Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

Nomination *(to be completed by nominator)*

Current conservation status	
Name of ecological community:	*Corymbia calophylla — Eucalyptus marginata* woodlands on sandy clay soils of the southern Swan Coastal Plain (floristic community type 3b as originally described in Gibson *et al.* 1994).
Other names:	Swan Coastal Plain community type 3b (SCP3b), floristic community type 3b (FCT3b) as described by Gibson *et al.* (1994). The community is hereafter termed 'FCT3b'.
Description:	The community is known from the eastern side of the Swan Coastal Plain largely between Orange Grove and Dunsborough. Most sites of the community are dominated by both *Corymbia calophylla* (marri) and *Eucalyptus marginata* (jarrah) with additional common taxa comprising low shrubs, sedges, grasses and herbs. These include *Bossiaea eriocarpa* (common brown pea), *Conostylis juncea*, *Hibbertia hypericoides* (yellow buttercups), *Tetraria octandra*, *Chamaescilla corymbosa* (blue squill), *Desmocladus fasciculatus*, *Banksia dallanneyi* (couch honeypot), *Mesomelaena tetragona* (semaphore sedge), *Babingtonia camphorosmae* (camphor myrtle), *Lepidosperma squamatum*, *Neurachne alopecuroidea* (foxtail mulga grass), *Philotheca spicata* (pepper and salt), *Burchardia congesta*, *Caesia micrantha* (pale grass-lily), *Kingia australis* (kingia), *Drosera erythrorhiza* (red ink sundew), *Lomandra hermaphrodita* and *Caladenia flava.* The community is also known as "floristic community type 3b" as originally described in Gibson N., Keighery B.J., Keighery G.J., Burbidge A.H. and Lyons M.N. (1994) "A floristic survey of the southern Swan Coastal Plain" (unpublished report for the Australian Heritage Commission prepared by the Department of Conservation and Land Management and the Conservation Council of Western Australia (Inc.)).
Nomination for:	Listing ☒ Change of status ☐ Delisting ☐

1. *Is the ecological community currently on any conservation list, either in a State or Territory, Australia or Internationally?* 2. *Is it present in an Australian jurisdiction, but not listed?*	*Provide details of the occurrence and listing status for each jurisdiction in the following table*

Jurisdiction	**List or Act name**	**Date listed or assessed (or N/A)**	**Listing category eg. critically endangered (or none)**	**Listing criteria eg. B1ab(iii)+2ab(iii) (or none)**
National	EPBC Act			
Western Australia	Current ranking under WA Minister ESA list in policy	6/11/2001	Vulnerable	B) under previous ranking criteria developed in WA
	Priority list		1 ☐ 2 ☐ 3 ☐ 4 ☐	
Other State/Territory				

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

Nominated conservation status: category and criteria under the BC Act (include recommended status for deleted ecological communities)				
Critically endangered (CR) ☐	Endangered (EN) ☒	Vulnerable (VU) ☐	Collapsed (CO) ☐	
Priority 1 ☐	Priority 2 ☐	Priority 3 ☐	Priority 4 ☐	None ☐

What criteria support the conservation status category for listing as a threatened ecological community or collapsed ecological community? *Refer to Section 32 of the Biodiversity Act 2016 for definition of 'Collapsed', and Appendix 3 table 'IUCN Red List Criteria for ecosystems version 2.2'.*	**EN** A3; B1b; B2b

Eligibility against the criteria		
*Provide justification for the nominated conservation status; is the ecological community eligible or ineligible for listing against the five criteria. For **delisting**, provide details for why the ecological community no longer meets the requirements of the current conservation status.*		
A.	Reduction in geographic distribution *(evidence of decline)*	☐ **A1** ☐ **A2a** ☐ **A2b** ☒ **A3**
	Justification of assessment under Criterion A.	For criteria A and B, the ecosystem was assumed to collapse when the mapped distribution declines to zero. • Community FCT3b occurs predominantly on the Guilford and Forrestfield vegetation complexes (the complexes these equate to soil and landform units). The remaining proportion of the pre-European extent of these complexes is 5% and 12% (Government of Western Australia 2019). The reduction in extent of native vegetation on the land units is considered to be indicative of the level of clearing of the community. The extent at which these vegetation complexes have declined since pre-industrialisation, ranges from 88% to 95%. • Gibson *et al*. (1994) determined that the range contraction of FCT3b was >90%. That is, they estimated that the community is >90% cleared based on lands and geomorphic data for units on which the community occurs. The community largely occurs on the highly cleared Pinjarra Plain and Ridge Hill Shelf units on the eastern side of the Swan Coastal Plain. As the timing of the clearing is unknown, it is conservatively assumed that the clearing has occurred since 1750. The Gibson *et al*. (1994) and Government of Western Australia (2019) data sources are both indicative of an estimate of a ≥90% reduction of FCT3b since 1750.

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

		• Based on available evidence, the community plausibly meets EN or CR criterion A3. The distribution decline is estimated to be 88%-95% which is largely above the 90% threshold to meet CR under A3 and is above the threshold of ≥70% reduction in geographic distribution since 1750 to meet EN. • Plausibly meets criteria for Critically Endangered or Endangered under A3. There are inaccuracies in estimates of decline. The most conservative estimate is 88% decline in the vegetation complexes (soil and landform units) that support the community. • To allow for potential inaccuracies, FCT3b is most conservatively considered to meet EN under A3. • **Meets Endangered under A3**
B.	Restricted geographic distribution *(EOO and AOO, number of locations and evidence of decline)*	☒ **B1** (specify at least one of the following): ☐ **a)(i)** ☒**a)(ii)** ☒**a)(iii)** ☒**b)** ☐**c);** ☒ **B2** (specify at least one of the following): ☐ **a)(i)** ☒**a)(ii)** ☒**a)(iii)** ☒**b)** ☐**c);** ☐ **B3 (only for Vulnerable Listing)**
	Justification of assessment under Criterion B.	• B1: EOO is 3976.6km^2 (≤20,000km^2-threshold for EN, and ≥2,000km^2-threshold for CR). The community's EEO is less that the 20,000km^2 threshold for rank EN. Community meets threshold for rank EN under criterion part B1. • B1a, 2a: Inadequate convincing data available to indicate ongoing decline in measure of spatial extent, biotic or abiotic interactions • B1 b): Observed and inferred continuing decline from land clearing, hydrological change, weed invasion, too frequent fire, disease, and grazing by introduced herbivores (see Appendix 1 for details of threats). • B1 c) Community is considered to occur at 28 threat defined locations, based on the identification of 28 of the community that may be subject to similar threats such as those that affect a particular bushland location. The community does not meet VU under B1c) as the threshold for VU is ≤10 threat-defined locations. • B2: AOO. Community covers 14 grid cells. The community meets EN under criterion B2 for which the AOO threshold is ≤20 grid cells (threshold for CR ≤2 grid cells) (b and c of B1 are the same for B2) • B3: community is considered to consist of 28 threat defined locations, based on the identification of 28 clusters of the community that may be subject to similar threats such as those that affect a particular bushland location. Does not meet VU under criterion B3, as community occurs at more than 28 threat defined locations. • **Meets criteria for Endangered B1b, B2b**

