the recognition that there are very limited resources to manage the Site, and the first efforts should be made to protect and manage the portion of the Site in best condition (Buchanan, 1989). This core area of 7.8 ha is shown in Figure 22 and encompasses all the vegetation in best condition on the Site (rated as in Excellent or Pristine Condition). Most of the remainder of the core area is assessed as having Very Good to Good condition vegetation.

A further objective of reducing the edge/area ratio to  $<0.04$  in the medium-term and reducing it further to  $<0.02$  in the long-term is also proposed. Edge/Area ratio is an important factor in the ecological viability and level of management required to maintain a natural area (Cullity & Clarke, 2005). Edge/Area ratio is described in more detail in Section 4.7.4.

An objective of improving the condition of the entire 10.0 ha Site is seen as unfeasible at this stage, given that no active management is currently occurring in any of the Site.

Further targets or evaluation measures could be easily determined based on changes in weed density or extent. See Section 4.6 on weed mapping and Action 5.3.7.2 on photo monitoring points.

## 3. Project scope and methods

### 3.1. Project scope

The project scope was defined by the City in April 2008 and included requirements to:

- prioritise and prescribe the management of environmental weed species
- provide detailed weed mapping and vegetation condition mapping
- identify and make recommendations regarding management and/or rationalisation of access to and within the site
- identify visually the potential presence of Dieback Disease within the site and provide management recommendations associated with potential management implications
- identify opportunistically, through direct observation or interpretation, fauna occurrences within the bushland
- identify potential issues and management synergies with existing golf course management practices and plans
- identify potential issues associated with the management of the adjacent golf course and prescribe actions to reduce any potential impacts
- provide long-term bushland regeneration strategies that focus on weed control and assisted regeneration principles
- identify management actions and provide appropriate recommendations to ensure the sustainability of areas of vegetation in very good to excellent condition; and
- Produce an aerial photo overlay of the study area, describing vegetation communities, significant areas of disturbance, management infrastructure and vegetation condition.

### 3.2 Project methods

The project has involved both site survey to identify environmental assets and management issues and the development of management strategies. Management strategies have been developed after consultation with staff of both the Gosnells Golf Club and the City of Gosnells.

Technical information has been gathered using the methods listed in Table 2.

#### Vegetation community<sup>2</sup> mapping

Vegetation community mapping is an important precursor to vegetation condition mapping. Vegetation community mapping was carried out in accordance with the methods in Table 2. Full vegetation community mapping, involving the establishment of sampling quadrats as recommended in Keighery (1994) was outside of the project brief.

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<sup>2</sup> Vegetation communities are groupings of vegetation with similar dominant species in the major structural layers. For example, banksia and sheok over a sedgeland understorey means that Banksia and sheok trees are the dominant species in the overstorey, and sedges are dominant in the understorey.

**Table 2: Methods used to collect technical environmental information**

Environmental information	Methods
Vegetation communities	A desktop review of Trudgen and Keighery (1995), Bush Forever Vol 2 (Government of WA, 2000) and Ecoscape (2006) was undertaken followed by on-ground assessment and GPS tracking of to identify vegetation boundaries. Regularly spaced transects were walked through the bushland noting vegetation variations. For example, in the wetland, the presence/absence of <i>Melaleuca preissiana</i> was determined and the adjacent edge of 'wetland dependant vegetation' was GPS tracked. Previous mapping of the Sheoak and Jarrah Low Woodland community was also inspected and remapped.
Vegetation condition	Keighery (1994) Vegetation Condition Scale was used. On-ground assessment was used to identify major changes in vegetation condition. This grades bushland into the categories of: Pristine, Excellent, Very Good, Good, Degraded and Completely Degraded.
Flora List	Flora list was compiled by 'walking through' each vegetation community. Uncertain taxa were submitted to the herbarium for ID.
Weeds – presence and mapping	GPS recording of spot occurrences of weeds plus GPS tracking of boundaries for density.
Phytophthora Dieback	Assessment of condition of key indicator species for Phytophthora Dieback was done throughout the Site
Fauna usage	Opportunistic observations were made during field work.
Other information (disturbances etc.)	All disturbances were logged with a GPS in the field and described in categories as shown in Figure 4.5.

### Edge/area ratio

An estimate of the edge/area ratio was also calculated using the following method:  
**Total edge of bushland areas in meters** =Interface between Completely Degraded areas and all other bushland + spots of Completely Degraded areas in other bushland + additional Campbell Road frontage (given the weeds on the fenceline)  
**Total area** = area of all bushland in Degraded condition or Better (i.e. omit completely degraded areas).

The lower the edge/ratio, the more likely the area requires significant management to maintain bushland condition.

### Management Areas

Management Areas have been defined in the Study Area for the purpose of grouping similar management requirements and designing management strategies. The Management Areas are shown in Figures 7 and 22 and are described in Section 5.2.

## 4. Survey results

### 4.1 Key results

The Site has at least 110 different native plant species and four recognisable vegetation communities. This is exceptional given that there is only about 7.4 ha of bushland remaining on the site.

Bushland condition mapping has assessed that 37% or 3.8 ha of the Site is in an Excellent or better condition. A further 31% of the site is in Very Good or Good condition. This indicates that almost 70% of the Site has vegetation in a healthy state or able to be restored to a near natural state with a reasonable level of management inputs. This is a promising feature for the Site's long-term viability and health.

The site's weed characteristics are also a promising feature, with half of the Site having only a low level of veldt grass infestation (low grass levels are classed as below 5% of the ground cover). The issue of managing grass weeds is discussed in detail in Section 5.3 as Veldt Grass invasions may expand considerably in a short period of time and need to be closely monitored on an annual basis.

Less positive is the edge/area ratio of the Site's bushland areas. The Site has an edge/area ratio of 0.1 which is well above acceptable levels recommended for conservation areas. An edge/area ratio above 0.04 is considered poor. This reflects the large number of edges between the Site's bushland and any area of disturbance. This is discussed further in Section 4.7.4.

### 4.2 Vegetation community mapping

Vegetation community mapping is important in understanding natural vegetation differences across a site. It provides an important reference for understanding vegetation condition and guides bushland restoration activities.

Trudgen & Keighery (1995), Bush Forever Vol 2 (Government of Western Australia, 2000) and Ecoscape (2006) were reviewed to establish previous descriptions of vegetation communities over the Site. Whilst the two major communities that previous authors had identified were recognised, (i.e. a wetland and an upland community), this study has described two additional transitional vegetation communities.

The vegetation communities mapped by this study are shown in Figure 2:

- Mixed Banksia sp. and Pricklybark (*E. tottiana*) over an open shrubland understorey = Upland Community
- Mixed Banksia sp. and Sheoak over a closed sedgeland understorey
- Closed Sedgeland with occasional grasstrees and Nuytsia
- Melaleuca Woodland = Wetland community

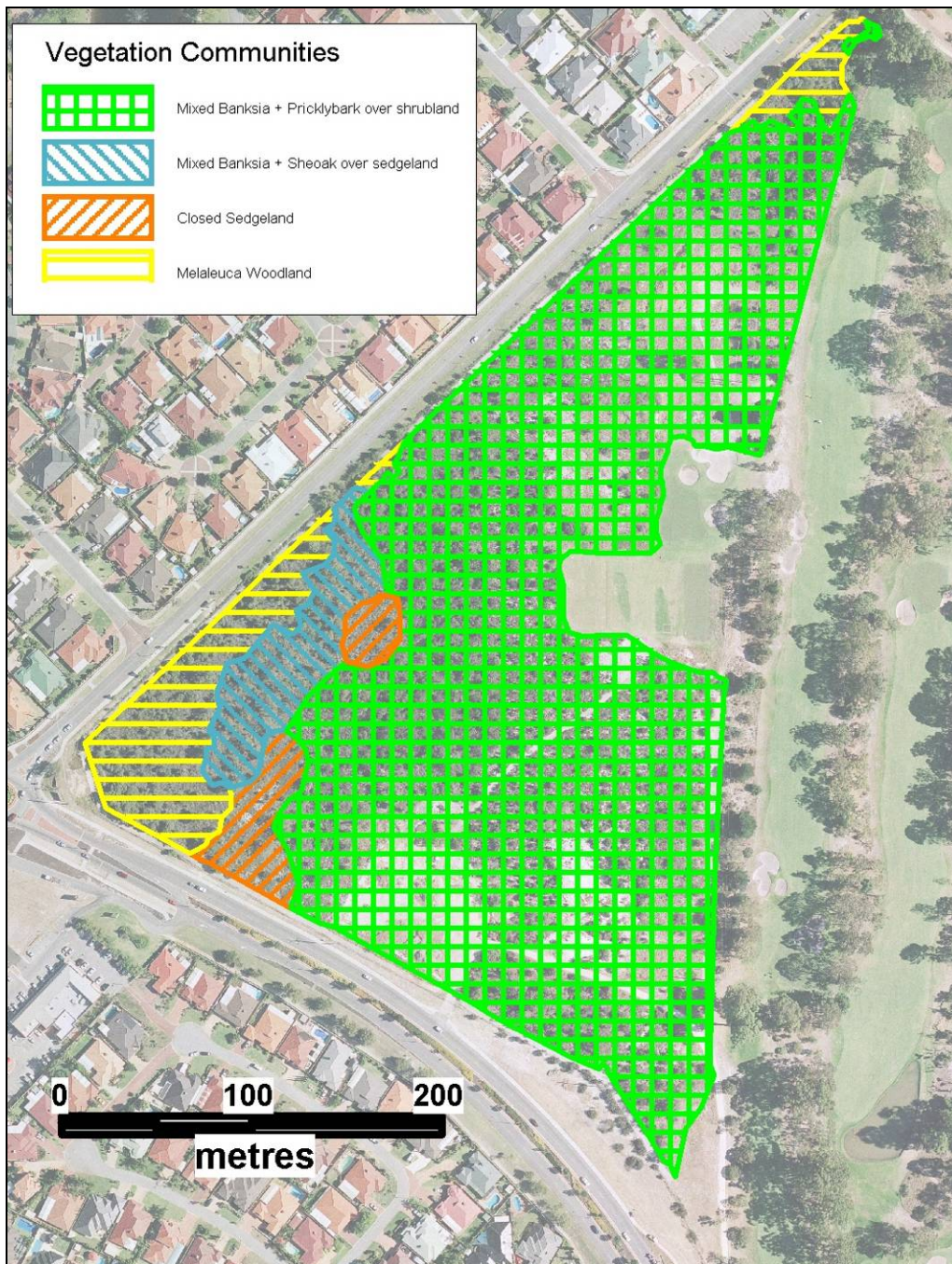


Figure 2: Preliminary mapping of vegetation communities undertaken in this study.

The Sheoak and Jarrah Low Woodland community identified in Ecoscape (2006) was not confirmed by this study, and has been mapped as the northern occurrence of Melaleuca wetland or Banksia and pricklybark over sedgeland. Much of this area is covered in *Acacia longifolia* and eastern states eucalypts.



Figure 3: Open shrubland with Banksia and Woolly Bush (in background) Vegetation Community



Figure 4: Banksia and sheoak over a closed sedgeland understorey Vegetation community



Figure 5: Closed Sedgeland Vegetation Community



Figure 6: Melaleuca Woodland Vegetation Community

### 4.3 Vegetation condition mapping

Vegetation condition was mapped over the entire Site using the method and condition scale of Keighery (1994). Under this scale, all areas mapped as in Good or better condition are considered able to be restored given available bushland restoration techniques. Areas that are completely cleared of native vegetation are mapped as Completely Degraded.

Results are shown in Figure 7 and summarised:

1. Pristine	2.7ha	26%
2. Excellent	1.1ha	11%
3. Very Good	2.3ha	22%
4. Good	1.0ha	9%
5. Degraded	0.3ha	3%
6. Comp. Degraded	2.9ha	28%

Of the total 10 ha study area, only 3.2 ha, or less than one-third of the Site is Degraded or Completely Degraded. Much of this land is completely denuded of all native vegetation, and used for storage of materials or hardstand areas.

