

16 April 2021

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AGL Macquarie Pty Ltd

Attention: Mathew Parkinson

Subject: Bayswater Power Station Upgrade (SSD 9697) – Review of Response to Submissions (RtS) Report– Response to RFI to address bushfire impacts to Matters of National Environmental Significance (MNES) – Commonwealth Assessment

1. INTRODUCTION

Kleinfelder was engaged by Jacobs, on behalf of AGL Macquarie Pty Ltd (**AGLM**), to prepare a Biodiversity Development Assessment Report (**BDAR**) to support the Environmental Impact Statement (EIS) for the Bayswater Power Station Upgrade (**SSD 9697**). The EIS was reviewed by the Department of Planning, Industry and Environment (**DPIE**), in relation to impacts on biodiversity (including matters of national environmental significance (**MNES**) under the *Environment Protection and Biodiversity Conservation Act 1999* (**EPBC Act**).

Kleinfelder has previously revised the BDAR based on comments provided in both the EIS and the RtS stage of the Project. In a recent request for information (**RFI**) (dated 25/02/2021), DPIE have requested the following additional information to inform its assessment of relevant threatened species or ecological communities:

- *“The percentage and total area (hectares) of habitat that was lost as a result of the bushfires from the Sydney Basin Interim Biogeographic Regionalisation for Australia (IBRA) bioregion and the Hunter subregion (Version 7, as specified in BAM 2020) and what percentage of the remaining habitat the study area comprises. If a ‘species credit’ species the Threatened Species Data Collection database should be consulted to ensure the appropriate type of habitat (e.g. foraging, roosting) is assessed.*
- *Whether the regional extent (Sydney Basin IBRA region and Hunter subregion) of the habitat has reduced to an extent that the habitat within the study area is of increased importance for recovery of the species or community.*
- *Updated Assessments of Significance under the Environment Protection and Biodiversity Conservation Act 1999 in accordance with the MNES Significant impact guidelines 1.1.”*

2. ASSESSMENT METHODS

Bushfire Mapping

The Google Earth Engine Burnt Area Map (**GEEBAM**) was used to determine the extent of vegetation that was affected by the 2019/2020 bushfires. This mapping indicated that a very low proportion of the Hunter subregion was actually impacted by the bushfires with the exception of a small area in the south-west (0.7% of the Hunter subregion). For the purposes of providing a more relevant assessment of bushfire impacts, the Assessment Area was increased to include areas within a 50km radius of the Bayswater Project Site (i.e. hereafter referred to as the Development Site).

The bushfire Assessment Area for the project is shown in **Figure 1**. The extent of bushfire impacts during 2019/20 within this area is shown in **Figure 2**.

Environmental Protection and Biodiversity Act Impact Assessment

The BioNet Threatened Species to Plant Community Types (**PCT**) Association data (DPIE 2020) was used to determine the appropriate habitat associations (e.g. foraging, roosting) for all EPBC listed biota (MNES) considered relevant to the Project (i.e. as presented in Appendix 9 of the BDAR). These include the following threatened species and Threatened Ecological Communities (**TECs**):

- *Prasophyllum* sp. Wybong (C. Phelps ORG 5269)
- Regent Honeyeater (*Anthochaera phrygia*)
- Swift Parrot (*Lathamus discolor*)
- Spotted-tailed Quoll (*Dasyurus maculatus*)
- *Ozothamnus tessellatus*
- Green and Golden Bell Frog (*Litoria aurea*)
- Large-eared Pied Bat (*Chalinolobus dwyeri*); and
- Corben's Long-eared Bat (*Nyctophilus corbeni*).
- Grey-headed Flying Fox (*Pteropus poliocephalus*)
- Koala (*Phascolarctos cinereus*)
- Brush-tailed Rock Wallaby (*Petrogale penicillata*)
- Striped Legless Lizard (*Delma impar*)
- Pink-tailed Worm-lizard (*Aprasia parapulchella*)
- Central Hunter Valley Eucalypt Forest and Woodland

The approximate area of habitat (i.e. within the 50km radius Assessment Area) for each of the above listed biota was estimated using a Geographical Information System (**GIS**). The following regional vegetation mapping was used to determine the extent of habitat for each species:

- State Vegetation Type Map: Upper Hunter v1.0. VIS_ID 4894 -
- Lower Hunter and Central Coast Regional Vegetation Survey VIS_ID 2225

An estimate of the area of habitat impacted by bushfires was calculated as a percentage for each threatened species. A revised impact assessment was then undertaken against the *Matters of National Environmental Significant – Significant impact guidelines 1.1* (DoE, 2013).

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Legend

- Assessment Area (50km radius from Development Site)
- Development Site
- IBRA Sub-region Boundaries

0 5 10 20 30 40 50 km

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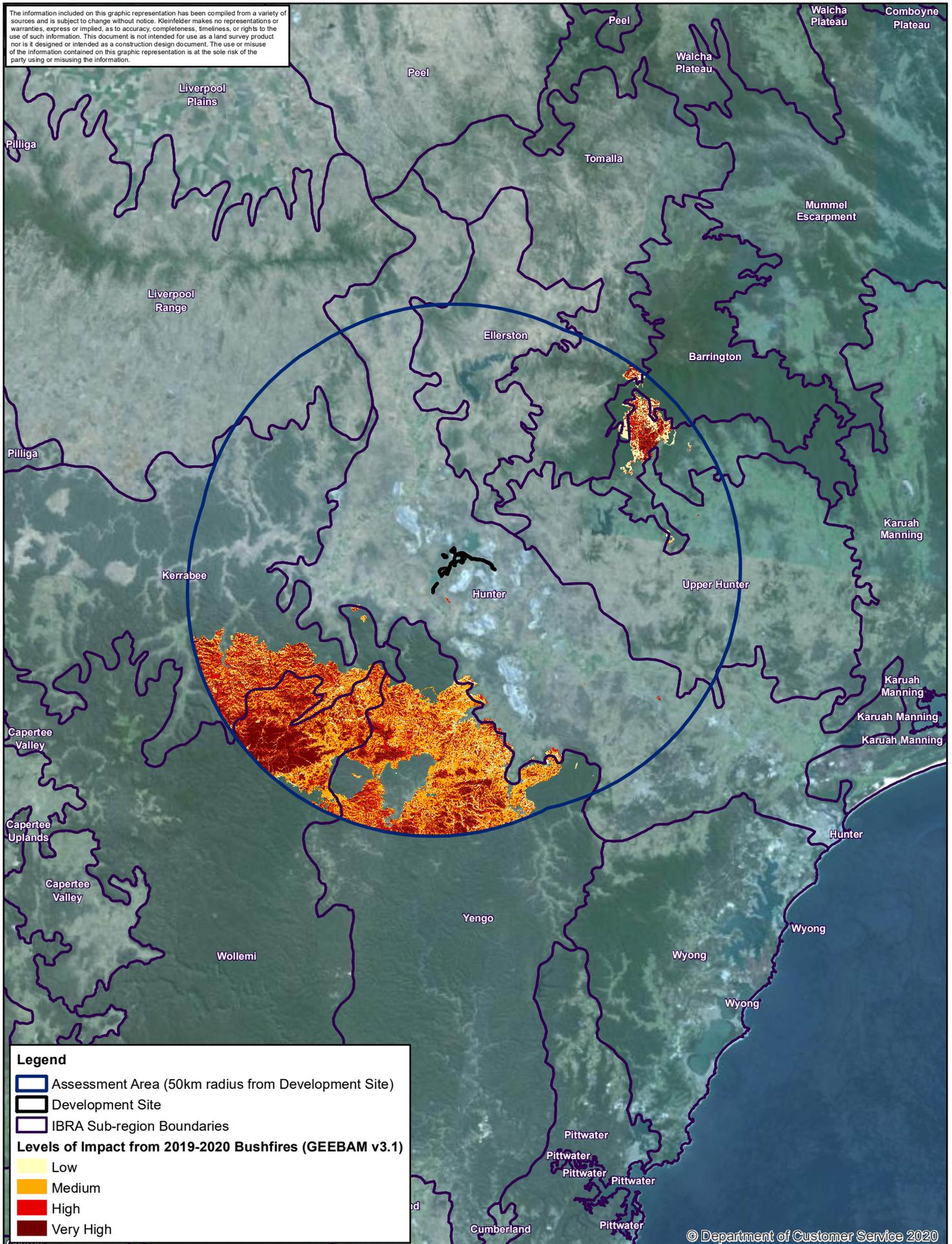
PROJECT REFERENCE: 20214047
DATE DRAWN: 2021/03/17 22:11 Version 1
DRAWN BY: G.Joyce
DATA SOURCE:
NSW DFSI - 2020
Commonwealth of Australia, Department of Agriculture, Water and the Environment (2012)

Assessment Area

AGL Macquarie
Analysis of Bushfire Impact on Habitats

FIGURE:
1

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Legend

- Assessment Area (50km radius from Development Site)
- Development Site
- IBRA Sub-region Boundaries

Levels of Impact from 2019-2020 Bushfires (GEEBAM v3.1)

- Low
- Medium
- High
- Very High

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	<p>PROJECT REFERENCE: 20214047</p> <p>DATE DRAWN: 2021/03/17 22:30Version 1</p> <p>DRAWN BY: G.Joyce</p> <p>DATA SOURCE: NSW DFSI - 2020 Commonwealth of Australia, Department of Agriculture, Water and the Environment (2012)</p>	<p>Areas Impacted by 2019-2020 Bushfires</p>	<p>FIGURE: 2</p>
		<p>AGL Macquarie Analysis of Bushfire Impact on Habitats</p>	

3. IMPACT ASSESSMENT

Bushfire Impact Summary

A summary of the impacts of the 2019/20 bushfires on threatened species habitat is presented in **Table 1**. Based on this assessment, bushfires had the greatest impact on the habitat of the Swift Parrot (31% habitat loss), Spotted-tailed Quoll (26% habitat loss), Large-eared Pied Bat (33% habitat loss), Corben's Long-eared Bat (53% habitat loss), Grey-headed Flying Fox (31% habitat loss) and the Brush-tailed Rock Wallaby (34% habitat loss). Note that none of these species were detected within the Development Site and the habitats present within the site are not considered to be important to the long-term survival of any of these species in the locality.

Of the species listed in **Table 1**, one threatened species: the Striped Legless Lizard was detected within the Development Site. The bushfire impact assessment determined that 2% of the habitat for this species was impacted by the 2019/20 bushfires within a 50 km radius of the Development Site. A revised impact assessment for this species and other relevant threatened biota has been undertaken against the *Matters of National Environmental Significance – Significant impact guidelines 1.1* (DoE, 2013) in consideration of potential bushfire impacts in the following subsections.

