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Your ref: SSI-9487

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Dear Mick

**Inland Rail Narromine to Narrabri project – Preferred Infrastructure/Amendment Report – Revision E BDAR**

Thank you for your email dated 25 August 2022 to the Biodiversity, Conservation and Science Directorate (BCS) inviting comments on the Preferred Infrastructure/Amendment Report and updated Biodiversity Development Assessment Report (BDAR) for the Inland Rail Narromine to Narrabri project.

Since BCS provided a response (dated 29 March 2022) to the draft Amendment and Preferred Infrastructure Report, we have liaised with ARTC and their accredited assessors to address residual issues that we identified in our response. We note that additional field surveys have been completed to better identify the impacts the project will have on biodiversity values, and specifically this has confirmed the absence of Coolabah Bertya, a Serious and Irreversible Impact entity. BCS supports the refinement of likely impacts through ongoing field surveys.

As stated previously, BCS would like to acknowledge the responsiveness of the accredited assessors to the feedback we have provided on assessing residual prescribed impacts relating to fauna connectivity in the Pilliga forest. However, BCS continues to have concerns regarding assumptions made on likely impacts to fauna and efficacy of structures, and how this influences the final credit markup. Ongoing liaison between BCS, ARTC and the accredited assessors is required to address these concerns.

Unfortunately, most of the concerns we raised in our March 2022 response regarding the expert report completed for determining the impact of the project on the Koala have not been adequately addressed. The recommendations provided in our previous response, and reiterated in this response, must be addressed so that we can be satisfied the report meets the requirements of the Biodiversity Assessment Method, and that the species credits appropriately reflect the impact of the project on the Koala.

A summary of BCS's recommendations is provided in **Attachment A**. A review of the status of recommendations we made in our response to the draft Amendment and Preferred Infrastructure Report in March 2022 are provided in **Attachment B**, and detailed comments on residual issues are provided in **Attachment C**.

A separate response will be provided relating to comments on the hydrology assessment.

If you require any further information regarding this matter, please contact Renee Shepherd, Principal Project Manager, via (02) 6883 5355 or [renee.shepherd@environment.nsw.gov.au](mailto:renee.shepherd@environment.nsw.gov.au).

Yours sincerely



**Sarah Carr**  
**Director North West**  
**Biodiversity, Conservation and Science Directorate**

23 September 2022

Attachment A – BCS's Summary of Recommendations

Attachment B – BCS's Review of Updated BDAR (Revision E)

Attachment C – BCS's Detailed Comments on Residual Issues

## BCS's Summary of Recommendations

### Inland Rail Narromine to Narrabri (N2N) – Preferred Infrastructure/Amendment Report – Revision E BDAR

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#### Fauna connectivity prescribed impacts – deficiencies will impact on the credit obligation

- 1.1 Revise the analysis of aperture and openness value of each underpass/culvert proposed to be used in offset calculations, to consider the relative widths of single culverts rather than culvert banks.
- 1.2 Remove any proposed dedicated culverts with an unsuitable openness or aperture value for target species from offset calculations.
- 2.1 Provide a definition and appropriate justification behind the condition metrics of Moderate, Good and Excellent for target fauna relating to bridge clearances.
- 2.2 If appropriate justification relating to the suitability of bridge clearances cannot be provided, it is recommended that all bridges are removed from residual prescribed impact calculations for aerial species.
- 3.1 Revise the requirement for mitigation scoring to consider prescribed impacts to connectivity as well as prescribed impacts resulting from train strike.
- 3.2 The accredited assessor should liaise with BCS when refining the residual prescribed impact assessment, given its complexity and impact on the biodiversity credit obligation.
- 4.1 Review the outcomes of BCS's audit of Table 10.12 to 10.17 and revise the sensitivity rating, risk assessment and credit markup accordingly.
- 5.1 Address the minor errors in section 10 of the BDAR identified in this response.

#### Koala expert report – linkage between method and credit obligation not clear

- 6.1 The expert report for the Koala should confirm how the following pieces of information were used to inform the report:
  - the standard Koala survey advice provided to the accredited assessor
  - PCTs associated with the Koala in the TBDC
  - Koala use tree list in the Koala Habitat Information Base Technical Guide.
- 6.2 Further information should be provided in the Koala expert report regarding the species which conform to the *Preferred Koala Food Trees*, and which species are considered to be primary and secondary food trees.
- 6.3 Further justification for the use of Koala generational persistence to determine the species polygon is requested.
- 6.4 Greater clarity is required in the “*species credit polygon*” section of the expert report to summarise the steps taken to determine the final Koala species polygon. This should be prepared in consultation with BCS.
- 6.5 Provide justification for the Koala species polygon extent associated with the Koala scat record located to the northwest of Gilgandra.

#### Data inconsistencies – impacts on final credit obligation

- 7.1 Review the area of impact for each species credit species and ensure all data sources (BDAR, BAM-C and spatial data) are consistent.

