Great Northern Highway
Muchea to Wubin Upgrade - Stage 2

MAIN ROADS WESTERN AUSTRALIA

2016/7761: Walebing to Wubin - SLK 147.7 - 258
Construction Environmental Management Plan

Document Number :	GNH-CN00-EN01-RPT-1003
Revision :	5
Phase :	Stage 2
Date :	08 / 05 / 2018
Contract Number :	CN00-EN01
Client Contract Number :	10/13

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Document Control

Document description	
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Current Issue

Revision	Date
5	08 May 2018

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	02-03-18	Draft	Cross Discipline Review / Technical Review / PAG Review
2	12-03-18	Draft	DoEE Review
3	20-04-18	Final	Issued for Approval
4	07-05-18	Final	Issued for Approval
5	08-05-18	Final	Issued for Approval

Contents

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 5) for EPBC 2016/7761 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

Full Name (please print)

Norm Fox

Organisation (please print)

Main Roads Western Australia

Date 11 / 05 / 2018

Tables

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Glossary

Abbreviation/Term	Definition
AHD	Australian Height Datum
ARI	Average Recurrence Interval
BAM Act	*Biosecurity and Agriculture Management Act 2007*
BoM	Bureau of Meteorology
CERR	Construction Environmental Risk Register
CEMP	Construction Environmental Management Plan
CoE	Clean on Entry and/or Exit
DAFWA	Department of Agriculture and Food WA
DBCA	Department of Biodiversity, Conservation and Attractions
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
DWER	Department of Water and Environmental and Regulation
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.
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
Eucalypt Woodlands TEC	*Eucalypt Woodlands of the Western Australian Wheatbelt* threatened ecological community
GDA94	Geocentric Datum of Australia 1994
GNH	Great Northern Highway
ha	Hectare
km	Kilometre
m	Metre
Main Roads	Main Roads Western Australia
MGA94	Map Grid of Australia 1994
MNES	Matters of National Environmental Significance
mm	Millimetre
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.

Abbreviation/Term	Definition
TEC	Threatened Ecological Communities
WA	Western Australia
WoNS	Weeds of National Significance

1. Introduction

On 28 July 2016 Main Roads Western Australia (Main Roads) referred the Great Northern Highway: Walebing to Wubin proposal to the Department of Environment and Energy (DoEE) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (EPBC Reference 2016/7761). The referral encompassed the Walebing, Miling Bypass, Pithara and Dalwallinu to Wubin contract areas. 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*) and the *Eucalypt Woodlands of the Western Australian Wheatbelt* threatened ecological community (Eucalypt Woodlands TEC).

On 19 February 2018 conditional approval was granted by the Minister for the Environment and the approval decision, including conditions of approval, was published on the DoEE website.

1.1 Purpose and Scope of this Construction Environmental Management Plan

This Construction Environmental Management Plan (CEMP) has been prepared to meet the requirements of Condition 4 of the conditions of approval. It has been developed in accordance with guidance received from DoEE on 23 February 2018 and the DoEE's Environmental Management Plan Guidelines. Condition 4 states:

To mitigate impacts to the Carnaby's Black Cockatoo and the Eucalypt Woodlands TEC, 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 CEMP must be prepared in accordance with the Departments Environmental Management Plan Guidelines.

The scope of this CEMP is limited to those construction activities which have potential to directly or indirectly impact on Carnaby's Black Cockatoo and the Eucalypt Woodlands TEC.

1.2 Project Management Structure

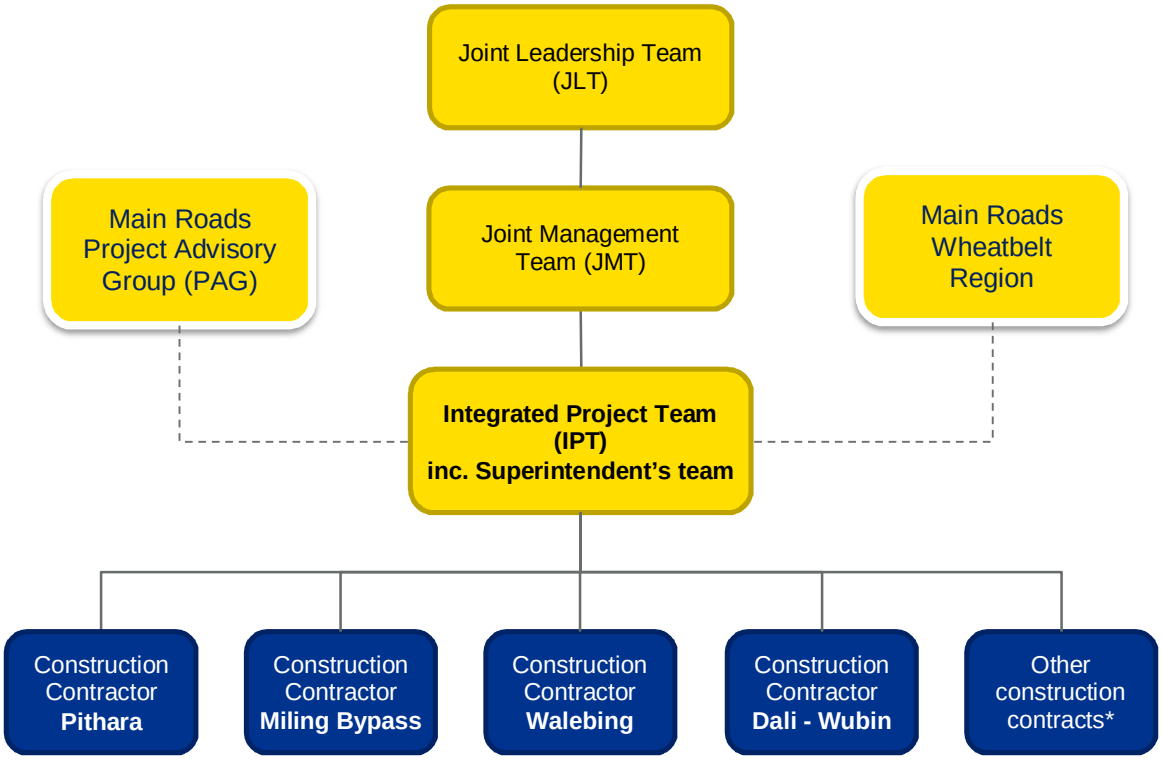
In 2014 Main Roads established the Muchea to Wubin Integrated Project Team (IPT), comprising Main Roads and industry partners Arup and Jacobs (combining to form Arup Jacobs Joint Venture, ASJV). The IPT operates under the supervision of the Joint Management Team (JMT) which includes the Main Roads Project 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 Wheatbelt 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 1-1**. Responsibilities and actions assigned to Main Roads in this CEMP may be delegated to the IPT.

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).



** The overall Muchea to Wubin Stage 2 Upgrade Project includes other construction contract which are not part of EPBC 2016/7761*

Figure 1-1 : Project Management Structure

1.3 Primary Strategies to Manage Key Risks

The key risks identified from the risk assessment referenced in Table 3-3 are:

- clearing outside of approved areas or in excess of approved limits;
- introduction or spread of noxious weed species and disease; and
- failure to appropriately establish revegetation.

The primary strategies to manage these risks are:

- areas to be cleared will be accurately pegged/marked on the ground.
- additional areas required for construction such as laydown areas, stockpile areas and vehicle turn around, will be located in cleared areas or areas of non-native vegetation.
- weed and hygiene control measures will be in place during construction.
- All cleared areas no longer required will be revegetated as soon as practicable after completion of earthworks and at the time of year that optimises survival of seedlings and germination of seed.
- Plant species which are known to provide food sources for Carnaby's Black Cockatoo will not be planted within 10m of the edge of the road seal.

- Revegetation species mixes have been formulated to reflect the surrounding native vegetation and be characteristic of Carnaby's Black Cockatoo foraging and potential breeding habitat and the Eucalypt Woodlands TEC.

1.4 CEMP Reference Tables

Table 1-1 sets out the specific requirements of Condition 4 and provides a cross reference to where in the CEMP this is addressed and demonstration of how the CEMP addresses the requirement. **Table 1-2** sets out the specific requirements of the guidance received from DoEE and provides a cross reference to where in the CEMP this is addressed.

1.5 Plan Implementation

This plan has been written to inform construction and revegetation activities to mitigate impacts to Carnaby's Black Cockatoo and the Eucalypt Woodlands TEC. Table 4-1, Table 4-2 and Table 4-3 document the activities that will be undertaken to implement this plan. All other statements throughout this CEMP have been provided for context and will not specifically form part of the environmental management system implemented throughout construction. All commitments made in this CEMP will be implemented and adhered to.

Table 1-1 : EPBC 2016/7761 Condition 4

Condition	Condition requirement	CEMP Reference	Demonstration of how the CEMP addresses the condition and commitment made to address condition requirements
4.	To mitigate impacts to the Carnaby's Black Cockatoo and the Eucalypt Woodlands TEC, 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 CEMP must be prepared in accordance with the Department's Environmental Management Plan Guidelines and include, but not be limited to:		
4.a.	Design principles and practices to minimise clearing of Carnaby's Black Cockatoo habitat and the Eucalypt Woodlands TEC – for example, road micro-alignment, traffic management alternatives to side roads.	Sections 3.3, 2 and 4	CEMP sets out the design principles and practices which have been or will be implemented. All relevant project design principles are detailed in Section 2.
4.b.	Measures to prevent impacts to Carnaby's Black Cockatoo habitat and the Eucalypt TEC during construction, including to:		
4.b.i.	Prevent and/or control site access, weeds, *Phytophthora* dieback, erosion, dust and fire.	Section 4	Weed and disease hygiene to prevent introduction/spread of weeds and dieback; drainage design to consider dieback status of vegetation at discharge points and to prevent scouring/erosion; dust controls measures and protocols for hot works and other equipment that has potential to ignite.
4.b.ii.	Minimise the impacts of excavation activities to the lateral root system of the Eucalypt Woodlands TEC.	Section 4	Earthworks cuts, excluding drainage construction, that are located within 3.5 m of a tree that is part of the Eucalypt Woodlands TEC and is to be retained will be subject to controls as per Table 4-1.
4.b.iii.	Delineate vegetation to be retained through, for example, the erection of temporary fencing or signage to avoid accidental clearing or disturbance outside the impact area.	Section 4	No-go areas identified and flagged/fenced for trees and vegetation to be retained.

Condition	Condition requirement	CEMP Reference	Demonstration of how the CEMP addresses the condition and commitment made to address condition requirements
4.c.	Management measures, including in relation to fencing and access controls to permanently restrict human and stock access to adjacent road reserves.	Section 4	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. 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.
4.d.	Objectives, targets and completion criteria for post construction rehabilitation measures including as site clean-up and weed management, including information on the mapping, monitoring and removal of noxious weeds.	Section 4	Objectives, targets and completion criteria for revegetation are provided in Section 4.1.
4.e.	Objectives, targets and completion criteria for landscaping and revegetation works on cleared areas of land and redundant sections of carriageway, with flora species to be planted that are identified as known foraging and breeding habitat for the Carnaby's Black Cockatoo (this should include detail on site preparation works, seedling planting programs, success rates, ongoing management post establishment and details of replanting requirements if success rates are not achieved).	Sections 4.1	Objectives, targets and completion criteria for revegetation are provided in Section 4.1.
4.e.i.	Flora species identified as known foraging and breeding habitat for the Carnaby's Black Cockatoo must not be planted within 10 metres of the road carriageway to reduce the risk of vehicle strike.	Section 4	Revegetation does not include species identified as food sources for Carnaby's Black Cockatoo within 10 m of the edge of seal.

Condition	Condition requirement	CEMP Reference	Demonstration of how the CEMP addresses the condition and commitment made to address condition requirements
4.f.	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.	Sections 4.1	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.
4.g.	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.	Sections 3.3 and 4	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 4.1.
4.h.	Timeframes for implementing the above measures.	Section 4	The implementation times frames are provided in Section 4.1.

Table 1-2 : CEMP Guidance

Guidance	Sections / pages of the CEMP
1. The plan submitted as final for approval includes a Declaration of Accuracy signed by the approval holder.	Page iii
2. The plan includes an executive summary or introduction which states the relevant EPBC Act approval conditions, and outlines the purpose of the plan and the primary strategies to manage key risks and achieve the plan's objectives.	Section 1
3. The plan includes a table containing: a) EPBC Act approval conditions that specify the content of the plan (i.e. Condition 4); and b) plan section and page numbers that address those content requirements.	Section 1.4

Guidance	Sections / pages of the CEMP
4. The plan describes the project and potential impacts sufficiently to give context to the purpose of the plan, and includes: a) the location and nature of project activities; b) a schedule of project commencement, construction and operation phases; c) the location of Carnaby's Black Cockatoo habitat and Eucalypt Woodlands TEC to be protected by implementing the plan; d) impact management objectives for Carnaby's Black Cockatoo habitat and Eucalypt Woodlands TEC; and e) environmental information and significance of these locations, including relationship to the approved action.	Sections 1.6, 1.7, 1.8.2, 1.8.4 and 1.8
5. The plan includes performance targets and completion criteria for Carnaby's Black Cockatoo habitat and Eucalypt Woodlands TEC. For the purpose of the plan: a) completion criteria are longer term time-bound values, specified for measurable parameters, that if attained and maintained ensure the plan's environmental objectives are achieved, and subsequently maintained for the balance of the period of approval; and b) performance targets are time-bound short and medium term targets for management interventions and environmental condition. They are used to monitor, evaluate, review and improve the effectiveness of the plan to avoid and mitigate impacts to Carnaby's Black Cockatoo habitat and Eucalypt Woodlands TEC and/or attain the completion criteria.	Section 4
6. The plan assesses the risk of failure to achieve the plan's performance targets and/or completion criteria. To this end the plan: a) states the plan's performance targets and completion criteria; b) includes evidence of a risk workshop, and workshop outcomes that inform the plan; c) identifies events or circumstances during the period of approval that prejudice achievement of performance targets and attainment/maintenance of completion criteria. The events or circumstances must address scientific/ecological uncertainty, stochastic events and legal/land use planning factors that may represent risks; d) includes a qualitative assessment of the likelihood and consequence of those events or circumstances, and the residual risk of failure to achieve those criteria due to identified events or circumstances (assuming management measures will be implemented); e) characterises risk as low, medium, high or severe, and derived from likelihood (highly likely, likely, possible, unlikely, rare) and consequence (minor, moderate, high, major and critical); and f) outlines how consequence, likelihood and risk level for each risk have been determined.	Section 3.3

Guidance	Sections / pages of the CEMP
7. The plan manages the risk of failure by: a) specifying impact avoidance measures that will be implemented to attain performance targets and attain/maintain the completion criteria; b) enhancing monitoring and management measures for high risk events or circumstances, thereby providing a 'margin of safety' to detect and avoid the likelihood and/or impacts of the event or circumstance; c) specifying measurable management triggers that detect actual or potential issues in a timely manner to avoid, minimise or mitigate adverse impacts; d) ensuring the monitoring program includes activities to detect management triggers, and explains how monitoring activities may inform the selection and implementation of corrective actions; e) specifying contingency responses to determine whether the management trigger is project attributable; f) specifying effective and appropriate corrective actions that may be implemented if a management trigger is realised and project attributable; and g) monitoring the effectiveness of corrective actions and implementing a 'stop work' response in the event corrective actions are not effective.	Section 4
8. The plan includes management measures to protect Carnaby's Black Cockatoo habitat and Eucalypt Woodlands TEC during construction and for rehabilitation of/revegetation with foraging and breeding habitat for Carnaby's Black Cockatoo. Each measure: a) has timeframes for implementation; b) is described sufficiently to avoid ambiguity and to inform plan implementation; c) is related to attaining/maintaining completion criteria and/or performance targets; and d) is derived from recognised principles, practices, or guidelines, and is justified - technically, scientifically and/or legally (e.g. by recommendation in a national recovery plan) – as an effective and appropriate measure to attain and/or maintain the plan's performance indicators.	Section 4

