



CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

PERMIT DETAILS

Area Permit Number: CPS 9357/1
File Number: DWERVT494922
Duration of Permit: From 05 January 2022 to 05 January 2024

PERMIT HOLDER

Shire of Bridgetown-Greenbushes

LAND ON WHICH CLEARING IS TO BE DONE

Brockman Highway Road Reserve (PINs 11292329, 11481353, 11599719, 11587825, 11587826, 11587828), Maranup and Bridgetown.

AUTHORISED ACTIVITY

The permit holder must not clear more than 57 native trees within the area cross-hatched yellow in Figures 1 to 9 of Schedule 1.

CONDITIONS

1. Avoid, minimise, and reduce impacts and extent of clearing

In determining the *native vegetation* authorised to be cleared under this permit, the permit holder must apply the following principles, set out in descending order of preference:

- (a) avoid the clearing of *native vegetation*;
- (b) minimise the amount of *native vegetation* to be cleared; and
- (c) reduce the impact of clearing on any environmental value.

2. Weed and dieback management

When undertaking any clearing authorised under this permit, the permit holder must take the following measures to minimise the risk of introduction and spread of *weeds* and *dieback*:

- (a) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;

- (b) ensure that no known *dieback* or *weed*-affected soil, *mulch*, *fill*, or other material is brought into the area to be cleared; and
- (c) restrict the movement of machines and other vehicles to the limits of the areas to be cleared.

3. Directional clearing

The permit holder must conduct clearing activities in a slow, progressive manner in the direction of adjacent *native vegetation* to allow fauna to move into adjacent *native vegetation* ahead of the clearing activity.

4. Soil management

The permit holder must commence road widening and construction of the associated surface water drainage no later than two months after undertaking the authorized activities to reduce the potential impacts from wind and water erosion.

5. Records that must be kept

The permit holder must maintain records relating to the listed relevant matters in accordance with the specifications detailed in Table 1.

Table 1: Records that must be kept

No.	Relevant matter	Specifications
1.	In relation to the authorised clearing activities generally	<ul style="list-style-type: none"> (a) (a) the species composition, structure, and density of the cleared area; (b) the location where the clearing occurred, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings; (c) the date that the area was cleared; (d) the date that construction activities commenced; (e) the size of the area cleared (in hectares); (f) actions taken to avoid, minimise, and reduce the impacts and extent of clearing in accordance with condition 1; and (g) actions taken to minimise the risk of the introduction and spread of <i>weeds</i> and <i>dieback</i> in accordance with condition 2.

6. Reporting

The permit holder must provide to the *CEO* the records required under condition 5 of this permit when requested by the *CEO*.

DEFINITIONS

In this permit, the terms in Table have the meanings defined.

Table 2: Definitions

Term	Definition
CEO	Chief Executive Officer of the department responsible for the administration of the clearing provisions under the <i>Environmental Protection Act 1986</i> .
clearing	has the meaning given under section 3(1) of the EP Act.
condition	a condition to which this clearing permit is subject under section 51H of the EP Act.
dieback	means the effect of <i>Phytophthora</i> species on native vegetation.
department	means the department established under section 35 of the <i>Public Sector Management Act 1994 (WA)</i> and designated as responsible for the administration of the EP Act, which includes Part V Division 3.
EP Act	<i>Environmental Protection Act 1986 (WA)</i>
native vegetation	has the meaning given under section 3(1) and section 51A of the EP Act.
weeds	means any plant – (a) that is a declared pest under section 22 of the <i>Biosecurity and Agriculture Management Act 2007</i> ; or (b) published in a Department of Biodiversity, Conservation and Attractions species-led ecological impact and invasiveness ranking summary, regardless of ranking; or (c) not indigenous to the area concerned.

END OF CONDITIONS



Mathew Gannaway

MANAGER

NATIVE VEGETATION REGULATION

*Officer delegated under Section 20
of the Environmental Protection Act 1986*

6 December 2021

SCHEDULE 1.

The boundaries of the area authorised to be cleared are shown in the map below (

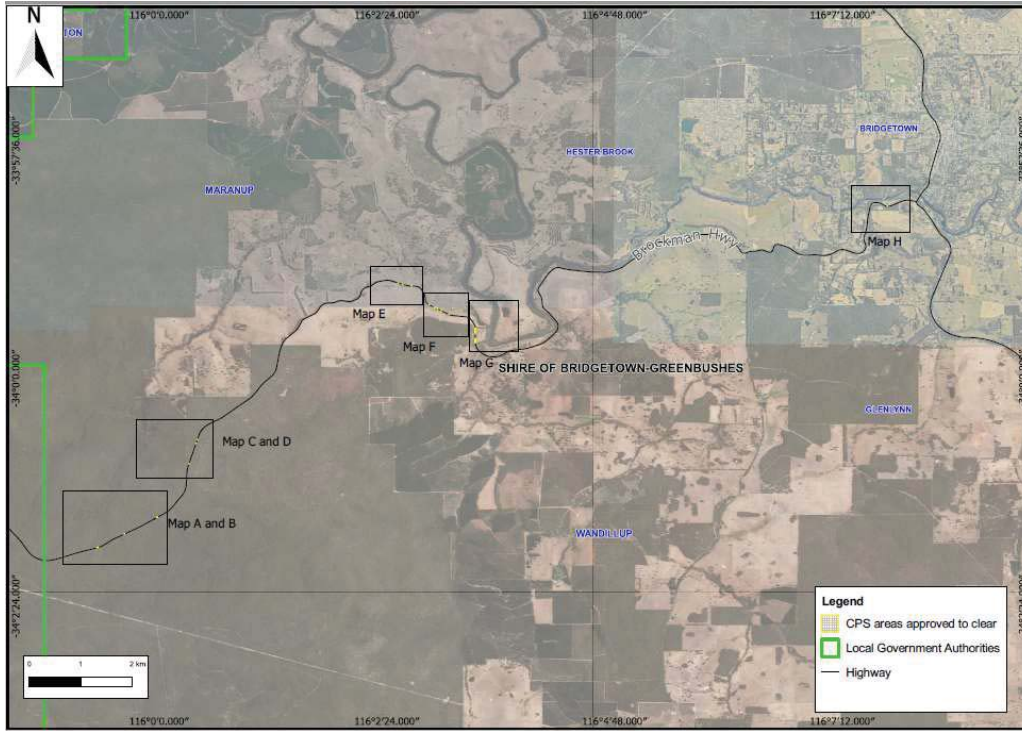


Figure 1 1 to 9).

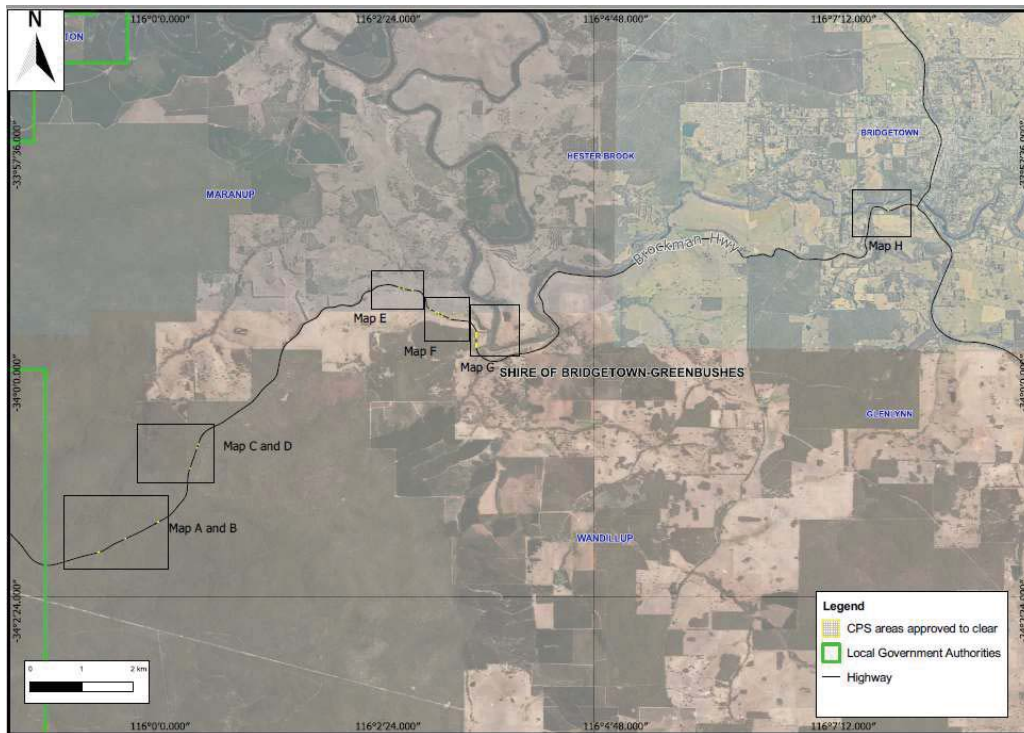


Figure 1: Context map of the boundary of the area within which clearing may occur