Table 1 2019/20 Bushfire Impact Assessment Summary

Threatened Biota	Total Habitat within Assessment Area	Not Impacted		Impacted	
		ha	%	ha	%
<i>Prasophyllum</i> sp. Wybong (C. Phelps ORG 5269)	113,449	112,836	99%	613	1%
Regent Honeyeater (<i>Anthochaera phrygia</i>)	234,795	198,788	85%	36,007	15%
Swift Parrot (<i>Lathamus discolor</i>)	330,286	226,800	69%	103,486	31%
Spotted-tailed Quoll (<i>Dasyurus maculatus</i>)	455,117	337,940	74%	117,177	26%
<i>Ozothamnus tessellatus</i>	65,683	64,909	99%	774	1%
Green and Golden Bell Frog (<i>Litoria aurea</i>)	132,047	128,637	97%	3,410	3%
Large-eared Pied Bat (<i>Chalinolobus dwyeri</i>); and	339,615	227,301	67%	112,314	33%
Corben's Long-eared Bat (<i>Nyctophilus corbeni</i>).	177,533	84,008	47%	93,525	53%
Grey-headed Flying Fox (<i>Pteropus poliocephalus</i>)	367,846	253,005	69%	114,841	31%
Koala (<i>Phascolarctos cinereus</i>)	289,089	179,311	62%	109,778	38%
Brush-tailed Rock Wallaby (<i>Petrogale penicillata</i>)	308,473	205,079	66%	103,394	34%
Striped Legless Lizard (<i>Delma impar</i>)	155,968	152,745	98%	3,223	2%
Pink-tailed Worm Lizard (<i>Aprasia parapulchella</i>)	370,891	366,559	99%	4,332	1%

Prasophyllum sp. Wybong (C. Phelps ORG 5269)

Prasophyllum sp. Wybong (C. Phelps ORG 5269) is a perennial orchid, appearing as a single leaf over winter and spring. The species flowers in spring and dies back to a tuber over summer and autumn. Leek orchids are generally found in shrubby and grassy habitats in dry to wet soil (Jones, 2006). *Prasophyllum* sp. Wybong is known to occur in open eucalypt woodland and grassland (DoEE, 2019). This species is endemic to NSW, it is known from near Ilford, Premer, Muswellbrook, Wybong, Yeoval, Inverell, Tenterfield, Currabubula and the Pilliga area. Most populations are small, although the Wybong population contains by far the largest number of individuals (DoEE, 2019).

An expert report was prepared for the project which determined that *Prasophyllum* sp. Wybong, may be potentially affected by the Action due to the presence of potentially suitable habitat within the Study Area. Targeted surveys for the species undertaken from 15-18 September 2020 detected no individuals within the Development Site.

Significant impact criteria

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- *lead to a long-term decrease in the size of a population*

Prasophyllum sp. Wybong is known to occur within grassy woodlands and grasslands derived from Narrow-leaved Ironbark and Grey Box woodlands, particularly grasslands of *Dichanthium sericeum*, *Sporobolus creber* and *Chloris ventricosa*, or *Aristida vagans*, *A. ramosa* and *Cymbopogon refractus* (Bell 2019). Within the Development Site, areas of Central Hunter Box – Ironbark Woodland were assessed as potential habitat as they generally meet the description outlined above. A more detailed assessment of each zone is provided below:

- An area of potential habitat was identified in Zone 3 (Regrowth). The Salt Cake Landfill portion of this vegetation zone was excluded as the ground layer has undergone heavy disturbance and is dominated by Exotic grass species. Other areas dominated by exotic species in the understorey were also excluded. A total of 18.23 ha of this Zone was assessed as moderate-low quality habitat (it should be noted that there are none along the Ravensworth Ash Line).
- Potential habitat for the species was identified in Zone 4 (Grassland). A total of 147.77 ha of this zone was assessed as moderate to low quality habitat.

Based on the above assessment, approximately 166 ha of habitat for *Prasophyllum* sp. Wybong occurs within the Development Site. An expert report was undertaken to determine the habitat suitability and any potential occurrence of this species in the Study Area. This expert report was prepared by Dr Stephen Bell, a recognised expert on the species. The expert report states the following:

"I consider the most likely habitat for Diuris tricolor and/or Prasophyllum petilum within the Project Area to comprise vegetation communities mapped by Kleinfelder (2020) as Derived/ Modified Native Grasslands (Zone 4) or Acacia Regrowth (Zone 3). This differs from the suggested orchid habitat contained in Kleinfelder (2020), where all areas of PCT1691 (Zones 1-6) were included with the exception of lands subjected to higher levels of historical disturbance as evidenced by higher weed occurrence. As indicated earlier, Diuris in particular is capable of persisting in moderately disturbed landscapes, and I suggest that all areas of Derived/ Modified Native Grasslands (Zone 4) and areas mapped as Acacia Regrowth (Zone 3), with the exception of the Salt Cake Landfill site, do provide orchid habitat.

Combined, 188 ha of Derived/ Modified Native Grasslands (Zone 4) and Acacia Regrowth (Zone 3) have been mapped by Kleinfelder (2020). However, after inspecting the Salt Cake Landfill site and observing the condition of habitats there, it is unlikely that a viable population of either orchid will be present there. This is also attested to by the single floristic plot positioned there by Kleinfelder (2017), showing it to support 60% cover of the weed Hyparrhenia hirta and only two native species (Aristida ramosa and Vittadinia cuneata, both at 0.1% cover). This, and the observation that there has been considerable ground disturbance in this area over many years, suggests that it is highly unlikely that orchids remain there. Consequently, the 21.85 ha of Acacia Regrowth (Zone 3) within this area can be deducted from the overall total of 188 ha, to leave 166 ha of potential orchid habitat within the Project Area.

Note that this 166 ha of potential orchid habitat is conservative, but I consider it unlikely to support large populations of Diuris, and probably no Prasophyllum. Relative to other Hunter populations of both species, the floristic composition of grasslands within the Project Area are very different and occur on different soil landscapes supporting richer soils.”

Targeted surveys were undertaken within the Development Site from 15-18 September 2020. No individuals of the species were detected within the Development Site. Therefore, the action is unlikely to lead to the long-term decline of a population of the species.

- *reduce the area of occupancy of the species*

Targeted surveys were undertaken within the Development Site from 15-18 September 2020. No individuals of the species were detected within the Development Site. Therefore, the action is unlikely to reduce the area of occupancy of the species.

- *fragment an existing population into two or more populations*

Targeted surveys were undertaken within the Development Site from 15-18 September 2020. No individuals of the species were detected within the Development Site. Therefore, the action is unlikely to fragment an existing population of the species.

- *adversely affect habitat critical to the survival of a species*

Targeted surveys were undertaken within the Development Site from 15-18 September 2020. No individuals of the species were detected within the Development Site. Therefore, the action is unlikely to impact habitat critical to the survival of the species.

- *disrupt the breeding cycle of a population*

Targeted surveys were undertaken within the Development Site from 15-18 September 2020. No individuals of the species were detected within the Development Site. Therefore, the action is unlikely to disrupt the breeding cycle of a population of the species.

- *modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

Targeted surveys were undertaken within the Development Site from 15-18 September 2020. No individuals of the species were detected within the Development Site. Therefore, the action is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat of the species.

- *result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*

A site-specific Construction Environment Management Plan (CEMP) will be prepared and implemented prior to the commencement of any clearing or construction works to ensure that impacts are minimised. Stringent management measures will prevent construction activities from introducing or spreading new or existing environmental and noxious weeds or plant and animal pathogens. As such, it is unlikely that the Action will result in invasive species becoming established in the habitat for the species.

- *introduce disease that may cause the species to decline, or*

A site-specific CEMP will be prepared and implemented prior to the commencement of any clearing or construction works to ensure that impacts are minimised. Management measures will prevent construction activities from introducing or spreading new or existing environmental and noxious weeds or plant and animal pathogens. As such, it is unlikely that the Action will result in the introduction of disease causing the species to further decline.

- *interfere with the recovery of the species.*

A recovery plan has not been prepared for the species.

2019/20 Bushfire Impacts

An assessment of potential impacts of the 2019/2020 bushfires determined that a very small area of habitat for the species was adversely affected by the fires (i.e. approximately 1% of the habitat within a

50km radius of the Development Site). The affected area occurs approximately 40km southeast of the Development Site near the borders of the Hunter and Yengo IBRA subregions (**Figure 3**). Populations of the species mainly occur near Ilford, Premer, Muswellbrook, Wybong, Yeoval, Inverell, Tenterfield, Currabubula and the Pilliga area. It is therefore unlikely that this species was directly impacted by the bushfires.

Conclusion

The expert report determined that approximately 166 ha of habitat for the species occurs within the Development Site. Surveys of this area indicate that a population of the species does not occur. Large areas of habitat unaffected by the 2019/20 bushfires occur throughout the Hunter IBRA subregion. The action is therefore unlikely to constitute a significant impact on this species.

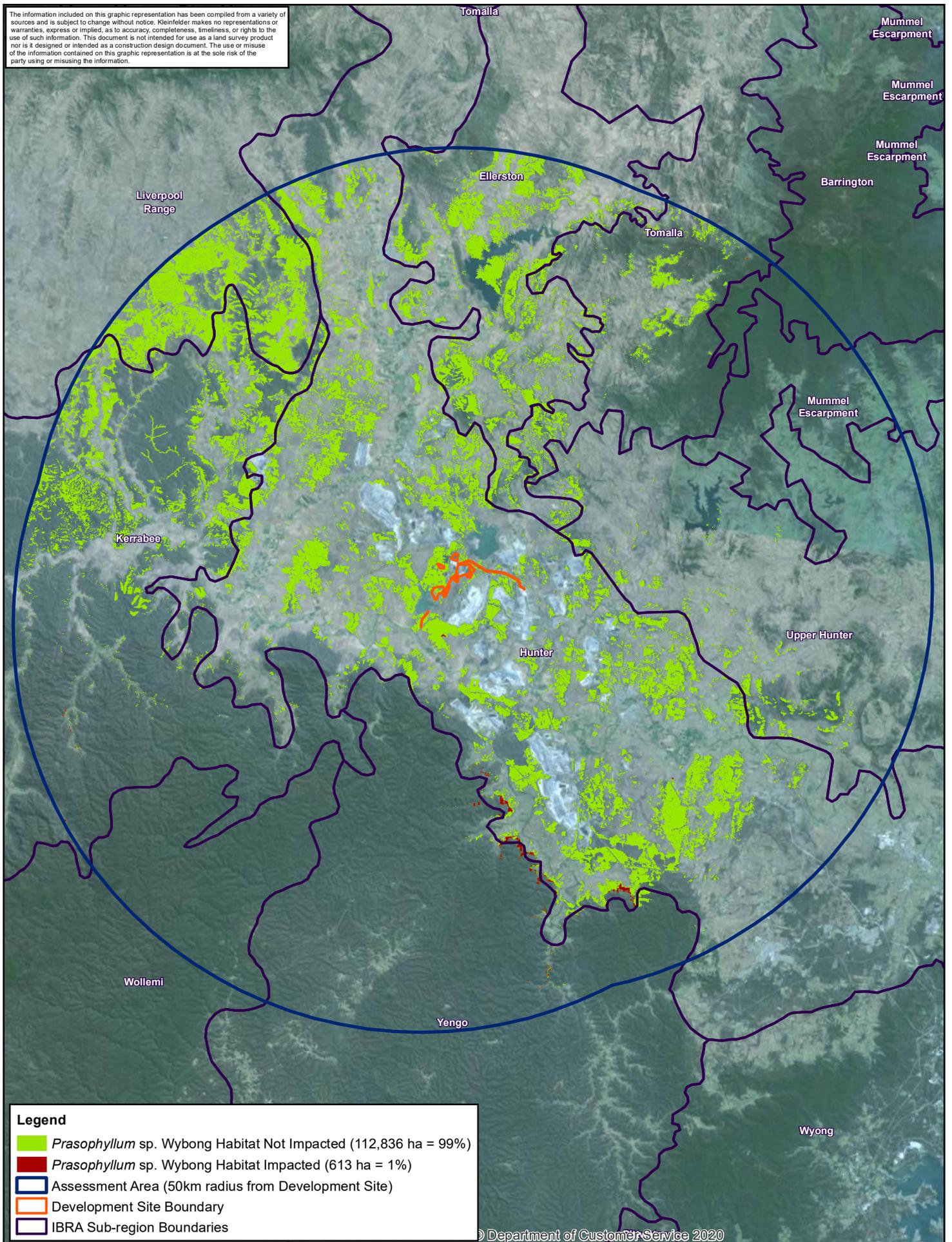
References

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Jones, D.L. (2006). *A complete guide to the native orchids of Australia, including the island territories*. Reed New Holland, Sydney.

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Legend

- Prasophyllum* sp. Wybong Habitat Not Impacted (112,836 ha = 99%)
- Prasophyllum* sp. Wybong Habitat Impacted (613 ha = 1%)
- Assessment Area (50km radius from Development Site)
- Development Site Boundary
- IBRA Sub-region Boundaries

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Regent Honeyeater (*Anthochaera phrygia*) and Swift Parrot (*Lathamus discolor*).

