Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

Nomination

Section 1 – Eligibility for Listing

1. Name of the ecological community

'Corymbia calophylla - Kingia australis woodlands on heavy soils' (floristic community type 3a as originally described in Gibson *et al*. (1994)).

2. Listing Category for which the ecological community is nominated

	Western Australia	EPBC Act (wholly or as a component)
Current listing category TEC list under WA Minister ESA list in policy (Please check box)	☒ Critically endangered ☐ Endangered ☐ Vulnerable ☐ Priority 1-4 ☐ Data Deficient ☐ None – not listed	Name: ☐ Critically endangered ☒ Endangered ☐ Vulnerable ☐ None – not listed
Proposed listing category under the *Biodiversity Conservation Act 2016* (Please check box)	☐ Collapsed ☒ CR: Critically endangered ☐ EN: Endangered ☐ VU: Vulnerable ☐ Priority 1-4	
Select one or more of the following criteria under which the community is to be nominated for BC Act listing. (Please check box). For further details on these criteria please refer to the Attachment to this form. The information you provide in Section 3 should support the criteria you select here.	☒ Criterion A – Reduction in geographic distribution (plausible) ☒ Criterion B – Restricted geographic distribution ☐ Criterion C – Environmental degradation based on change in an abiotic variable ☐ Criterion D – Disruption of biotic processes or interactions based on change in a biotic variable ☐ Criterion E – Quantitative analysis that estimates the probability of ecosystem collapse	

Section 2 – Description, Condition, Threats & Recovery

Please answer all the questions, providing references where applicable. If no or insufficient information exists to answer a question, you must indicate this instead of leaving the question blank. The answers may be provided within this form or as attachments, ensuring that responses clearly indicate which question number they refer to.

Classification

3. What is the name of the ecological community?

Note any other names that have been used recently, including where different names apply within different jurisdictions. For example, is it known by separate names in different States or regions?

Corymbia calophylla — Kingia australis woodlands on heavy soils, Swan Coastal Plain (floristic community type 3a as originally described in Gibson *et al.* (1994))

4. What authorities/surveys/studies support or use the name?

The ecological community is referred to as *Corymbia calophylla — Kingia australis* woodlands on heavy soils, Swan Coastal Plain (floristic community type 3a 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.)). It has been recognised since the publication of that report. The community is also known as "floristic community type 3a" (FCT3a) or Swan Coastal Plain type 3a (SCP3a). Endorsement to amend the name of the community from *Eucalyptus calophylla - Kingia australis* woodlands on heavy soils' to *Corymbia calophylla - Kingia australis* woodlands on heavy soils' occurred on the 28th of June, 2018. Data collected from the ecological community is saved in the departmental TEC database.

5. How does the nominated ecological community relate to other ecological communities that occur nearby or that may be similar to it?

Does it intergrade with any other ecological communities and, if so, what are they and how wide are the intergradation zones?
Describe how you might distinguish the ecological community in areas where there is overlap (also see Description section below).

The dominant species in the overstorey vary between the three marri (*Corymbia calophylla)* dominated community types recognised by Gibson *et al.* (1994). The wettest sites are generally dominated by *Corymbia calophylla* and *Kingia australis* (this community); the intermediate group (type 3b) by *Corymbia caloyphylla* and *Eucalyptus marginata*; and the driest group (type 3c) is largely dominated by *Corymbia calophylla* and *Xanthorrhoea preissii*. The mean species richness for ten quadrats in the FCT3a community surveyed by Gibson *et al.* (1994) was 58.9 species in 100 square metres. An average of 3.9 weed species were recorded per plot in the Gibson *et al.* (1994) study. This is lower than in the two other marri dominated communities in the group, and is a relatively low level of weed invasion.frequencies of *Eucalyptus marginata* and a high frequencies of *Corymbia calophylla*, *Kingia australis* and *Pericalymma ellipticum* in quadrats in this type.

Description

6. List the main features that distinguish this ecological community from all other ecological communities.

Characteristic (or diagnostic) features can be biological (e.g. taxa or taxonomic groups of plants and animals characteristic to the community; a type of vegetation or other biotic structure), or associated non-biological landscape characteristics (e.g. soil type or substrate, habitat feature, hydrological feature). Please limit your answer to those features that are specific to the ecological community and can be used to distinguish it from other ecological communities.

This community occurs on the wettest of soils and the highest rainfall sites of the group of Marri communities that occur on the heavy soils on the eastern side of the Swan Coastal Plain (Gibson et al. 1994).

7. Give a description of the biological components of the ecological community.

For instance, what species of plants and animals commonly occur in the community; what is the typical vegetation structure (if relevant).

Typical native taxa in the community are the tree *Corymbia calophylla* (marri), the shrubs *Banksia dallanneyi* (couch honeypot), *Philotheca spicata* (pepper and salt), *Kingia australis* (kingia) and *Xanthorrhoea preissii* (balga); and the herbs, rushes and sedges *Cyathochaeta avenacea, Dampiera linearis* (common dampiera), *Haemodorum laxum, Desmocladus fasciculatus, Mesomelaena tetragona* (semaphore sedge) and *Morelotia octandra*. The introduced grass *Briza maxima* is also common in the community, although weed cover in most occurrences was currently quite low for quadrats recorded in Gibson *et al*. (1994).

8. Give a description of the associated non-biological landscape characteristics or components of the ecological community.

For instance, what is the typical landscape in which the community occurs? Note if it is associated with a particular soil type or substrate; what major climatic variables drive the distribution of the ecological community (e.g. rainfall). Note particular altitudes, latitudes or geographic coordinates

This community occurs on a variety of land units and soil types including; Mogumber South, Southern River, Guildford, Forrestfield, Beermullah, Bassendean central and south, and Abba units. The soils in each occurrence all contain an impervious clay layer that is important in sustaining the soil water relations that support the community.

9. Provide information on the ecological processes by which the biological and non-biological components interact (where known).

The plant assemblage is supported by the habitat features, including the heavy soil substrate, hydrological processes, and pollinators that sustain it.

10. Does the ecological community show any consistent regional or other variation across its extent, such as characteristic differences in species composition or structure?

If so, please describe these.

Gibson *et al* (1994) recorded woodland, low woodland A, open woodland and open low woodland A, low heath D, low scrub A, low scrub B, open scrub and open low scrub A, in quadrats in the community.

11. Does the ecological community provide habitat for any listed threatened species and/or endemic species?

If so, please note the species and whether the species is listed on State and/or national lists and the nature of their dependence on the ecological community.

Ten other WA-listed TECs co-occur or are adjacent to the community. Eleven declared rare flora and 22 priority flora have been identified as occurring within or adjacent to this community. Four threatened fauna, three priority fauna and two additional fauna species with a protected status, are believed to occur in or within the vicinity of this community. Associated species and communities are:

Corymbia calophylla – Xanthorrhoea preissii woodlands and shrublands (community type 3c, Critically Endangered)

Herb rich saline shrublands in clay pans (community type 7, Vulnerable)

Herb rich shrublands in clay pans (community type 8, Vulnerable)

Dense shrublands on clay flats (community type 9, Vulnerable)

Shrublands on dry clay flats and (community type 10a, Endangered)

Banksia attenuata woodlands over species rich dense shrublands (community type 20a, Endangered)

Eastern *Banksia attenuata* and/or *Eucalyptus marginata* woodlands (community type 20b, Endangered). *Corymbia calophylla — Eucalyptus marginata* woodlands on sandy clay soils (community type 3b, vulnerable)

Southern wet shrublands, Swan Coastal Plain (community type 2, vulnerable)

Shrublands and woodlands on Muchea Limestone of the Swan Coastal Plain (Endangered)

Grevillea curviloba (endangered)

Grevillea thelemanniana (critically endangered)

Eucalyptus x balanites (critically endangered)

Synaphea sp. Serpentine (G.R. Brand 103) (critically endangered)

Lepidosperma rostratum (endangered)

Synaphea sp. Pinjarra Plain (A.S. George 17182) (endangered)

Morelotia australiensis (vulnerable)

Synaphea stenoloba (critically endangered)

Diuris purdiei (endangered)

Eleocharis keigheryi (vulnerable)
Conospermum undulatum (vulnerable)

Synaphea odocoileops (Priority 1)
Grevillea bipinnatifida subsp. *pagna* (Priority 1)
Acacia benthamii (Priority 2)
Phyllangium palustre (Priority 2)
Acacia oncinophylla subsp*. oncinophylla* (Priority 3)
Babingtonia urbana (Priority 3)
Schoenus pennisetis (Priority 3)
Schoenus benthamii (Priority 3)
Schoenus capillifolius (Priority 3)
Platysace ramosissima (Priority 3)
Eryngium pinnatifidum subsp. Palustre (Priority 3)
Haemodorum loratum (Priority 3)
Myriophyllum echinatum (Priority 3)
Eryngium sp. Ferox (G.J. Keighery 16034) (Priority 3)
Stylidium longitubum (Priority 4)
Aponogeton hexatepalus (Priority 4)
Drosera occidentalis (Priority 4)
Verticordia lindleyi subsp. lindleyi (Priority 4)
Tripterococcus sp. Brachylobus (A.S. George 14234) (Priority 4)
Ornduffia submerse (Priority 4)
Schoenus natans (Priority 4)
Trithuria australis (Priority 4)

Carnaby's cockatoo (endangered)
Baudin's cockatoo (endangered)
a short-tongued bee (endangered)
Forest red-tailed black cockatoo (vulnerable)
Peregrine falcon (Other Specially Protected)
Caspian Tern (Protected Migratory Bird)
Southern death adder (Priority 3)
Cemetery springtail, Guildford springtail (Priority 3)
Southern brown bandicoot (Priority 4).

12. Identify major studies on the ecological community (authors, dates, title and publishing details where relevant).

Bourke, L. (2017). Hydrological function of the Greater Brixton Street Wetlands: Data sourcing and review. Prepared for the Swan Region by the Wetlands Conservation Program, Science and Conservation Division, Department of Parks and Wildlife, Kensington, Western Australia.

Department of Environment and Conservation (2011). Interim Recovery Plan 2011-2016 for *Corymbia calophylla* - *Kingia australis* woodlands on heavy soil, Swan Coastal Plain. Interim Recovery Plan No. 315. Department of Environment and Conservation, Perth.

V & C Semeniuk Research Group (2001). Hydrological Study of the Greater Brixton Street Wetlands: Report prepared for the Friends of Brixton St Inc.
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Department of Environment and Conservation (2007), Review of Interim Recovery Plan for Floristic Community Type 3a. Unpublished Report to the Department of Water, Heritage, and the Arts. DEC, Perth.

English, V. and Blyth, J. (2000). *Corymbia calophylla - Kingia australis* woodlands on heavy soil (Swan Coastal Plain Community type 3a - Gibson *et al.* 1994) Interim Recovery Plan No. 59 2000-2003. Department of Conservation and Land Management. Perth, Western Australia.