## BCS's Review of Updated BDAR (Revision E)

### Inland Rail Narromine to Narrabri (N2N) – Preferred Infrastructure/Amendment Report

Amendment and Preferred Infrastructure Report (Revision B BDAR, 10 February 2022) Recommendation Reference	Summary of BCS Recommendation	Addressed in updated BDAR (Revision E)?	BDAR Reference	Comment and Recommendation(s)
1.1	Refine the focus of the prescribed impact assessment to focus specifically on the residual prescribed impacts to connectivity occurring within the Pilliga forests. This should include removal of the " <i>Weighting of Pilliga importance</i> " modifier from residual prescribed impact assessments and associated calculations in Table 10.12 and Table 10.13 of the BDAR.	Yes	Tables 10.12 and 10.13	The focus of prescribed impact assessment has been refined as suggested and the Weighting of Pilliga Importance has been removed in Tables 10.12 and 10.13 of the BDAR. No further action required.
1.2	The accredited assessor should liaise with BCS when refining the residual prescribed impact assessment, given its complexity and impact on the biodiversity credit obligation.	Yes	N/A	Liaison regarding updates to the BDAR has occurred between BCS and the accredited assessor. It is recommended that further liaison be conducted to address matters raised in this response. Further information has been provided in <b>Attachment C</b> .
2.1	An explicit commitment should be made in the BDAR to install the type, extent and specific number of fauna connectivity structures identified within Table 10.15 of the BDAR.	Yes	10.3.6	Clarification has been provided explaining the process which would be undertaken if any of the proposed fauna connectivity structures were to be modified prior to construction commencing. BCS is satisfied with the clarity which has been provided. No further action required.
2.2	If the proponent does not make a commitment to install fauna connectivity structures listed in Table 10.15 of the BDAR, any associated modifiers to the prescribed impact offset calculations should be removed and the residual prescribed impact should be re- calculated.	Yes	10.3.6	Aspects of the proposed fauna connectivity mitigation and minimisation strategies which cannot be committed to during this phase of the project have been removed from offset calculations. Clarification has been provided explaining the process which would be undertaken if any of the proposed fauna connectivity structures were to be modified prior to construction commencing. No further action necessary.

3.1	The height, compositional attributes and spatial extent of landscaping to be implemented across the project, and how the proponent proposes to create and maintain this landscaping, should be included in Table 10.15 of the BDAR.	Yes	Table 10.17	Landscaping treatments have been removed from residual prescribed impact calculations as the detail necessary could not be committed to during this phase of the project. The proponent has made a commitment to reduce vegetation impacts iteratively over the life of the design development where possible. No further action necessary.
3.2	If the proponent does not make an explicit commitment within the BDAR to undertake landscaping, any associated modifiers to the prescribed impact offset calculations should be removed.	Yes	Table 10.17	Landscaping treatments have been removed from residual prescribed impact calculations as the detail necessary could not be committed to during this phase of the project. The proponent has made a commitment to reduce vegetation impacts iteratively over the life of the design development where possible. No further action necessary.
4.1	Revise the risk matrix and associated credit quantum in Table 10.18 of the BDAR in consultation with BCS.	Yes	Table 10.18 and Table 10.19	The risk matrix and credit quantum within the BDAR have been revised as per BCS recommendations. No further action necessary.
5.1	Analyse the aperture value of each underpass proposed to be used in offset calculations, including the additional width of the entire earthworks required.	No	Table 10.15	The aperture and openness of each proposed dedicated culvert has been analysed as per BCS recommendations. However, the aggregated width of culvert banks has been used rather than individual culverts. Further information has been provided in <b>Attachment C</b> .
5.2	Remove any underpasses with an aperture value of greater than 1:8 from offset calculations.	No	Table 10.15	The aperture and openness of each proposed dedicated culvert has been analysed as per BCS recommendations. However, the aggregated width of culvert banks has been used rather than individual culverts. Further information has been provided in <b>Attachment C</b> .
6.1	Identify the height of each bridge and viaduct in Table C1 in the Preliminary Fauna Connectivity Strategy and revise the potential for candidate species in Table 10.16 of the BDAR expected to benefit from these structures as necessary.	No	Xcel file provided directly to BCS	The height of each bridge and viaduct has been analysed as per BCS recommendations. However, the metrics assigned to each bridge/viaduct have not been explained or justified in the BDAR. Further information has been provided in <b>Attachment C</b> .
7.1	Review the outcomes of BCS's audit of Table 10.12-10.17 and revise accordingly.	No	Tables 10.16-10.17	The identified values have not been changed from the original prescribed impact assessment and no attempt has been made to justify retaining these values. Further information has been provided in <b>Attachment C</b> .
8.1	Undertake further surveys to demonstrate the actual impact to Coolabah Bertya, prior to determination of the project by the consent authority	Yes	Section 6.1	Further surveys for the species were undertaken and its absence from the subject site has been demonstrated in the BDAR. No further action necessary.
8.2	Once surveys have been conducted, liaise with BCS to discuss mitigation strategies for the Coolabah	Yes	Section 6.1	Further surveys for the species were undertaken and its absence from the subject site has been demonstrated in the BDAR. No further action necessary.

