

# Dieback Management Plan

---

## Gosnells Golf Course Bushland Bush Forever Site 467



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

25 June 2010

## Acknowledgements

The authors thank the following for their advice and information:

- Evan Brown, Glevan Consultants.
- Chris Dunne, Senior Research Scientist, Department of Environment and Conservation
- Michael Pez, Disease Standards Officer, Department of Environment and Conservation.
- Toby Rees, Environmental Officer, City of Gosnells
- Wayne van Lieven, Environmental Coordinator, City of Gosnells

Toby Rees and Wayne van Lieven are thanked for their comments on earlier drafts of the Plan.

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 dieback in bushland.

Ironbark Environmental and Regen4 Environmental Services accept no responsibility for the implementation of this report's recommendations. 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, 2010.

© Ironbark Environmental and Regen4 Environmental Services, 2010

## Contents

Executive Summary.....	4
1. Introduction.....	6
1.1 Site description.....	7
1.2 Characteristics of dieback.....	7
1.3 Mapping of dieback on site.....	9
2. Objectives of the Dieback Management Plan.....	15
3. Key principles.....	15
4. Proposed management strategies.....	16
4.1 Access through the Protectable Area.....	16
4.2 Preventing spot infections within the dieback-free area.....	21
4.3 Access and disease spread on periphery of dieback-free area.....	22
4.4 Phosphite Treatment Program.....	23
4.5 Fire Response Planning.....	24
4.6 Communications plan.....	27
4.7 Signage.....	28
4.8 Implementation, monitoring, and plan review.....	32
References.....	33
Appendix 1: Recommendations - Operational summary.....	34

## Figures

Figure 1	Key on-ground recommendations.....	5
Figure 2	Site showing Management Areas as identified in the Bushland Management Plan (Ironbark Environment & Regen4 Environmental Services, 2010).....	6
Figure 3	Site showing the area to which this Plan applies	7
Figure 4	Dieback mapping at the Gosnells Golf Course Bushland by Glevan Consultants, 2009.....	10
Figure 5	Susceptible trees located outside of the 2 ha Protectable Area, shown over vegetation condition mapping.....	13
Figure 6	Susceptible trees located outside of the 2 ha, shown over vegetation community mapping.....	14
Figure 7	Recommended phosphite treatment areas and susceptible plants (generally over 4 m) outside the 2 ha Protectable Area.....	26
Figure 8	Standard signs for entry points to Dieback Protection Areas (Project Dieback, 2008).....	29
Figure 9	Dieback status markers and symbols (Project Dieback, 2008).....	29
Figure 10	Recommended location of signs.....	31

## Tables

Table 1	Examples of plant species found at Gosnells Golf Course bushland that are susceptible to phytophthora dieback.....	8
Table 2	Communications plan matrix.....	27

## Acronymns

COG	City of Gosnells
GGC	Gosnells Golf Club

## Executive Summary

The Gosnells Golf Course Bushland area is one of the highest priority natural areas managed by the City of Gosnells (City of Gosnells, 2010) and is one of a number of regionally significant natural areas in the Perth Metropolitan Region recognised by the State Government (Government of Western Australia, 2000).

A Bushland Management Plan (Ironbark Environment & Regen4 Environmental Services, 2010) has been prepared for the 10 ha Site, including its 7.4 ha of bushland. The Plan identified the mapping and management of dieback as a priority action. Dieback is an introduced pathogen which is transported through soil, water and roots which if left untreated has the ability to kill 40% of the native plant species of south-west Australia including an estimated 30 – 40% of the species in the Gosnells Golf Course Bushland.

The Gosnells Golf Course Bushland area was assessed and mapped for the presence of *Phytophthora* Dieback in 2009 by expert dieback interpreters. This work (Glevan, 2009) has confirmed that the dieback pathogen has infested much of the Site, but that some of the Site remains uninfested. Dieback mapping identified a two hectare (2 ha) area which is dieback-free, and subsequent interpretation by the authors has identified other smaller dieback-free areas or areas that support numerous species which are susceptible to the dieback pathogen.

Given the extent of vegetation that exists in the Site that is susceptible to dieback, and is not yet infested, active management needs to occur to limit the future impact on the Site. Dieback management includes restricting access; ensuring appropriate hygiene is carried out onsite and bushland treatment with phosphite.

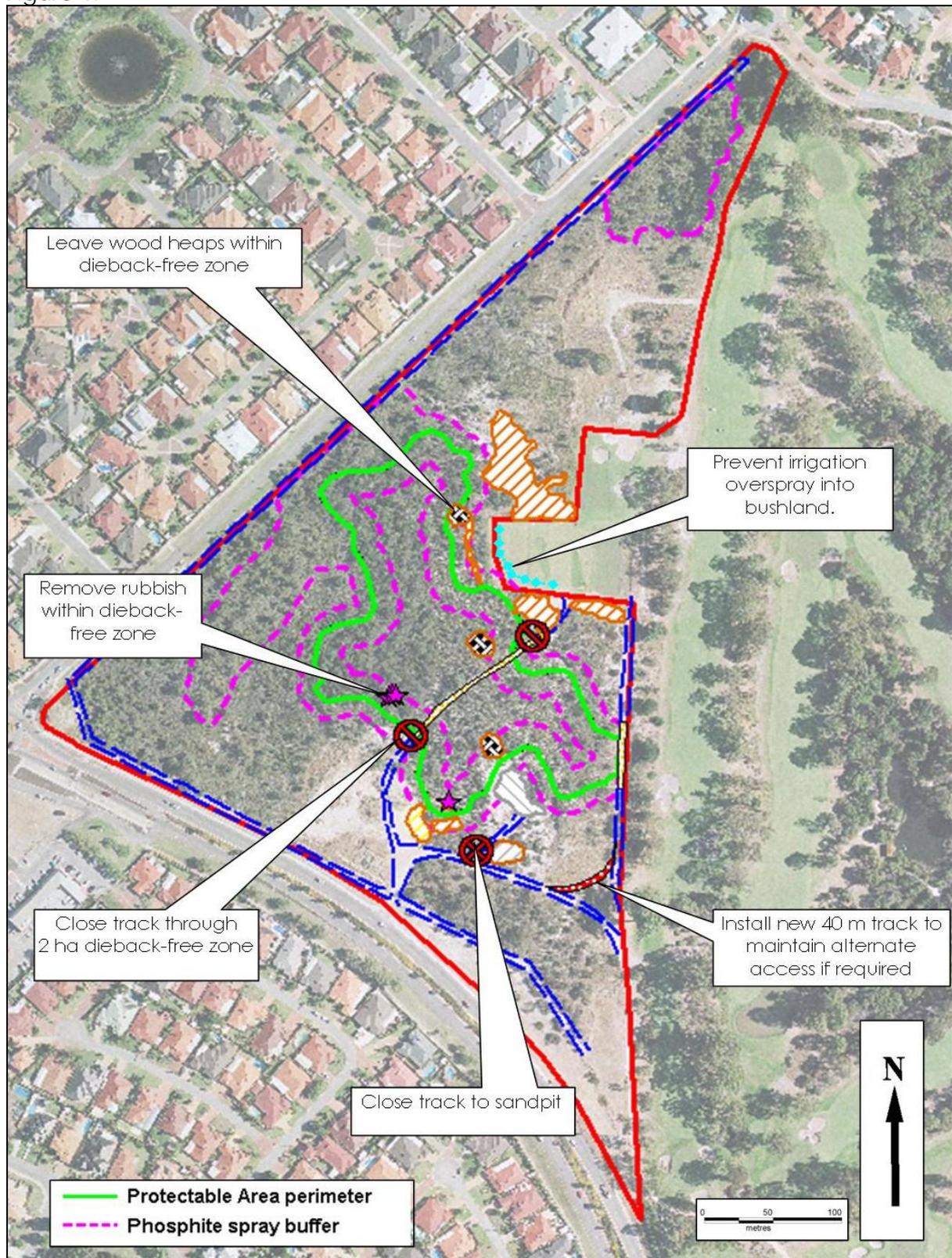
The key aspect to protection of the 2 ha dieback-free area is the control of access on the track which traverses this part of the Site. Restricting the use of this track is recommended in the Gosnells Golf Course Bushland Management Plan 2010 (Management Actions 5.3.3.3 and 5.4.4.4) as a dieback hygiene and weed management measure.

This Study examined three management options (Scenario A, B & C) for excluding or controlling track access, based on a range of different levels of risk, protection and management input. After considering the risks, management inputs and costs of each scenario, the most realistic and cost-effective option was found to be closure of the track, and re-routing access around the bushland to avoid any future breaches of hygiene.

This Study also recommends that a Phosphite Treatment Program be implemented to cover approximately three hectares (3 ha) of the Site which is either currently mapped dieback-free or which contains high concentrations of dieback-susceptible species. Spraying or stem injection of native species with the fungicide phosphite has been shown to increase plant's resistance to the dieback pathogen.

The Study also recommends other measures to reduce the spread of dieback across the site or reduce its ecological impact. These recommendations are summarised in Appendix 1 under the operational areas of dieback mapping, access/hygiene, treatment, Golf Course operational activities, fire suppression and management

planning, communication and knowledge transfer, signage and monitoring and review. Key Site recommendations requiring on-ground action are included in Figure 1.



