NSW EPA

PCU042266

Department of Planning
Received
7 MAR 2013
Scanning Room

Your reference: SSI-4963
Our reference: DOC12/52029
Contact: Robert Donohoe, (02) 6640 2518

- 5 MAR 2013

Mr Michael Young
Senior Planner, Infrastructure Projects
Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

Dear Mr Young

Pacific Highway Upgrade – Woolgoolga to Ballina Project (SSI-4963) – Exhibition of Environmental Impact Statement

I refer to the Environment Protection Authority's (EPA) comments on the Environmental Impact Statement (EIS) for the Woolgoolga to Ballina Pacific Highway Upgrade Project, and accompanying technical working papers, which were provided to you last week. I undertook to provide the biodiversity comments separately.

These comments are attached and I apologise for the delay in providing these to you.

As noted previously, the biodiversity comments include comments on the potential impacts to the endangered coastal emu populations. In 2012, the EPA met with Roads and Maritime Services to discuss designated emu underpasses and crossings. Agreement was reached on heights for four or five of these structures.

Subsequently, additional information has been received which has enabled the EPA to focus in more detail on critical emu crossing locations. Commentary on these sites is provided in the attachment. The EPA is recommending that the Department of Planning and Infrastructure (DP&I) convenes further meetings with RMS and EPA to discuss opportunities to further enhance connectivity options for the coastal emus.

The EPA acknowledges that the proponent is currently undertaking further critical work to enhance the detail provided in relation to flora and fauna survey effort and additional mitigation commitments have been presented to deliver on specific flora and fauna management plans and project mitigation. If the proponent presents the DP&I with significantly amended EIS documentation in relation to biodiversity, the EPA would appreciate the opportunity to undertake a targeted review of the amended documents prior to finalising the approval.

Nonetheless, based on this assessment of the EIS the EPA has determined that it is able to support the proposal, subject to the biodiversity and NPWS issues of concern (provided separately) being satisfactorily addressed and any recommended conditions of approval being appropriately considered and adopted.

I also wish to reiterate that if the project is approved, it will require an Environment Protection Licence as these activities are scheduled under the provisions of the *Protection of the Environment Operations Act 1997* (POEO Act). The proponent will need to make a separate application to the EPA to obtain this licence if project approval is granted.

PO Box 498 Grafton NSW 2460
NSW Government Offices
49 Victoria Street Grafton NSW
Tel: (02) 6640 2500 Fax: (02) 6640 2539
ABN 30 841 387 271
www.environment.nsw.gov.au

If you have any questions, or wish to discuss this matter further please contact Robert Donohoe (6640 2518).

Yours sincerely

BRETT NUDD
Manager North Coast Region
Environment Protection Authority

Attachment 1: EPA Comments on the Biodiversity Technical Working Paper and EIS Chapter 10

NSW EPA
ENVIRONMENT PROTECTION AUTHORITY

ATTACHMENT 1 – BIODIVERSITY COMMENTS ON THE EIS FOR THE WOOLGOOLGA TO BALLINA UPGRADE OF THE PACIFIC HIGHWAY

Project:	Pacific Hwy Upgrade – Woolgoolga to Ballina Project (SSI-4963)		
Document title:	Environmental Impact Statement Chapter 10 Biodiversity and Working Paper - Biodiversity Assessment		
Revision No.:	November 2012 Final		
Reviewer name:	Craig Harré	Review date:	04/12/12 to 18/02/13
Responses by:		Response due:	18/02/2013

Thank you for the opportunity to comment on the Project's **Working Paper: Biodiversity Assessment November 2012.** The EPA has reviewed the Assessment and has outlined key areas of concern and recommendations in the table below.

