

Bush Forever Site 51 Reserve 54021

Environmental Management Plan 2024- 2034



Prepared for: Department of Biodiversity, Conservation and Attraction
(DBCA)
Perth Hills District
District Nature Conservation Program

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June 2024

EXECUTIVE SUMMARY

This report has been prepared by Del Botanics Environmental Consulting on behalf of the Department of Biodiversity, Conservation and Attractions to provide a framework for the management of Bush Forever Site 51 (Reserve Number 54021), which will be referred to as BF51 for the purpose of this report. The site is located at 27, 28, 29 and 30 White Road, Orange Grove. The subject area is approximately 8.0 hectares.

The Management Plan has been developed to guide the management of the reserve based on its current condition and threats previously identified in detailed assessments of the site.

The Management Plan has been based on a duration of 10 years, which may be reviewed as DBCA resourcing or maintenance practices change. The management actions recommended in this plan include maintenance, control of introduced flora and fauna species, and rehabilitation of the site.

STATEMENT OF LIMITATIONS

This environmental report has been prepared in accordance with the scope of services set out in the original quotation. In preparing the report, Del Botanics Environmental Consulting has relied on data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the report. Del Botanics Environmental Consulting has not verified the accuracy or completeness of the data to the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report are based in whole or in part on the data, those conclusions are contingent upon the accuracy and completeness of the data. Del Botanics Environmental Consulting will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, unavailable, misrepresented or otherwise not fully disclosed.

In accordance with the scope of services, Del Botanics Environmental Consulting has relied on the data and have conducted environmental field monitoring in the preparation of the report. The nature and extent of monitoring conducted is described in the report. Within the limitations imposed by the scope of services, the monitoring and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care. No other warranty, express or implied, is made.

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1. INTRODUCTION

1.1 BACKGROUND

This report has been prepared by Del Botanics Environmental Consulting on behalf of the Department of Biodiversity, Conservation and Attractions to provide a framework for the management of Bush Forever Site 51, (Reserve Number 54021), Orange Grove. The site retains significant biodiversity values, with vegetation predominantly in Very Good condition.

Section 33(3) of the CALM Act provides for the management of reserve without an existing management plan according to ‘necessary operations’ (for nature reserves and marine nature reserves) or ‘compatible operations’ (for national parks, conservation parks and marine parks). However, having a management plan in place encourages strategic management actions to be undertaken. Basing the management plan on detailed and current survey information ensures that investment in management is made to protect priority areas and values and to target threats with the greatest potential to impact biodiversity values.

Under section 54 of the Conservation and Land Management Act 1984 (CALM Act), the controlling bodies of the ‘Conservation Commission’ and the ‘Marine Parks and Reserves Authority’ are responsible for the preparation of management plans and the review of expiring plans for all lands and waters vested in them.

1.2 PURPOSE OF THIS REPORT

The objective of the Management Plan is to provide a framework for management. The plan prioritises management activities in order of importance and considers factors such as level of threat and achievability of eradication. The indicative costs were calculated to provide estimates for budgeting and grant applications, however, weed control in urban areas is an on-going activity. Costs, priorities and timeframes will be subject to DBCA resources available in any given year.

1.3 ASSOCIATED DOCUMENTS

The Management Plan incorporates detailed information previously collected for the site including the following reports:

- Detailed Flora and Vegetation Assessment (Del Botanics Environmental Consulting, 2023)
- Weed Assessment (Del Botanics Environmental Consulting, 2022)

- Feral Bee Assessment (Natsync Environmental, 2023)
- Phytophthora Dieback Assessment (Bark Environmental, 2022)

The Management Plan brings together information from each of these surveys and provides guidance on the management and maintenance activities required within the Bush Forever Site 51.

1.4 PREVIOUS WORKS UNDERTAKEN

DBCA have undertaken a variety of environmental management works over the past 5 years. The works carried out are provided in **Table 1** below. Significant weed control of woody weeds including Victorian tea tree and Eastern states Eucalyptus and wattles has been undertaken.

Table 1: Previous works undertaken onsite

Year Works Undertaken	Activities
2018	Threatened Ecological Community Assessment
2020-ongoing	Weed control, rubbish removal, Fire break maintenance
2022	Detailed Flora and Vegetation Survey
2022	Dieback Assessment
2023	Weed Assessment
2023	Feral Bee Survey

1.5 CONTRACTOR CONTACTS INFORMATION

The information provided in **Table 2** below has been compiled by DBCA to list contractors, who have undertaken works within DBCA Nature Reserves.

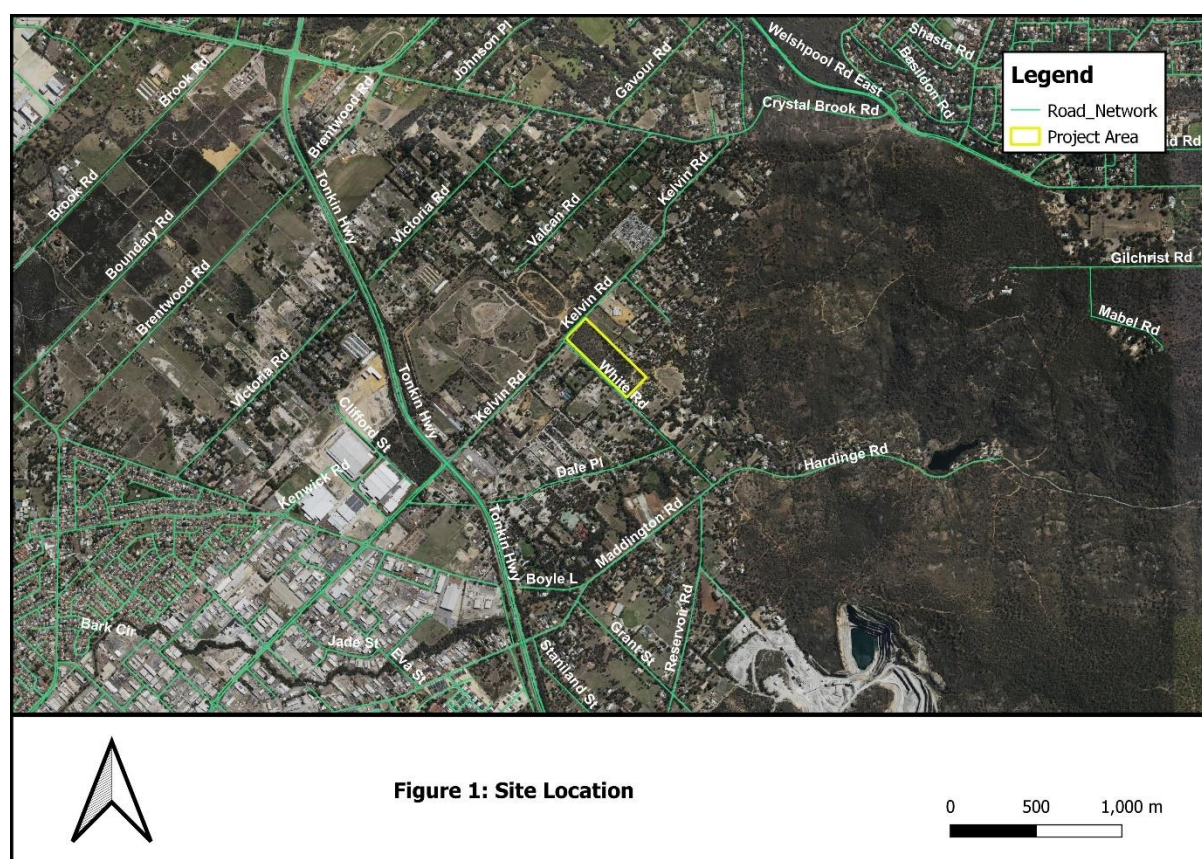
Table 2: Contractor's information

Company Details	Contact Person	Activities
Bark Environmental barkenv@gmail.com 0400 208 582	Bruno	Pc Dieback Survey's and Management
Del Botanics Environmental Consulting delbotanics@bigpond.com 0427 700 496	Kylie Del Fante	Flora and Vegetation Survey's/Weed Assessments/Revegetation Plans/Threatened Flora Surveys/BC Habitat Assessments/Seed Collection
Natsync Environmental joe@natsync.com.au 0418 918 367	Joe Tonga	Feral Bee Survey/Bee Management and Control

Tractoman tractomaninfo@gail.com 0403 488 270	Brett Walton	Weed Control/Reserve Management
Total Tree Services 0417 699 397 totaltreesservices@bigpond.com		Tree falling/mulching/removal

1.6 LOCATION

The land covered by this management plan is classified as an “A class Nature Reserve”, known as Bush Forever Site 51 (Reserve Number 54021), which is vested in the Department of Biodiversity, Conservation and Attractions (DBCA). It will be referred to as BF51 for the purpose of this report. The site is shown in **Figure 1** below.