**Figure 1: Key recommendations requiring on-ground action.**

See Figure 9 for recommended signage locations. See Appendix 1 for an operational summary of all recommendations. Additional information shown on map is taken from the Bushland Management Plan (Ironbark Environ. & Regen4 Environ. Services, 2008).

## 1. Introduction

The biodiversity value of the Gosnells Golf Course Bushland has been assessed by the City (*Biodiversity Conservation Management Plan, 2010*), using the Perth Biodiversity Project's ecological evaluation methodology, and is ranked as one of the highest priority natural areas managed by the City of Gosnells. It is also one of a number of regionally significant natural areas recognised by the State Government's Bush Forever policy document. (Government of Western Australia, 2000). The area is identified as Site #467 in the State Government's Bush Forever directory; its significance is due to the rarity of this type of vegetation remaining in the Perth Metropolitan Region.

A Bushland Management Plan (Ironbark Environment & Regen4

Environmental Services, 2010) was previously prepared for the site which identified the mapping and management of dieback as a priority action. To assist

management of the Site, four Management Areas were identified and these shown in Figure 2 and have been referenced in this Dieback Management Plan.

Dieback mapping and assessment was carried out in 2009 by Glevan Consultants. Building on that mapping, this Dieback Management Plan (herein referred to as the Plan) evaluates the site's known dieback infestation profile and provides guidance in the form of management actions to reduce the spread and the ecological impact of dieback on the site.

The responsibility for dieback disease management falls in the main to the City of Gosnells and the Gosnells Golf Club (Inc), but is shared by all who come into contact with the Site.



**Figure 2: Site showing Site Management Areas as identified in the Bushland Management Plan (Ironbark Environment & Regen4 Environmental Services, 2010)**

## 1.1 Site description

This Plan applies to all of the 10 ha area covered in the Bushland Management Plan (Ironbark Environment & Regen4 Environmental Services, 2010), and addresses the management of dieback disease in all of Bush Forever Site 467. This area is referred to as the Study Area in Figure 3. A number of management recommendations apply to activities external to the Bush Forever Site whose impact on the Site cannot be ignored. Activities carried out in the turf nursery area and the Western Power powerline easement, for example, occur in areas that either dissect or abut the dieback-free, Protectable Area within the Site.



Figure 3: Site showing the area to which this Plan applies.

## 1.2 Characteristics of dieback

Phytophthora dieback is a disease caused by a microscopic soil-borne water mould, *Phytophthora cinnamomi*. Dieback was once referred to as jarrah dieback because of its impact on the jarrah tree, however it is now known to kill approximately 40% of the plant species native to the south west of Western Australia, including many understorey species. *Phytophthora cinnamomi* is thought to have been introduced to Western Australia not long after European settlement.

As an indication of the diversity of flora species that are affected by the pathogen, some of the more common species found in the Gosnells Golf Course Bushland that are susceptible to Phytophthora dieback are listed in Table 1. It is estimated that between 30 % and 40% of the 111 species found on the site are susceptible to Phytophthora dieback.

The disease kills plants by invading the roots and stems to obtain nutrients for growth and reproduction. This process kills plant cells, effectively rotting the plant's roots and reducing its ability to transport water and nutrients. The plant is eventually starved of water and nutrients, and so appears to die back, or in some cases, dies quite suddenly as if affected by drought.

Once a plant or soil is infested, there is no known method of eradication. Limiting the spread of the disease is the most cost-effective control method (WWF Australia & Dieback Consultative Council, 2004).

**Table 1: Examples of plant species found at Gosnells Golf Course bushland that are susceptible to phytophthora dieback**

Botanical name	Common name
<i>Adenanthos cygnorum</i>	Woolly bush
<i>Adenanthos obovatus</i>	Basket flower
<i>Allocasuarina fraseriana</i>	Fraser's sheok
<i>Allocasuarina humilis</i>	Dwarf sheoak
<i>Banksia attenuata</i>	Candle banksia
<i>Banksia ilicifolia</i>	Holly leaved banksia
<i>Banksia menziesii</i>	Firewood banksia
<i>Eucalyptus marginata</i>	Jarrah
<i>Hibbertia hypercooides</i>	Yellow buttercups
<i>Jacksonia furcellata</i>	Grey stinkwood
<i>Kunzea ericifolia</i>	Spearwood
<i>Leucopogon polymorphous</i>	-
<i>Leucopogon propinquus</i>	-
<i>Macrozamia riedlei</i>	Zamia
<i>Melaleuca thymoides</i>	-
<i>Patersonia occidentalis</i>	Purple flag
<i>Pericalymma ellipticum</i>	Swamp tea tree
<i>Scholtzia involuocrata</i>	Spiked scholtzia
<i>Xanthorrhoea preissii</i>	Grasstree

(Groves, Hardy & McComb, undated)

The dieback pathogen is transported through three main mechanisms:

- The first mechanism is where infested soil or plant material is relocated across the landscape. The vector for this movement can include machinery, footwear and tools. Even tiny amounts of soil, as small as a teaspoon, can support the spores of the pathogen and can create new infestations if dropped onto warm, moist soils. Illustrating how easily this can occur, a new dieback infestation was observed in 2009 at a location in the Gosnells Golf Course Bushland near the turf nursery area where soil had recently been dumped (Glevan, 2009)
- The second transport mechanism is through movement in free water. At the Gosnells Golf Course site, the pathogen has moved across, and infected, all parts of the Site that are subject to seasonal waterlogging (e.g. in the west and south west of the Site which supports a Melaleuca Woodland community).
- The third mechanism is through root to root contact between individual plants, also called autonomous movement. Autonomous movement of dieback is more than likely occurring around the dieback-free, Protectable Area. Generally, autonomous movement of dieback on flat, dry sandy areas is less than 1 metre per year. This is valuable information for managing the disease.

### 1.3 Mapping of dieback on site

The results of dieback mapping and assessment by Glevan (2009) of the Site are included in Figure 3 and are summarised as follows:

- a) Two hectares (2 ha) of the 7.4 hectare bushland area have been mapped as uninfested and 5.4 ha have been mapped as infested.
- b) The 2 ha uninfested (dieback-free) area is considered to be a Protectable Area in Glevan (2009) because of its size, shape and the slow natural movement of dieback on relatively flat, dry sands. It is referred to in this Plan as the 2 ha Protectable Area;
- c) The main source of infestation appears to be associated with a dampland that begins in the south-western corner of the site and runs along a large part of Campbell Road boundary;
- d) The current spread of the disease appears to be relatively slow as it has covered all areas of inundation and is now spreading root to root (autonomously) upslope from the wetland area;
- e) No areas were mapped as uninterpretable.
- f) Several smaller spot infestations were also identified within the Site, which would indicate that the disease has been introduced by some form of vector. At least one of the infestations is indicative of soil being introduced from another area.
- g) Seven samples were taken from dead plants on the site to determine presence of the dieback pathogen. These are shown in Figure 3, together with the results of sampling. A positive sample means that the dieback pathogen has been identified, whereas a negative result indicates the dieback pathogen was not present in the sample.

Given that most spread on site is now via root to root, this will result in slow, predictable and easily monitored movement of the disease (Glevan, 2009). This is a favourable situation in terms of on-ground management, as long as no new infestations are created through movement of soil or plant material.



Figure 4: Dieback mapping at the Gosnells Golf Course Bushland by Glevan Consultants, 2009.

To assess the number and coverage of susceptible species outside of the Protectable Area, and the characteristics around the mapped dieback-free area, a site inspection was conducted by the authors on 20 May 2010. The location of tree specimens over 4 metres of the following susceptible species was mapped: *Allocasuarina fraseriana*, *Banksia attenuata*, *B. ilicifolia*, *B. menziesii*, and *Eucalyptus marginata*.<sup>1</sup> Large *Xanthorrhoea pressii* (grasstrees) and *Macrozamia reidleyi* (zamia) were also mapped. The results of the mapping exercise are provided in Figures 4 and 5.

This site inspection and mapping showed that there are a considerable number and distribution of these susceptible species in the areas mapped as infested by Glevan (2009). The most noticeable concentration of highly visible susceptible species was within Management Area A in the Mixed Banksia & Sheoak over Sedgeland community (Figure 5). This suggests that there may be an uninfested area of approximately one hectare (1 ha) between the infested dampland area to the south-west and a visibly dieback-affected area to the north. It is recommended that this area be re-assessed for presence of dieback as part of future re-mapping exercises. Discussion with Evan Brown of Glevan Consulting supported the author's view that this area is likely to be uninfested, and should be mapped as such. Glevan (2009) did not map uninfested pockets of vegetation less than 1 hectare in size, or less than 40 metres in width (Brown, pers. comm., 2010).

It is recommended to semi-permanently mark the perimeter of the mapped dieback front. To mark the perimeter it is recommended that capped star pickets or fence droppers be placed on the mapped dieback front at 30 to 50 metre intervals. This will also enable bushland management workers and others to quickly identify the mapped 2 hectare Protectable Area.

### Recommendations

1.3.1	The Site is to be re-assessed and re-mapped for dieback every three years by qualified dieback interpreters, commencing in 2011. (\$2640 in 2011 and similar costs every 2 – 3 years).	COG
1.3.2	First dieback re-mapping should include a requirement to specifically assess the status of the potential dieback-free area within Management Area A within the Mixed Banksia & Sheoak over Sedgeland community as indicated in Figure 5.	COG
1.3.3	Install semi-permanent markers at intervals of between 30 and 50 metres on the boundary of the mapped uninfested area to more permanently mark the boundary of infection. (2010)	COG

<sup>1</sup> Only specimens of trees over 4 m were mapped to provide an indication of the number of trees that would need to be stem-injected with phosphite. Most vegetation below 4 m in height is likely to be covered by spraying. See Section 4.4 for an outline on use of phosphite to build native plants resistance to dieback.

