Great Northern Highway
Muchea to Wubin Upgrade - Stage 2

MAIN ROADS WESTERN AUSTRALIA

Muchea North Construction Environmental Management Plan

Document Number:	GNH-CN03-EN01-RPT-0015
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Document Control

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Current Issue

Revision	Date
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Prepared by	Reviewed by	Reviewed by	Approved by
Document Owner	Contract Lead	Internal Technical Reviewer	Project Director
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Issue summary

Revision	Date	Issue description	Distribution
1	22/05/2018	Draft	Cross Discipline Review / Technical Review / PAG Review
2	29/05/2018	Final	For submission to DoEE
3	25/08/2018	Final	Revised to incorporate DoEE Comment
4	11/10/2018	Final	Revised management measure

Declaration of Accuracy

I declare that:

1. To the best of my knowledge, all the information contained in, or accompanying this Construction Environmental Management Plan (Revision 2) for EPBC 2016/7656 is complete, current and correct.
2. I am duly authorised to sign this declaration on behalf of the approval holder.
3. I am aware that:
    a. Section 490 of the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) makes it an offence for an approval holder to provide information in response to an approval condition where the person is reckless as to whether the information is false or misleading.
    b. Section 491 of the EPBC Act makes it an offence for a person to provide information or documents to specified persons who are known by the person to be performing a duty or carrying out a function under the EPBC Act or the Environment Protection and Biodiversity Conservation Regulations 2000 (Cth) where the person knows the information or document is false or misleading.
    c. The above offences are punishable on conviction by imprisonment, a fine or both.

Signed

Norm Fox

Full Name (please print)

Norm Fox

Organisation (please print)

Main Roads Western Australia

Date 25/10/18

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Glossary

Abbreviation/Term	Definition
Approval Boundary	Project area as approved under EPBC 2016-7656
BAM Act	*Biosecurity and Agriculture Management Act 2007*
CERR	Construction Environmental Risk Register
CEMP	Construction Environmental Management Plan
CoE	Clean on Entry and/or Exit
Construction Site Boundary	Project area in which the construction contractor is authorised to operate
Clearing event	In this CEMP clearing event means clearing of any Black Cockatoo habitat as one continuous activity with no break in clearing activities exceeding 48 consecutive hours.
DAFWA	Department of Agriculture and Food WA
Declared Plants	Plants contained on the Declared Plant Control Table maintained by the Department of Primary Industries and Regional Development.
DoEE	Department of the Environment and Energy
DPaW	Department of Parks and Wildlife
Environmental weeds	Weeds listed on the Roadside Environmental Weeds List maintained by the Department of Biodiversity, Conservation and Attraction and endorsed by the Minister for Environment.
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
Eucalypt Woodlands TEC	*Eucalypt Woodlands of the Western Australian Wheatbelt* threatened ecological community
GNH	Great Northern Highway
ha	Hectare
km	Kilometre
m	Metre
Main Roads	Main Roads Western Australia
MNES	Matters of National Environmental Significance
SLK	Straight Line Kilometre
Suitably Qualified Person	A person who has professional qualifications and at least three years of relevant work experience surveying for the Carnaby's Black Cockatoo and who can give authoritative assessment, advice and analysis on performance relative to the subject matter using relevant protocols, standards, methods or literature. If the person does not have appropriate professional qualifications, the person must have at least five years of work experience related to the subject matter and can give an authoritative assessment, advice and analysis on performance relative to the subject matter using relevant protocols, standards, methods or literature.
TEC	Threatened Ecological Communities
WA	Western Australia
WoNS	Weeds of National Significance

1. Introduction

On 2 March 2016, Main Roads Western Australia (Main Roads) referred the Great Northern Highway: Muchea North proposal to the Department of Environment and Energy (DoEE) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (EPBC Reference 2016/7656). The referral was determined to be a Controlled Action with the controlling provision being "listed threatened species and communities", namely the endangered Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*).

1.1 Purpose and Scope of this Construction Environmental Management Plan

This Construction Environmental Management Plan (CEMP) has been prepared to support the Commonwealth assessment of EPBC 2016/7656 and to meet the requirements of Condition 8 of the actual conditions of approval (dated 10 August 2018). The CEMP has been developed in accordance with the DoEE's *Environmental Management Plan Guidelines* (DoEE, 2014).

The purpose of this CEMP is to outline the actions required to mitigate and manage impacts from construction activities to the Carnaby's Black Cockatoo and their habitat, as described in *Muchea North – Straight Link Kilometre (SLK) 38.6 – 51.4 EPBC 2016/7656 Preliminary Documentation* dated 28 June 2017, and subsequent response to a request for information issued to the DoEE in May – June 2018.

The scope of this CEMP is limited to construction activities with the potential to directly or indirectly impact on the Carnaby's Black Cockatoo as well the revegetation activities required to mitigate impacts to the species. The CEMP will be implemented until the completion criteria listed in Table 5-1 have been met.

1.2 Structure of this Plan

To achieve the purpose of the CEMP the document is structured as follows:

Table 1-1 Structure of the CEMP

Description	Report Section
Identify potential impacts to Carnaby's Black Cockatoo and their habitat as per the potential impacts identified in *Muchea North SLK 38.5 – 51.4 Environment EPBC 2016/7656 Preliminary Documentation* dated 28 June 2017	Section 5 Table 4-1
Assign management measures for managing the risk of impacts occurring	Section 4 Table 5-1
Determine completion criteria for each management measure	Section 5 Table 5-1
Stipulate timing for meeting completion criteria	Section 5 Table 5-1
Identify the monitoring that is required to determine whether completion criteria have been met	Section 5 Table 5-1 and Table 5-2
Identify corrective actions that will be implemented if completion criteria are not being met	Section 5 Table 5-1
Assign responsibility to corrective actions.	Section 5 Table 5-1
Environmental management roles and responsibilities	Section 6.1 Table 6-1
Audit and review	Section 6.2
Managing uncertainty	Section 5.3

Primary Strategies to Manage Key Risks

This CEMP has been prepared in accordance with the Department's Environmental Management Plan Guidelines and includes but is not limited to the requirements of Condition 8. The below Table 1-2 details the conditions and provides a short summary of how the CEMP addresses each condition, a cross-reference to the relevant section within the CEMP has also been provided.

Condition 8, as defined by the Department of the Environment and Energy. States that "*to mitigate impacts to the Carnaby's Black Cockatoo, the approval holder must prepare and submit a Construction Environmental Management Plan (CEMP) for the approval of the Minister. The approval holder must not commence the action unless the Minister has approved the CEMP. The approved CEMP must be implemented*".

Table 1-2 EPBC 2016-7656 Condition 8

Requirements of Condition 8		Summary	Cross-Reference
Condition 8a	design principles and practices to minimise **clearing** of **Carnaby's Black Cockatoo habitat** – for example, road micro-alignment, traffic management alternatives to side roads.	CEMP sets out the design principles and practices which have been implemented in order to mitigate impacts to Carnaby's Black Cockatoo	**Section 3 and Section 5 (table 5-1)**
Condition 8b	Measures to prevent impacts to **Carnaby's Black Cockatoo habitat** during construction, including to: (i) prevent and/or control site access, weeds, *Phytophthora* dieback, erosion, dust and fire (ii) delineate vegetation to be retained through, for example, the erection of temporary fencing or signage to avoid accidental **clearing** or disturbance outside of the impact area.	Weed and disease hygiene to prevent introduction/spread of weeds and dieback status of vegetation at discharge points and to prevent scouring /erosion; dust control measures and protocols for hot works and other equipment that has the potential to ignite. No-go areas identified and flagged/fenced for trees and vegetation to be retained.	**Section 5**
Condition 8c	management measures, including in relation to fencing and access controls, to permanently restrict access to adjacent road reserves.	During construction the construction site is controlled by the Main Roads Superintendent to ensure no unauthorised access by humans. Also during construction, fences between private property and the road reserve are removed to allow for construction. Fence removal does not commence until stock have been moved from the paddocks where fences are removed.	**Section 5**

Requirements of Condition 8		Summary	Cross-Reference
		At the end of construction, the interface between the road reserve and private land is fully fenced. Maintenance of the fencing is the landowner's responsibility. At the end of construction human access to the road reserve will be unrestricted.	
Condition 8d	objectives, targets and completion criteria for post construction rehabilitation measures such as site clean-up and weed management, including information on the mapping, monitoring and removal of noxious weeds.	Objectives, targets and completion criteria for revegetation are provided in Section 5	**Section 5**
Condition 8e	objectives and targets for landscaping and revegetation works required by Condition 7, including details on site preparation works, seedling planting programs, success rates, ongoing management post establishment and details of replanting requirements if success rates are not achieved.	Objectives, targets and completion criteria for revegetation are provided in Section 5	**Section 5**
Condition 8f	clear objectives and performance indicators for all management actions, mitigation measures and practices prescribed by the CEMP including details of the monitoring to be undertaken to demonstrate the effectiveness of the measures.	Management actions have clear objectives and measurable performance indicators. The CEMP includes a monitoring program to evaluate the effectiveness of these measures to achieve the objectives and performance indicators.	**Section 5 (Table 5-1)**
Condition 8g	corrective actions for circumstances where an action, mitigation measure or practice prescribed by the CEMP fails to meet, or is unlikely to meet, its prescribed objective, and trigger action points at which these corrective actions will be implemented.	Feasible corrective actions have been provided as part of the risk assessment. The triggers for investigations to occur or corrective actions to be implemented are identified in Section 5.	**Section 5 and Section 6**
Condition 8h	timeframes for implementing the above measures.	The implementation times frames are provided in Section 5	**Section 5**

2. Project Description

2.1 Proposed Works

Main Roads proposes to upgrade and improve a section of Great Northern Highway (GNH) referred to as Muchea North (the proposed works). The proposed works are located approximately 63 kilometre (km) north east of Perth between SLK 38.6 and SLK 51.4.

GNH at Muchea North is a single carriageway alignment that commences at the northern extent of the Perth–Darwin National Highway (Swan Valley Section) and extends north of Sugar Gum Drive and Blue Plains Road before tying into the existing highway near the Chittering Roadhouse. There are a number of issues with the current Muchea North alignment including tight bends and sharp crests, rough surfaces and unsafe roadside areas with trees close to the seal edge. Due to the age and condition of the current GNH, and to minimise the environmental impact of the upgrade, the proposed works will largely involve the construction of a new road adjacent to the existing road (referred to as 'offline construction'). The alignment for the proposed works is predominantly to the east of the existing GNH, with a small section between (approximately) SLK 48.2 and SLK 50.4 constructed to the west.

The proposed works include:

- Construction and Road Works
  - Construction of approximately 11 km of new carriageway;
  - Wide centreline treatment (WCLT);
  - Upgrade and installation of new culverts on the proposed and existing GNH;
  - Installation of new signage and pavement markings where required; and
  - Clearing of vegetation and installation of safety barriers and audio tactile line markings where required.
- Intersection and Access Roads:
  - Realignment of Old Gingin Road to tie into a new access road;
  - Realignment of Reserve Road to maintain connectivity and accommodate direct access to GNH;
  - Realignment of Blue Plains Road, Chittering Road, Hart Drive, Tea Tree Road and Spice Road intersections and removal of Spice Road direct access to GNH;
  - Realignment of Wandena and Maddern Road junctions and the provision of a new access road for properties near Wandena Road;
  - Realignment of Sugar Gum Drive to direct traffic towards an access road;
  - New controlled access opposite Barracca Reserve to service traffic from Sugar Gum Drive and local landowners on the west;
  - Provision of new access roads in a number of locations;
  - Removal of Cobble Road to cater for the curve realignment; and
  - Provision of new intersections to link the existing GNH (retained as a local access road) to the new sections of GNH; and creation of controlled access points for landowners.
- Land and Services:
  - Acquisition and demolition of Tony's Place (former roadhouse, not operational), a local house on the east side of the Highway to the north of the Reserve Road junction and replacement of a residence at Lullfitz Nursery;
  - Accommodation works including driveway construction and fencing;