The Regent Honeyeater (*Anthochaera phrygia*) is a nomadic feeder and can be found throughout its range where there is suitable blossom occurring (Franklin *et al.*, 1989). This species is mostly recorded in box-ironbark eucalypt associations. They prefer the wettest, most fertile sites within these associations, such as along creek flats, broad river valleys and foothills. In NSW, riparian forests of River Oak (*Casuarina cunninghamiana*) with Needle-leaf Mistletoe (*Amyema cambagei*), are also important for feeding and breeding. Mugga Ironbark (*Eucalyptus sideroxylon*), White Box (*E. albens*), Yellow Box (*E. melliodora*) and Yellow Gum (*E. leucoxylon*) are particularly important food trees. At times of food shortage, the birds also use other woodland types and wet lowland coastal forest dominated by Swamp Mahogany (*E. robusta*) or Spotted Gum (*Corymbia maculata*) (Franklin *et al.*, 1989; Ley and Williams, 1992; Webster and Menkhorst, 1992; Geering and French, 1998; Oliver *et al.*, 1999).

The Swift Parrot (*Lathamus discolor*) is small parrot about 25 cm long. It is bright green with red around the bill, throat and forehead. The red on its throat is edged with yellow. Its crown is blue purple. There are bright red patches under the wings. One of most distinctive features from a distance is its long (12 cm), thin tail, which is dark red. This species breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as *Eucalyptus robusta* (Swamp Mahogany), *Corymbia maculata* (Spotted Gum), *C. gummifera* (Red Bloodwood), *E. tereticornis* (Forest Red Gum), *E. sideroxylon* (Mugga Ironbark), and *E. albens* (White Box). Commonly used lerp infested trees include *E. microcarpa* (Inland Grey Box), *E. moluccana* (Grey Box), *E. pilularis* (Blackbutt), and *E. melliodora* (Yellow Box). Individuals return to some foraging sites on a cyclic basis depending on food availability (OEH, 2019).

Significant impact criteria

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- *lead to a long-term decrease in the size of a population*

The Study Area represents potential foraging habitat for both of these species, with no breeding being recorded in the locality. A total of 14.64 ha of habitat for these species occurs within the Development Site. The majority of areas of habitat within the Study Area comprise small, isolated patches with a low-level of connectivity to surrounding habitat. Some small areas of Central Hunter Box – Ironbark Woodland (PCT 1691) (ranging from 0.7 to 1 ha) within Borrow Pit 4 are reasonably connected to larger areas of this vegetation to the north-west. However, given the small area of these patches, such loss is unlikely to contribute to the reduction in the size of a population of these species. Further, much of the habitat within the Study Area is highly disturbed due to current and historical agricultural practices. These species are highly mobile and any local population which may be present is likely to persist, should the Action proceed. As such, it is unlikely that the Action will decrease the size of a population of these species.

- *reduce the area of occupancy of the species*

The Action will result in a relatively small reduction in the potential habitat for these species in the local area. Due to the large amount of similar and higher quality habitat occurring within the Development Site, it is unlikely that the removal of the 14.64 ha of suitable foraging habitat for this species within the Site will reduce the area of occupancy of these species.

- *fragment an existing population into two or more populations*

The species is highly mobile, and a local population will be nomadic using a wide range of food resources depending on the availability of flowering eucalypts and lerp infestations within a 5 km radius of the Study Area. Due to the highly mobile nature of these species, and the distribution of similar suitable habitat within the Development Site, the Action is unlikely to fragment an existing population into two or more populations.

- *adversely affect habitat critical to the survival of a species*

Habitat critical to the survival of the Regent Honeyeater includes; any breeding or foraging areas where the species is likely to occur, and any newly discovered breeding or foraging locations (DoE, 2016). While the Study Area has been assessed as having a moderate to low likelihood of occurrence for the Regent Honeyeater, it is unlikely to contain habitat critical to the survival of the Regent Honeyeater. This is due to the Development Site containing a relatively low density of key feed species (Yellow Box recorded in one location within Borrow Pit 4). Additionally, there is only one record of the species in the locality in 1999 and there are no records of breeding in the locality.

Habitat critical to the survival of the Swift Parrot includes; those areas of priority habitat for which the Swift Parrot has a level of site fidelity or possess phenological characteristics likely to be of importance to the Swift Parrot or are otherwise identified by the recovery team (Saunders and Tzaros, 2011). As there are only nine records of the species in the locality (from 2005, 2012 and 2014) it is unlikely that the Study Area contains habitat critical to the survival of the Swift Parrot. Additionally, Important Habitat Mapping (BAM 2020) have been reviewed for each species indicating that no areas of the Development Site are classified as 'Important Habitat' for either species.

- *disrupt the breeding cycle of a population*

No evidence of breeding is not known from the locality for the Regent Honeyeater. The Swift Parrot is not known to breed within mainland Australia (DoEE, 2019). As such, it is unlikely that the Action will disrupt the breeding cycle of these species.

- *modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

The majority of the habitat onsite comprises small, isolated patches with a low-level of connectivity to surrounding habitat, or patches that are at the extremities of larger patches. The loss of any potential habitat for these species within the Study Area would not isolate remaining habitat from other patches and it is unlikely that the Action would significantly reduce the area of habitat occupied by these species relative to their regional distribution.

- *result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*

A site-specific CEMP will be prepared and implemented prior to the commencement of any clearing or construction works to ensure that impacts are minimised. Stringent management measures will prevent construction activities from introducing or spreading new or existing environmental and noxious weeds or plant and animal pathogens. As such, it is unlikely that the Action will result in invasive species becoming established in the habitat for the species.

- *introduce disease that may cause the species to decline, or*

A site-specific CEMP will be prepared and implemented prior to the commencement of any clearing or construction works to ensure that impacts are minimised. Management measures will prevent construction activities from introducing or spreading new or existing environmental and noxious weeds or plant and animal pathogens. As such, it is unlikely that the proposed action will result in the introduction of disease causing the species to further decline.

- *interfere with the recovery of the species.*

National recovery plans for the Regent Honeyeater and Swift Parrot are currently in place (DoE, 2016; Saunders and Tzaros, 2011). The activities which comprise the Action are not inconsistent with the species' recovery plans, and the Action would not interfere substantially with the recovery of these species given habitat resources for the Regent Honeyeater and Swift Parrot would remain outside of the Study Area, such that the species are likely to persist throughout the broader Hunter region.

2019/20 Bushfire Impacts

An assessment of potential impacts of the 2019/2020 bushfires determined that moderate to large areas of habitat for the Regent Honeyeater and Swift Parrot were adversely affected by the fires (i.e. approximately 15% of the habitat for the Regent Honeyeater and 31% of habitat for the Swift Parrot within a 50km radius of the Development Site). The affected areas of Regent Honeyeater habitat occur

mainly to the southwest in the Yengo IBRA subregion (**Figure 4**). Areas of Swift Parrot habitat were also affected in this area, including areas in the northwest near the Mummel Escarpment (**Figure 5**). Large areas of unaffected habitat for these species occur throughout the Hunter IBRA subregion and to the north. Given the low/moderate suitability of habitats within the Development Site for either species, it is unlikely that the loss of habitat (as a result of bushfires) across the Study Area is expected to increase the value of habitats within the Development Site.

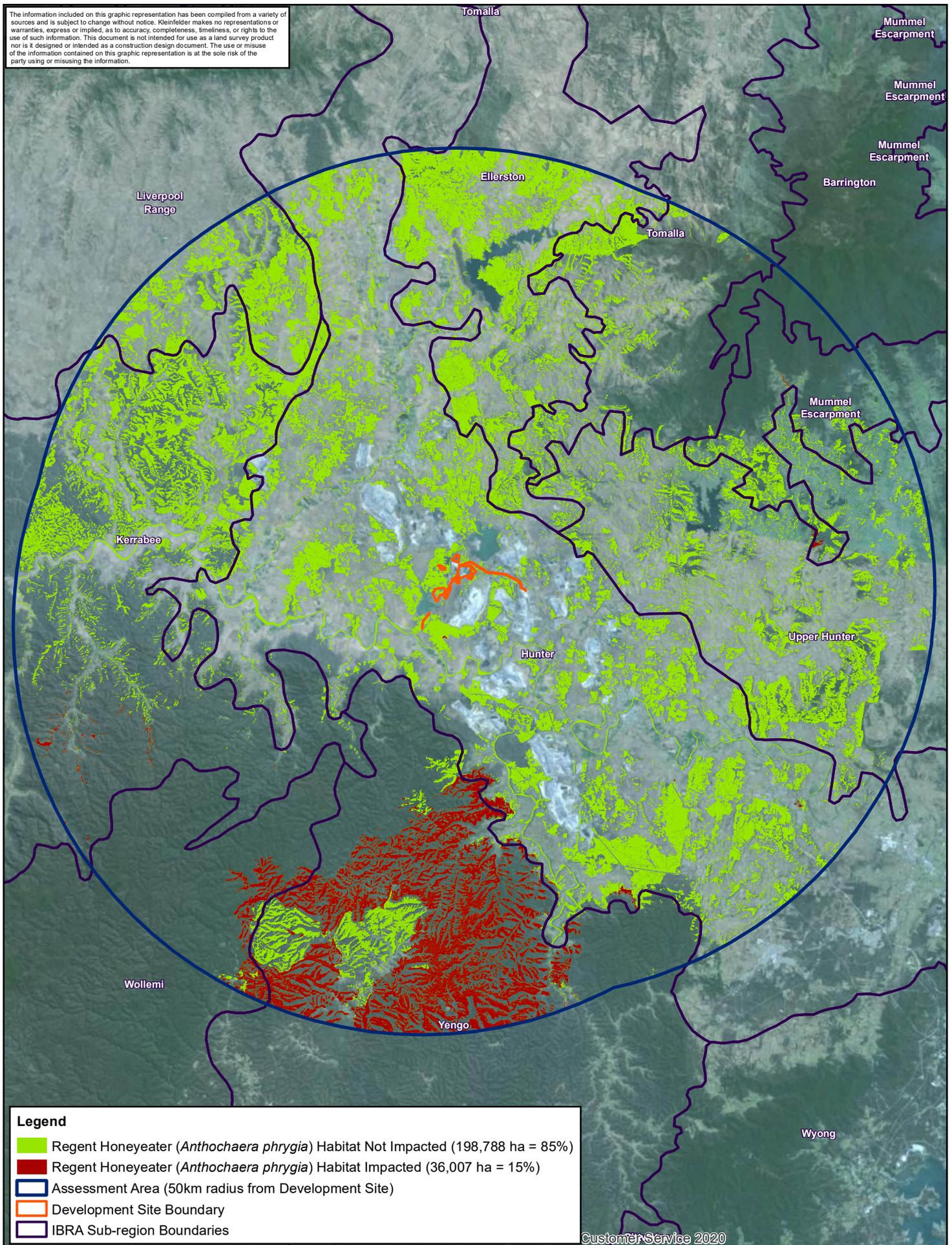
Conclusion

- **Regent Honeyeater (*Anthochaera phrygia*)** – Moderate to low likelihood of occurrence within the Study Area. Approximately 14.64 ha of potential foraging habitat present within the Development Site. One record occurs within the locality. The Action is unlikely to result in a significant impact to this species given:
 - Only foraging habitat for this species would be impacted.
 - The majority of areas of habitat within the Study Area comprise small, isolated patches with a low-level of connectivity to surrounding habitat, or small patches at the extremity of larger patches.
 - Habitat resources for this species would remain outside of the Study Area within the surrounding Development Site.
 - The species is highly mobile and any local population which may be present is likely to persist, should the Action proceed.
 - The Action is unlikely to introduce or increase number of invasive pest species or a disease that may cause the species to decline.
 - The Action would not interfere substantially with the recovery of this species.
 - Large areas of habitat unaffected by the 2019/20 bushfires occur throughout the Hunter IBRA subregion and broader area (50 km radius of the Development Site).
- **Swift Parrot (*Lathamus discolor*)** – Moderate to low likelihood of occurrence within the Study Area. Approximately 14.64 ha of potential foraging habitat present within the Development Site. Nine records occur within the locality. The Action is unlikely to result in a significant impact to this species given:
 - Only foraging habitat for this species would be impacted.
 - The majority of areas of habitat within the Study Area comprise small, isolated patches with a low-level of connectivity to surrounding habitat, or small patches at the extremity of larger patches.
 - Habitat resources for this species would remain outside of the Study Area.
 - The species is highly mobile and any local population which may be present is likely to persist, should the Action proceed.
 - The Action is unlikely to introduce or increase number of invasive pest species or a disease that may cause the species to decline.
 - the Action would not interfere substantially with the recovery of this species.
 - Large areas of habitat unaffected by the 2019/20 bushfires occur throughout the Hunter IBRA subregion and broader area (50 km radius of the Development Site).

