GOVERNMENT OF WESTERN AUSTRALIA

Environmental Protection Authority

Great Northern Highway – Bindoon Bypass

Commissioner of Main Roads Western Australia

Report 1742

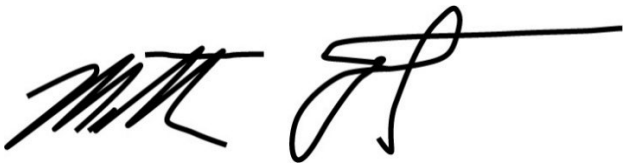
June 2023

This assessment report has been prepared by the Environmental Protection Authority (EPA) under s. 44 of the *Environmental Protection Act 1986* (WA). It describes the outcomes of the EPA's assessment of the Great Northern Highway – Bindoon Bypass proposal by Commissioner of Main Roads Western Australia.

The Great Northern Highway – Bindoon Bypass was determined under the Commonwealth *Environment Protection and Biodiversity Act 1999* to be a controlled action and approved with conditions (13 October 2021).

This assessment report is for the Western Australian Minister for Environment and sets out:

- what the EPA considers to be the key environmental factors identified in the course of the assessment
- the EPA's recommendations as to whether or not the proposal may be implemented and, if it recommends that implementation be allowed, the conditions and procedures, if any, to which implementation should be subject
- other information, advice and recommendations as the EPA thinks fit.



Prof. Matthew Tonts
Chair
Environmental Protection Authority

16 June 2023

ISSN 1836-0491 (Online)
Assessment No. 2135

Contents

Figures

Tables

Appendices

Summary

Proposal

The Great Northern Highway – Bindoon Bypass is a proposal to construct and operate a new 47 kilometre (km) section of the Great Northern Highway (GNH) within the Shires of Chittering and Gingin. The proposal bypasses the town of Bindoon located approximately 70 km northeast of Perth, WA. The proposal consists of a combination of four-lane dual carriageway, four-lane single carriageway, two-lane single carriageway, and a bridge across the Brockman River. The proposal diverts from the existing GNH at the Chittering roadhouse, runs west of Bindoon, re-joining the existing GNH north of Calingiri Road.

The proponent for the proposal is Commissioner of Main Roads Western Australia.

The proposal involves the construction and ongoing maintenance of a highway standard dual carriageway road, with associated bridges, culverts, road furniture, drainage, signage, lighting, and other infrastructure including side roads and road connections. The proposal involves the clearing and disturbance of no more than 490 hectares (ha) of native vegetation within an 848.5 ha development envelope.

Context

The southern portion of the proposal occurs within the eastern boundary of the Swan Coastal Plain Interim Biogeographic Regionalisation of Australia bioregion. The northern portion of the proposal deviates east, extending into the Jarrah Forest bioregion. The southern extent of the proposal is around 55 km northeast of Perth (see Figure 1).

The proposal intersects three regional and nine local linkages identified in the Shire of Chittering local biodiversity strategy (LBS) (2010). These linkages align with areas of native vegetation that extend across the development envelope and are considered to represent fauna movement corridors.

Ten wetlands defined by the DBCA's *Geomorphic wetlands of the Swan Coastal Plain* dataset (2016) occur within or adjacent to the development envelope, including three conservation category wetlands which form part of the Brockman River consanguineous suite.

The surrounding landscape largely includes a combination of cleared rural land and areas of remnant vegetation, including vegetation within the nearby Julimar State Forest (9 km east) and Boonanarring Nature Reserve (7.5 km west). There are no major industrial facilities or mining operations within the local area.

Environmental values

Flora and vegetation, terrestrial fauna, inland waters, and social surroundings (Aboriginal Heritage and Noise) are the key environmental factors that may be impacted by the proposal.

Consultation

The EPA published the proponent's referral information for the proposal on its website for 7-days public comment (15 September 2017). The EPA also published the proponent's environmental review document (MRWA 2020) on its website for public review for 6 weeks (from 25 May 2020 to 6 July 2020). The EPA considered the comments received during these public consultation periods in its assessment.

Mitigation hierarchy

The mitigation hierarchy is a sequence of proposed actions to reduce adverse environmental impacts. The sequence commences with avoidance, then moves to minimisation, rehabilitation, and offsets are considered as the last step in the sequence. The proponent has considered the mitigation hierarchy in the development and assessment of its proposal, and as a result will:

- avoid direct disturbance of a historic record of threatened flora *Drakaea elastica*
- minimise clearing of native vegetation by aligning a substantial portion of the proposal within existing cleared paddocks
- minimise clearing of native vegetation by using safety barriers and steepened batters to reduce the road width
- minimise direct disturbance to priority flora, significant ecological communities, and important fauna habitat types through setting limits of disturbance, and implementing internal site disturbance permit procedures for clearing activities
- minimise impact to terrestrial fauna by undertaking pre-clearance surveys, engaging fauna spotters, and installing underpasses near high value areas
- design drainage to avoid movement of soils and/or water potentially carrying dieback into disease free areas
- minimise the risk of impact to existing hydrological regimes by ensuring the road alignment matches the direction of natural flow, and incorporation of appropriate waterway crossings and culverts into the final road design
- rehabilitate cleared areas not required for operation.

Residual impacts are those that remain after the mitigation hierarchy has been applied. The residual impacts of the proposal for the relevant key environmental factors are outlined below.

Assessment of key environmental factors

The EPA has identified the key environmental factors (listed below) in the course of the assessment. For each factor, the EPA has assessed the residual impacts of the proposal on the environmental values and considered whether the environmental outcomes are likely to be consistent with the EPA environmental factor objectives.

Flora and vegetation

Residual impact or risk to environmental value	Assessment finding
Clearing of conservation listed ecological communities: • 2 ha of *Banksia attenuata* woodlands over species rich dense shrublands (community identifier SCP20a) • 3 ha of *Corymbia calophylla – Eucalyptus marginata* woodlands on sandy clay soils of the southern Swan Coastal Plain (community identifier SCP3b) • 53.5 ha of Banksia woodlands of the Swan Coastal Plain ecological community (Banksia Woodlands community).	The impact to each community represents the loss of less than 1.2% of their total mapped occurrence, and less than 26% of their occurrence recorded during vegetation surveys. While the proposal would result in a relatively small overall impact to the total known occurrences of these communities, the EPA considers that the proposed impact is significant given the threat of ongoing clearing of already fragmented patches of these communities. The EPA advises that this residual impact should be subject to reasonable conditions (recommended condition B1-2) to set clearing limits. The EPA advises that offsets should be imposed to counterbalance the significant residual impacts to these communities (recommended condition B6). Subject to the above recommended conditions, the environmental outcome is likely to be consistent with the EPA objective for flora and vegetation. The EPA has also recommended condition B7-3 to require the proponent to report on proposal impacts to SCP20a and SCP3b in relation to maintaining areas representative of these communities retained adjacent to the road.
Clearing of up to 4.5 ha of Swan Coastal Plain *Banksia attenuata – Banksia menziesii* woodlands ('floristic community type 23b') (FCT23b).	The impact to this community is spread across six occurrences recorded during the vegetation surveys and would not result in the loss of a single substantial occurrence of this community. The EPA advises that this residual impact should be subject to reasonable conditions (recommended condition B1-2) to set clearing limits, to ensure the environmental outcome is likely to be consistent with the EPA objective for flora and vegetation.
Clearing of up to 2.5 ha of the Nooning vegetation complex.	The Nooning vegetation complex retains 17.9% of its pre-European vegetation extent and the EPA considers that the impact to 2.5 ha of this complex, representing the loss of 0.2% of its remaining mapped extent, is a significant residual impact. The EPA advises that this significant residual impact should be subject to reasonable conditions (recommended condition B1-2) to set clearing limits and require offsets to counterbalance the significant residual impact (recommended condition B6), to ensure that the environmental outcome is likely to be consistent with the EPA objective for flora and vegetation.

Indirect impacts associated with the introduction and spread of weeds and dieback, altered hydrological regimes and groundwater drawdown.	The proposal has the potential to result in indirect impacts, including the spread of weeds and dieback, groundwater drawdown and altered hydrological regimes, during construction. The implementation of the proponent's mitigation and management measures are likely to ensure the EPA's objective for flora and vegetation can be met. The EPA advises that indirect impacts should be subject to reasonable conditions (recommended conditions B1-1 and B1-3) to require no project attributable adverse impacts to vegetation within 50 m of the development envelope, and undertake weed management and dieback hygiene protocols, to ensure the environmental outcome is likely to be consistent with the EPA objective for flora and vegetation. Further conditions have been recommended under 'inland waters' regarding the management of impacts to hydrological regimes and groundwater drawdown.

Terrestrial fauna

Residual impact or risk to environmental value	Assessment finding
Clearing of habitat for Carnaby's cockatoo and forest red-tailed black cockatoo (black cockatoos): • 204.8 ha of low-moderate or higher value foraging habitat for Carnaby's cockatoo • 168 ha of low-moderate or higher value foraging habitat for forest red-tailed black cockatoo • 10 trees with hollows previously used for nesting • 117 trees with hollows suitable for nesting (no signs of use) • 1,358 potential nesting trees.	The proposal will result in the loss of suitable breeding habitat and high-quality foraging habitat for black cockatoos, within a local area (15 km radius) that contains around 93,004 ha of native vegetation. The EPA considers that the impact to black cockatoo habitat is a significant residual impact, given it constitutes critical habitat for these species. The EPA advises that this residual impact should be subject to reasonable conditions (recommended condition B2-1) to set clearing limits. The EPA advises that offsets should be imposed to counterbalance this significant residual impact (recommended condition B6). Subject to the above recommended conditions, the environmental outcome is likely to be consistent with the EPA objective for terrestrial fauna.
Clearing of up to 54.4 ha of quality chuditch habitat.	Chuditch was not recorded within the proposal area. However, the 54.4 ha of marri-jarrah woodland habitat proposed for clearing aligns with the recovery plan description of critical habitat for this species, noting that it provides landscape linkage values and is in an area of suitable habitat where chuditch may exist. The EPA considers that while extensive suitable habitat exists in

	the local area, the impact to critical chuditch habitat is significant. The EPA advises that this significant residual impact should be subject to reasonable conditions (recommended condition B2-1) to set clearing limits. The EPA advises that offsets should be imposed to counterbalance this significant residual impact (recommended condition B6). Subject to the above recommended conditions, the environmental outcome is likely to be consistent with the EPA objective for terrestrial fauna.
Clearing of up to 69.2 ha of south-west brush-tailed phascogale habitat	South-west brush-tailed phascogale was not recorded within the proposal area. This species may occur in low abundance in the proposal area if not locally extinct. Extensive suitable habitat for this species occurs in the local area. The EPA advises that this residual impact should be subject to reasonable conditions (recommended condition B2-1) to set clearing limits, to ensure the environmental outcome is likely to be consistent with the EPA objective for terrestrial fauna.
Fragmentation of ecological linkages.	The proposal will result in the fragmentation of native vegetation which provides corridors for fauna movement, including areas recognised as important ecological linkages through the Shire of Chittering local biodiversity strategy. The EPA advises that this residual impact should be subject to reasonable conditions to require revegetation of temporarily cleared areas (recommended condition B1-3) and the installation of seven fauna crossings that align with ecological linkages, connect areas of good quality native vegetation, and/or connect areas with high environmental value (recommended condition B2-3). Subject to the above recommended conditions, the environmental outcome is likely to be consistent with the EPA objective for terrestrial fauna. The EPA has also recommended condition B7-3 to require the proponent to report on the utilisation of fauna crossings by native terrestrial fauna to determine their effectiveness, as part of its environmental performance reporting.
Impact to fauna through machinery or vehicle strike (clearing, construction and operation).	The proposal may impact on terrestrial fauna utilising the proposal area during construction and may result in fauna strikes during operation of the proposal. The EPA advises that this residual impact should be subject to reasonable conditions (recommended condition B2) to require inspection of all suitable black cockatoo nesting trees prior to construction, the engagement of fauna handlers during construction, and the installation of

	seven fauna crossings that connect fauna habitat to facilitate fauna movement across the road. Subject to the above recommended conditions to reduce the risk of fauna mortalities, the environmental outcome is likely to be consistent with the EPA objective for terrestrial fauna.

Inland waters

Residual impact or risk to environmental value	Assessment finding or Environmental outcome (choose which one to use)
Clearing and disturbance of up to 3.13 ha across four wetlands, including: • 2.7 ha of Conservation Category Wetlands (CCW) • 0.43 ha of Resource Enhancement Wetlands (REW)	The proposal will impact on four wetlands that range in condition from 'Good' to 'Completely Degraded', with the majority in a 'Degraded' to 'Completely Degraded' condition. The EPA has considered the permanent loss, degradation and cumulative impact occurring to CCWs and considers that the proposed clearing of these wetlands is a significant residual impact. The EPA considers that this significant residual impact should be subject to reasonable conditions (recommended condition B3) to set clearing limits. The EPA advises that offsets should be imposed to counterbalance significant residual impacts (recommended condition B6). Subject to the above recommended conditions, the environmental outcome is likely to be consistent with the EPA objective for inland waters.
Changes to surface water and groundwater flow paths and groundwater infiltration during construction and operation from increased sedimentation resulting from clearing of native vegetation, compaction of sandy soils and permanent infrastructure.	The EPA has assessed that the changes to surface water and groundwater flow can be managed to meet the EPA objective for inland waters, subject to reasonable conditions (recommended condition B4-1) requiring the ecological integrity of Brockman River, Udumung Brook and other waterways within or adjacent to the development envelope, to be maintained through bridge design, management of stormwater runoff, and revegetation. Subject to the above recommended conditions, the environmental outcome is likely to be consistent with the EPA objective for inland waters.
Temporary abstraction of groundwater and dewatering for construction purposes may result in drawdown of the watertable.	The EPA has assessed that impacts to groundwater levels are likely to be temporary during construction only. The EPA considers that groundwater drawdown is unlikely to be a significant residual impact, subject to reasonable conditions (recommended condition B3) requiring no adverse impacts to wetlands and watercourses, and regulation of the management and use of water through the issuing of licences under the *Rights in Water and Irrigation Act 1914* which will

	consider impacts to, and manage groundwater drawdown. Subject to the above recommended conditions, the environmental outcome is likely to be consistent with the EPA objective for inland waters.
Potential impact to surface water and groundwater quality through potential hydrocarbon spills.	The EPA recommends that the potential impact to surface and groundwater quality from hydrocarbon spills should be regulated through conditions requiring usage and storage protocols (recommended condition B3-3). Subject to the above recommended condition, the environmental outcome is likely to be consistent with the EPA objective for inland waters.

Social surroundings

Residual impact or risk to environmental value	Assessment finding
Potential for direct or indirect impact to Aboriginal heritage sites and areas of cultural significance.	The EPA has concluded that there is a risk of residual direct and indirect impacts to Aboriginal cultural heritage associated with disturbance of significant waterways. The EPA recommends that the potential residual impact to Aboriginal cultural heritage associated with significant waterways should be subject to reasonable conditions (recommended condition B4) which requires the ecological integrity of Brockman River, Udumung Brook and other waterways within or adjacent to the development envelope to be maintained and the preparation of a management plan that demonstrates how this objective will be achieved. Subject to the above recommended conditions, the environmental outcome is likely to be consistent with the EPA objective for social surroundings.
Increased and ongoing exposure from operational noise to sensitive receptors in rural residential areas.	The EPA considers that residual impacts to properties from operational noise should be subject to reasonable conditions (recommended condition B5) that require the proponent to minimise operational noise on noise sensitive receptors, to ensure that the environmental outcome is likely to be consistent with the EPA objective for social surroundings.

Holistic assessment

The EPA considered the connections and interactions between relevant environmental factors and values to inform a holistic view of impacts to the whole environment. The EPA formed the view that the holistic impacts would not alter the EPA's conclusions about consistency with the EPA factor objectives.

Conclusion and recommendations

The EPA has taken the following into account in its assessment of the proposal:

- environmental values which may be significantly affected by the proposal
- assessment of key environmental factors, separately and holistically (this has included considering cumulative impacts of the proposal where relevant)
- likely environmental outcomes which can be achieved with the imposition of conditions
- consistency of environmental outcomes with the EPA's objectives for the key environmental factors
- EPA's confidence in the proponent's proposed mitigation measures
- whether other statutory decision-making processes can mitigate the potential impacts of the proposal on the environment
- principles of the *Environmental Protection Act 1986*.

The EPA has recommended that the proposal may be implemented subject to conditions recommended in Appendix A.

Other advice

The EPA has provided other advice regarding the potential for the proposal to have indirect impacts on future subdivisions.

The EPA provides the following information for consideration by the Western Australian Planning Commission (WAPC) and local government authorities.

Noise

While the EPA has assessed the potential impacts of traffic noise from the proposal on existing noise sensitive residences, it is noted that there are likely to be future residential developments in close proximity to the proposal.

In this regard the EPA expects that planning authorities (WAPC and local government authorities) will consider future residential developments, against the policy provisions in *State Planning Policy 5.4: Road and Rail Noise (SPP 5.4),* to ensure local noise amenity is maintained consistent with the EPA's objective for social surroundings.

In relation to subdivisions that have already received planning approval, but are yet to be implemented, the EPA expects planning authorities to review their planning conditions to ensure the implications of traffic noise from the proposal have been appropriately considered.

Biodiversity

The EPA recognises that the Shire of Chittering is located in the internationally recognised South West Australia biodiversity hotspot, an area identified for its exceptional species diversity under threat from human disturbance. The EPA notes that the Shire of Chittering has done significant work in preparing a local biodiversity

strategy which deals specifically with the protection of the Shire's natural areas and the biodiversity that they contain. The EPA supports local government preparing such strategies to support biodiversity within their local area.

1 Proposal

The Great Northern Highway – Bindoon Bypass is a proposal to construct and operate a new 47 kilometre (km) section of the Great Northern Highway (GNH) within the Shires of Chittering and Gingin (see Figure 1). The proposal bypasses the town of Bindoon located approximately 70 km northeast of Perth, WA. The proposal occurs within the Swan Coastal Plain (SCP) and Jarrah Forest Interim Biogeographic Regionalisation of Australia (IBRA) bioregions. The major land use is agriculture and grazing with some horticulture. There are no major industrial facilities or mining operations within the region.

The proposal is located primarily in freehold land with the proponent acquiring land for the road reserve. The proposal will be constructed in stages depending on expected traffic volumes. The initial stage will consist of a combination of dual carriageway and single carriageway with multiple overtaking lanes, stopping facilities and a bridge and causeway structure crossing the Brockman River. Upgrades to local roads, rail crossings and intersections may also be required.

The proposal diverts from the existing GNH at the Chittering roadhouse, runs west of Bindoon, re-joining the existing GNH north of Calingiri Road. Approximately 36 km of new dual carriageway and 11 km of new single carriageway will be constructed along an alignment between Chittering roadhouse and the northern tie-in point, located approximately 1.2 km north of Calingiri Road.

The proposal includes the following key components:

- grade separated interchanges with existing roads
- at-grade intersections with existing roads
- a river bridge and culverts
- travellers rest areas, landscaping, and revegetation areas
- new service roads
- modifications to local roads.

The proponent for the proposal is the Commissioner of Main Roads Western Australia. The proponent referred the proposal to the Environmental Protection Authority (EPA) on 6 September 2017. The referral information was published on the EPA website for seven days public comment. On 28 September 2017, the EPA decided to assess the proposal at the level of Public Environmental Review. The EPA published the Environmental Review Document (ERD) (Arup Jacobs Joint Venture 2020) on its website for public review for 6 weeks (from 25 May 2020 to 6 July 2020).

The proposal was determined under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) to be a controlled action and was approved with conditions by the Commonwealth Minister for Environment (13 October 2021).

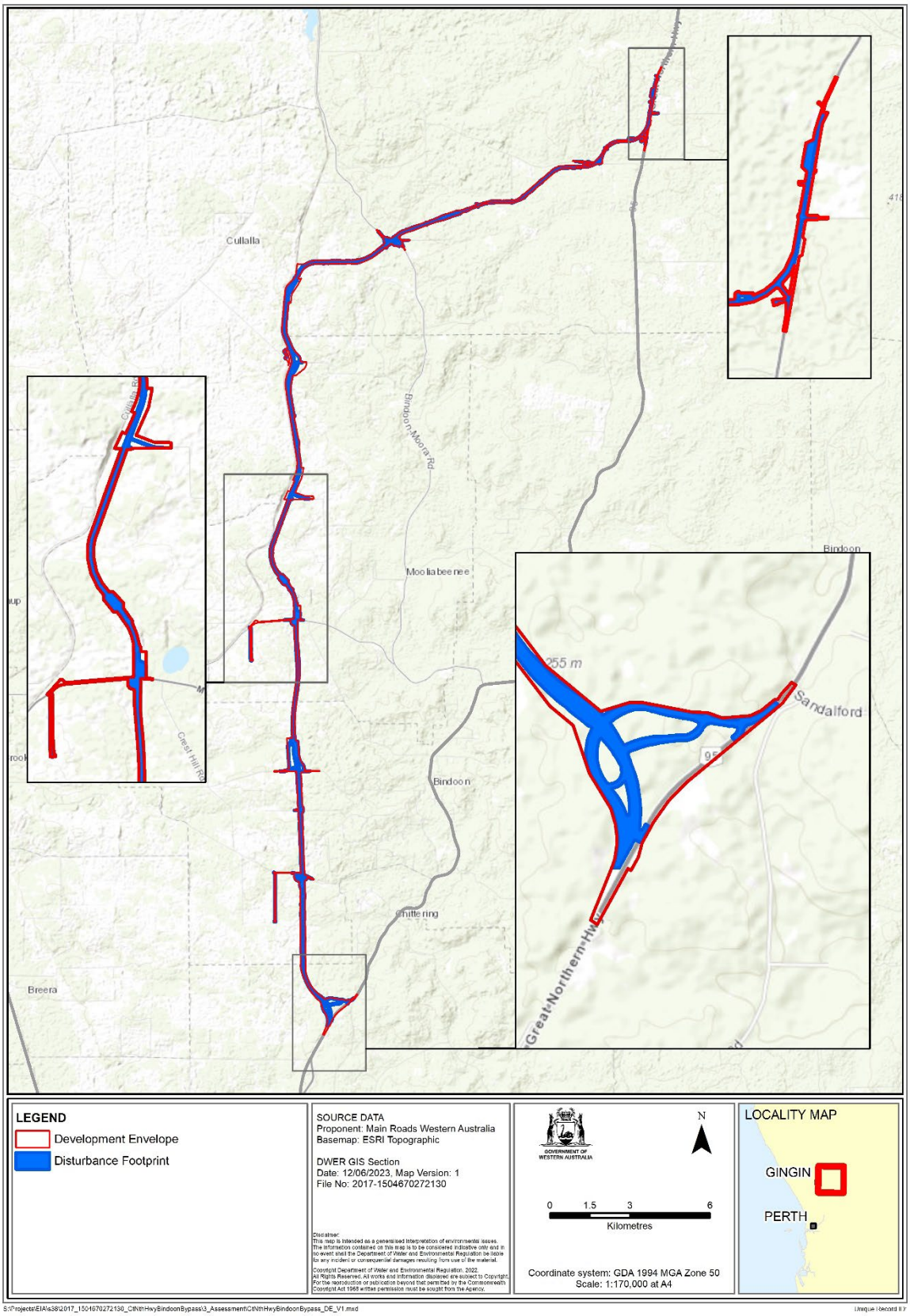


Figure 1: Project location, development envelope and disturbance footprint

The EPA assessed the elements outlined in the proponent's Proposal Content Document (MRWA 2022). The summary of the main matters addressed are contained in Table 1.

Table 1: Proposal content document (MRWA 2022)

Proposal element	Location	Maximum extent or range
Physical elements		
Construction and ongoing maintenance of a highway standard dual carriageway road, with all associated bridges, culverts, road furniture, drainage, signage, lighting, and other infrastructure including side roads and road connections.	Figure 1	Clearing and disturbance of no more than 490 ha of native vegetation within an 848.5 ha development envelope.
Proposal elements with greenhouse gas emissions		
Construction elements:		
Scope 1	194,603 tCO_2e	
Scope 2	No scope 2 emissions	
Scope 3	23,138 tCO_2e	

Units and abbreviations
ha – hectare
tCO_2e – tonnes of carbon dioxide equivalent

Proposal amendments

The original proposal is set out in section 2 of the proponent's referral supporting report (Arup Jacobs Joint Venture 2017), which is available on the EPA website. During the assessment process the EPA encouraged the proponent to identify avoidance and mitigation measures for the proposal in addition to those included in the original proposal.

The proponent requested changes to the original proposal during the assessment. The changes were assessed as unlikely to significantly increase any impacts of the proposal and resulted in some reduced potential impacts on the environment. The EPA Chair's notices, of 7 September 2018 and 7 July 2022, consenting to the changes are available on the EPA website. The consolidated and updated elements of the proposal which have been subject to the EPA's assessment are included in Table 1.

Proposal alternatives

Section 2.4 of the proponent's ERD (Arup Jacobs Joint Venture 2020) describes the alternatives considered for the proposal. Since 1997, multiple alignments associated with this proposal have been considered as part of investigations for the broader Perth-Darwin National Highway and the upgrading of the Great Northern Highway. Of the multiple alignments investigated, three final corridors were considered which were known as Western Bypass Corridor A, Western Bypass Corridor B, and

Eastern Bypass Corridor C. Further public consultation on these final alignments was undertaken by the proponent.

The proponent considered safety, freight, efficiency, network reliability, travel well-being, sustainability, community impacts and environment in identifying the most suitable alignment.