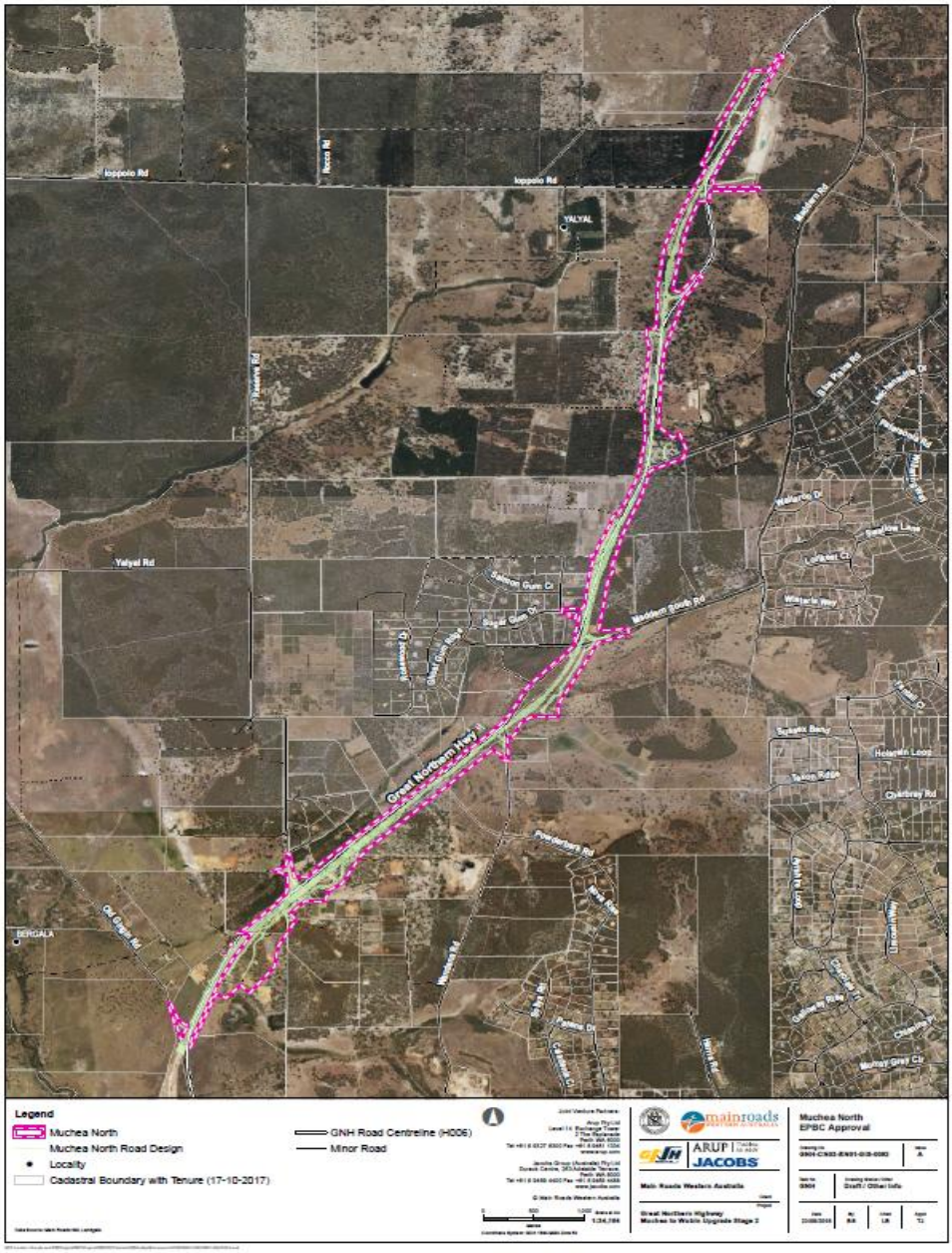
4 Services identification, planning and relocation works; and

4 Land resumption of a recommended 80m width for the road reserve corridor to allow for a future dual carriageway.

An Approval Boundary for the Project has been identified (Figure 2-1). The Approval Boundary encompasses an area of 312 hectares (ha), which larger than required for the construction footprint to provide a degree of flexibility and allow for minor changes in alignment during detailed design. The Level 2 Flora and Fauna Surveys (including Black Cockatoo habitat surveys) undertaken in 2014 and 2015 by Phoenix cover 65% (204 ha) of the Approval Boundary). The majority of the remaining area is either pasture, cleared land or road, or has been surveyed during a previous upgrade planning study.

It is anticipated that the development footprint required for the Project will comprise 89 ha within the Approval Boundary, of which 39.8 ha is native vegetation, 7 ha is re-planted non-native vegetation, and 42.4 ha is pasture/paddock, cleared land or road.

Figure 2-1 – Muchea North Approval Boundary



2.2 Project Schedule

The planned project schedule for the proposed works is currently as follows:

Activity	Current Scheduled Date
Commencement of Construction	Design is complete and the procurement process to select a construction contractor will commence once environmental approvals are obtained. Construction will commence upon appointment of construction contractor.
Construction Completed	18 months from commencement/ receipt of environmental approvals
Commencement of Operations	18 months from commencement/ receipt of environmental approvals

These dates are subject to change depending on a number of factors and will be updated accordingly. Once completed the highway is expected be in operation for at least 30 years.

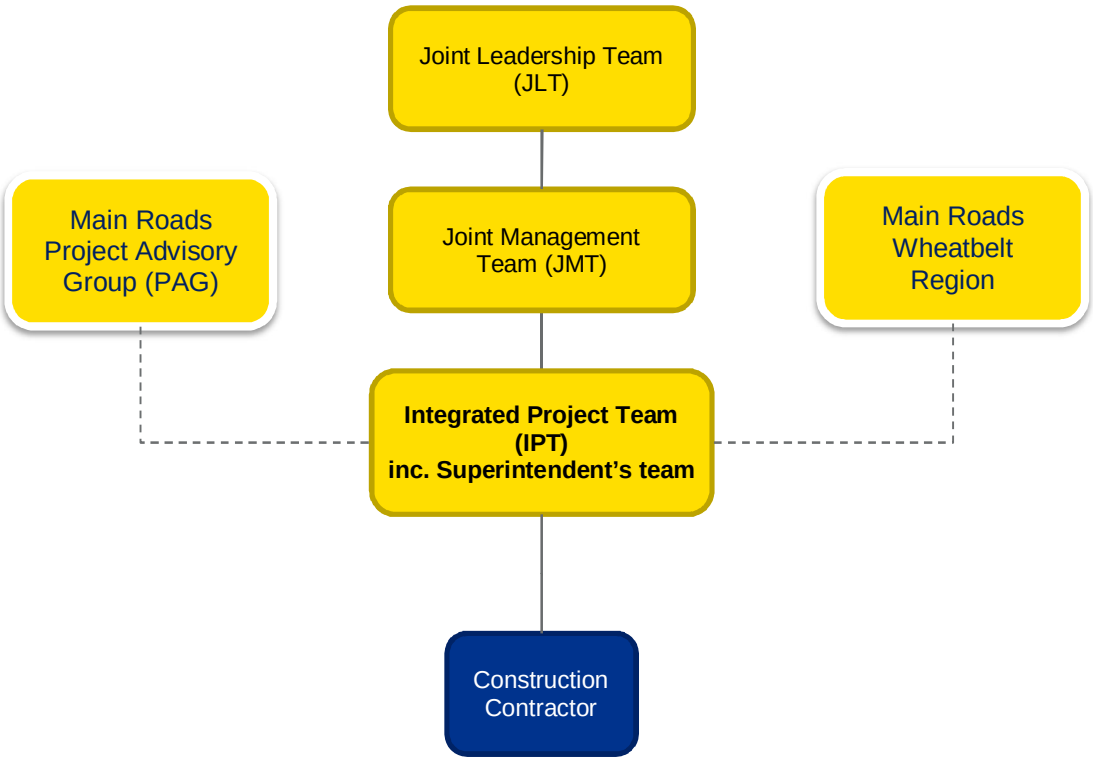
2.3 Project Management Structure

In 2014 Main Roads established the Muchea to Wubin Integrated Project Team (IPT), comprising Main Roads and industry partners Arup and Jacobs (combining to form Arup Jacobs Joint Venture, ASJV). The IPT operates under the supervision of the Joint Management Team (JMT), which includes the Main Roads Project Director, Main Roads Project Manager, ASJV Project Director and the IPT managers for each technical discipline. The GNH program consists of a series of individual contracts that have been tendered on a contruct only basis. The IPT manages the construction supervision, and whilst it is a requirement for individual contractors to report on enviromental issues, it will be the IPT that then collates the individual reports and summarises them for the purpose of reporting against permit/approval conditions. Additional support is provided by the Main Roads Wheat belt Region, who will ultimately be responsible for the ongoing maintenance and upkeep of the road, compliance with conditions of approval and other legal obligations, and ongoing monitoring against completion criteria once construction of the upgrade is complete. The management structure is shown in Figure 2-2.

The IPT has the following high level responsibilities in relation to the Muchea to Wubin Stage 2 Upgrade Project:

- planning review and upgrade strategy;
- environmental permitting and approvals (including supporting assessments and studies);
- stakeholder engagement;
- land acquisition;
- road design from concept to detailed design issued for construction;
- preparation of Request for Tender (RFT) documents and tender specifications;
- procurement of roadworks contractors;
- procurement of other contractors such as service relocations and fencing; and
- construction supervision (Superintendent's team).

Figure 2-2: Project Management Structure



Note: The overall Muchea to Wubin Stage 2 Upgrade Project includes other construction contracts which are not part of this CEMP

2.4 Environmental Setting

The following information is excerpts from the *Muchea North (Old Gingin Road to Chittering Roadhouse) EPBC Act Referral – Supporting Information* dated 18 February 2016 and *Muchea North SLK 38.5 – 51.4 Environment EPBC 2016/7656 Preliminary Documentation* dated 28 June 2017. These excerpts have been included in the CEMP to provide context to the proposed management measures.

2.4.1 Regional Setting

The Muchea North (Old Gingin Road to Chittering Roadhouse) section is located within the Swan Coastal Plain and Northern Jarrah Forest Bioregions as defined by the Interim Biogeographic Regionalisation for Australia (IBRA), version 7 (DoE, 2012). The Swan Coastal Plain bioregion is a low lying coastal plain, mainly covered with woodlands. It is dominated by Banksia and/or Tuart on sandy soils and paperbark in swampy areas.

The region experiences a semi-arid warm Mediterranean climate with warm dry summers and cool wet winters (Phoenix, 2015).

The predominant land use in the locality surrounding the Approval Boundary is mixed agricultural (including horticulture and viticulture) and small private rural and industrial properties. Additional land uses include forestry (both native forests and pine plantations) and nature conservation (Boonanarring Nature Reserve, Chandala Nature Reserve and Barracca Nature Reserve).

2.4.2 Flora and Vegetation

A total of seven flora species listed under the State WC Act or on the Department of Biodiversity, Conservation and Attractions Priority Flora list were recorded (Table 2-2). (Phoenix, 2015). One Threatened flora species listed under the EPBC Act namely, *Darwinia foetida* was recorded outside the Approval Boundary.

Table 2-2: Conservation significant species

Scientific Name (Common Name)	Conservation Category	Location (nearest SLK)	Number of records
Acacia drummondii subsp. *Affinis*	Priority 3	SLK 40.5 SLK 41 SLK 42 SLK 42.5 SLK 49 – SLK 50	10 populations; 99 single plants
Darwinia foetida (Muchea Bell)	Threatened (CE[1]) (*EPBC Act)* Schedule 2 (EN[2]) (*WC Act)*	SLK 37.5 (Outside of Approval Boundary)	Two populations; 17 single plants
Eucalyptus caesia (Caesia)	Priority 4	SLK 43.6	Single Plant
Haemodorum loratum	Priority 3	SLK 50.1	Single Plant
Stylidium squamellosum (Maize Trigger Plant)	Priority 2	SLK 44.6 (Outside of Approval Boundary)	Two populations
Veriticordia lindleyi subsp. *Lindleyi*	Priority 4	SLK 44.7 (Some records outside of Approval Boundary)	Five populations; 133 single plants
Verticordia serrata var. *linearis*	Priority 3	SLK 44.7	Two populations

1. *CE= Critically Endangered*
2. *EN=Endangered*

Vegetation mapping in the Approval Boundary undertaken by Phoenix (2015) defined 18 vegetation associations. An additional vegetation association (code 1000) was identified by GHD (2011) within an area not surveyed in the Phoenix (2015) surveys. Low to medium woodland associations containing combinations of Jarrah, Marri, and Wandoo as dominant overstory species were most prevalent, representing 14 of the 18 vegetation associations mapped for the survey area (Phoenix, 2015). Areas described as road, cleared (townships, driveways), cleared and planted (non-native species) and pasture accounted for the majority of the area surveyed, and account for approximately 53.5% of the Approval Boundary.