References

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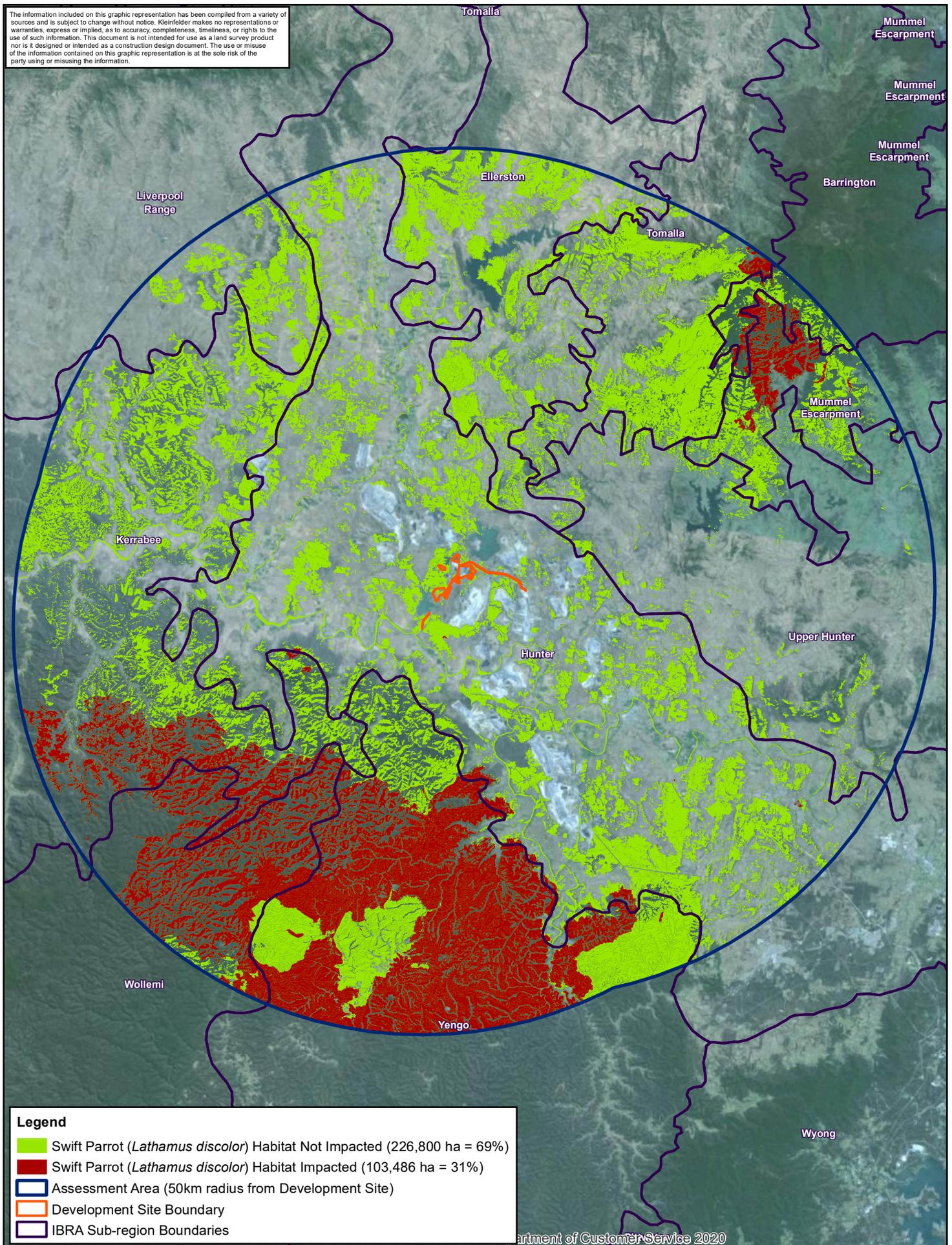
Legend

- Regent Honeyeater (*Anthochaera phrygia*) Habitat Not Impacted (198,788 ha = 85%)
- Regent Honeyeater (*Anthochaera phrygia*) Habitat Impacted (36,007 ha = 15%)
- Assessment Area (50km radius from Development Site)
- Development Site Boundary
- IBRA Sub-region Boundaries

Customer Service 2020

	PROJECT REFERENCE: 20214047 DATE DRAWN: 2021/03/18 00:07Version 1 DRAWN BY: G.Joyce	Impact of 2019-2020 Bushfires on Regent Honeyeater (<i>Anthochaera phrygia</i>) Habitat	FIGURE: 4
	DATA SOURCE: NSW DFSI - 2020 Commonwealth of Australia, Department of Agriculture, Water and the Environment (2012)	AGL Macquarie Analysis of Bushfire Impact on Habitats	

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Legend

- Swift Parrot (*Lathamus discolor*) Habitat Not Impacted (226,800 ha = 69%)
- Swift Parrot (*Lathamus discolor*) Habitat Impacted (103,486 ha = 31%)
- Assessment Area (50km radius from Development Site)
- Development Site Boundary
- IBRA Sub-region Boundaries



PROJECT REFERENCE: 20214047
 DATE DRAWN: 2021/03/18 00:05 Version 1
 DRAWN BY: G.Joyce
 DATA SOURCE:
 NSW DFSI - 2020
 Commonwealth of Australia, Department of
 Agriculture, Water and the Environment (2012)

**Impact of 2019-2020 Bushfires on
 Swift Parrot (*Lathamus discolor*)
 Habitat**

AGL Macquarie
 Analysis of Bushfire Impact on Habitats

FIGURE:
5

Spotted-tailed Quoll (*Dasyurus maculatus*)

The Spotted-tailed Quoll (*Dasyurus maculatus*) is listed as endangered under the EPBC Act. Although this species was not detected within the Study Area during the assessment, based on the availability of habitat and the occurrence of local species records, this species has a low to moderate likelihood of occurrence within the Study Area.

This species is about the size of a domestic cat; however, it has shorter legs and a more pointed face. Its fur is rich red to dark brown and covered with white spots on the back which continue down the tail. The spotted tail distinguishes it from all other Australian mammals, including other quoll species. The Spotted-tailed Quoll is found along both sides of the Great Dividing Range from the Victorian to the Queensland borders. Scattered, unconfirmed records of the species have also been reported in the western parts of NSW. Spotted-tailed Quolls live in various environments including forests, woodlands, coastal heathlands and rainforests. They are sometimes seen in open country, or on grazed areas and rocky outcrops. They are mainly solitary animals, and will make their dens in rock shelters, small caves, hollow logs and tree hollows. They use these dens for shelter and to raise young. These animals are highly mobile. They can move up to several kilometres in a night and may have quite large territories. Within their territories, they will have latrine sites where they defecate. These are often in exposed areas, such as on rocky outcrops (OEH, 2019).

Significant impact criteria

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- *lead to a long-term decrease in the size of a population*

Targeted surveys for the species were conducted using remote sensor cameras baited with chicken wings and fish sauce. No individuals were detected during the field surveys (camera established for 14-consecutive nights from 3/12/2019 to 17/12/2019). Additionally, the Study Area does not contain large areas of suitable denning habitat. Hollow bearing trees are present within the Study Area; however, patches of vegetation are typically small. The largest patch of vegetation, within Borrow Pit 4 primarily consists of Bull Oak Woodland which does not contain a high density of hollows or hollows large enough for the species. Furthermore, the Study Area lacks caves or cliff over-hangs that are often used as den sites. As such, it is unlikely that the Study Area forms part of the breeding habitat/range for a local population of the species. However, the Study Area may still provide foraging habitat and/or dispersal habitat for the species. Suitable habitat for the species was assessed as occurring within the majority of the vegetation types, with the exception of the Grasslands and Acacia Regrowth, due to the lack of woodland habitat features. The species may still disperse and move through the open areas of the Development Site. Approximately 82.13 ha of habitat for this species occurs within the Development Site

The majority of areas of habitat within the Study Area comprise small, isolated patches with a low-level of connectivity to surrounding habitat, with the exception of Borrow Pit 4 which contains a large patch of vegetation and is connected to vegetation off-site to the north/north-west. While the Action will impact potential habitat for this species, due to the large amount of surrounding, higher quality, habitat within the Development Site, it is unlikely that the Action will lead to the long-term decrease of any potentially occurring local population of the species.

- *reduce the area of occupancy of the species*

Due to the large home range sizes of the species, and availability of higher quality suitable habitat within the Development Site, it is unlikely that the Action would reduce the area of occupancy of any potentially occurring local population.

- *fragment an existing population into two or more populations*

The majority of habitat onsite comprises small, isolated patches with a low-level of connectivity to surrounding habitat, or patches located at the extremities of larger patches. The species is mobile and due to the availability of suitable habitat in the surrounding area, predominantly to the west of the impact area, it is unlikely that the Action will fragment any potentially occurring local population.

- *adversely affect habitat critical to the survival of a species*

Habitat critical to the survival of the Spotted-tailed Quoll includes large patches of forest with adequate denning resources and relatively high densities of medium-sized mammalian prey (DELWP 2016). Given mammal trapping and targeted surveys for Spotted-tailed Quoll did not reveal a high density of medium sized mammal species and the site does not contain large patches of forest with adequate denning resources. As such, it is unlikely that the Study Area contains habitat critical to the survival of the species.

- *disrupt the breeding cycle of a population*

No individuals were identified during targeted surveys of the species, and high-quality denning habitat was not identified within the Study Area. As such, it has been assumed that the Development Site does not form part of the breeding range of a local population (foraging and dispersal habitat only). As such, it is unlikely that the Action will disrupt the breeding cycle of a locally occurring population.

- *modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

The majority of the habitat onsite comprises small, isolated patches with a low-level of connectivity to surrounding habitat, or patches that are at the extremities of larger patches. The loss of any potential habitat for these species within the Study Area would not isolate remaining habitat from other patches and it is unlikely that the Action would significantly reduce the area of habitat occupied by the species relative to its regional distribution.

- *result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*

A site-specific CEMP will be prepared and implemented prior to the commencement of any clearing or construction works to ensure that impacts are minimised. Stringent management measures will prevent construction activities from introducing or spreading new or existing environmental and noxious weeds or plant and animal pathogens. As such, it is unlikely that the Action will result in invasive species becoming established in the habitat for the species.

- *introduce disease that may cause the species to decline, or*

A site-specific CEMP will be prepared and implemented prior to the commencement of any clearing or construction works to ensure that impacts are minimised. Management measures will prevent construction activities from introducing or spreading new or existing environmental and noxious weeds or plant and animal pathogens. As such, it is unlikely that the Action will result in the introduction of disease causing the species to further decline.

- *interfere with the recovery of the species.*

The Action does not contravene the objectives of the National recovery plan (DELWP 2016).

