



## **CONFIRMED MINUTES**

# **ENVIRONMENTAL ADVISORY COMMITTEE MEETING**

**22 MAY 2018**

I certify that the minutes of the meeting of the Environmental Advisory Committee held on Tuesday, 22 May 2018 were confirmed on Tuesday, 28 August 2018.

A handwritten signature in blue ink, consisting of several loops and flourishes, positioned above a horizontal line.

Presiding Person



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#### **ATTENTION/DISCLAIMER**

The purpose of this Committee Meeting is to discuss and make recommendations to Council about items appearing on the agenda and other matters for which the Committee is responsible. The Committee has no power to make any decisions which are binding on the Council or the Shire of Mundaring unless specific delegation of authority has been granted by Council. No person should rely on or act on the basis of any advice or information provided by a Member or Employee, or on the content of any discussion occurring, during the course of the Committee Meeting.

The Shire of Mundaring expressly disclaims liability for any loss or damage suffered by any person as a result of relying on or acting on the basis of any advice or information provided by a Member or Employee, or the content of any discussion occurring during the course of the Committee Meeting.

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**ENVIRONMENTAL ADVISORY COMMITTEE  
COMMITTEE ROOM, 7000 GREAT EASTERN HIGHWAY, MUNDARING**

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**1.0 OPENING PROCEDURES**

As a quorum was not met at the scheduled time of meeting commencement, it was agreed by all present that Joseph Grehan give his presentation. During the presentation, Mr Herbie Titelius arrived (6.10pm) and Mr Mark Robertson (6.18pm) arrived.

At the completion of the presentation, the Acting Presiding Person declared the meeting open at 6.44pm.

**1.1 Announcement of Visitors**

Cr Driver welcomed the Shire President, Cr Daw and Ms Jenny Currell, Mundaring in Transition.

**1.2 Attendance/Apologies**

<b>Members</b>	Cr Kate Driver (Acting Presiding Person) Christine Groom Tom Hogarth Selene Moonbeams Lee Roberts Mark Robertson (arrived 6.18pm) Jim Thom Herbie Titelius (arrived at 6.10pm)	East Ward
<b>Staff</b>	Briony Moran Angus Money Ruth Broz	Co-ordinator Environment & Sustainability Manager Planning & Environment Minute Secretary
<b>Apologies</b>	Cr Tony Brennan (Presiding Person) Darren Murphy (Deputy Presiding Person) Kathryn Batchelor Bethany Challen Robert Ragg Michael Waite	West Ward
<b>Absent</b>	Nil	
<b>Guests</b>	Joseph Grehan Jenny Currell Cr John Daw (Shire President)	Director, Terratree Mundaring in Transition
<b>Members of the Public</b>	Nil	
<b>Members of the Press</b>	Nil	

## 2.0 ANNOUNCEMENTS BY PRESIDING MEMBER WITHOUT DISCUSSION

Nil

## 3.0 DECLARATION OF INTEREST

### 3.1 Declaration of Financial Interest and Proximity Interests

Elected Members must disclose the nature of their interest in matters to be discussed at the meeting (*Part 5 Division 6 of the Local Government Act 1995*).

Employees must disclose the nature of their interest in reports or advice when giving the report or advice to the meeting (*Sections 5.70 and 5.71 of the Local Government Act 1995*).

Nil

### 3.2 Declaration of Interest Affecting Impartiality

An Elected Member or an employee who has an interest in a matter to be discussed at the meeting must disclose that interest (*Shire of Mundaring Code of Conduct, Local Government (Admin) Reg. 34C*).

Nil

## 4.0 CONFIRMATION OF MINUTES OF PREVIOUS MEETINGS

<b>COMMITTEE DECISION RECOMMENDATION</b>	<b>EAC1.05.18</b>
Moved by Mark Robertson	Seconded by Christine Groom

That the Minutes of the Environmental Advisory Committee Meeting held 27 February 2018 be confirmed.

### **CARRIED 8/0**

**For:** Cr Kate Driver, Christine Groom, Tom Hogarth, Selene Moonbeams, Lee Roberts, Mark Robertson, Jim Thom and Herbie Titelius

**Against:** Nil

## 5.0 PRESENTATIONS

### 5.1 Reserves Assessment Presentation

Mr Joseph Grehan, Terratree Director and Principal Ecologist

#### Purpose:

Mr Grehan provided an overview of the reserve assessment process and the mapping information that is now available for the assessed reserves.

Mr Grehan presented a powerpoint and took questions on the above. (Refer to powerpoint presentation at the end of these minutes)

The Acting Presiding Person thanked Mr Grehan for his presentation.

## 6.0 REPORTS OF EMPLOYEES

### 6.1 Nature Reserves Assessment

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<b>File Code</b>	EV.RES 2
<b>Author</b>	Briony Moran, Co-ordinator Environment and Sustainability
<b>Senior Employee</b>	Mark Luzi, Director Statutory Services
<b>Disclosure of Any Interest</b>	Nil
<b>Attachments</b>	1. Reserves Assessment Report 2018

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#### SUMMARY

The Shire is responsible for managing large areas of native vegetation within reserves of various sizes. Reserve management and weed control activities are undertaken by the Fire Protection Officers (within Community Safety and Emergency Management) and the Landcare Team (within Operations) in addition to volunteer Friends Groups for some reserves. Given the magnitude of the task, the Shire's finite resources and community effort needs to be coordinated and directed to best effect. In accordance with EAC priorities, nature reserve assessments were undertaken in the 2017/18 financial year.

Mapping and assessments have been undertaken across the Shire's highest conservation value reserves, totalling 863 hectares of native vegetation. The reserve assessments have gathered substantial information to be added to the Shire's GIS mapping system, to target reserve management actions. The consultant's report contains recommendations for the Shire's overall reserve management strategy, a re-prioritisation of the assessed reserves, and priority management recommendations have been made for each assessed reserve.

EAC may recommend that Council notes the findings of the reserve assessments, shares the findings with community environmental groups and the Eastern Metropolitan Regional Council, and considers some increases to resources for reserve management. In addition the EAC may wish to reconsider or update its list of priority actions and approach to environmental strategies at a subsequent meeting.

#### BACKGROUND

There are currently two staff within the Landcare Team, directed by the Supervisor Environment and Horticulture, who are dedicated to managing Shire nature reserves and assisting Friends Groups undertaking environmental restoration. There are two Fire Protection Officers who undertake hazard assessments and manage bushfire risk across reserves and other land that the Shire is responsible for (over 400 land parcels totalling over 1,850 hectares), which includes weed control as well as controlled burns and firebreak improvements. In addition the Fire Protection Officers undertake hazard assessments and make recommendations for land within the Shire that is managed by other agencies (another 180 land parcels totalling over 15,000 hectares).

Given the large total reserve area, the Shire's limited resources for reserve management and the limited project budget, the reserve assessments were planned to deliver the information that was considered most useful by the Supervisor Environment and Horticulture and the Fire Protection Officers, and for the reserves with the highest ecological values. The Shire's GIS mapping system was identified as a key communication tool to coordinate reserve management between different staff and directorates, and a new 'Reserve Management' module has been created to improve information sharing.

Past reserve assessments were used to produce a report in 2008 that ranked 141 Shire managed natural areas containing remnant vegetation based on ecological criteria from the Perth Biodiversity Project. The higher ranked reserves are large areas, in good condition, with an intact understorey and connections to other nature reserves. The lowest ranked reserves contain heavily modified vegetation (e.g. parkland with remnant trees but lacking understorey) which still have social and recreational values and some ecological functions. Weed occurrence information related to the 2008 report was added to the Shire GIS but generally as brief notes linked to the whole reserve area, not mapped as specific points within reserves.

The top 60 reserves listed in the 2008 'Shire of Mundaring Reserve Assessment Project Report' included four reserves that are planned to be added to a national park and managed by the State, plus Lake Leschenaultia which is separately managed by the Shire's Recreation and Leisure Services. These reserves were therefore not included in the Reserve Assessment List provided to the consultant.

The top 55 reserves were targeted for ecological assessments and feature mapping in the 2017/18 Mundaring Nature Reserves Assessment. A primary aim was to provide the Shire with useful 'fit for purpose' mapping of high priority conservation reserves. In addition the consultants would provide a report containing overall reserve management strategies and individual reserve management recommendations, taking into account the large reserve areas and limited staff and resources at the Shire's disposal. One reserve that was included in the list (Reserve 39034 in Helena Valley) was not assessed due to restricted access through surrounding private land.

The consultant's report 'Shire of Mundaring Priority Reserves Ecological Assessment' is in two parts. The first part (attached) contains a summary of the reserve assessment project, the overall results including re-prioritisation of reserves, and a recommended nature reserve management strategy for the Shire. The second part is Appendix 1 which contains the photographs and priority management recommendations for each assessed reserve. Appendix 1 is not attached due to the very large electronic file size.

## **STATUTORY / LEGAL IMPLICATIONS**

Remnant native vegetation and native fauna are protected under the *Environmental Protection Act 1986* and the *Biodiversity Conservation Act 2016*, which is in the process of replacing the *Wildlife Conservation Act 1950*.

## **POLICY IMPLICATIONS**

Nil

## **FINANCIAL IMPLICATIONS**

The Shire has a relatively low number of staff managing large land areas and a large number of nature reserves. The focus of the Nature Reserve Assessment Project was to

gather useful information and current management recommendations for high conservation value reserves, in order to better target the Shire's limited resources. Improving the Shire's management of certain areas or threatening processes (such as Dieback) would require increases to operating budgets.

## STRATEGIC IMPLICATIONS

Mundaring 2026 Strategic Community Plan

Priority 3 - Natural environment

Objective 3.2 – A place where the environment is well managed

Strategy 3.2.1 – Identify and mitigate threats to the natural environment

## SUSTAINABILITY IMPLICATIONS

Maintaining biological diversity and ecosystem integrity are fundamental principles of environmental sustainability. Shire managed nature reserves preserve local biodiversity, but also provide 'stepping stone' connections between national parks and regional reserves to support movement of fauna and potential adaptation to climate change.

Socially, well managed nature reserves provide important recreational opportunities for residents and visitors and maintain the amenity and character of local areas. This can also provide an economic benefit in supporting local tourism opportunities.

## RISK IMPLICATIONS

<b>Risk: Reputational</b> - Reserve management decisions are based on out-of-date information and do not achieve good environmental outcomes		
<b>Likelihood</b>	<b>Consequence</b>	<b>Rating</b>
Likely	Moderate	High
<b>Action / Strategy</b>		
Update reserve management approaches and mapping of important features and management needs.		

## EXTERNAL CONSULTATION

All Friends Group Coordinators were informed of the reserve assessments (not limited to Friends Groups on the list of 55 reserves). Aerial photographs were offered for Friends Groups to mark known weed issues or other reserve features. A very limited number of these were returned, and unfortunately these were mainly for smaller reserves which were not being mapped as part of this project. Each of the returned aerial photographs was forwarded to the Landcare Team as they showed locations of current weed and rubbish dumping issues.

## COMMENT

The Mundaring Nature Reserves Assessment has provided the Shire with updated mapping of conservation reserves, which has been added to the Shire's Geographic Information System (GIS) in a Reserve Management module intended to bring together all the spatial information relevant to reserve management.

The mapping includes a large number of vehicle and 4WD access tracks which will be of use for planning weed control activities and controlled burns, assessing firebreak and access requirements, and general reserve management. The categories of access track mapping were informed by discussion with Fire Protection Officers and Supervisor Environment and Horticulture in developing the scope of the Nature Reserve Assessment Project, and supported by an on-site meeting between the consultant and the Fire Protection Officers. The vehicle access track mapping may also be of use to local fire brigades.

The significant tree assessment was in accordance with the federal government Black Cockatoo referral guidelines for breeding trees (EPBC, 2012), which are defined as trees with a diameter at breast height of 500mm or greater. Over 9000 significant trees were mapped, with 11% having some visible hollow or hollows. The locations of the significant trees, and particularly those with hollows, can now be taken into account in planning controlled burns and other activities to minimise the risk of loss of habitat.

Weeds are both a threat to biodiversity in nature reserves and a bushfire fuel load risk. Key weed species were initially identified through review of the Shire's previous Weed Control Strategy and past reserve assessments, and nomination by the Fire Protection Officers and Supervisor Environment and Horticulture. These included Weeds of National Significance and Western Australian Declared Plants (particularly eastern states wattles, tagasaste, cottonbush, watsonia, Patterson's curse and lavender). A total of 31 exotic (weed) species were recorded during the assessment. Of these, seven were determined to represent a serious biodiversity threat. Effectively controlling serious weeds within nature reserves can also limit their spread onto surrounding road reserves, recreational reserves and private land.

Erosion and rubbish dumping were not found to be widespread issues due to controlled vehicle access to most conservation reserves. Several sites had suspected asbestos dumping, which will require assessment to confirm whether it is asbestos and consider options for removal. A small number of foxes and fox dens were also recorded.

For each assessed reserve, recommendations for priority management actions have been identified together with photographs and a summary of the assessment findings for that reserve. This provides the Landcare Team and Fire Protection Officers with an updated priority list for nature reserves, priority actions and GPS locations to target their work. In order for the weed mapping in particular to remain useful in targeting work, Shire officers would need to amend or annotate those GPS locations to mark the weeds as treated.

Unfortunately, signs of Phytophthora Dieback were present in almost all reserves. Dieback spreads slowly through root contact between plants and downslope through groundwater and stormwater runoff. It is spread most rapidly through vehicle movement. Although it may take a decade or more to completely spread through a reserve, many reserves are not considered protectable once the pathogen is present upslope:

*“Overall, the reserve assessment found that Dieback is having a very significant impact on species diversity and ecosystem function within most of the priority reserves assessed. While some reserves show widespread infestation, other reserves have only a small infested area and require urgent management effort if those areas are to be protected. Often in these instances the topography of the reserve is such that, while the lower slopes and gullies are infested, large uninfested protectable areas are present upslope within their boundaries.”*

The spread of Dieback has a devastating impact on the range of susceptible plant species and there is no known cure once it has been introduced to an area (although clearing, fallowing and solarisation of spot infestations are being trialled in Western Australia). As plant diversity declines in infested reserves, the Dieback-free areas will become increasingly critical in preserving native plant species and providing a refuge for wildlife. The overall reserve management recommendations below reflect the threat that Dieback poses to biodiversity in Shire managed nature reserves.

*“...It is recommended that the Shire of Mundaring adopt the following strategies for management and rehabilitation of nature reserves:*

- *In directing limited resources for natural area management for the best ecological outcomes, the Shire should follow the principles of the ‘Bradley Method of Bush Regeneration’. This approach seeks to consolidate the reserves and areas in the best condition first and this approach can also be applied to the management of Dieback.*
- *Declared Plant weed populations should be eradicated as soon as possible. Areas with Blackberry populations, especially Cookes Brook, should be revegetated with appropriate wetland species after weed eradication.*
- *Dieback management should be considered at least as important as weed management. An integrated Dieback and Weed Management Plan and Rehabilitation Strategy, or more holistic Biodiversity Strategy, should be developed and implemented.*
- *A comprehensive Dieback assessment should be undertaken of those reserves that have been identified as having protectable areas. Once identified, the protectable areas should be assessed for access restrictions, and treated as environmentally sensitive areas requiring greater Dieback hygiene practices from staff and contractors.*
- *Standard Dieback signage developed by Project Dieback (South Coast NRM 2008) should be installed in priority reserves that have areas of protectable vegetation.*
- *Reserve management plans should be developed or updated for high priority reserves to integrate Dieback control, weed management, bushfire risk management and other Shire activities.*
- *The Shire should seek to share information and consider partnerships with tertiary institutions or organisations (such as the Dieback Working Group) to trial Dieback treatment and restoration methods.*
- *Shire staff should use GPS technology to record weed and Dieback treatments and maintain the usefulness of GIS information for targeting reserve management resources.*

There are 33 reserves considered to have areas that are protectable from Dieback, even though the pathogen may be present in some parts of the reserves. The relative priority of reserves has been revised to reflect the importance of preserving Dieback-free areas, however the top seven reserves have remained the same. Public access and Shire works within the highest priority reserves will need to be more carefully managed to prevent the

spread of Dieback into these remaining areas where susceptible plant species (and associated fauna) can survive.

Phosphite injections and sprays can help plants survive in Dieback-infested areas but mask the symptoms rather than preventing the spread of the pathogen. The Shire does not currently have the capacity to complete treatment of all Dieback-affected areas, or even the Dieback-affected areas within the 33 reserves that have protectable areas. Increased time spent by the Landcare Team on Dieback treatment would be at the expense of current weed control and other reserve management activities. There are also interactions between weeds and Dieback management, where weed control activities including muddy tools or reserve access by vehicles potentially spread the pathogen, and Dieback affected areas becoming more open to weed invasion as the susceptible plant species die. To increase the treatment of Dieback-affected areas in Shire-managed reserves could involve seeking grants, allocating additional funds for contractors and additional training and support for Friends Group volunteers.

The recent reserve assessment report and Dieback interpretation mapping may assist the Shire in obtaining grants for weed control or detailed Dieback mapping, testing, and treatment of infested areas. The Shire can also share spatial information with local Friends Groups and Catchment Groups via the version of the GRID mapping system recently developed for Eastern Metropolitan Regional Council (EMRC). Variations of this mapping system are also used by Perth NRM and other grant-issuing organisations. Sharing reserve mapping through the GRID system could provide local environmental groups with up-to-date mapping of environmental management requirements in a form that is an advantage in grant applications and acquittals.

It has been suggested that the scope of the Shire's Weed Control Strategy (which has previously been listed for 2018-20) could be expanded to include Dieback management, or a more holistic Biodiversity Strategy. A separate recommendation is to prepare management plans for high priority reserves. Council may decide to defer the Weed Control Strategy review as part of its general budget considerations, or could defer the Weed Control Strategy to direct funding towards management plans for the highest priority reserves. Further discussion is required regarding the various options for the Shire to pursue single-issue strategies or more holistic strategies, and the the EAC may reconsider the relative priority of addressing various issues. This could occur at the August or November meetings of the EAC, and incorporate the Blue Sky Festival survey results collected by EAC members on community environmental priorities.

It should be noted that this reserve assessment project was focussed on the current state, threats and management requirements for high ecological value nature reserves, and the prioritisation does not take into account broader recreation and bushfire risk management issues. The findings and recommendations of this assessment will need to be taken into account in future Shire strategies and initiatives including the Bushfire Risk Management Plan, Watercourse Hierarchy Strategy and Public Open Space Strategy.

## **VOTING REQUIREMENT**

Simple Majority

## RECOMMENDATION

That Council:

1. Notes the findings and recommendations of the Priority Reserves Ecological Assessment Report, particularly the impacts of Phytophthora Dieback;
2. Lists for consideration an increase to the operational budgets for weed control and nature reserve management within Operations Services and Community Safety and Emergency Management Services in 2019/20 budget; and
3. Instructs the CEO to distribute the report findings and share spatial information with Friends Groups, Catchment Groups and Eastern Metropolitan Regional Council (EMRC).