Two other areas with vegetation in Very Good condition were also found to support dieback susceptible species:

- In Management Area B, a large number of susceptible species were found, including mature trees of *Banksia attenuata* and *B. ilicifolia*, over 50 mature grasstrees, and a number of understorey species and young Banksias.; and
- In Management Area A, south of the track linking Ranford Rd to the Golf Course Maintenance Facility entry.

The highly visible, susceptible species mapped on the 20 May 2010 were generally not present across the balance of the infested area, indicating the extent of the impact of dieback across much of the site. For example it is highly possible that dieback has removed the Banksia and Sheoak overstorey from part of the site to create the closed sedgeland community in Management Area A mapped to the south west of the uninfested area.

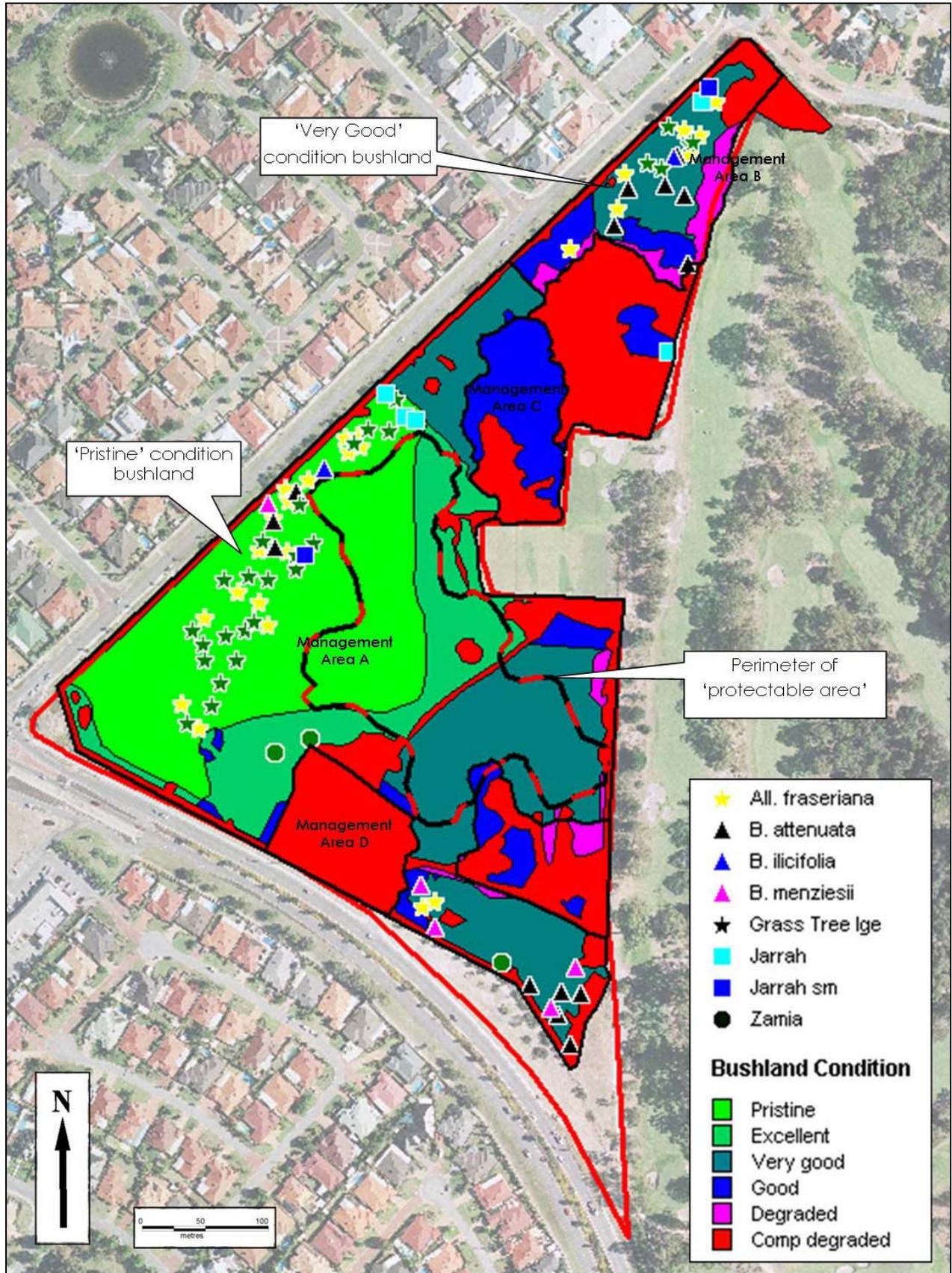


Figure 5: Susceptible trees located outside of the 2 ha Protectable Area, shown over vegetation condition mapping.

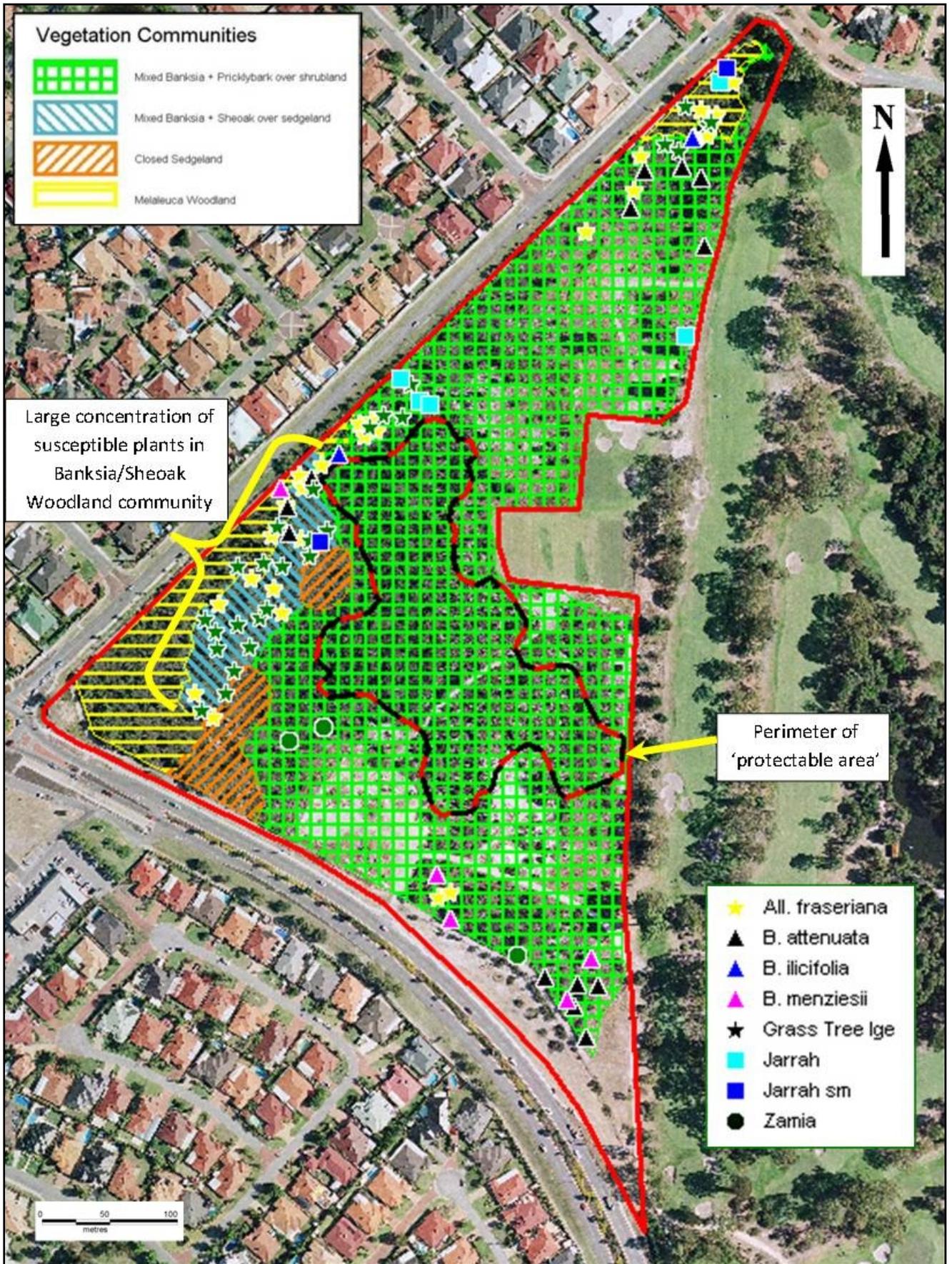


Figure 6: Susceptible trees located outside of the 2 ha Protectable Area, shown over vegetation community mapping.

## 2. Objectives of the Dieback Management Plan

This Plan has, at its core, the following objectives:

- a) To protect the 2 ha mapped Protectable Area from both the slow ingress of dieback infection and/or the introduction of new spot infections by physical means.
- b) To increase the resistance to the disease of susceptible species in the infested areas through chemical intervention (phosphite treatment).
- c) To provide clear and practical recommendations regarding the actions required to achieve a) and b).

