360 environmental

Bussell Highway - Hutton to Sabina (31.25 to 43.67 SLK)

Environmental Impact Assessment (EIA)

Prepared for:

Main Roads Western Australia

September 2016

people • planet • professional

Document Reference	Revision	Prepared by	Reviewed by	Submitted to Client	
				Copies	Date
1324AC	A INTERNAL DRAFT	CL	SS		29/8/16
1324AC	B CLIENT DRAFT	CL/SS	NM	1 Electronic (email)	7/9/16
1324AC	C CLIENT FINAL	CL	NM	1 Electronic (email)	

Executive Summary

Main Roads Western Australia (MRWA) commissioned 360 Environmental Pty Ltd (360 Environmental) to undertake an Environmental Impact Assessment (EIA) for the Bussell Highway - Hutton to Sabina (31.25 – 43.67 SLK) (the Project). The Project involves the construction of a second carriageway on a 12 kilometre (km) section of the Bussell Highway between approximately 950 metres (m) west of Hutton Road to 450 m west of the Sabina River crossing. The Project envelope, describing the maximum extent of potential disturbance, is 72.4 hectares (ha). Within the Project envelope a Clearing footprint has been defined, which has been based on the current road design and was used in the impact calculations. The Clearing footprint covers 49 ha.

Key Environmental Aspects and Impacts

Key environmental aspects and impacts relevant to the Project were identified as follows:

- Vegetation and Flora:
  - The Project will result in the clearing of:
    - 24.3 ha of vegetation consisting of 22 ha of native vegetation;
    - 2.3 ha of non-native vegetation;
    - 27 Priority flora listed by the Department of Parks and Wildlife (DPaW) including 11 *Eucalyptus rudis* subsp. *cratyantha* (Priority 4), one *Synaphea petiolaris* subsp. *simplex* (Priority 3), two *S. hians* (Priority 3) and 13 *Verticordia attenuata* (Priority 3) (Ecoedge 2014); and
    - 2.5 ha vegetation representative of representative of Priority 1 Ecological Community – Busselton Yate Community;
  - Three out of the five Shepherd et al. (2001) vegetation types occurring within the Project envelope are retained at less than 30%;
  - Two weed species listed as Declared under the *Biosecurity and Agriculture Management Act 2007* (BAM Act) and one species listed as a Weed of National Significance (WONS) occur in the Project envelope.
- Fauna: The Project has potential to impact four fauna species (Western Ringtail Possum (*Pseudocheirus occidentalis*), Baudin's Black Cockatoo (*Calyptorhynchus baudinii*), Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*), and Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) which are listed as Threatened fauna under the *Wildlife Conservation Act 1950* (WC Act) and listed as matters of National Environmental Significance (NES) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Implementation of the Project will result in the loss of:
  - 21.9 ha potential Black Cockatoo foraging and breeding habitat;

- 69 Black Cockatoo potential future breeding trees; and
- 24.9 ha potential Western Ringtail Possum habitat.

- Aboriginal Heritage: redacted

- Acid Sulfate Soils: Mapping of Acid Sulphate Soils Risk on the Swan Coastal Plain indicates that there is a 'high to moderate risk of ASS occurring within 3 m of natural soils surface' in areas where the Project envelope intersects the foreshore and banks of the Ludlow, Sabina and Abba Rivers. Where excavation or dewatering is required below three metres of the ground level, an ASS investigation may be required in accordance with the Department of Environment Regulation (DER) (formerly the Department of Environment and Conservation) *Identification and Investigation of Acid Sulfate Soils and Acidic Environments* (DEC 2009);

- Surface water/wetlands: The Project envelope intersects three waterways including the Sabina, Abba and Ludlow Rivers and one Conservation Category Wetland (CCW) occurs adjacent to the Clearing footprint;

- Dieback: Native vegetation areas within the Project envelope are considered to potentially contain Dieback; and

- Reserves/Conservation Areas: One conservation area occurs adjacent to the Project envelope, Coolilup State Forest. Two sections of the Project envelope intersect Environmentally Sensitive Areas (ESAs). The ESA's are attributed to nearby conservation areas including Ludlow State Forest and a Conservation Category Wetland (CCW).

Referrals Recommendation

It is recommended that the Project be referred to the Commonwealth Department of Environment and Energy (DEE) under the EPBC Act due to the potential for impacts on matters of NES specifically the loss of > 1 ha of Carnaby's Black Cockatoo, Baudin's Black Cockatoo and Forest Red-Tailed Black Cockatoo habitat and > 0.5 ha of Western Ringtail Possum habitat. However, it is noted that the impact of the Project on matters of NES is not expected to be significant.

An assessment of the Project against the Ten Clearing Principles has been undertaken. The assessment determined that the Project is likely to or may be at variance with Principles b and f.

It is considered that if the Project is deemed 'not a controlled action' under the EPBC Act the Project could be undertaken using MRWA's Clearing Permit CPS 818. If the Project is deemed a 'controlled action' a Purpose Permit may be required with an assessment completed under the Bilateral Agreement.

The Project is not considered likely to result in a significant impact to environmental factors as per the Environmental Protection Authority's (EPA) *Environmental Assessment Guideline 8 – Environmental Factors and Objectives* (2013) and *Environmental Assessment Guideline 9 – Application of a Significance Framework in the Environmental Impact* (2013a).

Subsequently the Project is unlikely to require referral to the Environmental Protection Authority (EPA) for assessment under the *Environmental Protection Act 1986*.

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1 Introduction

1.1 The Proposal

Bussell Highway is the main link between Perth, Bunbury and the Busselton – Margaret River area, supporting the tourism, forestry and agricultural industries in the region. It is also an important commuter link for residents who live in the Busselton or Margaret River area and work in the Bunbury and Perth Metropolitan areas.

The Bussell Highway between Bunbury and Busselton is 46 kilometres (km) in length and is a four land dual carriageway, except for a 17 km section between Capel and the Sabina River, east of Busselton, which is a two lane single carriageway with passing lanes at around 5 km intervals. Traffic flow currently exceeds the capacity of the single carriageway section resulting in congestion, delays and safety concerns. With a current traffic growth rate in order of 5% per annum, periods of congestion on this major rural highway will become more frequent and longer in duration.

Main Roads is proposing to construct a second carriageway on a 12 km section of the Bussell Highway between approximately 950 metres (m) west of Hutton Road to 450 m west of the Sabina River crossing. The Project is located approximately 200 km south of Perth and occurs in the Shire of Capel and City of Busselton. The location of the Project is shown in Figure 1. The Project envelope, describing the maximum extent of potential disturbance, is 72.4 hectares (ha). Within the Project envelope a Clearing footprint has been defined, which has been based on the current road design and was used in the impact calculations. The Clearing footprint covers 49 ha.

1.2 Environmental Impact Assessment Objectives

The objectives of the Environmental Impact Assessment (EIA) (this document) are to:

- Describe the existing environment, based on desktop and field investigations;
- Assess and document all relevant aspects and potential environmental impacts (including impacts to matters of NES);
- Outline management measures to be used to mitigate or avoid potential environmental impacts;
- Determine environmental and heritage approvals, permits and licenses required prior to implementation of the Project.

1.3 Scope of Work

The following scope of work was undertaken during the completion of this EIA:

- Site inspection by an Environmental Scientist;
- Assessment of potential impacts on flora, vegetation and fauna (including fauna habitat) on the basis of a desktop assessment of species distribution and available ecological data and field surveys. Specific considerations included:
    - Threatened Ecological Communities (TECs);
    - Priority Ecological Communities (PECs);
    - Rare/Threatened/Priority flora;
    - The conservation status of vertebrate fauna likely or known to be present on the site;
    - Presence of Dieback or other diseases or pathogens;
    - The condition of the native vegetation.
- Assessment of potential impacts to conservation areas on the basis of a desktop assessment of:
    - Bush Forever Sites;
    - Regional Conservation Parks; and
    - Environmentally Sensitive Areas (ESAs).
- Desktop review of climate, geology, surface hydrology and groundwater information using database and digital mapping information;
- Desktop site assessment of contamination risk, including a search of the Department of Environment Regulation's (DER) Contaminated Sites database (online) and a review of historical and current land uses;
- Desktop Acid Sulfate Soils (ASS) assessment including a search of DER mapping;
- Assessment of potential impacts on heritage (Indigenous and non-Indigenous) on the basis of desktop assessment and field surveys;
- Desktop review of surrounding land uses;
- Consideration of potential impacts to local air quality and to nearby premises from noise and vibration;
- GIS mapping; and
- Compilation of an EIA document detailing the above and specifically addressing the proposed site works.

1.4 Summary of Biological Surveys

Results from the following biological surveys have been included in the preparation of this EIA:

- Level 1 Fauna Survey (360 Environmental), June 2016;
- Level 1 Flora and Vegetation Survey (Ecoedge), October 2013, with a follow-up field visit in December to identify species of *Verticordia*;
- Phytphthora Dieback Occurrence Assessment (Glevan Consulting), March 2016; and
- Ethnographic Aboriginal Heritage Survey (Brad Goode and Associates), March 2016.

352500 355000 357500 360000 362500

6282500

6280000

6277500

6275000

LUDLOW STATE FOREST

COOLILUP STATE FOREST

BUSSELL HWY

LUDLOW STATE FOREST

WONERUP

TUART DR

BUSSELL HWY

RUABON RD

REINSCOURT

RUABON

N

352500 355000 357500 360000 362500

Legend

- Estimated Clearing Footprint (49.08 ha)
- Project Envelope (72.42 ha)
- Cadastral Boundaries

- PROJECT ENVELOPE SOURCED FROM MAIN ROADS WESTERN AUSTRALIA 2016
- CLEARING ENVELOPE SOURCED FROM MAIN ROADS WESTERN AUSTRALIA 2016
- CADASTRAL BOUNDARIES SOURCED FROM LANDGATE 2016
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2015 (© Western Australian Land Information Authority 2014)

mainroads WESTERN AUSTRALIA

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- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

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Meters

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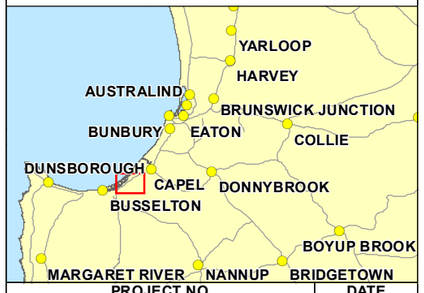
LOCALITY MAP



PROJECT NO	DATE
1324	1/09/2016

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
MH	CL	SS	0

Main Roads Western Australia
Bussell Highway Widening
Hutton to Sabina Section

Environmental Impact Assessment

Figure 1
Site Location

K:\Projects\2.0 INP\1324 Bussell Highway Widening\Figures\EIA Referral\1324 EIA Figure 1 - Project Location.mxd

2 Assessment of Aspects and Impacts

2.1 Aspects and Impacts

Table 1 is an evaluation of the potential impacts that the Project may have on the environmental aspects (as nominated in MRWA 2016). Impacts to key environmental aspects have been determined through review of government agency databases, the results of surveys, as well as previous environmental assessments and management plans of relevance to the Project.