	Bertya which will be appropriately commensurate to the likely impact.			
9.1	<p>The expert report for the Koala should confirm how the following pieces of information were used to inform the report:</p> <ul style="list-style-type: none"> <li>the standard Koala survey advice provided to the accredited assessor</li> <li>PCTs associated with the Koala in the TBDC</li> <li>Koala use tree list in the Koala Habitat Information Base Technical Guide.</li> </ul>	No	N/A	<p>The updated expert report dated June 2022 has not been updated to clarify whether the listed data sources have been considered. <b>The recommendation has not been satisfactorily addressed, and has been reinstated in the summary of recommendations in Attachment A.</b></p>
9.2	<p>Further information should be provided in the Koala expert report regarding the species which conform to the <i>Preferred Koala Food Trees</i>, and which species are considered to be primary and secondary food trees.</p>	No	<p>Expert Report dated June 2022 Page 6, Approach to assessment</p>	<p>The updated expert report does not provide a list of the species that have been relied upon as “<i>Preferred Koala Food Trees</i>”.</p> <p>The primary and secondary food tree species are not listed in the report, and their abundance in the project footprint is not described. BCS notes that Figure 2 has been added to the updated report however this figure does not provide any additional detail of which species are been relied upon as “<i>Preferred Koala Food Trees</i>”.</p> <p>The updated expert report states: <i>‘Collectively, all four of the preceding categories constitute suitable koala habitat for assessment purposes. This approach to the classification and ranking of koala habitat differs to that which might otherwise be derived by using the tree use rankings promulgated by a recent review of tree use by koalas in NSW (NSWDPE 2018) but is the superior approach because it is based on a quantitative partitioning of data relating to tree use by koalas rather than the qualitatively and statistically unsupported approach of the alternative.’</i></p> <p>This statement refers to the document ‘<i>A review of koala tree use across New South Wales</i>’ published by the former Office of Environment and Heritage in 2018. The expert report does not identify how the author’s habitat classification method differs from OEH’s report nor does it provide adequate justification for the use of the method that has been used.</p> <p><b>The recommendation has not been satisfactorily addressed, and has been reinstated in the summary of recommendations in Attachment A.</b></p>

9.3	The BDAR and expert report should explain why there is a difference in area between the foraging habitat entered in the BAM-C and the “ <i>ecosystem credit polygon</i> ” in the expert report.	N/A	N/A	The Koala is no longer a dual credit species and therefore foraging habitat for the Koala is no longer represented as an ecosystem credit in the BAM-C. No further action necessary.
9.4	Further justification for the use of Koala generational persistence to determine the species polygon is requested.	No	Expert Report dated June 2022 Page 7, Examination of contemporaneous koala records	<p>The updated expert report dated June 2022 states: <i>‘Because the records themselves are the result of field survey, albeit over a longer and ecologically relevant time frame for koalas, their use in the context of contemporary occupancy assessments such as that required for BAM purposes is considered valid.’</i></p> <p>This is not considered adequate justification for the reliance on generational persistence in the expert report to determine the species polygon. Both the previous expert report (dated January 2022) and the updated expert report (dated June 2022) state: <i>‘Koala records occurring within the resulting grid-cell series for the 3 consecutive koala generations 2003 – 2020 were obtained from the NSW BioNet Atlas’</i></p> <p>Given the reliance on generational persistence in the expert report, it is imperative that as many data sources as possible have been interrogated to identify Koala records. The expert report should confirm whether data sources other than the NSW BioNet Atlas were reviewed to ensure an inclusive data set was used.</p> <p><b>The recommendation has not been satisfactorily addressed, and has been reinstated in the summary of recommendations in Attachment A.</b></p>
9.5	Greater clarity is required in the “ <i>species credit polygon</i> ” section of the expert report to summarise the steps taken to determine the final Koala species polygon. This should be prepared in consultation with BCS.	No	Expert Report dated June 2022 Page 10	The expert report states that the final species credit polygon was determined by considering “ <i>records analysis and field survey</i> ” to create an “unrefined polygon” of 349.16 hectares. This area was then refined by calculating the total area of preferred/potential koala habitat present, generating a final species polygon of 260.44 hectares. Further explanation of this process is required to ensure there is no ambiguity in the method applied. As previously stated in BCS’s comments (dated 29 March 2022), it is not clear how the outcomes of field surveys (previously undertaken by the accredited assessor, as a result of the drone surveys, and by the expert for this report) have contributed to the final polygon.