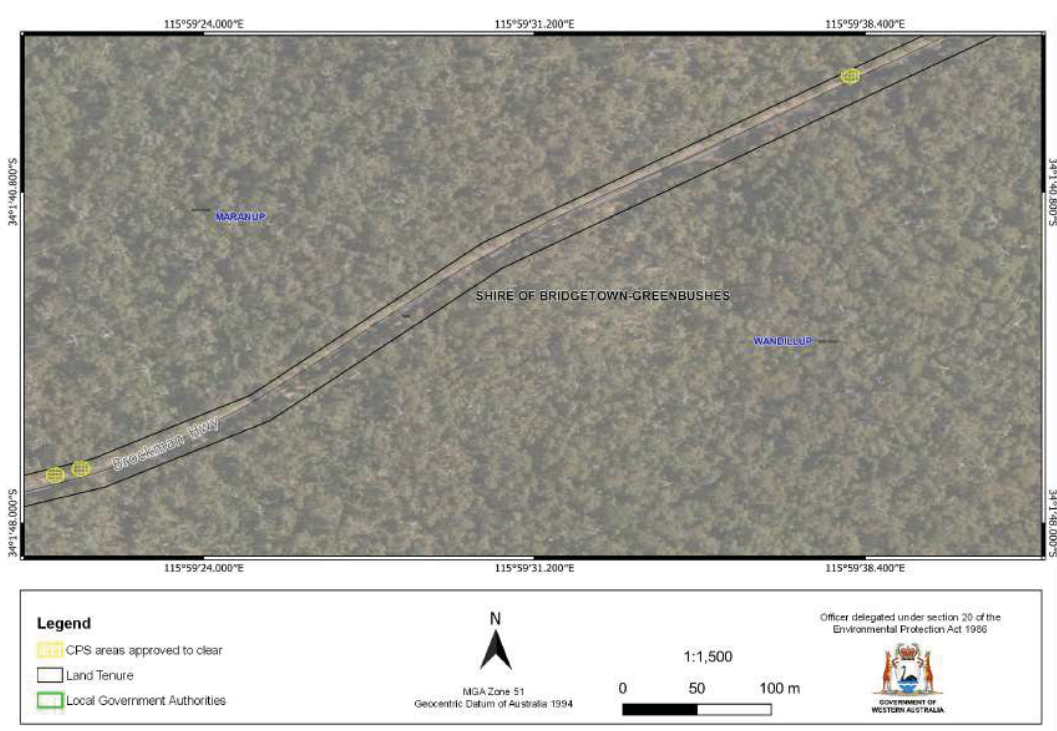


Figure 2: Map A of the boundary of the area within which clearing may occur

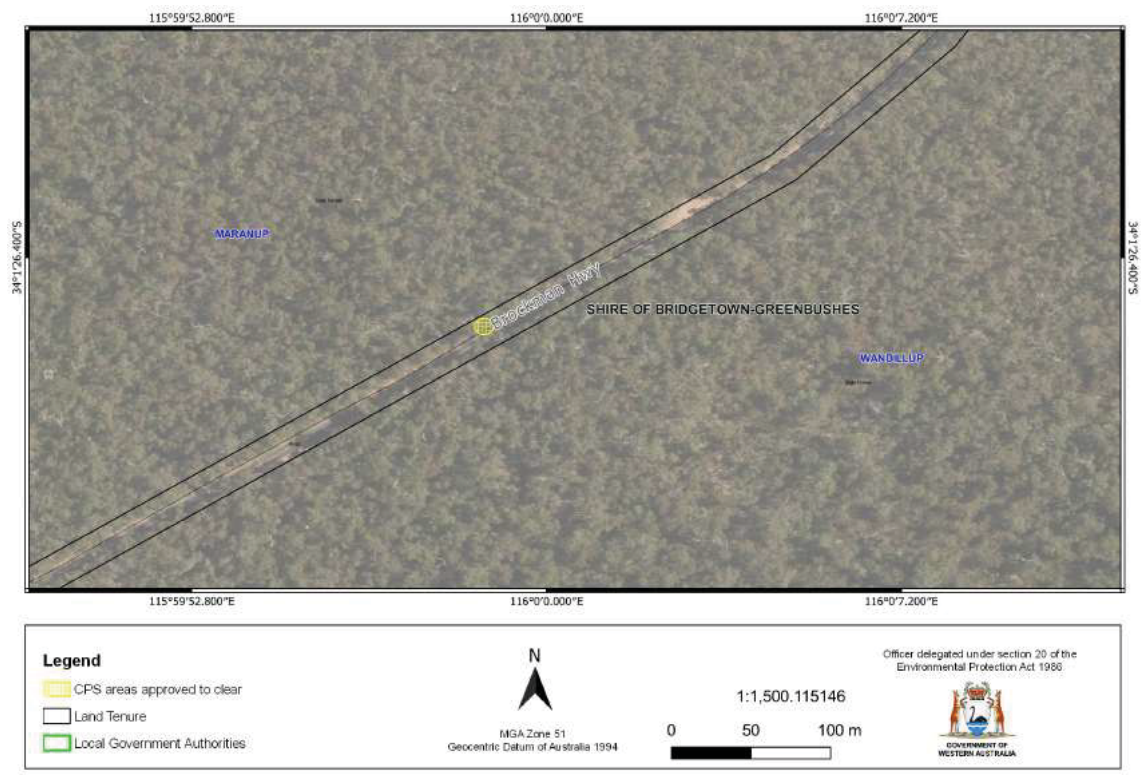


Figure 3: Map B of the boundary of the area within which clearing may occur

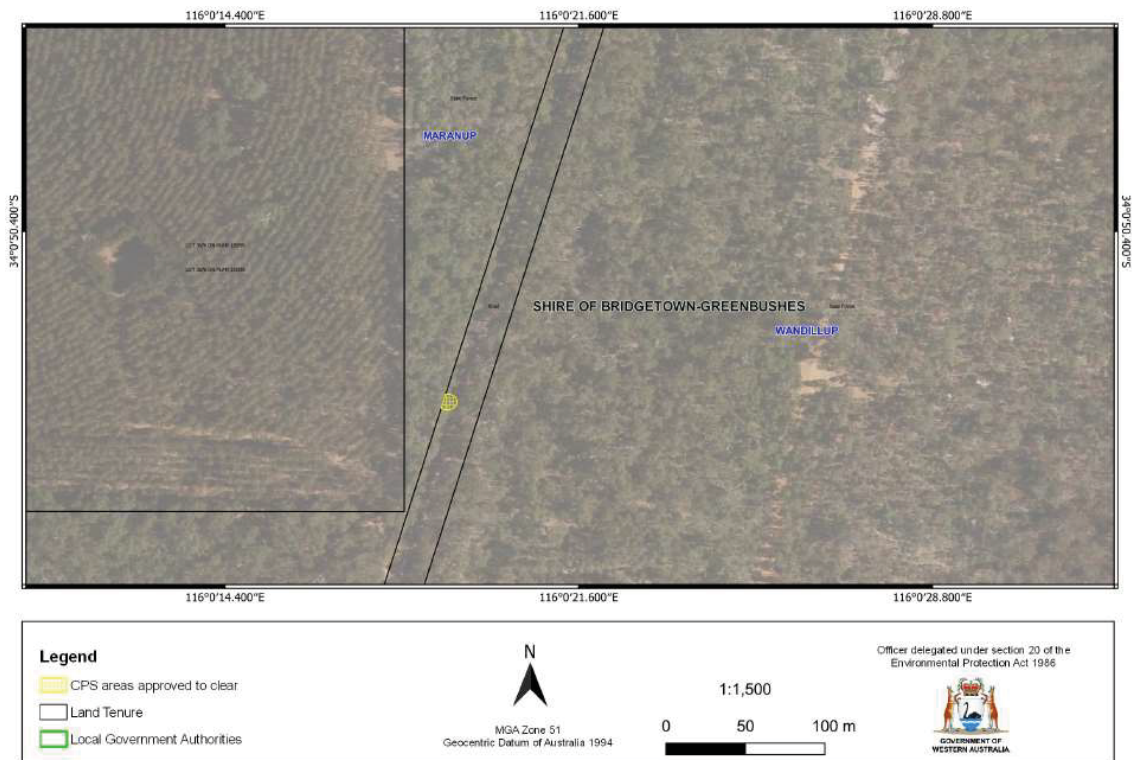


Figure 4: Map C of the boundary of the area within which clearing may occur

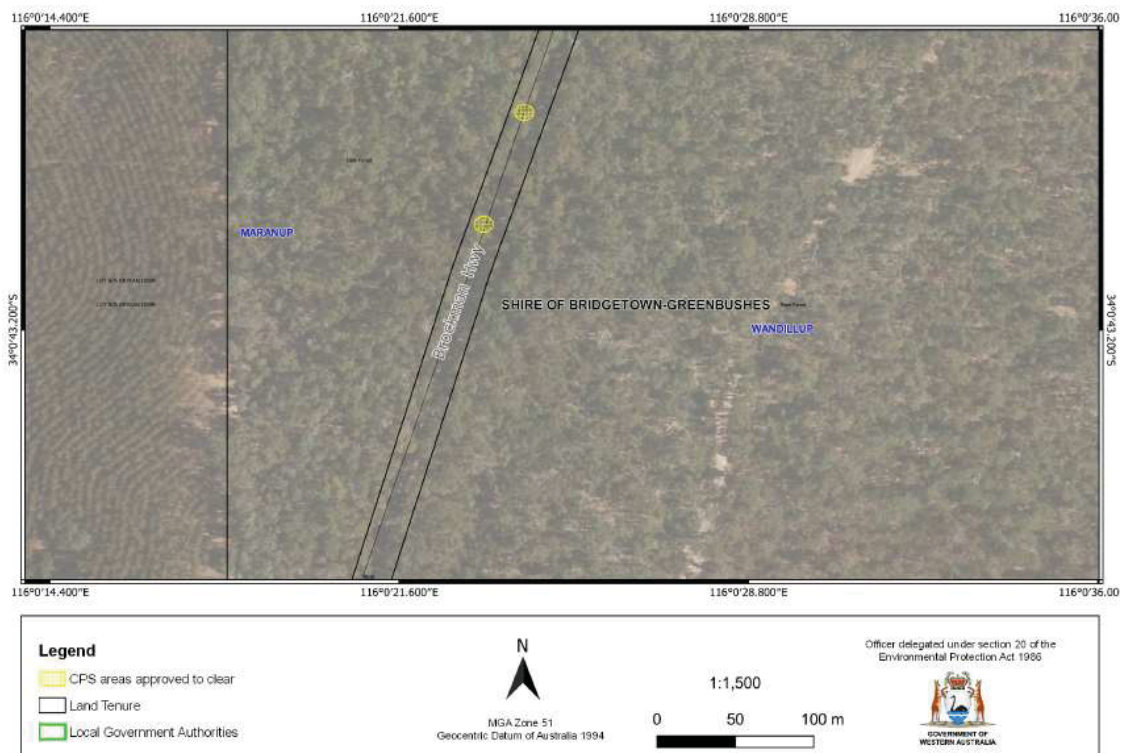


Figure 5: Map D of the boundary of the area within which clearing may occur

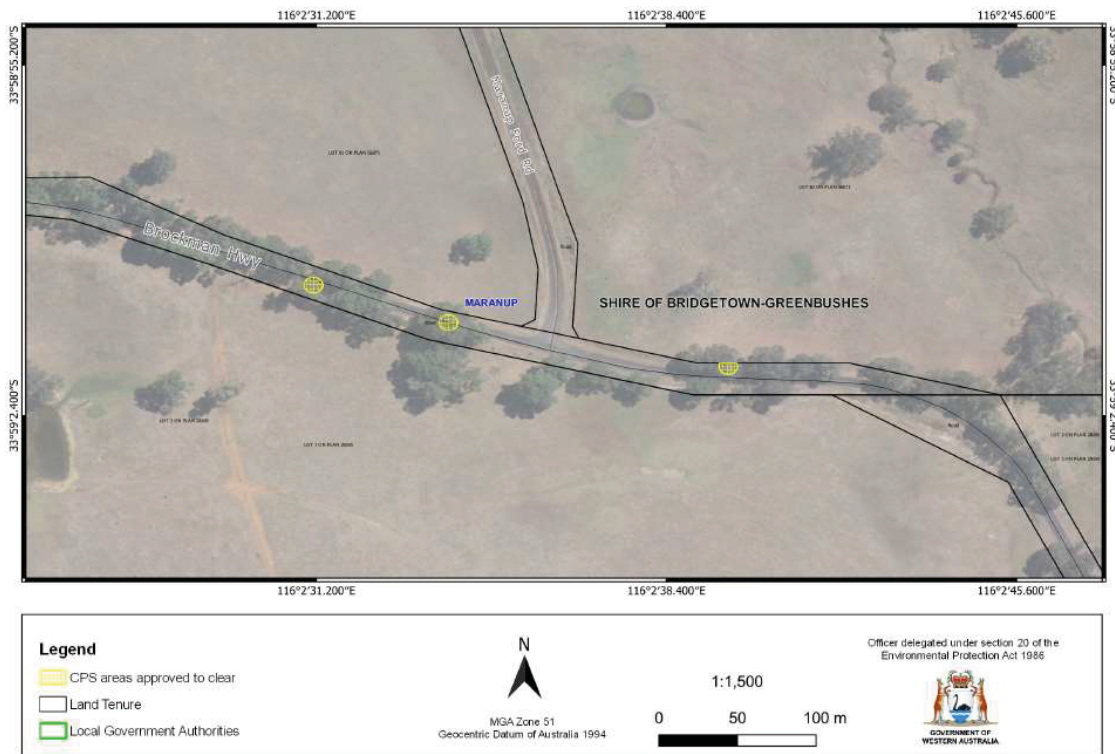


Figure 6: Map E of the boundary of the area within which clearing may occur

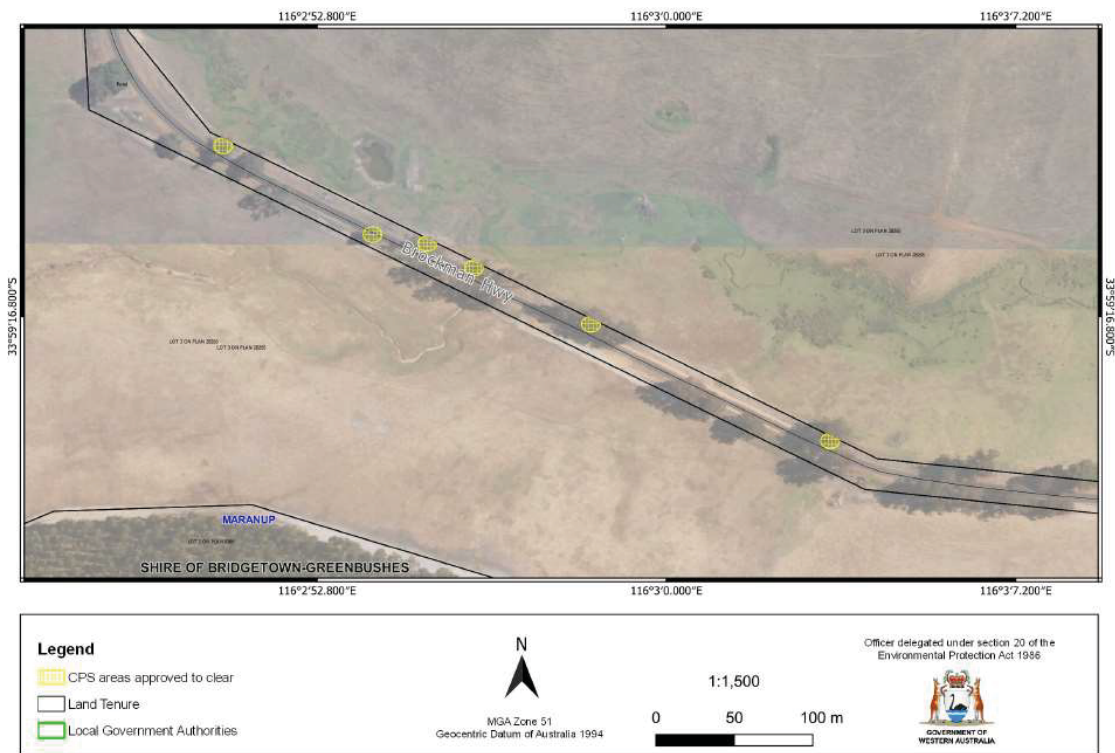


Figure 7: Map F of the boundary of the area within which clearing may occur

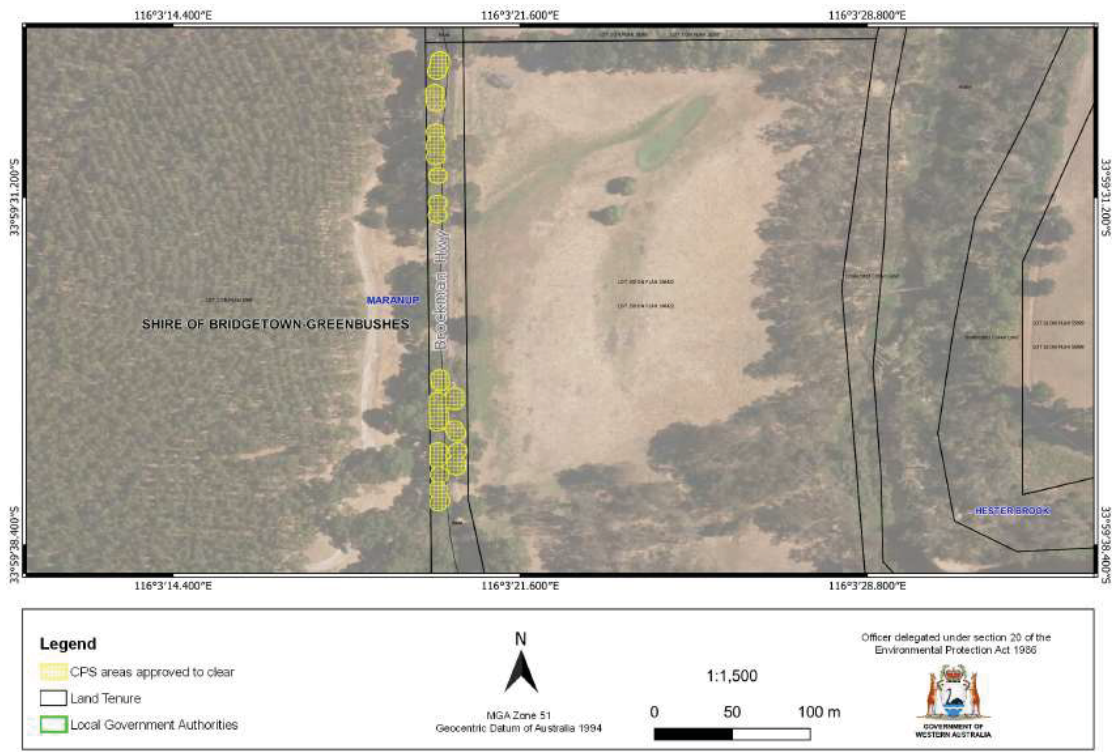


Figure 8: Map G of the boundary of the area within which clearing may occur



Figure 9: Map H of the boundary of the area within which clearing may occur



Clearing Permit Decision Report

1 Application details and outcome

1.1. Permit application details

Permit number:	CPS 9357/1
Permit type:	Area permit
Applicant name:	Shire of Bridgetown-Greenbushes
Application received:	19 July 2021
Application area:	57 native trees
Purpose of clearing:	Road upgrades
Method of clearing:	Mechanical
Property:	Brockman Highway Road Reserve (PINs 11292329, 11481353, 11599719, 11587825, 11587826, 11587828)
Location (LGA area/s):	Bridgetown-Greenbushes
Localities (suburb/s):	Maranup and Bridgetown

1.2. Description of clearing activities

The proposal is to clear 57 native trees distributed on the right and left sides of an approximately 21.3 kilometre (km) stretch of the Brockman Highway. The stretch of road is identified as having significant road hazards and requiring road widening and upgrade to reduce the incidence of single run-off vehicle crashes that have been responsible for significant number of road fatalities on rural government roads. The road works will include sealing of road gravel shoulders and installation of audible edge lines along its entire length. The trees proposed to be cleared are within the widening zone or have been identified as presenting significant roadside hazards because of the increased road width (Shire of Bridgetown-Greenbushes, 2021a).

A portion of the road within the application area traverses the North Donnelly and the Nannup State Forests. Eight of the trees proposed to be cleared are located within the State Forests boundaries, and 49 outside of it. Clearing of non-native understorey vegetation around 16 of the 49 trees located outside of the State Forests boundaries is required. Understorey vegetation in the remaining areas will be retained (Ecosystem Solutions, 2021a).

1.3. Decision on application

Decision:	Granted
Decision date:	6 December 2021
Decision area:	57 native trees as depicted in Section 1.5, below.

1.4. Reasons for decision

This clearing permit application was submitted, accepted, assessed and determined in accordance with sections 51E and 51O of the *Environmental Protection Act 1986* (EP Act). The Department of Water and Environmental Regulation (DWER) advertised the application for 21 days and one submission was received. Consideration of matters raised in the public submission is summarised in Appendix B.