Gibson, N., Keighery, B., Keighery, G., Burbidge, A and Lyons, M. (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.).

Government of Western Australia 2000. *Bush Forever*. Department of Environmental Protection, Perth.

Distribution

13. Describe the distribution across WA and nationally.

State the appropriate bioregions where the ecological community occurs. Attach or provide any maps showing its distribution with details of the source of the maps, or explain how they were created and the datasets used.

The map shows the distribution of the *'Corymbia calophylla - Kingia australis woodlands on heavy soil'* community. The community has a range of 224km, with the southernmost occurrence at Capel River and the northern-most at Bullsbrook. The map is indicative of the high level of the level of fragmentation of occurrences of the community.

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

14. What is the area of distribution of the ecological community?

For answers to parts a, b, c & d: please identify whether any values represent extent of occurrence or area of occupancy (as described in the Attachment); provide details of the source(s) for the estimates and explain how they were calculated and the datasets used.

14 a. What is the current known area (in ha)?

There are 47 records of occurrences currently in the TEC database. Five of these have been cleared and three require further survey. The 39 occurrences with mapped boundaries that are still extant cover a total of 192.6 hectares (as at 23/5/2019).

14 b. What is the pre-industrialisation extent or its former known extent (in ha)? An ecological community is considered to be naturally restricted if it has a pre-industrialisation area of occupancy that is less than 10 000 ha or a pre-industrialisation extent of occurrence that is less than 100 000 ha (refer to the Attachment A)

Floristic community type 3a occurs on Southern River, Guildford, Forrestfield, Beermullah, Bassendean central and south, and Abba soil and landform units. The boundaries of the soil and landform units align directly with the mapping of the vegetation complexes.

The pre-European and current extant of these vegetation complexes are outlined in table 1 (from Government of Western Australia 2019). The reduction in extent of native vegetation on the land units is indicative of the level of clearing of the community. These data provide some indication, only, of the likely decline of the community.

Table 1. Pre-European and current extent of vegetation complexes that FCT3a occurs within.

Vegetation Complex	Swan Coastal Plain (SCP) Pre-European extent (ha)	SCP Current extent (ha)	SCP % remaining
Southern River complex	58780.92	10832.16	18.43
Guilford complex	90513.13	4607.91	5.09
Forrestfield complex	22812.92	2803.36	12.29
Beermullah complex	6707.27	447.21	6.67
Bassendean complex central and south	87476.26	23508.66	26.87
Abba complex	50892.78	3326.20	6.54
Mogumber Complex-South	14821.71	5720.07	38.6

14 c. What is the estimated percentage decline of the ecological community?

As calculated from table 1 above, the extent at which the community has declined since pre-industrialisation, ranges from 73% to 95%. Gibson *et al*. (1994) estimated that the community's distribution had declined by >90% based on their analysis of the level of clearing of vegetation on the geomorphologies and landforms that support the community.

14 d. What data are there to indicate that future changes in distribution may occur?

Several occurrences have been vested as conservation reserves since the recovery plan was updated (DEC 2011). As a result, the threat of clearing has declined but may still represent a threat for occurrences whose purpose is not primarily conservation.

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). Future clearing is more likely to be associated with developments for residential development or infrastructure.. Occurrence 34 (Turner01) has been partially cleared for development, and occurrences 24 and 25 (Yoganup01, 02) are within a mine site. Occurrences that have been cleared recently include occurrence 55 and 58 (Kenwick08, 11), and occurrence 33 (Field01).

Other threatening processes such as weed invasion, dieback caused by *Phytophthora* species, grazing by native or introduced species, hydrological change, salinisation and too frequent fire, also have the potential to impact on the distribution of the community and this is explained for each occurrence in further detail in section 30 and 32. For example, occurrence 13 (MYABERN02), was excluded from the community as it was assessed as completely degraded in 2006 due to weed invasion and overgrazing, and occurrence 35 (MYBRIX_RAIL01) was assessed as completely degraded from weed invasion and too frequent fire.

Patch size

15. What is the typical size (in ha) for a patch of the ecological community (if known)?

Explain how it was calculated and the datasets that are used. Relevant data includes the average patch size, the proportion of patches that are certain sizes, particularly proportions below 10 ha and below 100 ha, (but also below 1 ha and above 100 ha, for example). This could be presented as the range of patch sizes that comprise 90% of the occurrences.

Statistics for the community shows (calculated from the TEC database 02.05.2019) show an average occurrence size of 4.9ha per occurrence (with known boundaries), with mapped patches of the occurrence ranging from 0.2ha to 33.8ha.

Table 2. Statistical summary of SCP3a occurrences

Count	39
Minimum	0.2
Maximum	33.8
Sum	192.6
Mean	4.9
Standard Deviation	7.3

16. Quantify, if possible, the smallest percentage or area required for a patch of the ecological community to be considered viable.

This refers to the minimum size of a remnant that can remain viable without active management. It may be determined through the requirements for dominant native species, level of species diversity, or the nature of invasive weeds.

No minimum size is specified, as future viability will depend on management.

Functionality

17. Is the present distribution of the ecological community severely fragmented?

If so, what are likely causes of fragmentation?
If fragmentation is a natural or positive characteristic of this ecological community, please explain this and state the reason.
Severely fragmented refers to the situation in which increased extinction risk to the ecological community results from most remnants being found in small and relatively isolated patches.

This ecological community is severely fragmented, with almost all the occurrences very close to or surrounded by

highly urbanised areas. The frequency of fires and risk of hydrological impacts are generally increased in urban areas. These factors can all lead to degradation of plant communities through increasing weed invasion and alteration of structure, species composition or loss of component taxa.

18. Has there been a loss or decline of functionally important species?

This refers to native species that are critically important in the processes that sustain or play a major role in the ecological community and whose removal has the potential to precipitate change in community structure or function sufficient to undermine the overall viability of the community.

There are no specific data available in this regard, however it is expected that the diversity and abundance of native species in the community has declined over time as a result of weed invasion, altered fire regimes, hydrological changes, grazing, and the introduction of disease.

18 a. If yes, which species are affected?

The dominant species, *Corymbia calophylla* and *Kingia australis*, have shown to be resistant to dieback disease caused by *Phytophthora* species (Naturemap). A series of taxa that commonly occur in the community are indicated to be susceptible or possibly susceptible to the disease (listed in table 3), and the susceptibility of many species that occur in the community is unknown. The loss of susceptible species will alter the structure and species composition of this community.

Dieback disease has been recorded in occurrences 7 and 23 (BRICK01, 05), occurrences 21 and 22 (FLETCHER02, 01), and some evidence in occurrences 24 and 25 (yoganup01, 02). It may potentially be present in additional occurrences as the disease has not been surveyed in all areas of the community.

Table 3. Known dieback susceptibility of species that commonly occur in FCT3a.

Taxon	**Dieback response**
Allocasuarina humilis	Inferred high susceptibility
Anigozanthos viridis	Inferred variable susceptibility
Astroloma pallidum	Some evidence of moderate susceptibility
Banksia lindleyana	Inferred moderate susceptibility
Dasypogon bromeliifolius	Some evidence of variable susceptibility
Eucalyptus marginata	Good evidence of moderate susceptibility
Grevillea bipinnatifida	Inferred moderate susceptibility
Hakea ceratophylla	Inferred variable susceptibility
Hakea lissocarpha	Some evidence of variable susceptibility
Hakea prostrata	Inferred variable susceptibility
Hakea varia	Some evidence of moderate susceptibility
Patersonia occidentalis	Inferred moderate susceptibility
Petrophile serruriae	Inferred variable susceptibility
Trymalium odoratissimum Lindl. subsp. *odoratissimum*	Some evidence of variable susceptibility
Xanthorrhoea preissii	Good evidence of high susceptibility

Corymbia calophylla and *Kingia australis* form the upper stratum/structural layer, that provides shade protection and helps control humidity to assist survival of a diverse range of understorey species. There are no specific data addressing the extent of decline associated with the impact of various threats.

Reduction in community integrity

19. Please describe any processes that have resulted in a reduction in integrity and the consequences of these processes, e.g. loss of understorey in a woodland. Include any available information on the rate of these changes.

This recognises that an ecological community can be threatened with extinction through on-going modifications that do not necessarily lead to total destruction of all elements of the community. Changes in integrity can be measured by comparison with a benchmark state that reflects as closely as possible the natural condition of the community with respect to the composition and arrangement of its abiotic and biotic elements and the processes that sustain them. Please provide a description of the benchmark state where available. For further information please refer to the Guidelines.

Dieback disease affects dieback susceptible species, palatable species are impacted by grazing, and weeds compete with various species in the community. There are no specific data about the rate of the rate of decline of the community as a consequence of these processes.

Survey and Monitoring

20. Has the ecological community been reasonably well surveyed?

Provide an overview of surveys to date, including coverage of different land tenure, and the likelihood of the ecological community's current known distribution and/or patch size being a true reflection of its actual distribution (consider area of occupancy and area of extent, including any data on number and size of patches).

A combination of 12 years survey of the Swan Coastal Plain was completed for the surveys mentioned below:

- Gibson *et al.* (1994). A floristic survey of the southern Swan Coastal Plain (509 quadrats established during 3 years survey of Swan Coastal Plain)
- Government of WA (2000). Directory of Bush Forever Sites Volume 2 (~1000 additional quadrats established and analysed 1994-1998 by B. Keighery and other Department of Environmental Protection staff).

Since 1994 environmental consultants, DBCA staff from Species and Communities Program and district and regional DBCA staff and other groups and individuals have identified additional occurrences that were not known in 1994.

Table 4. Recent surveys and status of occurrences of FCT3a extracted from the DBCA corporate TEC database.