				<p>BCS notes from analysis of the spatial data that there are areas of potential habitat along the alignment that have not been surveyed, however there is no justification provided in either the BDAR or expert report regarding why these areas have been excluded.</p> <p>BCS note the inclusion of Figures 5 and 6 in the updated report which show the locations of koala surveys completed by Jacobs GHD, results of the drone survey and the identified areas of 'generational persistence'. However, these figures alone do not provide adequate justification for the exclusion of areas of potential habitat along the alignment.</p> <p>In summary, BCS welcomes the opportunity to gain a greater understanding of the methodology used in the expert report to determine the Koala species polygon. Additional information is required for BCS to be satisfied that the final Koala species polygon has been appropriately determined and that the methodology has been adequately justified.</p> <p><b>The recommendation has not been satisfactorily addressed, and has been reinstated in the summary of recommendations in Attachment A.</b></p>
10.1	Review the area of impact for each species credit species and ensure all data sources (BDAR, BAM-C and spatial data) are consistent.	No	Table 13.3 of BDAR	BCS have reviewed the updated spatial layers provided for all species against the BAM-C and updated BDAR and note that small inconsistencies between the layers and the BDAR and BAM-C remain. These inconsistencies are detailed in <b>Attachment C</b> .
11.1	Provide BCS with an updated spatial layer for the Little Eagle and Square-tailed Kite polygons that are consistent with the BDAR and BAM-C.	No	Table 13.3 of BDAR	BCS have reviewed the updated spatial layers provided for the Little Eagle and Square-tailed Kite polygons and note that small inconsistencies between the layers and the BDAR and BAM-C remain. These inconsistencies are detailed in <b>Attachment C</b> .
12.1	The assessor should generate and attach a biodiversity credit report (like-for-like) from the BAM-C to the BDAR.	Yes	Appendix K	Like-for-Like credit reports have been attached to the revised BDAR. No further action required.



## BCS's Detailed Comments on Residual Issues

### Inland Rail Narromine to Narrabri (N2N) – Preferred Infrastructure/Amendment Report

#### Fauna connectivity prescribed impacts – deficiencies will impact on the credit obligation

1. The aperture of underpasses which have been used in prescribed impact calculations may need to be revised, or underpasses be removed from offset calculations

Section 4.2.2 of the Preliminary Fauna Connectivity Strategy states that:

*The size or “openness” of an underpass appears to be the primary factor influencing fauna crossing rates. Wherever possible, the height and width of underpasses should be maximised so that fauna can see habitat on the other side (VicRoads 2012). The optimal relative aperture should have a length/opening width or height ratio of less than eight (TMR 2010). In addition, landscaping treatments must ensure that the entrance of the culvert is not covered by vegetation.*

In our previous response, BCS highlighted concerns that that aperture values of some underpasses have not been considered and is less than what would be required to facilitate passage of fauna. It was recommended that an analysis of all culverts proposed to facilitate fauna passage be conducted.

In the revised PIR the proponent has determined both the aperture ratio (length x height) (TMR 2010) and the openness ratio (length x width x height/length) of proposed dedicated fauna underpasses. Table 10.15 of the revised BDAR states:

*“All culverts are assumed to comprise banks of three 2.4 metre wide culverts to maximise aperture (width x length) and openness (width x height x length).”*

In the revised BDAR, the aggregated width of culvert banks has been used to determine the openness ratio of dedicated culverts, rather than the width of single culverts within the culvert bank. For example, for culvert ID 706000 the width of 7.2 metres has been used in calculations (three side-by-side culverts) to determine an openness value of 0.44 (7.2m x 0.9m / 14.68m) rather than the openness value of 0.15 for a singular culvert within the three side-by-side culvert bank (2.4m x 0.9m / 14.68m).

BCS question why aggregated culvert bank width rather than individual culvert width has been used in openness calculations. The factors primarily influencing fauna passage relate to the amount of light present within a single culvert and the perceived risk for fauna entering a single culvert with limited visibility of an exit (Armstrong and Francis 1997)<sup>1</sup>. It is noted that if the width of a single culvert was used in openness calculations, none of the proposed dedicated culverts (according to the definitions for openness suitability provided in the BDAR) would be suitable for medium or large mammals. As such, it is critical for the overall assessment of mitigation efficacy that the value of dedicated culverts for target species is appropriately analysed.

BCS recommend that the analysis of culvert openness and aperture is revised to consider the relative width of single culverts rather than aggregated culvert banks. Any proposed dedicated

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<sup>1</sup> Armstrong, P and Francis, D (1997) *Culvert modifications to assist wildlife movement. Greening Australia – Queensland (Inc.)*

culverts with an unsuitable openness or aperture value for target species should be removed from offset calculations.

#### Recommendations:

- 1.1 Revise the analysis of aperture and openness value of each underpass/culvert proposed to be used in offset calculations, to consider the relative widths of single culverts rather than culvert banks.
- 1.2 Remove any proposed dedicated culverts with an unsuitable openness or aperture value for target species from offset calculations.