In making this decision, the Delegated Officer had regard for the site characteristics (see Appendix C), relevant datasets (see Appendix G.1), the findings of a fauna survey and other information provided by the applicant (see Appendix F), the clearing principles set out in Schedule 5 of the EP Act (see Appendix D), relevant planning instruments and any other matters considered relevant to the assessment (see Section 3). The Delegated Officer acknowledged that the proposed clearing is a part of the State Black Spot Program designed to improve road safety.

In particular, the Delegated Officer has considered that:

- The proposed clearing would remove foraging habitat for Black cockatoo species. Within the context of more than 35,000 hectares of intact vegetation within the protected reserves immediately north, south, and west of the application area, the foraging habitat being removed within the application area is unlikely to be significant.
- The proposed clearing area may be utilised by other conservation significant fauna. Given its mostly Degraded condition (Keighery, 1994) and the availability of vast, intact and protected vegetation within the reserves nearby, it is unlikely that the application area comprises significant habitat for fauna. Inadvertent impact on any individuals present can be minimised and mitigated by applying appropriate management condition to the permit.
- Clearing may facilitate the introduction and spread of dieback and weeds into adjacent vegetation including the State Forests, which could impact on the quality of the vegetation and its habitat values. Appropriate dieback and weed management measures can mitigate this potential impact.
- Clearing in the areas where bank excavation is required may lead to land degradation due to wind and water erosion. The potential impacts can be mitigated by ensuring that the sealing of the roadsides and construction of surface water drainage is commenced within two months of the approved clearing.

After consideration of the available information, as well as the applicant's minimisation and mitigation measures (see Section 3.1), the Delegated Officer determined that the proposed clearing is unlikely to lead to long-term adverse impact on the existence, maintenance and habitat of Black cockatoos and other conservation significant fauna and / or appreciable land degradation. Potential impacts can be minimised and managed by imposing appropriate management conditions to the Permit.

The Delegated Officer decided to grant a clearing permit subject to conditions to:

- avoid and minimise to reduce the impacts and extent of clearing
- take hygiene steps to minimise the risk of the introduction and spread of weeds and dieback
- undertake slow, progressive clearing in the direction of adjacent native vegetation to allow terrestrial fauna to move into adjacent habitat ahead of the clearing activity
- staged clearing to minimise wind and water erosion
- commencement of road shoulder sealing and construction of surface water drainage within two months of clearing.

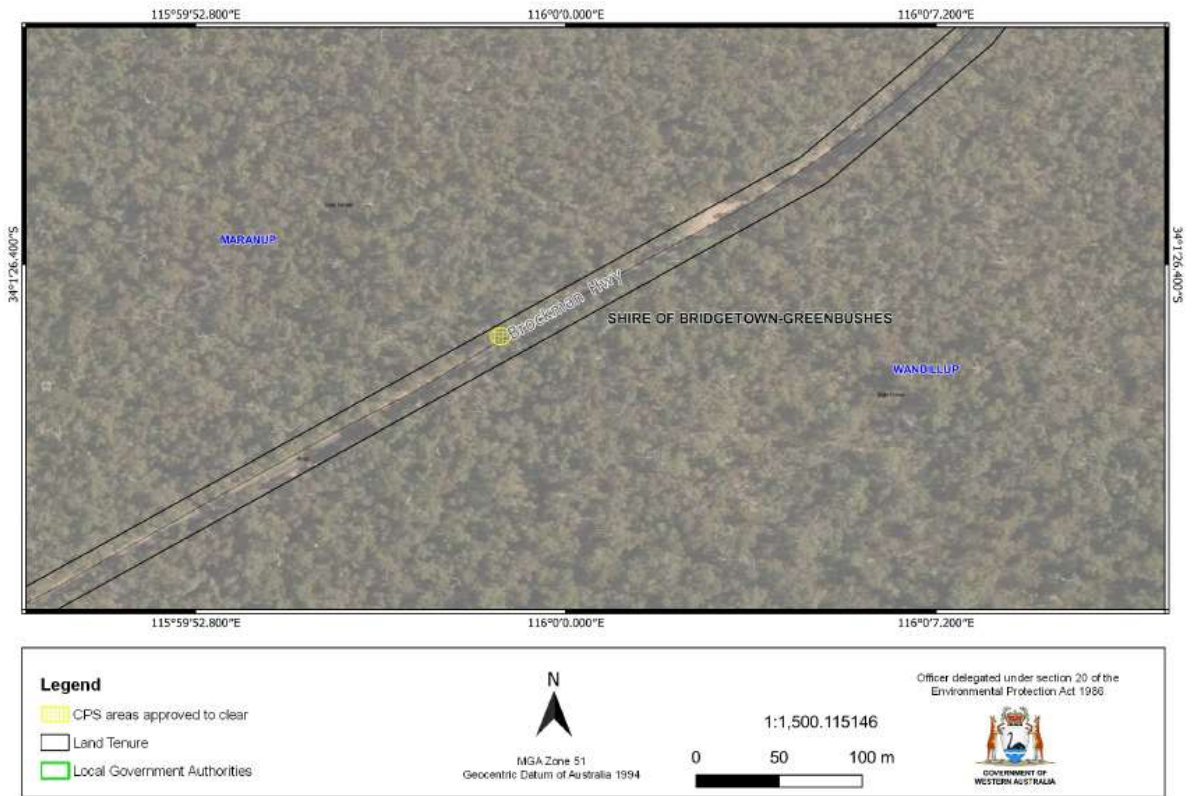


Figure 3. Map B of the application area. The area cross-hatched yellow indicates the areas authorised to be cleared under the granted clearing permit.

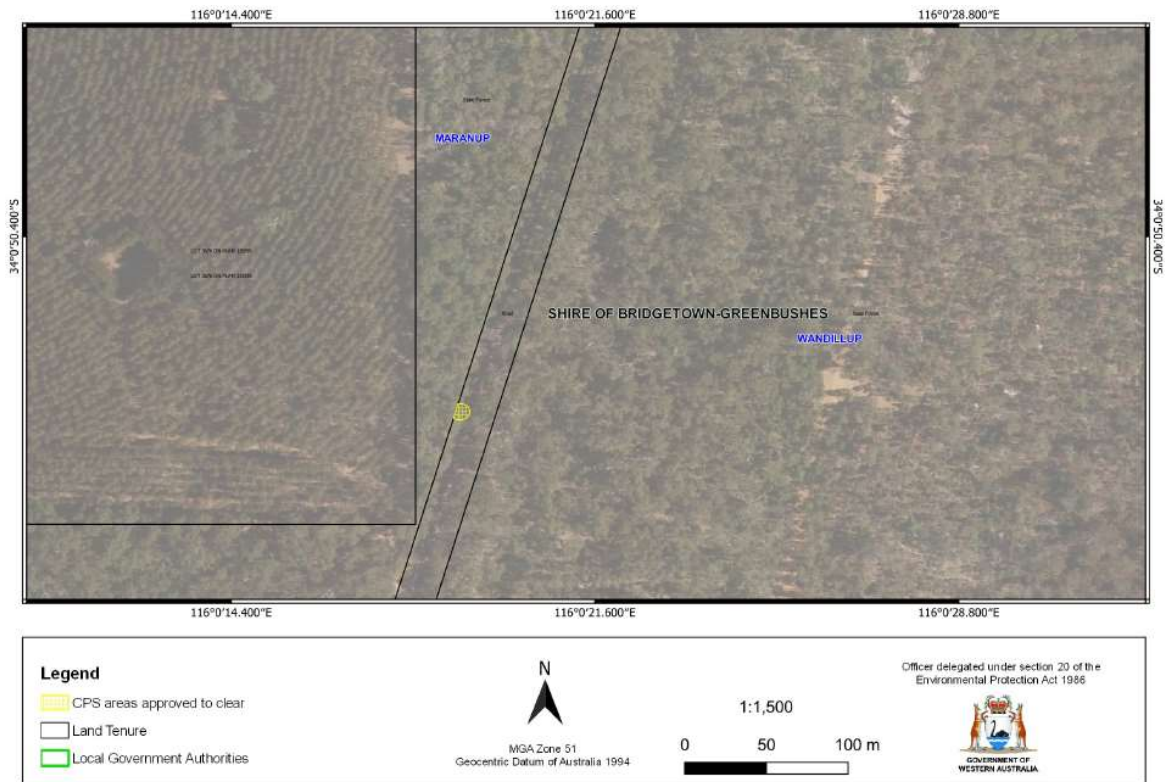


Figure 4. Map C of the application area. The area cross-hatched yellow indicates the areas authorised to be cleared under the granted clearing permit.