Guidance	Sections / pages of the CEMP
9. The plan identifies and manages uncertainty. To this end the plan specifies: a) key data/information used to formulate the plan; b) the limitations and/or uncertainty associated with the use of that data/information; c) the risks that limitation and/or uncertainty represents for plan failure; and d) how limitations and/or uncertainty, and associated risks, are mitigated during plan implementation. For example, where a margin of safety is applied to management measures until uncertainty is reduced to an acceptable level or performance targets/completion criteria are attained/maintained.	Section 4.3
10. The plan includes an adaptive implementation program to ensure uncertainty is reduced over time, and that performance targets and completion criteria are achieved. The plan includes arrangements for: a) ensuring new data/information is collected and incorporated into the plan, as a result of implementing the plan and new information from external sources (e.g. academic literature, EPBC policy statements); b) effectively coordinating and scheduling monitoring, risk management, auditing and reporting activities; c) periodically reviewing risks, including in response to a high risk rating, changing circumstances or the results from implementing contingency response/corrective actions; d) frequent review of the effectiveness of protection/rehabilitation/revegetation measures with significant levels of uncertainty, relatively long implementation timeframes, and upon which the plan is highly dependent; e) addressing the consequences of significant environmental incidents (planned and unanticipated); and f) reviewing the plan under the following circumstances: Ø performance reports indicate performance targets/completion criteria may not be achieved/maintained; Ø according to approved timeframes; or Ø the impacts of significant environmental incidents.	Point a) is addressed by Section 5.3 Point b) is addressed by Sections 4.2 and 6 Point c) is addressed by Section 5.3.1 Point d) is addressed by Section 4.3 Point e) is addressed by Section 6.4 Point f) is addressed by Sections 5.3 and 6

Guidance	Sections / pages of the CEMP
11. The plan states monitoring objectives to meet operational decision-making. To this end: a) the monitoring objectives provide for 'early-control' (that management measures are effective) and 'early warning' (corrective actions are required) functions, so as inform timely decisions on corrective actions to ensure performance targets and/or completion criteria are achieved/maintained; and b) for each objective, the monitoring plan specifies the variables to be measured, the state and/or rate of change, the precision and confidence, the spatial resolution and time scales required to inform operational decision-making.	Section 4.2
12. The plan describes the monitoring methods that will be implemented, and: a) includes quantitative (e.g. on-ground survey results) and qualitative baseline data (e.g. photo-point monitoring sites) that establish the start quality/condition of the environment; b) describes the sampling strategy (including monitoring area, site selection and sampling intensity over space and time) and statistical analyses to be employed; c) justifies the sampling strategy/monitoring/analytical methods, including through: Ø an assessment of effectiveness and constraints to use; Ø capacity to detect change in environmental condition due to management interventions; Ø capacity to demonstrate attainment of performance targets and/or completion criteria; and Ø the statistical power of the strategy/method/analysis. d) commits to engage appropriately qualified experts to design and conduct monitoring and survey activities, and analyse monitoring results; e) accounts for seasonal/climatic variability; and f) the location, nature and number of monitoring sites, including benchmark/reference sites to evaluate management performance.	Section 4.2
13. The plan includes a monitoring program for the life of the approval comprised of monitoring methods, a data handling strategy, arrangements for the periodic technical review and evaluation of the monitoring program and timeframes for implementing program components.	Section 4.2
14. As required by Condition 9, accurate records must be kept and provided to the Department upon request. The CEMP must detail a data handling program for data storage and protection, data extraction, quality control, analysis, interpretation, reporting and presentation. Data ownership, distribution, availability and licensing to the Department for compliance and recovery planning purposes are specified.	Section 7

Guidance	Sections / pages of the CEMP
15. The plan outlines a periodic technical review and evaluation of the plan and the likely composition of the review committee(s) (e.g. including a suitably qualified ecologist).	Section 5.3.3
16. The plan includes a schedule and triggers for self-auditing the implementation and effectiveness of the plan, and outlines auditable systems for recording plan implementation and attainment/maintenance of performance targets/completion criteria.	Section 6
17. The plan includes commitments to report on plan implementation. This is achieved by: a) identifying relevant reporting obligations under the EPBC approval (i.e., Condition 10 requires an annual report to be published on the Approval Holder's website); b) outlining how implementation will be reported in accordance with those obligations; and c) including a reporting template specifying key risk management, management measure, monitoring and adaptive implementation outcomes for the reporting period. d) a schedule and triggers for reporting types (e.g. annual compliance, incident, non-compliance, contingency).	Section 6.5
18. The plan specifies accountabilities/ responsibilities for who will be implementing the plan, including management measures, risk management, monitoring, reporting, review, auditing and contingency responses.	Section 5.1

Guidance	Sections / pages of the CEMP
19. Maps, plans, figures, images and sections used in the plan: a) shows the project and monitoring areas in a state and regional context; b) are clearly legible, including fine print, when printed on A4; c) show areas with differing environmental condition or quality; d) show the location of static monitoring plots and/or the general location of random monitoring/survey activities that will be undertaken; e) are scaled to enable the reader to clearly identify, based on local landmarks (trees, fences, structures) the location of management activities being shown on the map; f) include appropriate standard metric scales to represent the information (for example 1:100 000). Datum – plans and cross sections refer to AHD; g) have metric measurements, graphic bar scales, local grid lines and standards and north point or orientation of sections (include a key) are used throughout; and h) include title blocks in the lower right hand corner with the following information: EPBC number and project name, title and number of the plan, author, scale, date, source and date of data.	Pages 17, 23, 35 and 41
20. The plan references scientific, legal or other claims or statements that support the effectiveness of the plan, e.g. references to scientific literature, published guidelines, legislation, conservation advice, recovery plans, threat abatement plans.	Section 8
21. The plan uses the terms ‘will’ and ‘must’ when committing to actions, instead of ‘where possible’, ‘as required’, ‘to the greatest extent possible’, ‘should’ or ‘may’.	Noted
22. The footer or header of each page of the plan states the name of the project, EPBC #, the date of the plan and sequential page numbering.	Noted
23. The plan includes a glossary of terms comprised of acronyms, terms open to different interpretations, not in common use, technical or defined in the approval conditions.	Page 1
24. The plan includes risk assessment/management, implementation and monitoring schedules consistent with Appendix A of this guidance document.	Section 3.3

1.6 Project Description

Main Roads propose to upgrade, rebuild and /or partially relocate discrete sections of the Great Northern Highway (GNH) between Straight Line Kilometre (SLK) 147 (Walebing) and SLK 258 (Wubin) herein referred to as the Walebing to Wubin Project (**Figure 1-2**). The works will be carried out in a number of discrete locations to address the deficiencies identified along specific stretches of highway. These deficiencies include:

- Narrow and substandard road width. The original GNH was constructed with less than 8 m wide seal on a 10 m formation. Current Main Roads standards require at least a 9 m seal on an 11 m formation, with a 10 m seal on 12 m formation adopted for the proposed action;
- Areas with non-compliant horizontal and vertical geometry. To allow vehicle speeds of 110 km/h (100 km/h for heavy vehicles), these geometry issues require rectification;
- A number of intersections with poor sight distance or inadequate turning provisions; and
- Insufficient clear zone.

The Walebing to Wubin Project is divided into four construction contracts. The Pithara and Miling Bypass construction contract will commence in 2018 with the Walebing and Dalwallinu to Wubin construction contract commencing between late 2018 and 2019. The following works are planned for each contract area:

- Pithara:
  - Construction and upgrade of approximately 16.2 km of carriageway.
  - Upgrade and installation of new culverts on the proposed and existing GNH.
  - Construction of two overtaking lanes, one northbound and one south bound.
  - Redesigned or upgrade of the intersections at Sheoak Road, Moller Road, Crampton Street, Northam Pithara Road, Sutcliffe Road, Pithara West and Pithara East Road.
  - Removal of Roach Street, Bonney Street and Lewis Road intersections.
  - Accommodation works including driveway construction, stock underpasses and fencing.
  - Services relocation works.
- Miling Bypass:
  - Construction of approximately 8 km of new carriageway.
  - Realignment of the Miling Moora Road where it intersects with GNH.
  - Construction of new access roads to Miling townsite and the CBH Group grain terminal.
  - Construction of a new T-intersection for Miling East Road and Miling West Road.
  - Upgrade and installation of new culverts on the proposed and existing GNH.
  - Elimination of the existing floodway on the GNH.
  - Reinstatement of existing driveways to provide access onto the proposed alignment.
  - Provision of solar powered flag lighting at the two Miling Town Access Road T-intersections along the new highway alignment.
  - Services relocation works.

- Walebing:
  - Upgrade sub-standard geometry on GNH and associated minor roads, including significant realignment and rebuilding of GNH at the “Walebing curve”.
  - Realignment of Midlands Road with addition of an acceleration lane for GNH northbound entering traffic.
  - Widening an existing 9 m seal to a 10 m seal.
  - Intersection upgrade at Old Geraldton Road.
  - Demolition and remediation of the Walebing Roadhouse
  - Accommodation works including driveway construction and fencing.
  - Services relocation works.
- Dalwallinu to Wubin
  - Construction of a new bypass at Wubin.
  - Construction of new access roads to the Wubin town-site (to accommodate 53.5 m long vehicles).
  - Construction of a new T-intersection for Wubin East Road, removal of the intersection at Caravan Access Road and other intersections upgrades.
  - Offline horizontal curve improvements, seal widening from existing 9/11 carriageway and one sided pavement widening.
  - Southbound overtaking lane.

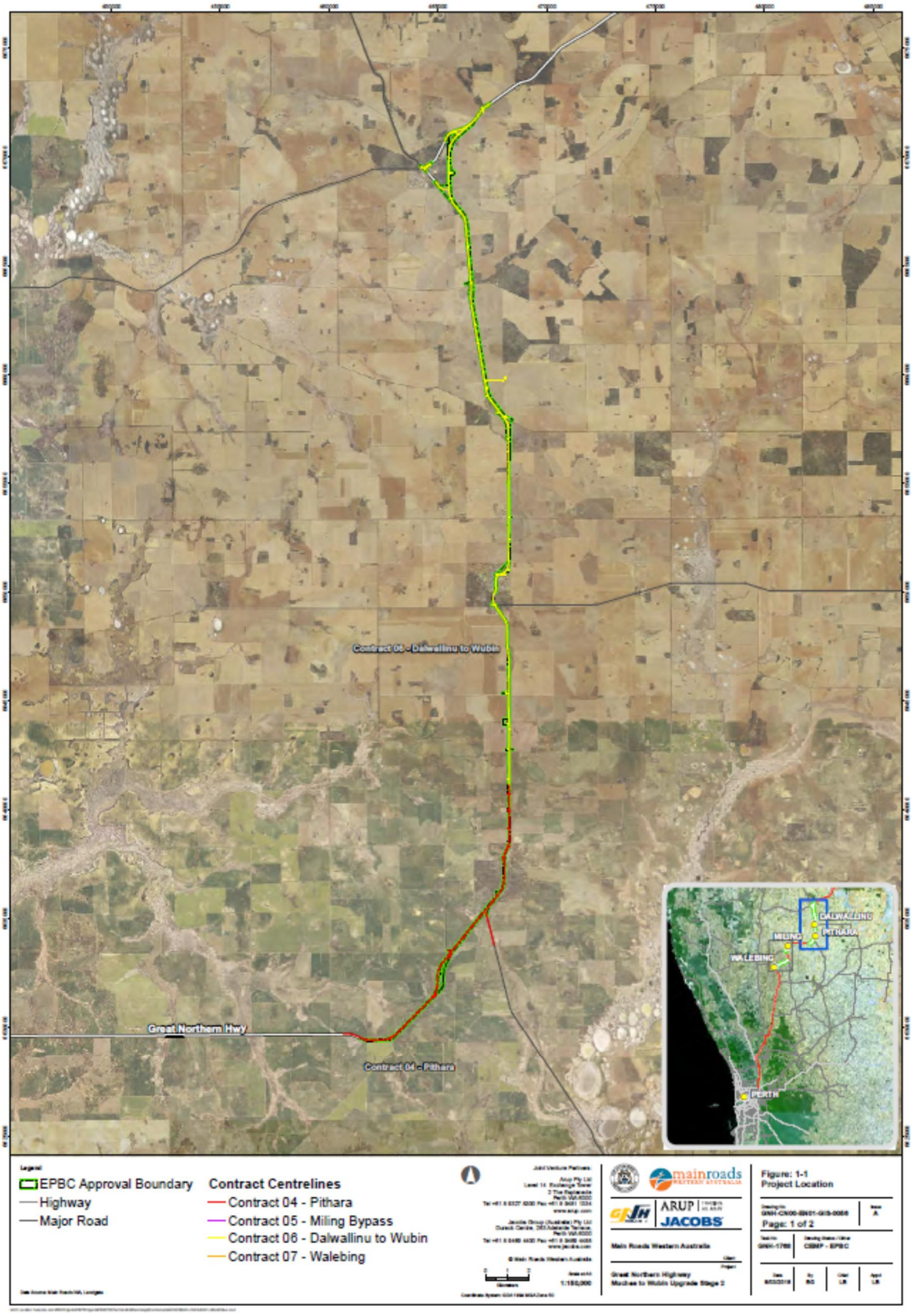
1.7 Project Schedule

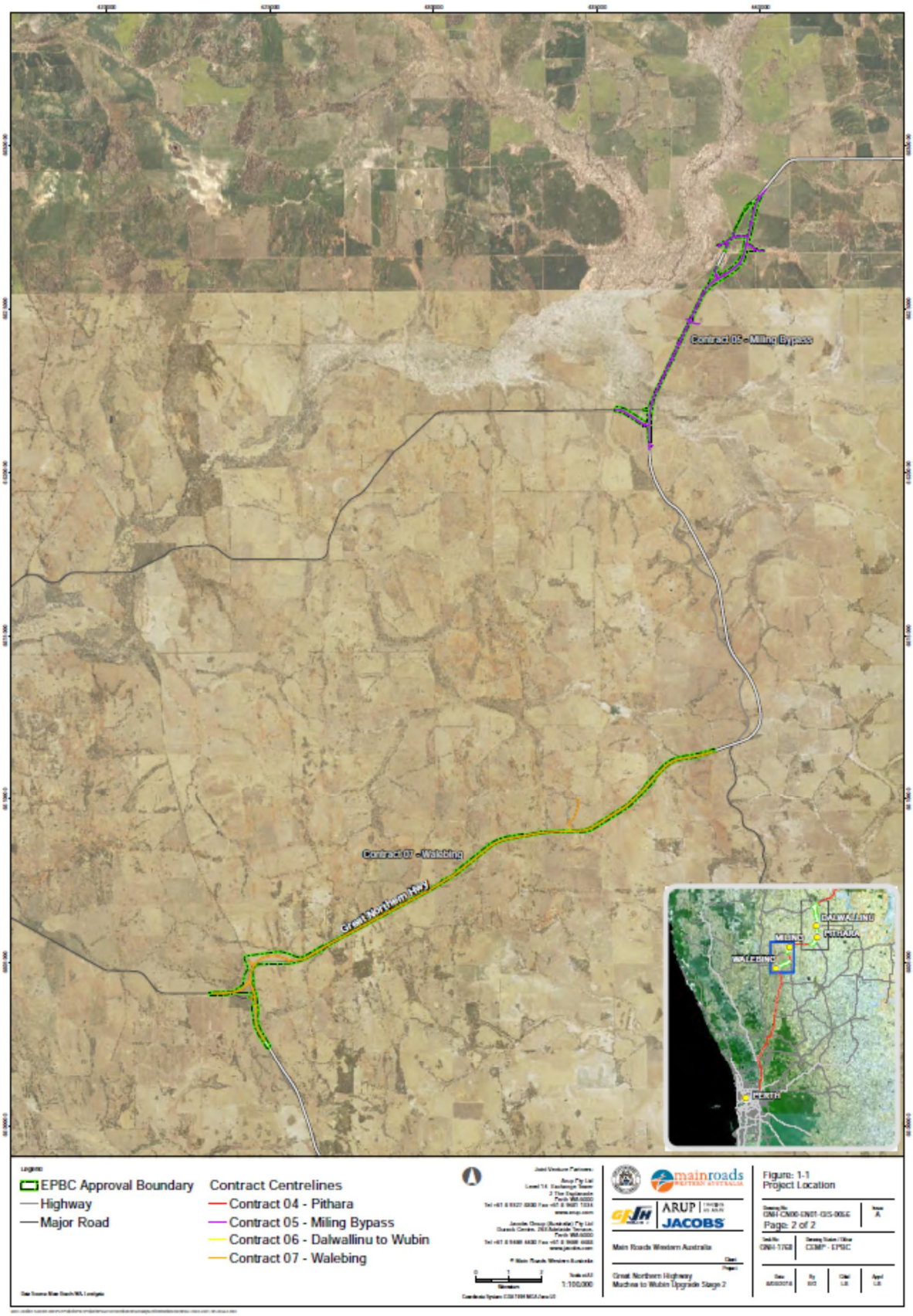
Table 1-3 outlines the planned project schedule. These dates are subject to change depending on a number of factors and will be updated accordingly. The design life for the sections of highway constructed as part of this project is 50 years with resealing expected to be required every 10 years. It should be noted that as discreet sections of road are completed they may be progressively opened to traffic. The Operation Start date therefore represents the date when construction is completed and the entire construction contract area is opened to traffic.

