

Appendix A. Submissions Received

From: [REDACTED] >

Sent: Tuesday, 26 May 2020 9:36 PM

To: [REDACTED] >

Subject: Bindoon Bypass EPA assessment comments

Dear John

I saw the notice in the paper asking for comments.

I have an orchard on [REDACTED] Kinkella Rd, Mooliabeenie. It used to be citrus and currants but now it is being 'rehabilitated' into a more dry land type of orchard: jujubes, figs, pomegranates, currants and bush tucker. Jujubes in particular are encouraged by the Agriculture Department and there is a newish variety of currants that does not require fungicides or setting spray. There is a variety of pomegranate without seeds although I don't think it is proven yet. But none of them can do without a source of water.

The reason is that over the last 20 years more and more extraction of water from the area that provides the water means that citrus is not viable. The extraction was not regulated according to higher temperatures and lower rainfall but allowed to continue according to amounts allocated to licences. For at least the last 5 years water in the dam reduces by metres without any real pumping. The Water Department seems to be working it out on the basis that if the allocations come to be in jeopardy then it will be time to restrict use. By then it will be too late because the system relies on saturation producing flow of a stream.

There is not much encouragement for growers who mitigate their circumstances, or 'encouragement' for them to mitigate their circumstances.

There is even a view in the Department that there is water available in the immediate area.

The water collects in an aquifer west along Barn Road and that aquifer collects water from the Cullalla Road area. The map I have from Main Roads shows 2 short blue streams on Cullalla Road that are directly west of the blue stream that goes to Barn Road. The blue lines on Cullalla Road though are not in the maps in the documents on the EPA web site. The label "Cullalla" covers the spot. There used to be a lot of water up there - it was a place where people went for a swim in a big tank or pool.

From there the water proceeds above and below the ground to the dam that waters the orchard and another dam that waters the place over the road. A few years ago he dug a very big dam and now it is not filling anywhere like it was 30 years ago. The land up to the aquifer is a long wet land area that is drier and drier over time.

The EPA documents show an expectation that there will be a significant impact on the amount of water that will go into this kind of system, and this particular system is not mentioned.

Water in this area is not capable of year-round extraction. And Cullalla is a source of the water to Barn Road.

I don't doubt engineers can sort something out, this water is not so far below the surface it can't be 'seen' with some technology. The problem is getting attention to it and sorting out how to keep whatever flow is there. If there is a doubt it is that an ineffective method is chosen and the place crashes, it is not as if this is a set of circumstances where there are choices tried and eliminated before the correct choice is made.

I look forward to hearing from you.

Regards

[REDACTED]

SCANNED

A1881667

To The Department of Biodiversity
Conservation (DBCA).

11/6/18

I am writing this letter to you & hope you can help.

Main Roads in Western Australia are coming through some of our property for the Bindoon By Pass for the Gt. Northern Highway.

We are on 100 acres. Main Roads are taking one end of our property with 16 acres of the Bankslea Ridge. The Cannabys & Red Tails come here for the Bankshears & Blackbutts for food & And the other end of our property (which many years ago were unsuitable Pines. They have died now & the Bankshears have taken over.

The main roads (as I have been told has not been given the okay to yet use the front of our property yet.

The Shire of Chittering has sent me a letter saying our property has a threatened ecological community.

If the main roads were to ~~not~~ ^{LEAVE} the Bankshears and took the land a bit higher we would leave our house & plenty of room for the road & take our middle property + house etc. That would leave all the Bankshears at the front of our property & all the Bankshears

at the back of the property all would
be saved.

yours sincerely

so hope you
DONT mind waiting

- 2 Have ~~you~~ the EPBC Per yet approved of
the taking of the bankshears where Main Roads.
wants to take the road.

Sorry emails are not working here
so far now 3 days. Please use phone



ATTENTION: [REDACTED], SPECIES + COMMUNITIES

Post. Department of Biodiversity, Conservation AND
Attractions.

Park and Wildlife Comms Tel: 03 9271 104



Your ref: DWERA-001261
Our ref: PRS 45552
Enquiries: Jacqui Clinton
Phone: 9442 0312
Email: Jacqui.clinton@dbca.wa.gov.au

Mr Hans Jacob
Manager EIA Infrastructure Branch
EPA Services
Department of Water and Environmental Regulation
Locked Bag 10
Joondalup DC WA 6919

Attention: Mark Jefferies

Dear Mr Jacob,

BINDOON BYPASS - ASSESSMENT NO:2135

I refer to your letter of 22 May 2020 advising that the Environmental Review Document (ERD) and associated appendices related to the proposed Bindoon Bypass are available for review. The Department of Biodiversity, Conservation and Attractions' (DBCA) Parks and Wildlife Service has reviewed the referred documentation in consultation with specialist staff and provides the following advice.

Terrestrial Fauna

The ERD identifies and outlines the direct and indirect impacts to native fauna including the loss of terrestrial fauna habitat through vegetation clearing and the fragmentation of multiple bushland remnants within and adjacent to the development envelope.

Based on the information provided, the implementation of the proposal will clear 137 hectares of vegetation that provides habitat for fauna species listed as threatened under the State's *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Fauna that will be potentially impacted by the proposal include Carnaby's Black cockatoo (*Calyptorhynchus latirostris*), (ranked Endangered) Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksia naso*) (ranked Vulnerable), Baudin's Black-Cockatoo (*Calyptorhynchus baudinii*) (ranked Endangered) and Chuditch (*Dasyurus geoffroii*) (ranked Vulnerable), Brush-tailed Phascogale (*Phascogale tapoatafa wambenger*) (ranked Vulnerable), in addition to a number of other reptile and invertebrate species and priority listed fauna.

While the alignment of the proposed Bindoon Bypass development footprint and envelope has been selected and will be designed minimise and avoid environmental impacts, several bushland remnants in Very Good or better condition will be bisected. The fragmentation of these bushland areas can reduce the ecological functionality of the resulting smaller remnants and their ability to support large macrofauna. In addition, the proposed road forms a significant physical barrier preventing and reducing natural movement of fauna across the landscape.

Swan Region

Cnr Australia II Drive and Hackett Drive, Crawley WA 6009
Locked Bag 104, Bentley Delivery Centre, Western Australia 6983
Phone: (08) 9303 7755 Email: michael.roberts@dbca.wa.gov.au
www.dbca.wa.gov.au

To mitigate the impacts of this fragmentation, the proponent has proposed up to seven fauna underpasses under the road, located and designed to allow the movement of terrestrial fauna species between areas of bushland. The functionality and success of road underpasses is significantly influenced by the dimensions, location and length of the underpass structure. Details regarding the specific design and location of the seven proposed underpasses have not been provided in the ERD. To ensure the underpasses will be utilised by a variety of native species, to reduce the potential risk of predation by cats and foxes and to ensure the optimal design, the structures should be designed and located on advice of fauna specialists.

The management of native fauna species during the implementation of the proposal, as outlined in the ERD (section 4.3.6, page 257-8), should be included in the proposed Construction Environmental Management Plan (CEMP). Actions such as fauna trapping and relocation, the presence of fauna spotters during clearing, appropriate timing of clearing works and associated BC Act requirements should be included in the CEMP.

Fauna mitigation measures post- construction are not identified or addressed within the ERD. Measures to prevent fauna impacts during the operational phase, such as the installation of appropriate signage, selection of revegetation species to avoid attracting fauna to the road corridor, fauna proof fencing along the road reservation and the channelling of fauna towards fauna underpasses, should all be considered to mitigate impacts to fauna from the project following construction.

Threatened and Priority Ecological Communities

Analysis of Floristic Community Types

Floristic community type (FCT) analysis to determine the vegetation communities within the development envelope is outlined in section 6.2.3 (pages 71-80) of the 'Flora and Vegetation Assessments - Bindoon Bypass, Great Northern Highway' (Focussed Vision 2019) report provided as Appendix D4 of the ERD. The analysis of FCTs requires revision to ensure that the project attributable environmental impacts to threatened ecological communities (TEC) listed under the BC Act and EPBC Act and/or DBCA listed priority ecological communities (PEC) are accurately considered and to inform the appropriate identification of offsets.

As outlined in the Flora and Vegetation Assessments report, to identify the locations of TECs and PECs within the development footprint and envelope and to inform an assessment of impacts to these values, a series of quadrats were established and scored with statistical analysis undertaken against Gibson *et al.* (1994) and Keighery (2012) quadrat data. The scoring and analysis of quadrats was undertaken in accordance with the 'Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment' (Environmental Protection Authority, 2016).

These quadrats have then been incorrectly consolidated and classified into 12 vegetation units, with a single FCT assigned to each vegetation unit. Vegetation units are broader classifications of 'vegetation types' and may contain a suite of FCTs as opposed to the single FCT alignment provided. Alignment of FCTs to vegetation units can result in the inaccurate classification of FCT affinities and extents with significant TECs and PECs not being identified.

The method to correctly identify the FCTs within the vegetation units, is to align quadrats to individual FCTs and determine the community extent through an on-ground assessment.

A review of the quadrat information indicates that the vegetation ascribed by the quadrats is likely of high importance with many of the quadrats aligning with TECs and PECs, which are also important subsets of the Banksia Woodlands of the Swan Coastal Plain TEC. As an example, Quadrat B56 had a high affinity for FCT 20a (Endangered in Western Australia (WA)), and with FCT 20c (Critically Endangered in WA). The high level of affinity of some quadrats to State and

Commonwealth listed TECs, as indicated in Table 17 of the Flora and Vegetation Assessments report (pages 95-98) is not discussed in the ERD or supporting documentation.

To enable the assessment of impacts to significant FCTs, section 6.2.3 should be revised in addition to the provision of amended dendograms, raw quadrat data and spatial data displaying quadrat locations and potential FCT extents.

Banksia Woodlands of the Swan Coastal Plain

The outcomes of the Banksia Woodland Assessment to determine and quantify the extent of the Commonwealth listed Banksia Woodlands of the Swan Coastal Plain (SCP) TEC within the project study area are described in the Flora and Vegetation Assessments report. Based on the methodology provided in section 6.3 (page 86), it appears that the combined PATN analysis, used in the determination of the extent of this TEC, is not be in accordance with the ‘Approved Conservation Advice for the Banksia Woodlands of the Swan Coastal Plain ecological community’ (Threatened Species Scientific Committee, 2016). Quadrat data can provide a general description for a vegetation unit, however, the mapping of areas ‘likely to be’ the Banksia Woodlands of the SCP TEC, require on ground assessment against the description, condition and area thresholds in the Approved Conservation Advice to determine if the TEC occurs. The Commonwealth Department of Agriculture, Water and Environment should be contacted if clarification is required regarding the assessment of the Banksia Woodlands of the SCP TEC.

Survey limitations

It is noted at section 7.2.1 (page 109) of the Flora and Vegetation Assessments report that 89.05 hectares of the study area was not accessible and therefore not included in the 2018 survey extent for vegetation. If project works are proposed to occur within this area, an assessment of conservation values is required to enable identification and management of potential environmental impacts.

Wetland Assessment

The ERD lists five wetlands, mapped in the Geomorphic Wetlands of the Swan Coastal Plain (GWSCP) dataset that will be directly impacted by the road construction (Table 4-40, page 278). Two of these wetlands are classified as sumpland wetlands (UFI 15154 and 12838), one classified as palusplain (UFI 12778) and two classified as floodplain wetlands (UFI 12840 and 12779). Of these, 1.1 hectares of mapped Conservation Category wetlands (CCW) and 0.43 hectares of mapped Resource Enhancement wetland (REW) will be subject of direct impacts (Table 4-40, page 278).

On the basis of the vegetation condition mapping, the ERD identifies that only 0.4 hectares of impacts to wetlands are considered significant and are proposed to be offset. In accordance with ‘A methodology for the evaluation of wetlands on the Swan Coastal Plain, Western Australia’ (DBCA, 2017) a wetland evaluation to determine conservation significance should consider a suite of wetland attributes, functions and values. In the absence of a formal request to modify the GWSCP, undertaken in accordance with current DBCA methodology, the existing GWSCP mapping should be utilised to calculate direct and indirect impacts to CCWs and REWs.

The ‘Wetland Assessment – Great Northern Highway, Bindoon Bypass Upgrades’ (Focused Vision, 2018) report provided as Appendix D3, which assessed the wetlands, associated with the Brockman River crossing within Lot 2261 Bindoon-Moora Road, Wannamal. The Wetland Assessment report concluded that an application to modify any of the wetlands within the study area would “unlikely to be justified” (page 33). Subsequently DBCA has not received any application to amend the current GWSCP mapping within and adjacent the development envelope.

