

LOTS 12 AND 13 LODGE DRIVE EAST ROCKINGHAM

EPBC 2021/9069 VEGETATION AND FAUNA MANAGEMENT PLAN

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ENVIRONMENTAL

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1 INTRODUCTION

1.1 Background

Lots 12 and 13 Lodge Drive, East Rockingham (the site) are in the City of Rockingham approximately 36km south of the Perth Central Business District (Figure 1). The site is bound to the north and east by cleared land in the Clipper Precinct of the Rockingham Industry Zone (RIZ), to the south by cleared rural land and to the west by native vegetation in the RIZ Conservation Area.

The site is 11.9098ha in size.

1.2 Proposed Action

The proposed Action is the development of the site for the purpose of commercial development. The proposed action will include (but is not necessarily limited to) the following activities:

- Clearing of existing vegetation.
- Bulk earthworks, including cutting and filling of the land, importation and/or exportation of fill where required.
- Civil construction works, including the construction of the pad, servicing and all other associated construction works.
- Landscape works

1.3 Requirement for the Plan

The site is being assessed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (EPBC 2021/9069).

The Referral of the proposed commercial development was accepted by DAWE on 1 November 2021. The original Referral documentation is provided as Addendum 1. The Action was determined as a 'Controlled Action' on 25 November 2021. The Controlled Action Decision was made for impacts pursuant to Section 18 and 18A; Listed threatened species and communities, specifically:

- Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain Threatened Ecological Community – Critically Endangered; and
- Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) – Endangered;

The decision on the assessment approach was by Preliminary Documentation. Correspondence dated 25 November 2021 outlined the Additional Information required by DAWE prior to the assessment process.

Part of the information requested relates to the *Tuart Woodlands and Forests of the Swan Coastal Plain Threatened Ecological Community* and was to:

Provide a Construction Environmental Management Plan (CEMP) to cover:

- *Management actions to reduce the introduction of edge effects into conservation area to the west of the proposed site. This includes species and weed management, chemical waste run off procedures microclimate shifts, species shifts, native species loss.*
- *Measures for continual upkeep of the site, including any bushfire management strategies that might involve modification to the conservation area to the west.*

In addition, information was also requested for the management of Black Cockatoos as follows:

Provide a CEMP that details how potential environmental impacts associated with construction activities will be managed. The CEMP provided should be developed consistent with the Department's Environmental Management Plan Guidelines referenced at item 9b.

The CEMP should include, but not be limited to:

i. Procedures to protect fauna during construction, through ensuring that a qualified fauna spotter catcher is present during all clearing and is given sufficient authority to guide all clearance, including stopping clearing while any checks or relocation requested by the fauna spotter catcher is undertaken. This should ensure that any Black Cockatoos that may be present have safely moved out of the development envelope identified for clearing, of their own volition, before the habitat is cleared. The Department notes that the survey done in July 2021 found no Black Cockatoos on site at the time.

ii) Procedures to minimise impacts on surrounding areas. This may include measures for work vehicles, noise contamination, the amount of human and non-human traffic allowed in the area, specific speed limits for heavy vehicles.

This Vegetation and Fauna Management Plan (VFMP) has been prepared to provide the information as requested to assist in the assessment of the proposed Action.

1.4 Scope of Works

The VFMP has been prepared in accordance with the *Environmental Management Plan Guidelines 2014* (DoE, 2014).

The VFMP highlights the key project management issues and provides actions required to be undertaken by the Proponent before, during and following project completion. The VFMP provides actions to manage the clearing impacts, to allocate areas of responsibility required for the implementation of identified management actions and to provide mechanisms to report on compliance with those actions. Timing in relation to the proposed development for the completion of actions and monitoring are also provided.

1.5 Management Objectives

The vegetation on the site will be cleared for the proposed commercial development. The site is surrounded by cleared areas for industrial development to the north and east, by Lodge Drive to the south and the Rockingham Industrial Zone (RIZ) to the west.

The VFMP has the following objectives:

- No impact to vegetation, including TEC, beyond the prescribed construction area;
- Minimise the impacts to Black Cockatoos during clearing of the site; and
- No impact on Black Cockatoo habitat beyond the prescribed construction area.

2 POTENTIAL IMPACTS ON MNES

2.1 Matters of National Environmental Significance

2.1.1 Tuart Woodland TEC

The *Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain TEC* was identified as potentially being present on the site and in the surrounding area. A survey of the site and the adjacent bushland indicates that the TEC is present on the site and one of the patches extends beyond the site boundary into the conservation area to the west (PGV Environmental, 2021). (Figure 2).

The impact of developing the site will not retain any native vegetation and therefore 1.5ha will be directly impacted (Figure 3). The VFMP is to ensure the risk of any impacts to the adjacent vegetation is minimised.

2.1.2 Carnaby's Black Cockatoos

The site contains habitat for Carnaby's Black Cockatoo as identified in the Black Cockatoo Habitat Assessment (PGV Environmental, 2021).

The Black Cockatoo Habitat Assessment identified approximately 1.5ha of foraging habitat on the site consisting of Tuart Trees which are considered a moderate foraging source (Johnson and Kirkby, 2018). Evidence of foraging was not found on the site during the site survey in October 2021.

The site does contain any evidence of breeding by Black Cockatoos. Potential breeding habitat for Carnaby's Black Cockatoos was recorded on the site and consisted of 58 Tuart trees with a diameter at breast height (DBH) of 500mm or greater. None of these trees contain suitable hollows or spouts for use by Black Cockatoos.

The site is not used as roosting habitat.

Higher quality habitat (91ha) for Black Cockatoos occurs in the conservation area adjacent to the site.

2.2 Identified Risks

Identified risks to the Tuart Woodland TEC in the surrounding area include:

- Direct impacts of the future development on clearing or damaging native vegetation in the adjacent area;
- Indirect impacts on trees through the installation of services severing tree roots;
- The spread of weeds from the development site into the adjacent area;
- The spread of dieback from the development site into the adjacent area;
- Temporary impact of dust during construction;
- Rubbish blowing off the development site into the adjacent area; and
- Changes in hydrology of surface water and groundwater.