The site is approximately 8.0ha of largely intact bushland. It is located at the corner of Kelvin Rd and White Rd in Orange Grove. The bushland is currently managed by DBCA as a reserve for the purpose of conservation.

1.7 BIOREGION

The Biogeographic Regionalisation of Australia (IBRA) divides Australia into 89 bioregions based on major biological and geographical/geological attributes. Western Australia has 26 biogeographic regions and 53 subregions based on dominant landscape characteristics of climate, lithology, geology, landform, and vegetation. The study area is in the Swan Coastal Plain System (SWA) subregion, The Swan Coastal Plain bioregion is described as a low-lying coastal plain, mainly covered with woodlands. It is dominated by Banksia or Tuart on sandy soils, *Casuarina obesa* on outwash plains, and paperbark in swampy areas. In the east, the plain rises to duricrusted Mesozoic sediments and is dominated by Jarrah woodland (Williams and Mitchell 2001).

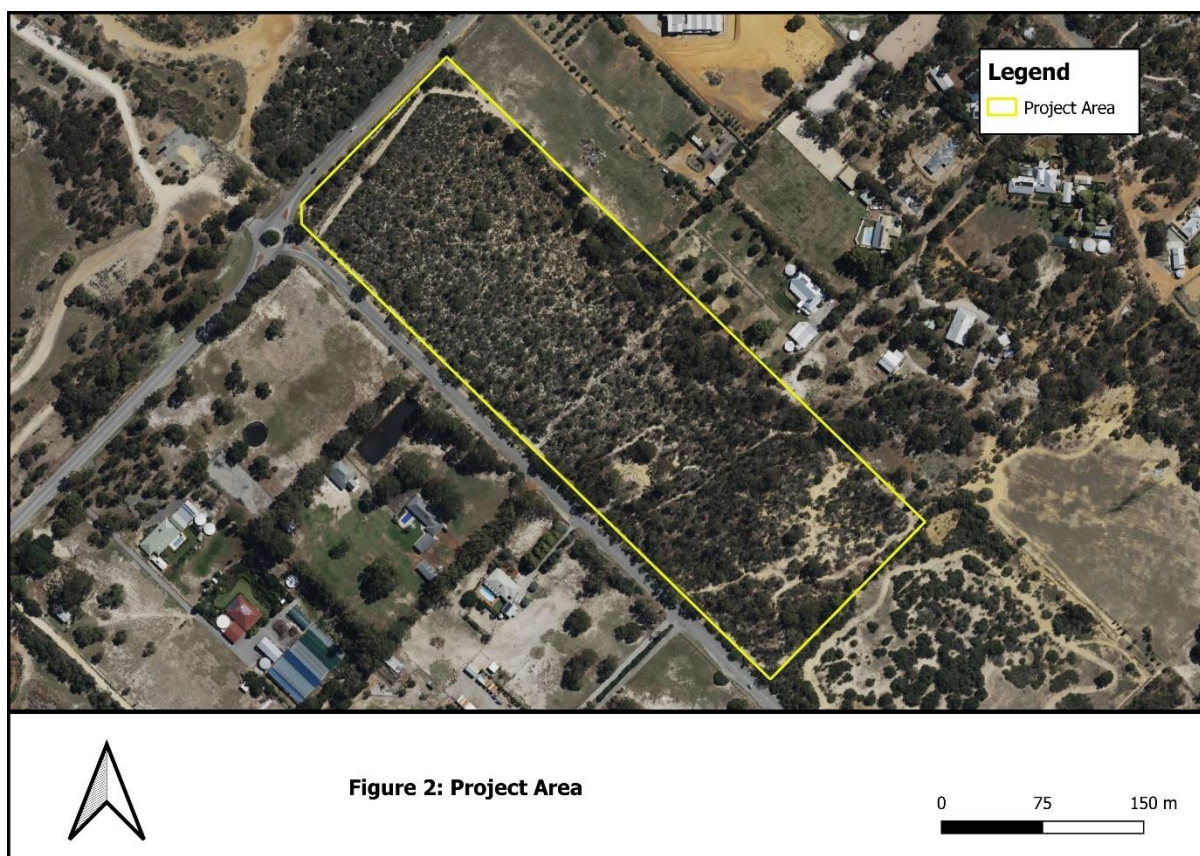
1.8 REGIONAL ECOLOGICAL LINKAGES

The Perth Regional Ecological Linkages dataset represents broad linkages between regionally significant patches of vegetation within the Perth Metropolitan Area. Bush Forever Site 51 lies within a mapped regional ecological linkage.

1.9 CURRENT LAND USES

BF51 is zoned Parks and Recreation under the City of Gosnells Local Planning Scheme 24. Private property adjoins the reserve to the east and north, with the southern and western edges of the reserve bound by roads. The project area is shown in **Figure 2** below.

The local area contains industrial and semi-rural landuses. The site previously contained a residence (which has been removed) and associated gardens which has resulted in severe but very localised disturbance. Private properties to the north currently support semi-rural landuses including residences and carrying stock, such as horses. The external boundary of the reserve is well fenced to exclude livestock and vehicles and limit pedestrian access. Firebreaks are installed around the perimeter of the reserve.



1.10 CLIMATE

The closest Bureau of Meteorology (BoM) weather station is approximately 5.3km southwest of the survey area in Gosnells (Site No.009106). The long-term mean minimum temperature for Gosnells ranged from 8.8°C in July to 18.8°C in February between 1991 and 2020. The long-term mean maximum temperature ranged from 18.7°C in July to 33°C in January and February between 1991 to 2020 (Bureau of Meteorology, 2020).

The long-term annual average rainfall is 736.4 millimetres (mm) from 1991 to 2020 (Bureau of Meteorology, 2020).

1.11 LANDFORM, TOPOGRAPHY AND SOILS

BF51 occurs on the Swan Coastal Plain (SCP). The SCP extends westwards from the lower edge of the Darling Scarp. The terrain is generally low lying, made up of alluvial and aeolian deposits, including the Guildford, Forrestfield and Southern River soils. In general, the soils become more fertile on the east of the plain, in the zone of transition between the Swan Coastal Plain and the Darling Scarp, locally identified as the 'foothills' (Churchward and McArthur, 1980).

Soil-landscape system mapping of Western Australia describes broad soil and landscape characteristics from regional to local scales. The survey area is within the Forrestfield System which is described as undulating foot slopes of the Darling and Whicher scarps. Duplex sandy gravels, pale deep sands, and grey, deep sandy duplexes. Vegetation found on this soil complex consists of woodland of *Eucalyptus marginata*, *Corymbia calophylla*, *Eucalyptus wandoo* and some *Banksia grandis* (Department of Agriculture and Food WA, 2012).

1.12 FLORA AND VEGETATION

The survey area lies in the Drummond Botanical Subdistrict within the Southwest Botanical Province as described by Beard (1990). Flora composition has been described by Beard (1990) as predominantly consisting of Banksia Low Woodlands on leached sands with Melaleuca swamps where ill drained and Woodlands of *Eucalyptus* spp. on less leached soils.

1.12.1 Vegetation Complex

The term vegetation complex describes pre-1750 distribution of vegetation communities of the southwest forest region of Western Australia as described by Mattiske and Havel (1998). This was part of the biodiversity assessment for the comprehensive regional assessment for the southwest forest region.

Based on this mapping at a scale of 1:50,000, the Department of Primary Industries and Regional Development (DPIRD) has compiled a list of vegetation extent and types across WA. This mapping suggests the survey area is part of the Forrestfield Complex.

The Forrestfield Vegetation Complex is described as open forest of *Corymbia calophylla* (Marri) - *Eucalyptus wandoo* (Wandoo) - *Eucalyptus marginata* (Jarrah) to open forest of *Eucalyptus marginata* (Jarrah) - *Corymbia calophylla* (Marri) - *Allocasuarina fraseriana* (Sheoak) and Banksia species. With fringing woodland of *Eucalyptus rudis* (Flooded Gum) occurring in the gullies that dissect this landform (WALGA, 2021).

