



mainroads
WESTERN AUSTRALIA

Upgrade to Great Eastern Highway and Mt Walton Road Intersection Clearing Assessment Report – CPS 818

*We're working for
Western Australia.*

Upgrade to Great Eastern Highway
(GEH) and Mt Walton Road
Intersection

June 2021

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Amendments

Report Compilation & Review	Name and Position	Document Revision	Date
Author:	Caitlyn Sepkus Graduate Environmental Scientist (AECOM)	Rev A	01/06/2021
Reviewer:	Margaret Dunlop Senior Environmental Scientist (AECOM)		
Author:	Caitlyn Sepkus Graduate Environmental Scientist (AECOM)	Rev B	02/06/2021
Reviewer:	Margaret Dunlop Senior Environmental Scientist (AECOM)		
Author:	Caitlyn Sepkus Graduate Environmental Scientist (AECOM)	Rev C	03/06/2021
Author:	Caitlyn Sepkus Graduate Environmental Scientist (AECOM)	Rev 0	08/06/2021
Reviewer:	Margaret Dunlop Senior Environmental Scientist (AECOM)		

1 PURPOSE

This Clearing Assessment Report (CAR) provides a detailed assessment of the impacts associated with the native vegetation clearing that is proposed to be undertaken using the Statewide Clearing Permit CPS 818 issued to Main Roads Western Australia (Main Roads).

The CAR outlines the key activities associated with the project, the existing environment and an assessment of native vegetation clearing. This assessment provides an evaluation of the vegetation clearing impacts associated with the project against the ten Clearing Principles, and the strategies used to manage vegetation clearing.

2 SCOPE

2.1 Project Scope

Project Name: Upgrade to Great Eastern Highway (GEH) and Mt Walton Road Intersection.

Project Purpose / Components: The purpose of the Project is to improve road safety, ensuring that the increase in trucks entering and exiting Great Eastern Highway (GEH) do not pose a safety risk to road traffic. The Project includes the upgrade of the GEH and Mt Walton Road intersection to support an increase in activity in the region.

The proposed clearing undertaking using CPS 818 is: 0.06 ha of native vegetation within a 0.26 ha Development Envelope.

The proposed temporary clearing undertaking using CPS 818 is: none

Project Location(s): Upgrades to the Great Eastern Highway and Mt Walton Road intersection will take place along a 135 metre (m) section of the Great Eastern Highway and a 20 m section of Mt Walton Road. The Project is located at Boorabbin, Shire of Coolgardie, approximately 430 km east of Perth.

- MGA reference: 817094, 6542996

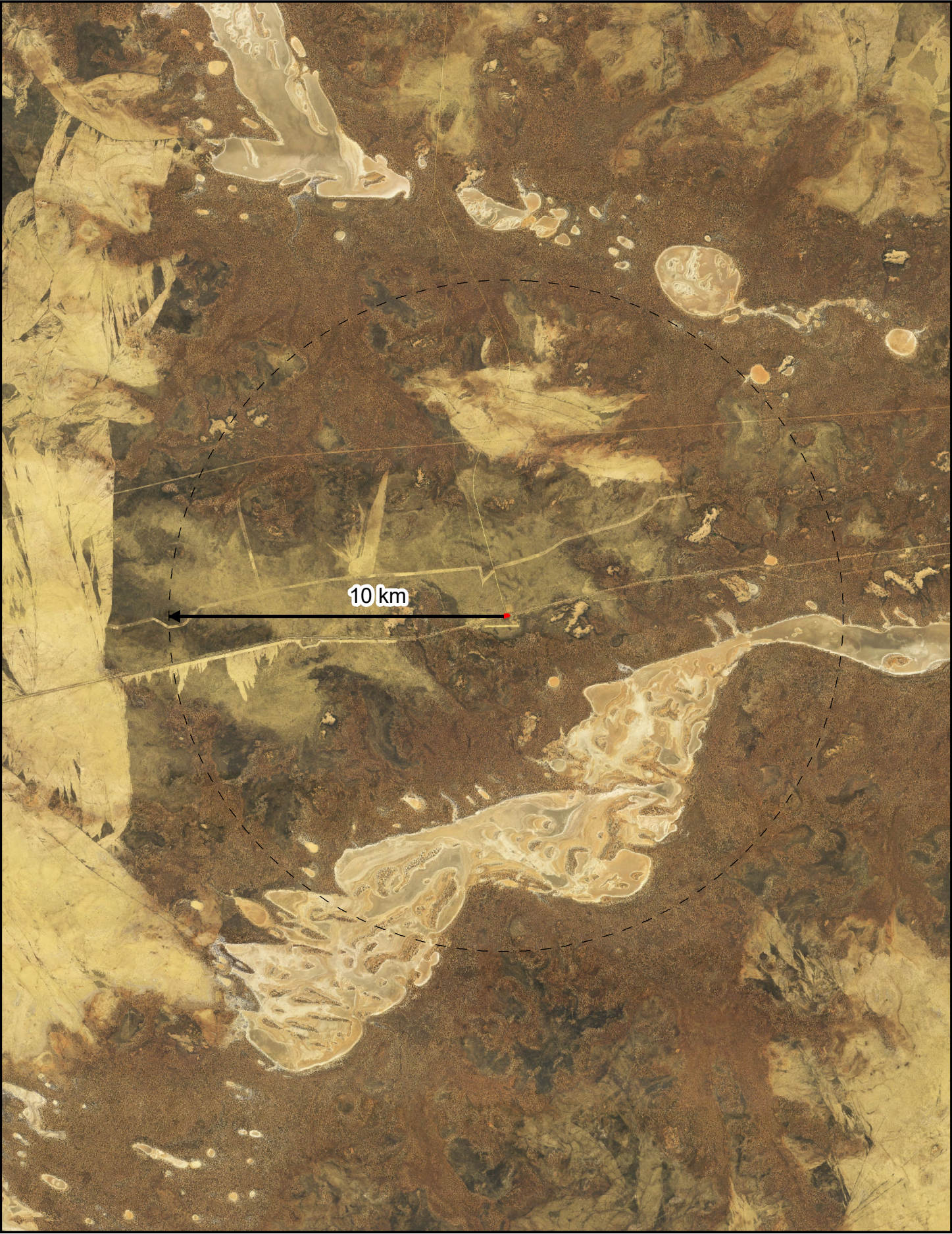
The location of the proposed works is at Figure 1.

2.2 Assessment Report Scope


A Biological survey undertaken by Phoenix Environmental Sciences (Phoenix), which included the Development Envelope, was conducted across a 7.16 ha study area (Phoenix study area) (Figure 1). The desktop assessment was confined to a local area of 10 km from the Development Envelope (Figure 2).





<div>PROJECT ID 60650191</div> <div>CREATED BY BRANDONP</div> <div>APPROVED BY LK</div> <div>LAST MODIFIED 02 JUN 2021</div>	<div>AECOM www.aecom.com</div> <div>LEGEND [Hatched Box] Vegetation_Clearing_Area [Blue Outline Box] Biological Study Area [Red Outline Box] Development Envelope</div>	<div>Project Location</div>	
<div>1:2,301 (when printed at A3)</div> <div>0 15 30 60 90 120 meters</div> <div><small>Data sources: Base Data: © Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2010); Geoscience Australia; Streetpro</small></div>		<div>MAIN ROADS WA</div> <div>UPGRADE TO GREAT EASTERN HIGHWAY AND MT WALTON ROAD INTERSECTION CLEARING ASSESSMENT REPORT</div>	<div>Figure 1</div>



PROJECT ID60650191
CREATED BYP BRANDON
APPROVED BYLK
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


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(when printed at A4)

DATUM GDA 1994 MGA Zone 50

Kilometers

Data sources:

Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2010), Geoscience Australia, Streetpro

LEGEND	
	Search Area
	Development Envelope

Search Area	
MAIN ROADS WA UPGRADE TO GREAT EASTERN HIGHWAY AND MT WALTON ROAD INTERSECTION CLEARING ASSESSMENT REPORT	Figure 2

2.3 Alternatives to clearing

The primary alternative to clearing considered during the design phase was utilising existing tracks and roads where possible to minimise the extent of native vegetation clearing.

2.4 Measures to Avoid, Minimise, Reduce and Manage Project Clearing Impacts

The design and management measures implemented to avoid and minimise the clearing impacts by the Project are provided in Table 1.