These factors can also impact on habitat for Black Cockatoos with the additional direct impacts on Black Cockatoos during the clearing of the site including:

- Injury or death of Black Cockatoos during clearing; and

- Disruption of foraging or roosting during construction.

2.3 Clearing

During clearing and construction there is a risk of inadvertent clearing off-site through inappropriate delineation of the vegetation to be cleared and lack of induction procedures to identify the limit of clearing. There is also the risk of clearing being undertaken for off-site laydown areas and storage of materials for the development.

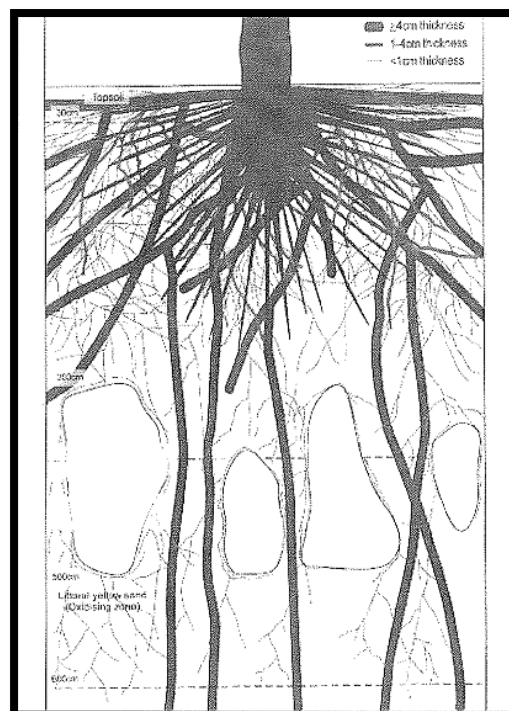
2.4 Damage to Root Zones

2.4.1 Tuart Root Morphology

The installation of services on the site may require digging trenches of varying depth. Trenches dug on the western boundary of the lot may have an impact on severing the roots of Tuart trees located to west of the development site. Information guiding the possible impact on Tuart tree roots is provided below.

The root system of Tuarts is similar to other eucalypts grown on deep sandy soils. The large root bowl is the dominant feature of the root system, consisting of abundant heart roots emanating from the rootstock and a dense network of fine and very fine roots. Extending from the root bowl and originating at the rootstock are numerous slope runner roots, which continue throughout the depth of the soil profile and are highly branched by horizontal and sinker roots. The surface lateral root system, which generally occurs in the surface 20cm of the soil profile, consists of large primary laterals radiating from the base of the tree. Smaller secondary laterals branch along the entire length of the primary laterals and a dense fine and very fine feeder root system is associated with both types of laterals. Sinker roots, which branch from both the primary and secondary laterals, traverse the entire soil profile (Plate 1) (EPA, 2003).

Plate 1: Typical Tuart Root Morphology (source EPA, 2003)



On sites with deep groundwater, such as on the site, large vertical roots with minimal horizontal branching dominate the root system (EPA, 2003).

Potential impacts on Tuart tree roots on the adjoining sites to the east can be managed under AS 4970-2009 (Standards Australia, 2010) as outlined in the following section.

2.4.2 Australian Standard

The AS 4970-2009 Protection of trees on development sites describes the best practices for the planning and protection of trees on development sites based on plant biology and current best practices as covered in recently published literature. The Standard defines the Tree Protection Zone (TPZ) which is “a specified area above and below ground and at a given distance from the trunk set aside for the protection of a tree’s roots and crown to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development” (Standards Australia, 2010).

Trees need to have an area that is greater than just the structural root area to maintain viability and according to the Australian Standard:

$$TPZ = DBH \times 12$$

Where TPZ is the radius of the Tree Protection Zone; and

DBH is the tree’s Diameter at Breast Height (1.4m from the ground).

The TPZ is a combination of the root area and crown area requiring protection. According to the Australian Standard the TPZ extends slightly outside the crown of the tree (Standards Australia, 2010).

The TPZ incorporates the Structural Root Zone (SRZ). The Structural Root Zone is defined as “The area around the base of a tree required for the tree’s stability in the ground. The woody root growth and soil cohesion in this area are necessary to hold the tree upright. The SRZ is nominally circular with the trunk at its centre and is expressed by its radius in metres. This zone considers a tree’s structural stability only, not the root zone required for a tree’s vigour and long-term viability, which will usually be a much larger area (Standards Australia, 2010).

It is possible to encroach into the TPZ with such works as excavation, compacted fill and machine trenching. The proposed encroachment should be less than 10% of the area of the TPZ and outside the SRZ. The Australian Standard outlines the investigations required if there is to be encroachment into the TPZ (Standards Australia, 2010). The SRZ is not advised to be compromised which is calculated as:

$$SRZ \text{ radius} = (D \times 50)^{0.42} \times 0.64$$

Where D is diameter of the trunk at the buttress (Standards Australia, 2010).

As an example, the two closest Tuarts to the eastern boundary of the site have a DBH of 0.55m and less than 0.5m. The tree with a DBH of 0.55m is 28m from the boundary of the site and the tree with a DBH less than 0.50m is 18m from the boundary.

Using the calculation in the Australian Standard the larger tree would have a TPZ with a radius of 6.6m. The same tree would have an SRZ radius of 2.57m (assuming the buttress was the same as the DBH

which is not unrealistic for Tuart trees). The TPZ and SRZ for the smaller tree would be less than these figures. As the two trees are 28m and 18m from the eastern boundary, respectively, there would be.

2.5 Weeds

The development of the site has the potential to spread weeds during construction and have a detrimental impact on the adjoining conservation area.