(Note: The 2 ha area mapped as 'uninfested' by Glevan (2009) is referred to as the 'Protectable Area' in this Plan).

## 3. Key principles

In achieving the above objectives, the Plan's management strategies outlined in Section 4 are based on the following principles:

- a) Infection of bushland with *P. cinnamomi* is irreversible. Once infested, the pathogen cannot be killed or eradicated. Prevention of introduction or spread of the pathogen, or slowing its movement, is therefore the basis of all dieback management.
- b) Dieback management is largely about risk management. The most cost-effective measures will generally be those which eliminate, or reduce to a negligible level, risks of new infections.
- c) The greatest dieback management risk for the Site is new infection being introduced into the body of the 2 ha dieback-free Protectable Area.
- d) In terms of infection risk, the disease can be introduced by a number of obvious and less obvious means. Small portions of infested soil can be introduced by vehicle tyres, boots, tools, the roots of weeds, trailer spillage etc. It must be understood that all soil materials, plants with intact roots and mulched materials are able to transmit the disease. Fresh prunings, provided they are taken from at least 300mm above ground, are assumed not to carry the disease, unless they have been stored on the ground.
- e) Access to the Protectable Area should be restricted to activity that is required to manage the Site's bushland. This will prove the most effective and cost efficient dieback management measure.
- f) Regular, programmed surveillance of the site, including re-assessment and mapping by a qualified dieback interpreter is an important part of managing dieback.
- g) Strategic application of the chemical phosphite to the bushland can be used as a means of slowing the movement of the dieback pathogen through the soil and root-to-root contact. Phosphite does not kill the dieback pathogen but acts as booster to the plant to enable it to fight off the pathogen. For more information on the use of phosphite, refer to Section 4.4.

## 4. Proposed management strategies

In approximate order of priority, the recommended dieback management strategies for the Site are:

- 1) Managing access THROUGH the 2 ha Protectable Area within Management Area A, which may include exclusion of machinery and soil movement.
- 2) Preventing other sources of infection ENTERING the 2 ha Protectable Area bushland area.
- 3) Managing access on the PERIPHERY of the 2 ha Protectable Area and reducing the rate of spread on the dieback front.
- 4) Strategic application of phosphite to increase the resistance of susceptible species to the dieback pathogen;
- 5) Building stakeholder awareness and capacity.
- 6) Installing Dieback Protection Area signage to assist those who come into contact with the Site.
- 7) Long-term monitoring and assessment of the spread and impact of the disease over the Site.

### 4.1 Access through the Protectable Area

Controlling or preventing access is a significant management technique to prevent or reduce the spread of the dieback pathogen across a bushland site. This is because the dieback pathogen can be transported in the soil on vehicle tyres or shoes, and once introduced, cannot be killed.

Preventing dieback from infecting the 2 ha Protectable Area is the highest priority of this Plan, and a high priority for overall management of the Site.

A significant and constant infection risk is presented by the location of the well-used track through the Protectable Area (Figure 1). Key risk aspects include:

- Introduction of soil and wet plant material transported on vehicle tyres and undercarriages;
- Spillage of soil and mulch transported in the course of golf course management activities; and
- Storage and/or dumping of alien materials.

The access track and its location are historical fact. It is also fact that no dieback disease infestation is evident along the track. Understanding dieback disease, the lack of infestation can reliably be attributed to good fortune. This study recommends a management approach less reliant on good luck.

Gosnells Golf Club (Inc) has advised, in its submission to the City of Gosnells on the Gosnells Golf Course Bushland Management Plan 2010, that the access track is used infrequently.

Three scenarios for the management of the access track have been developed and examined based on a range of different levels of risk, protection and management input. The scenarios are:

- Scenario A: Year round general purpose closure;
- Scenario B: Part year general purpose closure; and

- Scenario C: Year round controlled usage with intensive hygiene measures.

Each of the scenarios is discussed below in more detail.

#### **4.1.1. Scenario A: Exclude access**

The most effective, low-risk and cost efficient option is to close the track to general vehicle usage and re-route it around the south-east corner of the Site onto another existing track (to the east and south of the sand quarry). Redirecting vehicular traffic along this proposed alternative route would not appear to be a major inconvenience to golf course management activities, particularly given the very high risk presented by the continued use of the track through the Protectable Area. See Figure 1.

Post and lockable chain gates would be placed at either end of the closed track and signs installed (See Signage 4.7) indicating that general vehicle movement is prohibited due to the risk of spreading dieback.

Vehicle movement for the purposes of fire suppression and bushland management would be allowed. Keys to the gate would be held by the City of Gosnells, Gosnells Golf Club, Canning Vale Career Fire and Rescue Service and Gosnells Volunteer Bushfire Brigade.

The closed track would need to be monitored for weed growth, and weed control undertaken as necessary as part of overall bushland management activities.

Closing the track to pedestrian usage is considered counter-productive to encouraging appreciation of the bushland area, and will be necessary for bushland management purposes. Pedestrian use of the track should be permitted to continue on the basis of signage advising users that the area is 'dieback-free' and walker's shoes must be free of soil material. A boot scrubbing station and appropriate signage should be installed at each end of the track at the edge of the dieback-free area. The potential for new infections occurring as a result managed pedestrian access is considered negligible.

The key aspects of implementing this scenario are:

- the re-routing of all vehicular traffic;
- installation of a post and lockable chain gate at either end of the track;
- installation of a boot scrubbing station at either end of the track;
- Installation of signage; and
- Weed monitoring and management along the track

The advantage of this scenario is that it has a negligible risk of failure and does not require intensive monitoring and evaluation.

#### **4.1.2 Scenario B: Managed access, dry conditions only,**

A moderate risk option is to allow restricted use of the track in dry conditions (generally summer only), and prohibit use of track in wet conditions.

Under this scenario, the track may only be used when soil moisture is low (generally between December and March) and the risk of the pathogen being transported and surviving (in dry conditions) is low. Use would, of necessity, preclude the transport of soil, vegetative material with soil, or mulch. Movement of such material would still need to be by an alternative route (such as that proposed in Scenario A). Transport of prunings – aerial portions of plants only - could be permitted in dry conditions.

Access would still require management. Vehicles would need to be inspected at designated hygiene points (one at each end of the track, external to the gates) with any loose soil or vegetative material to be removed (Glevan, 2009). Under dry soil conditions, no other clean down of vehicles would be required.

Given the higher risk of introducing the disease into the dieback-free area under Scenario B the following management actions would be required:

- a) Installation of a lockable gate at either end of the track, which is locked at all times. Access would be prohibited between May and October, and any time that moist soil conditions exist, such as periods following rainfall. The City of Gosnells should be consulted prior to access. Vehicle inspection would be required prior to all use of the track;
- b) Paving the track with 100mm of crushed, compacted limestone. Limestone is known to be antagonistic to the dieback pathogen and is freely draining;
- c) Phosphite spraying of the vegetation bordering the track every 2 years; and
- d) Monitoring and mapping of the presence of dieback every two years along the track by a qualified dieback interpreter, in consultation with the City.

Other management aspects of Scenario A would also be included.

The key aspects of implementing this scenario are:

- re-routing vehicular traffic onto an alternative route during the wet period of the year and other unseasonal wet conditions;
- dry season and dry condition access to 'clean and inspected' vehicle movement;
- limestone surfacing of the traversing track;
- installation of a post and lockable chain gate at either end of the track;
- installation and maintenance of vehicle brush-down area;
- bi-annual phosphite application to areas adjoining the track;
- bi-annual dieback monitoring and mapping
- installation of a boot scrubbing station at either end of the track;
- Installation of signage; and
- weed monitoring and management along the track

The adoption of this option is considered to present a moderate risk of dieback infection. A considerable disadvantage, though, is that it has a high risk of failure, requires considerable capital works, and requires more intensive monitoring and evaluation.

If Scenario B were to be implemented, it would be considered reasonable for the cost of capital works above and beyond those addressed in Scenario A to be the responsibility of the Gosnells Golf Club (Inc), as they would be for the almost exclusive use of the Club.

#### 4.1.3 Scenario C: Managed access, year-round

This scenario presents the highest risk of all options. It was not recommended by Glevan Consulting (2009), and is not recommended as a practicable option by this study. Nonetheless, an exploration of this scenario has been undertaken and is presented. Being high risk, intensive management of Scenario C is prescribed to reduce the risk as much as possible.

Under this scenario, the track could be used all year, given the following management actions:

- a) Paving the track with 100mm of crushed, compacted limestone. Limestone is known to be antagonistic to the dieback pathogen and is freely draining;
- b) Constructing and maintaining a clean-down and disinfection control point at either end of the track to enable all vehicles to be inspected, and if necessary, soil removed and disinfected with a suitable agent before access to the track. This would require the provision of back-pack disinfection spray units and instruction on dieback hygiene measures to all vehicles and personnel wishing to use the track (including contractors), and the maintenance of records of vehicle passage and hygiene treatment;
- c) Monitoring and mapping of the presence of dieback along the track by a qualified dieback interpreter on an annual basis;
- d) Spraying along each side of the track every 2 years with phosphite; and
- e) A prohibition on the transport on the track of soil or vegetative material with soil.

Other management aspects of Scenario B would also be included.