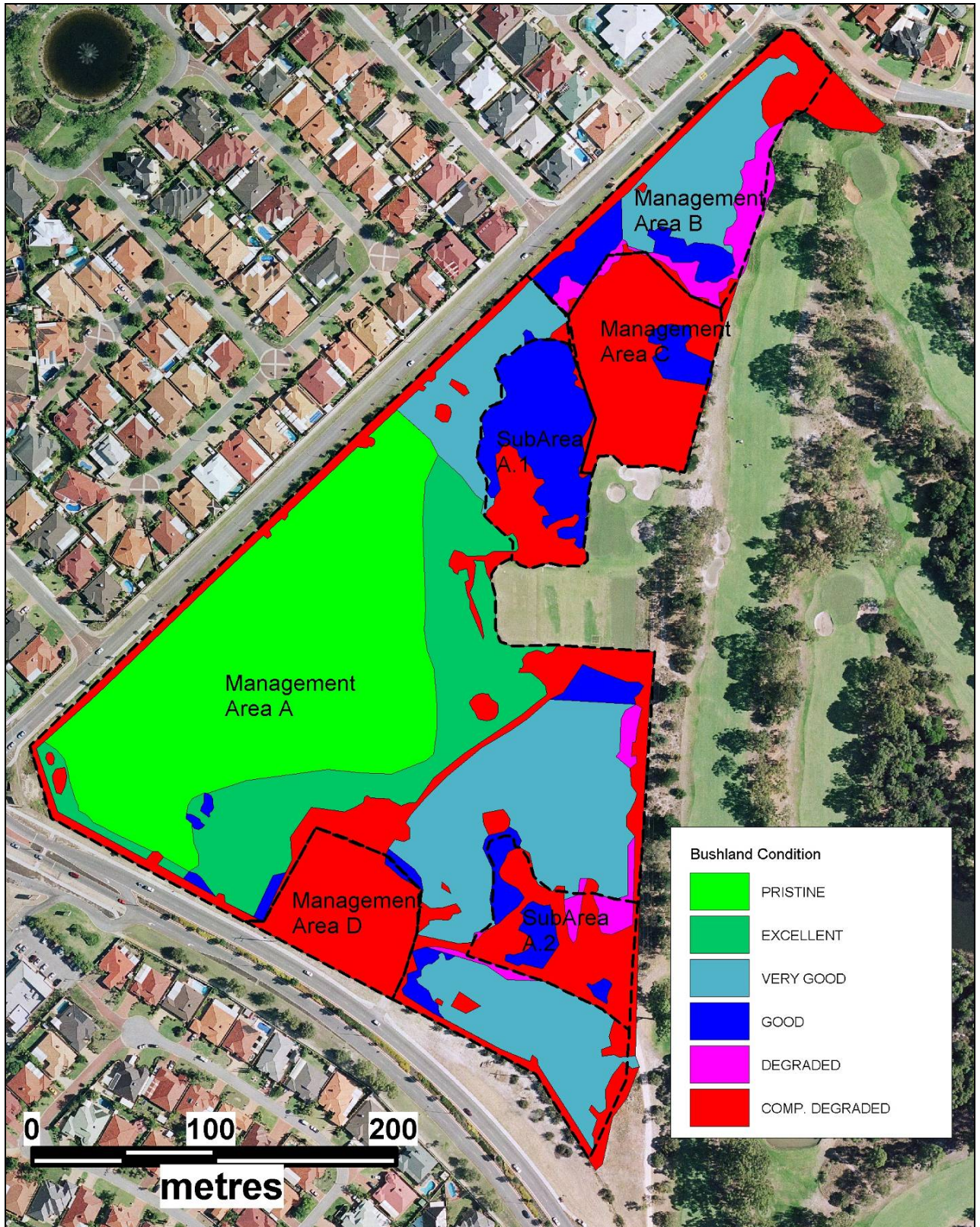


Figure 7: Bushland condition mapping

## 4.4 Flora List

The Site has an extremely high species diversity with 111 separate plant taxa<sup>3</sup> (species, subspecies and varieties) recognised over the Site. The full species list is included in Tables 5 and 6 (Appendix 1). The diversity of taxa in each vegetation community is summarized in Table 3.

**Table 3: Summary of number of taxa recorded in each vegetation community**

Vegetation Community N <sup>o</sup>	1	2	3	4
Vegetation Community	Banksia + Pricklybark Low Woodland	Banksias + Sheoak over sedgeland	Sedgeland	Melaleuca preissiana Woodland
Total N <sup>o</sup> taxa per Community	68	14	45	48

With the exception of 7 taxa, a *Leptomeria*, 2 *Lomandras*, a Sun Orchid, and several Epacrids that were not in flower, all were identified to 'species' level.

It is estimated that the survey has identified greater than 75% of the total number of species likely to be found on the Site.

<sup>3</sup> Taxa means the smallest unit of a taxonomic group, such as a species, subspecies (ssp), or variety (var).

## 4.5 Access and disturbance mapping

Access and areas of disturbance of the Site pose one of the most significant threats to the Site’s bushland. Disturbances provide perfect environments for weeds to germinate, and in many cases introduce new weeds. Examples of disturbances include the quarrying and storage of sand, dumping of rubbish, and dumping of cleared vegetation.

All mapped disturbances are shown in Figure 8.

Major disturbance areas are around the Ranford Road entrance area, an area filled with bush sand to the north of the turf nursery and the sand quarry area.

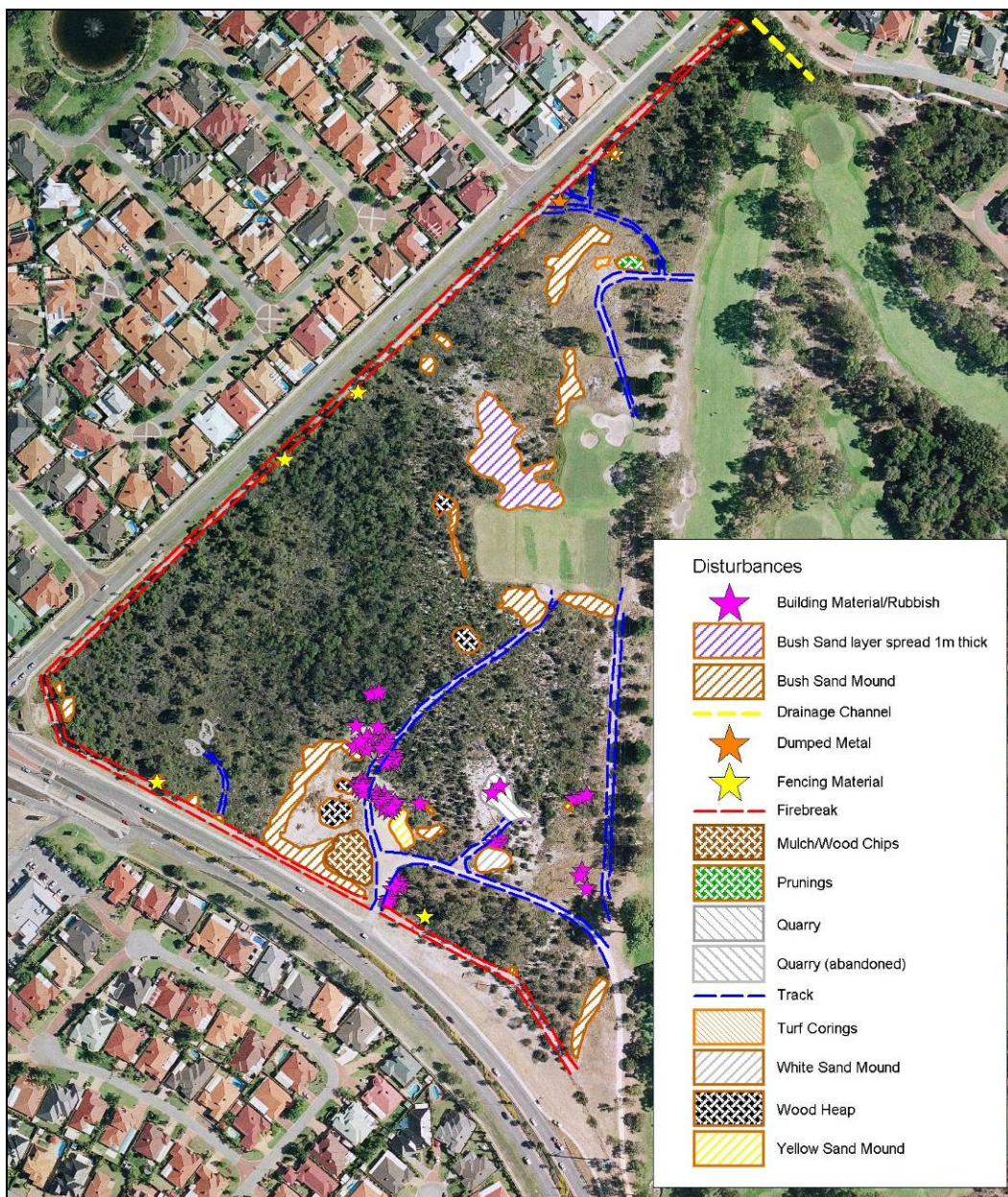


Figure 8: Disturbances present on the Site on October 2008.



Figure 9: Wood chip/Mulch heap on cleared area. Note sand bund covered in weeds in background.



Figure 10: Wood heaps in cleared area. Note sand bund covered in weeds in background



Figure 11: Linear sand mound adjacent to turf nursery. Note high density of Veldt Grass only on mound



Figure 12: General sand quarry



Figure 13: Sand stockpile near sand quarry



Figure 14: Yellow sand stockpile in cleared area



Figure 15: Dumped rubbish adjacent to central track



Figure 16: Abandoned quarry in Management Area A: Note that natural regeneration is occurring



Figure 17: Wood and sand mound behind quarry. Note high density of Veldt Grass on mound

## 4.6 Weed mapping

Weeds have been mapped into three groups based on weed biology and weed control requirements: grass weeds, woody weeds and bulbous weeds. Another group, 'other weeds' includes other significant weeds, mostly broadleaf species which also pose a high threat to the bushland.

### 4.6.1 Grass weeds

Mapping of grass weeds is included in Figure 18. Veldt grass has been mapped according to density into three categories, with the low density areas generally being able to be controlled with grass-specific spot spraying. Most areas mapped with veldt grass also contain Wild oats.

High densities of grass weeds, particularly Veldt Grass and Wild Oats, occur in areas of high disturbance. Generally, where bushland condition is 'Very Good' or better, the grass weed densities are less than 5%. Grass weeds are virtually absent from the area of 'Excellent' and 'Pristine' bushland apart from along the edge of tracks.

Perennial Lovegrass is generally confined to the roadside fences along Ranford and Campbell Roads. About 80 spot occurrences of this grass weed have been mapped (Figure 18). Perennial Love grass is a high priority to control given its present limited extent and potential to spread further over time.

### 4.6.2. Bulbous weeds

Locations of bulbous weeds are shown in Figure 19.

The major bulbous weed on the Site, Pink Gladiolus, *Gladiolus caryophyllaceus*, is scattered throughout all the bushland in consistent densities. It is not considered a priority for control as its impact on bushland is considered low to moderate.

All other bulbous weeds are generally in small infestations. This offers a great opportunity to remove these species before they spread further. A few patches of Soursob, *Oxalis pes-caprae*, and a single occurrence of both Freesia, (*Freesia* hybrid), and Watsonia (*Watsonia* sp), were found. The occurrences of Soursob and Oxalis were mostly limited to the edges of Management Area D, including the bund area on the interface with Management Area A. Control of the Freesia and Watsonia is a priority for the weed control program.

There was no evidence of Guildford Grass, *Romulea rosea*, or One-leaf Cape Tulip, *Moraea flaccida* on the Site. This was surprising given that both are ubiquitous throughout the metropolitan area. Both species are difficult to eradicate once introduced.