The condition of vegetation in the Approval Boundary for the proposed action ranged from completely degraded to pristine. A large proportion (53.5%/approximately 167 ha) of the Approval Boundary passes through cleared areas classed as completely degraded (paddocks, roads and other infrastructure) and revegetated non-native woodlands, which provide little value to fauna in terms of habitat or as ecological corridors. Of the total area bounded by the Approval Boundary, 1.8% (5.77 hectares (ha)) has been recorded as being in Pristine condition (vegetation types 946 and 965); 7.3% (22.80 ha) as Excellent; 9.0% (28.0 ha) as Very Good and 6.6% (20.5 ha) as Good. The area of vegetation recorded to be in excellent or pristine condition may be considered locally significant as they represent patches of comparatively high native species diversity in otherwise degraded vegetation (Phoenix, 2015).

The vegetation in the Approval Boundary is also noted to form important regional linkages between the Barracca Nature Reserve and surrounding areas of remnant native vegetation.

None of the vegetation types recorded within the Approval Boundary were considered to represent a Threatened Ecological Community (TEC) or Priority Ecological Community (PEC) at the time of referral.

2.4.3 Weeds and Disease

Phoenix recorded a total of 51 weed species during the 2015 surveys, of which three species (**Asparagus asparagoides* (Bridal Creeper), **Echium plantagineum* (Patterson's Curse) and **Moraea miniata* (Two-leaf Cape Tulip)) were identified as Declared Plants under the Western Australia (WA) *Biosecurity and Agriculture Management Act 2007* (BAM Act) (Phoenix, 2015). *Asparagus asparagoides* is also a Weed of National Significance (WoNS).

Dieback is known to occur within the proposed action area and includes Infested, Uninfested (Protectable and Unprotectable) and Uninterpretable areas (Terratree, 2016). The mapped extent of these areas are provided in Table 2-2;

Table 2-3: Mapped extent of Dieback within the proposed action area

Dieback Occurrence Category	Area (ha)	% Area
Infested	45.20	9.26
Uninfested (Protectable)	42.06	8.62
Uninfested (Unprotectable)	1.44	0.30
Uninterpretable	8.62	1.76
Excluded	390.70	80.06
Total	**488.02**	**100.0**

Seven positive samples for P. cinnamomi resulted in the identification of seven discrete Dieback infestations within the assessment area. In total 45.2 ha of the assessment area is infested with P. cinnamomi. The Infested diagnosis of some areas is supported by historical positive sample results for P. cinnamomi which were identified during an interrogation of the DIDMS database for the assessment area. Positive sample results were extrapolated along drainage lines and slope gradients to ensure all potentially infested areas are identified and managed accordingly.

The infested areas are comprised of both wetland and upland areas. Potential disease vectors include roads (sealed and unsealed), drainage (watercourses and culverts) and ground disturbing activities such as Basic Raw Materials extraction and land development.

Uninterpretable areas comprise 8.62 ha of the assessment area. These areas generally consist of Wandoo (Eucalyptus wandoo) woodland over Acacia and Trymalium spp., and contain no or very few Disease Indicator Species. Because the disease status of Uninterpretable areas cannot be determined they are managed as Infested and Uninfested concurrently. In practical terms this means that all vehicles and machinery must be 'clean on entry' into, and 'clean on exit' from Uninterpretable areas provided the area in question meets the requirements set out in DPaW's Protocol for identifying Protectable Areas (DPaW, 2015).

Excluded areas, comprise the majority of the assessment area (390.7ha). These areas were comprised of agricultural land, but also included areas of native vegetation in Degraded or Completely Degraded condition. Due to a lack of susceptible species, poor vegetation condition and the presence of numerous disturbance impacts, a determination on disease status is not possible for these areas.

Figures depicting the location of dieback infested areas is included in Appendix B.

2.4.4 Fauna

One endangered fauna species, the Carnaby's Black Cockatoo, was directly recorded within the Approval Boundary on numerous occasions. The Approval Boundary is within the known breeding range for the Carnaby's Black Cockatoo and suitable breeding and foraging habitat occurs within the Approval Boundary.

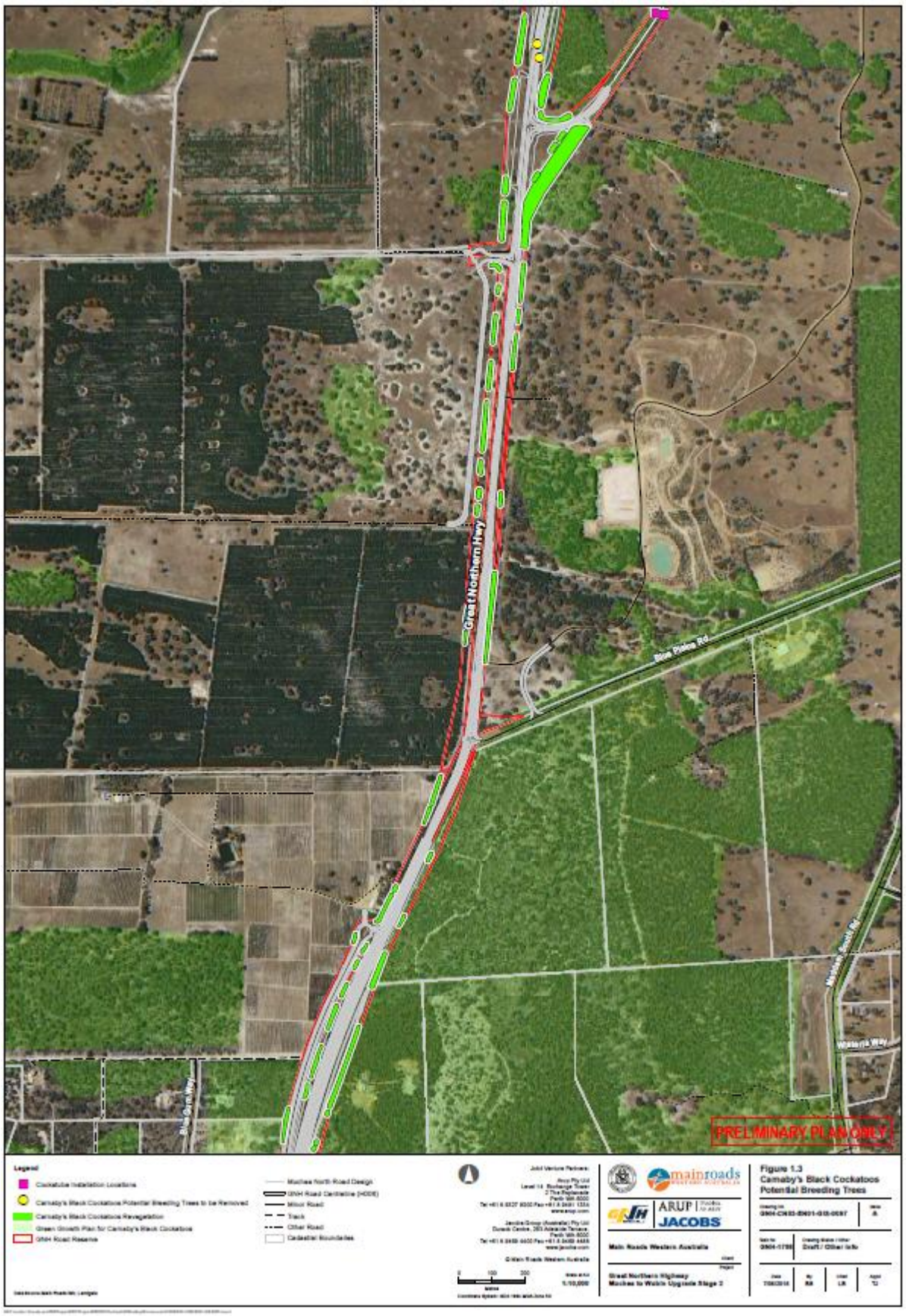
A total of 2,369 potential breeding trees (diameter at breast height greater than 500 mm) for Black Cockatoos were recorded within the Approval Boundary during the 2014 and 2015 surveys. Hollows were confirmed to occur in 99 trees within the Approval Boundary (Phoenix, 2015). Assessment of these trees by Tony Kirkby confirmed 32 to have hollows suitable for use by Carnaby's Black Cockatoo with 22 (known nesting trees) of these showing signs of use by the species. Of these 9 are expected to be impacted, or have the potential to be impacted by the proposal. The trees identified to have hollows with evidence of use by Carnaby's Black Cockatoo were:

1. HT00025 (406598E, 6510735N) – Corymbia calophylla, worn hollow
2. HT04059 (409566E, 6517603N) – Eucal*yptus wandoo*, nestbox with chewing on sacrificial post
3. HT05907 (40489E, 6508969N) – *Eucalyptus marginata*, slightly worn hollow, possible Carnaby's Black Cockatoo hollow but not much chewing at entrance
4. HT06071 (407871E, 6511728N) – *Eucalyptus wandoo*, well-worn hollow in large branch of large habitat tree
5. HT06261 (404998E, 6509195N) – *Eucalyptus wandoo*, good hollow at 10 metre (m) with chewing marks but Galahs present, hollow at 10 m.
6. HT06421 (408325E, 6512584N) – *Corymbia calophylla*, well chewed hollow at 10 m
7. HT08751 (404949E, 6509158N) – *Eucalyptus wandoo*
8. HT08752 (405059E, 6509287N) – *Eucalyptus wandoo*
9. HT08753 (409125E, 6516486N) – *Eucalyptus wandoo*.

The location of these hollows is depicted in Attachment 1, and 2 of 2016-7656 and reproduced in Figure 2.3.

Figure 2-3 - Location of Nesting Hollows


Salmon Gum Cr
Sugar Gum Dr
Great Northern Hwy
Muchea North Rd
Gnarlbine Rd
Powderbark Rd
PRELIMINARY PLAN ONLY
Figure 1.2
Carnaby's Black Cockatoos
Potential Breeding Trees
ARUP
JACOBS
mainroads


Great Northern Hwy
Blue Plains Rd
PRELIMINARY PLAN ONLY
Legend
Cockatube Installation Locations
Carnaby's Black Cockatoos Potential Breeding Trees to be Removed
Carnaby's Black Cockatoos Revegetation
Green Growth Plan for Carnaby's Black Cockatoos
GNH Road Reserve
Muchea North Road Design
GNH Road Centreline (HDD)
Minor Road
Track
Other Road
Cadastral Boundaries
Joint Venture Partners:
ARUP
JACOBS
mainroads
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
Figure 1.3
Carnaby's Black Cockatoos
Potential Breeding Trees


Great Northern Hwy
Iggalo Rd
PRELIMINARY PLAN ONLY
Legend
Cockatoo Habitation Locations
Carnaby's Black Cockatoos Potential Breeding Trees to be Removed
Carnaby's Black Cockatoos Revegetation
Green Growth Plan for Carnaby's Black Cockatoos
GNH Road Reserve
Muchea North Road Design
GNH Road Centreline (HDB)
Minor Road
Track
Other Road
Cadastral Boundaries
Joint Venture Partners:
Arup Pty Ltd
Jacobs Group (Australia) Pty Ltd
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
Figure 1.4
Carnaby's Black Cockatoos
Potential Breeding Trees


Suitable hollow
Hollow with evidence of use
Great Northern Hwy
CDC Trees
To be retained if possible
Cockatoo Trees
Hollow with Evidence of Use
Suitable Hollow
Not Suitable Hollow
No Hollow
Muchea North Road Design
Highway
Major Road
Minor Road
Cadastral Boundaries
ARUP
JACOBS
Muchea North
CDC trees to be retained during construction if possible

Approximately 92.8 ha of suitable Carnaby's Black Cockatoo habitat was mapped within the Approval Boundary by Phoenix (2015). There is an additional 50 ha of vegetation in areas mapped during the previous GHD (2011) survey that include habitat suitable for the Carnaby's Black Cockatoo. Of the habitat mapped by Phoenix in the Approval Boundary, 76 ha was classified as Quality habitat, generally due to presence of important foraging species (e.g. *Corymbia calophylla* and *Banksia* spp.) and foraging residues. This finding was supported by the spatial analysis of foraging habitat with known food species for Carnaby's Black Cockatoo recorded in 23 of the 26 sampled vegetation quadrats (Phoenix, 2015). Evidence (residues) of feeding by the Carnaby's Black Cockatoo was observed in the survey area and was noted to be extensive at some locations, particularly near *Corymbia calophylla* and *Banksia attenuata* (pers. comm. T. Kirkby, November 2015) (Phoenix, 2015).

No evidence of roosting by Carnaby's Black Cockatoo was recorded within the Approval Boundary; however, tree species that Carnaby's Black Cockatoo have potential to roost in were recorded (Phoenix, 2015).

2.5 Impacts to Carnaby's Black Cockatoo

Impacts to the Carnaby's Black Cockatoo associated with the proposal relate to the total extent of clearing required. **Table 2-3** details the maximum clearing required in relation to Carnaby's Black Cockatoo.