The vegetation on the site is rated as Completely Degraded and contains abundant weed cover. However, the VFMP includes measures to not exacerbate the weeds that already occur on the site.

Weeds are classified under several listings, based on their invasiveness and impact, being:

- A Weed of National Significance (WoNS);
- A Declared Pest under Section 22 of the Biosecurity and Agriculture Management Act 2007 (BAM Act) (DPIRD, 2012); or
- A Priority weed within the Natural Resource Management (NRM) region (DPaW, 2016).

Any species listed under the above three categories are priorities for management. The weeds recorded on the site are outlined in Table 1.

Table 1: Weed Species Recorded on the Site

Species	Common Name	Priority Species
<i>Arctotheca calendula</i>	Cape Weed	No
<i>Asparagus asparagoides</i>	Bridal Creeper	Declared, WoNS
<i>Asphodelus fistulosus</i>	Onion Weed	No
<i>Avena fatua</i>	Wild Oats	No
<i>Briza minor</i>	Shivery Grass	No
<i>Bromus catharticus</i>	Prairie Grass	No
<i>Bromus diandrus</i>	Great Brome	No
<i>Cirsium vulgare</i>	Spear Thistle	No
<i>Crassula glomerata</i>		No
<i>Ehrharta longiflora</i>	Annual Veldt	No
<i>Erigeron bonariensis</i>	Fleabane	No
<i>Euphorbia peplus</i>	Petty Spurge	No
<i>Euphorbia terracina</i>	Geraldton Carnation Weed	Yes Priority Swan NRM
<i>Fumaria capreolata</i>	White Flower Fumitory	No
<i>Gomphocarpus fruticosus</i>	Narrow Leafed Cotton Bush	Yes Declared Pest S22
<i>Hypochaeris glabra</i>	Flatweed	No
<i>Lagurus ovatus</i>	Hare's Tail Grass	No
<i>Lolium perenne</i>	Ryegrass	No
<i>Lolium rigidum</i>	Wimmera Ryegrass	No
<i>Lysimachia arvensis</i>	Pimpernel	No
<i>Malva parviflora</i>	Marshmallow	No
<i>Medicago polymorpha</i>	Toothed Medic	No

<i>Melilotus indicus</i>	Annual Yellow Sweet Clover	No
<i>Orobancha minor</i>	Lesser Broomrape	No
<i>Osteospermum ecklonis</i>	Veldt Daisy	No
<i>Oxalis pes-caprae</i>	Soursob	No
<i>Pelargonium capitatum</i>	Geranium	Yes Priority species in ICAMP
<i>Petrorhagia dubia</i>	Hairy Pink	No
<i>Raphanus raphanistrum</i>	Wild Radish	No
<i>Rhamnus alaternus</i>	Buckthorn	No
<i>Ricinus communis</i>	Castor Oil Plant	Yes – Priority species in ICAMP
<i>Rumex hypogaeus</i>	Doublegee	Yes – Declared pest S22
<i>Schinus terebinthifolius</i>	Brazilian Pepper Tree	Yes – Priority NRM, WoNS nominated
<i>Sisylx atropurpurea</i>	Wildenowia	No
<i>Solanum nigrum</i>	Blackberry Nightshade	No
<i>Sonchus asper</i>	Rough Sowthistle	No
<i>Sonchus oleraceus</i>	Common Sowthistle	No
<i>Taraxacum officinale</i>	Dandelion	No
<i>Trachyandra divaricata</i>	Dune Onion Weed	No
<i>Trifolium campestre</i>	Clover	No
<i>Urospermum picroides</i>	False Hawkbit	No
<i>Zantedeschia aethiopica</i>	Arum Lily	Declared pest S22

The RIZ conservation area has undergone a long period of weed control management for weeds that are considered to be highly invasive and listed under the three categories listed above.

The weeds recorded on the site that are invasive and are being actively managed in the RIZ conservation area are:

- *Asparagus asparagoides*;
- *Euphorbia terracina*;
- *Gomphocarpus fruticosus*;
- *Pelargonium capitatum*;
- *Ricinus communis*;
- *Rumex hypogaeus*;
- *Schinus terebinthifolius*; and
- *Zantedeschia aethiopica*

2.6 Dieback

Dieback is caused by the genus of water mould *Phytophthora* that infects the roots of vulnerable species, limiting the roots' ability to take up water, thereby weakening or killing the host plant. The spores of *Phytophthora* Dieback are transported by water and in soil.

In sloping areas *Phytophthora* dieback spreads quickly in surface and sub-surface water flows. It spreads slower up-slope and on flat ground because it is restricted to movement by root-to-root contact.

The most common species is *Phytophthora cinnamomi* (Jarrah Dieback), which generally infects proteaceous species, Xanthorrhoea, Jarrah and a number of other species. The vegetation on the site does not contain species identified as susceptible. *Phytophthora multivora* was recently described and associated with a range of *Phytophthora* sensitive indicator species including Tuart and Jarrah.

Phytophthora is commonly spread from site to site by:

- The transfer of soil on machinery;
- Human transfer in soil on shoes and equipment;
- Downhill movement of water;
- Use of infected tubestock or plants from another source;
- Use of fill and mulch from infected sources; and
- Use of water for irrigation/watering from infected sources.

The assessment of the *Phytophthora* Dieback disease status of the vegetation within the site can be mapped as three categories of vegetation, being Uninfested (no apparent *Phytophthora* Dieback disease), Infested (*Phytophthora* Dieback disease present), and Unmappable (unable to determine Dieback disease presence). Each category requires effective management to mitigate the spread of the existing Infested areas. Definitions of the categories are in Table 2.

Therefore, the area is considered to be Uninfested. The spread of dieback into the adjacent areas would have an adverse impact on the Tuart Woodland TEC and Black Cockatoo Habitat.