### Preamble to Alternative Recommendation

The Committee were of the opinion that there should be a budget for dieback control and the introduction of GPS equipment for the environmental officers.

### COMMITTEE DECISION MOTION

EAC2.05.18

Moved by Mark Robertson

Seconded by Tom Hogarth

That Council:

1. Notes the findings and recommendations of the Priority Reserves Ecological Assessment Report, particularly the impacts of Phytophthora Dieback;
2. Lists for consideration an increase to the operational budgets for dieback, weed control and nature reserve management (including GPS technology) within Operations Services and Community Safety and Emergency Management Services in 2019/20 budget; and
3. Instructs the CEO to distribute the report findings and share spatial information with Friends Groups, Catchment Groups and Eastern Metropolitan Regional Council (EMRC).

### CARRIED 8/0

**For:** Cr Driver, Christine Groom, Tom Hogarth, Selene Moonbeams, Lee Roberts, Mark Robertson, Jim Thom and Herbie Titelius

**Against:** Nil



## Shire of Mundaring Priority Reserves Ecological Assessment

Prepared for the Shire of Mundaring

*Ref: T17027*

**ecological assessment  
& management**



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**Document Control**

Revision	Details	Date	Author	Reviewer
Rev 0	Draft for Internal Review	27/04/2018	J. Grehan	P. Maher
Rev A	Draft for Submission to Client	30/04/2018	J. Grehan	B. Moran
Rev B	Final addressing client comments	7/05/2018	J. Grehan	B. Moran

A handwritten signature in black ink, appearing to read "Joe Grehan".

Joseph Grehan  
Principal Ecologist

## **DISCLAIMER**

This document is prepared in accordance with and subject to an agreement between Terratree Pty Ltd ("Terratree") and the client for whom it has been prepared ("Shire of Mundaring") and is restricted to those issues that have been raised by the client in its engagement of Terratree and prepared using the standard of skill and care ordinarily exercised by Environmental Scientists in the preparation of such documents. Any organisation or person that relies on or uses this document for purposes or reasons other than those agreed by Terratree and the client without first obtaining the prior written consent of Terratree, does so entirely at their own risk and Terratree denies all liability in tort, contract or otherwise for any loss, damage or injury of any kind whatsoever (whether in negligence or otherwise) that may be suffered as a consequence of relying on this document for any purpose other than that agreed with the client.

*Terratree Pty Ltd*

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## Executive Summary

In November 2017 the Shire of Mundaring commissioned Terratree Pty Ltd to undertake a comprehensive ecological assessment of priority nature reserves. These reserves comprised 863ha of native vegetation within the Shire of Mundaring Local Government Area. This assessment was commissioned to gather field data on ecological and logistical variables including significant trees, weeds, *Phytophthora* Dieback and vehicle access. The overarching objective of the reserves assessment was to collect a comprehensive spatial dataset for the selected variables to inform planning and environmental management across the reserves network within the Shire of Mundaring.

The scope of the assessment was to map and classify all tracks, undertake a Broadscale *Phytophthora* Dieback assessment, identify and map significant weed populations, map and briefly assess significant trees, and to report on evidence of feral animals and rubbish dumping. Terratree was also to provide the Shire with the spatial data resulting from the assessment and prepare a short report for each assessed reserve which presents the key findings of the assessment and the individual recommendations for each reserve.

A desktop assessment was undertaken prior to work in the field in order to establish background information about the assessment area and surrounding landscape, and to review previous reports and data. Maps of the area were accessed through the Dieback Information Data Management System (DIDMS). DIDMS maps use data from the Vegetation Health Services Laboratory to display Dieback sample results and occurrence mapping from previous assessments.

The reserve field assessment was conducted between December 2017 and April 2018 by Terratree ecologists and DBCA registered Dieback Interpreters Joseph Grehan and Kelby Jennings. The field assessment was conducted in two phases; first all tracks within each reserve were surveyed by 4WD to capture GPS track data while carrying out an initial reconnaissance of environmental factors. Subsequently, the reserves were comprehensively assessed on foot to gather accurate data related to significant trees, weed distribution, Dieback Occurrence, evidence of feral animals and rubbish dumping. The spatial data on track maps, as well as the data on weed and disease occurrence, were recorded on hand-held Global Positioning Satellite (GPS) units.

Overall, the reserve assessment found that Dieback is having a very significant impact on species diversity and ecosystem function within most of the priority reserves assessed. While some reserves show widespread infestation, other reserves have only a small infested area and require urgent management effort if those areas are to be protected. Often in these instances the topography of the reserve is such that, while the lower slopes and gullies are infested, large uninfested protectable areas are present upslope within their boundaries.

Given the very high impact of Dieback on biodiversity and the limited number of reserves (or parts of reserves) that are protectable against Dieback, the reserve priority ranking is proposed to change. Reserves or areas that do not currently have Dieback must be managed carefully to limit access and activities that would introduce Dieback. As plant diversity declines in reserves with Dieback, these Dieback-free areas will become increasingly critical in preserving native plant species and providing a refuge for wildlife.

In many of the reserves assessed Dieback signage was outdated or absent, and in some cases when the standard protocol signage was present, it was incorrectly located. Public vehicular access is a major vector in the spread of the Dieback pathogen and this problem is compounded in reserves with inadequate signage. Accurate Dieback mapping and a significant increase in signage would be required to address this issue. Firebreak maintenance activities requiring ground disturbance should also be planned so they are undertaken in a manner that will minimise the risk of spreading Dieback.

A total of 31 exotic (weed) species were recorded during the assessment. Of these, 7 were determined to represent a Serious Biodiversity Threat. While weeds are widespread across the priority reserves assessed, only three reserves received the 'very high' severity rating. Cookes Brook and Gilfellon Reserves have substantial populations of Blackberry which is a Declared Plant under the *BAM Act*, while Mandoon Reserve has populations of the Declared Plants Arum Lily (*Zantedeschia aethiopica*) and Bridal Creeper (*Asparagus asparagoides*). The Declared Plant Cottonbush (*Gomphocarpus fruticosus*) was recorded in several reserves. Most of the reserves assessed received the 'low' severity rating, having few or scattered Eastern States Acacias or Tagasaste.

Some non-native Acacia species such as *Acacia podalyriifolia* and *A. iteaphylla* have become naturalised in the Perth Hills. In some areas where the vegetation condition is 'degraded', Eastern States Acacia species are providing habitat and protecting soil from erosion. In several locations Dieback has greatly decreased native vegetation cover providing an opportunity for weed species such as Perennial Veldt Grass (*Ehrharta calycina*) or Watsonia (*Watsonia meriana* var. *bulbillifera*) to proliferate, thus increasing the fuel load.

A total of 9253 significant trees were recorded during the assessment. Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*) comprised the majority (91.6%) of trees, with Blackbutt (*Eucalyptus patens*), Flooded Gum (*Eucalyptus rudis*) and Wandoo (*Eucalyptus wandoo*) also represented.

Fox dens were observed at several reserves and a live fox was spotted at Cameron Road Reserve. A dead fox was also recorded at Gilfellon Reserve.

Rubbish dumping was not found to be a widespread issue due to controlled access in a large proportion of the reserves assessed. Suspected asbestos dumping was recorded in Strettle Road Reserve and Hovea Conservation Park.

Controlled access has also contributed to limiting soil erosion along tracks and watercourses within the reserves. While Quail Street Reserve has some significant erosion occurring along tracks in the eastern portion of the reserve due to the steepness of some of the slopes, soil erosion in the reserves did not appear to be a significant issue.

### **Recommended Nature Reserve Management Strategy**

It is recommended that the Shire of Mundaring adopt the following strategies for management and rehabilitation of nature reserves:

- In directing limited resources for natural area management for the best ecological outcomes, the Shire should follow the principles of the 'Bradley Method of Bush Regeneration'. This approach seeks to consolidate the reserves and areas in the best condition first and this approach can also be applied to the management of Dieback.
- Declared Plant weed populations should be eradicated as soon as possible. Areas with Blackberry populations, especially Cookes Brook, should be revegetated with appropriate wetland species after weed eradication.
- Dieback management should be considered at least as important as weed management. An integrated Dieback and Weed Management Plan and Rehabilitation Strategy, or more holistic Biodiversity Strategy, should be developed and implemented.

- A comprehensive Dieback assessment should be undertaken of those reserves that have been identified as having protectable areas. Once identified, the protectable areas should be assessed for access restrictions, and treated as environmentally sensitive areas requiring greater Dieback hygiene practices from staff and contractors.
- Standard Dieback signage developed by Project Dieback (South Coast NRM 2008) should be installed in priority reserves that have areas of protectable vegetation.
- Reserve management plans should be developed or updated for high priority reserves to integrate Dieback control, weed management, bushfire risk management and other Shire activities.
- The Shire should seek to share information and consider partnerships with tertiary institutions or organisations (such as the Dieback Working Group) to trial Dieback treatment and restoration methods.
- Shire staff should use GPS technology to record weed and Dieback treatments and maintain the usefulness of GIS information for targeting reserve management resources.

## 1 Introduction

In November 2017, the Shire of Mundaring (hereafter referred to as 'the Shire') commissioned Terratree Pty Ltd (Terratree) to undertake a comprehensive ecological assessment of 55 reserves, comprising 863ha of native vegetation within the Shire of Mundaring Local Government Area (LGA) (collectively referred to as the 'assessment area'). This assessment was commissioned to gather field data related to a number of ecological and logistical variables including significant trees, weeds, *Phytophthora* Dieback and vehicle access. A primary objective of the reserves assessment was to collect a comprehensive spatial dataset for the selected variables to inform planning and environmental management across the reserves network, and direct limited staff and resources to best effect. Priority management actions have been identified for each assessed reserve.

### 1.1 Project Location

The Shire of Mundaring LGA is located approximately 30km east of Perth, Western Australia, encompassing areas of the Darling Scarp and Northern Jarrah forest. The assessment area covers 55 separate reserves within the LGA boundary and is comprised of a variety of vegetation communities.

### 1.2 Scope

The scope of the assessment was to map and classify all tracks, undertake a broadscale assessment for *Phytophthora* Dieback (Dieback), identify and map significant weed populations, and to report on evidence of feral animals and rubbish dumping.

Prior to work in the field a desktop study with the following components was conducted:

- A review of existing relevant reports related to reserves and environmental characteristics present within the Shire;
- Analysis of the Dieback Information Delivery Management System (DIDMS) database for historical *Phytophthora* occurrences and probability mapping for Dieback occurrence within the Shire;
- Identification of possible disturbance impacts as a result of public access i.e. rubbish dumping and ground disturbance.

The field assessment of the nominated reserves required mapping and recording of the following:

- All vehicle tracks and firebreaks using hand-held GPS units;
- Substantial weed infestation or key weed species such as Weeds of National Significance and Western Australian Declared Plants (particularly eastern states wattles, Tagasaste, Cottonbush, Watsonia, Patterson's curse and lavender);
- Dieback (*Phytophthora cinnamomi*) infestations and significant impacts of Marri Canker (*Quambalaria coyrecup*);
- Significant fauna habitat e.g. nesting hollows suitable for Black Cockatoos and trees with a Diameter at Breast Height >500mm;
- Signs of feral animals (scats and burrows) and erosion; and
- Hazardous and green waste dumping.

Finally, Terratree was to provide the Shire with the spatial data resulting from the assessment and prepare a short report for each assessed reserve, which presents the key findings of the assessment and recommends priority management actions for each reserve.

## 2 Background

### 2.1 *Phytophthora* Dieback

Dieback is a soil borne pathogen with a range of hosts in the southwest of WA, predominantly from the Proteaceae, Ericaceae, Myrtaceae, Xanthorrhoeaceae and Fabaceae plant families. While some plant species are resistant, others are susceptible to the disease caused by the pathogen, which can result in chlorosis, dieback and usually death (Wills and Keighery, 1994).

According to the most recent Western Australian State of the Environment Report, Dieback (listed as a Priority 1 threat) is the third greatest threat to biodiversity after salinity and climate change (EPA, 2007). It is considered a more serious threat than weeds, clearing of native vegetation, acid sulphate soils and soil erosion. The effect of Dieback is significant in WA because:

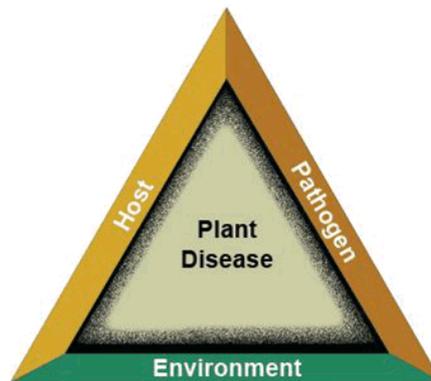
- Over 40% (2,300) of the native plant species, and half of endangered plant species, in the south-west of WA are susceptible to the pathogen;
- Changes in the composition and structure of floral communities as a result of Dieback have impacts throughout the ecosystem, including impacts on the indigenous fauna; and
- Dieback can lead to significant soil erosion as a result of the loss of susceptible vegetation.

Dieback is spread through the movement of water and soil within the landscape. Major vectors of Dieback include, but are not limited to, wet soil adhering to vehicle tyres/tracks and earthmoving equipment. Therefore, quarantine management procedures are an effective tool to reduce the spread of Dieback as a result of earthmoving activities.

Three variables are required to have disease expression caused by Dieback:

- **Host** - plant species present that are susceptible to *Phytophthora* spp. (i.e. *Banksia*, *Hakea*, *Leucopogon*, *Daviesia* spp.);
- **Pathogen** - The *Phytophthora* pathogen must be present either residing in susceptible or resistant species; and
- **Environment** - Soil temperatures 15-30° C and pH 5-6 (acidic) for *P. cinnamomi*. Some species including *P. multivora* can survive in alkaline soils (pH 7+).

The disease triangle on the next page represents the three variables required for disease expression caused by Dieback.



The Dieback pathogen is widespread in areas with greater than 800mm of annual rainfall, less extensive in areas that receive between 600 – 800mm and mainly restricted to water-gaining sites in areas that receive 400 – 600mm. The pathogen very rarely occurs in areas receiving less than 400mm. In WA, Dieback is a significant environmental issue between Geraldton in the Midwest and Esperance on the South Coast and is widespread in the Southwest region.

## 2.2 Regulatory Context

### 2.2.1 Phytophthora Dieback

*Phytophthora* Dieback ('Dieback') management is required under several regulatory mechanisms:

- *Phytophthora* Dieback is listed as a Key Threatening Process with the Federal Government under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- Projects being assessed under the *Environmental Protection Act* (1986); and
- *Environmental Protection Act* 1986 (EP Act) Part V S.50A "Serious Environmental Harm" provisions.

### 2.2.2 Introduced Flora (Weeds)

At a national level, there are 32 weed species listed as Weeds of National Significance (WONS)(DoE, 2015). *The Commonwealth National Weeds Strategy: A Strategic Approach to Weed Problems of National Significance* (2012) describes the broad goals and objectives in managing these species.

Within Western Australia, the *Biosecurity and Agriculture Management Act 2007* (BAM Act, DAFWA, 2007) seeks to prevent serious animal and plant pests and diseases from entering the State and becoming established, and to minimise the spread and impact of any that are already present. The BAM Act (and associated regulations) replaces the *Agriculture and Related Resources Protection Act 1976* (and associated regulations). The BAM Act regulations were enacted on 1 May 2013, placing organisms into four categories:

- Permitted organism (listed under Section 11) – permitted in Western Australia subject to regulations;
- Prohibited organism (listed under Section 12) – prohibited in Western Australia subject to regulations (i.e. is a Declared Pest for the whole of State);
- Permitted organism: permit required (under regulation 73) – must not be imported unless in accordance with an import permit ; and
- Permitted organism: Declared Pests (under Section 22) – can apply to part of or the whole of the State.

The current Western Australian Organism List (WAOL), published 1 May 2013 (DAFWA, 2013), lists organisms in each of these categories. Unlisted organisms must not be imported (unless in accordance with an import permit and regulations). The BAM Act further categorises Declared Pests in one of three control categories:

- C1 – Exclusion;
- C2 – Eradication; or
- C3 – Management.

Table 1 provides an explanation of the expectations for the declared plant categories.

**Table 1: Control categories for Declared Pests**

Declared Plant Category	Description
C1 - Exclusion	Pests assigned to this category are not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
C2 - Eradication	Pests assigned to this category are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3 - Management	Pests assigned to this category are established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

### 3 Existing Environment

#### 3.1 Biogeography

The assessment area is located within the Northern Jarrah forest (JF1) subregion, in accordance with the Interim Biogeographic Regionalisation for Australia (IBRA). The IBRA system identifies 89 bioregions and 419 subregions across Australia based on climate, geology, landforms, and characteristic vegetation and fauna.

Mitchell and Williams (2002) describe the Northern Jarrah Forest Subregion in “A Biodiversity Audit of Western Australia’s 53 Biogeographical Subregions” (CALM 2002) as follows:

Duricrusted plateau of Yilgarn Craton, characterised by Jarrah-Marri forest on laterite gravels and, in the eastern part, by woodlands of Wandoo - Marri on clayey soils. Eluvial and alluvial deposits support *Agonis* shrublands. In areas of Mesozoic sediments, Jarrah forests occur in a mosaic with a variety of species-rich shrublands. The climate is Warm Mediterranean. The Northern Jarrah Forest subregion incorporates the area east of the Darling Scarp, overlying Archaean granite and metamorphic rocks of an average elevation of 300 m, capped by extensive lateritic duricrust, dissected by later drainage and broken by occasional granite hills. In the east the laterite becomes deeply dissected until it compresses isolated remnants. Rainfall is from 1300 mm on the scarp to approximately 700 mm in the east and north. Vegetation comprises Jarrah - Marri forest in the west with Bullich and Blackbutt in the valleys grading to Wandoo and Marri woodlands in the east with Powder bark on breakaways. There are extensive but localised sand sheets with *Banksia* low woodlands. Heath is found on granite rocks and as a common understorey of forests and woodlands in the north and east. The majority of the diversity in the communities occurs on the lower slopes or near granite soils where there are rapid changes in site conditions.