Table 1. Project aspects and impacts

ASPECT	EVALUATION OF POTENTIAL IMPACTS
Aboriginal Heritage	Redacted.

ASPECT	EVALUATION OF POTENTIAL IMPACTS
	r
Acid Sulfate Soils (ASS)	The DER Acid Sulphate Soils Risk on the Swan Coastal Plain mapping indicates that 'high to moderate risk of ASS occurring within 3 m of natural soils surface' occur in areas where the Project envelope intersects the foreshore and banks of the Ludlow, Sabina and Abba Rivers (DER 2014). All remaining areas of the Project envelope are mapped as 'moderate to low risk of ASS occurring within 3 m of natural soils surface' (DER 2014) (Figure 3). It is noted that sand mining has previously been undertaken in some areas of the Project envelope which may have altered the expected soil profiles. Disturbance of ASS has the potential to cause contamination of soil, groundwater and surface water. Where excavation or dewatering is required below three metres of the ground level, an ASS investigation may be required in accordance with the Department of Environment Regulation (DER) (formerly the Department of Environment and Conservation) *Identification and Investigation of Acid Sulfate Soils and Acidic Environments* (DEC 2009). The investigation should be followed by the development of an Acid Sulfate Soils and Dewatering Management Plan (ASSDMP) to appropriately manage the handling and treatment of ASS and dewatering effluent.
Air Quality	The Project envelope is surrounded by rural land, State forest and National Parks. The closest sensitive receptor is residential housing located approximately 80 m from the Project envelope. Widening of the highway will increase the levels of vehicle emissions as a result of increased traffic volumes. Potential vehicle emissions include particulate matter and gasses including carbon monoxide (CO), oxides of nitrogen (NOx), polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs), including benzene, toluene,

ASPECT	EVALUATION OF POTENTIAL IMPACTS
	xylenes, formaldehyde and acetaldehyde. The closest DER ambient air quality monitoring station to the Project envelope is at Busselton (located approximately 5 km north east of the Project). This station measures suspended particulate matter as $PM_{2.5}$. The most recent data available for this station shows that there was one air NEPM exceedance recorded during 2014. This exceedance related to early morning smoke from domestic wood heating (DER 2014a). $PM_{2.5}$ concentrations remained below the NEPM standard for the remainder of the 2014 period (DER 2014a). Project construction activities that may result in air emissions include: ● Physical disturbance of the land – such as removal of vegetation and topsoil, excavation, earthworks and road rehabilitation works; and ● Movement of dust from dry, cleared areas and soil stockpiles during windy conditions. As there is an existing highway, the proposed works are not expected to significantly change existing air quality conditions. Impacts to air quality are expected to be minor and restricted to the construction phase only. These impacts will be minimised as much as practicably possible through the implementation of the Project Construction Environmental Management Plan (CEMP).
Biodiversity	**Flora** A search of the DPaW Threatened (Declared Rare) Flora and Priority Flora Database and the Department of Environment and Energy (DoEE) *Protected Matters Search Tool* (Appendix A) determined that 22 conservation significant flora species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or *Wildlife Conservation Act 1950* (WC Act) occur or may potentially occur within a 5 km radius of the Project envelope (DPaW 2016, DoEE 2016). A search of DPaW's Threatened (Declared Rare) Flora and Priority Flora Database and the Western Australian Herbarium Specimen database for Threatened and Priority flora species determined that 60 Threatened or Priority flora species occur or may potentially occur within a 5 km radius of the Project envelope (DPaW 2016, WAH 2016) (Appendix B). A likelihood of occurrence assessment was undertaken for each conservation significant flora species identified from the desktop searches. Results of the assessment are provided in Appendix B.

ASPECT	EVALUATION OF POTENTIAL IMPACTS

Based on the known habitats of each species the following species may occur in the Project envelope (Table 2).

Table 2. Results of likelihood assessment (Ecoedge 2014)

SPECIES	STATUS		
	EPBC ACT	WC ACT	DPAW
Likelihood: Likely			
Verticordia plumosa var. *vassensis*	Endangered	Threatened	-
Drakaea micrantha	Vulnerable	Threatened	-
Cardamine paucijuga	-	-	Priority 2
Chamaescilla gibsonii	-	-	Priority 3
Synaphea hians	-	-	Priority 3
Synaphea petiolaris subsp. *simplex*	-	-	Priority 3
Verticordia attenuata	-	-	Priority 3
Eucalyptus rudis subsp. *cratyantha*	-	-	Priority 4
Likelihood: Possible			
Caladenia procera	Critically Endangered	Threatened	-
Drakaea elastica	Endangered	Threatened	-
Synaphea stenoloba	Endangered	Threatened	-
Verticordia densiflora var. *pedunculata*	Endangered	Threatened	-
Verticordia plumosa var. *ananeotes*	Endangered	Threatened	-
Chamelaucium sp. *S Coastal Plain (R.D.Royce*	Vulnerable	Threatened	-

ASPECT	EVALUATION OF POTENTIAL IMPACTS			
	4872)			
	Diuris drummondii	Vulnerable	Threatened	-
	Bolboschoenus medianus	Not listed	Not listed	Priority 1
	Amperea micrantha	Not listed	Not listed	Priority 2
	Montia australasica	Not listed	Not listed	Priority 2
	Schoenus loliaceus	Not listed	Not listed	Priority 2
	Blennospora doliiformis	Not listed	Not listed	Priority 3
	Boronia anceps	Not listed	Not listed	Priority 3
	Boronia tetragona	Not listed	Not listed	Priority 3
	Eryngium sp. Ferox	Not listed	Not listed	Priority 3
	Eryngium sp. Subdecumbens	Not listed	Not listed	Priority 3
	Jacksonia gracillima	Not listed	Not listed	Priority 3
	Johnsonia inconspicua	Not listed	Not listed	Priority 3
	Adelphacme minima	Not listed	Not listed	Priority 3
	Schoenus benthamii	Not listed	Not listed	Priority 3
	Schoenus pennisetis	Not listed	Not listed	Priority 3
	Acacia flagelliformis	Not listed	Not listed	Priority 4
	Acacia semitrullata	Not listed	Not listed	Priority 4
	Caladenia speciosa	Not listed	Not listed	Priority 4
	Centrolepis caespitosa	Not listed	Not listed	Priority 4
	Schoenus natans	Not listed	Not listed	Priority 4
	Thysanotus glaucus	Not listed	Not listed	Priority 4

ASPECT	EVALUATION OF POTENTIAL IMPACTS

Tripterococcus brachylobus	Not listed	Not listed	Priority 4
Tripterococcus sp. Brachylobus	Not listed	Not listed	Priority 4
Verticordia lehmannii	Not listed	Not listed	Priority 4
Verticordia lindleyi Schauer subsp. *lindleyi*	Not listed	Not listed	Priority 4

A Level 1 Flora and Vegetation Survey was undertaken by Ecoedge on 22 and 23 October 2013, with a follow-up field visit on 19 December to identify *Verticordia* spp. which had not been in flower at the time of the initial survey. Two hundred and thirty seven plant species were identified within the Project envelope of which 52 were naturalised or planted species. No flora listed under the EPBC Act or WC Act were recorded during the survey (Appendix B). 31 flora listed as Priority species by DPaW were recorded in the Project envelope. Of the 31 Priority flora recorded, 27 flora occur within the Clearing footprint including *Eucalyptus rudis* subsp. *cratyantha* [11] (Priority 4), *Synaphea petiolaris* subsp. *simplex* [1] (Priority 3), *S. hians* [2] (Priority 3) and *Verticordia attenuata* [13] (Priority 3) (Figure 4).

Threatened and Priority Ecological Communities

A search of DPaW's Threatened Ecological Community (TEC) and Priority Ecological Community (PEC) database and the DoEE *Protected Matters Search Tool* determined that the following TECs and PECs occur within a 5 km radius of the Project envelope (Figure 4):

- TEC – Claypans of the Swan Coastal Plain, listed as Critically Endangered under the EPBC Act and Priority 1 by DPaW;
- TEC - SCP 1b - *Eucalyptus calophylla* woodlands on heavy soils of the southern Swan Coastal Plain, listed as Vulnerable by DPaW;
- TEC – Coastal Saltmarsh - Subtropical and Temperate Coastal Saltmarsh, listed as Vulnerable under the EPBC Act and Priority 3 by DPaW;
- TEC – SCP07 - Herb rich saline shrublands in clay pans, listed as Critically Endangered under the EPBC Act and Vulnerable by DPaW;
- TEC – SCP08 - Herb rich shrublands in clay pans, listed as Critically Endangered under the EPBC Act and Vulnerable by DPaW;