2019/20 Bushfire Impacts

An assessment of potential impacts of the 2019/2020 bushfires determined that moderate to large area of habitat for the Spotted-tailed Quoll were adversely affected by the fires (i.e. approximately 26% of the habitat within a 50km radius of the Development Site). The affected areas of habitat mainly occur to the southwest in the Yengo IBRA subregion and in the northwest near the Mummel Escarpment (**Figure 6**). Large areas of unaffected habitat for this species occurs throughout the Hunter IBRA subregion and to the north. Given the low/moderate suitability of habitats within the Development Site for the species, it is unlikely that the loss of habitat (as a result of bushfires) across the Study Area is expected to increase the value of habitats within the Development Site.

Conclusion

The species was assessed as having a moderate-low likelihood of occurrence within the Study Area. Approximately 82.13 ha of habitat for this species occurs within the Development Site. Sixty-five records occur within the locality. Targeted surveys for this species did not identify the species. The Study Area was assessed as providing potential foraging and dispersal habitat of the Spotted-tailed Quoll; however, it was not assessed as providing breeding habitat for the species. Large areas of habitat unaffected by the 2019/20 bushfires occur throughout the Hunter IBRA subregion.

As there is a large amount of higher quality habitat within the surrounding areas of the Development Site, the removal of the habitat within the Study Area is unlikely to have a significant impact on any potentially occurring local population of the species.

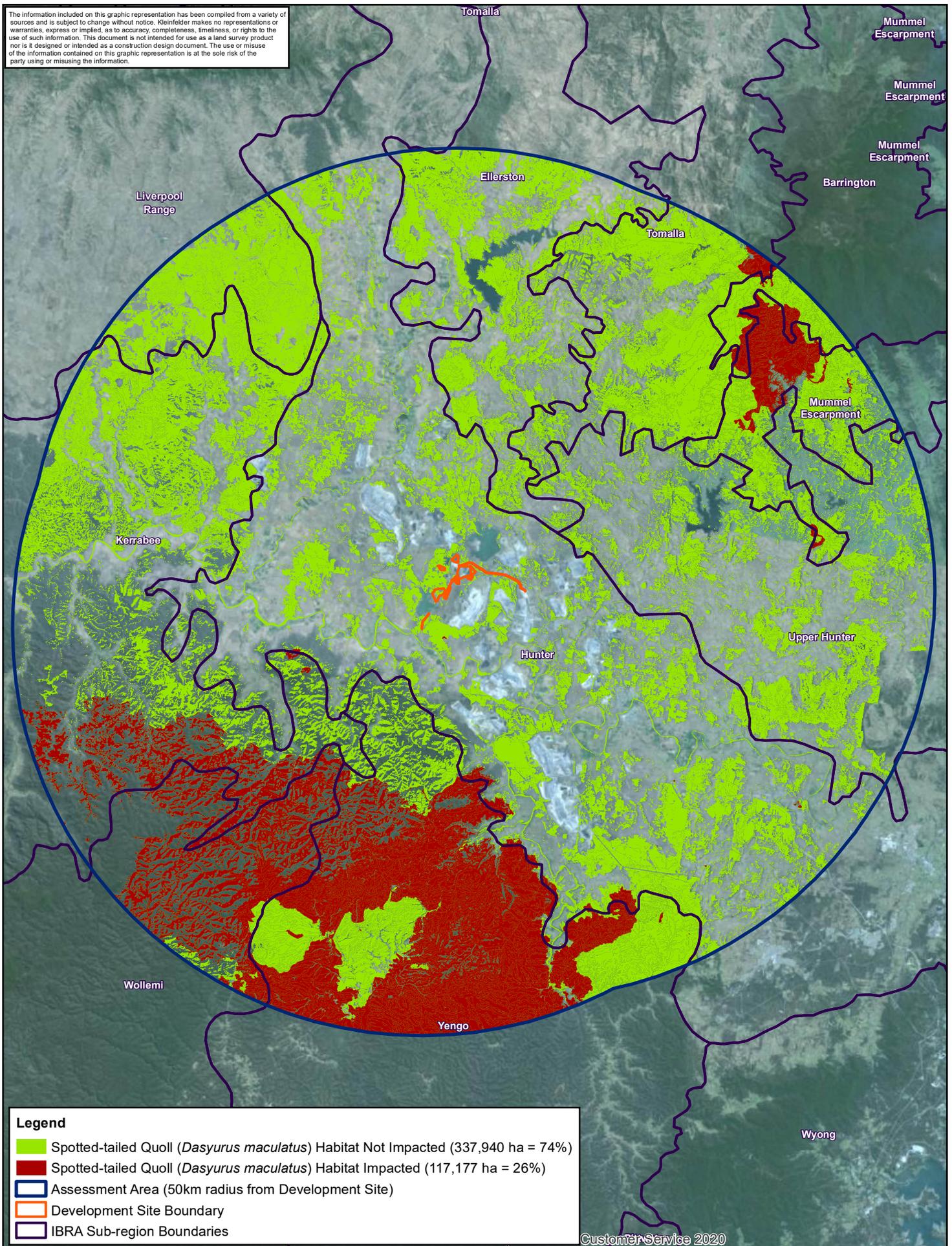
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Department of Environment, Land, Water and Planning (2016). *National Recovery Plan for the Spotted-tailed Quoll *Dasyurus maculatus**. Australian Government, Canberra.

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Legend

- Spotted-tailed Quoll (*Dasyurus maculatus*) Habitat Not Impacted (337,940 ha = 74%)
- Spotted-tailed Quoll (*Dasyurus maculatus*) Habitat Impacted (117,177 ha = 26%)
- Assessment Area (50km radius from Development Site)
- Development Site Boundary
- IBRA Sub-region Boundaries

Customer Service 2020

	PROJECT REFERENCE: 20214047 DATE DRAWN: 2021/03/18 00:03 Version 1 DRAWN BY: G.Joyce	Impact of 2019-2020 Bushfires on Spotted-tailed Quoll (<i>Dasyurus maculatus</i>) Habitat	FIGURE: 6
	DATA SOURCE: NSW DFSI - 2020 Commonwealth of Australia, Department of Agriculture, Water and the Environment (2012)	AGL Macquarie Analysis of Bushfire Impact on Habitats	

Ozothamnus tesselatus

Ozothamnus tesselatus is listed as vulnerable under the EPBC Act. This species was not detected within the Study Area during the assessment and was determined to have a low likelihood of occurrence. However, the species has been identified for further assessment in the supplementary assessment requirements; therefore, an assessment of potential impacts is presented here.

Ozothamnus tesselatus is a dense shrub growing to 1 m high with woolly branches. Leaves are spreading, oblong, 4–5 mm long, less than 1 mm wide, with leaf margins rolled backwards. The upper leaf surface is green, the lower leaf surface white and woolly, and the leaf base extends downwards on a stem 4 to 5 mm long. Floral heads grow in dense hemispherical corymbs, with the heads spherical, about 4 mm long, with obovate bracts surrounding the inflorescence. Floral heads consist of about 60 bisexual florets (Everett, 1992; DECC, 2005b).

Significant impact criteria

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- *lead to a long-term decrease in the size of an important population of a species*

Ozothamnus tesselatus is restricted to a few locations north of Rylstone, NSW, and is conserved within the Goulburn River National Park and Munghorn Gap Nature Reserve (DECC, 2005b). This species has been collected at eight sites in a restricted area over a range of 300 km². The preferred habitat of *Ozothamnus tesselatus* is eucalypt woodland (Everett, 1992) and occurs within the Hunter–Central Rivers (NSW) Natural Resource Management Region.

There is one historical record of the species in the locality (NSW Government Environment and Heritage 2020). Suitable habitat is present within the better-quality woodland habitats in the impact area (PCT 1690), however, the restricted distribution of the species does not encompass the Study Area. It is noted that the flora surveys within the site were not conducted under 'ideal' weather conditions for the detection of many plant species; however, given that *Ozothamnus tesselatus* is a shrub species that is not known to "die off" during dry conditions, it is unlikely that the adverse weather would have reduced the detectability of a resident population of the species within the site.

No population of *Ozothamnus tesselatus* was detected within the Study Area during field surveys. As such, the proposed Action is unlikely to lead to a long-term decrease in the size of an important population of the species.

- *reduce the area of occupancy of an important population*

As the species was not detected during field surveys, it is unlikely that the proposed Action will reduce the area of occupancy of an important population.

- *fragment an existing important population into two or more populations*

As the species was not detected during field surveys, it is unlikely that the proposed Action will fragment an existing important population.

- *adversely affect habitat critical to the survival of a species*

No habitat critical to the survival of the *Ozothamnus tesselatus* is mapped at this point in time (DEWHA, 2019). However, it can be assumed that due to the decline of the species and restricted nature of the known populations in NSW, any occupied habitat would be critical to the survival of the species. As the species was not detected during field surveys, it is unlikely to affect habitat critical to the survival of the species.

- *disrupt the breeding cycle of an important population*

As the species was not detected during field surveys, it is unlikely that the proposed Action will disrupt the breeding cycle of an important population.

- *modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

Better-quality woodland habitat occurs for this species in adjacent areas outside the development site. As the species was not detected during field surveys, it is unlikely that the proposed Action will impact on habitat to the extent that the species is likely to decline.

- *result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat*

The existing weed and feral animal threat levels are unlikely to change significantly due to the Action given the current agricultural use of the surrounding area. A site-specific CEMP will be prepared and implemented prior to the commencement of any clearing or construction works to ensure that impacts are minimised.

- *introduce disease that may cause the species to decline, or*

As the species was not detected during field surveys, it is unlikely that the proposed Action will introduce a disease that may cause the species to decline.

- *interfere substantially with the recovery of the species.*

A recovery plan for the species has not been prepared. As the species was not identified during surveys, it is unlikely to interfere with the recovery of the species.

2019/20 Bushfire Impacts

An assessment of potential impacts of the 2019/2020 bushfires determined that a very small area of habitat for the species was adversely affected by the fires (i.e. approximately 1% of the habitat within a 50km radius of the Development Site). The affected area occurs approximately 40km southeast of the Development Site near the borders of the Hunter and Yengo IBRA subregions (**Figure 7**). Populations of the species are mainly restricted to a few locations north of Rylstone. It is therefore unlikely that this species was directly impacted by the bushfires.

Conclusion

Surveys conducted within the Study Area for the proposed Action did not identify the species. The habitat present is not considered to be important to the long-term survival of the species. Large areas of habitat unaffected by the 2019/20 bushfires occur to the north of the Hunter IBRA subregion. The proposed Action is unlikely to have a significant impact on the species.

References

Department of Environment & Climate Change (DECC) New South Wales 2005b, *Ozothamnus tessellatus* – Priority actions (New South Wales Threatened Species Priority Action Statement).