Reference	EPA comment	RMS Response
Table 2-15 Page 63	As previously commented during the adequacy review of the EIS, the EPA recommends the inclusion of reporting and spatial representation of survey effort and threatened species habitat mapping. The EPA understands these issues are currently being addressed and will be incorporated into the Preferred Infrastructure Report. An excellent example of the level of information being sought for the key threatened species can be found on page 430 of the EIS. This section of the EIS commits to the following targeted survey and habitat mapping for the Pink Underwing Moth and Atlas Rainforest Ground Beetle. The EPA supports these surveys and habitat mapping being undertaken and notes that this requirement is also reflected in the DGRs.	
Figure 3-34	Given the diversity of symbols used it would be beneficial if Figure 3-34 provided names or an intuitive abbreviation to assist with interpreting threatened species records. It is not stated that these are records created from the project field surveys (so therefore may include all collated threatened species records?). It is	

	recommended that all threatened species records be included on this map or on a separate map if needed.	
Page 273 Genetic pilot study	It is noted that the following two objectives of the genetic pilot study do not appear to have been addressed: • *Estimate the total population size and structure and the range of group territories through replicated surveys designed as a Mark Capture Recapture study* • *Identify the proportion of the population using habitat around the alignment in the Pillar Valley /Tucabia area and therefore potentially impacted by the project (using the total population size data).* • The EPA suggests that an objective which focuses on post-construction population impacts (if any) and the effectiveness of the mitigation measures would be appropriate and could be addressed through continued genetic sampling and analysis. Given the limitations of the data currently available to support the significance assessment and proposed mitigation measures, the EPA recommends that the precautionary approach is adopted, particularly in relation to mitigation and offset planning for the Coastal Emu. The EPA discussed with RMS raising five of hydrological structures to facilitate Emu passage under the upgrade. Since those discussions, further data has been gathered which suggests that additional benefits would be derived for emu passage if other structures were modified. This is discussed in more detail below. The EPA suggests that DP&I convenes a meeting specifically targeted at reviewing other structures to facilitate emu passage.	
Table 3-18	*Mixophyes iteratus* records should to be updated to reflect the new record at Halfway Creek. Also, I refer to prior EPA advice on a possible *Mixophyes iteratus* population at Firth Heinz Road (Black Snake Creek?) and ask that it be investigated.	
Page 308	The EPA believes that the microbat searches need to be broadened to include searches and surveys in culverts planned for demolition or that may be impacted during construction. These surveys need to take place now to evaluate impacts and prior to construction to inform mitigation and to avoid a similar situation as	

	occurred at the Brunswick River with the demolition of the bridge there.	
4.2.3 Avoidance during detailed design	The biodiversity conservation principles applied to ancillary site selection should also apply to rest areas and truck weigh stations.	
Page 327	The commitment that *"identified high value habitat for threatened species or threatened ecological communities would not be considered further as ancillary sites"* is supported. However, it is important that these features are clearly defined in an objective and measurable way so there is no confusion when construction commences.	
Page 343	*Lindsaea incisa* occupies a very narrow niche in an environmental gradient and is therefore vulnerable to changes in climatic conditions and drainage patterns. The project has located only four populations of this species over a 155km study area (that is, a very extensive area), which illustrates the susceptibility of this species. It is stated "…. *however it is likely that there are other locations of Lindsaea incisa in adjacent areas of habitat not surveyed which could reduce the proportion of the population being impacted".* The EPA is of the view that in the absence of an assessment of adjacent areas the *precautionary principle* should be applied and, in the absence of survey data, it should be assumed that no *Lindsaea incisa* is present in nearby areas. The EPA is of the view that reducing proportional species impacts should only occur if there is specific evidence to sustain such and a decision.	
Page 345	The EPA supports the "*proposed seed collection and propagation program be implemented for Melaleuca irbyana near the project boundary".* This proposal would benefit from early planning by the RMS Environment Branch,, rather than leaving it to the construction contractor. It is noted that there is an ample window of opportunity for seed harvesting over the post-approval to pre-construction phase of the project.	
Page 365	The EPA notes that while this species may be widespread within the bioregion, consideration must be given to the importance of the Rufous Bettong population throughout the Halfway Creek, Wells Crossing, Glenugie and Pillar Valley area. The remnant vegetation in this area is predominantly intact and provides ideal habitat and resources to support the largest known population of Rufous Bettong on the NSW North Coast. This view is supported by the high number of road killed specimens, which also suggests this species is not necessarily deterred by	