Further details on how the clearing impacts have been avoided and minimised include:

- Environmental and heritage requirements included in the site induction and pre-starts
- Conduct a Dial Before You Dig prior to clearing
- The use of heavy machinery on the intersection map potentially damage the Goldfields Pipeline. The requirements for a vibration assessment from the proposed works will be determined in consultation with Water Corporation WA.
- Demarcate clearing boundaries prior to clearing
- Clearing activities to ensure machinery stays within the approved clearing area
- Pre-Starts to detail the approved clearing areas and what environmental values they contain
- Infrastructure used to maintain surface drainage patterns, if required (e.g. culverts, diversions)
- Construction during rainfall avoided where practicable
- Prior to clearing, Priority flora in the immediate surrounds of the Development Envelope to be retained shall be flagged with a 20 m exclusion zone, where practicable.
- Clearing will be done as a front, allowing Malleefowl to move across the Development Envelope and relocate to other areas. Given the scale and nature of clearing, proximity to GEH and adequate searches pre-clearance for the species, it is unlikely impacts to Malleefowl will occur
- Topsoil to be retained for rehabilitation by nearby stockpiles, where practicable
- Prior to clearing, weed species **Opuntia stricta* (Common Prickly Pear) and **Asphodelus fistulosus* (Onion Weed) should be searched for in the Development Envelope and removed to eliminate the risk of it being further dispersed by Project activities
- Hygiene inspections conducted for all vehicles and machinery, prior to entry and exit to site
- A hygiene inspection checklist will be used to record the results of hygiene inspections
- Inspections will be conducted to assess compliance with the Construction Environmental Management Plan (CEMP) during operations
- A practical completion inspection will be conducted to assess compliance completion of clearing
- Results of CEMP inspections will be recorded using an inspection checklist

Table 1: Measures undertaken to Avoid, Minimise, Reduce and Manage the Project Clearing Impacts

Design or Management Measure	Applied to Current Design	Discussion and Justification
Installation of safety barriers	Yes	Safety barriers will be installed as required to meet safety design requirements. Impacts to environmental values are not likely to be changed as a result of safety barrier installation.
Alignment to one side of existing road	No	The upgrade of the intersection will require clearing and works on both sides of Mt Walton Road.
Alternative alignment to follow existing road (or) to preferentially locate within pasture or a degraded areas	No	The Project requires upgrading an existing road intersection to improve road safety. There is no alternative location for the proposed works.
Installation of kerbing	Yes	Kerbing has been considered in the design and implemented where possible and appropriate.
Preferential use of existing cleared areas for access tracks, construction storage and stockpiling	Yes	Already cleared areas such as vehicle tracks will be utilised where possible to avoid additional clearing of native vegetation.
Drainage modification	No	The Project will not alter the existing hydrological regime or existing drainage infrastructure. No drainage lines intersect with the Development Envelope and the Project activities are not expected to cause erosion.
Weed Management	Yes	Separate identification and removal of weeds prior to clearing.

2.5 Approved Policies and Planning Instruments

The clearing of native vegetation in Western Australia is regulated under the *Environmental Protection Act 1986* (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 1.3), Main Roads has also had regard to the below instruments.

Other Legislation of relevance for assessment of clearing and planning/other matters

- *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)
- *Rights in Water and Irrigation Act 1914*
- *Aboriginal Heritage Act 1972* (WA)
- *Town Planning and Development Act 1928*

Other Relevant policies and guidance documents:

- *Environmental Offsets Policy* (Government of Western Australia, 2011)
- *A guide to the assessment of applications to clear native vegetation* (DEC, December 2014)
- *Procedure: Native vegetation clearing permits* (DWER, October 2019)
- *Environmental Offsets Guidelines* (Government of Western Australia, August 2014)
- *Technical guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016a)
- *Technical guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA, 2020)
- Approved conservation advice under section 266B of the EPBC Act for threatened flora/fauna/vegetation communities
- Approved Recovery Plans for threatened species
- Strategic advice - EPA

3 SUMMARY OF SURVEYS

3.1 Biological Survey

Phoenix conducted a Baseline and targeted flora and vegetation survey and a Basic fauna survey on behalf of MRL (Phoenix, 2021). The survey consisted of a desktop assessment to identify significant flora that may occur within 10 km of the study area (7.16 ha) by reviewing DBCA database search results of the WAHerb, TPFL, and Ecological Communities databases, and a field survey, conducted on 20 March 2021 (Phoenix, 2021).

Section 3.1.1 contains the summary of the survey and the full report memo is located in Appendix A.

3.1.1 Summary of Biological Survey

Vegetation

One native vegetation type, AaaAsLv, was recorded and mapped by Phoenix (2021), comprising 0.06 ha of the Development Envelope (Figure 3). This vegetation type is characterised by occasional scattered low mallees of *Eucalyptus pileata* and *E. leptopoda*, over variably present sparse tall shrubland of *Allocasuarina acutivalvis* subsp. *acutivalvis*, over mid open shrubland of *A. spinosissima*, *Grevillea hookeriana* subsp. *apiculoba*, and *G. paradoxa*, over variable sparse ground layer inclusive of *Lepidobolus volubis*, *Triodia scariosa*, and *Amphipogon caricinus* subsp. *caricinus*. This vegetation type does not represent any known Threatened or Priority Ecological Community and was described as being of Good condition within the Development Envelope.

Significant flora

A total of 17 significant flora species were identified through desktop assessment by Phoenix within 10 km of the Phoenix study area (Phoenix, 2021). Of these, five significant flora species were recorded in the Phoenix study area (Phoenix, 2021) (Figure 3). These species included:

- *Lepidosperma lyonsii* (Listed as Priority 1 by the DBCA)
- *Leucopogon* sp. Yellowdine (Listed as Priority 1 by the DBCA)
- *Acacia cylindrica* (Listed as Priority 3 by the DBCA)
- *Acacia desetorum* var. *nudipes* (Listed as Priority 3 by the DBCA)
- *Gastrolobium semiteres* (Listed as Priority 3 by the DBCA)

Two weed species were recorded in the Phoenix study area (Figure 3).

- **Asphodelus fistulosus* (Onion Weed)
- **Opuntia stricta* (Common Prickly Pear, Listed as a Declared Pest and a Weed of National Significance [WoNS])

No Threatened flora species were recorded within the Development Envelope (Figure 3).

Significant fauna

A single fauna habitat, sparse mallee woodland over tall shrubland, was recorded across the Development Envelope (Figure 4). This habitat was considered to be of low value for fauna due to its proximity to the GEH and Mt Walton Road, in conjunction with the presence of other tracks and surface drains, fragmenting the surrounding habitat.

No significant fauna species were recorded in the Development Envelope. Malleefowl (*Leipoa ocellata*) may transit through the Development Envelope occasionally, however, are unlikely to construct nests or actively forage in the Development Envelope because of the proximity to GEH (Phoenix, 2021).

The single fauna habitat is considered unlikely to support short-range endemic (SRE) invertebrate taxa (Phoenix, 2021).

3.1.2 Desktop Surface Water Assessment

A desktop surface water assessment was conducted for the Development Envelope. A search of ArcGIS shapefiles/the DWER database has confirmed that no major or permanent water courses intersect with the Development Envelope, and the proposed works will not disturb or interrupt any natural drainage and surface run-off patterns.

No wetlands intersect with the Development Envelope, with the closest wetlands a series of unnamed salt lakes 2.5 km to 8 km south of the Development Envelope.

3.1.3 Desktop Soil Assessment

A desktop soil assessment conducted for the Development Envelope indicates that the Development Envelope is located within the Norseman Zone (266) of the Kalgoorlie Soil-Landscape Province. This soil-landscape zone is characterised by undulating plains and uplands (with some sandplains and salt lakes) on granitic rocks of the Yilgarn Craton with calcareous loamy earths, yellow sandy and loamy earths, red loamy earths and deep sands, and salt-lake soils (Tille, 2006).

Soil-landscape units of the Development Envelope are of the soil type AC1, which is described as 'gently sloping to gently undulating plateau areas, or uplands, on granites, gneisses, and allied rocks, with long gentle slopes and, in places, abrupt erosional scarps' (Mine Earth, 2020). Such soils are anticipated to have a high infiltration rate with infrequent flooding.

4 VEGETATION DETAILS

4.1.1 Project Site Vegetation Description

The Development Envelope lies within the Coolgardie IBRA Bioregion, in the Southern Cross (COO2) subregion. The Coolgardie Southern Cross subregion lies on the Southern Cross Terrane of the Yilgarn Craton. This subregion is characterised by gently undulating uplands dissected by broad valleys with bands of low greenstone hills (Cowan *et al.*, 2001). Diverse *Eucalyptus* woodlands, rich in endemic eucalypts occur around salt lakes, on the low greenstone hills, valley alluvials and broad plains of calcareous earths (Cowan *et al.*, 2001).

Beard (1981) mapping is used to determine the current extent of remnant vegetation remaining when compared to pre-European vegetation extent. The EPA's objective is to retain at least 30% of all pre-European ecological communities, which is consistent with recognised retention levels (EPA, 2016b). The Development Envelope is entirely within Vegetation Associations 522. This Vegetation Association is described as Medium woodland; redwood (*Eucalyptus transcontinentalis*) and merrit (*E. floetoniae*) (Government of Western Australia, 2019). There is 99.93% of Vegetation Association 552 remaining across the state of Western Australia (Government of Western Australia, 2019).

However, the vegetation within the Development Envelope does not completely represent the composition of Vegetation Association 522. This may be due to the vegetation within the Development Envelope representing an intermediary composition between Vegetation Association 522, and Vegetation Association 1148, described as shrublands; scrub-heath in the Coolgardie Region, which is directly adjacent to the Development Envelope. Furthermore, the vegetation within the Development Envelope may also represent regrowth from clearing that was conducted during the construction of the Goldfields Water Scheme Pipeline in the 1890's. These factors may explain the disparity between the composition of the vegetation within the Development Envelope and Vegetation Association 522.