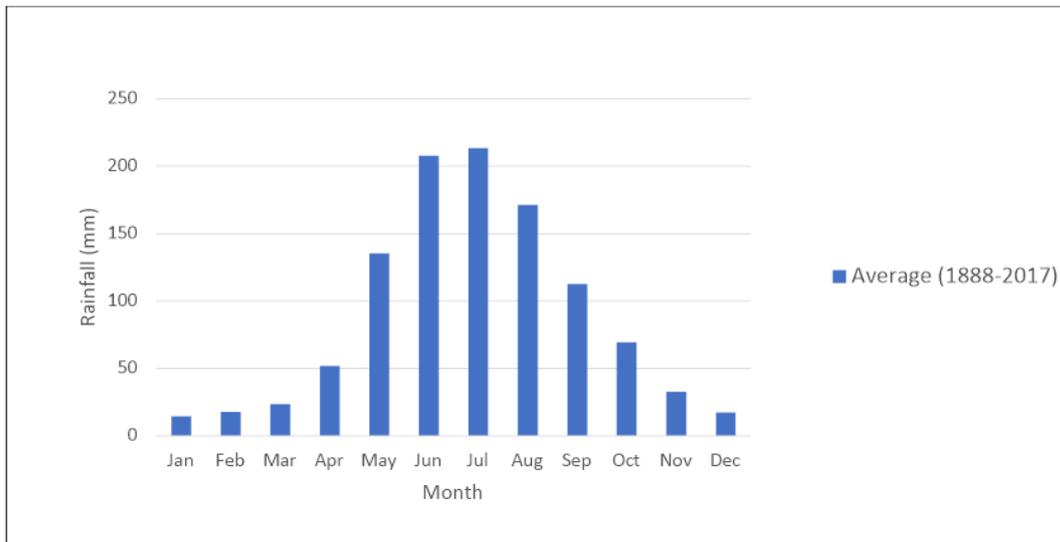
Prominent land uses within the subregion include forestry (native forests), conservation, grazing (improved pastures), cultivation (dry land agriculture), forestry (plantations), and mining. There are lesser areas of rural residential, easements for roads, power lines etc., and urban land use.

#### 3.2 Climate

The assessment area experiences an Interior Mediterranean climate under the Köppen climate classification system, characterised as mild, with dry, hot summers, where the warmest month averages  $>22^{\circ}\text{C}$ , with a winter-dominant rainfall (Pidwirny, 2011).

The assessment area receives an average of 1070.1mm rainfall per annum, as recorded in the Bureau of Meteorology Climate Data (BoM, 2017), with the majority of rainfall occurring April-September (**Graph 1**). Dieback is likely to be widespread in areas receiving over 800mm of rainfall per annum.

Although climate change is expected to continue impacting on the timing and volumes of rainfall, in addition to higher average temperatures and changed bushfire behaviour, assessment of climate change impacts was beyond the scope of this study.



**Graph 1: Average monthly rainfall over the assessment area (BoM, 2018)**

### 3.3 Flora and Vegetation

The assessment area is located in the Darling Botanical District of the South-western Botanical Province and is characterised by an Open Forest of *Eucalyptus marginata* (Jarrah) with a mixture of *Corymbia calophylla* (Marri) and some areas of *E. wandoo* (Wandoo) open forest. Species richness is greater than the western Jarrah forest as the area is located at the interface between the northern Jarrah forest and Wheatbelt regions (Mattiske 2005).

Vegetation complexes within the Darling Scarp and Plateau were mapped by Mattiske and Havel (1998) as part of the Regional Forest Agreement process (RFA). In accordance with this mapping, there are four vegetation complexes occurring within the assessment area. The dominant vegetation complexes within the assessment area, Dwellingup 2 and Yarragil 1, are generally highly interpretable for Dieback, with indicator species including *Banksia grandis*, *Persoonia longifolia* and *Xanthorrhoea* sp. being dominant elements of the vegetative composition. The Murray 2 and Helena 2 complexes, which occur in small areas within the assessment area, are less interpretable due to a dominance of resistant species but may be interpretable in localised areas with sufficient numbers of *Xanthorrhoea* sp., *Hakea* sp. and *Macrozamia riedlei* present to inform diagnosis.

**Table 2: Regional Vegetation Complexes (Mattiske and Havel, 1998)**

	Dwellingup (D2)	Yarragil (Yg1)	Murray (My2)	Helena (He2)
<b>Geographic region</b>	Subhumid North, East of Armadale and Jarrahdale	Subhumid North, East of Armadale and Jarrahdale	Semiarid North, South East of Mundaring	Arid North, North of Mundaring (Avon NP)
<b>Landform Description</b>	Upland ridges and spurs within mildly undulating northern Darling Plateau	Slopes of a minor valley moderately incised into the northern Darling Plateau	Slopes of a major valley moderately deeply incised into the Darling Plateau	Mid slopes of a major valley deeply incised into the Darling Plateau
<b>Soils</b>	Pale yellow to red brown gravelly sands and sandy loams, with frequent lateritic ironstone outcrops	Pale yellow brown gravelly sands, with occasional ironstone outcrop	Dark brown gravelly loams over red brown loamy clay, occasional granitic or doleritic outcrop	Bare rock or skeletal sandy loams
<b>Soil Hydrology</b>	Mildly water shedding via subsoil, good infiltration and storage capacity (as deep profile)	Mildly water shedding, with good infiltration and storage capacity	Strongly water shedding, with moderate infiltration and storage capacity	Very strongly water shedding with very low infiltration and storage capacity
<b>Over Storey</b>	Open Forest of <i>Eucalyptus marginata</i> subsp. <i>marginata</i> and <i>Corymbia calophylla</i>	Open Forest of <i>Eucalyptus marginata</i> subsp. <i>marginata</i> with some <i>Corymbia calophylla</i>	Woodland of <i>Eucalyptus wandoo</i> with some <i>Corymbia calophylla</i>	Lithic Complex, Herbfields, Heath or Open Woodland of <i>Eucalyptus wandoo</i> , <i>Corymbia calophylla</i> and <i>Allocasuarina huegeliana</i>
<b>Second Storey</b>	<i>Allocasuarina fraseriana</i> <i>Banksia grandis</i> and <i>Persoonia longifolia</i>	Strong development of <i>Allocasuarina fraseriana</i> <i>Banksia grandis</i> to a lesser degree <i>Persoonia longifolia</i>	No second storey	No second storey

	Dwellingup (D2)	Yarragil (Yg1)	Murray (My2)	Helena (He2)
<b>Shrubs and Herbs</b>	<i>Adenanthos barbiger</i> , <i>Hovea chorizemifolia</i> , <i>Hakea lissocarpha</i> , <i>Leucopogon capitellatus</i> , <i>Leucopogon propinquus</i> , <i>Macrozamia riedlei</i> , <i>Styphelia tenuiflora</i> and <i>Patersonia rudis</i> subsp. <i>rudis</i>	<i>Grevillea wilsonii</i> , <i>Styphelia tenuiflora</i> , <i>Adenanthos barbiger</i> , <i>Hovea chorizemifolia</i> , <i>Patersonia rudis</i> subsp. <i>rudis</i> , <i>Lepidosperma squamatum</i> , <i>Lechenaultia biloba</i> and <i>Hakea ruscifolia</i>	<i>Hakea lissocarpha</i> , <i>Diplolaena drummondii</i> , <i>Hypocalymma angustifolium</i> , <i>Lepidosperma squamatum</i> , <i>Baeckea camphorosmae</i> , <i>Gastrolobium calycinum</i> and <i>Macrozamia riedlei</i>	<i>Borya sphaerocephala</i> , <i>Grevillea bipinnatifida</i> , <i>Hakea undulata</i> , <i>Hakea elliptica</i> , <i>Hakea lissocarpha</i> , <i>Trymalium ledifolium</i> and <i>Hakea undulata</i>

## 4 Methods

The reserves assessment was conducted in a two-stage process: a desktop review of relevant information regarding site characteristics and previous relevant assessments and literature, followed by a field assessment to observe ecological values, record spatial data and collect photographs of relevant features.

### 4.1 Desktop Review

A desktop assessment was undertaken prior to the field assessment to gather background information about the assessment area and surrounding landscape and review previous reports and data. Maps of the area were accessed through the Dieback Information Data Management System (DIDMS). DIDMS maps use data from the Vegetation Health Services Laboratory to display Dieback sample results and occurrence mapping from previous assessments undertaken in the area. The desktop assessment also sought to:

- Identify access to the assessment area and internal tracks;
- Examine topography and drainage of the assessment area and broader landscape;
- Identify possible disease vectors e.g. tracks, utility corridors and ground disturbance;
- Determine the location of high risk areas (e.g. areas of high disturbance and water-gaining sites); and
- Review previous reports and other relevant literature.

### 4.2 Field Assessment

The reserve field assessment was conducted between December 2017 and April 2018 by Terratree ecologists and DBCA registered Dieback Interpreters Joseph Grehan and Kelby Jennings. The field assessment was conducted in two phases; first all tracks within each reserve were surveyed by 4WD to capture GPS track data while carrying out an initial reconnaissance of environmental factors. Subsequently, the reserves were comprehensively assessed on foot to gather accurate data related to significant trees, weed distribution, Dieback occurrence, evidence of feral animals and rubbish dumping. The spatial data on track maps, as well as the data on weed and disease occurrence, were recorded on hand-held Global Positioning Satellite (GPS) units.

#### 4.2.1 Significant Tree Assessment

The significant tree assessment categorised significant trees in accordance with the Black Cockatoo referral guidelines for breeding trees (EPBC, 2012), which are defined as trees with a diameter at breast height (d.b.h.) of 500mm or greater, of the following species (expected to occur within the assessment area):

- Jarrah (*Eucalyptus marginata*);
- Marri (*Corymbia calophylla*);
- Wandoo (*Eucalyptus wandoo*);
- Flooded Gum (*Eucalyptus rudis*); and
- Blackbutt (*Eucalyptus patens*).

Trees which do not meet this definition of significant may still possess biodiversity values in terms of fauna habitat and foraging value, including trees with a d.b.h. of less than 500mm and even introduced, non-native species such as *Pinus* spp.

Significant tree location data were captured using handheld GPS units, with tree species, estimated d.b.h. (to nearest 100mm), health (healthy, stressed or dead) and the presence of potential nesting hollow(s) also recorded.

#### 4.2.2 Weed Assessment

Weed distribution data was captured using handheld GPS units with weed species, approximate population size and extent, growth habit and Serious Biodiversity Impact ratings recorded. The qualitative assessment of severity is based on the descriptions in **Table 3** below:

**Table 3: Qualitative Weed Severity Ratings Descriptions**

Weed Severity Category	Description
Low	Scattered non-invasive woody perennial weeds such as Eastern States <i>Acacia</i> spp. and Tagasaste or small populations of herbaceous perennials or annuals
Medium	Widespread perennial weeds such as Eastern States <i>Acacia</i> spp. and Tagasaste or multiple populations of herbaceous perennials or annuals
High	Dominant perennial weeds such as Eastern States <i>Acacia</i> spp. and Tagasaste or multiple populations of herbaceous perennials or annuals
Very High	Declared weeds or Serious Environmental weeds present and abundant i.e. Blackberry, Bridal Creeper, Watsonia, Cottonbush

#### 4.2.3 Broadscale Dieback Assessment

The Broadscale Dieback assessment was implemented in accordance with the *FEM047 Phytophthora Dieback Interpreter's Manual for lands managed by the Department* (FEMD, 2015).

During a Broadscale assessment, Dieback occurrence data is collected to enable a generalised review of Dieback occurrence and severity within the assessment area. Data from a Broadscale assessment has a moderate confidence level and is not suitable for operational purposes (DPaW 2015).

The *Phytophthora* occurrence categories, impacts and syndromes (FEMD, 2015) are described below. Native vegetation is assessed by observing the factors described to determine the appropriate category.

The Dieback Interpreters' Manuals categorises land that has been cleared of native vegetation (such as farmland) as 'excluded' from assessment. Non-vegetated areas that are 'excluded' from assessment include pasture, pits, easements, development, large roads (sealed and unsealed), permanent flooding and parkland tree stands. **Table 4** presents the *Assessability of vegetated and non-vegetated areas*, which includes the Excluded category (DPaW, 2015).

The 'temporarily uninterpretable' category is allocated to areas of native vegetation which have been disturbed, but native vegetation will recover over time and may become interpretable and therefore mappable. Examples of temporarily uninterpretable areas include vegetation that has been impacted by fire, timber harvesting, flooding or mining with subsequent rehabilitation. The recovery time for temporarily uninterpretable areas may be longer than 3 years (DPaW, 2015). Excluded areas are distinguished from 'temporarily uninterpretable' areas by the fact that excluded areas do not generally retain the ability to regenerate and eventually become mappable.

The Keighery vegetation disturbance scale (DPaW 2013) presented in **Table 5** was used to determine the interpretability of the vegetation. Areas with a vegetation condition rating of 1-3 (Pristine - Very Good) are considered to be assessable. In addition, there must be enough disease indicator species present to enable a diagnosis of the disease status. An area with a vegetation condition rating of 4 (Good) is possibly assessable; however, it is up to the Interpreter's discretion. Temporarily uninterpretable and excluded areas may be given a condition rating of 5 or 6 (Degraded or Completely Degraded).

Reserve priority ranking in **Table 9** is modified to reflect the very high impact of Dieback on biodiversity and the limited number of reserves (or parts of reserves) that are protectable. As plant diversity declines in reserves with Dieback, these Dieback-free areas will become increasingly critical in preserving native plant species and providing a refuge for wildlife. Reserves or areas that do not currently have Dieback must be considered high priority and managed carefully to limit access and activities that would introduce Dieback.

**Table 4: Assessability of vegetated and non-vegetated areas (as cited in DPaW, 2015)**

	<i>Phytophthora</i> occurrence category	Typically present	May be present
<p><b>Naturally vegetated areas</b> Keighery disturbance rating of 3 or less. <i>Phytophthora</i> occurrence categorisation is possible. Small un-vegetated areas can exist and may be included in the assessment area considering total environmental context.</p>	<b>INFESTED</b>	Dead and dying reliable indicator species	Healthy reliable indicator species. Indicator Species Deaths (ISDs) that have been killed by other agents
	<b>UNINFESTED</b>	Healthy reliable indicator species	ISDs that have been killed by other agents
	<b>UNINTERPRETABLE</b>	Very few reliable indicator species	Occasional reliable indicators, but too few for <i>Phytophthora</i> Dieback interpretation
	<b>NOT YET RESOLVED</b>	Usually reliable indicator species in an environment not favourable to disease development	Negative sample results for all <i>Phytophthora</i> species
<p><b>Vegetation structure temporarily altered.</b> <i>Phytophthora</i> occurrence assessment is will be possible when vegetation structure recovers. Recovery times will be variable depending on severity and type of disturbance.</p>	<b>TEMPORARILY UNINTERPRETABLE</b>	Indicator species masked by disturbance typically from fire, harvesting, temporary flooding, poisoning.	Occasional reliable indicator species, but disturbance prevents accurate placement of <i>Phytophthora</i> occurrence
<p><b>Road disturbance area</b></p>	<b>DISEASE RISK ROAD (DRR)</b>	Unformed track with shoulders of interpretable vegetation	Shoulders and batters with regenerated vegetation. Incipient infestation
<p><b>Vegetation structure severely altered.</b> Keighery disturbance rating 5 or greater. <i>Phytophthora</i> occurrence assessment is not possible. Can be determined by desktop assessment (aerial photo). Small vegetated areas can exist and may be excluded from the assessment area considering total environmental context.</p>	<b>EXCLUDED</b>	Pasture, pits, easements, infrastructure, large roads (sealed and unsealed) permanent flooding, plantations, parkland tree stands.	Sporadic reliable indicator species

**Table 5: Keighery (1994) Vegetation Disturbance Scale and Assessability (as cited in DPaW, 2015)**

Assessability	Scale	Condition	
Assessable	1	Pristine	Pristine or nearly so, no obvious signs of disturbance
	2	Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species
	3	Very Good	Vegetation structure altered with obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing
Possibly assessable, discretion required	4	Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, Dieback and grazing.
Not assessable or excluded from assessment	5	Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of aggressive weeds, partial clearing, Dieback and grazing.
	6	Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as "parkland cleared" with the flora comprising weed or crop species with isolated native trees or shrubs.

### 4.3 Protocols for Identifying Protectable Areas

According to Dieback Interpreters Guidelines (DPaW 2015), the following primary criteria are used to define 'Protectable Areas' as those that:

- Have been determined to be free of the *Phytophthora* spp. pathogen by a registered Dieback Interpreter (all susceptible indicator plant species are healthy and no plant disease symptoms normally attributed to *Phytophthora* Dieback are evident);
- Consists of areas where human vectors are controllable (e.g. not an open road, private property); and
- Are positioned in the landscape and are of sufficient size (e.g. > 4 ha with axis >100 m) such that a qualified Interpreter judges that the pathogen will not autonomously engulf them in the short term (a period of a few decades); or
- Includes areas of high conservation and/or socio-economic value (for example, a small uninfested area with a known population of a susceptible species of Threatened flora). (DPaW 2015, page 113).

## 5 Results

**Table 9** presents a summary of the key findings of the reserves assessment including weed severity, Dieback occurrence, whether the reserve has protectable vegetation, as well as other issues and comments.

### 5.1 *Phytophthora* Dieback

Disease indicator species observed within the assessment area include representatives of the Proteaceae, Fabaceae and Xanthorrhoeaceae families. *Banksia grandis* and *Xanthorrhoea preissii* were the most abundant disease indicator species within the assessment area, with evidence from *Banksia sessilis* var. *sessilis*, *Persoonia elliptica* and *Eucalyptus marginata* also relied upon to inform interpretation. The disease indicator species used during the Broadscale Dieback assessment are listed in **Table 6**.

**Table 6: Indicator species observed during the field assessment**

Family	Species
Iridaceae	<i>Patersonia occidentalis</i>
	<i>Astroloma</i>
Ericaceae	<i>Leucopogon propinquus</i>
Fabaceae	<i>Daviesia decurrens</i>
Myrtaceae	<i>Eucalyptus marginata</i>
Proteaceae	<i>Banksia dallanneyi</i> var. <i>dallanneyi</i>
	<i>Banksia grandis</i>
	<i>Banksia littoralis</i>
	<i>Banksia sessilis</i> var. <i>sessilis</i>
	<i>Banksia squarrosa</i>
	<i>Grevillea wilsonii</i>
	<i>Hakea amplexicaulis</i>
	<i>Hakea prostrata</i>
	<i>Hakea ruscifolia</i>
Xanthorrhoeaceae	<i>Xanthorrhoea gracilis</i>
	<i>Xanthorrhoea preissii</i>
Zamiaceae	<i>Macrozamia reidleyi</i>

### 5.2 Significant Trees

A total of 9253 significant trees were recorded during the assessment. Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*) comprised the majority (91.6%) of trees, with Blackbutt (*Eucalyptus patens*), Flooded Gum (*Eucalyptus rudis*) and Wandoo (*Eucalyptus wandoo*) also represented. Significant trees summary data (numbers of trees recorded) is presented below in **Table 7**.