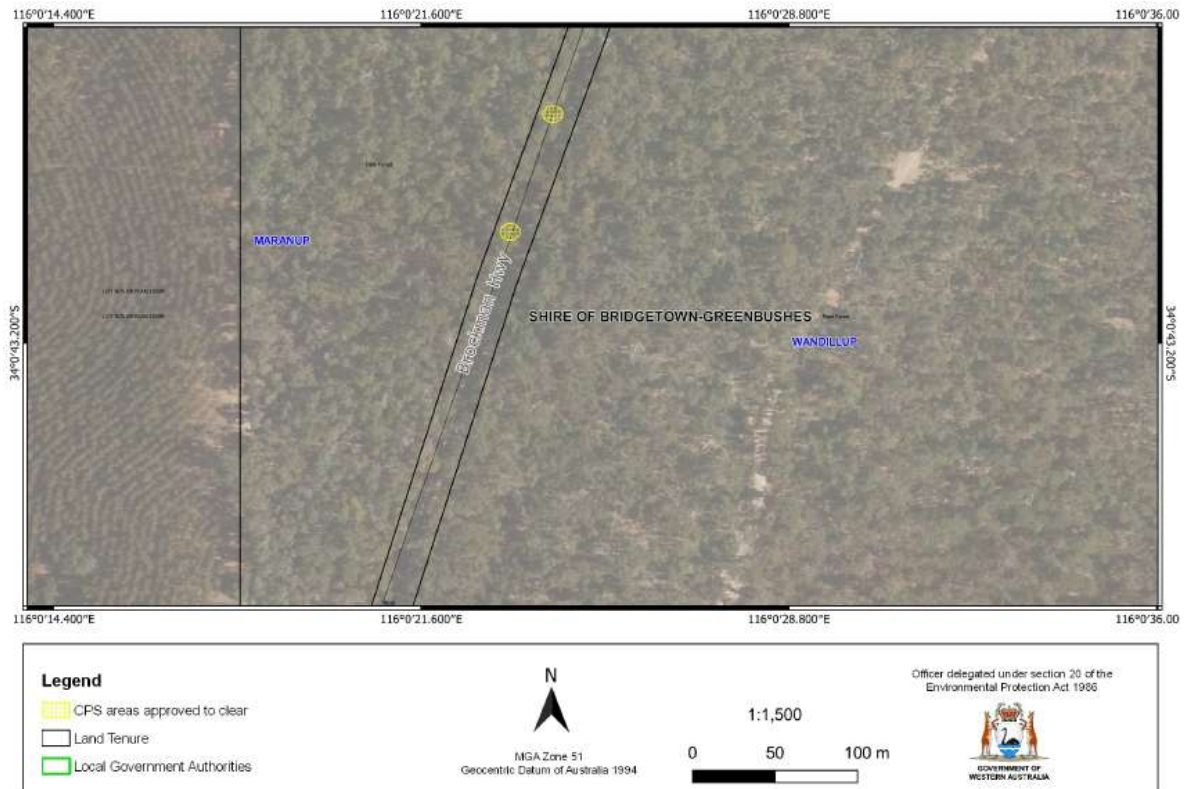


Figure 5. Map D of the application area. The areas cross-hatched yellow indicate the areas authorised to be cleared under the granted clearing permit.

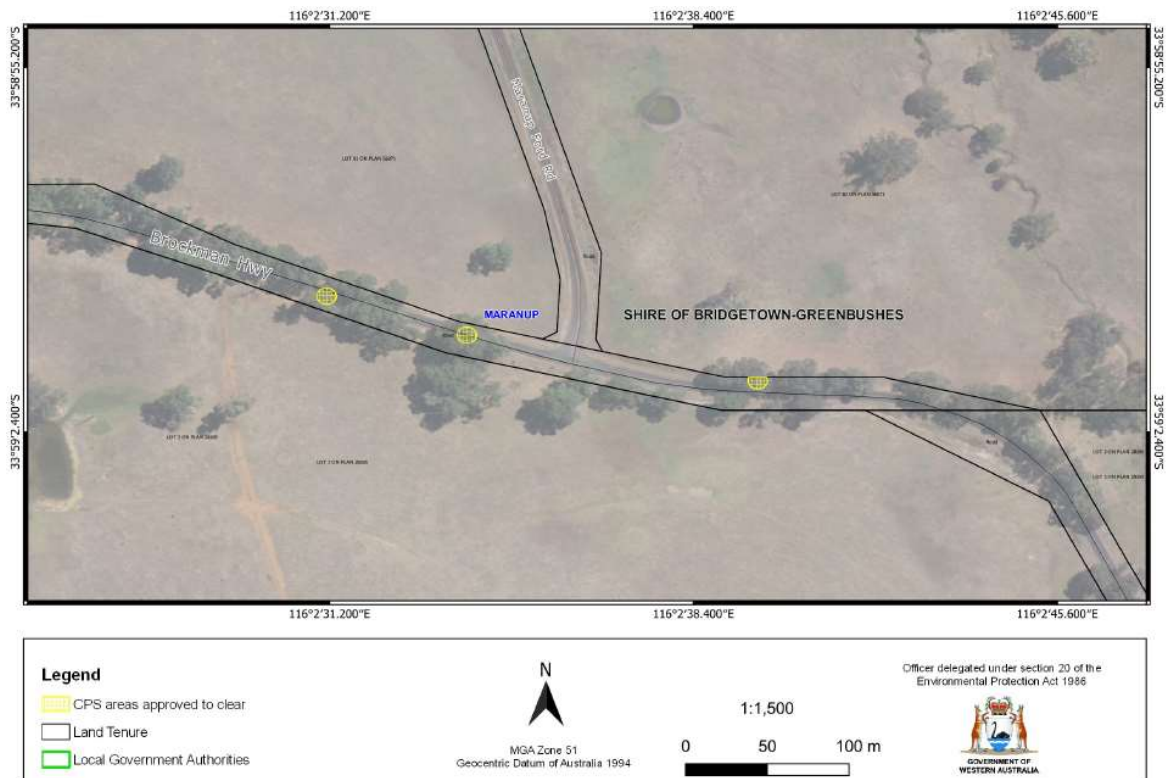


Figure 6. Map E of the application area. The areas cross-hatched yellow indicate the areas authorised to be cleared under the granted clearing permit.

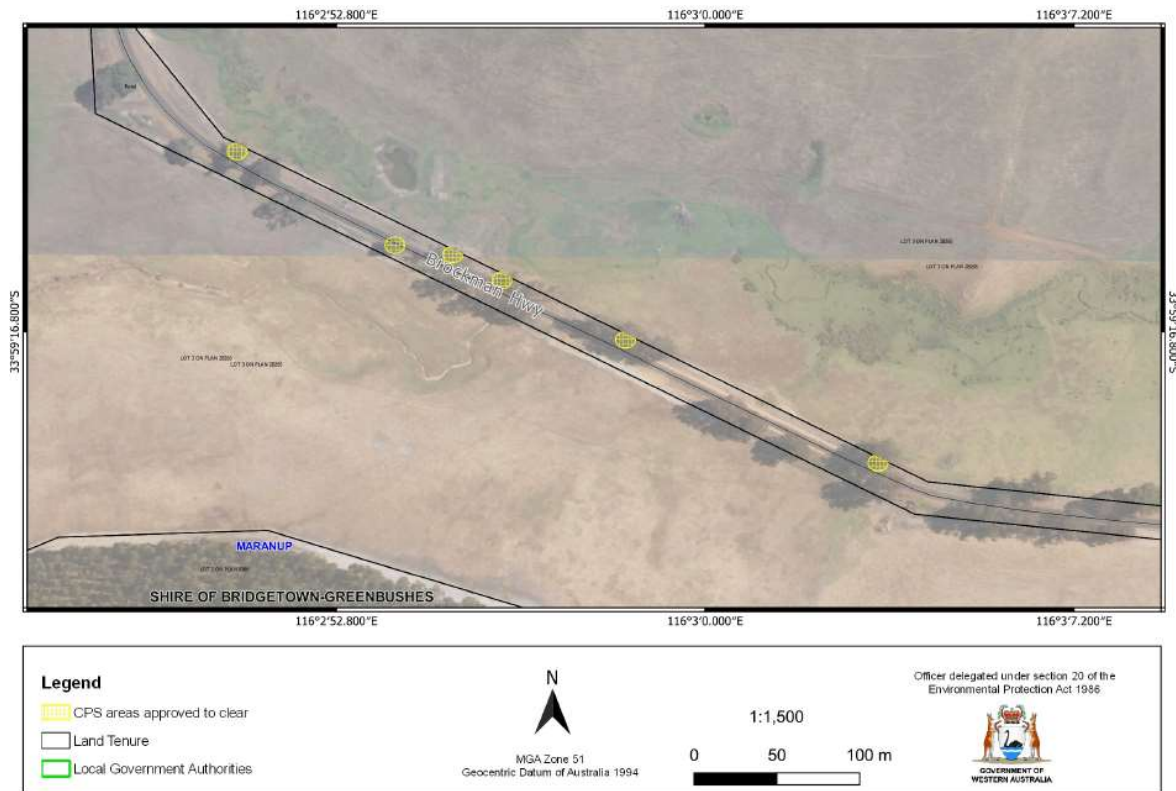


Figure 7. Map F of the application area. The areas cross-hatched yellow indicate the areas authorised to be cleared under the granted clearing permit.

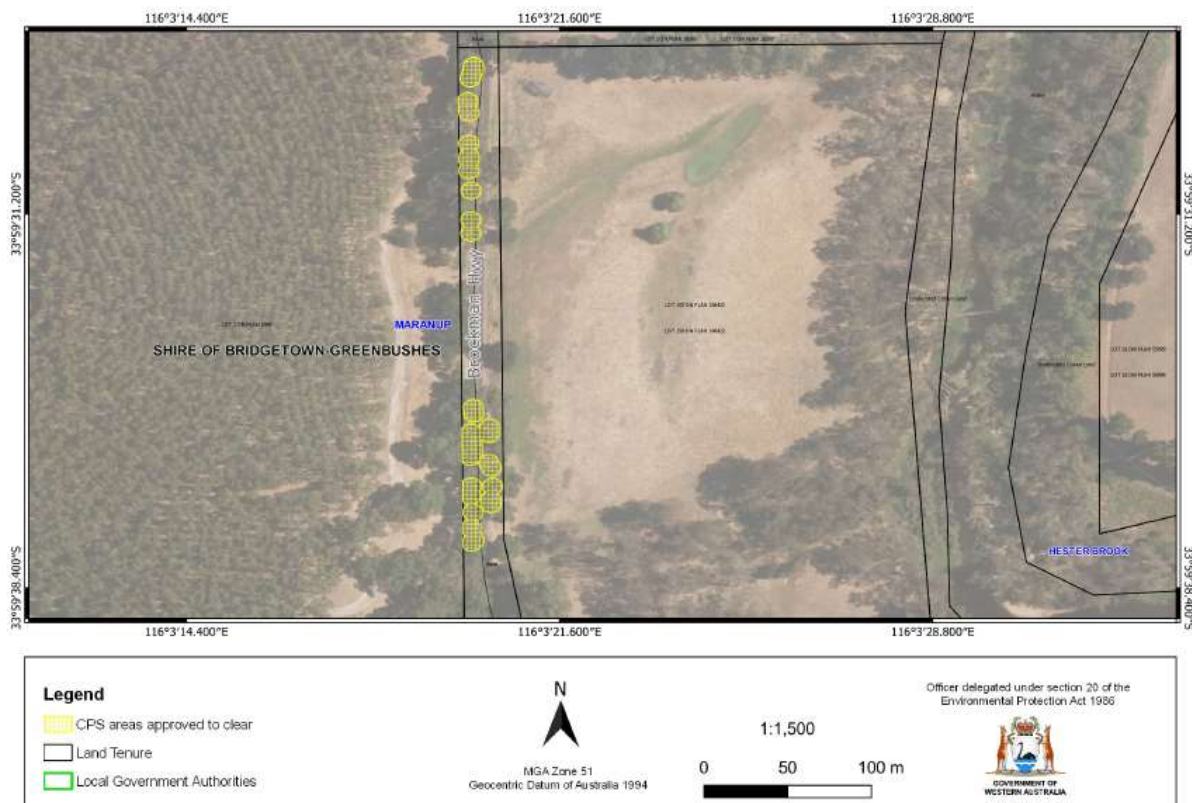


Figure 8. Map G of the application area. The areas cross-hatched yellow indicate the areas authorised to be cleared under the granted clearing permit.