Proposal context

The southern extent of the proposal occurs within the east of the SCP bioregion. The northern extent deviates east, extending into the Jarrah Forest bioregion. The southern extent of the proposal is around 55 km northeast of Perth (see Figure 1).

The proposal intersects three regional and nine local ecological linkages identified in the Shire of Chittering local biodiversity strategy (2010). These linkages align with areas of native vegetation that extend across the development envelope and are considered to represent fauna movement corridors.

The proposal is located across three surface water catchments, the Brockman River, Gingin Brook, and Ellen Brook catchments. The major portion of the proposed alignment runs through the Brockman River catchment, with small portions crossing the Gingin Brook and Ellen Brook catchment areas.

Ten wetlands defined by the DBCA's *Geomorphic wetlands of the Swan Coastal Plain* dataset (2016) occur within or adjacent to the development envelope, including three conservation category wetlands (CCW) which form part of the Brockman River consanguineous suite.

The surrounding landscape includes a combination of cleared rural land and areas of remnant vegetation, including vegetation within the nearby Julimar State Forest (9 km east) and Boonanarring Nature Reserve (7.5 km west). There are no major industrial facilities or mining operations within the local area.

2 Assessment of key environmental factors

This section includes the EPA's assessment of the key environmental factors. The EPA also evaluated the impacts of the proposal on other environmental factors and concluded these were not key factors for the assessment. This evaluation is included in Appendix D.

2.1 Flora and Vegetation

2.1.1 Environmental objective

The EPA environmental objective for flora and vegetation is *to protect flora and vegetation so that biological diversity and ecological integrity are maintained* (EPA 2016a).

2.1.2 Investigations and surveys

The EPA advises the following investigations and surveys were used to inform the assessment of the potential impacts to flora and vegetation:

- Flora and Fauna Assessment for Calingiri to Wubin Study Areas. Great Northern Highway, Muchea to Wubin Upgrade Stage 2 Project, prepared for ASJV and Main Roads (Phoenix Environmental Sciences 2016)
- Level 2 Flora and Vegetation Assessment and Targeted *Thelymitra stellata* Survey, Great Northern Highway, Muchea to Wubin Upgrades Stage 2 – Bindoon options, prepared for ASJV (FVC 2017)
- Bindoon Bypass Phytophthora Dieback Assessment, T18002, prepared for the IPT (Terratree 2018)
- Detailed Flora and Vegetation Assessment, Bindoon Bypass, Great Northern Highway, prepared for the Integrated Project Team (IPT) (FVC 2018a)
- Wetland Assessment, Great Northern Highway, Bindoon Bypass Upgrades, prepared for the IPT (FVC 2018b)
- Flora and Vegetation Assessments, Bindoon Bypass, Great Northern Highway, prepared for the IPT (FVC 2019)
- Memorandum, Bindoon Bypass – Revised FCT Analysis (Appendix F of the response to submissions document) (FVC 2022).

The surveys were consistent with the *Technical guidance – Flora and vegetation surveys for environmental impact assessment* (EPA 2016b).

2.1.3 Assessment context – existing environment

The proposal development envelope is 848.5 ha, with an indicative disturbance footprint of 507.8 ha comprising 490 ha of native vegetation. The native vegetation ranges from 'Excellent' to 'Completely Degraded' condition. Around 98 ha (20%) is in a 'Good' or better condition and 383 ha (78%) comprises native trees over pasture and paddocks (MRWA 2022).

Biological surveys that encompassed the development envelope recorded 572 flora taxa (including 30 weed species) from 218 genera and 63 families (FVC 2019). A dieback assessment identified that 27.15 ha (0.83%) of the larger study area is dieback infested (Terratree 2018).

The development envelope comprises seven vegetation complexes. Of these, the Nooning Vegetation Complex retains less than 30% of its pre-European extent across the SCP. A total of 13 vegetation types were recorded as described in Table 4-4 of the proponent's ERD (Arup Jacobs Joint Venture 2020).

Two threatened ecological communities (TEC) and two priority ecological communities (PEC) were recorded within the development envelope (FVC 2019) (see Figures 2 and 3):

- *Banksia attenuata* woodlands over species rich dense shrublands (floristic community type 20a as originally described in Gibson et al. 1994) – critically endangered ecological community (*Biodiversity Conservation Act 2016* (BC Act))
- *Corymbia calophylla* – *Eucalyptus marginata* woodlands on sandy clay soils of the southern Swan Coastal Plain (floristic community type 3b as originally described in Gibson et al. 1994) – endangered ecological community (BC Act)
- Swan Coastal Plain *Banksia attenuata* – *Banksia menziesii* woodlands ('floristic community type 23b') (FCT23b) – Priority 3(i) (Department of Biodiversity, Conservation and Attractions (DBCA))
- Banksia woodlands of the Swan Coastal Plain (Banksia Woodlands community) – Priority 3(iii) (DBCA) and endangered (EPBC Act).

Surveys identified six priority flora species within the development envelope (FVC 2019). Of these, *Drosera sewelliae* (Priority (P) 2), *Leucopogon squarrosus* subsp. *trigynus* (P2), *Verticordia rutilastra* (P3), *Anigozanthos humilis* subsp. *chrysanthus* (P4) and *Verticordia paludosa* (P4) occur within the indicative disturbance footprint.

2.1.4 Consultation

Matters raised during stakeholder consultation and the proponent's responses are provided in the proponent's response to submissions document (Arup Jacobs Joint Venture 2022). No public comments relating specifically to this factor were received.

The EPA consulted with DBCA regarding the proponent's methods used for the FCT analysis. In response, the EPA requested the proponent revise the methods used and redo the analysis. The EPA considers that the revised FCT analysis undertaken by the proponent was appropriate to determine the presence of TECs and PECs.

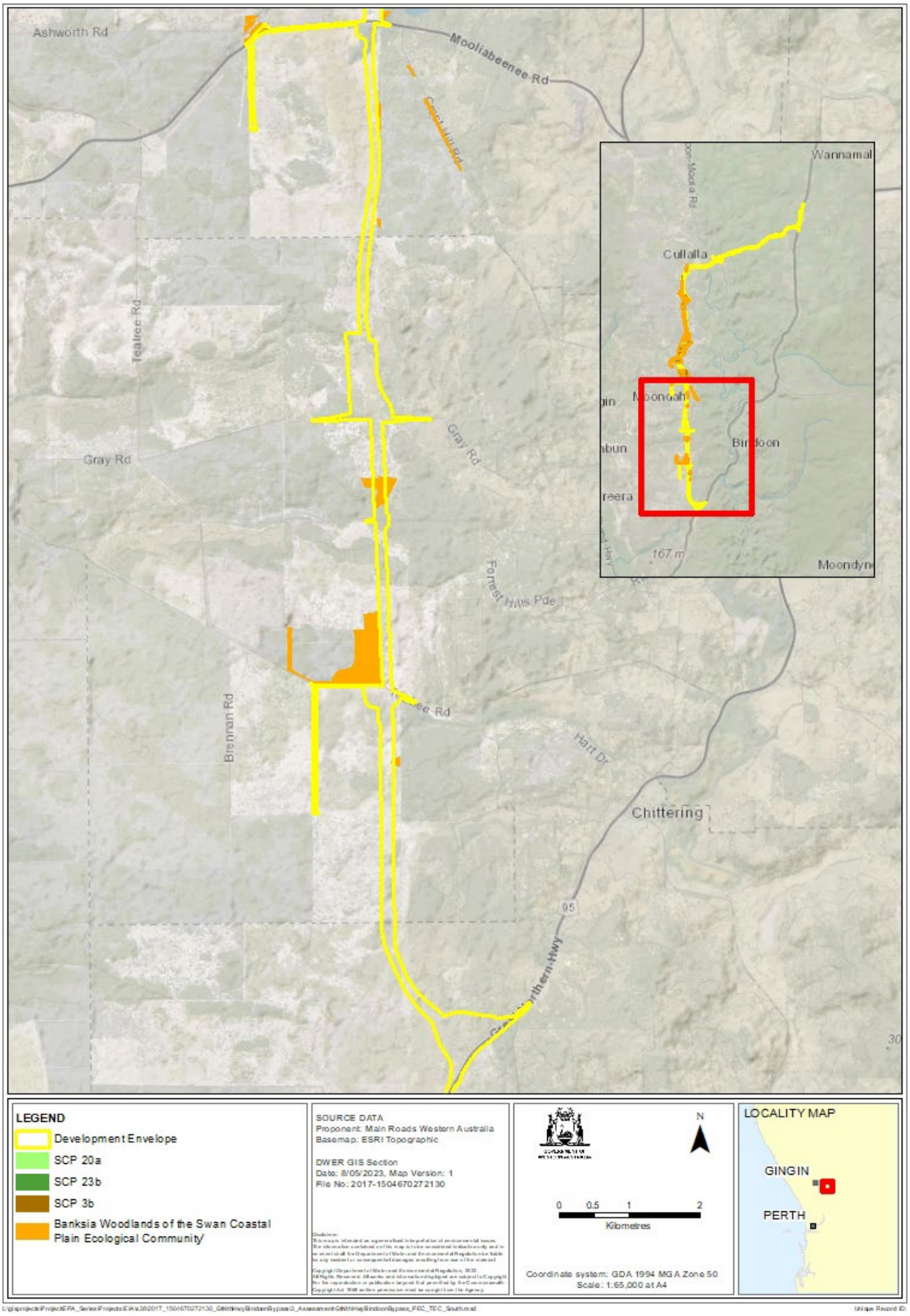


Figure 2: TECs and PECs recorded within and surrounding the development envelope (south) (FVC 2019)

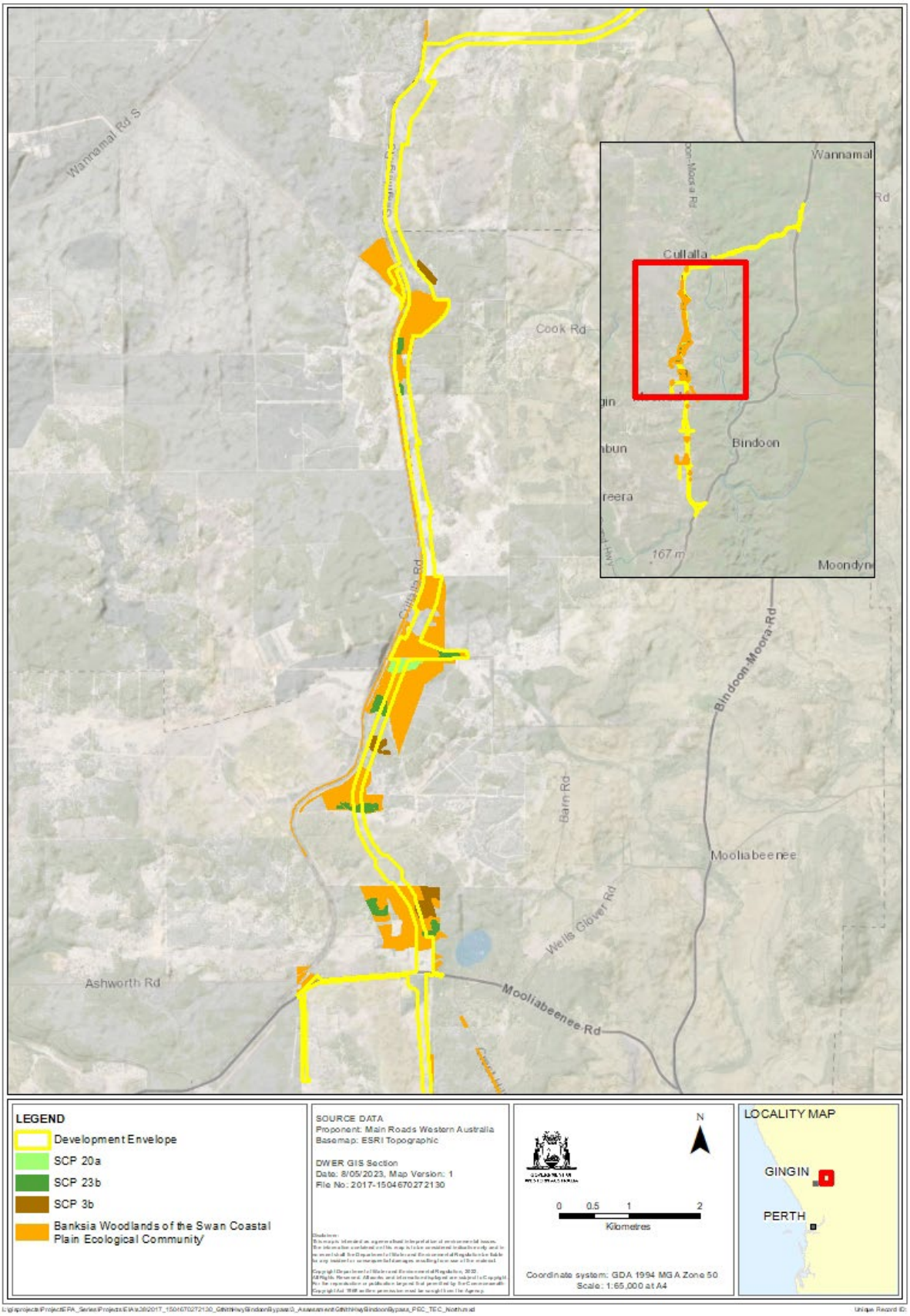


Figure 3: TECs and PECs recorded within and surrounding the development envelope (north) (FVC 2019)

2.1.5 Potential impacts from the proposal

The proposal has the potential to significantly impact on flora and vegetation from:

- clearing of:
  - 2 ha of SCP20a
  - 3 ha of SCP3b
  - 53.5 ha of the Banksia Woodlands community
  - 4.5 ha of FCT23b
- clearing of 2.5 ha of the Nooning Vegetation Complex
- clearing of five priority flora species, *Drosera sewelliae* (P2), *Leucopogon squarrosus* subsp. *trigynus* (P2), *Verticordia rutilastra* (P3), *Anigozanthos humilis* subsp. *chrysanthus* (P4) and *Verticordia paludosa* (P4)
- clearing of 2.7 ha of CCW and 0.43 ha of Resource Enhancement Wetlands (REW) (considered under section 2.3 – Inland Waters)
- potential indirect impacts to surrounding vegetation from the introduction and/or spread of weeds and dieback and altered hydrological regimes.

The proposal would impact on 4.6 ha of suitable habitat for *Chamelaucium lullfitzii* (formerly *Chamelaucium* sp. Gingin (N.G. Marchant 6)). This species is state listed as vulnerable (BC Act) and federally listed as endangered (EPBC Act). This species was not recorded within the development envelope during targeted surveys, with the closest record around 5.6 km west (FVC 2019). The suitable habitat proposed for clearing does not align with the definition of critical habitat in the draft recovery plan for this species. Therefore, the EPA has not considered this species further in this assessment.

2.1.6 Avoidance measures

The proponent has designed the proposal to avoid impacts to flora and vegetation by (Arup Jacobs Joint Venture 2020; Arup Jacobs Joint Venture 2022):

- modifying the development envelope to avoid historic records of threatened flora species *Drakaea elastica*
- avoiding impacts to priority flora species *Hibbertia miniata*, *Acacia drummondii* subsp. *affinis*, *Adenanthos cygnorum* subsp. *chamaephyton, Halgania corymbose* and *Hypolaena robusta*, which were recorded in the larger survey area. The proponent has advised that occurrences of these species will be marked as no-go zones, and a 20 m buffer will be applied to occurrences where practicable.

2.1.7 Minimisation measures (including regulation by other DMAs)

The proponent has proposed the following measures to minimise impacts to flora and vegetation (Arup Jacobs Joint Venture 2020; Arup Jacobs Joint Venture 2022):

- modifications during assessment to substantially reduce the development envelope by 2,558.5 ha

- aligned a substantial portion of the proposed development envelope within previously cleared paddocks where practicable
- proposed use of road safety barriers, steepening batters of cut and fill areas and adjusting road levels to minimise the depth/height of cut and fill areas.

2.1.8 Revegetation measures

The proponent proposes to progressively revegetate temporarily cleared areas within the road reserve to reflect the existing vegetation type and structure. Revegetation would commence in autumn following construction works and would consider the maintenance of ecological linkages. The proponent notes that annual surveys of revegetation areas will be undertaken to assess revegetation success and weed presence/cover (Arup Jacobs Joint Venture 2020).

2.1.9 Assessment of impacts to environmental values

The EPA considers that the potential impacts to SCP20a, SCP3b, the Banksia woodlands community, and Nooning Vegetation Complex are likely to be significant residual impacts. The EPA also considers that the proposal has the potential to result in residual impacts to FCT23b, priority flora and groundwater dependent vegetation. The proposal may also result in indirect impacts to surrounding environmental values. These impacts have been assessed below.

In assessing this proposal, the EPA has had regard to the cumulative effect that surrounding approved and proposed projects may have on relevant environmental values. This includes the cumulative effects of a range of threats and pressures in the area of the proposal; and whether the environment affected by the proposal has significant value due to other successive, incremental, and interactive cumulative impacts in the assessment area. The EPA recognises that cumulative loss of native vegetation for infrastructure developments is a key threat to flora and vegetation values on the SCP.

Conservation significant ecological communities

SCP20a

SCP20a is floristically the richest of any Banksia community on the SCP. It is very restricted in distribution and regionally rare with remaining areas comprising highly fragmented occurrences. Floristic analysis based on a single relevé identified that 7.9 ha of native vegetation was similar to SCP20a (see Figure 3). Affiliation of the vegetation with SCP20a could not initially be confirmed noting the cluster and dissimilarity indices did not align (FVC 2022). The DBCA has since confirmed that the vegetation is likely to be representative of SCP20a. The EPA has therefore considered it as such in this assessment.

According to DBCA databases, 76 occurrences of SCP20a have been recorded covering an area of 586.8 ha across its range which largely occurs in Wanneroo (south)/Stirling, Wanneroo (central), Forrestfield and Chittering. Occurrences range in size from less than 0.5 ha up to 104.6 ha. The interim recovery plan for SCP20a notes that around 366 ha of this community occurs in conservation reserves (165 ha

in nature reserves and 201 ha in local government conservation areas) (DPAW 2016).

The 7.9 ha of SCP20a within the survey area represents the northernmost recorded occurrence of the community and occurs within a larger area of the Banksia woodland community (see Figure 3). The development envelope would bisect the recorded occurrence, resulting in the loss of 2 ha, and would result in two smaller areas of the community being retained on either side of the proposal, comprising 2.2 ha and 3.7 ha. The retained areas would remain directly adjacent to vegetation representative of the Banksia woodland community in 'Very Good' to 'Excellent' condition. The proposed impact to 2 ha of SCP20a represents 0.34% of its total known extent.

In assessing the impact of the proposal on SCP20a, the EPA considered that the ongoing presence of adjacent and adjoining areas of high-quality native vegetation increases the likelihood of these reasonably sized areas of SCP20a persisting long term. The EPA has recommended conditions (as discussed under 'Indirect impacts') to protect SCP20a that will remain outside of the disturbance area, which would further increase the likelihood of these areas persisting long term. The EPA has also recommended condition B7-3 to require the proponent to report on the maintenance of values representative of SCP20a within the area identified as this community that will be retained adjacent to the road.

According to the interim recovery plan, the area of SCP20a being impacted is considered 'critical habitat' (DPAW 2016). While the proposal would result in a small overall impact to the total known occurrence of SCP20a, the EPA has assessed the impact as significant. This is based on the limited known and scattered extent of SCP20a and the threat of ongoing clearing of already fragmented patches on the SCP.

The EPA considers that all reasonable efforts to avoid where possible and otherwise minimise impacts to SCP20a should be applied. The EPA has considered the proponent's efforts to minimise impacts to SCP20a to the extent possible through alignment and design. The EPA has also considered the proponent's commitment to clear no more than 2 ha of the larger 7.9 ha area of SCP20a recorded and the likelihood that the retained areas are likely to persist in the long term.

The EPA advises that the significant residual impact to SCP20a should be subject to conditions to set clearing limits (recommended condition B1-2) and counterbalanced by offsets (recommended condition B6). The recommended offset condition would require the proponent to update its offset strategy in consultation with DBCA prior to ground disturbance. The offsets are to include acquisition for conservation and management in perpetuity of an area of currently unprotected land that contains this community, and/or funding management of a currently conserved patch of this community to improve its condition (see offsets detailed under section 4). This would align with the interim recovery plan for this TEC, noting the objective to increase the number of occurrences of this community managed for conservation and/or with conservation included in the purpose and improve/maintain the condition of existing occurrences (DPAW 2016).

Subject to the above recommended conditions, the environmental outcome is likely to be consistent with the EPA objective for this factor.

The EPA notes that modifications to SCP20a would likely require authorisation under section 45 of the BC Act.

SCP3b

SCP3b is dominated by both *Corymbia calophylla* and *Eucalyptus marginata* over low shrubs, sedges, grasses, and herbs. The key threats to this community include clearing for infrastructure, dieback, weed invasion, altered fire regimes, grazing, trampling by walkers and horses and hydrological change (DBCA 2020).

This TEC is known from 37 occurrences across 260.15 ha, with areas ranging in size from less than 0.5 ha up to 64.6 ha. The community is known from the eastern side of the SCP largely between Queens Park and Dunsborough. Seven of the known SCP3b occurrences, totalling 108.78 ha (41.8% of the total known occurrence), are within the DBCA estate.

The 25.4 ha of SCP3b recorded in the survey areas (see Figures 2 and 3) comprises four occurrences over 12 km and represents the northernmost range of SCP3b (FCT 2019). The proposed impact to 3 ha of SCP3b represents the loss of approximately 1.2% of its total known extent.

Three of the four occurrences recorded by Focussed Vision Consulting (FVC) are intersected by the development envelope. The development envelope intersects only a sliver of two of these occurrences. The proposed clearing would however fragment a small portion of the third occurrence, splitting it into two areas comprising 3.4 ha on the eastern side and 0.2 ha on the western side of the proposal. The EPA considers that this 0.2 ha area is unlikely to persist long-term following construction. The EPA has therefore considered that the proposal will directly impact this area, which has been factored into the total proposed 3 ha impact to SCP3b. The EPA has recommended conditions (as discussed under the 'Indirect impacts') to protect the larger patch of SCP3b that will remain adjacent to the disturbance area. The EPA has also recommended condition B7-3 to require the proponent to report on the maintenance of values representative of SCP3b within the area identified as this community retained adjacent to the road.

While the proposal would result in a small overall impact to three small occurrences of the total mapped occurrence of SCP3b, the EPA has assessed the impact to SCP3b as significant. This is based on the scattered known extent of SCP3b which largely comprises small areas subject to surrounding development pressures, and that the recorded survey occurrences represent its northernmost extent (FVC 2019).

The EPA considers that all reasonable efforts to avoid where possible and otherwise minimise impacts to SCP3b should be applied. The EPA has considered the proponent's efforts to minimise impacts to this TEC through avoiding an occurrence, preferentially aligning the proposed road through cleared paddocks, and the proposed use of road safety barriers and steep batters to narrow the clearing footprint. The EPA has also considered the proponent's commitment to clear no more than 3 ha of the larger 25.4 ha of SCP3b recorded in the survey area.

The EPA advises that the significant residual impact to SCP3b should be subject to conditions to set clearing limits (recommended condition B1-2) and counterbalanced by offsets (recommended condition B6). The recommended offset condition would require the proponent to update its offset strategy in consultation with DBCA prior to ground disturbance. The offsets are to include acquisition for conservation and management in perpetuity of an area of currently unprotected land that contains this community, and/or funding management of a currently conserved patch of this community to improve its condition (see offsets detailed under section 4).

Subject to the above recommended conditions, the environmental outcome is likely to be consistent with the EPA objective for this factor.

The EPA notes that modifications to this TEC will likely require authorisation under section 45 of the BC Act.

Banksia woodlands community

The Banksia woodlands community supports a rich and diverse array of flora and fauna species and is largely restricted to the Perth and Dandaragan subregions of the SCP. The key threats to this community include clearing for development, fragmentation, dieback, weeds, feral animals, changes to fire regimes and hydrological changes (TSSC 2016).

The proposed impact to 53.5 ha of the Banksia woodlands community (see Figures 2 and 3) represents the loss of less than 0.02% of its total mapped extent (321,603 ha) and 0.46% of its mapped extent within 50 kms (11,423 ha), according to DBCA databases. Around 81,800 ha of this community (25% of the total mapped extent) is estimated to occur within reserves across its range (TSSC 2016).

Surveys recorded this community from multiple areas over around 21 km of the proposed alignment (FVC 2019). The proposed development envelope bisects several of these patches. Except for two of the bisected areas, they would not become isolated, noting they occur within larger areas of remnant vegetation. The presence of native vegetation surrounding the adjacent retained areas of this community increases the likelihood that these reasonably sized areas will persist long term. The two areas that will be largely isolated by the proposal comprise 1.8 ha and 1.87 ha respectively. The EPA has recommended conditions to protect (as discussed under ‘Indirect impacts’) areas of this community that will remain outside of the disturbance area, which would increase the likelihood of these areas persisting in the long term.

While the proposal would result in a small overall impact to the total mapped extent of this community, the EPA has assessed the impact to the Banksia woodlands community as significant given the threat of ongoing clearing of representative occurrences from development on the SCP. The residual impact on this community aligns with the definition of significant residual impact in the *WA Environmental Offset Guidelines*, which includes areas defined as being critically impacted in a cumulative context (Government of Western Australia 2014).