Table 2-3 : Impact to – Carnaby's Black Cockatoo

	Maximum Cleared	Mapped*
Known Nesting Trees	6	22
Trees with Suitable Hollows	8	32
Potential Breeding Trees	744	2,369
Foraging Habitat	52.5 ha	228.69 ha

3. Project Design Principles and Practices

The final route selection for the proposed action was determined through numerous design iterations which were refined by design options analysis. During the design options analysis, mitigation measures were implemented to manage the potential direct and indirect impacts of the proposed actions to Carnaby's Black Cockatoos and/or their habitat.

As discussed in the EPBC 2016/7656 referral supporting information document (ASJV, 2016), the ultimate decision was made to construct the proposed action primarily offline and adjacent to the existing alignment with the existing GNH retained as a local service road.

The location of the proposed alignment is constrained by a number of factors including:

- alignment of the existing GNH;
- road geometry requirements;
- impacts to landowners;
- location of environment and heritage sensitivities;
- geotechnical and geological ground conditions;
- road user safety;
- economic concerns such as travel times and freight efficiency; and
- connectivity with the northern end of the Perth Darwin National Highway (Swan Valley Section) and southern end of the Bindoon Bypass.

Realignment of the entire Muchea North section is not feasible given the linkages with the Perth Darwin National Highway (Swan Valley Section) [commonly referred to as "Northlink"] and the Ministerial endorsed Bindoon Bypass corridor. Realignment would also result in a much longer section of road that would increase travel times and reduce efficiency. Longer travel times may also negatively impact on the safety of road users.

Surveys conducted by Phoenix (2015; 2017a) indicate that Reserve 40350 / Lot 500, Great Northern Highway is locally important for Carnaby's Black Cockatoo as it contains an unusually high density of known nesting trees. Following receipt of the survey results, the alignment in this area (SLK 40.2 to SLK 40.9) was reviewed to determine if any changes could be made, such as moving the road to the west. There are a number of constraints which preclude moving the highway to the west, including:

- Reserve 209/ Lot 11141, Great Northern Highway (Barracca Springs Reserve) is adjacent to the western side of the GNH ;
- Rocky Creek is approximately 120 m west of the existing GNH, running parallel to the road;
- the ground conditions are likely to be unsuitable for road construction in the area to the west given the presence of Rocky Creek and stream substrate. Diversion of the creek would be also be required resulting in impact to hydrologic characteristics of surface water flows and groundwater interactions;
- Rocky Creek is a registered ethnographic Aboriginal heritage site;
- the existing GNH is retained as a local access road. Moving the proposed highway to the west would require an additional access road to be constructed to provide access to properties on the west; and

- achieving appropriate and safe road geometry would require greater land acquisition at Lot 5 Reserve Road, potentially impacting the viability of the business at that location.

It was decided that realignment in this area was not feasible for the above reasons. Consideration was given to construction of a single carriageway; however, this was disregarded due to safety concerns and potential traffic conflicts including:

- northbound traffic travelling along the Perth – Darwin National Highway (Swan Valley Section) transitioning from dual carriageway to single carriageway;
- the grade of the highway increasing as the road moves from the flat land of the Swan Coastal Plain to the undulating hills of the northern Darling Scarp; and
- slow moving heavy vehicles (i.e. 53.5 m road trains) entering the highway (from the road train assembly area) at the bottom of the hill, causing delay for light vehicles.

This combination of circumstances presents an increased safety risk (in the form of traffic accidents and collisions) and the dual carriageway design was adopted to reduce this risk.

In order to reduce the disturbance footprint required for the cutting between SLK 45.4 to SLK 46.2, the highway median has been reduced from approximately 15 m to 4.65 m wide median. This has reduced the width of the cut and associated disturbance from approximately 140 m to approximately 115 m, and the amount of clearing required by approximately 2.5 ha. This area contains quality foraging habitat for Carnaby's Black Cockatoo with vegetation generally being in either Very Good or Pristine condition (Phoenix 2015; 2017a).

Other design or engineering controls implemented include steepening of batter slopes to reduce the earthworks footprint, particularly in areas where known nesting trees occur, designing private driveways to avoid clearing of large trees where practicable, and providing property access via areas that have previously been cleared.

4. Risk Assessment

4.1 Threats to Matters of National Environmental Significance

A risk register was prepared as part of the Muchea North Preliminary Environmental Impact Assessment phase.

The risk assessment identified the risk of impacting Matters of National Environmental Significance (MNES), whereby the Carnaby's Black Cockatoo was the only MNES identified as having potential to be impacted by the proposed works. The key potential impacts to this MNES as a result of implementing the project are:

- Loss of quality foraging and breeding habitat
- Loss of suitable and known nesting hollows
- Fragmentation of habitat
- Degradation of adjacent or nearby areas of habitat
- Fauna mortality during construction; and
- Spread of weeds or disease that may degrade Carnaby's Black Cockatoo habitat in the future.

Table 4-1 contains details of the risk assessment relevant to impacts to the Carnaby's Black Cockatoo. Appendix B contains a copy of the assessment framework used for the risk assessment. It is important to note that the project risk register will continue to be a live document and updated if new risks are identified.

Table 4-1 : MNES Risk Assessment (from Construction Environment Risk Register (CERR))

Management Objective / Desired Outcome	Issue (Event or Circumstance)	Cause	Management Measures	Residual Risk		
				Likelihood	Consequence	Risk Rating
To avoid impacts to Carnaby's Black Cockatoo habitat beyond that approved.	Loss of quality habitat	Clearing of more than the approved amount of 52.5 ha of Carnaby's Black Cockatoo habitat or habitat outside the approved area.	· All currently identified known nesting trees and suitable nesting trees within the construction site boundary that are not required to be cleared will be marked and identified as no-go areas, demarcated on relevant drawings and provided to the Construction Contractor Representative · Vegetation to be retained will be clearly marked with flagging on site. · All clearing areas will be marked with flagging and approved by the Main Roads Superintendent prior to clearing commencing. · Additional areas required for construction such as laydown areas, stockpile areas and vehicle turn around, will be located in areas cleared for permanent works or areas that do not contain CBC habitat. Clearing will be avoided for any temporary construction activities.	Unlikely	High	Medium
		Reduced vegetation health or impacts to faunal health due to construction dust emissions.	· Water carts and/or surface stabilization measures (e.g. hydro mulch) will be used to minimise dust generated from cleared areas. · Dust generating activities will be suspended at the direction of the Construction Contractors Environmental Representative if deemed too dusty and will not recommence without approval of same. · Vehicle speeds will be limited to between 40-80km/hr on site for safety purposes and this will consequently reduce dust generated.	Rare	Moderate	Low
		Damage to foraging habitat from accidental fires caused by construction activities.	· All hot work will be undertaken in accordance with Contractor's hot work procedure. This will be reviewed and approved by the Main Roads Superintendent prior to work commencing. · All vehicles, plant and equipment to be fitted with fire extinguishers and restricted to designated cleared areas. · Fire danger ratings and Shire vehicle movement bans to be observed and the requirements of these implemented.	Unlikely	High	Medium
		Damage to foraging habitat from changes to drainage flow.	· Temporary drainage structures within or adjacent to Carnaby's Black Cockatoo habitat will be designed and constructed such that scouring or erosion within adjacent vegetated areas does not occur.	Unlikely	Minor	Low
		Damage to habitat from stock.	· Road reserve will be fenced within 3 months of completion of construction to prevent stock accessing vegetation within the road reserve from adjacent farms. · Prior to removing existing fencing landowners will be notified and given time to relocate stock away from the paddock where the fence will be removed.	Possible	Minor	Low

Management Objective / Desired Outcome	Issue (Event or Circumstance)	Cause	Management Measures	Residual Risk		
				Likelihood	Consequence	Risk Rating
To avoid impacts to Carnaby's Black Cockatoo breeding habitat within the Approval Boundary.	Loss of nesting hollows	Clearing of known nesting trees within the approved clearing boundary	· Within 7 days prior to clearing, trees with hollows used by or suitable for use by the Carnaby's Black Cockatoo will be inspected by a suitably qualified person to confirm that there are no hollows being used by the Carnaby's Black Cockatoo within the area to be cleared · Any tree and vegetation within 10m of the tree identified as being used by the Carnaby's Black Cockatoo for nesting must not be cleared until a suitably qualified person has verified that the tree is no longer in use. · Two trees have been identified on the edge of the anticipated disturbance footprint, HT4749 and HT04059. Whilst these trees are included in the area to be cleared efforts will be made prior to clearing to determine whether they can be retained. Approval from the Main Roads Superintendent is required to clear these trees and approval will only be granted if clearing is the only practicable option. Within 1 month of the completion of clearing, MRWA shall provide the Department with evidence that these hollows have not been cleared, or a detailed assessment of why clearing of these hollows could not be avoided.	Rare	Major	Medium
	Spread of weeds or disease that may degrade Black Cockatoo habitat in the future.	Growth of listed pest plant species in the Approval Boundary during construction Introduction or spread of weeds and disease impacting on vegetation health or condition from plant and machinery Introduction or spread of weeds and disease impacting on vegetation health of condition from unauthorised site access	· Declared Plants within the construction site boundary will be treated according to their Control Codes and advice from Department of Agriculture and Food WA (DAFWA). · WoNS and environmental weeds within the construction site boundary will be treated according to the weed control management outlined by Weeds Australia (http://weeds.ala.org.au/). · All heavy plant and machinery will be inspected by the contractor prior to entry at the work site and be confirmed to be clean and free of vegetation and soil material. · Topsoil from infected or potentially infected Phtophtora dieback area shall be segregated and not used in non-infected areas. · Clean on Entry and/or Exit (CoE) procedures will be implemented on site, and entry and exit records kept for CoE points.	Unlikely	Moderate	Low
To avoid injury or mortality to Carnaby's Black Cockatoos during vegetation clearing and construction.	Fauna mortality during construction	Vehicle interaction with fauna	· Where trees that are known to be Black Cockatoo habitat are retained but are located within 10 m of the edge of the road seal the risk of fauna strike will be assessed to determine if wildlife hazard signage is required. · Speed limits between 40-80km p/hr will be applied throughout the construction site for safety purposes which will consequently reduce the risk of fauna strikes during construction. · A list of local wildlife rescue organisations and carers will be maintained on site to contact in the event of fauna injury. · Revegetation designs do not include foraging or breeding plant species within 10 m of the road.	Possible	Minor	Low

Management Objective / Desired Outcome	Issue (Event or Circumstance)	Cause	Management Measures	Residual Risk		
				Likelihood	Consequence	Risk Rating
To provide ecosystem services and habitat for the Carnaby's Black Cockatoo	Additional Black Cockatoo Habitat ecosystem services not provided following construction.	Revegetation does not occur or seed/seedlings do not sufficiently establish.	· Revegetation of at least 19.69ha of land with species that are known to provide foraging and breeding habitat for the Carnaby's Black Cockatoo shall commence within 1 year of commencement of construction, and within all areas identified for revegetation within one year of the completion of construction. All rubbish and surplus materials are removed from site at the completion of construction · Revegetation plans will identify connected areas of Black Cockatoo habitat outside of the clearing footprint that are identified as degraded or completely degraded for infill planting/seeding to improve their condition · Compacted areas and redundant carriageway will be ripped prior to seeding/planting to provide an area of seed/seedling establishment and improve infiltration · Plant species which are known to provide food sources for Black Cockatoo will not be planted within 10 m of the edge of the road seal. · Revegetation species mixes will be formulated to reflect the surrounding native vegetation and be characteristic of Black Cockatoo foraging and potential breeding habitat. · Revegetation works may cease once a suitably qualified person has verified that revegetation area's meet the completion criteria referenced within EPBC 2016-7676 (definition J), then inspected once every two years, during Spring for at least the next 20 years to ensure the completion criteria are maintained. · Undertaken corrective actions to improve vegetation quality within the revegetated areas, within 3 months of becoming aware that an area of revegetation no longer meets the completion criteria; corrective actions may cease once the completion criteria have again been achieved.	Unlikely	Moderate	Low

5. Environmental Management

5.1 Implementation

Table 5-1 details the management measures to be put in place to achieve the outcomes identified in the risk assessment. Table 5-1 shows each management measure identified in the risk assessment, the implementation timing of these, their completion criteria and the monitoring record to show when each completion criteria is met.