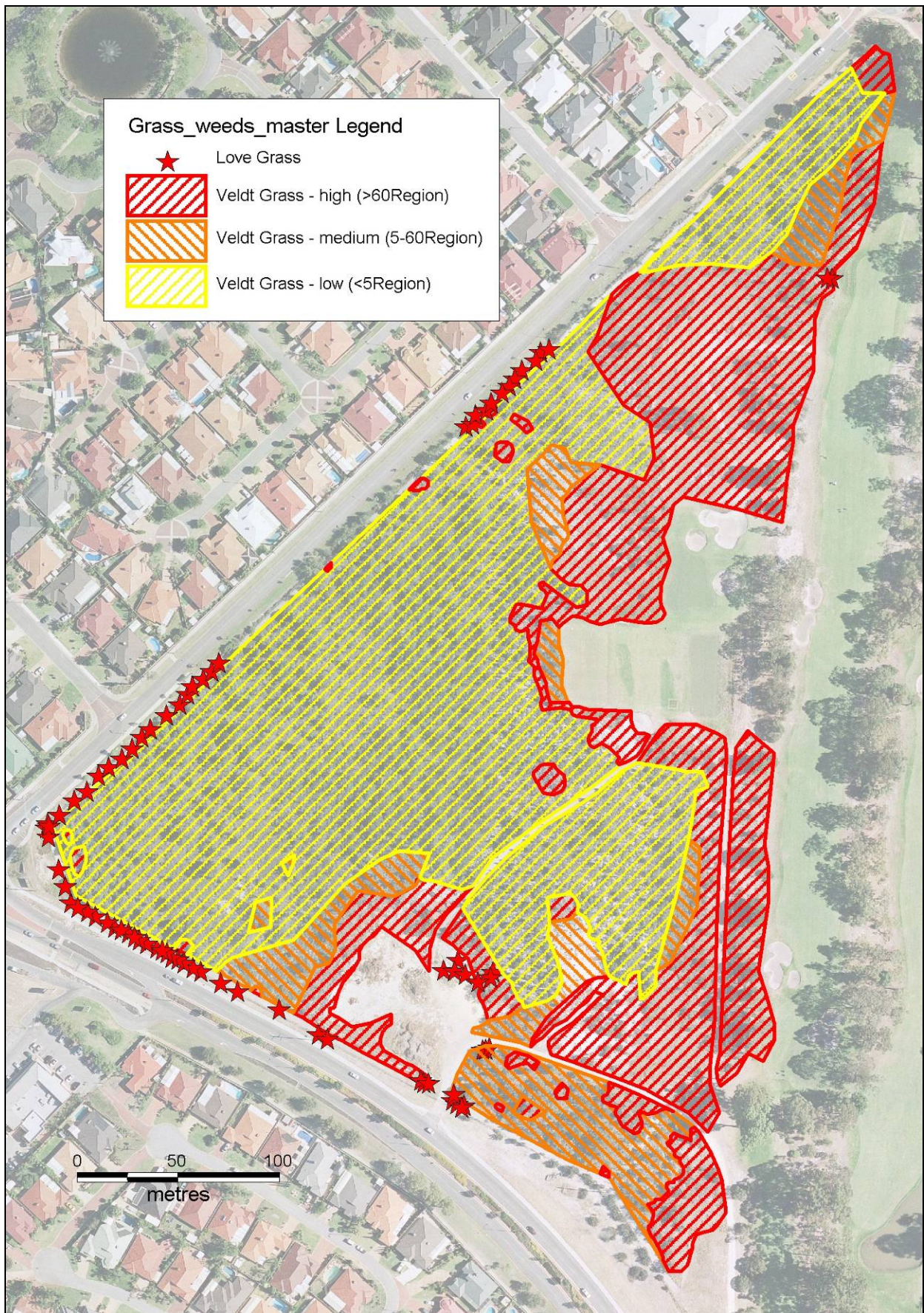


Figure 18: Mapping of major grass weeds

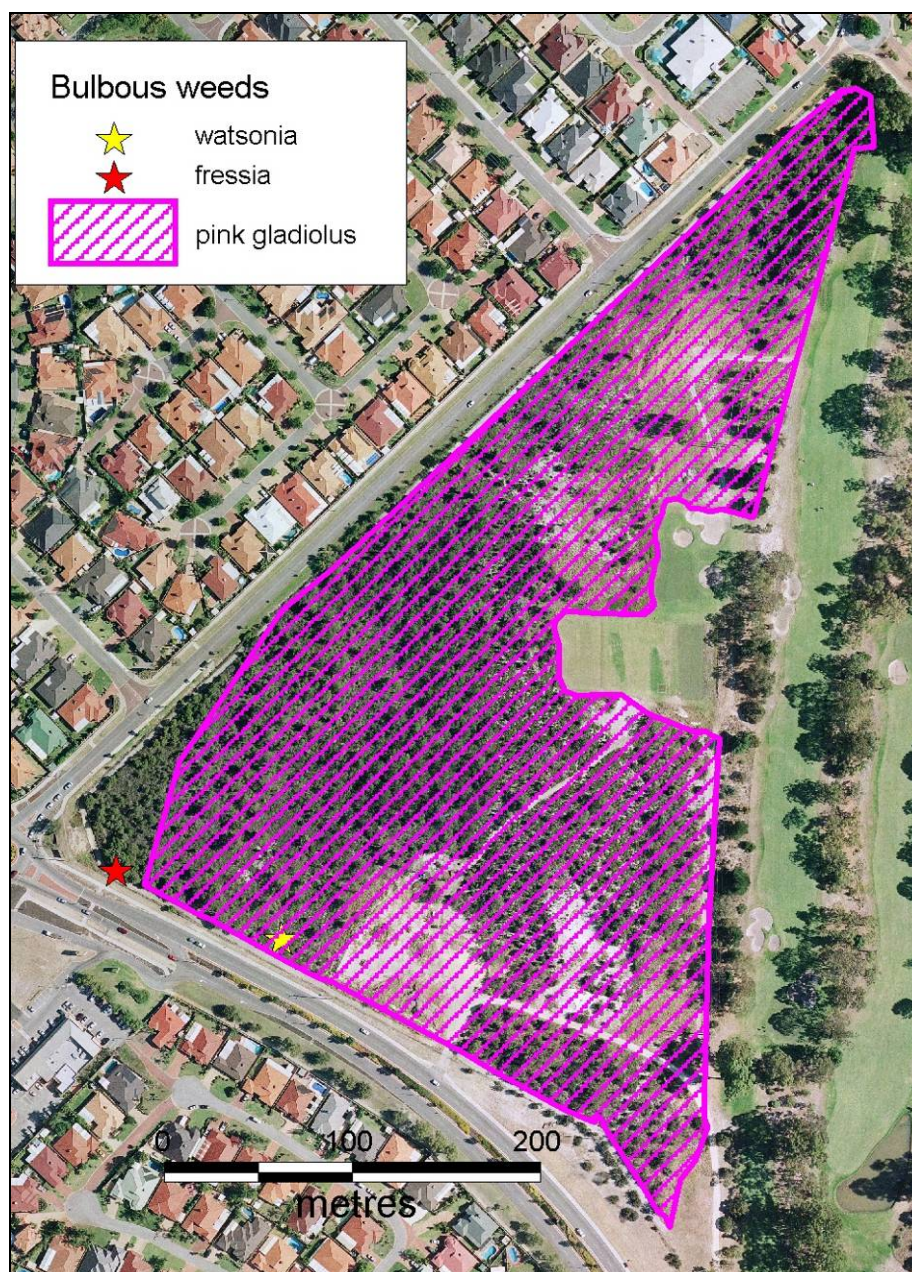


Figure 19: Mapping of bulbous weeds

#### 4.6.3 Woody weeds

Six species of woody weed have been found throughout the Site (Figure 20). With the exception of *Pinus* sp., and Swamp Mahogany, *Eucalyptus botryoides*, all are considered invasive. There are numerous seedlings/saplings of River Red Gum (*Eucalyptus camaldulensis*) and Sydney Golden Wattle (*Acacia longifolia*).

The most intensive woody weed clusters are in the northern part of the Site. However, Figure 20 shows that isolated plants of *Acacia longifolia* are scattered throughout the site. This is the priority woody weed to control.

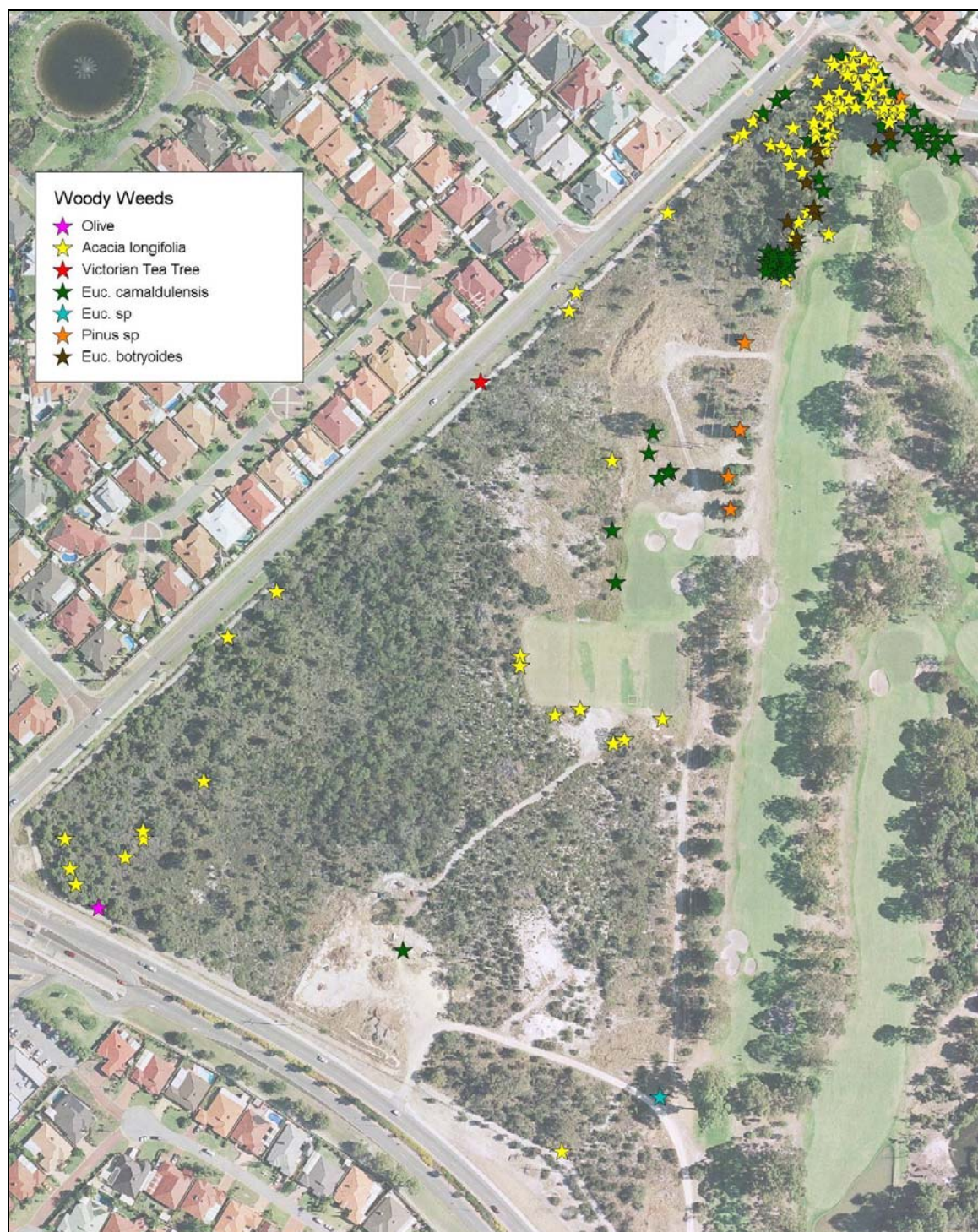


Figure 20: Woody weeds mapped on the Site.

#### 4.6.4 Other weeds.

A number of other weeds that have the potential to become more serious problems were mapped. Figure 21 shows occurrences of seven species, most which are presently confined to the perimeter of the Site or along tracks. Figure 21 shows that these weeds closely follow disturbances, especially tracks and areas where soil may have been imported into the Site. A single plant of Paterson's Curse, *Echium plantagineum*, was found on the eastern side of Management Area D.