ASPECT	EVALUATION OF POTENTIAL IMPACTS
	• TEC – SCP09 - Dense shrublands on clay flats, listed as Critically Endangered under the EPBC Act and Vulnerable by DPaW; • TEC – SCP10a - Shrublands on dry clay flats, listed as Critically Endangered under the EPBC Act and Endangered by DPaW; • TEC – 10b - Shrublands on southern Swan Coastal Plain Ironstones (Busselton area), listed as Critically Endangered under the EPBC Act and Endangered by DPaW (DoEE 2016, DPaW 2016a). • PEC – Busselton Yate Community - *Eucalyptus cornuta*, *Agonis flexuosa* and *Eucalyptus decipiens* forest on deep yellow-brown siliceous sands over limestone, listed as Priority 1 by DPaW; • PEC - *Eucalptus rudis*, Marri and Peppermint Forest - *Eucalyptus rudis* (flooded gum), *Corymbia calophylla*, *Agonis flexuosa* Closed Low Forest (near Busselton), listed as Priority 1 by DPaW; • PEC - Wooded waterbird wetlands - Wooded wetlands which support colonial waterbird nesting areas, listed as Priority 2 by DPaW; • PEC – SCP21b - Southern *Banksia attenuata* woodlands, listed as Priority 3 by DPaW (DPaW 2016a). Nine vegetation units were recognised within the Project envelope (Ecoedge 2014). None of the vegetation units appears to constitute a Threatened Ecological Community (Ecoedge 2014). Vegetation Unit C represents degraded examples of the Southern *Eucalyptus gomphocephala*, *Agonis flexuosa* woodlands (SWAFCT25) community on the Bassendean soil-landscape system and "*Eucalyptus cornuta* (Yate) and *Agonis flexuosa* Open Low Forest" on the Spearwood soil-landscape system at the southern end of the Project envelope. Vegetation within this unit is classified as 'Degraded' or 'Completely Degraded' (Ecoedge 2014). Due to the altered and disturbed state of vegetation multivariate analysis was not able to be undertaken however the Yate dominated occurrence of this unit is representative of Priority 1 PEC – Busselton Yate Community (Ecoedge 2014). 2.5 ha of this community occurs within the Clearing footprint. **Fauna** A search of DPaW's Threatened Fauna Database and the DoEE *Protected Matters Search Tool* determined that 264 fauna species

ASPECT	EVALUATION OF POTENTIAL IMPACTS

have been identified to occur or potentially occur within a 10 km radius of the Project envelope (DPaW 2016b, DoEE 2016) (Appendix A). Marine, wetland and coastal species were discounted from the search, given the Project envelope does not contain preferred habitat for these species.

A likelihood of occurrence assessment was undertaken for each fauna species identified from the desktop searches. This assessment was based on the habitat requirements of each species, the availability of suitable habitat and records of the species in the area (noting that some species will now have become locally or regionally extinct e.g. the Numbat). A Level 1 Fauna Survey was undertaken in the Project envelope in June 2016 (360 Environmental 2016). With the aforementioned species removed a total of 10 conservation significant species (including Priority species) could potentially occur in the Project envelope. Of these 10 conservation significant species, three species were recorded during the fauna survey, three species are considered 'Likely' to occur, two species are considered 'Possible' and two species are considered 'Unlikely' to occur within the Project envelope (Table 3) (360 Environmental 2016).

Table 3. Conservation significant fauna potentially occurring in the Project envelope (360 Environmental 2016)

SPECIES	CONSERVATION STATUS	LIKELIHOOD
Birds		
Peregrine Falcon (*Falco peregrinus*)	S7	Unlikely
Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*)	Vu, S3	Likely
Baudin's Black Cockatoo (*Calyptorhynchus baudinii*)	Vu, S2	Likely
Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*)	En, S2	Recorded
Rainbow Bee-eater (*Merops ornatus*)	MaMi, S5	Likely
Mammals		
Southern Brush-tailed Phascogale (*Phascogale tapoatafa*)	S3	Possible
Southern Brown Bandicoot (*Isoodon obesulus fusciventer*)	P5	Recorded

ASPECT	EVALUATION OF POTENTIAL IMPACTS

Western Ringtail Possum (*Pseudocheirus occidentalis*)	Vu, S2	Recorded
Water Rat (*Hydromys chrysogaster*)	P4	Possible
Western Mouse (*Pseudomys occidentalis*)	P4	Unlikely

En = Listed as Endangered under the EBPC Act, Vu = Listed as Vulnerable under the EBPC Act, Mi = Listed as Migratory under the EBPC Act, Ma = Listed as Marine under the EBPC Act, S = Scheduled under the WC Act, and P = Listed as Priority by the DPaW.

Western Ringtail Possum (WRP)

During the fauna survey 34 ha of potential WRP habitat was mapped within the Project envelope, including both potential foraging and potential denning habitat in which WRPs could build dreys (no suitable hollows were observed). Of this 34 ha, 24.9 ha of WRP habitat is contained in the Clearing footprint.

13.4 ha of the 24.9 ha is mapped as regrowth and 11.4 ha is mapped as remnant vegetation (Figure 5a) (Appendix C). During the survey one drey was recorded in a Peppermint tree, however, it was inactive and there were old scats underneath on the ground (360 Environmental 2016).

Black Cockatoos

During the fauna survey 31.5 ha of potential Black Cockatoo habitat was mapped within the Project envelope including both potential foraging and potential breeding habitat (Figure 5b) (Appendix C). Of the potential Black Cockatoo habitat, 21.9 ha of habitat is contained within the Clearing footprint.

11 ha of the 21.9 ha is mapped as regrowth and 10.8 ha is mapped as remnant vegetation. Foraging habitat in the Clearing footprint includes species such as Marri, Tuart, Flooded Gum, *Acacia* sp., *Banksia* sp., Peppermint and *Jacksonia* sp. (360 Environmental 2016).

During the survey, a small group of Carnaby's Black Cockatoos were observed flying over the Project envelope. Chewed Marri nuts, with markings from Carnaby's Black Cockatoos were observed at several locations in the Project envelope. Chewed Tuart nuts and Pine Cones were also observed in several locations. The chewed Pine Cones can most likely be attributed to Carnaby's Black Cockatoo.

Three species of Eucalypts, including Marri, Tuart and Flooded Gum were recorded during the fauna survey and are considered Black Cockatoo potential future breeding habitat. 92 potential future breeding trees with a Diameter at Breast Height (DBH) of more than

ASPECT	EVALUATION OF POTENTIAL IMPACTS
	500 millimetres (mm) were recorded in the Project envelope. Of these, 69 are contained within the Clearing footprint including Marri [38], Tuart [18], Flooded Gum [8] and Eucalyptus sp. [5]) (Figure 5). No hollows suitable for Black Cockatoo nesting were observed during the assessment (360 Environmental 2016). Required clearing for the Project will result in the loss of habitat for Black Cockatoos and the WRP including: • 21.9 ha of potential Black Cockatoo foraging habitat; • 69 Black Cockatoo potential future breeding trees; and • 24.9 ha of potential WRP habitat. **Ecological Linkages** The retention of native vegetation and fauna habitat within Regional Ecological Linkages aims to reduce the loss of biodiversity and key ecological functions across the South West of Western Australia. Mapping of Regional Ecological Linkages of the south west undertaken by Molloy et al. (2009) shows that the Project envelope is intercepted by three regional ecological linkage axis lines. Two of these linkages follow riparian vegetation connected to the Sabina and Ludlow Rivers (Linkage ID 80 and 36 respectively) (Figure 6). The remaining linkage (Linkage ID 77) follows roadside vegetation connected to Ruabon Road. The linkages connect areas of remnant vegetation on the west of Bussell Highway to areas of remnant vegetation on the east of Bussell Highway. A limited amount of native vegetation will be removed for the Project within the ecological linkages mapped by Molloy et al. (2009). The proposed clearing within these linkages is not expected to have a significant impact on existing fauna movement given that the mapped linkages are currently bisected by Bussell Highway.
Contamination	An online search of the DER's contaminated sites database indicates there are no known or recorded contaminated sites within 5 km of the Project envelope (DER 2016). Some areas of the Project envelope have historically been mined for mineral sands but it is considered unlikely that these areas have been contaminated during mining. It is understood that construction of the additional lane will require limited use of hazardous substances. It is expected that any hazardous substances used on site will be stored and handled appropriately according to the Materials Safety Data Sheet and Main Roads standard procedures and as such, should not pose a soil or surface

<table>
<tr><th>Aspect</th><th>Evaluation of Potential Impacts</th></tr>
<tr><td></td><td>water contamination risk.</td></tr>
<tr><td>Declared Plants/Weeds</td><td>
The DoEE Protected Matters Search Tool (Appendix A) yielded 12 weed species of national significance that have the potential to occur within the Project envelope (DoEE 2016).

During the Level 1 Flora Survey several weed species were recorded throughout the Project envelope. Management classifications allocated to these species by DPaW, the Department of Agriculture and Food Western Australia (DAFWA) and DoEE are provided in Table 4.

Table 4. Management categories for weeds observed in the Project envelope
<table>
<tr><th>Species</th><th>Common Name</th><th>WONS</th><th>Declared under BAM Act 2007*</th></tr>
<tr><td>*Acacia dealbata</td><td>Silver Wattle</td><td>-</td><td>-</td></tr>
<tr><td>*Acacia iteaphylla</td><td>Flinders Ranges Wattle</td><td>-</td><td>-</td></tr>
<tr><td>*Acacia longifolia</td><td>Long leaved Wattle</td><td></td><td></td></tr>
<tr><td>*Acacia podalyriifolia</td><td>Queensland Silver Wattle</td><td>-</td><td>-</td></tr>
<tr><td>*Asparagus asparagoides</td><td>Bridal Creeper</td><td>Yes</td><td>C3</td></tr>
<tr><td>*Ehrharta calycina</td><td>Veldt Grass</td><td></td><td></td></tr>
<tr><td>*Ehrharta longifolia</td><td>Annual Veldt Grass</td><td></td><td></td></tr>
<tr><td>*Eragrostis curvula</td><td>African Lovegrass</td><td></td><td></td></tr>
<tr><td>*Leptospermum laevigatum</td><td>Coastal Tea-tree, Australian Teatree</td><td>-</td><td>-</td></tr>
<tr><td>*Lupinus angustifolius</td><td>Blue Lupin</td><td>-</td><td>-</td></tr>
<tr><td>*Pinus pinaster</td><td>Maritime Pine</td><td>-</td><td>-</td></tr>
<tr><td>*Watsonia meriana</td><td>Watsonia</td><td>-</td><td>-</td></tr>
<tr><td>*Zantedeschia aethiopica</td><td>Arum Lily</td><td>-</td><td>C3</td></tr>
</table>
*The DAFWA maintains a list of Declared Plants for Western Australia under the Biosecurity and Agriculture Management Act 2007 (BAM Act). If a plant is declared for the whole of the State or for particular Local Government Areas, all landholders are obliged to comply with the relevant species-specific control measures.