Table 5-1: Environmental Management Implementation Schedule

Management Objective	Management Measure	Performance Target/Completion Criteria	Timing	Monitoring/Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
Loss of quality habitat							
To avoid impacts to Carnaby's Black Cockatoo habitat beyond that approved	All currently identified known nesting trees and suitable nesting trees within the construction site boundary that are not required to be cleared will be marked with flagging and identified as no-go areas, demarcated on relevant drawings and provided to the Construction Contractor Representative	Drawings showing environmental no-go areas provided to the Construction Contractor Representative	Contract award and prior to commencement of clearing.	Record of provision of drawings showing environmental no-go areas	Clearing more than 52.5ha of Carnaby's Black Cockatoo habitat, or more than six of the hollows identified as 'hollow with evidence of use' and more than eight of the hollows identified as 'suitable hollows' habitat outside of approved clearing areas	Incorrectly cleared areas must be included in the Landscape and Revegetation Plan for the project within 6 months of completion of clearing for revegetation with Black Cockatoo foraging habitat species Clearing in the direct vicinity will cease immediately if trigger is met. Clearing will not recommence until no-go areas have been reviewed and confirmed to be in place correctly, and Main Roads Superintendent provides approval to recommence.	Construction Contractor Environmental Management Representative Main Roads Superintendent
		All environmental no-go areas clearly marked with flagging on site	Prior to commencement of clearing	Pre clearing inspection for hollows that are being utilised, or are capable of being utilised signed off my Main Roads Superintendent. Incident reports Monthly site inspections Site inspection by Construction Contractor Environmental Management Representative prior to and following clearing to confirm no-go areas are appropriately flagged / fenced, and that clearing remains within limits			
	Vegetation to be retained will be marked with flagging on site	All vegetation to be retained will be marked with flagging on site					
	All clearing areas will be clearly marked with flagging and approved by the Main Roads Superintendent prior to clearing commencing so that there is no clearing of Carnaby's Black Cockatoo habitat outside of the approval boundary.	All areas to be cleared will be marked with flagging on site					
	Additional areas required for construction such as laydown areas, stockpile areas and vehicle turn around, will be located in areas cleared for permanent works or areas that do not contain Carnaby's Black Cockatoo habitat. Clearing will be avoided for any temporary construction activities.	Areas for ancillary services located in cleared areas or areas that do not contain Carnaby's Black Cockatoo habitat.	During construction	Construction site plan and photos showing all ancillary areas not located on land containing Carnaby's Black Cockatoo habitat Monthly site inspections	Areas required for construction such as laydown areas etc are proposed to be located within areas of native vegetation	Main Roads Superintendent is required to provide approval for clearing of native vegetation for construction laydown etc. and approval must only be given if there are no other practicable options. Incorrectly cleared areas must be included in the	Main Roads Superintendent

Management Objective	Management Measure	Performance Target/Completion Criteria	Timing	Monitoring/Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
						Landscape and Revegetation Plan within six months of completion of clearing for revegetation with Black Cockatoo foraging habitat species	
	Dust suppression (e.g. water carts) and/or surface stabilization measures (e.g. hydromulch) will be used to protect loose surfaces or cleared areas.	No dust complaints from community or other stakeholders. No visual dust plumes generated by construction activities.	During construction	Visual dust observations by all project personnel	Reports of visible dust plumes by project personnel. Complaints from community or other stakeholders	Increased application rate/frequency for dust suppression methods (e.g water carts) will be implemented effective immediately of trigger being realized	Construction Contractor Environmental Management Representative
	Dust generating activities will be suspended at the direction of the Construction Contractors Environmental Representative if deemed too dusty and will not recommence without approval of same.			Monthly site inspections			
	Reduced speed limitsto between 40-80km/hr km/hr will be enforced within the construction site boundary	No incidents of speeding within the construction site boundary	During construction	Incident reports Adherence to speed limit enforced on site	Reported exceedance of site speed limits	Refresher training will be conducted within 1 week Instances of speeding are identified and offenders will be asked to immediately reduce speed Repeat offenders (ie. Caught speeding more than 2 times) will undergo further refresher training.	Construction Contractor Environmental Management Representative
	All hot work will be undertaken in accordance with Contractor's hot works procedure. This will be reviewed and approved by the Main Roads Superintendent prior to hot work commencing.	No fires started as a result of hot works	During hot works such as welding	Monthly site inspections to confirm required controls are in place	Hot work procedures not correctly implemented/followed	Incident investigation shall be initiated within 1 day and a report completed within 1 week Impacted areas included in the Landscape and Revegetation Plan for the project and marked with flagging for revegetation with Black Cockatoo foraging habitat species	Construction Contractor Environmental Management Representative
		No impact on Black Cockatoo as a result of fires originating from work areas		Training records for project personnel involved in hot works	Ignition/ fire started as a result of hot works		

Management Objective	Management Measure	Performance Target/Completion Criteria	Timing	Monitoring/Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
						Refresher training will be conducted within 2 weeks	
	All vehicles, plant and equipment to be fitted with fire extinguishers and restricted to designated cleared areas.	No fires started as a result of exhaust from vehicles, plant and equipment	All activities	Incident reports related to fires	Fire originating from work area(s)	Incident investigation and report undertaken as soon as practicable Impacted areas included in the Landscape and Revegetation Plan for the project and marked for revegetation with Black Cockatoo foraging habitat species Refresher training will be conducted within 2 weeks	Construction Contractor Environmental Management Representative
	Temporary drainage structures adjacent to or within Black Cockatoo habitat areas to be retained or no-go areas will be designed and constructed such that scouring or erosion within adjacent vegetated areas does not occur. Surface stabilization measures (e.g. hydromulch) will be used to protect loose surfaces or cleared areas.	No evidence of erosion from construction activities within no-go areas or Black Cockatoo habitat to be retained.	Prior to and during construction	Monthly site inspections.	Erosion identified in Black Cockatoo habitat	Review drainage to identify whether there are any failure points, and repair/address any failure points identified within 2 weeks	Construction Contractor Environmental Management Representative
	Where paddocks adjacent to the road reserve are used for stock grazing the boundary between the road reserve and paddock will be fenced following completion of construction.	All private property will be fenced along the road reserve	At completion of construction	Contract completion inspection	Stock reported in the road reserve	Inspect fencing prior to opening the road for operation to confirm fencing installation is complete. If fencing is incomplete the road will not be open for operation/use until the fencing has been completed. If fencing is damaged the landowner will be notified immediately	Construction Contractor Representative

Management Objective	Management Measure	Performance Target/Completion Criteria	Timing	Monitoring/Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
						so that they can complete repairs	
	Prior to removing existing fencing landowners will be notified and given time to relocate stock away from the paddock where the fence will be removed.	All private property owners will be notified before fences are removed for construction purposes.	Prior to fence removal	Communication records	Stock is found to still be in paddocks before fence is removed or stock is reported in the road reserve	Landowners notified immediately and stock removed from road reserve.	Construction Contractor Environmental Management Representative
		Paddocks are confirmed as being free of stock prior to fence removal		Monthly inspection			
Loss of nesting hollows							
To avoid impacts to Black Cockatoo breeding habitat within the approved boundary	Prior to clearing events, trees with hollows used by or suitable for use by Black Cockatoo will be inspected by a suitably qualified person to confirm that there are no hollows being used by Black Cockatoo within the area to be cleared	Survey of trees with hollows used by or suitable for use by Black Cockatoo undertaken within 7 days prior to clearing events	Within 7 days prior to clearing events	Survey for hollows that are being used, or are capable of being used, by Black Cockatoos Maintain a register of nesting trees	Clearing event undertaken without pre-clearing survey	Contractor to provide evidence that a suitably qualified person is engaged to conduct surveys prior to subsequent clearing events	Construction Contractor Environmental Management Representative
						Contractor to provide evidence that surveys are scheduled within 7 days prior to subsequent clearing events	
					Survey undertaken more than 7 days prior to clearing	Unanticipated clearing event delays will be risk assessed against survey findings. Clearing in the direct vicinity will cease immediately if trigger is met. Clearing will not recommence until no-go areas have been reviewed and confirmed to be in place correctly, and Main Roads Superintendent provides approval to recommence.	
	Any tree identified as being used by Black Cockatoo for nesting, and vegetation within a 10m radius from the tree, must not be cleared until a suitably qualified person has verified that the tree is no longer in use	No clearing of trees used by Black Cockatoo All trees currently being used by Carnaby's Black Cockatoos are marked with flagging as no-go areas with flagging with a 10 m exclusion zone All hollows being utilised by the species are detected during surveys No CBC mortality or injury during clearing	Black Cockatoo breeding season and following survey of area to be cleared	Surveys undertaken by suitably qualified person to confirm hollow is no longer being used by Black Cockatoo	Clearing of a tree with a hollow currently used by Black Cockatoo Suitably qualified person has not confirmed the tree is no longer being utilised by Carnaby's Black	Immediate inspection of felled tree (eg with hollow currently in use) to determine survivability of Carnaby's Black Cockatoo (if present).	Construction Contractor Environment Management Representative Main Roads Superintendent

Management Objective	Management Measure	Performance Target/Completion Criteria	Timing	Monitoring/Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
				Maintain a register of nesting trees	Cockatoo before it is cleared	A list of local wildlife rescue organisations and carers will be maintained on site. This will allow efficient identification of an appropriate destination to which to transfer injured cockatoo. Incorrectly cleared areas must be included in the Landscape and Revegetation Plan for the project and marked for revegetation with Black Cockatoo foraging habitat species Clearing activities are immediately ceased in the vicinity of the unmarked trees and relevant trees are correctly flagged before clearing activities recommence. If a tree currently utilised by the species is felled, clearing in the direct vicinity will cease immediately if trigger is met. Clearing will not recommence until no-go areas have been reviewed and confirmed to be in place correctly, and Main Roads Superintendent provides approval to recommence.	
	Employ a suitably qualified person to investigate all potential nesting trees within the area to be cleared to determine if there are any additional hollows (to those identified as no-go areas) that are being utilised, or are	Surveys of potential nesting trees undertaken within 7 days prior to clearing All potential nesting trees are identified Three artificial nesting hollows are installed for each known nesting hollow and suitable nesting hollow cleared.	Within 7 days prior to clearing	Pre-clearing surveys for hollows that are being utilised, or are capable of being utilised, by Carnaby's Black Cockatoos Maintain a register of nesting trees and record the location	Clearing undertaken without preclearing survey Survey undertaken more than 7 days prior to clearing	Clearing in the direct vicinity will cease immediately if trigger is met and a suitably qualified person will be engaged to survey the remaining areas to be cleared. Clearing	Main Roads Superintendent Construction Contractor

Management Objective	Management Measure	Performance Target/Completion Criteria	Timing	Monitoring/Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
	capable of being utilised, by Carnaby's Black Cockatoos for nesting. Install at least three artificial hollows for each known nesting hollow and suitable nesting hollow cleared. Must not exceed four additional hollows identified in figure 2.3.			of any known nesting hollow or suitable nesting hollow, identified during the investigations, that are additional to the nesting hollows identified as no-go areas. Records of installed nesting hollows	More than 4 additional nesting hollows are cleared	will not recommence until survey has been undertaken. Contractor to provide evidence that a suitably qualified person is engaged for the next clearing events and that they are scheduled to conduct surveys within 7 days of all future clearing events. Unanticipated clearing delays will be risk assessed against survey findings within 5 days	Environmental Management Representative
	Two trees have been identified on the edge of the anticipated disturbance footprint, HT4749 and HT04059 (figure 2-6). Whilst these trees are included in the area to be cleared efforts will be made prior to clearing to determine whether they can be retained. Approval from the Main Roads Superintendent is required to clear these trees and approval will only be granted if clearing is the only practicable option.	Trees HT4749 and HT04059 are only cleared if there are no other safe or practicable engineering solutions.	During construction.	Approval obtained from Main Roads Superintendent prior to clearing HT4749 and HT04059	Trees HT4749 and HT04059 are cleared without approval from Main Roads Superintendent	Construction Contractor to provide justification for clearing of these trees. Within one month of the completion of clearing, the approval holder must provide the Department with evidence that these hollows have not been cleared or a detailed assessment of why clearing of these hollows could not be avoided.	Construction Contractor Environment Management Representative
Spread of weeds or disease that may degrade Black Cockatoo habitat							
To avoid impacts to Black Cockatoo habitat within and outside the approval boundary.	Declared Plants within the construction site boundary will be treated according to their Control Codes and advice from DAFWA.	No new occurrence or spread of Declared Plants within the construction site boundary during construction activities	All construction activities	Monthly site inspections Annual revegetation monitoring	New occurrence or spread of a Declared Plant identified	Application of weed eradication techniques for the weed species Review of CoE process	Construction Contractor Environmental Management Representative
	WoNS and environmental weeds within the construction site boundary will be treated according to the weed control management outlined by Weeds Australia (http://weeds.ala.org.au/)	No new occurrence or spread of WoNS or environmental weeds within the construction site boundary	All construction activities	Monthly site inspections Annual revegetation monitoring	New occurrence or spread of a WoNS or environmental weed identified	Application of weed eradication techniques for the weed species until completion criteria of weed cover at less than 30% is met. Review of CoE process and	Construction Contractor Environmental Management Representative