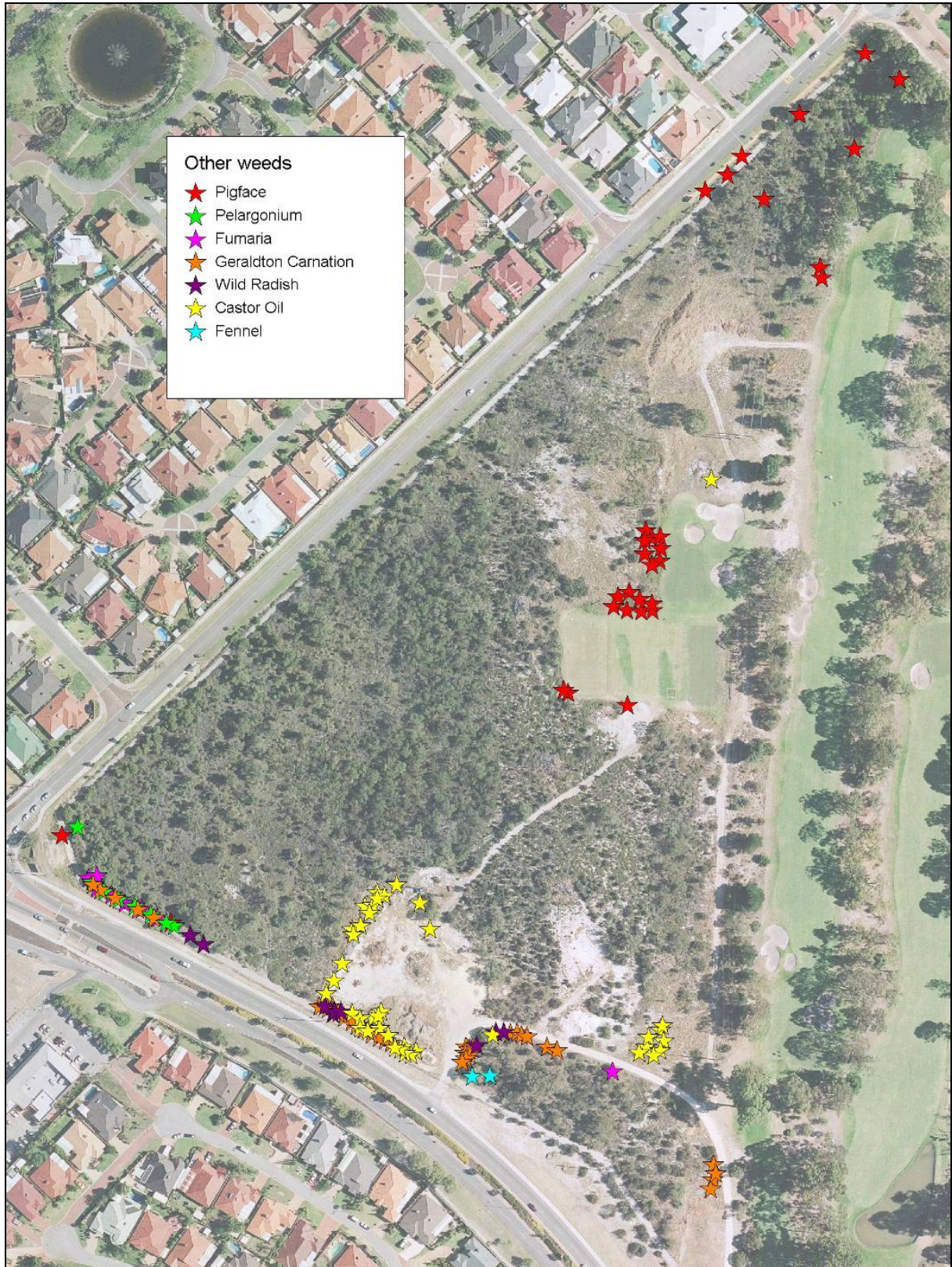


Figure 21: Other weeds mapped on the Site

## 4.7 Other results

### 4.7.1 Fauna use

Whilst no detailed survey of fauna was conducted as part of this project, the Site is well used by a variety of native birds, reptiles and frogs. During the survey period, a snake was observed, as were bobtail lizards and honeyeaters.

There is extensive evidence of rabbits throughout the Site to the east of the area of 'Pristine Condition' bushland. However, there is little evidence of rabbits within the 'Pristine Condition' bushland. No rabbit warrens were found.

No diggings of the Quenda (Southern Brown Bandicoot) were found, although this does not necessarily indicate that the Site does not support this species. Community observations recorded by the Department of CALM in the 1990's indicate that the Site did provide habitat to the Quenda (Friend 1996). Lack of observation does not necessarily mean the species is absent from the Site.

### 4.7.2 Phytophthora Dieback Disease

Phytophthora disease can kill many plant species, including many understorey species. Once introduced, the disease cannot be eliminated, only controlled.

Key species which can be used to indicate the presence of the disease such as Prickly Moses (*Acacia pulchella*), Woolly Bush, (*Adenanthos cygnorum*), *Banksia* sp, and Grasstrees (*Xanthorrhoea preissii*) were inspected for evidence of Phytophthora Dieback disease. Whilst there are signs of small scale and localised dieback, possibly caused by environmental factors such as summer water stress, no evidence was found of a Phytophthora Dieback front.

However, to obtain an unequivocal diagnosis, the Site needs to be tested for the major dieback disease organisms. Until this testing occurs, the Site should be assumed to be free of dieback, and controls should be placed on import of soil and organic materials and the movement of machinery through the Site's bushland. This has implications for continued use of the track between Management Area D and the turf nursery area.

### 4.7.3 Fire management access

There is generally very good access throughout the Site. However the fire access track along the perimeter fence on Ranford and Campbell Roads is untrafficable around the south western corner for most of the year due to the ground being waterlogged. It is also too narrow in this corner to allow easy movement of fire-response vehicles. In addition there is no possibility of egress from the northern end of the perimeter track near the thirteenth tee across the drainage channel. Upgrading of the track, especially near the Ranford/Campbell Rd corner with limestone is considered a medium term priority. This would assist in responding to early-mid spring fires when the track is still waterlogged, as well as providing all-weather access for bushland management purposes.

#### **4.7.4 Edge/Area Ratio**

The edge/area ratio for the Site's bushland is 0.06 as calculated using the method described in Section 3.2. Edge/area ratio provides a useful measure of the level of impacts that are likely to be imposed on a natural area. The longer the perimeter relative to the area of bushland, the more difficult it is for the bushland to be buffered from the impacts of weeds, fire and other disturbances. Conversely, the smaller the ratio the better the remnant in terms of size and shape and the greater chance it has of being sustainable.

The Commonwealth Government has set this ratio as a national indicator for biodiversity (Saunders and Margules, 1998):

- Less than 0.01 is considered excellent
- Greater than 0.01 but less than 0.02 is considered good
- Greater than 0.02 but less than 0.04 is considered poor
- Greater than 0.04 is considered very poor

## 5. Management strategies

### 5.1 Introduction

Ideally all of the 10 ha Site should be actively managed to restore it to a more self-sustaining natural area. This would require all use of the Site to cease and a comprehensive restoration and rehabilitation plan to be implemented. Unfortunately, this is not a realistic objective as it would require significant funds and relocation of all of the Golf Club's operations to areas outside of the Site.

In light of the Site's important conservation values, and the Golf Club's use of the Site as part of its course operations, a staged management approach is proposed which involves:

- Focusing active conservation efforts on a core management area in the short to medium term (present to 5 years). This core management area is described as Management Area A in Figure 22 and the remainder of this Plan.
- Active management efforts in Management Area A mean both the removal of uses which have a negative impact on the bushland and undertaking measures which positively assist the rehabilitation and restoration of both vegetation and habitat. Positive management measures include the control of environmental weeds.
- Major considerations for the Golf Club and City in the short to medium term include:
  - Phasing out the use of the sand quarry, located within the Bushland, and obtaining sand from licensed quarries;
  - Removing or intensively managing the bund around the Ranford Road service area (Management area A); and
  - Restricting use of the track from the Ranford Road service entrance to the turf nursery.
- A major consideration for the Golf Club and City in the long term is shifting the service entry and hardstand area off Ranford road to a location further east on Ranford Road on the edge of the bushland area.

It is important that the implementation of these recommendations is negotiated by the City and Club so that a partnership can be formed to bring together the necessary resources.

To support this approach, this plan recommends defining a number of management areas to which specific management actions apply. This framework will allow a strategic and staged approach to be adopted towards management.

## 5.2 Management areas

The management actions proposed in Table 1 are based on protecting all of the Site’s native vegetation, but give highest attention to a core management area (Management Area A) where vegetation is in the best condition.<sup>4</sup>

Three other management areas are defined as shown in Figure 22. These four management areas can be each viewed as an area with a distinct management aim as described in Table 4.

**Table 4: The Site’s four Management Areas and their management aims**

Management Area	Description	Management Aim
<b>A</b>	7.8 ha, Core Management Area, containing most of the vegetation in Good or better condition. The boundaries of this area have been drawn to reduce the perimeter to area ratio as much as possible.	To progressively remove all disturbances and weeds from this area so that the bushland is protected in the long-term.
<b>B</b>	1.0 ha Northern Bushland Area; This areas contains a large area of Very Good Condition bushland but it has a high perimeter to area ratio and is flanked by relatively large areas of Completely Degraded bushland with significant weed banks.	To retain the vegetation in this area and ensure that weeds from this area do not impact on Management Area A.
<b>C</b>	0.7 ha – organics storage area, This area is Completely Degraded, except for a small (isolated) area of Good condition bushland.	To ensure use of this area is confined and managed so that it does not impact on Management Areas A and B.
<b>D</b>	0.5 ha – Entrance Storage Area, this area is the cleared area off the Ranford Road entrance where various materials are stored or stockpiled.	To ensure use of this area is confined and managed so that it does not impact on Management Area A.

<sup>4</sup> A small number of grass trees and other native plants (less than 10 specimens) may need to be removed for a realignment of the thirteenth tee. The club is cognisant of the values of all native vegetation in the Site and has planned to offset this impact.



Figure 22: Proposed Management Areas over the Site

Ideally, Management Area D should be included in the Core Management Area (Area A), as it has a significant impact on the Core management Area and creates a long perimeter for disturbances and weeds. However, it has been maintained as a distinct management area at this stage to ensure that its special management issues are specifically addressed. It is also likely to be maintained as a distinct storage area in the medium term.

Two management sub-areas are included in Management Area A. These are shown in Figure 22, and are the Sand fill area near the turf nursery (Sub Area A.1) and the

Sand Quarry area (Sub Area A.2). Both of these sub areas have large areas of Completely Degraded vegetation/disturbances and require special management consideration. They have been included in Management Area A as they are large intrusions into the core management area but are showing signs of natural regeneration. The management of both sub areas will have a large bearing on the viability of the core conservation area. By allowing these areas to naturally restore in the medium term, where possible, the edge/area ratio of the site will be reduced which will significantly improve the viability of the Area.

## 5.3 Over-Arching Management strategies and actions

Actions which apply to the entire Site, or are actions that support the overall implementation of the plan are summarised in the first part of Table 1. The most important of these overall actions are discussed below under the headings of:

- Support for plan implementation
- Reduce risk and impact of fire on Site
- Management of Phytophthora Dieback Disease
- Management of physical disturbances
- Golfer and Local Community awareness of Site's ecological value
- Site delineation, access control and signage
- Environmental Weed control (A component of bushland restoration)
- Suggested environmental weed control program
- Revegetation (planting and direct seeding)

### 5.3.1 Support for plan implementation

Important to the implementation of this plan is its adoption by the Council of the City of Gosnells and the Board of the Gosnells Golf Club.

It is also important that the relevant State Government agencies assess this plan in light of any proposals to manage Bush Forever site 467. For example, issues relating to the realignment of the thirteenth tee should be assessed in the context of the key management needs of this Site.

It is also suggested that key Golf Club Personnel and City staff are identified to work together on the implementation of this plan, starting with the adoption of the management framework and proposed management actions. This group should coordinate implementation of the plan, including lobbying for resources and ongoing evaluation.

**Action 5.3.1.1:** Undertake process to get City and Golf Club's endorsement of this plan and the Action Plan. This includes endorsement of the proposed Management Areas shown in Figure 22.

**Action 5.3.1.2:** Identify key Golf Club personnel and City staff to work together on the implementation of this plan.

**Action 5.3.1.3:** Provide copy of plan to the Department for Planning and Infrastructure (Bush Forever Unit) and Department of Environment and Conservation (Swan Coastal District).

### 5.3.2 Reduce risk and impact of fire on Site

Fire poses a significant and unpredictable threat to the Site. The exclusion of fire from the Site is the preferred approach, but is difficult in an urban environment.

To protect the Site's ecological values, the aim should be to prevent the occurrence of fire in the Site and reduce the risk of the spread of fire once introduced.