FID	Occurrence No.	Site ID	Area (Ha)	No. of quadrats in occurrence / statistical report	Year of latest condition survey	Condition	Land manager
0	60	CHITTERING PLOT1	2.27	1 (Griffin 2012)	2013	100% excellent	City of Swan
1	21	FLETCHER02	3.97	1 (Griffin 2012)	2002	70% excellent and 30% completely degraded	City of Armadale
2	2	LAMB01	5.41	2 Identified in Bush Forever. Site no. 264	2012	95% excellent and 5% degraded	DBCA
3	14	MYABERN03	1.81	Inferred in Bush Forever. Site no. 65	2000	100% very good	DPLH

4	5	MUD04	2.31	2 Identified in Bush Forever. Site no. 360	2014	50% excellent and 50% very good	Shire of Serpentine Jarrahdale
5	62	FHALL01	0.44	1 (Griffin 2012)	2010	40% excellent, 40% very good and 20% good	DBCA/PTA
6	10	PUNR02	1.77	1 (DEP, 1996)	2010	100% excellent	DPLH
7	9	PIND01	1.36	1 (DEP, 1996)	2014	100% excellent	Shire of Murray
8	19	WARO06	33.83	1 (DEP, 1996)	2012	95% excellent and 5% very good	Shire of Waroona
9	32	WARO07	9.21		2012	90% excellent and 10% very good	Shire of Waroona
10	25	yoganup02	1.76		2003	100% good	Private
11	24	yoganup01	2.13		2003	100% good	Private
12	20	davies03	6.14		2003	90% excellent and 10% good	DPLH
13	23	BRICK05	26.70	1 Gibson *et al* (1994)	2012	95% excellent and 5% good	Private/Shire of Serpentine Jarrahdale
14	22	FLETCHER01	3.56	1 (Griffin 2012)	2002	90% excellent and 10% very good	PTA/City of Armadale
15	7	BRICK01	13.40	2 Keighery *et al* (2012).	2012	95% excellent and 5% good	Shire of Serpentine Jarrahdale
16	3	BRIX02	0.86	2 Keighery *et al* (2012).	2013	95% excellent and 5% very good	DBCA
17	30	BRIX09	0.73		1995	90% excellent and 10% very good	DBCA/DPLH
18	31	BRIX10	0.30		1995	90% excellent and 10% very good	DBCA
19	12	MYABERN01	0.64	Inferred in Bush	2006	100% degraded	DPLH

				Forever. Site no. 65			
20	27	BRIX06	0.25		1995	90% excellent and 10% very good	DBCA
21	28	BRIX07	0.41		1995	90% excellent and 10% very good	DBCA
22	29	BRIX08	0.27		1995	90% excellent and 10% very good	DBCA
23	8	dundas02	9.65	2 Keighery *et al*. (2012)	2009	90% excellent and 10% good	FESA/Western Power
24	34	Turner01	0.35	3 releves (Cardno 2008)	2008	70% excellent, 15% completely degraded, 10% good and 5% very good	PTA
25	39	CoolupGun05	1.62	1 (Requires further analysis)	2011	50% very good and 50% excellent	Shire of Murray
26	44	TALBNTH16	1.49	1 (Griffin 2012)	2017	90% very good and 10% good	DBCA
27	45	RoeHwy01	1.32		2012	100% very good	Main Roads WA
28	37	VICTORIA19	1.75	1 (Tauss and Weston 2010)	2007	100% very good	Private
29	38	VICTORIA28	0.28	1 (Tauss and Weston 2010)	2018	40% degraded, 25% completely degraded, 20% very good and 15% excellent	Private
31	40	PINJ01	1.12	1 (Ekologica 2007)	2007	100% very good	Shire of Murray
32	53	Pinjrail01	5.17	1 (Griffin 2012)	2011	No condition survey	PTA
33	66	BYFrail04	6.39	1 (Griffin 2014)	2011	100% excellent	PTA

34	54	WATKINS04	16.89	2 (Griffin 2012)	2013	90% excellent and 10% very good	DBCA
35	64	Fairbridge03	7.32	1	2013	100% excellent	Private
36	67	Fairbridge04	14.62	1	2013	100% excellent	Private
37	63	Fairbridge01	1.78		2013	100% good	Private
39	36	BRENTWD12	0.65	1 (Tauss and Weston 2010)	2017	30% excellent, 50% good and 20% completely degraded	Private
40	68	BYFrail01	2.62	1 (Griffin 2012)	2013	40% excellent, 30% very good and 30% good	Shire of Serpentine-Jarrahdale/UCL/Private

21. Where possible, please indicate areas that haven't been surveyed but may add to the information required in determining the community's overall viability and quality.

Include commentary on issues to do with accessing different land tenures within the area of distribution, including private property, and the likelihood that these areas may include occurrences.

Occurrence 5 (MUD04) – Requires survey of *Casuarina obesa* association recorded from within mapped boundary (at corner of Kargotich Rd and Mundijong Rd).

Occurrence 41 (MUNJOVA01) - Site species data not analysed – data considered preliminary.

Occurrence 42 (CoolupGun01) - Another quadrat in nearby vegetation may be required as analyses not conclusive (Griffin, 2012).

Occurrence 53 (Pinjrail01) – No detailed survey data

Occurrence 59 (RUAB01_Webb) - In lieu of further survey information should be considered an example of SCP3a ([1] [redacted] personal communication).

Occurrence 24 and 25 (Yoganup01, 02) – Evidence of dieback and needs further survey (active mine, access difficult)

22. Is there an ongoing monitoring program? If so, please describe the extent and length of the program.

Specific monitoring plans and actions, completed and planned, are detailed for each occurrence in sections 38, 39b and 40.

Condition Classes and Thresholds

23. Do you think condition classes/thresholds apply to this ecological community? If not, give reasons.

[1] [redacted] DBCA South West Region

The Committee recognises that ecological communities can exist in various condition states. In reaching its decision the Committee uses condition classes and/or thresholds to determine the patches that are included or excluded from the listed ecological community (see the Guidelines for details of the process of determining condition classes). Relevant here is recognition of different states following disturbance and the natural recovery of the occurrence towards a higher condition class.

The minimum viable condition for this community to be considered viable is Good condition. This refers to a patch in which "Vegetation structure altered but retains basic vegetation structure or ability to regenerate it. Obvious signs of disturbance, e.g. from partial clearing, dieback, logging, grazing. Presence of very aggressive weeds." (Keighery (1994) Vegetation Condition Scale (Government of WA, 2000)). No minimum patch size is specified, as future viability will depend on management. Very small areas are known to be able to maintain their condition if they are subject to very minimal disturbance.

24. If so, how much of the community would you describe as in relatively <u>good condition</u>,
i.e. likely to persist into the long-term with minimal management?

WA condition categories 'Very Good to Pristine' as below (see Table 5 below) are considered to be in good condition, so therefore 173.5 ha or 93% of occurrences with known condition are considered to be in good condition, and contain high native plant species diversity, maintain integrity of vegetation structure, and minimal cover of weed species. All occurrences that are in rural areas are subject to the ongoing pressures/disturbances associated with proposed clearing and agriculture, and all require substantial management to protect from pressures such as spread of introduced species.

Table 5. Known vegetation condition of 38 occurrences of '*Corymbia calophylla - Kingia australis* woodlands on heavy soil' for which condition is recorded

Condition Ranking (Keighery 1994 in Government of Western Australia 2000)	**Hectares**
Pristine	0
Excellent	159.0
Very Good	14.5
Good	9.9
Degraded	0.4
Completely degraded	2.1
Total	187.4

25. What features or variables do you consider to be most valuable for identifying a patch of the ecological community in relatively <u>good condition</u>?

Variables for establishing the highest condition class may include: patch size; connectivity; native plant species composition; diversity and cover (for example in overstorey; mid-shrub and/or understorey layers); recognised faunal values; and cover of weeds or other invasive species.

See section 26.

This includes vegetation ranging from 'Pristine' - with no obvious signs of disturbance and native plant species diversity fully retained or almost so, zero or almost so weed cover/abundance, to 'Excellent' - Vegetation structure intact, with disturbance only affecting individual species, weeds are non-aggressive species, and the area contains high native plant species diversity, with less than 10% weed cover, and 'Very Good' - Vegetation structure altered, obvious signs of disturbance eg: from repeated fires, dieback, logging, grazing, aggressive weeds are present, with moderate native plant species diversity, and typical weed cover is less than 20% (5 – 20%).

26. How much of the community would you describe as in relatively <u>medium condition</u>, i.e. likely to persist into the long-term future with management?

Medium condition relates to WA condition categories 'Very Good to Good' as below (see below and Table 5 above) are considered to be in medium condition, so therefore 9.9 ha or 5% of occurrences with known condition are considered to be in medium condition, and contain medium plant species diversity, reduced of vegetation structure, and a medium level of weed/introduced species cover.

^This includes vegetation ranging from 'Very Good-Good' and '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, logging, grazing, and very aggressive weeds are present, with low native plant diversity (5 – 50%).

27. Please describe how you would identify areas in <u>medium condition</u> using one or a combination of indicators such as species diversity, structure, remnant size, cover of weeds or other invasive species, etc.

See section 28.

28. How much of the community would you describe as in relatively <u>poor condition</u>, i.e. unlikely to be recoverable with active management?

For the purposes of relating condition to IUCN Criteria, poor condition in this instance relates to WA condition categories 'Degraded' and 'Completely Degraded', (see below and Table 5 above), so 2.5 ha or 1% of occurrences with known condition are considered to be in poor condition.

Poor condition is considered to be that containing minimal native flora, presence of aggressive weeds, and evidence of high level disturbance.

^ This includes vegetation ranging from 'Degraded' - basic vegetation structure severely impacted by disturbance, the vegetation requires intensive management, and disturbance such as partial clearing, dieback, logging and grazing are present, very aggressive weeds are present at high density, and very low native plant species diversity is observed (20 – 70%) to 'Completely Degraded' where vegetation structure is no longer intact and the area is completely or almost completely without native flora, also referred to also as 'parkland cleared', with very low to no native species diversity (weed species greater than 70%).

29. Please describe how you would identify areas in <u>poor condition</u> using one or a combination of indicators such as species diversity, structure, remnant size, cover of weeds or other invasive species, etc.

See section 30.

Threats

Note: If you plan to identify <u>climate change</u> as a threat to the ecological community, please refer to the Guidelines for information on how this should be addressed.

30. Identify <u>PAST</u> threats to the ecological community indicating whether they are *actual* or *potential*.

Clearing

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 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). Occurrences that have been cleared

include occurrence 13 (MYABERN02), occurrences 55 and 58 (Kenwick08,11), occurrence 33 (Field01) and occurrence 35 (MYBRIX_RAIL01).

Altered fire regimes

Mediterranean ecosystems are usually fire responsive and may require a particular fire regime to assist regeneration (Abbot and Burrows 2003). It is likely that the burning regime in the remnants that contain the community has been modified to more frequent fires, especially hot burns, since European settlement. Many of the occurrences have been burnt recently. Fires have recently burnt through occurrences 7 and 23 (BRICK01, 05), close to or within occurrence 5 (MUD04), occurrences 3, 27, 28, 29, 30 and 31 (BRIX02, 06, 07, 08, 09, 10), and at occurrence 10 (PUNR02).

Grazing

Some occurrences of the community such as occurrences 20, 24 and 25 (davies03, Yoganup02, 01) have been grazed historically. The significance of the impact of grazing has not been quantified through monitoring. Grazing by stock results in impacts to palatable species, with the associated alterations to the species composition, and weed invasion.