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

C.	Environmental degradation of abiotic variable *(Evidence of decline over 50-year period)*	☐ **C1** ☐ **C2** ☐ **C3**

	Justification of assessment under Criterion C.	• Hydrological change in the form of groundwater decline is an abiotic variable that is a significant threat to the community. • For criterion C, the assessment of decline in abiotic processes focussed on hydrological change using data on the depth of the water tables. It was assumed conservatively that the community would collapse if the water table depth fell to about 10m below ground surface based on the maximum water depth accessed by deep rooted phreatophytic taxa in nearby areas (Froend and Loomes 2006), and observations that the vigour of canopies declined in groundwater dependent trees in association with declining water table levels (Froend *et al*. 2004). • Ground water level monitoring data were available for 8 occurrences of the community (CoolupGun01,02,03,04 and 06, PAUL02 and 03, and Pinjrail02). The steady water table decline at the Coolup Reserve 29033, where occurrences CoolupGun01,02,03,04 and 06 occur (representative of 7% of the community), indicates an approximate 1m groundwater decline, from 1988 to 2019. Figure 2 in Appendix 1 shows an approximated 2m groundwater decline at the reserve over the next 50 years, as calculated from the previous trendline in Figure 1. Based on current and future forecasted groundwater levels at this one location, it is predicted that within the next 50 years there will be a 30% severity in relation to total collapse assuming groundwater levels decline at the current calculated rate (y=-0.003x + 12.225). • The relatively stable groundwater level at occurrences PAUL02 and 03 (representative of 0.7% of the community), is indicative of less than 1m groundwater decline over the next 50 years, calculated from the previous trendline in Figure 3 (Figure 4). Based on current and future forecasted groundwater levels at this location, it is predicted that within the next 50 years there will be a 7% severity in relation to total collapse assuming groundwater levels decline at the current calculated rate (y=-0.001x + 38.216). • The relatively stable groundwater level at occurrence Pinjrail02 (representative of 2% of the community), is indicative of an approximate 1m groundwater decline over the next 50 years, as calculated from the previous trendline in Figure 5 (Figure 6). Based on current and future forecasted

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

		groundwater levels at this location, it is predicted that within the next 50 years there will be a 2% severity in relation to total collapse assuming groundwater levels decline at the current calculated rate (y=-0.0018x + 26.664). • Based on current and future predictions of groundwater levels across the community, 10% of the extent of the community has a quantified severity ranging from 2%-30% over a 50-year period. The minimum thresholds to meet VU are environmental degradation of ≥50% extent with ≥50% severity over the next 50 years to meet C2a. Available data do not indicate the community meets minimum thresholds for criteria for VU based on data available for specific occurrences. • **Available data indicate the community does not meet criterion C.**
D.	Disruption of biotic processes or interactions *(Evidence of decline over 50-year period)*	☐ **D1** ☐ **D2** ☐ **D3**
	Justification of assessment under Criterion D.	• Dieback disease caused by *Phytophthora* species is a biotic interaction that is a threat to the community. • For criterion D, collapse of this community is defined as 100% loss of dieback sensitive species in the community. It is assumed that this would result from very severe infestation and impacts of disease caused by *Phytophthora* species. • Based on dieback surveys completed for 1 occurrence (CARD12), a minimum of 8.2ha (3%) of the community is infected with the disease. A minimum severity of ≥30% loss of dieback sensitive species over ≥80% of the extent of the community in any 50 year period would be required to meet VU. • Although there are dieback maps that encompass the community, currently there are inadequate systematically collected quantitative data about the impacts of dieback on individual sensitive species across the extent of the community to support assessment against criterion D. • There are inadequate quantitative data to indicate the community meets the minimum proportion of the extent (≥30%) or proportional severity of disruption of abiotic processes (≥30%) over any 50-year period to meet criteria D1 or D2. • D3: There are inadequate quantitative data to indicate that the community meets the minimum proportion of the extent (≥50%) or proportional severity of disruption of abiotic processes (≥50%) since 1750 to meet VU.

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

		• **Insufficient evidence to indicate the community meets criterion D.**
E.	Quantitative analysis *(statistical probability of ecosystem collapse)*	• No quantitative estimates of the risk of ecosystem collapse have been completed • **Not evaluated under criterion E**

Reasons for change of status

Genuine change ☐ New knowledge ☐ Previous mistake ☐ Review/Other ☒

Provide details: The community was initially ranked as Vulnerable using ranking criteria developed in WA that differ from those in the IUCN Red List Criteria for Ecosystems (version 2.2).

Summary of assessment information *(provide detailed information in the relevant sections of the nomination form)*

EOO	3976.6km^2	AOO	1400 km^2 (10x10km grid method).
No. locations	36	Severely fragmented	Yes ☒ No ☐ Unknown ☐ The community is likely to have historically been more extensive. Land clearing has resulted in the community being severely fragmented, with only small occurrences remaining in isolated patches.
Current known area			260 ha
Pre-industrialisation extent or its former known extent (if known)			Community FCT3b occurs predominantly in the Guilford and Forrestfield vegetation complexes. The proportion of these complexes remaining since 1750, is 5% and 12% (Government of Western Australia 2019). Based on this, it is estimated that the community originally occupied between 2167ha and 5200ha.
Estimated percentage decline			The extent to which the vegetation complexes (soil and landform units) in which FCT3b occurs have declined since pre-industrialisation ranges from 88% to 95% (Government of Western Australia 2019).

Summary assessment against IUCN RLE Criteria

Criterion	Rank indicated	Overall conclusion
A1	-	• Available data do not indicate if community meets criterion
A2a	-	• Available data do not indicate if community meets criterion
A2b	-	• Available data do not indicate if community meets criterion

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

A3	EN-CR	• Based on the level of clearing of the vegetation complexes in which FCT3b occurs, the community most conservatively meets EN under criterion A3, but also plausibly meets CR
B1a	-	• EOO is ≤20,0000km^2 • Inadequate convincing data available to indicate ongoing decline in measure of spatial extent, biotic or abiotic interactions • Does not meet criterion
B1b	EN	• EOO is ≤2,000km^2 • Observed and inferred continuing decline from land clearing, hydrological change, weed invasion, too frequent fire, disease and grazing by introduced herbivores • Meets criterion for EN
B1c	-	• AOO is 14 grid cells • Ecosystem exists at 28 threat defined locations • Does not meet
B2a	-	• AOO is 14 grid cells • Inadequate data available to indicate ongoing decline in measure of spatial extent, biotic or abiotic interactions • Does not meet criterion
B2b	EN	• AOO is 14 grid cells • Observed and inferred continuing decline from land clearing, hydrological change, weed invasion, too frequent fire, disease and grazing by introduced herbivores. • Meets criterion for EN
B2c	-	• AOO is 14 grid cells • Ecosystem exists at 28 threat defined locations • Does not meet criterion
B3	-	• Known from 28 threat-defined locations • Does not meet criterion
C1	-	• Available data indicate community does not meet minimum thresholds for proportion of the extent (≥30%) or proportional severity of degradation (≥30%) over the past 50 years to meet VU.
C2	-	• Available data indicate community does not meet minimum thresholds for proportion of the extent (≥30%) or proportional severity of degradation (≥30%) any 50 year period to meet VU.
C3	-	• Available data indicate community does not meet minimum thresholds for proportion of the extent (≥50%) or proportional severity of degradation (≥50%) since 1750 to meet VU.
D1	-	• Inadequate quantitative data to indicate if the community meets the minimum proportion of the extent (≥30%) or proportional severity of disruption of biotic processes (≥30%) over the past 50 years to meet VU.
D2	-	• Inadequate quantitative data to indicate if the community meets the minimum proportion of the extent (≥30%) or proportional severity of disruption of biotic processes (≥30%) over any 50-year period to meet VU.
D3	-	• Inadequate quantitative data to indicate if the community meets the minimum proportion of the extent (≥50%) or proportional severity of disruption of biotic processes (≥50%) since 1750 to meet VU.
E	NA	• No quantitative estimates of the risk of ecosystem collapse.
		Plausibly meets CR and EN under A3. Allowing for inaccuracies, community most conservatively meets EN under A3. Also meets EN B1b, B2b. **Meets EN under A3; B1b; B2b.**