The EPA has considered the hierarchy of protect, restore, and offset as set out in approved conservation advice for the Commonwealth listed community with the

same characteristics (TSSC 2016). The EPA has considered the proponent's efforts to minimise impacts to this community by preferentially locating the proposed road within previously cleared paddocks and the proposed use of road safety barriers and steep batters to narrow the clearing footprint. The EPA also considered the proponent's commitment to clear no more than 53.5 ha of the larger 483.7 ha of the community recorded in the FVC surveys.

The EPA advises that the significant residual impact to this community should be subject to conditions to set clearing limits (recommended condition B1-2) and counterbalanced by offsets (recommended condition B6). The recommended offset condition would require the proponent to update its offset strategy in consultation with DBCA prior to ground disturbance, that includes acquisition for conservation and management in perpetuity of an area of currently unprotected land that contains this community (see offsets detailed under section 4). This would align with the approved conservation advice for this community which states that a perpetual change in land tenure for conservation with ongoing threat abatement and monitoring can provide a substantial net conservation benefit for the community (TSSC 2016).

Subject to the above recommended conditions, the environmental outcome is likely to be consistent with the EPA objective for this factor.

FCT23b

FCT23b comprises *Banksia attenuata* and *Banksia menziesii* woodlands growing on the Bassendean system of the SCP from Melaleuca Park to Gingin. The community is a component of the Commonwealth listed Banksia woodlands community. The total extent of this PEC has not been mapped by DBCA. However, according to native flora quadrat data of the SCP sampled by Keighery et al. (2012), there are 79 occurrences of FCT23b on the SCP.

A total 26.6 ha of FCT23b was identified from seven occurrences over 10 km within the survey area (FVC 2019) (see Figures 2 and 3). The proposed impact to 4.5 ha across six of these occurrences is largely confined to the periphery of five of the six occurrences intersected by the indicative disturbance footprint and will not bisect these. However, the development envelope does bisect one larger occurrence of 5.98 ha into two relatively evenly sized areas. These areas are part of a larger area of high-quality remnant native vegetation that would remain on either side of the proposal.

The presence of high-quality native vegetation adjacent to the retained areas increases the likelihood of these reasonably sized occurrences persisting long term. The EPA has recommended conditions to protect FCT23b that will remain outside of the disturbance area, which would further increase the likelihood of these areas persisting in the long term (as discussed under the 'Indirect impacts').

Having regard to the *Environmental Protection Act 1986* (EP Act) principles, the environmental objective for flora and vegetation, the high number of FCT23b occurrences recorded by Keighery et al. (2012), and the small proposed extent of impact to FCT23b relative to that recorded in the survey area, the EPA considers that the residual impact to this FCT23b is not likely to be significant, subject to recommended condition B1-2 to set clearing limits to FCT23b. Subject to this

condition, the environmental outcome is likely to be consistent with the EPA objective for this factor.

Nooning Vegetation Complex

The proposal would impact 2.5 ha of vegetation associated with the Nooning Vegetation Complex, described as a mosaic of low open forest of *Casuarina obesa* and open scrub of *Casuarina obesa-Acacia* spp. *Melaleuca* spp. and woodland of *Eucalyptus rudis-Melaleuca rhaphiophylla* on major valley systems (Heddle et al. 1980). This complex retains 17.9% of its pre-European vegetation extent on the SCP (1,156.4 ha), which is less than the 30% target threshold for biodiversity conservation (Government of Western Australia 2019) beyond the intensive land use zone of the metropolitan region. The proposed clearing represents the loss of 0.2% of its remaining extent. Around 2.3% (150.6 ha) of the complex occurs in DBCA managed lands.

While the proposal would result in a small overall impact to the total mapped occurrence of this complex, given that it retains less than the 30% target threshold for biodiversity conservation, and the limited extent currently protected in DBCA estate, the EPA considers that the proposed impact is significant.

The EPA considers that all reasonable efforts to avoid where possible and otherwise minimise impacts to this complex should be applied. The EPA has considered the proponent's measures to minimise the clearing footprint through steepening batters, using road safety barriers, preferentially aligning the development envelope within previously cleared paddocks, and commitment to revegetate temporarily cleared areas.

The EPA advises that the significant residual impact to this complex should be subject to conditions (recommended condition B1-2) to set clearing limits and counterbalanced by offsets (recommended condition B6) to ensure the environmental outcome is likely to be consistent with the EPA objective for this factor (see offsets described under section 4).

Groundwater dependent vegetation

Several tree species recorded in the development envelope are considered groundwater dependent to some extent. These include *Banksia attenuata*, *Banksia menziesii, Corymbia calophylla, Eucalyptus todtiana*, *Banksia illicifolia*, *Banksia littoralis*, and *Eucalyptus rudis.* These species form the dominant overstorey of several of the recorded vegetation types, including the Banksia woodlands community, SCP20a and SCP3b. The EPA notes that the interim recovery plan for SCP20a recognises that it is partially groundwater dependent (DPAW 2016).

The proponent has committed to set clearing limits to the abovementioned communities which would limit the extent of impact to groundwater dependent vegetation. The EPA has also recommended offset conditions to address impacts to TECs and PECs which would counterbalance direct impacts to groundwater dependent vegetation. Indirect impacts to native vegetation, including groundwater dependent vegetation, and their management are assessed below under 'Indirect impacts'.

Conservation significant flora

Six priority flora species of which five are proposed to be impacted were recorded within the development envelope. These include *Drosera sewelliae* (P2), *Leucopogon squarrosus* subsp. *trigynus* (P2), *Verticordia rutilastra* (P3), *Anigozanthos humilis* subsp. *chrysanthus* (P4) and *Verticordia paludosa* (P4). The P3 and P4 species are known from 28 or more records. The proposed clearing of less than 40% of the total individuals of *Anigozanthos humilis* subsp. *chrysanthus* (P4) and *Verticordia paludosa* (P4) recorded by FVC, and two individuals of *Verticordia rutilastra*, which do not represent a range extension, is not expected to significantly impact on the local or regional extents or conservation status of these species.

Drosera sewelliae and *Leucopogon squarrosus* subsp. *trigynus*, are known from 16 and 20 records respectively. The proposed impact to *Drosera sewelliae* is four out of a total 46 occurrences and around 20% of the total individuals recorded by FVC. The proposed impact to *Leucopogon squarrosus* subsp. *trigynus* individuals is four out of five individuals recorded by FVC. There are 16 records of *Leucopogon squarrosus* subsp. *trigynus* within 30 km of the development envelope, where its documented frequency in eight of these locations is 'locally common'.

Based on the proposed extent of impact to these species, the EPA considers that the proposed clearing is not likely to significantly impact on the local or regional extents, or conservation status, of the species.

Noting the above, the EPA considers that the proposed impact to priority flora is not a residual impact that requires a condition to ensure the environmental outcome is likely to be consistent with the EPA objective for this factor.

Indirect impacts to flora and vegetation

The EPA has assessed potential residual impacts to flora and vegetation from indirect impacts to be the introduction and spread of weeds and *Phytophthora* dieback, and changes to hydrological regimes, including groundwater abstraction.

Introduction and spread of weeds and dieback to adjacent vegetation

A *Phytophthora cinnamomi* (dieback) assessment identified 27.15 ha of dieback infected vegetation (Terratree 2018) and FVC surveys identified the presence of 30 weed species in the larger study area (FVC 2019). The spread of weeds and dieback presents a key threat to the health of the recorded TECs/PECs, given they have a high proportion of dieback susceptible species.

To prevent the introduction and spread of weeds and dieback during construction, the proponent has committed to preparing a weed and dieback hygiene management plan. The plan will include the identification of dieback protectable areas, requirements for wash-down locations and weed management (Arup Jacobs Joint Venture 2020). The proponent notes that drainage will be designed to avoid the movement of soils and/or water potentially carrying dieback into dieback-free areas (Arup Jacobs Joint Venture 2020).

Noting the proponent's management measures, the EPA considers that the proposal is not likely to result in a substantial increase in the risk of weed or dieback spread above the risk that currently exists to surrounding native vegetation.

To further protect surrounding native vegetation, the EPA recommends conditions B1-1 and B1-3 to require no adverse impacts to native vegetation within 50 m of the development envelope, weed control and management during construction, and implementation of dieback hygiene protocols. These conditions would ensure that the environmental outcome is likely to be consistent with the EPA objective for this factor.

Changes to existing hydrological regimes

The proponent notes that groundwater abstraction will be required for construction water, and dewatering will be required to construct a bridge over Brockman River. Therefore, localised temporary drawdown of groundwater is expected. The proponent has committed to placing bores so that drawdown below occurrences of the Banksia Woodlands community and other groundwater dependent vegetation is less than 0.5 m (in accordance with ecological water requirements criteria of groundwater dependant ecosystems in the Southwest).

The EPA considers that abstraction will be localised, of relatively low rate and required for a short duration during construction. The EPA considers that abstraction will require a 5C licence under the *Rights in Water and Irrigation Act 1914* (RIWI Act) which will consider the impacts of groundwater drawdown.

The development envelope intersects the Brockman River and its tributaries (including Udumung Brook), Lennard Brook and several wetlands. The proponent notes that the proposal has been designed to ensure road culverts and the Brockman River bridge maintain existing water flow paths and regimes (Arup Jacobs Joint Venture 2020). The EPA considers that the soils of the development envelope are generally deep sands and infiltration rates would be high and close to source, resulting in minimal increased runoff. Therefore, the EPA considers that the risk of impact to flora and vegetation as a result of change to surface water flow and sedimentation would be minimal and short term.

The EPA recommends condition B1-1 to ensure there are no adverse impacts to native vegetation within 50 m of the development envelope, to ensure the environmental outcome is likely to be consistent with the EPA objective for flora and vegetation. The EPA has recommended further conditions that relate to no adverse impacts to wetlands/ watercourses and the maintenance of hydrological regimes and water quality under section 2.3 – Inland Waters.

Cumulative impact assessment

The EPA has considered the existing and reasonably foreseeable cumulative impacts to TECs and PECs occurring in the vicinity of the proposal and as a result of other developments in the local area. The EPA's cumulative impact assessment has considered the cumulative effects of a range of threats and pressures in the area of the proposal; and whether the environment affected by the proposal has significant

value due to other successive, incremental, and interactive cumulative impacts in the assessment area.

There are no cumulative impacts to the TEC and PEC occurrences recorded during the surveys from other known projects/development in the immediate vicinity of the proposal. The cumulative loss of native vegetation in the local area largely relates to historical clearing of rural land for agriculture, some horticulture, and subdivision development for rural residential properties.

From a regional perspective, there are several developments within 60 km (south) that impact on FCT20a, FCT23b and/or the Banksia Woodlands community. The EPA is aware that these proposals have the potential to impact up to 110.55 ha of the Banksia Woodlands ecological community, 11.6 ha of FCT23b and 9.17 ha SCP20a.

The EPA acknowledges that the proposal will have the effect of reducing the known local and regional extent of SCP20a, FCT23b and the Banksia Woodlands community. However, the EPA considers that known cumulative impacts to the regional extent of these communities are small relative to the extent of their mapped occurrence, and known cumulative impacts to the local extent of SCP20a and FCT23b are limited to this proposal.

The proposal will result in a relatively small incremental loss of native vegetation representative of these conservation listed ecological communities. The EPA therefore considers that, subject to recommended condition B1-2 to set clearing limits and condition B6 to require appropriate offsets, the environmental outcome is likely to be consistent with the EPA objective for flora and vegetation.

2.1.10 Summary of key factor assessment and recommended regulation

The EPA has considered the likely residual impacts of the proposal on flora and vegetation environmental values. In doing so, the EPA has considered whether reasonable conditions could be imposed, or other decision-making processes can ensure consistency with the EPA factor objective. The EPA assessment findings are presented in Table 2 below.

The EPA has also considered the principles of the EP Act (see Appendix C) in assessing whether the residual impacts will be consistent with its environmental factor objective and whether reasonable conditions can be imposed (Appendix A).

The EPA has also had regard to its conclusions in other recent assessments, including the Alkimos Seawater Desalination Plant assessment.

Table 2: Summary of assessment for flora and vegetation

Residual impact or risk to environmental value		Assessment finding	Recommended conditions and DMA regulation
1.	Clearing of conservation listed ecological communities: • 2 ha of SCP20a • 3 ha of SCP3b • 53.5 ha of Banksia woodlands community.	The EPA considers that the proposed impact to these communities is a significant residual impact. The EPA advises that this residual impact should be subject to reasonable conditions to set clearing limits, and require offsets to counterbalance the significant residual impact to these communities. Subject to the above recommended conditions, the environmental outcome is likely to be consistent with the EPA objective for this factor. The EPA has also recommended a condition to require the proponent to report on proposal impacts to SCP20a and SCP3b in relation to maintaining areas representative of these communities retained adjacent to the road.	**Condition B1 (Flora and Vegetation)** Disturbance limits to environmental values. **Condition B6 (Offsets)** Requirement of an adequate environmental offset strategy. **Condition B7 (Environmental Performance Reporting)** Proposal impacts to SCP20a and SCP 3b adjacent to the road.
2.	Clearing of up to 4.5 ha of FCT23b.	The EPA advises that this residual impact should be subject to reasonable conditions to set clearing limits to ensure that the environmental outcome is likely to be consistent with the EPA objective for this factor.	**Condition B1 (Flora and Vegetation)** Disturbance limits to environmental values.
3.	Clearing of up to 2.5 ha of the Nooning Vegetation Complex.	The EPA considers that the proposed impact to this complex is a significant residual impact. The EPA advises that this impact should be subject to reasonable conditions to set clearing limits and require offsets to counterbalance this significant residual impact. Subject to the above recommended conditions, the environmental outcome is likely to be consistent with the EPA objective for this factor.	**Condition B1 (Flora and Vegetation)** Disturbance limits to environmental values. **Condition B6 (Offsets)** Requirement of an adequate environmental offset strategy.
4.	Indirect impact to flora and vegetation from weeds, dieback,	The implementation of the proponent's mitigation and management measures are likely	**Condition B1 (Flora and Vegetation)**

Residual impact or risk to environmental value		Assessment finding	Recommended conditions and DMA regulation
	and changes to hydrological regimes.	to ensure the EPA's objective for flora and vegetation can be met. The EPA advises that indirect impacts should also be subject to reasonable conditions to ensure the environmental outcome is likely to be consistent with the EPA objective for this factor.	Environmental outcomes requiring no project attributable adverse impacts to vegetation within 50 m of the development envelope, undertake weed management, and dieback hygiene protocols.

2.2 Terrestrial Fauna

2.2.1 Environmental objective

The EPA environmental objective for terrestrial fauna is *to protect terrestrial fauna so that biological diversity and ecological integrity are maintained* (EPA 2016c).

2.2.2 Investigations and surveys

The EPA advises that the following investigations and surveys were used to inform the assessment of the potential impacts to terrestrial fauna:

- Great Northern Highway: Bindoon Bypass Fauna Assessment, prepared for Arup Jacobs Joint Venture (Bamford Consulting Ecologists (BCE) 2017)
- Great Northern Highway: Bindoon Bypass Targeted Fauna Surveys, prepared for Arup Jacobs Joint Venture (BCE 2018a)
- Great Northern Highway Bindoon Bypass Project, Additional survey area February 2018 (BCE 2018b)
- Great Northern Highway Bindoon Bypass Project: Revised Fauna Assessment, prepared for IPT (BCE 2019).

The surveys were consistent with the *Technical guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment* (EPA 2020a) and *Technical guidance – Sampling of short range endemic invertebrate fauna* (EPA 2016d).

2.2.3 Assessment context – existing environment

The southern two thirds of the proposal runs north south and largely occur just within the eastern boundary of SCP bioregion and Dandaragan Plateau subregion. The northern portion of the proposal deviates east, extending into the Jarrah Forest bioregion and Northern Jarrah Forest subregion. The development envelope is surrounded by a combination of cleared rural areas and large patches of remnant vegetation, including Julimar State Forest and Boonanarring Nature Reserve.

The proponent's fauna surveys identified 10 fauna habitat types (vegetation substrate associations (VSA)) within the 848.5 ha development envelope. These include Banksia woodland with or without scattered jarrah/marri (VSA 1 and VSA 2), marri/jarrah woodland with or without understorey (VSA 3 and VSA 4), wandoo woodland (VSA 5), heath (VSA 6) (not within the indicative disturbance footprint), waterways or wetlands (VSA 7), paddocks with large remnant trees (VSA 8), paddocks (VSA 9) and plantations (VSA 10) (BCE 2019). Around 363 ha of the development envelope comprises paddocks, or paddocks with remnant trees (BCE 2019; Arup Jacobs Joint Venture 2020).

Fauna surveys identified evidence of 66 vertebrate fauna species within a larger survey area encompassing the development envelope, of which four species are conservation significant. These include (BCE 2019):

- Carnaby's cockatoo (*Zanda latirostris*) – endangered (BC Act and EPBC Act)

- forest red-tailed black cockatoo (*Calyptorhynchus banksii naso)* – vulnerable (BC Act and EPBC Act)
- rakali (*Hydromys chrysogaster*) – Priority (P) 4 (DBCA)
- western brush wallaby (*Notamac ropus Irma*) – P4 (DBCA).

The fauna surveys also identified one conservation significant invertebrate fauna species (BCE 2019), being a species of shield-backed trapdoor spider (*Idiosoma mcclementsorum*) – P2 (DBCA).

A further 11 conservation significant fauna species were recorded as being likely resident within the survey area, as shown in Table 2-5 of the proponent's ERD (Arup Jacobs Joint Venture 2020).

The development envelope intersects three regional and nine local ecological linkages identified through the Shire of Chittering's local biodiversity strategy (LBS), which provide corridors for fauna movement.

2.2.4 Consultation

Matters raised during stakeholder consultation and the proponent's responses are provided in the proponent's response to submissions document (Arup Jacobs Joint Venture 2022).

Four submissions were received regarding this factor. These submissions raised concerns about the following matters:

- limited consideration of short-range endemics (i.e. trapdoor spider)
- the extent of impact to black cockatoo foraging and current and future breeding habitat, cumulative impacts to black cockatoos, the importance of revegetation within the range of affected flocks and importance of artificial nest hollows
- lack of detail regarding fauna underpasses and revegetation
- impact to fauna corridors and risk of increased fauna mortality.

The key issues raised during the public consultation on the proposal and how they have been considered in the assessment are described below in sections 2.2.7, 2.2.8 and 2.2.9.

2.2.5 Potential impacts from the proposal

The proposal has the potential to significantly impact terrestrial fauna from:

- loss of 204.8 ha of low-moderate or higher value foraging habitat for Carnaby's cockatoo
- loss of 168 ha of low-moderate or higher value foraging habitat for forest red-tail black cockatoo
- loss of Carnaby's cockatoo and forest red-tailed black cockatoo (herein referred to collectively as black cockatoos) habitat trees including:
    - 10 trees containing hollows with evidence of nesting

  - 117 trees containing hollows of a suitable size for nesting (no evidence)
  - 1,358 trees with the potential to develop nesting hollows
- loss of 54.4 ha of quality chuditch (*Dasyurus geoffroii*) habitat – vulnerable (BC Act and EPBC Act)
- loss of 69.2 ha of south-western brush-tailed phascogale (*Phascogale tapoatafa wambenger*) habitat (phascogale) – conservation dependent (BC Act)
- habitat fragmentation, including fragmentation of ecological linkages
- potential fauna injury and/or mortality from vehicle strike during clearing, construction, and operation
- potential degradation of adjacent black cockatoo habitat from root disturbance, the introduction/spread of dieback, and disruption to black cockatoo breeding in suitable nesting trees adjacent to the proposal.

2.2.6 Avoidance measures

The proponent requested changes to the original proposal during the assessment which resulted in the avoidance of some impacts to black cockatoo habitat, including (Arup Jacobs Joint Venture 2020; Arup Jacobs Joint Venture 2022):

- two trees with evidence of black cockatoo nesting (proposed impact reduced from 12 trees to 10 trees)
- 107 trees of a suitable size to develop nesting hollows (proposed impact reduced from 1,465 to 1,358 trees).

The EPA notes that the proponent will aim to avoid additional trees of a suitable size to develop hollows where possible during the detailed design phase.

2.2.7 Minimisation measures (including regulation by other DMAs)

The proponent has proposed the following measures to minimise impacts to terrestrial fauna (Arup Jacobs Joint Venture 2020; Arup Jacobs Joint Venture 2022):

- aligning a large portion of the development envelope in highly disturbed paddocks and the proposed steepening of batters and installation of barriers to minimise impacts to fauna habitat
- fauna spotters to be present during clearing activities to supervise dispersal or relocation of remaining fauna; fauna will be encouraged to disperse of their own accord prior to clearing, ahead of trapping and relocation
- pre-clearing inspections of suitable nesting trees during the black cockatoo breeding season (1 July to 31 December), avoiding hollows being used
- construction of fauna underpasses to align with ecological linkages and reconnect areas of high-quality habitat, designed in accordance with the proponent's guideline ‘Design of Fauna Underpasses’
- drainage designed to avoid the movement of soils/water potentially carrying dieback into areas mapped as dieback free to minimise impacts to fauna habitat

- installation of drainage structures to maintain existing surface water flows and incorporate erosion protection measures to minimise impacts to aquatic habitats
- lighting will be limited to intersections/interchanges only. Installation of full lighting will only occur at major intersections, with 'flag' lighting installed at other intersections and designed to minimise light spill.

The EPA notes that trapping and relocation or inadvertent take of listed fauna must be undertaken in accordance with a section 40 authorisation under the BC Act.

The issue raised during the public consultation about potential impacts to the extent of black cockatoo habitat, the risk of increased fauna mortalities, and impacts to fauna corridors has been considered through the above minimisation measures.

2.2.8 Revegetation measures

The proponent proposes to progressively revegetate temporarily cleared areas within the road reserve to reflect the existing vegetation type and structure. Revegetation would commence in autumn following construction works and would consider the maintenance of ecological linkages. The proponent notes that annual surveys of revegetation areas will be undertaken to assess revegetation success and weed presence/cover (Arup Jacobs Joint Venture 2020).

2.2.9 Assessment of impacts to environmental values

The EPA considered that the key environmental values for terrestrial fauna likely to be impacted by the proposal are conservation significant fauna including black cockatoos, chuditch, phascogale and *Idiosoma mcclementsorum*.

Black cockatoos

Forest red-tailed black cockatoo and Carnaby's cockatoo are both known from the local area and were recorded regularly during the fauna surveys (BCE 2019). The development envelope crosses the northern boundary of the forest red-tailed black-cockatoo's distribution, and the records of this species were confined largely to the southern two-thirds of the development envelope (BCE 2019).

The EPA considers the residual impacts of the proposal on black cockatoos to be the loss of foraging habitat and breeding habitat (potential and confirmed). The EPA considers that the proposed residual impacts would exacerbate some of the key threatening processes as outlined in the recovery plans for both black cockatoo species (DEC 2008; DPAW 2013).

Foraging habitat

The entirety of the 490 ha of native vegetation proposed for clearing provides some suitability as black cockatoo foraging habitat. The fauna surveys analysed the type and density of foraging habitat throughout the survey area to determine a quality score, ranging from 'Nil' (0) to 'High' (6) value foraging habitat. The scoring system considered vegetation composition, condition, and structure (BCE 2019). Vegetation classified as negligible (1), or low (2) value comprised scattered specimens of known

food plants with minimal foliage cover (for example paddocks with low density trees) (BCE 2019) and were therefore not considered a significant foraging resource.

The fauna surveys recoded 1,466.6 ha and 1,119.5 ha of low-moderate (3) or higher quality foraging habitat for Carnaby's cockatoo and forest red-tailed black cockatoo, respectively (BCE 2019). Of this habitat, the proponent proposes to impact:

- 204.8 ha of low-moderate or higher value foraging habitat for Carnaby's cockatoo (13.9% of the total foraging habitat recorded of this quality)
- 168 ha of low-moderate or higher value foraging habitat for forest red-tailed black cockatoo (15% of the total foraging habitat recorded of this quality).

The proportion of higher value foraging habitat for both species is greater within the portion of the development envelope that runs north-south, within the Dandaragan Plateau, noting the presence of highly cleared rural areas associated with the portion of the development envelope that runs east-west. Fauna surveys identified 118 forest red-tailed black cockatoo foraging records (jarrah and marri) which occurred in the southern two-thirds of the survey area. There were 120 Carnaby's cockatoo foraging records (largely banksia, jarrah, and marri) which occurred over the whole survey area (BCE 2019). Most foraging records for both species occurred within foraging habitat that was classified as low-moderate value or higher (BCE 2019).

The importance of foraging habitat for Carnaby's cockatoo increases when it occurs within foraging distance of nesting sites (12 km) as it supports breeding effort (DPAW 2013; EPA 2019). Food resources within the range of roost sites are also important to sustain populations of black cockatoos (EPA 2019). Specifically, night roosting sites need suitable foraging habitat and water within 6 km (EPA 2019). There are several confirmed nesting sites for Carnaby's cockatoo within 12 km of the development envelope, and known roosting sites for both species exist within 6 km of the development envelope, which indicates the foraging habitat present within the development envelope supports breeding effort and is therefore of greater significance.

Breeding and roosting habitat

Fauna surveys identified 69 trees with hollows showing evidence of nesting (chew marks etc.) of which 10 are proposed for clearing (see Figures 4, 5 and 6). These 10 trees showed evidence of historical use and were not currently in use at the time of survey (BCE 2019). A total of 1,159 trees with hollows of a suitable size for nesting (no signs of nesting), were recorded in the survey area, of which 117 are proposed for clearing. The surveys identified 8,486 trees with the potential to develop nesting hollows (diameter at breast height of greater than 500 mm) of which 1,358 are proposed for clearing.