Table 2 and Table 3 provide details of the Pre-European Vegetation Associations within the Development Envelope and the remaining extents of these associations. For a full description of the existing vegetation, refer to the Biological Survey Memo Report (Appendix A).

Table 2: Summary of the Development Envelope's Mapped Pre-European Vegetation Associations

Pre-European Vegetation Association(s)	Clearing Description	Vegetation Condition	Comments
Vegetation Association 522: Medium woodland; redwood (<i>Eucalyptus transcontinentalis</i>) and merrit (<i>E. floetoniae</i>) (Government of Western Australia, 2019)	Clearing of up to 0.06 ha for road upgrades of GEH and Mt Walton Road.	Good	Vegetation description determined by the 2018 Statewide Vegetation Statistics (Government of Western Australia, 2019) and condition determined from the biological survey undertaken by Phoenix in 2021 (Phoenix, 2021).

Table 3: Pre-European Vegetation Representation (Government of Western Australia, 2019)

Pre-European Vegetation Association	Scale	Pre-European (ha)	Current Extent (ha)	% Remaining	% Remaining in DBCA reserves
Vegetation Association 522	Statewide	709,714.81	709,228.05	99.93	5.54
	IBRA Bioregion Coolgardie	688,406.97	687,920.22	99.93	5.72
	IBRA Sub-region Southern Cross	480,231.80	480,206.00	99.99	7.32
	Local Government Authority Shire of Coolgardie	313,238.77	312,787.98	99.86	11.53

5 ASSESSMENT AGAINST THE TEN CLEARING PRINCIPLES

In assessing whether the Project's proposed clearing is likely to have a significant impact on the environment, the Project was assessed against the ten Clearing Principles (EP Act, Schedule 5).

Each principle has been assessed in accordance with DWER's 'A Guide to the Assessment of Applications to Clear Native Vegetation' and other relevant CPS Decision Reports prepared by DWER.

The proposed clearing is not likely to be at variance with the 10 Clearing Principles.

(a) Native vegetation should not be cleared if it comprises a high level of biological diversity.

Comments	Proposed clearing is not at variance to this Principle
	<p>The Project is located within the Coolgardie Bioregion in the Southern Cross (COO2) subregion. The region is characterised by gently undulating uplands dissected by broad valleys with bands of low greenstone hills (Cowan <i>et al.</i>, 2001). One Vegetation Association occurs within the Development Envelope, Vegetation Association 522, described as Medium woodland; redwood (<i>Eucalyptus transcontinentalis</i>) and merri (E. <i>floctoniae</i>) (Government of Western Australia, 2019).</p> <p>One native vegetation type, AaaAsLv, was recorded and mapped by Phoenix (2021), within the Phoenix study area (Figure 3). This vegetation type is characterised by occasional scattered low mallees of <i>Eucalyptus pileata</i> and <i>E. leptopoda</i>, over variably present sparse tall shrubland of <i>Allocasuarina acutivalvis</i> subsp. <i>acutivalvis</i>, over mid open shrubland of <i>A. spinosissima</i>, <i>Grevillea hookeriana</i> subsp. <i>apiciloba</i>, and <i>G. paradoxa</i>, over variable sparse ground layer inclusive of <i>Lepidobolus volubis</i>, <i>Triodia scariosa</i>, and <i>Amphipogon caricinus</i> subsp. <i>caricinus</i>. The vegetation present within the Development Envelope is representative of AaaAsLv and the surrounding vegetation mapped by Phoenix (Figure 3) (Phoenix, 2021).</p> <p>This vegetation type does not represent any known Threatened or Priority Ecological Community and was described as being of Good condition within the Development Envelope (Figure 5).</p> <p>A 2021 targeted flora survey (Phoenix, 2021) recorded five significant flora species within the Phoenix study area (Phoenix, 2021). These species included:</p> <ul style="list-style-type: none"> • <i>Lepidosperma lyonsii</i> (Listed as Priority 1 by the DBCA) • <i>Leucopogon</i> sp. Yellowdine (Listed as Priority 1 by the DBCA) • <i>Acacia cylindrica</i> (Listed as Priority 3 by the DBCA) • <i>Acacia desetorum</i> var. <i>nudipes</i> (Listed as Priority 3 by the DBCA) • <i>Gastrolobium semiteres</i> (Listed as Priority 3 by the DBCA) <p>Two weed species were recorded in the Phoenix study area.</p> <ul style="list-style-type: none"> • *<i>Asphodelus fistulosus</i> (Onion Weed) • *<i>Opuntia stricta</i> (Common Prickly Pear) (Listed as a Declared Pest and a WoNS) <p>No Threatened, or Priority flora species were recorded within the Development Envelope (Figure 3). The vegetation within the Development Envelope is not considered to comprise a high level of biodiversity.</p>

	<p>A single fauna habitat, sparse mallee woodland over tall shrubland, was recorded across the Development Envelope (Figure 4). This habitat was considered to be of low value for fauna due to its proximity to the GEH and Mt Walton Road, and the presence of other tracks and surface drains, fragmenting the surrounding habitat.</p> <p>No significant fauna species were recorded in the Development Envelope. Malleefowl (<i>Leipoa ocellata</i>) may transit through the Development Envelope occasionally, however, are unlikely to construct nests or actively forage in the Development Envelope (Phoenix, 2021).</p> <p>The single fauna habitat is considered unlikely to support short-range endemic (SRE) invertebrate taxa (Phoenix, 2021).</p> <p>The small amount of native vegetation within the Development Envelope (0.06 ha) is represented in the surrounding area (Phoenix, 2021) and is not expected to comprise a high level of biological diversity. It is therefore expected that the proposed clearing will not be at variance with this Principle.</p>
Methodology	<p>Phoenix (2021)</p> <p>EPA (2016a, 2020)</p> <p>Government of Western Australia (2019)</p> <p>DPRID shapefiles (DPRID, 2019)</p>

(b) 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 indigenous to Western Australia.

Comments	Proposed clearing is not at variance to this Principle
	<p>A single fauna habitat, sparse mallee woodland over tall shrubland was recorded within the Development Envelope (Figure 4). This fauna habitat is considered to be of low value to fauna due to the proximity to roads (GEH and Mt Walton Road), as well as the presence of other tracks and surface drains in the surrounds of the Development Envelope, causing significant fragmentation of the habitat.</p> <p>Desktop records for three significant fauna species were identified within 10 km of the Development Envelope from the desktop assessment undertaken by Phoenix (2021). The conservation significant fauna includes:</p> <ul style="list-style-type: none"> • <i>Apus pacificus</i> Fork-tailed Swift (Listed as Migratory under the EPBC Act and BC Act) • <i>Leipoa ocellata</i> Malleefowl (Listed as Vulnerable under the EPBC Act and BC Act) • <i>Thinornis rubricollis</i> Hooded Plover (Listed as Priority 4 by the DBCA) <p>No fauna of conservation significant fauna species were identified during the field survey of the Phoenix study area (Phoenix, 2021). Furthermore, all three conservation significant fauna species listed were assessed on likelihood of occurrence, and were considered unlikely to occur within the Development Envelope and the Phoenix study area (Phoenix, 2021).</p> <p>Malleefowl may transit through the Development Envelope and surrounds on occasion, however it is considered unlikely that the species would construct nests or actively forage in the Development Envelope, due to the lack of native vegetation and proximity to GEH and Mt Walton Road.</p> <p>As no conservation significant fauna were recorded or are expected to occur within the Development Envelope. Considering the limited amount of low quality fauna habitat that is expected to be removed along the roadside, the Project not at variance with this Principle.</p>
Methodology	<p>Phoenix (2021)</p> <p>EPA (2016a, 2020)</p>

(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.

Comments	Proposal is not at variance to this Principle
	<p>The desktop assessment conducted by Phoenix identified two Threatened flora species under the EPBC Act and the BC Act within 10 km of the Development Envelope:</p> <ul style="list-style-type: none"> • <i>Eremophila virens</i> (Listed as Endangered under the EPBC Act and the BC Act) • <i>Gastrolobium graniticum</i> (Listed as Endangered under the EPBC Act and Vulnerable under the BC Act) <p>Both species were considered unlikely to occur within the Development Envelope and its surrounds, due to unsuitable habitat (Phoenix, 2021).</p> <p>No declared rare or Threatened flora were recorded in the Development Envelope during the field survey (Phoenix, 2021) (Figure 3). Therefore, the Project is not at variance to this Principle.</p>
Methodology	<p>Phoenix (2021)</p> <p>Protected Matters Search Report (DAWE, 2021)</p>

(d) 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.