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

Summary of location (occurrence) information *(provide detailed information in the relevant sections of the nomination form)*						
Occurrence ID (Occurrence No.)	Land manager	Survey information: date of survey	Condition*	Area of occurrence (ha)	Threats *(note if past, present or future)*	Specific management actions
elbr01 (23)	Department of Planning, Lands and Heritage (DPLH)	2002	40% excellent 60% good	0.4	Weed invasion, disease, too frequent fire and trampling (stock and recreational users) (past, present, future)	Fencing, weed management.
Rush03 (24)	City of Gosnells/Private	2002	95% excellent 5% good	2.0	Disease, too frequent fire, and trampling (track through occurrence) (past, present, future)	Fencing or signage along track.
MYOSCAR01 (49)	Shire of Serpentine-Jarrahdale (Reserve 10385)	2000 and 2010	50% very good 40% excellent 10% good	2.0	Weed invasion, too frequent fire, and rubbish dumping (past, present, future)	Fencing, weed management and appropriate fire regime.
norm04 (22)	Private	2002	100% excellent	12.3	Clearing, weed invasion, too frequent fire, disease and grazing by native or introduced animals (past, present, future)	Maintenance of fence.
MYBYFORD09 (13)	Railway reserve	2000	100% excellent	1.1	Clearing, weed invasion, and too frequent fire (past, present, future)	Fencing and weed management.

PAUL02 (25)	Shire of Serpentine-Jarrahdale	2002	90% excellent 10% good	1.0	Weed invasion, disease, too frequent fire, and recreational activities (past, present, future)	Fencing, weed management.
PAUL03 (26)	Shire of Serpentine-Jarrahdale	2002	100% excellent	0.9	Weed invasion, disease, too frequent fire, and recreational activities (past, present, future)	Fencing, weed management.
MYSERP01 (10)	DBCA (Reserve 28861, Serpentine NP)	2000 and 2014	90% excellent 10% good	19.4	Weed invasion, too frequent fire and recreational activities (past, present, future)	Fencing, weed management and appropriate fire regime
KOOLJ05 (1)	DBCA (Kooljerrenup Nature Reserve 23756)	1995	95% excellent 5% good	64.6	Weed invasion and too frequent fire (past, present, future)	Weed management, maintenance of fencing.
WARO01 (6)	Main Roads (20585)	1994, 2012 (condition survey) and 2018	95% excellent 5% very good	8.5	Weed invasion, disease, too frequent fire, rubbish dumping and grazing by native or introduced species (past, present, future)	Fencing and maintenance of gates, signage. Continued weed management and introduced fauna removal.
DUNS01 (4)	DBCA (Reserve 35733)	1995 and 2018	50% very good 20% good	1.0	Weed invasion, disease and grazing by native or introduced	Maintenance of fencing, weed management and removal of

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

			20% excellent 10% degraded		species (past, present, future)	introduced fauna.
MYPAGE01 (11)	Private	2000	100% excellent	1.1	Clearing, too frequent fire and weed invasion (past, present, future)	Liaison with owners.
BURNRD02 (2)	DBCA (Reserve 6268)	1995	100% excellent	1.8	Weed invasion, disease, and too frequent fire (past, present, future)	Fencing, weed management.
MYROMAN01 (50)	DBCA (Reserve 46818)	2000, 2006, 2012 and 2015	90% very good 10% completely degraded	5.1	Clearing, weed invasion, too frequent fire, and grazing by native and introduced species (past, present, future)	Maintenance of fence, weed management, appropriate fire regime and introduced fauna removal.
MYTRANS PLOT1 (12)	Private/Public road	2000, 2005, 2011 and 2014	50% excellent 50% degraded	3.3	Clearing, too frequent fire, and weed invasion (past, present, future)	Liaise with owners.
CARD12 (3)	DBCA (Cardup Nature Reserve 2457)	1994, 2012 and 2018	100% very good	8.2	Weed invasion, disease, and too frequent fire (past, present, future)	Continued weed management, maintenance of fencing and appropriate fire regime.
MYYARL04 (9)	DBCA (Reserve 47123)	1995	Unknown	13.4	Weed invasion and too frequent fire (past, present, future)	Maintenance of fence, weed management and appropriate fire regime.

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

YARL03 (5)	DBCA (Reserve 3672), DPLH (Reserves 16681 and 23307), Main Roads (Reserve 31901)	1995	100% excellent	36.3	Clearing (mining) (past), too frequent fire, and grazing by native or introduced species (past, present, future)	Fencing, introduced fauna control.
AustralBFsite (28)	Private	2007	100% excellent	4.4	Weed invasion, disease, and grazing by native or introduced species (past, present, future)	Liaise with owners.
CLIFFORD02 (17)	Main Roads WA	2001	90% excellent 10% very good	0.8	Clearing, weed invasion and too frequent fire	Fencing, weed management.
MYYARL01 (7)	DPLH (Reserve 31900 and 16681), Main Roads WA (Reserve 31901)	1995	100% excellent	15.1	Clearing (mining - past), weed invasion and too frequent fire (past, present, future)	Fencing.
COOK01 (31)	Shire of Harvey (Reserve 3309)/Private	2007 and 2011	100% very good	4.3	Clearing, weed invasion, too frequent fire, grazing by native or introduced animals, and recreational activities (past, present, future)	Liaise with owners, weed management, fencing and introduced fauna removal.
CoolupGun01 (34)	Shire of Murray (Reserve 6038)/DWER (Reserve 29033)	2007	10% good 75% very good 15% degraded	0.2	Clearing, weed invasion, disease, too frequent fire, recreational activities and hydrological	Liaise with land manager and investigate hydrological impacts.

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

					changes (past, present, future)	
CoolupGun03 (35)	Shire of Murray (Reserve 6038)	2007	10% good 75% very good 15% degraded	0.8	Clearing, weed invasion, disease, too frequent fire, recreational activities, and hydrological changes (past, present, future)	Liaise with land manager and investigate hydrological impacts.
CoolupGun02 (32)	Shire of Harvey (Reserve 6038)/DWER (Reserve 29033)	2007	10% good 75% very good 15% degraded	6.5	Clearing, weed invasion, disease, too frequent fire, recreational activities and hydrological changes (past, present, future)	Liaise with land manager, investigate hydrological impacts.
CoolupGun06 (37)	Shire of Murray (Reserve 6038)	2007	10% good 75% very good 15% degraded	0.2	Clearing, weed invasion, disease, too frequent fire, recreational activities, and hydrological changes	Liaise with land manager and investigate hydrological impacts.
CoolupGun04 (33)	Shire of Murray (Reserve 6038)	2007	10% good 75% very good 15% degraded	11.3	Clearing, weed invasion, disease, too frequent fire, recreational activities, and hydrological changes (past, present, future)	Liaise with land manager and investigate hydrological impacts.
AITKEN02 (47)	DPLH (Reserve 25823)/Public road/Private	2006 and 2011	100% excellent	5.2	Weed invasion, rubbish dumping and resource extraction (some disturbance	Liaise with owners, fencing, and weed management.

					due to suspected logging and firewood collection) (past, present, future)	
PINJ02 (40)	Shire of Murray (Reserve 34033)	2007 and 2014	100% very good	3.1	Weed invasion, and declining rainfall (deaths of Synapheas and other sensitive taxa from drought) (past, present, future)	Maintenance of fence and weed management.
NthDand02 (45)	DBCA (Reserve 5997)	2011	100% good	1.0	Weed invasion and too frequent fire (past, present, future)	Continue weed management.
Pinjrail02 (46)	PTA	2011 (installed quadrat)	Unknown	4.4	-	-
WattleRd01Serp (51)	Private	2012	100% excellent	0.4	Clearing, and grazing by native or introduced species (past, present, future)	Liaison with managers.
BYFrail03 (42)	Public railway/UCL	2011 and 2013	30% good 30% very good 40% excellent	1.5	Clearing, weed invasion and too frequent fire (past, present, future)	Weed management.
BYFrail05 (43)	Public railway	2011 and 2013	50% very good 50% excellent	10.9	Clearing, weed invasion, and too frequent fire (past, present, future)	Weed management.
BYFrail08 (41)	Public road/railway	2011 and 2014	70% very good	0.6	Clearing, weed invasion and too frequent	Weed management.