**Table 7: Significant Tree Summary Data**

<b>Species</b>	<b>500-699mm</b>	<b>700-899mm</b>	<b>900-1099mm</b>	<b>1100+mm</b>	<b>Grand Total</b>
<b>Blackbutt (<i>Eucalypts patens</i>)</b>	<b>32</b>	<b>10</b>	<b>10</b>	<b>5</b>	<b>57</b>
Hollow(s) present	0	0	0	0	0
<b>Flooded Gum (<i>Eucalyptus rudis</i>)</b>	<b>84</b>	<b>29</b>	<b>8</b>	<b>11</b>	<b>132</b>
Hollow(s) present		1	1	4	6
<b>Jarraah (<i>Eucalyptus marginata</i>)</b>	<b>2373</b>	<b>1134</b>	<b>446</b>	<b>491</b>	<b>4444</b>
Hollow(s) present	37	76	100	249	462
<b>Marri (<i>Corymbia calophylla</i>)</b>	<b>1894</b>	<b>1178</b>	<b>491</b>	<b>471</b>	<b>4034</b>
Hollow(s) present	17	70	103	253	443
<b>Unknown (dead)</b>	<b>45</b>	<b>126</b>	<b>41</b>	<b>21</b>	<b>233</b>
Hollow(s) present	2	12	12	21	47
<b>Wandoo (<i>Eucalyptus wandoo</i>)</b>	<b>179</b>	<b>112</b>	<b>32</b>	<b>30</b>	<b>353</b>
Hollow(s) present	8	15	20	22	65
<b>Grand Total</b>	<b>4607</b>	<b>2589</b>	<b>1028</b>	<b>1029</b>	<b>9253</b>

### 5.3 Weeds

A total of 31 exotic (weed) species were recorded during the assessment. Of these, 7 were determined to represent a Serious Biodiversity Threat. Weed species are listed below in **Table 8**.

**Table 8: Weeds recorded during priority reserves assessment**

Family	Species	Common Name	Status (Declared pest by DAF)	DPAW Roadside Environmental Weeds	Priority weed species 2002	Weed of national significance
Anacardiaceae	<i>Schinus terebinthifolius</i>	Brazilian Pepper	Permitted - s11 - Whole of state			
Apocynaceae	<i>Gomphocarpus fruticosus</i>	*Cottonbush	Declared pest - s22(2)	Roadside environmental weed		
	<i>Vinca major</i>	Blue Periwinkle	Permitted - s11 - Whole of state			
Araceae	<i>Zantedeschia aethiopica</i>	*Arum Lily	Declared pest - s22(2)	Roadside environmental weed	6	
Asparagaceae	<i>Asparagus asparagoides</i>	*Bridal Creeper	Declared pest - s22(2)	Roadside environmental weed	6	X
	<i>Agave</i>	Agave	All 98 species permitted - s11			
Bignoniaceae	<i>Pandorea pandorana</i>	*Wonga Wonga Vine	Permitted - s11 - Whole of state			
Convovulaceae	<i>Ipomoea indica</i>	Morning Glory	Permitted - s11 - Whole of state			

Family	Species	Common Name	Status (Declared pest by DAF)	DPAW Roadside Environmental Weeds	Priority weed species 2002	Weed of national significance
Euphorbiaceae	<i>Homalanthus populifolius</i>	Bleeding Heart Tree	Permitted - s11 - Whole of state			
	<i>Ricinus communis</i>	Castor Oil Plant	Permitted - s11 - Whole of state			
Fabaceae	<i>Acacia pycnantha</i>	Golden Wattle	Permitted - s11 - Whole of state	Roadside environmental weed		
	<i>Acacia longifolia</i> subsp. <i>longifolia</i>	-	Permitted - s11 - Whole of state	Roadside environmental weed		
	<i>Acacia iteaphylla</i>	Flinders Range Wattle	Permitted - s11 - Whole of state	Roadside environmental weed		
	<i>Acacia baileyana</i>	Cootamundra Wattle	Permitted - s11 - Whole of state	Roadside environmental weed		
	<i>Acacia decurrens</i>	Early Black Wattle	Permitted - s11 - Whole of state			
	<i>Acacia podalyriifolia</i>	Queensland Silver Wattle	Permitted - s11 - Whole of state	Roadside environmental weed		
	<i>Chamaecytisus palmensis</i>	Tagasaste	Permitted - s11 - Whole of state			
Iridaceae	<i>Robinia pseudoacacia</i>	Robinia	Permitted - s11 - Whole of state			
	<i>Freesia alba x leichtlinii</i>	Freesia	Permitted - s11 - Whole of state	Roadside environmental weed	6	

Family	Species	Common Name	Status (Declared pest by DAF)	DPAW Roadside Environmental Weeds	Priority weed species 2002	Weed of national significance
Iridaceae	<i>Watsonia meriana</i> var. <i>bulbillifera</i>	*Watsonia	Watsonia meriana is Permitted - s11 - Whole of state	Roadside environmental weed	5	
	<i>Gladiolus caryophyllaceus</i>	Gladiolus	Permitted - s11 - Whole of state	Roadside environmental weed	5	
Meliaceae	<i>Melia azerdarach</i>	Cape Lilac, White Cedar	Permitted - s11 - Whole of state			
Moaceae	<i>Ficus carica</i>	Edible Fig	Permitted - s11 - Whole of state		5	
Myrtaceae	<i>Leptospermum laevigatum</i>	*Victorian Tea Tree	Permitted - s11 - Whole of state	Roadside environmental weed	6	
Poaceae	<i>Arundo donax</i>	Giant Reed	Permitted - s11 - Whole of state	Roadside environmental weed		
	<i>Cenchrus clandestinus</i>	Kikuyu Grass	Permitted - s11 - Whole of state			
	<i>Ehrharta calycina</i>	*Perennial Veldt Grass	Permitted - s11 - Whole of state	Roadside environmental weed	6	
	<i>Paspalum dilatatum</i>	Paspalum Grass	Permitted - s11 - Whole of state			
Rosaceae	<i>Rubus ulmifolius</i>	*Blackberry	Declared pest - s22(2)		5	<i>Rubus fruticosus</i>
Solanaceae	<i>Solanum nigrum</i>	Deadly Nightshade	Permitted - s11 - Whole of state			<i>Solanum elaeagnifolium</i>

Family	Species	Common Name	Status (Declared pest by DAF)	DPAW Roadside Environmental Weeds	Priority weed species 2002	Weed of national significance
Typhaceae	<i>Typha orientalis</i>	Bulrush	Permitted - s11 - Whole of state		6	
			<p>Status of organisms under the <i>Biosecurity and Agriculture Management Act 2007</i>.</p>	<p>Roadside Environmental Weeds List. Endorsed by WA's Minister for Environment. Used to prioritise and guide best practice management of weeds on road and rail reserves.</p>	<p>Weed Control Strategy, Shire of Mundaring. Prepared by EcoScape 2002. Ranks priority weeds on scale of 1 to 6, with 6 being highest priority.</p>	<p>32 weeds of national significance have been agreed on by Australian governments.</p>

#### **5.4 Feral Fauna**

Feral fauna were recorded opportunistically while undertaking the assessment. Fox dens were observed at several reserves and a live fox was spotted at Cameron Road Reserve. A dead fox was also recorded at Gilfellon Reserve.

#### **5.5 Human Disturbance**

Rubbish dumping was not found to be a widespread issue due to controlled access in a large proportion of the in the reserves assessed. Suspected asbestos dumping was recorded in Strettle Road Reserve and Hovea Conservation Park.

#### **5.6 Erosion**

Controlled access has also contributed to limiting soil erosion along tracks and watercourses within the reserves. While Quail Street Reserve has some significant erosion occurring along tracks in the eastern portion of the reserve due to the steepness of some of the slopes, soil erosion in the reserves did not appear to be a significant issue.

**Table 9: Key findings of Priority Reserves assessment**

Priority	Name of area	Reserve	Suburb	Weed Severity	Dieback Occurrence	Protectable Area(s)?	Other Issues/Comments
1	<b>Alps Street Reserve</b>	34103	Mount Helena	<b>Low</b> Some <i>Watsonia</i> in NE corner otherwise Eastern States <i>Acacia</i> spp. scattered along tracks plus Tagasaste and Olive trees.	<b>Approximately 30% infested-</b> significant infestations in NE of reserve and along perimeter tracks	<b>Yes-</b> possibly large uninfested area in mid and upper slopes portion of reserve which requires a comprehensive Dieback assessment.	There is no Standard Protocol Dieback signage in this reserve and public vehicular access is a significant hygiene issue.
2	<b>Strettle Road Reserve</b>	32727	Mahogany Creek	<b>Low</b> Some <i>Watsonia</i> on eastern side of smaller reserve north of Strettle Street, Eastern States <i>Acacia</i> spp. along Eastern side of large reserve south of Strettle Road.	<b>Smaller north-western portion – approximately 80% infested.</b> <b>Larger southern portion approx. 50% infested.</b>	<b>Yes-</b> possibly large uninfested in mid and upper slopes portion of southern reserve which requires a comprehensive Dieback assessment.	Standard Dieback Protocol Signage present but sometimes in the wrong place. Asbestos dumps located along the southern boundary of the northern reserve.
3	<b>Pindalup Reserve</b>	39853	Wooroloo	<b>Low</b> Mainly Eastern States <i>Acacia</i> spp. and Tagasaste in the western portion of the reserve adjacent to cleared areas plus some scattered <i>Gladiola</i> .	<b>Predominantly uninfested. (5% infested)</b> Possible small infestation along lower slope track in the north-western portion of the reserve	<b>Yes-</b> this reserve is mostly uninfested and protectable. Small possible infestation requires sampling and mapping.	Lots of old car bodies. There is no Standard Protocol Dieback signage in this reserve.

Priority	Name of area	Reserve	Suburb	Weed Severity	Dieback Occurrence	Protectable Area(s)?	Other Issues/Comments
4	<b>Superblock (incl. previous wildflower seed Res 36428)</b>	50018	Glen Forrest	<b>Medium</b> Bridal creeper, Freesias and Watsonia prevalent along western boundary track. Otherwise scattered Eastern States <i>Acacia</i> spp. along Ryecroft Road and Tagasaste	<b>Approximately 30% infested.</b> Significant active disease along Ryecroft Rd which is an upslope infestation otherwise disease is concentrated in lower slopes and gullies. Wildflower Seed Reserve is 90% infested.	<b>Yes</b> - possibly large uninfested in mid and upper slopes portion of Superblock reserve which requires a comprehensive Dieback assessment.	There is no Standard Protocol Dieback signage in this reserve and public vehicular access is a significant hygiene issue.
5	<b>North Darlington Reserves</b>	6922	Darlington	<b>Medium</b> Cottonbush, Wonga Wonga Vine, Brazilian Pepper tree and Kurrajong present along Darlington Rd near the intersection of GEH. Otherwise Eastern States <i>Acacia</i> spp. scattered in reserve area east of Darlington Rd. Paspalum grass in drain adjacent to Ferguson Rd with	<b>Approximately 50% infested.</b> <b>Nan McMillan Park has very active disease and is approximately 70% infested.</b> The portion south of Oxley Road appears to be uninfested. <b>The area between Lionel and Darlington roads is approximately 60% infested.</b> <b>The area south</b>	<b>Yes</b> - the mid and upper slope areas west of Darlington Road which requires a comprehensive Dieback assessment.	Pollution from drain was evident across the road, and possibly emanating from the water treatment plant. The discharge appears to be killing native vegetation downslope west of Darlington Rd.  Nan McMillan Park has a very active Dieback. It's interesting to note the species that are surviving and thriving in the infested areas. Some of these species such as <i>Calothamnus sp.</i> (Either <i>C. quadrifidis</i> or <i>C. lateralis</i> )

Priority	Name of area	Reserve	Suburb	Weed Severity	Dieback Occurrence	Protectable Area(s)?	Other Issues/Comments
				Freesias and Gladioli present along western boundary.	<b>of Oxley Road appears to be uninfested.</b>		<i>and Hakea trifurcata</i> are providing foraging habitat that has been lost with the <i>Banksia</i> spp. succumbing to the pathogen. <i>Grevillea wilsonii</i> is also thriving in some areas and offers a significant seed resource from which to collect and propagate.
6	<b>Black Cockatoo Reserves (north)</b>	20990	Mundaring	<b>None</b> This reserve was found to be weed free-probably due to the diligent work of the friends group	<b>Approximately 70% infested.</b> Only the upper slope area along the western boundary and north western corner remains Dieback free.	<b>Yes</b> - there is some demarcation present but it's out of date and the area requires a comprehensive Dieback assessment.	Standard Dieback Protocol Signage present but sometimes in the wrong place. The migratory protected species the Rainbow Bee-Eater was observed in the reserve. There is a fox den in the north - western portion of the reserve. Herbicide spraying under the powerline was observed to be careless and impacting non-tree species
7	<b>Black Cockatoo Reserves (mid)</b>	12422	Mundaring	<b>Low</b> Scattered Eastern States <i>Acacia</i> spp., Gladioli and Victorian Teatree mainly along the eastern boundary (Stevens Street).	<b>Approximately 30% infested.</b> Infested area mostly in the northern portion of the reserve with smaller infestations near the southern	<b>Yes</b> - there appears to be a large protectable area in the reserve which requires a comprehensive Dieback assessment.	Standard Dieback Protocol Signage present but sometimes in the wrong place.

Priority	Name of area	Reserve	Suburb	Weed Severity	Dieback Occurrence	Protectable Area(s)?	Other Issues/Comments
					and eastern boundary.		
8	<b>Falls Road Reserve</b>	12453	Hovea	<b>Low</b> Four small Watsonia population plus scattered Eastern States <i>Acacia</i> spp. and Freesias in lower areas.	<b>Approximately 25% infested.</b> Dieback around the perimeter of the reserve both in upland and lowland areas.	<b>Yes-</b> It looks like there is a large uninfested area in mid and upper slopes portion of the reserve, however there is an infestation encroaching from Richardson Road moving downslope. The reserve requires a comprehensive Dieback assessment	Signage is old and located incorrectly. There is no Standard Protocol Dieback signage in this reserve.
9	<b>Hovea Conservation Park</b>	14163	Parkerville	<b>Western Reserve - Low</b> Two small Watsonia populations and some Gladiolas plus scattered Eastern States <i>Acacia</i> spp.  <b>Eastern Reserve - Medium</b> Significant population of Victorian Teatree in the south-	<b>Western Reserve is approximately 50% infested.</b> Dieback widespread in lower slopes and mid-slope areas especially in the southern portion and along Hedges Road. There is a very active infestation in the northern portion of the reserve	<b>Yes -</b> there are uninfested protectable areas in both reserves which require a comprehensive Dieback assessment.	There are two old asbestos dumps in the northern portion of the western reserve. The asbestos is broken up into small pieces and scattered over a large area. There is no Standard Protocol Dieback signage in this reserve.

Priority	Name of area	Reserve	Suburb	Weed Severity	Dieback Occurrence	Protectable Area(s)?	Other Issues/Comments
				western portion of the reserve. There are also two <i>Watsonia</i> populations and scattered Eastern States <i>Acacia</i> spp	and along the narrow access corridor to the east. <b>Eastern Reserve is approximately 70% infested.</b> Dieback is widespread apart from an uninfested upland area in the northern portion of the reserve.		
10	<b>Callan Road Reserve</b>	38224	Hovea	<b>Low</b> Scattered Eastern States <i>Acacia</i> spp. mainly <i>A. iteaphylla</i> and Robinia or Black locust trees.	<b>Approximately 40% infested.</b> Dieback widespread in lower slopes and some mid slope areas,	<b>Yes</b> - there is a large uninfested protectable area which requires a comprehensive Dieback assessment.	There is no Standard Protocol Dieback signage in this reserve.
11	<b>Binbrook Park</b>	1847	Darlington	<b>Low</b> Wong Wonga vine and Kurrajong trees along north eastern boundary. Some <i>Watsonia</i> and <i>Freesias</i> along southern boundary.	<b>Approximately 40% infested.</b> Dieback widespread in eastern portion of the reserve.	<b>Yes</b> - there is a large uninfested protectable area which requires a comprehensive Dieback assessment.	There is no Standard Protocol Dieback signage in this reserve.

Priority	Name of area	Reserve	Suburb	Weed Severity	Dieback Occurrence	Protectable Area(s)?	Other Issues/Comments
12	<b>Chidlow Oval</b>	23921	Chidlow	<b>High</b> Three <i>Watsonia</i> populations and scattered Eastern States <i>Acacia</i> spp. (mainly <i>A. iteaphylla</i> and <i>A. longifolia</i> ), and <i>Tagasaste</i> in native vegetation adjacent to oval.	<b>Approximately 10-20% infested</b> Dieback is present in gully area, but the extent is unknown due to disturbance and Degraded vegetation condition.	<b>Yes</b> - there is likely to be an uninfested upper slope area which is protectable and requires a comprehensive Dieback assessment	Uncontrolled public vehicular access is a significant issue in this reserve.  There is no Standard Protocol Dieback signage in this reserve.
13	<b>Sexton Street Reserve</b>	10924	Mount Helena	<b>Low</b> Mainly <i>Tagasaste</i> along the eastern boundary of the reserve but also <i>Wonga Wonga</i> vine and some <i>Acacia iteaphylla</i> .	<b>Approximately 40% infested.</b> Dieback widespread in south-eastern portion of the reserve.	<b>Yes</b> - there is likely to be an uninfested upper slope area which is protectable and requires a comprehensive Dieback assessment	There is no Standard Protocol Dieback signage in this reserve.
14	<b>Railway Reserve Parkerville</b>	32484	Parkerville	<b>High</b> Four populations of <i>Blackberry</i> along with <i>Watsonia</i> and <i>Bridal creeper</i> populations. Scattered Eastern States <i>Acacia</i> spp. (mainly <i>A. iteaphylla</i> and <i>A. longifolia</i> ) throughout along with <i>Tagasaste</i> .	<b>Unknown-</b> Evidence of Dieback has been recorded along the Railway Reserve but requires a comprehensive linear assessment.	<b>Yes-</b> there are likely to be an uninfested areas which are protectable requires a comprehensive linear Dieback assessment. This is especially important where the trail adjoins another reserve.	The Threatened (Declared Rare) Species <i>Acacia aphylla</i> was recorded between Seaborne Street and Sexton Street.  There is no Standard Protocol Dieback signage in this reserve.

Priority	Name of area	Reserve	Suburb	Weed Severity	Dieback Occurrence	Protectable Area(s)?	Other Issues/Comments
15	<b>Cameron Road Reserve</b>	37837	Stoneville	<b>Low</b> Some Gladioli and Scattered Eastern States <i>Acacia</i> spp. (mainly <i>A. iteaphylla</i> and <i>A. longifolia</i> ) throughout.	<b>Approximately 90% infested.</b>	<b>Yes</b> - there is likely to be an uninfested upper slope area which is protectable and requires a comprehensive Dieback assessment	Soil movement associated with firebreak maintenance might be spreading Dieback. There is no Standard Protocol Dieback signage in this reserve There is no Standard Protocol Dieback signage in this reserve
16	<b>Mathieson Road Transfer Station</b>	31053	Chidlow	<b>Medium</b> One Blackberry and three <i>Watsonia</i> populations. Scattered Eastern States <i>Acacia</i> spp. (mainly <i>A. iteaphylla</i> and <i>A. longifolia</i> ) throughout along with Victorian Teatree and Tagasaste. Other weeds include Lavender, Olive and Pine trees.	<b>Approximately 40% infested.</b>	<b>Yes</b> - there is likely to be an uninfested areas which are protectable in the south-western, north-western and eastern portions of the reserve which require a comprehensive Dieback assessment	There is an asbestos dump near the western boundary.
17	<b>Lechenaultia Park</b>	25433	Chidlow	<b>Low</b> Some <i>Watsonia</i> and Eastern States <i>Acacia</i> spp.	<b>Approximately 20% infested.</b> Infestation along interface with Railway Reserve	<b>Yes</b> - there is likely to be an uninfested areas which are protectable and require a comprehensive	Vegetation in Very Good-Excellent in uninfested area. There is no Standard Protocol Dieback signage in this reserve.