Comments	Proposed clearing is not at variance to this Principle
	<p>The desktop assessment indicates that no Threatened Ecological Communities (TECs) occur within the 10 km of the Development Envelope (Phoenix, 2021). No native vegetation within the Development Envelope was considered to represent any known TEC nor is it considered necessary for the maintenance of a TEC (Phoenix, 2021).</p> <p>No impacts are expected to occur to TECs, therefore, the Project is not at variance to this Principle.</p>
Methodology	<p>Phoenix (2021)</p> <p>Protected Matters Search Report (DAWE, 2021)</p> <p>DWER shapefiles (DWER, 2020)</p> <p>EPA (2016a, 2020)</p>

(e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

Comments	Proposed clearing is not at variance to this Principle
	<p>The National Objectives and Targets for Biodiversity Conservation 2001-2005 (Commonwealth of Australia, 2001) recognises that the retention of 30% or more of the pre-clearing of each ecological community is necessary if Australia's biodiversity is to be protected, consistent with recognised retention levels (EPA, 2016b).</p> <p>Vegetation Association 522 occurs within the Development Envelope (Table 2). This Vegetation Association is described as medium woodland; redwood (<i>Eucalyptus transcontinentalis</i>) and merri (E. <i>floetoniae</i>) (Government of Western Australia, 2019). There is 99.93% of Vegetation Association 522 remaining across the state of Western Australia, and 99.86% remaining within the Shire of Coolgardie (Table 3) (Government of Western Australia, 2019).</p> <p>The Development Envelope is primarily cleared, with small patches of native vegetation expected to be cleared to support the proposed works. The broader landscape surrounding the Development Envelope is mostly vegetated, although has some fragmentation with access roads and some cleared areas present (Figure 2).</p> <p>The proposed clearing for the Project does not represent a significant remnant of native vegetation in an area that has been extensively cleared, and clearing of 0.06 ha of native vegetation for the Project will meet the threshold of 30% retention. Therefore, the Project is not at variance to this Principle.</p>
Methodology	<p>Aerial photography</p> <p>Phoenix (2021)</p> <p>EPA (2016a, 2020)</p> <p>Government of Western Australia (2019)</p>

(f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

Comments	Proposed clearing is not at variance to this Principle
	<p>No Ramsar Wetlands, nationally Important Wetlands or DBCA managed waters occur within the Development Envelope. The closest wetlands are a series of unnamed salt lakes 2.5 km to 8 km south of the Development Envelope. No clearing of vegetation growing in, or in association with, a water course or wetland is required for the proposed works.</p> <p>The proposed clearing is not at variance with this principle.</p>
Methodology	<p>Phoenix (2021)</p> <p>DWER shapefiles</p>

(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

Comments	Proposed clearing is not at variance to this Principle
	<p>The Development Envelope consists of 0.06 ha of native vegetation, classified as Good condition.</p> <p>The Development Envelope is located within the Norseman Zone (266) of the Kalgoorlie Soil-Landscape Province. This soil-landscape zone is characterised by undulating plains and uplands (with some sandplains and salt lakes) on granitic rocks of the Yilgarn Craton with calcareous loamy earths, yellow sandy and loamy earths, red loamy earths and deep sands, and salt-lake soils (Tille, 2006).</p> <p>There is potential for local soil erosion to occur, although topography is not steep and gullyng would not be expected. As described in Table 3, there is extensive pre-European vegetation remaining around the proposed clearing area (>95%). Given the extent of remaining vegetation in the adjacent areas, it is not expected that clearing of up to 0.06 ha of vegetation surrounding GEH will impact or cause salinity, eutrophication or other appreciable land degradation.</p> <p>Vegetation clearing will be minimised, utilising existing roads, tracks and cleared areas where possible, reducing the potential for land degradation. The Project will be managed in accordance with a CEMP, with measures to mitigate and/or minimise potential environmental impacts that can cause land degradation. Suitable management measures include dust suppression to prevent excessive fugitive dust.</p> <p>With the implementation of management measures and the minimisation of vegetation clearing, the proposed clearing is not at variance with this Principle.</p>
Methodology	<p>Tille (2006)</p> <p>Natural Resource Information (DPRID, 2021)</p>

(h) 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.

Comments	Proposed clearing is not likely to be at variance to this Principle
	<p>The Development Envelope lies within the Great Western Woodlands, an area of great biological richness that extends over 16 million hectares (DBCA, 2021a).</p> <p>Conservation areas surround the Development Envelope, with the Goldfields Woodlands National Park located approximately 100 m south, 400 m north-east, and 340 m north-west of the Development Envelope (Figure 7). The Goldfields Woodlands National park consists of granite rock complexes throughout woodland areas that support vegetation such as thickets of rock sheoak (<i>Allocasuarina huegeliana</i>), jam (<i>Acacia acuminata</i>), silver wattle (<i>Acacia lasiocalyx</i>), sandalwood and quandong (<i>Santalum</i> spp.). The Threatened flora granite poison (<i>Gastrolobium graniticum</i>) is restricted to several granite rock complexes in the area (Department of Conservation and Land Management, 2006).</p> <p>Barriers to connectivity of the National Park exist due to the presence of Great Eastern Highway, Mt Walton Road, and other cleared/disturbed areas in close proximity to the Development Envelope (Figure 7). The Development Envelope consists primarily of pre-existing cleared areas, and the small amount of native vegetation within the Development Envelope is unlikely to provide an ecological link between the conservation areas.</p>

Comments	Proposed clearing is not likely to be at variance to this Principle
	<p>Clearing of 0.06 ha of vegetation within the Development Envelope is unlikely to increase fragmentation of the Great Western Woodlands. Clearing will be managed in accordance with a CEMP to minimise the extent of native vegetation clearing and to avoid exacerbating existing threats to the Great Western Woodlands such as weed invasion.</p> <p>With management measures in place, it is not expected that clearing of 0.06 ha of native vegetation for this Project will impact on the environmental values of any adjacent or nearby conservation area.</p>
Methodology	<p>DBCA shapefiles (DBCA, 2021b; DAWE, 2021)</p> <p>DBCA (2021a)</p> <p>Department of Conservation and Land Management (2006)</p>

(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.

Comments	Proposed clearing is not at variance to this Principle
	<p>There are no permanent watercourses or wetlands within the Development Envelope, and the upgrades to the GEH and Mt Walton Road intersection will not intercept/disturb groundwater.</p> <p>The Development Envelope lies on eastern extent of the Swan Avon River Catchment (NRM, 2021). This section of basin is characterised by low rainfall, ancient geology with little relief, slow flowing areas and large areas of salt lakes (Hennig and Kelsey 2015). Regional-scale catchments drain towards series of large and small salt lakes which typically contain surface water only following significant rainfall events (Rockwater, 2020). Any ephemeral flow due to rainfall quickly evaporates or infiltrates leaving minimal pooling. The region has poorly defined drainage and has no rivers or creeks.</p> <p>The Project will source water for construction activities and dust suppression from the Goldfields pipeline. Consequently, construction of water bores and taking of groundwater will not be required for the Project.</p> <p>The Project is not expected to have an appreciable impact upon surface water and groundwater quality, and therefore is not likely to be at variance with this Principle.</p>
Methodology	<p>DWER and DBCA shapefiles</p> <p>Natural Resource Information (DPRID, 2021)</p> <p>Hennig and Kelsey (2015)</p> <p>Rockwater (2020)</p>

(j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

Comments	Proposed clearing is not likely to be at variance to this Principle
	<p>The Development Envelope can be described as a mostly semi-desert Mediterranean climate, with nine to 11 dry months a year (Tille, 2006). Mean annual rainfall for the area is 295.3ml, which tends to fall in winter. (BoM, 2021).</p> <p>The Project lies on the Norseman soil-landscape zone, with undulating plains on granitic rocks with calcareous loamy earths, yellow sandy and loamy earths, red loamy earths and deep sands, and salt-lake soils (Tille, 2006). Soil-landscape units of the Development Envelope are of the soil type AC1, which is described as gently sloping to gently undulating plateau areas, or uplands, on granites, gneisses, and allied rocks, with long gentle slopes and, in places, abrupt erosional scarps (DPRID, 2021). Such soils are anticipated to have a high infiltration rate with infrequent flooding. This factor is not anticipated to change with the proposed works in the Development Envelope.</p>

Comments	Proposed clearing is not likely to be at variance to this Principle
	Clearing for this Project will remove 0.06 ha of vegetation in a predominantly cleared Development Envelope. It is not expected that clearing will alter the pre-existing hydrology or cause, or exacerbate the incidence or intensity of flooding events. Therefore, the Project is not likely to be at variance with this Principle.
Methodology	Tille (2006) BoM (2021) Natural Resource Information (DPRID, 2021)

6 ADDITIONAL ACTIONS REQUIRED

Table 4 summarises what further pre-clearing impact assessment and vegetation management is required in accordance with CPS 818.

Table 4: Summary of Additional Management Actions Required by CPS 818

Impact of Clearing	Yes/No or NA	Further Action Required
<p>1. The CAR indicates that the clearing is 'At Variance' or 'May be at Variance' with one or more of the Clearing Principles.</p> <p>Where the clearing is at variance or may be at variance to Clearing Principle (f) and no other Clearing Principle, and the area of the proposed clearing is less than 0.5 hectares in size and the Clearing Principle (f) impacts only relate to:</p> <ul style="list-style-type: none"> (i) a minor non-perennial watercourse(s); (ii) a wetland(s) classed as a multiple use management category wetland(s); and/or (iii) a wetland that is not a defined wetland; <p>the preparation of an Assessment Report, as required by condition 6(e), is not required.</p>	No	No further action required.
<p>2. Clearing is at variance or may be at variance with Clearing Principle (g) land degradation, (i) surface or underground water quality or (j) the incidence of flooding.</p>	No	No further action required.
<p>3. The project involves clearing for temporary works (as defined by CPS 818).</p>	No	No further action required.
<p>4 a. Project is within Region that:</p> <ul style="list-style-type: none"> - Has rainfall greater than 400mm and - Is South of the 26th parallel and - Works are in 'Other than dry conditions' and - Works have potential for uninfested areas to be impacted 	No	Proceed with standard Vehicle and Plant management actions and Vehicle and Plant Hygiene Checklists as outlined in the CEMP.