			30% good		fire (past, present, future)	
Fairbridge (53)	Private/DPLH (Reserve 21290)	2013	100% excellent	7.1	Weed invasion and grazing by native or introduced species (past, present, future)	Liaison with owner, weed management, and introduced fauna control.

*For the purposes of relating condition to IUCN Criteria, condition categories from (Keighery (1994) Vegetation Condition Scale (Government of WA 2000)) are defined below:

Good ('Pristine', 'Excellent', 'Very Good' using Bush Forever (2000) scale): This includes vegetation ranging from 'Pristine' - with no obvious signs of disturbance, to 'Excellent' - Vegetation structure intact, with disturbance only affecting individual species, weeds are non-aggressive species and 'Very Good' - Vegetation structure altered, obvious signs of disturbance eg: from repeated fires, dieback, logging, grazing.

Medium ('Good' using Bush Forever (2000) scale): This includes vegetation categorised as 'Good' - Vegetation structure altered but retains basic vegetation structure or ability to regenerate it, obvious signs of disturbance are present, from activities including partial clearing, dieback and grazing.

Poor ('Degraded' using Bush Forever (2000) scale): Basic vegetation structure severely impacted by disturbance such as partial clearing, dieback, logging and grazing. Scope for regeneration but not to a state approaching good condition without intensive management.

Beyond recovery ('Completely degraded' using Bush Forever (2000) scale): Vegetation structure 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 shrubs and trees.

APPENDIX 1 THREATS

Clearing

Land clearing for agriculture has been extensive on the heavy soils on the eastern side of the Swan Coastal Plain, with approximately 97% of all vegetation in the area being cleared (Keighery and Trudgen 1992; CALM 1990). The marri dominated types on these heavy soils were probably some of the most common on this portion of the plain but are now very rare and are likely to be at least 90% cleared (Gibson *et al*. 1994). Sand mining may affect occurrences YARL03 (5) and MYYARL01 (7). Occurrence MYBYFORD09 (13) may be affected by upgrading of the road or rail line. Occurrence MYTRANSPLOT1 (12) is a road reserve impacted by firebreak construction. Occurrence Coolupgun01, 02, 03, 04 and 06 (34, 32, 35, 33, 37) have been affected by some clearing in the past. Occurrences BYFrail03, 05, 08 (42, 43, 41) occur on railway reserves and future management is uncertain.

Grazing

Native and introduced species cause physical damage to the vegetation through trampling, and altering species composition by selectively removing edible species, and can lead to weed invasion. Many occurrences are affected by high kangaroo numbers, especially occurrence MYSERP01 (10). Occurrence WattleRd01Serp (51) is subject to light grazing by sheep, and damage by pigs has been recorded at occurrence Fairbridge (53).

Trampling

Some occurrences are subject to recreational activities that can disturb and crush vegetation. Occurrence elbr01 (23) is used by horse riders and walkers and occurrence Rush03 (24) has a recreational track that dissects the occurrence.

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

Weeds

Weeds displace native plants and compete with them for light, nutrients and water. Weeds can also prevent recruitment, cause changes to soil nutrients, and affect abundance of native fauna. They can also impact on other conservation values by harbouring pests and diseases and increasing the fire risk. A common weed affecting many occurrences of community SCP3b is *Watsonia*. Other weeds include; veldt grass (*Ehrharta calycina*), lovegrass (*Eragrostis curvula*), Geraldton carnation weed (*Euphorbia terracina*), cotton bush (*Gomphocarpus fruticosus*), cape tulip (*Moraea flaccida*), arum lily (*Zantedeschia aethiopica*), kikuyu (*Pennisetum clandestinum*), bridal creeper (*Asparagus asparagoides*) and Cootamundra wattle (*Acacia baileyana*).

Hydrological changes

Increased clearing results in increased runoff and an increase in recharge to the groundwater table, while uncontrolled extraction from irrigation bores may lower groundwater levels, especially in summer. This may predispose the community to the impacts of hydrological changes such as increasing inundation and salinisation as a consequence of clearing or urbanisation of the catchment. Based on available evidence from groundwater levels and presence of wetland adapted flora in some occurrences, this community may be at least partially groundwater dependent. Groundwater level data was available from bores located near occurrences CoolupGun01,02,03,04 and 06, PAUL02 and 03, and Pinjrail02. A monitoring bore, located 14m north of occurrences Coolupgun01, 02, 03, 04 and 06 (34, 32, 35, 33 and 37), recorded an approximate 1m groundwater decline over monitoring period. Figure 2 shows the predicted groundwater decline of occurrence Coolupgun02 (32), over the next 50 years, as calculated from the previous trendline in Figure 1. A total collapse of SCP3b is assumed if groundwater levels dropped 10m below ground surface level (maximum root depth for *Corymbia calophylla*). Figures 1 and 2 indicate that these occurrences do not face an immediate threat or a significant threat in the future of total collapse from groundwater decline. Monitoring bores located near PAUL02 and 03, and Pinjrail02, show groundwater levels are relatively stable and are declining at slow rate. Figures 3 through to 6 indicate the threat of total collapse from groundwater decline appears relatively insignificant.