The proponent extrapolated the potential nesting tree density numbers recorded within each of the fauna habitat types, to provide an estimate of potential nesting tree density within a 15 km radius (based on regional vegetation mapping). Based on this extrapolation, the proponent estimates that it is possible that more than one million potential breeding trees occur within 15 km (Arup Jacobs Joint Venture 2022).

Three forest red-tailed black-cockatoo roosts were identified outside of the development envelope, all supporting between 10 to 30 birds (BCE 2019). No other roosts were identified within the survey areas, although the EPA considers that there is the potential for more presently undetected roosts to occur within development envelope.

The assessment of indirect impacts to black cockatoo habitat has been included under the 'other impacts to terrestrial fauna' section.

Significant residual impact to black cockatoos

There is around 93,000 ha of native vegetation within a 15 km radius of the development envelope, which includes around 12,900 ha and 8,100 ha of native vegetation within the western portion of Julimar State Forest and Boonanarring Nature Reserve respectively. This native vegetation is expected to provide a high proportion of suitable foraging and breeding habitat for black cockatoos. The proponent notes that according to mapping undertaken for the Perth-Peel strategic assessment, 225,338 ha of Carnaby's cockatoo foraging habitat and 3,138,214 ha of forest red-tailed black cockatoo foraging habitat remains within the SCP and Jarrah Forest bioregions respectively.

Noting the above, the EPA considers that the proposal is not likely to substantially impact on the regional availability of foraging or breeding habitat for black cockatoos. However, the EPA has assessed the proposed residual impact to suitable and potential breeding habitat and low-moderate or higher quality foraging habitat as significant, given:

- the foraging habitat proposed for clearing is within 12 km of known nesting sites and within 6 km of known roost sites, and supports breeding effort
- the existing and continued loss of habitat across these species range
- the habitat proposed for clearing fits the description of 'critical habitat', as defined within the recovery plan for each species (DEC 2008; DPAW 2013).

The EPA's consideration and quantification of significant residual impacts to black cockatoo habitat aligns with the Department of Climate Change, Energy, the Environment and Waters (DCCEEW) approval of the project under the EPBC Act.

The EPA considers that all reasonable efforts to avoid where possible and otherwise minimise impacts to black cockatoo habitat should be applied. The EPA has considered the proponent's efforts to minimise impacts to foraging and breeding habitat through preferentially aligning the proposed road through cleared paddocks, the proposed use of road safety barriers and steep batters to narrow the clearing footprint and refining the proposal during assessment to reduce the impact to nesting hollows. The EPA has also considered the proponent's commitment to limit the proposed clearing extent of low-moderate or higher value foraging habitat, and breeding habitat, to less than 16% of that recorded in the survey areas.

The EPA has recommended condition B2-1 to set clearing limits on the extent of impact to foraging and breeding habitat, and condition B6 to require adequate offsets to counterbalance the impacts to black cockatoo habitat.

The EPA's recommended offset condition would require the proponent to update its offset strategy in consultation with DBCA prior to ground disturbance. The offsets are to include acquisition for conservation and management in perpetuity of an area of currently unprotected land that contains black cockatoo foraging habitat and potential nesting trees. The recommended offset condition also includes a requirement to revegetate land (within 50 km of the proposal) with species that will provide future foraging and breeding habitat for black cockatoos and install artificial nest hollows to address the short-term loss of suitable breeding habitat. The EPA considers that a combination of acquisition and restoration is a sustainable offset strategy for black cockatoos and is necessary to enhance local environmental values and counterbalance significant residual impacts.

Subject to the above recommended conditions, the environmental outcome is likely to be consistent with the EPA objective for this factor.

Chuditch

Chuditch has previously been recorded in the Bindoon area and the 54.4 ha of marri-jarrah woodland proposed for clearing provides potential quality habitat for this species. Of this, 37.1 ha is in a 'Good' to 'Excellent' condition. Targeted surveys did not record any evidence of chuditch and noted that should this species be present on site, it would likely occur in very low levels of abundance (BCE 2019).

The survey identified 496.9 ha of suitable chuditch habitat within the survey area. The proponent notes that an estimated 7,302 ha of native vegetation within 5 km of the development envelope is expected to provide suitable chuditch habitat (foraging and potential denning). The proposed clearing of 54.4 ha represents 0.7% of the potentially suitable habitat within 5 km of the development envelope.

While the extent of impact to this species both locally and regionally is relatively minimal, the 54.4 ha of marri-jarrah woodland habitat proposed to be cleared meets the definition of critical habitat for this species given that it likely includes areas used by chuditch to move across the landscape (including areas mapped as east-west ecological linkages), and areas of suitable habitat where undiscovered chuditch may exist (DEC 2012). Therefore, the EPA considers that the proposed impact to this species is significant.

The EPA has considered the proponent's efforts to minimise impacts to chuditch habitat through aligning a large portion of the development envelope in highly disturbed paddocks and steepening batters to minimise the clearing footprint.

The EPA advises that the significant residual impact to chuditch habitat should be subject to conditions (recommended condition B2-1) to set clearing limits and counterbalanced by offsets (recommended condition B6). The recommended offset condition would require the proponent to update its offset strategy in consultation with DBCA and prior to ground disturbance, that includes acquisition for conservation and management in perpetuity, of an area of currently unprotected land that contains habitat for this species (see offsets detailed under section 4).

Subject to the above recommended conditions, the environmental outcome is likely to be consistent with the EPA objective for this factor.

The EPA has assessed the impact of fragmentation to this species habitat, including ecological linkages which are likely to facilitate the movement of this species across the landscape, and the risk of fauna injury/fatalities below under 'other impacts to terrestrial fauna'.

Phascogale

Phascogale is known from five historical records within 20 km of the development envelope (most recently in 2005). While targeted surveys did not record evidence of this species, it is likely to be a resident in the area, in low abundance, if not locally extinct (BCE 2019).

The 69.2 ha of marri-jarrah woodland and wandoo woodland proposed for clearing provides potentially suitable habitat for this species. The survey identified 565 ha of suitable phascogale habitat within the broader survey area and the proposed clearing represents the loss of 12.2% of this habitat. The proponent notes that around 93,000 ha of native vegetation occurs within 15 km of the development envelope, which is expected to provide a high proportion of suitable habitat for this species.

The EPA considers that the proposed impact to phascogale habitat is not likely to be significant. This is given that no individuals were recorded during targeted surveys, the extent of native vegetation in the local area, and the relatively minimal extent of suitable habitat proposed for impact relative to that recorded in the survey area.

The EPA has recommended condition B2-1 to set clearing limits to phascogale habitat to ensure that the environmental outcome is likely to be consistent with the EPA objective for this factor.

Shield-backed trapdoor spider (Idiosoma mcclementsorum)

The proponent commissioned a short-range endemic (SRE) invertebrate survey for the proposal which included targeted shield-backed trapdoor spider searches. The survey identified two *Idiosoma mcclementsorum* burrows more than 50 m from the development envelope, within two larger patches of remnant vegetation in the north and south adjacent to the proposal (BCE 2019). The proposal will not fragment these patches.

Noting that the development envelope provides a minimum 50 m buffer to the identified burrows, that the proposed clearing will not fragment the patches where the burrows occur, and that extensive areas of likely suitable habitat occur adjacent to the proposal, the EPA considers that the proposed clearing is not likely to significantly impact on *Idiosoma mcclementsorum* or its habitat. The EPA considered the public consultation concerns regarding SREs and considers that the surveys were adequate to identify SREs, noting they included appropriately timed opportunistic searches over three field trips, and targeted searches for *I. mcclementsorum* burrows within suitable habitat, where suitable habitat was determined through site inspections of existing known *I. mcclementsorum* locations. The EPA considers that adequate consideration of potential impacts to SREs has been undertaken.

Other conservation significant fauna

The EPA has considered that direct impacts to habitat for other conservation listed vertebrate fauna which likely reside in the development envelope are not likely to be significant. This is based on the linear nature of the road, extent of surrounding habitat in the local area and that except for western brush wallaby and rakali (both recorded outside the development envelope), these species were not recorded in the survey area. Therefore, the EPA did not assess direct impacts to habitat for these species any further in its assessment. The EPA has assessed fauna mortality risks and fragmentation impacts, which are relevant to these species, below under 'other impacts to threatened terrestrial fauna'.

Carter's freshwater mussel (*Westralunio carteri*) and western mud minnow (*Galaxiella munda*) (both vulnerable under the BC Act) are known from the Brockman River and Lennard Brook (permanent waters only) respectively, and both watercourses are intersected by the development envelope. Given the salinity levels of the Brockman River where it intersects the development envelope, it is unlikely that Carter's freshwater mussel would occur in the development envelope (BCE 2019). The headwaters of the Lennard Book that intersect the development envelope are ephemeral, and the recorded locations of the minnow are downstream of the proposal, therefore, the minnow is unlikely to occur in the development envelope. Fauna surveys found no evidence of either species in the development envelope (BCE 2019). Therefore, the EPA did not assess direct impacts to these species further in its assessment. The EPA has assessed impacts to water flow and quality under section 2.3 - Inland Waters, which may have an indirect impact on these species.

Other impacts to terrestrial fauna

Black cockatoo fauna mortality/injury and indirect impacts

The EPA notes that there are ten confirmed nesting trees, several potential nesting trees and suitable foraging habitat that occur within the development envelope but outside of the indicative disturbance footprint (not proposed for direct impact).

The EPA considers that there is a risk of:

- reduced use of suitable nesting trees by black cockatoos for breeding during operation (in trees adjacent to the proposal)
- impact to nesting trees adjacent to the proposal from dieback or root zone disturbance
- fauna mortality/injury to black cockatoos from the construction (clearing of trees being utilised by black cockatoos for breeding during construction) and operation (through vehicle strike) of the proposal.

To minimise these risks the proponent has committed to the following measures (Arup Jacobs Joint Venture 2020):

- pre-clearing inspections of suitable nesting trees during the black cockatoo breeding season (1 July to 31 December), avoiding hollows in use

- placement of roadside signs in high-risk fauna strike areas to alert drivers
- no planting of suitable habitat for black cockatoos within 10 m of the road, noting it increases the risk of vehicle strike.

The proponent has provided breeding activity monitoring results for 39 artificial nest hollows it installed near the GNH for the Muchea North GNH upgrade project (located immediately south). In 2023, the proponent recorded 20 confirmed breeding events in these artificial nest hollows. Several of these hollows were adjacent to the project area, and in close proximity to the GNH. The proponent has advised that based on these results, operation of the road is not likely to prevent breeding activity within nesting trees that occur close to the road.

The proponent notes that vehicle grain spills greatly increase the risk of black cockatoo vehicle strike, particularly on major canola haulage routes in the Great Southern Region. The proponent has advised that to reduce the potential for black cockatoo vehicle strike in high-risk areas (identified with DBCA), it is increasing inspections of vehicles carting grain to ensure adequate tailgate seals and load coverage, to minimise the amount of grain being spilt during transit.

The EPA considers that potential impacts associated with dieback and root zone disturbance to nesting trees should be subject to the EPA's recommended conditions B2-1 and B1-3, to set limits to nesting tree impacts, and require dieback hygiene protocols during construction.

The EPA considers that the potential impact associated with black cockatoo mortality/injury should be subject to the EPA's recommended condition B2-2, requiring the inspection of all suitable nesting trees prior to clearing, including avoidance until young have fledged if in use. The EPA also recommends condition B2-3 to ensure that revegetation within 10 m of the road does not include black cockatoo foraging habitat, to minimise the risk of vehicle strike.

Subject to the above recommended conditions, the environmental outcome is likely to be consistent with the EPA objective for this factor.

The EPA has also recommended condition B7-3 to require the proponent to report on proposal impacts to the use of suitable and potential nesting trees adjacent to the road by black cockatoos as part of its environmental performance reporting.

Ground dwelling fauna mortality/injury and fragmentation of ecological linkages

The EPA considers that there is risk of fauna mortality/injury to ground dwelling fauna from the construction and operation of the proposal. The EPA also considers that the proposal would fragment fauna habitat, including known ecological linkages recognised through the Shire of Chittering's LBS. The EPA notes that the LBS sets out the shire's biodiversity conservation objectives which include the retention, protection, and management of natural areas. To minimise these impacts the proponent has committed to the following measures (Arup Jacobs Joint Venture 2020):

- undertake pre-clearing trapping and relocation of fauna post dispersal encouragement, and fauna spotters to be present during clearing activities

- construction of fauna underpasses to align with ecological linkages and connect areas of high-quality habitat
- placement of roadside signs in high-risk fauna strike areas to alert drivers
- reducing construction speed limits (for example, to 40 km per hour)
- trenches to be fenced, inspected daily and include temporary escape ramps.

It is considered that the presence of fauna handlers would appropriately manage the risk of the clearing resulting in non-avian terrestrial fauna injury/mortality. The EPA has recommended condition B2-2, requiring the presence of fauna handlers during construction, to ensure the proponents commitment is adhered to.

The proposal will fragment areas of remnant vegetation in 'Very Good' or better condition that provide corridors for fauna movement. Several of these areas are mapped as ecological linkages through the Shire of Chittering's LBS. The fragmentation of these areas can reduce the ecological functionality of the resulting smaller remnants and their ability to support fauna. In addition, the proposed road forms a significant physical barrier, preventing and reducing natural movement of fauna across the landscape.

Notably, the proposal would fragment a regional LBS linkage in the vicinity of multiple chuditch records around Teatree Road and Gray Road in the southern portion of the development envelope, which may present a barrier to chuditch movement at this location. Operation of the proposed road will also increase the risk of vehicle strike to chuditch and other ground dwelling fauna, particularly around the ecological linkages.

To minimise impacts to ecological linkages and vehicle strike risks to ground dwelling fauna during operation, the proponent has committed to installing a minimum of seven fauna underpasses, which may be co-located with culverts where appropriate, to facilitate terrestrial fauna movement across the road and between areas of high-quality habitat. The proponent has selected underpass locations that align with the LBS ecological linkages, reconnect high-quality fauna habitat, and align with areas where the road is higher to avoid flooding (Arup Jacobs Joint Venture 2022). The proponent notes that underpasses will aim to include vegetated entrances to minimise the risk of predation (Arup Jacobs Joint Venture 2022).

The EPA notes advice from DBCA that if designed correctly (suitable size and considers predation risks) and located appropriately (between continuous patches of remnant vegetation) native fauna such as chuditch, western brush wallaby and rakali may utilise underpasses. DBCA advised that the indicative location and design of underpasses should be referred to it for advice to ensure they are adequate for the target species. DBCA further advised that appropriate monitoring of entry and exit points of underpasses is recommended to assess their effectiveness in mitigating fragmentation impacts.

The EPA has recommended condition B2-3, requiring the installation of a minimum of seven fauna underpasses (crossings) along the alignment that are suitable for a variety of native fauna, minimise the potential risk of predation, align with ecological linkages, connect areas of good quality native vegetation, and/or connect areas with

high environmental values. The location and design of the fauna underpasses is to be determined in consultation with DBCA. The EPA has also recommended condition B1-3, requiring the revegetation of temporarily cleared areas, which will help to minimise long term impacts to linkage values.

Subject to the above recommended conditions, the environmental outcome is likely to be consistent with the EPA objective for this factor.

The EPA has also recommended condition B7-3 to require the proponent to report on the utilisation of fauna crossings by native terrestrial fauna to inform the effectiveness of fauna crossings as part of its environmental performance reporting.

Cumulative impact assessment

The EPA has considered the existing and reasonably foreseeable cumulative impacts to terrestrial fauna occurring in the vicinity of the proposal and across developments in this portion of the SCP and Jarrah Forest. The EPA's cumulative impact assessment has considered the cumulative effects from the range of threats and pressures in the area of the proposal and whether the environment affected by the proposal has significant value due to other successive, incremental, and interactive cumulative impacts in the assessment area.

The EPA considers that of the conservation significant fauna being impacted by the proposal, cumulative impacts pose the greatest threat to black cockatoo habitat.

The proponent has provided a cumulative impact assessment for black cockatoo habitat being impacted by approved EP Act related proposals within a 15 km radius of the proposal. The proponent identified that (Arup Jacobs Joint Venture 2020):

- impact to 517.3 ha of foraging habitat and 298.1 ha of potential breeding habitat for Carnaby's cockatoo has been previously approved
- impact to 303.3 ha of foraging habitat and 199.7 ha of potential breeding habitat for forest red-tailed black cockatoo has been previously approved.

The above totals do not include the impacts associated with the development of Stage 1 (north) of the Bindoon Bypass project which was approved under clearing permit CPS 8573/2. This permit authorised the loss of one tree with a suitable breeding hollow (no evidence of use) and 20.6 ha of foraging habitat and was subject to environmental offsets to counterbalance these impacts.

The EPA acknowledges that the proposal occurs along the eastern border of the SCP (Dandaragan Plateau) and western border of the Jarrah Forest, where cumulative impacts are largely related to rural, and rural residential land uses. The proponent notes that there is around 93,000 ha of native vegetation mapped within the local area, which is expected to provide a high proportion of suitable habitat for black cockatoos. This includes 12,900 ha of native vegetation within the western portion of Julimar State Forest, which is known to support Carnaby's cockatoo foraging and breeding activity.

While cumulative impacts to black cockatoo habitat impacted by this proposal are not at a level that would warrant a decision to allow no further clearing of this value for

this proposal, the EPA considers that the incremental loss of foraging and breeding habitat across these species range must be appropriately managed.

The EPA has therefore recommended condition B2-1 to set clearing limits to foraging and breeding habitat, and condition B6, to require adequate offsets to counterbalance the loss of habitat. The offset condition includes the requirement for acquisition and revegetation of black cockatoo nesting and potential breeding habitat, research, and the installation of artificial nest hollows within an area of known breeding activity. These recommended conditions will ensure that the environmental outcome is likely to be consistent with the EPA objective for this factor.

The issues raised during the public consultation regarding cumulative impacts to black cockatoo habitat, the importance of artificial nest hollows and the importance of revegetation (with foraging and potential nesting habitat) within the range of affected flocks has been further considered through the EPA's assessment of offsets (section 4).

2.2.7 Summary of key factor assessment and recommended regulation

The EPA has considered the likely residual impacts of the proposal on terrestrial fauna. In doing so, the EPA has considered whether reasonable conditions could be imposed, or other decision-making processes can ensure consistency with the EPA factor objective. The EPA assessment findings are presented in Table 3.

The EPA has also considered the principles of the EP Act in assessing whether the residual impacts will be consistent with its environmental factor objective and whether reasonable conditions can be imposed (see Appendix A).

The EPA has also had regard to its conclusions in other recent assessments, including the Alkimos Seawater Desalination Plant assessment.

Table 3: Summary of assessment for terrestrial fauna

Residual impact or risk to environmental value		Assessment finding or Environmental outcome	Recommended conditions and DMA regulation
1.	Clearing of habitat for Carnaby's cockatoo and forest red-tailed black cockatoo (black cockatoos): • 204.8 ha of low-moderate or higher value foraging habitat for Carnaby's cockatoo • 168 ha of low-moderate or higher value foraging habitat for forest red-tailed black cockatoo	The EPA considers that the impact to black cockatoo habitat is a significant residual impact. The EPA advises that this residual impact should be subject to reasonable conditions to set clearing limits and require offsets to counterbalance this significant residual impact. Subject to these recommended conditions, the environmental outcome is likely to be consistent with the EPA objective for this factor.	**Condition B2 (Terrestrial Fauna)** Sets limits of disturbance to black cockatoo habitat. **Condition B6 (Offsets)** Requirement of an adequate environmental offset strategy.

Residual impact or risk to environmental value		Assessment finding or Environmental outcome	Recommended conditions and DMA regulation
	• 10 trees containing hollows with evidence of nesting • 117 trees with hollows suitable for nesting (no signs of use) • 1,358 potential nesting trees.		
2.	Direct impact to 54.4 ha of quality chuditch habitat.	The EPA considers the proposed impact to chuditch habitat is a significant residual impact. The EPA advises that this residual impact should be subject to reasonable conditions to set clearing limits and require offsets to counterbalance this significant residual impact. Subject to these recommended conditions, the environmental outcome is likely to be consistent with the EPA objective for this factor.	**Condition B2 (Terrestrial Fauna)** Sets limits of disturbance to chuditch habitat. **Condition B6 (Offsets)** Requirement of an adequate environmental offset strategy.
3.	Direct impact to 69.2 ha of phascogale habitat.	The EPA considers that the impact to phascogale habitat is not a significant residual impact and can be managed through recommended conditions to set clearing limits on suitable habitat. Subject to this recommended condition, the environmental outcome is likely to be consistent with the EPA objective for this factor.	**Condition B2 (Terrestrial Fauna)** Sets limits of disturbance to phascogale habitat.
4.	Fragmentation and loss of habitat providing ecological linkages.	The EPA advises that this residual impact should be subject to reasonable conditions that require the installation of seven fauna crossings that align with ecological linkages, connect areas of good quality vegetation and/or connect areas with high environmental value, to ensure that the environmental outcome is likely to be consistent with the EPA objective for this factor. The EPA has also recommended a condition to require the	**Condition B1 (Flora and Vegetation)** Revegetation of temporarily cleared areas. **Condition B2 (Terrestrial Fauna)** Install seven fauna crossings. **Condition B7 (Environmental**

Residual impact or risk to environmental value		Assessment finding or Environmental outcome	Recommended conditions and DMA regulation
		proponent to report on the utilisation of fauna crossings by native fauna as part of its environmental performance reporting.	**Performance Reporting)** Utilisation of fauna crossings by native fauna.
5.	Impact to fauna through machinery or vehicle strike (clearing, construction and operation).	The EPA considers that the proposal has the potential to cause terrestrial fauna injury/mortalities including potential impacts to nesting black cockatoos. The EPA advises that this residual impact should be subject to reasonable conditions that require pre-clearance surveys of suitable nesting trees, fauna spotters during construction, and installation of seven fauna crossings to connect habitat. Subject to the above recommended conditions, the environmental outcome is likely to be consistent with the EPA objective for this factor.	**Condition B2 (Terrestrial Fauna)** Pre-clearance surveys of black cockatoo nesting trees. Engage fauna handlers. Install seven fauna crossings. No planting of black cockatoo foraging plants within 10 m of the road.
6.	Indirect impacts to adjoining black cockatoo habitat and adjacent black cockatoo nesting tree use.	The EPA considers that the proposal may indirectly impact adjoining black cockatoo habitat from root zone disturbance and the introduction/spread of dieback. The EPA advises that this residual impact should be subject to reasonable conditions to limit the clearing extent and require hygiene protocols, to ensure the environmental outcome is likely to be consistent with the EPA objective for this factor. The EPA has considered the proponent's additional information regarding disturbance to breeding activity in adjacent trees and has recommended a condition to require the proponent to report on proposal impacts to black cockatoo's use of adjacent nesting trees.	**Condition B1 (Flora and Vegetation)** Undertake dieback hygiene protocols during construction. **Condition B2 (Terrestrial Fauna)** Sets limits of disturbance to black cockatoo habitat. **Condition B7 (Environmental Performance Reporting)** Report on proposal impacts to black cockatoos regarding the use of nesting trees adjacent to the road and success of artificial nest hollows.

2.3 Inland Waters

2.3.1 Environmental objective

The EPA environmental objective for inland waters is *to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected* (EPA 2018).

2.3.2 Investigations and surveys

The EPA advises the following investigations and surveys were used to inform the assessment of the potential impacts to inland waters:

- Great Northern Highway Muchea to Wubin Upgrade – Stage 2, Main Roads Western Australia, Bindoon Bypass Environment | Surface Water Assessment (Appendix F of the environmental review document) (Arup Jacobs Joint Venture 2018c)
- Great Northern Highway Muchea to Wubin Upgrade – Stage 2, Main Roads Western Australia, Bindoon Bypass Environment | Groundwater Assessment (Appendix G of the environmental review document) (Arup Jacobs Joint Venture 2018a).

The EPA notes that the proponent also utilised DWER's water information sites dataset and DBCA geomorphic wetlands database.

The EPA determined the information provided by the proponent for inland waters was adequate to proceed with its assessment.

2.3.3 Assessment context – existing environment

Groundwater

The majority of the proposal is located within the Gingin Groundwater Area proclaimed under the *Rights in Water and Irrigation Act 1914* (RIWI Act). There are four aquifers present in the proposal area, the unconfined surficial aquifer, semi-confined Mirrabooka aquifer (west of the Darling Fault), a fractured rock aquifer (east of the Darling Fault) and the semi-confined Leederville-Parmelia aquifer.

The proposal will primarily interact with the superficial, Mirrabooka and fractured rock aquifers, with possible indirect impacts to the Leederville-Parmelia aquifer (Arup Jacobs Joint Venture 2020). There is a designated wellhead protection zone around the Bindoon-Chittering water reserve designed to protect drinking water from contamination. The development envelope is located about 600 metres (m) east of the Bindoon-Chittering water reserve, which abstracts groundwater from the Leederville-Parmelia aquifer for the town of Bindoon's water supply. There are no other known operational water supply bores within 2 km of the development envelope.

Surface water

The proposal is predominantly located in the Swan River System, and borders on the Gingin Brook catchment area. Both are proclaimed under the RIWI Act. The proposal intersects with three surface water catchments, the Brockman River, Gingin Brook, and the Ellen Brook, with the majority of the proposal being located within the Brockman River catchment. Within these catchments the proposal intersects two waterways – the Brockman River and its tributaries (including Udumung Brook), and Lennard Brook. The Brockman River flows in a southerly direction and Lennard Brook in a westerly direction.