Impact of Clearing	Yes/No or NA	Further Action Required
4b. Does the proposed works require clearing within or adjacent to DBCA estate in non-dry conditions?	No	No further action required.
5. Main Roads has been notified by DWER or an environmental specialist that the area to be cleared is susceptible to a pathogen other than dieback	No	No further action required.
6. The vegetation within the area to be cleared and/or the surrounding vegetation in a good or better condition and weeds likely to spread to and result in environmental harm to adjacent areas of native vegetation that are in good or better condition	No	Given the scale of work and lack of weeds found on the site, weeds can be managed effectively in accordance with a CEMP. No further action is required.

7 CONSTRAINTS MAPPING

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LEGEND

 Development Envelope


 Native Vegetation Clearing


 Biological Study Area


Vegetation Community


 AaaAsLv


Threatened Flora Species


 *Acacia cylindrica* (Priority 3)


 *Acacia desertorum* var. *nudipes* (Priority 3)

 *Gastrolobium semiteres* (Priority 3)


 *Lepidosperma lyonsii* (Priority 1)


 *Leucopogon* sp. Yellowdine (M. Hislop & F. Hort MH 3194) (Priority 1)


 **Opuntia stricta* (WONS)


 **Asphodelus fistulosus* (Weed)


abundance

 1 - 2

 3 - 4

 5 - 9

 10 - 15

 16 - 20

Conservation Significant Flora and Vegetation Communities

MAIN ROADS WA

UPGRADE TO GREAT EASTERN HIGHWAY
AND MT WALTON ROAD INTERSECTION
CLEARING ASSESSMENT REPORT

Figure










3

Map Document: \\laper1p001\Projects\606X\60650191\900_CAD_GIS\920_GIS\02_MXD\09_MtWalton_EIA Figures\60650191_Fig4_ConsSigFlora_MtWalton_EIA_20210602.mxd (BrandonP)

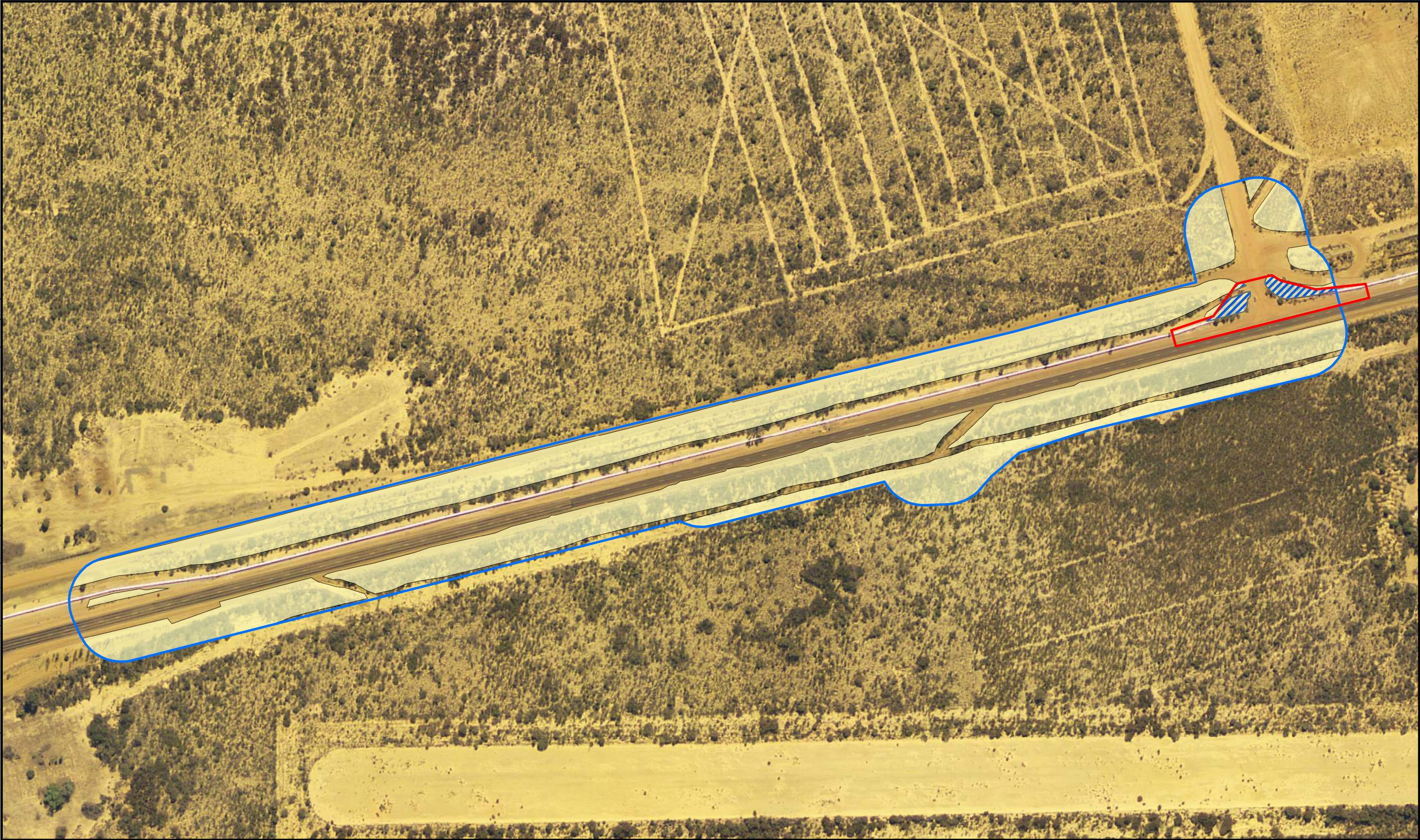
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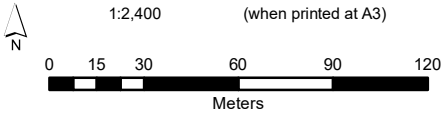
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
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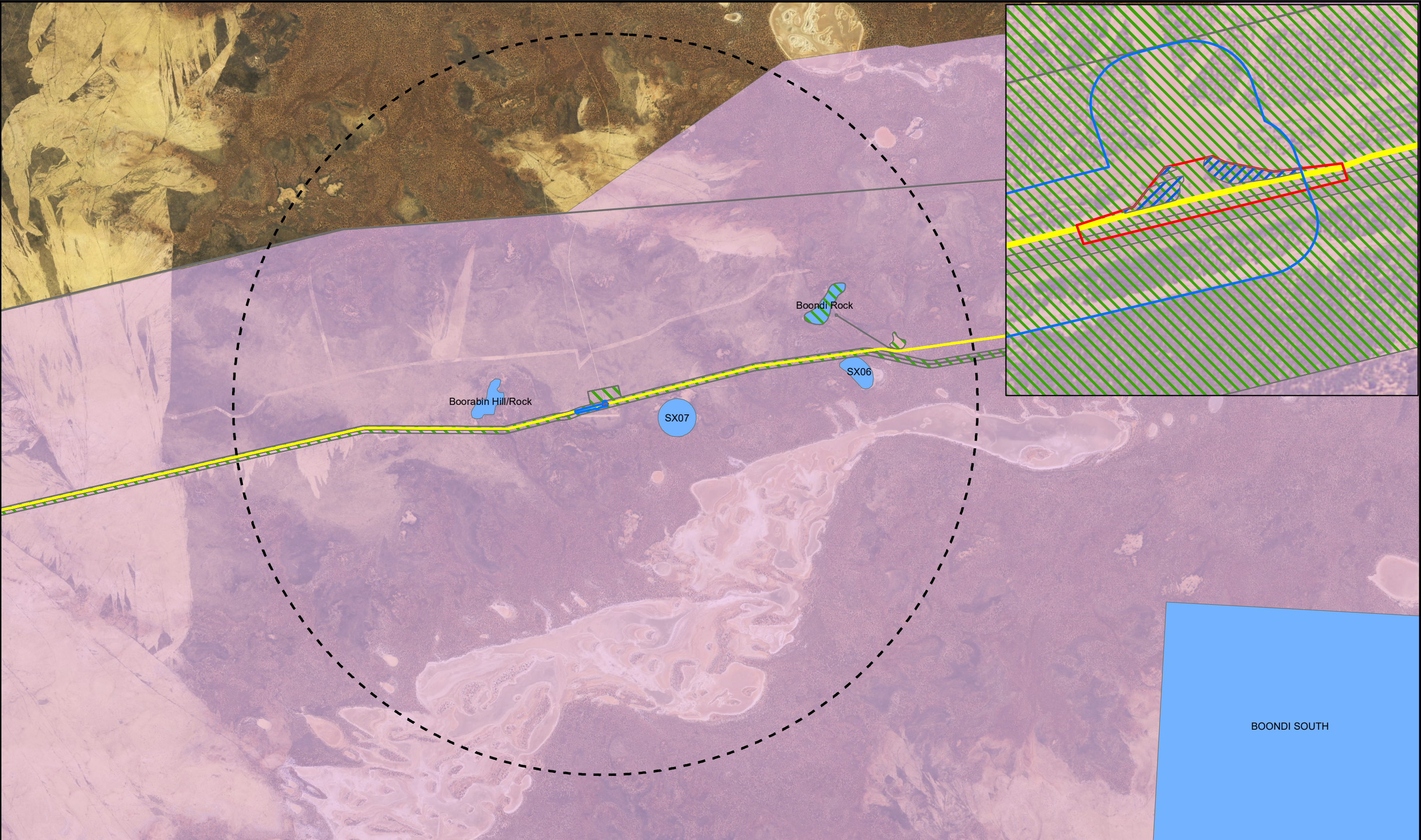
- LEGEND**
-  Development Envelope
 -  Biological Study Area
 -  Native Vegetation Clearing
 - Fauna Habitat**
 -  Sparse mallee woodland over tall shrubland