Weed invasion

Disturbances such as fires and grazing can predispose areas to weed invasion if weed propagules are present. All of the occurrences of this community are close to weed sources such as urban or agricultural areas and would be vulnerable to weed invasion following any disturbance. Small remnants can exhibit surprising resistance to weed invasion particularly if left undisturbed (Keighery 1996). In this community such resistance relates to the density of cover, and can relate to the hardness of the soils in summer. Alteration of these factors reduces the ability to resist weed invasion (Keighery 1996). Weeds have invaded to varying extents along tracks through occurrences. Occurrences that are currently highly impacted by weeds are; occurrence 5 (MUD04), occurrences 12 and 14 (MYABERN01, 03), and occurrence 63 (Fairbridge01). Other occurrences that are at risk from aggressive weed invasion include occurrence 66 (BYFrail04), due to disturbances associated with road and maintenance, and occurrence 38 (VICTORIA28), located on private land with housing and industrial properties on adjacent land. Occurrence 13 (MYABERN02), was excluded from this community as it was severely degraded as at 2006 by weed invasion and overgrazing, and occurrence 35 (MYBRIX_RAIL01) is completely degraded from weed invasion and too frequent fire.

Hydrological changes

The hydrology of specific areas of the eastern side of the Swan Coastal Plain has been altered through the construction of drains to lower the water-table (Keighery and Trudgen 1992). The area is characterised by much valued heavy soils, which were historically highly cleared for agriculture. Despite a likely increase in runoff and recharge of the groundwater resulting from this clearing, drainage has probably resulted in an overall lowering of the watertable in localised areas ([redacted][2] personal communication). Altered surface flow and/or alteration of the height of the local watertable may change the seasonality of wetting and drying. In some areas, groundwater is very close to the surface in occurrences. Occurrences that are at a future risk due to hydrological change are noted in section 32.

Salinisation

Salinity levels of around 250 to over 2,000 milligrams per litre total dissolved salts (mg/L total dissolved salts - TDS) have been recorded for the superficial aquifers where the community occurs (Davidson 1995). Levels of over 2,000

[2] [redacted], Department of Environmental and Conservation.

mg/L TDS were recorded for the shallow Leederville aquifer in the area of occurrences 3, 27, 28, 29, 30, 31 (Brixton Street reserve) and occurrence 5 (MUD04). In these areas, Guildford clay soils inhibit the infiltration of rainfall and cause concentration of salts by evaporation (Davidson 1995). Water with a TDS of less than 3000 mg/L is considered fresh water.

31. Identify CURRENT threats to the ecological community indicating whether they are *actual* or *potential*.

See above

32. Identify FUTURE threats to the ecological community indicating whether they are *actual* or *potential*.

All past and current threats continue to be a future threat.

Clearing

Future clearing is likely to be associated with developments for housing or infrastructure. Occurrence 34 (Turner01) has been partially cleared for development, and Occurrences 24 and 25 (Yoganup01, 02) are within a mine site.

Introduction of Disease

Dieback disease caused by *Phytophthora* species has the potential to impact the community, although it is not known if the community is particularly susceptible to the disease. Plant communities that occur on heavy soils such as this one, especially in relatively flat areas, are generally not highly susceptible to *Phytophthora* (Helyar 1994). As mentioned previously, the dominant species, *Corymbia calophylla* and *Kingia australis*, are resistant to dieback (Naturemap). A series of taxa that commonly occur in the community are susceptible or may be susceptible to the disease (listed in table 3), and the susceptibility of many species in the community is not known. Dieback disease may potentially be present in additional occurrences as not all locations of the community have been surveyed for the pathogen, as shown in table 6.

Phytophthora dieback assessments have been undertaken for 17 occurrences. In 2012, a full *Phytophthora* dieback interpretation was completed for Fletcher Park (Figure 1) (DEC 2012). As there was a widespread infestation of the entire park, it is assumed 100% of FLETCHER02 is infested with dieback. The vegetation of Brickwood Reserve was mapped for dieback in 2000 (Glevan Dieback Consultancy Services 2000). As reported in the Brickwood management plan for Serpentine-Jarrahdale, the northern portion of the reserve is 100% infested with dieback and the southern portion is more than 50% infested with dieback (figure 2). Therefore, 100% of BRICK05 and approximately 50% of BRICK01, are infested with dieback. There was reported evidence of dieback in occurrences yoganup01 and 02 (Hart, Simpson and Associates Pty Ltd 1997), however, this has not been mapped. Occurrences assessed for dieback that were not infested include, LAMB01, MUD04, BRIX02, 06, 07, 08, 09, 10 and CHITTERING PLOT1. The dieback status of occurrences FHALL01 and MYABERN01 and 03 is uncertain.

Table 6. Dieback presence in occurrences of FCT3a.

Occ. No.	Site ID	Assessed	Result
2	LAMB01	y	Dieback free
3, 27, 28, 29, 30, 31	BRIX02, 06, 07, 08, 09, 10	y	Dieback free
5	MUD04	y	Dieback free
7, 23	BRICK01, 05	y	Dieback present (Glevan Dieback Consultancy Services 2000)

8	dundas02	n	
9	PIND01	n	
10	PUNR02	n	
12, 14	MYABERN01, 03	y	Report not located
19	WARO06	n	
20	davies03	n	
21	FLETCHER02	y	Dieback present (DEC 2012)
22	FLETCHER01	n	
24, 25	yoganup01, 02	y (not mapped)	Evidence of dieback (Hart, Simpson and Associates Pty Ltd, 1997)
32	WARO07	n	
34	Turner01	n	
36	BRENTWD12	n	
37, 38	VICTORIA19, 28	n	
39	CoolupGun05	n	
40	PINJ01	n	
44	TALBNTH16	n	
45	RoeHwy01	n	
53	Pinjrail01	n	
54	WATKINS04	n	
60	CHITTERING PLOT1	y	Dieback free
62	FHALL01	y	Report not located
63	Fairbridge01	n	
64	Fairbridge03	n	
66, 68	BYFrail04, BYFrial01	n	
67	Fairbridge04	n	

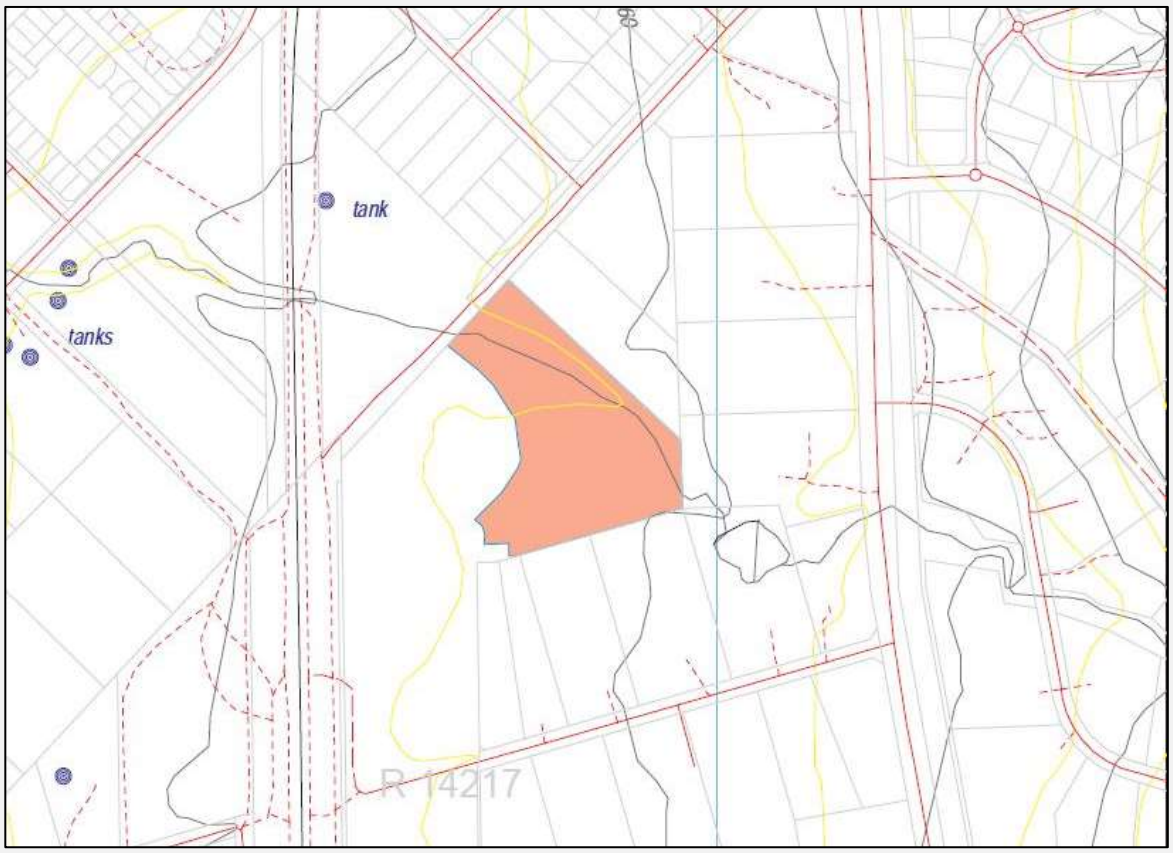

Figure 1. Dieback infection in Fletcher Park (includes occurrence FLETCHER02). Pink represents those areas infested, green represents those areas where there was no infestation, and no colour within the perimeter of reserve represents areas not able to be mapped at the time (DBCA 2018).

Figure 2. Dieback infection in Brickwood Reserve (includes occurrences BRICK01 and 05). Green hatching represents areas of vegetation that are dieback free, green stars and red represent vegetation that are dieback infested (Serpentine Jarrahdale Shire 2009).

Marri canker, caused by a native fungus, *Quambalaria coyrecup*, which 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. Infected trees appear to be non-recoverable with attempts to contain the pathogen by callus production ultimately circumvented by the pathogen (Lamond 2009; Paap *et al*. 2017).

Hydrological change

Available hydrological and floristic data indicates that this community is a wetland and that groundwater is likely to be generally less than 3m below the surface in occurrences of the community. This is supported by static groundwater data from Department of Water's Groundwater Information System. These data indicate groundwater was generally within 3m of the natural ground surface for bores located close to occurrences of the community when the bores were drilled. The static water levels can provide a rough guide to the dependence of the community on groundwater, hence likely susceptibility to change (shown in table 7). Froend *et al*. (2004) notes that wetlands on the Gnangara mound where the groundwater is within 0-3m of natural ground surface are highly susceptible to changes in groundwater levels and would be considered to be highly groundwater dependent. Froend *et al*. (2004) also noted that for wetlands for which groundwater is within 0-3m of surface, a historic change in groundwater level of <0.25m is regarded as low risk, a change of between 0.25m and 0.5m is

moderate risk, and a change of >0.5m results in high risk of impact to the wetlands. The level of applicability of these concepts for vegetation on heavier soils requires investigation.