Management Objective	Management Measure	Performance Target/Completion Criteria	Timing	Monitoring/Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
						implement corrective actions and or refresher training	
	All plant and machinery will be inspected by the contractor prior to entry at the work site and be confirmed to be clean and free of vegetation and soil material	All plant and machinery will be verified clean on arrival at site	All construction activities	Records verifying plant and machinery arriving on site is clean	Plant and machinery arriving on site without verification that it is clean of soil and vegetative matter	Refresher training will be conducted	Construction Contractor Environmental Management Representative
	CoE procedures will be implemented on site	No breach of CoE protocols	For the duration of the approval	Entry and/or exit records for CoE points Monthly site inspections	Breach of CoE protocol	Refresher training will be conducted within 2 weeks	Construction Contractor Environmental Management Representative
Vehicle interaction with fauna							
To avoid injury or mortality of Black Cockatoo during vegetation clearing and construction	Where trees that are known to be Black Cockatoo habitat are retained but are located within 10 m of the edge of the road seal the risk of fauna strike will be assessed to determine if wildlife hazard signage is required	Black Cockatoo habitat retained within 10 m of the edge of the seal of the road will be risk assessed and wildlife hazard signage installed as required.	During construction	Risk assessment	Black Cockatoo habitat is retained within 10m of the edge of the road seal and is not risk assessed to determine whether wildlife hazard signage is required.	Risk assess retained Black Cockatoo habitat within 10 m of the edge of the road seal and install wildlife hazard signage if required.	Construction Contractor Environment Management Representative
	Speed limitsbetween 40-80km/hr will be applied throughout the construction site for safety purposes which will consequently reduce the risk of fauna strikes during construction	No incidents of speeding within the construction site boundary	During construction	Visual monitoring by all construction personnel.	Exceedance of site speed limits are observed.	Offenders will be asked to immediately reduce speed. Refresher training will be conducted within 1 week	Construction Contractor Environmental Management Representative.
	A list of local wildlife rescue organisations and carers will be maintained on site to contact immediately in the event of fauna injury	A list of local wildlife rescue organisations and carers is on site at all times.	During construction	Monthly inspection	A list of local wildlife rescue organizations and carers is not on site. Wildlife rescue specialists not contacted immediately on discovery of an injured Carnaby's Black Cockatoo	A list of local wildlife rescue organizations and carers is obtained by site immediately. Refresher training will be conducted within 1 week	Construction Contractor Environmental Management Representative.
Revegetation							
To revegetate at least 19.69 hectares of land with Carnaby's Black Cockatoo habitat	Revegetation works will commence within 1 year after commencement of construction and within the all the area's identified for revegetation in Attachment 3 of 2016-7656, within 1 year of completion of construction. At least 19.69 hectares of land will be revegetation with	All cleared areas have commenced revegetation within a year following the completion of construction Revegetation works will occur within the optimum time of year (May-June)	Will begin within one year of commencement of the action, and will commence within all the areas identified for revegetation in Attachment 3 within one year of	Weekly site inspections during revegetation works Monthly site inspections once revegetation works have been finalized until completion criteria have been achieved	Cleared areas not revegetated as soon as practicable Revegetated areas do not meet the 19.69 ha threshold	Revegetation of cleared areas to commence as soon as practicable Review scheduling to ensure all future revegetation activities are included	Construction Contractor Environmental Management Representative.

Management Objective	Management Measure	Performance Target/Completion Criteria	Timing	Monitoring/Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
	Carnaby's Black Cockatoo habitat.		the completion of construction			Identify additional areas of for revegetation or rehabilitation to ensure that at least 19.69 hectares of land is revegetation with CBC habitat	
	All rubbish and surplus materials are removed from site at the completion of revegetation	No rubbish will remain on site after construction is completed. No materials not required for revegetation to remain on site after construction is completed. After revegetation works, all remaining materials will be removed from the site.	Within a year of the end of construction OR Within a year following completion of revegetation	Contract completion inspection	Rubbish or surplus materials observed during the contract completion inspection	Rubbish or surplus materials are removed and disposed of immediately.	Contractor Environmental Management Representative
	Revegetation plans will identify connected areas of Black Cockatoo habitat outside of the clearing footprint that are identified as degraded or completely degraded for infill planting/seeding to improve their condition	Infill planting in areas of degraded or completely degraded Black Cockatoo habitat undertaken shall be assessed by a suitably qualified person to determine that the condition rating of these areas is trending upwards consistent with Conservation Advice for Eucalyptus Woodland http://www.environment.gov.au/biodiversity/threatened/communities/pubs/128-conservation-advice.pdf)	During drafting of revegetation plans, which will initially occur prior to contract award	Monthly site inspections during seeding/planting until completion criteria have been achieved	Condition of infill planting areas not trending towards attainment of rehabilitation completion criteria after 2 years of monitoring of the respective rehabilitated area	Infill planting and reseeding will be undertaken as required to meet completion criteria within 3 months of becoming aware that an area of revegetation no longer meets the completion criteria	Main Roads Environmental Management Representative
				Annual revegetation surveys (in Spring) will be undertaken until completion criteria has been achieved. Once completion criteria have been achieved, revegetation surveys will occur once every 2 years during spring forat least a further 20 years.	Revegetation surveys show that revegetation completion criteria are not being maintained		
	Compacted areas and redundant carriageway will be ripped prior to seeding/planting to provide an area of seed/seedling establishment and improve infiltration	All compacted areas are deep ripped prior to seeding/planting	At the start of revegetation activities. Within a year of the end of construction OR Within a year following completion of revegetation	Weekly site inspections during seeding/planting	Compacted areas and redundant carriageway are not deep ripped prior to seeding/planting	Affected revegetation areas will be inspected annually with infill planting and reseeding being undertaken as required to meet revegetation completion criteria, within 3 months of becoming aware that an area of revegetation no longer meets the completion criteria.	Construction Contractor Environmental Management Representative
	Plant species which are known to provide habitat for the Carnaby's Black Cockatoo will	No foraging, nesting or roosting plant species for Black Cockatoo planted within 10 m of the edge of seal	During drafting of revegetation plans, which will	Weekly site inspections during seeding/planting	Black Cockatoo preferred plant species planted	Black Cockatoo preferred plant species within 10 m of	Construction Contractor Environmental

Management Objective	Management Measure	Performance Target/Completion Criteria	Timing	Monitoring/Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
	not be planted within 10 m of the edge of the road seal		initially occur prior to contract award		within 10 m of the edge of the road seal	the edge of the road seal will be removed within 2 days and will be replanted further than 10 m from the edge of the road seal	Management Representative
	Revegetation species mixes will be formulated to reflect the surrounding native vegetation and be characteristic of Black Cockatoo foraging and potential breeding habitat	Species mixes will be specified in the Main Roads Revegetation and Landscaping Specifications developed for the contractor	During drafting of revegetation plans, which will initially occur prior to contract award	Weekly site inspections during seeding/planting	Species mix used during revegetation does not comply with the Landscape and Revegetation Plan and/or provide habitat for the Carnaby's Black Cockatoo	Approval is obtained from the Main Roads Environment Representative to use alternative species that continue to achieve revegetation completion criteria	Construction Contractor Environmental Management Representative
						If the Main Roads Environment Representative does not approve alternative species mix non-compliant species must be removed and correct species used	Construction Contractor Environmental Management Representative
		Revegetation will meet the following completion criteria within five years of installation, as verified by a suitable qualified person: · at least 2,436 plants will be Eucalyptus wandoo plants are alive across all areas of vegetation · minimum foliage cover of 50%projected foliage cover of native species of a minimum of 50% of planting area. · an average of 3 native vegetation stems/m2 · weed cover will not exceed 30% · the majority (greater than 50%) of plant species are at least 5 years old.	During revegetation	Annual revegetation surveys (in Spring) will be undertaken until completion criteria has been achieved Once completion criteria have been achieved, revegetation surveys will occur once every 20 years (in Spring) for at least 20 years to ensure completion criteria is being maintained	Revegetation surveys show that revegetation completion criteria are not being maintained	If species that do not provide CBC habitat is used it will be removed within 2 weeks and replaced with species that are approved for use in the Main Roads Revegetation and Landscape Specifications. If vegetation density or vegetation cover is not achieved infill planting will be undertaken within 3 months of becoming aware that an area of revegetation no longer meets the **completion criteria** as soon as practicable If minimum weed cover is not achieved weed eradication techniques will be applied within	Construction Contractor Environmental Management Representative

Management Objective	Management Measure	Performance Target/Completion Criteria	Timing	Monitoring/Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
						3 months of becoming aware that an area of revegetation no longer meets the **completion criteria** be applied as soon as practicable Monitoring required during the initial round of revegetation must be implemented within 3 months of becoming aware that an area no longer meets the completion criteria; corrective actions may cease once the completion criteria have again been achieved.	
	Topsoil from areas infected or potentially infected with *Phytophthora* dieback shall be segregated and not used in non-infected areas. Dieback free topsoil may be used in any area, but topsoil taken from Uninterpretable areas may only be used in Uninterpretable areas or Dieback infested areas.	No topsoil potentially infected with *Phytophthora* dieback used for revegetation in non-infected areas.	During revegetation activities	Monthly site inspections Topsoil management records	Topsoil from areas identified as potentially infected used during revegetation works	Engage a *Phytopthora* dieback specialist within 2 weeks to assess potentially infected area and implement corrective actions as advised within 1 month	Construction Contractor Environmental Management Representative
Access Controls							
To achieve performance targets and completion criteria for Carnaby's Black Cockatoo and Eucalypt Woodlands TEC	No-go areas are clearly marked on site	No intrusion into no-go areas No-go areas are clearly marked on site	Prior to clearing	Intrusion into no-go area	Site inspections prior to and following clearing to confirm no-go areas are appropriately flagged / fenced Monthly site inspections Any intrusion into no-go areas or damage to fencing/ flagging is raised as an incident All no-go areas will be reviewed within 2 days to ensure exclusions are still in place Conduct refresher training within 1 week	No-go area inspected immediately for damage to TEC or Carnaby's Black Cockatoo habitat If clearing has occurred, the area is to be included in the Landscape and Revegetation Plan within 2 weeks	Construction Contractor Environmental Management Representative Main Roads Superintendent
	Road reserve will be fenced to prevent stock accessing vegetation within the road reserve from adjacent farms.	100% of fencing between road reserve and private property installed Fences remain in good condition (no signs of damage) No access to road reserves by stock	At completion of construction	Contract Completion inspection	Stock reported in road reserve after installation of fence	Clearing in the direct vicinity will cease immediately if trigger is met.	Construction Contractor Representative

Management Objective	Management Measure	Performance Target/Completion Criteria	Timing	Monitoring/Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
	Construction site will be controlled by the Main Roads Superintendent to ensure no unauthorised access by humans during construction.	No unauthorised access by humans during construction			Evidence of unauthorised access to the construction site by humans. Damaged fencing	Clearing will not recommence until no-go areas have been reviewed and confirmed to be in place correctly, and Main Roads Superintendent provides approval to recommence	Main Roads Superintendent
	Notify adjacent landowners of existing fence removal so stock can be relocated and do not have access to vegetation in the road reserve	All property owners notified of fence removal at least 2 weeks prior to commencing removal of the fence Stock is confirmed to not be within paddock prior to fence removal.	Prior to fence removal	Communication records Monthly inspections	Stock reported in road reserve after existing fence removed and before installation of replacement fence Stock found to still be in the paddock prior to fence removal.	Landowners notified immediately and stock removed from road reserve. Landowners notified immediately and stock removed from paddock so that fence can be removed.	Construction Contractor Environmental Management Representative

5.2 Monitoring Program

A number of monitoring and reporting activities will be undertaken to ensure management measures are being implemented and completion criteria is being met. Monitoring activities are mapped to each management measure in Table 5-1 and Table 5-2 describes the monitoring in more detail and includes relevant monitoring guidelines or methods and responsible people.