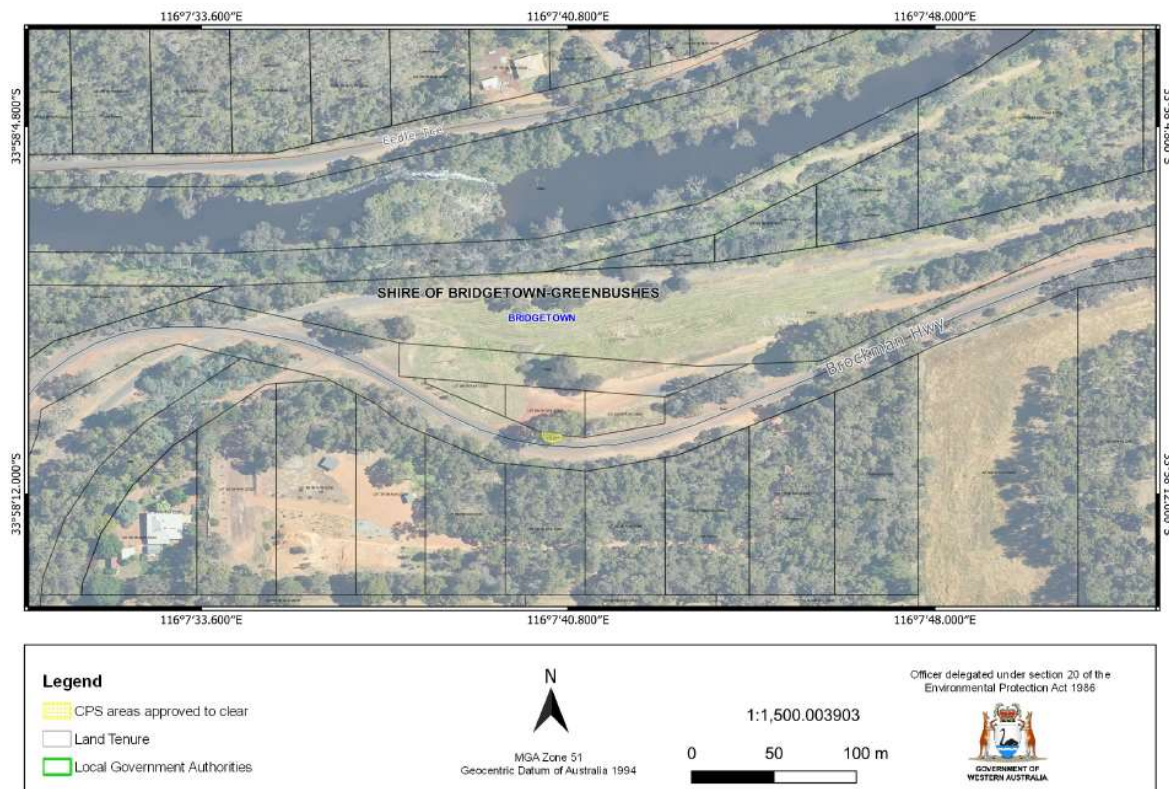


Figure 9. Map H of the application area. The area cross-hatched yellow indicates the areas authorised to be cleared under the granted clearing permit.

2 Legislative context

The clearing of native vegetation in Western Australia is regulated under the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (Clearing Regulations).

In addition to the matters considered in accordance with section 51O of the EP Act (see Section 1.4), the Delegated Officer has also had regard to the objects and principles under section 4A of the EP Act, particularly:

- the precautionary principle
- the principle of intergenerational equity
- the principle of the conservation of biological diversity and ecological integrity.

Other legislation of relevance for this assessment include:

- *Biodiversity Conservation Act 2016* (WA) (BC Act)
- *Conservation and Land Management Act 1984* (WA) (CALM Act)
- *Country Areas Water Supply Act 1947* (WA) (CAWS Act)
- *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act)
- *Planning and Development Act 2005* (WA) (P&D Act)
- *Soil and Land Conservation Act 1945* (WA)

Relevant policies considered during the assessment include:

- *Environmental Offsets Policy* (2011)

The key guidance documents which inform this assessment are:

- *A guide to the assessment of applications to clear native vegetation* (DER, December 2013)
- *Procedure: Native vegetation clearing permits* (DWER, October 2019)
- Technical guidance – *Terrestrial Fauna Surveys for Environmental Impact Assessment* (EPA, 2016)

3 Detailed assessment of application

3.1. Avoidance and mitigation measures

The applicant has demonstrated their commitments and efforts to avoid and minimise clearing and mitigate any potential impacts of the proposed clearing on environmental values. The avoid and minimise principles were considered and exercised throughout the design and decision-making processes for the road works and the application for a clearing permit (Shire of Bridgetown-Greenbushes, 2021a, b, c). These considerations include:

- the use of roadwork design that would reduce the chance of single run-off crashes by between 43-67%
- selective clearing based on a survey of the road
- retention of understorey vegetation on more than 75% of the proposed clearing area (understorey that is being cleared is non-native)
- reducing road shoulders' width from the standard 1 m wide on each side to the minimal width of 0.5 m to minimise clearing
- performing a fauna survey to identify and minimise any potential impacts on fauna and their habitats.

The Delegated Officer was satisfied that the applicant has made a reasonable effort to avoid and minimise potential impacts of the proposed clearing on environmental values.

3.2. Assessment of impacts on environmental values

In assessing the application, the Delegated Officer has had regard for the site characteristics (see Appendix C) and the extent to which the impacts of the proposed clearing present a risk to biological, conservation, or land and water resource values.

The assessment against the clearing principles (see **Error! Reference source not found.**) identified that the impacts of the proposed clearing may present a risk to fauna, adjacent forest reserves, and land and water resources. The consideration of these impacts, and the extent to which they can be managed through conditions applied in line with sections 51H and 51I of the EP Act, is set out below.

3.2.1. Biological value – Fauna – Clearing Principle (b)

Assessment:

The densely vegetated area adjacent to the application area, especially within the Forest Reserves boundaries, may provide habitat for fauna. Twenty-two conservation significant fauna have been recorded within 10 km from the application area. Some of the recorded fauna are historical records or extinct that could be considered the least likely to be present in the application area. Considering the proximity, time and number of records, and habitat requirements and their resemblance with the application area, the following fauna species have been assessed to likely be present, inhabit, and / or utilise the application area:

- *Dasyurus geoffroii* (chuditch) - VU
- *Falco peregrinus* (Peregrine falcon) - OS
- *Isodon fusciventer* (quenda) – P4
- *Notamacropus Irma* (wallaby) – P4
- *Phascogale tapoafa wamberger* (Red-tailed phascogale) - CD
- *Pseudocheirus occidentalis* (Western ringtail possum - WRP) - CR
- *Setonix branchyurus* (quokka) - VU
- *Tyto novaehollandiae* (masked owl) -P3
- Black cockatoo species:
 - *Calyptorhynchus banksia naso* (Forest red-tailed) - VU
 - *Calyptorhynchus baudinii* (Baudin's) - EN
 - *Calyptorhynchus latirostris* (Carnaby's) - EN

In support of the application, a fauna survey targeting Black cockatoos, WRP and other conservation significant fauna including the fauna species mentioned above was carried out. Potential habitat trees were identified, targeting hollow bearing trees that could potentially be utilised by fauna species that need tree hollows. The survey identified that eight of the 57 trees proposed to be cleared contain or potentially contain hollows (Ecosystem Solutions, 2021a). It

was determined that the hollows were not being utilised by any of the species listed above (Ecosystem Solutions, 2021b). The survey findings are considered in the assessment.

Desktop assessment indicates that Peregrine falcon (*Falco peregrinus*) has been known from the local area. At least four Peregrine falcons have been recorded, with the closest record located approximately within 7 km from the application area. The Peregrine Falcon typically nests on rocky ledges in tall, vertical cliff faces and gorges, or in tall trees associated with drainage lines, and can hunt in a range of habitat types including timbered watercourses, riverine environments, wetlands, plains, open woodlands, and pylons and spires of buildings (DAWE, 2021). The application area and surrounds exhibit some of these characteristics that it is likely to provide suitable habitat for the Peregrine Falcon. Given the sparse extent of clearing, the large movement range of the Peregrine Falcon, and the availability of the large and intact tracks of vegetation within the State Forests nearby, whilst the Peregrine Falcon may fly by or utilise the area in transit, it is unlikely that the application area represents a significant habitat for this species.

Chuditch are known to occur within the local area with the closest record located within 0.5 km from the application area. The large unfragmented forests with dense riparian jarrah forests adjacent to the application area could provide habitat to Chuditch. However, given its location on the road verge, the largely Degraded vegetation condition, and the availability of intact vegetation within the adjacent State Forests, the application area is unlikely to comprise significant habitat for Chuditch. This is confirmed by the fauna survey in the application area which did not identify any Chuditch individuals around ground logs or low hollows present (Ecosystem Solutions, 2021a & b).

Within the local context, the most recent record of Wallaby was made in 2020 from within approximately 1.26 km radius from the application area. Given its known home-range of about 10 to 12 ha, Wallaby is likely to roam into the application area. Wallaby prefers *Banksia spp.* woodlands, possibly due to the availability of canopy cover. Not only that *Banksia* woodlands are absent from the application area, but also the roadside vegetation is poor of canopy cover. Consequently, although dispersing Wallaby may utilise the application area, it is unlikely that Wallaby would inhabit the application area. Clearing is unlikely to significantly impact the habitat and maintenance of this fauna species.

Brush-tailed phascogale inhabits dry sclerophyll forest and open woodlands with hollow bearing trees. Vegetation in parts of the application area are mapped as that of associated with valleys, valley floors and swamps which can be wet from time to time and avoided by phascogale. On the upland parts of the application area, phascogale may occur, especially given that eight of the trees proposed to be cleared contain hollows. The fauna survey targeting these trees was conducted nocturnally using spotlight and head torch. Despite the survey technique used, phascogale individuals were not identified in the hollows and vicinity (Ecosystem Solutions, 2021 a & b). Given the above, in addition to the mostly Degraded condition of the roadside vegetation and the presence of an intact forest immediately adjacent to it, the proposed clearing area is unlikely to comprise significant habitat for this species. Inadvertent impacts on any individuals present at the time of clearing can be mitigated by applying fauna management measures.

Quenda may be present in the local area as it contains tall and dense vegetation, especially within the State Forest areas. The application area, however, does not contain dense understory preferred by quenda for cover (van Dyck, S., and Strahan, R., 2008; Watson 2018). The fauna survey did not identify this fauna species within the application area (Ecosystem Solutions, 2021a). Although dispersing quenda may use the habitat, the availability of the densely vegetated area in the adjacent State Forest indicate quenda is unlikely to be prolonged inhabitants of the application area.

Three records of WRP are known from the local area, with the closest one recorded from approximately 2.3 km from the application area in 2003. The application area is located outside of the three key management zones for WRP identified by DPaw (2014) based upon core areas of the known current distribution of the species. The application area is therefore located outside of areas mapped as suitable WRP habitat. WRP is an arboreal folivore, associated with long unburnt mature remnants, characterised by high canopy cover and connectivity (DPAW, 2017). The application area, especially outside of the State Forest boundary, does not have high canopy connectivity. On the contrary, the State Forests immediately adjacent to the application area are intact with high level of canopy connectivity. A fauna survey targeting WRP in the application area did not identify evidence of WRP utilising any of the targeted trees and surrounds. WRP dreys and scats were absent from the application and survey area (Ecosystem Solutions, 2021 a & b). Given the above, in addition to the availability of intact vegetation within the State Forests nearby, it is unlikely that WRP inhabits the application area. The proposed clearing of the roadside trees is unlikely to impact on the habitat values for WRP within the local context.

Quokka has been recorded at least 55 times in the local area until as recent as 2018. The closest record of quokka is from within 150 metres of the application area. In the southern forest, quokkas are known to occupy a range of

forest, woodlands and wetland ecotypes where habitat is more continuous (DoEC, 2013). The forests adjacent to the application area exhibits the characteristics of potential habitat for quokka. Quokka is also known to be distributed across the Nannup Forest located immediately north of the application area. As such, the presence of quokka within the application area and vicinity cannot be ruled out. Quokka is mostly nocturnal and a browsing herbivore, favouring leaves and stems. However, the fauna survey conducted by the applicant, which was performed both diurnally and nocturnally, did not identify any quokka individuals within the application area (Ecosystem Solutions, 2021a). This is most likely due to the scarcity of understorey vegetation on the roadsides. Given the above, in addition to the availability of vast and continuous forest nearby, it is considered likely that dispersing quokka utilise the application area and vicinity, but it is unlikely that the application area comprises significant habitat for quokka. The proposed clearing of the roadside trees is unlikely to result in long term adverse impacts on quokka's habitat.