There are no monitoring bores located within occurrences of the *Banksia attenuata* and/or *Eucalyptus marginata* woodlands, but there are a series of bores located very close to the community, including one within 100m. Monitoring bore data were available for occurrences 40 (PINJ01), 39 (Coolupgun05) and occurrence 53 (Pinjrail01). The data indicate groundwater levels are relatively stable but declining at a slow rate (Figure 3, and 5). The level of groundwater dependence of the community has not been investigated, but some level of dependence is assumed. Based on this the hydrographs show these occurrences do not currently face an immediate threat, or major threat of collapse associated with groundwater decline in the next 50 years (figures 4, 5). Occurrences 20, 24 and 25 (Davies03, Yoganup01, 02) may potentially be threatened by dewatering from mining activities that are occurring nearby or immediately adjacent.

Table 7. Hydrology data indicating potential risk to occurrences of the SCP3a

Occurrence No. and Site ID	**Depth to groundwater-(static m below ground) from DoW - Groundwater - Water Information System (WIN)**	**Relative risk of change to groundwater levels (based on Froend *et al*. 2004)**
Occurrence 8 (Dundas02)	2.12m (on 8 Aug 1995, bore located within Occ)	High
Occurrences 3 and 27-31 (Brix02, 06, 07, 08, 09, 10)	1.52m (bore 130m NE of occ) on 9 Oct 1976	High
Occurrence 2, 21 and 22 (Lamb01, Fletcher02, 01)	3.05m (bore 230m NE of Fletcher Park occ – date unknown). 1.22m (bore 75m west of Lambert Lane occ - date unknown).	High-Moderate
Occurrence 12 and 14 (MyAbern01, 03)	0.3m (bore 30m east of occ – date unknown)	High
Occurrence 7 and 23 (Brick01, 05)	2.4m (bore 50m west of occ - date unknown). 22m (bore 20m south of Occ on 11 Nov 1989)	High
Occurrence 5 (MUD04)	3m (in bore 150m east of occ on 15 April 1998)	High
Occurrence 10 (Punr02)	1.52m (in bore 170m NW of occ on unknown date)	High
Occurrence 34 (Turner 01)	4.75m (in bore 180m NW of occ, unknown date)	Moderate
Occurrence 9 and 40 (Pind01, PINJ01)	2.02m (in bore 130m NW of occ on 28 June 2012)	High
Occurrence 62 (FHALL01)	3.52m (in bore 80m SE of occ on 29 September 1998)	Moderate

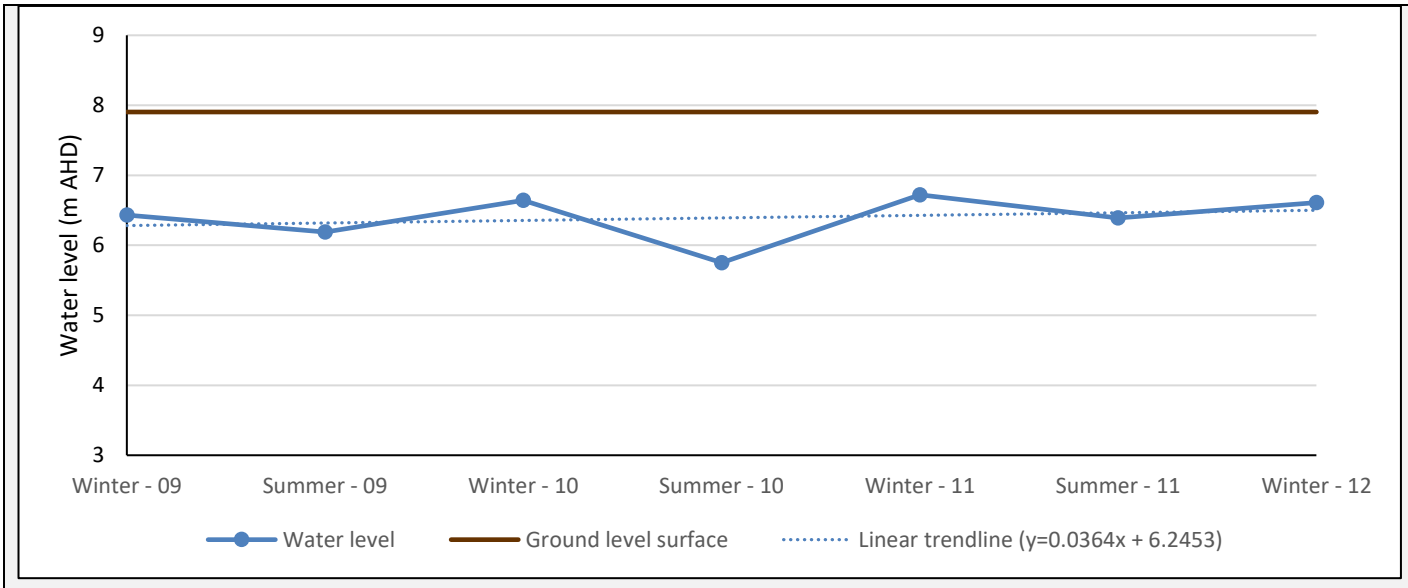

Figure 3. Hydrograph of monitoring bore located 50m west of occurrence 40 (PINJ01) (site ref: 61410657) in reserve 34033, sampling the superficial Swan aquifer. Brown line represents ground surface level and blue line represents groundwater levels (Department of Water and Environmental Regulation ((DWER) 2019)).

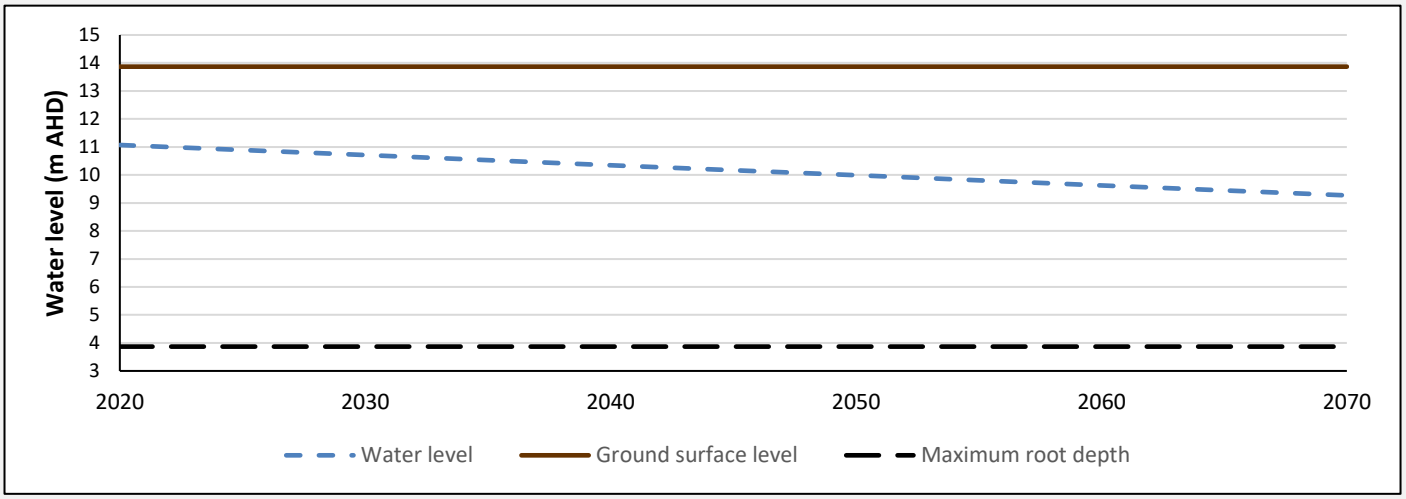

Figure 4. A 50-year forecast of groundwater level decline at occurrences Coolupgun05 (39) (site ref: 61330076) calculated using the trendline (y=-0.003x + 12.225) (DWER 2019).

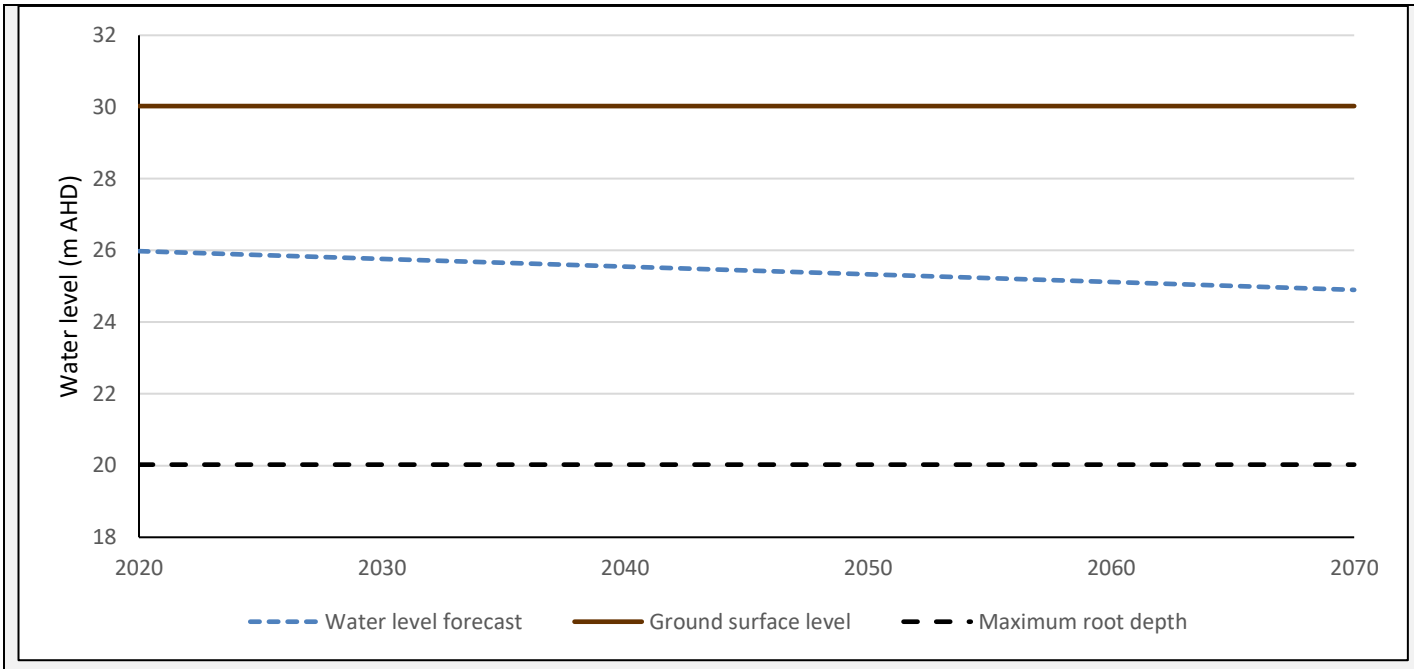

Figure 5. A 50-year forecast of groundwater level decline at occurrence Pinjrail01 (53) (site ref: 61430006) calculated using the trendline (y=-0.0018x + 26.664) (DWER 2019).