There are two nationally important wetlands within the Bindoon region which are listed in the Directory of Important Wetlands of Australia. The Wannamal Lake System is located 3.5 km north (upstream) of the proposal. The Chittering-Needonga Lake System is located 4.5 km east of the proposal and within the same surface water catchments as the proposal. Neither of these wetlands are expected to be affected by the proposal.

There are 14 wetlands mapped within or adjacent to the development envelope including six Multiple Use Wetlands (MUW), four Resource Enhancement Wetlands (REW) and four Conservation Category Wetlands (CCW).

2.3.4 Consultation

Matters raised during stakeholder consultation and the proponent's responses are provided in the proponent's response to submission document (Arup Jacobs Joint Venture 2022).

Four submissions were received regarding this factor. These submissions raised concerns about the following matters:

- potential disruption to hydrological function, flow, and availability of groundwater
- indirect impacts to wetlands, including Lake Nangar
- the extent of impact to wetlands.

The key issues raised during the public consultation on the proposal and how they have been considered in the assessment are described in sections 2.3.6, 2.3.7 and 2.3.8.

2.3.5 Potential impacts from the proposal

The proposal has the potential to significantly impact on inland waters from:

- Clearing and disturbance of up to 3.13 ha across four wetlands (2.7 ha occurs across three CCWs and 0.43 ha of an REW associated with the Brockman River).
- Changes to surface and groundwater flow paths and groundwater infiltration during construction and operation from increased sedimentation resulting from the clearing of native vegetation, compaction of sandy soils associated with road construction and physical barriers from the presence of permanent infrastructure.

This has the potential to affect wetlands, watercourses, fauna habitat and potential groundwater dependant ecosystems (GDEs).

- Degradation of surface and groundwater quality during construction and operation from accidental spills and leaks from machinery and construction related chemicals, disposal of dewatered discharge, increased surface run off transporting pollutants, which may affect groundwater resources, wetlands, watercourses, fauna habitat and potential GDEs.
- Temporary abstraction of groundwater and dewatering for construction purposes may result in drawdown of the watertable which may affect wetlands, fauna habitat and potential GDEs.

2.3.6 Avoidance measures

The proponent has designed the proposal to avoid impacts to hydrological regimes by:

- proposing to construct a bridge that spans the Brockman River
- amending the development envelope through a change to the proposal under s. 43A, thereby avoiding direct and indirect impacts to Lake Nangar. The proposal is located more than 250 m from Lake Nangar.

Matters raised during public consultation in relation to disruption to hydrological function and flow and indirect impacts to wetlands, including Lake Nangar have been partially addressed through avoidance measures 1 and 2.

2.3.7 Minimisation measures (including regulation by other DMAs)

The proponent has proposed the following measures to minimise impacts to inland waters:

- culverts will be designed to maintain current hydrological regimes
- temporary groundwater drawdown will not exceed 0.5 m in the vicinity of known GDEs
- where practicable, roadworks at Teatree Road will be undertaken to the north of the existing road to minimise impacts to CCWs
- where practicable, construction of the Brockman River bridge will be undertaken during drier months to minimise dewatering requirements.

The issue raised during public consultation in relation to disruption to hydrological function, flow, and availability of water to other users and indirect impacts to wetlands has been addressed through the minimisation measures above.

2.3.8 Revegetation measures

The proponent has committed to stabilise and revegetate the banks of watercourses that are disturbed during construction (Arup Jacobs Joint Venture 2020).

2.3.9 Assessment of impacts to environmental values

The EPA considered that the key environmental values for inland waters likely to be impacted by the proposal are:

- clearing of 2.7 ha of CCW and 0.43 ha of REW that is part of the Brockman River
- abstraction and dewatering during construction
- disruption to surface water flows and hydrological regimes as a result of permanent infrastructure
- changes to groundwater and surface water quality from spills and leaks, and sedimentation.

Groundwater

Groundwater is proposed to be abstracted for construction purposes; however, the exact location of groundwater abstraction bores is not yet known. The proponent proposes to minimise drawdown of groundwater in the vicinity of GDEs including the Banksia woodlands community by ensuring abstraction bores used during construction will be located so that potential groundwater drawdown will be less than 0.5 m. This is in accordance with ecological water requirements criteria of GDEs in the South West.

Dewatering is likely to be required during construction of the bridge over the Brockman River due to groundwater levels being close to the surface. Potential impacts from dewatering are likely to be temporary and localised with groundwater levels recovering on completion of the dewatering activities.

Any increase in salinity associated with dewatering is expected to be temporary and is likely to return to normal levels following winter rains.

The EPA agrees with the proponent that the disposal of dewatered discharge should be reinfiltrated and should not be discharged to the Brockman River unless it is of suitable quality.

The EPA has assessed the likely residual impacts of the proposal on groundwater to be:

- localised and temporary drawdown of groundwater levels during construction
- the potential for hydrocarbon spills during construction.

The EPA advises that the residual impact to groundwater should be subject to implementation conditions (recommended conditions B3) to set clearing limits and ensure no adverse impacts to wetlands or watercourses from the abstraction bores or construction activities to protect the quality and quantity of existing groundwater resources to ensure the environmental outcome is likely to be consistent with the EPA objective for inland waters.

Surface water

The proponent has designed the proposal to ensure road culverts and the Brockman River bridge minimise impacts to existing water flow paths and regimes. The proponent proposes to construct a bridge over the Brockman River and a causeway structure spanning associated floodplains and wetlands. The causeway will consist of a series of culverts to maintain water flows (Arup Jacobs Joint Venture 2020).

Culverts used for minor watercourse crossings to maintain surface water flows will be designed to ensure flooding is minimised. The proponent has committed to designing the culverts to ensure water levels are not greater than 100 millimetres above current levels (Arup Jacobs Joint Venture 2020).

Udumung Brook is a significant tributary of the Brockman River located along Hay Flat Road, in the northeast of the development envelope. The proponent has designed the proposal to ensure that the Udumung Brook crossing incorporates a bridge span design rather than culverts to reduce the amount of clearing, excavation, and disruption to the underground stream at this location.

The EPA has assessed that the proposal will result in the clearing of four wetlands including:

- 2.0 ha of CCW (UFI 12840) (Brockman River)
- 0.43 ha of REW (UFI 12838) (Brockman River)
- 0.40 ha of CCW (UFI 12779) (Teatree Road)
- 0.30 ha of CCW (UFI 15154) (Teatree Road).

The EPA notes that the vegetation condition of these wetlands ranged from being in Good to Completely Degraded condition, with the majority being in Degraded to Completely Degraded as the area appears to be heavily grazed.

The EPA has assessed there to be a significant residual impact to CCWs. This is due to the permanent loss, degradation and cumulative impact occurring to CCWs. The EPA has concluded that the disturbance of CCWs represents a significant residual impact. This is consistent with the *WA Environmental Offsets Guidelines* (Government of Western Australia 2014) definition of significant residual impact regarding areas within the formal conservation reserve system.

The EPA notes that the proponent has proposed to offset the loss of 2.7 ha of CCWs containing conservation values through the acquisition of land containing CCWs.

The EPA has assessed the residual impacts on surface water and provided that appropriate management measures are implemented, the implementation of the proposal is likely to be consistent with the EPA's objective to maintain surface water hydrological regimes and quality so that environmental values are protected.

The EPA has assessed the likely residual impacts of the proposal on surface water to be:

- direct impact to 2.7 ha of CCWs
- minor localised alteration to surface water flow during construction
- minor increase in runoff volume and contaminant concentrations during drainage of road runoff during operation.

The EPA advises that the residual impact to surface water should be subject to implementation conditions that ensures the hydrological regime and water quality of Brockman River, including Udumung Brook, and other waterways and wetlands within or adjacent to the development envelope are maintained (recommended condition B4) and ensure the environmental outcome is likely to be consistent with the EPA objective for inland waters.

2.3.10 Summary of key factor assessment and recommended regulation

The EPA has considered the likely residual impacts of the proposal on inland waters. In doing so, the EPA has considered whether reasonable conditions could be imposed, or other decision-making processes can ensure consistency with the EPA factor objective. The EPA assessment findings are presented in Table 4.

The EPA has also considered the principles of the EP Act (see Appendix C) in assessing whether the residual impacts will be consistent with its environmental factor objective and whether reasonable conditions can be imposed (see Appendix A).

Table 4: Summary of assessment for inland waters

Residual impact or risk to environmental value		Assessment finding or Environmental outcome	Recommended conditions and DMA regulation
1.	Clearing and disturbance of up to 3.13 ha across four wetlands: • 2.7 ha of CCWs • 0.43 ha REW	The EPA advises that the proposed clearing of these communities is a significant residual impact. The EPA advises that this significant residual impact should be subject to reasonable conditions that require clearing extent limitations, and counterbalanced by offsets to ensure that the environmental outcome is likely to be consistent with the EPA objective for this factor.	**Condition B3 (Inland Waters)** Set limits of disturbance **Condition B6 (Offsets)** Requirement for an adequate offset strategy
2.	Changes to surface water and groundwater flow and groundwater infiltration during construction and operation from increased	The EPA has assessed that changes to surface water and groundwater flow can be managed to meet the EPA objectives for inland waters, subject to recommended conditions	**Condition B4 (Social Surroundings ((Aboriginal Heritage)) and Inland Waters)** Maintain hydrological regimes and water quality of Brockman River, Udumung

	sedimentation resulting from clearing of native vegetation, compaction of sandy soils and permanent infrastructure.	requiring the ecological integrity of Brockman River, Udumung Brook and other waterways within or adjacent to the development envelope, to be maintained, through the management of bridge design, stormwater runoff and revegetation. Subject to these conditions, the environmental outcome is likely to be consistent with the EPA objective for this factor.	Brook and other waterways within or adjacent to development envelope.
3.	Temporary abstraction of groundwater and dewatering for construction purposes may result in drawdown of the water table.	The EPA has assessed that impacts to groundwater levels are likely to be temporary during construction only and considers that groundwater drawdown is unlikely to be a significant residual impact, subject to recommended conditions requiring no adverse impacts to wetlands and watercourses, and regulation under the RIWI Act. Subject to these conditions, the environmental outcome is likely to be consistent with the EPA objective for this factor.	**Condition B3** (**Inland Waters)** No adverse impact to wetlands or watercourses within 50 m of abstraction bores. <u>DMA controls</u> The DWER can regulate groundwater abstraction and dewatering through RIWI Act licenses, which will consider the impacts associated with groundwater drawdown, and ensure that these are appropriately managed.
4.	Potential impact to surface water and groundwater quality through potential hydrocarbon spills.	The EPA considers that the potential impact to surface water quality from hydrocarbon spills is likely to be regulated through recommended conditions requiring usage and storage protocols, so that the environmental outcome is likely to be consistent with the EPA objective for this factor.	**Condition B3** (**Inland Waters)** No refuelling, chemical storage or stockpiling within 50 m of CCW during construction.

2.4 Social Surroundings (Aboriginal Heritage and Noise)

2.4.1 Environmental objective

The EPA environmental objective for social surroundings is *to protect social surroundings from significant harm* (EPA 2016e).

2.4.2 Investigations and surveys

The EPA advises the following investigations and surveys were used to inform the assessment of the potential impacts to social surroundings:

- Report of an Aboriginal Heritage Survey for the Great Northern Highway: Bindoon Bypass: In the Yued Native Title Claim Area (WC1997/071), Western Australia (Appendix H1 of the environmental review document) (Brad Goode and Associates 2018)
- Report on a Historical Heritage Assessment undertaken as part of upgrade works to the Great Northern Highway, Muchea to Wubin (Stage 2) Bindoon Bypass (Appendix H2 of the environmental review document) (Archae-aus Pty Ltd 2018)
- Great Northern Highway Muchea to Wubin Upgrade – Stage 2, Main Roads Western Australia, Bindoon Bypass | Noise Assessment (Appendix I of the environmental review document) (Arup Jacobs Joint Venture 2018b)
- Bindoon Bypass Project – Landscape Character and Visual Impact Assessment (Appendix J of the environmental review document) (Arup 2018a)
- Technical Note – GNH CN12 Bindoon – Lighting – concept design (Appendix K1 of the environmental review document) (Arup 2018b)
- Response to Submissions addenda: Response to Request for further information - Great Northern Highway Muchea to Wubin Upgrade – Stage 2 Bindoon Bypass (Jacobs Group Australia Pty Ltd 2022).

The EPA notes that the proponent has committed to undertaking additional archaeological and ethnographical surveys prior to the implementation of the proposal with the Yued Noongar representatives in order to update the surveys undertaken in 2018. This will include an additional survey to cover two small additional areas because of changes to the alignment since the original consultation was undertaken.

The EPA determined it could proceed with its assessment despite the small, unsurveyed areas, because of the proponent's commitment to undertake the additional surveys and recommended condition B4, which requires the proponent to prepare and implement an Environmental Management Plan with the relevant Traditional Owners about achievement of objectives for Aboriginal cultural heritage and inland waters (in the context of Aboriginal heritage).

2.4.3 Assessment context: existing environment

Aboriginal heritage

The proposal is within the Yued (Yued WC1997/071) native title claim. Most of the proposal is located within and adjacent to land that is freehold private land and not subject to native title requirements.

The proposal intersects with three registered sites: Gingin Brook Waggyl Site (ID 20008); Moore River Waugal (ID 20749); and Chandala Brook (ID 21620); and seven 'other heritage places' (Burroloo Well (ID 3528), Lennard Brook (ID 20650), Boonanarring Brook (ID21616), Wallering Brook (ID21617), Nullilla Brook (ID 21618), Breera Brook (ID 21619) and Udumung Brook Artefact 1 (ID 22027).

The EPA notes that Moore River Waugal and Chandala Brook have the same boundaries and are overlapping, as does Lennard Brook with Boonanarring Brook, Wallering Brook, Nullilla Brook and Breera Brook.

Burroloo Well and Udumung Brook Artefact 1 are archaeological sites. While the Gingin Brook Waggyl Site and Lennard Brook are ethnographic sites associated with watercourses, which have mythological significance to the Yued people.

The desktop survey identified the Burroloo Well and Udumung Brook Artefact 1 as being located within the disturbance footprint for this proposal. However, further surveys and investigations have not identified any archaeological artefacts or a permanent waterhole and that the site may be located within Burroloo Well Nature Reserve which is located about 500 m north along the existing Great Northern Highway.

The proponent has advised that all the 'other heritage places' have been lodged with the Department of Planning, Lands and Heritage (DPLH) and are awaiting assessment by the Aboriginal Cultural Material Committee.

The EPA also notes that during consultation with the proponent, the Yued identified watercourses within the study area as having significant spiritual values and beliefs, particularly Brockman River and Udumung Brook.

Noise

The proposal is located in a rural setting where noise sensitive premises are isolated and consist of sparsely distributed single dwellings. Baseline noise monitoring in the vicinity of the proposal found noise levels represented the rural environment, consisting of traffic on local roads, farm machinery and rural residential activities. Outdoor noise levels during the daytime ranged from 42 decibels (dB) to 61 dB and night noise levels ranged from 31 dB to 45 dB.

Two properties exceeded the outdoor daytime noise targets in *State Planning Policy 5.4 Road and Rail Noise (2019)* (SPP 5.4). One site had noise levels of 57 dB due to operating motorcycles and the other site had bird-scaring mechanisms which was captured by the noise monitoring equipment and recorded noise levels of 61 dB.

Ambient noise levels along the existing GNH had daytime noise levels that ranged from 61 dB (noise logger only in place for two days) to 71 dB. Night-time levels ranged from 50 dB to 63 dB.

2.4.4 Consultation

Matters raised during stakeholder consultation and the proponent's responses are provided in the proponent's response to submissions document (Arup Jacobs Joint Venture 2022).

Three submissions were received regarding this factor. These submissions raised concerns about the following matters:

- potential for construction and operation noise to impact rural residences
- impacts on amenity (noise) from truck bays
- effects of noise and vibration on future subdivisions.

The EPA notes the proponent also undertook consultation with Yued representatives who provided the following comments:

- a bridge is the preferred option over the Udumung Brook rather than culverts as this area is a significant habitat for turtles and echidnas. Furthermore, the Yued request to be given an opportunity to relocate turtles to the Wannamal Wetlands prior to works occurring at Udumung Brook
- that the proponent avoids impacting an unnamed tributary and the wetland southwest of Bindoon-Moora Road between Kangaroo Gully and Pines Road
- that 'Emu Spring' is not impacted from the proposal and that culverts be designed to maintain flows
- that construction of the proposal avoids a large *Nuytsia floribunda* located north of Cook Road as this tree was identified as having important cultural significance. Where possible all *Nuytsia floribunda* should be avoided
- Yued monitors should be engaged during initial ground disturbing works and construction of watercourse crossings.

The key issues raised during the public consultation on the proposal and how they have been considered in the assessment are described in sections 2.4.6, 2.4.7 and 2.4.8.

2.4.5 Potential impacts from the proposal

The proposal has the potential to have direct and indirect impacts on social surroundings during construction and operation from:

- permanent loss of Aboriginal heritage sites from clearing activities
- changes to hydrological regimes of waterways and wetlands which are of mythological significance
- contamination of waterways and wetlands associated with ethnographic sites from chemical leaks and spills

- temporary increased exposure from construction noise to sensitive receptors in rural residential areas
- increased and ongoing exposure from operational noise to sensitive receptors in rural residential areas.

2.4.6 Avoidance measures

The proponent has designed the proposal to avoid impacts to social surroundings (Aboriginal heritage and noise) by:

- designing the proposal to avoid nine of the 12 identified Aboriginal heritage sites (registered and other 'heritage places') and cultural values
- reducing the amount of vegetation clearing near residence and implementing a maximum road grade of 3.5% to reduce the amount of braking and/or revving as a result of travel up/down hill.

2.4.7 Minimisation measures (including regulation by other DMAs)

The proponent outlined the following minimisation measures to reduce both direct and indirect impacts to social surroundings:

Aboriginal heritage

- construction of a bridge and culverts to maintain existing surface water flows
- educate employees and contractors of the presence of cultural heritage values and their obligations under section 15 of the *Aboriginal Heritage Act 1972* (AH Act) to report any discovery of Aboriginal cultural material
- monitoring of ground disturbance by archaeologists and/or Yued representatives in areas that have a high potential of sub-surface archaeological integrity.

Noise and visual amenity

- moving the alignment a further 900 m from an occupied residence near the Wannamal wetland
- low-noise materials for sections of road near noise sensitive premises
- modification and improvements (e.g. double glazing, installation of air conditioning units (to allow windows to be kept closed)) to buildings to reduce indoor noise.

2.4.8 Revegetation measures

The proponent proposes to revegetate cleared areas not required for ongoing operation to reduce potential noise impacts. The planting will use vegetation in road reserves to reflect existing vegetation patterns and cover bare patches.

2.4.9 Assessment of impacts to environmental values

The EPA considered that the key environmental values for social surroundings likely to be impacted by the proposal are Aboriginal Heritage and noise.

Aboriginal heritage

Construction of the proposal has the potential to impact on the heritage values of the Gingin Brook Waggyl registered site (ID 20008) and the Lennard Brook (Lodged site) 'Other heritage places' (ID 20650). All watercourses in the proposal area are considered to be culturally significant. The proponent proposes to install appropriate drainage infrastructure to ensure pre-construction flows are maintained.

The Udumung Brook Artefact 1 (ID 22027) 'other heritage place' was described in 2005 as a single basalt flake. The coordinates provided by DPLH locate the Udumung Brook Artefact 1 (ID 22027) 180 m south of the Udumung Brook in a cleared paddock. A review of the Aboriginal Heritage Inquiry System considers the coordinates provided by DPLH are reliable, however it is noted the coordinates have not been converted when the datum changed from GDA84 to MGA94. When converting the datum, the location of this site shifts 204 m to the northeast adjacent to the southern margin of the Udumung Brook. However, surveys of both locations found no Aboriginal heritage material. The proponent considers that it is possible that natural factors (rain, flooding) and/or land practices (tilling of fields, animal movement) may have either concealed or moved the artefact.

Construction of the proposal also has the potential to indirectly impact Aboriginal heritage sites. Indirect impacts include contamination, sedimentation and hydrological change to waterways and wetlands associated with the ethnographic sites. However, with proposed mitigation measures the EPA does not consider indirect impacts to Aboriginal heritage sites and places would be significant.

The EPA supports the proponent's commitment for ongoing consultation with the Yued people to further minimise impacts from construction of the proposal.

The EPA notes that five residential properties within the development envelope have not had on-ground heritage surveys due to access constraints. The majority of these properties have altered landscapes and therefore it is considered that there is a low risk of uncovering archaeological material. The EPA supports the proponent undertaking further heritage investigations once land acquisitions have occurred.

The EPA notes that permission under relevant legislation will be required to disturb registered sites and Other Heritage Places. Furthermore, the proponent will seek formal advice from DPLH in relation to disturbing any sites which have not yet been formally registered.

The EPA concludes that the proposal is likely to have an impact on Aboriginal heritage, however with implementation of the proposed mitigation and management measures, the EPA considers there is no significant impact to Aboriginal heritage and that the proposal is likely to be consistent with the EPA's objectives for social surroundings.

Noise

Noise emissions have the potential to unreasonably interfere with the welfare, convenience, and comfort of people. The proposal has the potential to impact nearby noise sensitive premises during both construction and operation through construction

generated noise and vibration and ongoing traffic noise. The noise sensitive premises are those occupied for residential or accommodation purposes and are defined in the Environmental Protection (Noise) Regulations 1997 (Noise Regulations).

Construction noise

The EPA notes that noise impacts from road construction activities on noise sensitive premises are managed under Regulation 13 (Construction sites) of the Noise Regulations. This regulation specifies that any construction noise made between 7.00 am and 7.00 pm Monday to Saturday (excluding public holidays) is exempt from assigned noise limits in the Noise Regulations. This is provided the works are being carried out in accordance with the *Australian Standard (AS) 2436:2010 Guide to noise and vibration control on construction, demolition, and maintenance sites*.

The proponent has proposed a number of measures to minimise impacts. The EPA notes that a noise management plan will need to be developed and submitted for approval to the Chief Executive Officer of the Shire of Chittering and/or the Shire of Gingin, should work be planned outside of the permissible hours as required by Regulation 13 of the Noise Regulations, to ensure that management and mitigation measures are identified and implemented.

The EPA considers during construction activities any noise and vibration impacts would be localised and temporary, and with appropriate minimisation measures, impacts are expected to be manageable and meet Regulation 13 of the Noise Regulations and likely to be consistent with the EPA's social surroundings objective.

Traffic noise

The EPA notes that impacts to noise sensitive premises from traffic noise is not covered by the Noise Regulations. The EPA has considered impacts from traffic noise based on the *Environmental Factor Guideline – Social Surroundings* and *State Planning Policy 5.4 Road and Rail Noise (2019)* (SPP 5.4). One of the objectives of SPP 5.4 is to protect the community from unreasonable levels of transport noise. This policy applies to proposed new major road projects in the vicinity of existing or future noise sensitive land uses. As this proposal is for the development of a new road the EPA has had regard to the daytime and night-time outdoor noise targets which apply to new roads as outlined in Table 2 of SPP 5.4.

The assessment of noise levels from the proposal has been forecasted for traffic volumes for the years 2038 and 2051. Noise modelling found there were 12 noise sensitive premises where the outdoor noise targets are predicted to be exceeded, both during the daytime and night-time. One of the 12 properties is located within the proposal works and is likely to be relocated by the proponent.

Of the 11 potentially affected noise sensitive premises the EPA notes that one premise would be significantly impacted, with ambient outdoor noise levels recorded during the daytime at 47 decibels (dB) and night-time noise level at 43 dB. Modelling predicts this premise would experience increased daytime outdoor noise levels of 61 dB and night-time noise levels of 55 dB when the proposal is operational.

The EPA supports the proponent's commitment to develop and implement a noise management plan consistent with the provisions in SPP 5.4 *Road and Rail Noise Guidelines* (2019). The EPA also supports the proponent's commitment to apply noise mitigation measures as set out in the guidelines to the 11 affected noise sensitive premises in consultation with the affected property owners.

The proponent advises that noise walls or earthen bunds are generally not considered for noise mitigation, as they are unlikely to be effective in most situations in rural settings, and in some cases they have the potential to impact on other factors such as visual amenity.

For future rural residential estates and subdivisions that have received planning approval, the EPA expects the proponent to engage with the proponents of those future estates to determine what types of measures (eg. noise walls) will be required to mitigate noise impacts to meet the targets in SPP 5.4.

The EPA notes that the proponent has not detailed specific mitigation measures to minimise noise impacts but has committed to reducing the impacts from road noise to as low as reasonably practicable, consistent with the guidelines in SPP 5.4. The EPA expects the proponent to undertake further noise monitoring once the proposal is operational to verify the predictions of the modelling and demonstrate it is meeting the relevant noise targets.

The EPA expects the proponent to use best practice noise management to minimise impacts on amenity and meet the relevant noise targets in SPP 5.4. The EPA considers the proponent is proposing reasonable and practicable measures to minimise traffic noise impacts which is consistent with measures in SPP 5.4 relevant to new roads. The EPA recommends that the proponent continue to consult with the nearby residents and proponents of approved subdivisions proposal in relation to the specific mitigation measures to apply.

2.4.9 Summary of key factor assessment and recommended regulation

The EPA has considered the likely residual impacts of the proposal on social surroundings. In doing so, the EPA has considered whether reasonable conditions could be imposed, or other decision-making processes can ensure consistency with the EPA factor objective. The EPA assessment findings are presented in Table 5.

The EPA has also considered the principles of the EP Act (see Appendix C) in assessing whether the residual impacts will be consistent with its environmental factor objective and whether reasonable conditions can be imposed (see Appendix A).