It is acknowledged that the proponent has identified that there may be several impacts to wetlands as a result of the project construction and operation which will be managed in accordance with the mitigation measures outlined in Table 4-42 (pages 284-285). Maintenance of the hydrological function of mapped wetlands should be addressed during construction within the proposed CEMP and post-construction through the implementation of proposed site-relevant stormwater treatment measures developed in accordance with the 'Stormwater Management Manual for Western Australia' (DoW 2004-2007) and the 'Decision process for stormwater management in WA' (DWER 2017). These measures, in addition to the proposed offsets for residual wetland impacts, should assist in mitigating and offsetting direct and indirect impacts to wetlands within the development envelope.

Advice regarding the proposed impacts to the floodplain wetlands associated with the Brockman River (UFI 12840) and adjacent to Tea Tree Road (UFI 12779) as a result of the road and bridge construction is deferred to the Department of Water and Environmental Regulation who assess impacts to waterways.

Mitigation and Offsets

It is recognised that the Bindoon Bypass development footprint and envelope has been selected to avoid and minimise impacts to significant environmental values. As outlined in Chapter 7 of the ERD, there remains a number of significant direct and indirect impacts which require mitigation and potential offsets. The offsets proposed within the ERD primarily will be provided through the acquisition of land which contains the environmental values being offset.

Noting that specific offsets have not yet been identified, the proponent should be advised to liaise with DBCA in the development of future offset proposals, should it be expected that DBCA is to have a significant role assisting in the identification and delivery of future offset requirements. The identification of an appropriate offset acquisition site, which meets the multiple offset requirements listed in Table 7-2 (page 430), including the associated landowner negotiations, is likely to present challenges requiring significant resources and time.

There are several references in section 7.1 (page 434) and Table 7-2: (pages 430-433) that any proposed land offset will be 'acquired and placed in secure tenure' prior to the commencement of the proposal. While proposed offsets sites can be acquired and managed by DBCA in the short-term, the process to transfer State freehold into the conservation estate can take several years. The time required to achieve protection for any acquired offset site through reservation as conservation estate should be recognised in the ERD.

Thank you for the opportunity to comment on this proposal. Please contact Jacqui Clinton at Parks and Wildlife's Swan Region office on 9442 0312 or by email at jacqui.clinton@dbca.wa.gov.au if you have any queries regarding this advice.

Yours faithfully

Peter Hartley
A/ REGIONAL MANAGER

22 July 2020



6 July 2020

RE: Public Comment for Great Northern Highway Muchea to Wubin Upgrade – Stage 2 - Bindoon Bypass - Public Environmental Review

Dear EPA Referrals team,

Thank you for the opportunity to provide comments regarding the following Referral submitted to the EPA: Great Northern Highway Muchea to Wubin Upgrade – Stage 2 - Bindoon Bypass - Public Environmental Review.

Background: Our ecological research with Western Australia's three threatened black cockatoo species

I am a member of the Conservation Medicine Program in the School of Veterinary Medicine at Murdoch University. Our research group has been studying the health, ecology and demographics of Western Australia's three species of black cockatoos for 10 years. We have strong collaborative research ties with the state Department of Biodiversity, Conservation and Attractions (DBCA), Kaarakin Black Cockatoo Conservation Centre, WA Museum, World Wildlife Fund, Birdlife Australia, industry groups in the mining and housing sectors, and Perth Zoo. Our research projects include health monitoring of Carnaby's cockatoo nestlings throughout the species' breeding range, disease screening of injured black cockatoos treated at the Perth Zoo Veterinary Department for rehabilitation back to the wild, and large-scale ecological research using satellite and GPS tracking of all three black cockatoo species across their distribution ranges, to identify key habitat areas and migratory movements, about which much remains unknown. Collectively, our research addresses several major Actions and Objectives of the national Recovery Plans for all three species.

Through our research, we have observed that despite dedicated efforts of Recovery Teams, as well as efforts of research teams studying the species and community groups fighting to save habitat and rehabilitate debilitated birds back to the wild, all three species remain in grave danger of continued and catastrophic population decline. This is particularly the case given that the human population of Western Australia is set to grow rapidly in the next few decades, with increasing risks to cockatoos from land clearing, vehicle strikes and other human-related threats. The biggest threat to these birds remains the ongoing clearing of their breeding, feeding and roosting habitat, which occurred throughout much of the last century and appears to have escalated again in recent times, meaning that the populations of all three species are still in decline.

Our ongoing black cockatoo movement and ecology research includes both satellite PTT and GPS tracking, as well as direct on-ground observations, of flocks of black cockatoos using remnant small areas of habitat on and near the Swan Coastal Plain. Below, for your consideration when assessing this application, information is provided regarding (a) **The importance of retaining foraging habitat**; (b) **Importance of retaining not only current but future breeding habitat**; (c) **The need to consider cumulative impacts**; and (d) **Importance of offsets that minimize the risk of significant impacts on affected flocks**.

The importance of maintaining foraging habitat

Section 6.4.3 of the Environmental Review Documentation states that:

'The entirety of the Development Footprint has been mapped as having at least some values as foraging habitat for Black Cockatoos. A total of 204.8ha of foraging habitat identified as having Moderate or higher value for Carnaby's Black Cockatoo will be cleared, while 168ha of foraging habitat with a Moderate or higher value for the Forest Red-tailed Black Cockatoo will be cleared.'

This is one of the largest areas of black cockatoo foraging habitat proposed for clearing that we have seen, in over two years of reading submissions to state and federal level environment authorities for proposed clearing actions.

With respect to proposed clearing of foraging habitat for threatened black cockatoos, the relevant point is that foraging habitat for threatened black cockatoos is already insufficient – and this is the primary reason for their ongoing declines. It is therefore likely that any remaining hectares of quality foraging vegetation – particularly in breeding areas, such as the area of this proposed clearing – will be important for the persistence of the flocks that depend on them.

To ensure no significant impact on black cockatoos from the habitat to be cleared for this development, the cleared habitat will need to be replaced with at least the same area of foraging vegetation, through revegetation in the range areas of the affected flocks.

Importance of retaining not only current but future breeding habitat

We acknowledge the statement in the Environmental Review Documentation that:

‘Impacts to hollows showing evidence of use by Black Cockatoos have been avoided and minimised, through alignment changes and engineering solutions...’.

We note also that impacts to breeding habitat remain. Section 6.4.3 of the Environmental Review Documentation states that:

‘[the area of black cockatoo habitat to be cleared] includes 79.3ha of potential breeding habitat for Carnaby’s Black Cockatoo and 69.2ha of potential breeding habitat for the Forest Red-tailed Black Cockatoo. A total of 10 trees containing hollows showing evidence of previous use by Black Cockatoos, and 117 trees with suitable (but not used) hollows, are located within the Development Footprint and are intended to be cleared. This represents 12% and 9.2% of the total number of hollows used by or suitable for Black Cockatoos recorded by BCE (2017, 2018—Table 6-14)...In addition, 117 trees with hollows suitable for Black Cockatoos, but with no evidence they have been used, are within the Development Footprint and will be cleared....To further mitigate impacts, Main Roads will offset the clearing of hollows previously used by or suitable for Black Cockatoos through the acquisition of land containing at least an equivalent number of suitable hollows, or a combination of land acquisition and installation of artificial hollows. Details of the offsets proposed are provided in Chapter 7.’

With respect to the proposed offsets to mitigate this impact, we emphasise the importance of providing (at least) an equivalent number of suitable hollows (natural / artificial) *in the range areas of affected flocks*. We note also the importance of managing those hollows over the long term, as well as revegetating nearby areas with trees that can ensure breeding habitat succession in the long term. We note that the proponents advise (in Section 7 – Offsets) that they will develop an Artificial Hollow Management Plan to ‘set out the monitoring required to demonstrate the artificial hollows are effective as an offset (i.e. they are used by Black Cockatoos), maintenance schedule and an adaptive management approach should monitoring identify that the offset is at risk of not succeeding.’ We highly comment this initiative for black cockatoo conservation.

The acquisition and protection of habitat that includes suitable hollows for breeding is an important offset, to support breeding over the long term. Depending on the location of the acquired land, is also important to accommodate the needs of the flocks directly affected by the loss of hollows associated with this project. These losses include not only the 10 hollows that have evidence of previous use, but the 117 additional trees that contain suitable large hollows. An appropriate number of artificial hollows, installed and managed in the range areas of the affected flocks, will represent important short-medium term nesting opportunities for these flocks. Artificial hollows should always be additional to – rather than instead of – the protection of natural breeding habitat, alongside succession planning involving revegetation with new breeding (and associated foraging) habitat, to support the long-term viability of local flocks.

With respect to the other trees that are slated to be cleared and are of suitable DBH to be potential breeding trees, it is important to consider the value of not only current but also future breeding trees. Lack of suitable breeding habitat has been identified as a major threat to the persistence of black cockatoo populations (Department of Environment and Conservation 2007; Department of Environment and Conservation 2012). As the EPA will be aware, the Recovery Plans and referral guidelines for Western Australia’s three species of black

cockatoos recommend maintaining the long-term supply of trees with the potential to provide suitable nest hollows in the future, to support breeding over the medium and long-term.

Given the threat to the viability of Western Australia's black cockatoos from the lack of hollow-bearing trees, and the cumulative impacts associated with the destruction of many trees on and near the Swan Coastal Plain that represent future hollow-bearing trees, **all large trees that contain existing hollows, or that may become suitable for black cockatoo breeding in future years, are important to retain for breeding habitat succession. If such trees cannot be retained, adequate mitigation measures may include installing appropriate artificial hollows in protected reserves nearby** (with long-term monitoring/care, in liaison with appropriate organisations e.g. DBCA), and **planting of replacement habitat for breeding tree succession that can be managed over the long term.** We hope that this will be accommodated as part of the offset package for this development.

The need to consider Cumulative Impacts

We would like to emphasise the importance of considering cumulative impacts, when assessing the impacts of development actions on black cockatoo populations. There is currently a large – and growing – number of development actions and associated clearing of black cockatoo habitat across the species' ranges. Many clearing actions involve clearing of smaller areas of important habitat that do not individually meet the threshold for requiring referral or controlled action, but which, cumulatively, involve loss of extensive areas of foraging, breeding and/or corridor habitat used by black cockatoo populations. The impacts of clearing for development must also be considered in light of the cumulative impacts from the unplanned large habitat losses from bushfires. **Consideration of cumulative impacts is vital for black cockatoo population viability and for development applications.** Given the high number of smaller clearing actions, the risks posed to these MNES species from cumulative habitat losses appear to be greatly under-appreciated. **It is vital to consider the impacts of proposed clearing actions in the context of the many smaller, unregulated (and at present under-evaluated) clearing actions that are currently occurring across the ranges of these three species, particularly on and near the Swan Coastal Plain.**

Importance of offsets that minimise the risk of significant impacts on affected flocks

Section 7 of the Environmental Review Documentation notes that offsets for this proposed project will primarily involve land acquisition. We emphasise the importance of ensuring no net significant impact on local flocks. If the acquired land is not in the range area of the flocks affected by this project, then it will also be important to restore and revegetate land in the range areas of the affected flocks. We commend the proponents for including this option in their offsets strategy. We note the proponents' suggestion to work together with conservation-focused NGOs, and we support any such measures that will help with local efforts to revegetate black cockatoo habitat.

Given the current extent of development involving clearing of black cockatoo habitat on and near the Swan Coastal Plain, retention of all remaining important habitat is critical. **Where this is not possible, lost habitat can only be mitigated effectively by providing appropriate replacement habitat, through revegetation and (for breeding habitat) installation and ongoing monitoring and management of artificial hollows, in the range-area of the affected flocks; within appropriate time frames.** Long-term monitoring of revegetated areas is important, to ensure the success of revegetated habitat and the success of artificial hollows (including management to remove competitor species). Current lack of habitat, and ongoing habitat loss, are the main drivers for the continued declines of Western Australia's black cockatoos (Department of Environment and Conservation 2007; Department of Environment and Conservation 2012). Given the predicted short timelines to extinction for Western Australia's black cockatoos if their declines are not halted soon, and given the need to conserve as much remaining habitat as possible, mitigation measures need to be identified which help the species recover in the immediate term, and which are targeted towards supporting the specific flocks that will be impacted by the proposed development actions. **Proposed mitigation measures will only be effective if they do effectively counterbalance the short and medium-term impacts on black cockatoo populations from net loss of existing habitat.**

Development and biodiversity conservation do not need to be mutually exclusive. Southwest Western Australia is undergoing rapid and extensive development; and could be a strong model for how development and conservation can be managed synergistically. Part of what makes this region special is its unique and endemic biodiversity, including our endangered and iconic black cockatoos. As Western Australia develops, it will be important to implement effective efforts to ensure the conservation management of our threatened species. For black cockatoos, this will mean not only protecting existing important habitat on the Swan Coastal Plain but also – critically – revegetating with sufficient replacement habitat in the range areas of affected flocks, within appropriate time frames to ensure no net habitat loss at this critical juncture for Western Australia's declining black cockatoo populations.