Salinisation

There are no monitoring data for levels of salinity in the community so the level of threat to the community posed by salinisation is not known. Occurrences may be under threat in future if water-tables rise or if levels of surface water increase as a result of urbanisation or other causes.

For <u>each</u> threat describe:

32 a. How the threat has impacted on this ecological community in the past.

See section 32

32 b. What its expected effects are in the future. Include or reference supporting research or information.

1. Clearing of vegetation - Areas of the community may be subject to future clearing proposals for various uses including infrastructure. Clearing adjacent to or within the community also exacerbates weed invasion along the disturbance interface.
2. Grazing – Some occurrences are likely to be subject to ongoing grazing by feral animals including rabbits. grazing causes alterations to the species composition by selective grazing of edible species, the introduction of weeds and nutrients, and trampling and general disturbance.
3. Weeds- Weed invasion is likely to be ongoing in most occurrences, in particular those subject to disturbances such as too frequent fire, grazing or partial clearing. 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.
4. Fire – occurrences that are close to urban areas are likely to be subject to an ongoing heightened risk of fire. In addition, fire risk 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. Too frequent fire can increase the risk of invasive weeds establishing within small bushland remnants such as this community (Abbot and Burrows 2003). Altered fire regimes can also result in altered structure and composition.

5. Hydrological impacts – occurrences close to developed areas or infrastructure are likely to be subject to ongoing heightened risk of altered hydrology through changes to local drainage patterns. In addition, the drying climate is likely to result in gradual changes to composition associated with terrestrialisation of these wetlands over time. Altered surface flow and/or alteration of the height of the local water table may change the seasonality of local hydrological processes resulting in altered structure and composition of the community.

32 c. Identify whether the threat only affects certain portions or occurrences. Give Details.

Occurrences near urbanised areas are more likely to be affected by a series of threats, especially occurrences on private land such as; occurrences 20, 24 and 25 (Yoganup01, 02 and davies03), occurrences 63, 64 and 67 (Fairbridge01, 03, 04), occurrence 36 (BRENTWD12), occurrences 37 and 38 (VICTORIA19, 28). Aside from land clearing, edge effects and recreational activity increases the risk and frequency of weed invasion and fire. There is a higher risk of hydrological change in occurrences 20, 24 and 25 (davies03 yoganup01, 02) located within a mine site, that may be affected by groundwater drawdown or other alterations to drainage patterns.

33. Identify any natural catastrophic event/s

Explain its likely impact and indicate the likelihood of it occurring (e.g. a drought/fire in the area every 100 years). Catastrophic events are those with a low predictability that are likely to severely affect the ecological community.

The incidence of more frequent and intense fires in Western Australia is likely to be associated with drying climate in the south west of the state (Australian Government Department of Climate Change and Energy Efficiency Fact Sheet). Projections indicate that the annual average number of days above 35°C in Perth could increase from the 28 currently experienced to up to 67 days by 2070 based on current emission scenarios. Projections also indicate an increase in the intensity and frequency of bushfires. The 2010-11 WA bushfire season was one of the most devastating and destructive in the state's history, and followed the driest winter on record.

34. Additional biological characteristics

Identify and explain any additional biological characteristics particular to the community or species within it that are threatening to its survival (e.g. low genetic diversity). Identify and explain any models addressing survival or particular features.

35 a. How does it respond to disturbance?

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 communities. Too frequent fire can increase the risk of invasive weeds establishing within small bushland remnants such as this community (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 European settlement.

35 b. How long does it take to regenerate and/or recover?

The juvenile period of many species that occur in the community is listed in table 8. Although the juvenile periods of many taxa is not known (not included in table), the data in table 8 can be used as a guide. Burrows *et al.* (2008) recommend a minimum period between fires that are lethal to fire-sensitive plants (obligate seeders with long juvenile periods) of at least twice the juvenile period of the slowest maturing species. That is, the juvenile period of plant taxa that are killed by fire and only reproduce from seed can be used as a guide to determine minimum inter-fire intervals. In fire sensitive habitats, this may be increased to 3-4 times the juvenile period for fire sensitive species (Barrett *et al.* 2009). In this case*, Hakea trifurcata* and *Petrophile serruriae* are serotinous species that are killed by fire and reproduce only from seed. The juvenile period of these two taxa is 48 months, therefore a minimum inter-fire period of eight years, and up to 16 years would be recommended for occurrences that contain these species. The juvenile period for other taxa in the community is also quite long. For example, although *Regelia ciliata* and *Melaleuca scabra* survive fire, they have a juvenile period of 60 and 72 months respectively. These long juvenile periods should also be taken into account when designing appropriate fire regimes for this community.

Table 8. Known juvenile periods and longevity of plants recorded from at least 50% of plots in occurrences of SCP3a (Sourced from Naturemap)

Taxon	Months to first flowering	Longevity
Acacia lasiocarpa var. *bracteolata*	36	Perennial
Acacia pulchella	24	Perennial
Acacia stenoptera	36	Perennial
Actinotus leucocephalus	12	Perennial
Allocasuarina humilis	36	Perennial
Amphipogon debilis	12	
Anigozanthos viridis	36	
Asteridea pulverulenta	12	Annual
Astroloma pallidum	24	
Babingtonia camphorosmae	6	Perennial
Banksia dallanneyi	48	Perennial
Burchardia multiflora	12	
Caladenia ferruginea	9	Perennial
Caladenia huegelii	9	Perennial
Calytrix flavescens	30	Perennial
Calytrix fraseri	36	Perennial
Chamaescilla corymbosa	7	Perennial
Conostylis aculeata	32	Perennial
Conostylis setigera	24	Perennial
Corymbia calophylla	48	Perennial
Cyathochaeta avenacea	6	Perennial
Dampiera linearis	24	Perennial
Dasypogon bromeliifolius	6	Perennial
Daviesia decurrens	18	Perennial
Dianella revoluta	36	Perennial
Drosera erythrorhiza	11	Perennial
Drosera gigantea	10	Perennial
Eucalyptus marginata	48	Perennial
Eucalyptus todtiana	48	Perennial
Eucalyptus wandoo	48	Perennial
Eremaea pauciflora	48	Perennial
Eutaxia virgata	24	Perennial

Gompholobium aristatum	24	Perennial
Gompholobium knightianum	21	Perennial
Gompholobium polymorphum	10	Perennial
Gompholobium tomentosum	31	Perennial
Grevillea bipinnatifida	24	Perennial
Haemodorum laxum	6	Perennial
Haemodorum simplex	8	Perennial
Hakea ceratophylla	24	Perennial
Hakea lissocarpha	29	Perennial
Hakea prostrata	36	Perennial
Hakea trifurcata	48	Perennial
Hakea undulata	29	Perennial
Hakea varia	24	Perennial
Hibbertia hypericoides	22	Perennial
Hyalosperma cotula	12	Annual
Jacksonia furcellata	12	Perennial
Jacksonia floribunda	24	Perennial
Johnsonia pubescens	24	Perennial
Kingia australis	2	
Kunzea micrantha	36	Perennial
Lepidosperma angustatum	26	Perennial
Lepidosperma squamatum	22	Perennial
Lomandra preissii	12	Perennial
Lyginia barbata	21	Perennial
Melaleuca incana subsp. *incana*	33	Perennial
Melaleuca preissiana	24	Perennial
Melaleuca trichophylla	72	Perennial
Mesomelaena tetragona	22	Perennial
Neurachne alopecuroidea	13	Perennial
Nuytsia floribunda	24	Perennial
Patersonia occidentalis	36	Perennial
Pericalymma ellipticum	22	Perennial
Petrophile serruriae	48	Perennial
Phlebocarya ciliata	18	Perennial
Podolepis gracilis	12	Annual
Regelia ciliata	60	Perennial
Schoenus grandiflorus	12	Perennial
Siloxerus filifolius	12	Annual
Sowerbaea laxiflora	7	Perennial
Stirlingia latifolia	24	Perennial
Stylidium brunonianum	12	Perennial
Stylidium calcaratum	7	Ephemeral
Morelotia octandra	12	Perennial
Thysanotus manglesianus	6	Perennial
Thysanotus multiflorus	12	Perennial
Thysanotus sparteus	12	Perennial
Tricoryne elatior	24	Perennial
Trymalium odoratissimum Lindl. subsp. odoratissimum	27	Perennial

Verticordia densiflora	30	Perennial
Xanthorrhoea drummondii	6	Perennial
Xanthorrhoea preissii	9	Perennial
Xanthosia huegelii	32	Perennial

Threat Abatement and Recovery

36. Identify key management documentation available for the ecological community, e.g. recovery plans, biodiversity management programmes, or site specific management plans (e.g. for a reserve).

- Bourke, L. (2017). Hydrological function of the Greater Brixton Street Wetlands: Data sourcing and review. Prepared for the Swan Region by the Wetlands Conservation Program, Science and Conservation Division, Department of Parks and Wildlife, Kensington, Western Australia.
- Brown, K. and Clarke, V. (2009). Weed control within Brixton Street Wetlands Herb Rich Shrublands in Clay Pans (FCT 8) Threatened Ecological Community. Unpublished report prepared for Significant Native Species and Ecological Communities – Resource Condition Monitoring Project. DEC, Perth.
- Department of Environment and Conservation (2011). Interim Recovery Plan 2011-2016 for *Corymbia calophylla - Kingia australis* woodlands on heavy soil, Swan Coastal Plain. Interim Recovery Plan No. 315. Department of Environment and Conservation, Perth.
- Keighery, B. (1995). Knowing and Managing the Brixton Street Wetlands. Report compiled for the Friends of Brixton Steet Wetlands and the Perth Branch of the Wildflower Society of Western Australia (Inc.), in cooperation with the Department of Conservation and Land Management.
- Papenfus, D. (2004). Mundijong Road Reserve and Duckpond Reserve: management plan 2004-2009. Edited by R. Luu, V. English and S. Osborne. Report prepared for the Department of Conservation and Land Management and Shire of Serpentine Jarrahdale. Perth, Western Australia
- Serpentine Jarrahdale Shire (2009). Draft Brickwood Reserve and Briggs Park Management Plan. Shire of Serpentine Jarrahdale, Western Australia.
- Serpentine Jarrahdale Shire (2016). Brickwood Reserve and Briggs Park Management Plan. Shire of Serpentine Jarrahdale, Western Australia.
- Wallingarra Pony Club and City of Armadale (2010). Fletcher Park Management Plan. Perth, Western Australia.