Table 2: Categories of Dieback Infestation Mapping

Mappability	Diagnosis	
Unmappable Areas that are sufficiently disturbed so that Dieback disease occurrence mapping is not possible at the time of inspection	Further categorisation may be possible after variable regeneration periods for different types of disturbance	
Mappable Natural undisturbed vegetation. Dieback disease occurrence mapping is possible. Three categories may result	Infested	Determined to have plant disease symptoms (Dieback disease) consistent with the presence of the pathogen.
	Uninfested	Areas that are determined to be free of plant disease symptoms (<i>Phytophthora</i> Dieback disease) that indicate the presence of the pathogen.
	Uninterpretable	Areas where indicator plants are absent or too few to determine the presence or absence of disease caused by <i>P. cinnamomi</i>

2.7 Dust

The generation of dust on the site has the potential to impact on vegetation by:

- Impeding plant photosynthesis;
- Potentially spreading the seed of invasive weed species; or
- Potentially spreading pathogens such as dieback.

The impact of dust on vegetation could have an adverse impact on the Tuart Woodland TEC and Black Cockatoo habitat.

2.8 Rubbish

The inappropriate management of waste and rubbish on a construction site can result in the rubbish being transferred into the adjoining conservation area as well as the increase in feral species such as rats and mice due to an increase in food resources, thereby adversely impacting the TEC and Black Cockatoo habitat.

2.9 Hydrology

Altered hydrological regimes in groundwater or on surface water flows can lead to increased or decreased water availability to vegetation, both of which can have a detrimental impact on vegetation values. There are no surface water flows on the deep sandy soils and groundwater is at least 10m below the natural surface. Clearing the 5.495ha of native vegetation, in an area that is already highly modified or cleared, will not result in any change to the groundwater levels under the site.

2.10 Impact on Black Cockatoos

Black Cockatoos can feed and drink water in puddles at the edge of roads and being a large-winged bird, Black Cockatoos usually take off into the wind often putting them in the path of vehicles, making them vulnerable to vehicle strike (Dawson, 2014). The impact can lead to injury or death.

Impact on Black Cockatoos utilising the adjoining habitat may occur due to disturbance to foraging or roosting from truck movements. The impacts may cause interruptions to the Black Cockatoos, thereby reducing their use of the adjoining bushland.

2.11 Bushfire Management

The site will maintain the required firebreaks around the perimeter of the site in accordance with State Planning Policy 3.7 – Planning in Bushfire Prone Areas (WAPC, 2015) and Local government by-laws..

3 MANAGEMENT PLAN

3.1 Site Induction

3.1.1 Objective

To ensure all construction personnel are familiar with and comply with the VFMP.

3.1.2 Induction Package

The induction package will be presented to all construction personnel during the start up meeting and will include:

- Location and identification of the development area, limit of clearing, habitat for Black Cockatoos and Tuart Woodland TEC;
- Procedures for clean-on-entry and exiting the development area;
- Information on the cause and effect of dust on the environment;
- Required record keeping, including incident reporting; and
- Requirements to comply with any management actions in the VFMP.

M1 An induction package will be presented to all personnel prior to the commencement of works outlining the objectives, procedures and management actions in the VFMP.

3.2 Fencing

3.2.1 Objective

Vehicle and pedestrian access to the bushland area will be restricted by the installation of fencing around the perimeter of the area.

3.2.2 Proposed Fencing

The existing fence around the Lots is 1.8m high chain mesh fence. Dust curtains will be installed along the western side of the Lots to minimise any airborne dust during construction. Fencing will be maintained, and any breaches noted during visual inspections will be repaired in a timely fashion to ensure that the barrier remains in place.

At the conclusion of development, the dust curtains will be taken down. The existing fence meets the design requirements from the City of Rockingham.

M2 The existing fence will have dust curtains installed along the western boundary.

M3 The fence will be maintained during construction to ensure unauthorised access is minimised.

M4 Post construction the dust curtains will be taken down.

3.3 Vegetation

3.3.1 Objective

Native vegetation in the conservation area adjacent to the site will not be removed or disturbed.

3.3.2 Management

Implementation of the VFMP actions will not require any clearing in the adjoining bushland.

M5 Native vegetation outside of the development footprint will not be removed or disturbed

3.4 3.4 Weeds

3.4.1 Objective

No Declared weed species or Swan Region NRM Priority weeds will be introduced into the conservation area as a result of the development.

3.4.2 Weed Management

The spread of weed species from the development site to the adjoining RIZ conservation would most likely occur due to vehicle movements from weed-affected areas on the development site driving into the adjoining bushland. Access to the adjoining bushland area is prevented through a 1.8m chain mesh fence. Weeds could also be spread during clearing works and weed seeds blowing into the adjoining bushland. The existing 1.8m high fence will have dust curtains installed to limit the risk of spread of priority weed species. Any priority weeds that occur in landscaped areas will be managed.

M6 Fencing with dust curtains to prevent spread of airborne seeds as well as those that can be transported on vehicles.

M7 Any priority weeds that grow in the landscaped areas of the site will be removed during landscaping maintenance works.

3.5 Landscaping

3.5.1 Objective

Landscaping should avoid using non-endemic species that could invade the adjoining bushland area over time.

3.5.2 Management

Landscaping is to be undertaken in accordance with an approved Plan as a Condition of the Development Application approval. The species list will include locally native species, specifically Black Cockatoo foraging species as listed in Plants Used by Carnaby's Black Cockatoo (Groom, 2011). No non-native species that could invade the bushland area will be used in the landscaping.

M8 Landscaping is to be undertaken in accordance with an approved Plan and will include, but not be limited to, species from Plants Used by Carnaby's Black Cockatoo (Groom, 2011).

3.6 Dieback

3.6.1 Objective

To prevent the spread of dieback into the adjoining bushland.

3.6.2 Dieback Management

All machinery entering the site will have undergone a hygiene process at their headquarters after their last project. Hygiene management procedures will be implemented on the site with signage erected at all access points to the development area. The signs should include the following procedures:

- Vehicle inspection protocols to ensure the vehicle is free from soil/organic material prior to entry and exit;
- Brush down of contaminated vehicles and machinery in dry weather
- Wash down of contaminated vehicles and machinery used in clearing with suitable disinfectant such as bleach dilution, methylated spirits or an approved product such as Phytoclean during wet weather.