Priority	Name of area	Reserve	Suburb	Weed Severity	Dieback Occurrence	Protectable Area(s)?	Other Issues/Comments
						Dieback assessment.	
18	<b>Rosedale Road Reserve</b>	22659	Chidlow	<b>Low</b> Some Watsonia along Rosedale Road and Eastern States <i>Acacia</i> spp around boundary track	<b>Uninfested</b>	<b>Yes</b> - this reserve is uninfested and protectable	There is no Standard Protocol Dieback signage in this reserve
19	<b>Thomas Street Reserve</b>	31066	Mahogany Creek	<b>Low</b> Eastern States <i>Acacia</i> spp. (predominantly <i>A. iteaphylla</i> ), Lavender and Agave	<b>Mostly Uninterpretable</b> -one potential sample location identified.	Sample required	Wetland area should be revegetated
20	<b>Roland Road Reserve</b>	45986	Parkerville	<b>Low</b> <i>Acacia longifolia</i>	<b>Approximately 30% infested.</b>	<b>Yes</b> - there is likely to be an uninfested areas which are protectable and require a comprehensive Dieback assessment	There is no Standard Protocol Dieback signage in this reserve
21	<b>Carawatha Road Reserve</b>	13766	Parkerville	<b>None</b>	<b>Possibly Uninfested-needs sampling</b>	<b>Yes</b> - there is likely to be an uninfested areas which are protectable and require a comprehensive Dieback assessment	There is no Standard Protocol Dieback signage in this reserve

Priority	Name of area	Reserve	Suburb	Weed Severity	Dieback Occurrence	Protectable Area(s)?	Other Issues/Comments
22	<b>Southern Railway Heritage Trail</b>	31196	Boya-Mundaring	<b>High</b> Serious environmental weeds including Bridal creeper, Watsonia, Victorian Teatree, Giant Reed ( <i>Arundo donax</i> ). Scattered Eastern States <i>Acacia</i> spp. (mainly <i>A. iteaphylla</i> and <i>A. longifolia</i> ) throughout along with Fig and Olive trees, and Tagasaste.	<b>Approximately 70% infested.</b> Evidence of Dieback recorded at regular intervals along the trail	<b>Yes</b> - there is likely to be an uninfested areas which are protectable and require a comprehensive Dieback assessment.	There is no Standard Protocol Dieback signage in this reserve.
23	<b>Cookes Brook</b>	38367	Chidlow	<b>Very High</b> Significant Blackberry populations in the riparian zone, in addition to Cotton Bush, Fig and Olive trees and Scattered Eastern States <i>Acacia</i> spp. (mainly <i>A. iteaphylla</i> and <i>A. longifolia</i> ) throughout.	<b>Mostly Uninterpretable</b> but some evidence of possible Dieback infestation in upland vegetation – requires sampling	<b>Sample required</b>	The Blackberry populations in this reserve are significant and need urgent attention to prevent it being spread to other areas within the Shire

Priority	Name of area	Reserve	Suburb	Weed Severity	Dieback Occurrence	Protectable Area(s)?	Other Issues/Comments
24	<b>Old Parkerville School Site</b>	13214	Parkerville	<b>Low</b> Tagasaste	<b>Uninterpretable</b>	<b>Uninterpretable</b>	
25	<b>Glynden Reserve</b>	29959	Helena Valley	<b>Low</b> Small <i>Watsonia</i> populations and some <i>Gladioli</i> . Tagasaste near boundary	<b>Uninfested-no evidence of Dieback</b>	<b>Yes</b> -protectable uninfested vegetation	There is no Standard Protocol Dieback signage in this reserve.
26	<b>Marriott Park</b>	25700	Boya	<b>Medium</b> Cotton bush in the southern portion of the reserve. There are Date Palms and a Japanese Pepper tree in the middle portion and <i>Paspalum</i> grass in the creek in the northern portion of the reserve.	<b>Uninterpretable</b>	<b>Uninterpretable</b> but creek likely to be infested.	
27	<b>Jane Byfield Reserve</b>	880	Mahogany Creek	<b>Low</b> <i>Acacia pycnantha</i> and Spotted Gum ( <i>Corymbia maculata</i> )	<b>Uninfested</b>	<b>Yes</b> -protectable uninfested vegetation	There is no Standard Protocol Dieback signage in this reserve.
28	<b>Milligan Road Reserve</b>	22843	Stoneville	<b>Low</b> Tagasaste present	<b>Uninterpretable</b>	<b>Uninterpretable</b>	
29	<b>Hilltop Reserve</b>	41670	Mahogany Creek	<b>High</b> Cotton bush, Bridal creeper, Wonga Wonga vine, Periwinkle,	<b>Approximately 20%</b> infested- requires sample to confirm	<b>Yes</b> - there is likely to be an uninfested areas which are protectable and	Serious environmental weeds need to be removed/treated.

Priority	Name of area	Reserve	Suburb	Weed Severity	Dieback Occurrence	Protectable Area(s)?	Other Issues/Comments
				Bleeding Heart Fig and Olive trees		require a comprehensive Dieback assessment	There is no Standard Protocol Dieback signage in this reserve
30	<b>Marloo Theatre Reserve</b>	36045	Greenmount	<b>Medium</b> Several <i>Watsonia</i> populations, as Veldt Grass, Tagasaste, Olive and Cape Lilac trees, Agave and <i>Acacia pycnantha</i>	<b>No evidence of Dieback in Very Good to Excellent condition vegetation</b>	<b>Yes-</b> there is likely to be an uninfested area which are protectable and requires a comprehensive Dieback assessment	There is no Standard Protocol Dieback signage in this reserve
31	<b>Beechina Rail Reserve</b>	35397	Chidlow	<b>High</b> Large blackberry population plus Eastern States <i>Acacia</i> spp. (mainly <i>A. iteaphylla</i> and <i>A. longifolia</i> ) and Tagasaste	<b>Approximately 60% infested-</b> requires sample to confirm	<b>Yes-</b> there is likely to be an uninfested area which are protectable and requires a comprehensive Dieback assessment	There is a fallen tree blocking vehicle access mid-way along the southern section of the reserve. Lots of litter at the northern access to the southern section due to bus shelter- needs a bin.
32	<b>Gilfellon Reserve</b>	31264	Stoneville	<b>Very High</b> Creek line has extensive Blackberry population. Also, Paspalum grass and Eastern States <i>Acacia</i> spp. (mainly <i>A. iteaphylla</i> and <i>A. longifolia</i> .)	<b>No evidence of Dieback, creek line uninterpretable</b>	<b>Yes-</b> there is likely to be an uninfested area which are protectable and requires a comprehensive Dieback assessment	This reserve has a large population of <i>Grevillea vestita</i> and offers a significant seed resource from which to collect and propagate.

Priority	Name of area	Reserve	Suburb	Weed Severity	Dieback Occurrence	Protectable Area(s)?	Other Issues/Comments
33	<b>Rabone Way Reserve</b>	31261	Darlington	<b>High</b> Large populations of <i>Watsonia</i> , some Bridal creeper, Periwinkle and Eastern States <i>Acacia</i> spp. (mainly <i>A. iteaphylla</i> and <i>A. longifolia</i> )	<b>Uninterpretable</b>	<b>Uninterpretable</b>	
34	<b>Burma Road Reserve</b>	37563	Wooroloo	<b>Medium</b> Significant populations of Bulrush and Fig tree in the creek line with some Cotton bush and <i>Acacia iteaphylla</i> .	<b>Approximately 90% infested.</b> While the riparian vegetation is Uninterpretable there is evidence of Dieback upslope which means that the creek is infested	<b>No-</b> because of infestation upslope of creek. Sampling would confirm this determination.	Rubbish dumping in open area north of Burma Road
35	<b>Richard Watson Hardey</b>	7789	Glen Forrest	<b>High</b> Significant <i>Watsonia</i> populations. Also, some Tagasaste, Kurrajong and Eastern States <i>Acacia</i> spp.	<b>Approximately 60% infested.</b>	<b>No</b> - Remaining uninfested area is too small to be protectable in the long term due to upslope infestation along Strettle Road	Vegetation over about 50% of the reserve is Degraded due to weeds and Dieback and ground disturbance.
36	<b>Quail Street Reserve</b>	29269	Chidlow	<b>Low</b> Scattered Eastern States <i>Acacia</i> spp.	<b>Approximately 85% infested.</b> Very old infestation with	<b>No</b> - Remaining uninfested area is too small to be protectable in the	Significant erosion along some of the track in the eastern portion of the reserves and a dangerous

Priority	Name of area	Reserve	Suburb	Weed Severity	Dieback Occurrence	Protectable Area(s)?	Other Issues/Comments
				and Freesias in lower areas.	mid -storey species missing and evidence of active disease as Dieback moves into mid and upper slope uninfested remnants.	long term due to upslope infestation.	sinkhole in creek crossing near the southern boundary.
37	<b>North Darlington Reserves</b> (Bilgoman Pool Site)	38155	Darlington	<b>Medium</b> Significant weed infestation at the corner of Darlington Road and GEH including Wonga Wonga vine and Hawthorn. There are scattered Eastern States <i>Acacia</i> spp. throughout the reserve and some Victorian Teatree along the eastern boundary of the reserve adjacent to Lionel Road.	<b>Approximately 80% infested.</b>	<b>No</b> - Remaining uninfested area is too small to be protectable in the long term.	There is a dump of concrete rubble at the end of the road behind the pool.
38	<b>Superblock Connection Reserve</b>	44203	Glen Forrest	<b>None</b>	<b>Approximately 90% infested.</b>	<b>No</b> - Remaining uninfested area is too small to be protectable in the long term	

Priority	Name of area	Reserve	Suburb	Weed Severity	Dieback Occurrence	Protectable Area(s)?	Other Issues/Comments
39	<b>Clifton Park</b>	4041	Chidlow	<b>Medium</b> Watsonia populations in lower slope and gully areas. Also, Eastern States <i>Acacia</i> spp. (mainly <i>A. iteaphylla</i> and <i>A. longifolia</i> ) along with <i>Tagasaste</i> , scattered throughout.	<b>20% - 70% infested</b> Dieback is present in gully area, but the extent is unknown due to disturbance and Degraded vegetation condition.	<b>No-</b> Remaining uninfested area is too small to be protectable in the long term.	Uncontrolled public vehicular access is a significant issue in this reserve.
40	<b>Boyamine Reserve</b>	40416	Parkerville	<b>Low</b> Scattered Eastern States <i>Acacia</i> spp. (mainly <i>A. iteaphylla</i> and <i>A. longifolia</i> ) throughout.	<b>20-50% infested</b> Dieback is active in in the northern and eastern portions of the reserve, but the extent is unknown due to disturbance and Degraded vegetation condition.	<b>No-</b> Remaining uninfested area is too small to be protectable in the long term	
41	<b>Black Cockatoo Reserves (south)</b>	22848	Mundaring	<b>Low</b> <i>Acacia. iteaphylla</i>	<b>Approximately 90% infested.</b>	<b>No-</b> Remaining uninfested area is too small to be protectable in the long term	
42	<b>Bulkirra Reserve</b>	39034	Helena Valley	<b>No Access</b>			Investigate access

Priority	Name of area	Reserve	Suburb	Weed Severity	Dieback Occurrence	Protectable Area(s)?	Other Issues/Comments
43	<b>Chidlow Rail Reserve</b>	35396	Chidlow	<b>Low</b> Some <i>Watsonia</i> and Eastern States <i>Acacia</i> spp.	<b>At least 30% Infested</b>	<b>No-</b> Remaining uninfested area is too small to be protectable in the long term	
44	<b>Sunninghill Park Reserve</b>	33352	Stoneville	<b>Low</b> Some <i>Watsonia</i> and Eastern States <i>Acacia</i> spp.	<b>Infested--extend unknown</b>	<b>No-</b> Remaining uninfested area is too small to be protectable in the long term	
45	<b>Yennerdin Reserve</b>	22781	Parkerville	<b>Low</b> Eastern States <i>Acacia</i> spp	<b>Possibly Uninfested-needs sampling</b>	<b>No-</b> Remaining uninfested area is too small to be protectable in the long term	Rubbish dump present
46	<b>Chidlow Rail Reserve</b>	32482	Chidlow	<b>Low</b> Mainly Eastern States <i>Acacia</i> spp. and <i>Tagasaste</i>	<b>At least 50% Infested</b>	<b>No-</b> Remaining uninfested area is too small to be protectable in the long term	
47	<b>Swan View Trail</b>	32485	Swan View	<b>High</b> Significant populations of <i>Watsonia</i> , Bridal Creeper and Morning Glory.	Mostly <b>Excluded</b> due to degraded vegetation condition	<b>No-</b> Vegetation is in Degraded condition and cannot be assessed	
48	<b>Chidlow Village Green</b>	6276	Chidlow	<b>High</b> Bridal creeper plus large <i>Watsonia</i> populations. Scattered Eastern States <i>Acacia</i> spp. (mainly <i>A. iteaphylla</i> and <i>A.</i>	Mostly <b>Excluded</b> due to degraded vegetation condition	<b>No-</b> Vegetation is in Degraded condition and cannot be assessed	

Priority	Name of area	Reserve	Suburb	Weed Severity	Dieback Occurrence	Protectable Area(s)?	Other Issues/Comments
				<i>longifolia</i> ), Kurrajong trees, Agave, Tagasaste and Robinia.			
49	<b>Lilydale Road Reserve</b>	46376	Chidlow	<b>High</b> Large watsonia population plus Eastern States <i>Acacia</i> spp. (mainly <i>A.</i> <i>iteaphylla</i> and <i>A.</i> <i>longifolia</i> ) and Tagasaste	<b>Approximately 80%</b> infested- requires sample to confirm	<b>No- Infested</b>	
50	<b>Brookside Park</b>	31777	Parkerville	<b>Low</b> Introduced grasses	<b>Excluded</b> due to degraded vegetation condition	No	No understorey-needs revegetation.
51	<b>Noblewood Reserve</b>	43993	Mundaring	<b>Low</b> Eastern States <i>Acacia</i> spp. (mainly <i>A.</i> <i>iteaphylla</i> and <i>A.</i> <i>longifolia</i> ), Kurrajong and Kikuyu	Mostly <b>Excluded</b> due to Degraded vegetation condition. Sample site recorded at the corner of Stoneville Rd and Stevens Street	No	No understorey-needs revegetation. Evidence of some past revegetation but requires significantly more.
52	<b>Sculpture Park</b>	39693	Mundaring	<b>Not assessed, recreational park</b>			Managed as recreational area with frequent visitors.

Priority	Name of area	Reserve	Suburb	Weed Severity	Dieback Occurrence	Protectable Area(s)?	Other Issues/Comments
53	<b>Iron Road Reserve</b>	44999	Parkerville	Additional assessment to be undertaken in May	Not conclusive	-	Adjacent to Threatened (Declared Rare) species <i>Acacia aphylla</i> population
54	<b>Wandeara Cres Reserve</b>	41682	Mundaring	<b>High</b> Cotton bush plus Eastern States <i>Acacia</i> spp. (mainly <i>A. iteaphylla</i> , <i>A. longifolia</i> and <i>A. pycnantha</i> ) and Cape Lilac	<b>Excluded</b> due to degraded vegetation condition	No	Eastern States <i>Acacia</i> spp. have been cut down without any rehabilitation/revegetation. Suggest that a more strategic approach be adopted for weed control such as the Bradley Method of Bush Regeneration.
55	<b>Mandoon Reserve</b>	33079	Darlington	<b>Very High</b> Significant Bridal creeper population in southern portion of the reserve. Also, Arum lily and Caster Oil Plant Olive and Fig trees present.	Creepline is uninterpretable. Sample site recorded in upland area	No	One individual of the Threatened (Declared Rare) species <i>Acacia aphylla</i> was recorded in the central reserve. The reserve needs substantial revegetation.

## 6 Discussion

### 6.1 *Phytophthora* Dieback

Conducting the significant tree survey, in addition to the mapping and classifying of tracks, provided the opportunity to undertake a Broadscale Dieback assessment to determine the disease status of each reserve.

Disease expression was variable throughout the assessment area, with disease symptoms being more obvious in the lower slopes and gullies, and more cryptic in mid and upper slope areas where the impact of drought and less active disease complicated interpretation.

The Broadscale Dieback assessment reveals that most of reserves assessed have some level of infestation. Some reserves such as Quail Street are almost completely infested, as the pathogen has been present over a long period of time. Other areas such as Pindalup Reserve have only a small infested area and therefore require urgent management attention. Many reserves with these small infestations still have large uninfested protectable areas within their boundaries.

Dieback is significantly altering the reserves within the Shire in the following ways:

- Altering vegetative structure by removing keystone mid-storey species and a large proportion of the shrub layer.
- Significantly reducing species richness and cover and providing openings for weed species including *Watsonia* and Veldt Grass which increase fuel loads and fire vulnerability;
- Diminishing foraging and nesting habitat for birds and small mammals through the removal of Proteaceous species including *Banksia grandis*, *B. sesillis* and *B. squarrosa*; and
- A reduction of canopy resulting in less interception of rainfall and therefore increased surface water run-off, erosion and spread of Dieback.

In many of the reserves assessed Dieback signage was outdated or absent, and in some cases when the standard protocol signage was present, it was incorrectly located. Public vehicular access is a major vector in the spread of the Dieback pathogen and this problem is compounded in reserves with inadequate signage. Firebreak maintenance activities requiring ground disturbance should also be planned so they are undertaken in a manner that will minimise the risk of spreading Dieback.

The data recorded in the Broadscale Dieback assessment cannot be used for managing Dieback during operational activities, however the information generated will be very useful in identifying the reserves that have protectable vegetation and warrant comprehensive Dieback mapping. Once comprehensive mapping has been undertaken, appropriate hygiene management measures can be applied in the conservation of these uninfested areas. The Protocol for Identifying Protectable Areas (DPaW 2015) stipulates that protectable areas '*are positioned in the landscape and are of sufficient size (e.g. > 4 ha with axis >100 m) such that a qualified Interpreter judges that the pathogen will not autonomously engulf them in the short term (a period of a few decades)*'. A 4ha minimum size has been adopted for protectable areas within State Forest however, with appropriate

hygiene management, the Shire should consider areas as small as 0.5ha as potentially protectable depending on their landscape position in relation to infested areas.