Table 5-2 : Monitoring Schedule

Monitoring Activity	Parameter Measured	Items Addressed	Applicable Method / Guideline	Responsibility
Monthly site inspection	Compliance with CEMP requirements	· Confirm environmental no-go areas are clearly marked on site · Confirm that clearing outside of approved area or in excess of approved limits (as per condition 1) has not or will not occur · Confirm areas required for temporary construction activities, such as laydown, are only located on previously cleared areas · Confirm no new occurrences of declared plants within the construction site boundary · Confirm no new occurrences of WoNS or Environmental Weeds within the construction site boundary · Confirm no breach of CoE procedures · Confirm list of wildlife rescue organization contact details is on site · Confirm no visual dust plumes · Confirm hot works procedures are in place and correctly implemented · Confirm no erosion or scouring within vegetation that is to be retained, within no-go areas or outside the approval boundary · Confirm paddocks where fencing has been removed are free of stock · Have previous weed control measures been effective and is follow-up treatment required to eliminate the weeds? · Have weed control measures been implemented as per this CEMP and in line with Weeds Australia Guidance (**http://weeds.ala.org.au/WoNS/**)	Visual inspection to confirm that management measures in the CEMP are being implemented correctly.	Construction Contractor Environmental Management Representative
Weekly site inspection during seeding/planting	Revegetation progress	· Revegetation must begin within one year of commencement of the action within all areas identified for revegetation, within one year of the completion of construction · Confirm all revegetation is occurring within winter · Confirm all compacted areas are deep ripped prior to seeding/planting · Confirm no foraging, nesting or roosting plant species for Black Cockatoo are planted within 10 m of the edge of the seal · Confirm all species used for revegetation are as per the Main Roads Revegetation and Landscape Specifications and any alternative species have been approved and provide CBC habitat. · Is the revegetation species mix and density as per the management measures in this CEMP?	Visual inspection by a suitable qualified person to confirm that revegetation is occurring/has occurred in accordance with the Main Roads Revegetation and Landscape Specifications	Construction Contractor Environmental Management Representative
Monthly revegetation monitoring	Revegetation progress	· Confirm that revegetated areas are tracking towards achieving completion criteria as verified by a suitable qualified person	Visual inspection to confirm that revegetation is occurring/has occurred in accordance with the Main Roads Revegetation and Landscape Specifications and this CEMP	Main Roads Environment Management Representative

Monitoring Activity	Parameter Measured	Items Addressed	Applicable Method / Guideline	Responsibility
		· Identify areas that require further infill planting, based on commitments made in this CEMP · Identify areas that require further weed controls, based upon commitments made in this CEMP		
Annual revegetation monitoring	Revegetation progress	· Confirm completion criteria is being achieved	Visual inspection to confirm that revegetation is occurring/has occurred in accordance with the Main Roads Revegetation and Landscape Specifications and this CEMP	Main Roads Environment Management Representative
2 yearly revegetation survey for 20 years	Revegetation progress	· Confirm completion criteria is maintained	Visual inspection by a suitably qualified person to confirm that revegetation is occurring/has occurred in accordance with the Main Roads Revegetation and Landscape Specifications and this CEMP	Main Roads Environment Management Representative
Pre-clearing surveys for hollows being used by Black Cockatoos	Presence of hollows being used by Black Cockatoo	· Confirm all actual or potential nesting trees are free of hollows that are being used by Black Cockatoo before clearing begins · Confirm that Black Cockatoo are no longer using hollows before clearing begins · Maintain a register of nesting trees · record the location of any known nesting hollow or suitable nesting hollow that are additional to the nesting hollows already marked as no-go areas	Suitably qualified person with experience in hollow identification to visually inspect all potential nesting trees within the clearing area and record spatial co-ordinates for any trees identified with hollows that are being utilised, or are capable of being utilised, by Black Cockatoos. Monitoring will be conducted in line with best practice and monitoring methods used will be consistent advice contained within the Black Cockatoo Recovery Plan (DPAW, 2013). Note: no-go areas are areas of vegetation that are not approved to be cleared, these include trees with hollows that are being used by or are suitable for Black Cockatoos (Figure 2.3), conservation significant flora and all areas outside of the approval boundary. These areas are identified on the engineering drawings issued for construction.	Suitably qualified person
Follow up weed monitoring	Weed control	· Confirm no new occurrence or spread of Declared Plants within the construction site boundary during construction activities · Confirm no new occurrence or spread of WoNS or environmental weeds within the construction site boundary · Confirm all plant and machinery will be verified clean on arrival at site · Confirm no breach of CoE protocols	Monthly site inspections Annual revegetation monitoring Records verifying plant and machinery arriving on site is clean Breach of CoE protocol	Construction Contractor Environmental Management Representative

5.3 Managing Uncertainty

This CEMP has been developed based on a number of different data and information sources. This data and information has informed the risk assessments and managements contained within the CEMP and therefore any limitations or uncertainties with this data or information may impact the accuracy of this CEMP. Therefore, Table 5-3 contains measures for managing uncertainty so that the CEMP continues to be based on the most up to date and relevant information and data.

Table 5-3: Managing Uncertainty

Data	Limitations / Uncertainty	Risk Presented by Limitation / Uncertainty	Risk Management Measures
Road Alignment Design	High level of certainty.	Unforeseen/additional impact to MNES Design changes result in alignment moving outside of approved areas.	Design changes reviewed against requirements of this CEMP, MNES occurrences and approval conditions for EPBC 2016/7761
Ecological Survey Reports (Phoenix 2015; 2016a, b, c, 2017 and GHD 2011)	High level of certainty. No significant limitations. Assessments undertaken in line with relevant guidelines and approved methods.	N/A	N/A
Carnaby's Black Cockatoo Recovery Plan	Moderate level of certainty in relation to effectiveness of recovery actions.	The outcomes and objectives of this CEMP may not be achieved.	Work with relevant government Departments to share information, understand implementation status and identify any interdependencies with the project. Adopt a staged approach to implementing rehabilitation measures to capture/implement learnings

6. CEMP Implementation

6.1 Roles and Responsibilities

All project personnel, including sub-contractors/sub-consultants, are responsible for complying with applicable Commonwealth and State legislation, local government requirements and the conditions of all licences, permits and approvals. Specific responsibilities in relation to this CEMP are provided in Table 6-1.

Table 6-1 : CEMP Roles and Responsibilities

Role	CEMP Responsibilities
Main Roads Project Director	· The overall management and control of the CEMP. · Reviewing and approving the CEMP. · Assisting with implementation of the CEMP and sub-plans. · Providing the necessary resources to ensure the CEMP is properly implemented. · Ensuring all personnel are inducted into the project's environmental requirements prior to commencement of works on-site. · Ensuring suppliers are made aware of the environmental objectives pertaining to them through conditions of contract. · Taking strategic actions to continuously improve the CEMP. · Participating in incident investigations. · Management, implementation, monitoring and compliance of the CEMP and any approval conditions, including construction supervision and performance of all staff, contractors and subcontractors. · Reviewing CEMP performance and implementation of correction actions, or stop work procedures, in the event of breaches of CEMP conditions, that may lead to serious impacts on local communities, or affect the reputation of the project. · Representing the project at community meetings.
Main Roads Superintendent	· Confirming all environmental requirements are implemented as outlined in the CEMP as required to avoid and minimise actual or potential environmental harm on-site. · Assisting the Environmental Management Representative to develop and maintain the various registers and checklists. · Supporting the Environmental Management Representative to plan and implement environmental requirements.

Role	CEMP Responsibilities
	· Reporting activity that has resulted, or has the potential to result, in an environmental incident immediately to the Environmental Management Representative. · Participating in incident investigations. · Monitoring construction activities to ensure that identified and appropriate control measures are effective and in compliance with the CEMP. · Managing CEMP performance and implementation of correction actions, or stop work procedures, in the event of breaches of CEMP conditions, that may lead to serious impacts on local communities, or affect the reputation of the project. · Ensuring that all construction personnel and subcontractors are informed of the intent of the CEMP and are made aware of the required measures for environmental a compliance and performance. · Ensuring effective communication and dissemination of the content and requirements of the CEMP to contractors and subcontractors. · During construction, maintain traffic safety along access roads, with special emphasis on high trafficked areas.
Main Roads Environmental Management Representative	· Reviewing the CEMP. · Developing sub-plans and monitoring programs required under this CEMP. · Being the primary contact point in relation to the environmental performance of the construction phase. · Managing procedures and practices for receiving and responding to complaints and inquiries in relation to the environmental performance. · Reporting any activity that has resulted in, or has the potential to result in an environmental incident immediately to the Project Manager, Construction Manager and other relevant personnel. · Considering and advising on matters specified in the conditions of licences and approvals relating to the environmental performance and impacts of the proposal. · Requiring reasonable steps to be taken to avoid or minimise unintended or adverse environmental impacts, and failing the effectiveness of such steps, to direct that relevant actions be ceased immediately should an adverse impact on the environment is likely to occur.

Role	CEMP Responsibilities
	· Identifying environmental competence requirements for all staff and ensure delivery of environmental training to personnel within the team. · Acting as main point of contact between the regulatory authorities and the proposal on environmental issues. · Providing advice and liaison with the construction teams to ensure that environmental risks are identified and appropriate controls are developed and included within method statements. · Assisting in the development and delivery of environmental training for site personnel and subcontractors. · Environmental auditing of subcontractors and suppliers. · Managing the environmental monitoring program once construction has been completed.
Construction Contractor Representative	· Assisting with implementation of the CEMP for construction related activities. · Providing the necessary resources to ensure the CEMP is properly implemented. · Making sure all personnel are inducted into the proposal's environmental requirements prior to commencement of works on-site. · Participating in incident investigations. · Management, implementation, monitoring and compliance of the CEMP and any approval conditions
Construction Contractor Environmental Management Representative	· Implementation of the CEMP on-site · Coordinating and managing all the environmental activities during the construction phase. · Being the primary contact point in relation to the environmental performance of the construction phase. · Managing procedures and practices for receiving and responding to complaints and inquiries in relation to the environmental performance. · Reporting any activity that has resulted in, or has the potential to result in an environmental incident immediately to the Main Roads Superintendent and other relevant personnel. · Requiring reasonable steps to be taken to avoid or minimise unintended or adverse environmental impacts, and failing the effectiveness of such steps, to direct that relevant actions be ceased immediately

Role	CEMP Responsibilities
	should an adverse impact on the environment is likely to occur. · Identify environmental competence requirements for all staff and ensure delivery of environmental training to personnel within the team. · Assistance in the development and delivery of environmental training for site personnel and subcontractors. · Management of the construction contractor's environmental monitoring, inspection and audit program in so far as it relates to construction activities.

6.2 Inspections, Audits and Reporting

6.2.1 Contractor Inspections and Audits

The Construction Contractor will undertake monthly inspection of the entire worksite against this CEMP for the duration of construction works. Where any High or Severe risks are identified, inspections in the areas to which these apply will be undertaken on a weekly basis.

An audit this CEMP will be undertaken by the Construction Contractor within five weeks of the commencement of work and every three months thereafter.

Main Roads will conduct environment and heritage audits of the construction contract area on a six monthly basis during the construction phase.

6.2.2 Incident Reporting

Environmental incident categories and reporting timeframes are outlined in the Main Roads Environmental Incident and Investigation Report Form. This form provides a guide for classifying the severity of an environment or heritage incident and the required reporting timeframe to be adhered to. The following is a summary of the Main Roads Environmental Guideline – Environmental Incidents: Reporting, Investigation and Management:

Environmental incident occurs:

- Immediate remedial action: where safe to do so the observer of an incident should undertake any immediate actions to stop, control or contain the incident to prevent further damage;
- Determine the environmental incident category (i.e. minor, significant or major): environmental incidents are to be categorised as per the Environmental Incident Category table accompanying the Environmental Incident Report Form;
- Notify management: Notification requirements for environmental incidents are listed on the Environmental Incident Report Form;
- Assessment and investigation;
- Incident report: Main Roads Corporate Environmental Incident Report Form will be used to record environmental incidents associated with the Project; and
- Corrective and preventative actions – the Contractor will track the progress of agreed corrective and preventative actions.
- All environmental incidents are to be reported to the Superintendent and filed by the Contractor.

Corrective actions may also arise from audits, inspections and management reviews. Corrective actions are to reviewed and endorsed by Main Roads before the action is implemented. Audits will follow to confirm satisfactory completion.

6.3 Environmental Training

An environment induction will be carried out for all visitors, personnel, contractors and sub consultants who are required to work on the Project. This induction details the responsibilities of all project personnel, contractors and sub consultants under this CEMP and outlines environment requirements that personnel need to be aware of when undertaking work activities in accordance with this CEMP.

All personnel will be required to sign an attendance form on completion of the induction. Attendance at these inductions is recorded in the training register for the Project.

Daily pre-start meetings will be conducted to inform project personnel of specific environmental issues related to the day's work. These meetings are to also include visitors and sub-consultants who are on site. In addition, toolbox meetings will be held with all project personnel to provide environmental awareness training, disseminate any relevant outcomes of environmental inspection and audits, including areas for improvement or positive achievements.