Key actions towards this aim include:

- The removal of weeds and some isolated native plants from the thin strip of vegetation between fire access track and roadsides on Campbell and Ranford Roads. This will achieve two aims. It will reduce the very long double edge of weeds in close proximity to the bushland and make it easier to control weeds. It will also reduce the risk of fire moving from the roadside into the bushland. It is important that all vegetation along the fenceline be removed, including a number of isolated native plants.
- Minor improvements to the track on Campbell and Ranford Roads to upgrade the track to all-weather (install a crushed limestone surface around the southwest corner) will assist in the fighting of fires early in the fire season (when this portion of the current track tends to be to be waterlogged and un-trafficable). It is also recommended that a crossing be built over the drain on the track near the Campbell Road/Chatsworth Gate intersection to allow safe movement in an emergency situation.
- Extending the northern end of the perimeter fire access track to allow egress from that point across the drain.
- Converting the current central track which divides Management Area A into a restricted use track will maintain its function as a front from which to control fires. All other regular usage should be prevented by installation of gates.

These recommended actions should be implemented with the support and advice of the City's Risk and Emergency Management Coordinator and the Fire and Rescue Service. It would then be wise to ensure they are included in a simple Fire Management/Response Plan which should also be developed in consultation with the City's Risk and Emergency Management Coordinator.

**Action 5.3.2.1:** Remove weeds and isolated native plants which are growing between the fire access track and Campbell and Ranford Road verges.

**Action 5.3.2.2:** Make minor improvements to the track on the Campbell and Ranford Roads frontages to upgrade the track to all-weather surface (minor widening will be required on the corner, and resurfacing with crushed limestone)<sup>5</sup>. A drain crossing on the track near the Campbell Road/Chatsworth Gate intersection should also be considered.

**Action 5.3.2.3:** Ensure Action 5.3.2.2 is implemented with support of the City's Risk and Emergency Management Coordinator and Fire and Rescue Service.

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<sup>5</sup> The widening on the corner of Campbell and Ranford can be undertaken at relatively little expense, but care must be taken to minimise disturbance to native vegetation. Re-surfacing with limestone may be more expensive, and would need to be a new capital expense.

**Action 5.3.2.4:** Develop a simple Fire Management/Response Plan in Consultation with the City's Risk and Emergency Management Coordinator and Fire and Rescue Service, which incorporates the above.

### 5.3.3 Management of Phytophthora Dieback Disease

Before any management strategies are put in place that involves movement of soil and materials, it is recommended that a definitive Phytophthora Dieback Disease assessment be undertaken.

Although there are effective treatments to slow the spread of Phytophthora Dieback there is no known method to eradicate the pathogen. It is better to take steps to prevent infestation rather than attempting to control the disease once it has been introduced.

Restrictions on the use of the track between Management Area D and the turf nursery should also be introduced, not only to reduce the deposition of weed seed, but also the risk of introducing dieback disease into the bushland in best condition.

**Action 5.3.3.1:** Undertake dieback disease mapping and interpretation over the Site

**Action 5.3.3.2:** Ensure movement and import of machinery soils and organic materials occurs so as not to risk introduction or spread of dieback.

**Action 5.3.3.3:** Restrict use of the track between Management Area D and the Turf nursery not only to reduce risk of introducing dieback disease into the bushland in best condition but also the deposition of weed seed. It is recommended that a lockable gate be installed to achieve this.

### 5.3.4 Management of physical disturbances

Physical disturbances in this plan include all ground disturbance, excavations, and dumping of fill and rubbish. These types of disturbances create an environment for weeds to establish and spread. The management of disturbances are discussed in each Management Area, as different approaches are required given the specific threat versus the possible impact of removing the dumped sand or rubbish. Generally, if the sand or rubbish material can be removed without creating further disturbance, and would result in restoration of native vegetation, then the material should be removed. Most piles of building material fall into this category, and should be removed where they are located in areas of Good or better condition vegetation.

Removal of sand and rubbish should only occur after a dieback assessment has been conducted, and then only after precautions are taken not to introduce or spread dieback.

Removal of disturbances in the short – medium term should reduce the edge/area ratio in the long-term. Currently the ratio is 0.06. The ratio could be reduced to 0.049

by removing the weeds on Campbell Road fence, and reduced further to 0.042 by also rehabilitating the Completely Degraded spots of disturbance in the bushland.

### 5.3.5 Club Member and Local Community awareness of Site's ecological value

The Gosnells Golf Course is marketed as a bushland course and as such, can promote the outstanding environmental values of the bushland area. This could be as simple as producing a pamphlet or poster to have in the Clubhouse, or even to send out to new members.

A guided walk through the Site in the height of spring wild-flowering could also be a positive promotional event.

These actions will also achieve the aims of the Golf Club's Rehabilitation and Landscaping Plan which discussed the need for an education program for patrons on the importance of 'no-go' zones and the protection of the existing environment (Siemon & May, 1999, pg 18).

**Action 5.3.5.1:** Consider publication of a pamphlet or poster to raise Club Members' awareness and understanding of the ecological values of the Bush Forever Site. This could be linked to a broader environmental pamphlet for the Course.

**Action 5.3.5.2:** Consider holding an event such as a guided wildflower walk through the Site for members and the local community.

### 5.3.6 Site delineation, access control and signage

Access to the bushland is well controlled from street frontages, but there is a need to provide some visible delineation in other parts of the Site, especially around Management Areas C and D where there is machinery access and storage of materials. It is recommended that this delineation take the form of bollards with a 3 – 4 metre cleared track on the more degraded side of the bollards. In this way the bollards shield the bushland from further machinery access, and the track prevents materials being stored on the bushland edge. This approach is recommended in Action 5.4.3.1 (Management Area C) and Action 5.4.4.3 (Management Area D).

It is also suggested that two or three signs on the edge of the thirteenth fairway could be used to signal to golfers that the Bushland is a significant area and that ground disturbance is prohibited.

**Action 5.3.6.1:** Consider delineation of bushland from Management Areas C and D as described in Section 5.4 (See also Actions 5.4.3.1 and 5.4.4.3). This delineation should take the form of bollards and a 3 – 4 metre cleared track inside the bollards. The track should be maintained weed-free through sensitive herbicide applications.

**Action 5.3.6.2:** Consider erection of two or three interpretative signs on the edge of the thirteenth fairway to signal to golfers that the Bushland is a significant area and that ground disturbance is prohibited.

### 5.3.7 Environmental Weed Control (part of bushland restoration)

Environmental weed control is a key part of managing natural areas to maintain and or improve bushland condition and assist natural regeneration. The complex inter-relationships between weeds, native vegetation, disturbances and fire, mean that weed control needs to be planned in concert with other management activities.

Both primary and secondary treatments need to be incorporated into the environmental weed control program. In bush regeneration terms, 'primary treatment' is the first weeding treatment at a Site – the one that removes the 'parent' generation of weeds. As it creates new gaps for emergence of weed stored as seed in the soil, multiple 'secondary treatments' may be required to deplete the weeds sufficiently to allow the pre-existing native vegetation to fill the gaps (Buchanan 1990).

Limited resources for the work dictates that the area subjected to primary treatment by a regeneration team needs to be carefully limited to that area which the team can reliably re-treat multiple times (Bradley 1988). This is because regenerators have found that taking on too large an area can lead to an inability to follow up, which in turn can lead to much higher densities of weeds and a more highly charged weed seedbank than prior to the primary treatment.

For example, on this Site, the control of grass weeds in areas of Good condition bushland to encourage regeneration of native vegetation may lead to an increase of other weeds such as Geraldton Carnation weed (*Euphorbia terracina*) if a well-planned, and adaptive weed control program is not implemented.

This plan makes specific recommendations on environmental weed control priorities and enables a weed control program to be commenced should resources be available. However, a more comprehensive bushland restoration program is not provided as it is considered premature, and beyond the resources available at this time. An indication is provided on where more sophisticated bushland restoration should occur, but this is likely to be something that only occurs in the long-term, given the need to first address environmental weed control priorities for the bushland in Very Good to Pristine Condition.

Another important aspect of weed control is that it must be continued into the long-term if it is to be cost-effective and effectively control the weeds. Natural area managers must acknowledge that initial weed control efforts in an area will be significant, but they must also be supported by long-term control and vigilance.

It is also important that the weed control program is able to be adapted and responsive to changing conditions. For example, the spread of Veldt grass into the bushland in Excellent/Pristine condition may occur rapidly, even with blanket grass-specific spraying if the right environmental conditions exist. These may include a hot summer fire and strong easterly winds blowing the seed into the burnt area.

In light of the above considerations the following environmental weed control program is provided as an optimal, high-standard control program that is subject to resource availability. It should be regarded as a preliminary control program, and able to be adapted on an annual and season-by-season basis to respond to conditions and observations. It is recommended that a suitably qualified and experienced environmental weed manager is engaged to plan and undertake weed control activities for the Site.

Selected details on the control of specific weed species found on the Site are included in Appendix 2, Table 7. These should be used in conjunction with the advice of professional bush environmental weed control operators.

**Action 5.3.7. 1:** Implement all components (1 to 4) of the environmental weed control program described in Section 5.3.8. The highest priority is Component 1 of the program, but all components are necessary in the long-term.

### 5.3.8 Suggested environmental weed control program

This weed control program should be integrated with a more comprehensive bushland restoration program in the long-term. It is presented as four components to allow for implementation as resources permit. It is not necessary to implement the first three components sequentially, but Component 3 (Control of grasses) should not be commenced until a commitment to ongoing grass weed control has been made). Component 4 is a summary of the ongoing weed control that should be maintained once Components 1 to 3 are underway.

#### **Component 1: The aim of this component is to focus on the most invasive weeds in Management Area A**

Remove weed species and infestations that pose a risk to Good or better bushland in Management Area A, and where there is a low risk of re-colonisation by other weeds. This includes:

- i. All woody weeds and bulbous weeds in Management Area A. Undertake control in ways that avoid off-target damage or minimise ground disturbance. Major woody weeds are *Acacia longifolia* and *Leptospermum laevigatum*. A single specimen of *Leptospermum laevigatum* occurs along the western boundary fence. The plant is covered with masses of ripe fruits and it should be removed as a matter of urgency. It is important to ensure that no fruits are left behind to shed seed and all plant material should be removed from Site or moved to an area where it can be burnt. Bulbous weeds in Management Area A include Freesias and Watsonia.
- ii. All woody weeds in Management Area B<sup>6</sup>. Undertake control in ways that avoid off-target damage and minimise ground disturbance.
- iii. Control all Lovegrass infestations. These infestations predominantly border Management Area A, especially on the Campbell and Ranford Road fencelines.

<sup>6</sup> There were no recorded infestations of mapped bulbous weeds in Management Area B (other than Wild Gladiolus)

- iv. Monitor all areas where weeds are removed to control new seedlings and monitor re-colonisation. This can be 7 years for areas where *Acacia longifolia* is removed and 3-4 years for *Leptospermum laevigatum*. It is important that, once the woody weed removal programme commences, all new seedlings/saplings must be removed **before** they have a chance to set seed.
- v. Immediately bag and remove single plant of Paterson's Curse from edge of Management Area D; ensure that all seeds are removed.
- vi. Control of isolated, spot infestations of grass weed can occur in Management Area A, on the basis of resources being available to maintain control in subsequent years.

**Component 2: The aim of this component is to prepare for future possible grass weed control and also control other woody weeds before they become difficult to remove. It could be undertaken with Component 1 if resources permit.**

- vii. **Control all infestations of the selected 'Other Weeds'** (Figure 21) which are known to actively recolonise areas formerly covered in grass weeds in and around areas of Good or better condition vegetation. This includes Pelargonium, Fumaria, Geraldton Carnation, Wild Radish, Castor Oil and Fennel in and bordering Management Areas A and B.
- viii. Control of all other weedy Eucalypts remaining on Site;
- ix. Continue Component 1 weed control
- x. Monitor all areas where weeds are removed to control new seedlings and monitor re-colonisation.

**Component 3: The aim of this component is grassy weed control in Management Area A.**

**Develop and implement a grass weed control program to reduce the spread and impact of veldt grass in Management Area A.**

- xi. Ensure that a commitment can be made to long-term grass weed control (using a grass-selective herbicide). This may involve an intensive, blanket spraying program over a 2-3 year period, and thereafter, more restricted blanket spraying and spot spraying. The cost of blanket spraying is approximately \$800-\$1200/spray/ha, and spot spraying is around \$85-\$120/hour/operator, inclusive of chemicals. As a guide, it is estimated that the initial area requiring blanket spraying would be approximately 3 ha to provide a buffer to the vegetation in Excellent–Pristine condition, with 2 days of spot spraying work through the remainder of **Management Area A**. Blanket spraying would be required for areas of medium density veldt (and high density areas which are adjacent to bushland in Very Good to Pristine condition). Low densities of veldt can be spot sprayed. An alternative approach, may be to only use spot spraying within Management Area A of low density infestations.