The key aspects of implementing this scenario are:

- all season and condition access to 'clean and inspected' vehicle movement;
- re-routing the transport of soil, vegetative material with soil attached, and mulch material to an alternative route;
- limestone surfacing of the traversing track;
- installation of a post and lockable chain gate at either end of the track;
- installation and maintenance of a vehicle clean-down and disinfection control point at either end of the track;
- maintenance of records of vehicle movement and hygiene treatment;
- bi-annual phosphite application to areas adjoining the track;
- annual dieback monitoring and mapping
- installation of a boot scrubbing station at either end of the track; and
- Installation of signage

The adoption of this option is considered to present an extremely high risk of introducing dieback into the 2 ha Protectable Area. The disadvantage, though, is that it has an extremely high risk of failure, requires considerable capital works and management, and requires intensive monitoring and evaluation.

If Scenario C were to be implemented, it would be considered reasonable for the cost of capital works above and beyond those addressed in Scenario A to be the responsibility of the Gosnells Golf Club (Inc), as they would be for the almost exclusive use of the Club.

#### 4.1.4 Recommended scenario

Glevan (2009) suggested that access could be restricted to dry conditions and prohibited in wet conditions (i.e. Scenario B). Having more fully explored this option, it is considered that this option has an unacceptably high risk of failure given the limited resources of the Golf Club and the City.

Scenarios B and C both present significant complexities with regard to the management of conditional access. Given the known importance of the Site and the presence of dieback disease in adjoining areas, these management complexities are considered to present an unacceptable risk of failure to both options.

Scenarios B and C also present considerable capital and maintenance costs.

Scenario A provides a high level of certainty with regard to the exclusion of dieback disease from the Protectable Area, and is highly cost-effective. It is recommended as the only practically achievable dieback management option for the access track.

The following Recommendations are framed in the context of the adoption of Scenario A.

##### Recommendations

4.1.4.1	Adopt Scenario A, which excludes access through the two hectare Protectable Area	COG & GGC
4.1.4.2	Establish an alternative route, if required, to link the powerline easement track and the Entrance Gate-Depot Track, approximately 40 metres in length.	COG & GGC
4.1.4.3	Install a post and lockable chain gate at either end of the track	COG
4.1.4.4	Install boot scrubbing stations at either end of the existing track through the two hectare Protectable Area.	COG
4.1.4.5	Carry out annual surveillance for weed infestations along the existing track through the two hectare Protectable Area	COG

#### 4.2 Preventing spot infections within the dieback-free area

Glevan (2009) made two recommendations in relation to preventing spot infections within the Protectable Area. These relate to the regulation of soil movement within the Site, and the prevention of dumping of plant material and mulch.

This Plan recommends the following operating measures to prevent spot infestations within the Protectable Area and avoid further impacts on susceptible vegetation across the Site.

##### Recommendations

4.2.1	Undertake all bushland management in the Protectable Area (including the track) using appropriate dieback hygiene techniques, including the avoidance of soil introduction and the planting of vegetation. (ongoing)	COG
4.2.2	Prohibit the placement of soil, plant material or mulch within 10 metres of the perimeter of the 4.7ha phosphite-treatment areas (Figure 6). (ongoing)	COG & GGC
4.2.3	Prohibit dumping and storage activity within the Bush Forever Site.	COG & GGC
4.2.4	Manually remove existing dumped rubbish near the edge of the dieback-free area (see Figure 1) and ensure as little disturbance as possible to vegetation. (2011).	GGC
4.2.5	Do not disturb existing woodpiles near the edge of the infested area (or within the two hectare Protectable Area).	CCG & COG
4.2.6	Include existing woodpiles near the edge of the infested area (or within the dieback-free area) in the Phosphite Treatment Program (See Section 4.4).	COG
4.2.7	Manage weeds in existing woodpiles near the edge of the infested area (or within the dieback-free area) with minimal soil disturbance (targeted chemical control is preferable).	COG

### 4.3 Access and disease spread on periphery of dieback-free area

The movement of the dieback pathogen on the infection front will be through two mechanisms: firstly, by slow autonomous root-to-root movement, and, secondly, via the movement of soil or infested material. To reduce this rate of spread even further, three main actions should be considered.

The first is to prevent any movement of soil, machinery and people across the disease front, and the bushland generally. To achieve this, it is recommended that:

- Entry of any machinery to the Site’s bushland be prohibited; and
- Golfers be prohibited from entering the bushland to retrieve golf balls

The second action is to prevent any irrigation (including spray drift) of bushland given that the dieback pathogen thrives in moist, warm conditions<sup>2</sup>. For example, it has been observed that irrigation sprinklers on the edge of the turf nursery deliver spray drift into the bushland area, encouraging weed growth up to 4 metres into the bushland. This overspray should be addressed to remove the threat to the bushland. The most effective way of achieving this will be to move the sprinklers approximately 4 metres away from their current locations.

The third action is to slow and possibly halt the impact of the dieback pathogen on the Site by treating vegetation in the vicinity of the dieback front, and elsewhere, with the fungicide Phosphite. Phosphite is known to boost the resistance of susceptible species enabling them to fight off infestation from *Phytophthora* dieback. A Phosphite Treatment Program is recommended for the Site and described in Section 4.4 of the Plan.

#### Recommendations

4.3.1	Prohibit the entry of any machinery into the Site’s bushland (ongoing).	COG & GGC
4.3.2	Prevent irrigation overspray into the Site from sprinklers within the turf nursery. <sup>3</sup> (2011)	GGC
4.3.3	Prohibit entry into bushland area to retrieve golf balls. (2011)	GCC
4.3.4	Install signage advising prohibition of entry into the bushland area to retrieve golf balls (2011).	COG

<sup>2</sup> Irrigation also degrades native vegetation through altering water regimes and encouraging weed spread.

<sup>3</sup> The current spray drift is encouraging couch to grow up to 4 m into bushland. A dry buffer between turf and native vegetation of at least 4 metres should be created. This is also recommended in Glevan (2009) and Ironbark & Regen4 Environmental Services (2008).

#### 4.4 Phosphite Treatment Program

The slow autonomous root-to-root spread on the disease front can be slowed further by the regular application of the fungicide phosphite. Phosphite (Phosphonate) is a biodegradable, inexpensive chemical that is systemically transmitted throughout treated plants and has a very low toxicity to animals. Whilst phosphite does not kill the pathogen, it acts as a booster to native plants enabling them to fight off the pathogen for a significantly longer period of time. Phosphite can be applied ahead of an advancing *Phytophthora* dieback front to form a protective barrier. It can also be applied in an already infested area to protect susceptible plants that have not yet been infected.

Phosphite needs to enter a plant's water transport system in order for it to be effective. This can be done by injecting phosphite directly into the trunk (or roots) of trees, or spraying the leaves of plants. Injecting a tree with phosphite provides three to five years protection from *Phytophthora* Dieback, whilst spraying with phosphite only provides protection for one to two years.

It is recommended that phosphite spraying be carried out in a 25 metre band on the disease front in Management Area A (10 m into the infested vegetation, and 15 metres into the dieback-free vegetation). The spray buffer should also be expanded to include vegetation to the south-west of the mapped dieback-free area (as shown in Figure 6). The total area of this buffer and additional area is estimated at 2.6 ha. This expansion of the buffer will protect susceptible vegetation outside of the dieback-free area. Phosphite spraying should also occur in the 0.4 ha area in Management Area B where the vegetation is in Very Good condition and numerous susceptible species are present.

Spraying should occur every two years to maintain ongoing protection. However, as spraying may only provide protection for one year, there should be annual monitoring of vegetation to assess the effectiveness of the treatment. As dieback is actively killing plants on the site, initial spraying should occur as soon as possible, ideally in Spring 2010. If there are no plant deaths on the disease front, then spraying may be repeated on a 2-yearly basis, but with ongoing annual monitoring of plant health.

Susceptible trees greater than 4 metres in height (i.e. those that are too tall to spray adequately) in the dieback buffer zone should be stem injected with phosphite on a 3 to 5 year basis. Initial injections should be in Spring 2010. Annual monitoring of tree health should be used to determine the frequency of repeat injections thereafter.

As stem injection is known to give a greater level of protection than spraying, consideration should also be given to stem injecting those trees less than 3m in height but that have an adequate trunk diameter.

Approximately eighty (80) trees of susceptible species are located outside of the mapped 2 ha Protectable Area and phosphite treatment buffer. It is estimated that a further 200 trees over 4 m of susceptible species are located within the phosphite treatment buffer.

The cost of the above recommended phosphite treatment in 2010 is estimated at:

Cost of stem injection, including labour:

- 280 trees, assuming each tree requires 3 injections, estimated cost per injection is \$1/injection (Source: Glen Tuffnell, pers. comm, 2003 in WALGA &PBP, 2004)

Total cost of injections = 280 x 3 x 1 = \$840

Cost of spraying

- Total area requiring spraying = 2.6 ha + 0.4 ha =. 3.0 ha
- Estimated average cost of spraying is \$1000/ha.
- Cost of spraying recommended areas = 3.0 X \$1000 = \$3000

Total estimated cost of initial Phosphite Treatment Program is \$3840.

Technical instructions for the spraying of bushland and stem injection with phosphite are provided in *Managing Phytophthora Dieback – Guidelines for Local Government* (Dieback Working Group, 2000).