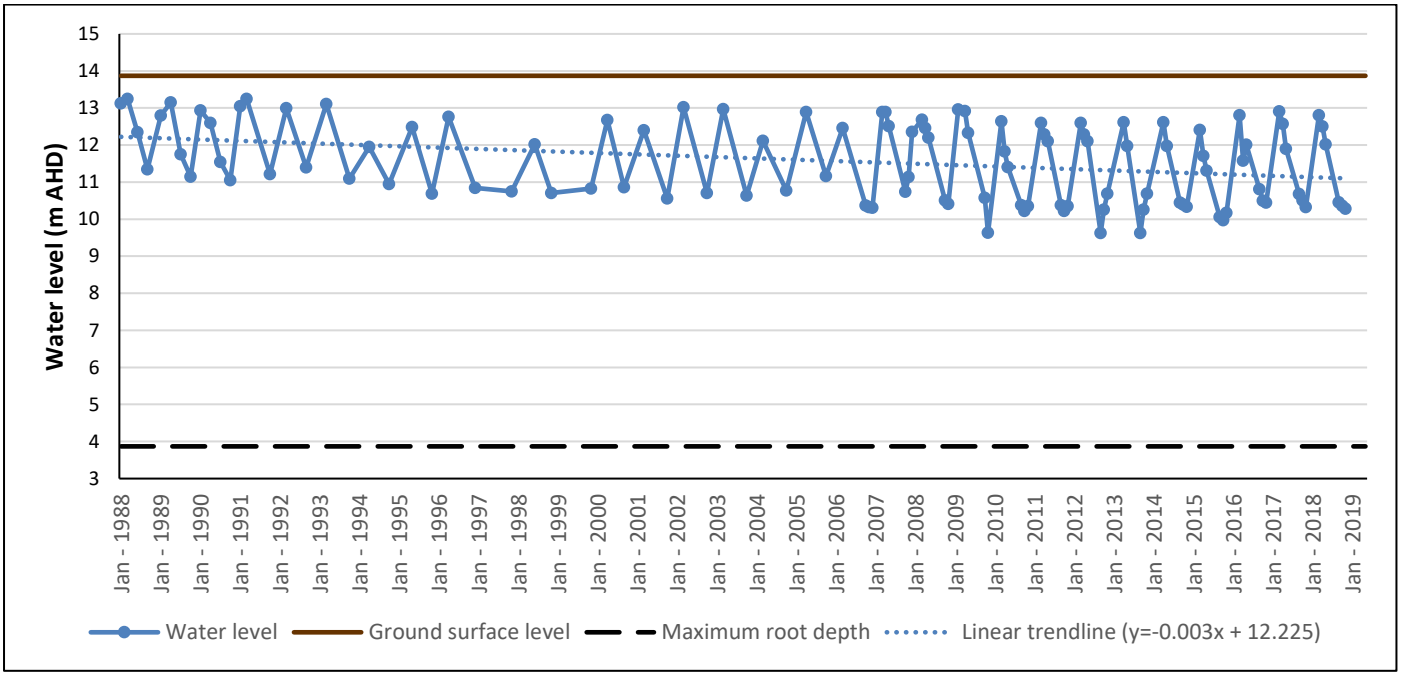

Figure 1. Hydrograph of monitoring bore located 14m north of occurrences Coolupgun01, 02, 03, 04 and 06 (34, 32, 35, 33 and 37) (site ref: 61330076) in reserve 29033, sampling the superficial swan aquifer.

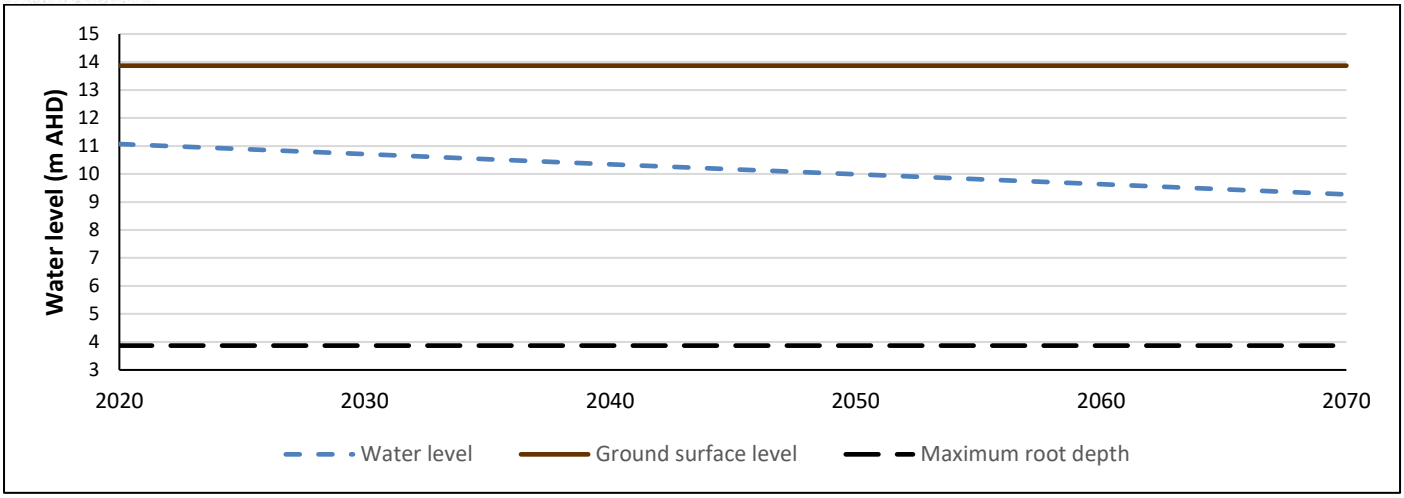

Figure 2. A 50-year forecast of groundwater level decline at occurrences Coolupgun02 (32) (site ref: 61330076) calculated using the trendline (y=-0.003x + 12.225).

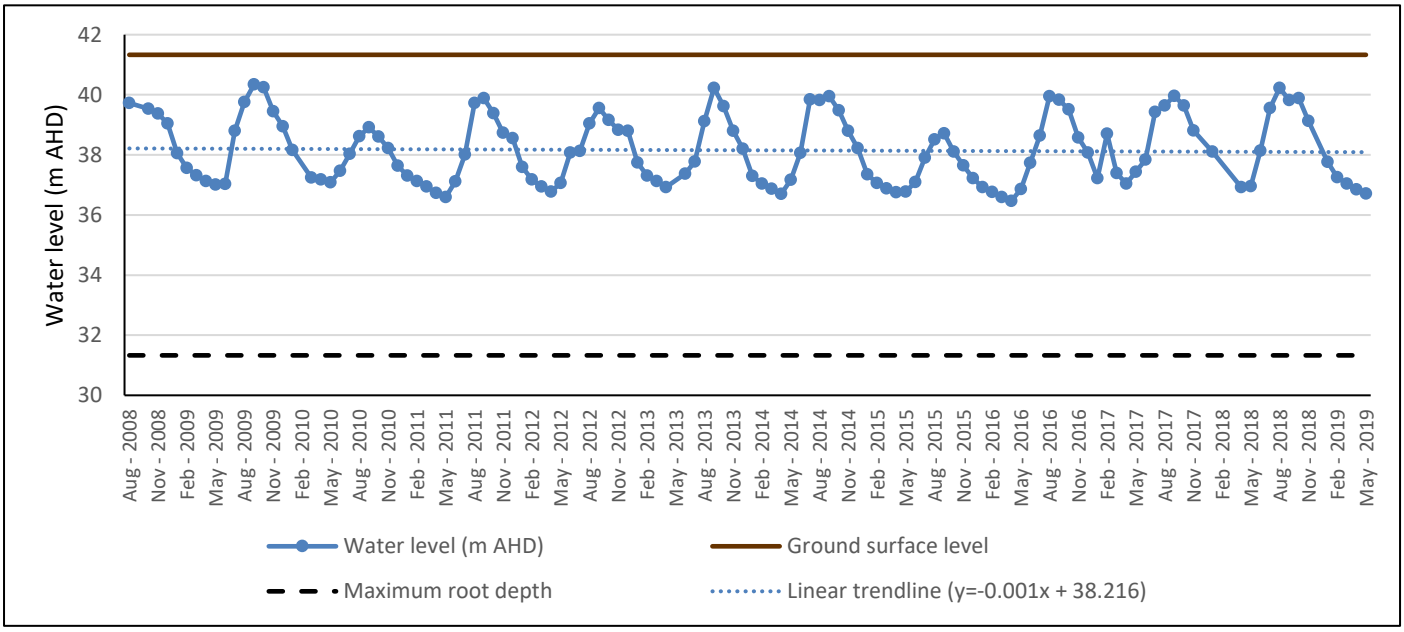

Figure 3. Hydrograph of monitoring bore located 400m south-east of occurrence PAUL03 (26) and PAUL02 (25) (site ref: 61410655), sampling the superficial Swan aquifer.