This would reduce costs, and may be a cost-effective approach in the short to medium term (i.e. next 5 years).

- xii. Reach agreement on the area to which the program is to apply. It is recommended that this initially be at least the portion of Management Area A that is currently mapped as having a low or medium Veldt Grass density, plus a buffer of at least 10 metres. This is most of Management Area A. Over time, the original area requiring blanket spraying should decrease as more areas can be spot sprayed. This allows the grass weed control to expand into new areas. NB. Wind-blown seeds can travel significant distances so it would be prudent to consider the prevailing wind direction when designing the spraying program.
- xiii. Commence the grass weed control program.
- xiv. Review the results of the control program, and adjust accordingly. Over the long-term, the aim is that the area requiring blanket spraying decreases, so that a broader area can be included in the grass weed control spray.
- xv. Continue Component 1 and 2 weed control

**Component 4: Adapt program based on results of Components 1, 2 and 3 of weed control program.** This means considering the options of further weed control or other bush restoration techniques should be engaged:

- The highest priority is to maintain/improve the vegetation condition of the Very Good to Pristine bushland in Management Area A. Therefore, any spot infestations of woody weeds, bulbous weeds, and Other Weeds in management Area A is a priority.
- A review of the results of grass weed control should also be undertaken. If Grass weed densities or spread is stable or increasing then an assessment should be undertaken as to why the control has not been successful (e.g. spraying at wrong times after veldt has flowered, additional germination of seed after spraying due to late rains, re-invasion of seed due to prevailing winds). If veldt spread or density is decreasing, then the grass weed control program should be reviewed to expand into other areas of bushland in Good and Very Good Condition. This includes Sub Areas A1 and A2 and Management Area B.

To enable the weed control program to be monitored and evaluated, it is recommended that a number of photo monitoring points are established and used to record changes over time. A photo monitoring point is a fixed point on a site used to take photos of the same area over a period of time, usually each year. It is recommended that fixed photo points be established in the following locations:

- Boundary between management Areas A and D on edge of northern track, looking west (Into Management Areas A and D);
- Sand Quarry at point between recolonising native species and grass weeds (into SubArea A2);
- At the current *Watsonia* infestation, looking north into bushland (Management Area A);
- On edge of the practice green to look north-west into Management Sub-Area A2 and Management Area C;

- On edge of fire access track on Campbell Road, looking in both directions along track

These points should be established using fence-droppers in the field, and recorded via GPS. Photos should be taken at approximately the same time each year, subject to seasonal variations.

**Action 5.3.7.2:** Establish photo monitoring points to record changes in bushland condition and effectiveness of weed control in at least five points across the site. Take photos at each of the points every year at approximately the same time (such in late winter for the flowering of annual grasses).

### 5.3.9 Revegetation (planting and direct seeding)

Revegetation with locally indigenous species (planting or direct seeding) is not a priority for management of this Site in the short to medium term. This is because there is significant work to be undertaken in controlling weeds in the bushland in Good to Pristine condition (7.1 ha) and implement all other high and medium priority recommendations of this report.

This plan therefore does not recommend that any planting or direct seeding should be undertaken on the Site in the next 5 years. After this period, active revegetation should only occur:

- 1) Using locally indigenous species found on the Site;
- 2) Using local provenance plant material (seeds and/or cuttings) preferably gathered from the Site; and
- 3) In areas that have been mapped as Degraded or Completely Degraded condition and where there is no adjacent local plant specimens (i.e. no soil store of seeds/plant material that may result in natural regeneration);
- 4) Where at least 5 years of follow-up maintenance of plants and weed control will occur.

In summary, revegetation is not a priority for management of this natural area in the foreseeable future.

## 5.4 Management area strategies and actions

The following recommended actions provide more detail to support the overarching actions discussed in Section 5.3.

### 5.4.1 Management Area A

This area contains large areas of vegetation in Good or better condition and so the management objective of this area is to maintain or improve the condition rating of its bushland. Most of the area has a low density of grass weed cover which is a good indication of the vegetation's health and resilience to negative impacts.

The main locations of disturbances and weeds in this Management Area are on the boundary fire access tracks, the interface with management Area D (entrance storage area), the sand fill area (Sub-Area A.1), and the quarry area (Sub-Area A.2). There are also a number of dumped materials in the bushland in this Management Area, mostly near Management Area D (Entrance storage area).

The actions that apply to Management Area A are listed in Table 1 or are discussed below:

- 1) Focus environmental weed control efforts on Management Area A, as discussed in Section 5.3.7. This includes weed control in the two wood heaps shown in Figure 8.
- 2) Develop and implement a plan for the closure of the sand quarry in Sub area 1 within the next 3 years. This includes removing rubbish, sand piles and other materials stored in and around the quarry area. The quarry acts as a disturbance area and there are large areas of bare sand open to colonisation by grass weeds and native plants. Long-term, annual disturbance will favour the dominance of weeds over native plants.
- 3) Make changes to the perimeter fire-access track and central track as discussed elsewhere in this report; This will have benefits for fire responses and reduce the risk of Phytophthora Dieback introduction and spread.
- 4) Plan and action the sensitive removal of the two bush sand mounds in the bushland near corner of Campbell and Ranford Roads (Shown on Figure 8). This should only occur after dieback interpretation and mapping have occurred, and procedures are in place to ensure that the disease is not introduced to the site, or spread if already present. Removal should occur with the smallest machinery possible so as to avoid any damage to native vegetation (e.g. bobcat). Soil can be placed on fire access track, or alternatively moved off-site<sup>7</sup>. Monitor weeds and regeneration after disturbance.
- 5) Plan and action sensitive removal of white and yellow sand mounds (near maintenance track) from Management Area A.
- 6) Plan and action sensitive removal all building material and rubbish from Management Area A, into Management Area D or off-Site. Care should be taken to avoid soil disturbance; minimise use of heavy machinery.

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<sup>7</sup> The preferred method should be determined after closer assessment in consultation with machinery operators. Either method could be undertaken with little impact on native vegetation or weed spread, depending on the type of machinery used and the style of operation.

- 7) Consider creation of a non-irrigated buffer between the turf nursery area/practice green and the bushland in Management Area A. Spray-drift is inevitable from irrigation and leads to high weed growth around the turf area. It is recommended that a 3 – 4 metre wide non-irrigated track is created around the turf nursery. The track is to be kept weed-free through for example, herbicide use. The track cannot be replaced with native plants as spray drift will always favour the growth of weeds over natives. Bollards may need to be placed between the track and the bushland to delineate this buffer.

**Action 5.4.1.1:** Develop a plan for the closure of the sand quarry in Sub Area 1. An implementation timeframe of 3 years is suggested.

**Action 5.4.1.2:** Plan and action the sensitive removal of the two bush sand mounds in the bushland near corner of Campbell and Ranford Roads.

**Action 5.4.1.3:** Focus environmental weed control efforts on Management Area A, as discussed in Section 5.3.7. This includes weed control in the two wood heaps shown in Figure 8

**Action 5.4.1.4:** Plan and action the sensitive removal all building material and rubbish from Management Area A into Management Area D or off Site.

**Action 5.4.1.5:** Plan and action the sensitive removal of white and yellow sand mounds (near southern track to Maintenance Depot) from Management Area A.

**Action 5.4.1.6:** Consider creation of a non-irrigated buffer between the turf nursery/practice green and bushland. The buffer should be a 3–4 metre wide bare-earth zone, which is maintained weed free through regular herbicide applications. Bollards should also be installed between this track and the bushland.

## 5.4.2 Management Area B

This is a 1.0 ha area of vegetation, of which approximately 0.6 ha is in Good to Very Good condition. The remainder is Degraded to Completely Degraded. Most of the Completely Degraded area is covered in Woody Weeds, namely *Acacia longifolia*, *Eucalyptus botryoides*, *E. camaldulensis*, and *Pinus* sp. A small part of the area assessed as being Degraded or Completely Degraded is planned to be cleared for the realignment of the thirteenth tee by the Club. These works would involve the removal of up to 10 native plants, mostly grass trees, and are considered to be of low impact in the Site, especially if any offset that may be required in the context of any approvals associated with potential realignment works are directed towards active conservation management in other high priority parts of the bushland area (e.g. environmental weed control). The approval of the Bush Forever office will need to be sought prior to these works, or any other works being carried out in the Bush Forever site (i.e. The DPI Bush Forever Office should endorse this Management Plan prior to its implementation).

As discussed in Section 5.3.7, attempting grass weed control in Management Area B is not a priority until grass weed control in Management Area A has been successful, or sufficient resources permit to support a long-term weed control program.

It is important to note the narrow area of Good and Very Good condition vegetation which links Management Area B with Management Area A (Figure 7). This link is vulnerable to further disturbances such as fire and physical trampling. A long-term aim (10 –year horizon) should be to supplement this narrow vegetation band with revegetation. This could be possible following implementation of Action 5.4.3.1.

**Action 5.4.2.1:** Undertake control of woody weeds as a priority in Management Area B

**Action 5.4.2.2:** Ensure that any offset that may be required in the context of any approvals associated with the potential realignment of the thirteenth tee be directed towards active conservation management (e.g. environmental weed control) in high priority locations in Management Area A.

### 5.4.3 Management Area C

This Management Area is 0.77 ha and was assessed mostly as Completely Degraded. Only a 0.07 ha area was assessed as having vegetation in Good condition. Management Area C is used to store corings, grass clippings and other light organic materials.<sup>8</sup> It is bounded by areas of Good to Very Good condition vegetation and therefore care should be taken to prevent encroachment of this area into the bushland.

Management Area C, or part of the area, should be delineated so as to prevent vehicles and machinery moving into the adjacent native vegetation that occurs around and within this area. The delineation should occur using bollards and a 3-4 metre wide track inside Management Area C. The track is to be kept weed free by regular herbicide application. The track provides a clear 3-4 metre wide surface between the area to be actively used for storage of organics and the rest of the Site. Materials should not be dumped against the bollards or on the track so that a clear, manageable zone is maintained between dumped materials and the rest of the Site.

An option exists to locate the bollards on the edge of the Completely Degraded vegetation in Management Area C, or alternatively to create a smaller organics storage areas within Management Area C, preferably in the southern half of the Management Area near the turf nursery. A smaller storage area should still meet the needs of the Club whilst allowing an opportunity to eventually restore and revegetate a wider connection between the bushland in Management Areas A and B.

A further, more long-term option is using Management Area C to consolidate all storage of materials currently within the Site. (i.e. shifting storage from Management

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<sup>8</sup> The Club should be approached in regard to the use of these organic materials for the creation of compost, which could be used in landscaped parts of the Course.

Area D). This would reduce the risk of ongoing impacts directly onto the core management area (Management Area A). This option would require complete removal of the bund and hardstand in Management Area D, active control of weeds and in the longer-term, revegetation. This option has significant cost implementations and changes to Golf Course operating practice, but should be considered as part of negotiations over long-term use in and adjacent to the Site.

**Action 5.4.3.1:** Consider delineation of this Management Area to ensure surrounding bushland is not impacted by movement of machinery. This should involve creation of a 3-4 metre wide track inside a bollarded area. Bollards should also be used to identify the area of Good condition bushland inside Management Area C.

#### 5.4.4 Management Area D

This is the 0.5 ha area at the Ranford Road entrance used for the storage of woody debris, mulched material, building materials, and sand. A 2-metre high sand bund has been established on the Ranford Road and western boundaries of this cleared area. The bund is heavily weed infested and is a source of weed seed for a range of species including Castor Oil and grass weeds. The northern boundary of this area (interface with Management Area A) is less clearly defined and contains a number of native trees and shrubs and is used to store building materials used on the course.

The existence of heavily weed-infested bunds and a poorly defined area for storage of building materials makes management of the adjacent bushland, (part of which is in Excellent Condition) difficult. This is due to the bund hiding weeds from the active use area and also making it difficult to get access to the areas of weeds between the bund and bush.