To prevent transfer of potentially infected soil into the adjoining bushland there will be no access to the adjoining bushland from the development area. There are two 1.8m fences separating the lots.. Earthworks will ensure that no contours are created that drain surface water from the development area to the conservation area. Stockpiles of soil and mulch will be:

- Located in sheltered areas
- Limited in height and steepness;
- Piled lengthways to prevailing winds; and
- Stabilised if required.

All soils or mulch to be imported to the site during works will be disease and pathogen free, including seedlings and any building materials will be free from soil.

M09 Initial clearing works will be scheduled as much as possible in drier conditions.

M10 Soil in the construction footprint will be stabilised so it is not prone to water erosion and being washed into adjoining bushland areas.

M11 No contours will be created that will allow surface water drainage into the bushland.

M12 Stockpiles will be constructed to ensure no soil transfer occurs to the adjoining bushland

M13 All imported landscaping and revegetation materials (i.e. soil, mulch, seedlings) brought onsite will be weed and certified dieback free. Imported pipes, stone pitching materials and other construction materials are to be free of mud and soil.

3.7 Dust

3.7.1 Objective

To minimise dust generated from the development area to avoid adverse impacts on the vegetation in the adjoining bushland.

3.7.2 Dust Management

Dust will be minimised by ensuring that speed limits in the development area are set, appropriately sign posted and enforced during construction. Water carts will be utilised in the event of dust generation and if the dust is caused due to unfavourable weather conditions activities likely to

generate dust will be suspended until conditions are less likely to create dust. If stockpiles are to be left for more than one month the pile will be stabilised using a hydro-mulch or equivalent.

Additional dust control measures may be required under a Dust Management Plan as a condition of the Development Application approval.

M14 Establish and enforce vehicle speed limits for unsealed areas with an objective to minimise dust generation soil.

M15 Water cart to be present on-site during construction to dampen areas if dust is being generated and commence dust suppression immediately on visual evidence of dust lift.

M16 Avoid dust generating activities during unfavourable weather conditions (e.g. high wind speed) and unfavourable wind directions relative to sensitive areas, where practicable.

M17 Implement semi-permanent dust control treatments (e.g. hydro-mulching, dust stabilisers, tarps or geo-textile materials) on stockpiles that are to be left for longer than one month.

3.8 Rubbish

3.8.1 Objective

To minimise rubbish being transferred from the development area to the adjoining bushland.

3.8.2 Rubbish Management

The construction site office will use self-closing lids on bins. Road and drainage basin construction will need to be undertaken in a clean manner, ensuring no waste, including plastic wrapping, tape, bags and other moveable materials are able to be blown off-site.

M18 All outdoor bins at the site office are to have self-closing lids.

M19 Any waste that can become airborne to be removed from the construction site as soon as possible.

M20 All road and drainage basin construction waste are to be removed at the conclusion of construction.

3.9 Hydrology

3.9.1 Objective

To maintain surface water and groundwater quality in the adjoining bushland.

3.9.2 Hydrological Management

The hydrology of the site will be managed in accordance with the approved Urban Water Management Plan. The Urban Water Management Plan will ensure that there is no overland flow into the bushland areas and stormwater is appropriately managed.

M21 Ensure construction is consistent with the drainage design as outlined in an approved Urban Water Management Plan

M22 All stormwater to be retained and infiltrated on site

M23 No overland flow of water will be allowed from the development into the adjoining bushland areas

3.10 Black Cockatoos

3.10.1 Objective

To reduce the risk of birdstrike in the subdivision and impacts on individuals during clearing and those utilising the surrounding habitat.

3.10.2 Bird strike Management

Vehicles entering the development will be turning in from Lodge Drive, limiting truck speeds to low levels. The development site will be speed limited at 20km/hr. The industrial area does not contain any major roads so will be speed limited to 50km/hr. Roads and tracks will be maintained to prevent formation of water holding structures which may attract Black Cockatoos and increase the risk of vehicle strike. Any areas noted to have Black Cockatoos on the ground on a regular basis will be signposted with a traffic sign to alert drivers to the presence of black cockatoos as shown in Plate 2.

Plate 2: Black Cockatoo Traffic Alert Sign



M24 Implement a 20km/hr speed limit during construction and 50km/hr limit in the industrial area

M25 Maintain construction roads to prevent the formation of water holding structures

M26 Install traffic alert signs in areas noted to regularly have Black Cockatoos

3.10.3 Impacts During Clearing

A zoologist will assess the trees prior to clearing to ensure that Black Cockatoos are not present. Most often Black Cockatoos will not remain on the site during clearing. The trees will be bumped with machinery before being pushed over, then felled if no fauna is spotted. This will give any avian fauna a chance to fly off before the tree is felled.

M27 A zoologist will assess the trees prior to clearing.

M28 Employ fauna friendly clearing protocols by bumping trees prior to felling

3.10.4 Utilisation of Adjoining Habitat

As well as access being prohibited into the bushland area construction and movement of machinery will be restricted to daylight hours so will not impact on night roosting, should Cockatoos start roosting

on the site during the development period. To avoid light spill into the adjoining bushland at night, lights that are directional (minimising spill to surrounding areas) will be utilised.

M29 Construction to be limited to daylight hours.

M30 Use of cut-off lights designed to direct light onto the road and minimise off-target glare and light spill where appropriate.

3.11 Monitoring

Monitoring will be undertaken to determine whether the environmental objectives specified in this VFMP are being achieved in accordance with the performance indicators, and whether the management actions require remedial action.