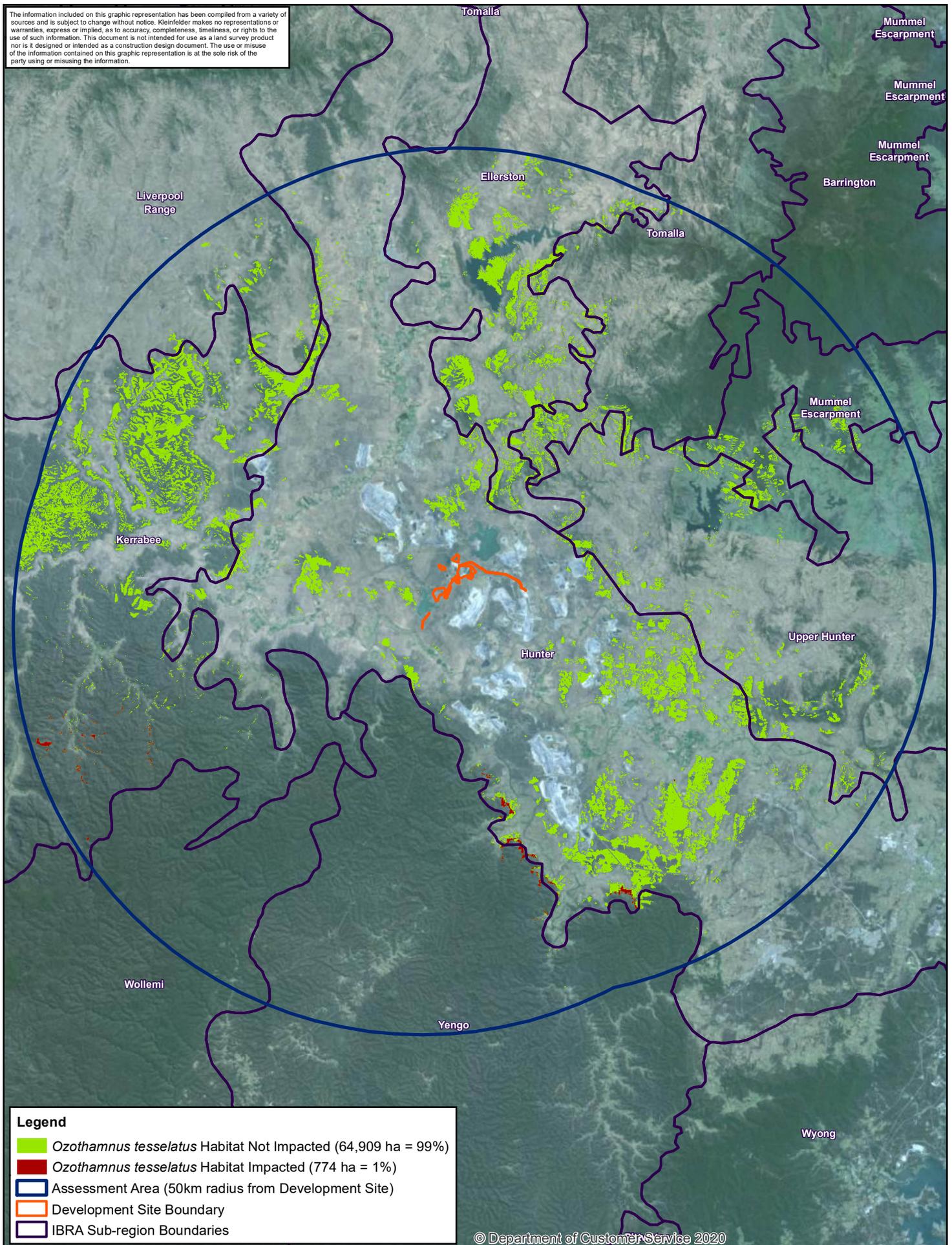
Department of the Environment (2021). *Ozothamnus tessellatus* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: <https://www.environment.gov.au/sprat>.

Department of the Environment, Water, Heritage and the Arts (DEWHA) 2008, Species Profile and Threats Database for *Ozothamnus tessellatus*.

Everett, J (1992), 'Ozothamnus' in Flora of New South Wales, vol.3, eds GJ Harden, University of New South Wales Press, Sydney, pp. 237-243.

NSW Government Environment and Heritage (2020) *NSW BioNet Atlas*

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Legend

- *Ozothamnus tessellatus* Habitat Not Impacted (64,909 ha = 99%)
- *Ozothamnus tessellatus* Habitat Impacted (774 ha = 1%)
- Assessment Area (50km radius from Development Site)
- Development Site Boundary
- IBRA Sub-region Boundaries

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PROJECT REFERENCE: 20214047

DATE DRAWN: 2021/03/18 00:01Version 1

DRAWN BY: G.Joyce

DATA SOURCE:
NSW DFSI - 2020
Commonwealth of Australia, Department of
Agriculture, Water and the Environment (2012)

**Impact of 2019-2020 Bushfires on
(*Ozothamnus tessellatus*)
Habitat**

AGL Macquarie
Analysis of Bushfire Impact on Habitats

FIGURE:
7

Green and Golden Bell Frog (*Litoria aurea*)

The Green and Golden Bell Frog (*Litoria aurea*) is listed as vulnerable under the EPBC Act. Although this species was not detected within the Study Area during the assessment, based on the availability of habitat and the occurrence of local species records, this species has a moderate likelihood of occurrence within the Study Area.

The Green and Golden Bell Frog occurs mainly along coastal lowland areas of eastern NSW and Victoria. Large populations are located around the metropolitan areas of Sydney, Shoalhaven and mid north coast (one an island population). This species inhabits marshes, dams and stream-sides, particularly those containing bullrushes (*Typha* spp.) or spikerushes (*Eleocharis* spp.). Optimum habitat includes waterbodies that are unshaded, free of predatory fish such as Plague Minnow (*Gambusia holbrooki*), have a grassy area nearby and diurnal sheltering sites available. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas. Green and Golden Bell Frogs need various habitats for different aspects of their life cycle including foraging, breeding, over-wintering and dispersal. They will also use different habitats or habitat components on a temporal or seasonal basis (Department of the Environment, Water, Heritage and the Arts, 2009). The species is active by day and usually breeds in summer when conditions are warm and wet (OEH, 2019).

The species has previously been identified within the Sewage Treatment Plant Polishing Ponds within the Bayswater Site (last recorded in early 2000's) and Lake Liddell (last confirmed in late 1970's) (DECC, 2007).

Significant impact criteria

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- *lead to a long-term decrease in the size of an important population of a species*

This species prefers open water bodies, fringed by reeds and other aquatic vegetation for breeding and foraging. The species needs fallen logs and debris for shelter and over-wintering purposes.

There are historical records of the species in the locality, and the last confirmed record of the species in the Upper Hunter was from the Bayswater Sewage Treatment Plant Polishing Ponds in the early 2000's (DECC, 2007). During this period, 4-5 adults, a number of juveniles and tadpoles were observed. There have not been any confirmed records of the species in the Upper Hunter since most likely due to impacts associated with Chytridiomycosis (fungal infection resulting in amphibian decline worldwide).

Suitable habitat is present within the Development Site and consists of constructed Dams which contain permanent water and suitable wetland vegetation (primarily *Thypha* and *Juncus acutus*). A total of eight Dams were identified within the Study Area (total of 4.99 ha). One area occurs within the existing Ash Dam (3.90 ha; within the approved disturbance area of the Dam), two occur within the Study Area outside the disturbance area (0.35 ha), and 5 occur within the Impact Area (total of 0.74 ha).

While these Dams contain suitable abiotic features, three of the eight Dams were identified as containing Plague Minnow (*Gambusia holbrooki*). While the presence of this species does not exclude the potential for presence of Green and Golden Bell Frogs, they are known to severely reduce the likelihood of species occurring.

A total of four separate one-person hour surveys have been conducted on each of the eight dams within the Study Area. Additionally, four surveys have also been conducted within the six Sewage Treatment Plant Polishing Ponds located to the west of the Ash Dam. One round of targeted survey was conducted on 5-7/11/2019, with each dam being surveyed once. Three rounds of survey were then conducted on 20 – 22 January (survey methodology provided within the BDAR (Kleinfelder 2020)). The species was not detected within the Study Area during the surveys.

The targeted surveys for the Green and Golden Bell Frog conducted in November, occurred after 21.6 mm of rain over three days (3 – 5 November; data from Liddell). The surveys conducted in January were following 36.8 mm of rain over five days (16 – 20 January; data from Liddell). Personal communication with the Conservation Biology Research Group at the University of Newcastle confirmed

that Green and Golden Bell Frogs were active at monitoring sites on Kooragang Island prior to the November and January surveys.

It is noted that the surveys within the site have not been conducted under ‘ideal’ weather conditions as recommended by the *Survey guidelines for Australia’s threatened frogs* (DEWHA 2009; within one week of heavy rainfall, which is defined as >50 mm in seven days). Due to drought conditions, there has been limited rainfall during the seasonal survey period for the species (September to March). It should also be noted that high rainfall events (>50mm) are rarer in the locality than on the coast. Surveys were conducted after the most significant rain events during the October to January period (monthly rainfall data from 2019 from the Liddell Site is shown in the BDAR (Kleinfelder 2020)), and when the species was known to be active at Kooragang Island. While this known population of Green and Golden Bell Frogs at Kooragang Island is over 80 km to the south-east of the Study Area, it is the closest known population to the Study Area and received moderate rainfall in November and high rainfall in the January period (based on rainfall data from weather Stations located at Newcastle University (Station 061390) and Newcastle Nobbys Signal Station (Station 061055); see **Table 3**).

While heavy rainfall is preferred to encourage breeding activity, the presence of permanent water is sufficient to provide habitat. All of the identified dams within the Study Area and the six Sewage Treatment Plant Polishing Ponds contained standing water at the time of survey, and are likely to contain standing water all year round. Additionally, surveys were conducted on warm and calm (low wind) nights during the survey period (September to March). As such, surveys within the Study Area were conducted when the species was active and detectable.

Table 2: Rainfall comparison

Month	Liddell	Newcastle University	Newcastle Nobbys
November 2019	21.6 mm	27.2 mm	38.4 mm
December 2019	0.2 mm	0.0 mm	5.2 mm
January 2020	46.6 mm Total 36.8 mm prior to 20/01	39.8 mm Total 24.2 mm prior to 20/01	31.0 mm Total 29.4 prior to 20/01

No population of Green and Golden Bell Frog was detected within the Study Area during field surveys. As such, the proposed Action is unlikely to lead to a long-term decrease in the size of an important population of the species.

- *reduce the area of occupancy of an important population*

As the species was not detected during field surveys, it is unlikely that the proposed Action will reduce the area of occupancy of an important population.

- *fragment an existing important population into two or more populations*

As the species was not detected during field surveys, and the closest known population occurs approximately 80 km to the south-east of the Study Area, it is unlikely that the proposed Action will fragment an existing important population.

- *adversely affect habitat critical to the survival of a species*

No habitat critical to the survival of the Green and Golden Bell Frog is mapped at this point in time (DoEE, 2019). However, it can be assumed that due to the decline of the species and restricted nature of the known populations in NSW, any occupied habitat would be critical to the survival of the species. As the species was not detected during field surveys, it is unlikely to affect habitat critical to the survival of the species.

- *disrupt the breeding cycle of an important population*

As the species was not detected during field surveys, it is unlikely that the proposed Action will disrupt the breeding cycle of an important population.

- *modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

Suitable habitat is present within the Development Site consisting of constructed dams which contain permanent water and suitable wetland vegetation (primarily *Typha* sp. and *Juncus* sp.). A total of eight

Dams were identified within the Study Area (total of 4.99 ha). One area occurs within the existing Ash Dam (3.90 ha; within the approved disturbance area of the Dam), two occur within the Study Area outside the disturbance area (0.35 ha, and 5 occur within the Impact Area (total of 0.74 ha).

While these Dams contain suitable abiotic features, three of the eight dams were identified as containing Plague Minnow (*Gambusia holbrooki*). While the presence of this species does not exclude the potential for presence of Green and Golden Bell Frogs, they are known to severely reduce the likelihood of species occurring.

As the species was not detected during field surveys, it is unlikely that the proposed Action will impact on habitat to the extent that the species is likely to decline.

- *result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat*

The existing weed and feral animal threat levels are unlikely to change significantly due to the Action given the current agricultural use of the surrounding area. A site-specific CEMP will be prepared and implemented prior to the commencement of any clearing or construction works to ensure that impacts are minimised.

- *introduce disease that may cause the species to decline, or*

Infection of amphibians with chytrid fungus resulting in chytridiomycosis is a key threatening process to the Green and Golden Bell Frog.

As the species was not detected during field surveys, it is unlikely that the proposed Action will introduce a disease that may cause the species to decline.

- *interfere substantially with the recovery of the species.*

There is a draft recovery plan for the species (DEC 2007). As the species was not identified during surveys, it is unlikely to interfere with the recovery of the species.