#### Recommendation

4.4.1	Implement a Phosphite Treatment Program on the Site in accordance with the specifications provided in Section 4.4. (initiate in Spring 2010; \$4140 in 2010, and similar costs every 2 years)	COG
-------	---	-----

#### **4.5 Fire Response Planning**

The development of a Fire Management/Response Plan was recommended under the Site's Bushland Management Plan (Management Action: 5.3.2.4). The responsibility for preparing the plan rests with the City's Coordinator for Risk and Emergency Management, in consultation with FESA and the City's Environmental Management team. Fire management practices can unknowingly spread dieback and the following measures are recommended to minimise this risk.

Recommendations

4.5.1	<p>Develop a Fire Management/Response Plan that addresses dieback aspects of fire management and suppression activities, including:</p> <ul style="list-style-type: none"> <li>• The preference for fire suppression to be undertaken from outside the perimeter of the bushland area.</li> <li>• The restriction of vehicle movements to existing tracks.</li> <li>• The exclusion from use of the track through the dieback-free area unless risk to life or property warrants such use.</li> <li>• The use of mains water for fire suppression due to the likely contamination of groundwater by the Phytophthora pathogen.</li> <li>• Avoiding any disturbance to native vegetation in the Site, except where risk to life or property warrants such disturbance. (2011)</li> </ul>	COG
4.5.2	<p>Provide interim advice, in the absence of a Fire Management/Response Plan, together with Figure 6, to the City's Coordinator Risk and Emergency Management, FESA and the Gosnells Volunteer Bushfire Brigade that:</p> <ul style="list-style-type: none"> <li>• The preference for fire suppression is that it be undertaken from outside the perimeter of the bushland area.</li> <li>• Vehicle movements are to be restricted to existing tracks.</li> <li>• The track through the dieback-free area is excluded from use unless risk to life or property warrants such use.</li> <li>• The use of mains water for fire suppression is preferred due to the likely contamination of groundwater by the Phytophthora pathogen.</li> <li>• Disturbance to native vegetation in the Site should be avoided, except where risk to life or property warrants such disturbance. (2010)</li> </ul>	COG
4.5.3	<p>Undertake the maintenance of perimeter fire access tracks on the Campbell and Ranford Road frontages strictly in accordance with the Bushland Management Plan 2010 (Management Actions 5.3.2.2 and 5.3.3.2), ensuring that all machinery used is cleaned of all soil and vegetative material prior to fire access track maintenance. (ongoing)</p>	GGC

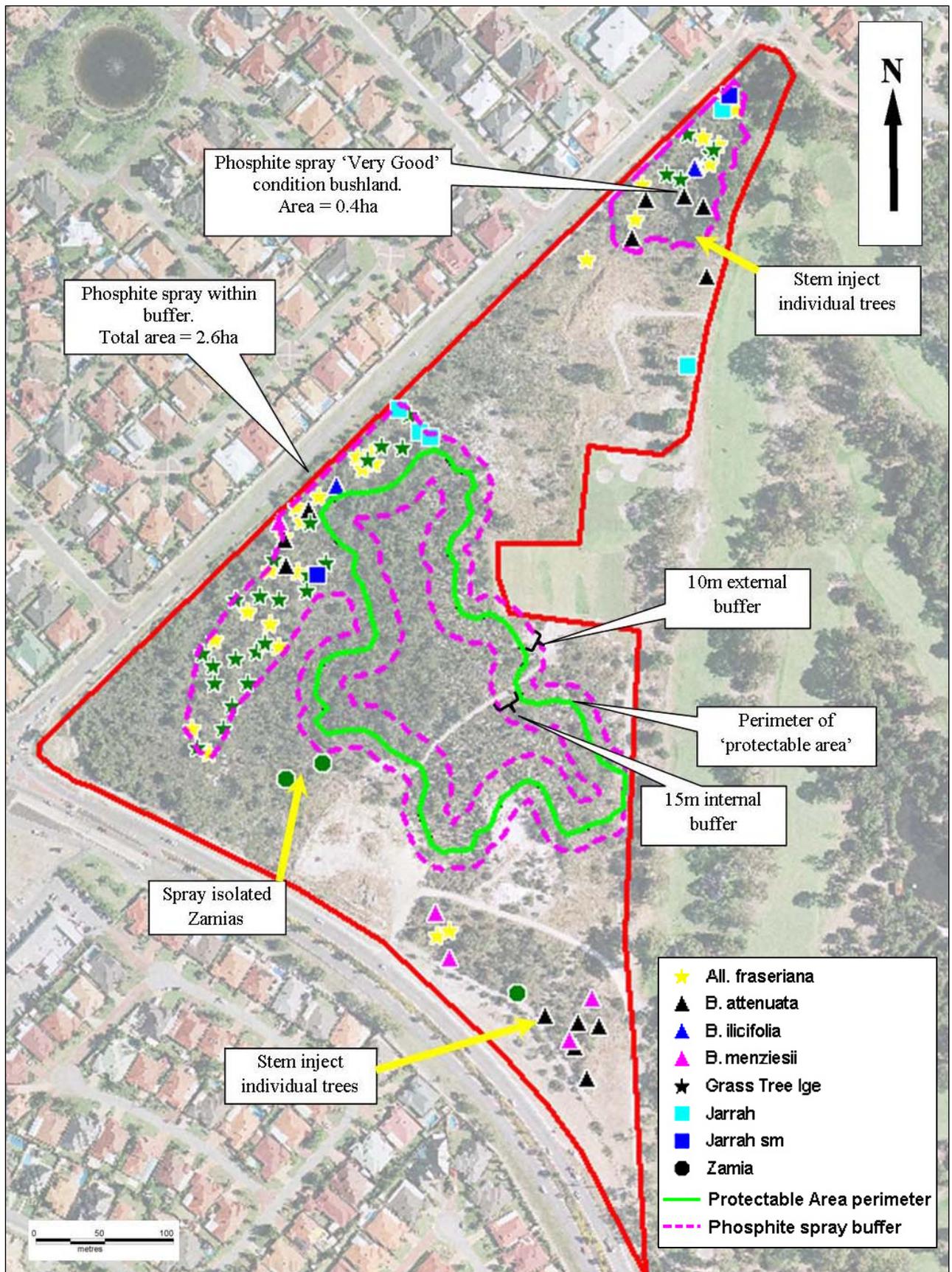


Figure 7: Recommended phosphite treatment areas and susceptible trees (generally over 4 m in height) outside the 2 ha Protectable Area.

#### 4.6 Communications plan

It is critical that the Plan is communicated to those with management responsibilities that affect the Site, and to operational stakeholders who work around, within, or come into contact with, the Site.

The main stakeholders involved with the Site are listed in Table 2. Mechanisms by which they should be engaged, and information transferred, are identified alongside. The right-hand column identifies where there is a need for one-on-one instruction from supervisors prior to working on the Site. This is simply an exercise in ensuring that recommendations relevant to a person's work are made clear to them *before* they commence on-ground activity.

**Table 2: Communications plan matrix**

Main group	Familiarity with Management Plan (and provide copy of DMP)	A4 box and instructions	Glove map	Signage	One-to-One Instruction prior to site access
GGC Operational staff	✓		✓	✓	✓
GGC Manager	✓			✓	
Golfers				✓	
Golf Course contractors who work near the Site			✓	✓	✓
COG Environment Team	✓		✓	✓	
COG Parks and Environmental Operations	✓		✓	✓	✓
FESA & Volunteer Bushfire Brigade	✓		✓	✓	
Contractors to City working in vicinity of Site			✓	✓	✓
Western Power and its contractors	✓		✓	✓	✓

For example, the Gosnells Golf Club operational staff should receive instruction from their supervisor on how the Plan affects their work. The City's Environmental Management team should engage with Golf Course operational and management staff, possibly through an initial instruction meeting.

Table 2 also recommends the production of laminated A4 maps & instructions, based on this Management Plan, which could be given to operators working near the site as a 'quick reference guide'. Alternatively, the content of the map/instructions sheet could be widened to include all major points relating to both the Dieback Management Plan and Bushland Management Plan.

Recommendations

4.6.1	Undertake briefing of Gosnells Golf Club operational staff on the DMP and its implications for their activities.	COG & GGC
4.6.2	Contractors working for the City of Gosnells or Gosnells Golf Club (Inc) are to be advised that any work in the vicinity of the bushland poses a dieback disease risk, and that they are required in such instances to undertake a site induction, and to take appropriate measures to address dieback disease risk presented by their activities. (ongoing)	COG & GGC
4.6.3	Provide copies of the Dieback Management Plan (and A4 Quick Reference Guide) to stakeholders in accordance with Table 2 (2010).	COG
4.6.4	Produce an 'A4 Quick Reference Guide' for the Site to provide to all stakeholders as per Table 2. (2011, in house costs)	COG

**4.7 Signage**

The use of signage is an important part of making people aware of the dieback status of the Site, and of access restrictions. The following signs are recommended for use at the Site at the locations shown in Figure 9.

**a. Dieback Protection Area signs**

Use of the standard 'Dieback Protection Area' signs (Figure 7) is recommended in four (4) locations as shown in Figure 9. These four locations have been chosen to capture the attention of contractors and staff entering the Site from Ranford Road, golfers who may be teeing off from the thirteenth tee, and those considering using the track that dissects the dieback-free area.

**b. Track closed to general use**

At the either end of the track that bisects the dieback-free area, a sign should be placed in that reads: 'Track closed to general vehicle use'. This could be placed on the same posts holding the 'Dieback Protection Area' sign.