The boundary of the development area and the adjoining bushland will be inspected weekly by the site manager for:

- Damage to the fence and any signs of unauthorised access;
- Any areas that have inadvertently been cleared;
- Rubbish;
- Invasive Weeds (Declared pests or Priority Swan NRM weeds);
- Dust on leaves of the vegetation; and
- Any decline in plant health along the boundary.

During monitoring if any of these parameters are observed remediation will be initiated immediately.

Three permanent 10x10m quadrats will be established within the adjoining bushland, two of which will be in the Tuart Woodland TEC. The quadrats will be located approximately 20m in from the cleared track/firebreak.

The quadrats will be inspected prior to commencement of construction to establish a baseline and on an annual basis during construction. The following parameters will be recorded including:

- A photo to be taken on the south-western corner;
- Invasive weed species;
- Invasive weed density (% cover), if present
- Native species health;
- Vegetation condition;
- Visual signs of disturbance;
- Visual signs of dust on vegetation; and
- Visual signs of dieback.

On a monthly basis the contractor's hygiene register will be reviewed to ensure protocols and hygiene requirements are met and all soil and mulch products imported to the site are dieback free.

M31 Visual inspection of the boundary of the development area on a weekly basis by the site manager.

M32 Visual inspection by the project botanist of three photo points in the adjoining bushland on an annual basis.

M33 Monthly review of the hygiene register by site manager.

3.12 Reporting

Monitoring results will be provided in an annual Compliance Report that will be required under the EPBC Approval.

M34 Annual monitoring report detailing activities, any contingency actions, any remedial actions and monitoring results will be submitted in the annual compliance report

Table 3: Management Action Table

Number	Action	Timing	Responsibility
M1	An induction package will be presented to all personnel prior to the commencement of works outlining the objectives, procedures and management actions in the VFMP.	Pre-Construction	Site Manager
M2	The existing fence will have dust curtains installed along the western boundary.	Pre-Construction	Construction Manager
M3	The fence will be maintained during construction to ensure unauthorised access is minimised.	Ongoing	Site Manager
M4	Post construction the dust curtains will be taken down	Post Construction	Construction Manager
M5	Native vegetation outside of the development footprint will not be removed or disturbed	Ongoing	Site Manager
M6	Fencing with dust curtains installed to prevent spread of airborne seeds as well as those that can be transported on vehicles.	Pre-Construction	Construction Manager
M7	Any priority weeds that grow in the landscaped areas of the site will be removed during landscaping maintenance works	Ongoing	Site Manager
M8	Landscaping is to be undertaken in accordance with an approved Plan and will include, but not be limited to, species from Plants Used by Carnaby's Black Cockatoo (Groom, 2011).	Post Construction	Site Manager
M09	Initial clearing works will be scheduled as much as possible in drier conditions.	Pre-Construction	Site Manager
M10	Soil in the construction footprint will be stabilised so it is not prone to water erosion and being washed into adjoining bushland areas.	During Construction	Construction Manager
M11	No contours will be created that will allow surface water drainage into the bushland	During Construction	Construction Manager
M12	Stockpiles will be constructed to ensure no soil transfer occurs to the adjoining bushland	During Construction	Construction Manager
M13	All imported landscaping and revegetation materials (i.e. soil, mulch, seedlings) brought onsite will be weed and certified dieback free. Imported pipes, stone pitching materials and other construction materials are to be free of mud and soil	Post Construction	Site Manager
M 14	Establish and enforce vehicle speed limits for unsealed areas with an objective to minimise dust generation soil.	Preconstruction	Site Manager
M15	Water cart to be present on-site during construction to dampen areas if dust is being generated and commence dust suppression immediately on visual evidence of dust lift.	During Construction	Construction Manager
M16	Avoid dust generating activities during unfavourable weather conditions (e.g. high wind speed) and unfavourable wind directions relative to sensitive areas, where practicable	During Construction	Construction Manager
M17	Implement semi-permanent dust control treatments (e.g. hydro-mulching, dust stabilisers, tarps or geo-textile materials) on stockpiles that are to be left for longer than one month	During Construction	Construction Manager

M18	All outdoor bins at the site office are to have self-closing lids.	Ongoing	Site Manager
M19	Any waste that can become airborne to be removed from the construction site as soon as possible.	Ongoing	Site Manager
M20	All road and drainage basin construction waste are to be removed at the conclusion of construction.	Post Construction	Construction Manager
M21	Ensure construction is consistent with the drainage design as outlined in an approved Urban Water Management Plan	During Construction	Construction Manager
M22	All stormwater to be retained and infiltrated on site	During Construction	Construction Manager
M23	No overland flow of water will be allowed from the development into the adjoining bushland areas	During Construction	Construction Manager
M24	Implement a 20km/hr speed limit during construction and 50km/hr limit in the industrial area	During Construction	Site Manager
M25	Maintain construction roads to prevent the formation of water holding structures	During Construction	Construction Manager
M26	Install traffic alert signs in areas noted to regularly have Black Cockatoos	During Construction	Site Manager
M27	A zoologist will assess the trees prior to clearing.	Pre-Construction	Site Manager
M28	Employ fauna friendly clearing protocols by bumping trees prior to felling	During Construction	Construction Manager
M29	Construction to be limited to daylight hours.	During Construction	Site Manager
M30	Use of cut-off lights designed to direct light onto the road and minimise off-target glare and light spill where appropriate	During Construction	Site Manager
M31	Visual inspection of the boundary of the development area on a weekly basis by the site manager	Ongoing	Site Manager
M32	Visual inspection by the project botanist of three photo points in the adjoining bushland on an annual basis.	Pre Construction	Site Manager and Project Botanist
M33	Monthly review of the hygiene register by site manager.	Ongoing	Site Manager
M34	Annual monitoring report detailing activities, any contingency actions, any remedial actions and monitoring results will be submitted in the annual compliance report	Ongoing until Development Complete	Environmental Consultant

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M16	Avoid dust generating activities during unfavourable weather conditions (e.g. high wind speed) and unfavourable wind directions relative to sensitive areas, where practicable	During Construction	Construction Manager
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M33	Monthly review of the hygiene register by site manager.	Ongoing	Site Manager
M34	Annual monitoring report detailing activities, any contingency actions, any remedial actions and monitoring results will be submitted in the annual compliance report	Ongoing until Development Complete	Environmental Consultant

3.13 Contingency Plans

3.13.1 Vegetation

It is highly unlikely that the adjoining RIZ Conservation area will be disturbed due to the separation area between the lot to be developed and that there are two 1.8m fences in the separation zone.