## **2. The height of bridges and viaducts used in residual prescribed impact calculations should be considered for their potential use by target fauna**

In our previous response it was stated that “BCS has concerns that given the incised and narrow nature of some of the creek lines within the Pilliga, the associated bridges proposed to be installed may be low to the ground. The relative height of each bridge to be installed may affect their potential use by some fauna species i.e. aerial species including birds and microbats. The height of each bridge should be identified in Table C.1 and the potential benefit for each species in Table 10.16 should be further considered.”

In the revised BDAR the average clearance of each bridge has been calculated and a suitability for fauna metric has been assigned to each bridge. A summary of the outcomes of this assessment has been replicated in Table 1 below.

**Table 1: Average bridge height and fauna suitability evaluation**

Bridge Chainage No.	Average Clearance (metres)	Suitability for Fauna
250-BR786808	5.7	Good
250-BR834541	6.3	Good
250-BR747768	6.3	Good
250-BR789380	7.4	Moderate
250-BR783652	10.9	Moderate
250-BR767941	1.2	Excellent
250-BR773373	2.0	Excellent
250-BR805743	2.1	Excellent
250-BR809114	2.3	Excellent
250-BR756787	2.7	Excellent
250-BR779828	2.7	Excellent
250-BR817058	2.9	Excellent
250-BR796414	2.9	Excellent
250-BR752712	3.0	Excellent
250-BR800445	3.0	Excellent
250-BR817650	3.3	Excellent
250-BR763460	3.4	Excellent
250-BR817325	3.4	Excellent
250-BR817258	3.4	Excellent

250-BR817573	3.4	Excellent
250-BR779635	3.4	Excellent
250-BR749279	4.1	Excellent
250-BR828222	4.2	Excellent
250-BR834450	4.3	Excellent
250-BR769143	4.4	Excellent
250-BR835640	4.7	Excellent
250-BR781523	4.8	Excellent
250-BR834764	5.4	Excellent

The decision logic behind the fauna suitability metrics of “*Excellent, Moderate and Good*” for each bridge have not been defined or justified within the BDAR. In addition, it is unclear to BCS how the different metrics have been assigned, as relative bridge height does not seem to have a correlative relationship with fauna suitability ratings.

As per our original response, BCS are concerned that bridges may have limited or no suitability for aerial species including birds and microbats, which may preferentially fly over low bridges (exposing them to train strike risk) rather than fly under. This should be discussed and appropriately justified with evidence in the BDAR. If appropriate evidence cannot be provided it is recommended that all bridges are removed from residual prescribed impact calculations for aerial species.

#### Recommendations:

- 2.1 Provide a definition and appropriate justification behind the condition metrics of Moderate, Good and Excellent for target fauna relating to bridge clearances.
- 2.2 If appropriate justification relating to the suitability of bridge clearances cannot be provided, it is recommended that all bridges are removed from residual prescribed impact calculations for aerial species.

### **3. The requirement for mitigation should address the prescribed impacts to connectivity as well as the prescribed impacts of train strike**

Section 10.3.5 of the revised BDAR states:

*“The requirement for mitigation is based on the risk of fatality, with the score here the opposite of the risk of fatality score provided in **Error! Reference source not found.** (ie. 100-risk of fatality score).*

*The mitigation score has then been calculated by multiplying the mitigation rating by the requirement for mitigation as a percent. The mitigation score represents how well the mitigation measures counteract the risk of fatality.”*

From review of Table 10.17 within the BDAR, the requirement for mitigation scoring for each impacted species will, in some cases, have a significant effect on the final risk evaluation and associated credit obligation assigned for prescribed impacts (Table 10.18 of the BDAR).

Given that for most species assessed the risk of train strike would be considered marginal when compared to the impacts resulting from the loss of connectivity, BCS consider that both prescribed impacts should be represented in the requirement for mitigation scoring.

BCS acknowledges the complexity of the residual prescribed impact assessment that has been developed for this project. BCS also acknowledges that articulating the outcomes of a critical analysis of the variables and inputs used for residual prescribed impact calculations, and methods created to undertake these calculations, is difficult to achieve in a response like this. As such, BCS invites the accredited assessor to liaise with us regarding the appropriateness of residual prescribed impact calculations when addressing this response.

#### Recommendations:

- 3.1 Revise the requirement for mitigation scoring to consider prescribed impacts to connectivity as well as prescribed impacts resulting from train strike.
- 3.2 The accredited assessor should liaise with BCS when refining the residual prescribed impact assessment, given its complexity and impact on the biodiversity credit obligation.

#### **4. Prescribed impact predictions will need to be supported with further evidence or revised**

In our previous response, BCS identified values assigned to the expected impact and/or mitigation response in Tables 10.12 to 10.17 of the BDAR which were not considered to be adequately supported with valid evidence. It was recommended that a precautionary approach be adopted in circumstances where there is insufficient evidence to support the assigning of an impact or mitigation efficacy value.