Table 5: Summary of assessment for social surroundings

Residual impact		Assessment finding	Recommended conditions and DMA regulation
1.	Potential for direct or indirect impact to Aboriginal heritage sites and areas of cultural significance.	The EPA has concluded that there is a risk of residual direct and indirect impacts to Aboriginal cultural heritage associated with disturbance of significant waterways. Residual impacts to Aboriginal cultural heritage associated with significant waterways is likely to be managed through recommended conditions to require the maintenance of hydrological regimes and water quality, to ensure the environmental outcome is likely to be consistent with the EPA objective for this factor.	**Condition B4 (Social Surroundings)** Objective requiring the maintenance of hydrological regime and water quality of the Brockman River, Udumung Brook, and other waterways that support Aboriginal cultural heritage values. Preparation of an environmental management plan in consultation with relevant Traditional Owners about the infrastructure required across the waterways.
2.	Increased and ongoing exposure from operational noise to sensitive receptors in rural residential areas.	The EPA considers that residual impacts to properties from operational noise should be subject to recommended conditions to require the proponent to minimise operational noise and prepare a noise management plan to ensure environmental outcome is likely to be consistent with the EPA objective for this factor.	**Condition B5 (Noise Amenity)** Objective requiring proponent to minimise operational noise impacts on noise sensitive receptors. Preparation of a noise management plan consistent with policy provisions and measures set out in SPP 5.4.

3 Holistic assessment

While the EPA assessed the impacts of the proposal against the key environmental factors and environmental values individually in the key factor assessments above, given the link between flora and vegetation, terrestrial fauna, inland waters and social surroundings, the EPA also considered connections and interactions between them to inform a holistic view of impacts to the whole environment.

Figure 4 illustrates the connections and interactions between the key environmental factors to inform the EPA's holistic assessment.

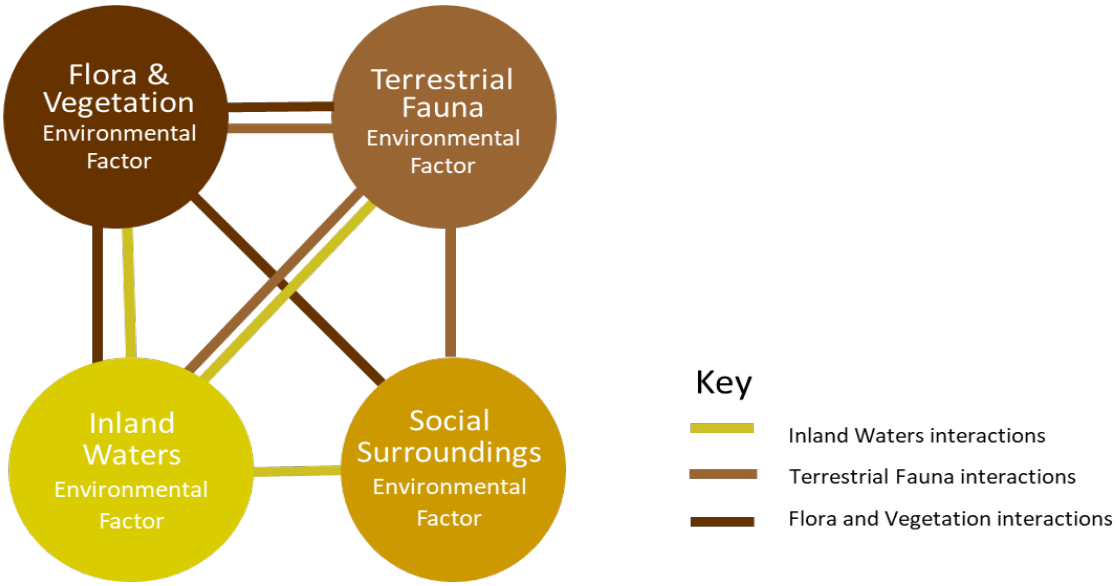


Figure 4: Intrinsic interactions between environmental factors

Flora and Vegetation – Terrestrial Fauna – Inland Waters

There is a high level of connectivity between the environmental factors of flora and vegetation, terrestrial fauna, and inland waters. The conservation significant flora and vegetation provides habitat for the conservation significant fauna occurring within the proposal area. Impacts to flora and vegetation, particularly riparian vegetation also has the potential to impact surface water quality. Minimising the direct and indirect impacts to flora and vegetation will also minimise impacts to conservation significant fauna habitat and inland waters. Maintaining these holistic interactions complements the objectives of the Shire of Chittering's LBS.

The EPA considers that the proponent's proposed mitigation and management measures, the recommended conditions for residual impacts, and provision of offsets to counterbalance the significant residual impacts to flora and vegetation will also mean the inter-related impacts to the health of other factors of the environment including the values associated with terrestrial fauna and inland waters will be consistent with the EPA's environmental factor objectives.

The EPA also considered the high connectivity between maintaining good quality surface and groundwater, healthy habitat for aquatic fauna and ecologically

important riparian and groundwater dependent flora and vegetation. This in turn also supports conservation significant fauna habitat and maintains the condition of the watercourses which are culturally important to the Traditional Owners. The EPA considers that the proponent's proposed mitigation and management measures and recommended conditions for residual impacts to inland waters will also mean the inter-related impacts to the health of other factors of the environment including the values associated with flora and vegetation, social surroundings and terrestrial fauna will be consistent with the EPA's environmental factor objectives.

Summary of holistic assessment

When the separate environmental factors and values affected by the proposal were considered together in a holistic assessment, the EPA formed the view that the impacts from the proposal would not alter the EPA's views about consistency with the EPA's factor objectives as assessed in section 2.

4 Offsets

Environmental offsets are actions that provide environmental benefits which counterbalance the significant residual impacts of a proposal.

Consistent with the *WA Environmental Offsets Guidelines* (Government of Western Australia 2014), the EPA may consider the application of environmental offsets to a proposal where it determines that the residual impacts of a proposal are significant, after avoidance, minimisation and rehabilitation have been pursued.

In the case of this proposal, likely (and potential) significant residual impacts are:

- clearing of vegetation representative of:
    - 2.0 ha of *Banksia attenuata* woodland over species rich dense shrublands (SCP20a)
    - 3.0 ha of *Corymbia calophylla – Eucalyptus marginata* woodlands on sandy clay soils of the southern Swan Coastal Plain (SCP3b) – northern expression
    - 53.5 ha of Banksia woodlands of the SCP ecological community
    - 2.5 ha of Nooning Vegetation Complex
- clearing of 204.8 ha of low-moderate or higher value foraging habitat for Carnaby's cockatoo
- clearing of 168 ha of low-moderate or higher value foraging habitat for forest red-tailed black cockatoo
- loss of 10 black cockatoo nesting trees, 117 black cockatoo potential nesting trees with suitable hollows, and 1,358 black cockatoo potential nesting trees
- clearing of 54.4 ha of quality chuditch habitat
- clearing of 2.7 ha of CCWs, of which 0.4 ha contains vegetation in good or better condition.

Environmental offsets are not appropriate in all cases. In this case the EPA considers offsets are appropriate given the scale of the environmental impacts are not minor (principle 2 of the *WA Environmental Offsets Policy*) and, in accordance with principle 1 of the *WA Environmental Offsets Policy*, the proponent has applied avoidance and mitigation measures by:

- locating a substantial portion of the proposal in areas of previously cleared or disturbed land to avoid or minimise impacts to environmental values
- amending the proposal during assessment to avoid or minimise impacts to environmental values
- proposing to revegetate areas temporarily cleared for construction purposes that will not be required for ongoing operation of the proposal.

In developing a package of offsets, the proponent has proposed several options that include land acquisition, creation of fauna habitat through on-ground revegetation and installation of artificial nesting hollows, and on-ground measures and/or funding to improve areas in existing reserves. Properties have been identified within 20 km of

the proposal, in Mogumber, Bindoon, and Lower Chittering, two directly adjacent to the development envelope. Desktop or reconnaissance surveys indicate that the properties identified to-date are likely to contain sufficient extent of most impacted values, to counterbalance the significant residual impacts. The proponent has committed to undertake further surveys to confirm the locations and extent of offsets to counterbalance the significant residual impact to the Nooning Vegetation Complex and CCWs.

In considering whether the offsets are likely to counterbalance the significant residual impacts, the EPA has had regard for principles 3 and 4 of the *WA Environmental Offsets Policy*. Given proposals for environmental offsets should be underpinned by sound information and knowledge, and should be relevant and proportionate to the significance of the environmental values being impacted, the EPA is of the view that detailed surveys should be undertaken to confirm the presence of the environmental values at each of the proposed offset sites. In addition, the EPA is recommending that the environmental offset strategy be revised in consultation with the DBCA (recommended condition B6-3) and any floristic community type analysis to determine the presence of environmental values should be reviewed, and the findings supported by the DBCA (recommended condition B6-4(2)).

The EPA is aware that the proponent is in the process of selecting, negotiating, and acquiring potential offset properties, and that detailed surveys are required to confirm the presence and extent of environmental values to counterbalance the significant residual impacts. The EPA therefore recommends that the environmental offset strategy be revised following confirmation of the presence of the environmental values within the offset properties (recommended conditions B6-3 and B6-2).

Further, the EPA has recommended condition C1-1(3) to prevent ground disturbing activities from occurring until the CEO has confirmed that the environmental offsets strategy meets all requirements of the recommended offset condition (recommended condition B6), to ensure that the offsets will counterbalance the significant residual impacts of the proposal.

If the properties are not acquired or do not contain the required environmental values, the EPA understands that the proponent has identified several other potential offset sites within 50 km of the proposal that are likely to contain values commensurate with those impacted by the proposal, and at extents sufficient to counterbalance the significant residual impacts of the proposal.

The EPA notes that DCCEEW's approval of the project under the EPBC Act did not require approval of an offset strategy prior to disturbance. However, the EPA considers that this requirement is necessary to provide it with greater confidence that offsets will be in place to sufficiently counterbalance all significant residual impacts.

To ensure environmental offsets are applied within a framework of adaptive management (principle 5 of the *WA Environmental Offsets Policy*) that allows for improvement as knowledge and understanding advances, the EPA has recommended a requirement for the revised offset strategy to include land acquisition, on-ground management, restoration, and research components (recommended conditions B6-2 and B6-3). The EPA considers that a range of measures are needed to ensure that any risks associated with individual types of

offsets, such as time lags associated with restoration, or practical application of research findings, are balanced and give greater overall confidence that the significant residual impacts are able to be counterbalanced.

The revised environmental offset strategy will need to account for the uncertainty in predicting environmental impacts for each environmental value and to manage the risk associated with any time-lag between establishing offsets and generating the anticipated benefits (recommended condition B6-4(5)).

The EPA has recommended an offset condition (recommended condition B6-2(2)) to require revegetation of 147 ha with foraging habitat for Carnaby's cockatoo. The revegetation area must also include the planting and establishment of tree species known to develop suitable nest hollows to ensure no net loss of potential nesting trees (recommended condition B6-2(3)). The proponent will be required to include adaptive management measures (principle 5 of the *WA Environmental Offsets Policy*) in the revised environmental offset strategy to ensure the revegetation is successful (recommended condition B6-4(10)).

The EPA considers that the identified offset properties, along with the proponent's proposed offset package (to be revised), particularly the creation of foraging habitat and potential breeding habitat for black cockatoos, provision of artificial nesting hollows in an area of known breeding activity, and management to improve the condition of vegetation representative of SCP20a, will provide offsets that are enduring and will deliver long term strategic outcomes (principle 6 of *WA Environmental Offsets Policy*). The EPA has also recommended that for acquired offset properties the revised environmental offset strategy is to specify a contribution for maintaining the offset for at least 20 years (recommended condition 6-4(9)) to ensure the environmental objectives will be achieved.

The EPA is also recommending a condition to require the provision of funds for research (recommended conditions B6-2(7) and B6-4(11)). The EPA considers there may be opportunities to contribute funds for research associated with the environmental values being impacted, including but not limited to revegetation of foraging habitat for Carnaby's cockatoo and subject to there being such opportunities, management to improve the condition of vegetation representative of floristic community type SCP20a and/or SCP3b.

Notwithstanding the above, the EPA considers that it has received sufficient information to give it confidence that suitable offsets are available to counterbalance the significant residual impacts. The EPA is therefore reasonably confident that following the provision of offsets as required by recommended condition B6, the environmental outcome for the environmental values for which a significant residual impact remains are likely to be consistent with the EPA's objectives for flora and vegetation, terrestrial fauna, and inland waters.

5 Recommendations

The EPA has taken the following into account in its assessment of the proposal:

- environmental values which may be significantly affected by the proposal
- assessment of key environmental factors, separately and holistically (this has included considering cumulative impacts of the proposal where relevant)
- likely environmental outcomes which can be achieved with the imposition of conditions
- consistency of environmental outcomes with the EPA's objectives for the key environmental factors
- EPA's confidence in the proponent's proposed mitigation measures
- whether other statutory decision-making processes can mitigate the potential impacts of the proposal on the environment
- principles of the EP Act.

The EPA recommends that the proposal may be implemented subject to the conditions recommended in Appendix A.

6 Other advice

The EPA may, if it sees fit, include other information, advice, or recommendations relevant to the environment in its assessment reports, even if that information has not been taken into account by the EPA in its assessment of a proposal.

The EPA provides the following information for consideration by the Western Australian Planning Commission (WAPC) and local government authorities.

Noise

The EPA notes that the purpose of SPP 5.4 is to minimise the adverse impact of road and rail noise on noise sensitive land-uses and/or development and seeks to ensure that the community is protected from unreasonable levels of transport noise, whilst also ensuring the future operations of these transport corridors.

While the EPA has assessed the potential impacts of traffic noise from the proposal on existing noise sensitive residences, it is noted that there are likely be future residential developments in close proximity to the proposal.

In this regard the EPA expects that planning authorities (WAPC and local government authorities) will consider future residential developments, against the policy provisions in *State Planning Policy 5.4: Road and Rail Noise* (SPP 5.4), to ensure local noise amenity is maintained consistent with the EPA's objective for social surroundings.

In relation to subdivisions that have already received planning approval, but yet to be implemented, the EPA expects planning authorities to review their planning conditions and determine whether the implications of traffic noise from the proposal have been appropriately considered, and complements conditions placed on the proponent of new roads.

Biodiversity

The EPA recognises that the Shire of Chittering is located in the internationally recognised South West Australia biodiversity hotspot, an area identified for its exceptional species diversity under threat from human disturbance.

The EPA notes that the Shire of Chittering has done significant work in preparing its LBS. The EPA supports local government authorities preparing such strategies to support biodiversity within their local area. The EPA recognises that the greatest threat to biodiversity in the Shire of Chittering is subdivision development in vegetated areas or other types of development that require clearing of native vegetation. This threat can largely be managed by careful planning.

Consideration has been given in the LBS for future development to occur on previously cleared land as a result of the original version of this strategy, and the Local Planning Strategy. The LBS recommends distributing responsibilities for implementation of the local biodiversity conservation goals across the organisation, including the planning, engineering, marketing, and executive services.

Implementation of these overarching recommendations will enable achievement of retention and protection targets identified for each planning precinct. The EPA expects proponents to consider local biodiversity strategies during planning.

Appendix A: Recommended conditions

Section 44(2)(b) of *Environmental Protection Act 1986* specifies that the EPA's report must set out (if it recommends that implementation be allowed) the conditions and procedures, if any, to which implementation should be subject. This appendix contains the EPA's recommended conditions and procedures.

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED
***(Environmental Protection Act 1986*)**

GREAT NORTHERN HIGHWAY – BINDOON BYPASS

Proposal: The proposal is to construct and operate a new 47 kilometre (km) section of the Great Northern Highway within the Shires of Chittering and Gingin. The proposal bypasses the town of Bindoon located approximately 70 km north east of Perth, WA. The proposal consists of a combination of four-lane dual carriageway, four-lane single carriageway, two-lane single carriageway and a bridge across the Brockman River. The proposal diverts from the existing Great Northern Highway at the Chittering roadhouse, runs west of Bindoon, re-joining the existing Great Northern Highway north of Calingiri Road.

Proponent: Commissioner of Main Roads Western Australia
Australian Business Number – 50 860 676 021

Proponent address: Waterloo Crescent
EAST PERTH WA 6004

Assessment number: 2135

Report of the Environmental Protection Authority: 1742

Introduction: Pursuant to section 45 of the *Environmental Protection Act 1986,* it has been agreed that the proposal entitled Great Northern Highway – Bindoon Bypass described in the 'Proposal Content Document' attachment of the referral of 6 September 2017, as amended by the change to proposal approved under s. 43A on 7 September 2018 and 7 July 2022, may be implemented and that the implementation of the proposal is subject to the following implementation conditions and procedures:

Conditions and procedures

Part A: Proposal extent

Part B: Environmental outcomes, prescriptions and objectives

Part C: Environmental management plans and monitoring

Part D: Compliance and other conditions

PART A: PROPOSAL EXTENT

Limitations and Extent of Proposal

A1-1 The proponent must ensure that the proposal is implemented in such a manner that the following limitations or maximum extents are not exceeded:

Proposal element	Location	Maximum extent
Physical elements		
Development envelope	Figure 1	848.5 **ha**
Direct disturbance of native vegetation	Within the development envelope	490.0 **ha**

PART B – ENVIRONMENTAL OUTCOMES, PRESCRIPTIONS AND OBJECTIVES

B1 Flora and Vegetation

B1-1 The proponent must ensure the implementation of the proposal does not result in:

(1) **adverse impacts** to native vegetation within fifty (50) metres outside the development envelope.

B1-2 The proponent must ensure the implementation of the proposal achieves the following environmental outcome:

(1) **disturb** no more than the following environmental values:

(a) 2.0 **ha** of vegetation representative of *Banksia attenuata* woodlands over species rich dense shrublands (SCP20a);

(b) 3.0 **ha** of vegetation representative of *Corymbia calophylla – Eucalyptus marginata* woodlands on sandy clay soils of the southern Swan Coastal Plain (SCP3b) (northern expression);

(c) 2.5 **ha** of vegetation representative of the Nooning Vegetation Complex;

(d) 53.5 **ha** of vegetation representative of Banksia woodlands of the Swan Coastal Plain ecological community (Priority 3(iii)); and

(e) 4.5 **ha** of vegetation representative of Swan Coastal Plain *Banksia attenuata – Banksia menziesii* woodlands ('floristic community type 23b') (Priority 3(i)).

B1-3 The proponent must:

(1) undertake weed control and management during **construction activities** to prevent the introduction or spread of **environmental weeds**;

(2) implement hygiene protocols consistent with the *Management of Phytophthora cinnamomi for Biodiversity Conservation in Australia, Part 2 National Best Practice Guidelines* as amended or replaced from time to time;

(3) **revegetate** all areas of native vegetation **disturbed**, but not reasonably expected to be required for ongoing **operations**, within the development envelope within twenty four (24) months of completion of **construction activities**;

(4) demonstrate the **revegetation** required by condition B1-3(3) is consistent with the pre-construction **vegetation density**;

(5) undertake annual monitoring consistent with condition C3-1 and implement any **contingency measures** to ensure **revegetation** required by condition B1-3(3) will successfully establish within five (5) years post construction; and

(6) continue to undertake the monitoring required by condition B1-3(5) until the **CEO** confirms by notice in writing that it has been demonstrated that the **revegetation** required by condition B1-3(3) has successfully established.

B2 Terrestrial Fauna

B2-1 The proponent must ensure the implementation of the proposal achieves the following environmental outcome:

(1) **disturb** no more than the following environmental values:

(a) 204.8 **ha** of **low to moderate or higher value foraging habitat** for Carnaby's cockatoo (*Zanda latirostris*);

(b) 168 **ha** of **low to moderate or higher value foraging habitat** for forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*);

(c) 10 **nesting trees**;

(d) 117 **potential nesting trees** with suitable hollows;

(e) 1,358 **potential nesting trees**;

(f) 54.4 **ha** of suitable chuditch (*Dasyurus geoffroii*) habitat; and

(g) 69.2 **ha** of suitable south-western brush-tailed phascogale (*Phascogale tapoatafa wambenger*) habitat.

B2-2 During **construction activities**, the proponent must undertake the following actions:

(1) within seven (7) days prior to clearing, using a **fauna handler** with experience in surveying for **black cockatoos**, inspect all **nesting trees** and **potential nesting trees** with suitable hollows within the development envelope to determine if any hollows are being used for nesting by **black cockatoos**;

(2) if any hollows are in use by **black cockatoos**, the proponent shall not **disturb** the **nesting tree**, or vegetation within a ten (10) metre radius of the **nesting tree**, until after the **black cockatoos** have naturally

completed nesting (young have fledged and dispersed) and a **fauna handler** has verified that the hollow(s) are no longer being used by **black cockatoos**; and

(3) ensure the presence of appropriately qualified and licensed **fauna handler**(s).

B2-3 The proponent must:

(1) not plant known foraging species for **black cockatoos** within ten (10) metres of the road;

(2) install a minimum of seven (7) **fauna crossings** that:

(a) align with **ecological linkages**;

(b) connect areas of **good** quality vegetation; and/or

(c) connect areas with high environmental values;

(3) ensure the **fauna crossings** required by condition B2-3(2) are:

(a) designed to minimise the potential risk of predation;

(b) able to be utilised by a variety of native fauna; and

(c) are located in areas that will not be subject to flooding;

(4) consult with **DBCA** on the design and location of the **fauna crossings** to achieve the requirements of condition B2-3(3); and

(5) maintain the **fauna crossings** required by condition B2-3(2) for the life of the proposal.

B3 Inland Waters

B3-1 The proponent must ensure the implementation of the proposal results in:

(1) no **adverse impacts** to wetlands or watercourses within fifty (50) metres of groundwater abstraction bores for the proposal.

B3-2 The proponent must ensure the implementation of the proposal achieves the following environmental outcome:

(1) **disturb** no more than the following environmental values:

(a) 0.4 **ha** of vegetation associated with **Conservation Category Wetlands** in **good** or better condition;

(b) 0.4 **ha** within Unique Feature Identifier 12779;

(c) 0.3 **ha** within Unique Feature Identifier 15154; and

(d) 2.0 **ha** within Unique Feature Identifier 12840.

B3-3 During construction, the proponent must:

(1) ensure that no refuelling, chemical storage, or stockpiling occurs within fifty (50) metres of **Conservation Category Wetlands**.

B4 Social Surroundings (Aboriginal heritage) and Inland Waters

B4-1 The proponent must implement the proposal to meet the following environmental objective:

(1) maintain the hydrological regime and water quality of the Brockman River, Udumung Brook, and other waterways within or adjacent to the development envelope, that support:

(a) **Aboriginal cultural heritage**; and

(b) the **ecological integrity** of the Brockman River, incorporating **Conservation Category Wetland** Unique Feature Identifier 12840.

B4-2 The proponent must, in consultation with relevant Traditional Owner representatives, prepare an environmental management plan that satisfies the requirements of condition C4 and demonstrates how the social surroundings and inland waters environmental objective in condition B4-1 will be achieved, and submit it to the **CEO**.

B5 Social Surroundings (Noise Amenity)

B5-1 The proponent shall implement the proposal to meet the following environmental objective:

(1) minimise operational noise impacts on existing and approved noise sensitive receptors, as far as practicable.

B5-2 The proponent must prepare an environmental management plan that satisfies the requirements of condition C4 and demonstrates how the social surroundings environmental objective in condition B5-1 will be achieved, and submit the plan to the **CEO**.

B6 Environmental Offsets

B6-1 The proponent must implement offsets to counterbalance the significant residual impacts of the proposal on the following environmental values:

(1) *Banksia attenuata* woodlands over species rich dense shrublands (SCP20a);

(2) *Corymbia calophylla – Eucalyptus marginata* woodlands on sandy clay soils of the southern Swan Coastal Plain (SCP3b) (northern expression);

(3) Nooning Vegetation Complex;

(4) Banksia woodlands of the Swan Coastal Plain ecological community (Priority 3(iii));

(5) **low to moderate or higher value foraging habitat** for Carnaby's cockatoo (*Zanda latirostris*);

(6) **low to moderate or higher value foraging habitat** for forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*);

(7) **nesting trees**;

(8) **potential nesting trees** with suitable hollows;

(9) **potential nesting trees**;

(10) suitable chuditch (*Dasyurus geoffroii*) habitat; and

(11) **Conservation Category Wetlands**.

B6-2 The proponent must ensure the implementation of the offsets achieves the following environmental objectives:

(1) counterbalance the significant residual impacts to the environmental values identified in condition B6-1;

(2) revegetate at least 147 **ha** within fifty (50) kilometres of the development envelope to provide **self-sustaining** high quality foraging habitat for Carnaby's cockatoo;

(3) ensure no net loss of **potential nesting trees** authorised to be cleared by condition B2-1(e) through the **planting and establishment** of species known to develop hollows suitable for nesting by **black cockatoos** within the area required to be revegetated by condition B6-2(2);

(4) install at least three (3) artificial nesting hollows for every **nesting tree** authorised to be cleared by condition B2-1(c);

(5) install at least one (1) artificial nesting hollow for every **potential nesting tree** with a suitable hollow authorised to be cleared by condition B2-1(d);

(6) ensure **acquired** offsets collectively contain at least three (3) times the number of **potential nesting trees** authorised to be cleared by condition B2-1(d) and condition B2-1(e); and

(7) contribute to a research program/s for a value/s identified in condition B6-1, consistent with the requirements of condition B6-4(11).

Environmental Offset Strategy (Environmental Management Plan)

B6-3 The proponent must, in consultation with the **DBCA**, revise the Environmental Offset Strategy (Revision 2, 8 November 2022) to demonstrate how the environmental objectives in condition B6-2 will be achieved, and submit it to the **CEO**.