The following recommended actions aim to reduce the weed burden on the adjacent bushland and delineate the 'active use' zone:

- 1) Implementing one or more of the following options to manage the spread of weeds from the bunded area into Management Area A:
  - a. Option 1: Remove the entire bund from the Site so that Management Area D can be bollarded and a clear 3 -4 metre track is maintained around the active use area. All materials would be stored in the area away from the bollards so as to maintain the 3 -4 metre wide clear area where regular weed control can occur. This option would be best-practice as the weed seed-bank is also removed. However, the cost of this exercise would be significant.
  - b. Option 2: Retain the bund and create a 3 m cleared break around the outside of the bund between the bund and native vegetation. The location of the track is to be kept within the Completely Degraded area and should be as close to the bund as possible. There should be sufficient space for this without the clearing of native plants<sup>9</sup>. In two locations, the bund may need to be re-contoured so as to avoid clearing of native vegetation. Placement of bollards between the track and the bush should also be undertaken. All work need to be

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<sup>9</sup> A Clearing Permit under the Environmental Protection Act would be required if clearing native vegetation.

undertaken in accordance with dieback hygiene procedures and ensure that no spoil material is pushed onto native plants to create the track. Control of weeds on the cleared track and bund would be required 2 -3 times per year.

- c. Option 3: Control weeds over the entire bund. This could allow for planting of local native plants (landscaping) over the bund in the long-term. The bund could be mulched as an interim measure. This option requires moderate ongoing resources and may prove difficult given lack of access between bund and bushland.
- 2) Remove stored building materials and sand piles which occur on the edge of Management Area D in amongst native vegetation. The location of these is shown in Figure 8. Ensure this work is undertaken in accordance with dieback hygiene management procedures and minimises ground disturbance.
- 3) Delineate the active use area in Management Area D from Management Area A. This should be achieved using bollards and a 3 – 4 metre wide track, inside Management Area D. The track should be regularly controlled for weeds.
- 4) Control use and access on the existing track between Management Area A and D. Regular use of this track increases risk of introduction of weeds and dieback to vegetation in Good or better condition. Use of the track should be limited to emergency access only by installing a lockable gate.

While the above four actions all reduce the level of threat posed by weeds and other disturbances on Management Area A, the continued access and storage of materials adjacent to bushland in Excellent condition is a ongoing management concern. Ideally, consideration should be given in to shifting the Course Service Entry and hardstand area off to a location further south-east on Ranford Road on the edge of the bushland area. This is a significant long-term proposition which could avoid costly impacts in the future.

**Action 5.4.4.1:** Implement one of the options suggested in Section 5.4.4 to manage the spread of weeds from the bunded area into Management Area A.

**Action 5.4.4.2:** Remove stored building materials and sand piles which occur on the edge of Management Area D in amongst native vegetation. The location of these is shown in Figure 8. They often occur on the interface between Management Areas A and D. Ensure this work is undertaken in accordance with dieback hygiene management procedures and minimises ground disturbance.

**Action 5.4.4.3:** Delineate the interface of Management Area A and D with bollards.

**Action 5.4.4.4:** Control use and access on the existing track between Management Areas A and D. Use of the track should be limited to emergency access only by installing a lockable gate

**Action 5.4.4.5:** In the long-term, consider shifting the Course service entry and hardstand area off Ranford Road to a location further south-east on Ranford Road on the edge of the bushland area.

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# Appendix 1: Flora taxa recorded on the site

Table 5: Flora taxa recorded in the Site (September – November 8008) – sorted by species

	GENUS	SPECIES	FAMILY	COMMON NAME	Vegetation Community No			
					<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
					Banksia + Pricklybark Low Woodland	Banksias + Sheoak over sedgeland	Sedgeland	Melaleuca preissiana Woodland
1	Acacia	pulchella var pulchella	Mimosaceae	Prickly Moses	*	*	*	*
2	Acacia	stenoptera	Mimosaceae	Narrow Winged Wattle				*
3	Adenanthos	cygnorum	Proteaceae	Woolly Bush	*		*	
4	Adenanthos	obovatus	Proteaceae	Basket Flower				*
5	Allocasuarina	fraseriana	Casuarinaceae	Fraser's Sheoak	*	*		*
6	Allocasuarina	humilis	Casuarinaceae	Dwarf Sheoak	*		*	
7	Anigozanthos	humilis	Haemodoraceae	Cats Paw	*			
8	Aotus	gracillima	Papilionaceae					*
9	Arnocrinum	preissii	Anthericaceae	Preiss's Arnocrinum	*			
10	Astartea	scoparia (prev. fascicularis)	Myrtaceae					*
11	Astroloma	pallidum	Epacridaceae	Kick Bush	*?			
12	Astroloma	xerophyllum	Epacridaceae			*		
13	Austrostipa (prev. Stipa)	compressa	Poaceae	Annual Speargrass		*	*	
14	Banksia	attenuata	Proteaceae	Candle Banksia	*			
15	Banksia	ilicifolia	Proteaceae	Holly Leaved Banksia	*			
16	Banksia	menziesii	Proteaceae	Firewood Banksia	*	*	*	
17	Baumea	juncea	Cyperaceae	Bare Twig Rush				*
18	Boronia	dichotoma	Rutaceae					*
19	Boronia	ramosa	Rutaceae		*			
20	Bossiaea	eriocarpa	Papilionaceae	Common Brown Pea	*		*	
21	Burchardia	bairdiae	Colchicaceae					*
22	Burchardia	congesta	Colchicaceae	Milk Maid	*		*	*

	GENUS	SPECIES	FAMILY	COMMON NAME	Vegetation Community No			
					1	2	3	4
					Banksia + Pricklybark Low Woodland	Banksias + Sheoak over sedgeland	Sedgeland	Melaleuca preissiana Woodland
23	Caesia	micrantha	Anthericaceae		*			
24	Caladenia	flava	Orchidaceae	Cowslip Orchid	*			*
25	Calytrix	angulata	Myrtaceae	Yellow Starflower	*		*	
26	Calytrix	fraseri	Myrtaceae	Pink Summer Caltrix	*			
27	Cassytha	flava	Lauraceae	Dodder Laurel	*			*
28	Conostephium	preissii	Epacridaceae	Preiss's pearlflower	*?		*?	
29	Conostylis	aculeata	Haemodoraceae	Cottonhead/Prickly Conostylis	*			
30	Conostylis	juncea	Haemodoraceae		*		*	*
31	Cyathochaeta	avenacea	Cyperaceae					*
32	Cyathochaeta	teretifolia P3	Cyperaceae					*
33	Dampiera	linearis	Goodeniaceae	Common Dampiera	*		*	*
34	Dasyopogon	bromeliifolius	Dasyopogonaceae	Pineapple Bush	*		*	*
35	Daviesia	physodes	Papilionaceae					*
36	Daviesia	triflora	Papilionaceae		*			
37	Desmocladius (prev. Loxocarya)	fasciculatus	Restionaceae				*	
38	Desmocladius (prev. Loxocarya)	flexuosus	Restionaceae		*		*	
39	Drosera	erythrorhiza	Droseraceae	Red Ink Sundew	*			
40	Drosera	glanduligera	Droseraceae	Scarlet or Pimpernel Sundew				*
41	Drosera	menziesii spp. penicillaris	Droseraceae		*			
42	Drosera	porrecta (prev. stolonifera)	Droseraceae	Leafy Sundew				*
43	Elythranthera	brunonis	Orchidaceae	Purple Enamel Orchid				*
44	Eremaea	pauciflora	Myrtaceae		*		*	
45	Eucalyptus	marginata	Myrtaceae	Jarrah				*
46	Eucalyptus	todtiana	Myrtaceae	Prickly Bark	*	*		
47	Gastrolobium (prev. Nemcia)	capitatum (prev. capitata)	Papilionaceae		*		*	
48	Gompholobium	tomentosum	Papilionaceae	Hairy Yellow Pea	*		*	*

	GENUS	SPECIES	FAMILY	COMMON NAME	Vegetation Community No			
					1	2	3	4
					Banksia + Pricklybark Low Woodland	Banksias + Sheoak over sedgeland	Sedgeland	Melaleuca preissiana Woodland
49	Haemodorum	spicatum	Haemodoraceae	Bloodroot				*
50	Hemiandra	pungens	Lamiaceae	Snake Bush			*	*
51	Hibbertia	hypericoides	Dilleniaceae	Yellow Buttercups	*		*	
52	Hibbertia	subvaginata	Dilleniaceae		*		*	*
53	Hovea	trisperma	Papilionaceae	Common Hovea		*	*	
54	Hypocalymma	angustifolium	Myrtaceae	White Myrtle				*
55	Isotropis	cuneifolia	Papilionaceae	Granny Bonnets	*			
56	Jacksonia	furcellata	Papilionaceae	Grey Stinkwood	*			*
57	Kunzea	glabrescens (prev. ericifolia)	Myrtaceae	Spearwood	*			*
58	Laxmannia	squarrosa	Anthericaceae	Paper Lily	*	*	*	
59	Lechenaultia	floribunda	Goodeniaceae	Free-Flowering Leschenaultia	*			
60	Lepidosperma	longitudinale	Cyperaceae	Pithy Sword-sedge				*
61	Lepidosperma	squamatum (prev. angustatum)	Cyperaceae	Common Lepidosperma	*?		*?	
62	Leptocarpus	diffusus	Restionaceae					*
63	Leptomeria	sp	Santalaceae				*?	
64	Leucopogon	australis	Epacridaceae	Spiked Beard-heath				*
65	Leucopogon	polymorphous	Epacridaceae		*?			
66	Leucopogon	propinquus	Epacridaceae		*			
67	Lomandra	hermaphrodita	Dasyopogonaceae		*?		*?	
68	Lomandra	nigricans	Dasyopogonaceae		*	*		
69	Lomandra	preissii	Dasyopogonaceae		*			
70	Lomandra	sp (grey leaf)	Dasyopogonaceae				*?	
71	Lyginia	barbata	Restionaceae		*		*	
72	Lyginia	imberbis	Restionaceae		*			
73	Lysinema	ciliatum	Epacridaceae	Curry Flower	*			
74	Macrozamia	riedlei	Zamiaceae	Zamia Palm	*			
75	Melaleuca	preissiana	Myrtaceae	Modong or Stout Paperbark				*

	GENUS	SPECIES	FAMILY	COMMON NAME	Vegetation Community No			
					1	2	3	4
					Banksia + Pricklybark Low Woodland	Banksias + Sheoak over sedgeland	Sedgeland	Melaleuca preissiana Woodland
76	Melaleuca	seriata	Myrtaceae		*			
77	Melaleuca	thymoides	Myrtaceae				*	*
78	Melaleuca	trichophlla	Myrtaceae		*		*	
79	Microtis	media (prev. unifolia)	Orchidaceae	Common Mignonette Orchid	*			
80	Neurachne	alopecuroidea	Poaceae	Foxtail Mulga Grass	*		*	
81	Nuytsia	floribunda	Loranthaceae	W.A Christamas Tree	*		*	
82	Opercularia	hispidula	Rubiaceae	Hispid Stinkweed				*
83	Patersonia	occidentalis	Iridaceae	Purple Flag		*	*	
84	Pericalymma	ellipticum	Myrtaceae	Swamp Tea Tree				*
85	Petrophile	linearis	Proteaceae	Pixie Mops				*
86	Philothea (prev. Eriostemon)	spicata	Rutaceae	Pepper and Salt	*			*
87	Phlebocarya	ciliata	Haemodoraceae		*		*	*
88	Phlebocarya	filifolia	Haemodoraceae		*		*	
89	Pimelea	leucantha	Thymelaeaceae				*	
90	Podolepis	gracilis	Asteraceae	Slender Podolepis			*	
91	Pterostylis	recurva	Orchidaceae	Jug Orchid				*
92	Pterostylis	vittata	Orchidaceae	Banded Greenhood	*			
93	Pultenaea	ochreatea	Papilionaceae				*	*
94	Pyrorchis	nigricans	Orchidaceae	Red Beak Orchid	*			*
95	Regelia	inops	Myrtaceae				*	*
96	Scaevola	repens	Goodeniaceae	Prostate Scaevola	*			
97	Schoenus	curvifolius	Cyperaceae		*		*	
98	Schoenus	efoliatus (prev. rodwayanus)	Cyperaceae			*	*	*
99	Scholtzia	involucrata	Myrtaceae	Spiked Scholtzia	*		*	
100	Siloxerus	humifusus	Asteraceae	Procumbent Siloxerus		*		
101	Stirlingia	latifolia	Proteaceae	Blue Boy	*			
102	Stylidium	brunonianum	Stylidiaceae	Pink Fountain Trigger Plant				*



Table 6: Flora taxa recorded in the Site (September – November 2008) – sorted by family

	FAMILY	GENUS	SPECIES	COMMON NAME	Vegetation Community N°			
					1	2	3	4
					Banksia + Pricklybark Low Woodland	Banksias + Sheoak over sedgeland	Sedgeland	Melaleuca preissiana Woodland
<b>Cycads</b>	Zamiaceae	Macrozamia	riedlei	Zamia Palm	*			
<b>Mono-cots</b>	Anthericaceae	Arnocrinum	preissii	Preiss's Arnocrinum	*			
		Caesia	micrantha		*			
		Laxmannia	squarrosa	Paper Lily	*	*	*	
		Thysanotus	patersonii	Twining Fringe lily			*	
		Thysanotus	manglesianus		*			
		Tricoryne	elatior	Yellow Autumn lily	*		*	
	Colchicaceae	Burchardia	bairdiae					*
		Burchardia	congesta	Milk Maid	*		*	*
	Cyperaceae	Baumea	juncea	Bare Twig Rush				*
		Cyathochaeta	avenacea					*
		Cyathochaeta	teretifolia <b>P3</b>					*
		Lepidosperma	longitudinale	Pithy Sword-sedge;				*
		Lepidosperma	squamatum (prev. angustatum)	Common Lepidosperma	*?		*?	
		Schoenus	curvifolius		*		*	
		Schoenus	efoliatus (prev. rodwayanus)			*	*	*
	Dasypogonaceae	Dasypogon	bromeliifolius	Pineapple Bush	*		*	*
		Lomandra	hermaphrodita		*?		*?	