1.12.2 Local Vegetation Community

Del Botanics Environmental Consulting (2023) described the vegetation community within BF51 as ‘Low woodland of *Banksia attenuata*, *Banksia menziesii* and *Allocasuarina* spp., with occurrences of *Eucalyptus marginata* over shrubland of *Banksia sessilis*, *Hibbertia hypericoides* and *Eremaea pauciflora* over open sedgeland of *Lyginia barbata* and *Mesomelaena pseudostygia* over open grassland of **Briza maxima* and **Ehrharta* spp.’

1.12.3 Fauna

Feral bees have been recorded visiting the reserve, but no hives were located during the Feral Bee Assessment in October 2023 (Natsync, 2023). The survey recorded a number of animal species utilising BF51, including Kangaroos, Echidna, a Rufous Whistler and Ducks nesting in tree hollows. Signs of historic use by Foxes were also recorded. During the Flora and Vegetation survey, a Bobtail Lizard was also recorded.

A comprehensive fauna survey has not been undertaken on this reserve.

1.13 SIGNIFICANT FLORA, FAUNA AND VEGETATION

1.13.1 Significant Flora

During the Detailed Flora and Vegetation survey undertaken in spring 2023 one conservation significant species, *Conospermum undulatum*, was recorded within the reserve. The Wavy-leaved Smokebush is classified as Vulnerable under ICUN Red list criteria and listed as such under the *Environmental Protection and Biodiversity Conservation Act* (EPBC Act), 1999. *Conospermum undulatum* is also listed as Threatened under the *Biodiversity Conservation Act* (BC Act), 2016. It is geographically restricted to a range of less than 20km² and is subject to ongoing threats such as land fragmentation, and degradation, inappropriate fire regimes, impacts from recreational activities, and grazing by rabbits.

1.13.2 Significant Fauna

The site provides high value forage habitat for Carnabys' Cockatoo and may also be a valuable remnant for Baudins' Cockatoo and Forest Red-tailed Black Cockatoo. Key forage species within the reserve include *Banksia attenuata*, *Banksia menziesii*, *Banksia sessilis* and *Eucalyptus marginata*.

A Black Cockatoo Habitat Assessment has not been undertaken at this reserve.

1.13.3 Threatened Ecological Communities

A survey undertaken in 2018 by DBCA confirmed the presence of floristic community type 20a *Banksia attenuata* woodlands over species rich dense shrublands. The recent Flora and Vegetation survey undertaken at the reserve (Del Botanics, 2023) noted that the remnant vegetation within the BF51 site is likely to represent the EPBC listed Endangered ecological community *Banksia Woodlands of the Swan Coastal Plain*. The species composition, size and condition of the remnant fit within the thresholds defined for the community. However, a complete TEC assessment was not undertaken as part of the survey.

At a state level the vegetation represents the floristic community type 20a *Banksia attenuata* woodlands over species rich dense shrublands which is listed as the Critically Endangered under the BC Act, 2016.

No other Threatened Ecological Communities listed by Department of Agriculture, Water and the Environment (DAWE) or Department of Biodiversity, Conservation and Attractions (DBCA) were located during the survey.

2. THREATENING PROCESSES

Threatening processes are those that act to degrade an ecosystem or its biodiversity values. A key threatening process is one that may put the long-term survival of a species or community at risk. Both the federal *Environmental Protection and Biodiversity Conservation Act* (EPBC Act), 1999 and the state *Biodiversity Conservation Act* (BC Act) define key threatening processes as those which threaten or may threaten the survival, abundance or evolutionary development of a native species or ecological community (DCCEEW, 2024).

The most evident threatening process recorded within the reserve are:

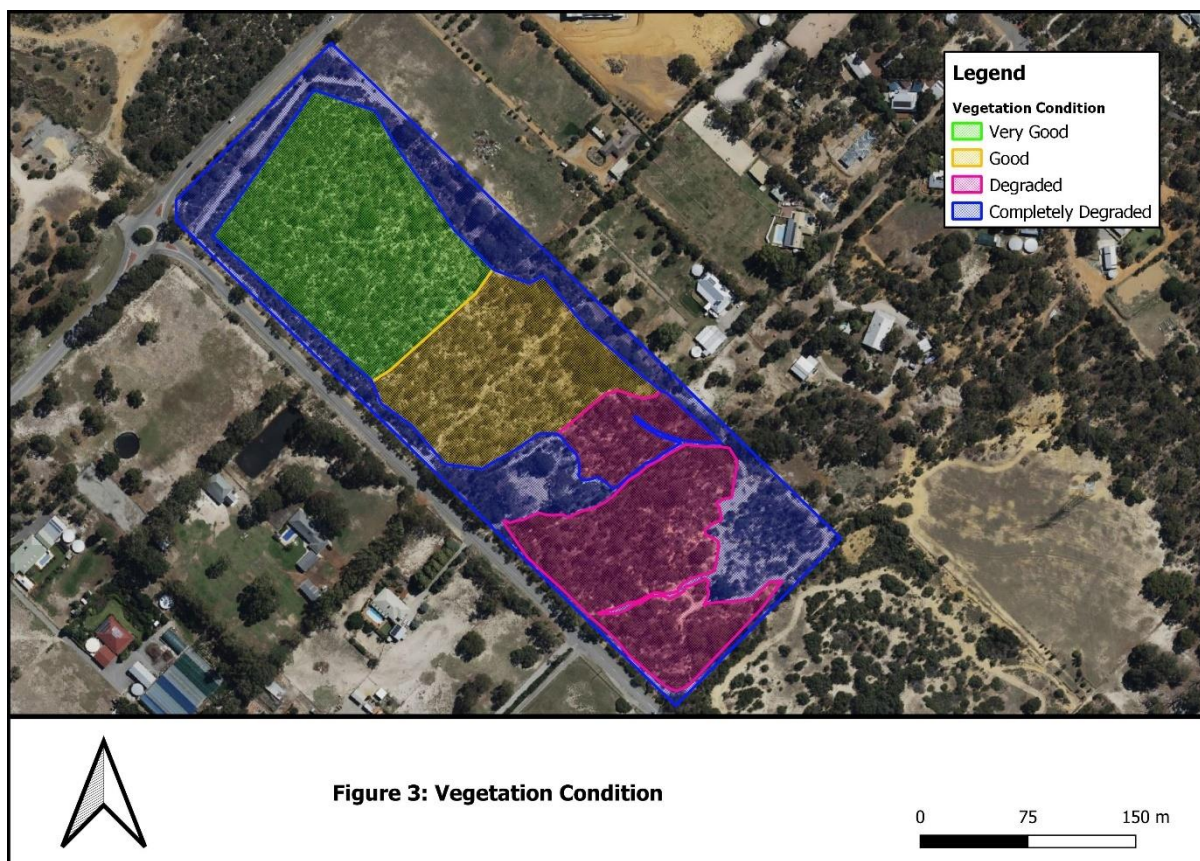
- Weeds;
- Dieback;
- Feral Fauna; and
- Fire.

These threats are described in detail below. The management plan has incorporated these threats and developed a range of options to help control these threats and reduce the risk to the reserve.

2.1 WEEDS

Invasive plants are widespread in fragmented landscapes that have been highly modified, and where nutrient enrichment of soils and frequent disturbance encourages the establishment of weeds over native vegetation. Established weeds compete with native plants, affecting their recruitment and survival, therefore reducing the habitat quality for native fauna. Grassy weeds can also increase the flammability of the vegetation, increasing fire frequency and intensity. Once established, weeds become a long-term and potentially costly management issue.

When undertaking weed control programs, the primary guiding principle is to work from areas in the best condition to those in the worst condition and all works should be undertaken in conjunction with a rehabilitation plan. Timely and effective weed control limits the spread of established weed species and prevents new weeds from establishing.



Environmental weed management techniques include prevention, eradication, manual, chemical and biological controls and containment. An adaptive management strategy is most effective for overall site management and restoration of the natural environment. Priorities for weed management are determined by factors such as impacts on native species particularly threatened or priority flora, fauna or ecological communities; legislative requirements; size of infestations; invasiveness; resources; public safety, and aesthetics at popular visitor sites.