B6-4 The Environmental Offset Strategy (Environmental Management Plan) must:

(1) demonstrate that the environmental outcomes in condition B6-1 and the environmental objectives in condition B6-2 will be met;

(2) demonstrate that any floristic community type analysis of proposed offset areas has been reviewed, and the findings supported by the **DBCA;**

(3) identify an area, or areas, (the **Proposed Offset Conservation Area**) to be **acquired**, to be **acquired** with **on-ground management**, and/or for **on-ground management**, that contains the environmental value/s identified in condition B6-1;

(4) demonstrate how the environmental values within the **Proposed Offset Conservation Areas** will be maintained, improved and/or managed in order to counterbalance the significant residual impact to the environmental values in condition B6-1 and achieve the environmental objectives in condition B6-2;

(5) demonstrate application of the principles of the *WA Environmental Offsets Policy*, the WA *Environmental Offsets Metric* and the WA Offsets Template, as described in the *WA Environmental Offsets Guidelines*, or any subsequent revisions of these documents;

(6) identify the proportion of resources allocated for each specific offset addressed by the Environmental Offset Strategy (Environmental Management Plan);

(7) identify how the ongoing performance of the offset measures, and whether they are achieving the objectives in condition B6-2, will periodically be made publicly available;

(8) identify how the **Proposed Offset Conservation Areas** will be protected, being either the sites are ceded to the Crown for the purpose of management for conservation, or the sites are managed under other suitable mechanism for the purpose of conservation as agreed by the **CEO** by notice in writing;

(9) for offsets **acquired** specify:

(a) a timeframe and works associated with establishing the **Proposed Offset Conservation Areas**, including a contribution for maintaining the offset for at least twenty (20) years after completion of purchase;

(b) identify the **relevant management body** for the on-going management of the **Proposed Offset Conservation Areas**, including its role, and the role of the proponent, and confirmation in writing that the **relevant management body** accepts responsibility for its role;

(10) where **on-ground management** is proposed:

(a) state the targets for each environmental value identified in condition B6-1 to be achieved, including completion criteria, which will result in a **tangible improvement** to the environmental values being offset. For revegetation offsets relating to foraging habitat for Carnaby's cockatoo environmental values, this must include, but not be limited to:

(i) completion criteria to measure (at a minimum) whether the objective in condition B6-2(2) has been achieved and is commensurate with high quality foraging habitat for Carnaby's cockatoo within a ten (10) kilometre radius; and

(ii) adaptive management to ensure successful revegetation;

(b) demonstrate the consistency of the targets with environmental objectives in condition B6-2 and the objectives of any relevant guidance, including but not limited to, recovery plans or area management plans;

(c) detail the **on-ground management** actions, with associated timeframes for implementation and completion, to achieve the targets identified in condition B6-4(10)(a);

(d) detail the monitoring, reporting and evaluation mechanisms for the targets and actions identified under condition B6-4(10)(a);

(11) where a **research offset** is proposed, identify an existing or prepare a research program that**:**

(a) identifies the objectives and intended outcomes, and specifies the deliverables and completion criteria;

(b) identifies how the research will result in a positive conservation outcome, and will either improve management and protection or address priority knowledge gaps that have been identified as a research priority needed to improve management and protection, for the environmental values identified in condition B6-1;

(c) demonstrate the consistency of the objectives in condition B6-4(11)(a) with any relevant guidance, including but not limited to, recovery plans or area management plans, the principles of the *WA Environmental Offsets Policy*, the *WA Environmental Offsets Guidelines,* or any subsequent revisions of these documents;

(d) identifies and justifies how the research will support land **acquired** and/or **on-ground management** in achieving a positive conservation outcome;

(e) provides an implementation and reporting schedule, including an outline of key activities, all deliverables, stages of implementation, reporting of research results (including interim results), reporting on implementation status, and milestones towards completion criteria;

(f) identifies the governance arrangements including responsibilities for implementing, and oversight of, the research program, agreements with government agencies, agreements with any third parties, and **contingency measures**;

(g) identify how a research program summary, and the results (including interim results) of the research program, will be communicated and/or published in an open access format; and

(h) identifies the third party(s) to carry out the work required to meet the outcomes of condition B6-4(11)(a), who is satisfactory for the role to the **CEO**. In applying to the **CEO** for endorsement of the selected third party(s), the proponent shall provide:

(i) demonstration of the track record, experience, qualifications and competencies of the proposed third party(s) to carry out the work and achieve the outcomes;

(12) Demonstrate the artificial nesting hollows required by condition B6-2(4) and condition B6-2(5) will:

(a) be installed at suitable locations determined in consultation with **DBCA**, and in accordance with the specifications detailed in ‘Artificial Hollows for Black Cockatoos’ (DBCA Fauna Notes 2023), or any subsequent **DBCA** revision of this guideline;

(b) be designed and placed in accordance with the specifications detailed in 'Artificial Hollows for Black Cockatoos' (DBCA Fauna Notes 2023), or any subsequent **DBCA** revision of this guideline;

(c) be monitored and maintained in accordance with the specifications detailed in 'Artificial Hollows for Black Cockatoos' (DBCA Fauna Notes 2023), or any subsequent **DBCA** revision of this guideline; and

(d) be spatially recorded with location data provided to **DBCA**.

B7 Environmental Performance Reporting

B7-1 The proponent shall submit an Environmental Performance Report to the Minister for the Environment every five (5) years, until the **CEO** has **confirmed** in writing that submission of an Environmental Performance Report is no longer required.

B7-2 The first Environmental Performance Report shall be submitted within three (3) months of the expiry of the five (5) year period commencing from the date of substantial commencement of the proposal, or such other time as may be approved by the **CEO**.

B7-3 Each Environmental Performance Report shall report on proposal impacts to **black cockatoos,** terrestrial fauna, *Banksia attenuata* woodland over species rich dense shrublands (SCP20a) and *Corymbia calophylla – Eucalyptus marginata* woodlands on sandy clay soils of the southern Swan Coastal Plain (SCP3b) (northern expression) in relation to:

(1) use of **black cockatoo nesting trees** retained adjacent to the road;

(2) use of **black cockatoo potential nesting trees** with suitable hollows retained adjacent to the road;

(3) success of installed artificial nest hollows;

(4) utilisation of fauna crossings by native terrestrial fauna and potential future application of this to other projects;

(5) maintenance of values commensurate with and representative of *Banksia attenuata* woodlands over species rich dense shrublands (SCP20a) within the areas identified as this community retained adjacent to the road; and

(6) maintenance of values commensurate with and representative of *Corymbia calophylla – Eucalyptus marginata* woodlands on sandy clay soils of the southern Swan Coastal Plain (SCP3b) (northern expression)

within the areas identified as this community retained adjacent to the road.

B7-4 The Environmental Performance Report must include:

(1) a comparison of the environmental values identified in condition B7-3 at the end of the five (5) year period; against the state of each environmental value prior to substantial commencement;

(2) a comparison of the environmental values identified in condition B7-3 at the end of every five (5) year period; against the state of the environmental values identified in the first Environmental Performance Report submitted in accordance with condition B7-1;

(3) proposed adaptive management and continuous improvement strategies; and

(4) a discussion of how monitoring, knowledge, and learnings from the implementation of the proposal will be applied to future proposals to minimise impacts on each relevant environmental value**.**

B7-5 Each Environmental Performance Report must be published on the proponent's website and provided to the **CEO** in electronic form suitable for on-line publication by the Department of Water and Environmental Regulation within twenty (20) business days of being provided to the Minister for the Environment.

PART C – ENVIRONMENTAL MANAGEMENT PLANS AND MONITORING

C1 Environmental Management Plans: Conditions Related to Commencement of Implementation of the Proposal

C1-1 The proponent must not undertake:

(1) **ground disturbing activities** in relation to the Brockman River, Udumung Brook, and other waterways within or adjacent to the development envelope until the **CEO** has **confirmed** in writing that the environmental management plan required by condition B4-2 meets the requirements of that condition and conditions C4-1 and C4-2;

(2) **ground disturbing activities** until the **CEO** has **confirmed** in writing that the environmental management plan required by condition B5-2 meets the requirements of that condition and condition C4-3; and

(3) **ground disturbing activities** until the **CEO** has **confirmed** in writing that the Environmental Offset Strategy (Environmental Management Plan) required by condition B6-3 meets the requirements of that condition.

C2 Environmental Management Plans: Conditions Relating to Approval, Implementation, Review and Publication

C2-1 Upon being required to implement an environmental management plan under Part B, or after receiving notice in writing from the **CEO** under condition C1-1 that the environmental management plan(s) required in Part B satisfies the relevant requirements, the proponent must:

(1) implement the most recent version of the **confirmed** environmental management plan; and

(2) continue to implement the **confirmed** environmental management plan referred to in condition C2-1(1), other than for any period which the **CEO** confirms by notice in writing that it has been demonstrated that the relevant requirements for the environmental management plan have been met, or are able to be met under another statutory decision-making process, in which case the implementation of the environmental management plan is no longer required for that period.

C2-2 The proponent:

(1) may review and revise a **confirmed** environmental management plan provided it meets the relevant requirements of that environmental management plan, including any consultation that may be required when preparing the environmental management plan;

(2) must review and revise a **confirmed** environmental management plan and ensure it meets the relevant requirements of that environmental management plan, including any consultation that may be required when preparing the environmental management plan, as and when directed by the **CEO;** and

(3) must revise and submit to the **CEO** the **confirmed** environmental management plan if there is a material risk that the outcomes or objectives it is required to achieve will not be complied with, including but not limited to as a result of a change to the proposal.

C2-3 Despite condition C2-1, but subject to conditions C2-4 and C2-5, the proponent may implement minor revisions to an environmental management plan if the revisions will not result in new or increased **adverse impacts** to the environment or result in a risk to the achievement of the limits, outcomes or objectives which the environmental management plan is required to achieve.

C2-4 If the proponent is to implement minor revisions to an environmental management plan under condition C2-3, the proponent must provide the **CEO** with the following at least twenty (20) business days before it implements the revisions:

(1) the revised environmental management plan clearly showing the minor revisions;

(2) an explanation of and justification for the minor revisions; and

(3) an explanation of why the minor revisions will not result in new or increased **adverse impacts** to the environment or result in a risk to the achievement of the limits, outcomes or objectives which the environmental management plan is required to achieve.

C2-5 The proponent must cease to implement any revisions which the **CEO** notifies the proponent (at any time) in writing may not be implemented.

C2-6 **Confirmed** environmental management plans, and any revised environmental management plans under condition C2-4(1), must be published on the proponent's website and provided to the **CEO** in electronic form suitable for on-line publication by the Department of Water and Environmental Regulation within twenty (20) business days of being implemented, or being required to be implemented (whichever is earlier).

C3 Conditions Related to Monitoring

C3-1 The proponent must undertake monitoring capable of:

(1) substantiating whether the proposal limitations and extents in Part A are exceeded; and

(2) **detecting** and substantiating whether the environmental outcomes identified in Part B are achieved (excluding any environmental outcomes in Part B where an environmental management plan is expressly required to monitor achievement of that outcome).

C3-2 The proponent must submit as part of the Compliance Assessment Report required by condition D2, a compliance monitoring report that:

(1) outlines the monitoring that was undertaken during the implementation of the proposal;

(2) identifies why the monitoring was capable of substantiating whether the proposal limitation and extents in Part A are exceeded;

(3) for any environmental outcomes to which condition C3-1(2) applies, identifies why the monitoring was scientifically robust and capable of **detecting** whether the environmental outcomes in Part B are met;

(4) outlines the results of the monitoring;

(5) reports whether the proposal limitations and extents in Part A were exceeded and (for any environmental outcomes to which condition C3-1 (2) applies) whether the environmental outcomes in Part B were achieved, based on analysis of the results of the monitoring; and

(6) reports any actions taken by the proponent to remediate any potential non-compliance.

C4 Environmental Management Plans: Conditions Related to Management Actions and Targets for Objective Based Conditions

C4-1 The environmental management plans required under condition B4-2, condition B5-2 and condition B6-3 must contain provisions which enable the achievement of the relevant objectives of those conditions and substantiation of whether the objectives are reasonably likely to be met, and must include:

(1) **management actions**;

(2) **management targets**;

(3) **contingency measures** if **management targets** are not met; and

(4) reporting requirements.

C4-2 The environmental management plan required under condition B4-2 is also required to demonstrate reasonable steps with appropriate and relevant Traditional Owner representatives to consult about inland waters environmental outcomes prior to and during construction of the Brockman River bridge and the Udumung Brook crossing.

C4-3 The environmental management plan required under condition B5-2 is:

(1) required to describe the relevant mitigation measures to meet the outdoor noise targets in the *State Planning Policy 5.4 Road and Rail Noise* and indoor noise targets for potentially affected dwellings;

(2) to provide the location, height and timing of construction of the noise walls;

(3) required to include a noise level contour map based on the final road design and demonstrate that design and construction of mitigation measures will meet the objective in conditions B5-1 and C4-3(1) and is consistent with the *Road and Rail Noise Guidelines*;

(4) required to include evidence of reasonable steps for consultation with potentially affected residences and proponents of **approved** subdivisions;

(5) required to include the responsibilities for implementing noise mitigation measures (including noise walls) for future dwellings in **approved** subdivisions adjacent to the proposal; and

(6) required to specify the timing for the review of the approved environmental management plan, prior to commencing **construction activities** of subsequent stages of the proposal.

C4-4 Without limiting condition C2-1, the failure to achieve an environmental objective, or implement a **management action**, regardless of whether **contingency measures** have been or are being implemented, represents a non-compliance with these conditions.

PART D – COMPLIANCE, TIME LIMITS, AUDITS AND OTHER CONDITIONS

D-1 Non-Compliance Reporting

D1-1 If the proponent becomes aware of a potential non-compliance, the proponent must:

(1) report this to the **CEO** within seven (7) days;

(2) implement **contingency measures**;

(3) investigate the cause;

(4) investigate environmental impacts;

(5) advise rectification measures to be implemented;

(6) advise any other measures to be implemented to ensure no further impact; and

(7) provide a report to the **CEO** within twenty-one (21) days of being aware of the potential non-compliance, detailing the measures required in conditions D1-1(1) to D1-1(6) above.

D1-2 Failure to comply with the requirements of a condition, or with the content of an environmental management required under a condition, constitutes a non-compliance with these conditions, regardless of whether the **contingency measures**, rectification or other measures in condition D1-1 above have been or are being implemented.

D2 Compliance Reporting

D2-1 The proponent must provide an annual Compliance Assessment Report to the **CEO** for the purpose of determining whether the implementation conditions are being complied with.

D2-2 Unless a different date or frequency is approved by the **CEO**, the first annual Compliance Assessment Report must be submitted within fifteen (15) months of the date of this Statement, and subsequent plans must be submitted annually from that date.

D2-3 Each annual Compliance Assessment Report must be endorsed by the proponent's Chief Executive Officer, or a person approved by proponent's Chief Executive Officer to be delegated to sign on the Chief Executive Officer's behalf.

D2-4 Each annual Compliance Assessment Report must:

(1) state whether each condition of this Statement has been complied with, including:

(a) exceedance of any proposal limits and extents;

(b) achievement of environmental outcomes;
(c) achievement of environmental objectives;

(d) requirements to implement the content of environmental management plans;

(e) monitoring requirements;

(f) implement **contingency measures**;

(g) requirements to implement adaptive management; and

(h) reporting requirements;

(2) include the results of any monitoring (inclusive of any raw data) that has been required under Part C in order to demonstrate that the limits in Part A, and any outcomes or any objectives are being met;

(3) provide evidence to substantiate statements of compliance, or details of where there has been a non-compliance;

(4) include the corrective, remedial and preventative actions taken in response to any potential non-compliance;

(5) be provided in a form suitable for publication on the proponent's website and online by the Department of Water and Environmental Regulation;

(6) be prepared and published consistent with the latest version of the Compliance Assessment Plan required by condition D2-5 which the **CEO** has **confirmed** by notice in writing satisfies the relevant requirements of Part C and Part D.

D2-5 The proponent must prepare a Compliance Assessment Plan which is submitted to the **CEO** at least six (6) months prior to the first Compliance Assessment Report required by condition D2-2, or prior to implementation of the proposal, whichever is sooner.

D2-6 The Compliance Assessment Plan must include:

(1) what, when and how information will be collected and recorded to assess compliance;

(2) the methods which will be used to assess compliance;

(3) the methods which will be used to validate the adequacy of the compliance assessment to determine whether the implementation conditions are being complied with;

(4) the retention of compliance assessments;

(5) the table of contents of Compliance Assessment Reports, including audit tables; and

(6) how and when Compliance Assessment Reports will be made publicly available, including usually being published on the proponent's website within sixty (60) days of being provided to the **CEO**.

D3 Contact Details

D3-1 The proponent must notify the **CEO** of any change of its name, physical address or postal address for the serving of notices or other correspondence within twenty-eight (28) days of such change. Where the proponent is a corporation or an association of persons, whether incorporated or not, the postal address is that of the principal place of business or of the principal office in the State.

D4 Time Limit for Proposal Implementation

D4-1 The proposal must be substantially commenced within five (5) years from the date of this Statement.

D4-2 The proponent must provide to the **CEO** documentary evidence demonstrating that they have complied with condition D4-1 no later than fourteen (14) days after the expiration of period specified in condition D4-1.

D4-3 If the proposal has not been substantially commenced within the period specified in condition D4-1, implementation of the proposal must not be commenced or continued after the expiration of that period.

D5 Public Availability of Data

D5-1 Subject to condition D5-2, within a reasonable time period approved by the **CEO** upon the issue of this Statement and for the remainder of the life of the proposal, the proponent must make publicly available, in a manner approved by the **CEO**, all validated environmental data collected before and after the date of this Statement relevant to the proposal (including sampling design, sampling methodologies, monitoring and other empirical data and derived information products (e.g. maps)), environmental management plans and reports relevant to the assessment of this proposal and implementation of this Statement.

D5-2 If:

(1) any data referred to in condition D6-1 contains trade secrets; or

(2) any data referred to in condition D6-1 contains particulars of confidential information (other than trade secrets) that has commercial value to a person that would be, or could reasonably be expected to be, destroyed or diminished if the confidential information were published,

the proponent may submit a request for approval from the **CEO** to not make this data publicly available and the **CEO** may agree to such a request if the **CEO** is satisfied that the data meets the above criteria.

D5-3 In making such a request the proponent must provide the **CEO** with an explanation and reasons why the data should not be made publicly available.

D6 Independent Audit

D6-1 The proponent must arrange for an independent audit of compliance with the conditions of this statement, including achievement of the environmental outcomes and/or the environmental objectives and/ or environmental performance with the conditions of this statement, as and when directed by the **CEO**.

D6-2 The independent audit must be carried out by a person with appropriate qualifications who is nominated or approved by the **CEO** to undertake the audit under condition D6-1.

D6-3 The proponent must submit the independent audit report with the Compliance Assessment Report required by condition D2, or at any time as and when directed in writing by the **CEO**. The audit report is to be supported by credible evidence to substantiate its findings.

D6-4 The independent audit report required by condition D6-1 is to be made publicly available in the same timeframe, manner and form as a Compliance Assessment Report, or as otherwise directed by the **CEO**.

Table 1: Abbreviations and definitions

Acronym or abbreviation	Definition or term
Aboriginal cultural heritage	Means the tangible and intangible elements that are important to the Aboriginal people of the State, and are recognised through social, spiritual, historical, scientific, or aesthetic values, as part of Aboriginal tradition to the extent they directly affect or are affected by physical or biological surroundings.
Acquired	The protection of environmental values on an area of initially unprotected land for the purpose of conservation through improved security of tenure or restricting the use of land (e.g. ceding land to the Crown or perpetual conservation covenants). This includes upfront costs of establishing the offset site and the on-going management of costs of maintaining the offset for the long term (20 years).
Adverse impact /adversely impacted	Negative change that is neither trivial nor negligible that could result in a reduction in health, diversity or abundance of the receptor/s being impacted, or a reduction in environmental value. Adverse impacts can arise from direct or indirect impacts, or other impacts from the proposal.
Approved	Refers to residential subdivision adjacent to the development envelope that has received planning approval from the Western Australian Planning Commission.
Black cockatoo/s	Carnaby's black cockatoo (*Zanda latirostris*) and forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*).
CEO	The Chief Executive Officer of the Department of the Public Service of the State responsible for the administration of section 48 of the *Environmental Protection Act 1986*, or the **CEO's** delegate.
Confirmed	In relation to a plan required to be made and submitted to the **CEO**, means, at the relevant time, the plan that the **CEO** confirmed, by notice in writing, meets the requirements of the relevant condition. In relation to a plan required to be implemented without the need to be first submitted to the **CEO**, means that plan until it is revised, and then means, at the relevant time, the plan that the **CEO** confirmed, by notice in writing, meets the requirements of the relevant condition.
Conservation Category Wetland	Wetlands classified as conservation management category wetlands in the Geomorphic Wetlands, Swan Coastal Plain dataset maintained by the **DBCA**.
Construction activities	Activities that are associated with the substantial implementation of a proposal including but not limited to, earthmoving, vegetation clearing, grading or construction of right of way. Construction activities do not include Geotechnical investigations (including potholing for services and the installation of piezometers) and other

	preconstruction activities where no clearing of vegetation is required.
Contingency measures	Planned actions for implementation if it is identified that an environmental outcome, environmental objective, **threshold criteria** or **management target** are likely to be, or are being, exceeded. Contingency measures include changes to operations or reductions in disturbance to reduce impacts and must be decisive actions that will quickly bring the impact to below any relevant threshold, **management target** and to ensure that the environmental outcome and/or objective can be met.
DBCA	Department of Biodiversity, Conservation and Attractions
Detecting/ Detectable	The smallest statistically discernible effect size that can be achieved with a monitoring strategy designed to achieve a statistical power value of at least 0.8 or an alternative value as determined by the **CEO**.
Disturb/ed	Means directly has or materially contributes to the disturbance effect on the health, diversity or abundance of the receptor/s being impacted or on an environmental value. In relation to flora, vegetation, or fauna habitat, includes to result in the death, destruction, removal, severing or doing substantial damage to an environmental value. In relation to fauna, includes to have the effect of altering the natural behaviour of fauna to its detriment.
Ecological integrity	The composition, structure, function and processes of ecosystems and the natural range of variation of these elements.
Ecological linkages	Ecological linkages identified in the Shire of Chittering *Local Biodiversity Strategy 2022*.
Environmental weeds	Any plant declared under section 22(2) of the *Biosecurity and Agriculture Management Act 2007*, any plant listed on the Weeds of National Significance List and any weeds listed on the Department of Biodiversity, Conservation and Attractions' Swan Region Impact and Invasiveness Ratings list, as amended, or replaced from time to time.
Fauna crossings	Infrastructure to reduce fauna vehicle strike, habitat fragmentation and facilitate fauna movement.
Fauna handler	A person who is qualified and licenced under section 40 of the *Biodiversity Conservation Act 2016.*
'Good'	Means the condition of native vegetation rated in accordance with the *Technical guidance – Flora and vegetation surveys for environmental impact assessment* (EPA 2016) including any revision to this technical guidance.
Ground disturbing activities	Any activity or activities undertaken in the implementation of the proposal, including any clearing, civil works, or construction

	activities, other than preliminary works to which approval has been given under the **EP Act**.
Ha	Hectare
Low to moderate or higher value foraging habitat	Black cockatoo foraging habitat described as low to moderate value, moderate value, moderate to high value or high value in the report and supporting spatial data in the *Great Northern Highway Bindoon Bypass Project: Revised Fauna Assessment* (June 2019) by Bamford Consulting Ecologists.
Management action	The identified actions implemented with the intent of achieving the environmental objective.
Management target	A type of indicator to evaluate whether an environmental objective is being achieved.
Nesting tree/s	Any existing tree with a hollow exhibiting evidence of use for nesting by **black cockatoos**.
On-ground management	This includes revegetation (re-establishment of native vegetation in degraded areas) and rehabilitation (repair of ecosystem processes and management of weeds, disease or feral animals) with the objective to achieve a **tangible improvement** to the environmental values in the offset area.
Operations	Means operation of the road infrastructure for the proposal.
Planting and establishment	The re-establishment of vegetation by creating favorable soil conditions and planting seeds and/or seedlings of the desired species, and actions to help ensure survival post planting.
Potential nesting trees	Any existing tree of a species known to support **black cockatoo** breeding which has a diameter at breast height of 500 millimetres or greater that therefore may develop a nest hollow.
Proposed Offset Conservation Area	The area of land identified in condition B6-4(3).
Relevant management body	A party or parties that has a role in the establishment and/or on-going management of the Proposed Offset Conservation Area. Note: This includes the role of the proponent.
Revegetate/ revegetation	Re-establishment of native vegetation/habitat in degraded areas.
Research offset	A program or study that must be reasonably related to the impact and is designed to result in a positive conservation outcome. It may include improving the management and protection of existing conservation estate, adding to existing State Government initiatives, policies or strategies, or addressing priority knowledge gaps.
Self-sustaining	Refers to vegetation that can survive (continue indefinitely) without on-going management actions such as watering, weed control or infill planting.

Tangible improvement	A perceptible, measurable and definable improvement that provides additional ecological benefit and/or value.
Threshold Criteria	The indicators that have been selected to represent limits of impact beyond which the environmental outcome is not being met.
Vegetation density	The number of individual plants of a defined group that are present in a given area at a particular time (for example stems per **ha**).

Figures (attached)

Figure 1 Development envelope for the Great Northern Highway – Bindoon Bypass (this figure is a representation of the co-ordinates referenced in Schedule 1).