Our research team commends the proponents of this proposed development for their offsets efforts. We hope that mitigation measures will be implemented to ensure no net loss of foraging and breeding habitat for local black cockatoo flocks in the medium-term (or short term, with respect to the installation of breeding hollows). Thank you again for the opportunity to provide comment on this proposal. I trust this comment will be considered in confidence where possible. Please do not hesitate to be in touch if you have any further queries.

Yours sincerely



Rebecca Donaldson BSc (Zool) Hons
Assoc. Lecturer, School of Veterinary Medicine
College of Science, Health, Engineering & Education
Murdoch University

References:

- 1.) Department of Environment and Conservation. (2007) Forest Black Cockatoo (Baudin's Cockatoos *Calyptorhynchus baudinii* and Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso*) Recovery Plan 2007-2016. (Perth, Western Australia).
- 2.) Department of Environment and Conservation. (2012) Carnaby's Cockatoo (*Calyptorhynchus latirostris*) Recovery Plan. (Perth, Western Australia).
- 3.) <https://www.conservation.wa.gov.au/management-plans/forest-management-plan-2014-2023>
- 4.) Other publications as cited in-text.

Comments relevant to Matters of National Environmental Significance are highlighted in yellow

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

22 June 2020

Dear EPA Chairman,

Re: Preliminary Bindoon Bypass Public Environmental Review as advertised 25/5/2020 and closing date 6/7/2020.

There are blaringly obvious reasons Bindoon Bypass should not be built North of Mooliabeenee Road, a major one is [REDACTED] Cullalla Road Mooliabeenee)

Political environment

1. At the time of endorsing Western route Corridor A, Transport Minister Bill Marmion (who was just about to be booted out of Parliament) rammed through corridor A as the endorsed option. Since then, the decision has just rolled on. No doubt loud voices in business, local community and government agencies are pushing for the Corridor A option. However, the Northern section of this route, past Mooliabeenee Road, is not mitigatable. It must be avoided because of the environmental values and the cumulative impact on the co-dependant ecosystems in this area.
2. Today 22/6/20 we have received Registered Post letter from [REDACTED] MRWA contractor. It is 30 days' notice, to tell us they are coming back onto our property again. Now it's a "Feasibility Study". The Map sent to us shows the whole middle part of our block. Not just the road reserve.
3. How am I supposed to comment on **this proposal** for the road reserve, if now they might change the route? Should a feasibility study be done before it is put out for comment...surely? The ongoing, never ending, relentless, time wasting, heart-breaking, stress that we have been subjected to is.....unconscionable.

WATER

4. [REDACTED] is a PEC (DBCA) and a TEC (DBCA). Reliant on shallow surficial water in the local area.
5. Our groundwater bores are in the surficial aquifer, replenished by local rainfall. Two of our bores are less than 100m from proposed highway. The other is in the feasibility area. These bores are not shown on map.
6. Water is everything to us, to our environment and to our business. If we were to put another bore in, it would be on the northern end of the proposed road reserve. It is where the road curves around and takes in this spot. MRWA will take the land where the bulk of our surficial water is.

7. In the proponent's submission, where is Part 9 of this document? Did this show the flow of surficial water and show the risks to our water?

http://www.epa.wa.gov.au/sites/default/files/PER_documentation2/BindoonBypass_E RD-PD_Assess2135_EPBC2017-8035

3. SEVERANCE of [REDACTED], in half

- Local Biodiversity Strategy adopted 21/4/20 identifies linkages at either end of M1364. Animals and birds **do** travel through our property from west to east. I dispute the assertion that they do not.
- There is no dieback in the property because there is not a highway through the middle of it. The property is 489 acres. There is dieback nearby along Crest hill Road and (not in the scope of this mapping).The only way to avoid dieback, weed infestation and degradation of the whole is to avoid this massive disturbance.
- For 25 years, on a weekly basis, I have bushwalked and ridden my motorbike alone, often, all around the firebreaks of our property. As a woman, there is nowhere else in the world that I could walk freely, quietly and alone, without fear of rape or assault. Having to enter from the other end is too far. The animals and I need to get from one side to the other, as we do now, west to east.
- Fragmentation of Habitat- the impact is cumulative and destruction will be well beyond the proposed envelope, not only on [REDACTED].
- Red tail Cockatoos are on [REDACTED] frequently, but are not shown on maps.
- Severance will bring road noise, road kill, vibration and especially light pollution. This will disrupt nocturnal creatures and birds, animals and reptiles beyond the road reserve and destroy biodiversity.
- [REDACTED] and the property to the north [REDACTED] will both be severed in half. Fauna move through both properties. Connectivity occurs through our properties and local ecological linkages. Movement of organisms and genetic material between linkages and our property occurs and animals have safe passage to water and food. This will be destroyed when our properties are severed.
- We object to the severance of our property resulting in zoning being changed from Agricultural to Conservation. This would be detrimental to us financially and impact our future plans. Clearing cannot occur on Agricultural land without a permit, so there is no need to change the zoning.

Massive Truck Stop on [REDACTED]. (Property to the north of [REDACTED]).

- It is an industrial land use
- It is on both sides of the road and at least 500m long.
- It is just 600m to the North/ East of our family home and about 50m from our property boundary. We object to our property is being used as a buffer zone for this Industrial Land use.
- Where are the details of ablutions, noise walls, fences? Or anything?

- Noise will be magnified because it is on a hill. Trucks will be using their brakes coming into it and moving towards the intersection on Mooliabeeenee road and coming up to it from Mooliabeeenee Road. I dispute the noise estimates in this area on mapping. It will be extensive and will travel further than the mapping shows, especially if road surface is the same as Tonkin highway around Muchea.
- Types of trucks using it- I object to Stinking cattle trucks parking up and idling there. It is too close to my home. There is already Cullalla Feedlot (2km to the Nth east) and you can check and see that I have reported stink from there before. I don't want to have cattle from other places like Andrew Forrest's 50,000 head proposed feedlot or a Rubbish dump or Manure trucks all parked up there. It will destroy our amenity and quiet enjoyment of our home and it is environmentally destructive. Odour, fumes and noise from Trucks idling and parked there will adversely impact us
- Noise estimation has not even been shown on the mapped area surrounding this Truck Stop bay.
- This will be unreasonable impost on our amenity and enjoyment of our home and surrounds. We always spend most of our time outside.
- Massive truck stop is located on top of /or very close by, where the surficial water flow commences or runs from. It is on higher land than where our bores are. When the area is disturbed, then they will destroy the natural water flow in the area and onto our property. (I think this route has been deliberately put over our water so the road builders can have free sand and water) But this is a fragile ecosystem and a there is no getting it back. Once one variable, (either water flow, soil layers, gravel outcrops are altered), it will all be affected. These are some but by no means all of my concerns.

I would suggest

That MRWA be directed to look at Western Bypass Corridor B or go back to the best option, which is the teeny, tiny Eastern corridor.

There needs to be specific ground water controls during the operational phase of the project. MRWA and contractors need to be fully accountable for destroying community livelihoods and shallow surficial aquifers that support life.

Move the Industrial Truck Stop or choose a shorter route that doesn't require a stinking, noisy, polluting truck stop.

Kind Regards

████████████████
Attachments: .2x Noise prediction,2. TEC and PEC whole of █████ and █████, including where the Massive truck stop is.3 Vegetation mapping-Excellent, Banksia Woodland

Submission ID: ANON-8KZR-56UW-6

Comments relevant to Matters of National Environmental Significance are highlighted in yellow

Fauna

- 1) Trapdoor spiders
 - a) No mention that none were found in other places.
 - b) Not even sure if the ones found will be avoided. Need to have conditions put in place to check for SRE before clearing is done. Route changes should be permitted to allow that.
 - c) I looked for Short Range Endemics within Section 4.3 as indicated on p.15 of Part 1. There was no mention of them. It appears that Chapter 4f is missing, so I don't know if that would have anything to say. Also a search revealed nothing about them in Chapters 6 or 7.
- 2) Carnaby's Cockatoo
 - a) There appear to be many suitable nesting trees in that area, including the proposed road. These would appear to be in danger of dying or naturally reducing in number and it would be interesting to know if there is a plan to save the Carnaby's Cockatoo and if so, how are these trees going to be kept and what is to be done to ensure that there are new ones coming on? Can offsets be used to formulate such a plan if it doesn't exist?

Need for the environmental destruction

- 1) Safety. This is using environmental destruction to avoid the consequences of past bad human/political decisions to site the town near the road and to allow population increase through federal government's immigration policy and also possible over-development and hence over-clearing of natural areas that gave commercial opportunity for population growth. Thus, we have a compounding of poor decision making, making matters even worse for the environment (as usual).
- 2) Big road trains can't cope. It's interesting that road hasn't caught up with the technology of rail – use more than one locomotive!
- 3) Making things nicer for people should never be an excuse for clearing good quality vegetation habitat. Why should wildlife have to suffer so that we can be more comfortable?
- 4) What is so bad about trucks diverting to the Brand Hwy via a off-take near Calingiri Rd to the railway line then via Mooliabeeenee Rd if they want some comfort and, presumably, a suitable grade of road?

Modifications

- 1) It is good to see how much planning has been done to avoid even more clearing.
- 2) It is good that there will be attention paid to fauna connectivity and rehabilitation. However not clear what is being done to minimise predators taking advantage of these.
- 3) It is not clear that the road is only dual carriageway through the good bushland and that passing lanes are on already-cleared land.
- 4) Good that there will be monitoring to ensure weed suppression."

Appendix B. Construction Environmental Management Plan



Great Northern Highway

Muchea to Wubin Upgrade - Stage 2

MAIN ROADS WESTERN AUSTRALIA

EPBC 2017/8035 Bindoon Bypass

EPBC Act | Construction Environmental Management Plan

Document Number :	GNH-CN12-EN01-MPL-0001
Revision :	4
Phase :	Environmental Assessment and Approval
Date :	11 / 12 / 2020
Contract Number :	CN12-EN01
Client Contract Number :	10/13

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Document Control

Document description	
Project :	Great Northern Highway - Muchea to Wubin Upgrade - Stage 2
Document Title :	EPBC 2017/8035 Bindoon Bypass EPBC Act Construction Environmental Management Plan
Document No. :	GNH-CN12-EN01-MPL-0001
Contract Number :	CN12-EN01
Client Contract Number :	10/13

Current Issue

Revision	Date
4	11 December 2020

Prepared by	Reviewed by	Reviewed by	Approved by
Document Owner	Contract Lead	Internal Technical Reviewer	Project Director
Claire Beckett	Lisa Boulden	N/A	Nigel Scott

Issue summary

Revision	Date	Issue description	Distribution
1	22-10-2020	Draft	Cross Discipline Review / Technical Review / PAG Review
2	30-10-2020	Draft	Issued to DAWE for comment
3	09-12-2020	Draft	PAG Review
4	11-12-2020	Final	Issued to DAWE

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 for EPBC 2017/8035 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)

Organisation (please print)

Date ____ / ____ / ____

Contents

Glossary	1
1. Introduction.....	2
1.1 Purpose and Scope of this Construction Environmental Management Plan.....	2
1.2 Objectives	3
1.3 Project Description	3
1.4 Project Schedule	4
1.5 Environmental Setting	4
2. Potential Environmental Impacts and Risks.....	9
2.1 Threats to Listed Threatened Species and Communities.....	9
2.2 Potential Impacts.....	10
2.3 Risk Assessment.....	11
3. Environmental Management	15
3.1 Implementation.....	15
3.2 Monitoring Program.....	27
3.3 Managing Uncertainty	30
4. CEMP Implementation	31
4.1 Roles and Responsibilities	31
4.2 Environmental Training.....	33
4.3 Inspections, Audits and Reporting	34
4.4 Review	35
5. Data Management	36
6. References	37

Tables

Table 1-1: Planned Project Schedule	4
Table 2-1: Impact to Black Cockatoos	10
Table 2-2: Condition of Suitable Chuditch Habitat to be Cleared	10
Table 2-3: Condition of Banksia woodland TEC to be Cleared	11
Table 2-4: Risk Assessment.....	12
Table 3-1: Environmental Management Implementation Schedule	16
Table 3-2: Monitoring Schedule	28
Table 3-3: Measures for Managing Uncertainty	30
Table 4-1: CEMP Roles and Responsibilities.....	31