Historical records of the masked owl have been known from the local area. The closest record of the masked owl was made from within 3 km from the application area. The masked owl is known to inhabit forests, woodlands, timbered waterways and open country on the fringe of these areas. The owl requires tall trees with suitable hollows for nesting and roosting and adjacent areas for foraging. The nocturnal bird tends to be loyal, and pairs remain in or near their territory all year round. Given the habitat characteristics and previous records, the masked owl is considered likely to be present in the application area and vicinity. The nocturnal fauna survey in the application area, however, did not record any calling by this fauna, a surrogate for their presence. An inspection of the tree hollows using a drone also suggested that the hollows were too small for the masked owl to inhabit, and any signs of use by this fauna was absent (Ecosystem Solutions, 2021 a & b). Although the occurrence of masked owl in the local area cannot be ruled out, given the findings of the fauna survey mentioned above, it is considered unlikely that the masked owl inhabits the application area.

Of the vertebrate fauna species of conservation significance identified, the species most likely to occur over the application area are the black cockatoo species. Numerous records of black cockatoo are known from the local area, with the nearest record from within 750 m of the application area. The most recent records of black cockatoos in the local area mainly occur within the State Forests, especially in the North Donnelly State Forest, south of the Brockman Highway. The application area is also mapped within the modelled distribution areas for the Baudin's, Carnaby's and Red-tailed black cockatoos.

Black cockatoo habitat can be considered in terms of breeding habitat, night roosting habitat, and foraging habitat. Black cockatoos will generally forage up to 12 kilometres from an active breeding site (DSEWPaC 2012; DPaW 2013). Following breeding, they will flock in search of food, usually within six kilometres of a night roost (DSEWPaC 2012; DPaW 2013) but may range up to 20 kilometres (Commonwealth of Australia 2017). Black cockatoo night roosts are usually located in the tallest trees of an area, and near both a food supply and surface water (Commonwealth of Australia 2017). Flocks will use different night roosts, often for weeks, or until the local food supply is exhausted. Flocks show some fidelity to night roosts with sites used in most years to access high-quality feeding sites. However, not all-night roosts are used in every year (DPaW 2013).

Within the local context, eight roosting sites have been recorded. According to the most recent black cockatoo survey in the area, at least three of these recorded sites are active roosting sites (Peck, Barret, and Williams, 2019). The nearest active roosting sites include one located approximately 2.5 km east of the eastern most site of the application area near to the town of Bridgetown, and a site located approximately 7.7 km south of the western most site of the proposed clearing within the State Forest. No breeding site is recorded within 12 km radius from the application area.

Food resources within the range of breeding sites and roost sites are important to sustain populations, and foraging resources are therefore viewed in the context of known breeding and night roosting sites, particularly within 12 kilometres of an impact area (Commonwealth of Australia 2017). The *Corymbia calophylla* (marri) and *Eucalyptus marginata* (jarrah) trees present within areas of closed scrub vegetation such as that of the Donnelly and Nannup Forests provide suitable foraging habitat for black cockatoos.

Inspection of the hollows on the targeted trees during the Fauna Survey indicates the unsuitability of the hollows present for roosting or breeding of black cockatoos. Signs of usage by black cockatoos were also absent from these hollows and trees. Notwithstanding this, black cockatoos were heard in the distance and chewed *Corymbia calophylla* nuts were observed within the road reserve, evidencing foraging of black cockatoos in the area (Ecosystem Solutions, 2021a). Consequently, clearing of the marri and jarrah trees from the roadsides would remove some of this foraging habitat. However, in the context of the more than 35,000 hectares of intact vegetation within the protected reserves immediately north, south and west, the foraging habitat being removed within the application area is unlikely to be significant. The proposed clearing is not likely to cause a long-term adverse impact on the existence and maintenance of black cockatoos and their habitat within the local context.

Conclusion

Based on the above assessment, the proposed clearing may clear habitat suitable for fauna. Given the vegetation condition of the application area and the availability of vast, intact, and more suitable vegetation within the adjacent State Forests; the application area is unlikely to comprise significant habitat for the fauna within the local context. The proposed clearing is unlikely to result in a detrimental impact on the conservation of the fauna species. It is considered that the impacts of the proposed clearing on the fauna individuals can be managed through suitable conditions.

Conditions

To address the potential impact to any fauna individuals present at the time of clearing, slow clearing in the direction of adjacent native vegetation is required to allow fauna to move into adjacent habitat ahead of clearing activity.

3.2.2. Biological value – Flora diversity and Flora – Clearing principles (a) and (c)

Being adjacent to the State Forest, parts of the application area may contain high level of flora diversity. It is noted that the proposed clearing within the State Forest boundaries will only remove the identified trees and retain the understorey vegetation.

Clearing of understorey vegetation will take place around 14 trees outside of the State Forest area. Photographs of these areas indicate that the understorey vegetation consist of weeds and is in Degraded condition. Given the above, the proposed clearing is unlikely to significantly impact on the flora diversity within the local context.

Spatial data indicates that seven conservation significant flora have been known from the local area. One of these species is listed as Threatened, and the remaining are listed as Priority 1, 3 and 4. Although none of these records occur within the application area, the likelihood of their occurrence has been assessed based on soil type, habitat preference and proximity to the application area, as summarised in Appendix C. Whilst the application area exhibits the soil and / or habitat characteristics similar to that of the priority flora, assessment has been focused on *Caladenia harringtoniae* not only because it is a threatened species, but also due to its proximity and higher number of records.

At least 10 records of *C. harringtoniae* have been known from the local area. This tuberous, perennial herb of between 0.2 to 0,4 m high is often found on winter wet flats, margin of lakes or creeks and around granite outcrops and areas seasonally inundated with water. In the local area, however, records of *C. harringtoniae* concentrate within the North Donnelly State Forest, with a minimum distance of approximately 0.65 km from the application area. This suggests that the flora species is more likely to be present within the State Forest boundaries where the vegetation is in much better condition. Noting that clearing within the State Forest boundaries will not remove understorey vegetation, inadvertent removal of this species from the application area is unlikely.

Conclusion:

Based on the above assessment, it is unlikely that the proposed clearing has a detrimental impact on the flora diversity and habitat of threatened flora within the local context.

Condition:

Nil conditions required for this environmental value.

3.2.3. Biological value – Conservation area (h)

Assessment:

Parts of the application area are adjacent to the North Donnelly and Nannup State Forests. The forests are adjoining the Dalgarp National Park in the north, and much larger forest reserves further south. Whilst the proposed clearing of the identified trees is unlikely to significantly reduce the vegetation extent or conservation values of these reserves, clearing of the trees may facilitate the spread of weeds and dieback into the State Forest. Given the limited extent of the proposed clearing, it is considered that these impacts can largely be managed through suitable weed and dieback conditions.

Conclusion

Based on the above assessment, the proposed clearing may result in the spread of weeds and dieback into the adjacent North Donnelly and Nannup State Forests. These impacts can be managed through imposing suitable conditions.

Conditions

To address impacts to the adjacent State Forests, weed and dieback management measures will be required as a condition on the clearing permit.

3.2.4. Land resources - Clearing Principles (g)

Assessment

Clearing of understorey vegetation and excavation of the banks for road widening will occur at an area where trees 26 to 40 are located, outside of the Forest Reserves near the town of Bridgetown (see Appendix F; Figure 9 and 10C). This area, comprising approximately 25 per cent of the total application area, is mapped as prone to land degradation due to wind erosion and nutrient export. In addition, being on a slope, bare soils in this area can be prone to water erosion in the high rainfall events. In the absence of ground cover, soils can be easily eroded by wind and surface water runoff which may exacerbate the risk of nutrient export. Consequently, clearing of trees and excavation in this area may result in land degradation due to wind and water erosion, unless proper land management and erosion control measures are in place. Sealing of the road shoulders, reinforcement of the banks affected by excavation, and construction and maintenance of surface water drainage to avoid runoff of water and sediment into the surrounding environment may mitigate the potential impacts associated with wind erosion and surface runoff.

Conclusion

Based on the above assessment, the proposed clearing is unlikely to cause appreciable land degradation due to water and land degradation provided land management practices are applied.

Conditions:

To address the above impact, commencement of sealing of road shoulders and surface water drainage construction within two months of clearing will be required as a condition to the permit.

3.3. Relevant planning instruments and other matters

The road works requiring the proposed clearing is one of 34 projects under the Western Australian Black Spot Program 2021-2022. The program is funded by the Australian Government to improve road safety measures to reduce serious injuries and deaths on the State's roads. The program envisages to reduce the number of crashes causing death and injury by 30 per cent on average. The high priority locations funded by the Program are those having high number of fatal and crashes incidences, including the 21.3 km stretch of the Brockman Highway covered by this application. In the Shire of Bridgetown-Greenbushes, the project is approved to install kerbing and skid resistant surface, install barriers at culverts, signs, pavement marking and delineation and remove trees from sightlines at intersection with Mattamattup Street (MITRD, 2021). The planned works have been shown to substantially reduce the chance of the single vehicle run-off crashes by 43 to 67% (Shire of Bridgetown-Greenbushes, 2021a).

Several Aboriginal sites of significance have been mapped in close proximity to the application area. It is the permit holder's responsibility to comply with the *Aboriginal Heritage Act 1972* (WA) and ensure that no Aboriginal Sites of Significance are damaged through the clearing process.

End

Appendix A. Additional information provided by applicant

During assessment, DWER provided the applicant with the results of a preliminary assessment on the potential impacts of the proposed clearing. Additional information was requested of the applicant to address a number of concerns arising from the preliminary assessment and a public submission. The applicant has addressed the concerns as follows:

Summary of comments	Consideration of comment	Information provided by the applicant (Shire of Bridgetown-Greenbushes 2021b & c, Ecosystem Solutions, 2021 a & b)
<p>Given the potential impacts to the environmental values, evidence of additional efforts to avoid and/or mitigate the need for clearing are required to be provided. Further justification for the proposed works will also assist in responding to the submission.</p> <p>DWER considers that it may be appropriate to revise the road design to minimise disturbance of native vegetation and avoid removal of potential habitat trees identified within the fauna survey (Ecosystem solutions, 2021).</p>	<p>The preliminary assessment has identified that: The application area and surrounds may provide important habitat to conservation significant fauna. The proposed clearing may impact on this environmental value.</p> <p>A public submission has been received regarding this application. The submission questions the necessities for the road to be widened, citing the amount of earthworks and clearing required to widen the road would be disproportional to the actual gains in road safety.</p>	<ul style="list-style-type: none"> • The avoidance and minimise principles have been included in the road work design and processes. For safety, as per advice by the Regional Road Safety, 3.5 m wide lanes with sealed shoulders of 1.0m wide on each side are required. During the designing stage, road shoulder's width was reduced to the minimal width of 0.5 m to avoid and minimise clearing, resulted in approximately 1/10 of the clearing that would be needed. • Realignment of the road to avoid isolated or group of trees would require a realignment of the entire Brockman Road, resulting in much larger clearing area.
<p>It is noted that the survey indicates unsuitability of some of the hollows for Black cockatoo, and the lack of evidence of roosting or nesting of Black cockatoos in the hollows.</p> <p>An assessment of suitability of the eight hollow bearing trees for <i>Pseudocheirus occidentalis</i> (Western ringtail possum), <i>Dasyurus geoffroii</i> (Chudith), <i>Phascogale tapoatafa wambenger</i> (South-western brushtail phascogale) and <i>Tyto novaehollandiae</i> (masked owl) are required.</p>	<p>The fauna survey (Ecosystem solutions, 2021) identified that eight out of the 57 trees proposed to be cleared contain or potentially contain hollows that may or may not be suitable for Black cockatoos.</p> <p>Records of <i>Pseudocheirus occidentalis</i> (Western ringtail possum), <i>Dasyurus geoffroii</i> (Chuditch), <i>Phascogale tapoatafa wambenger</i> (South-western brushtail phascogale) and <i>Tyto novaehollandiae</i> (masked owl) have been known from the local area. These fauna species may utilise the tree hollows identified during the survey.</p>	<ul style="list-style-type: none"> • Fauna survey on the targeted trees was conducted during the day and nocturnally using spotlight and head torch. • Sites were monitored for calls or noises of any fauna. • No WRP or phascogale was spotted, despite the survey technique used. • Chuditch was not identified around ground logs or low hollows present. • Masked owl was not identified. Calls by the Owl was not heard during the survey. Drone surveys revealed that the hollows were not suitable for breeding of the Masked owl. This species needs much larger hollows. • A tree shows signs of modifications, but the hollow is too small for masked owls. The manipulation is likely due to smaller parrot or rosella species, which were not present at the time of survey.