Table 1-3 : Project Schedule

Construction Contract	Commencement (Construction Start)	Construction Completed	Operation Start
Pithara	April 2018	August 2019	September 2019
Miling Bypass	April 2018	April 2019	April 2019
Walebing	Quarter 4 2018	Quarter 4 2019	Quarter 4 2019
Dalwallinu to Wubin	Quarter 4 2018	Quarter 4 2019	Quarter 4 2019

Figure 1-2 : Project Location




Contract 05 - Miling Bypass
Contract 07 - Walebing
Great Northern Hwy
DALWALLINU
PITHARA
MILING
WALEBING
PERTH
EPBC Approval Boundary
Highway
Major Road
Contract Centrelines
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1.8 Environmental Setting

1.8.1 Climate

The project area experiences warm dry summers and cool wet winters. Two Bureau of Meteorology (BoM) weather stations are located in proximity to the project at Dalwallinu (site number 008297) and Walebing (site number 008151). The average maximum temperature is recorded in January at both stations with 33.9 degrees Celsius recorded at Walebing and 35.3 degrees Celsius at Dalwallinu. The average minimum temperature is 5.4 degrees Celsius at Walebing and 5.8 degrees Celsius at Dalwallinu, both recorded in July. Average annual rainfall is 475.4 mm at Walebing, with the majority falling between May and September, and 290.7 mm at Dalwallinu, also with the majority falling between May and September, though significant falls are common in January and March (BoM, 2016).

1.8.2 Flora and Vegetation

Vegetation mapping undertaken by Phoenix Environmental Services (Phoenix) (2016) recorded 19 vegetation associations directly associated with the project. Broadly, the vegetation associations recorded represent medium woodlands (ie Vegetation Association 7 – Medium Woodland; York Gum & Wandoo). Of the 19 recorded vegetation associations, 15 are considered "underrepresented" as the current extent of these is less than 30% of the pre-European extent.

The condition of vegetation mapped by Phoenix (2016) ranged from Completely Degraded to Pristine, with Excellent and Pristine vegetation condition comprising only a small proportion of the area surveyed (0.93% (10.63 ha) and 0.12% (1.40 ha) respectively). A large proportion (74.86%; 856.29 ha) of the area surveyed passes through cleared areas classed as Completely Degraded (paddocks, roads and other infrastructure) and cleared and revegetated woodlands of non-indigenous species, which provide little value to fauna in terms of habitat or as ecological corridors. 92.72 ha (8.11%) of the vegetation to be cleared is considered Degraded, 89.40 ha (7.82%) is in Good condition and 93.43 ha (8.17%) is Very Good condition. A total area of 1143.87 ha will be cleared for the Project.

The surveys undertaken by Phoenix (2016) recorded eight flora species listed on the Department of Biodiversity, Conservation and Attractions (DBCA) Threatened (Declared Rare) and Priority Flora list (DPaW, 2016). These 8 species are not currently protected under the EPBC Act. **Table 1-4** lists these species and the Section of the Project in which they were recorded.

Table 1-4: Threatened (Declared Rare) and Priority Flora List

Scientific Name (Common Name)	Conservation Category	Section
Acacia isoneura subsp*. nimia*	P3	Pithara
Acacia scalena	P3	Dalwallinu to Wubin
Chamelaucium sp. Wongan Hills	P3	Miling Bypass
Daviesia debilior subsp*. sinuans*	P3	Dalwallinu to Wubin
Frankenia glomerata (Cluster Head Frankenia)	P3	Miling Bypass
Grevillea asparagoides	P3	Miling Bypass Dalwallinu to Wubin
Verticordia venusta	P3	Dalwallinu to Wubin
Banksia benthamiana	P4	Dalwallinu to Wubin

A record of the EPBC listed Threatened flora species *Eremophila pinnatifida* is located within the Dalwallinu to Wubin construction contract area, approximately 1.0 km south of Nugadong Nature Reserve. No live plants have been recorded at this location though soil stored seed is likely to be present.

A total of 87.37 ha of the Eucalypt Woodlands TEC has been recorded by Phoenix (2015; 2016a, b, c) within and adjacent to the project area (**Figure 1-3**). The condition of the Eucalypt Woodlands TEC ranged from Degraded to Pristine. Very Good to Pristine areas of the Eucalypt Woodlands TEC are generally associated with larger patches of vegetation which extend beyond the road reserve. No clearing is anticipated in Eucalypt Woodlands TEC identified as being in Excellent or Pristine condition while approximately 70% of clearing will occur within areas of Eucalypt Woodlands TEC identified as Degraded or Completely Degraded. **Table 1-5** shows the quality of Eucalypt Woodland TEC proposed to be cleared.

Table 1-5: Quality of Eucalypt Woodland TEC proposed to be cleared

Vegetation Quality Category	Area (ha)	Percentage of cleared area
Pristine	0.22	0.25 %
Excellent	0.45	0.51 %
Very Good	10.52	12.04 %
Good	21.15	24.21 %
Degraded	55.03	62.99 %

1.8.3 Weeds and Disease

A total of 45 weed species were recorded during the flora and vegetation surveys (Phoenix, 2016). Four weed species are Declared Plants under the WA Biosecurity and Agriculture Management Act 2007 (BAM Act) (Phoenix, 2016).

- Asparagus asparagoides (Bridal creeper);
- *Echium plantagineum* (Patterson's curse),
- *Emex australis* (Spiny emex); and
- *Opuntia monacantha* (Barabary fig).

Asparagus asparagoides and *Opuntia monacantha* are also Weeds of National Significance (WoNS).

Phytophthora Dieback is caused by a soil borne pathogen that occurs in areas receiving more than 400 mm annual rainfall (Terratree, 2016). In relation to this CEMP, only the Walebing section is within this area of occurrence, however, the Terratree report (2016) explains why the physical environment in the area is not conducive to spreading dieback. A *Phytophthora* Dieback and disease occurrence assessment was undertaken between 19 January and 5 February 2016 (Terratree, 2016). The assessment resulted in no Dieback infestations being observed or diagnosed within the project footprint. All samples taken from recently dead disease indicator species within the assessment area returned negative results for *Phytophthora* Dieback.

Surveys undertaken by Terratree (2016) concluded that the majority of the assessment area is predominantly cleared agricultural land and therefore categorised as *Excluded* (areas that have been disturbed to an extent that they are not assessable and therefore excluded from dieback interpretation). The following areas contained sufficient native vegetation to be able to be mapped (see **Figure 1-4**):

- Intersection of Midland Road and Great Northern Highway: this area was found to be *Protectable Uninterpretable* which defines areas of land, over which hygiene management rules for *Phytophthora* dieback, including clean on entry, will apply.
- Two *Uninterpretable* wetland areas and watercourses that do not meet the protocol for being *Protectable* because of their size or dimensions; and

- One small *Uninterpretable* area associated with a drainage line was determined to be *Unprotectable* because of its size and dimensions.

The *Phytophthora* Dieback categories are as defined by the Department of Biodiversity, Conservation and Attractions. These categories are discussed in more detail in the Terratree (2016) report.

1.8.4 Fauna

Nine fauna habitats occur within the project area as follows:

- cleared (agriculture, road, infrastructure);
- cleared and revegetated non-native woodland mosaic;
- shrubland (thicket);
- Jarrah, Marri, Wandoo and/or Banksia woodland;
- York Gum, Wandoo, Salmon Gum, and/or Gimlet woodland;
- Paperbark or Sheoak woodland;
- succulent steppe/samphire;
- low heath/scrub shrubland; and
- succulent steppe/samphire with woodland or shrubland (Phoenix, 2016).

The majority of the project area (75%) comprises cleared areas (paddocks, roads and other infrastructure) and cleared and revegetated woodlands. The habitats present vary in quality and suitability for fauna. Most of the native vegetation remnants are of low value as fauna habitat due to a poor or absent native understory, presence of weeds, presence of feral animals, narrowness of the existing habitat, fragmentation from other areas of native vegetation by cleared or highly degraded areas and the lack of native vegetation in the surrounding agricultural landscape (Phoenix, 2016).

The Shield-back Trapdoor Spider, the Forest Red-tailed Black Cockatoo, Western Spiny-tailed Skink and Malleefowl were identified as 'possibly' occurring within the project area. The Western Spiny-tailed Skink and Malleefowl may occur in woodland and shrubland habitats between Dalwallinu and Wubin (Phoenix, 2016), however this habitat is largely degraded and fragmented. Additionally, no evidence of Malleefowl (including nests, which persist in the environment after use) were recorded during surveys of the area, thereby indicating that the species is not resident in the vicinity of the project (Phoenix, 2016).

One Endangered fauna species (Carnaby's Black Cockatoo) has been directly recorded from the project area (Phoenix 2016), and is within the known breeding range for Carnaby's Black Cockatoo. Phoenix (2016) has recorded a total of 203.08 ha of breeding/ foraging habitat for Carnaby's Black Cockatoo across the area of the proposed action (**Figure 1-5**) (this includes 87.37 ha of Eucalypt Woodland TEC that is proposed to be cleared). Research has shown that the availability of foraging habitat within 6 km of nesting trees has a significant relationship to breeding success (Parks and Wildlife 2013). In addition to this breeding/foraging habitat, 17 trees showing evidence of use by the species, 13 trees with hollows suitable for use and 1,194 potential breeding trees (diameter at breast height greater than 500 mm) have been recorded within and adjacent to the project area. No Quality or Valued foraging habitat was recorded or mapped by Phoenix (2015; 2016).

No trees with hollows that have currently been identified as suitable for use or have evidence of being used by Carnaby's Black Cockatoo will be cleared during construction activities.

1.9 Impact Management Objectives

The project management objectives in relation to impacts to Carnaby's Black Cockatoo and the Eucalypt Woodlands TEC are:

- Improve the condition of the Eucalypt Woodlands TEC and Carnaby's Black Cockatoo habitat adjacent to the area of disturbance
- No clearing beyond approved limits of the Eucalypt Woodlands TEC or Carnaby's Black Cockatoo habitat.
- To achieve performance targets and completion criteria for Carnaby's Black Cockatoo and Eucalypt Woodlands TEC.

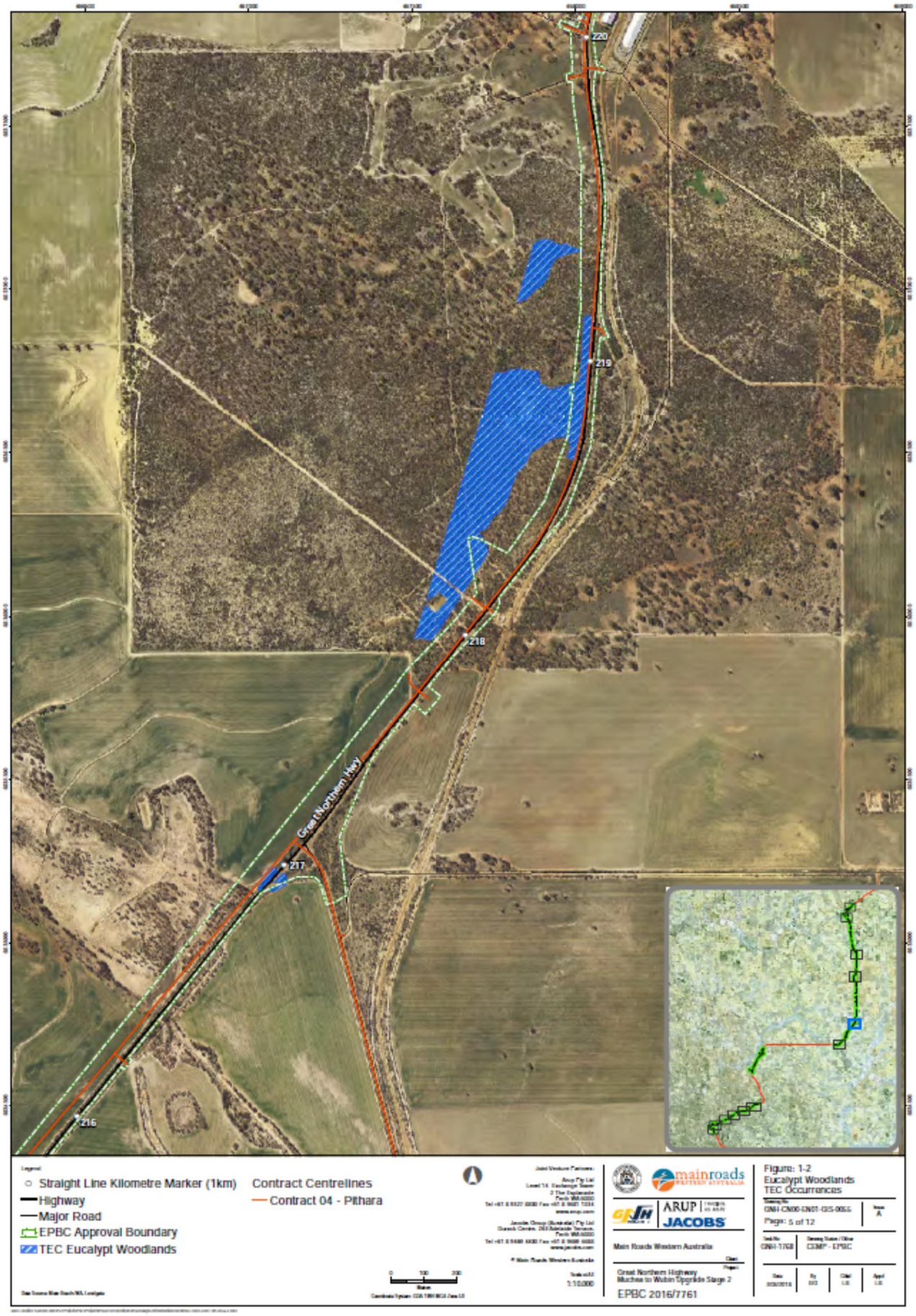
Performance targets and completion criteria supporting these objectives are detailed in **Section 4**.