1. Consider potential causes of the clearing and provide the appropriate action to prevent any further clearing;
2. Map the impacted area;
3. Prepare a Rehabilitation Plan using flora studies on the site and surrounding vegetation as a baseline to determine appropriate species and level of biodiversity that should be reinstated on the cleared area;
4. Implement the Rehabilitation Plan until the completion criteria have been met; and
5. Continue monitoring vegetation health and the effectiveness of remedial actions.

If there is a decline in the vegetation health or condition within the adjoining bushland, the following contingency plan will be implemented:

1. Consider potential causes for decline in vegetation health or increase in weed cover.
2. Determine if the decline may be within normal limits.
3. If decline in health is not within normal limits, determine the most likely cause of this decline.
4. Determine management and/or contingency actions implemented if the cause is from construction activities.
5. Continue monitoring vegetation health and the effectiveness of remedial actions.

3.13.2 Weeds

If new infestations of invasive weeds are recorded in the adjoining bushland the following will be undertaken:

1. Investigation of the potential sources of the weeds.
2. If the weeds originate in the development area:
 - The weeds in the development area will be eradicated; and
 - The weeds will be managed by an appropriate weed contractor that is proficient in managing weeds in bushland.
3. Follow-up monitoring will be undertaken on a monthly basis to ensure the weeds have been managed.

3.13.3 Dust

If dust deposition is recorded on vegetation in the bushland areas:

1. Investigate the cause.

2. If the dust is the result of construction activities, ensure dust control measures are being implemented and are appropriate.
3. Consider spraying dust covered vegetation with water truck to remove dust (note this should occur no more than monthly during October – April).

3.13.4 Erosion and Sedimentation

In the event that visual erosion or sedimentation occurs in the adjoining bushland:

1. Investigate cause.
2. If the cause is due to construction activities implement appropriate control to reduce or rectify impact which could include:
 - restricting access to areas that are impacted;
 - installing additional fencing in consultation with City of Rockingham; and
 - undertaking rehabilitation of the eroded area.
3. Continue to observe any changes.

3.13.5 Hydrology

In the event that there is erosion in the adjoining bushland caused by surface water flow from off-site the following will be undertaken:

1. Consider potential causes for erosion.
2. Rectify the cause.
3. Determine management and/or contingency actions implemented if the cause is from construction activities.
4. Continue monitoring the area to ensure remedial action is effective.

3.14 Implementation

The Trustee for Hamersley Sub Trust has overall responsibility to implement the Flora and Fauna Management Plan. The FMP will be considered to be fully implemented at the completion of construction once all management actions are undertaken and, if required, any remedial actions have been completed.

Completion of construction is deemed to be once all earthworks, internal roads, drainage features and landscaping has been installed to the City of Rockingham's satisfaction.

3.15 Risk Assessment

A risk assessment of the potential impacts to black cockatoos discussed above has been undertaken, based on the definitions in Table 3 and the risk matrix provided in Table 4. The risk assessment has calculated the residual risk of the proposed impacts when implementation of the proposed mitigation measures is considered. The results of the risk assessment are provided in Table 5.

Table 3: Risk Assessment Definitions

Qualitative measure of likelihood (how likely is it that this event/circumstance will occur after management activities are implemented)	
Highly likely (E)	Is expected to occur in most circumstances
Likely (D)	Will probably occur during the life of the project
Possible (C)	Might occur during the life of the project
Unlikely (B)	Could occur but considered unlikely or doubtful
Rare (A)	May occur in exceptional circumstances
Qualitative measure of consequences (what will be the consequence/result if the issue does occur)	
Minor (1)	Minor incident of environmental damage that can be reversed (<i>e.g. short-term delays to achieving plan objectives, implementing low- cost, well-characterised corrective actions</i>)
Moderate (2)	Isolated but substantial instances of environmental damage that could be reversed with intensive efforts (<i>e.g. short term delays to achieving plan objectives, implementing well- characterised, high-cost/effort corrective actions</i>)
High (3)	Substantial instances of environmental damage that could be reversed with intensive efforts (<i>e.g. medium-long term delays to achieving objectives, implementing uncertain, high-cost/effort corrective actions</i>)
Major (4)	Major loss of environmental amenity and real danger of continuing (<i>e.g. plan objectives are unlikely to be achieved, with significant legislative, technical, ecological and/or administrative barriers to attainment that have no evidenced mitigation strategies</i>)
Critical (5)	Severe widespread loss of environmental amenity and irrecoverable environmental damage (<i>e.g. plan objectives are unable to be achieved, with no evidenced mitigation strategies</i>)

Table 4: Risk Assessment Matrix

	Likelihood					
		Rare (A)	Unlikely (B)	Possible (C)	Likely (D)	Highly likely (E)
Consequence	Minor (1)	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
	Moderate (2)	Acceptable	Acceptable	Acceptable	Moderate	Moderate
	High (3)	Acceptable	Moderate	Moderate	High	High
	Major (4)	Moderate	Moderate	Moderate	High	Extreme
	Critical (5)	Moderate	High	High	Extreme	Extreme

Inherent risk to the MNES assumes all controls are not implemented in accordance with best practice. The residual risk is determined with the development and implementation of the VFMP that has been specifically developed to mitigate the offsite impacts on MNES. As the impacts are to the Tuart Woodland TEC vegetation as well as vegetation that provides Black Cockatoos Habitat the risks are

considered for both MNES, except the risks pertaining specifically to Black Cockatoos. The risk analysis is provided in Table 5. All risks have been managed and are Acceptable.