Weed management measures should be implemented during the Project to prevent the spread of WONS and Declared weed species. Measures may include procedures such as wash and clean down
</td></tr>
</table>

Aspect	Evaluation of Potential Impacts
	of vehicles, machinery and equipment prior to mobilisation.
Dieback	Dieback (*Phytophthora cinnamomi*) is considered to potentially occur in native vegetation that occurs in an area that receives annual rainfall greater than 400 mm and is south of the 26th parallel of latitude. Native vegetation within the Project envelope meets these criteria and should therefore be considered to potentially contain Dieback. A Phytphthora Dieback occurrence assessment was undertaken in the Project envelope by Glevan Consulting in March 2016. One portion of the Project envelope was observed to be uninfested. This section contained many healthy indicator plant species and was considered to be in very good condition. No signs of drought or other natural environmental factors were evident (Glevan Consulting 2016). The remaining assessable areas were observed to be uninterpretable. Although these sections contained a high level of vegetation, there were not enough reliable indicators species present to consider these areas interpretable (Glevan Consulting 2016). Management measures will need to be implemented to avoid the potential introduction or spread of Dieback within uninfested and uninterpretable areas. These measures may include: ● Ensuring machinery is clean-on-entry to site; ● Avoid movement of soil in wet conditions; ● Ensure no material (such as fill and mulch) potentially containing Dieback is brought to site; and ● Limit movement of soil from uninterpretable areas to uninfested areas. Management measures for Dieback should be included in the Project-specific CEMP.
Dust	Surface geology varies throughout the Project envelope and consists of the following: ● Tamala Limestone: described as unconsolidated to strongly lithified calcarernite with calcrete/kankar soils; Aeolian. Locally quartzose, feldspathic or heavy-mineral-bearing; ● Guildford formation: described as alluvial sand and clay with shallow-marine and estuarine lenses and local basal conglomerate; and

ASPECT	EVALUATION OF POTENTIAL IMPACTS
	● Bassendean Sand: described as basal conglomerate overlain by dune quartz sand with heavy mineral concentrations (GSWA 2008). The Project envelope occurs on two soil subsystems including: ● Abba System: Poorly drained flats, on the southern Swan Coastal Plain. Grey deep sandy duplex and wet soil; and ● Bassendean System: Swan Coastal Plain from Busselton to Jurien. Sand dunes and sandplains with pale deep sand, semi-wet and wet soil (DAFWA 2012) (Figure 7). There is potential for dust to be generated temporarily during construction from cleared areas and stockpiles where sandy soil is predominant. Dust generation will be avoided long term by revegetation of cleared areas on completion of the Project. Excessive dust levels generated during construction may impair the visibility of motorists utilising the existing Bussell Highway in addition to impacting local air quality, amenity and vegetation. It is expected that impacts associated with dust can be managed during construction via the implementation of appropriate dust suppression techniques such as watering down. A Dust Management Plan should be prepared in accordance with DER guidelines prior to commencement of the Project.
Groundwater	The Project envelope falls within the proclaimed Busselton-Capel Groundwater Area. The Project envelope is located on the Superficial and Leederville aquifers (DoW 2016). The Superficial Aquifer forms an unconfined aquifer beneath the Swan Coastal Plain with a saturated thickness of <5 m. The aquifer is fully recharged and saturated during winter months resulting in large areas of waterlogging. However the extensive drainage network captures and diverts most of the excess water towards the ocean. Depth of the Leederville formation ranges from 15-200 m below ground level (below the Superficial aquifer) (DoW 2009). The Project envelope is not located in a Public Drinking Water Source Area (DoW 2012). A search of the Department of Water (DoW)'s Water Information Network (WIN) database has identified that five WIN bores exist within the Project envelope (DoW 2012a). Groundwater levels in the WIN bores were recorded as high as 0.5 m below ground level at the intersection of Ruabon Road and Bussell Highway (DoW 2012a). Groundwater salinity is considered to be marginally brackish varying

ASPECT	EVALUATION OF POTENTIAL IMPACTS

between 500 and 1000 mg/L (DoW 2010). Information from these bores is provided in Table 5.

Table 5. Bore construction, ownership and use (DoW 2012a)

WIN BORE ID	DATE CONSTRUCTED	OWNER	PURPOSE	WATER LEVEL	TDS
1482	20/12/1983	DoW	Monitoring	2.8 m from top of casing on 10/09/2012	460.000 uS/cm on 26/05/2005
20005285	Unknown	None	Domestic/household	1.8 m from ground level	575.000 mg/L
12524	01/01/1972	DoW	-	10 m from water surface level on 08/12/2003	835.000 uS/cm on 29/10/2012
23041286	10/03/2009	DoW	Monitoring	2.290 m from ground level on 05/05/2009	-
23020734	03/08/2005	None	-	0.5 m from ground level on 02/08/2005	

It is understood that dewatering will not be required and there will not be a requirement to construct bores for construction water. Therefore it is not expected that groundwater levels or quality will be impacted by the Project. Should dewatering or bores be required permits/licenses will be obtained from the DoW for installation of bores and

ASPECT	EVALUATION OF POTENTIAL IMPACTS
	groundwater abstraction.
Heritage (non-indigenous)	A search of the State Register of Heritage Places determined that no State heritage places are located within 2 km of the Project envelope (SHO 2015).
Land Vesting	The Project envelope falls outside the Metropolitan Region Scheme and Greater Bunbury Region Scheme. The Project envelope is reserved as 'road' and allocated for future road use under the City of Busselton Local planning Scheme No. 21 and Shire of Capel Town Planning Scheme No. 7. A corridor reserved under the City of Busselton Local Planning Scheme for recreation/public purpose as a railway reserve intercepts the Project envelope at Ruabon Road. The Project envelope contains mixed cadastre including freehold, crown land, road, reserve and vacant crown land.
Noise and Vibration	The Project envelope is surrounded by State forest, rural land and conservation reserve. The closest sensitive receptor is residential housing located approximately 80 m from the Project envelope. The closest residential suburb (Yalyalup) is located more than two kilometres south east of the Project envelope. Noise and vibration emitted during construction of the Project is expected to be temporary and minor, with the exception of ongoing noise from vehicles using Bussell Highway. However, as there is an existing highway, the proposed works are not expected to significantly change existing conditions. Noise and vibrations levels associated with the construction phase will be managed through implementation of a Construction Environmental Management Plan (CEMP).
Reserves/ Conservation Areas	A search of the DoEE *Protected Matters Search Tool* and DPaW Managed Lands database determined that the Project envelope does not intersect any National Parks, nature reserves or Bush Forever Sites (DoEE 2016, DPaW 2014) (Figure 6). Three conservation areas occur within two kilometres of the Project envelope including Ludlow State Forest, Tuart Forest National Park, and Coolilup State Forest (DPaW 2014) (Figure 6). The nearest conservation area is Coolilup State Forest which occurs adjacent to the Project envelope. Two portions of the Project envelope occur within Environmentally Sensitive Areas (ESAs) (DER 2015) (Figure 6). The ESAs are attributed to nearby conservation areas including Ludlow State Forest

ASPECT	EVALUATION OF POTENTIAL IMPACTS
	and a Conservation Category Wetland (CCW). Construction will need to be managed to avoid impacts to adjacent conservation areas and the ESAs. The CEMP will outline measures to be applied during construction to manage aspects that have the potential to cause potential indirect impacts to conservation areas and ESAs such as contamination, dust, weeds and Dieback.
Surface Water/ Drainage	The Project envelope occurs in the Vasse Wonnerup and Geographe Bay catchment. The catchment is approximately 2,000 km^2 and drains north into Geographe Bay (DoEE 2016a). Three waterways intersect the Project envelope including the Sabina River, Abba River and Ludlow River as well as numerous drainage lines (Figure 8). The Sabina, Abba and Ludlow Rivers drain into the Vasse-Wonnerup system. Culverts will be installed where the road intersects surface water flows, ensuring that existing hydrological regimes are maintained.
Vegetation	The Project envelope is situated in the South West Botanical Province of Western Australia (Beard 1990), within the Swan Coastal Plain IBRA bioregion and Perth IBRA subregion. Mapping of the vegetation of the Perth region of WA was completed on a broad scale (1:250,000) by Beard (1972-80). These vegetation units were re-assessed by Shepherd et al. (2001) to account for clearing in the intensive land use zone, dividing some larger vegetation units into smaller units. There are five Beard / Shepherd vegetation units in the Project envelope. The Shepherd et al. (2001) vegetation units are described below: ● Spearwood 2: Tall woodland; Tuart (*Eucalyptus gomphocephala*); ● Bassendean 1000: Mosaic; Medium forest; jarrah-marri/Low woodland; banksia/Low forest; teatree (*Melaleuca* sp.); ● Bassendean 4: Medium woodland; marri and wandoo; ● Bassendean 1136: Medium woodland; marri with some jarrah, wandoo, river gum and casuarina; and ● Bassendean 949: Low woodland; banksia (Figure 9). The regional representation of each vegetation unit and type has been compiled from the Government of Western Australia (2014) 2014 *Statewide Vegetation Statistics incorporating the CAR Reserve Analysis*. The current extent of the vegetation units is presented in Table 6.

ASPECT	EVALUATION OF POTENTIAL IMPACTS

Table 6. Remnant vegetation statistics (Government of Western Australia 2014)

	PRE–EUROPEAN (HA)	2014 EXTENT (HA)	% REMAINING	% REMAINING IN DPAW RESERVES
Spearwood 2	3,142	1,860	59	91
Bassendean 1000	94,175	23,873	25	19
Bassendean 4	15,897	3,020	19	14
Bassendean 1136	48,118	3,428	7	4
Bassendean 949	209,983	120,390	57	56

The EPA aims to retain ecological communities at a minimum of 30% of the pre-clearing extent of that community in each bioregion to meet the *National Objectives and Targets for Biodiversity Conservation 2001-2005* (Commonwealth of Australia 2001) (EPA 2008). Three out of the five Shepherd et al. (2001) vegetation types occurring within the Project envelope are retained at less than 30%.