Figure 1-3 : Eucalypt Woodlands TEC Occurrences


253
Great Northern Hwy
252
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
TEC Eucalypt Woodlands
Contract Centrelines
Contract 06 - Dalwallinu to Wubin
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761
Figure: 1-2
Eucalypt Woodlands
TEC Occurrences


Great Northern Hwy
240
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
TEC Eucalypt Woodlands
Contract Centrelines
Contract 06 - Dalwallinu to Wubin
mainroads
ARUP
JACOBS
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761
Figure: 1-2
Eucalypt Woodlands
TEC Occurrences
Page: 3 of 12


Clinch Rd
Acacia Way
Great Northern Hwy
234
233
232
Straight Line Kilometre Marker (1km)
Highway
Major Road
EPBC Approval Boundary
TEC Eucalypt Woodlands
Contract Centrelines
Contract 06 - Dalwallinu to Wubin
Figure: 1-2
Eucalypt Woodlands
TEC Occurrences
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761


Z20
Z19
Z18
Z17
Z16
Great Northern Hwy
Straight Line Kilometre Marker (1km)
Highway
Major Road
EPBC Approval Boundary
TEC Eucalypt Woodlands
Contract Centrelines
Contract 04 - Pithara
Figure: 1-2
Eucalypt Woodlands
TEC Occurrences
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761


Great Northern Hwy
230
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
TEC Eucalypt Woodlands
Contract Centrelines
Contract 04 - Pilbara
mainroads
ARUP
JACOBS
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761
Figure: 1-2
Eucalypt Woodlands
TEC Occurrences
Page: 6 of 12


Great Northern Hwy
165
164
163
162
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
TEC Eucalypt Woodlands
Contract Centrelines
Contract 07 - Walebing
Figure: 1-2
Eucalypt Woodlands
TEC Occurrences
Page: 7 of 12
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761


Great Northern Hwy
159
160
161
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
TEC Eucalypt Woodlands
Contract Centrelines
Contract 07 - Walebing
mainroads
ARUP
JACOBS
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761
Figure: 1-2
Eucalypt Woodlands
TEC Occurrences
Page: 8 of 12
CEMP - EPBC


Great Northern Hwy
156
157
158
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
TEC Eucalypt Woodlands
Contract Centrelines
Contract 07 - Walebing
mainroads
ARUP
JACOBS
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761
Figure: 1-2
Eucalypt Woodlands
TEC Occurrences


Great Northern Hwy
153
154
155
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
TEC Eucalypt Woodlands
Contract Centrelines
Contract 07 - Walebing
mainroads
ARUP
JACOBS
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761
1:10,000
Figure: 1-2
Eucalypt Woodlands
TEC Occurrences
Page: 10 of 12
CEMP - EPBC


Great Northern Hwy
152
151
150
149
148
Straight Line Kilometre Marker (1km)
Highway
Major Road
EPBC Approval Boundary
TEC Eucalypt Woodlands
Contract Centrelines
Contract 07 - Walebing
Figure: 1-2
Eucalypt Woodlands
TEC Occurrences
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761

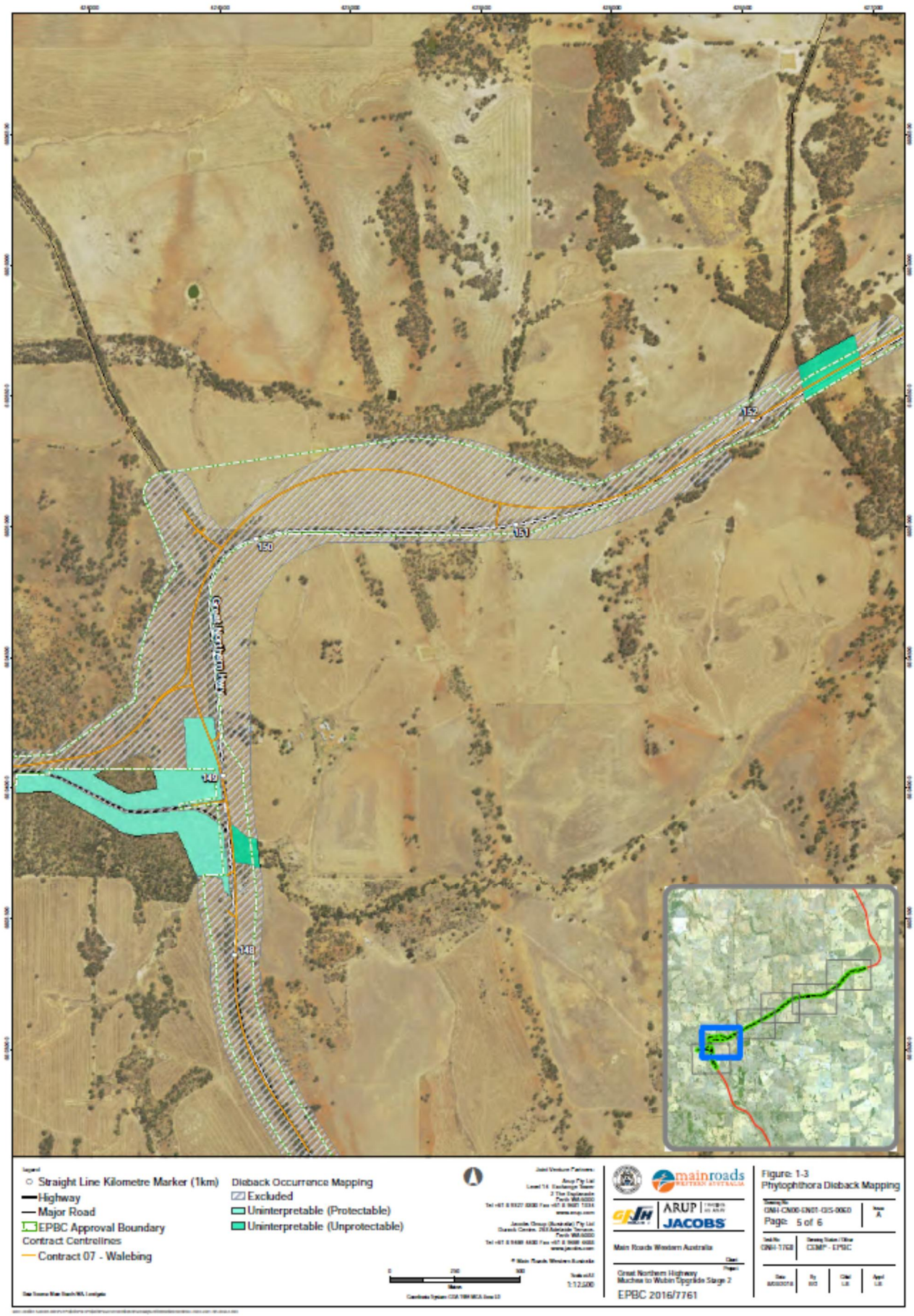

151
150
149
148
147
Straight Line Kilometre Marker (1km)
Highway
Major Road
EPBC Approval Boundary
TEC Eucalypt Woodlands
Contract Centrelines
Contract 07 - Walebing
Figure: 1-2
Eucalypt Woodlands
TEC Occurrences
Page: 12 of 12
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761

Figure 1-4 : *Phytophthora* Dieback Mapping


Great Northern Hwy
159
160
161
162
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
Contract Controlines
Contract 07 - Walebing
Dieback Occurrence Mapping
Excluded
mainroads
ARUP
JACOBS
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761
Figure: 1-3
Phytophthora Dieback Mapping
Page: 2 of 6


Great Northern Highway
155
156
157
158
159
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
Contract Centrelines
Contract 07 - Walebing
Dieback Occurrence Mapping
Excluded
Uninterpretable (Unprotectable)
1:15,000
mainroads
ARUP
JACOBS
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761
Figure: 1-3
Phytophthora Dieback Mapping
Page: 3 of 6


Great Northern Hwy
156
155
154
153
152
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
Contract Controlines
Contract 07 - Walebing
Dieback Occurrence Mapping
Excluded
Uninterpretable (Unprotectable)
1:15,000
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761
Figure: 1-3
Phytophthora Dieback Mapping
Page: 4 of 6


Straight Line Kilometre Marker (1km)
Highway
Major Road
EPBC Approval Boundary
Contract Controlines
Contract 07 - Walebing
Dieback Occurrence Mapping
Excluded
Uninterpretable (Protectable)
Uninterpretable (Unprotectable)
Great Northern Highway
152
151
150
149
148
mainroads
ARUP
JACOBS
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgride Stage 2
EPBC 2016/7761
Figure: 1-3
Phytophthora Dieback Mapping
Page: 5 of 6

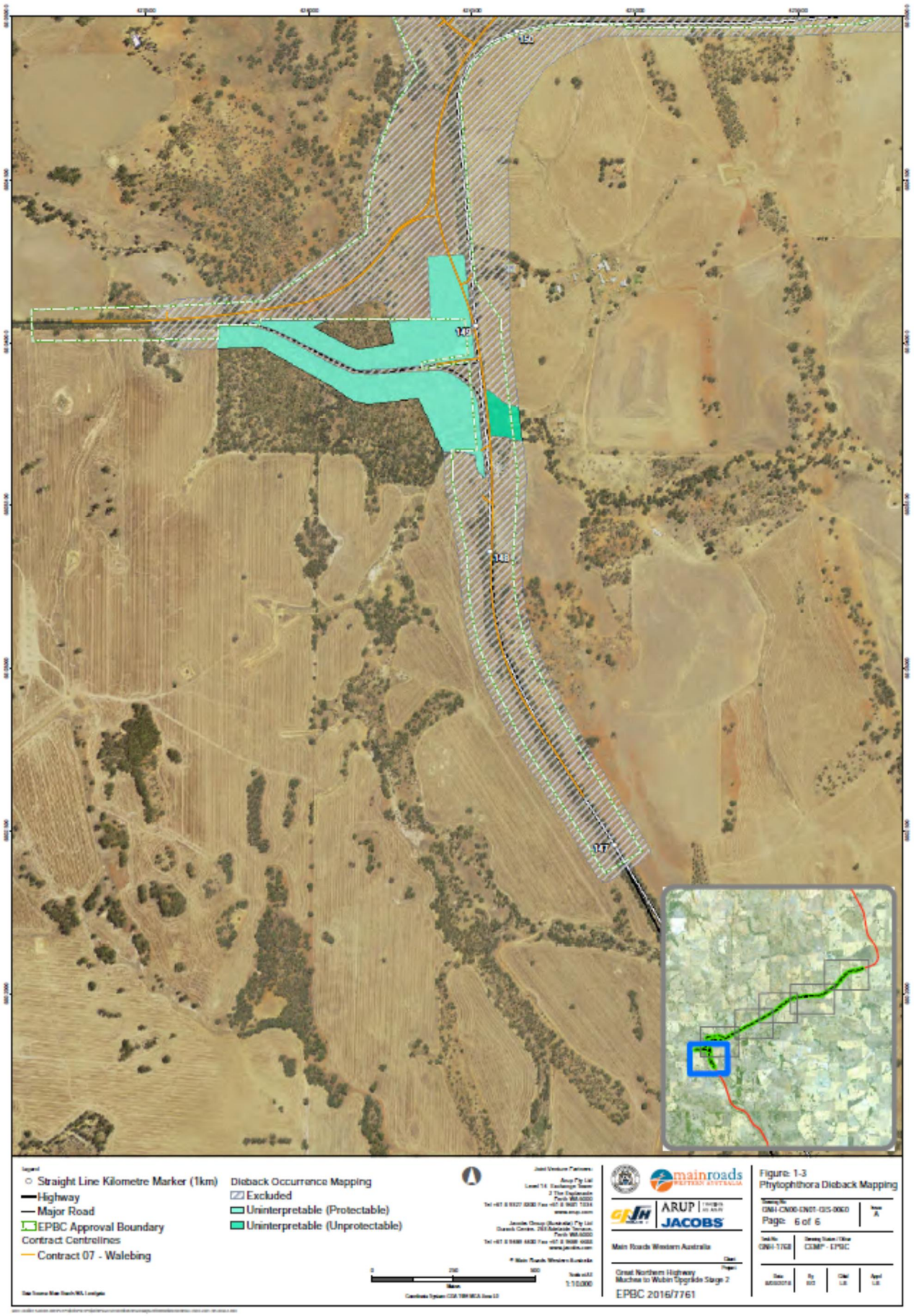

Straight Line Kilometre Marker (1km)
Highway
Major Road
EPBC Approval Boundary
Contract Centrelines
Contract 07 - Walebing
Dieback Occurrence Mapping
Excluded
Uninterpretable (Protectable)
Uninterpretable (Unprotectable)
1:10,000
Figure: 1-3
Phytophthora Dieback Mapping
Page: 6 of 6
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761

Figure 1-5 : Carnaby's Black Cockatoo Habitat


255
254
253
252
Great Northern Hwy
Straight Line Kilometre Marker (1km)
Highway
Major Road
EPBC Approval Boundary
CBC Foraging Habitat
Low value
Contract Centrelines
Contract 06 - Dalwallinu to Wubin
mainroads
ARUP
JACOBS
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761
Figure: 1-4
Carnaby's Black Cockatoo Habitat
Page: 2 of 21


253
Great Northern Hwy
252
251
250
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
CBC Foraging Habitat
Low value
Contract Centrelines
Contract 06 - Dalwallinu to Wubin
mainroads
ARUP
JACOBS
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761
Figure: 1-4
Carnaby's Black Cockatoo Habitat
Page: 3 of 21


250
249
248
247
Great Northern Hwy
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
CBC Foraging Habitat
Low value
Contract Centrelinec
Contract 06 - Dalwallinu to Wubin
ARUP
JACOBS
mainroads
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761
Figure: 1-4
Carnaby's Black Cockatoo Habitat
Page: 4 of 21

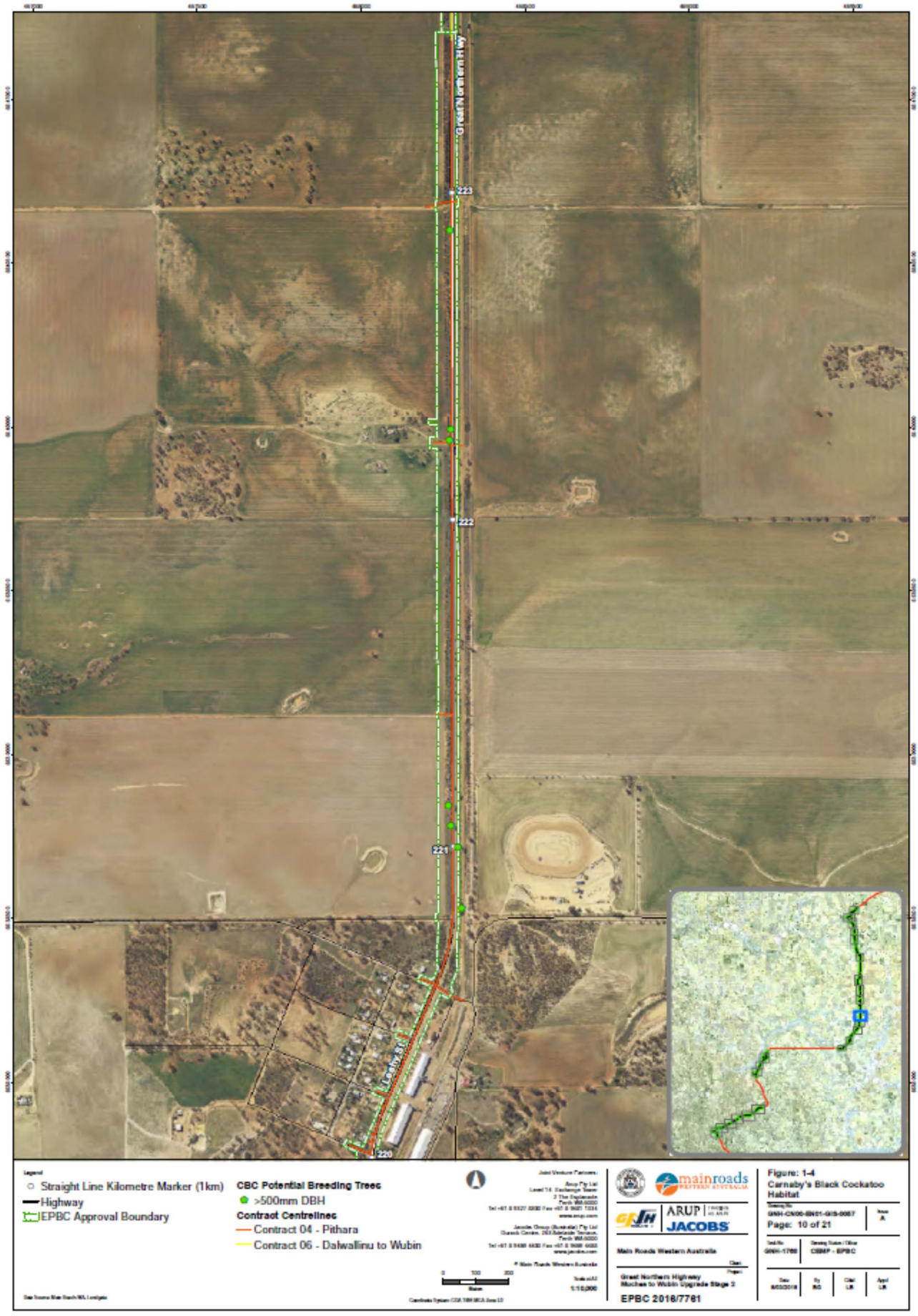

247
246
245
Great Northern Hwy
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
CBC Foraging Habitat
Low value
Contract Centrelines
Contract 06 - Dalwallinu to Wubin
mainroads
ARUP
JACOBS
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761
Figure: 1-4
Carnaby's Black Cockatoo
Habitat
Page: 5 of 21


242
241
240
230
Great Northern Hwy
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
CBC Foraging Habitat
Low value
CBC Potential Breeding Trees
>500mm DBH
CBC Habitat Trees
Suitable Hollow
Contract Centrelines
Contract 06 - Dalwallinu to Wubin
mainroads
ARUP
JACOBS
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7781
Figure: 1-4
Carnaby's Black Cockatoo Habitat
Page: 6 of 21
CEMP - EPBC


235
234
Clinch Rd
233
Acacia Way
232
Great Northern Hwy
231
Straight Line Kilometre Marker (1km)
Highway
Major Road
EPBC Approval Boundary
CBC Foraging Habitat
Low value
CBC Potential Breeding Trees
>500mm DBH
Contract Centrelines
Contract 06 - Dalwallinu to Wubin
mainroads
ARUP
JACOBS
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7781
Figure: 1-4
Carnaby's Black Cockatoo Habitat
Page: 7 of 21