A comprehensive weed assessment was undertaken across the BF51 area in 2022 by Del Botanics Environmental Consulting. Twenty-eight weed species were recorded, with several posing a significant threat to biodiversity. Significant environmental weeds recorded include **Acacia* spp. (Eastern States Wattles), **Leptospermum laevigatum* (Victorian Tea-tree), **Ehrharta calycina* (Veldt Grass) and **Oxalis* spp., which appear to have the greatest impact on this site. One species recorded, **Asparagus*

asparagoides (Bridal Creeper) is listed as a Weed of National Significance (WoNS) and a Declared Pest species.

The weeds recorded within BF51 have been grouped into four categories for the purposes of presenting mapping and management options: Grasses, Bulbs, Woody and Herbs. As expected, the survey reported weeds in highest abundance in the most highly disturbed areas of the site, particularly firebreaks and the eastern section of the site where sand mining has historically occurred. The report identified five species as the most significant in terms of posing the greatest threat to biodiversity values of the reserve. These weed species are listed below in **Table 3** below. It is important to start weed control as soon as possible, considering the priority ranking of the species listed in **Table 3**, below and work in areas from the best to the worst condition.

Table 3: Priority weeds for control at Bush Forever Site 51, Orange Grove

Priority ranking	Species	Common Name
1	* <i>Ehrharta</i> spp.	Veldt Grass
2	* <i>Acacia</i> spp. * <i>Eucalyptus citriodora</i> , * <i>Leptospermum laevigatum</i>	Woody Weeds
3	* <i>Freesia alba x leichtlinii</i>	Freesia
4	* <i>Gladiolus caryophyllaceus</i>	Wild gladiolus
5	* <i>Oxalis</i> spp.	Soursob

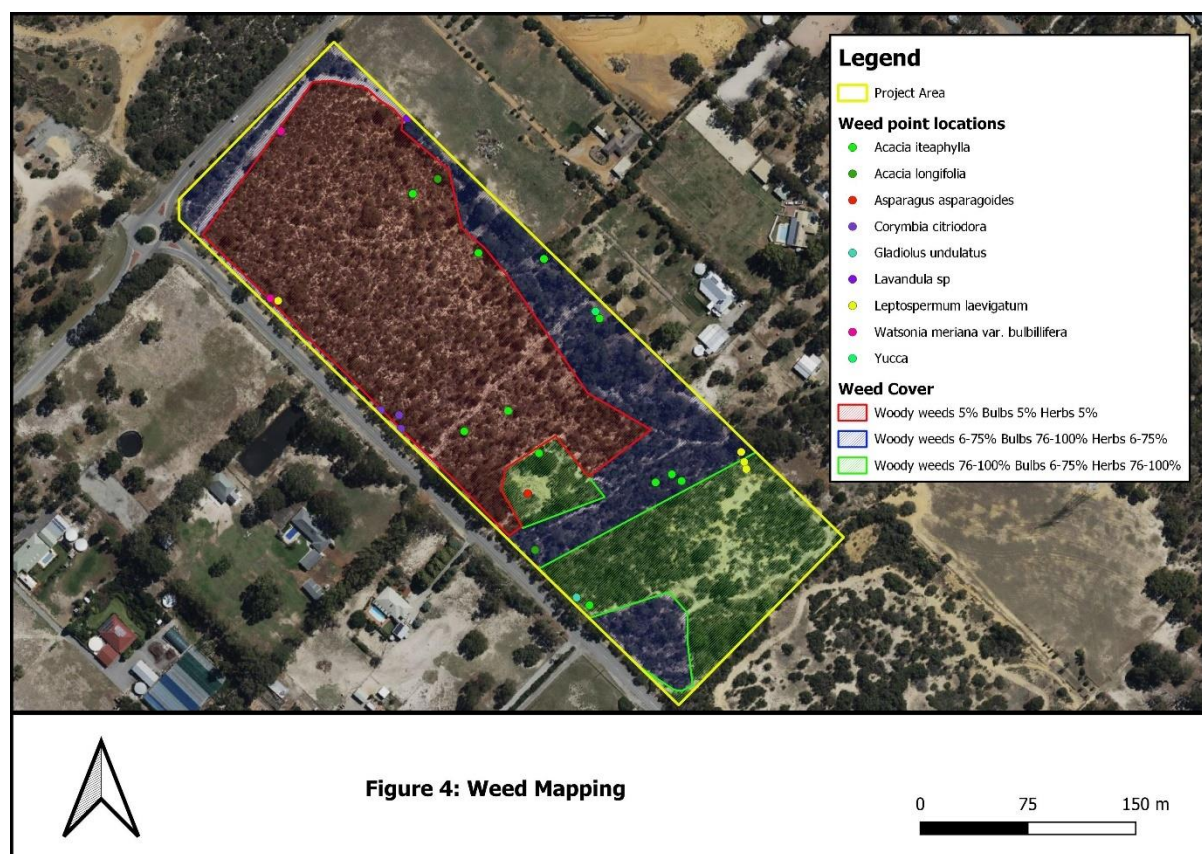


Figure 4: Weed Mapping

2.2 DIEBACK

Phytophthora cinnamomi is an introduced soil-borne pathogen (water mould) that causes the death of a vast and diverse range of plant species in Southwest Western Australia through a disease known as *Phytophthora* Dieback. The disease enters through the plant roots, gradually breaking down the structure of the roots, ultimately causing roots to ‘rot’. As a result of this ‘root rot’, the vascular system (xylem and phloem) in the root region of the plant is destroyed and the ability to transport water and nutrients is lost along with it.

Phytophthora dieback is most rapidly spread through human activity resulting in the movement of infected soil on vehicles, equipment and footwear. Recreational bushland users (such as off-road vehicles, mountain bikes and bush walkers) need to take particular care not to spread the disease.

A comprehensive Phytophthora dieback assessment was undertaken of the site in December 2022 by Bark Environmental. The assessment found 2.6ha of the site to be infested in two separate areas. The largest infested area being adjacent to the northern boundary of the reserve. A small pocket was also located near the western corner along White Rd. The disease expression within BF51 was reportedly subtle, with *Xanthorrhoea* spp. and *Banksia* spp. species being most affected. Regular best practice phosphite treatment is most likely helping to control the impacts of Phytophthora dieback and contain it.

Continuing to limit access to the reserve, by maintaining boundary fencing is vital to protecting this remnant. Dieback hygiene protocols should be followed, with all contractors to be informed about the presence and location of dieback within the reserve. Utilising standard dieback markers in the reserve will help to provide a visual reminder to contractors working in the reserve.

Firebreak maintenance and any other machinery movement in the reserve should only ever be undertaken when soil is dry. Good planning and communication with contractors to ensure firebreaks are installed/maintained working from uninfested areas to infested areas only will help to reduce the likelihood of spreading dieback further in BF51.

Consideration should be given to installation of a limestone apron, sometimes referred to as a ‘green bridge’ along the northern boundary of the reserve. This will help to reduce the likelihood of Phytophthora dieback being spread further southeast along the firebreak, into areas currently uninfested with Phytophthora.