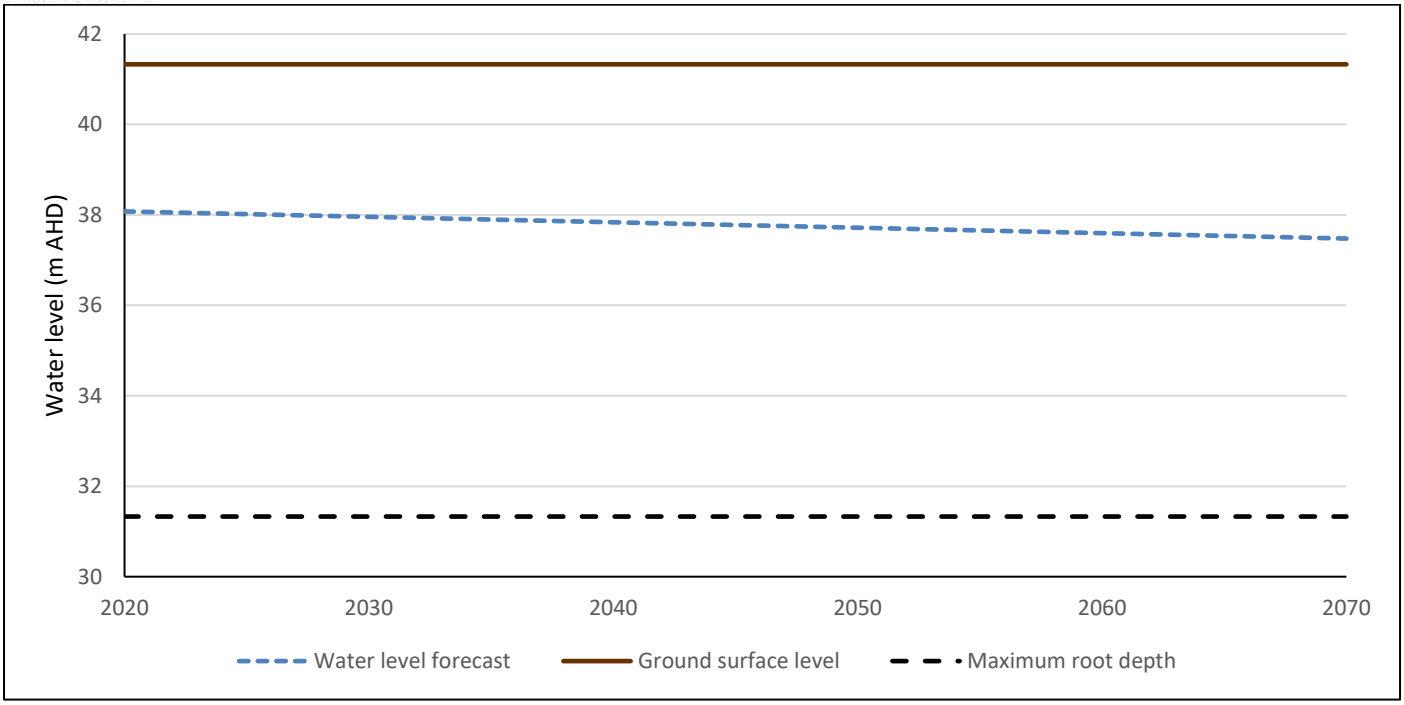

Figure 4. A 50-year forecast of groundwater level decline at occurrences PAUL03 (26) and PAUL02 (25) (site ref: 61410655) calculated using the trendline (y=-0.001x + 38.216).

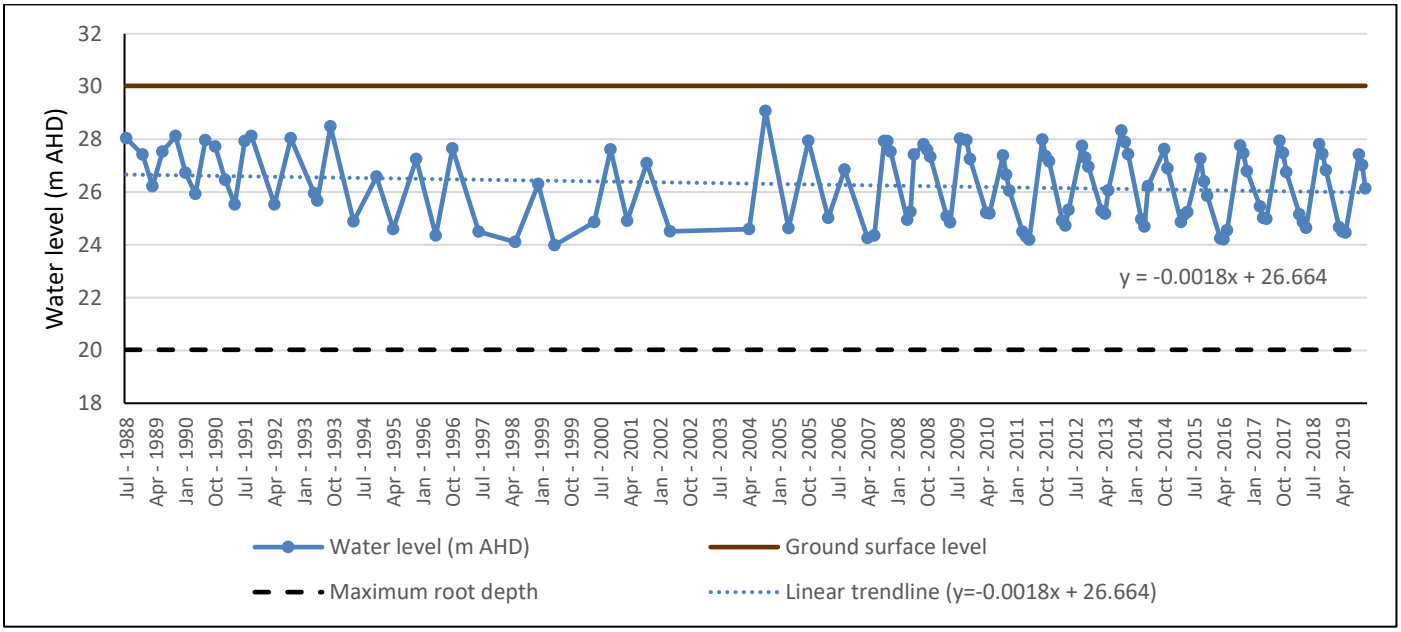

Figure 5. Hydrograph of monitoring bore located 300m west of occurrence Pinjrail02 (46) (site ref: 61430006), sampling the superficial swan aquifer.

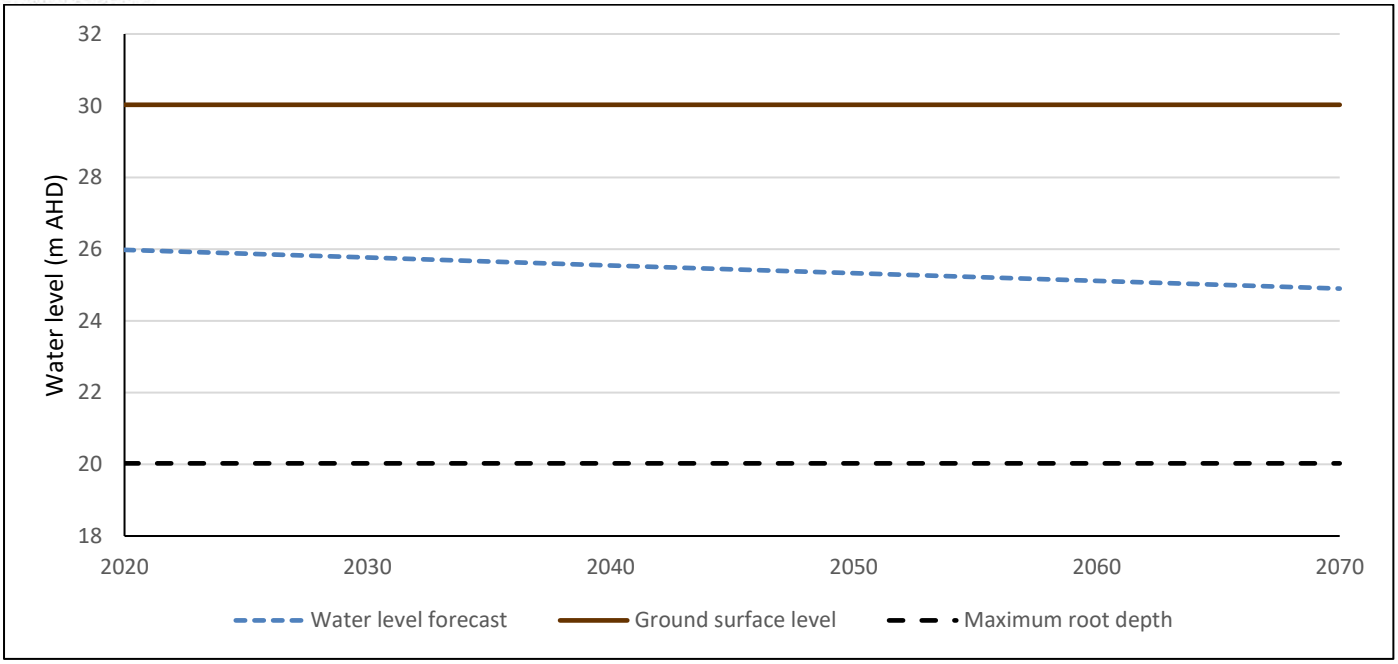

Figure 6. A 50-year forecast of groundwater level decline at occurrence Pinjrail02 (46) (site ref: 61430006) calculated using the trendline (y=-0.0018x + 26.664).