Specialised training will be provided to relevant personnel and will include spill prevention, control and containment/clean up, erosion and sediment control, and environmental emergency response.

6.4 Review

6.4.1 Risk Review

The CERR will be reviewed periodically to confirm it remains relevant and captures all risks to MNES. Review triggers are:

- changes to project/CEMP scope;
- following significant environmental incidents;
- where corrective actions or contingency management measures are implemented; or
- when new information in regards to MNES becomes available.

6.4.2 CEMP Review

Throughout the life of the EPBC Act approval the CEMP will be reviewed and updated as required. The review will include an evaluation of the effectiveness of the plan, and incorporate and new data or information pertinent to the management of Carnabys Black Cockatoo. Review triggers are as follows:

- annually on the anniversary of the approval of the CEMP;
- following significant incidents;
- anticipated changes to scope;
- following community or stakeholder complaints;
- identification of non-compliance with environmental approval conditions;
- monitoring results, inspections or audits indicate performance targets or completion criteria may not be achieved or maintained; or
- monitoring results, inspections or audits indicate completion criteria have been achieved.

The CEMP will be updated by the Main Roads Environmental Management Representative or suitably qualified delegate and approved by the Main Roads Project Director.

Changes to the CEMP will be communicated to all project personnel, contractors and sub consultants via the regular pre-start and toolbox meetings.

Main Roads will inform DoEE of any changes to the CEMP in accordance with Condition 14 and at least four weeks before implementation of the revised CEMP. For the purpose of Condition 14(c) Main Roads will assess the change against the risks identified in Table 3-1 of this CEMP

7. Data Management

Records will be kept to demonstrate compliance with this CEMP. These records include, but are not limited to:

- Risk assessments
- Audit results and reports, including the timing, location and spatial delineation of clearing, and periodic reconciliation against approved disturbance limits
- Monthly and weekly inspection results
- Environmental incident reports
- Monitoring data, results and reports
- Records of revegetation activities including dates, location and area of revegetation, species mixes used and quantities
- Induction records
- Pre-start and Toolbox meeting minutes
- Correspondence in relation to the requirements of this CEMP between Main Roads, construction contractors and/or regulators

The Main Roads Site Superintendent and the Construction Contractor Representative are responsible for establishing and maintaining electronic and hardcopy filing systems for the above information. Once construction is completed, all documents that were kept on site during construction will be transferred to Main Roads head office as part of site demobilisation.

8. References

Department of the Environment, 2012. *Interim Biogeographic Regionalisation for Australia Version 7*. Department of Environment Canberra, ACT.

Department of the Environment and Energy, 2014. *Environmental Management Plan Guidelines*. Commonwealth of Australia, Canberra, ACT.

GHD Pty Ltd (GHD), 2011. *Report for Great Northern Highway Upgrade: Muchea to Bindoon Environmental Impact Assessment.* Prepared for Main Roads WA.

Phoenix, 2015. Flora and fauna assessment for Lyons East Road to Gatti Road study area, Great Northern Highway, Muchea to Wubin Upgrade Stage 2 Project. Phoenix Environmental Sciences Pty Ltd, Balcatta, WA. Unpublished report prepared for Muchea to Wubin Integrated Project Team (Main Roads WA, Jacobs and Arup).

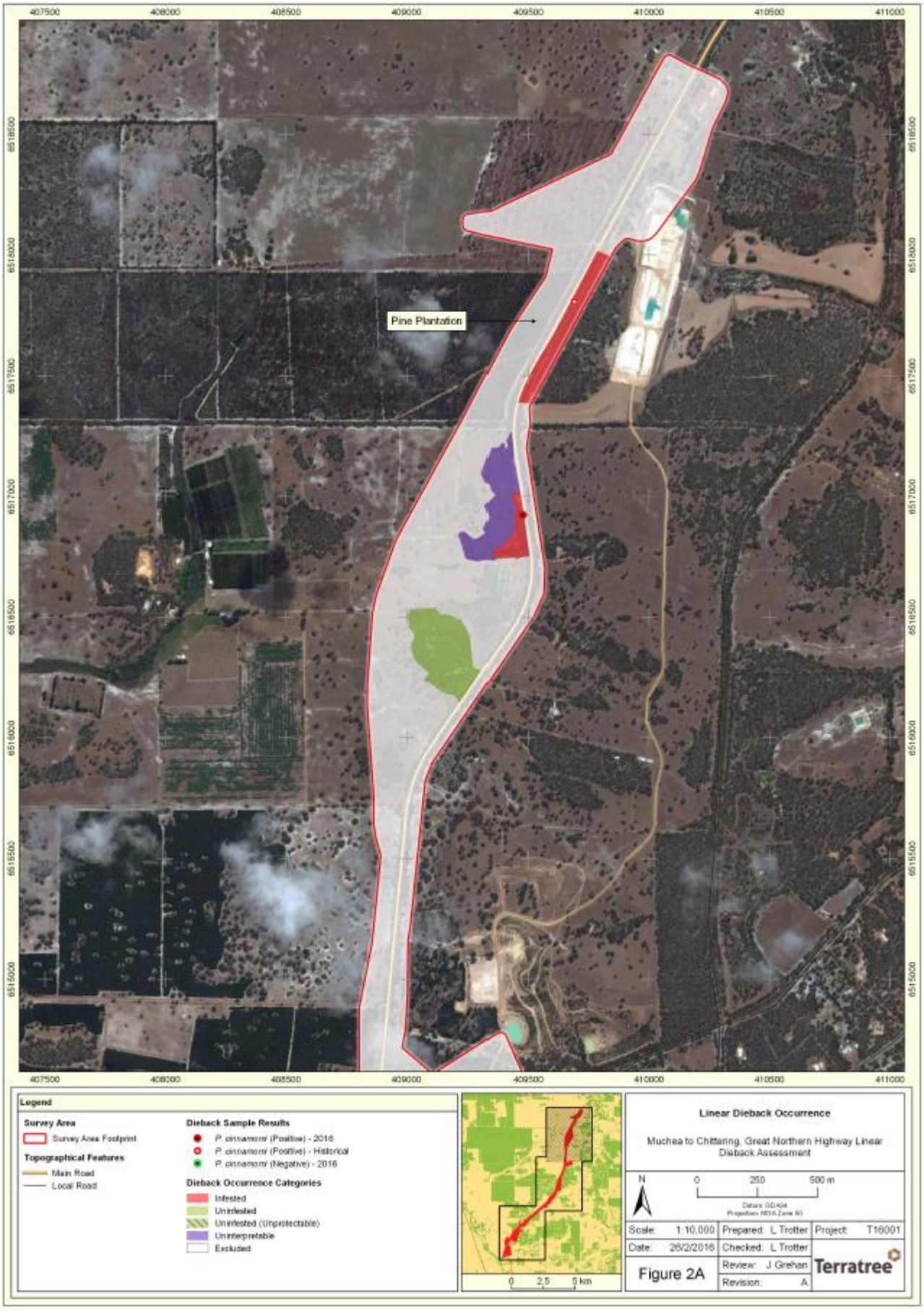
Phoenix, 2016a. Flora and fauna assessment for Calingiri to Wubin study areas, Great Northern Highway, Muchea to Wubin Upgrade Stage 2 Project. Phoenix Environmental Sciences Pty Ltd, Balcatta, WA. Unpublished report prepared for Muchea to Wubin Integrated Project Team (Main Roads WA, Jacobs and Arup).

Phoenix, 2016b. Flora and fauna assessment for Calingiri to Wubin study areas – Report Addendum, Great Northern Highway, Muchea to Wubin Upgrade Stage 2 Project. Phoenix Environmental Sciences Pty Ltd, Balcatta, WA. Unpublished report prepared for Muchea to Wubin Integrated Project Team (Main Roads WA, Jacobs and Arup).

Phoenix, 2016c. Flora and fauna and fauna assessment for the Lyons East Road to Gatti Road study area – Report Addendum, Great Northern Highway, Muchea to Wubin Upgrade Stage 2 Project. Phoenix Environmental Sciences Pty Ltd, Balcatta, WA. Unpublished report prepared for Muchea to Wubin Integrated Project Team (Main Roads WA, Jacobs and Arup). Department of Environment and Energy, 2014. Environmental Management Plan Guidelines. Commonwealth of Australia 2014.

Terratree Pty Ltd, 2016. Phytophthora Dieback Assessment of Great Northern Highway (Bindoon Bypass to Bindi Bindi)

Appendix A. **Dieback Figures**


Pine Plantation
Legend
Survey Area
Survey Area Footprint
Topographical Features
Main Road
Local Road
Dieback Sample Results
P. cinnamomi (Positive) - 2016
P. cinnamomi (Positive) - Historical
P. cinnamomi (Negative) - 2016
Dieback Occurrence Categories
Infested
Uninfested
Uninfested (Unprotectable)
Uninterpretable
Excluded
0 2.5 5 km
Linear Dieback Occurrence
Muchea to Chittering, Great Northern Highway Linear Dieback Assessment
N
0 250 500 m
Scale: 1:10,000
Prepared: L Trotter
Project: T16001
Date: 26/2/2016
Checked: L Trotter
Reviewer: J Grehan
Revision: A
Figure 2A
Terratree


Not assessed due to no access
Legend
Survey Area
Survey Area Footprint
Topographical Features
Main Road
Local Road
Dieback Sample Results
P. cinnamomi (Positive) - 2016
P. cinnamomi (Positive) - Historical
P. cinnamomi (Negative) - 2016
Dieback Occurrence Categories
Infested
Uninfested
Uninfested (Unprotectable)
Uninterpretable
Excluded
Linear Dieback Occurrence
Muchea to Chittering, Great Northern Highway Linear Dieback Assessment
N
0
250
500 m
Scale: 1:10,000
Prepared: L Trotter
Project: T16001
Date: 26/2/2016
Checked: L Trotter
Figure 2B
Review: J Grehan
Revision: A
Terratree
0 2.5 5 km


404000
404500
405000
405500
406000
406500
407000
6511000
6510500
6510000
6509500
6509000
6508500
6508000
6507500
6507000
Gravel Pit
Legend
Survey Area
Survey Area Footprint
Topographical Features
Main Road
Local Road
Dieback Sample Results
P. cinnamomi (Positive) - 2016
P. cinnamomi (Positive) - Historical
P. cinnamomi (Negative) - 2016
Dieback Occurrence Categories
Infested
Uninfested
Uninfested (Unprotectable)
Uninterpretable
Excluded
0 2.5 5 km
Linear Dieback Occurrence
Muchea to Chittering, Great Northern Highway Linear Dieback Assessment
N
0 250 500 m
Scale: 1:10,000
Prepared: L Trotter
Project: T16001
Date: 26/2/2016
Checked: L Trotter
Review: J Grehan
Revision: A
Figure 2C
Terratree

Appendix B. **Risk Assessment Framework**

B.1 Risk framework

		Consequence				
		Minor	**Moderate**	**High**	**Major**	**Critical**
Likelihood	**Highly Likely**	**Medium**	**High**	**High**	**Severe**	**Severe**
	Likely	**Low**	**Medium**	**High**	**High**	**Severe**
	Possible	**Low**	**Medium**	**Medium**	**High**	**Severe**
	Unlikely	**Low**	**Low**	**Medium**	**High**	**High**
	Rare	**Low**	**Low**	**Low**	**Medium**	**High**

B.2 Likelihood and consequence

Likelihood – Qualitative measure of likelihood (how likely is it that this event/circumstances will occur after management actions have been put in place/are being implemented)	
Highly likely	Is expected to occur in most circumstances
Likely	Will probably occur during the life of the project
Possible	Might occur during the life of the project
Unlikely	Could occur but considered unlikely or doubtful
Rare	May occur in exceptional circumstances
Consequence – Qualitative measure of consequences (what will be the consequence/result if the issue does occur)	
Minor	Minor risk of failure to achieve the plan's objectives. Results in short term delays to achieving plan objectives, implementing low cost, well characterised corrective actions.
Moderate	Moderate risk of failure to achieve the plan's objectives. Results in short term delays to achieving plan objectives, implementing well characterised, high cost/effort corrective actions.
High	High risk of failure to achieve the plan's objectives. Results in medium-long term delays to achieving plan objectives, implementing uncertain, high cost/effort corrective actions.
Major	The plan's objectives are unlikely to be achieved, with significant legislative, technical, ecological and/or administrative barriers to attainment that have no evidenced mitigation strategies.
Critical	The plan's objectives are unable to be achieved, with no evidenced mitigation strategies.