Fauna Habitat

MAIN ROADS WA
*UPGRADE TO GREAT EASTERN HIGHWAY
AND MT WALTON ROAD INTERSECTION
CLEARING ASSESSMENT REPORT*

Figure
5

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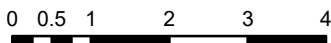
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LEGEND

- Native Vegetation Clearing
- Biological Study Area
- Development Envelope
- Search Area (10 km)
- Goldfields Water Supply Scheme
- Aboriginal Heritage Survey Areas
- Other Aboriginal Heritage Sites
- Great Western Woodlands of Western Australia

Heritage Sites

MAIN ROADS WA

UPGRADE TO GREAT EASTERN HIGHWAY
AND MT WALTON INTERSECTION
CLEARING ASSESSMENT REPORT

Figure

6

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LEGEND

Boorabbin National Park

Development Envelope

Biological Study Area

Native Vegetation Clearing

Goldfields Woodlands National Park

DBCA Legislated Lands (National Parks)

MAIN ROADS WA

UPGRADE TO GREAT EASTERN HIGHWAY
AND MT WALTON INTERSECTION
CLEARING ASSESSMENT REPORT

Figure

7

8 REFERENCES

Beard J. S, (1981), Vegetation of Western Australia. Forests Department, Perth.

Bureau of Meteorology (BoM). (2021). Climate Data for Dedari (Station Number: 012204). Commonwealth of Australia. Accessed May 2021. Available online from: http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_stn_num=012204

Commonwealth of Australia. (2001). National Objectives and Targets for Biodiversity Conservation 2001-2005. Canberra: ACT. Commonwealth of Australia.

Cowan, M., Graham, G. & McKenzie, N. (2001). Coolgardie 2 (COO2—Southern Cross subregion). In: May, J. E. & McKenzie, N. L. (eds). A biodiversity audit of Western Australia's 53 biogeographical subregions in 2002. Department of Conservation and Land Management, Perth, WA, pp. 143–155.

Department of Agriculture, Water and the Environment (DAWE). (2020). Protected Matters Search Tool Report. Available online from: <https://www.environment.gov.au/epbc/protected-matters-search-tool>. Accessed May 2021.

Department of Biodiversity, Conservation and Attractions (DBCA). (2021a). The Great Western Woodlands. Government of Western Australia. Available online from: <https://www.dpaw.wa.gov.au/management/off-reserve-conservation/the-great-western-woodlands>

Department of Biodiversity, Conservation and Attractions (DBCA). (2021b). DBCA – Legislated Lands and Waters (DBCA-011). Government of Western Australia.

Department of Conservation and Land Management. (2006). Goldfields Woodlands National Park and Surrounding Conservation Reserves Interim Management Guidelines. Government of Western Australia. Available online from: <https://library.dbca.wa.gov.au/static/FullTextFiles/070955.pdf>

Department of Primary Industries and Regional Development (DPRID). (2019). Pre-European Vegetation (DPRID-006). Government of Western Australia.

Department of Primary Industries and Regional Development (DPRID). 2020. NRInfo (Natural Resource Information) for Western Australia. Government of Western Australia. Available online from: <https://maps.agric.wa.gov.au/nrm-info/>. Accessed 30 October 2020.

Department of Water and Environmental Regulation (DWER). (2020). Clearing Regulations – Environmentally Sensitive Areas (DWER-046). Government of Western Australia.

Environmental Protection Authority (EPA). (2016a). Technical Guide – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment (eds. K Freeman, G Stack, S Thomas and N Woolfrey). Perth, Western Australia.

Environmental Protection Authority (EPA). (2016b). Environmental Factor Guideline – Flora and Vegetation. EPA, Western Australia.

Environmental Protection Authority (EPA). (2020). Technical Guidance – Terrestrial vertebrate fauna surveys for Environmental Impact Assessment. Perth, Western Australia.

Government of Western Australia. (2019). 2018 South West Vegetation Complex Statistics. Current as of March 2019. WA Department of Biodiversity, Conservation and Attractions, Perth, Western Australia. Available online from <https://catalogue.data.wa.gov.au/dataset/dbca>.

Hennig K and Kelsey P 2015, Avon Basin hydrological and nutrient modelling, Water Science Technical Series, report no. 74, Water Science Branch, Department of Water, Perth, Western Australia.

Heritage Branch of the Australian Government Department of Agriculture, Water and the Environment (DAWE). (2021). National Heritage List Spatial Database (NHL). Commonwealth of Australia.

MineEarth. (2020). Desktop Soil Assessment Park Range Transport Corridor. Report prepared for Mineral Resources Ltd.

Phoenix Environmental Sciences (Phoenix). (2021). Memo report for the Mt Walton Road bypass lane flora targeted search survey. Unpublished report prepared for Mineral Resources Ltd.

Rockwater. (2020). Parker Range Project Haul Road Surface Water Assessment. Report prepared for Mineral Resources Ltd.

Tille, P J. (2006), Soil-landscapes of Western Australia's rangelands and arid interior. Department of Agriculture and Food, Western Australia, Perth. Report 313. Available online from: <https://researchlibrary.agric.wa.gov.au/cgi/viewcontent.cgi?article=1294&context=rmtr>

9 APPENDICES

Appendix	Title
Appendix A	Phoenix Environmental Sciences Biological Survey Memo Report (2021)

Appendix A: Phoenix Environmental Sciences Biological Survey Memo Report (2021)

Memo Report



To: Mr Neil Smith

From: Dr David Leach

Date: 19 May 2021

Scope: Memo report for the Mt Walton Road bypass lane flora targeted search survey

Dear Neil Smith,

Phoenix Environmental Sciences (Phoenix) is pleased to present this memo report summarising results of the flora targeted search survey of the Mt Walton Road bypass lane area conducted on 20 March 2021.

Background

Phoenix has been undertaking a program of biological survey work to support Parker Range Iron Ore Project (PRIOP), on behalf of Mineral Resources Ltd (MRL), including surveys of the proposed PRIOP haul road. A temporary haulage plan for PRIOP entails the trucking of ore to Carina mine. MRL is in discussions with Main Roads WA regarding this plan and the potential need for acceleration/deceleration lanes at the intersection of Great Eastern Highway with Mt Walton Road, approximately 93 km east of Southern Cross. The 7.16 ha study area consists of a planned disturbance footprint expanded by a 30 m buffer (Figure 1).

Scope

The scope of work was as below (some desktop scope items excluded as they are superseded by field results):

- desktop assessment comprising
 - search of the Department of Biodiversity, Conservation and Attractions (DBCA's) threatened and priority flora database
 - search of DBCA's Threatened and Priority Ecological Communities database
 - assess likelihood of occurrence of significant flora in the study area from the haul road dataset
- field survey comprising
 - high level vegetation and mapping by relevé sampling / ground validation of vegetation and habitat extrapolation mapping
 - targeted searches for significant flora.

Methods

A suitably qualified senior botanist (as per technical guidance, EPA 2016) supervised and led the field survey and all other aspects of the works.

Desktop assessment

A desktop assessment was conducted to identify significant flora that may occur within the study area by review of current DBCA database search results of the WAHerb, TPFL and Ecological Communities databases (search ref# 20-0321FL). Known records of significant flora within 10 km of the study area were used to create a list of significant flora with potential to occur within the study area.

Memo Report

Following the field survey, the likelihood of occurrence for each significant flora species identified in the desktop review was assessed and assigned to one of four ratings:

- recorded – species recorded within the study area by previous or current survey
- likely – study area within current known range of species; suitable habitat within the study area, records within 5 km and may not have been detectable during survey (e.g. survey conducted outside flowering period, annual plant survey conducted outside likely period of occurrence, small herbaceous plant in dense vegetation), or entire area of habitat not thoroughly searched
- possible – study area within known range of species; some potential habitat within the study area, no records within 5 km of study area and may not have been detectable during survey (e.g. survey conducted outside flowering period, annual plant survey conducted outside likely period of occurrence, small herbaceous plant in dense vegetation), or entire area of habitat not thoroughly searched
- unlikely – study area outside known range of species and/or no suitable habitat present in study area and/or suitable/potential habitat present but study area considered adequately searched for the species.