Detailed mapping of vegetation in the Project envelope was undertaken by Ecoedge in October 2013. Nine vegetation units were recorded (Table 7) (Figure 10). 24.4 ha of vegetation is contained within the Clearing footprint. Of this, 2.3 ha is non-native and 22 ha is native.

The condition of vegetation within the Project envelope was surveyed according to the Vegetation Condition Scale developed by Keighery (1994) (Table 8) (Figure 11). The condition of the units varied from 'Good' to 'Very Good' condition to 'Completely Degraded' condition. More than half of the native vegetation in the Project envelope is cleared or is in 'Completely Degraded' condition, with only 12% rated as being in 'Good' to 'Very Good' condition (Ecoedge 2014).

Table 7. Description of vegetation units (Ecoedge 2014)

VEG UNIT	DESCRIPTION	CONDITION	AREA (HA) WITHIN CLEARING FOOTPRINT
A1	Pine Plantation (**Pinus pinaster* with occasional **Asparagus asparagoides*, *Hibbertia*	Completely Degraded	1.8

Aspect	Evaluation of Potential Impacts			
		cuneiformis, **Zantedeschia aethiopica* scattered shrubs and herbs)		
	A2	**Eucalyptus* spp. plantings over introduced herbs and grasses	Completely Degraded	0.5
	B	*Eucalyptus rudis* subsp. *cratyantha* woodland/open woodland over *Agonis flexuosa*, *Melaleuca preissii* open low woodland with occasional *Corymbia calophylla* and *M. rhaphiophylla* over *Acacia saligna*, *Astartea* sp., *Melaleuca viminea* open shrubland over introduced herbs and grasses including **Ehrharta calycina* on grey-brown sandy-loam or loam	Degraded	2.8
	C	*Agonis flexuosa* low woodland/low open woodland with scattered *Eucalyptus gomphocephala* or **Pinus pinaster* over *Kunzea glabrescens*, (**Acacia longifolia*) shrubland/open shrubland over introduced herbs and grasses including **Lupinus angustifolius*, **Ehrharta calycina* and **E. longifolia* on grey-brown sand/sandy loam or yellow-grey sand. (*Eucalyptus cornuta* replaces *E. gomphocephala* west of Sue's Road turnoff)	Degraded or Completely Degraded	2.5
	D	*Eucalyptus marginata* subsp. *marginata*, *Corymbia calophylla* with scattered *Nuytsia floribunda* woodland over *Kunzea glabrescens* shrubland over *Gastrolobium praemorsum*, *Hibbertia hypericoides*, *Leucopogon parviflorus*, *Stirlingia latiflora*, *Xanthorrhoea brunonis* low shrubland over *Tetraria octandra* open sedgeland on grey-brown or	Good to Very Good	2.9

Aspect	Evaluation of Potential Impacts			
		yellow-grey sand. (*Eucalyptus rudis* subsp. *cratyantha* and *Banksia littoralis* and shrubs such as *Hakea varia* and *H. prostrata* may occur in damper areas)		
	E	*Corymbia calophylla* woodland (sometimes with *Melaleuca rhaphiophylla*) over **Acacia* spp., *Hibbertia cuneiformis*, *Kunzea glabrescens*, (*Spyridium globulosum*) shrubland over introduced herbs and grasses including **Ehrharta calycina*, **Eragrostis curvula* and **Zantedeschia aethiopica* on grey-brown or yellow-brown sand	Degraded to Good	4.1
	F	**Acacia* spp., *Kunzea glabrescens* tall shrubland over *Adenanthos meisneri*, *Gastrolobium praemorsum*, (*Leucopogon conostephioides*) low shrubland over *Loxocarya cinerea* and introduced herbs and grasses on grey or yellow-brown sand. (Revegetated areas)	Completely Degraded	5.9
	G	*Kunzea glabrescens* (*Viminaria juncea*) tall shrubland over *Acacia saligna*, *Adenanthos meisneri*, *Jacksonia furcellata*, *Kunzea recurva*, *Melaleuca viminea*, *Verticordia attenuata*, (*Verticordia densiflora* subsp. *densiflora*) shrubland over *Conostylis aculeata*, *Patersonia occidentalis* open herbland and introduced herbs and grasses including on yellow-brown or yellow-grey sandy loams/sandy clay loams	Degraded to Good	2.9
	H	*Melaleuca preissiana* low open forest/low woodland over *Astartea leptophylla*, *A. scoparia*, *Melaleuca viminea*, *M. osullivanii*, (*Verticordia*	Degraded to Good	0.9

<table>
<tr><th>ASPECT</th><th>EVALUATION OF POTENTIAL IMPACTS</th></tr>
<tr><td></td><td>
<table>
<tr><td></td><td>attenuata) open heath/shrubland over Baumea juncea open sedgeland on grey sand over clay</td><td></td><td></td></tr>
</table>

Table 8. Vegetation condition (Keighery 1994)
<table>
<tr><th>CLASS</th><th>AREA (HA) WITHIN CLEARING FOOTPRINT</th><th>% TOTAL</th></tr>
<tr><td>Completely Degraded</td><td>2.97</td><td>6.1</td></tr>
<tr><td>Degraded</td><td>9.18</td><td>18.7</td></tr>
<tr><td>Good</td><td>4.35</td><td>8.9</td></tr>
<tr><td>Very Good</td><td>1.57</td><td>3.2</td></tr>
<tr><td>Pine Plantation</td><td>1.83</td><td>3.7</td></tr>
<tr><td>Revegetated</td><td>4.46</td><td>9.1</td></tr>
<tr><td>Cleared</td><td>24.72</td><td>50.4</td></tr>
<tr><td>Total Clearing Footprint</td><td>49.08</td><td></td></tr>
</table>

Given the condition of native vegetation and its fragmentation from larger, more intact areas of native vegetation, native vegetation within the Project envelope is not regarded as conservation significant. However to protect fauna habitat, clearing will still be minimised wherever possible. Unnecessary clearing will be avoided through demarcation of areas to be cleared (within the Clearing footprint) and no clearing will be undertaken for temporary work areas such as site offices, storage areas or access tracks.
</td></tr>
<tr><td>Visual Amenity</td><td>The visual amenity of the area within and surrounding the Project envelope could be impacted by the following:
● Vegetation clearing; and
● Construction.
Impacts to visual amenity in the longer-term will be minimised, through revegetation and landscaping within the road reserve and retaining vegetation to provide screening where possible. These mitigation measures are expected to be addressed in the ultimate road design.</td></tr>
<tr><td>Wetlands</td><td>Four geomorphic wetlands occur within or adjacent to the Project envelope including:
● Multiple Use wetland UFI 15809 – Palusplain (within);
● Multiple Use wetland UFI 581 – Floodplain (within);</td></tr>
</table>

ASPECT	EVALUATION OF POTENTIAL IMPACTS
	• Multiple Use wetland UFI 579 – Palusplain (within); and • Conservation UFI 590 – Palusplain (adjacent) (DPaW 2016c) (Figure 10). The objective for Multiple Use wetlands is to 'use, develop and manage wetlands in the context of water, town and environmental planning'. The objective for Conservation wetlands is to 'preserve wetland (natural) attributes and functions' (Hill et al. 1996). Destabilisation of water courses and drains and changes in surface and groundwater water levels associated with construction works can potentially alter the hydrology of intersecting and surrounding wetlands and creeks (e.g. length of inundation). Changes in surface hydrology can subsequently alter the composition of surface water ecosystems. Furthermore, the quality of surrounding surface water areas can potentially be altered via the entry of contaminated surface water runoff (including pollutants and suspended solids). Indirect impacts to the system will be avoided through drainage design and pollution control measures. Culverts will be installed where the road intersects surface water flows, ensuring that existing hydrological regimes are maintained. It is expected that surface water contamination during the construction phase can be avoided through the implementation of the Project Construction Environmental Management Plan (CEMP).

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3 Commonwealth Aspects and Impacts

Table 9 presents an evaluation of the impacts to matters of National Environmental Significance (NES), with consideration of DoEE significant impact guidelines for Western Ringtail Possum, Black Cockatoos and listed migratory species.

Table 9. Assessment of existing environment, matters of National Environmental Significance (NES) and potential impacts

MATTER OF NES	EXISTING ENVIRONMENT AND LIKELY IMPACT
Nationally Listed Threatened Species or Ecological Communities	According to the DEE's *Significant Impact Guidelines*, the Project envelope falls within the known distribution of four matters of NES: ● Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) – listed as Endangered; ● Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) – listed as Vulnerable; ● Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) – listed as Vulnerable (DSEWPaC 2012); and ● Western Ringtail Possum (WRP) (*Pseudocheirus occidentalis*) – listed as Vulnerable (DSEWPaC 2012 and DEWHA 2009). Required clearing for the Project will result in the loss of: ● 21.9 ha of potential Black Cockatoo foraging and breeding habitat; ● 69 Black Cockatoo potential future breeding trees; and ● 24.9 ha potential WRP habitat (360 Environmental 2016). An assessment of the significance of these impacts has been undertaken with reference to the DoEE's *Significant Impact Guidelines* for each species (SEWPaC 2012 and DEWHA 2009). The outcome of the assessment (provided in EPBC2016/……) was that the Project is unlikely to have a significant impact on the Carnaby's Black Cockatoo, Forest Red-tailed Black Cockatoo, Baudin's Black Cockatoo or Western Ring-tail Possum. The following provides a summary of the assessment. **Black Cockatoos** It is noted that none of the 69 Black Cockatoo potential future breeding trees recorded within the Clearing footprint contain suitable nesting hollows that currently support breeding. The Black