37. Give an overview of how threats are being/potentially abated and other recovery actions underway and/or proposed. Identify who is undertaking these activities and how successful the activities have been to date.

The Banksia Woodland Restoration Project implemented weed management across 8 bushland restoration sites that included occurrences of community FCT3a. In total 281ha of weed control was carried out for 14 priority weeds: *Acacia longifolia, Babiana angustifolia, Ehrharta calycina, Eragrostis curvula, Euphorbia terracina, Ficus edulis, Freesia alba x leichtlinii, Gomphocarpus fruticosus, Lachenalia reflexa, Leptospermum laevigatum, Moraea flaccida, Pinus pinaster, Sparaxis pillansii and Zantedeschia aethiopica***.** In 2014, this project covered the Brixton Street wetlands (occurrences 3, 27, 28, 29, 30, 31) that contain FCT3a.

All dieback assessment and mapping are carried out by DBCA unless otherwise specified in table 9. Weed management is carried out by a range of people including mainly DBCA, the Green Army and various contractors.

Other recovery actions for each occurrence of FCT3a are outlined in table 10. As at December 2007, it was estimated that $3,086,593 had been expended on recovery of the community (Department of Environment and Conservation 2007) but this figure is now dated. The majority of that budget was on land acquisition.

Table 9: Weed control and dieback mapping actions in FCT3a **able 9.** Weed and disease management of SCP3a occurrences.

Site ID	Occ. No.	Weed management and rehabilitation	Dieback mapping
LAMB01	2	Weed control, mapping and rehabilitation (2001-2012)	Dieback assessed and mapped (2006 and 2012)
BRIX02, 06, 07, 08, 09, 10	3, 27, 28, 29, 30, 31	Weed control, mapping and rehabilitation (2000-2016)	Dieback assessed and mapped (2006)
MUD04	5	Portion weed mapped (2009). Watsonia controlled (2000).	Dieback assessed and mapped (1999)
BRICK01, 05	7, 23	Weed control and mapping (2000-2012)	Dieback assessed and mapped (2006)
dundas02	8	Weed control and seed collection (2002)	Dieback assessed and mapped (2006)
MYABERN01	12	Weed mapping (2009)	Dieback assessed and mapped (2006 and 2009)
MYABERN03	14	Weed mapping (2009)	Dieback assessed and mapped (2006 and 2009)
WARO06, 07	19, 32	Annual weed management was undertaken at Bandicoot Brook by Urban Nature (2014/15)	
FLETCHER02	21	Weed control, mapping, rehabilitation and seed collection (2002 and 2010)	Portion of dieback assessed (2000 and 2006)
CHITTERING PLOT1	60		Dieback mapping of area done by Glevron Dieback Consultancy (2003)
FHALL01	62		Dieback assessed and mapped (2006)
Fairbridge01	63	Received grant from SGIO for weed control (2013)	

Table 10. Additional recovery actions for FCT3a occurrences.

Site ID	Occ. No.	Fencing and markings	Fire management	Acquisition for conservation
LAMB01	2	Fenced. TEC sign installed.	Fire response plan by DBCA and FESA reviewed in 2005	
BRIX02, 06, 07, 08, 09, 10	3, 27, 28, 29, 30, 31	Fenced. TEC sign installed.	Fire management and response plan	
BRICK01, 05	7, 23	Mostly fenced. TEC sign installed.	Fire management plan	
dundas02	8	Fence on E and N of occurrence.		

		Some tracks have been closed off with boulders.		
PIND01	9	Fenced.		
PUNR02	10	Fenced on E side, S side west.		
MYABERN01	12	Fenced.		
MYABERN03	14	Fenced.		
WARO06, 07	19, 32	Access track blocked with gate		
FLETCHER02	21	Fenced and signed.	Fire management plan	
CoolupGun05	39	Fenced. Signs noting firing range risk.		
PINJ01	40	Fenced.		
TALBNTH16	44			Acquired (2017)
FHALL01	62	Fenced. TEC sign installed.		

38. What portion of the current extent of the ecological community is protected in a reserve set aside for conservation purposes, and what proportions are private land, or other tenure? Give details including the name of the reserves, and the extent the ecological community is protected within these reserves.

The community is currently known from a total of approximately 192.6 hectares. Currently, there are approximately 162.3 hectares of the community found on public lands. Of this, approximately 27.1 hectares are managed by DBCA, and of those 24.9 hectares are in nature reserves. Approximately 135.9 hectares are on lands under the care, control and management of other authorities. Approximately 30.3 hectares of the community are recorded on private land.

Approximately 95.1 hectares of SCP3a are included in Perth's Bush Forever, in areas of 'regionally significant bushland to be retained and protected forever' (State of Western Australia 2000).

38 a. Which of the reserves are actively managed?
Note which, if any, reserves have management plans and if they are being implemented.

The Wildflower Society has developed Management Guidelines for Brixton Street reserve (occurrences 3, 27, 28, 29, 30, 31) (Keighery 1995). There is a management plan for Occurrences 7 and 23 in Brickwood Reserve (Shire of Serpentine Jarrahdale 2016). Fletcher Park (occurrences 21 and 22) is also managed under management guidelines (City of Armadale 2010). The Roadside Care Volunteers and the Serpentine-Jarrahdale Landcare Group are involved in the management of the roadside remnants that contain occurrence 5 (MUD04). Keighery (1996) and Papenfus (2004) provide a detailed account of the conservation values and management recommendations for the remnant.

38 b. Give details of any other forms of protection, such as conservation covenants, and whether the protection mechanisms are permanent.

38 a. Indigenous interests
Is the nominated ecological community or parts thereof known to occur on any culturally significant sites? If so comment on any issues with respect to aboriginal interests, in particular with regard to management of the ecological community.

The South West Aboriginal Land and Sea Council (SWALSC), an umbrella group, covers the areas that contain occurrences of FCT3a. Table 11 identifies areas of the ecological community that contain sites that are known to have particular aboriginal significance. No general significance to indigenous people has been identified for the ecological community.

Table 11. Indigenous sites found within occurrences of community SCP3a

Occ. Number	Indigenous sites
Occurrence 8 (Dundas02)	Birthplace/water source nearby
Occurrences 3, 27, 28, 29, 30 and 31 (Brix02, 06, 07, 08, 09, 10)	Artifact/scatter site nearby
Occurrence 2, 21 and 22 (Lamb01, Fletcher02, 01)	Mythological site nearby
Occurrence 12 and 13 (MyAbern01, 03)	Mythological site nearby
Occurrence 7 and 23 (Brick01, 05)	Artifact/scatter site nearby
Occurrence 5 (MUD04)	No known sites in close proximity
Occurrence 10 (Punr02)	No known sites in close proximity
Occurrence 34 (Turner 01))	Ceremonial/mythological site
Occurrence 9 (Pind01)	No known sites in close proximity

38 b. Native Title

Do Native Title or Indigenous Protected Areas apply to any parts of the community? If so comment on any issues with respect to exclusive possession and rights to plants and animals, in particular with regard to management of the ecological community.

FCT3a occurs within the following Native Titles;

- Gnaala Karla Booja Indigenous Land Use Agreement
- Whadjuk People Indigenous Land Use Agreement

40. Give details of recovery actions that are or could be carried out at the local and regional level, e.g. develop and implement management plan for the control of specific weed species (regional), undertake weeding of known sites (local).

1. Monitoring of the community

There are permanent quadrats set up in most occurrences. Where vegetation is in suitable condition, permanent quadrats should be established in these additional areas, utilising methods as described in Gibson et al. (1994). Data collected should include weed levels, plant species diversity and flora species composition. All native and weed species were recorded in quadrats that were previously established, but quantitative data that would provide information about density or cover for each species were not included in standard quadrat monitoring. Occurrences should continue to be monitored every five years to provide information on composition, and condition.

Eight monitoring transects in eight occurrences of the community have also been established to determine the impact of edge effects on the community (ie edge to area ratio). Transects measure 20m in length, are permanently marked, and were monitored in 2003 and 2008. Monitoring should be continued.

The weed monitoring method for Brixton St wetlands describes the use of small quadrats to allow accurate weed counts and accurate cover estimates of native species and weeds. To monitor the effectiveness of

weed management and changes in the impacted plant community over time, transects were run from the disturbed edges of the bushland into intact areas, and quadrats were placed at intervals along each transect. Transects were placed so that changes in the spread of weeds away from the disturbed edge could be detected. This type of detailed monitoring is required to quantify the effects of on-ground management and plan future management strategies. Determining the impact of factors such as changed fire frequency would require a monitoring program such as that established by Clarke (2009).

2. **Survey for dieback**
Some occurrences have been assessed and mapped for dieback. Other occurrences require baseline and ongoing monitoring of the extent, impact and boundaries of dieback to determine if there are priority areas for dieback treatment. Priority areas for dieback treatment in the community should be determined from the Dieback Protocol that was written by the Dieback Working Group (2000). Data on dieback presence and impact, and future biodiversity implications (eg loss or decline of DRF or Priority taxa, structurally or functionally important taxa) are likely to be important determinants of the priority of treatment of individual occurrences. Dieback has been recorded in a few occurrences of this community. Once dieback is detected, the dieback front should be monitored at least every five years in summer and flagging tape marking the front replaced regularly. Additional quadrat or transect data would provide useful monitoring data.

3. **Weed control, and replant where necessary**
Weed control plans should be developed for all areas of bushland that contain the community and be based on information from weed mapping. Plans should identify the highest priority weeds that pose the greatest threat to the community, in the early stages of invasion where possible. Appropriate methods of weed control are found in Brown and Brooks (2002) and may include hand weeding or localised application of herbicide. The herb layer is an integral part of this plant community and care will be taken to minimise disturbance of native herbs in any weed control program.

Rehabilitation through reintroduction of local native species may be necessary if areas are no longer capable of regenerating following weed control. Piles of weed-contaminated soil in any occurrences should be removed and the areas replanted. Tracks excess to requirements should be left to revegetate naturally. Only seed from the same occurrence should be used for rehabilitation. No seed from other areas should be introduced into occurrences.

4. **Fence remnants that contain the community**
Fencing may be necessary to prevent degradation where occurrences are in high usage areas, or to prevent grazing. Some occurrences on private land may require fencing to prevent degradation by uncontrolled access. Occurrence 5 (MUD04) is suffering degradation from the impact of horse riders and indiscriminate clearing for tracks, but as the bushland is on a roadside, fencing would be difficult. The requirement for fencing at Occurrences 19 and 32 (WARO06, 07) to prevent uncontrolled access should be assessed. Most occurrences are already fenced, and there is little evidence of broad-scale degradation of other occurrences as a result of uncontrolled vehicle access.

41. Is there an existing support network for the ecological community that facilitates recovery? e.g. an active Landcare group, Conservation Management Network.