A NatureMap search was conducted within a 20 km radius of the study area to identify previous records of significant fauna in the vicinity.

Targeted search survey

The targeted search field survey was conducted on 20 March 2021. Visits to nearby known records of significant flora were conducted prior to searches to assist the botanists' knowledge of target flora during. The study area was traversed on foot by two botanists walking transects spaced approximately 10-15 metres apart subject to density of vegetation. Representative relevés were conducted to assist description of vegetation types present within the study area.

If an encountered flora species was considered to potentially be a significant species (i.e. similar floristic characteristics and occurring within suitable habitat), the following information was collected:

- GPS coordinates, including population boundary where applicable
- description of the habitat and floristic community in which the potential significant species was located
- population size estimate (i.e. estimated number of individual plants), where applicable
- specimen collection for taxonomic identification and lodgement at the WA Herbarium
- photograph of live plant in situ and description of important details, such as flower colour, height of individual or average height of population.

Results

Significant flora

Sixty-four significant flora were found in DBCA searches within 60 km of the study area (Figure 2, data supplied). None of these records lie within the study area.

Records of 17 significant flora were identified within 10 km of the study area (Table 1). Of these, five were recorded in the study area during the survey, two Priority 1 species – *Lepidosperma lyonsii*,

Leucopogon sp. Yellowdine – and two Priority 3 species – *Acacia cylindrica*, *A. desertorum* var. *nudipes*, *Gastrolobium semiteres* (Table 2; Figure 3). Plants of *A. cylindrica* and *A. desertorum* var. *nudipes* were sterile at the time of survey and notably difficult to differentiate in the field by vegetative characters alone. It is therefore possible that some confusion in field identification between the two species has occurred.

Lepidosperma lyonsii was recorded in high abundance in the PRIOP haul road survey (Phoenix 2021a), with 3,686 plants recorded from six populations. An additional 128 plants were recorded in the Emu Fence bypass lane survey (Phoenix 2021b). Four other records for this species were returned in the database searches, with one location containing '92+ plants'. Based on an assessment of all regional records for *L. lyonsii* (Table 2), 0.7% of the regional population is present in the study area.

Three specimens of *Leucopogon* sp. Yellowdine (M. Hislop & F. Hort MH 3194) (P1) were identified by Mike Hislop of the Western Australian Herbarium. The genus *Leucopogon* is in the later stages of taxonomic review, with most species being redefined into the genus *Styphelia*. A single *L. sp.* Yellowdine plant was recorded in the PRIOP haul road survey (Phoenix 2021a). Four other records for this species were returned in the database searches, with comments on frequency including 'isolated plants', 'one seen'. Based on an assessment of all regional records for *L. sp. Yellowdine* (Table 2), 5.3% of the regional population is present in the study area.

A single desktop record of *Acacia cylindrica*, described as 'isolated plants', was returned in the database searches approximately 500 m north of the study area. There are 32 additional records of the species in Florabase (WA Herbarium 2021); very few of these records contain plant counts but frequency observations often note 'common'.

Acacia desertorum var. *nudipes* was recorded in high abundance in two previous surveys by Phoenix, 3,025 plants from four populations for the Parker Range Iron Ore Project (PRIOP) haul road (Phoenix 2021a) and 1,197 plants in one population for the Emu Fence Bypass Lane (Phoenix 2021b). Seven other records for this species were also returned in the database searches, with comments on frequency including 'very sparse', 'isolated plants' and 'six plants'. Based on an assessment of all regional records for *A. d. var. nudipes* (Table 2), 0.2% of the regional population is present in the study area.

There are 11 populations (from 13 records) of *Gastrolobium semiteres* in Florabase (WA Herbarium 2021). Eight populations (from nine records) of *G. semiteres* were returned in the database searches; all of these also occur within Florabase. Two desktop records (of one population) located approximately 50 m west of the study area could not be located. These two records are dated 1961 and 1965 and the plants may no longer exist, or the location data may be erroneous or of low precision. As a precautionary measure, this population has been treated as extinct. Therefore, available regional data in Florabase indicates 10 known populations exist for *G. semiteres* in addition to the new record from the study area (Table 2). Very few of the desktop records contain plant counts but comments on frequency often state 'common' or 'occasional'. All plants of *G. semiteres* encountered appeared to be juvenile in age and on previously burnt and disturbed terrain.

While it is almost certain that all five species occur in much greater abundance than known records, impact assessment for the Proposal should take into account potential impacts from other planned works for the PRIOP haul road, specifically for *Lepidosperma lyonsii*, *Leucopogon* sp. Yellowdine and *Acacia desertorum* var. *nudipes*.

None of the undetected potential significant flora were considered to have a 'likely' likelihood of occurrence within the study area (Table 1).

Memo Report

Table 1 Significant flora likelihood of occurrence for the study area

Significant flora	Conservation status	Habitat	Comments	Likelihood of occurrence
<i>Acacia cylindrica</i>	Priority 3	Previously recorded in the Avon Wheatbelt P1 and Southern Cross subregions in <i>Allocasuarina</i> shrubland on yellow/brown sand and gravelly soils of undulating plains and flats (WA Herbarium 1998-)	Likely occurs outside the study area in numbers greater than recorded.	Recorded
<i>Acacia desertorum</i> var. <i>nudipes</i>	Priority 3	Previously recorded in the western portion of the Coolgardie region in yellow sand and lateritic gravel of sandplains and flats (WA Herbarium 1998-).	Likely occurs outside the study area in numbers greater than recorded.	Recorded
<i>Banksia lullfitzii</i>	Priority 3	Previously recorded in the Coolgardie, Esperance Plains and Mallee regions in mixed <i>Acacia</i> shrublands on yellow sandplains (WA Herbarium 1998-)	Readily visible and identifiable.	Unlikely
<i>Bossiaea celata</i>	Priority 3	Previously recorded in the Eastern Goldfield and Southern Cross subregion in deep sand in open <i>Eucalyptus</i> mallee woodland (WA Herbarium 1998-).	Uncertain habitat suitability (only occasional mallees), known record within 5 km, flowering Sep to Oct.	Possible
<i>Cryptandra polyclada</i> subsp. <i>aequabilis</i>	Priority 1	Previously recorded in the Southern Cross subregion in <i>Allocasuarina</i> shrubland with emergent <i>Eucalyptus</i> mallee shrubs on yellow sandplains (WA Herbarium 1998-).	Suitable habitat, known record within 5 km, cryptic species that flowers in Oct.	Possible
<i>Cyathostemon verrucosus</i>	Priority 3	Previously recorded in the Eastern Goldfield and Southern Cross subregion in low mixed mallee woodland on yellow sandplain (WA Herbarium 1998-).	Suitable habitat but no known records within 5 km.	Possible
<i>Daviesia sarissa</i> subsp. <i>redacta</i>	Priority 2	Previously recorded in the Southern Cross subregion in low mixed mallee woodland on yellow sandplain (WA Herbarium 1998-).	Suitable habitat, known record within 5 km, but distinctive and recognisable.	Unlikely
<i>Eremophila virens</i>	Threatened	Previously recorded in the Avon Wheatbelt P1 and Southern Cross subregions in <i>Eucalyptus</i> mallee shrubland on red or brown sand and granite hillsides (WA Herbarium 1998-).	Unsuitable habitat, readily visible and identifiable.	Unlikely

Memo Report

Significant flora	Conservation status	Habitat	Comments	Likelihood of occurrence
<i>Gastrolobium graniticum</i>	Threatened	Previously recorded in the Avon Wheatbelt and Coolgardie regions in sand, sandy loam, or granite on margins of rock outcrops and along drainage lines (WA Herbarium 1998-).	Unsuitable habitat.	Unlikely
<i>Gastrolobium semiteres</i>	Priority 3	Previously recorded in the Southern Cross subregion in mixed shrubland on yellow sandplains (WA Herbarium 1998-)	Additional plants may occur outside the study area in small, scattered populations.	Recorded
<i>Grammosolen odgersii</i> subsp. <i>odgersii</i>	Priority 2	Previously recorded in the Eastern Goldfield, shield and Southern Cross subregions in burnt over areas and roadsides (WA Herbarium 1998-)	Uncertain habitat suitability, known record within 5 km, but distinctive and recognisable.	Possible
<i>Lepidosperma lyonsii</i>	Priority 1	Previously recorded in the Eastern Goldfield and Southern Cross subregions in low <i>Eucalyptus</i> woodlands and tall shrublands in pale orange skeletal sandy loam with banded ironstone gravel & rock, well-drained shallow stony loamy with quartz on gentle hill slopes and upper slopes of large hill (WA Herbarium 1998-).	Likely occurs outside the study area in numbers greater than recorded.	Recorded
<i>Leucopogon</i> sp. Yellowdine (M. Hislop & F. Hort MH 3194)	Priority 1	Previously recorded in the Southern Cross and Avon Wheatbelt P1 subregions in <i>Allocasuarina</i> mid-shrubland on yellow sandplains (WA Herbarium 1998-)	Suitable habitat, known records within 5 km, cryptic species with uncertain flowering period.	Recorded
<i>Myriophyllum petraeum</i>	Priority 4	Previously recorded in the Avon Wheatbelt, Coolgardie, Esperance Plains and Mallee regions and is confined to ephemeral rock pools on granite outcrops (WA Herbarium 1998-).	Unsuitable habitat.	Unlikely
<i>Phlegmatospermum eremaeum</i>	Priority 3	Previously recorded in the Avon Wheatbelt, Coolgardie, Hampton, Mallee and Nullarbor regions in mixed <i>Eucalyptus</i> woodland over stony loam (WA Herbarium 1998-).	Unsuitable habitat.	Unlikely