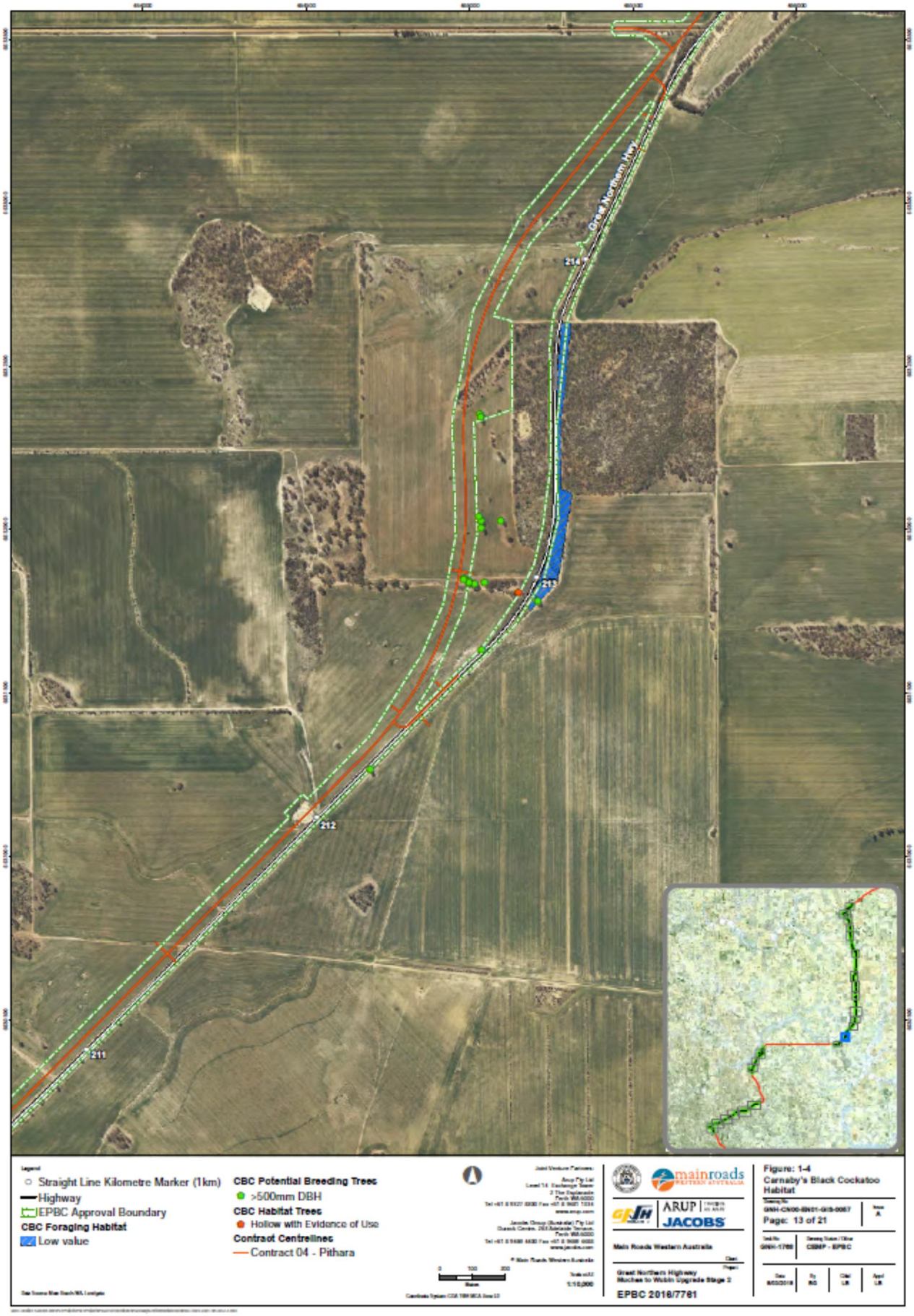

231
230
229
228
Great Northern Hwy
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
CBC Potential Breeding Trees
>500mm DBH
Contract Centrelines
Contract 06 - Dalwallinu to Wubin
Figure: 1-4
Carnaby's Black Cockatoo Habitat
Page: 8 of 21
Main Roads Western Australia
Great Northern Highway Muchea to Wubin Upgrade Stage 2
EPBC 2016/7781


228
227
Great Northern Hwy
226
225
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
CBC Potential Breeding Trees
>500mm DBH
Contract Centrelines
Contract 06 - Dalwallinu to Wubin
mainroads
ARUP
JACOBS
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761
Figure: 1-4
Carnaby's Black Cockatoo
Habitat
Page: 9 of 21


Great Northern Highway
223
222
221
220
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
CBC Potential Breeding Trees
>500mm DBH
Contract Centrelines
Contract 04 - Pithara
Contract 06 - Dalwallinu to Wubin
mainroads
ARUP
JACOBS
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761
Figure: 1-4
Carnaby's Black Cockatoo Habitat
Page: 10 of 21


221
220
219
218
Great Northern Hwy
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
CBC Foraging Habitat
Low value
CBC Potential Breeding Trees
>500mm DBH
Contract Centrelines
Contract 04 - Pithara
mainroads
WESTERN AUSTRALIA
ARUP
JACOBS
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761
Figure: 1-4
Carnaby's Black Cockatoo Habitat
Page: 11 of 21

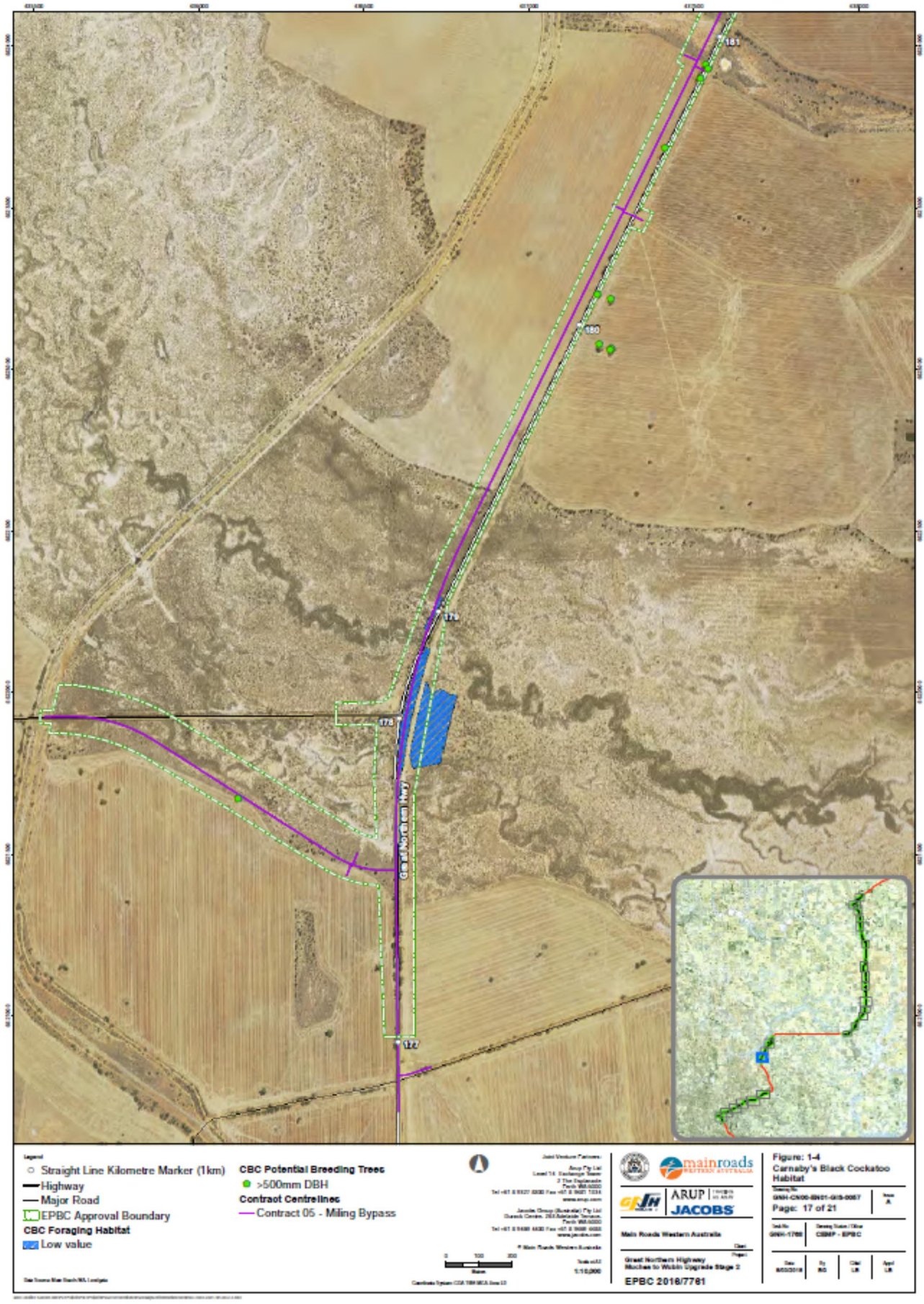

Great Northern Hwy
Highway
Major Road
EPBC Approval Boundary
CBC Foraging Habitat
Low value
CBC Potential Breeding Trees
>500mm DBH
Contract Centrelines
Contract 04 - Pithara
Figure: 1-4
Carnaby's Black Cockatoo Habitat
Page: 12 of 21
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761


Great Northern Hwy
214
213
212
211
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
CBC Foraging Habitat
Low value
CBC Potential Breeding Trees
>500mm DBH
CBC Habitat Trees
Hollow with Evidence of Use
Contract Centrelines
Contract 04 - Pithara
mainroads
ARUP
JACOBS
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761
Figure: 1-4
Carnaby's Black Cockatoo Habitat
Page: 13 of 21


Great Northern Hwy
211
210
209
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
CBC Potential Breeding Trees
>500mm DBH
Contract Centrelines
Contract 04 - Pithara
mainroads
ARUP
JACOBS
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7781
Figure: 1-4
Carnaby's Black Cockatoo Habitat
Page: 14 of 21
CEMP - EPBC


186
185
184
183
Great Northern Hwy
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
CBC Foraging Habitat
Low value
CBC Potential Breeding Trees
>500mm DBH
Contract Centrelines
Contract 05 - Miling Bypass
mainroads
ARUP
JACOBS
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761
Figure: 1-4
Carnaby's Black Cockatoo Habitat
Page: 15 of 21


183
182
181
180
Great Northern Hwy
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
CBC Foraging Habitat
Low value
CBC Potential Breeding Trees
>500mm DBH
CBC Habitat Trees
Hollow with Evidence of Use
Suitable Hollow
Contract Centrelines
Contract 05 - Miling Bypass
mainroads
ARUP
JACOBS
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761
Figure: 1-4
Carnaby's Black Cockatoo Habitat
Page: 16 of 21
CEMP - EPBC


181
180
179
178
177
Great Northern Hwy
Straight Line Kilometre Marker (1km)
Highway
Major Road
EPBC Approval Boundary
CBC Foraging Habitat
Low value
CBC Potential Breeding Trees
>500mm DBH
Contract Centrelinec
Contract 05 - Miling Bypass
mainroads
ARUP
JACOBS
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7781
Figure: 1-4
Carnaby's Black Cockatoo Habitat
Page: 17 of 21


Great Northern Hwy
165
164
163
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
CBC Foraging Habitat
Low value
CBC Potential Breeding Trees
>500mm DBH
CBC Habitat Trees
Hollow with Evidence of Use
Suitable Hollow
Contract Centrelines
Contract 07 - Walebing
1:10,000
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761
Figure: 1-4
Carnaby's Black Cockatoo
Habitat
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Great Northern Hwy
161
160
162
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
CBC Foraging Habitat
Low value
CBC Potential Breeding Trees
>500mm DBH
CBC Habitat Trees
Hollow with Evidence of Use
Suitable Hollow
Contract Centrelines
Contract 07 - Walebing
Figure: 1-4
Carnaby's Black Cockatoo Habitat
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Main Roads Western Australia
Great Northern Highway Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761


Great Northern Hwy
156
157
158
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
CBC Potential Breeding Trees
>500mm DBH
CBC Habitat Trees
Hollow with Evidence of Use
Suitable Hollow
Contract Centrelines
Contract 07 - Walebing
mainroads
ARUP
JACOBS
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2018/7781
Figure: 1-4
Carnaby's Black Cockatoo Habitat
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153
154
155
156
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
CBC Foraging Habitat
Low value
CBC Potential Breeding Trees
>500mm DBH
CBC Habitat Trees
Hollow with Evidence of Use
Suitable Hollow
Contract Centrelines
Contract 07 - Walebing
mainroads
ARUP
JACOBS
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7761
Figure: 1-4
Carnaby's Black Cockatoo Habitat
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Great Northern Hwy
151
152
Straight Line Kilometre Marker (1km)
Highway
EPBC Approval Boundary
CBC Foraging Habitat
Low value
CBC Potential Breeding Trees
>500mm DBH
CBC Habitat Trees
Hollow with Evidence of Use
Contract Centrelines
Contract 07 - Walebing
mainroads
ARUP
JACOBS
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2016/7781
Figure: 1-4
Carnaby's Black Cockatoo
Habitat
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151
150
149
148
147
Great Northern Hwy
Straight Line Kilometre Marker (1km)
Highway
Major Road
EPBC Approval Boundary
CBC Foraging Habitat
Low value
CBC Potential Breeding Trees
>500mm DBH
Contract Centrelines
Contract 07 - Walebing
mainroads
ARUP
JACOBS
Main Roads Western Australia
Great Northern Highway
Muchea to Wubin Upgrade Stage 2
EPBC 2018/7761
Figure: 1-4
Carnaby's Black Cockatoo Habitat
Page: 23 of 21

2. Project Design Principles and Practices

The key design principle used by Main Roads to reduce impact to the Eucalypt Woodlands TEC and Carnaby's Black Cockatoos and/or their habitat is to prioritise construction of the Walebing to Wubin Project primarily within paddock and cleared areas as opposed to vegetated areas. To achieve this the majority of the alignment is constructed offline (ie. away from the existing road) as the majority of the vegetated areas exist in the current road reserve. This strategy reduces clearing of Carnaby's Black Cockatoo habitat by 33% and the amount of clearing of the TEC by 25%. Additionally, there is a 59% reduction in the number of potential breeding trees to be cleared and avoids clearing of known nesting trees or trees with hollows suitable for Carnaby's Black Cockatoo.

Design and pre-construction planning practices include:

- The IPT will conduct ongoing review of designs during design development and execution planning to:
  - identify if any known nesting trees or trees with suitable hollows are impacted and evaluate feasible alternative alignments or micro-alignment adjustments to avoid impacts;
  - review opportunities where batter slope angles in areas of cut or fill could be made steeper to reduce construction footprint and impacts to the Eucalypt Woodlands TEC and Carnaby's Black Cockatoo habitat, without significantly impacting on other considerations such as road safety, revegetation success or batter slope stability;
  - review strategies for providing landowners with access to their land and driveway relocations to determine if these can be refined to reduce impacts to native vegetation or if alternative solutions are available/feasible; and
  - review drainage design against *Phytophthora* dieback mapping to minimise the risk of transport of the pathogen via the drainage system.
- Additional areas required for construction such as laydown areas, stockpile areas and vehicle turn arounds will be located in areas that are not identified as containing Carnaby's Black Cockatoo habitat or Eucalypt Woodlands TEC. Laydown etc., areas will be located in cleared areas or areas of non-native vegetation in order to avoid clearing.
- Road reserve fencing (ring-lock fencing) through Reserve 15867 will be installed on foot, with vehicle access only to transport materials (including posts, strainer assemblies and concrete) to construct strainer assemblies.
- Traffic management alternatives to side roads, such as reduction of the road to a single lane with movement controlled by either temporary electronic signals or by qualified traffic management personnel, will be considered. Where alternatives to side roads are not feasible, justification for the use of side roads will be provided by the Construction Contractor's Representative to the Main Roads Superintendent. Side roads will not be constructed in, or impact on, areas of Eucalypt Woodlands TEC or Carnaby's Black Cockatoo habitat.
- Inclusion of safety barriers in lieu of a design standard compliant safety clear zone where trees with hollows used by or suitable for Carnaby's Black Cockatoo are within 10 m of the edge of seal. Wildlife warning signs will also be installed in these instances. Areas of Eucalypt Woodlands TEC and trees with hollows used by or suitable for Carnaby's Black Cockatoo (trees with suitable nest hollow or are of a suitable diameter at breast height (DBH) to develop a nest hollow[1]) within the construction boundary that can be avoided are identified as 'No-Go Areas'. No-go areas are marked in construction drawings, detailed in Principal's Environmental Management Plans and flagged on site.