					<b>Vegetation Community N°</b>			
					<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
	FAMILY	GENUS	SPECIES	COMMON NAME	Banksia + Pricklybark Low Woodland	Banksias + Sheoak over sedgeland	Sedgeland	Melaleuca preissiana Woodland
		Lomandra	nigricans		*	*		
		Lomandra	preissii		*			
	Haemod- oraceae	Anigozanthos	humilis	Cats Paw	*			
		Conostylis	aculeata	Cottonhead/Prickly Conostylis	*			
		Conostylis	juncea		*		*	*
		Haemodorum	spicatum	Bloodroot				*
		Phlebocarya	ciliata		*		*	*
		Phlebocarya	filifolia		*		*	
	Iridaceae	Patersonia	occidentalis	Purple Flag		*	*	
	Orchidaceae	Caladenia	flava	Cowslip Orchid	*			*
		Elythranthera	brunonis	Purple Enamel Orchid				*
		Microtis	media (prev. unifolia)	Common Mignonette Orchid	*			
		Pterostylis	recurva	Jug Orchid				*
		Pterostylis	vittata	Banded Greenhood	*			
		Pyrorchis	nigricans	Red Beak Orchid	*			*
		Thelymitra	sp.	A Sun Orchid	*?			
	Poaceae	Austrostipa (prev. Stipa)	compressa	Annual Speargrass		*	*	
		Neurachne	alopecuroidea	Foxtail Mulga Grass	*		*	
	Restionaceae	Desmocladus (prev.	fasciculatus				*	

					<b>Vegetation Community N°</b>			
					<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
	FAMILY	GENUS	SPECIES	COMMON NAME	Banksia + Pricklybark Low Woodland	Banksias + Sheoak over sedgeland	Sedgeland	Melaleuca preissiana Woodland
		Loxocarya)						
		Desmocladus (prev. Loxocarya)	flexuosus		*		*	
		Leptocarpus	diffusus					*
		Lyginia	barbata		*		*	
		Lyginia	imberbis		*			
	Xanthorrhoeaceae	Xanthorrhoea	preissii	Grasstree	*	*	*	*
<b>Dicots</b>	Apiaceae	Trachymene	pilosa	Native Parsnip	*			*
	Asteraceae	Podolepis	gracilis	Slender Podolepis			*	
		Siloxerus	humifusus	Procumbent Siloxerus		*		
		Waitzia	suaveolens	Fragrant Waitzia	*			
	Casuarinaceae	Allocasuarina	fraseriana	Fraser's Sheoak	*	*		*
		Allocasuarina	humilis	Dwarf Sheoak	*		*	
	Dilleniaceae	Hibbertia	hypericoides	Yellow Buttercups	*		*	
		Hibbertia	subvaginata		*		*	*
	Droseraceae	Drosera	erythrorhiza	Red Ink Sundew	*			
		Drosera	glanduligera	Scarlet or Pimpernel Sundew				*
		Drosera	menziesii spp.		*			

					<b>Vegetation Community N°</b>			
					<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
FAMILY	GENUS	SPECIES	COMMON NAME	Banksia + Pricklybark Low Woodland	Banksias + Sheoak over sedgeland	Sedgeland	Melaleuca preissiana Woodland	
		penicillaris						
	Drosera	porrecta (prev. stolonifera)	Leafy Sundew				*	
Epacridaceae	Astroloma	pallidum	Kick Bush	*?				
	Astroloma	xerophyllum			*			
	Conostephium	preissii	Preiss's pearlflower	*?		*?		
	Leucopogon	australis	Spiked Beard-heath				*	
	Leucopogon	polymorphous		*?				
	Leucopogon	propinquus		*				
	Lysinema	ciliatum	Curry Flower	*				
Goodeniaceae	Dampiera	linearis	Common Dampiera	*		*	*	
	Lechenaultia	floribunda	Free-Flowering Leschenaultia	*				
	Scaevola	repens	Prostate Scaevola	*				
Lamiaceae	Hemiandra	pungens	Snake Bush			*	*	
Lauraceae	Cassytha	flava	Dodder Laurel	*			*	
Loranthaceae	Nuytsia	floribunda	W.A Christmas Tree	*		*		
Mimosaceae	Acacia	pulchella var pulchella	Prickly Moses	*	*	*	*	
	Acacia	stenoptera	Narrow Winged Wattle				*	
Myrtaceae	Astartea	scoparia (prev. fascicularis)					*	

					<b>Vegetation Community N°</b>			
					<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
	FAMILY	GENUS	SPECIES	COMMON NAME	Banksia + Pricklybark Low Woodland	Banksias + Sheoak over sedgeland	Sedgeland	Melaleuca preissiana Woodland
		Calytrix	angulata	Yellow Starflower	*		*	
		Calytrix	fraseri	Pink Summer Caltrix	*			
		Eremaea	pauciflora		*		*	
		Eucalyptus	marginata	Jarrah				*
		Eucalyptus	todtiana	Prickly Bark	*	*		
		Hypocalymma	angustifolium	White Myrtle				*
		Kunzea	glabrescens (prev. ericifolia)	Spearwood	*			*
		Melaleuca	preissiana	Modong or Stout Paperbark				*
		Melaleuca	seriata		*			
		Melaleuca	thymoides				*	*
		Melaleuca	trichophlla		*		*	
		Pericalymma	ellipticum	Swamp Tea Tree				*
		Regelia	inops				*	*
		Scholtzia	involutrata	Spiked Scholtzia	*		*	
	Papilionaceae	Aotus	gracillima					*
		Bossiaea	eriocarpa	Common Brown Pea	*		*	
		Daviesia	physodes					*
		Daviesia	triflora		*			
		Gastrolobium (prev. Nemcia)	capitatum (prev. capitata)		*		*	
		Gompholobium	tomentosum	Hairy Yellow Pea	*		*	*
		Hovea	trisperma	Common Hovea		*	*	
		Isotropis	cuneifolia	Granny Bonnets	*			
		Jacksonia	furcellata	Grey Stinkwood	*			*

					<b>Vegetation Community N°</b>			
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FAMILY	GENUS	SPECIES	COMMON NAME	Banksia + Pricklybark Low Woodland	Banksias + Sheoak over sedgeland	Sedgeland	Melaleuca preissiana Woodland	
	Pultenaea	ochreatea				*	*	
Proteaceae	Adenanthos	cygnorum	Woolly Bush	*		*		
	Adenanthos	obovatus	Basket Flower / Swamp Jugflower				*	
	Banksia	attenuata	Candle Banksia	*				
	Banksia	ilicifolia	Holly Leaved Banksia	*				
	Banksia	menziesii	Firewood Banksia	*	*	*		
	Petrophile	linearis	Pixie Mops				*	
	Stirlingia	latifolia	Blue Boy	*				
Rubiaceae	Opercularia	hispidula	Hispid Stinkweed				*	
Rutaceae	Boronia	dichotoma					*	
	Boronia	ramosa		*				
	Philotheca (prev. Eriostemon)	spicata	Pepper and Salt	*			*	
Santalaceae	Leptomeria	sp				*?		
Stylidiaceae	Stylidium	brunonianum	Pink Fountain Trigger Plant				*	
	Stylidium	piliferum	Common Butterfly Trigger Plant				*	
	Stylidium	repens	Matted Trigger Plant		*	*		
Thymelaeaceae	Pimelea	leucantha				*		

# Appendix 2: Specific weed control notes

This section provides additional advice specific to the Site. It should be read in conjunction with Section 4.6 and 5.3.

**Table 7: Specific weed control advice for the Site**

Weed (common name)	Control notes
Castor Oil	Castor Oil, <i>Ricinus communis</i> , (weeds other) hand-pull and saw larger plants, need to repeat control each year for +-7 years.
Eucalypts (weedy eastern states species)	Weedy Eucalypts are not so pressing to control, but any saplings should be cut and painted with Roundup, before they get too big so as to require chainsaws/tree lopper. A few small seedlings were seen.
Fennel	Control of Fennel. Slash existing clumps and spot spray regrowth with Glyphosate
Freesias,	Control of freesias is a priority –Only occurs in a small clump (See Figure 19). Control before infestations grow or new infestations are created. Spot spray Freesia and Soursob with Metsulfuron Methyl. Control Watsonia by digging carefully and removing all plant material.
Fumaria	Control of Fumaria is a priority. Currently confined to edges. Difficult to control, and given that infestations are small at this stage, best to hand pull.
Geraldton Carnation Weed	Euphorbia (Geraldton Carnation weed) control is a priority. Relatively small infestations (mapped); hand pull is best control method at this stage. A specific herbicide can be used when seedlings are very small (less than 7 cm).
Lovegrass	Lovegrass is a priority weed that will need to be controlled with Glyphosate (it does not respond to grass-selective herbicides). Hit with Glyphosate when controlling other weeds.
Olive	Cut at ground level and paint stump with undiluted Glyphosate.
Paterson's Curse	Paterson's Curse, <i>Echium plantagineum</i> , only occurs as a single plant. Remove immediately by hand. Ensure all seeds are removed. Monitor location next spring for new germinants and spray with Glyphoste if found.

Weed (common name)	Control notes
Pigface	Pigface, <i>Carpobrotus edulis</i> , only occurs as a few plants. Remove by hand.
Rose Pelargonium	Rose Pelargonium, <i>Pelargonium capitatum</i> , can be removed by hand but it will reshoot from pieces of root left behind. Spot spray with Glyphosate or Metsulfuron Methyl if there is no chance of off-target damage. However, if it is growing amongst natives that will be damaged by spraying, paint a selection of leaves with undiluted Glyphosate.
Soursob	Control of soursob is a priority –Only occurs in a small clumps around Management Area D. Control before infestations grow or new infestations are created. Spot spray Soursob with Metsulfuron Methyl.
Sydney Golden Wattle, <i>Acacia longifolia</i>	Remove all plants from Site. Mature plants can be sawn at ground level, no need to brush with Roundup. Then, because seeds have a 7-year viability, either: <ul style="list-style-type: none"> <li>o pull seedlings each year for 7 years, OR</li> <li>o Pull (and saw larger plants) every 2 or 3 years (because plants with grow too large to pull). It is important to ensure that seedlings are not left to flower and set seed.</li> </ul>
Veldt grass	See section 5.3.8
Victorian Tea Tree,	<i>Leptospermum laevigatum</i> ; Only one specimen (Campbell Road fire track), Its removal is a priority. The plant is covered with masses of ripe fruits. It is important to ensure that no fruits are left behind to shed seed, and all plant material should be removed from Site or moved to an area where it can be burnt
Watsonia	Control of watsonia is a priority –Only occurs in a small clump (See Figure 19). Control before infestations grow or new infestations are created. Control Watsonia by digging carefully and removing all plant material.