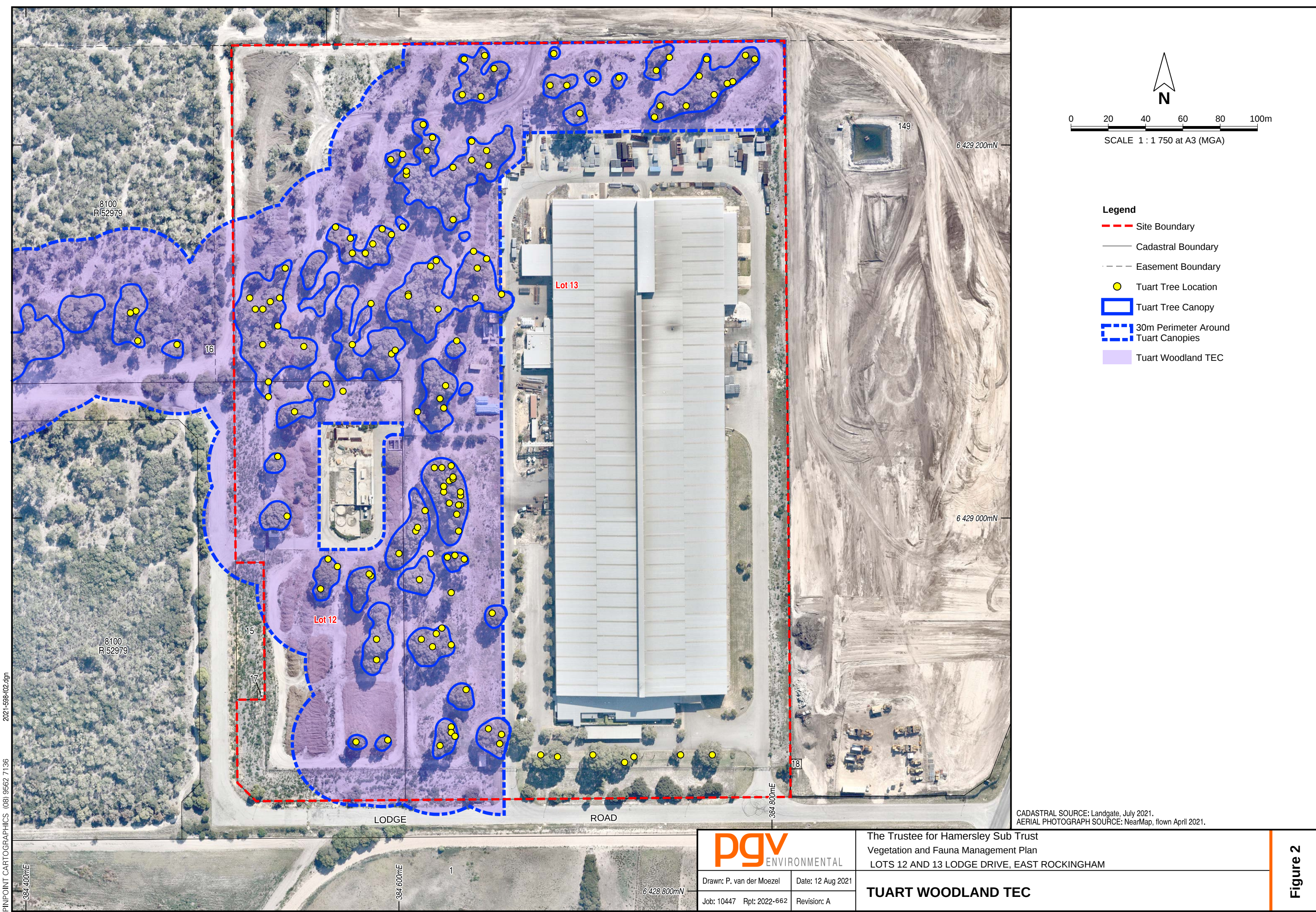
Table 5: Risk Analysis

Potential Impact	Inherent Risk			Controls	Residual Risk		
	Likelihood	Consequence	Significance		Likelihood	Consequence	Significance
Inadvertent clearing during the DA works	B	3		Delineation of works on all plans and on ground and induction procedures to ensure all personnel are aware of areas that cannot be disturbed	A	3	Acceptable
Direct impacts of the future development on clearing or damaging native vegetation on the adjacent area	B	3		Access and vegetation clearing demarcation as well as onsite inductions as per the VFMP	A	3	Acceptable
Damage to the root zones on vegetation in the adjacent area unlikely due to the currently cleared track providing separation	A	3		No management required	A	3	Acceptable
The spread of weeds from the development site into the adjacent area	B	3		Access control, dust fencing, regular monitoring and control if required as per the Flora and VFMP	A	2	Acceptable
The spread of invasive species from landscaping	B	1		Landscaping list limited to species as listed in Groom (2011)	A	1	Acceptable
The spread of dieback from the development site into the adjacent area	C	3		Hygiene procedures as per VFMP	B	3	Acceptable
Temporary impact of dust during construction	D	2		Dust control methods as per VFMP	B	2	Acceptable
Rubbish blowing off the development site into the adjacent area	D	1		Adopting clean work practices as per the VFMP	B	1	Acceptable

4 REFERENCES

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- Tuart Response Group (2002) An Atlas of Tuart Woodlands on the Swan Coastal Plain in Western Australia Perth, Western Australia
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- Valentine, L.E. and Stock, W. (2008) Food Resources of Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) In The Gnangara Sustainability Strategy Study Area. Report for the Gnangara Sustainability Strategy. Government of Western Australia, Perth.
- WAPC Western Australian Planning Commission (WAPC) (2015). State Planning Policy 3.7 - Planning in Bushfire Prone Areas.

FIGURES



APPENDIX 1

APPENDIX 2