	Cockatoo habitat within the Clearing footprint is fragmented from other areas of larger, intact vegetation. Larger, more intact areas of Black Cockatoo habitat reserved for conservation occur within a 5 km radius of the Clearing footprint including Ludlow State Forest, Coolilup State Forest and Tuart Forest National Park. A search of the State (DPaW) threatened database returned several records of Carnaby's Black Cockatoo and Baudin's Black Cockatoo identified in these conservation areas (DPaW 2016). Given that habitat within the Clearing footprint does not support breeding and larger, more intact areas of habitat are available nearby, clearing of 21.9 ha of potential foraging and breeding habitat is unlikely to remove habitat critical to the survival of the Carnaby's Black Cockatoo, Forest Red-tailed Black Cockatoo and Baudin's Black Cockatoo. **Western Ringtail Possum** Of the 24.9 ha of potential WRP habitat contained in the Clearing footprint, 2.3 ha is contained within areas defined as 'Core Habitat' and 22.7 ha is contained within areas defined as 'Primary Corridors' (DEWHA 2009). Habitat within the Clearing footprint is highly fragmented and linear in nature, surrounded by Pine Plantations, paddocks and the Bussell Highway on the western side. The patches of WRP habitat contained within the Clearing footprint provide limited connectivity between areas defined as 'Core Habitat'. As such implementation of the Project is not considered likely to cause a significant impact to local Western Ringtail Possum populations.
Migratory Species	Desktop analysis has identified that the Project could potentially impact the Rainbow Bee-eater (*Merops ornatus*) which is likely to occur within the vicinity of the Project envelope (360 Environmental 2016). The Rainbow Bee-eater was not recorded during the fauna survey (360 Environmental 2016) although the species has regularly been recorded in disturbed habitats including roadside vegetation (McKeown 1923; Sedgwick 1986). According to the *Significant Impact Guidelines* for Migratory species, an action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will: ● Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species; ● Result in an invasive species that is harmful to the migratory

	species becoming established in an area of important habitat for the migratory species; or • Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species (DotE 2013). The Rainbow Bee-eater is one of the most common and widespread birds in Australia with a distribution that covers the majority of Australia and in Western Australia the species can occur as a resident, breeding visitor, post-nuptial nomad, passage migrant and winter visitor (Johnstone and Storr 1998) and (Barrett et al. 2003). The Project envelope is surrounded by Pine Plantation and paddocks, as such similar habitat (semi-cleared areas) is available outside the Project envelope. Habitat within the Project envelope is likely to be part of a greater home range for the species. Clearing of habitat for the Project is therefore unlikely to disrupt the lifecycle of this species.
Wetlands of International Importance	The Project occurs within 500 m of a RAMSAR wetland (the Vasse–Wonnerup System). This wetland is also listed as a Nationally Important Wetland (DoEE 2016). Close to 30 wetlands are linked to the Vasse-Wonnerup System, these wetlands are important for migratory bird species. The hydrology of the Vasse-Wonnerup System has been modified by European settlement on the coastal plain area. Subsequently the system now receives large loads of nutrient-laden flow delivered by waterways during winter, the vast majority of nutrient loads derived from agricultural sources (DoW 2010a). The DoWs objective for the Vasse-Wonnerup system is to control the decrease in runoff and changes to drainage from agricultural and urban activities (DoW 2009). The Project has the potential to impact the adjacent Vasse-Wonnerup system indirectly via alteration of natural drainage patterns and contamination (via sedimentation or hydrocarbon spill). Indirect impacts to the system will be avoided through drainage design and pollution control measures. Culverts will be installed where the road intersects surface water flows, ensuring that existing hydrological regimes are maintained. Sedimentation of drainage areas will be avoided through undertaking revegetation of all cleared areas post construction.

World Heritage Properties	Not relevant to the proposed activity. No World Heritage properties are located within the Project envelope (DoEE 2016). The closest World Heritage property is located 150 km from the Project envelope.
National Heritage Places	Not relevant to the proposed activity. No National Heritage places are located within the Project envelope (DoEE 2016). The closest National Heritage Place is located 200 km from the Project envelope.
Commonwealth Land or Marine Areas	Not relevant to the proposed activity .The Project does not occur within or adjacent to a Commonwealth land or Marine Area (DoEE 2016).
Nuclear Actions	Not relevant to the proposed activity. The Project does not involve a nuclear action.
Water Resource	Not relevant to the proposed activity. The Project does not involve a water resource in relation to a coal seam gas development or a large coal mining development.

4 Assessment of Native Vegetation Clearing Against the Ten Clearing Principles

An assessment of the Project against the Ten Clearing Principles has been undertaken (Table 10). The assessment determined that the Project is likely to be or may be at variance with Principles b and f.

It is considered that if the Project is deemed 'not a controlled action' under the EPBC Act the Project could be undertaken using Main Roads Clearing Permit CPS 818. If the Project is a 'controlled action' a Purpose Permit may be required under the Bilateral Agreement.

Table 10. Assessment of Project against the 10 Clearing Principles

PRINCIPLE	ASSESSMENT	OUTCOME	DATA SOURCES
(a) - Native vegetation should not be cleared if it comprises a high level of biological diversity	**Vegetation Types** 24.4 ha of vegetation is contained within the Clearing footprint. Detailed mapping of vegetation was undertaken by Ecoedge in October 2013. Nine vegetation units were recorded (Table 7). Two of the units are considered to be non-native, comprising primarily of introduced species and one unit consists of revegetated species. More than half of the native vegetation in the Clearing footprint is cleared or in 'Completely Degraded' condition, with 12% rated as being in 'Good' to 'Very Good' condition (Ecoedge 2014). One vegetation unit, Vegetation Unit D, is classified as being in 'Very Good' condition. This unit appears to be a relatively intact undescribed floristic community type. 45 plant taxa and one species of Priority flora (*Synaphea petiolaris* subsp. *simplex)* were recorded in this community (Ecoedge 2014) (Appendix B). The size of this unit is less than 0.5 ha. **TECs/PECs** Desktop searches identified eight TEC buffers and four PEC buffers within a five kilometre radius of the Project envelope (DPaW 2016a). Vegetation Unit G has some similarities to SCP09 and SCP10a however is no longer considered to be representative of a TEC given the degraded nature of the community. Yate (*Eucalyptus cornuta*) dominated occurrences of Vegetation Unit C is representative of Priority 1 PEC – Busselton Yate Community (Ecoedge 2014). 2.5 ha of this community occurs within the Clearing footprint. **Flora** Desktop searches identified 629 flora species that occur or may potentially occur within a 5 km radius of the Project envelope (DPaW 2016, WAH 2016). Two hundred and thirty seven plant species were identified within the Project envelope during the flora survey of which 52	The Project is unlikely to be at variance to this Principle	Ecoedge (2014) 360 Environmental (2016) DPaW (2016) DPaW (2016a) DPaW (2016d) WAH (2016) DER (2015)

PRINCIPLE	ASSESSMENT	OUTCOME	DATA SOURCES
	were naturalised or planted species. Representation was highest amongst the Fabaceae with 34 taxa (including 11 introduced species) and Myrtaceae (30 taxa). No Declared Rare Flora pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act* (1950) or flora listed as Endangered pursuant to section 179 of the EPBC Act were found in the Project envelope. 27 flora listed as Priority flora by DPaW occur within the Clearing footprint including; 11 *Eucalyptus rudis* subsp. *cratyantha* (Priority 4), 1 *Synaphea petiolaris* subsp. *simplex* (Priority 3), 2 *S. hians* (Priority 3) and 13 *Verticordia attenuata* (Priority 3) (Ecoedge 2014). **Fauna** A total of 264 fauna species have been identified to occur or potentially occur within a 10 km radius of the Project envelope (DPaW 2016d). Two broad fauna habitats were identified in the Project envelope during the Level 1 Fauna Survey; remnant vegetation and regrowth vegetation (360 Environmental 2016) (Appendix C). Remnant habitat has vegetation in multiple strata (canopy, midstorey and understorey), woody debris and leaf litter that provides habitat for small reptile, bird and mammal species. However, these patches are fragmented and isolated, limiting fauna movement between them, particularly for the less mobile groups such as small reptiles and mammals (360 Environmental). Both habitats were considered to provide potential habitat for conservation significant fauna species including Black Cockatoos and the WRP (360 Environmental 2016). During the fauna survey 29 species from 19 families were recorded. This consisted of one reptile species, 24 bird species from 14 families and four mammal species from four families (360 Environmental 2016). Of these, three conservation significant fauna species were sighted or evidence (such as scats, dreys and diggings) of their occurrence recorded, including:		

PRINCIPLE	ASSESSMENT	OUTCOME	DATA SOURCES
	• Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) – listed as Endangered under EPBC Act and Threatened under WC Act; • Western Ringtail Possum (*Pseudocheirus occidentalis*) – listed as Vulnerable under EPBC Act and Threatened under WC Act; • Quenda/Southern Brown Bandicoot (*Isoodon obesulus fusciventer*) – Listed as Priority 5 by DPaW. **Summary** The Project envelope contains a number of vegetation and habitat types and supports a range of flora and fauna species. However, vegetation within the Project envelope is considered to have a lower level of biodiversity than might typically be expected in the area given its fragmentation and isolation from larger, more intact areas of vegetation.		
(b) - Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a	Two broad fauna habitats were identified in the Project envelope during the Level 1 Fauna Survey: • Remnant vegetation – typically has an overstorey that includes Marri, Tuart and Flooded Gum, a midstorey that comprises of a number of species in various sections of the Project envelope and including Acacia sp., Banksia sp., Christmas Tree, Peppermint, Spearwood, Jacksonia sp., Melaleuca sp., and Xanthorrhoea sp., over a relatively sparse understorey of mixed herbs and grasses; and • Regrowth vegetation – typically a mix of many species and with a similar broad composition to the Remnant Vegetation habitat in some sections. Much of this habitat lacks vegetation in multiple strata (canopy, midstorey and understorey) and woody debris; however, there is	The Project is likely to be at variance to this Principle	360 Environmental (2016) DoEE (2016) DPaW (2016d)

PRINCIPLE	ASSESSMENT	OUTCOME	DATA SOURCES
significant habitat for fauna indigenous to Western Australia	considerable leaf litter and cover in some sections that provides habitat, particularly for small reptiles and birds (360 Environmental 2016) (Appendix C). 264 fauna species have been identified to occur or potentially occur within a 10 km radius of the Project envelope (DoEE 2016) (DPaW 2016d). A likelihood of occurrence assessment was undertaken for each fauna species identified from the desktop searches. This assessment was based on the habitat requirements of each species, the availability of suitable habitat and records of the species in the area (noting that some species will now have become locally or regionally extinct e.g. the Numbat). A Level 1 Fauna Survey was undertaken in the Project envelope in June 2016 by 360 Environmental. With the aforementioned species removed a total of 10 conservation significant species (including Priority species) from the database searches are potentially considered to either be likely, possibly or unlikely to occur in the Project envelope. Of these 10 conservation significant species, three species were recorded during the fauna survey, three species are considered 'Likely' to occur, two species are considered 'Possible' and two species are considered 'Unlikely' to occur within the Project envelope (360 Environmental 2016) (Table 3). Results of the Fauna Survey determined that the Clearing footprint contains: • 21.9 ha of potential Black Cockatoo foraging habitat; • 69 Black Cockatoo potential future breeding trees; and • 24.9 potential WRP habitat. The Clearing footprint comprises of vegetation that provides habitat for Black Cockatoos and the WRP and is likely to be at variance to this Principle.		