	the road corridor. Given the importance of this population and the likelihood of encountering this species during construction, the EPA recommends the Rufous Bettong population is included in the list of threatened species requiring development of management plans.	
Page 416	The Emu exclusion fencing should be designed to prevent Emus from attempting to move through the fencing and harming themselves. Emu farmers and handlers have observed Emus injuring themselves on chain mesh fencing. This has been alleviated by placing a dense shadecloth over the fence. The EPA is seeking input into an Emu exclusion fence design. The EPA supports the commitment to build the fencing prior to commencement of construction. The concept of using vegetation as a fence has limited merit as it can never completely prevent fauna movement, is susceptible to fire and has a lengthy establishment period.	
Table 5-4 Emu management plan	As commented directly above the vegetated fence will have limited effectiveness. Therefore it should be used in conjunction with a chain mesh fence to exclude the Emu from the road. The EPA recommends that baseline monitoring of Emu movement should commence now. This will provide sufficient lead time to address any difficulties.. The EPA and RMS have previously identified five major emu underpasses and agreed on heights. These agreements stand. Nonetheless, in light of additional information, the EPA has given further consideration to facilitating emu passage and recommends further enhancements for discussion with RMS. The values of each site are outlined below: The survey data indicates that the *priority* Emu crossing zone starts at the bridge over **Pillar Valley Creek 1 (ch46.074)** and extends to **ch59.28** (covering approximately 15km).This priority area provides direct links from the coastal foothills to the Coldstream wetlands and Emus' breeding grounds. There are high numbers of road kills and Emu sightings in this entire zone and additionally there are movement hotspots within this zone which coincide with westerly flowing waterways which also frequently correspond to proposed upgrade	

	crossing structures. • Bridges over **Pillar Valley Creek 4 (ch47.622)** and an **unnamed tributary of Pillar Valley Creek (ch47.925)** are essentially known as **White Bridge** (location). This represents one of the *highest priority* crossing hotspots as Emus are regularly seen travelling through here from the foothills, travelling along watercourses and following water holes and across the existing road to the adjacent wetlands. There is a distinct open vista to the wetlands at this location which would be a driver for likely Emu passage beneath a roadway structure. • The next structure further north at **ch48.300** is the proposed (latent) **Emu overpass**. The EPA understands this structure will be retrospectively fitted over the highway if the current proposed mitigation fails. It will be critical to ensure that the overpass is properly situated. It is currently planned at the top of a very steep ridge. This is likely to result in little or no Emu use. Emus are not known to traverse steep ridge tops in this location. Emus have been observed travelling along the water holes and creeks that provide links between the forest and the wetlands. Alternatively Emus are regularly seen travelling through paddocks, woodlands or low traffic volume roads. The EPA believes the overpass is unlikely to provide a suitable connectivity outcome for Emus in its current planned location.. • Further north is **Mitchell Road Bridge ch48.761** which is a low traffic volume dirt road. There are regular Emu sightings on this road which will likely continue during highway operation. It is logical to provide a wide and high opening under the upgrade to facilitate this anticipated regular movement. There is no clearance figure provided in the connectivity structures table but, potentially, the bridge clearance here is high enough to facilitate farm machinery (that is >3.6m, up to 5.5m). Irrespective, it is recommended that this opening is as high as possible. • The next bridge north is known as **North of Pillar Valley 1 ch49.265** and is 120m long. This structure falls within the group of *highest priority* crossing locations as this structure could provide a link to the known Emu nest locations on the western side of the upgrade. These nesting sites are just above the limits of the wetland flood levels and are within	