In the revised BDAR the identified values have not been changed from the original prescribed impact assessment and no attempt has been made to justify retaining these values. As such BCS reiterates our request for these values to be revised.

BCS have provided a table of all the values identified in our previous response below (Table 2). To assist the accredited assessor in determining a precautionary credit obligation for the identified values, BCS have also supplied suggestions of alternatives considered to be appropriately precautionary.

#### Recommendation:

- 4.1 Review the outcomes of BCS's audit of Table 10.12 to 10.17 and revise the sensitivity rating, risk assessment and credit markup accordingly.

#### **5. Minor amendments to section 10 of the BDAR are required**

In review of the updated BDAR BCS have identified some minor aspects of the BDAR requiring edits or revisions, these are:

- Section 10.3.2 of the BDAR states that *"For the proposal, the width of the rail corridor varies between around 40 to 60 metres, with larger gaps up to around 95 metres wide are created where compound sites are located adjacent to the rail corridor"*. This statement is contradicted by the information presented within Figure 17 of the BDAR which displays that gap widths of greater than 250 metres are expected to occur.
- Section 10.3.5 of the BDAR provides a rating for the benefit provided by fauna passage installations, being *low-high, no need for mitigation and not possible*. Each metric in this rating system should be provided with a definition to explain how each have been assigned.
- Table 10.17 of the BDAR provides a mitigation rating for each species. It is understood that each value in the Mitigation Rating column of Table 10.17 represents a decimal number, however no decimal points have been provided for these values.

#### Recommendation:

- 5.1 Address the minor errors in section 10 of the BDAR identified in this response.

**Table 2: Residual Prescribed Impact Audit**

Metric and current value	Species	Alternative Value Suggested	Comments
Table 10.12 Vulnerability to Loss of Connectivity; and Table 10.13 Train Strike Risk			
Gap Threshold (<60 metres)	Rufous Bettong	<50 metres	Insufficient evidence, outside of anecdotal observations, have been provided to justify the assignment of a gap threshold of greater than 50 metres.
Gap Threshold (<100 metres)	Diamond Firetail	<60 metres	The primary source of literature relied upon to provide evidence for gap crossing capability is not species specific. Rather it proposes general connectivity recommendations for an aggregation of both threatened and non-threatened woodland birds and references a minimum separation gap of ~100 metres as a general recommendation.  In the absence of species-specific literature referencing the species' biology and capability to traverse unforested gaps, a more precautionary gap threshold should be assumed.
	Flame Robin		
	Hooded Robin		
	Speckled Warbler		
	Varied Sittella		
Table 10.16 Connectivity structures by species and linear impact			
Bridge or Viaduct (Number–23)	Brown Treecreeper	Value should be determined by the number of viaducts and bridges which would be high enough to facilitate passage for aerial species.	BCS considers that the relative height of bridges within the Pilliga may significantly affect the potential use by aerial species. The assessor should consider the height of each of the 23 bridges proposed to provide connectivity and passage to these species. See recommendation 8.1 of this response.
	Diamond Firetail		
	Flame Robin		
	Hooded Robin		
	Speckled Warbler		
	Bush Stone-curlew		
	Grey-crowned Babbler		

Metric and current value	Species	Alternative Value Suggested	Comments
	Corben's Long-eared Bat		
	Large-eared Pied Bat		
	Little Pied Bat		
	Yellow-bellied Sheath-tail bat		
	Eastern Bentwing		
Underpass (Number)	Koala	This value should be determined by the number of underpasses which would have a sufficient aperture to facilitate passage.	A variety of dedicated underpasses of different sizes have been proposed to facilitate fauna passage. These numbers will require revision once the relative aperture ratio of each underpass is assessed for its potential mitigation efficacy. See recommendations 7.1-7.2 of this response.
	Black-striped Wallaby		
	Rufous Bettong		
	Eastern Pygmy Possum		
	Pilliga Mouse		
Underpass (Weighting – 0.5)	Koala	0.25	<p>The evidence provided to support underpass efficacy for the Koala primarily includes reference to grey literature i.e. government guidelines and mitigation monitoring programs required for developments.</p> <p>The primary source of peer reviewed literature relied upon to assign weighting is the sand-trap survey monitoring of purpose-built culverts along a 1.4-kilometre section of the Pacific Highway at Brunswick Heads, north-east New South Wales. This investigation identified limited use by the Koala i.e. two instances of underpass use.</p> <p>In the absence of peer-reviewed studies showing reliable and habitual use of underpasses by the Koala a precautionary weighting should be assumed.</p>
	Black-striped Wallaby	0.25	<p>The evidence provided to support underpass efficacy for the Black-striped Wallaby primarily includes reference to grey literature i.e. government guidelines and mitigation monitoring programs required for developments.</p> <p>The primary source of peer reviewed literature relied upon to assign weighting is the sand-trap survey monitoring of purpose-built culverts along a 1.4-kilometre section of the Pacific Highway at Brunswick Heads, north-east New South</p>