Figures

- Figure 1: Project Location**
- Figure 2: Banksia Woodlands TEC Occurrences**
- Figure 3: *Phytophthora* Dieback Mapping (Source: Terratree 2018)**
- Figure 4: Carnaby's Black Cockatoo Habitat Foraging Value**
- Figure 5: Forest Red-tailed Black Cockatoo Habitat Foraging Value**
- Figure 6: Black Cockatoo Habitat – Trees with Suitable or Used Hollows**
- Figure 7: Potential habitat for Gingin Wax**

Appendices

- Appendix A. Risk Assessment Framework**
- Appendix B. Dieback Management Strategy**

Glossary

Abbreviation	Description
°C	Degrees Celsius
APV	Avian Polyomavirus
BCE	Bamford Consulting Ecologists
BFDV	Beak and Feather Disease Virus
Black Cockatoos	The two species of Black Cockatoos recorded from the Development Envelope being Carnaby's Black Cockatoo (<i>Calyptorhynchus latirostris</i>) and The Forest Red-tailed Black Cockatoo (<i>Calyptorhynchus banksii naso</i>)
BoM	Bureau of Meteorology
CEMP	Construction Environmental Management Plan
CoE	Clean on Entry
DAWE	Department of Agriculture, Water and the Environment
Declared Plant	A potentially harmful plant regulated under the <i>Biosecurity and Agriculture Management Act 2007</i> (WA).
Development Envelope	the maximum area within which the proposal footprint will be located
DoEE	Department of the Environment and Energy
Dow	Department of Water
DPaW	Department of Parks and Wildlife
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
footprint	the location where the physical proposal elements occur
GNH	Great Northern Highway
ha	hectare
km	kilometre
m	metre
Main Roads	Main Roads Western Australia
MNES	Matters of National Environmental Significance
mm	Millimetre
TEC	Threatened Ecological Communities
WA	Western Australia
BC Act	Biodiversity Conservation (Act)
WoNS	Weeds of National Significance

1. Introduction

On 1 September 2017, Main Roads Western Australia (Main Roads) referred the Bindoon Bypass proposal to the Department of Agriculture, Water and the Environment (DAWE) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (EPBC Reference 2017/8035). The referral was determined to be a Controlled Action with the controlling provision being “listed threatened species and communities”. In particular, it was considered that there was potential for significant impacts to:

- Black Cockatoos, in particular Carnaby’s Black Cockatoo (*Calyptorhynchus laticaudis*) and the Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*);
- Chuditch (*Dasyurus geoffroii*);
- Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community (TEC; hereafter referred to as the ‘Banksia Woodlands TEC’); and
- eight flora species listed as Threatened under the EPBC Act:
 - ▶ Bindoon Starbush (*Asterolasia nivea*)
 - ▶ Fine-leaved Darwinia (*Darwinia acerosa*)
 - ▶ Muchea Bell (*Darwinia foetida*)
 - ▶ Glossy-leaved Hammer Orchid (*Drakaea elastica*)
 - ▶ Gingin Wax (*Chamelaucium* sp. Gingin—NG Marchant 6)
 - ▶ *Grevillea corrugata*
 - ▶ Spiral Bush (*Spirogardnera rubescens*)
 - ▶ Star Sun-orchid (*Theelymitra stellata*)

Field surveys undertaken for the Bindoon Bypass recorded the presence of Carnaby’s Black Cockatoo, the Forest Red-tailed Black Cockatoo and the Banksia Woodlands TEC within the Development Envelope (FVC 2019; BCE 2018). While no direct observations of the Chuditch were made, there is anecdotal evidence of the species being present and suitable habitat was identified. None of the flora species listed above were recorded during the field surveys, despite extensive and targeted searches (FVC 2019).

1.1 Purpose and Scope of this Construction Environmental Management Plan

This Construction Environmental Management Plan (CEMP) has been prepared to support DAWE’s assessment of EPBC 2017/8035 under the EPBC Act. This CEMP has been developed in accordance with DAWE’s Environmental Management Plan Guidelines (Department of the Environment and Energy [DoEE – now DAWE] 2014).

The purpose of this CEMP is to outline the actions required to avoid, mitigate and manage impacts from construction activities to the relevant listed threatened species and communities, in line with the management measures described in the *Bindoon Bypass Environmental Review Document and Preliminary Documentation* (Version 7) dated 17/05/2020.

The scope of this CEMP is limited to project construction and revegetation activities with the potential to directly or indirectly impact on Banksia Woodlands, Carnaby’s Black Cockatoo, the Forest Red-tailed Black Cockatoo and the Chuditch. As no flora species listed as Threatened under the EPBC Act were identified within or adjacent to Development Envelope no specific measures for these species are included.

1.2 Objectives

The objectives of this CEMP are to:

- avoid clearing beyond approved limits of the Banksia Woodlands TEC, potential Gingin Wax habitat, Black Cockatoo habitat or Chuditch habitat;
- avoid clearing of more than 10 trees with hollows previously used by Black Cockatoos, as identified in BCE (2017, 2018, 2019);
- achieve performance targets and completion criteria for rehabilitation of Black Cockatoo habitat and Banksia Woodlands TEC; and
- maintain ecological connectivity across the Development Envelope.

Performance targets and completion criteria supporting these objectives are detailed in **Section 3**.

1.3 Project Description

Main Roads proposes to construct a bypass around Bindoon town and Bindoon Hill (hereafter referred to as the Bindoon Bypass, or the Proposal), located within the Shire of Chittering approximately 70 km north east of Perth and approximately 13 km north of Muchea, Western Australia (**Figure 1**). The Bindoon Bypass will divert from the existing GNH at the Chittering Roadhouse, running to the west of Bindoon and re-joining the GNH north of Calingiri Road. This will involve the construction of 47 km of new highway. The Bindoon Bypass will be constructed in stages based on the expected traffic volumes. The initial stage (Interim Stage) will consist of single carriageway (two lanes) with a number of overtaking lanes for both north-bound and south-bound traffic as well as stopping facilities. The second stage (Ultimate Stage) will build on the work done in the Interim Stage to accommodate higher numbers of road users, comprising an upgrade to dual carriageway (four lanes) between Chittering Roadhouse and Bindoon-Moora Road. Upgrades to local roads, rail crossings and intersections may also be required, as well as relocation of services, fencing of the road reserve and construction of driveway accesses for landowners.

The proposed works include:

- approximately 36 km of new dual carriageway and approximately 11 km of new single carriageway road;
- grade separated interchanges with existing roads;
- at-grade intersections with existing roads;
- a crossing at the Brockman River consisting of a bridge and culverts;
- travellers' rest areas;
- landscaping and revegetation works;
- new service roads; and
- modifications to local roads.

Activities that generally form part of the construction phase include:

- vegetation removal and topsoil stripping;
- fencing;
- earthworks, including excavation of road cuttings, material extraction from borrow pits, placement and compaction of fill and embankment foundations;
- piling and construction of foundations;
- bridge construction;
- stormwater drainage installation;

- pavement construction;
- road surfacing;
- culvert supply and installation;
- installation of associated road furniture;
- relocation of services;
- modifications to local roads;
- construction of drainage basins;
- use of water for construction purposes; and
- landscaping and revegetation.

1.4 Project Schedule

The planned project schedule for the proposed works is currently as detailed in **Table 1-1**. These dates are subject to change depending on a number of factors and will be updated accordingly.

Table 1-1: Planned Project Schedule

Activity	Current Schedule
Commencement of Construction	Quarter 3 2021
Construction Completed	2023
Commencement of Operations	2023

1.5 Environmental Setting

1.5.1 Climate

The Bindoon area has a warm, temperate climate with hot summers and cool, wet winters. The closest Bureau of Meteorology (BoM) rainfall recording station is Gingin Aero (site number 9178). That station records the average maximum temperature range as 18.3 degrees Celsius (°C) in July to 33.2 °C in January and February, and the average minimum temperature range as 6.3 °C in July to 17 °C in February (BoM 2018). The average annual rainfall recorded at Gingin Aero is 632.5 mm, with the majority falling over the winter months. July also records the highest average monthly rainfall of 125.8 mm. The highest recorded month of rainfall was 236.4 mm in June 2005 (BoM 2018).

1.5.2 Flora and Vegetation

No flora species listed as threatened under the EPBC Act have been recorded within the Development Envelope during the field surveys despite extensive searching during targeted surveys undertaken for all Threatened species that may occur within the Development Envelope. Eleven species listed on the WA Department of Biodiversity, Conservation and Attraction's (DBCA) Priority Flora list were recorded in the Development Envelope (FVC 2019).

Vegetation within the study area has broadly been characterised as Banksia low woodland, Jarrah-Marri woodland, Marri woodland, Bullich and Blackbutt (FVC 2018). The flora and vegetation surveys identified and mapped 12 vegetation associations (FVC 2019):

- *Banksia* spp. sparse woodland (Vegetation Association BaXpAn);
- *Banksia attenuata* sparse woodland (Vegetation Association BaXpUa);
- *Kunzea glabrescens* shrubland (Vegetation Association BmKgHg);

- *Eucalyptus marginata* and *Banksia sessilis* sparse woodland (Vegetation Association EmBsHh);
- *Eucalyptus marginata* sparse woodland (Vegetation Association EmXpAn);
- *Eucalyptus marginata* and *Corymbia calophylla* low sparse woodland (Vegetation Association EmXpHh);
- *Eucalyptus rudis* and *Melaleuca preissiana* sparse woodland (Vegetation Association ErXpBm);
- *Eucalyptus todiana*, *Banksia attenuata* and *Banksia menziesii* low sparse woodland (Vegetation Association EtBeAn);
- *Eucalyptus todiana* and *Banksia* spp. low sparse woodland (Vegetation Association EtEpAn);
- *Eucalyptus wandoo* and *Casuarina obesa* sparse woodland (Vegetation Association EwBeNa);
- *Eucalyptus wandoo* sparse woodland (Vegetation Association EwXpHh); and
- *Melaleuca viminea* shrubland (Vegetation Association MvJspLs).

Vegetation condition ranges from Completely Degraded to Excellent, with the majority of the study area being Completely Degraded to Degraded due to the large amount of cleared land and pasture. Whilst cleared land and pasture do support occasional trees or stands of trees, the absence of understorey reduces the quality of the vegetation and the value that the vegetation presents as habitat for native fauna.

The Banksia Woodlands of the Swan Coastal Plan TEC (Banksia Woodlands TEC) occurs across the Development Envelope (**Figure 2**). Five vegetation associations are considered to represent this TEC: BaXpAn, BaXpUa, EmXpAn, EtBeAn and EtEpAn (FVC 2019). Within the Development Envelope, 307.5 ha of Banksia Woodlands TEC has been mapped with the condition ranging from Degraded to Excellent (FVC, 2019).

1.5.3 Weeds and Disease

Weeds

A total of 30 introduced (weed) species were recorded during the flora and vegetation surveys (FVC 2019). The number of weeds identified is not unexpected, given that the Development Envelope and surrounding area includes large areas of paddock that are used for grazing of stock (and therefore seeded with pasture grasses and other species such as clover), cropping and horticulture

Of the weed species identified, one species is a Declared Plant under the *Biosecurity and Agriculture Management Act 2007*: *Chondrilla juncea* (Skeleton Weed). Skeleton Weed is a category C2 plant (eradication required) in the Shires of Chittering and Gingin, and other areas of the State, and is the subject of a Department of Agriculture eradication program. No Weeds of National Significance (WoNS) were recorded within the Development Envelope or the study area.

Phytophthora Dieback

Phytophthora Dieback is caused by a soil borne pathogen that occurs in areas receiving more than 400 mm annual rainfall. A dieback (*Phytophthora cinnamomi*) assessment was undertaken between March and April 2018 (Terratree, 2018). The majority of the native vegetation present within and surrounding the Development Envelope was mapped as uninfested though there are a number of areas identified as Dieback infested between Mooliabeenee Road and Cook Road (**Figure 3**). Dieback was predominately found to be present on lower slopes and in areas that showed evidence of ground disturbance activities.

1.5.4 Fauna

Fauna Habitats

Ten fauna habitats occur within the Development Envelope as follows:

- Banksia woodland;
- Banksia woodland with scattered Marri and/or Jarrah;
- Marri-Jarrah woodland;
- Marri-Jarrah woodland with little to no remnant understorey;
- Wandoo woodland (with or without understorey);
- Heath;
- Waterways or wetlands/damplands;
- Paddocks with large remnant trees;
- Paddocks; and
- Plantations.