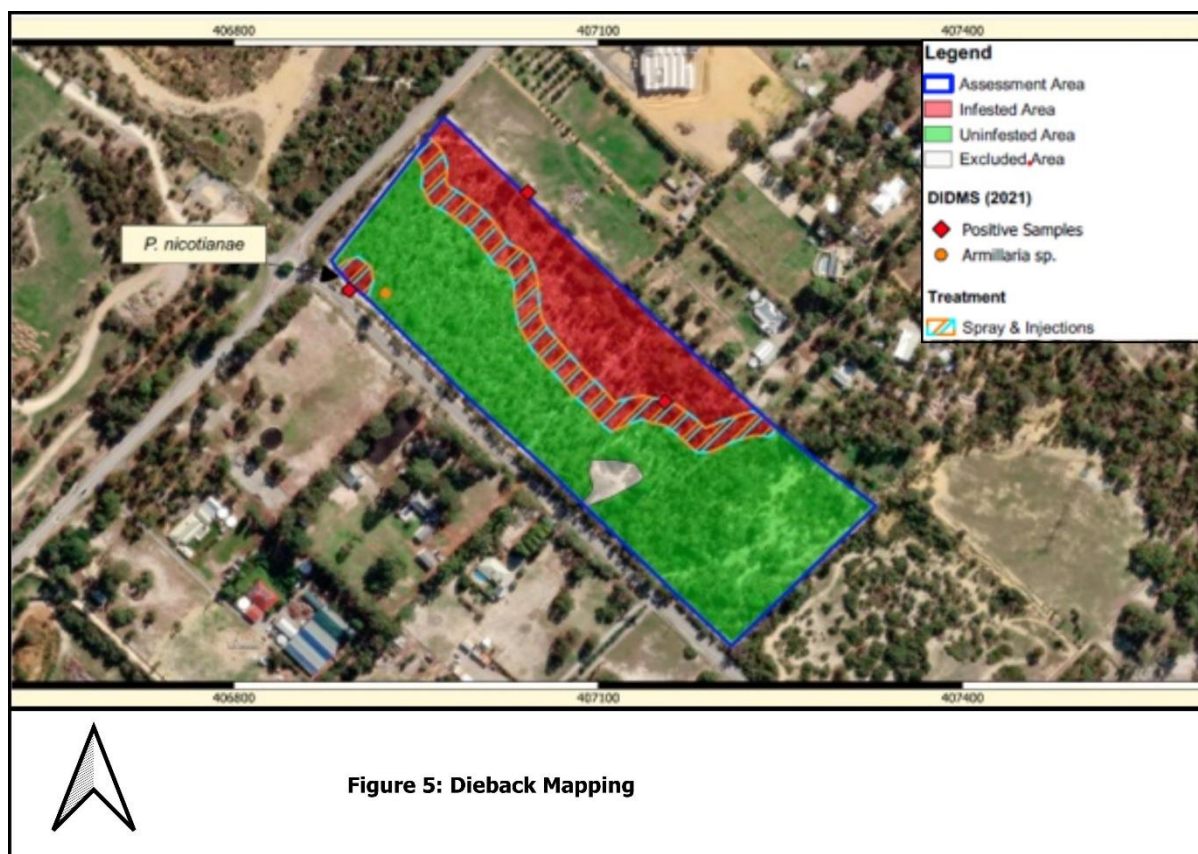


Figure 5: Dieback Mapping

2.3 FERAL FAUNA

Several species of invasive fauna have become well adapted in suburban areas which have impacted upon native vegetation and fauna. Feral cats (*Felis catus*) and the European fox (*Vulpes vulpes*) are key predators that prey upon ground-dwelling native fauna. The Feral Bee Assessment (Natsync, 2023) reported discussed fox dens. While impacts may not be evident at the present time, it can be presumed that foxes, cats and rabbits are in the area. The reserve should be monitored for feral animals as part of regular reserve monitoring, to inform management activities.

2.4 FIRE

Fire regimes in many parts of Western Australia have altered since European settlement, particularly in areas of high population density. The presence of environmental weeds may then contribute to a fire-weed cycle that is the primary cause of bushland degradation in some areas (Wycherley, 1984).

The causes of the cycle are many and diverse, but some of the key points are: -

- Weed species are often advantaged by the burst of nutrients available immediately after a fire.
- Weed species, particularly grass weed species, accumulate biomass rapidly and therefore increase fuel loads and encourage fires more frequently.

- Grass fuels have a different structure to shrub fuels. The grasses have a fine, evenly spread structure, compared with the more heterogenous, discreet structure of native understorey shrubs. This affects fire behaviour and rate of spread, particularly in the initial stages of a fire.
- Weed seeders are usually annuals whilst native seeder species require time between fires to not only to set seed but also to replenish their seed stocks, which may take several years. Frequent fires may deplete native seed stocks and encourage weed seed stocks, which can eliminate the native species from the environment.
- Resprouters can also succumb if the fire interval is so frequent that the root stock resources become depleted.

Weeds can rapidly colonise the open spaces and use the available nutrients released by fire, outcompeting natives. A fire event provides opportunities for weed control through the reduction in weed biomass and the allows the development of a timeline for appropriate weed control measures to treat germinating plants (Wycherley, 1984).

There does not appear to be any major issues with access to the area for fire vehicles, the tracks are well maintained and provide access around the site in addition to Kelvin Rd and White Rd.

It is important to maintain firebreaks around the reserve and ensure any wildfires or controlled burns are used as an opportunity to control weeds. It is recommended to develop, map and prepare a wildfire response plan, which is reviewed and updated at least every 5 years.

3. SITE MANAGEMENT

3.1 PUBLIC ACCESS, SIGNAGE, HAZARDS AND RUBBISH CONTROL

The boundary fencing of the site is in good condition. The fencing should be checked regularly, and repairs made in a timely fashion, should breaches appear. Access appears to be sufficiently restricted to reduce potential impacts on the reserve. Kangaroo gates are recommended for access into the reserve.

Current signage located near the corner of Kelvin and White roads is in good condition, however, is an older style of sign and will require updating. Additional signage is recommended in the southeastern end and the northeast end of the reserve.

During the fieldwork for the Flora and Vegetation Survey, a large hole was discovered in the northern section of the reserve. A Bobtail was rescued which had fallen into this hole and was in poor health, unable to escape. Bones of other animals were also evident in the hole. This hazard is likely to be

within the Phytophthora dieback infested area. Careful consideration of the best way to remediate this issue should be undertaken. If filling this hole is deemed to cause too great a dieback risk, then covering the hole or at least adding logs to the hole to allow animals to climb out is advised.

In the disturbed areas of the southeastern section of the reserve there is a series of semi buried sections of corrugated iron, sticking out of the ground approximately 30cm for at least 10m, in two sections. The approximate location is indicated on **Figure 6** in **Section 4** below. This poses a hazard to wildlife and may act as a barrier to small fauna. It is recommended that this debris be removed from the reserve.

Rubbish doesn't appear to be a major issue but being bound by two busy roads means there is the potential for rubbish to accumulate regularly. If it becomes a major issue, consider upgrading the fencing along Kelvin and White roads to include rabbit mesh along the lower 1m of the fence, to reduce the amount of litter entering the site. This strategy has been effective in significantly reducing the amount of litter entering Maralla Rd Nature Reserve in Ellenbrook. There is also the ever-present threat of rubbish dumping. Maintaining good boundary fences will discourage this practice but the site should also be checked regularly, and any dumped materials removed as quickly as possible to avoid attracting further rubbish dumping.

There appears to be no major issues with vandalism on site. Signage may need to be checked and upgraded periodically.

3.2 REVEGETATION

Revegetation may be required in the highly impacted areas of the site, including the previously residential area and the highly disturbed sections at the eastern end of the reserve where sand extraction has occurred.

Only local native species should be utilised for revegetation at this site. Weeds should be well controlled before any revegetation work is commenced. A combination of direct seeding and planting of tubestock is recommended for best results in establishing a good diversity of species in these areas.

Species selection should be undertaken by referencing local native species recorded within the site. It is recommended to utilise species which colonise after natural disturbances and infill plant to follow the successional patterns of the vegetation community.

Follow up or infill planting is recommended to be undertaken to replace losses. Monitoring of the success of the revegetation will determine the amount of infill planting required after the initial

revegetation. Take note of which species have done well in which areas and which species have been lost to inform the infill planting species list.

Depending on availability it is recommended to collect seed from the reserve to supplement species for future rehabilitation projects.

4. KEY MANAGEMENT DIRECTIONS

BF51 is currently in very good condition for a small, isolated remnant bushland. It contains significant biodiversity values that warrant an ongoing investment in management, restoration and monitoring. The primary focus of this Environmental Management Plan is retaining and protecting the natural remnant vegetation and working to reduce threats to biodiversity and improve the resilience of the reserve.

Investment should be made in order of protecting the highest value areas primarily and in controlling the threats with the biggest potential impacts to the long-term resilience of this valuable remnant.

Management actions should always be undertaken using best practice methodology and in accordance with DBCA's standard operating procedures. Should management advances be made during the life of this Environmental Management Plan then it is expected that the best practice methodologies would be followed in accordance with the priorities outlined in this plan.