Metric and current value	Species	Alternative Value Suggested	Comments
			<p>Wales. This investigation is not specific to the biology and behaviour of Black-striped Wallaby and instead provides some evidence of general macropod use.</p> <p>In the absence of species-specific literature referencing the species' biology and behaviour to reliably and habitually use underpasses, a precautionary weighting should be assumed.</p>
	Rufous Bettong	0.1	<p>The evidence provided to support underpass efficacy for the Rufous Bettong primarily includes reference to grey literature i.e. government guidelines and mitigation monitoring programs required for developments.</p> <p>The primary source of literature relied upon to assign weighting is the sand-trap survey monitoring of purpose-built culverts along a 1.4-kilometre section of the Pacific Highway at Brunswick Heads. This investigation is not specific to the biology and behaviour of the Rufous Bettong and instead provides some evidence of general macropod and Potoroo use.</p> <p>In addition, BCS is concerned that there is an absence of detail regarding the landscaping which will be committed to for the project. Also, there is a notable lack of targeted treatments being proposed to incentivise use of underpasses for small terrestrial mammals. For example, internal structures inside the underpass to provide shelter and refuge.</p> <p>Given the absence of targeted species incentivisation being committed to in Table 4.3 of the Preliminary Fauna Connectivity Strategy and in the absence of species-specific literature referencing habitual use of underpasses, a precautionary weighting should be assumed.</p>
	Eastern Pygmy Possum	0.1	<p>The primary source of literature relied upon to assign weighting is the monitoring of purpose-built culverts at Mt Higginbotham, Victoria. This investigation is specific to the biology and behaviour of the Mountain Pygmy Possum and included the installation of structures to specifically facilitate movement of Mountain Pygmy Possum i.e. 60 metre-long corridors of basalt rocks.</p> <p>BCS considers it unlikely, given the Mountain Pygmy Possums unique habitat requirements i.e. scree escarpments, that the same efficacy of underpasses would be equivalent to Eastern Pygmy Possum. This is supported in Mansergh and Scotts (1989) paper which states, "<i>the animals use of the structures can probably be attributed to the unique habitat requirements and social organization of the species</i>".</p> <p>In addition, BCS is concerned that there is an absence of detail regarding the landscaping which will be committed to for the project. Also, there is a notable lack of targeted treatments being proposed to incentivise use of underpasses for small terrestrial mammals. For example, internal structures inside the underpass to provide shelter and refuge.</p> <p>Given the absence of targeted species incentivisation being committed to in Table 4.3 of the Preliminary Fauna Connectivity Strategy and in the absence of species-specific literature referencing habitual use of underpasses, a precautionary weighting should be assumed.</p>
	Pilliga Mouse	0.1	<p>The evidence provided to support underpass efficacy for the Pilliga Mouse primarily includes reference to grey literature i.e. government guidelines and mitigation monitoring programs required for developments.</p> <p>The primary source of literature relied upon to assign weighting is the monitoring of purpose-built culverts at Mt Higginbotham, Victoria and reference to grey literature i.e. government guidelines. These investigations are not specific to the biology and behaviour of the Pilliga Mouse and instead provides some evidence of general terrestrial fauna use.</p>



Metric and current value	Species	Alternative Value Suggested	Comments
			<p>In addition, BCS is concerned that there is an absence of detail regarding the landscaping which will be committed to for the project. Also there is a notable lack of targeted treatments being proposed to incentivise use of underpasses for small terrestrial mammals. For example, internal structures inside the underpass to provide shelter and refuge.</p> <p>Given the absence of targeted species incentivisation being committed to in Table 4.3 of the Preliminary Fauna Connectivity Strategy and in the absence of species-specific literature referencing habitual use of underpasses, a precautionary weighting should be assumed.</p>
Canopy Bridge (Weighting – 0.5)	Squirrel Glider	0.25	<p>The evidence provided to support rope bridge efficacy for the Squirrel Glider only includes reference to grey literature i.e. government guidelines and mitigation monitoring programs required for developments.</p> <p>The primary study used is the mitigation monitoring for the Woolgoolga to Ballina Pacific Highway Upgrade. The final report for this study (Sandpiper Ecological Surveys 2020) has shown only a very limited number of crossings being detected over three years of monitoring i.e. 35 complete crossings over a cumulative 2940 days of monitoring.</p> <p>In the absence of peer-reviewed studies showing reliable and habitual use of rope bridges by the Squirrel Glider, a precautionary weighting should be assumed.</p>
Canopy Bridge (Weighting – 0.5)	Eastern Pygmy Possum	0	No evidence has been provided to support the statement that the Eastern Pygmy Possum reliably and habitually utilises canopy bridges.
Barrier Poles (Weighting – 0.25)	Corben's Long-eared Bat	0	The evidence provided to support barrier pole efficacy for microbats only references scientific literature relevant to avifauna mortality and mitigation efficacy.
	Large-eared Pied Bat		
	Little Pied Bat		
	Yellow-bellied Sheath-tail bat		
	Eastern Bent wing Bat		
Landscaping (Score)	Koala	The efficacy of landscaping for each species will	<p>No detail regarding the landscaping which will be implemented has been provided.</p> <p>BCS cannot provide comment on the efficacy of landscaping for candidate species until key factors such as landscaping height, compositional attributes and spatial extent are detailed in the BDAR. In addition, the proponent's commitment to</p>
	Rufous Bettong		