## 6.2 Weeds

Cookes Brook and Gilfellow Reserves have substantial populations of Blackberry which is a Declared Plant, while Mandoon reserve has populations of the Declared Plants Arum Lily (*Zantedeschia aethiopica*) and Bridal Creeper (*Asparagus asparagoides*). The Declared Plant Cottonbush (*Gomphocarpus fruticosus*) was recorded in several reserves. Weed severity was only rated as 'very high' in Cookes Brook and Gilfellow Reserves. These two reserves have extensive Blackberry populations along the creek lines and require urgent treatment to avoid the Blackberries being spread to other reserves in the vicinity. Mandoon Reserve has Arum lily and abundant Bridal Creeper and is also rated as 'very high'. The Railway Reserve Parkerville, Southern Railway Heritage Trail, Chidlow Village Green, Hilltop Reserve, Rabone Way Reserve, Lilydale Road Reserve, and Beechina Reserve have all been rated as 'high' for the number of weed species present and their distribution.

It should be noted that in some areas where the vegetation condition is 'degraded' Eastern States Acacia species are providing habitat and protecting soil from erosion. Some non-native Acacia species such as *Acacia podalyriifolia* and *A. iteaphylla* have become naturalised in the Perth Hill and are also fire-resistant species (Australian Plants Society (Victoria), website accessed 2018). In some instances, Dieback has greatly decreased native vegetation cover providing an opportunity for weed species such as Perennial Veldt Grass (*Ehrharta calycina*) or Watsonia (*Watsonia meriana* var. *bulbillifera*) to proliferate, thus increasing the fuel load.

It can be argued that individuals of these species should only be removed if they are displacing native species or negatively impacting the ecosystem. If they are to be removed, then this should be done as part of a strategic rehabilitation program which prioritises reserves according to their biodiversity values and seeks to consolidate areas in better condition as a priority (Bradley, J. 1988).

## 6.3 Limitations

The reserves assessment encountered the following limitations:

1. Two reserves, Bulkirra Reserve and a small portion of Wandeara Crescent were inaccessible;
2. The timing of the reserves assessment was not suitable to record some ephemeral weed species; and
3. No samples were taken for laboratory testing during the Broadscale Dieback assessment to confirm the disease status of the reserves assessed as being infested.

## 7 Conclusion and Recommendations

While weeds are widespread across the priority reserves assessed, only three reserves received the 'very high' severity rating. Cookes Brook and Gilfellon Reserves have substantial populations of Blackberry which is a Declared Plant under the *BAM Act*, while Mandoon Reserve has populations of the Declared Plants Arum Lily (*Zantedeschia aethiopica*) and Bridal Creeper (*Asparagus asparagoides*). The Declared Plant Cottonbush (*Gomphocarpus fruticosus*) was recorded in several reserves. Most of the reserves assessed received the 'low' severity rating, having few or scattered Eastern States Acacias or Tagasaste.

In some areas where the vegetation condition is 'degraded', Eastern States Acacia species are providing habitat and protecting soil from erosion. Some non-native Acacia species such as *Acacia podalyriifolia* and *A. iteaphylla* have become naturalised in the Perth Hill and are also fire-resistant species. In some instances, Dieback has greatly reduced native vegetation cover providing an opportunity for weed species such as Perennial Veldt Grass (*Ehrharta calycina*) or Watsonia (*Watsonia meriana* var. *bulbillifera*) to proliferate, thus increasing the fuel load.

A total of 9253 significant trees were recorded during the assessment. Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*) comprised the majority (91.6%) of trees, with Blackbutt (*Eucalyptus patens*), Flooded Gum (*Eucalyptus rudis*) and Wandoo (*Eucalyptus wandoo*) also represented.

Fox dens were observed at several reserves and a live fox was spotted at Cameron Road Reserve. A dead fox was also recorded at Gilfellon Reserve.

Rubbish dumping was not found to be a widespread issue due to controlled access in a large proportion of the reserves assessed. Suspected asbestos dumping was recorded in Strettle Road Reserve and Hovea Conservation Park. Testing may be required to confirm that the material is asbestos.

Controlled access has also contributed to limiting soil erosion along tracks and watercourses within the reserves. While Quail Road Reserve has some significant erosion occurring along tracks in the eastern portion of the reserve due to the steepness of some of the slopes, soil erosion in the reserves did not appear to be a significant issue.

In many of the reserves assessed Dieback signage was outdated or absent, and in some cases when the standard protocol signage was present, it was incorrectly located. Public vehicular access is a major vector in the spread of the Dieback pathogen and this problem is compounded in reserves with inadequate signage. Firebreak maintenance activities requiring ground disturbance should also be planned so they are undertaken in a manner that will minimise the risk of spreading Dieback.

Overall, the reserve assessment found that Dieback is having a very significant impact on species diversity and ecosystem function within most of the priority reserves assessed. While some reserves show widespread infestation, other reserves have only a small infested area and require urgent management effort if they are to be protected. Often in these instances the topography of the reserve is such that, while the lower slopes and gullies are infested, large uninfested protectable areas are present upslope within their boundaries. As noted previously, Dieback is the third greatest threat to Western Australian

biodiversity after salinity and climate change (EPA, 2007). It is considered a more serious threat than weeds, clearing of native vegetation, acid sulphate soils and soil erosion.

Given the very high impact of Dieback on biodiversity and the limited number of reserves (or parts of reserves) that are protectable against Dieback, the reserve priority ranking is required to change. As plant diversity declines in reserves with Dieback, these Dieback-free areas will become increasingly critical in preserving native plant species and providing a refuge for wildlife. Reserves or areas that do not currently have Dieback must be managed carefully to limit access and activities that would introduce Dieback.

It is recommended that the Shire of Mundaring adopt the following strategies for management and rehabilitation of nature reserves:

- In directing limited resources for natural area management for the best ecological outcomes, the Shire should follow the principles of the 'Bradley Method of Bush Regeneration'. This approach seeks to consolidate the reserves and areas in the best condition first and this approach can also be applied to the management of Dieback.
- Declared Plant weed populations should be eradicated as soon as possible. Areas with Blackberry populations, especially Cookes Brook, should be revegetated with appropriate wetland species after weed eradication.
- Dieback management should be considered at least as important as weed management. An integrated Dieback and Weed Management Plan and Rehabilitation Strategy, or more holistic Biodiversity Strategy, should be developed and implemented.
- A comprehensive Dieback assessment should be undertaken of those reserves that have been identified as having protectable areas. Once identified, the protectable areas should be assessed for access restrictions, and treated as environmentally sensitive areas requiring greater Dieback hygiene practices from staff and contractors.
- Standard Dieback signage developed by Project Dieback (South Coast NRM 2008) should be installed in priority reserves that have areas of protectable vegetation.
- Reserve management plans should be developed or updated for high priority reserves to integrate Dieback control, weed management, bushfire risk management and other Shire activities.
- The Shire should seek to share information and consider partnerships with tertiary institutions or organisations (such as the Dieback Working Group) to trial Dieback treatment and restoration methods.
- Shire staff should use GPS technology to record weed and Dieback treatments and maintain the usefulness of GIS information for targeting reserve management resources.

## 8 References

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## 9 Glossary of Terms

**Assessment** – (*Phytophthora* occurrence) any combination of activities including, detection, diagnosis (interpretation), mapping and demarcation of *Phytophthora* Dieback disease in natural ecosystems.

**Assessment Area** – an area where *Phytophthora* occurrence assessment is possible or will be possible in the short to medium term. This area may be larger or smaller than the proponent's project area.

**Disease** – The combination of a pathogen, host and correct environmental conditions, which results in disease symptoms or death of a host.

**Environment** - The sum of all external factors which act on an individual organism during its lifetime.

**Excluded Area** – An area of high disturbance in which native vegetation is unlikely to recover.

**Host** - means the plant which is invaded by a pathogen and from which the pathogen derives its energy.

**Indicator species** – Plant species that are more susceptible to *Phytophthora* disease and reliably show symptoms earlier than other species.

**Infection** – The invasion of a host organism's bodily tissue by disease causing organisms. In relation to Dieback this refers to an individual plant and not the population.

**Infested** – The state of being invaded or overrun by pests or parasites. In relation to Dieback it refers to a population of plants and not individual plants.

**Pathogen** – Any organism or factor causing disease within a host

***Phytophthora* Dieback** – A term referring to the disease symptoms caused by *Phytophthora* species in susceptible vegetation.

**Protectable area**- an area of vegetation that can be protected by the application of hygiene controls to prevent infestation.

**Susceptible** – Likely to be influenced or able to be harmed by particular pathogen

**Symptom** – A phenomenon that arises from, and accompanies a particular disease or disorder and serves as an indication of it

**Uninfested** – An area that does not contain infected plants or show visible signs of disease

**Uninterpretable** – a natural area where there are inadequate visible symptoms present to make a diagnosis

**Unprotectable** – A disease free area that is likely to become infested within a given time

**Vector** – any agent that acts as a carrier or transporter

## 10 Appendices

*Shire of Mundaring Reserves Assessment 2017-2018*

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## **Appendix 1: Individual Reserves Results, Comments and Recommendations**

## 6.2 Draft Environmental Sustainability Policy

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<b>File Code</b>	GV.OPP 1
<b>Author</b>	Briony Moran, Co-ordinator Environment and Sustainability
<b>Senior Employee</b>	Mark Luzi, Director Statutory Services
<b>Disclosure of Any Interest</b>	Nil
<b>Attachments</b>	1. Draft Environmental Sustainability Policy

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### SUMMARY

The draft Environmental Sustainability Policy has been further developed in collaboration with a sub-committee of the Environmental Advisory Committee (EAC).

This draft policy consolidates the Shire's strategic position on key environmental issues and provides a basis for future environmental initiatives. It will guide decisions affecting the environment or use of natural resources to minimise the Shire's environmental footprint, maintain ecosystem health and promote environmental sustainability.

It is requested EAC recommend Council adopts the policy.

### BACKGROUND

The Shire has a range of existing environmental strategies, plans and initiatives, developed over time with the input of the EAC. The Shire's Environmental Management Plan 2012-2022 outlined an environmental management framework that included provision for development of an overarching environmental policy.

A draft policy was prepared by staff and discussed at a Council Forum in late 2015. The draft did not progress and a Councillor request was made in late 2017 for a draft policy to again be presented for Council consideration.

The initial draft was considered by the EAC at its meeting of 27 February 2018 (EAC3.02.18) and the EAC decided that:

- 1. EAC form a sub-committee of EAC members, Staff and EAC Councillors to review the draft Policy and associated principles within the context of an Environmental Policy framework for consideration at the 22 May 2018 EAC Meeting; and*
- 2. Darren Murphy, Mark Robertson, Michael Waite, Bethany Challen, Crs Kate Driver and Tony Brennan and the Co-ordinator Environment and Sustainability be members of such committee.*

The sub-committee met three times between 15 March and 2 May 2018 and within each session, carefully reviewed the intent, purpose vision and terminology contained within all aspects of the policy.

## STATUTORY / LEGAL IMPLICATIONS

There is limited guidance in the *Local Government Act 1995* and subsidiary regulations on the content and function of non-financial local government policies. The (then) Department of Local Government and Communities December 2016 Governance Bulletin included the following:

*“Section 2.7 of the Act states that the council is responsible for the performance of a local government’s functions, then specifies the roles of:*

- *overseeing the allocation of finances and resources*
- *determining the local government’s policies.*

*A key responsibility within council’s strategic decision making role is to approve the annual budget. There are also legislative provisions that necessitate budgetary reporting to council at particular times, and it is therefore incumbent on council to provide regular and ongoing oversight of how finances are allocated. This does not extend, however, to operational or day-to-day decision making.*

*Policy development and review is as much the responsibility of council as budgeting, and has a clear impact at the operational level. While administrative procedures fall within the realm of the CEO and senior employees, the Act intends that those procedures, wherever appropriate, be guided by council policy.”*

The draft policy has been prepared with this balance in mind; to provide guidance on the matters to be considered by staff and Council when considering works, projects or services that may have environmental impacts, without including administrative procedures or involving Council in day-to-day decisions.

Over time, revision of Shire requirements, policies and local laws will be expected to give effect to the applicable principles contained within the draft Environmental Sustainability Policy.

## POLICY IMPLICATIONS

The Shire does not currently have an overarching Environmental Sustainability Policy.

This has been noted by EAC members as a gap in the Shire’s environmental management framework during discussion of other matters.

Policy principles included in the draft are generally strategic and broad in scope, avoiding a narrow focus which would limit the range of matters or situations where the policy would apply. The policy principles are intended to provide guidance to staff and Council in making decisions across a wide range of issues, while allowing discretionary decisions to take account of the circumstances.

Over time, revision of other Shire policies and guidelines could be required to give effect to the principles contained within the draft Environmental Sustainability Policy. For example, if the Shire wished to buy more local produce or minimise single-use plastics within Shire facilities or Shire supported events (in accordance with sustainability principles 2.1 and 2.4) then changes could be made to the Purchasing Policy (AS-04), guidelines related to community event funding, or the Civic Functions,

Ceremonies, Receptions and Provision of Hospitality and the Use of the Council Civic Area Policy (OR-10).

## **FINANCIAL IMPLICATIONS**

The draft policy is intended to guide future decision making that may include the allocation of increased resources, but does not in itself require additional resources. Giving effect to particular principles within the policy may increase the cost of certain activities or require increased funding for events, projects or services.

## **STRATEGIC IMPLICATIONS**

Mundaring 2026 Strategic Community Plan

Priority 1 - Governance

Objective 1.2 – Transparent, responsive and engaged processes for Shire decision making

Strategy 1.2.1 – Increase transparency and responsiveness of Shire administration processes

The draft policy would improve transparency regarding the Shire's position and approach to a range of environmental sustainability issues. The principles of the draft Environmental Sustainability Policy are also consistent with a number of additional objectives and strategies of the Mundaring 2026 Strategic Community Plan as noted in the comment section later in this report.

## **SUSTAINABILITY IMPLICATIONS**

Sustainability is a very broad term with a range of definitions. The elements of environmental sustainability that are consistently raised by the local community during the consultative strategic community planning process are use of renewable energy, energy and water efficiency, waste minimisation and recycling. These community priorities are reflected in the principles of the draft policy. While environmental issues are complex and interrelated, each of the strategies and initiatives have underlying biodiversity, sustainability or community themes.

As noted in the Environmental Management Plan 2012-2022, protection of biodiversity is a priority for the Shire. While biodiversity conservation can also be considered an element of sustainability, biodiversity principles have been listed separately in the draft policy due to the Shire's high level of direct responsibility and influence over natural areas. The number of biodiversity related strategies and initiatives (including Wildlife Corridor Strategy, Weed Control Strategy, Private Land Conservation Strategy, Biodiversity Strategy and Roadside Conservation Strategy) demonstrates the value that has been consistently placed on protecting native flora and fauna by the EAC, Council and the wider community.

Within the Environmental Management Plan 2012-2022 and the range of supporting strategies there is a clear acknowledgement that while the Shire has control over its own land, facilities and operations it also has limited resources, and environmental issues do not stop at property boundaries. Achieving biodiversity and sustainability objectives requires the Shire to maintain a culture of environmental responsibility and accountability and be open to collaboration.

Effective environmental initiatives will often require inter-agency cooperation (such as participation in regional EMRC initiatives) and awareness, engagement and participation from residents and community groups. Recognition of the importance of partnerships, environmental education and involvement of residents has informed the community and culture principles of the draft policy.

## RISK IMPLICATIONS

<b>Risk:</b> Reputational - No Environmental Sustainability Policy is adopted, decisions do not sufficiently consider environmental and sustainability impacts, and the Shire's reputation for environmental management is diminished.		
<b>Likelihood</b>	<b>Consequence</b>	<b>Rating</b>
Possible	Minor	Medium
<b>Action / Strategy</b>		
Provide a recommendation to Council regarding the adoption of an Environmental Sustainability Policy.		

## EXTERNAL CONSULTATION

The initial draft was reviewed and adjusted based on consultation with the Shire's Governance Coordinator, Service Area Managers and Executive Leadership Team (CEO and Directors). The revised draft has been further modified based on feedback and suggestions from the EAC sub-committee.

## COMMENT

The principles contained within the draft policy complement the Shire's current environmental management framework including the Environmental Management Plan 2012-2022, specific environmental strategies, ongoing programs and initiatives.

The draft policy also reflects and responds to the range of environment and sustainability issues and community values that are consistently raised through the strategic community planning process, including the following objectives and strategies of the Shire's Mundaring 2026 Strategic Community Plan:

### Priority 3. Natural Environment

Objective 1 – A community that manages water sustainably.

Strategy 3.1.1 'Support and encourage the re-use of water'

Strategy 3.1.2 'Support and encourage a reduction in mains and ground water consumption.'

Strategy 3.1.3 'Encourage preservation of clean local waterways.'

Objective 2 – A place where the environment is well managed.

Strategy 3.2.1 'Identify and mitigate threats to the natural environment.'

Strategy 3.2.2 'Develop greater recycling opportunities.'

Strategy 3.2.3 'Encourage and promote environmental education and stewardship by local community groups.'

Strategy 3.2.4 'Encourage renewable energy use by residents and businesses.'

Objective 3 – A great place to immerse yourself in nature.

Strategy 3.3.1 'Encourage environmental tourism by supporting nature based activities.'

#### Priority 4. Built Environment

Objective 2 – Community needs are considered in planning for the future.

Strategy 4.2.2 'Promote sustainability in design and development for buildings.'

The principles within the draft have been informed by and align with the range of local community concerns and aspirations above, as well as the Shire's existing environmental management framework. It should be noted that water, waste, natural resources, recycling, energy use and emissions are intrinsically linked. Water itself has energy and emissions impacts, particularly now that desalination plants supply much of Perth's water. All products will have some embedded water and energy costs and carbon emissions through manufacture and distribution.

Community awareness of issues with plastic waste and recycling are increasing, and the next Strategic Community Plan may show a shift in community concerns and expectations. The Shire has direct control over the purchase of single-use plastic items used in Shire facilities, some control over items used at Shire organised events, and could have some influence over items at events supported by Shire funding. The incorporation of a specific principle relating to single-use plastics was discussed by the sub-committee, and also discussed with Shire staff involved in hosting or supporting events.

The draft policy contains two sustainability principles which relate to single-use plastics:

- 2.1 The Shire will pursue and promote improved water and energy efficiency, reduced carbon emissions and sustainable use of natural resources.
- 2.4 Reuseable, recycled content or recyclable products should be selected where possible to minimise the use of natural resources and the volume of waste sent to landfill.

Staff and the sub-committee considered changes to the sustainability policy principles but found that the principles above would clearly apply to single-use plastics, but also to the wider issues including other disposable items, minimising landfill, and supporting recycling by buying recycled products. Adding a specific reference to single-use plastics to either 2.1 or 2.4 could narrow the scope of its application or interpretation.

As noted in the Policy section above, there are existing Shire policies relating to purchasing and events that can be modified to reflect the intent of the sustainability principles, but give more specific guidance in how to apply those principles in certain decisions. In addition, it should be noted that where changes are made to the policies for purchasing or events (for example, to avoid single-use plastics) there will be related decisions regarding budgets and activities.

If adopted, promotion of the policy is required to improve Community and Shire staff awareness. A media release and a memo to all staff was considered as an appropriate first step to increase awareness.