2019/20 Bushfire Impacts

An assessment of potential impacts of the 2019/2020 bushfires determined that a very small area of habitat for the species was adversely affected by the fires (i.e. approximately 3% of the habitat within a 50km radius of the Development Site). The affected area occurs approximately 40km southeast of the Development Site near the borders of the Hunter and Yengo IBRA subregions (**Figure 8**).

Conclusion

The Green and Golden Bell Frog has previously been recorded within the Sewage Treatment Plant Polishing Ponds within the Bayswater Site (directly to the west of the Study Area), approximately 20 years ago. Surveys conducted within the Study Area for the proposed Action did not identify the species. As with many historic populations of the Green and Golden Bell Frog, chytridiomycosis has resulted in broadscale range contractions and is now extinct of much of the former range of the species. As such, no location populations of the species is known in recent years and no individuals was detected during surveys. Large areas of habitat for the species were unaffected by the 2019/20 bushfires within the Hunter IBRA subregion. The proposed Action is unlikely to have a significant impact on the species.

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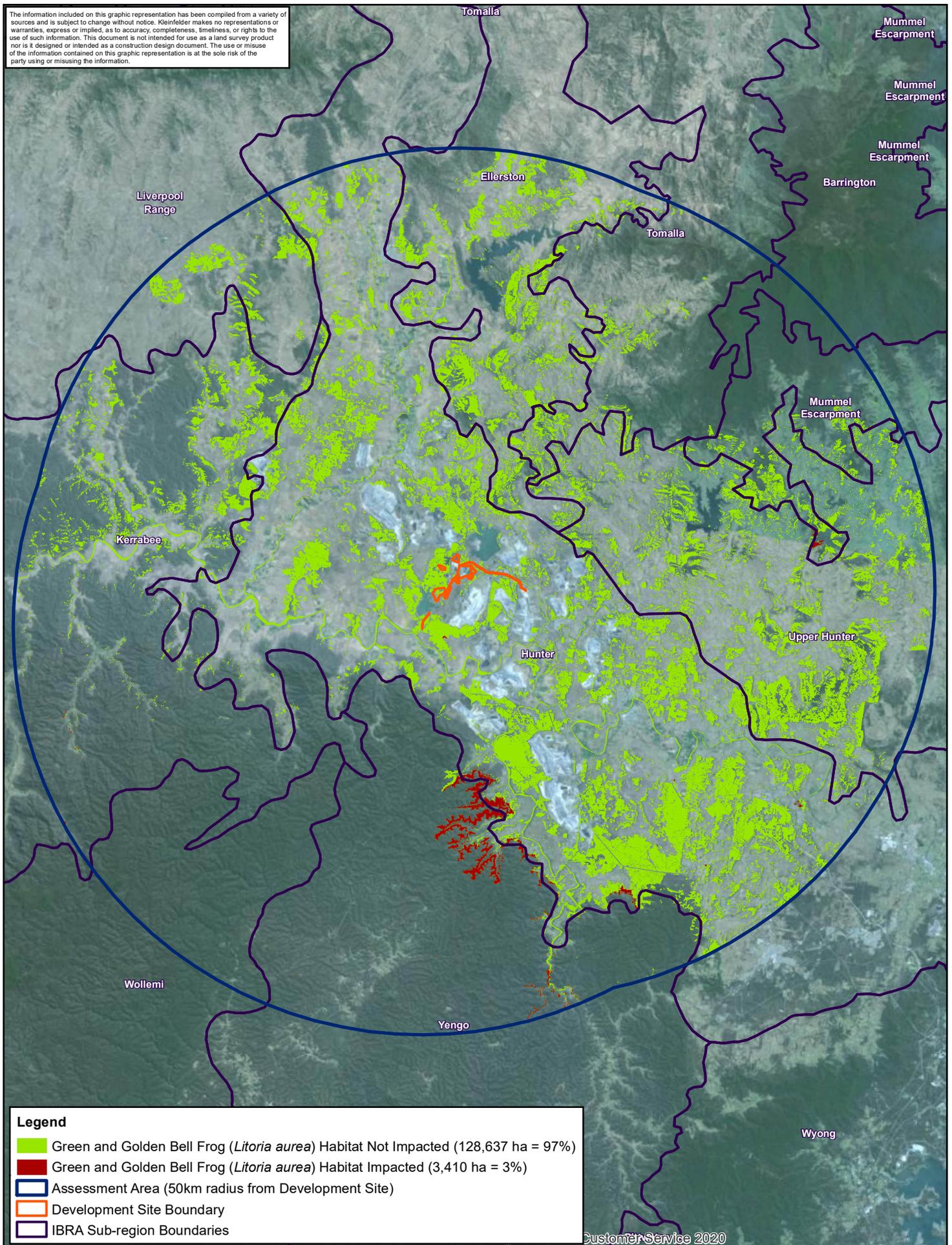
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Legend

- Green and Golden Bell Frog (*Litoria aurea*) Habitat Not Impacted (128,637 ha = 97%)
- Green and Golden Bell Frog (*Litoria aurea*) Habitat Impacted (3,410 ha = 3%)
- Assessment Area (50km radius from Development Site)
- Development Site Boundary
- IBRA Sub-region Boundaries

Customer Service 2020

	PROJECT REFERENCE: 20214047 DATE DRAWN: 2021/03/17 23:59 Version 1 DRAWN BY: G.Joyce	Impact of 2019-2020 Bushfires on Green and Golden Bell Frog (<i>Litoria aurea</i>) Habitat	FIGURE: 8
	DATA SOURCE: NSW DFSI - 2020 Commonwealth of Australia, Department of Agriculture, Water and the Environment (2012)	AGL Macquarie Analysis of Bushfire Impact on Habitats	

Large-eared Pied Bat (*Chalinolobus dwyeri*) and Corben's Long-eared Bat (*Nyctophilus corbeni*)

The Large-eared Pied Bat (*Chalinolobus dwyeri*) is found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. This species is Found in well-timbered areas containing gullies. It roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features. Sandstone cliffs and fertile woodland valley habitat within close proximity of each other is habitat of importance to the Large-eared Pied Bat (Department of Environment and Climate Change, 2007). Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years. This species likely forages for small, flying insects below the forest canopy (OEH, 2019).

Corben's Long-eared Bat (*Nyctophilus corbeni*) is a relatively large, solid bat. Overall, the distribution of this species coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Corben's Long-eared Bat is found in a wide range of inland woodland vegetation types. These include box/ironbark/cypress pine woodlands, Buloke woodlands, Brigalow woodland, Belah woodland, Smooth-barked Apple Woodland, River Red Gum Forest, Black Box Woodland, and various types of tree mallee (Duncan *et al.*, 1999; Schulz and Lumsden, 2010). The species is more abundant in extensive stands of vegetation in comparison to smaller woodland patches (Turbill and Ellis, 2006), suggesting its home range is probably large (Lumsden *et al.*, 2008). This species is an insectivorous bat that hunts by taking flying prey or by foliage-gleaning in flight or by foraging on the ground (Lumsden and Bennett, 2000; Schulz and Lumsden, 2010). Foraging appears to be concentrated around patches of trees in the landscape, with many individuals from different species of bat sharing the same foraging area (DoEE, 2019). Studies have found that this species roosts solitarily, mainly in dead trees or dead spouts of live trees (Lumsden *et al.*, 2008).

Significant impact criteria

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- *lead to a long-term decrease in the size of an important population of a species*

Suitable foraging habitat for both these species within the Study Area consists of Central Hunter Box – Ironbark Woodland, Rehabilitation, Plantation, Central Hunter Bull Oak Forest, Swamp Oak Forest. Within the impact area there is a total of 82.13 ha of habitat.

No suitable roosting or breeding habitat for the Long-eared Pied Bat occurs within the Study Area (foraging habitat only). There are 18 records of this species in the locality.

The Study Area represents potential roosting and foraging habitat for the Corben's Long-eared Bat. There is only one record of the species in the locality, with its main area of occurrence being further west.

An 'important population' is defined as a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- Key source populations either for breeding or dispersal
- Populations that are necessary for maintaining genetic diversity, and/or
- Populations that are near the limit of the species range.

It is unlikely that any potentially occurring population of either of these species within the site would be considered an important population as they do not meet any of the criteria listed above.

- *reduce the area of occupancy of an important population*

It is unlikely that any potentially occurring local populations would be classified as an important population, as such the Action would not impact on the area of occupancy of an important population. However, given the highly mobile nature of these species and large area of surrounding suitable habitat, it is unlikely that the Action would impact on the area of occupancy of any locally occurring populations.

- *fragment an existing important population into two or more populations*

The habitat onsite comprises small, isolated patches with a low-level of connectivity to surrounding habitat, or patches at the extremities of larger patches. Therefore, the loss of any potential habitat for these species within the Study Area would not isolate remaining habitat from other patches and it is unlikely that the Action would fragment an existing population into two or more populations.

- *adversely affect habitat critical to the survival of a species*

Sandstone cliffs and fertile wooded valley habitat within close proximity of each other, and any maternity roosts, should be considered habitat critical to the survival of the Large-eared Pied Bat (Department of Environment and Resource Management, 2011). No sandstone cliffs have been observed within the Study Area or within its close proximity. The structure of maternity roosts appears to be very specific (arch caves with dome roofs). Caves need to be high and deep enough to allow juvenile bats to learn to fly safely inside and have indentations in the roof (Department of Environment and Resource Management, 2011). Such structures are not present within the Study Area. On this basis, no habitat critical for the survival of the Large-eared Pied Bat occurs within the Study Area, and therefore the Action is unlikely to have a significant adverse impact on a local population of these species such that their local occurrence would be placed at risk.

The listing advice for the Corben's Long-eared Bat states that old-growth forest are critical habitat in its Victorian extent (DoEE, 2019). No areas of old-growth forests were identified within the Study Area as such, there is no impact on critical habitat for the Corben's Long-eared Bat.

- *disrupt the breeding cycle of an important population*

It is unlikely that any potentially occurring local populations would be important population, as such the Action would not impact on the breeding cycle of these species, furthermore there no breeding habitat for the Long-eared Pied Bat present within the Study Area. Given the highly mobile nature of Corban's Long-eared Bat and large area of surrounding suitable habitat, it is unlikely that the Action would impact on a locally occurring population of this species.

- *modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

The habitat onsite comprises small, isolated patches with a low-level of connectivity to surrounding habitat, or patches at the extremities of larger patches. Therefore, the loss of any potential habitat for these species within the Study Area would not isolate remaining habitat from other patches and it is unlikely that the Action would significantly reduce the area of available habitat such that it would lead to the decline of these species.

- *result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat*

The existing weed and feral animal threat levels are unlikely to change significantly due to the Action given the current agricultural use of the surrounding area. A site-specific CEMP will be prepared and implemented prior to the commencement of any clearing or construction works to ensure that impacts are minimised.

Disturbance and damage to primary nursery roosts of the Large-eared Pied Bat by feral goats (*Capra hircus*) is a recognised threat for this species (Department of Environment and Resource Management, 2011). No breeding or roosting habitat for the Large-eared Pied Bat is present within the Study Area.

- *introduce disease that may cause the species to decline, or*

The Action is unlikely to include activities that area likely to introduce any disease to the Large-eared Pied Bat or Corben's Long-eared Bat. A site-specific CEMP will be prepared and implemented prior to the commencement of any clearing or construction works to ensure that impacts are minimised.

- *interfere substantially with the recovery of the species.*

A National Recovery Plan for the Large-eared Pied Bat is currently in place (Department of Environment and Resource Management, 2011). No recovery plan is currently in place for Corben's Long-eared Bat.

The activities which comprise the Action are not inconsistent with the National Recovery Plans. The Action would not interfere substantially with the recovery of these species given habitat resources for these species would remain outside of the Study Area, such that the species are likely to persist in the landscape.