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Significant flora	Conservation status	Habitat	Comments	Likelihood of occurrence
<i>Stylidium choreanthum</i>	Priority 3	Previously recorded in <i>Acacia</i> and <i>Allocasuarina</i> shrublands over white, yellow or red sand plains in the Avon Wheatbelt P1, Eastern Goldfield or Southern Cross subregions (WA Herbarium 1998-).	Suitable habitat, known records within 5 km, annual flowering Sep to Nov.	Possible
<i>Thysanotus</i> sp. Yellowdine (A.S. George 6040)	Priority 2	Previously recorded in the Southern Cross and Western Mallee subregions in <i>Melaleuca</i> spp. shrubland over yellow sandplain (WA Herbarium 1998-).	Unsuitable habitat (lack of <i>Melaleuca</i> spp).	Unlikely

Table 2 Significant flora records for the study area

Species	Status	No. plants recorded during survey	No. plants in study area	Regional records ¹	All records	Proportion of all in study area
<i>Lepidosperma lyonsii</i>	P1	136	135 (99%)	17,930 plants	18,066 plants	0.7% of plants
<i>Leucopogon</i> sp. Yellowdine (M. Hislop & F. Hort MH 3194)	P1	4	4 (100%)	71 plants	75 plants	5.3% of plants
<i>Acacia cylindrica</i>	P3	184	178 (97%)	33 records ²	34 records	3% of records
<i>Acacia desertorum</i> var. <i>nudipes</i>	P3	27	22 (81%)	14,788 plants	14,815 plants	0.2% of plants
<i>Gastrolobium semiteres</i>	P3	14	14 (100%)	10 populations (13 records) ³	11 populations (14 records)	9% of known populations

1 – Phoenix (2021a) including field and desktop results (excluding plants in current study area); additional records in Florabase.

2 – very few Florabase records for *Acacia cylindrica* contain plant counts. Frequency observations often note ‘common’.

3 – very few Florabase records for *Gastrolobium semiteres* contain plant counts. Frequency observations note ‘common’ and ‘occasional’.

Significant weeds

Two weed species were encountered within the study area during the survey (Table 3). **Asphodelus fistulosus* was found under and near the water pipeline in the western end of the study area. A single plant of **Opuntia stricta* was found in native vegetation also in the western end of the study area.

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**Opuntia stricta* is both a Declared Pest plant and a Weed of National Significance (WoNS). As such, the removal or control of this plant may be required under the *Biosecurity and Agriculture Management Act 2007*.

Table 3 Weed species recorded in the study area

Species	Status	Number of plants newly recorded during survey	Number of plants within study area
* <i>Opuntia stricta</i>	Weed: Declared Pest s22(2) Weed of National Significance (WONS)	1	1 (100%)
* <i>Asphodelus fistulosus</i>	Weed	35	35 (100%)

Vegetation types

A single vegetation type, AaaAsLv, was encountered within the study area (Table 4; Figure 4). The AaaAsLv vegetation type does not represent any known Threatened or Priority Ecological Community. The DBCA search results found no Threatened or Priority Ecological Communities within 60 km of the study area.

Though a single vegetation type exists in the study area, there is some variability in species dominance across the study area due to past impacts of track and road construction, previous fire events, and general vegetation condition. Vegetation condition of the study area ranged from Degraded to Excellent with a majority of the vegetation (54.61%) being of Very Good condition (Table 5; Figure 5).

Table 4 Vegetation type in the study area

Vegetation type	Vegetation description	Area (ha) within study area	Percentage of study area (%)
AaaAsLv	Occasional scattered low mallees of <i>Eucalyptus pileata</i> and <i>E. leptopoda</i> , over variably present sparse tall shrubland of <i>Allocasuarina acutivalvis</i> subsp. <i>acutivalvis</i> , over mid open shrubland of <i>A. spinosissima</i> , <i>Grevillea hookeriana</i> subsp. <i>apiciloba</i> , and <i>G. paradoxa</i> , over variable sparse ground layer inclusive of <i>Lepidobolus volubis</i> , <i>Triodia scariosa</i> , and <i>Amphipogon caricinus</i> subsp. <i>caricinus</i> .	4.24	59.22
Cleared	Roads, tracks, other areas devoid of vegetation.	2.92	40.78
Totals		7.16	100.00

Table 5 **Vegetation condition in the study area**

Condition ranking	Area (ha)	% of native vegetation in study area	% of study area (%)
Pristine	-	-	-
Excellent	0.23	5.44	3.21
Very Good	2.31	54.61	32.26
Good	1.67	39.48	23.32
Degraded	0.02	0.47	0.28
Completely Degraded	-	-	-
NA	2.92	NA	40.78
Totals	7.16	100.00	100.00

Significant fauna

Vegetation type AaaAsLv in the study area represents a single fauna habitat type, sparse mallee woodland over tall shrubland. The habitat within the study area is considered low value for fauna because of its proximity to the GEH and Mt Walton road and presence of other tracks and surface drains. Tracks along the northern and southern boundaries of the study area significantly fragment the habitat present from more contiguous habitat to the north and south (Figure 4).

Three significant fauna returned desktop records within 10 km of the study area (Table 6). No records of significant fauna were returned within the study area. The study area is unlikely to support any significant fauna species as core habitat due to the level of disturbance and proximity of the roads.

Malleefowl may transit through the study area on occasion but unlikely to construct nests or actively forage in the study area. Road upgrade works will need to consider management measures to avoid impacts to transient Malleefowl, particularly risk of strike from vehicles/machinery.

The single habitat of the study area is considered unlikely to support short-range endemic (SRE) invertebrate taxa.

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Table 6 Significant fauna likelihood of occurrence within the Emu Fence Road bypass lane study area

Species ¹	Status	Habitat and distribution	Likelihood of occurrence
<i>Apus pacificus</i> (Fork-tailed Swift)	Mig. (EPBC & BC Acts)	Widespread migratory species that does not breed in Australia, typically present from October to April. It occurs in a wide range of dry or open habitats across most of WA (DoEE 2020)	Unlikely, other than rare flyover
<i>Leipoa ocellata</i> Malleefowl	VU (EPBC & BC Acts)	Malleefowl occur mainly in scrubs and thickets of mallee (<i>Eucalyptus</i> spp.), boree (<i>Melaleuca lanceolata</i>) and bowgada (<i>Acacia linophylla</i>), and other dense litter-forming shrublands including mulga shrublands (Johnstone and Storr, 2004). Nest mounds require sandy soil as well as abundant litter (Benshemesh 2007).	Unlikely, except occasional transient individuals only. Habitat of study area is poor quality for Malleefowl.
<i>Thinornis rubricollis</i> (Hooded Plover)	P4	Predominantly coastal, non-migratory species endemic to Australia; occurs on sandy beaches of all southern States, and the Western Australian population winters on inland salt lakes up to 250 km from the coast (Birdlife Australia N.D.).	Unlikely, no suitable habitat present

Phoenix Environmental Sciences endeavours to assist MRL should clarification or amendment of this report's content is sought.

Yours Sincerely,

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Reference List

- Benshemesh, J. 2007. *National Recovery Plan for Malleefowl *Leipoa ocellata**. South Australian Department of Environment and Heritage, South Australia.
- Birdlife Australia. N.D. *Hooded Plover *Thinornis rubricollis**. Available at: <https://birdlife.org.au/bird-profile/hooded-plover>
- DoEE. 2020. *Species Profile and Threats Database*. Department of the Environment and Energy, Australian Government, Canberra, ACT. Available at: <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>
- EPA. 2016. *Technical Guidance: Flora and vegetation surveys for Environmental Impact Assessment*. Environmental Protection Authority, Perth, WA. Available at: http://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/EPA%20Technical%20Guidance%20-%20Flora%20and%20Vegetation%20survey_Dec13.pdf
- Phoenix. 2021a. *Baseline flora, vegetation and fauna surveys for the Parker Range Haul Road Project*. Phoenix Environmental Sciences Pty Ltd, Osborne Park, WA. Unpublished report prepared for Mineral Resources Ltd.
- Phoenix. 2021b. *Memo report for the Emu Fence Road bypass lane flora targeted search survey*. Phoenix Environmental Sciences Pty Ltd, Osborne Park, WA.
- WA Herbarium. 2021. *Florabase - the Western Australian Flora*. Department of Biodiversity, Conservation and Attractions. Available at: <https://florabase.dpaw.wa.gov.au/>