Disease

Dieback caused by *Phytophthora* species has the potential to impact the community, although it is not known if this community is particularly susceptible to the disease. The dominant species, *Corymbia calophylla* has shown to be resistant to dieback, whilst *Eucalyptus marginata* shows evidence of moderate susceptibility according to data on Naturemap. Taxa that commonly occur in the community, such as *Banksia dallanneyi* and *Xanthorrhoea preissii*, also have some susceptibility to the disease. Dieback disease may potentially be present in occurrences in addition to those in which it has already been detected as not all locations of the community have been surveyed for the pathogen. In 2018, a full *Phytophthora* dieback interpretation was completed for Cardup Nature Reserve, in the Shire of Serpentine Jarrahdale (Figure 7) (DBCA 2018). Occurrence CARD12 (3) is located in the north-west portion of the reserve covering 8.2ha and was determined to be 100% infested with dieback.

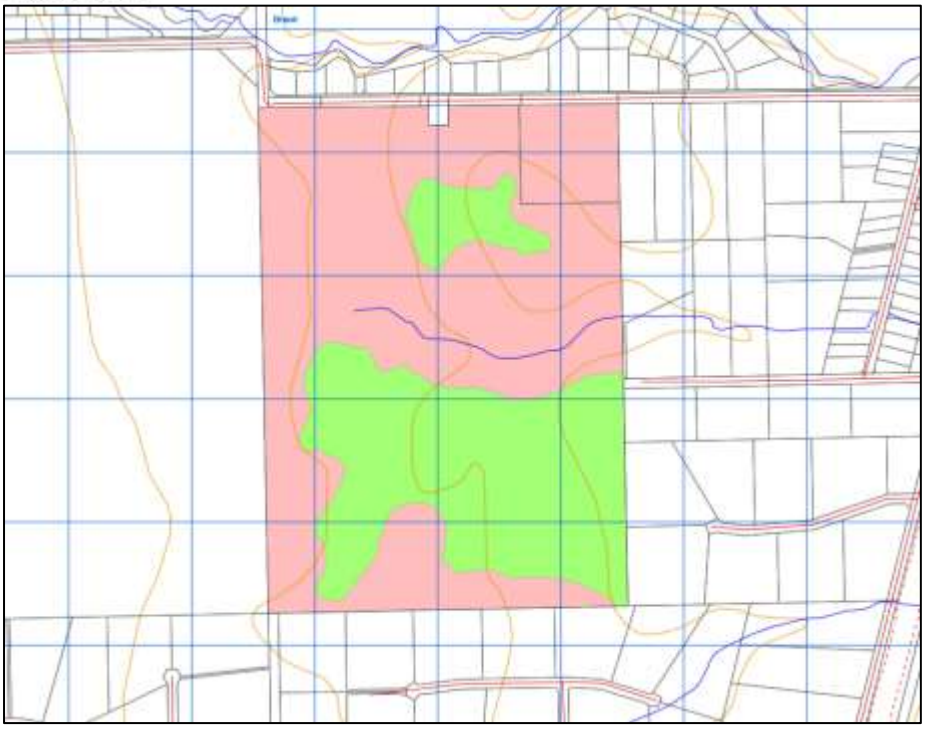

Figure 7. Dieback infestation map of the Cardup Nature Reserve that contains occurrence CARD12. Pink represents those areas infested, green represents those areas where there was no infestation and no colour within the perimeter of reserve represents areas not able to be mapped for the disease at the time (DBCA 2018). (NB: dieback mapping only available as PDF documents from original reports).

Marri canker, caused by the native fungus *Quambalaria coyrecup* that appears to attack the stem, is also a threat to the survival of the marri. The disease incidence is greater in disturbed areas such as along roads, in parks, in remnant bushland on farms and on small rural blocks. The disease appears to be non-recoverable with attempts to contain the pathogen by callus production ultimately circumvented by the pathogen (Lamond 2009; Paap *et al*. 2017). Infection and loss of overstorey is evident within occurrence DUNS01 (4).

Inappropriate fire regimes

Mediterranean ecosystems are usually fire responsive and may require a particular fire regime to assist regeneration (Abbot and Burrows 2003). If an appropriate fire frequency is exceeded, however, species that are obligate seeders may not have sufficient time to flower and produce seed. If the time between fires is too long, obligate seeders may senesce and be unable to regenerate. Therefore, wildfires or prescribed burns must occur at appropriate intervals, and possibly at the appropriate season and intensity, to sustain the integrity of plant assemblages.

Too frequent fire can increase the risk of invasive weeds establishing within small bushland remnants (Abbot and Burrows 2003). It is likely that the burning regime in the remnants containing the community has been modified to more frequent fires, especially hot burns, since 1750.

The risk of fire is generally increased by the presence of grassy weeds in the understorey, as they are likely to be more flammable than many of the original native species in the herb layer.

Drying climate also needs to be considered when designing appropriate fire regimes. It is likely that reduced rainfall will cause diminishing growth rates, and plant maturation times will also therefore increase. Longer inter-fire intervals are therefore likely to be desirable.

Climate drying

Reduced rainfall may affect various components of the community, as it is likely to be reliant on local hydrologic regimes. Reduced rainfall and altered hydrology may have a detrimental effect on the herbaceous layer in particular. Altered periods or depths of ponding may impact the timing of growth of herbs in the understorey and may also affect the species composition of the community by favouring different plant species.

Decreases in winter, spring and annual rainfall are projected with high confidence for the south west of Western Australia. There is strong model agreement and good understanding of the contributing underlying physical mechanisms driving this change (southward shift of winter and spring storm systems).

According to data provided by the CSIRO, early in the century (2030) and under all emission scenarios, winter rainfall is projected to decrease by up to 15 per cent. Late in the century, intermediate emissions (RCP4.5) lead to a projected decrease in winter rainfall of up to around 30%, and under high emissions (RCP8.5) winter rainfall decline is projected to decrease by up to 45%. Changes in autumn and summer are less clear, although downscaling results suggest a continuation of the observed autumn declines. (from URL https://www.climatechangeinaustralia.gov.au/en/climate-projections/future-climate/regional-climate-change-explorer/sub-clusters/?current=SSWSW&tooltip=true&popup=true, accessed November 2019).