2019/20 Bushfire Impacts

An assessment of potential impacts of the 2019/2020 bushfires determined that large areas of habitat for the Large-eared Pied Bat and Corben's Long Eared Bat were adversely affected by the fires (i.e. approximately 33% and 53% of habitat respectively within a 50km radius of the Development Site) (**Figure 9** and **Figure 10**). The habitat affected by the fires is likely to represent both foraging and breeding habitat for these species. The affected areas mainly occur in the Yengo IBRA Subregion to the southwest. Habitat for the Large-eared Pied Bat was also affected by bushfires in the Mummel Escarpment to the northeast (**Figure 9**).

Conclusion

Large-eared Pied Bat (*Chalinolobus dwyeri*) has a high likelihood of occurrence within the Study Area. Eighteen records occur within the locality (OEH, 2019). Targeted surveys for this species were conducted in December 2019. These surveys did not detect any individuals or breeding habitat. The Action is unlikely to have a significant impact on this species given:

- The lack of breeding habitat for this species within the Study Area.
- Evidence of this species within the locality indicates this species has the potential to occur in the adjacent habitat.
- No habitat critical to the survival of this species occurs within the Study Area.
- The habitat onsite comprises small, isolated patches with a low-level of connectivity to surrounding habitat, or patches at the extremities of larger patches.
- The Action is unlikely to introduce or increase number of invasive pest species or a disease that may cause the species to decline.
- The Action would not interfere substantially with the recovery of this species.
- Large areas of habitat unaffected by the 2019/20 bushfires occur throughout the Hunter IBRA subregion.

Corben's Long-eared Bat (*Nyctophilus corbeni*) has a moderate likelihood of occurrence within the Study Area due to potentially suitable habitats, however, very few records are known from the locality. Approximately 122.70 ha of suitable habitat is identified within the Study Area. One record occurs within the locality (OEH, 2019). Targeted surveys for this species were conducted in December 2019. These surveys did not detect any individuals or breeding habitat. The Action is unlikely to have a significant impact on this species, given:

- Evidence of this species within the locality indicates this species has the potential to occur in the adjacent habitat.
- No habitat critical to the survival of this species occurs within the Study Area.
- The habitat onsite comprises small, isolated patches with a low-level of connectivity to surrounding habitat, or patches at the extremities of larger patches.
- The Action is unlikely to introduce or increase number of invasive pest species or a disease that may cause the species to decline.

- The Action would not interfere substantially with the recovery of this species.
- Large areas of habitat unaffected by the 2019/20 bushfires occur throughout the Hunter IBRA subregion.

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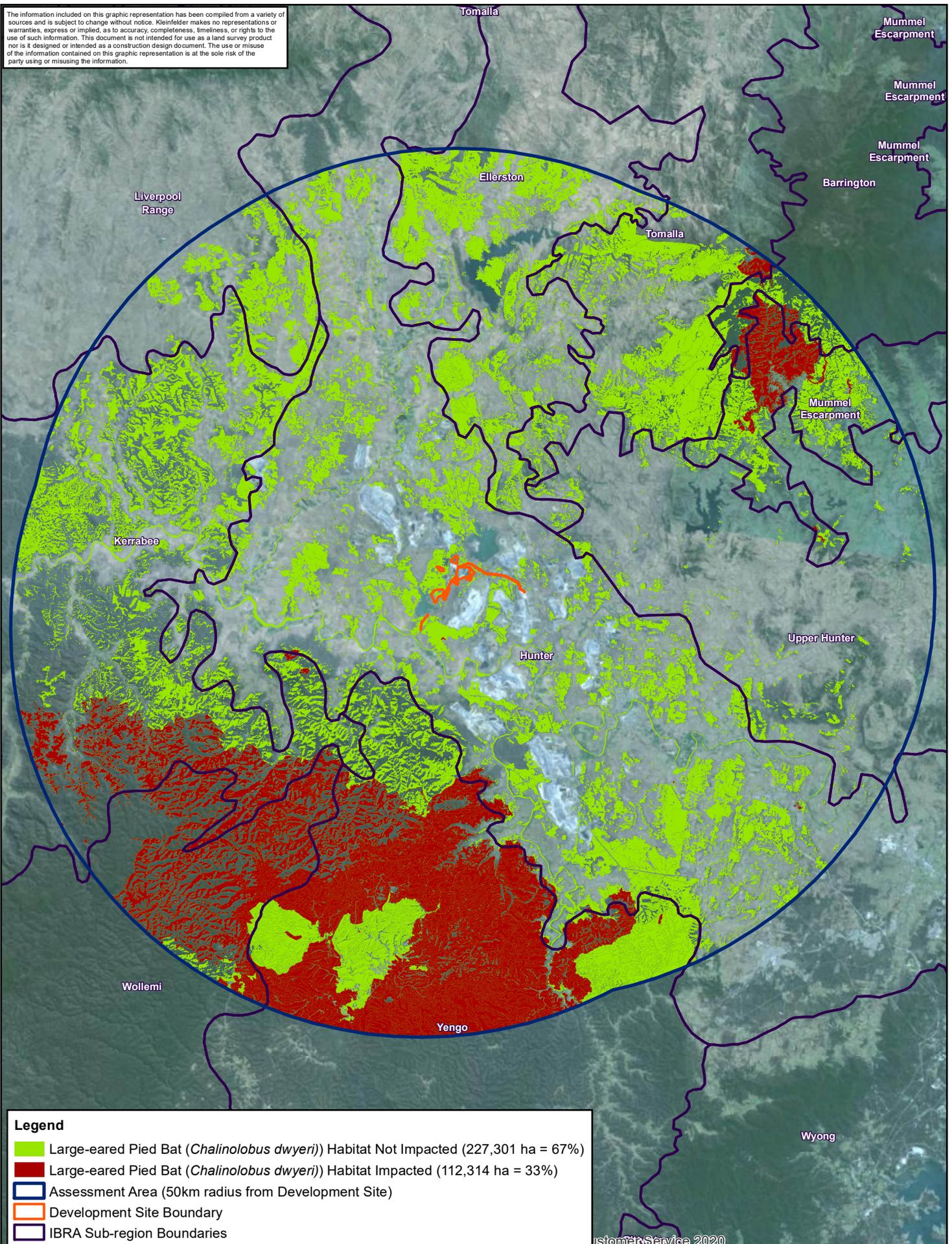
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Legend

- Large-eared Pied Bat (*Chalinolobus dwyeri*) Habitat Not Impacted (227,301 ha = 67%)
- Large-eared Pied Bat (*Chalinolobus dwyeri*) Habitat Impacted (112,314 ha = 33%)
- Assessment Area (50km radius from Development Site)
- Development Site Boundary
- IBRA Sub-region Boundaries

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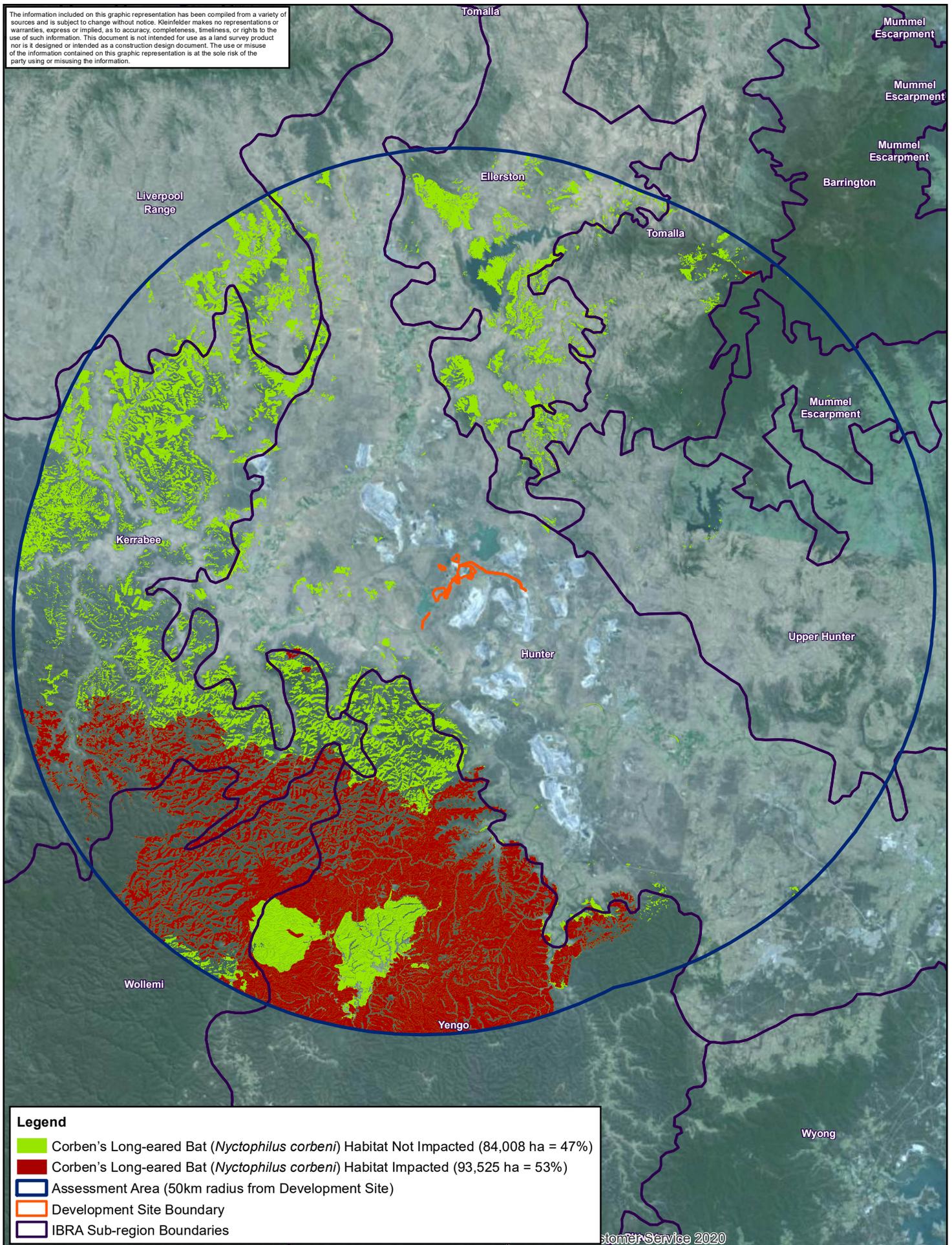
PROJECT REFERENCE: 20214047
 DATE DRAWN: 2021/03/17 23:48Version 1
 DRAWN BY: G.Joyce
 DATA SOURCE:
 NSW DFSI - 2020
 Commonwealth of Australia, Department of
 Agriculture, Water and the Environment (2012)

**Impact of 2019-2020 Bushfires on
 Large-eared Pied Bat
 (*Chalinolobus dwyeri*) Habitat**

AGL Macquarie
 Analysis of Bushfire Impact on Habitats

FIGURE:
9

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Legend

- Corben's Long-eared Bat (*Nyctophilus corbeni*) Habitat Not Impacted (84,008 ha = 47%)
- Corben's Long-eared Bat (*Nyctophilus corbeni*) Habitat Impacted (93,525 ha = 53%)
- Assessment Area (50km radius from Development Site)
- Development Site Boundary
- IBRA Sub-region Boundaries

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	PROJECT REFERENCE: 20214047 DATE DRAWN: 2021/03/17 23:45 Version 1 DRAWN BY: G.Joyce	Impact of 2019-2020 Bushfires on Corben's Long-eared Bat (<i>Nyctophilus corbeni</i>) Habitat	FIGURE: 10
	DATA SOURCE: NSW DFSI - 2020 Commonwealth of Australia, Department of Agriculture, Water and the Environment (2012)	AGL Macquarie Analysis of Bushfire Impact on Habitats	