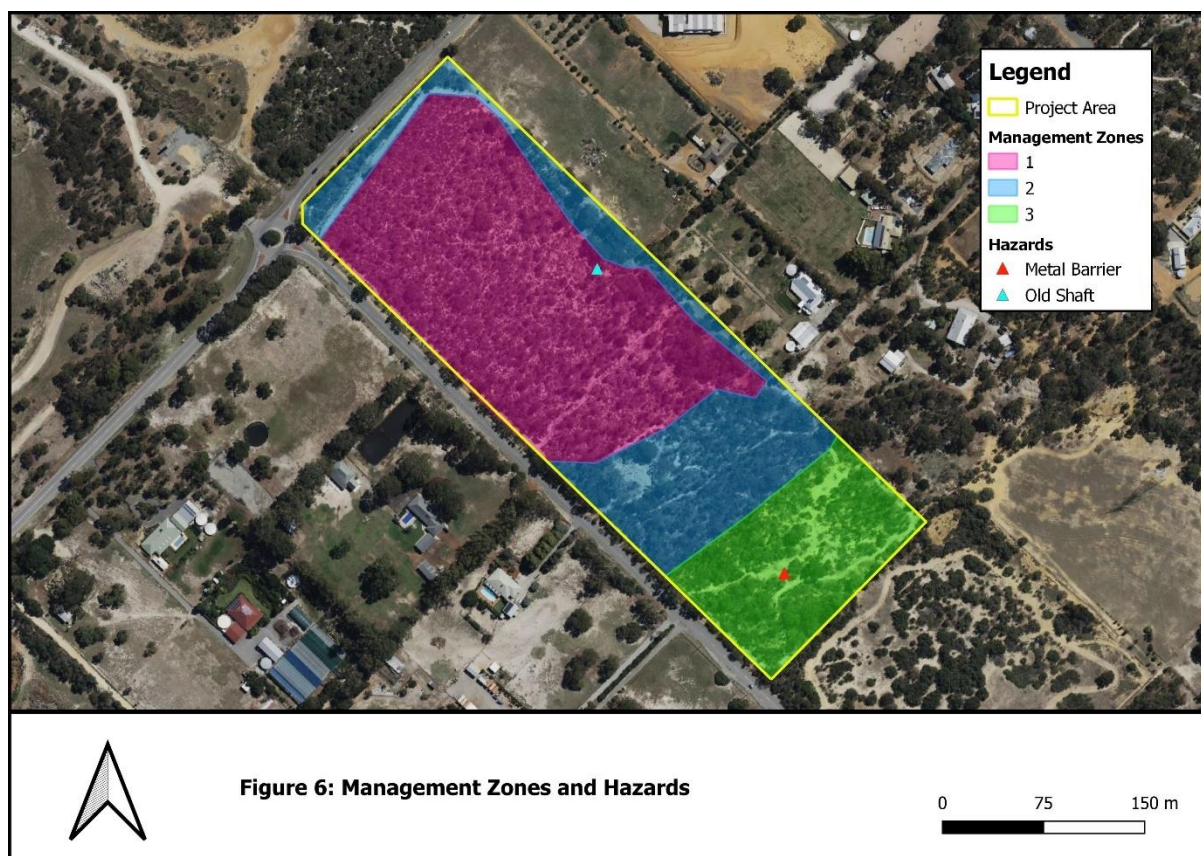
Specific weed control techniques and timings recommended in the recent weed survey of BF51 (Del Botanics, 2022) are included as **Appendix A** for ease of reference.

In general, across the nature reserve, the following key activities are recommended for management:

- Management and control of weed species;
- Management and control the spread of Phytophthora dieback;
- Restoration and rehabilitation of degraded areas; and
- Ongoing monitor and maintenance.

4.1 MANAGEMENT ZONES

Figure 6 below delineates the reserve into three management zones. Management zones are listed in order of priority for management. Key actions for each zone are recommended in order of importance.



4.1.1 Management Zone 1

Description:

Protection of this area is the priority management focus for this nature reserve. This area includes the vegetation mapped as being in Very Good and Good vegetation condition (Del Botanics, 2023) and the area immediately surrounding it. This section of the reserve also contains the best quality vegetation representing the *Banksia Woodland of the Swan Coastal Plain* ecological community and the majority of the population of Declared Rare Flora *Conospermum undulatum* which has been recorded within the nature reserve.

Key management activities:

Phytophthora dieback control:

Phytophthora dieback infestation is mapped as occurring within and adjacent to this high priority management zone.

- Regular phosphite injection of trees and foliar spray of shrubs and groundcover should be undertaken every 2-3 years, in accordance with the recommendations of the Dieback Assessment Treatment report (Bark Environmental, 2022).

- Standard dieback indicator signage to be installed in the reserve to notify users, staff and contractors of the presence/absence of dieback.

Control of invasive weeds:

Weeds are mapped within the core of this priority area in low densities of <5% for Bulbs, grasses and woody weeds. Controlling the most invasive species within this core area and its immediate surroundings is vital to protect and retain biodiversity values.

- Control of bulbous weeds including isolated pockets of **Watsonia meriana* and scattered **Freesia* sp., **Gladiolus caryophyllaceus* and **Gladiolus undulatus* is the top priority for weed control in this area.
- Control of highly invasive grassy weeds including **Ehrharta calycina* and **Ehrharta longiflora* should be undertaken annually before seed set.
- Control isolated woody weeds including **Acacia iteaphylla* and **Acacia longifolia*.
- Map and monitor vegetation condition every 3 years.
- Map and monitor weed distribution every 2 years.

Remediate hazards:

The old shaft (marked on **Figure 4** above) presents a hazard to wildlife.

- In the short term the addition of suitable logs may allow fauna to escape this hole.
- Liaison with a fauna specialist and consideration of the position of the hazard in relation to the potential Phytophthora dieback risk should be considered in determining the best approach to remediating this hazard long term.

Seed collection

- Collect native seed from the site (where possible) to use in future rehabilitation projects.

4.1.2 Management Zone 2

Description:

This zone is characterised by vegetation in Degraded condition and contains areas of severe localised disturbance as well as the area immediately surrounding management Zone 1. A combination of protection of biodiversity values and rehabilitation of historically disturbed areas is recommended.

Key management activities:

Phytophthora dieback control:

Phytophthora dieback infestation is mapped as occurring within this management zone which also includes a network of tracks and therefore has a high potential to be spread into higher value areas.

- Regular phosphite injection of trees and foliar spray of shrubs and groundcover should be undertaken every 2-3 years, in accordance with the recommendations of the Dieback Assessment Treatment report (Bark Environmental, 2022).
- Standard dieback indicator signage to be installed in the reserve to notify users, staff and contractors of the presence/absence of dieback.

Control of invasive weeds:

Weed densities vary across this zone and the weed mapping provided by Del Botanics Environmental Consulting in 2022 should be referred to for details (**Figure 4**). Key components for management include:

- Treat and monitor the isolated infestation of Bridal creeper (*Asparagus asparagoides*) in this zone.
- High densities of woody weeds including *Acacia iteaphylla* and *Acacia longifolia* are present in the area that used to contain a dwelling. Control of these highly invasive species is recommended before they spread.
- High densities of bulbous weeds, primarily *Oxalis* spp. Occur along tracks and in highly disturbed areas of this zone. Control to contain these infestations with a focus on areas adjacent to Zone 1.
- Map and monitor vegetation condition every 3 years.
- Map and monitor weed distribution every 2 years.

Revegetation

Consider undertaking revegetation in the completely degraded area of this zone where the house, gardens and other infrastructure was removed. This can act to buffer the better condition vegetation by reducing the opportunities for weeds to take hold of the area and increasing the biodiversity value of the site.

Only local native species should be considered for revegetation of this Nature Reserve. A comprehensive species list (adapted from Del Botanicus, 2023) has been included in **Appendix B** for reference. Naturally colonising species are recommended eg. Acacias, Hakeas and native grasses.

Revegetation can be undertaken by planting or direct seeding. Addition of *Banksia* spp. may need to be undertaken by tubestock planting.

4.1.3 Management Zone 3

Description:

This zone is characterised by vegetation in Degraded to Completely Degraded condition and areas of extensive and severe disturbance. The focus for this area is to reduce the impact of woody weeds and begin the process of rehabilitation. Returning this highly modified area to a pre-european vegetation composition, structure and ecological function will not be possible within the timeframe of this plan. However, controlling highly invasive weeds and undertaking revegetation will help to protect and buffer the areas of the reserve in better condition and create valuable habitat for fauna.

Key management activities:

Control of invasive weeds:

High densities of woody weeds (76-100%), particularly Victorian Tea Tree (**Gaudium laevigatum*) characterise this zone.