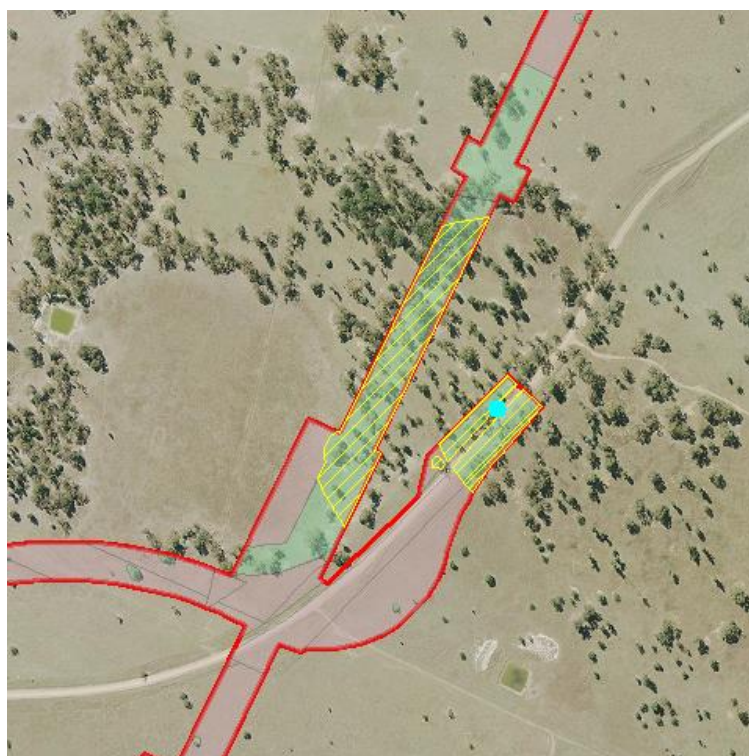
Metric and current value	Species	Alternative Value Suggested	Comments
	Black-striped Wallaby	be contingent on the landscaping detail the proponent is committing to establishing and maintaining.	create and maintain landscaping according to these details will also be required. See recommendations 4.1-4.2 of this response.
	Eastern Pygmy-possum		
	Pilliga Mouse		
	Pale-headed Snake		
	Bush Stone-curlew		
	Brown Treecreeper		
	Diamond Firetail		
	Flame Robin		
	Grey-crowned Babbler		
	Hooded Robin		
	Speckled Warbler		
	Turquoise Parrot		

## Koala expert report – linkage between method and credit obligation is not clear

### 6. Justification of the final koala species polygon is insufficient

Recommendations listed in BCS's response dated 29 March 2022 regarding the expert report prepared for the koala, how it relates to the BAM, and the validity of the final species polygon, have been reinstated in this response. See **Attachment A** for a summary of the relevant recommendations (6.1 – 6.4).

Additionally, BCS notes that a polygon has been added to the Koala species polygon for the area of habitat associated with a Koala scat record located to the northwest of Gilgandra during the field surveys completed to inform the expert report. It is not clear from the expert report how the extent of this polygon was determined. The polygon (shown below in yellow hatching) does not include the full extent of PCT 56 in the broader vegetation patch.



#### Recommendation:

- 6.5 Provide justification for the Koala species polygon extent associated with the Koala scat record located to the northwest of Gilgandra.

## Data inconsistencies – impacts on final credit obligation

### 7. Inconsistencies exist between the BDAR, BAM-C and spatial data for some species polygons

The areas for each species polygon presented in the BDAR are consistent with the BAM-C, however they are not consistent with the spatial data provided for a number of species. The inconsistencies are detailed below:

Species	Area (ha) in BDAR and BAM-C	Area (ha) in spatial data
<i>Commersonia procumbens</i>	572.9	573.04
Eastern Pygmy Possum	835.5	835.74
Koala	260.1	260.44
Little Eagle	465.8	465.4
Masked Owl	185.8	185.97
Pale-Headed Snake	286.4	49.99
Slender Darling Pea	50.1	50.08
Square-tailed Kite	407.3	407.09
Squirrel Glider	651	651.26
Winged Peppercreess	175.8	175.86

**Recommendation:**

- 7.1 Review the area of impact for each species credit species and ensure all data sources (BDAR, BAM-C and spatial data) are consistent.