**c. 'Entering dieback free' signs**

The standard 'Entering Dieback Free' signs (Figure 8) with symbols should be placed at either end of the track on the disease front. These signs should be located next to the boot scrubbing stations if installed.



Figure 8: 'Dieback Protection Area' standard sign for entry points (Project Dieback, 2008)

d. 'Keep Out' - Entry to bushland prohibited signage

At six (6) locations on the interface between the golf course and the bushland, it is recommended that signs be erected stating "Keep Out – Entry to bushland prohibited". The locations for these signs are shown in Figure 9, and denoted by yellow triangles. These signs could also include the standard dieback status signage with symbols, as shown in Figure 8.



Figure 9: Dieback status markers and symbols, standard size, 95 mm x 140mm aluminium panels (Project Dieback, 2008).

These signs have been recommended for positioning at strategic locations where golfers or contractors may enter bushland that has been evaluated as being in Good or better condition. The Golf Club should advise golfers that they are not to enter the bushland to retrieve balls as they may spread dieback.

**e. Markers of the infection boundary.**

It is recommended that fence-droppers be placed at intervals of between 30 and 50 metres on the disease front (i.e. the perimeter of the mapped Protectable Area). These will enable bushland managers and others to immediately identify the dieback front on site. The fence –droppers should be capped to ensure the safety of those working in the bush.

Erection and maintenance of all signs should be the responsibility of the City.

Recommendations

4.7.1	Install signage advising prohibition of entry into the bushland area to retrieve golf balls (2010).	COG
4.7.2	Erect and maintain all signage detailed in Figure 9. (\$5000 in 2010/11 to supply and erect the signage)	COG

**Signage cost estimate**

The cost of purchase and erection of recommended signage is estimated at \$5000 as follows:

- a) Standard 'Dieback Protection Area signs \$2000 (4 @ \$500 each)
- b) Track closed to general use - \$200 (2 @ \$100 – custom made)
- c) 'Entering dieback free' signs \$200 (2 @ \$100 )
- d) 'Keep Out – entry to bushland prohibited' signage with standard dieback status symbols \$600 (6 @ \$100 each)
- e) Markers of the infection boundary. – fence droppers - negligible cost
- f) Poles and other materials \$1000
- g) Erection labour \$1000

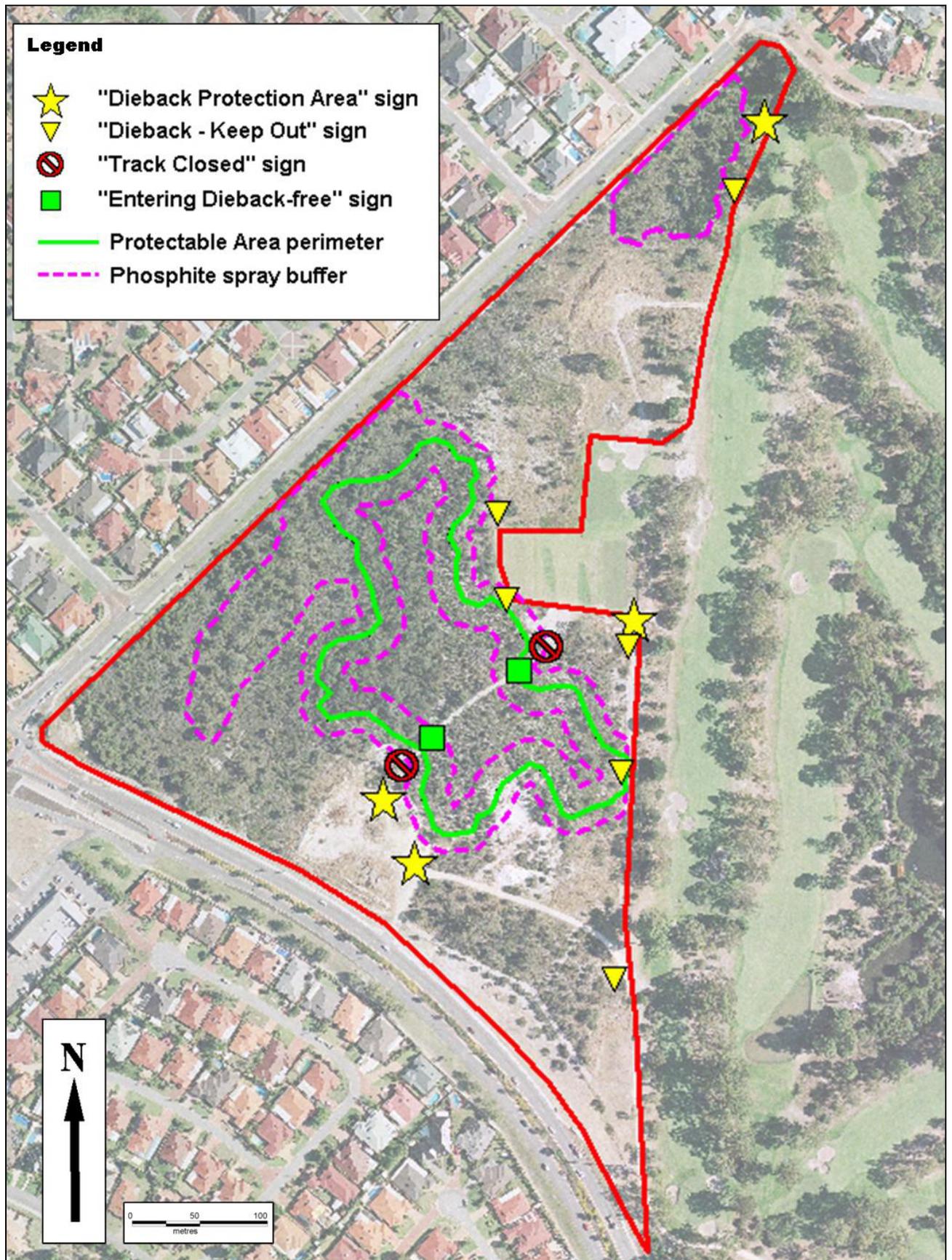


Figure 10: Recommended location of signs

#### 4.8 Implementation, monitoring, and plan review

The City of Gosnells has responsibility for ensuring the recommendations of this Plan are implemented. A summary of recommendations made throughout this Plan is provided in Appendix 1. Included are capital or operating costs over \$500 and key implementation dates.

The most important monitoring tool will be programmed inspections of the Site by the City to identify critical management needs, and to assess dieback impact, weed spread on the disused track, rubbish dumping and soil disturbance. Inspection output should be used to determine the frequency for remapping dieback on the Site.

As per Recommendation 1, the City should initially have the Site re-assessed and remapped for dieback in 2011, or as early as possible, to verify the presence of uninfested area(s) in Management Area A, outside of the mapped 2 ha Protectable Area. Ordinarily, re-assessment and mapping of dieback at the Site should occur every three years by a qualified dieback interpreter, funded by the City. However, where potential dieback spread is observed, then remapping may be necessary every two years.

The responsibility for auditing the implementation and effectiveness of this Plan rests with the City. This audit should be undertaken after five years of implementation. A rapid audit may be required after significant plant deaths linked to dieback infection are observed. The results of the five year audit should be provided to stakeholders as a means of ensuring that the Site's management needs remain a priority.

For ease of administration and reporting, it is also recommended that this Plan be integrated into the Site's Bushland Management Plan at the next audit or review of the Bushland Management Plan.

##### Recommendations

4.8.1	Audit this Plan after five years of its operation; rapid audits may occur after significant dieback-related plant death. (2015, in-house costs)	COG
4.8.2	Review this Plan after 10 years of operation or, preferably, as part of a review of the Bushland Management Plan. (2020, in house costs)	COG
4.8.3	Undertake programmed inspections of the Site to identify critical management issues, including potential dieback impact, as relevant under this Plan and the Site's Bushland Management Plan. (ongoing)	COG
4.8.4	Re-assess and map the Site's dieback disease status every two to three years, the frequency depending upon observed impacts on the Site. (\$2000 in 2011, and then every 2 - 3 years)	COG

## References

Brown, Evan (pers. comm., 2010). Glevan Consulting, Erskine.

City of Gosnells (2010) City of Gosnells Biodiversity Conservation Management Plan, City of Gosnells, Perth.

Dieback Working Group (2000) *Managing Phytophthora Dieback – Guidelines for Local Government*, Dieback Working Group, Perth.

Glevan Consulting (2009) *Phytophthora cinnamomi occurrence assessment August 2009, Location: Gosnells Golf Course*, A report by Simon Robinson of Glevan Consulting to the City of Gosnells and the South East Regional Centre for Urban Landcare, Perth.

Government of Western Australia (2000) *Bush Forever – Keeping the Bush in the City*, Western Australian Planning Commission.

Groves E, Hardy G & McComb J (undated), Western Australian natives susceptible to *Phytophthora cinnamomi*, Centre of *Phytophthora* Science and Management, Murdoch University, Perth.

Ironbark Environmental & Regen4 Environmental Services (2008) Bushland Management Plan – Gosnells Golf Course Bush Forever Site 467, A report to the City of Gosnells, Perth.

Project Dieback (2008) Standard Dieback Signage – Protocol for Use, *State Dieback Consultative Council (DCC), Dieback Working Group (DWG) and Department of Environment & Conservation (DEC)*, Perth.

Tuffnell Glen (pers. comm., 2003) In: WALGA & PBP (2004) *Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region*, authors: Del Marco A, Taylor R, Clarke K, Savage K, Cullity J & Miles C, Perth.