- Control woody weeds by cutting and painting stems. Branches may be left on site in low densities to cover bare areas and encourage natural recruitment.
- Control priority species of bulbous weeds including **Watsonia meriana*.
- Control of highly invasive grassy weeds including **Ehrharta calycina* and **Ehrharta longiflora* should be undertaken annually before seed set.
- Map and monitor vegetation condition every 3 years.
- Map and monitor weed distribution every 2 years.

Revegetation

Consider undertaking revegetation in this zone, only once weeds are well controlled. This can act to buffer the better condition vegetation by reducing the opportunities for weeds to take hold of the area and increasing the biodiversity value of the site.

Only local native species should be considered for revegetation of this Nature Reserve. A comprehensive species list (adapted from Del Botonics, 2023) has been included in **Appendix B** for reference. Naturally colonising species are recommended eg. Acacias, Hakeas, native grasses.

Revegetation can be undertaken by planting or direct seeding. Addition of *Banksia* spp. may need to be undertaken by tubestock planting.

4.2 IMPLEMENTATION SCHEDULE

Table 4 includes key activities for the management of Bush Forever Site 51. Implementation of these activities should be considered in terms of budget availability and the priority of the activity, and the management zones, as discussed above. Activities listed in **Table 4** below are in order of priority for each management category. Costings are an estimate based on previous activities undertaken by consultants appointed by DBCA. Costings will change yearly.

Table 4: Implementation Schedule

Activity	Description	Timing	Costing
Disease			
Map and treat Phytophthora dieback	Regularly undertake dieback mapping and phosphite treatment.	Every 2 – 3 years	\$7,500/treatment
Install dieback markers and dieback signage	Install Dieback marker posts on either side of Infested track sections to inform track maintenance /firebreak contractors of the locations.	ASAP	\$2,000
Information/Protection	Develop a 1-page handout for contractors which clearly outlines hygiene requirements, shows locations of dieback infestation and highlights the direction of firebreak maintenance (uninfested to infested) to reduce the likelihood of spreading the disease.	ASAP	\$1000
Fire			
Map and Prepare Fire Response Plan	Develop, map and prepare a wildfire response plan	Update every 5 years	\$5000
Fire Breaks	Install and maintain fire breaks	Annually	\$15000
Flora and Vegetation			
Control grassy weeds	<ul style="list-style-type: none"> Undertake control of priority grassy weed species within Management Zone 1 	Annually	\$5000/year for all weed control

	<ul style="list-style-type: none"> ● Undertake control of priority grassy weed species within Management Zone 2 ● Undertake control of all invasive grassy weeds throughout the reserve. 		
Control bulbous weeds	<ul style="list-style-type: none"> ● Undertake control of priority bulbous weed species within Management Zone 1 ● Undertake control of priority bulbous weed species within Management Zone 2 ● Undertake control of all invasive bulbous weeds across the site. 		
Control woody weeds	<p>Undertake control of priority woody weed species within Management Zone 1</p> <ul style="list-style-type: none"> ● Undertake control of priority woody weed species within Management Zone 2 ● Undertake control of all invasive woody weeds across the site. 	Annually in summer	
Weed Mapping	Map weed distribution and compare to previous mapping to understand the level of control being achieved. Adapt weed management approaches accordingly	Every 2 – 3 years	\$5000
<i>Conospermum undulatum</i> monitoring	Undertake a population census of the DRF <i>Conospermum undulatum</i> within BF51. Repeat to monitor size and health of the population over time.	Every 3-5 years in spring.	\$10000
Revegetation	<p>Restore and rehabilitate degraded areas through improving floristic diversity (planting, direct seeding, applying debris to bare areas etc).</p> <ul style="list-style-type: none"> ● Use a staged approach ● Use local native species only ● Only undertake revegetation once weeds have been controlled in each revegetation area. ● Collect local provenance seed October – March ● Order tubestock - September ● Undertake direct seeding in autumn ● Plant seedlings in winter after 1st heavy rains 	2 – 10 years (annually)	\$10000

Flora and Vegetation Survey	Update Flora and Vegetation Survey. Undertake a targeted flora survey to determine if any other threatened flora species occur within BF 51 to inform management.	Every 5 years in Spring	\$15000
Threatened Ecological Community (TEC) Assessment	Access and monitor the TEC and determine protection measures	Every 5 years	\$5000
Vegetation condition monitoring	Monitor and map vegetation condition and compare to previous mapping. Consider threats where condition has declined or not improved. Adapt management accordingly.	Every 3-5 years	\$5000
Fauna			
Remediate fauna hazards	<ul style="list-style-type: none"> ● Add logs to old shaft to enable fauna to escape ● Seek advice of a fauna specialist regarding the least impact approach to making the existing excavation site safe for fauna – consider possible Phytophthora dieback implications. ● Remove metal barriers in the southeastern area of the reserve. 	ASAP	\$5000
Feral animal survey	Survey the Nature Reserve for signs of feral/introduced animals. Adaptively manage accordingly.	Every 3 – 5 years. Management as needed	\$5000
Fauna survey	Undertake a fauna survey of BF51 to better understand faunal use and inform management. Include a Black Cockatoo habitat assessment	Sept – Dec Every 3 – 5 years.	\$10000
Habitat Improvement	<ul style="list-style-type: none"> ● Consider planting completely degraded areas specifically to provide forage resources for Black Cockatoos. ● Consider adding novel habitat features to maximise the potential for this remnant to support fauna, improve faunal assemblage and attract beneficial fauna. This may include installation of bee 	Any time	\$5000

	hotels, Quenda hotels or bat and bird boxes.		
Kangaroo gates	Installation of plain wire and Kangaroo gates	ASAP Management as needed	\$2500
Maintenance			
Signage	Installation of Nature Reserve signage	Once, with review	\$2500
Rubbish removal	Remove rubbish from within the reserve	Annually	\$2200
Fencing, access, hazards and signage	Monitor reserve for any breaches in fencing, vandalism or any hazards	Every 6 months	\$1000

4.3 ANNUAL WORKS PLAN

The management activities in the annual works plan (**Table 5**) have been developed from the information described for each activity in **Table 4** (Implementation Schedule). The works plan provides an overview of when each activity requires attention over the life of the environmental management plan.

Table 5: Annual Works Plan 0-10 years

Reserve Management Activity	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Map and treat <i>Phytophthora dieback</i>	X			X			X			X
Install dieback markers and dieback signage	X			X			X			X
Information/Protection	X									
Map and Prepare Fire Response Plan		X						X		
Fire Breaks	X	X	X	X	X	X	X	X	X	X
Control grassy weeds	X	X	X	X	X	X	X	X	X	X
Control bulbous weeds	X	X	X	X	X	X	X	X	X	X
Control woody weeds	X	X	X	X	X	X	X	X	X	X
Weed Mapping		X			X		X			X
<i>Conospermum undulatum</i> monitoring	X					X				
Revegetation			X	X	X	X	X	X	X	X
Flora and Vegetation Survey					X					X
Threatened Ecological Community (TEC) Assessment	X					X				
Vegetation condition monitoring					X					X
Remediate fauna hazards	X					X				
Feral animal survey					X					X
Fauna survey					X					X

Habitat Improvement	X					X				
Kangaroo gates	X					X				
Signage	X					X				
Rubbish removal	X	X	X	X	X	X	X	X	X	X
Fencing, access, hazards and signage	X	X	X	X	X	X	X	X	X	X

5. CONCLUSION

This Environmental Management Plan has been developed to provide direction to the management of the site for a 10-year period, updating will be required once management actions have been achieved. The proposed implementation schedule is based on all activities that can be undertaken on the site. The activities chosen from this plan will be based on budget allocations availability and based on DBCA priorities for the whole Perth Hills District. The site has been separated into three management zones. These zones provide spatial prioritisation for the allocation of resources based on the values within the reserve. For each zone a list of prioritised key activities provides further direction for management implementation and strategic allocation of limited resources.

Protection of the highest value areas of vegetation by controlling the greatest threats to biodiversity will provide the best approach to long term management of the site.