Fauna habitat within and adjacent to the Development Envelope has been significantly fragmented due to clearing for agriculture (BCE 2017). Review of aerial photography indicates fragmentation is greatest near the southern interchange and along the northern third of the Development Envelope, where the alignment turns to the east to re-join the existing GNH. Habitat fragmentation in the surrounding area appears to be more significant to the east of the Development Envelope. Large areas of remnant native vegetation occur immediately west of the Development Envelope, particularly in the vicinity of Cook Road.

Areas of native vegetation, and therefore fauna habitat, extend across the Development Envelope at Cook Road, Barn Road, Gray Road and south of Teatree Road. These areas align with the ecological linkages identified by the Shire of Chittering (2010).

Conservation Significant Mammals

Two sightings of the Brush Wallaby were recorded by BCE (2018), though the species was not detected by the motion camera traps. These opportunistic sightings were in Banksia woodland habitat north of Mooliabeenee Road, and Marri-Jarrah woodland habitat north of Teatree Road. BCE (2018) concluded that the species is likely present at low levels of abundance in all large areas of native vegetation in the region.

No other conservation significant species were directly recorded during the 2016 and 2017 surveys; however, there were indirect records of the Water-rat (scats or possible foraging signs) along the Hay Flat Road drainage line. Residents around Chittering-Needonga Lakes have considered the species locally extinct for the last 20 years, though there are recent records along Gingin Brook near the town of Gingin (BCE 2017).

Motion-sensitive camera surveys did not record any evidence of the Chuditch, Quenda or Brush-tailed Phascogale. This does not necessarily indicate that the species are not present: they may occur in very low levels of abundance (BCE 2018). There is anecdotal evidence of Chuditch in the Bindoon area and historic records for the Brush-tailed Phascogale (BCE 2018). Quenda are known to occur at Bullsbrook and south of Muchea, though their range may not extend as far north as the Development Envelope (BCE 2018).

Black Cockatoos

The field surveys undertaken by BCE (2017, 2018, 2019) recorded considerable evidence of foraging by Forest Red-tailed Black Cockatoos in the southern two thirds of the study area, with 113 individual records of foraging activity. Evidence of foraging by Carnaby's Black Cockatoos was spread more evenly across the entire study area, with 115 individual records of foraging activity noted by BCE (2019).

Foraging habitat for both Carnaby's Black Cockatoo and the Forest Red-tailed Black Cockatoo occurs across the Development Envelope (**Figure 4** and **Figure 5**). For the Forest Red-tailed Black Cockatoo, 68.5% of the mapped habitat was determined to consist of habitat with Low or Negligible foraging value while for Carnaby's Black Cockatoo 60% of the mapped habitat was recorded as Low or Negligible (BCE 2019). Only 2.7% and 6.2% of the foraging habitat was recorded as High value for the Forest Red-tailed Black Cockatoo and Carnaby's Black Cockatoo respectively. In general, the Development Envelope provides Moderate value foraging habitat for both species of Black Cockatoo (BCE 2019).

During field surveys of the Development Envelope and surrounds, 1,352 tree hollows were recorded that are suitable for use by Black Cockatoos (BCE 2019) with a further 83 identified with evidence of chew marks around hollow entrances, indicating these are likely to be used for breeding (**Figure 6**).

1.5.5 Hydrology

Surface Water

The Development Envelope traverses three river catchments: Brockman River, Gingin Brook and Ellen Brook. The majority of the Development Envelope is in the Brockman River catchment, with smaller sections in the Gingin Brook and Ellen Brook catchment areas. Within these river catchments the Development Envelope crosses two surface water features: Brockman River (and its tributaries, the most significant of these being Uдумung Brook) and Lennard Brook. The Brockman River that runs sub-parallel to most of the proposed alignment is a tributary of the Avon River and ultimately the Swan River which flows through the centre of the Perth metropolitan area. Gingin Brook is a tributary of the Moore River located west of the project area. Both river systems provide economic and environmental benefits in their catchments for tourism, agriculture and groundwater-dependent ecosystems.

Water flows in the Brockman sub-catchments are generally in an easterly direction relative to the north-south section of the proposed alignment. Flow is typically in a westerly direction relative to the alignment, where the alignment runs approximately west-east. Water flows in the Gingin Brook sub-catchments are generally in a westerly direction.

Groundwater

Four aquifers are present within the Bindoon region (DoW 2015):

- an unconfined surficial aquifer on the Swan Coastal Plain;
- a fractured rock aquifer east of the Darling Fault;
- the Mirrabooka semi-confined aquifer west of the Darling Fault; and
- the semi-confined Leederville-Parmelia aquifer.

The surficial aquifer comprises colluvium and lateritised soil profiles, including a combination of colluvial and lateritic clays, sands, ferricrete and gravels that are intersected by alluvial deposits associated with natural drainage lines. The aquifer is thin and often unsaturated (DoW 2015).

The fractured rock aquifer comprises fractured and weathered crystalline bedrock with small groundwater storage capacity (DoW 2015). Low groundwater yields can be obtained from the base of the weathered zone in the saprolite, generally around 25 m depth; however, water-bearing fractures in the granitic rock are widely spaced and springs can occur below the laterite (Commander 2003).

The Mirrabooka aquifer is comprised of the Lancelin Formation, which includes variably lateritised glauconitic sands and clays, and the Osborne Formation, which includes glauconitic siltstone, claystone, shale and sandstone, where the Kardinya Shale Member acts as a basal aquitard (Commander 2003; Geological Survey of Western Australia 1978). The aquifer is hydraulically connected to the surficial aquifer and is recharged in the north of the Perth Basin (Commander 2003). The Mirrabooka aquifer contributes to the summer flows in the headwaters of the Gingin Brook and maintains summer flows in the Moore River (DoW 2015).

The Leederville-Parmelia aquifer is an interconnected aquifer of the Leederville Formation and Parmelia Group, comprising sandstone and shale aquitards. It is semi-confined and recharged by the Gnangara mound approximately 15 km west of Bindoon, before becoming confined to the south of the Gingin proclaimed groundwater area (DoW 2015). The Leederville-Parmelia aquifer is also referred to as a 'shallow artesian aquifer' and is used for public water supply (Commander 2003). Similar to the Mirrabooka aquifer, the Leederville-Parmelia contributes to the baseflow of the Gingin Brook and is important for maintaining summer flow in the Moore River (DoW 2015).

2. Potential Environmental Impacts and Risks

2.1 Threats to Listed Threatened Species and Communities

Threats to Carnaby's Black Cockatoo, the Forest Red-tailed Black Cockatoo, Chuditch and Banksia woodlands TEC are defined in their respective recovery plans and conservation advice.

The Recovery Plans for Carnaby's Black Cockatoo (Department of Parks and Wildlife 2013) and the Forest Red-tailed Black Cockatoo (Chapman 2008) identified the following threats common to both species:

- loss of habitat due to clearing or degradation;
- competition for nest sites (including with other bird species and feral honeybees) and nest hollow shortage;
- collisions with motor vehicles; and
- illegal shooting and poaching.

In addition, the recovery plan for the Carnaby's Black Cockatoo identified disease, such as beak and feather disease virus (BFDV), avian polyomavirus (APV) and chlamydophilosis, may also pose a threat to the species (Department of Parks and Wildlife 2013).

The National Recovery Plan for the Chuditch (Department of Environment and Conservation 2012) outlines the current major threats to the species as:

- land clearing, particularly of riparian vegetation, and the removal of suitable den logs and den sites from Chuditch habitat;
- predation by, and competition from, foxes and feral cats; and
- deliberate and accidental mortality from poisoning, trapping, illegal shooting, and road kills.

The main ongoing threats to the Banksia Woodlands TEC as listed in the conservation advice (Threatened Species Scientific Committee 2016), include the following:

- clearing and fragmentation;
- dieback diseases (especially those caused by *Phytophthora* species);
- invasive species;
- fire regime change (particularly increased fire frequency; prescribed burning during late autumn to late spring when plants are in active growth, flowering and seed development and animals are active);
- hydrological degradation (groundwater abstraction, eutrophication, soil acidification); and
- loss of keystone Banksia species and fragmenting of nectar/pollen nutritional networks e.g. loss of *Banksia ilicifolia* in water drawdown areas.

2.2 Potential Impacts

2.2.1 Black Cockatoos

Table 2-1 details the potential impacts to Black Cockatoos as a result of clearing for construction of the Bindoon Bypass. Revegetation activities at the completion of construction will include planting and/or seeding with species known to provide foraging and future breeding habitat for Black Cockatoos.

Table 2-1: Impact to Black Cockatoos

Habitat	Maximum Clearing Required
Trees with hollows showing evidence of use	10
Trees with suitable hollows	117
Foraging and breeding habitat for Carnaby's Black Cockatoo	204.8 ha
Foraging and breeding habitat for the Forest Red-tailed Black Cockatoo	168 ha

The quality of foraging habitat for Black Cockatoos 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 Black Cockatoos and vehicles resulting in injury or death of the bird.

2.2.2 Chuditch

Up to 54.4 ha of habitat that is suitable for the Chuditch will be cleared for construction of the Bindoon Bypass. **Table 2-2** details the clearing by vegetation quality.

Table 2-2: Condition of Suitable Chuditch Habitat to be Cleared

Condition	Area (ha)
Completely Degraded – Degraded	15.3
Degraded	2.0
Good	10.5
Good – Very Good	6.2
Very Good	14.0
Very Good – Excellent	6.4

Should Chuditch be present within or in the vicinity of the Development Envelope, other potential impacts include:

- fragmentation of habitat and loss of connectivity;
- habitat degradation due to introduction or spread of weed or dieback; and
- fauna mortality from vehicle strikes.

2.2.3 Banksia Woodlands TEC

Up to 60 ha of the Banksia Woodlands TEC will be cleared for construction of the Bindoon Bypass. Landscaping activities will include revegetation with Banksia woodlands TEC species. **Table 2-3** details the clearing by vegetation quality.

Table 2-3: Condition of Banksia woodland TEC to be Cleared

Vegetation Quality	Maximum Cleared (ha)
Degraded – Good	4.0
Good – Very Good	21.2
Very Good	11.6
Very Good – Excellent	14.0
Excellent	9.2

Other potential impacts to the Banksia Woodlands TEC are:

- changes to Banksia Woodlands TEC vegetation health as a result of changes to groundwater levels;
- reduced biodiversity due to introduction and/or spread of weeds; and
- loss of Banksia Woodlands TEC due to the spread or introduction of *Phytophthora* dieback.

2.3 Risk Assessment

An environmental risk assessment has been undertaken for the Bindoon Bypass. The risk assessment is a live document that will continue to be revisited on receipt of approvals, in response to changes in scope or as a result of environmental incident. The outcomes of the risk assessment are presented in **Table 2-4**. The assessment framework and definitions for Likelihood and Consequence are provided in **Appendix A**.

Table 2-4: Risk Assessment

Management Objective / Desired Outcome	Impact and Risk (Event or Circumstance)	Relevant Management Measures/Actions	Residual Risk		
			Likelihood	Consequence	Residual Risk Rating
To avoid impacts to Black Cockatoo habitat beyond that approved.	Clearing of more than the approved amount of habitat or clearing of habitat outside of approved areas.	<ul style="list-style-type: none"> Area to be cleared will be accurately pegged/mark 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 10 trees with hollows previously used by Black Cockatoos or 117 hollows suitable for use by Black Cockatoos	<ul style="list-style-type: none"> Installation of safety barriers to avoid clearing of trees with suitable/used hollows. 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	<ul style="list-style-type: none"> Weed and hygiene control measures will be in place during construction including: <ul style="list-style-type: none"> verifying all plant and machinery as clean prior to arrival at site; segregating stripped topsoil according to its weed and disease status; and 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 or condition from unauthorised site access	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> Dust suppression will be used on all cleared areas during construction activities. Vehicle speed on site will be limited for safety of construction personnel and this will consequently reduce dust lift off. 	Rare	Moderate	Low
	Damage to habitat from accidental fires resulting from construction activities.	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> 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 and Risk (Event or Circumstance)	Relevant Management Measures/Actions	Residual Risk		
			Likelihood	Consequence	Residual Risk Rating
To avoid impacts to Banksia Woodlands TEC beyond that approved.	Clearing of more than the approved extent of 60 ha	<ul style="list-style-type: none"> Area to be cleared will be accurately pegged/mark 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
	Introduction or spread of weeds and disease impacting on vegetation health or condition.	<ul style="list-style-type: none"> Weed and hygiene control measures will be in place during construction including: <ul style="list-style-type: none"> verifying all plant and machinery as clean prior to arrival at site; segregating stripped topsoil according to its weed and disease status; and 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.	<ul style="list-style-type: none"> 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 Banksia Woodlands TEC from accidental fires resulting from construction activities.	<ul style="list-style-type: none"> 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 to designated cleared areas. Fire danger ratings and Shire vehicle movement bans will be observed and the requirements of these implemented. 	Rare	Moderate	Low
	Reduced vegetation health due to groundwater drawdown in areas adjacent to construction water sources	<ul style="list-style-type: none"> All groundwater abstraction undertaken in line with appropriate licences and management plans approved under the <i>Rights in Water and Irrigation Act 1914</i>. 	Unlikely	Moderate	Low
To achieve performance targets and completion criteria for rehabilitation of Carnaby's Black Cockatoo habitat and Banksia Woodlands TEC.	Revegetation fails to achieve completion criteria.	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> Project funding cost estimates include environmental management requirements. 	Rare	Major	Medium
	Weed control measures fail to achieve performance targets.	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> 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
To maintain ecological connectivity across the Development Envelope	Fauna underpasses not used by target species	<ul style="list-style-type: none"> Fauna underpasses designed in accordance with Main Roads guidance (Design of Fauna Underpasses). This guidance takes into consideration current experience across Australia in relation to use of underpasses by various fauna species. 	Possible	High	Medium

Management Objective / Desired Outcome	Impact and Risk (Event or Circumstance)	Relevant Management Measures/Actions	Residual Risk		
			Likelihood	Consequence	Residual Risk Rating
	Revegetation fails to achieve completion criteria.	<ul style="list-style-type: none"> 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

3. Environmental Management

3.1 Implementation

Table 3-1 details the management measures to be put in place to achieve the outcomes identified in the risk assessment. The table also shows each management measure identified in the risk assessment, the implementation timing of these, their completion criteria and the monitoring record to show when each completion criteria is met.