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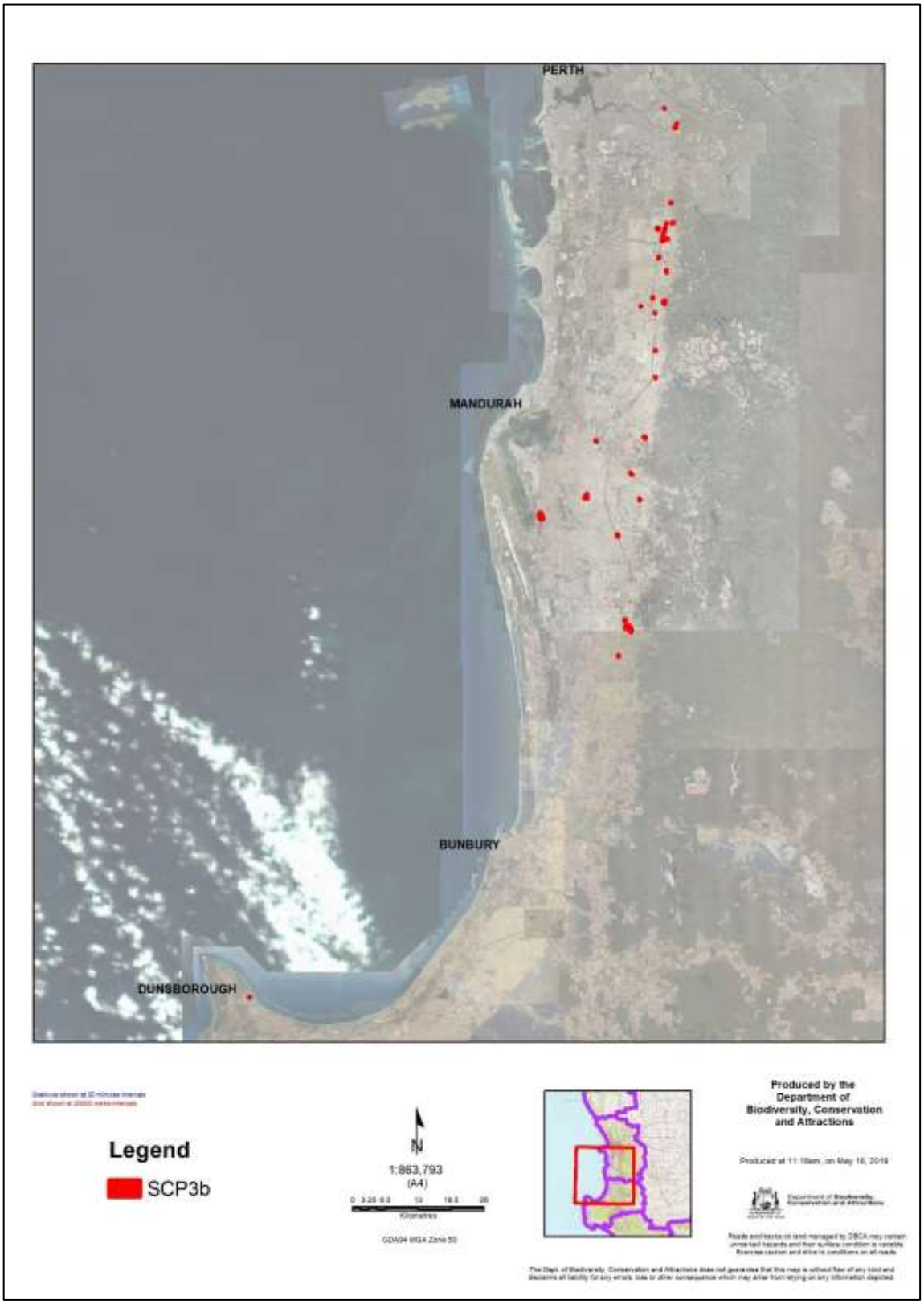
GOVERNMENT OF WESTERN AUSTRALIA

APPENDIX 2 Distribution of FCT3b



The community has a range of 194km, with the southernmost occurrence at Dunsborough and the northernmost at Maddington. The map is indicative of the high level of fragmentation of occurrences.

The map was created from known mapped occurrences of the community contained on the Western Australian Threatened Ecological Community database (TECDB), administered by the Department of Biodiversity and Conservation (DBCA).

Department of Biodiversity, Conservation and Attractions

GOVERNMENT OF WESTERN AUSTRALIA

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Department of Biodiversity, Conservation and Attractions

GOVERNMENT OF WESTERN AUSTRALIA

APPENDIX 3 IUCN Red List Criteria for ecosystems (version 2.2) (IUCN 2017)

A. Reduction in geographic distribution over ANY of the following time periods:

		CR	EN	VU
A1	Present (over the past 50 years).	≥ 80%	≥ 50%	≥ 30%
A2a	Future (over the next 50 years).	≥ 80%	≥ 50%	≥ 30%
A2b	Future (over any 50 year period including the present and future).	≥ 80%	≥ 50%	≥ 30%
A3	Historic (since 1750).	≥ 90%	≥ 70%	≥ 50%

B. Restricted geographic distribution indicated by EITHER B1, B2 or B3:

		CR	EN	VU
B1	Extent of a minimum convex polygon enclosing all occurrences (Extent of Occurrence)	≤ 2,000 km²	≤ 20,000 km²	≤ 50,000 km²

AND at least one of the following (a-c):

(a) An observed or inferred continuing decline in **EITHER**:

i. a measure of spatial extent appropriate to the ecosystem; **OR**

ii. a measure of environmental quality appropriate to characteristic biota of the ecosystem; **OR**

iii. a measure of disruption to biotic interactions appropriate to the characteristic biota of the ecosystem.

(b) Observed or inferred threatening processes that are likely to cause continuing declines in geographic distribution, environmental quality or biotic interactions within the next 20 years.

		CR	EN	VU
	(c) Ecosystem exists at …	1 location	≤ 5 locations	≤ 10 locations
B2	The number of 10 × 10 km grid cells occupied (Area of Occupancy)	≤ 2	≤ 20	≤ 50

AND at least one of a-c above (same sub-criteria as for B1).

B3	A very small number of locations (generally fewer than 5) **AND** prone to the effects of human activities or stochastic events within a very short time period in an uncertain future, and thus capable of collapse or becoming Critically Endangered within a very short time period (B3 can only lead to a listing as VU).	VU

C. Environmental degradation over ANY of the following time periods:

C1 The past 50 years based on change in an abiotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:

Extent (%)	Relative severity (%) ≥ 80	≥ 50	≥ 30
≥ 80	CR	EN	VU
≥ 50	EN	VU	
≥ 30	VU		

C2 The next 50 years, or any 50-year period including the present and future, based on change in an abiotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:

Extent (%)	≥ 80	≥ 50	≥ 30
≥ 80	CR	EN	VU
≥ 50	EN	VU	
≥ 30	VU		

C3 Since 1750 based on change in an abiotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:

Extent (%)	≥ 90	≥ 70	≥ 50
≥ 90	CR	EN	VU
≥ 70	EN	VU	
≥ 50	VU		

D. Disruption of biotic processes or interactions over ANY of the following time periods:

D1

Extent (%)	Relative severity (%) ≥ 80	≥ 50	≥ 30
≥ 80	CR	EN	VU

Department of Biodiversity, Conservation and Attractions

GOVERNMENT OF WESTERN AUSTRALIA

	The past 50 years based on change in a biotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:	≥ 50	EN	VU	
		≥ 30	VU		
D2	(D2a) The next 50 years, or (D2b) any 50-year period including the present and future, based on change in a biotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table: OR		≥ 80	≥ 50	≥ 30
		≥ 80	CR	EN	VU
		≥ 50	EN	VU	
		≥ 30	VU		
D3	Since 1750, based on a change in a biotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:		≥ 90	≥ 70	≥ 50
		≥ 90	CR	EN	VU
		≥ 70	EN	VU	
		≥ 50	VU		
E. Quantitative analysis					
			CR	EN	VU
	… that estimates the probability of ecosystem collapse to be:		≥ 50% within 50 years	≥ 20% within 50 years	≥ 10% within 100 years