Appendix B. Details of public submissions

Summary of comments	Consideration of comment
<p>The highway is in good condition, there is no need for more road construction or upgrades. The amount of earthworks and clearing to widen the road would be disproportional to the actual gains in road safety.</p>	<p>The applicant was requested to provide clarification on this subject. The applicant's clarification relevant to the matters included the following (Shire of Bridgetown-Greenbushes, 2021a, b, c):</p> <ul style="list-style-type: none"> • Single vehicle run-off crashes were responsible for 42% of all people killed on rural government roads, including the 21.3 km road of the Brockman Highway, between 2015 and 2019. • Sealing of the roads gravel shoulders and installation of audible lines along the road have been shown to substantially reduce the chance of these crash types. • The road widening project is based on the research and statistics underpinning the \$455 million state Regional Road Safety Program targeting 2000 lives to be saved. • Avoidance and minimisation for the need of clearing and related impacts have been considered, including limiting earthworks to less than 25% of the area proposed to be cleared, reducing the road shoulders width from 1 m to 0.5 m on each side of the road. <p>DWER considers the applicant's explanation was sufficient in addressing the reasoning behind the need for clearing. DWER also considers that the applicant has made sufficient efforts in avoiding, minimising and mitigating the extent of clearing and associated potential impacts, which is discussed in Section 3.1 and Appendix A above.</p>
<p>The road is designated as a tourist drive. The road works is suspected to be directed toward the use of the highway as a trucking road for the timber industry.</p>	<p>The applicant confirmed that the road has been and will remain designated as a tourist drive. There is no planning to use it as a trucking road for the timber industry. The timber industry does not use this highway for trucking (pers. Comm, 30 September 2021).</p>
<p>The mature trees proposed to be cleared might be used as Possum habitats.</p>	<p>A fauna survey was performed and provided in support of the application (Ecosystem Solutions, 2021a, b). Undertaken in accordance with the <i>Technical guidance – Flora and Vegetation Surveys for Environmental Impact Assessment</i> (EPA, 2016a), the survey targeted the potential habitat trees and conservation significant fauna including the WRP.</p> <p>The survey, which was performed during the day and night time, did not find any evidence of WRP utilising the targeted trees and vicinity. Not only that WRP individuals were absent, but also the secondary signs of their presence (dreys, scats) were absent from the application area. The potential direct and indirect impacts to the conservation significant fauna including WRP were considered in detailed assessment under Section 3.2.1.</p>

Appendix C. Site characteristics

The information provided below describes the key characteristics of the area proposed to be cleared and is based on the best information available to DWER at the time of this assessment. This information was used to inform the assessment of the clearing against the Clearing Principles, contained in Appendix D.

C.1. Site characteristics

Characteristic	Details
Local context	<p>The area proposed to be cleared comprises of 57 native trees on both sides of an approximately 21.3 km stretch of the Brockman Highway in the intensive land use zone of Western Australia. About a third of this stretch of road within the application area is located within the North Donnelly and Nannup State Forests where eight of the trees proposed to be cleared are located. Outside the State Forest boundaries, the trees proposed to be cleared are isolated stands of trees.</p> <p>The proposed clearing area is surrounded by reserves (State Forests) and farmlands. Spatial data indicates the local area (10-kilometre radius from the centre of the area proposed to be cleared) retains approximately 60 per cent of the original native vegetation cover.</p>
Ecological linkage	The application area is not a part of any significant or formal ecological linkages.
Conservation areas	R43031 Nature Reserve for the conservation of flora and fauna is located approximately 4.5 km northeast and the Dalgarpur National Park (Class A) – IUCN cat 2 – is approximately 1.5 km west of the application area.
Vegetation description	<p>The vegetation within the application area occurs within the Darling Plateau subregion of the Southwest Forests Bioregion of WA, spanning across variety of landforms, from valley floors to uplands. The mapped vegetation complexes within the application area include:</p> <ul style="list-style-type: none"> • Uplands: <ul style="list-style-type: none"> ○ Bevan 1; described as tall open forest of <i>Corymbia calophylla-Eucalyptus marginata</i> subsp. <i>marginata</i> on uplands in perhumid and humid zones. This vegetation type retains 81.79 % of its original extent. • Valley Floors and Swamps: <ul style="list-style-type: none"> ○ Southampton; described as woodland of <i>Eucalyptus rudis</i> on valley floors and woodland of <i>Eucalyptus patens-Corymbia calophylla</i> on footslopes with some <i>Eucalyptus marginata</i> subsp. <i>marginata</i> on lower slopes in the humid zone. This type of vegetation retains 43.55% of its original extent. • Valleys <ul style="list-style-type: none"> ○ Balingup; described as woodland of <i>Eucalyptus rudis</i> on valley floors and woodland of <i>Eucalyptus patens-Corymbia calophylla</i> on footslopes with some <i>Eucalyptus marginata</i> subsp. <i>marginata</i> on lower slopes in the humid zone. This vegetation complex retains approximately 29.38% of its original extent. ○ Bridgetown; described as open forest of <i>Corymbia calophylla</i> over <i>Hakea lasianthoides</i> with some <i>Eucalyptus rudis</i> on lower less undulating footslopes in the humid zone. This vegetation types retain approximately 21.02 % of its original cover. ○ Catterick; described as open forest of <i>Eucalyptus marginata</i> subsp. <i>marginata-Corymbia calophylla</i> mixed with <i>Eucalyptus patens</i> on slopes, <i>Eucalyptus rudis</i> and <i>Banksia littoralis</i> on valley floors in the humid zone. (Shepherd et al., 2001). This vegetation types retain approximately 70.61 % of its original extent (<i>Government of Western Australia, 2019</i>). <p>Photographs supplied by the applicant indicate the vegetation within the proposed clearing area mainly consists of <i>Eucalyptus marginata</i> subsp. <i>marginata-Corymbia calophylla</i> which is consistent with the general characteristics of most of the vegetation complexes in the local area.</p> <p>Representative photos and maps are available in Appendix F.</p>

Characteristic	Details
Vegetation condition	<p>Photographs supplied by the applicant indicate the vegetation within the proposed clearing area, being on the road verge, is varied between Degraded (outside the forest area) to Good (within the forest area) conditions (Keighery, 1994).</p> <p>The full Keighery (1994) condition rating scale is provided in Appendix E. Representative photos are available in Appendix F.</p>
Climate and landform	<p>The application area occurs on the undulating Brockton Highway Road with elevation ranging between 120 m and 285 m. Some of the trees proposed to be cleared are situated on steep slopes.</p> <p>The climate in the area is characterised by a mean annual precipitation of 721.4 mm, with mean temperature ranges between 4.5 and 30.0 °C.</p>
Soil description	<p>The application area falls within the Western Darling Range zone whose soils are characterised as loamy gravel, duplex sand, red and brown.</p> <p>The soils across the stretch of the road reserve within which the application area is located are mapped as:</p> <ul style="list-style-type: none"> • Bevan Subsystem (Manjimup) - 254MpBE • Catterick Subsystem (Manjimup) - 254MpCC • Balingup Moderate slope phase - 255LvBL4 • Bridgetown low slope Phase - 255LvBT3 • Bridgetown steep slopes phase - 255LvBT5 • Bridgetown foot slopes phase - 255LvBTf • Southampton Subsystem (255Lv) on river channel, flood plain and raised alluvial
Land degradation risk	<p>The mapped soil types within the application area have the following risks:</p> <ul style="list-style-type: none"> • Nutrient export risk: Medium to High • Surface compaction risk: High • Water erosion risk: Low to High • Flooding risk: Low to Medium • Wind erosion risk: Low to Extremely high
Waterbodies	<p>A section of the application area is within 35 metres from the Blackwood River. Several non-perennial minor tributaries of the Blackwood River are found in the proximity to the application area.</p>
Hydrogeography	<p>The application area is within the Hardy Estuary – Blackwood River Catchment Division 6 of the South-West Catchment.</p> <p>Salinity of ground water: 500-1000 (tds mg/L).</p>
Flora	<p>Seven threatened and priority flora species have been recorded within 10 km radius from the application area. The closest record is that of <i>Caladenia harringtoniae</i> (VU) located approximately 0.7 km away from the application area. Some parts of the application area exhibit the characteristics of the known habitats of these flora species.</p>
Ecological communities	<p>No priority or threatened ecological communities (P/TEC) is mapped within the application area, along the road reserve nor within 10 km radius from the application area.</p>
Fauna	<p>Twenty-three conservation significant fauna have been recorded within 10 km radius from the application area, consisting of eleven Threatened, eight Priority, and four specifically protected species. Three black cockatoo species are likely to occur within the area, whilst some other species are likely to utilise the area.</p>

C.2. Vegetation extent

	Pre-European extent (ha)	Current extent (ha)	Extent remaining (%)	Current extent in all DBCA managed land (ha)	Current proportion (%) of pre-European extent in all DBCA managed land
IBRA bioregion: Southwest Forests					
Jarrah Forest	4,506,660.25	2,399,838.15	53.25	1,673,614.25	37.14
Warren	833,985.56	659,432.21	79.07	558,485.38	66.97
Vegetation Complexes					
Bevan 1- Upland	76,7832	62,802.37	81.79	27,353.61	97.76
Southampton	799.52	348.52	43.55	12.97	1.62
Balingup - Valleys	59,446.57	17,466.47	29.38	9,120.37	15.34
Bridgetown - Valleys	21,477.74	4,515.10	21.02	1,483.75	6.91
Catterick - Valleys	13,053.60	9,216.67	70.61	13,053.60	9,216.67
Local area					
10km radius	61,907	38,565	62.29	-	-
*Government of Western Australia (2019a)					
**Government of Western Australia (2019b)					

C.3. Flora analysis table

With consideration for the site characteristics set out above and relevant datasets (see Appendix G.1) impacts to the following conservation significant flora required further consideration.

Species name	Cons status	Count	Distance km	Soil suitability	Vegetation suitability	Habitat suitability	Likely	Are surveys adequate to identify
<i>Caladenia harringtoniae</i>	T	10	0.67	Y	Y	Y	Y	N/A
<i>Caladenia validinervia</i>	1	1	4.27	N	Y	N	N	N/A
<i>Calothamnus microcarpus</i>	4	2	8.35	Y	Y	Y	Y	N/A
<i>Carex tereticaulis</i>	3	2	3.88	Y	Y	Y	Y	N/A
<i>Dampiera heteroptera</i>	3	1	2.89	Y	Y	N	N	N/A
<i>Grevillea ripicola</i>	4	1	8.51	N	Y	N	N	N/A
<i>Hemigenia microphylla</i>	3	1	7.71	N	N	N	N	N/A
T: threatened, CR: critically endangered, EN: endangered, VU: vulnerable, P: priority								

C.4. Fauna analysis table

Taxon	Conservation status	Year of record (most recent)	Number of known records within 10 km radius	Closest distance to application area	Suitable Habitat Feature ?	Likelihood of presence	Are surveys adequate to identify
<i>Calyptorhynchus banksii naso</i> (Forest red-tailed black cockatoo)	VU	2020	49	0.57	Y	Y	Y
<i>Calyptorhynchus baudinii</i> (Baudin's cockatoo)	EN	2017	40	0.54	Y	Y	Y
<i>Calyptorhynchus latirostris</i> (Carnaby's cockatoo)	EN	2018	30	2.21	Y	Y	Y
<i>Calyptorhynchus sp.</i> 'white-tailed black cockatoo' (White-tailed black cockatoo)	EN	2018	20	0.59	Y	Y	Y
<i>Dasyurus geoffroyi</i> (chuditch, western quoll)	VU	2019	13	0.50	Y	Y	Y
<i>Falco peregrinus</i> (Peregrine falcon)	OS	2015	4	7.22	Y	Y	Y
<i>Isodon fusciventer</i> (quenda, southwestern brown bandicoot)	P4	2017	16	0.59	Y	Y	Y
<i>Notamacropus irma</i> (Western brush wallaby)	P4	2020	42	1.26	Y	Y	Y
<i>Phascogale tapoatafa wambenger</i> (South-western brush-tailed phascogale, wambenger)	CD	2019	88	0.59	Y	Y	Y
<i>Pseudocheirus occidentalis</i> (Western ringtail possum, ngwayir)	CR	2017	5	2.303096	Y	Y	Y
<i>Setonix brachyurus</i> (Quokka)	VU	2018	117	0.01082	Y	Y	Y
<i>Tyto novaehollandiae novaehollandiae</i> (masked owl)	P3	2003	10	2.833646	Y	Y	Y
T: threatened, CR: critically endangered, EN: endangered, VU: vulnerable, P: priority							