WWF Australia & Dieback Consultative Council (2004) *Arresting Phytophthora Dieback: The biological bulldozer*, Perth.

## Appendix 1: Recommendations - Operational summary

(Responsibility codes: COG – City of Gosnells, GGC – Gosnells Golf Club)

Dieback Mapping		Responsibility
1.3.1	The Site is to be re-assessed and re-mapped for dieback every three years by qualified dieback interpreters, commencing in 2011. (\$2640 in 2011 and similar costs every 2 – 3 years).	COG
1.3.2	First Dieback re-mapping should include a requirement to specifically assess the status of the potential dieback-free area within Management Area A within the Mixed Banksia & Sheoak over Sedgeland community as indicated in Figure 5.	COG
1.3.3	Install fence droppers on the mapped dieback front to semi-permanently and more visually define the dieback-free area. (2010)	COG

Access/Hygiene		
4.1.4.1	Adopt Scenario A, which excludes access through the two hectare Protectable Area.	COG & GGC
4.1.4.2	Establish an alternative route, if required, to link the powerline easement track and the Entrance Gate-Depot Track, approximately 40 metres in length.	COG & GGC
4.1.4.3	Install a post and lockable chain gate at either end of the track.	COG
4.1.4.4	Install boot scrubbing stations at either end of the existing track through the two hectare Protectable Area.	COG
4.1.4.5	Carry out annual surveillance for weed infestations along the existing track through the two hectare Protectable Area.	COG
4.2.1	Undertake all bushland management in the Protectable Area (including the track) using appropriate dieback hygiene techniques, including the avoidance of soil introduction and the planting of vegetation. (ongoing)	COG
4.2.2	Prohibit the placement of soil, plant material or mulch within 10 metres of the perimeter of the phosphite-treatment areas (Figure 6). (ongoing)	COG & GGC
4.2.3	Prohibit dumping and storage activity within the Bush Forever Site.	COG & GGC
4.2.4	Manually remove existing dumped rubbish near the edge of the dieback-free area (see Figure 1) and ensure as little	GGC

	disturbance as possible to vegetation. (2011).	
4.3.1	Prohibit the entry of any machinery into the Site's bushland. (ongoing).	COG & GGC
4.3.3	Prohibit entry into bushland area to retrieve golf balls. (2010)	GCC
4.3.4	Install signage advising prohibition of entry into the bushland area to retrieve golf balls. (2010)	COG
4.5.2	<p>Provide interim advice, in the absence of a Fire Management/Response Plan, , together with Figure 5, to the City's Coordinator Risk and Emergency Management, FESA and the Gosnells Volunteer Bushfire Brigade that:</p> <ul style="list-style-type: none"> <li>• The preference for fire suppression is that it be undertaken from outside the perimeter of the bushland area.</li> <li>• Vehicle movements are to be restricted to existing tracks.</li> <li>• The track through the dieback-free area is excluded from use unless risk to life or property warrants such use.</li> <li>• The use of mains water for fire suppression is preferred due to the likely contamination of groundwater by the Phytophthora pathogen.</li> <li>• Disturbance to native vegetation in the Site should be avoided, except where risk to life or property warrants such disturbance. (2010)</li> </ul>	COG

Treatment		
4.2.1	Undertake all bushland management in the Protectable Area (including the track) using appropriate dieback hygiene techniques, including the avoidance of soil introduction and the planting of vegetation. (ongoing)	COG
4.4.1	Implement a Phosphite Treatment Program on the Site in accordance with the specifications provided in Section 4.4. (initiate in Spring 2010; \$4140 in 2010, and similar costs every 2 years)	COG
4.2.4	Manually remove existing dumped rubbish near the edge of the dieback-free area (see Figure 1) to ensure as little disturbance as possible to vegetation. (2011).	GGC
4.2.5	Do not disturb existing woodpiles near the edge of the infested area (or within the two hectare Protectable Area).	CCG & COG
4.2.6	Include existing woodpiles near the edge of the infested area (or within the dieback-free area) in the Phosphite Treatment Program (See Section 4.4).	COG

4.2.7	Manage weeds in existing woodpiles near the edge of the infested area (or within the dieback-free area) with minimal soil disturbance (targeted chemical control is preferable).	COG
-------	--	-----

<b>Golf Course operational Activities</b>		
4.6.1	Undertake briefing of Gosnells Golf Club operational staff on the DMP and its implications for their activities.	COG & GGC
4.6.2	Contractors working for the City of Gosnells or Gosnells Golf Club (Inc) are to be advised that any work in the vicinity of the bushland poses a dieback disease risk, and that they are required in such instances to undertake a site induction, and to take appropriate measures to address dieback disease risk presented by their activities. (ongoing)	COG & GGC
4.2.2	Prohibit the placement of soil, plant material or mulch within 10 metres of the perimeter of the phosphite-treatment areas (Figure 6). (ongoing)	COG & GGC
4.2.3	Prohibit dumping and storage activity within the Bush Forever Site.	
4.2.5	Do not disturb existing woodpiles near the edge of the infested area (or within the dieback-free area).	COG & GGC
4.3.1	Prohibit the entry of any machinery into the Site's bushland. (ongoing).	COG & GGC
4.3.2	Prevent irrigation overspray into the Site from sprinklers within the turf nursery. This could be achieved by moving the in-ground sprinklers in the turf nursery area at least 4 metres into the existing turf to prevent spray-drift into a non-cultivated buffer area (2011),	GGC
4.3.3	Prohibit entry into bushland area to retrieve golf balls. (2010)	GGC
4.3.4	Install signage advising prohibition of entry into the bushland area to retrieve golf balls (2010).	COG
4.5.3	Undertake the maintenance of perimeter fire access tracks on the Campbell and Ranford Road frontages strictly in accordance with the Bushland Management Plan 2010 (Management Actions 5.3.2.2 and 5.3.3.2), ensuring that all machinery used is cleaned of all soil and vegetative material prior to fire access track maintenance. (ongoing)	GGC

<b>Fire Suppression and Management Planning</b>		
4.5.1	<p>Develop a Fire Management/Response Plan that addresses dieback aspects of fire management and suppression activities, including:</p> <ul style="list-style-type: none"> <li>• The preference for fire suppression to be undertaken from outside the perimeter of the bushland area.</li> <li>• The restriction of vehicle movements to existing tracks.</li> <li>• The exclusion from use of the track through the dieback-free area unless risk to life or property warrants such use.</li> <li>• The use of mains water for fire suppression due to the likely contamination of groundwater by the Phytophthora pathogen.</li> <li>• Avoiding any disturbance to native vegetation in the Site, except where risk to life or property warrants such disturbance. (2011)</li> </ul>	COG
4.5.2	<p>Provide interim advice, in the absence of a Fire Management/Response Plan, together with Figure 6, to the City's Coordinator Risk and Emergency Management, FESA and the Gosnells Volunteer Bushfire Brigade that:</p> <ul style="list-style-type: none"> <li>• The preference for fire suppression is that it be undertaken from outside the perimeter of the bushland area.</li> <li>• Vehicle movements are to be restricted to existing tracks.</li> <li>• The track through the dieback-free area is excluded from use unless risk to life or property warrants such use.</li> <li>• The use of mains water for fire suppression is preferred due to the likely contamination of groundwater by the Phytophthora pathogen.</li> <li>• Disturbance to native vegetation in the Site should be avoided, except where risk to life or property warrants such disturbance. (2010)</li> </ul>	COG

<b>Communication and knowledge transfer</b>		
4.6.1	Undertake briefing of Gosnells Golf Club operational staff on the DMP and its implications for their activities.	COG & GGC
4.6.2	Contractors working for the City of Gosnells or Gosnells Golf Club (Inc) are to be advised that any work in the vicinity of the bushland poses a dieback disease risk, and that they are required in such instances to undertake a site induction, and to take appropriate measures to address dieback disease risk presented by their activities. (ongoing)	COG & GGC
4.6.3	Provide copies of the Dieback Management Plan (and A4 Quick Reference Guide) to stakeholders in accordance with Table 2 (2010).	COG

4.6.4	Produce an 'A4 Quick Reference Guide' for the Site to provide to all stakeholders as per Table 2. (2011, in house costs)	COG
-------	--	-----

<b>Signage</b>		
4.7.1	Install signage advising prohibition of entry into the bushland area to retrieve golf balls (2010).	COG
4.7.2	Erect and maintain all signage detailed in Figure 9. (\$5000 in 2010/11 to supply and erect the signage)	COG
1.3.3	Install semi-permanent markers <sup>4</sup> at intervals of between 30 and 50 metres on the boundary of the mapped uninfested area to more permanently mark the boundary of infection. (2010)	COG

<b>Monitoring and Review</b>		
4.8.1	Audit this Plan after five years of its operation; rapid audits may occur after significant dieback-related plant death. (2015, in-house costs)	COG
4.8.2	Review this Plan after 10 years of operation or, preferably, as part of a review of the Bushland Management Plan. (2020, in house costs)	COG
4.8.3	Undertake programmed inspections of the Site to identify critical management issues, including potential dieback impact, as relevant under this Plan and the Site's Bushland Management Plan. (ongoing)	COG
4.8.4	Re-assess and map the Site's dieback disease status every two to three years, the frequency depending upon observed impacts on the Site. (\$2000 in 2011, and then every 2 – 3 years)	COG