Table 3-1: Environmental Management Implementation Schedule

Management Objective	Management Measure	Performance Target/Completion Criteria	Timing	Monitoring/ Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
Vegetation Clearing							
To avoid impacts to Black Cockatoo habitat beyond that approved	Trees with hollows previously used by or suitable for Black Cockatoos within the Development Envelope but not within the clearing footprint will be clearly marked as no-go zones and access to these areas restricted. No-go zones will include a 10 m buffer from the trunk of the tree unless this is not achievable due to the proximity of the clearing footprint. Where a 10 m buffer is not achievable, the maximum buffer achievable between the tree and the clearing footprint will be implemented.	Drawings showing environmental no-go areas provided to the Construction Contractor Representative All environmental no-go areas clearly marked with flagging on site	Contract award and prior to start of clearing. Prior to start of clearing	Record of provision of drawings showing environmental no-go areas Initial site inspection prior to clearing to confirm no-go zones are in place. Site inspections to confirm no-go zones remain in place and have not been entered. Incident reports	Clearing within a No-go area	Incorrectly cleared areas must be included in the landscape design for the project within 6 months of completion of clearing for revegetation with 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 Superintendent
If clearing of Black Cockatoo habitat is to occur between 1 July and 28 February, all potential nesting trees identified by BCE (2017, 2018, 2019) within the area to be cleared will be inspected by a suitably qualified person to determine if any hollows are being used by Black Cockatoos	Survey of trees with hollows used by or suitable for use by Black Cockatoos undertaken within 7 days prior to clearing events	Within 7 days prior to clearing events that occur between 1 July and 28 February	Pre-clearing inspection for hollows that are being used, or are capable of being utilised signed off my Main Roads Superintendent. Maintain a register of nesting trees	Clearing event undertaken without pre-clearing survey. Survey undertaken more than 7 days prior to clearing	Contractor to provide evidence that a suitably qualified person is engaged to conduct surveys prior to subsequent clearing events Contractor to provide evidence that surveys are scheduled within 7 days prior to subsequent clearing events Unanticipated clearing event delays will be risk assessed against survey findings.	Contractor to provide evidence that a suitably qualified person is engaged to conduct surveys prior to subsequent clearing events Contractor to provide evidence that surveys are scheduled within 7 days prior to subsequent clearing events Unanticipated clearing event delays will be risk assessed against survey findings.	Construction Contractor Environmental Management Representative
If any hollows within the clearing footprint are identified as being in use by Black Cockatoos, the hollow bearing tree and a 10 m buffer will be marked as a No-Go area. Clearing of the tree will not be undertaken until a suitably qualified person has verified that the hollow is no longer being used	No clearing of trees used by Black Cockatoo All trees currently being used by Black Cockatoos are marked with flagging as no-go areas with a 10 m exclusion zone	Black Cockatoo breeding season and following survey of area to be cleared	Surveys undertaken by suitably qualified person to confirm hollow is no longer being used by Carnaby's Black Cockatoo Maintain a register of nesting trees	Clearing of a tree with a hollow currently used by a Black Cockatoo Suitably qualified person has not confirmed the tree is no longer being used by Black Cockatoo before it is cleared	Immediate inspection of felled tree (e.g. with hollow currently in use) to determine survivability of Black Cockatoo (if present) Incorrectly cleared areas must be included in the landscape design for the project and marked for revegetation with Black Cockatoo habitat species Clearing activities are immediately ceased in the vicinity of the unmarked trees and relevant trees are correctly flagged before clearing activities recommence If a tree currently utilised by the species is felled, clearing in the direct	Construction Contractor Environment Management Representative	

Management Objective	Management Measure	Performance Target/Completion Criteria	Timing	Monitoring/ Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
						<p>vicinity will cease immediately if trigger is met</p> <p>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</p>	
To avoid injury or mortality of Chuditch during vegetation clearing and construction	Capture and relocation of fauna in areas of native vegetation undertaken by a suitably qualified person prior to clearing. Fauna trapping and relocation will be conducted in accordance with the DBCA's standard operating procedures < https://www.dpaw.wa.gov.au/plants-and-animals/96-monitoring/standards/99-standard-operating-procedures > The trapping program will include: <ul style="list-style-type: none"> • Cage traps suitable for Chuditch • On days over 35°C or in extreme rain events, traps will be closed after checking in the morning and re-opening in the late afternoon, to avoid capture during the day • Relocation of fauna found to a suitable habitat nearby • Trapping until no conservation significant species are caught for two consecutive nights or otherwise determined by a fauna expert 	Capture and relocation of fauna undertaken prior to clearing in all areas of native vegetation.	Prior to vegetation clearing	Records of fauna capture and relocation	<p>Clearing commenced without capture and relocation of fauna having been undertaken</p> <p>If practicable, move to areas where capture and relocation of fauna has been completed while additional trapping is undertaken.</p> <p>Suitably qualified person to conduct a walkover of the clearing area to encourage fauna to disperse.</p>	Clearing activities are immediately ceased and additional trapping/relocation undertaken.	Construction Contractor Environment Management Representative
	Fauna spotters engaged during clearing activities supervise the dispersal and/or capture and relocation of fauna detected ahead of clearing machinery	Fauna spotters engaged for all clearing activities	Vegetation clearing	Daily reports from fauna spotters	Fauna spotter not present during clearing of native vegetation	<p>Clearing activities are immediately ceased and clearing of native vegetation will not resume until a fauna spotter is in attendance.</p> <p>Cleared areas checked for injured fauna</p>	Construction Contractor Environment Management Representative

Management Objective	Management Measure	Performance Target/Completion Criteria	Timing	Monitoring/ Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
To avoid impacts to Black Cockatoo habitat beyond that approved To avoid impacts to Banksia woodlands TEC beyond that approved	All clearing areas will be clearly marked with flagging and approved by the Main Roads Superintendent prior to clearing commencing so that there is no clearing of Black Cockatoo habitat or Banksia woodlands TEC outside of the approval boundary.	All areas to be cleared will be marked with flagging on site	Prior to start of clearing	Site inspections	More than 60 ha of Banksia Woodlands TEC will be cleared. More than 204.8 ha of Carnaby's Black Cockatoo foraging habitat will be cleared. More than 168 ha of Forest Red-tailed Black Cockatoo foraging habitat will be cleared.	Incorrectly cleared areas must be included in the landscape design for the project and marked for revegetation with Black Cockatoo habitat species Clearing activities are immediately ceased and clearing of native vegetation will not resume until additional approval has been granted for the extra clearing required	Construction Contractor Environment Management Representative
	Additional areas required for construction such as laydown areas, stockpile areas and vehicle turn around, will be located in areas cleared for permanent works or areas that do not contain Black Cockatoo habitat or Banksia woodlands TEC. Clearing will be avoided for any temporary construction activities.	Areas for ancillary services located in cleared areas or areas that do not contain Black Cockatoo habitat or Banksia woodlands TEC.	During construction	Construction site plan showing all ancillary areas not located on land containing Black Cockatoo habitat or Banksia woodlands TEC. Site inspections	Areas required for construction such as laydown areas etc are proposed to be located within areas of native vegetation	Main Roads Superintendent is required to provide approval for clearing of native vegetation for construction laydown etc. and approval must only be given if there are no other practicable options. Incorrectly cleared areas must be included in the landscape design within six months of completion of clearing for revegetation with Black Cockatoo foraging habitat species and/or Banksia species as appropriate	Main Roads Superintendent Construction Contractor Environment Management Representative
	Vegetation to be retained will be marked with flagging on site	All vegetation to be retained will be marked with flagging on site	Prior to start of clearing	Site inspections	Clearing within an area of vegetation to be retained	Incorrectly cleared areas must be included in the landscape design for the project within 6 months of completion of clearing for revegetation with 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 Superintendent
To avoid and mitigate impacts to potential habitat for Gingin Wax (<i>Chamaelacium sp.</i> Gingin)	In areas of habitat suitable for Gingin Wax (Figure 7), topsoil will be stripped separately to other areas and retained for later use in revegetation. The topsoil stockpile will be clearly marked with the species name and location the topsoil was taken from.	Topsoil from within the area identified in Figure 7 is retained for use in landscaping and revegetation.	During clearing and topsoil removal.	Site inspections Topsoil management records	Topsoil from within the area identified in Figure 7 is not stockpiled separately but mixed with topsoil from surrounding areas.	Incident investigation and report undertaken within 1 week. Investigations to identify the location of stockpile(s) containing topsoil from the area identified in Figure 7 . These stockpiles will be clearly marked with the species name and identified as to be used in landscaping and	Construction Contractor Environmental Management Representative

Management Objective	Management Measure	Performance Target/Completion Criteria	Timing	Monitoring/ Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
						revegetation of areas within potential Gingin Wax habitat.	
Vehicle interaction with fauna							
To avoid injury or mortality of Black Cockatoos or Chuditch during vegetation clearing and construction	Where trees that are known to be Black Cockatoo habitat are retained but are located within 10 m of the edge of the road seal the risk of fauna strike will be assessed to determine if wildlife hazard signage is required. Fauna warning signs will be installed in areas where native vegetation occurs next to the roadside on either side of the road.	Black Cockatoo habitat retained within 10 m of the edge of the seal of the road will be risk assessed and wildlife hazard signage installed as required. Fauna warning signs installed where native vegetation occurs on either side of the road.	During construction	Risk assessment Site inspection of signage installed at completion of construction	Black Cockatoo habitat is retained within 10 m of the edge of the road seal and is not risk assessed to determine whether wildlife hazard signage is required No fauna warning signs in an area where native vegetation occurs on either side of the road	Risk assess areas where signage not installed and install wildlife hazard signage if required	Construction Contractor Environment Management Representative
	Speed limits between 40 – 80 km/hr will be applied throughout the construction site for safety purposes which will consequently reduce the risk of fauna strikes during construction	No incidents of speeding within the construction site boundary	During construction	Visual monitoring by all construction personnel.	Exceedance of site speed limits are observed	Offenders will be asked to immediately reduce speed Refresher training will be conducted within 1 week	Construction Contractor Environmental Management Representative
	A list of local wildlife rescue organisations and carers will be maintained on site to contact immediately in the event of fauna injury	A list of local wildlife rescue organisations and carers to be on site at all times	During construction	Site inspections	A list of local wildlife rescue organizations and carers is not on site Wildlife rescue specialists not contacted immediately on discovery of an injured Black Cockatoo or Chuditch	A list of local wildlife rescue organizations and carers is to be maintained on site immediately Refresher training will be conducted within 1 week	Construction Contractor Environmental Management Representative
Habitat Connectivity							
To maintain ecological connectivity across the Development Envelope	Fauna underpasses to be included in areas that align with ecological linkages identified by the Shire of Chittering's local biodiversity strategy (Shire of Chittering 2010).	Underpasses constructed in locations identified on design drawings issued for construction	During construction	Monthly progress reporting Closeout and handover inspection	Fauna underpasses (or alternatively, overpasses) not constructed as per the design drawings	Investigation to determine if under/overpass can be constructed in an alternative location Review of locations of constructed fauna under/overpasses to determine if important linkages have been maintained	Main Roads Project Manager