[1] For most tree species, suitable DBH is a minimum of 500 mm. For salmon gum and wandoo, suitable DBH is a minimum of 300 mm

- Revegetation uses species known to be foraging or breeding habitat for Carnaby's Black Cockatoo and/or representative of the Eucalypt Woodlands TEC, and based on the adjacent vegetation composition.

3. Potential Environmental Impacts and Risks

3.1 Threats to Matters of National Environmental Significance

There are two Matters of National Environmental Significance (MNES) relevant to the Walebing to Wubin Project; Carnaby's Black Cockatoo (Endangered); and the Eucalypt Woodlands of the WA Wheatbelt Threatened Ecological Community (Critically Endangered). The key threats to these MNES as a result of implementation of the project are:

- Carnaby's Black Cockatoo:
  - Clearing of foraging habitat;
  - Vehicle strike;
  - Clearing of potential and known nesting trees; and
  - Introduction and/or spread of weeds, dust and dieback, and altered surface flows, resulting in degradation of the TEC.
- Eucalypt Woodlands TEC:
  - Clearing of this TEC resulting in reduced occurrence;
  - Fragmentation into smaller, disconnected patches;
  - Increased accessibility to areas of TEC being intersected by the road, particularly in relation to pest animals; and
  - Introduction and/or spread of weeds, dust and dieback, and altered surface flows, resulting in degradation of the TEC.

3.2 Impacts to MNES

3.2.1 Carnaby's Black Cockatoo

Table 3-1 details the number of potential breeding trees and habitat that will be cleared for each Construction Contract area. Revegetation activities at the completion of construction will include planting and/or seeding with Carnaby's Black Cockatoo foraging and breeding species.

Table 3-1 : Clearing Requirements - Carnaby's Black Cockatoo Habitat

Construction Contract Area	Potential Breeding Trees	Habitat (ha)
Walebing	84	8
Miling Bypass	12	2
Pithara	14	6
Dalwallinu to Wubin	20	14
Total	**130**	**30**

The quality of foraging habitat for Carnaby's Black cockatoo may also be impacted by the introduction or spread of weeds and disease due to construction activities. Vegetation health may also be adversely affected from increased dust deposition during construction or through accidental fires originating from construction activities.

During both construction and operation of the road, there is a possibility of collisions between Carnaby's Black Cockatoos and vehicles resulting in injury or death of the cockatoo.

3.2.2 Eucalypt Woodlands TEC

A total of 15 hectares of the Eucalypt Woodlands TEC will be cleared for the purposes of the project. Landscaping activities will include revegetation with Eucalypt Woodlands TEC species. **Table 3-2** details the clearing required for each construction contract area.

Table 3-2 : TEC Clearing Requirements by Construction Contract

Construction Contract Area	Area Mapped by Phoenix (2016) (ha)	Clearing Requirement (ha)	Clearing as a percentage of Phoenix (2016) mapped area
Walebing	64.30	11.50	17.88%
Miling Bypass	0.00	N/A	N/A
Pithara	16.04	1.00	6.23%
Dalwallinu to Wubin	7.03	2.50	35.56%
Total	**87.37**	**15.00**	**17.17%**

Other potential impacts to the Eucalypt Woodlands TEC are:

- Disturbance of the root system from excavations for road cuttings;
- Reduced vegetation health due to soil compaction and changes to infiltration in the immediate vicinity of the road. As compaction and infiltration changes will be confined to the road formation with Eucalypt Woodlands TEC occurrences approximately five to 10 m from the edge of the road, there is likely to be negligible impact on the health of the TEC.
- Vegetation health may also be adversely affected from increased dust deposition during construction or through accidental fires originating from construction activities.

3.3 Risk Assessment

A Construction Environmental Risk Assessment was undertaken for the Walebing to Wubin project during the preliminary environmental impact assessment. A risk assessment workshop was conducted on July 2015 with the IPT. The outcomes of this risk assessment workshop were recorded in the Construction Environmental Risk Register (CERR). The CERR provides detailed information on the environmental aspects and predicted impacts for the project, including management and control measures for each respective activity. The CERR is a live document, and will continue to be revisited on receipt of approvals, in response to changes in scope or as a result of environmental incident. The CERR items relating to identified impacts to Carnaby's Black Cockatoo habitat and the Eucalypt Woodlands is summarised in **Table 3-3**. The assessment framework and definitions for Likelihood and Consequence ratings are provided in **Appendix A**.

Table 3-3 : MNES Risk Assessment (from CERR)

Management Objective / Desired Outcome	Impact (Event or Circumstance)	Relevant Management Measures/Actions	Residual Risk		
			Likelihood	Consequence	Risk Rating
To avoid impacts to Carnaby's Black Cockatoo habitat beyond that approved.	Clearing of more than the approved amount of 30 ha of habitat or clearing of habitat outside of approved areas.	· Area to be cleared will be accurately pegged/marked on the ground. · Additional areas required for construction such as laydown areas, stockpile areas and vehicle turn around, will be located in cleared areas or areas of non-native vegetation. · Revegetation of cleared areas more than 10 m from the road with species mixes which include Carnaby's Black Cockatoo breeding and foraging species.	Unlikely	High	Medium
	Clearing of more than the approved number of potential breeding trees (130).	· Installation of safety barriers to avoid clearing of potential breeding trees. · Additional areas required for construction such as laydown areas, stockpile areas and vehicle turn around located in cleared areas or areas that do not contain potential breeding trees.	Unlikely	Minor	Low
	Introduction or spread of weeds and disease impacting on vegetation health or condition from plant and machinery	· Weed and hygiene control measures will be in place during construction including: 4 verifying all plant and machinery as clean prior to arrival at site; 4 segregating stripped topsoil according to its weed and disease status; and 4 clean on entry/exit protocols for areas at risk from weed/disease introduction or spread.	Possible	High	Medium
	Introduction or spread of weeds and disease impacting on vegetation health of condition from unauthorised site access	· The site will be controlled as a construction site with no unauthorised access permitted.	Rare	High	Low
	Reduced vegetation health due to construction dust emissions.	· Dust suppression will be used on all cleared areas during construction activities. · Vehicle speed on site will be limited due to safety (ie. <40 km/hr) and this will consequently reduce dust lift off.	Rare	Moderate	Low
	Damage to habitat from accidental fires resulting from construction activities.	· All hot works will be undertaken in accordance with Contractor's safety procedures which will be approved and reviewed by Main Roads Environmental Management Representative prior to works. · 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 will be observed and the requirements of these implemented.	Rare	Moderate	Low
	Injury or death caused by vehicle strikes.	· Revegetation designs do not include foraging or breeding plant species within 10 m of the road. · Wildlife hazard signage installed and maintained in areas at high risk of cockatoo-vehicle collisions. · Vehicle speed will be limited during construction and this will subsequently allow drivers more time to react to fauna on the road. · 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.	Rare	High	Low

Management Objective / Desired Outcome	Impact (Event or Circumstance)	Relevant Management Measures/Actions	Residual Risk		
			Likelihood	Consequence	Risk Rating
To avoid impacts to Eucalypt Woodlands TEC beyond that approved.	Clearing of more than the approved amount of 15 ha of TEC.	· Area to be cleared will be accurately pegged/marked on the ground. · Additional areas required for construction such as laydown areas, stockpile areas and vehicle turn around will be located in cleared areas or areas of non-native vegetation. · Revegetation of cleared areas more than 10 m from the road with species mixes which are representative to the Eucalypt Woodlands TEC.	Unlikely	High	Medium
	Disturbance to root systems of eucalypts within the TEC resulting in death of individual trees.	· Qualified arborist engaged to undertake pruning of tree roots greater than 50 millimetres in diameter.	Rare	Moderate	Low
	Introduction or spread of weeds and disease impacting on vegetation health or condition.	· Weed and hygiene control measures will be in place during construction including: 4 verifying all plant and machinery as clean prior to arrival at site; 4 segregating stripped topsoil according to its weed and disease status; and 4 clean on entry/exit protocols for areas at risk from weed/disease introduction or spread.	Possible	High	Medium
	Reduced vegetation health due to construction dust emissions.	· Dust suppression will be used on all cleared areas during construction activities. · Vehicle speed on site will be limited due to safety reasons which will consequently reduce dust lift-off.	Rare	Moderate	Low
	Damage to Carnaby's Black Cockatoo habitat or the Eucalypt Woodlands TEC from accidental fires resulting from construction activities.	· All hot works will be undertaken in accordance with contractor safety procedures. · All vehicles, plant and equipment to be fitted with fire extinguishers and restricted and to designated cleared areas. · Fire danger ratings and Shire vehicle movement bans will be observed and the requirements of these implemented.	Rare	Moderate	Low
To achieve performance targets and completion criteria for rehabilitation of Carnaby's Black Cockatoo habitat and Eucalypt Woodlands TEC.	Cockatoo - Vehicle collisions resulting in death of Cockatoos.	· Revegetation designs do not include foraging or breeding plant species within 10 m of the road. · Wildlife hazard signage installed and maintained in areas at high risk of cockatoo-vehicle collisions. · Vehicle speed will be limited during construction and this will subsequently allow drivers more time to react to fauna on the road · 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.	Rare	High	Low
	Revegetation fails to achieve completion criteria.	· Planting / seeding occurs at optimal time of year to promote seedling survival and seed germination. · Revegetation species mixes will be formulated to replicate the surrounding native vegetation. · Local provenance seed/seedling to be used in revegetation.	Unlikely	High	Medium
	Insufficient funds available to implement this CEMP.	· Project funding cost estimates include environmental management requirements.	Rare	Major	Medium

Management Objective / Desired Outcome	Impact (Event or Circumstance)	Relevant Management Measures/Actions	Residual Risk		
			Likelihood	Consequence	Risk Rating
	Weed control measures fail to achieve performance targets.	· Review weed control methods used to confirm they are appropriate for the target species. · Implement alternative methods of weed control.	Rare	Moderate	Low
	Stochastic events (wildfire/drought/flood) prejudice rehabilitation outcomes.	· Support emergency response organisations (e.g. assistance with firefighting) during construction. Road design allows for easy access for emergency services to high risk areas (e.g. large areas of vegetation).	Unlikely	High	Medium

4. Environmental Management

4.1 Environmental Management Implementation Schedule

Table 4-1 details the management measures and actions to be put in place to achieve the desired project outcomes and objectives, the timing of these and the related performance targets or completion criteria, triggers for investigations and the monitoring or reporting activities associated with each.

Table 4-1 : Environmental Management Implementation Schedule

Management Objective / Desired Outcome	Management Measures / Actions	Performance Target / Completion Criteria	Timing	Monitoring / Reporting Activity	Investigation / Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
Carnaby's Black Cockatoo Breeding Habitat							
To avoid impacts to Carnaby's Black Cockatoo habitat beyond that approved	All known nesting trees and trees with suitable hollows within the construction site boundary will be clearly marked 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. All environmental no-go areas clearly marked on site	On Contract award and prior to commencement of clearing.	Record of provision of drawings showing environmental no-go areas	Clearing more than 30 ha of Carnaby's Black Cockatoo habitat or areas outside of approved clearing areas, such as No-go areas	Affected areas must be included in the Landscape and Revegetation Plan within 2 weeks for the project and marked for revegetation with Carnaby's Black Cockatoo 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 Site Superintendent
	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 capable of being utilised, by Carnaby's Black Cockatoos for nesting	Surveys of potential nesting trees undertaken within 7 days prior to clearing All potential nesting trees are identified	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	Clearing undertaken without pre-clearing 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 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	Main Roads Superintendent Construction Contractor Environmental Management Representative
	If any Carnaby's Black Cockatoo is detected utilising any hollow in any tree the tree must be clearly identified and	All trees identified as currently utilised by Carnaby's Black Cockatoo are marked as no-go areas with a 10 m exclusion zone	Following survey of area to be cleared	Site inspection by Construction Contractor Environmental Management Representative prior to and following clearing to confirm	A tree currently utilised by Carnaby's Black Cockatoo is not marked as a no-go area with a 10 m radius	Clearing activities are immediately ceased in the vicinity of the unmarked trees and relevant trees	Construction Contractor Environment

	marked as a no-go area with a 10 m radius from the tree	All hollows being utilised by the species are detected during surveys		no-go areas are appropriately flagged / fenced Monthly site inspections		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.	Management Representative Main Roads Superintendent
	All trees identified as being utilised by Carnaby's Black Cockatoo must not be cleared until a suitably qualified person has verified that the hollows in the tree are no longer being used	No clearing of trees utilised by Carnaby's Black Cockatoo	Carnaby's Black Cockatoo breeding season	Surveys undertaken by suitably qualified person to confirm hollow is no longer being utilised by Carnaby's Black Cockatoo	Clearing of a tree currently utilised by Carnaby's Black Cockatoo. Suitably qualified person has not confirmed the tree is no longer being utilised by Carnaby's Black Cockatoo before it is cleared	Affected areas must be included in the Landscape and Revegetation Plan within 2 weeks for the project and marked for revegetation with Carnaby's Black Cockatoo foraging habitat species. If a tree currently utilised by the species is felled, clearing in the direct vicinity will cease immediately. 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 Environment Management Representative Main Roads Superintendent
	For each cleared hollow that is being utilised, or capable of being utilised by Carnaby's Black Cockatoo install at least three (3) artificial nesting hollows within 12 km of the location of the cleared hollow and in accordance with relevant artificial hollow guidance When artificial nesting hollows are installed, an annual review of scientific articles and information on artificial hollows suitable for CBC will be undertaken. This review will be conducted by a suitably qualified ecologist to ensure that practices are current and likely to be the most effective.	All artificial hollows are installed before the next breeding season Location and configuration of artificial hollows follow current best-practice guidelines	Prior to commencement of the next breeding season	Records of hollow installation, including date of installation, details of the type of artificial hollow, GPS coordinates of the tree, where it was placed on the tree and the relevant cleared hollow that is being offset.	Artificial hollows are not installed before the next breeding season. Best-practice artificial hollow guidance has not been followed and implemented.	Install artificial hollows as soon as practicable. Review and update procedures within 2 weeks of trigger being realised for future installations based on advice by suitably qualified person.	Main Roads Environmental Management Representative
	Artificial hollows are inspected and maintained at least annually	All artificial hollows are inspected annually.	Annually during the breeding season for inspecting hollow use.	Annual survey/inspection of hollows undertaken by suitably qualified experts	Inspection not undertaken for all artificial hollows as scheduled	Ensure inspection is scheduled during the next breeding season	Main Roads Environmental Management Representative Main Roads Environmental

		All required maintenance undertaken prior to the next breeding season	Annually prior to breeding season for artificial hollow maintenance and/or replacement	Hollow maintenance records	Maintenance not undertaken prior to the next breeding season	Required maintenance is carried out as soon as practicable	Management Representative
Environmentally Significant Vegetation Management (Carnaby's Black Cockatoo Habitat and Eucalypt Woodlands TEC)							
To avoid impacts to Carnaby's Black Cockatoo habitat beyond that approved	No clearing of Carnaby's Black Cockatoo habitat outside of the approval boundary	No clearing of Carnaby's Black Cockatoo habitat outside of the construction site boundary No clearing of habitat and nesting trees (known and potential) beyond approved limits	During construction	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	Clearing of Carnaby's Black Cockatoo habitat outside of the approval boundary Clearing of more than 30 hectares of Carnaby's Black Cockatoo habitat Clearing of suitable nesting hollow or known nesting hollow	Affected areas must be included in the Landscape and Revegetation Plan within 2 weeks for the project and marked for revegetation with Carnaby's 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
To avoid impacts to Eucalypt Woodlands TEC beyond that approved	Earthwork cuts (excluding earthworks for drainage construction) within 3.5 m of any tree within the Eucalypt Woodland TEC that is to be retained will be supervised by a qualified arborist. No clearing of Eucalypt Woodlands TEC outside of the approval boundary	No death of trees within the Eucalypt Woodlands TEC as a result of excavation activities No clearing of Eucalypt Woodlands TEC outside of the construction site boundary	During earthwork cuts (excluding earthworks for drainage construction) within 3.5 m of Eucalypt Woodland TEC During construction	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 Monthly site inspections Records of arborist engagement	Clearing of Eucalypt Woodlands TEC outside of the approval boundary Clearing of more than 15 hectares of Eucalypt Woodlands TEC Monthly site inspections identify death of tree(s) within Eucalypt Woodlands TEC adjacent to excavations Earthwork cuts (excluding earthworks for drainage construction) within 3.5 m of Eucalypt Woodland TEC that is to be retained are not supervised by a qualified arborist.	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. Areas where there are deaths within the TEC will get added to the Landscape and Revegetation Plan within 2 weeks. Earthwork cuts will be retrospectively inspected by a qualified arborist within 2 days, subject to availability.	Main Roads Superintendent Main Roads Environmental Management Representative Construction Contractor Environmental Management Representative.
Control of Access							
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	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	Intrusion into no-go area	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