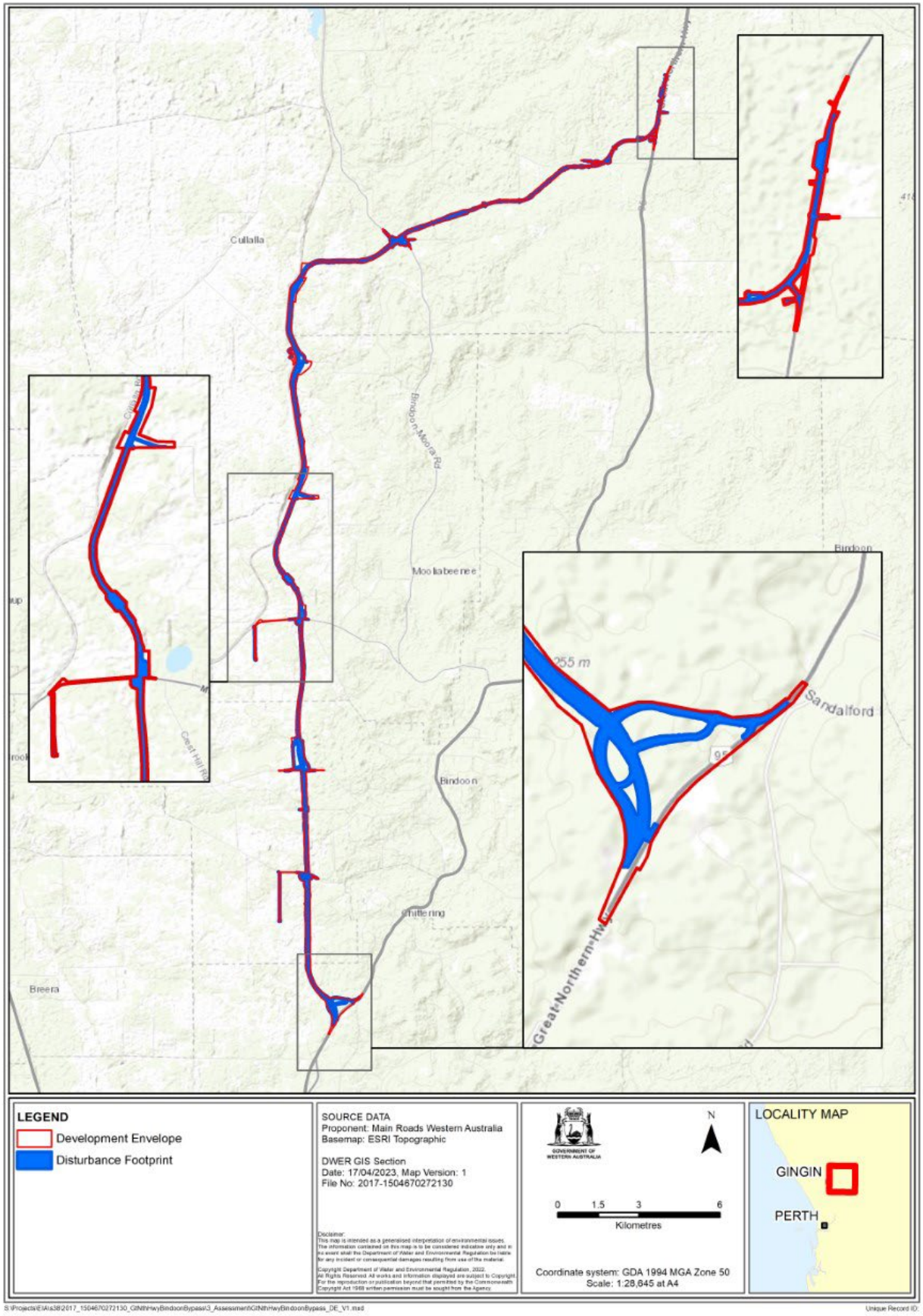


Figure 1: Development envelope for the Great Northern Highway – Bindoon Bypass

Schedule 1

All co-ordinates are in metres, listed in Map Grid of Australia Zone 50 (MGA Zone 50), datum of Geocentric Datum of Australia 2020 (GDA20).

Spatial data depicting the figures are held by the Department of Water and Environmental regulation. Record no. DWERT622325.

Appendix B: Decision-making authorities

Table B1: Identified relevant decision-making authorities for the proposal

Decision-Making Authority	Legislation (and approval)
1. Minister for Aboriginal Affairs	*Aboriginal Heritage Act 1972* - section 18 consent to impact a registered Aboriginal heritage site
2. Minister for Environment	*Biodiversity Conservation Act 2016* - section 40 authority to take or disturb threatened species - section 45 authority to modify occurrence of a threatened ecological community
3. Minister for Lands	*Land Administration Act 1997* - section 28(1) compulsory acquisition of land
4. Minister for Transport	*Main Roads Act 1930* - section 22 approval to construct roads
5. Minister for Water	*Rights in Water and Irrigation Act 1914* - permit to interfere with beds and banks - groundwater abstraction licence - licence to construct bores - dewatering licence
6. Chief Executive Officer, Department of Water and Environmental Regulation	*Environmental Protection Act 1986* - part V clearing permit
7. Chief Executive Officer, Department of Biodiversity, Conservation and Attractions	*Biodiversity Conservation Act 2016* - authority to take flora and fauna (other than threatened species)
8. Chairman, Western Australian Planning Commission	*Planning and Development Act 2005* - s. 135 subdivision or amalgamation of land - s. 115 development approval within planning control area - approval for developments in areas reserved under the Metropolitan Region Scheme
9. Chief Executive Officer, Shire of Chittering and Shire of Gingin	Environmental Protection (Noise) Regulations 1997 - approval of noise management plans for construction outside of prescribed hours

Appendix C: Environmental Protection Act principles

Table C1: Consideration of principles of the *Environmental Protection Act 1986*

EP Act principle	Consideration
1. The precautionary principle *Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.* *In application of this precautionary principle, decisions should be guided by –* *(a) careful evaluation to avoid, where practicable, serious, or irreversible damage to the environment; and* *(b) an assessment of the risk-weighted consequences of various options.*	The EPA has considered the precautionary principle in its assessment and has had particular regard to this principle in its assessment of flora and vegetation, terrestrial fauna, inland waters, and social surroundings. The assessment of these impacts is provided in this report. The proponent has investigated the biological and physical environment to identify environmental values of the proposal area. The EPA notes that the proponent has undertaken avoidance and minimisation measures to avoid potential serious or irreversible damage to the environment by: • avoiding historic records of threatened flora species *Drakea elastica* • avoiding impacts to priority flora species which were recorded in the larger survey area • aligning the road in highly disturbed paddocks where possible to minimise habitat disturbance • pre-clearance trapping and relocation of fauna • proposing bridges over significant waterways • undertaking cultural heritage surveys and engaging in meaningful consultation with Traditional Owners From its assessment of this proposal the EPA has concluded that there is no threat of serious or irreversible harm.
2. The principle of intergenerational equity *The present generation should ensure that the health, diversity, and productivity of the environment is maintained and enhanced for the benefit of future generations.*	The EPA has considered the principle of intergenerational equity in its assessment and has had particular regard to this principle in its assessment of flora and vegetation, terrestrial fauna, inland waters, and social surroundings. The EPA notes that the proponent has identified measures to avoid and minimise impacts to the key environmental factors. The EPA has considered these measures during its assessment and has recommended conditions to ensure that appropriate measures are implemented.

EP Act principle	Consideration
	The EPA has concluded that the environmental values will be protected, and the health, diversity and productivity of the environment will be maintained for the benefit of future generations.
3. The principles of the conservation of biological diversity and ecological integrity *Conservation of biological diversity and ecological integrity should be a fundamental consideration.*	The EPA has considered the principle of conservation of biological diversity and ecological integrity in its assessment, and has had particular regard to this principle in its assessment of flora and vegetation, and terrestrial fauna and in its consideration of offsets. <u>Flora and vegetation and terrestrial fauna</u> The EPA has considered to what extent the potential impacts from the proposal to flora and vegetation and terrestrial fauna can be ameliorated to ensure consistency with the principle of conservation of biological diversity and ecological, including by provision of offsets. The EPA has concluded that given the nature of the impacts that the proposed offsets are likely to counter-balance the impacts of the loss of biological diversity and ecological integrity.
4. Principles relating to improved valuation, pricing, and incentive mechanisms *(1) Environmental factors should be included in the valuation of assets and services.* *(2) The polluter pays principle — those who generate pollution and waste should bear the cost of containment, avoidance, or abatement.* *(3) The users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any wastes.* *(4) Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solutions and responses to environmental problems.*	In considering this principle, the EPA notes that the proponent will bear the costs relating to implementing the proposal to achieve environmental outcomes, and management and monitoring of environmental impacts during construction, operation, and decommissioning of the proposal. The EPA has had particular regard to this principle in considering flora and vegetation, terrestrial fauna, and inland waters. The notes the proponent's commitment to implement a framework which encourages design and construction of innovative solutions to environmental and sustainability problems.

EP Act principle	Consideration
5. The principle of waste minimisation *All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.*	The EPA has considered the principle of waste minimisation in its assessment. In considering this principle, the EPA notes the proponent's commitment to, where practicable, use recycled materials in the road formation and source fill material from areas of cut along the alignment. This will minimise the requirements to export excess fill off site. The EPA notes the proponent's commitment to implementing developed concepts and practices for the diversion of waste from landfill.

Appendix D: Other environmental factors

Table D1: Evaluation of other environmental factors

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Government agency and public comments	Evaluation of why the factor is not a key environmental factor
Land			
Terrestrial environmental quality	Dewatering/excavation exposing potential Acid Sulphate Soils (ASS)	Public comments • Truck stop is proposed 600 m from residence and is considered an industrial land use. Agency comments • None received for this factor	Terrestrial environmental quality was not identified as a preliminary key environmental factor when the EPA decided to assess the proposal. The assessment of terrestrial environmental quality within the proposal area concluded that: • no known contaminated sites occurring in the development envelope • dewatering will be temporary and localised • no dewatering will occur without an approved dewatering management plan to be developed in accordance with DWER Guidelines • management and mitigation measures proposed by the proponent including spill response procedures, refuelling compounds, and development of Construction Environmental Management Plan. The EPA considers it unlikely that the proposal would have a significant impact on terrestrial environmental quality and that the impacts to this factor are manageable. Accordingly, the EPA did not consider the factor terrestrial environmental quality to be a key environmental factor at the conclusion of its assessment.

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Government agency and public comments	Evaluation of why the factor is not a key environmental factor
People			
Social surroundings (European heritage)	Surveys found several places with historical value in the Bindoon area.	No agency or public comments were received for this factor.	Social Surroundings (European Heritage) was not identified as a preliminary environmental factor when the EPA set the level of assessment. The assessment of Social Surroundings (European Heritage) within the proposal areas concluded that: • no places within the development envelope were listed on the State Register of Heritage Places or National Heritage lists. The EPA notes that the proponent will continue to liaise with the DPLH in relation to any places likely to be impacted. It is likely that the proposal will be consistent with the EPA objective for social surroundings (European heritage). Accordingly, the EPA did not consider social surroundings (European heritage) to be a key environmental factor at the conclusion of its assessment.
Social surroundings (visual amenity)	Potential for impacts to the existing amenity of the rural setting.	<u>Public comments</u> • The impact of lighting design on the night-time environment. • The potential for headlight glare to intrude on private residences. • Impacts on amenity and security from truck bays/stopping areas. • Effects of road on amenity of future subdivisions. <u>Agency comments</u> • None received for this factor	Social surroundings (visual amenity) was identified as a preliminary key environmental factor when the EPA set the level of assessment. The proposal is in a naturally undulating rural environment. As a result of the agricultural activities and cleared areas within and around the development envelope it is expected existing dust levels would be elevated. Existing artificial light levels within and adjacent to the development area are relatively low due to the proposal not being located close to any towns. Generated artificial

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Government agency and public comments	Evaluation of why the factor is not a key environmental factor
			light is created from residential dwellings and headlights from vehicles including farm equipment. However, in considering the potential impacts to social surroundings (visual amenity), the EPA had regard to the following: • proponent's commitment to undertake construction activities during daylight hours where possible and thereby minimising light spill impacts during construction • implement best practice lighting to minimise light spill including installing lighting at intersections only and not the remainder of the alignment • implement planting and landscaping to screen the proposal minimising visual impacts and glare from vehicle headlights. The EPA considers it unlikely that the proposal would have a significant impact on social surroundings (visual amenity) and that the impacts to this factor are manageable. Accordingly, the EPA did not consider the factor social surroundings (visual amenity) to be a key environmental factor at the conclusion of its assessment.
Air			
Greenhouse gas (GHG) emissions	Potential GHG emissions	No agency or public comments were received for this factor.	GHG emissions was not identified as a preliminary key environmental factor when the EPA decided to assess the proposal. Having regard to: • the proponent's estimation of greenhouse gas emissions – scope 1 emissions of 55,600 t($CO_{2\text{-}e}$) per annum

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Government agency and public comments	Evaluation of why the factor is not a key environmental factor
			– scope 3 emissions of 25,774 t(CO_{2-e}) per annum • *Environmental factor guideline – Greenhouse gas emissions* (EPA 2023) which states GHG emissions from a proposal will be assessed where it exceeds 100,000 tonnes of CO_{2-e} each year for scope 1 emissions. • the significance of considerations in the *Statement of environmental principles, factors, objectives and aims of EIA* (EPA 2023). The EPA considers it unlikely that the proposal would have a significant impact on GHG emissions and that the impacts to this factor are manageable. Accordingly, the EPA did not consider GHG to be a key environmental factor at the conclusion of its assessment.

Appendix E: Relevant policy, guidance, and procedures

The EPA had particular regard to the policies, guidelines and procedures listed below in the assessment of the proposal.

- *Environmental factor guideline – Flora and vegetation* (EPA 2016)
- *Environmental factor guideline – Inland waters* (EPA 2018)
- *Environmental factor guideline – Social surroundings* (EPA 2016)
- *Environmental factor guideline – Terrestrial fauna* (EPA 2016)
- *Environmental impact assessment (Part IV Divisions 1 and 2) procedures manual* (EPA 2021a)
- *WA Environmental Offsets Policy* (Government of Western Australia 2011)
- *WA Environmental Offsets Guidelines* (Government of Western Australia 2014)
- *Statement of environmental principles, factors, objectives and aims of EIA* (EPA 2023)
- *Environmental impact assessment (Part IV Divisions 1 and 2) administrative procedures 2021* (State of Western Australia 2021)
- *Technical guidance – Flora and vegetation surveys for environmental impact assessment* (EPA 2016)
- *Technical guidance – Sampling of short-range endemic invertebrate fauna* (EPA 2016)
- *Technical guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment* (EPA 2020).

Appendix F: List of submitters

7-day comment on referral

Organisations and public

- Public Submission 1

Government agencies

- Shire of Chittering

Public review of proponent information

Organisations and public

- WA Limestone
- Parkwood Properties Pty Ltd
- Astrotourism WA Pty Ltd
- ANON-8KZR-56U6-5
- ANON-8KZR-56UW-6
- ANON-8KZR-56UJ-S
- ANON-8KZR-56US-2
- Public submission 1

Government agencies

- Department of Biodiversity, Conservation and Attractions

Appendix G: Assessment timeline

Date	Progress stages	Time (weeks)
28 September 2017	EPA decided to assess – level of assessment set	
4 December 2017	EPA approved Environmental Scoping Document	9
21 May 2020	EPA accepted Environmental Review Document	128
25 May 2020	Environmental Review Document released for public review	4 days
6 July 2020	Public review period for Environmental Review Document closed	6
10 November 2022	EPA received final information for assessment	123
19 May 2023	EPA accepted proponent's Response to Submissions	27
18 May 2023	EPA completed its assessment (s. 44(2b))	1 day
21 June 2023	EPA provided report to the Minister for Environment	5
26 June 2023	EPA report published	3 days
17 July 2023	Appeals period closed	3

Timelines for an assessment may vary according to the complexity of the proposal and are usually agreed with the proponent soon after the EPA decides to assess the proposal and records the level of assessment.

In this case, the EPA did not meet its timeline objective to complete its assessment and provide a report to the Minister.

References

Archae-aus Pty Ltd 2018, *Report on a Historical Heritage Assessment undertaken as part of upgrade works to the Great Northern Highway, Muchea to Wubin (Stage 2) Bindoon Bypass*, Archae-aus Pty Ltd, Perth, WA.

Arup Jacobs Joint Venture 2017, *Bindoon Bypass s. 38 EP Act Referral supporting information document,* prepared by Arup Jacobs Joint Venture for Main Roads Western Australia.

Arup 2018a, *Bindoon Bypass Project – Landscape Character and Visual Impact Assessment*, Arup, Brisbane, QLD.

Arup 2018b, *Technical Note – GNH CN12 Bindoon – Lighting – concept design*, Arup, Brisbane, QLD.

Arup Jacobs Joint Venture 2018a, *Great Northern Highway Muchea to Wubin Upgrade – Stage 2, Main Roads Western Australia, Bindoon Bypass Environment | Groundwater Assessment*, Arup Jacobs Joint Venture, Perth, WA.

Arup Jacobs Joint Venture 2018b, *Great Northern Highway Muchea to Wubin Upgrade – Stage 2, Main Roads Western Australia, Bindoon Bypass | Noise Assessment*, Arup Jacobs Joint Venture, Perth, WA.

Arup Jacobs Joint Venture 2018c, *Great Northern Highway Muchea to Wubin Upgrade – Stage 2, Main Roads Western Australia, Bindoon Bypass Environment | Surface Water Assessment*, Arup Jacobs Joint Venture, Perth, WA.

Arup Jacobs Joint Venture 2020, *Bindoon Bypass Environmental Review Document Great Northern Highway - Main Roads Western Australia and Preliminary Documentation*, Arup Jacobs Joint Venture, Perth, WA.

Arup Jacobs Joint Venture 2022, *Great Northern Highway - Main Roads Western Australia, Bindoon Bypass Environmental Review Document | Response to Submissions*, Arup Jacobs Joint Venture, Perth, WA.

Australian Soil Resource Information System 2014, ARIS – *Australian soil resource information system, June 2014*, Commonwealth Scientific and Industrial Research Organisation, Australian Collaboration Land Program and Department of Agriculture, Forestry and Fisheries, Canberra. Viewed 29 January 2021, https://www.asris.csiro.au

Bamford Consulting Ecologists 2017, *Great Northern Highway: Bindoon Bypass Fauna Assessment*. Report prepared for Arup Jacobs Joint Venture. Perth, WA.

Bamford Consulting Ecologists 2018a, *Great Northern Highway: Bindoon Bypass Targeted Fauna Surveys*. Report prepared for Arup Jacobs Joint Venture. Perth, WA.

Bamford Consulting Ecologists 2018b, *Great Northern Highway Bindoon Bypass Project, Additional Survey Area*. Perth, WA.

Bamford Consulting Ecologists 2019, *Great Northern Highway Bindoon Bypass Project: Revised Fauna Assessment.* Report prepared for the Integrated Project Team (IPT). Perth, WA.

Brad Goode and Associates 2018, *Report of an Aboriginal Heritage Survey for the Great Northern Highway: Bindoon Bypass: In the Yued Native Title Claim Area (WC1997/071), Western Australia*, Brad Goode and Associates Consulting Anthropologists & Archaeologists, Dunsborough, WA.

Commonwealth of Australia 2012, *EPBC Act referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo (endangered) Calyptorhynchus latirostris Baudin's cockatoo (vulnerable) Calyptorhynchus baudinii Forest red-tailed black cockatoo (vulnerable) Calyptorhynchus banksii naso*, Commonwealth of Australia, Canberra, ACT.

DBCA 2020, *Recovery plans and interim recovery plans* https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/wa-s-threatenedecological-communities. Department of Biodiversity, Conservation and Attractions, Western Australia.

DEC 2008, *Forest Black Cockatoo (Baudin's Cockatoo Calyptorhynchus baudinii and Forest Red-tailed Black Cockatoo Calyptorhynchus banksii naso) Recovery Plan*, Department of Environment and Conservation, Perth, WA.

DEC 2012, *Chuditch (Dasyurus geoffroii) National Recovery Plan: Wildlife Management Program No.54*, Department of Environment and Conservation, Perth, Western Australia.

DPAW 2013, *Carnaby's Cockatoo (Calyptorhynchus latirostris) Recovery Plan, Western Australian Wildlife Management Program No. 52,* Department of Parks and Wildlife, Perth, WA.

DPAW 2016, *Banksia attenuata woodlands over species rich dense shrublands (Swan Coastal Plain community type 20a – Gibson et al. 1994). Interim Recovery Plan No. 359.* Department of Parks and Wildlife, Perth, WA.

DoW 2006, *A summary of investigations into ecological water requirements of groundwater-dependent ecosystems in the South West groundwater areas,* Department of Water, Perth, WA.

DoW 2010, *Setting allocation limits for Brockman River and Marbling Brook, Water Resource Allocation and Planning series Report no. 44*, Department of Water, Perth, WA.

DWER 2021, *Western mud minnow – Galaxiella munda,* Healthy Rivers South-West, Department of Water and Environmental Regulation viewed 30 August 2021*,* *https://rivers.dwer.wa.gov.au/species/galaxiella-munda/*

EPA 2016a, *Environmental factor guideline – Flora and vegetation*, Environmental Protection Authority, Perth, WA.

EPA 2016b, *Technical guidance – Flora and vegetation surveys for environmental impact assessment*, Environmental Protection Authority, Perth, WA.

EPA 2016c, *Environmental factor guideline – Terrestrial fauna*, Environmental Protection Authority, Perth, WA.

EPA 2016d, *Technical guidance – Sampling of short-range endemic invertebrate fauna*, Environmental Protection Authority, Perth, WA.

EPA 2016e, *Environmental factor guideline – Social surroundings*, Environmental Protection Authority, Perth, WA.

EPA 2016f, *Environmental factor guideline – Terrestrial environmental quality*, Environmental Protection Authority, Perth, WA.

EPA 2018, *Environmental factor guideline – Inland waters*, Environmental Protection Authority, Perth, WA.

EPA 2019, *Technical Report: Carnaby's Cockatoo in Environmental Impact Assessment in the Perth and Peel Region. Advice of the Environmental Protection Authority under Section 16(j) of the Environmental Protection Act 1986*. Environmental Protection Authority, Perth, WA.

EPA 2020a, *Technical guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment*, Environmental Protection Authority, Perth, WA.

EPA 2023, *Environmental factor guideline – Greenhouse gas emissions*, Environmental Protection Authority, Perth, WA.

EPA 2021a, *Environmental impact assessment (Part IV Divisions 1 and 2) procedures manual*, Environmental Protection Authority, Perth, WA.

EPA 2023, *Statement of environmental principles, factors, objectives and aims of EIA*, Environmental Protection Authority, Perth, WA.

FVC 2017, *Level 2 Flora and Vegetation Assessment and Targeted Thelymitra Stellata Survey, Great Northern Highway, Muchea to Wubin Upgrades Stage 2 – Bindoon options*. Report prepared by Focused Vision Consulting for ASJV. Perth, WA.

FVC 2018a, *Detailed Flora and Vegetation Assessment, Bindoon Bypass, Great Northern Highway*. Report prepared by Focused Vision Consulting for the Integrated Project Team (IPT). Perth, WA.

FVC 2018b, *Wetland Assessment, Great Northern Highway, Bindoon Bypass Upgrades*. Report prepared by Focused Vision Consulting for the IPT. Perth, WA.

FVC 2019, *Flora and Vegetation Assessments, Bindoon Bypass, Great Northern Highway*. Report prepared by Focused Vision Consulting for the IPT. Perth, WA.

FVC 2022, *Memorandum, Bindoon Bypass – Revised FCT Analysis*. Focused Vision Consulting, Perth, WA.

Government of Western Australia 2011, *WA Environmental Offsets Policy*, Government of Western Australia, Perth, WA.

Government of Western Australia 2014, *WA Environmental Offsets Guidelines*, Government of Western Australia, Perth, WA.

Government of Western Australia 2019, *2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report)*. Current as of March 2019. WA Department of Biodiversity, Conservation and Attractions.

Heddle, E. M., Loneragan, O. W., and Havel, J. J. 1980, *Vegetation Complexes of the Darling System, Western Australia*. In Department of Conservation and Environment, Atlas of Natural Resources, Darling System, Western Australia.

Keighery, B., Keighery, G., Longman, V.M., and Clarke, K.A. 2012, *Weed and native flora quadrat data compiled between 1990 – 1996 for the Swan Coastal Plain*.

MRWA 2022, *Bindoon Bypass s43A request*. Main Roads Western Australia.

Phoenix Environmental Sciences 2016, *Flora and Fauna Assessment for Calingiri to Wubin Study Areas. Great Northern Highway, Muchea to Wubin Upgrade Stage 2 Project*. Report prepared for ASJV and Main Roads. Perth, WA.

Simons, John & George, J & Raper, R. 2013, Dryland Salinity in *Report card on sustainable natural resource use in agriculture* (pp.2:86-2:109). Department of Agriculture and Food Western Australia.

State of Western Australia 2021, *Western Australia Government Gazette, No. 180*, *Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2021,* 22 October 2021.

Terratree 2018, *Bindoon Bypass Phytophthora Dieback Assessment, T18002*. Report prepared for the IPT. Midland, Western Australia.

Threatened Species Scientific Committee 2016, *Approved Conservation Advice (incorporate listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community*. Threatened Species Scientific Committee, Department of the Environment and Energy. Canberra, Australian Capital Territory.