PRINCIPLE	ASSESSMENT	OUTCOME	DATA SOURCES
(c) - Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora	A search of the DPaW Threatened (Declared Rare) Flora and Priority Flora Database and the Department of the Environment (DoEE) *Protected Matters Search Tool* (Appendix A) determined that 22 conservation significant flora species listed under the EPBC Act or (WC Act) occur or may potentially occur within a 5 km radius of the Project envelope (DPaW 2016, DoEE 2016). A search of DPaW's Threatened (Declared Rare) Flora and Priority Flora Database and the Western Australian Herbarium Specimen database for Threatened and Priority flora species determined that 60 Threatened or Priority flora species occur or may potentially occur within a 5 km radius of the Project envelope (DPaW 2016, WAH 2016) (Appendix B). A Level 1 Flora and Vegetation Survey was undertaken by Ecoedge in October 2013, with a follow-up field visit on 19 December to identify Verticordia sp. which had not been in flower at the time of the initial survey. Two hundred and thirty seven plant species were identified within the Project envelope of which 52 were naturalised or planted species (Ecoedge 2014). No flora (including Verticordia sp.) listed under the EPBC Act or WC Act were recorded in the Project envelope (Appendix B) (Ecoedge 2014).	The Project is not at variance to this Principle	Ecoedge (2014) DPaW (2016) WAH (2016) DoEE (2016)
(d) - Native vegetation should not be cleared if it comprises the whole or a part of, or is	A search of DPaW's Threatened Ecological Community (TEC) and Priority Ecological Community (PEC) database and the DoEE *Protected Matters Search Tool* determined that the following TECs occur within a 5 km radius of the Project envelope (Figure 4): ● TEC – Claypans of the Swan Coastal Plain, listed as Critically Endangered under the EPBC Act and Priority 1 by DPaW; ● TEC - SCP 1b - *Eucalyptus calophylla* woodlands on heavy soils of the southern Swan Coastal Plain, listed as Vulnerable by DPaW; ● TEC – Coastal Saltmarsh - Subtropical and Temperate Coastal Saltmarsh, listed as	The Project is not at variance to this Principle	Ecoedge (2014) (DPaW 2016a) DoEE 2016

PRINCIPLE	ASSESSMENT	OUTCOME	DATA SOURCES
necessary for the maintenance of, a threatened ecological community	Vulnerable under the EPBC Act and Priority 3 by DPaW; • TEC – SCP07 - Herb rich saline shrublands in clay pans, listed as Critically Endangered under the EPBC Act and Vulnerable by DPaW; • TEC – SCP08 - Herb rich shrublands in clay pans, listed as Critically Endangered under the EPBC Act and Vulnerable by DPaW; • TEC – SCP09 - Dense shrublands on clay flats, listed as Critically Endangered under the EPBC Act and Vulnerable by DPaW; • TEC – SCP10a - Shrublands on dry clay flats, listed as Critically Endangered under the EPBC Act and Endangered by DPaW; • TEC – 10b - Shrublands on southern Swan Coastal Plain Ironstones (Busselton area), listed as Critically Endangered under the EPBC Act and Endangered by DPaW (DoEE 2016, DPaW 2016a). Nine vegetation units were recognised within the Project envelope (Ecoedge 2014). None of the vegetation units appears to constitute a Threatened Ecological Community (Ecoedge 2014).		
(e) - Native vegetation should not be cleared if it is significant	Mapping of the vegetation of the Perth region of WA was completed on a broad scale (1:250,000) by Beard (1972-80). These vegetation units were re-assessed by Shepherd et al. (2001) to account for clearing in the intensive land use zone, dividing some larger vegetation units into smaller units. There are five Beard / Shepherd vegetation units within the Project envelope. These vegetation units are described below: • Spearwood 2: Tall woodland; Tuart (*Eucalyptus gomphocephala*);	The Project is unlikely to be at variance to this Principle	Beard (1972-80) Shepherd et al. (2001) Government of Western

PRINCIPLE	ASSESSMENT	OUTCOME	DATA SOURCES
as a remnant of native vegetation in an area that has been extensively cleared	• Bassendean 1000: Mosaic; Medium forest; jarrah-marri/Low woodland; banksia/Low forest; teatree (*Melaleuca* sp.); • Bassendean 4: Medium woodland; marri and wandoo; • Bassendean 1136: Medium woodland; marri with some jarrah, wandoo, river gum and casuarina; and • Bassendean 949: Low woodland; banksia (Figure 9). The EPA aims to retain ecological communities at a minimum of 30% of the pre-clearing extent of that community in each bioregion to meet the *National Objectives and Targets for Biodiversity Conservation 2001-2005* (Commonwealth of Australia 2001) (EPA 2008). The regional representation of each vegetation unit and type has been compiled from the Government of Western Australia (2014) *2014 Statewide Vegetation Statistics incorporating the CAR Reserve* Analysis. The current extent of the vegetation units is presented in Table 6. Three out of the five Shepherd et al. (2001) vegetation types occurring within the Project envelope are retained at less than 30% including Bassendean 1000 [25%], Bassendean 4 [19%], and Bassendean 1136 [7%]. Although the Project envelope contains vegetation representative of a vegetation complex retained at less than 30%, this vegetation is not considered representative of regional vegetation associations (either Beard Vegetation Association 1000, 4 or 1136) given the generally degraded condition of the vegetation and its fragmentation and isolation from larger areas of native vegetation.		Australia (2014)
(f) - Native vegetation	Four geomorphic wetlands occur within or adjacent to the Project envelope including:	The Project may be at	DPaW

PRINCIPLE	ASSESSMENT	OUTCOME	DATA SOURCES
should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland	• Multiple Use wetland UFI 15809 – Palusplain (within); • Multiple Use wetland UFI 581 – Floodplain (within); • Multiple Use wetland UFI 579 – Palusplain (within); and • Conservation UFI 590 – Palusplain (adjacent) (DPaW 2016c) (Figure 8). None of these wetlands are listed as Nationally Important Wetlands or Wetlands of International Importance under the EPBC Act. The closest Wetland of International Importance is the RAMSAR wetland the Vasse– Wonnerup System which occurs about 500 m west of the Project envelope. This wetland is also listed as a Nationally Important Wetland (DoEE 2016). Multiple Use Wetlands mapped within the Project envelope have historically been extensively cleared for rural pursuits. As such vegetation within the MUWs is mapped as cleared, Degraded or Completely Degraded (Ecoedge 2014). The Project contains riparian vegetation although this vegetation does not fall within a mapped geomorphic wetland. Vegetation Unit H is a wetland of the Bassendean soil-landscape system but it does not closely resemble either of the wetland floristic community types typical of this system (SWAFCT12, SWAFCT13) nor does it resemble the *Melaleuca rhaphiophylla* Low Closed Forest with no perennial understorey species noted by Webb et al. (2009) to occur in the Bassendean Dunes (Ecoedge 2014). This unit appears to be an unrecognised floristic community type of the Bassendean Dune wetlands. In places, Vegetation Unit H represents a relatively intact wetland. 0.9 ha of vegetation is mapped as Vegetation Unit H.	variance to this Principle	(2016) Ecoedge (2014) DoEE (2016)

PRINCIPLE	ASSESSMENT	OUTCOME	DATA SOURCES
(g) - Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation	Surface geology varies throughout the Project envelope and consists of the following: ● Tamala Limestone: described as unconsolidated to strongly lithified calcarernite with calcrete/kankar soils; Aeolian. Locally quartzose, feldspathic or heavy-mineral-bearing; ● Guildford formation: described as alluvial sand and clay with shallow-marine and estuarine lenses and local basal conglomerate; and ● Bassendean Sand: described as basal conglomerate overlain by dune quartz sand with heavy mineral concentrations (GSWA 2008). The Project envelope occurs on two soil subsystems including: ● Abba System: Poorly drained flats, on the southern Swan Coastal Plain. Grey deep sandy duplex and wet soil; and ● Bassendean System: Swan Coastal Plain from Busselton to Jurien. Sand dunes and sandplains with pale deep sand, semi-wet and wet soil (DAFWA 2012) (Figure 7). There is some potential for dust to be generated temporarily during construction from cleared areas and stockpiles where sandy soil is predominant. It is expected that impacts associated with dust can be managed during construction via the implementation of appropriate dust suppression techniques such as watering down. A Dust Management Plan will need to be prepared in accordance with DER guidelines prior to commencement of the Project. Dust generation will be avoided long term (post-construction) by revegetation of cleared areas on completion of the Project. The DER Acid Sulphate Soils Risk on the Swan Coastal Plain mapping indicates that 'high to	The Project is unlikely to be at variance to this Principle	GSWA (2008) Geoscience Australia (2008) DotE (2010)