6. REFERENCES

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PHOTOGRAPHIC PLATES



Photographic Plate 1: Management Zone 1



Photographic Plate 2: Management Zone 2



Photographic Plate 3: Management Zone 3



Photographic Plate 4: Old Shaft

APPENDIX A
WEED TREATMENT SCHEDULE

WEED TREATMENT SCHEDULE FOR BUSH FOREVER SITE 51, ORANGE GROVE,

Species	Priority	Prescription
* <i>Ehrharta calycina</i> (Perennial Veldt grass)	1	For small infestations, cut out plants ensuring crown removal. Do not slash. Alternatively spray with Fusilade® Forte 13 ml/L or 6.5 L/ha + wetting agent on actively growing and unstressed plants. For generic fluazifop-p (212g/L active ingredient) 8ml/L or 4L/ha +wetting agent. Follow-up in subsequent years. Use unplanned fires to spray regrowth and seedlings within 4-6 weeks of germination.
* <i>Ehrharta longiflora</i> (Annual Veldt grass)	1	Hand remove small infestations. Alternatively spray with Fusilade Forte® 30 ml/10 L or 1.6 L/ha (based on 500 L water/ha) + wetting agent or for generic fluazifop-p (212g/L active ingredient) 18ml/10L or 1L/ha + wetting agent before flowering stem emerges, or at 3-5 leaf stage. Secondary seedling flush often occurs, repeat treatment if necessary.
* <i>Acacia</i> spp	2	Hand pull seedlings. Fell mature plants. Monitor site for recruitment from seedbank
* <i>Eucalyptus citriodora</i>	2	Hand pull seedlings. Fell mature plants. Monitor site for recruitment from seedbank.
* <i>Leptospermum laevigatum</i>	2	Hand pull seedlings. Fell mature plants. Where resprouting has been observed, apply 250 ml Access® in 15 L of diesel to bottom 50 cm of trunk (basal bark). Slash, fell, mulch Spray regrowth until just wet – 100mL Grazon® plus Pulse® in 10L water Standing plants (thickets) 10L/ha glyphosate plus 0.25% Pulse® for overall spraying or 100mL glyphosate (450g/L) plus 25mL Pulse® in 10L water – spot spraying Individual plants 200mL Access® in 10L diesel applied to the lower 50cm of each trunk in spring. Seedlings Manually remove seedlings 1 – 2 years Older seedlings cut 2cm below the soil surface Mature plants Cut and paint the stump with glyphosate, picloram gel or Access® Seedlings amongst other vegetation 3L/ha 2,4-D Ester 800 (or 4L/ha 2,4-D LVE 600) in 30L water – aircraft application (larger native species will survive these rates)

* <i>Freesia alba x leichtlinii</i> (Freesia)	3	Spot spray metsulfuron methyl 0.2 g/15 L + Pulse® or 2.5-5 g/ha + Pulse®. Apply just on flowering at corm exhaustion
* <i>Gladiolus caryophyllaceus</i> (Wild Gladiolus)	4	Wipe individual leaves with glyphosate 10 % or spray dense infestations in degraded areas with 1% glyphosate just on flowering at corm exhaustion.
* <i>Oxalis</i> spp. (Soursob)	5	Spot spray metsulfuron methyl 0.2 g/15 L + Pulse®, or 1% glyphosate. Apply at bulb exhaustion, generally just on flowering. Exercise care if manually removing as physical removal can result in spread of bulbils

APPENDIX B
COMPREHENSIVE SPECIES LIST FOR BUSH FOREVER
SITE 51

VASCULAR PLANT SPECIES RECORDED AT BUSH FOREVER SITE 51, ORANGE GROVE, SEPTEMBER 2022

(*Denotes a weed species)

Family	Genus/Species
Amaranthaceae	<i>Lepidobolus preissianus</i>
	<i>Lyginia barbata</i>
	<i>Ptilotus manglesii</i>
	<i>Schoenus</i> sp
Apiaceae	<i>Xanthosia huegelii</i>
Araliaceae	<i>Tracymene pilosa</i>
Asparagaceae	<i>Lomandra</i> sp
	<i>Lomandra ?hermaphrodita</i>
	<i>Thysanotus patersonii</i>
Asteraceae	* <i>Arctotheca calendula</i>
	* <i>Hypochaeris glabra</i>
	* <i>Sonchus oleraceus</i>
	* <i>Taraxacum khatoonae</i>
	* <i>Ursinia anthemoides</i>
	<i>Pterochaeta paniculata</i>
Casuarinaceae	<i>Allocasuarina</i> sp
	<i>Allocasuarina humilis</i>
Colchicaceae	<i>Burchardia congesta</i>
Cyperaceae	<i>Isolepis cernua</i> var <i>cernua</i>
	<i>Mesomelaena pseudostygia</i>
	<i>Mesomelaena tetragona</i>
	<i>Morelotia octandra</i>
Dasypogonaceae	<i>Calectasia narragara</i>
	<i>Dasypogon bromeliifolius</i>
Dilleniaceae	<i>Hibbertia huegelii</i>
	<i>Hibbertia hypericoides</i>
Droseraceae	<i>Drosera erythrorhiza</i>
	<i>Drosera pallida</i>
	<i>Drosera stolonifera</i>
Fabaceae	* <i>Chamaecytisus palmensis</i>
	* <i>Ornithopus compressus</i>
	<i>Cristonia biloba</i>
	<i>Daviesia nudiflora</i>
	<i>Daviesia decurrens</i>
	<i>Gompholobium tomentosum</i>
	<i>Hardenbergia comptoniana</i>
	<i>Jacksonia floribunda</i>
<i>Labichea punctata</i>	
Goodeniaceae	<i>Scaevola</i> sp
Haemodoraceae	<i>Anigozanthos humilis</i>
	<i>Conostylis</i> sp
	<i>Dianella revoluta</i>
	<i>Haemodorum laxum</i>

	<i>Haemodorum</i> sp
	<i>Haemodorum spicatum</i>
	<i>Johnsonia pubescens</i>
Hemerocallidaceae	<i>Chamaescilla corymbosa</i>
	<i>Tricoryne elatior</i>
Iridaceae	* <i>Freesia alba</i> × <i>leichtlinii</i>
	* <i>Gladiolus caryophyllaceus</i>
	* <i>Romulea rosea</i>
	<i>Patersonia pygmaea</i>
Laminaceae	<i>Hemiandra pungens</i>
Loganiaceae	<i>Phyllangium divergens</i>
Myrtaceae	* <i>Leptospermum laevigatum</i>
	<i>Babingtonia camphorosmae</i>
	<i>Calytrix</i> sp
	<i>Conothamnus trinervis</i>
	<i>Eremaea pauciflora</i>
	<i>Eucalyptus marginata</i>
Orchidaceae	* <i>Disa bracteata</i>
	* <i>Oxalis glabra</i>
	* <i>Oxalis pes-caprae</i>
	<i>Caladenia discoidea</i>
	<i>Caladenia flava</i>
	<i>Pterostylis ?pyramidalis</i>
	<i>Pterostylis sanguinea</i>
Poaceae	* <i>Briza maxima</i>
	* <i>Ehrharta calycina</i>
	* <i>Ehrharta longiflora</i>
	* <i>Poa annua</i>
	* <i>Vulpia bromoides</i>
	<i>Neurachne alopecuroidea</i>
Primulaceae	* <i>Lysimachia arvensis</i>
Proteaceae	<i>Banksia attenuata</i>
	<i>Banksia menziesii</i>
	<i>Banksia nivea</i>
	<i>Banksia sessilis</i>
	<i>Banksia armata</i> var. <i>armata</i>
	<i>Conospermum undulatum</i>
	<i>Daviesia divaricata</i>
	<i>Daviesia nudiflora</i>
	<i>Hakea conchifolia</i>
	<i>Hakea prostrata</i>
	<i>Hakea undulata</i>
	<i>Hemiphora bartlingii</i>
	<i>Lambertia multiflora</i>
	<i>Petrophile biloba</i>
	<i>Petrophile linearis</i>
	<i>Petrophile macrostachya</i>

	<i>Synaphea spinulosa</i>
Restionaceae	<i>Desmocladus fasciculatus</i>
	<i>Desmocladus flexuosus</i>
Stylidiaceae	<i>Stirlingia latifolia</i>
	<i>Stylidium diuroides</i>
	<i>Stylidium junceum</i>
	<i>Stylidium tenue</i> subsp. <i>majusculum</i>
Thymelaeaceae	<i>Pimelea</i> sp
Xanthorrhoeaceae	<i>Xanthorrhoea brunonis</i>
	<i>Xanthorrhoea preissii</i>