## VOTING REQUIREMENT

Simple Majority

<b>RECOMMENDATION</b>
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That Council

1. adopts the Policy OR-23 Environmental Sustainability; and
2. Instructs the CEO to undertake the necessary actions to promote staff and community awareness of the policy.

### Preamble to Alternative Recommendation

After some discussion, the Committee agreed that the words “on watercourses or native vegetation” be removed from the end of Point 1.1.

<b>COMMITTEE DECISION MOTION</b>	<b>EAC3.05.18</b>
Moved by Christine Groom	Seconded by Jim Thom

That Council

1. adopts the Policy OR-23 Environmental Sustainability; subject to the following change in clause 1.1 of the Policy:

Removal of the words “on watercourses or native vegetation” after the word ‘impacts’.

and;

2. Instructs the CEO to undertake the necessary actions to promote staff and community awareness of the policy.

### CARRIED 8/0

**For:** Cr Driver, Christine Groom, Tom Hogarth, Selene Moonbeams, Lee Roberts, Mark Robertson, Jim Thom and Herbie Titelius

**Against:** Nil

## Shire of Mundaring

# DRAFT POLICY

### ENVIRONMENTAL SUSTAINABILITY

**Policy Ref:** OR-23

**Committee Rec:**

**Date:**

**Adopted:**

**Date:**

**Amended:**

**Date:**

**Reviewed:**

**Date:**

**Procedure Ref:**

**Delegation Ref:**

**Statute Ref:** *Local Government Act 1995*

**Local Law Ref:**

### PURPOSE

To establish a sustainable Shire that demonstrates our corporate and community commitment to the environment and reflects our responsibility to its natural assets for future generations. The Shire strives to be a leader in local government sustainability and environmental management.

### INTRODUCTION

This policy consolidates the Shire's strategic position on key environmental issues and provides a basis for future environmental initiatives. It guides decisions affecting the environment or use of natural resources to minimise the Shire's environmental footprint, maintain ecosystem health and promote environmental sustainability.

Sustainable development integrates social, economic and environmental values to meet the needs of the community, without compromising the ecosystems that support life or the ability of future generations to meet their own needs. Environmental sustainability includes responsible use of natural resources, protecting ecosystems and biodiversity, maximising energy and water efficiency and minimising pollution and waste sent to landfill.

The Shire has a primary role in protection of biodiversity within local road reserves, conservation reserves and other land containing natural assets. Various Shire activities and facilities also have environmental impacts through use of natural resources, energy and water.

The Shire can lead by example in responsible environmental management of its own land and activities. The Shire will also guide or assist residents and others to manage weeds and other threats to natural areas, provide habitat for native fauna, and reduce their overall environmental footprint.

## **POLICY**

This policy applies to Elected Members, employees and contractors engaged by the Shire of Mundaring.

### **1. Biodiversity principles**

- 1.1. Biodiversity and watercourse integrity should be maintained and mitigation measures will be considered where the works cannot be designed or constructed to avoid impacts. ~~on watercourses or native vegetation.~~
- 1.2. The Shire will strive to lead by example in balancing bushfire risk management with maintaining biodiversity and conservation of natural landscapes.
- 1.3. Allocation of Shire resources for natural area management will take into account social and ecological values and the nature of threatening processes.
- 1.4. Human induced climate change is recognised as a key threat to biodiversity, requiring mitigation action to reduce carbon emissions at all levels of government, and adaptation to local impacts.

### **2. Sustainability principles**

- 2.1. The Shire will pursue and promote improved water and energy efficiency, reduced carbon emissions and sustainable use of natural resources.
- 2.2. Energy and water efficiency is a key consideration in design, construction, maintenance or renovation of Shire facilities, and in the purchase of vehicles, machinery, fittings and appliances.
- 2.3. The Shire will make improvements to green infrastructure that will contribute to water and energy efficiency, through tree canopy shade, waterwise landscaping and stormwater harvesting.
- 2.4. Reusable, recycled content or recyclable products should be selected where possible to minimise the use of natural resources and the volume of waste sent to landfill.

### **3. Community principles**

- 3.1. The Shire recognises that healthy ecosystems and well-managed natural areas support the health and well-being of the community, and the Shire will strive to lead by example as a responsible custodian of public environmental assets.
- 3.2. The Shire seeks to build and maintain effective partnerships to promote environmental awareness, responsible natural resource management and sustainable lifestyles.
- 3.3. Information will be made available for schools and residents on sustainability and local environmental issues through publications, talks, workshops and other mediums.

3.4. The Shire encourages enjoyment, environmental stewardship and care of natural areas by residents and community groups.

#### **4. Culture principles**

4.1. The Shire will be transparent and accountable to key performance indicators for environmental management, through regular monitoring and reporting.

4.2. The Shire will remain agile; learning and collaborating with community groups, research institutions and relevant government agencies to adapt best practice environmental management to fit the Shire's context.

4.3. The Shire will continuously improve environmental protection measures within its legislative control and the corresponding enforcement practices.

4.4. Where the Shire has an opportunity to influence state government decisions on proposals that may have a significant environmental impact, the Shire will advocate for a precautionary approach to environmental risks and for decisions that can achieve a net environmental benefit.

## 6.3 Energy and Emissions Working Group

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<b>File Code</b>	EV.PRG 13
<b>Author</b>	Briony Moran, Co-ordinator Environment and Sustainability
<b>Senior Employee</b>	Mark Luzi, Director Statutory Services
<b>Disclosure of Any Interest</b>	Nil
<b>Attachments</b>	1. Community Energy Flyer 2018

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### SUMMARY

Council has requested that the Environmental Advisory Committee (EAC) create a working group to investigate financial implications and broader community interest in a Community Solar Project.

The 'Darebin model' of collecting repayments via rates cannot operate under Western Australian local government legislation. If only one option for reducing community emissions was investigated by a working group and found not feasible, then an opportunity would be lost to consider more broadly the issues and opportunities to reduce energy costs and emissions across the Shire. A working group could investigate a range of alternative options to reduce emissions and assist vulnerable households, including possible variations of the Darebin model.

It is therefore recommended a more holistic 'Energy and Emissions Working Group' be established to explore the full range of policy responses to reduce energy and emissions within the Shire in 2018/19. A Community Solar Project could then form one of the initiatives considered by that working group.

### BACKGROUND

A 'Community Energy for Mundaring' initiative has been promoted by Mundaring in Transition. The dual aims listed are to help fight climate change through reducing emissions, and to help the most financially vulnerable residents to reduce their energy costs. The model suggested is that the Shire funds installation of rooftop solar panels on residences, targeting low-income seniors, and the 'no-interest' loan is paid back with rates over 10 years (see attached flyer).

The following decision was made at the annual electors meeting on 13 December 2017:

*As members of the local community and Mundaring in Transition we would like to move a motion that the Shire of Mundaring create a working group, including members of the community, council staff and councillors, to investigate undertaking a project in our local area based on the Darebin Solar Savers initiative.*

The report to Council regarding this decision noted that:

*Whilst such initiatives have been introduced by local governments in the eastern states, introducing such a program could have significant financial implications for the Shire in terms of funding. The broader community interest in participating in such a program is also unknown. It is therefore considered prudent that prior to establishing a working group, Council consider funding a community survey to ascertain the broader community interest. The funding of such a survey would be considered as part of Council's deliberations in developing the 2018/19 Corporate Business Plan.*

When Council considered the request at its meeting of 13 February 2018 they resolved to:

- 1. Request the Environmental Advisory Committee to create a working group including members of the community, a council representative and Shire staff to investigate financial implications and broader community interest in a Community Solar Project; and*
- 2. Note that as the reporting of the working group will come back to Council via the Environmental Advisory Committee, this reduces any financial need to set up a separate working group.*

At its meeting of 26 April 2016, EAC prioritised twelve key initiatives to progress within the Shire's available environmental resources. While development of a carbon reduction strategy was included as the twelfth item, a specific project dedicated to exploring a community solar initiative did not form part of the list of EAC priorities.

The Shire is currently working with the Eastern Metropolitan Regional Council (EMRC) through the Achieving Carbon Emissions Reduction (ACER) program to draft an Energy and Emissions Reduction Plan, to address high energy costs and emissions sources from Shire facilities and operations. Energy costs (electricity, gas and vehicle fuel) for Shire operations which are now approximately \$1 million per year are expected to continue to rise. Energy efficiency measures and the installation of rooftop solar systems on more Shire facilities has been recommended within the latest draft and may provide a buffer against rising electricity prices as well as reducing emissions.

## **STATUTORY / LEGAL IMPLICATIONS**

Within the suggested Community Solar Project arrangement, the Shire would be responsible for borrowing funds or using funds that are currently invested to bulk-buy solar panels for interested/eligible residents and then recoup funds over a number of years via Shire rates.

On review of the possible options, it is apparent that the *Local Government Act 1995* does not provide the ability to simply recoup these repayments as part of the rates, as may be the case in Darebin. As a result, civil agreements are likely to be required by way of caveats on the respective certificates of title, binding successive landowners to repay the Shire. This would be administratively cumbersome, with every land transaction or refinancing process triggering the need to lift and replace the caveat on the title.

## **POLICY IMPLICATIONS**

A Community Solar Project represents one possible policy response to reduce emissions but does not necessarily address energy efficiency. It also would not address the Shire's existing high energy costs, where savings would be of benefit to all ratepayers. There are likely to be a range of lower cost options that could contribute to the dual aims of reducing residential emissions and assisting vulnerable households, which might enable the Shire to assist more households within budget limitations. If EAC proceeds with a working group focussed on a single option without stepping back and exploring other options to tackle emission reduction and energy efficiency, opportunities may be missed that are more cost effective or would assist a larger number of residents.

## **FINANCIAL IMPLICATIONS**

Establishing a working group to explore a range of energy efficiency initiatives will incur minor resource costs.

To manage community expectations, consultation with the broader community is not recommended until the working group considers workable policy options. The total cost for a community survey or market research to gauge broader community interest or support for energy and emissions reduction measures would vary depending on the method chosen, and whether consultation could be combined with any other Shire surveys or research.

A community solar project based on the Darebin model would have a specific set of costs and risks to be explored, including administrative and legal costs. There would be opportunity costs in terms of foregone interest for Council funds that are currently invested. If such a program allowed a long timeframe for collection of repayments and targeted older residents (likely to downsize) there would be a significant proportion of residents who move before repaying the cost of the solar system. As noted above, collection of loan repayments via rates is not possible under Western Australian legislation and would require caveats on each property (incurring administrative costs) to secure the loan. Of concern is that if a single solution is pursued without considering alternatives, a fundamental question that would remain unanswered would be 'how does a community solar initiative perform relative to other possible energy reduction initiatives?'

## **STRATEGIC IMPLICATIONS**

Mundaring 2026 Strategic Community Plan

Priority 1 - Governance

Objective 1.1 – A fiscally responsible Shire that prioritises spending appropriately

Strategy 1.1.1 – Prudently consider resource allocation

Strategy 1.1.3 – Provide increased transparency and opportunities for community feedback on proposed spending.

Priority 3 – Natural Environment

Objective 3.2 – A place where the environment is well managed

Strategy 3.2.4 – Encourage renewable energy use by residents and businesses

Priority 3 – Built Environment

Objective 3.2 – Community needs are considered in planning for the future

Strategy 3.2.4 – Promote sustainability in design and development for buildings

## SUSTAINABILITY IMPLICATIONS

Environmentally, climate change is recognised as a significant threat to species and ecosystems, requiring action at all levels of government to reduce carbon emissions. Funds allocated by the Shire to reducing energy use and emissions should be directed carefully in a way that will result in substantial emissions reductions. In addition it must be noted that the Shire has limited resources and there would be opportunity costs if funds and staff time are redirected to establish and administer loans for solar panels.

There would be social benefits to enhancing energy efficiency and reducing energy costs for financially vulnerable residents. However it may be difficult to set eligibility criteria if there are a limited number of opportunities for assistance and high demand. Approximately 22% (3190) of all residential properties already receive a pensioner rates rebate, and this proportion is expected to rise as the Shire's population ages. This would provide a high number of potentially eligible households, but also declining rates revenue to fund all Shire services.

Economically, there would be benefits to reducing energy costs for residents and businesses. However it should be noted that residents and businesses already have a range of rooftop solar installation options which provide for no up-front payments, or 'green loan' interest rates from some financial institutions. Rooftop solar panels are a relatively expensive intervention and alternative energy efficiency improvements may be able to provide a benefit to a larger number of residents.

## RISK IMPLICATIONS

<b>Risk:</b> Reputational – Shire commits to a particular model of reducing residential energy costs and emissions without considering lower cost options available, or does not commit to any community energy initiatives due to the high cost of the Darebin solar panel model.		
<b>Likelihood</b>	<b>Consequence</b>	<b>Rating</b>
Possible	Moderate	Medium
<b>Action / Strategy</b>		
Energy and emissions working group is formed to investigate the potential costs and benefits of a range of options to reduce residential energy costs and emissions.		

<b>Risk:</b> Reputational – narrow focus for community consultation raises unrealistic expectations for the Shire to fund solar panels for private residences, or only attracts responses from those interested in solar panels.		
<b>Likelihood</b>	<b>Consequence</b>	<b>Rating</b>
Possible	Minor	Medium
<b>Action / Strategy</b>		
Energy and emissions working group carefully considers options to reduce Shire and community emissions and energy use, and appropriate consultation methods prior to public consultation stage.		

## EXTERNAL CONSULTATION

The current Strategic Community Plan gives some indication of community interest in encouraging renewable energy use and promoting sustainable building design.

The request from Council includes investigation of 'broader community interest' which would require community consultation. Voluntary surveys can be misleading as there is a tendency to attract responses from residents who are either strongly in favour or against a proposal. However, engaging professional market research consultants to gauge broader community support or interest in a representative way is expensive. The Shire does engage consultants to undertake household surveys every four years as part of the Strategic Community Plan review process. It could be possible to include additional climate change or energy-focussed questions as part of this process, however this is not due to occur until the second half of 2019.

As noted above, the consultation process itself needs to be carefully considered to investigate community interest without leading to unrealistic expectations. For example, a community consultation process that raised expectations of the Shire funding reduced cost and/or interest-free solar panels could lead some residents to delay their current plans for purchasing solar panels, and then find that the Shire does not fund this kind of program or that they are not eligible. Alternatively, a consultation process that highlights the benefits of reducing energy costs could lead to an increase in installation of solar panels even if the Shire does not fund the program, or funds alternative household energy efficiency measures.

## COMMENT

Council has requested that the EAC form a working group, which could include community representatives in addition to EAC members. The EAC has several options, including not forming a working group; forming a working group specifically to investigate a community solar project; or forming a working group to investigate broader energy use and emissions reduction options.

As noted above, the Shire's current expenditure on energy is significant and measures to reduce energy use and emissions from Shire operations are being considered in the drafting of an Energy and Emissions Reduction Plan. An Energy and Emissions Working Group could assist the EAC in advising Council on priorities and options for both Shire operations and community emissions.

The Manager Finance and Governance has advised that formal terms of reference are not required and that the Terms of Reference of the EAC would be applicable.

**VOTING REQUIREMENT**

Simple Majority

**RECOMMENDATION**

That the Environmental Advisory Committee, nominates:

- five EAC members to participate in the Energy and Emissions Working Group; and
- invites Mundaring in Transition to nominate two members to participate in the working group.

**Preamble to Alternative Recommendation**

The Committee nominated the following to participate in the Energy and Emissions Working Group.

<b>COMMITTEE RECOMMENDATION MOTION</b>	<b>EAC4.05.18</b>
Moved by Mark Robertson	Seconded by Selene Moonbeams

That the Environmental Advisory Committee:

- appoints Darren Murphy, Mark Robertson, Jim Thom and Cr Driver; and
- invites Michael Waite to participate in the Energy and Emissions Working Group.
- Invites Jenny Currell and Bronwyn Scallan from Mundaring In Transition to participate in the working group.

**CARRIED 8/0**

**For:** Cr Driver, Christine Groom, Tom Hogarth, Selene Moonbeams, Lee Roberts, Mark Robertson, Jim Thom and Herbie Titelius

**Against:** Nil

# Community Energy for Mundaring

Why community energy?



Helps our most vulnerable residents save money



Helps fight climate change

## Solar Saver – The Darebin Model

What is it?

Council-funded plan to install rooftop solar PV on residences. Targeting low-income seniors.

How does it work?

Council arranges a bulk-purchase discount with supplier. The “no-interest” loan is paid back via rates over 10 years (loan attaches to the property, not the individual).



500kW installed on 300 residential rooftops



Residents save money on their electricity bills



Taking a leadership role on climate change and helping insure residents against rising electricity prices

## Could this work in Mundaring?

This model could work well in Mundaring. Compared to Darebin, we have:

- a much higher proportion of single-detached housing;
- a much higher proportion of owner-occupiers; and
- a relatively high proportion of residents aged 60 years or older.



For more info, contact Jenny: [greenjenny29@gmail.com](mailto:greenjenny29@gmail.com)

## **7.0 URGENT BUSINESS (LATE REPORTS)**

## **8.0 CLOSING PROCEDURES**

### **8.1 Date, Time and Place of the Next Meeting**

The next Environmental Advisory Committee will be held on 28 August 2018 at 6.00 pm in the Committee Room, 7000 Great Eastern Highway, Mundaring.

### **8.2 Closure of the Meeting**

The Acting Presiding Person declared the meeting closed at 7.25pm.



# Shire of Mundaring Reserves Assessment

Presentation to the Environmental Advisory Committee



## Scope of Works

The scope of the assessment was to:

1. Map and classify all tracks;
2. Identify and map significant weed populations;
3. Map significant trees and record species, health and hollows;
4. Undertake a Broadscale *Phytophthora* Dieback assessment; and
5. To record significant erosion, feral animals and rubbish dumping.



## Track Mapping and Classification

1. Fire truck access – minimum 3m in diameter and overhead clearance;
2. 4WD access only- not accessible by 2WD Shire vehicles; and
3. 4WD & 2WD accessible tracks.

Pinch points along fire truck access tracks were also recorded.



## Identify and map significant weed populations

### Method

Weed distribution data were captured using handheld GPS units with weed species, approximate population size and extent, growth habit and Serious Biodiversity Impact ratings recorded.