PRINCIPLE	ASSESSMENT	OUTCOME	DATA SOURCES
	moderate risk of ASS occurring within 3 m of natural soils surface' occur in areas where the Project envelope intersects the foreshore and banks of the Ludlow, Sabina and Abba Rivers (DER 2014). All remaining areas of the Project envelope are mapped as 'moderate to low risk of ASS occurring within 3 m of natural soils surface' (DER 2014) (Figure 3). It is noted that sand mining has previously been undertaken in some areas of the Project envelope which may have altered the expected soil profiles. Where excavation or dewatering is required below a depth of three metres, ASS management measures will be implemented in accordance with the Department of Environment Regulation (formerly the Department of Environment and Conservation) guidelines *Treatment and Management of Soils and Water in Acid Sulfate Soil Landscapes* (DEC 2011) and *Identification and Investigation of Acid Sulfate Soils and Acidic Landscapes* (DEC 2013). Groundwater salinity is considered to be marginally brackish varying between 500 to 1000 mg/L (DoW 2010). Clearing will be localised and of a small scale and is not expected to exacerbate salinization of groundwater. The clearing of vegetation within the Project envelope has the potential to cause increased erosion and disturbance of acid sulfate soils. However, given the small extent of clearing and proposed management actions including revegetation of temporally disturbed areas, clearing is unlikely to cause appreciable deterioration in the quality of the land.		
(h) - Native vegetation should not be cleared if	A search of the DoEE *Protected Matters Search Tool* and DPaW Managed Lands database determined that the Project envelope does not intersect any National Parks, nature reserves or Bush Forever Sites (DoEE 2016, DPaW 2014) (Figure 6). Three conservation areas occur near the Project envelope including Ludlow State Forest, Tuart Forest National Park, and	The Project is unlikely to be at variance to	DoEE (2016) DPaW

PRINCIPLE	ASSESSMENT	OUTCOME	DATA SOURCES
the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area	Coolilup State Forest (DPaW 2014) (Figure 6). Two portions of the Project envelope intersect Environmentally Sensitive Areas (ESAs) (DER 2015) (Figure 6).The following management measures will be implemented during construction of the Project to avoid and minimise impacts to surrounding conservation areas: ● Implementation of weed management procedures (such as wash and clean down of vehicles, machinery and equipment prior to mobilisation); ● Implementation of erosion and sediment control measures; and ● Best practice storage of hazardous materials and bunding of hydrocarbon storage and re-fuelling areas to prevent contaminated runoff entering adjacent bushland areas or drainage lines.	this Principle	(2014) DER (2015)
(i) - Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in	The Project envelope falls within the proclaimed Busselton-Capel Groundwater Area. Rainfall events (1 year ARI) have the potential to mobilise spilled or leaked contaminants such as hydrocarbons and mobilise loose topsoil and sand disturbed during construction. The contamination of surface or underground water will be prevented through the best practice storage of hazardous materials and bunding of hydrocarbon storage and re-fuelling areas to prevent contaminated runoff. Mobilisation of suspended solids during frequent rainfall events will be managed via the implementation of best management practice techniques including: ● Incorporation of stormwater management measures into road design such as temporary detention storages, drop structures and rock lined/pitched drainage channels; and ● Implementation of temporary drainage infrastructure during construction to promote	The Project is unlikely to be at variance to this Principle	DPaW (2016c) Ecoedge (2014) DoW (2009) GSWA (2008)

PRINCIPLE	ASSESSMENT	OUTCOME	DATA SOURCES
the quality of surface or underground water	sediment fall out and prevent erosion.		
(j) - Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding	The Project envelope occurs on two soil subsystems including: • Abba System: Poorly drained flats, on the southern Swan Coastal Plain. Grey deep sandy duplex and wet soil; and • Bassendean System: Swan Coastal Plain from Busselton to Jurien. Sand dunes and sandplains with pale deep sand, semi-wet and wet soil (DAFWA 2012) (Figure 7). The Project envelope does not fall within an area categorised as 100 Year ARI Floodplain Development Control Area (DoW 2012b). The Project envelope supports riparian vegetation in damper areas (Ecoedge 2014). These areas have a higher risk of localised waterlogging, and may experience some seasonal inundation. The Project envelope is not considered to be susceptible to flooding and clearing of vegetation is therefore unlikely to exacerbate the incidence of flooding.	The Project is not at variance to this Principle	DoW (2012b) GSWA (2008) DoW (2012b) Ecoedge (2014)

5 Summary

5.1 Outcome and Key Findings of Assessment

Key environmental aspects and impacts relevant to the Project were identified as follows:

- Vegetation and Flora:
    - The Project will result in the clearing of:
        - 24.3 ha of vegetation consisting of 22 ha of native vegetation;
        - 2.3 ha of non-native vegetation;
        - 27 Priority flora listed by the Department of Parks and Wildlife (DPaW) including 11 *Eucalyptus rudis* subsp. *cratyantha* (Priority 4), one *Synaphea petiolaris* subsp. *simplex* (Priority 3), two *S. hians* (Priority 3) and 13 *Verticordia attenuata* (Priority 3) (Ecoedge 2014); and
        - 2.5 ha vegetation representative of representative of Priority 1 Ecological Community – Busselton Yate Community;
    - Three out of the five Shepherd et al. (2001) vegetation types occurring within the Project envelope are retained at less than 30%;
    - Two weed species listed as Declared under the *Biosecurity and Agriculture Management Act 2007* (BAM Act) and one species listed as a Weed of National Significance (WONS) occur in the Project envelope.
- Fauna: The Project has potential to impact four fauna species (Western Ringtail Possum (*Pseudocheirus occidentalis*), Baudin's Black Cockatoo (*Calyptorhynchus baudinii*), Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*), and Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) which are listed as Threatened fauna under the *Wildlife Conservation Act 1950* (WC Act) and listed as matters of National Environmental Significance (NES) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Implementation of the Project will result in the loss of:
    - 21.9 ha potential Black Cockatoo foraging and breeding habitat;
    - 69 Black Cockatoo potential future breeding trees; and
    - 24.9 ha potential Western Ringtail Possum habitat.
- Aboriginal Heritage: Redacted

- Acid Sulfate Soils: Mapping of Acid Sulphate Soils Risk on the Swan Coastal Plain indicates that there is a 'high to moderate risk of ASS occurring within 3 m of natural soils surface' in areas where the Project envelope intersects the foreshore and banks of the Ludlow, Sabina and Abba Rivers. Where excavation or dewatering is required below three metres of the ground level, an ASS investigation may be required in accordance with the Department of Environment Regulation (DER) (formerly the Department of Environment and Conservation) *Identification and Investigation of Acid Sulfate Soils and Acidic Environments* (DEC 2009);
- Surface water/wetlands: The Project envelope intersects three waterways including the Sabina, Abba and Ludlow Rivers and one Conservation Category Wetland (CCW) occurs adjacent to the Clearing footprint;
- Dieback: Native vegetation areas within the Project envelope are considered to potentially contain Dieback; and
- Reserves/Conservation Areas: One conservation area occurs adjacent to the Project envelope, Coolilup State Forest. Two sections of the Project envelope intersect Environmentally Sensitive Areas (ESAs). The ESA's are attributed to nearby conservation areas including Ludlow State Forest and a Conservation Category Wetland (CCW).

6 Additional Actions Required

6.1 Recommended Approvals Approach

It is recommended that the Project be referred to the DoEE under the EPBC Act due to the potential for significant impacts on matters of NES, specifically the loss of > 1 ha of Carnaby's Black Cockatoo, Baudin's Black Cockatoo and Forest Red-Tailed Black Cockatoo habitat and > 0.5 ha of Western Ringtail Possum habitat. However, a significant impact to matters of NES is not expected.

An assessment of the Project against the Ten Clearing Principles has been undertaken. The assessment determined that the Project is likely to or may be at variance with Principles b and f.

It is considered that if the Project is deemed 'not a controlled action' under the EPBC Act the Project could be undertaken using MRWA's Clearing Permit CPS 818. If the Project is a 'controlled action' a Purpose Permit may be required, with an assessment completed under the Bilateral Agreement.

The Project is not considered to result in a significant impact to environmental factors as per the EPA's *Environmental Assessment Guideline 8 – Environmental Factors and Objectives* (2013) and *Environmental Assessment Guideline 9 – Application of a Significance Framework in the Environmental Impact* (2013a). Subsequently the Project is unlikely to require referral to the Environmental Protection Authority (EPA) for assessment under the *Environmental Protection Act 1986*.

7 Limitations

This report is produced strictly in accordance with the scope of services set out in the contract or otherwise agreed in accordance with the contract. 360 Environmental makes no representations or warranties in relation to the nature and quality of soil and water other than the visual observation and analytical data in this report.

In the preparation of this report, 360 Environmental has relied upon documents, information, data and analyses ("client's information") provided by the client and other individuals and entities. In most cases where client's information has been relied upon, such reliance has been indicated in this report. Unless expressly set out in this report, 360 Environmental has not verified that the client's information is accurate, exhaustive or current and the validity and accuracy of any aspect of the report including, or based upon, any part of the client's information is contingent upon the accuracy, exhaustiveness and currency of the client's information. 360 Environmental shall not be liable to the client or any other person in connection with any invalid or inaccurate aspect of this report where that invalidity or inaccuracy arose because the client's information was not accurate, exhaustive and current or arose because of any information or condition that was concealed, withheld, misrepresented, or otherwise not fully disclosed or available to 360 Environmental.

Aspects of this report, including the opinions, conclusions and recommendations it contains, are based on the results of the investigation, sampling and testing set out in the contract and otherwise in accordance with normal practices and standards. The investigation, sampling and testing are designed to produce results that represent a reasonable interpretation of the general conditions of the site that is the subject of this report. However, due to the characteristics of the site, including natural variations in site conditions, the results of the investigation, sampling and testing may not accurately represent the actual state of the whole site at all points.

It is important to recognise that site conditions, including the extent and concentration of contaminants, can change with time. This is particularly relevant if this report, including the data, opinions, conclusions and recommendations it contains, are to be used a considerable time after it was prepared. In these circumstances, further investigation of the site may be necessary.

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FIGURES

APPENDIX A

Protected Matters Search Tool

APPENDIX B

Level 1 Flora and Vegetation Survey (Ecoedge 2014)

APPENDIX C

Fauna Survey (360 Environmental 2016)