Management Objective	Management Measure	Performance Target/Completion Criteria	Timing	Monitoring/ Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
Fire							
To avoid impacts to 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	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 Refresher training will be conducted within 1 week	Construction Contractor Environmental Management Representative
To avoid impacts to Banksia woodlands TEC beyond that approved	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 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	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 Black Cockatoo habitat beyond that approved	Dust suppression (e.g. water carts) and/or surface stabilization measures (e.g. hydromulch) will be used to protect loose surfaces or cleared areas.	No visual dust plumes generated by construction activities	Post clearing and during construction	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
To avoid impacts to Banksia woodlands TEC beyond that approved	Dust generating activities suspended during periods of high wind conditions						
To achieve performance targets and completion criteria for Black Cockatoo and Banksia woodlands TEC	Reduced speed limits (40 - 80 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

Management Objective	Management Measure	Performance Target/Completion Criteria	Timing	Monitoring/ Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
	Temporary construction drainage within or adjacent to Carnaby's Black Cockatoo habitat or Banksia 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 Black Cockatoo habitat or Banksia woodlands TEC	Prior to and during construction	Site inspections. Annual revegetation monitoring	Erosion identified in Black Cockatoo habitat or Banksia 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
Construction Water Abstraction							
To avoid impacts to Black Cockatoo habitat beyond that approved	Water abstraction for construction purposes will be operated so as not to reduce groundwater levels below groundwater dependent banksia communities more than 0.5 m below existing groundwater levels.	Groundwater drawdown 0.5m or less in Banksia woodland monitoring sites.	During construction	Monitoring in accordance with the groundwater operating strategy required under RIWI Act approval for the abstraction. Monitoring of groundwater levels in areas of Banksia woodland that are within 100m of bores	Groundwater drawdown of more than 0.5m in Banksia woodland monitoring sites	Abstraction from the bore in question is suspended until groundwater levels recover. Rate of abstraction reviewed to determine if a lower rate which does not reduce groundwater levels more than 0.5m in Banksia woodland monitoring sites is feasible.	Construction Contractor Environmental Management Representative
Brockman River Crossing – ASS							
To avoid impacts to Black Cockatoo and Chuditch habitat beyond that approved	Undertake ASS investigation of the Brockman River Crossing location.	ASS investigation undertaken prior to start of construction within the Brockman River floodplain.	Prior to construction within the Brockman River floodplain.	Start-up audit Construction Hold Point for Brockman River crossing construction	ASS investigation not undertaken prior to start of construction within the Brockman River floodplain	Construction activities are immediately ceased within the Brockman River floodplain until ASS survey is undertaken, results known and construction method updated as required in order to manage and PASS or AASS risks. Field readings from already disturbed areas to identify PASS/AASS risk and management measures (such as covering with clean fill or neutralisation) put in place if required	Construction Contractor Environmental Management Representative
	Should AASS or PASS be identified from the investigation, management measures consistent with the <i>Treatment and management of soil and water in acid sulfate soil landscapes</i> (DER 2015b) will be implanted. This will include: <ul style="list-style-type: none"> Minimising the disturbance footprint in PASS or AASS areas to that required for construction, such as excluding PASS/AASS areas from topsoil stripping. Neutralising PASS/AASS soil and stockpiles with lime 	No statistically significant change in surface water quality downstream of the Brockman River crossing when compared to baseline conditions.	All construction activities within the Brockman River floodplain	Water quality monitoring during construction Monthly reporting	Water quality monitoring shows increased levels of salinity, metals or hydrocarbons or decreased pH downstream of the Brockman River crossing	Review of results from downstream monitoring site against upstream (control) site to determine if change is a result of construction activities. If applicable, review ASS procedures and treatment infrastructure to confirm neutralisation dosing rate is effective and all PASS/AASS material is being treated Investigation to identify cause of change	Construction Contractor Environmental Management Representative

Management Objective	Management Measure	Performance Target/Completion Criteria	Timing	Monitoring/ Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
	<ul style="list-style-type: none"> Selecting construction methods to reduce the need for soil excavation or dewatering Neutralising acidic dewatering effluent 						
Construction Near Waterways							
To avoid impacts to Black Cockatoo and Chuditch habitat beyond that approved	Fuels and chemicals will be stored in secure bunded areas in the construction compound and at least 50 m from drainage lines. Individual substances will be stored in accordance with the relevant material safety data sheet (MSDS) specifications and Australian Standard (AS) 1940:2017 (<i>The Storage And Handling Of Flammable And Combustible Liquids</i>).	All fuels and chemicals stored in accordance with MSDS and/or Australian Standard requirements	All construction activities	Start-up audit/inspection Site inspections	Chemicals identified during site inspections that are not stored as required Chemicals/fuels stored within 50 m of watercourse	Non-compliant vessels/containers will be moved into storage areas with appropriate containment. Chemical/fuel storage areas moved so they are more than 50 m from a water course	Construction Contractor Environmental Management Representative
To avoid impacts to Banksia woodlands TEC beyond that approved	All construction areas will be equipped with appropriately stocked spill kits near construction works such that they are readily accessible should a spill occur.	Spill kits in place at all construction areas Spill kits are stock with appropriate materials relevant to the works being undertaken and the site conditions	All construction activities	Site inspections	Site inspection identifies missing or inappropriate spill kits	Supply appropriately equipped spill kit to worksite	Construction Contractor Environmental Management Representative
Where possible, no refuelling will be undertaken within 50 m of watercourses/waterbodies. The only exception to this will be immobile plant (eg generators or pumps) or large plant (eg piling crane) where it is impractical to move the plant away from the watercourse for refuelling. In this situations, drip trays will be used and spill kits will be on hand.	No refuelling within 50 m of watercourses/waterbodies, not including the exceptions noted	All construction activities	Site inspections Incident reporting	Incident reporting or site inspections identify that refuelling has occurred within 50 m of watercourse or waterbody	Issue raised at the next toolbox meeting Review site signage and install additional signage if required	Construction Contractor Environmental Management Representative	
Where construction in or near waterways is undertaken while water is present in the watercourse, silt curtains and/or silt fences (or equivalent) will be used to contain and/or filter high turbidity water generated during construction and prevent sediment from reaching the waterway	silt curtains and/or silt fences (or equivalent) in place to manage high turbidity water	All construction activities	Site inspections	High turbidity water observed downstream of silt curtain and/or silt fences (or equivalent)	Review placement and condition of silt curtain and/or silt fences (or equivalent) Replace silt curtain and/or silt fences (or equivalent) if identified to be damaged/faulty	Construction Contractor Environmental Management Representative	

Management Objective	Management Measure	Performance Target/Completion Criteria	Timing	Monitoring/ Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
Weeds and Disease							
To avoid impacts to Black Cockatoo and Chuditch habitat beyond that approved	Declared Plants within the construction site boundary will be treated according to their Control Codes and advice from the Department of Primary Industries and Regional Development.	No new occurrence or spread of Declared Plants within the construction site boundary during construction activities	All construction activities	Site inspections Annual revegetation monitoring	New occurrence or spread of a Declared Plant identified	Application of weed eradication techniques for the weed species Review of Clean on Entry (CoE) process	Construction Contractor Environmental Management Representative
To avoid impacts to Banksia woodlands TEC beyond that approved	All plant and machinery will be inspected by the contractor prior to entry at the work site and be confirmed to be clean and free of vegetation and soil material	All plant and machinery will be verified clean on arrival at site	All construction activities	Records verifying plant and machinery arriving on site is clean	Plant and machinery arriving on site without verification that it is clean of soil and vegetative matter	Refresher training will be conducted	Construction Contractor Environmental Management Representative
To maintain ecological connectivity across the Development Envelope	CoE procedures will be implemented on site (refer to the Dieback Management Strategy – Appendix B)	No breach of CoE protocols	For the duration of the approval	Entry and/or exit records for CoE points Site inspections	Breach of CoE protocol	Refresher training will be conducted within 2 weeks	Construction Contractor Environmental Management Representative
	Topsoil from areas infected or potentially infected with <i>Phytophthora</i> dieback shall be segregated and not used in non-infected areas. Dieback free soil may be used in any area, but topsoil taken from Uninterpretable areas may only be used in Uninterpretable or Dieback infested areas (refer to the Dieback Management Strategy – Appendix B)	No topsoil potentially infected with <i>Phytophthora</i> dieback used for revegetation in non-infected areas	During revegetation activities	Site inspections Topsoil management records	Topsoil from areas identified as potentially infected used during revegetation works	Engage a <i>Phytophthora</i> dieback specialist within 2 weeks to assess potentially infected area and implement corrective actions as advised within 1 month	Construction Contractor Environmental Management Representative
	Temporary construction drainage will be designed and constructed such that surface water runoff from dieback infested areas is not allowed to drain into protectable areas or areas that have not been assessed for the presence of Dieback (refer to the Dieback Management Strategy – Appendix B)	No movement of water from construction areas in dieback infested areas into protectable areas or areas that have not been assessed for the presence of Dieback	All construction activities	Site inspections Inspection of drainage structures following rainfall events	Failure of construction drainage in dieback infested areas	Repair drainage structures as soon as conditions allow access to the location Engage a <i>Phytophthora</i> dieback specialist within 2 weeks to assess potentially infected area and implement corrective actions as advised within 1 month	Construction Contractor Environmental Management Representative
Revegetation							
To achieve performance targets and completion criteria for Black Cockatoo and Banksia woodlands TEC	Revegetation will commence in the autumn/winter following completion of construction works within designated revegetation areas and corridors to maintain ecological linkages	Revegetation commenced within a year following the completion of construction Revegetation works will occur within the optimum time of year (May-June)	Post construction	Site inspections during revegetation works Annual site inspections 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 to ensure all future revegetation activities are included	Construction Contractor Environmental Management Representative

Management Objective	Management Measure	Performance Target/Completion Criteria	Timing	Monitoring/ Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
To avoid and mitigate impacts to potential habitat for Gingin Wax (<i>Chamelaeicum sp.</i> Gingin) To maintain ecological connectivity across the Development Envelope	All rubbish and surplus materials are removed from site at the completion of revegetation	No rubbish will remain on site after construction is completed Materials not required for revegetation are not to remain on site after construction is completed. After revegetation works, all remaining materials will be removed from the site.	Within a year of the end of construction OR Within a year following completion of revegetation	Contract completion inspection	Rubbish or surplus materials observed during the contract completion inspection	Rubbish or surplus materials are removed and disposed of immediately.	Contractor Environmental Management Representative
	Compacted areas will be ripped prior to seeding / planting to provide an area of seed / seedling establishment and improve infiltration	All compacted areas are deep ripped prior to seeding / planting	At the start of revegetation activities. Within a year of the end of construction OR Within a year following completion of revegetation	Site inspections during seeding/planting	Compacted areas are not deep ripped prior to seeding / planting	Affected revegetation areas will be inspected annually with infill planting and reseeding being undertaken as required to meet revegetation completion criteria	Construction Contractor Environmental Management Representative
	Plant species which are known to provide habitat for the Black Cockatoos will not be planted within 10 m of the edge of the road seal	No foraging, nesting or roosting plant species for Black Cockatoos planted within 10 m of the edge of seal	During drafting of revegetation plans, which will initially occur prior to contract award	Site inspections during seeding/planting	Black Cockatoo preferred plant species planted within 10 m of the edge of the road seal	Black Cockatoo preferred plant species within 10 m of the edge of the road seal will be removed within 2 days and will be replanted further than 10 m from the edge of the road seal	Construction Contractor Environmental Management Representative
	Species mixes used in revegetation will aim to provide the following ecological services: <ul style="list-style-type: none">• provide foraging and potential breeding habitat for Black Cockatoos in locations more than 10 m from the edge of the seal; and• support fauna movement within the road reserve and between patches of existing native vegetation outside of the Development Envelope.	Species mixes will be specified in the Main Roads Revegetation and Landscaping Specifications developed for the contractor Revegetation will meet the following completion criteria within five years of completion, as verified by a suitable qualified person: <ul style="list-style-type: none">• minimum of 60% of number of native species across rehabilitation site when compared to all the reference sites.	During drafting of revegetation plans, which will initially occur prior to contract award	Site inspections during seeding/planting	Species mix used during revegetation does not comply with the landscape design and/or provide habitat for the Carnaby's Black Cockatoo	Approval is obtained from the Main Roads Environment Representative to use alternative species that continue to achieve revegetation completion criteria If the Main Roads Environment Representative does not approve alternative species mix non-compliant species must be removed and correct species used	Construction Contractor Environmental Management Representative
			During revegetation	Annual revegetation surveys (in Spring) will be undertaken until completion criteria have been achieved	Revegetation surveys show that revegetation completion criteria are not being maintained	If vegetation density or vegetation cover is not achieved infill planting will be undertaken between May and June If minimum weed cover is not achieved weed eradication techniques will be applied within 3 months of becoming aware that an area of revegetation no longer meets the completion criteria	Main Roads Environment Representative