				/ 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 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	Main Roads Superintendent
	Road reserve will be fenced to prevent stock accessing vegetation within the road reserve from adjacent farms. Construction site will be controlled by the Main Roads Superintendent to ensure no unauthorised access by humans during construction.	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 No unauthorised access by humans during construction	At completion of construction	Contract completion inspection	Stock reported in road reserve after installation of fence Evidence of unauthorised access to the construction site by humans. Damaged fencing	Inspect fencing prior to opening the road for operation to confirm fencing installation is complete. If fencing is incomplete, it will be completed as soon as practicable. 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 so that they can complete repairs Unauthorised humans will be required to immediately leave the construction site immediately.	Construction Contractor Representative 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
Fire							
To avoid impacts to Carnaby's Black Cockatoo habitat beyond that approved	All hot works will be undertaken in accordance with contractor safety procedures, which will be reviewed by Main Roads Environment Management Representative prior to works.	No ignitions / fires started as a result of hot works No impact on MNES as a result of ignitions/fires originating from work areas	During hot works such as welding	Monthly site inspections to confirm required controls are in place Training records for project personnel involved in hot works	Hot work procedures not correctly implemented/followed Ignition/ fire started as a result of hot works	Incident investigation and report undertaken within 1 week. Impacted areas included in revegetation plans within 2 weeks	Construction Contractor Environmental Management Representative

To avoid impacts to Eucalypt Woodlands TEC beyond that approved						Refresher training will be conducted within 1 week	
	All vehicles, plant and equipment to be fitted with appropriate exhaust system shielding and restricted to designated cleared areas	No ignitions / fires started as a result of hot vehicles exhausts, plant or equipment No impact on Carnaby's Black Cockatoo habitat or Eucalypt Woodlands TEC as a result of ignitions/fires originating from work areas	All activities	Incident reports related to fires	Fire originating from work area(s)	Incident investigation and report undertaken within 1 week. Impacted areas included in revegetation plans within 2 weeks Refresher training will be conducted within 1 week	Construction Contractor Environmental Management Representative
	Fire danger ratings and Shire vehicle movement bans will be observed and the requirements of these implemented	No operation of vehicles, plant or equipment in contravention of Fire danger ratings and Shire vehicle movement bans No impact on Carnaby's Black Cockatoo habitat or Eucalypt Woodlands TEC as a result of ignitions/fires originating from work areas	All activities outside of cleared areas	Pre-start and Toolbox meeting agenda items and/or minutes	Fire originating from work area(s)	Incident investigation and report undertaken within 1 week. Impacted areas included in revegetation plans within 2 weeks Refresher training will be conducted within 1 week	Construction Contractor Environmental Management Representative
Erosion and Dust Emissions							
To avoid impacts to Carnaby's Black Cockatoo habitat beyond that approved To avoid impacts to Eucalypt Woodlands TEC beyond that approved To achieve performance targets and completion criteria for Carnaby's Black Cockatoo and Eucalypt Woodlands TEC	Dust suppression (e.g. water carts) and/or surface stabilization measures (e.g. hydromulch) will be used to protect loose surfaces or cleared areas. Dust generating activities suspended during periods of high wind conditions	No visual dust plumes generated by construction activities	Post clearing and during construction	Monthly site inspections include visual monitoring for dust generation	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 realised	Construction Contractor Environmental Management Representative
	Reduced speed limits e.g <40 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
	Temporary construction drainage within or adjacent to Carnaby's Black Cockatoo habitat or Eucalypt Woodlands TEC will be designed and constructed such that it does	No evidence of erosion from construction activities within Carnaby's Black Cockatoo habitat or Eucalypt Woodlands TEC	Prior to and during construction	Monthly site inspections. Annual revegetation monitoring	Erosion identified in Carnaby's Black Cockatoo habitat or Eucalypt Woodlands TEC areas	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

	not result in scouring or erosion within these vegetated areas						
Weeds							
To avoid impacts to Carnaby's Black Cockatoo habitat beyond that approved To avoid impacts to Eucalypt Woodlands TEC beyond that approved	Clean on Entry and/or Exit (CoE) protocols will be in place as required by the results of dieback and weed mapping for the site	No breach of CoE protocols	All construction activities	Entry and/or exit records for CoE points Monthly site inspections	Breach of CoE protocol	Refresher training will be conducted within 1 week	Construction Contractor Environmental Management Representative
	All plant and machinery will be verified by the contractor to be clean and free of all vegetative and soil material prior to arriving at the work site	All vehicle/plant/equipment verified clean on arrival at site	All construction activities	Records verifying vehicle/plant/equipment arriving on site is clean	Vehicle/plant/equipment arriving on site without verification that it is clean of soil and vegetative matter	Refresher training will be conducted within 1 week	Construction Contractor Environmental Management Representative
	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)	No new occurrence of Declared Plants within the construction site boundary (in comparison to baseline levels) during construction activities	All construction activities	Monthly site inspections Annual revegetation monitoring	New occurrence of a Declared Plant identified	Application of weed eradication techniques for the weed species will be undertaken within 2 weeks Review of CoE process within 1 week	Construction Contractor Environmental Management Representative
	WoNS and environmental weeds within the construction site boundary will be treated according to the weed control management provided by Weeds Australia (http://weeds.ala.org.au/WoNS/)	No new occurrence of WoNS or environmental weeds within the construction site boundary (in comparison to baseline levels)	All construction activities	Monthly site inspections Annual revegetation monitoring	New occurrence of a WoNS or environmental weed identified	Application of weed eradication techniques for the weed species within 1 week Review of CoE process within 2 weeks	Construction Contractor Environmental Management Representative
Revegetation							
No nett loss of foraging and potential breeding habitat for Carnaby's Black Cockatoo Improve the condition of the ecological community adjacent to the area of disturbance To achieve performance targets and completion criteria for Carnaby's Black	Revegetation works will commence as early as practicable after completion of earthworks and within the optimum time of year (May-June) to enhance survival of seedlings and germination of seed	All cleared area have commenced revegetated within a year following the completion of construction. Revegetation works will occur within the optimum time of year (May – June)	Within a year following completion of earthworks	Weekly site inspections during revegetation works Monthly site inspections once revegetation works have been finalised until completion criteria have been achieved	Cleared areas not revegetated as soon as practicable	Revegetation of cleared areas to commence as soon as practicable. Review scheduling within 1 week to ensure it includes future revegetation activities	Construction Contractor Environmental Management Representative
	All rubbish and surplus materials are removed from site at the completion of construction	No materials not required for revegetation remain on site after construction is completed. After revegetation works, all remaining materials will be removed from the site. No rubbish will remain on site after construction is completed.	End of construction	Contract completion inspection.	Rubbish/surplus materials recorded during the contract completion inspection, or during and after revegetation works	Rubbish/surplus materials are removed and disposed of immediately once trigger is detected.	Construction Contractor Environmental Management Representative

Cockatoo and Eucalypt Woodlands TEC	Revegetation plans will identify connected areas of Eucalypt Woodlands TEC or Carnaby's 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 Eucalypt Woodlands TEC or Carnaby's Black Cockatoo habitat undertaken with condition rating of these areas trending upwards consistent with Conservation Advice for Eucalyptus Woodland.	During drafting of revegetation plans, which will initially occur prior to contract award. Revegetation plans will be continuously updated throughout construction as required.	Monthly site inspections Biannual revegetation surveys (in April and October) will be undertaken until completion criteria has been achieved. Once completion criteria have been achieved, revegetation surveys will occur every 5 years (in October) for the life of the Approval to ensure completion criteria is being maintained.	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. Monitoring events will return to biannual until a further 2 years of monitoring provide evidence that the revegetated/rehabilitated areas are trending towards attainment of the completion criteria.	Main Roads Environmental Management Representative
	Topsoil from areas infected or potentially infected with *Phytophthora* dieback will not be used in revegetation activities	No topsoil potentially infected with *Phytophthora* dieback used for revegetation	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
	Compacted areas and redundant carriageway will be deep ripped prior to seeding / planting to provide an area for seed/seedling establishment and improve infiltration.	All compacted areas deep ripped prior to seeding/ planting	At the start of revegetation activities	Contract completion inspection Weekly site inspection	Compacted areas and redundant carriageway are not deep ripped prior to seeding/planting	Affected revegetated areas will be inspected biannually (in September and March) with infill planting and reseeding being undertaken within 2 weeks of a trigger being realised.	Main Roads Environmental Management Representative
	Trees and shrubs which are known as Carnaby's Black Cockatoo foraging, nesting and roosting plants will not be planted within 10 m of the edge of the road seal.	No foraging, nesting or roosting plant species for Carnaby's Black Cockatoo planted within 10 m of the edge of seal	During drafting of revegetation plans, which will initially occur prior to contract award. Revegetation plans will be continuously updated throughout construction as required and during revegetation activities	Weekly site inspections Initial post revegetation survey	Carnaby's Black cockatoo preferred plant species planted within 10 m of the edge of the road seal	Triggered plants will be removed and replanted further than 10 m from the edge of the road seal within 2 days	Construction Contractor Environmental Management Representative
	Revegetation species mixes will be formulated to be reflect the surrounding native vegetation and be characteristic of Carnaby's Black Cockatoo habitat and the Eucalypt Woodlands TEC. Species mixes will be specified in the Revegetation and Landscaping specifications developed for the contractor.	Complete revegetation according to the following completion criteria: · 100% of species used for revegetation will be native and representative of Eucalypt Woodlands TEC. · a minimum of 50% native vegetation cover. · an average of 3 native vegetation stems/m^2 · an average of 10 Eucalyptus (mature trees) stems/ha.weed cover will	Prior to, during and after revegetation works	Biannual revegetation surveys (in April and October) will be undertaken until completion criteria has been achieved. Once completion criteria have been achieved, revegetation surveys will occur every 5 years (in October) for the life of the Approval to ensure completion criteria is being maintained. Weekly site inspection	Results of monitoring indicate weed coverage is greater than completion criteria or that plant condition or plant density is lower than completion criteria All completion criteria are not achieved and/or maintained	Application of weed eradication techniques for the weed species will be undertaken within 2 weeks, with follow-up treatment occurring 4 weeks after initial treatment. If the completion criteria for stems/ha are not attained or maintained, then supplementary planting will be undertaken as soon as practicable (between May and June). Monitoring events will return to biannual until a further 2 years of monitoring provide evidence that	Construction Contractor Environmental Management Representative

		not exceed 30%plants used for revegetation will be free of plant disease symptoms. · minimum patch width of 5 metres so that the revegetated areas will be classified as Eucalypt Woodlands TEC **N.B.** these completion criteria will achieve Category B Good Condition Eucalypt Woodlands TEC (which is also Carnaby's Black Cockatoo habitat) as outlined in the approved Conservation Advice for Eucalypt Woodlands of the Western Australian Wheatbelt				the revegetated/rehabilitated areas are trending towards attainment of the completion criteria.	

4.2 Monitoring Program

Table 4-2 details the monitoring activities to be undertaken to meet decision making requirements, detect management triggers and monitor corrective actions along with the methods/guidelines to be used and the management objectives the monitoring addresses.

Table 4-2 : Monitoring Schedule

Monitoring Activity	Management Objectives / Questions Addressed	Parameter Measured	Applicable Method / Guideline	Timing	Responsibility
Weekly revegetation inspections	· Has revegetation commenced as required? · Is revegetation occurring during optimal time of the year (May – June)? · Have compacted areas been ripped/ are they being ripped? · Is the revegetation species mix and density as per the management measures in this CEMP?	Compliance with CEMP requirements	Inspection template to be developed by the Construction contractor and agreed with Main Roads prior to commencement of the action	Weekly during revegetation	Main Roads Environmental Management Representative

Monitoring Activity	Management Objectives / Questions Addressed	Parameter Measured	Applicable Method / Guideline	Timing	Responsibility
Monthly site inspections	· Are no-go areas appropriately flagged/fenced? · Have all or part of no-go areas been cleared? · Is clearing outside of approved areas or in excess of approved limits? · Is all fencing in place and free of damage? · Is there evidence of stock accessing road reserves? · Is there evidence of unauthorised access in construction site? · Are there impacts to Eucalypt Woodlands TEC due to excavation/cuttings required for road construction? · Are site fire prevention requirements compliant? · Are there visible dust plumes during construction? · Is drainage design/construction resulting in erosion/scouring within Carnaby's Black Cockatoo habitat or the Eucalypt Woodlands TEC? · Are CoE points in place and being used? · Are there new weed infestations in construction areas? · 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/) · Is revegetation activity undertaken in accordance with revegetation plans and this CEMP?	Compliance with CEMP requirements	Inspection template to be developed by the Construction contractor and agreed with Main Roads prior to commencement of the action	Monthly during construction	Main Roads Environmental Management Representative
Pre-clearance survey of clearing area for Carnaby's Black Cockatoo hollows	Are there additional hollows (to those identified as no-go areas) that are utilised, or capable of being utilised, by Carnaby's Black Cockatoos for nesting?	Presence of hollows used or capable of being used by Carnaby's Black Cockatoo	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 Carnaby's Black Cockatoos. Monitoring will be conducted in line with best practice and monitoring methods used will be consistent advice contained within the Carnaby's 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 Carnaby's Black Cockatoos, conservation significant flora and all areas outside of the approval boundary. These areas are identified on the engineering drawings issued for construction.	No more than 7 days prior to clearing	Suitably qualified person
Inspection of occupied hollows	Are hollows no longer in use by Carnaby's Black cockatoo?	Presence / absence of Carnaby's Black Cockatoos	Suitably qualified person to inspect hollows to determine if Carnaby's Black Cockatoos are still utilising the hollow Monitoring will be conducted in line with best practice and monitoring methods used will be consistent advice contained within the Carnaby's Black Cockatoo Recovery Plan (DPAW, 2013).	Monthly during breeding season	Suitably qualified person

Monitoring Activity	Management Objectives / Questions Addressed	Parameter Measured	Applicable Method / Guideline	Timing	Responsibility
Annual inspection of installed artificial hollows	· Are artificial hollows being utilised? · Do artificial hollows require maintenance?	Presence / absence of Carnaby's Black Cockatoos and artificial hollow condition	Visual inspection by suitably qualified person of installed artificial hollows to determine if Carnaby's Black Cockatoos are utilising the hollows and identify any maintenance requirements such as replacement of sacrificial posts, repairs to the sides or base of the hollow, etc.	During breeding season	Suitably qualified person
Follow up weed monitoring	Are new infestations of Declared Plants, environmental weeds or WoNS eradicated? Have previously identified weeds (based on baseline data and/or previous monitoring event) been eradicated?	Weed presence and abundance/cover	Assessment undertaken by a suitably qualified person in line with the following guidelines: · Main Roads Specification 304 Revegetation & Landscaping.	Growth and/or flowering period for weeds Biannual monitoring (in April and October) will be undertaken until completion criteria has been achieved. Once completion criteria has been achieved, weed monitoring will occur every 5 years (in October) for the life of the Approval to ensure completion criteria is being maintained.	Suitably qualified person
Revegetation Monitoring	Are revegetation activities achieving desired rehabilitation completion criteria?	Native vegetation cover (%). Native species richness. Weed vegetation cover (%). Weed species identification. Bare ground (%). Plant health / deaths. Average stems/m^2 (total) Average stems/ha (eucalypts), and DBH of eucalypts once possibly mature	Assessment undertaken by a suitably qualified ecologist in line with: · Main Roads Specification 304 Revegetation & Landscaping	Biannual revegetation surveys (in April and October) will be undertaken until completion criteria has been achieved. Once completion criteria has been achieved, revegetation surveys will occur every 5 years (in October) for the life of the Approval to ensure completion criteria is being maintained.	Suitably qualified person
Artificial Hollow Inspections	Are artificial hollows installed as mitigation/offset measures being used by Carnaby's Black cockatoo and is maintenance of the hollow required?	Hollow use Artificial hollow condition	Monitoring undertaken by a suitably qualified person in accordance with: · How to monitor and maintain artificial hollows for Carnaby's cockatoo (DPAW, 2015b), or any consecutive revisions of this document	Annually outside the breeding season for maintenance. Annually during the breeding season in September or October.	Suitably qualified person

4.3 Managing Uncertainty

Table 4-3 details the data and information used to develop this CEMP, any limitations or uncertainties within that data and information, the risks this uncertainty presents and how these risks will be managed.