Appendix D. Assessment against the clearing principles

Assessment against the clearing principles	Variance level	Is further consideration required?
Environmental value: biological values		
<p><u>Principle (a):</u> <i>“Native vegetation should not be cleared if it comprises a high level of biodiversity.”</i></p> <p><u>Assessment:</u></p> <p>The area proposed to be cleared does not contain significant flora assemblages, but a portion of the area adjacent to the State Forest is likely to contain habitat for fauna.</p>	May be at variance	Yes <i>Refer to Section 3.2.2, above.</i>
<p><u>Principle (b):</u> <i>“Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna.”</i></p> <p><u>Assessment:</u></p> <p>The area proposed to be cleared contains foraging habitat for Black cockatoos and may contain foraging habitat for other conservation significant fauna.</p>	May be at variance	Yes <i>Refer to Section 3.2.1, above.</i>
<p><u>Principle (c):</u> <i>“Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, threatened flora.”</i></p> <p><u>Assessment:</u></p> <p>The area proposed to be cleared does not contain habitat for Threatened flora.</p>	Not likely to be at variance	Yes <i>Refer to Section 3.2.2, above.</i>
<p><u>Principle (d):</u> <i>“Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community.”</i></p> <p><u>Assessment:</u></p> <p>The area proposed to be cleared does not contain species that resemble a threatened ecological community.</p>	Not likely to be at variance	No
Environmental value: significant remnant vegetation and conservation areas		
<p><u>Principle (e):</u> <i>“Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.”</i></p> <p><u>Assessment:</u></p> <p>The extent of native vegetation in the local area is consistent with the national objectives and targets for biodiversity conservation in Australia. The vegetation proposed to be cleared is not considered to be part of a significant ecological linkage in the local area.</p>	Not likely to be at variance	No
<p><u>Principle (h):</u> <i>“Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.”</i></p> <p><u>Assessment:</u></p> <p>A portion of the application area lies within the North Donnelly and Nannup State Forests boundaries. Clearing may introduce and spread weeds and dieback to the State Forests.</p>	Not likely to be at variance	Yes <i>Refer to Section 3.2.3, above.</i>
Environmental value: land and water resources		

Assessment against the clearing principles	Variance level	Is further consideration required?
<p><u>Principle (f)</u>: <i>“Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.”</i></p> <p><u>Assessment</u>:</p> <p>A portion of the proposed area is located within 100 metres from the Blackwood River and its non-perennial minor tributaries. The proposed clearing, however, is unlikely to impact on the on- or off-site hydrology and water quality.</p>	Not likely to be at variance	No
<p><u>Principle (g)</u>: <i>“Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.”</i></p> <p><u>Assessment</u>:</p> <p>Parts of the application area are mapped within soil units that are highly susceptible to wind erosion. Noting that some trees proposed to be cleared are located on steep slopes, clearing of and earthworks around these trees may contribute to erosion and nutrient export.</p>	Not likely to be at variance	Yes <i>Refer to Section 3.2.4, above.</i>
<p><u>Principle (i)</u>: <i>“Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.”</i></p> <p><u>Assessment</u>:</p> <p>The proposed clearing will not intercept any water courses or wetlands. The proposed clearing is unlikely to impact surface or ground water quality.</p>	Not likely to be at variance	No
<p><u>Principle (j)</u>: <i>“Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.”</i></p> <p><u>Assessment</u>:</p> <p>The mapped soils and topographic contours in the surrounding area do not indicate the proposed clearing is likely to contribute to increased incidence or intensity of flooding.</p>	Not likely to be at variance	No

Appendix E. Vegetation condition rating scale

Vegetation condition is a rating given to a defined area of vegetation to categorise and rank disturbance related to human activities. The rating refers to the degree of change in the vegetation structure, density and species present in relation to undisturbed vegetation of the same type. The degree of disturbance impacts upon the vegetation's ability to regenerate. Disturbance at a site can be a cumulative effect from a number of interacting disturbance types.

Considering its location, the scale devised by Keighery, B.J. (1994) is used to measure the condition of the vegetation proposed to be cleared. This scale has been extracted from *Bushland Plant Survey: A Guide to Plant Community Survey for the Community*. Wildflower Society of WA (Inc). Nedlands, Western Australia.

Measuring vegetation condition for the South West and Interzone Botanical Province (Keighery, 1994)

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

Appendix F. Photographs of representative vegetation and fauna survey excerpts (Ecosystem Solutions, 2021a)



Figure 9. Map of the trees proposed to be cleared (Source: Shire of Bridgetown-Greenbushes, 2021)

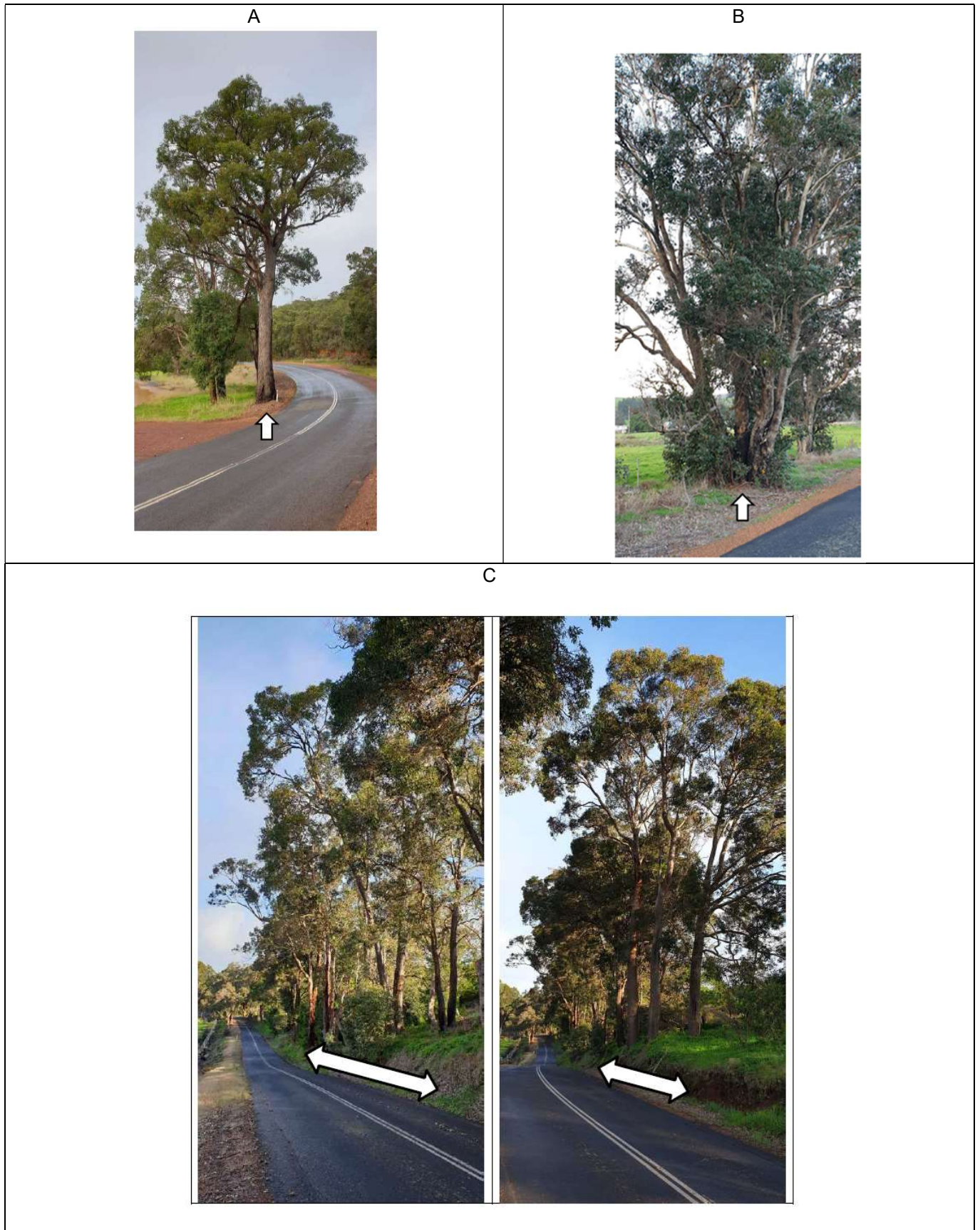


Figure 10 A to C. Trees proposed to be cleared along the Brockman Highway sections outside of the State Forest area. (A) Tree no 1, (B) Tree 42, (C) Tree 26 to 40, where understorey vegetation will be removed and banks would be excavated (Source: Shire of Bridgetown-Greenbushes, 2021)



Figure 11 A – D. Trees proposed to be cleared within the State Forest boundary. (A) Tree 57, (B) Tree 56, (C) Tree 55, (D) Tree 52 (Source: Shire of Bridgetown – Greenbushes, 2021).

Excerpt of the Fauna Significant Assessment, Brockman Highway, Bridgetown

Ecosystem Solutions were contracted by the Shire of Bridgetown-Greenbushes to survey a portion of Brockman Highway to document the presence and distribution of threatened fauna and fauna habitat values to ensure any impacts are minimised.

The Survey was conducted in accordance with the EPA (2004) Technical Guidance for Terrestrial fauna Survey for Environmental Impact Assessment in Western Australia.

The survey targeted the trees that are required to be removed and adjacent trees that would be impacted. The fauna species specifically targeted were the WRP, black cockatoo species, Southern brown bandicoots, and Brush tailed phascogale, as well as other fauna likely to occur within the proposed area of disturbance.

Approach adopted for the survey included:

- A daytime visual inspection of the property and adjoining vegetation for any signs of fauna including secondary signs (scats, diggings, dreys, nests, burrows, feeding remains)
- Inspection on the trees for hollow and suitability for black cockatoo
- Inspection of hollows for signs of use using a drone
- A nocturnal spotlight survey to determine fauna activity, using 40 w white light hand-held spotlight
- A pre-dawn and dusk survey to determine black cockatoo activity.
- The site was traversed in a systematic fashion

Results of the survey:

- 8 trees had hollows or suspected hollows
- One tree with hollows appeared to be too small for black cockatoo with no sign of animals
- No black cockatoo, WRP or other significant fauna were observed
- No evidence of significant fauna utilising the trees
- Black cockatoos were heard in the distance, and chewed *C. calophylla* nuts were observed
- Drone survey confirmed the absence of any usage of the hollows by black cockatoos or other conservation significant fauna.



Figure 12. Significant Trees surveyed within the application area (Source: Ecosystem Solutions, 2021)



Figure 13. Significant trees surveyed within the application area (Source: Ecosystem Solutions, 2021)



Figure 14. Significant trees surveyed within the application area (Source: Ecosystem Solutions, 2021)



Figure 15. Significant trees surveyed within the application area (Source: Ecosystem Solutions, 2021)



Figure 16. Significant trees surveyed within the application area (Source: Ecosystem Solutions, 2021)



Figure 17. Significant Trees surveyed within the application area (Source: Ecosystem Solutions, 2021)

Appendix G. Sources of information

G.1. GIS databases

Publicly available GIS Databases used (sourced from www.data.wa.gov.au):

- 10 Metre Contours (DPIRD-073)
- Aboriginal Heritage Places (DPLH-001)
- Aboriginal Heritage Places (DPLH-001)
- Cadastre (LGATE-218)
- Cadastre Address (LGATE-002)
- Contours (DPIRD-073)
- DBCA – Lands of Interest (DBCA-012)
- DBCA Legislated Lands and Waters (DBCA-011)
- Directory of Important Wetlands in Australia – Western Australia (DBCA-045)
- Environmentally Sensitive Areas (DWER-046)
- Flood Risk (DPIRD-007)
- Groundwater Salinity Statewide (DWER-026)
- Hydrography – Inland Waters – Waterlines
- Hydrological Zones of Western Australia (DPIRD-069)
- IBRA Vegetation Statistics
- Imagery
- Local Planning Scheme – Zones and Reserves (DPLH-071)
- Native Title (ILUA) (LGATE-067)
- Offsets Register – Offsets (DWER-078)
- Pre-European Vegetation Statistics
- Public Drinking Water Source Areas (DWER-033)
- Ramsar Sites (DBCA-010)
- Regional Parks (DBCA-026)
- Remnant Vegetation, All Areas
- RIWI Act, Groundwater Areas (DWER-034)
- RIWI Act, Surface Water Areas and Irrigation Districts (DWER-037)
- Soil Landscape Land Quality – Flood Risk (DPIRD-007)
- Soil Landscape Land Quality – Phosphorus Export Risk (DPIRD-010)
- Soil Landscape Land Quality – Subsurface Acidification Risk (DPIRD-011)
- Soil Landscape Land Quality – Water Erosion Risk (DPIRD-013)
- Soil Landscape Land Quality – Water Repellence Risk (DPIRD-014)
- Soil Landscape Land Quality – Waterlogging Risk (DPIRD-015)
- Soil Landscape Land Quality – Wind Erosion Risk (DPIRD-016)
- Soil Landscape Mapping – Best Available
- Soil Landscape Mapping – Systems
- Wheatbelt Wetlands Stage 1 (DBCA-021)

Restricted GIS Databases used:

- ICMS (Incident Complaints Management System) – Points and Polygons
- Threatened Flora (TPFL)
- Threatened Flora (WAHerb)
- Threatened Fauna
- Threatened Ecological Communities and Priority Ecological Communities
- Threatened Ecological Communities and Priority Ecological Communities (Buffers)

G.2. References

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