Weed Severity Category	Description
Low	Scattered non-invasive woody perennial weeds such as Eastern States <i>Acacia</i> spp. and Tagasaste or small populations of herbaceous perennials or annuals
Medium	Widespread perennial weeds such as Eastern States <i>Acacia</i> spp. and Tagasaste or multiple populations of herbaceous perennials or annuals
High	Dominant perennial weeds such as Eastern States <i>Acacia</i> spp. and Tagasaste or multiple populations of herbaceous perennials or annuals
Very High	Declared weeds or Serious Environmental weeds present and abundant i.e. Blackberry, Bridal Creeper, Watsonia, Cottonbush

## Results



A total of 31 exotic (weed) species were recorded during the assessment. Of these, 8 were determined to represent a Serious Biodiversity Threat

Family	Species	Common Name	Status (Declared pest by DAF)	Priority weed species for Shire of Mundaring
Iridaceae	<i>Freesia alba x leichtlinii</i>	Freesia	Permitted - s11 - Whole of state	6
	<i>Watsonia meriana var. bulbifera</i>	*Watsonia	<i>Watsonia meriana</i> is Permitted - s11 - Whole of state	5
	<i>Gladiolus caryophyllaceus</i>	Gladiolus	Permitted - s11 - Whole of state	5
Moaceae	<i>Ficus carica</i>	Edible Fig	Permitted - s11 - Whole of state	5
Myrtaceae	<i>Leptospermum laevigatum</i>	*Victorian Tea Tree	Permitted - s11 - Whole of state	6
Poaceae	<i>Ehrharta calycina</i>	*Perennial Veldt Grass	Permitted - s11 - Whole of state	6
Rosaceae	<i>Rubus ulmifolius</i>	*Blackberry	Declared pest - s22(2)	5
Umbelliferae	<i>Trifolium repens</i>	White Clover	Permitted - s11 - Whole of state	6



## Key Findings

1. Weed severity was only rated as 'very high' in Cookes Brook and Gilfellon Reserves which have substantial populations of Blackberry which is a Declared Plant;
2. Mandon reserve has populations of the Declared Plants Arum Lily (*Zantedeschia aethiopica*) and Bridal Creeper (*Asparagus asparagoides*);
3. The Declared Plant Cottonbush (*Gomphocarpus fruticosus*) was recorded in several reserves;

Key findings (Continued)

1. The Railway Reserve Parkerville, Southern Railway Heritage Trail, Chidlow Village Green, Hilltop Reserve, Rabone Way Reserve, Lilydale Road Reserve, and Beechina Reserve have all been rated as 'high' for the number of weed species present and their distribution
2. Eastern States *Acacia* spp.-providing an ecological function in Degraded reserves?

Cookes Brook



## Clifton Park

Terratree 



Terratree 

## Undertake a Broadscale Dieback assessment

### Method

- The Broadscale Dieback assessment was implemented in accordance with the *FEM047 Phytophthora Dieback Interpreter's Manual for lands managed by the Department* (FEMD, 2015).
- During a Broadscale assessment, Dieback occurrence data is collected to enable a generalised review of Dieback occurrence and severity within the assessment area. Data from a Broadscale assessment has a moderate confidence level and is not suitable for operational purposes (DPaW 2015).



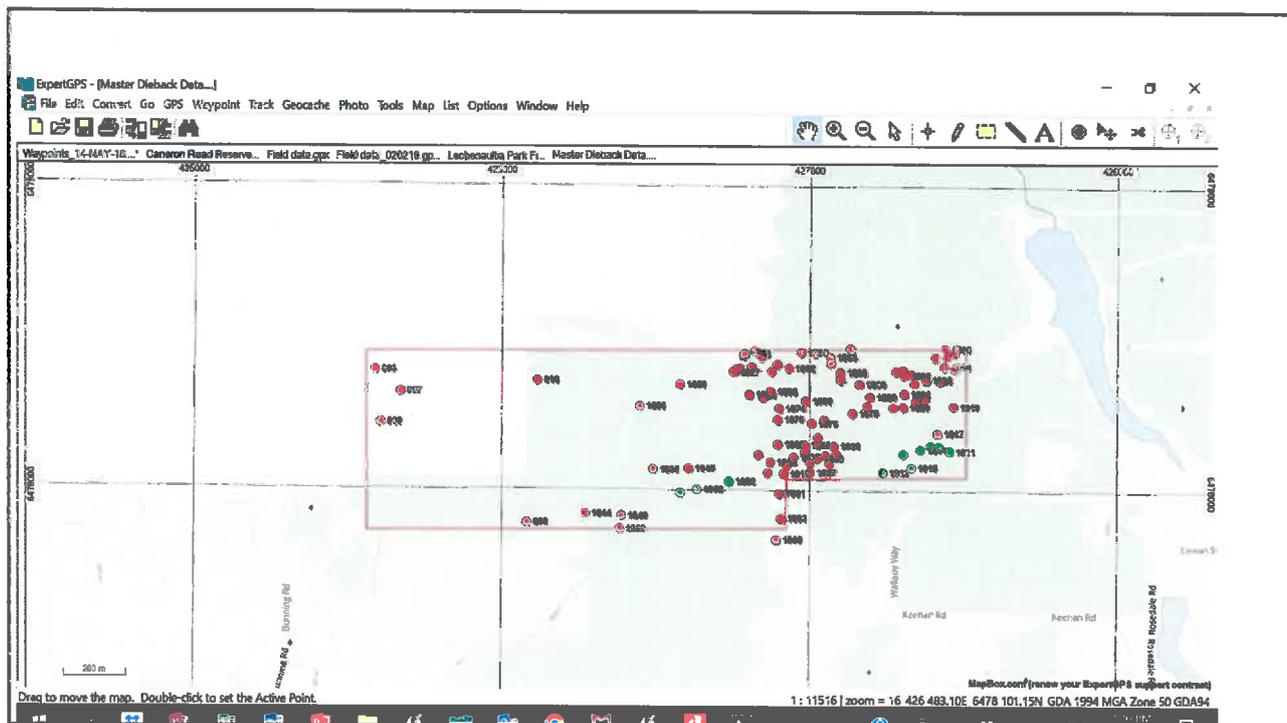
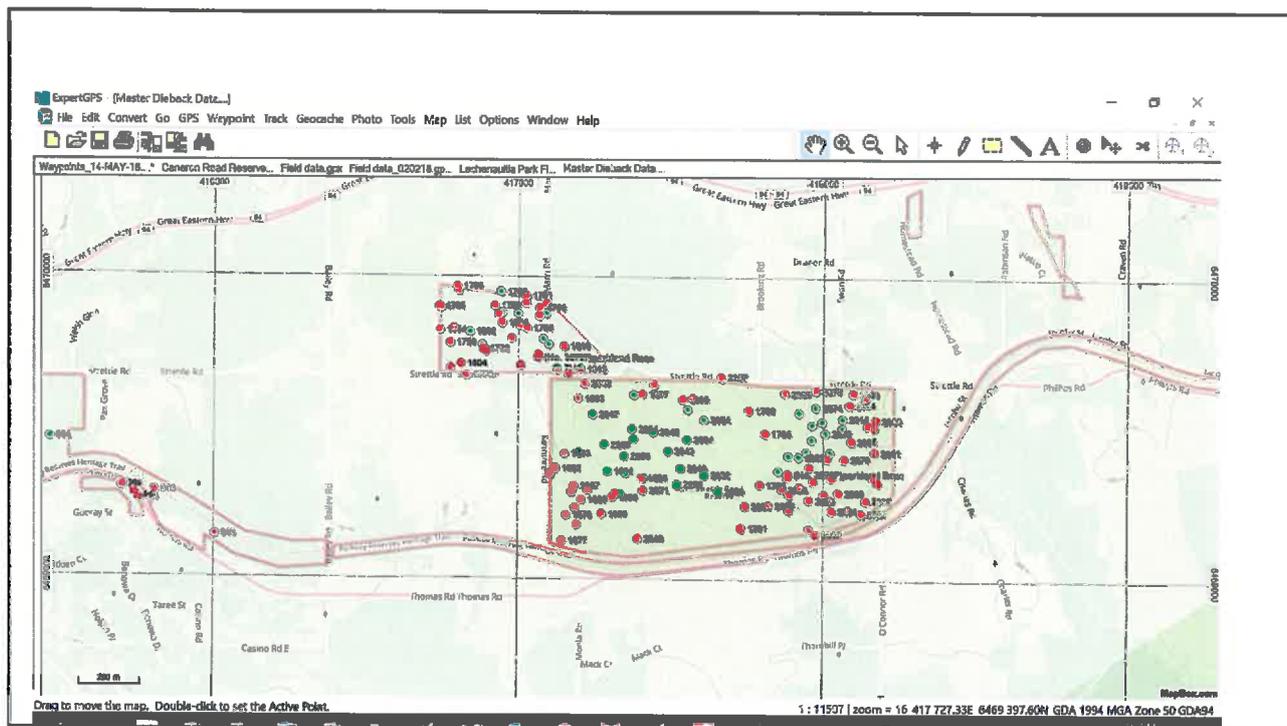
### Key Findings

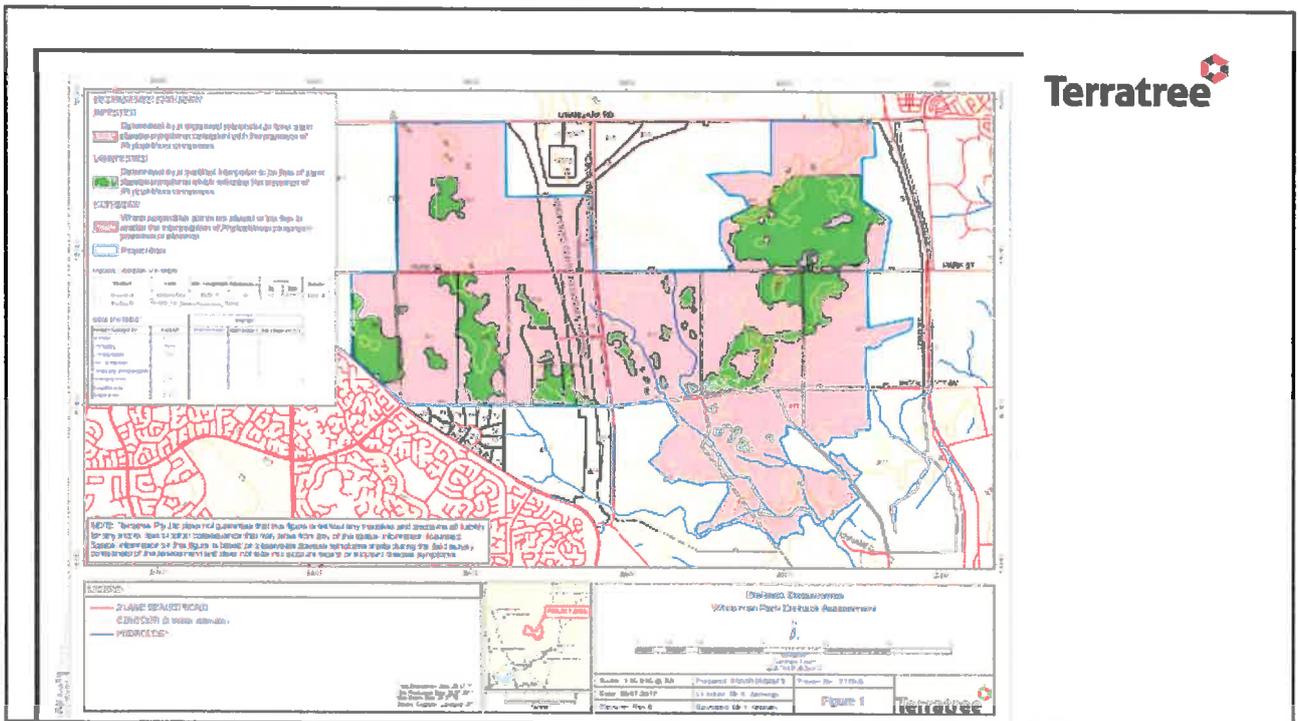
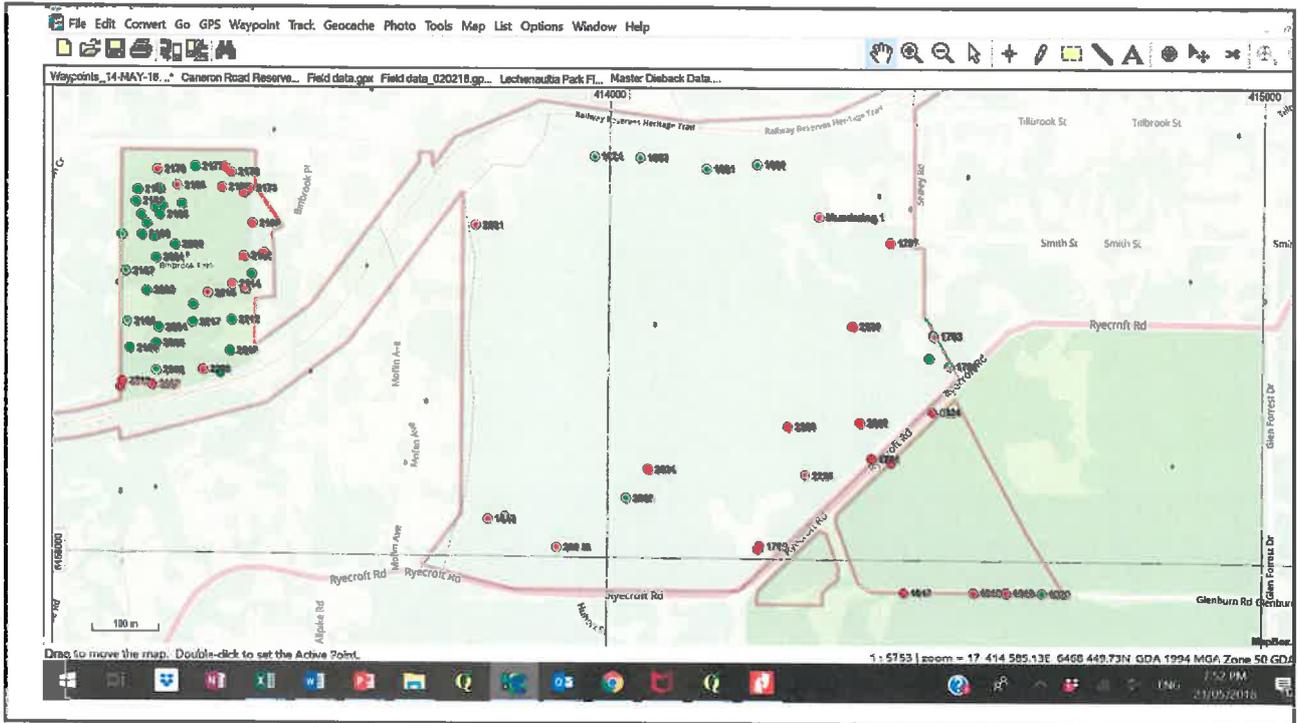
- Only three reserves, Jane Byfield, Rosedale and Glynden Reserve, out of 53 assessed can be categorised as uninfested;
- Pindalup Reserve is predominantly (95%) uninfested
- The largest reserves all have infested areas: Alp street (30%), Quail Street (85%), Strettle Street (north 80%; south 50%), Superblock (30%), Black Cockatoo North (70%). Black Cockatoo mid (30%), Falls Road (25%); Hovea CP (50%).



### Key Findings (continued)

- In many of the reserves assessed Dieback signage was outdated or absent.
- Public vehicular access is a major vector in the spread of the Dieback pathogen.
- Firebreak maintenance activities requiring ground disturbance should also be planned so they are undertaken in a manner that will minimise the risk of spreading Dieback





**Observed impact of Dieback on biodiversity, condition and function:**

- Altering vegetative structure by removing keystone mid-storey species and a large proportion of the shrub layer.
- Significantly reducing species richness and cover and providing openings for weed species including Watsonia and Veldt Grass;
- Diminishing foraging and nesting habitat for birds and small mammals through the removal of Proteaceous species; and
- A reduction of canopy resulting in less interception of rainfall and therefore increased surface water run-off, erosion and spread of Dieback.



**Terratree** 



**Mathieson Transfer Station**

**Terratree** 



Terratree Terratree 

### Significant Trees

The significant tree assessment categorised significant trees in accordance with the Black Cockatoo referral guidelines for breeding trees (EPBC, 2012), which are defined as trees with a diameter at breast height (d.b.h.) of 500mm or greater, of the following species (expected to occur within the assessment area):

- Jarrah (*Eucalyptus marginata*);
- Marri (*Corymbia calophylla*);
- Wandoo (*Eucalyptus wandoo*);
- Flooded Gum (*Eucalyptus rudis*); and
- Blackbutt (*Eucalyptus patens*).



Species	500-699mm	700-899mm	900-1099mm	1100+mm	Grand Total
<b>Blackbutt (<i>Eucalypts patens</i>)</b>	<b>32</b>	<b>10</b>	<b>10</b>	<b>5</b>	<b>57</b>
Hollow(s) present	0	0	0	0	0
<b>Flooded Gum (<i>Eucalyptus rudis</i>)</b>	<b>84</b>	<b>29</b>	<b>8</b>	<b>11</b>	<b>132</b>
Hollow(s) present		1	1	4	6
<b>Jarrah (<i>Eucalyptus marginata</i>)</b>	<b>2373</b>	<b>1134</b>	<b>446</b>	<b>491</b>	<b>4444</b>
Hollow(s) present	37	76	100	249	462
<b>Marri (<i>Corymbia calophylla</i>)</b>	<b>1894</b>	<b>1178</b>	<b>491</b>	<b>471</b>	<b>4034</b>
Hollow(s) present	17	70	103	253	443
<b>Unknown (dead)</b>	<b>45</b>	<b>126</b>	<b>41</b>	<b>21</b>	<b>233</b>
Hollow(s) present	2	12	12	21	47
<b>Wandoo (<i>Eucalyptus wandoo</i>)</b>	<b>179</b>	<b>112</b>	<b>32</b>	<b>30</b>	<b>353</b>
Hollow(s) present	8	15	20	22	65
<b>Grand Total</b>	<b>4607</b>	<b>2589</b>	<b>1028</b>	<b>1029</b>	<b>9253</b>



### Rubbish dumping and feral animals and other observations

- Rubbish dumping was not found to be a widespread issue due to controlled access in a large proportion of the in the reserves assessed.
- Asbestos dumping was recorded in Strettle Road Reserve, Hovea Conservation Park and Mathieson Road Transfer Station.
- Fox dens were recorded in several reserves, a fox was observed at Callan Road Reserve and a dead Fox at Gilfellon Reserve.
- Populations of the Threatened (Declared Rare) species *Acacia aphylla* were recorded along the Railway Reserve Parkerville between Seaborne Street and Sexton Street, Iron Road Reserve and Mandoon Reserve



## Recommendations

- In directing limited resources for natural area management for the best ecological outcomes, the Shire should follow the principles of the 'Bradley Method of Bush Regeneration'.
- Declared Plant weed populations should be eradicated as soon as possible..
- Dieback management should be considered at least as important as weed management. An integrated Biodiversity Strategy, should be developed and implemented.
- A comprehensive Dieback assessment should be undertaken of those reserves that have been identified as having protectable areas.



## Recommendations (continued)

- Standard Dieback signage developed by Project Dieback (South Coast NRM 2008) should be installed in priority reserves that have areas of protectable vegetation.
- Reserve management plans should be developed or updated for high priority reserves to integrate Dieback control, weed management, bushfire risk management and other Shire activities.
- The Shire should seek to share information and consider partnerships with tertiary institutions or organisations (such as the Dieback Working Group) to trial Dieback treatment and restoration methods.
- Shire staff should use GPS technology to record weed and Dieback treatments and maintain the usefulness of GIS information for targeting reserve management resources.