Table 4-3 : Management of 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)	High level of certainty. No significant limitations. Assessments undertaken in line with relevant guidelines and approved methods.	N/A	N/A
Phytophthora Dieback Assessment (Terratree 2016)	High level of certainty. Assessment undertaken in line with relevant guidance 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
DoEE Eucalypt Woodlands TEC Guidance	Moderate level of certainty as TEC is newly listed and guidance may change as further information about the TEC becomes available	Changes to identification criteria for the Eucalypt Woodlands TEC	Review any revised guidance against Eucalypt Woodlands TEC mapping for the project and this CEMP

5. CEMP Implementation

5.1 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 5-1**.

Table 5-1 : 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.

5.2 Environmental Training

An Environment and Heritage induction will be carried out for all visitors, personnel, contractors and subconsultants who are required to work on the Walebing to Wubin Project. This induction details the responsibilities of all project personnel, contractors and subconsultants under this CEMP and outlines any environmental and heritage considerations and requirements that personnel need to be aware of when undertaking design and arranging early works activities. It also outlines the processes that may be required to manage environment and heritage risks on the project, including:

- threatened flora, vegetation and fauna, no go zones
- weed and disease hygiene procedures for project vehicles/footwear, areas of weed infestations and dieback management areas;
- adhering to native vegetation clearing permit and EPBC approval conditions and what constitutes clearing/ground disturbance;
- waste and hazardous materials management practices;
- environmental incident reporting procedure;
- indigenous and non-indigenous values and sites; and
- topsoil management and land rehabilitation.

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

Pre-start meetings will be undertaken on a daily basis and will inform project personnel of specific environmental issues related to the day's work. These meetings will also include any visitors or sub-consultants who are on site. Additional 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.

5.3 Review

5.3.1 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.

5.3.2 Uncertainty Review

The effectiveness of revegetation activities will be reviewed following each round of monitoring. The review will aim to identify any trends discernible from the data and, where trends show targets or completion criteria may not be achieved corrective action will be identified and implemented.

5.3.3 CEMP Review

Throughout the life of the EPBC Act approval the CEMP will be continually reviewed and updated as required. The review will include an evaluation of the effectiveness of the plan with review triggers being:

- 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, who will have a degree in environmental science, ecology or something similar to ensure they are qualified to conduct the update. Where required, the Main Roads Environmental Management Representative will engage qualified specialists to provide input. The review will incorporate any new data or information relevant to Carnaby's Black Cockatoo and the Eucalypt Woodlands TEC such as:

- results of surveys and monitoring activities;
- results of incident investigations;
- new external research papers and scientific literature; and
- new or updated EPBC Act policy statements and guidance material.

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

Main Roads will inform DoEE of any changes to the CEMP in accordance with Condition 12 and at least four weeks before implementation of the revised CEMP. For the purpose of Condition 12(c) Main Roads will assess the change against the risks identified in Table 3-3 of this CEMP.

6. Inspections, Audits and Reporting

6.1 Contractor Inspections and Audits

The Construction Contractor will undertake monthly inspection of the entire worksite. 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 against conditions of approval and other legal obligations 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 quarterly basis during the construction phase.

Non-compliances with conditions of approval will be reported as an incident in accordance with Section 6.4.

6.2 Annual Compliance Audit

An annual audit of compliance with the conditions of approval for EPBC 2016/7761 will be undertaken by Main Roads and the results of this audit reported to DoEE in line with Condition 10. The Annual Compliance Audit will be undertaken within one month of the 12-month anniversary of the commencement of the action.

6.3 Independent Compliance Audit

Main Roads will engage an independent auditor for auditing compliance with conditions of the approval as and when directed by the Commonwealth Minster for the Environment. The independent auditor and audit criteria must be approved by the Minister prior to the commencement of the audit.

6.4 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 in Section 5 of 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.

6.5 Annual Compliance Reporting

Main Roads will report against compliance with this CEMP and the conditions of approval for EPBC 2016/7761 annual (within three months of every 12-month anniversary of the date of commencement) and publish the compliance report on the Great Northern Highway - Muchea to Wubin Upgrade Stage 2 project website.

Annual compliance reporting template has been provided in **Appendix B**.

7. Data Management

The following records are required to be kept in relation to the implementation of this CEMP:

- 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.
- 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. All records will be retained on site for the duration of the construction contract. Once construction is completed, these documents will be transferred to Main Roads head office as part of site demobilisation where they will be retained for the duration of the EPBC Act approval.

The above records will be made available to DoEE and/or any external auditors as required for the purposes of compliance auditing.

8. References

Bureau of Meteorology (2016) Bureau of Meteorology Climate Zones. Commonwealth of Australia (online), Available at: **http://www.bom.gov.au/climate/averages/maps.shtml . Accessed on 20/7/2016**

Department of Parks and Wildlife (DPaW), 2013 *Carnaby's Cockatoo (Calyptorhynchus latirostris) Recovery Plan.* Department of Parks and Wildlife, Perth, Western Australia

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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. Risk Assessment Framework

A.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

A.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.

Appendix B. Annual Compliance Reporting Template

Management Objective / Desired Outcome	Management Measures / Actions	Performance Target / Completion Criteria	Timing	Monitoring / Reporting Activity	Compliance Statement (include details of any corrective actions that have been implemented)
To avoid impacts to Carnaby's Black Cockatoo habitat beyond that approved	All known nesting trees and trees with suitable hollows within the construction site boundary will be clearly marked 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. All environmental no-go areas clearly marked on site	On Contract award and prior to commencement of clearing.	Record of provision of drawings showing environmental no-go areas	
	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 capable of being utilised, by Carnaby's Black Cockatoos for nesting	Surveys of potential nesting trees undertaken within 7 days prior to clearing All potential nesting trees are identified	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	
	If any Carnaby's Black Cockatoo is detected utilising any hollow in any tree the tree must be clearly identified and marked as a no-go area with a 10 m radius from the tree	All trees identified as currently utilised by Carnaby's Black Cockatoo are marked as no-go areas with a 10 m exclusion zone All hollows being utilised by the species are detected during surveys	Following survey of area to be cleared	Site inspection by Construction Contractor Environmental Management Representative prior to and following clearing to confirm no-go areas are appropriately flagged / fenced Monthly site inspections	
	All trees identified as being utilised by Carnaby's Black Cockatoo must not be cleared until a suitably qualified person has verified that the hollows in the tree are no longer being used	No clearing of trees utilised by Carnaby's Black Cockatoo	Carnaby's Black Cockatoo breeding season	Surveys undertaken by suitably qualified person to confirm hollow is no longer being utilised by Carnaby's Black Cockatoo	
	For each cleared hollow that is being utilised, or capable of being utilised by Carnaby's Black Cockatoo install at least three (3) artificial nesting hollows within 12 km of the location of the cleared hollow and in accordance with relevant artificial hollow guidance When artificial nesting hollows are installed, an annual review	All artificial hollows are installed before the next breeding season Location and configuration of artificial hollows follow current best-practice guidelines	Prior to commencement of the next breeding season	Records of hollow installation, including date of installation, details of the type of artificial hollow, GPS coordinates of the tree, where it was placed on the tree and the relevant cleared hollow that is being offset.	

	of scientific articles and information on artificial hollows suitable for CBC will be undertaken. This review will be conducted by a suitably qualified ecologist to ensure that practices are current and likely to be the most effective.				
	Artificial hollows are inspected and maintained at least annually	All artificial hollows are inspected annually. All required maintenance undertaken prior to the next breeding season	Annually during the breeding season for inspecting hollow use. Annually prior to breeding season for artificial hollow maintenance and/or replacement	Annual survey/inspection of hollows undertaken by suitably qualified experts Hollow maintenance records	
To avoid impacts to Carnaby's Black Cockatoo habitat beyond that approved	No clearing of Carnaby's Black Cockatoo habitat outside of the approval boundary	No clearing of Carnaby's Black Cockatoo habitat outside of the construction site boundary No clearing of habitat and nesting trees (known and potential) beyond approved limits	During construction	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	
To avoid impacts to Eucalypt Woodlands TEC beyond that approved	Earthwork cuts (excluding earthworks for drainage construction) within 3.5 m of any tree within the Eucalypt Woodland TEC that is to be retained will be supervised by a qualified arborist. No clearing of Eucalypt Woodlands TEC outside of the approval boundary	No death of trees within the Eucalypt Woodlands TEC as a result of excavation activities No clearing of Eucalypt Woodlands TEC outside of the construction site boundary	During earthwork cuts (excluding earthworks for drainage construction) within 3.5 m of Eucalypt Woodland TEC During construction	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 Monthly site inspections Records of arborist engagement	
To achieve performance targets and completion criteria for Carnaby's Black Cockatoo and	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	Site inspections prior to and following clearing to confirm no-go areas are appropriately flagged / fenced Monthly site inspections	

Eucalypt Woodlands TEC				Any intrusion into no-go areas or damage to fencing / flagging is raised as an incident	
	Road reserve will be fenced to prevent stock accessing vegetation within the road reserve from adjacent farms. Construction site will be controlled by the Main Roads Superintendent to ensure no unauthorised access by humans during construction.	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 No unauthorised access by humans during construction	At completion of construction	Contract completion inspection	
	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	
To avoid impacts to Carnaby's Black Cockatoo habitat beyond that approved To avoid impacts to Eucalypt Woodlands TEC beyond that approved	All hot works will be undertaken in accordance with contractor safety procedures, which will be reviewed by Main Roads Environment Management Representative prior to works.	No ignitions / fires started as a result of hot works No impact on MNES as a result of ignitions/fires originating from work areas	During hot works such as welding	Monthly site inspections to confirm required controls are in place Training records for project personnel involved in hot works	
	All vehicles, plant and equipment to be fitted with appropriate exhaust system shielding and restricted to designated cleared areas	No ignitions / fires started as a result of hot vehicles exhausts, plant or equipment No impact on Carnaby's Black Cockatoo habitat or Eucalypt Woodlands TEC as a result of ignitions/fires originating from work areas	All activities	Incident reports related to fires	
	Fire danger ratings and Shire vehicle movement bans will be observed and the requirements of these implemented	No operation of vehicles, plant or equipment in contravention of Fire danger ratings and Shire vehicle movement bans No impact on Carnaby's Black Cockatoo habitat or Eucalypt Woodlands TEC as a result of	All activities outside of cleared areas	Pre-start and Toolbox meeting agenda items and/or minutes	

		ignitions/fires originating from work areas			
To avoid impacts to Carnaby's Black Cockatoo habitat beyond that approved To avoid impacts to Eucalypt Woodlands TEC beyond that approved To achieve performance targets and completion criteria for Carnaby's Black Cockatoo and Eucalypt Woodlands TEC	Dust suppression (e.g. water carts) and/or surface stabilization measures (e.g. hydromulch) will be used to protect loose surfaces or cleared areas. Dust generating activities suspended during periods of high wind conditions	No visual dust plumes generated by construction activities	Post clearing and during construction	Monthly site inspections include visual monitoring for dust generation	
	Reduced speed limits e.g <40 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	
	Temporary construction drainage within or adjacent to Carnaby's Black Cockatoo habitat or Eucalypt Woodlands TEC will be designed and constructed such that it does not result in scouring or erosion within these vegetated areas	No evidence of erosion from construction activities within Carnaby's Black Cockatoo habitat or Eucalypt Woodlands TEC	Prior to and during construction	Monthly site inspections. Annual revegetation monitoring	
To avoid impacts to Carnaby's Black Cockatoo habitat beyond that approved To avoid impacts to Eucalypt Woodlands TEC beyond that approved	Clean on Entry and/or Exit (CoE) protocols will be in place as required by the results of dieback and weed mapping for the site	No breach of CoE protocols	All construction activities	Entry and/or exit records for CoE points Monthly site inspections	
	All plant and machinery will be verified by the contractor to be clean and free of all vegetative and soil material prior to arriving at the work site	All vehicle/plant/equipment verified clean on arrival at site	All construction activities	Records verifying vehicle/plant/equipment arriving on site is clean	
	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)	No new occurrence of Declared Plants within the construction site boundary (in comparison to baseline levels) during construction activities	All construction activities	Monthly site inspections Annual revegetation monitoring	
	WoNS and environmental weeds within the construction site boundary will be treated according to the weed control management provided by Weeds Australia (http://weeds.ala.org.au/WoNS/)	No new occurrence of WoNS or environmental weeds within the construction site boundary (in comparison to baseline levels)	All construction activities	Monthly site inspections Annual revegetation monitoring	

No nett loss of foraging and potential breeding habitat for Carnaby's Black Cockatoo Improve the condition of the ecological community adjacent to the area of disturbance To achieve performance targets and completion criteria for Carnaby's Black Cockatoo and Eucalypt Woodlands TEC	Revegetation works will commence as early as practicable after completion of earthworks and within the optimum time of year (May-June) to enhance survival of seedlings and germination of seed	All cleared area have commenced revegetated within a year following the completion of construction. Revegetation works will occur within the optimum time of year (May – June)	Within a year following completion of earthworks	Weekly site inspections during revegetation works Monthly site inspections once revegetation works have been finalised until completion criteria have been achieved	
	All rubbish and surplus materials are removed from site at the completion of construction	No materials not required for revegetation remain on site after construction is completed. After revegetation works, all remaining materials will be removed from the site. No rubbish will remain on site after construction is completed.	End of construction	Contract completion inspection.	
	Revegetation plans will identify connected areas of Eucalypt Woodlands TEC or Carnaby's 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 Eucalypt Woodlands TEC or Carnaby's Black Cockatoo habitat undertaken with condition rating of these areas trending upwards consistent with Conservation Advice for Eucalyptus Woodland.	During drafting of revegetation plans, which will initially occur prior to contract award. Revegetation plans will be continuously updated throughout construction as required.	Monthly site inspections Biannual revegetation surveys (in April and October) will be undertaken until completion criteria has been achieved. Once completion criteria have been achieved, revegetation surveys will occur every 5 years (in October) for the life of the Approval to ensure completion criteria is being maintained.	
	Topsoil from areas infected or potentially infected with *Phytophthora* dieback will not be used in revegetation activities	No topsoil potentially infected with *Phytophthora* dieback used for revegetation	During revegetation activities	Monthly site inspections Topsoil management records	
	Compacted areas and redundant carriageway will be deep ripped prior to seeding / planting to provide an area for seed/seedling establishment and improve infiltration.	All compacted areas deep ripped prior to seeding/ planting	At the start of revegetation activities	Contract completion inspection Weekly site inspection	
	Trees and shrubs which are known as Carnaby's Black Cockatoo foraging, nesting and roosting plants will not be	No foraging, nesting or roosting plant species for Carnaby's Black Cockatoo planted within 10 m of the edge of seal	During drafting of revegetation plans, which will initially occur prior to contract award. Revegetation plans will	Weekly site inspections Initial post revegetation survey	

	planted within 10 m of the edge of the road seal.		be continuously updated throughout construction as required and during revegetation activities		
	Revegetation species mixes will be formulated to be reflect the surrounding native vegetation and be characteristic of Carnaby's Black Cockatoo habitat and the Eucalypt Woodlands TEC. Species mixes will be specified in the Revegetation and Landscaping specifications developed for the contractor.	Complete revegetation according to the following completion criteria: · 100% of species used for revegetation will be native and representative of Eucalypt Woodlands TEC. · a minimum of 50% native vegetation cover. · an average of 3 native vegetation stems/m^2 · an average of 10 Eucalyptus (mature trees) stems/ha.weed cover will not exceed 30%plants used for revegetation will be free of plant disease symptoms. · minimum patch width of 5 metres so that the revegetated areas will be classified as Eucalypt Woodlands TEC **N.B.** these completion criteria will achieve Category B Good Condition Eucalypt Woodlands TEC (which is also Carnaby's Black Cockatoo habitat) as outlined in the approved Conservation Advice for Eucalypt Woodlands of the Western Australian Wheatbelt	Prior to, during and after revegetation works	Biannual revegetation surveys (in April and October) will be undertaken until completion criteria has been achieved. Once completion criteria have been achieved, revegetation surveys will occur every 5 years (in October) for the life of the Approval to ensure completion criteria is being maintained. Weekly site inspection	