The Swan and South West Region Threatened Flora and Communities recovery teams consider all threatened ecological communities and threatened flora in DBCA's South West and Swan Regions. These teams assist DBCA in coordinating recovery actions for the community and other declared rare flora and threatened ecological communities in their regions.

42. Describe methods for identifying the ecological community including when to conduct surveys.

For example, season, time of day, weather conditions; length, intensity and pattern of search effort; and limitations and expert acceptance; recommended methods; survey-effort guide. Include references.

Sampling protocols and timelines best used for identifying and conducting surveys in this ecological community are identified in EPA Technical Guidance for Flora and Vegetation Surveys for Environmental Impact Assessment.

http://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/EPA%20Technical%20Guidance%20-%20Flora%20and%20Vegetation%20survey_Dec13.pdf

43. Are there other any aspects relating to the survival of this ecological community that you would like to address?

Section 3 - Justification for this nomination

In order for the nomination to be considered further, one or preferably more of the following criteria need to be fulfilled and substantiated. A clear case for why the ecological community is eligible for listing under the criteria is required, including evidence as to how it meets the requirements for listing under a particular listing category, e.g. 'David *et al*. (1999) finding of 95% decline in geographic distribution suggests it should be listed as critically endangered'. The type of data available will determine which criteria will be used to justify the application of a listing category.
At least one criterion must trigger the thresholds of a listing category as indicated in the Attachment. Criteria may be of different levels of listing category e.g. Criterion 1 = CR and Criterion 3 = VU.

44. Provide data that demonstrates why the ecological community meets at least one of the following criteria for the nominated listing category.

Please use data provided in previous sections to demonstrate how it specifically meets at least one of the following criteria. Advice on how to interpret the listing criteria is in Attachment A. Provide a response for every sub-criterion.

Criterion A: Reduction in geographic distribution.

Criterion A	
☒ CR ☒ EN ☐ VU ☐ not eligible	☐ **A1** ☐ **A2a** ☐ **A2b** ☒ **A3**

Justification for assessment under Criterion A:

For criteria A and B, the ecosystem was assumed to collapse when the mapped distribution declines to zero.

- SCP3a occurs predominantly within the Southern River, Guilford, Forrestfield, Beermullah, Bassendean central and south, and Abba, vegetation complexes. It is assumed that the reduction in extent of native vegetation on the land units that support the community is indicative of the level of clearing of this community. The level of clearing in the relevant soil and landform units ranges from 73% to 95% (Government of Western Australia 2019). These data provide some indication, only, of the likely decline of the community. These estimates are comparable to of the >90% range contraction of FCT3a estimated in Gibson *et al*. (1994), based on the level of clearing of land forms and geomorphologies associated with the community. Continued decline in spatial extent of the ecological community is inferred, with ongoing proposals to clear vegetation in an urban environment.
- Based on the above assumptions, the community plausibly meets EN to CR under criterion A3 as the estimates of decline in distribution ranges from 61%-95%. The community plausibly meets the threshold for criterion EN under A3 for which the reduction in geographic distribution is ≥ 70% since approximately 1750. CR is also plausible under A3, for which the threshold the reduction in geographic distribution is >90%. The time period of the clearing is not known so is inferred to be since 1750.

- **Plausible rank EN to CR under A3**

Criterion B: Restricted geographic distribution.

Criterion B	
☒ CR ☐ EN ☐ VU ☐ not eligible	☒ **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 for assessment under Criterion B:

- B1: EOO is 1522km^2 (≤2,000km^2-threshold for CR).
  The community's EEO is less that the 2,000km^2 threshold for rank CR. Community meets threshold for rank CR under criterion B1.
- B1a (i): Observed spatial decline of 1.87ha over a period of 19 years (2000-2019), through clearing for development, and degradation from factors such as weed invasion, overgrazing and too frequent fire.
- B1 b): Continuing decline observed from the impacts of land clearing, hydrological change, weed invasion, altered fire regimes, disease and grazing by introduced fauna (see Appendix 1 for details of threats).
- B1 c) Community is considered to occur at 26 threat defined locations, based on the identification of 26 areas 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 26 threat defined locations, based on the identification of 26 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 5 threat defined locations.
- **Meets criteria for Critically Endangered B1b as EOO is** ≤2,000km^2 and subject to observed and inferred threatening processes that are likely to cause continuing declines in environmental quality and biotic distribution within the next 20 years.

Criterion C: Environmental degradation based on change in an abiotic variable.

Criterion C	
☐ CR ☐ EN ☐ VU ☒ not eligible	☐ **C1** ☐ **C2** ☐ **C3**

Justification for 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 3 occurrences of the community (CoolupGun05, PINJ01, and Pinjrail01). The steady water table decline at the Coolup Reserve 29033, where occurrence CoolupGun05 occur (representative of 0.8% of the community), indicates an approximate 1m groundwater decline, from 1988 to 2019 (Figure 2). Figure 3 in section 32 indicates a predicted approximately 2m groundwater decline at the reserve over the next 50 years, as calculated from the previous trendline in Figure 2. 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). This can therefore be quantified as a predicted 30% severity over 0.8% of the extent of the community.
- The groundwater level at occurrences PINJ01 (representative of 0.6% of the community) are relatively stable and do not indicate groundwater decline between 2009 and 2012 (Figure 1).

- Predictions calculated from the previous trendline in Figure 4 (Figure 5) indicate a decline of approximately 1m groundwater over the next 50 years at occurrence Pinjrail01. This occurrence represents 2.7% of the extent of the community. Based on current and future forecasted 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 continue to decline at the current calculated rate (y=-0.0018x + 26.664). This can therefore be quantified as a predicted 2% severity over 2.7% of the extent of the community.

- Based on current and future predictions of groundwater levels across the community, 4.1% of the extent of the community has a quantified severity ranging from 0%-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.**

Criterion D: Disruption of biotic processes or interactions based on change in a biotic variable.

Criterion D ☐ CR ☐ EN ☐ VU ☒ not eligible	☐ **D1** ☐ **D2** ☐ **D3**

Justification for assessment under Criterion D:

- Dieback disease caused by *Phytophthora* species is a significant biotic 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 available for 3 occurrences (FLETCHER01, BRICK01 and 05), a minimum of approximately 37ha (19%) of the community is infected with the disease (Section 34).
- The impacts of the disease in southwestern Australia have been observed since 1921 (Dell *et al*. (2005).
- It is assumed that the impacts of the disease have occurred since 1750, as there are no data to indicate the timing of the impact in this community. A minimum severity of >30%, with an extent of >80% would be required to be affected by the disease to meet the minimum thresholds for VU under D3.
- Although there are dieback maps that encompass the community, there are inadequate systematic collected quantitative data about the impacts of dieback on individual sensitive species to support assessment of the community against criterion D.
- Currently, there is insufficient evidence to determine the total loss of susceptible native species lost through dieback infestation in this community to support assessment of the community 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 if the community meets the minimum proportion of the extent (≥50%) or proportional severity of disruption of abiotic processes (≥50%) since ~1750.

Insufficient evidence to indicate if the community meets criterion D.

Criterion E: Quantitative analysis that estimates the probability of ecosystem collapse.

Criterion E ☐ CR ☐ EN ☐ VU ☒ not eligible	

Justification for assessment under Criterion E:

No quantitative analysis of probability of collapse has been completed, so the community is not known to meet criterion E.

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
A3	EN-CR	• Based on the level of clearing of the vegetation complexes in which SCP3a occurs, the community plausibly meets EN-CR under criterion A3
B1a	-	• EOO is ≤2,000km^2 • Inadequate data available that indicate decline in a measure of spatial extent, environmental quality or disruption to biotic interactions that would meet minimum thresholds for the criterion (VU) • Does not meet criterion
B1b	CR	• EOO is ≤2,000km^2 • Observed and inferred continuing decline from land clearing, hydrological change, weed invasion, altered fire regimes, disease, grazing by introduced fauna, and a drying climate • Meets criterion for CR
B1c	-	• EOO is ≤2,000km^2 • Ecosystem exists at 26 threat defined locations • Does not meet criterion
B2a	-	• AOO is 14 grid cells • Inadequate data available that indicate decline in a measure of spatial extent, environmental quality and disruption to biotic interactions that would meet lowest thresholds for the criterion (VU) • Does not meet criterion
B2b	EN	• AOO is 14 grid cells • Observed and inferred continuing decline from land clearing, hydrological change, weed invasion, altered fire regimes, disease, grazing by introduced fauna, and a drying climate • Meets criterion for EN
B2c	-	• AOO is 14 grid cells • Ecosystem exists at 26 threat defined locations • Does not meet criterion
B3	-	• Known from 26 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 EN-CR under A3. Meets CR under B1b. Meets EN under B2b. Plausible rank EN to CR. *'The highest risk category obtained by any of the assessed criteria will be the overall risk status of the ecosystem'* (IUCN RLE Guidelines V1.1 page 42). **Meets CR under criterion B1b.**

Section 4 – References/Standard of Scientific Evidence/Critical habitat

Note: The opinion of appropriate scientific experts may be cited (with their approval) in support of a nomination. If this is done the names of the experts, their qualifications and full contact details must also be provided in the reference list below. Harvard style of referencing is preferred.

45. Please provide copies of key documentation/references used in the nomination.

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46. Statement on the Standard of Scientific Evidence

Published studies (referenced above) when combined with unpublished information and survey data, were sufficient to apply the Red List of Ecosystem criteria.

Major uncertainties exist regarding fire-response, dieback impacts, hydrological change and salinisation of this community. There is an urgent need for research on all these aspects, especially hydrology as the community is ground/surface water dependant, to help determine the implications of findings for management.

47. Has this document been reviewed and/or have relevant experts been consulted? If so, indicate by whom and provide their contact details.
[redacted] DBCA
48. Do you wish to propose any areas of habitat for consideration as Critical Habitat for the nominated community? If so, refer to Ministerial Guideline No 5 and attached a separate nomination proposal addressing the matters required under that guideline. Indicate location/s including a map, and attached shapefiles.
No.

Section 5 - Nominator Details & Declaration

49. Contact Details

Note: Nominator details are subject to the provision of the *Privacy Act 1988*

Title/Full Name	Conservation Ecologist
Organisation or Company name	DBCA
Postal address	DBCA Kensington
Email	
Phone	
Fax	

50. Declaration

Signature (Or insert electronic signature)	***I declare that the information in this nomination form and any attachments is true and correct to the best of my knowledge.***
Date signed	

Completed nominations may be lodged either:

1. by email to: **communities.data@dbca.wa.gov.au**

If submitting by email, please also mail hard copies of attachments that cannot be emailed.

OR

2. by mail to: Species and Communities Branch
Department of Biodiversity, Conservation and Attractions, WA Government
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983

If submitting by mail, please include an electronic copy on memory stick or CD.