Management Objective	Management Measure	Performance Target/Completion Criteria	Timing	Monitoring/ Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
		<ul style="list-style-type: none"> all common tree species identified at reference sites present in revegetation minimum of 50% of number of Black Cockatoo habitat species when compared to all the reference sites. minimum of 50% of number of Banksia species in revegetation of areas adjacent to Banksia woodlands TEC when compared to all reference sites within Banksia woodland TEC. minimum of 50% native species foliage cover. weeds are manageable and not likely to outcompete revegetation greater than 50% of plant species are at least 5 years old. 					
	Topsoil from areas infected or potentially infected with <i>Phytophthora</i> dieback shall be segregated and not used in non-infected areas. Dieback free soil may be used in any area, but topsoil taken from Uninterpretable areas may only be used in Uninterpretable or Dieback infested areas (refer to the Dieback Management Strategy - Appendix B)	No topsoil potentially infected with <i>Phytophthora</i> dieback used for revegetation in non-infected areas	During revegetation activities	Site inspections Topsoil management records	Topsoil from areas identified as potentially infected used during revegetation works	Engage a <i>Phytophthora</i> dieback specialist within 2 weeks to assess potentially infected area and implement corrective actions as advised within 1 month	Construction Contractor Environmental Management Representative
	Topsoil taken from the area identified in Figure 7 to be used in landscaping and revegetation of areas within potential habitat for Gingin Wax	All topsoil taken from the area identified in Figure 7 used in landscaping and revegetation of areas of potential habitat for the species	During landscaping and revegetation activities	Site inspections Topsoil management records	Topsoil from the area identified in Figure 7 used in landscaping and revegetation of areas outside of potential habitat for the species	Investigation to confirm if topsoil recovered from the area identified in Figure 7 was used in landscaping and revegetation of areas of potential habitat for Gingin Wax and if the recovered topsoil was greater than required for these areas Review of locations outside of identified potential habitat to determine if these could be suitable for Gingin Wax	Construction Contractor Environmental Management Representative

Management Objective	Management Measure	Performance Target/Completion Criteria	Timing	Monitoring/ Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
Access Controls							
To achieve performance targets and completion criteria for Black Cockatoo and Banksia woodlands TEC	No-go areas are clearly marked on site	No intrusion into no-go areas No-go areas are clearly marked on site	Prior to clearing	Intrusion into no-go area	Site inspections prior to and following clearing to confirm no-go areas are appropriately flagged / fenced Monthly site inspections Any intrusion into no-go areas or damage to fencing/ flagging is raised as an incident All no-go areas will be reviewed within 2 days to ensure exclusions are still in place Conduct refresher training within 1 week	No-go area inspected immediately for damage to TEC or Black Cockatoo habitat If clearing has occurred, the area is to be included in the landscape design within 2 weeks	Construction Contractor Environmental Management Representative Main Roads Superintendent
Road reserve will be fenced to prevent stock accessing vegetation within the road reserve from adjacent farms.	100% of fencing between road reserve and private property installed Fences remain in good condition (no signs of damage) No access to road reserves by stock 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	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 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 Site 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	

3.2 Monitoring Program

A number of monitoring and reporting activities will be undertaken to ensure management measures are being implemented and completion criteria is being met. Monitoring activities are mapped to each management measure in **Table 3-1**. **Table 3-2** describes the monitoring in more detail, including relevant monitoring guidelines or methods; and responsible people.

Table 3-2: Monitoring Schedule

Monitoring Activity	Parameter Measured	Items Addressed	Applicable Method / Guideline	Responsibility
Weekly site inspection	Compliance with CEMP requirements	<ul style="list-style-type: none"> • Confirm environmental no-go areas are clearly marked on site • Confirm that clearing outside of approved area or in excess of approved limits has not or will not occur • Confirm areas required for temporary construction activities, such as laydown, are only located on previously cleared areas • Confirm no new occurrences of declared plants within the construction site boundary • Confirm no new occurrences of WoNS or Environmental Weeds within the construction site boundary • Confirm no breach of CoE procedures • Confirm list of wildlife rescue organization contact details is on site • Confirm no visual dust plumes • Confirm hot works procedures are in place and correctly implemented • Confirm no erosion or scouring within vegetation that is to be retained, within no-go areas or outside the approval boundary • Confirm paddocks where fencing has been removed are free of stock • Have previous weed control measures been effective and is follow-up treatment required to eliminate the weeds? • Have weed control measures been implemented as per this CEMP 	Visual inspection to confirm that management measures in the CEMP are being implemented correctly.	Construction Contractor Environmental Management Representative
Weekly site inspection during seeding/planting	Revegetation progress	<ul style="list-style-type: none"> • Revegetation must begin within one year of commencement of the action within all areas identified for revegetation, within one year of the completion of construction • Confirm all revegetation is occurring within winter • Confirm all compacted areas are deep ripped prior to seeding/planting • Confirm no foraging, nesting or roosting plant species for Black Cockatoo are planted within 10 m of the edge of the seal • Confirm all species used for revegetation are as per the Main Roads Revegetation and Landscape Specifications and any alternative species have been approved and provide CBC habitat. • Is the revegetation species mix and density as per the management measures in this CEMP? 	Visual inspection by a suitable qualified person to confirm that revegetation is occurring/has occurred in accordance with the Main Roads Revegetation and Landscape Specifications	Construction Contractor Environmental Management Representative
Annual revegetation monitoring	Revegetation progress	<ul style="list-style-type: none"> • Confirm that revegetated areas are tracking towards achieving completion criteria as verified by a suitable qualified person • Identify areas that require further infill planting, based on commitments made in this CEMP • Identify areas that require further weed controls, based upon commitments made in this CEMP • Confirm completion criteria is being achieved 	Visual inspection to confirm that revegetation is occurring/has occurred in accordance with the Main Roads Revegetation and Landscape Specifications and this CEMP	Main Roads Environment Management Representative

Monitoring Activity	Parameter Measured	Items Addressed	Applicable Method / Guideline	Responsibility
Pre-clearing surveys for hollows being used by Black Cockatoos	Presence of hollows being used by Black Cockatoo	<ul style="list-style-type: none"> Confirm all actual or potential nesting trees are free of hollows that are being used by Black Cockatoo before clearing begins Confirm that Black Cockatoo are no longer using hollows before clearing begins Maintain a register of nesting trees 	<p>Suitably qualified person with experience in hollow identification to visually inspect all potential nesting trees within the clearing area and record spatial co-ordinates for any trees identified with hollows that are being utilised, or are capable of being utilised, by Black Cockatoos.</p> <p>Monitoring will be conducted in line with best practice and monitoring methods used will be consistent with advice contained within the Black Cockatoo Recovery Plan (DPAW, 2013).</p> <p>Note: no-go areas are areas of vegetation that are not approved to be cleared, these include trees with hollows that are being used by or are suitable for Black Cockatoos, conservation significant flora and all areas outside of the approval boundary. These areas are identified on the engineering drawings issued for construction.</p>	Suitably qualified person
Follow up weed monitoring	Weed control	<ul style="list-style-type: none"> Confirm no new occurrence or spread of Declared Plants within the construction site boundary during construction activities Confirm no new occurrence or spread of WoNS or environmental weeds within the construction site boundary Confirm all plant and machinery will be verified clean on arrival at site Confirm no breach of CoE protocols 	<p>Monthly site inspections</p> <p>Annual revegetation monitoring</p> <p>Records verifying plant and machinery arriving on site is clean</p> <p>CoE records/logs</p>	Construction Contractor Environmental Management Representative
Water quality downstream of the Brockman River crossing	Water quality of the Brockman River	<ul style="list-style-type: none"> Confirm no statistically significant change in water quality of the Brockman River resulting from construction activities 	<p>Establish water quality monitoring sites upstream and downstream of the crossing location</p> <p>Weekly sampling of surface water at these sites during in river works. Field readings for pH and EC to be taken during sampling. Lab analysis of samples for EC, TSS, TN, TP, aluminium, cadmium, chromium, copper, nickel, lead, zinc and polycyclic aromatic hydrocarbons</p> <p>Review downstream results against upstream control site</p>	Construction Contractor Environmental Management Representative

3.3 Managing Uncertainty

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

Table 3-3: Measures for Managing Uncertainty

Data / Information Source	Limitations / Uncertainty	Risk Presented by Limitation / Uncertainty	Risk Management Measures
Road Alignment Design	Concept level of design only.	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 statutory conditions of approval
Ecological Surveys (FVC 2017, 2018, 2019; BCE 2017, 2018, 2019)	High level of certainty. No significant limitations. Assessments undertaken in line with relevant guidelines and approved methods.	N/A	N/A
<i>Phytophthora</i> Dieback Assessment (Terratree 2018)	Dieback surveys undertaken 2+ years in advance of commencement of construction.	Extent of dieback infested areas may change between the time of the survey and start of construction.	Boundaries of Dieback infested areas checked by a qualified Dieback interpreter prior to commencement of construction.

4. CEMP Implementation

4.1 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 relevant to the Bindoon Bypass. Specific responsibilities in relation to this CEMP are provided in **Table 4-1**.

Table 4-1: CEMP Roles and Responsibilities

Role	CEMP Responsibilities
Main Roads Project Manager	<ul style="list-style-type: none">• The overall management and control of the CEMP.• Reviewing and approving the CEMP.• Ensuring that the necessary transfer of risk and obligations to the contractor (arising from the CEMP) are carried to the construction contract.• 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	<ul style="list-style-type: none">• 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.• 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.

Role	CEMP Responsibilities
	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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. • 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.

Role	CEMP Responsibilities
Construction Contractor Representative	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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 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.

4.2 Environmental Training

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

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

Daily pre-start meetings will be conducted to inform project personnel of specific environmental issues related to the day's work. These meetings are to also include visitors and sub-consultants who are on site. In addition, toolbox meetings will be held with all project personnel to provide environmental awareness training and to 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.

4.3 Inspections, Audits and Reporting

4.3.1 Contractor Inspections and Audits

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

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

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

4.3.2 Incident Reporting

Environmental incident categories and reporting timeframes are outlined in the 'Main Roads Environmental Incident and Investigation Report Form'. This form provides a guide for classifying the severity of an environment or heritage incident and the required reporting timeframe to be adhered to.

The following is a summary of the Main Roads Environmental Guideline: *Environmental Incidents: Reporting, Investigation and Management*.

In this instance that an environmental incident occurs:

- Immediate remedial action to be undertaken: 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 'Main Roads Environmental Incident and Investigation Report Form';
- Notify management: notification requirements for environmental incidents are listed on the 'Main Roads Environmental Incident and Investigation Report Form';
- Assessment and investigation;
- Complete an incident report: the 'Main Roads Environmental Incident and Investigation Report Form' will be used to record environmental incidents associated with the Project;
- Corrective and preventative actions – the Contractor will track the progress of agreed corrective and preventative actions; and
- 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 be reviewed and endorsed by Main Roads before the action is implemented. Audits will follow to confirm satisfactory completion of the corrective action.

4.4 Review

4.4.1 Risk Review

The environmental risk assessment will be reviewed periodically to confirm it remains relevant and captures all risks to Black Cockatoo, Banksia woodlands TEC and Chuditch. Additional review triggers are:

- changes to project/CEMP scope;
- following significant environmental incidents;
- implementation of corrective actions or contingency management measures; or
- when new information with regards to the relevant MNES becomes available.

4.4.2 CEMP Review

The CEMP will be reviewed and updated as required. Each review will include an evaluation of the effectiveness of the plan and incorporate new data / information pertinent to the management of the relevant MNES. Triggers for review are as follows:

- annual review from the approval date of the CEMP;
- following significant environmental incidents;
- anticipated changes to scope;
- in response to community or stakeholder complaints;
- identification of non-compliance with environmental approval conditions;
- if monitoring results, inspections and/or audits indicate performance targets or completion criteria may not be achieved or maintained; or
- when monitoring results, inspections and/or audits indicate completion criteria have been achieved.

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

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

5. Data Management

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

- risk assessments;
- audit results and reports, including the timing, location and spatial delineation of clearing, and periodic reconciliation against approved disturbance limits;
- monthly and weekly inspection results;
- environmental incident reports;
- monitoring data, results and reports;
- records of revegetation activities including dates, location and area of revegetation, species mixes used and quantities;
- induction records;
- pre-start and toolbox meeting minutes; and
- correspondence between Main Roads, construction contractors and/or regulators relating to the requirements of this CEMP.

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

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