	dense understorey forest. • The next bridge north is known as **North of Pillar Valley 2 ch50.299**. This bridge is <1km from the bridge mentioned above and also provides connectivity to the known Emu nest sites. Whilst this bridge is important, it falls within the *moderate priority* category as it is in the same catchment as the creek above and is also close to a large hill. Therefore the EPA suggests that the clearance beneath this bridge could be reduced to 5.5m. • The next identified Emu crossing structure is a 2.4m x 3.6m rectangular concrete box culvert **(RCBC)** at **ch51.43.** This location is ideal for a functional Emu crossing structure as the highway will swing in close to the wetlands at this location, providing ease of access to seasonal habitat and a good visual cue to adjacent wetlands to encourage movement under the road. Any increase in height or the option of a bridge structure in place of the culverts would be welcomed. • **Firth Heinz Road overpass ch51.86** has been identified as the *2nd highest priority* location for consideration as a dual use overpass. There are frequent Emu sightings along this road and within the adjoining properties. There is a reasonably high probability that the overpass would provide functional Emu passage if it were widened to 20m, provided there was sufficient screening from highway traffic below, was planted with low preferred habitat and does not have overly steep approaches (say <1:5). It is more conceivable that Emus will find and cross the overpass when travelling from the east to the west. Opaque fencing will play a significant role when travelling in the reverse direction; that is from the open wetlands towards the highway and forest. • The next bridge structure north is located at **Chaffin Creek ch52.438**. This is considered a *high priority* area as Chaffin Swamp is virtually adjacent to the upgrade at this location and could be seen quite easily if the bridge were raised enough. Clearance is currently proposed at 3.6m. RMS should be asked to consider an increase in height. • The next structure immediately north at **ch52.605** is a proposed **RCBC** 3.6m x 2.1m (height). Clearly this structure is too low for Emus as it is	

	only centimetres from their heads and should not be considered as an emu underpass. • Further north to **ch53.710** is another **RCBC** 3.6m x 3.6m. This structure is in an *ideal location* as it links Chaffin Hill to Chaffin Swamp. This would be another site for a bridge option. • The bridge over Chaffin Creek ch54.706 is subject to inundation and this will limit its effectiveness for emu movement. • The next effective Emu crossing structure north is the **Bostock Road overpass ch55.499**. The structure is ideally situated to provide access to Chaffin Swamp and represents the *highest priority* location for a dual use overpass. There is a reasonably high probability that the overpass would provide functional Emu passage if it were widened to 20m, provided sufficient screening from highway traffic below, was planted with low preferred habitat and is not overly steep on the approaches (say <1:5). • The next two structures are virtually adjacent to one another, being **Somervale Road bridge ch56.898** and **Champions Creek ch57.027**. The height of the Somervale Bridge is not given. Clearance under the Champions Creek Bridge is proposed at 3.6m. *The structure over Champions Creek is considered the **single most important structure** for potential Emu passage on the upgrade.* This area is at the western limit of a series of interconnected pools known as Stokes Waterholes. Emus frequent this feature as there are abundant foraging resources and permanent water. The waterholes also link the eastern forests to the Clarence wetlands. • There is a structure immediately north of Champions Creek known as **North of Champions Creek ch58.639**. This structure also falls within the *highest priority* Emu crossing zone. The connectivity structures table does not give a height so presumably it is 3.6m or less.. This bridge represents the northern limit of the high priority Emu crossing zone. • The adjacent property access bridge **ch61.046** does not have a height	

	nominated in the table. Is it possible to combine these two features to provide a bridge with 5.5m clearance? • The property access overpass **ch63.634** has been nominated for future consideration to upgrading to cater for Emus. This structure falls outside the priority Emu crossing zone and is therefore unlikely to provide effective Emu crossing opportunities. • The **5.5m arch ch64.505** (if fill batters allow) falls outside of the priority Emu crossing zone. It is unlikely to provide effective connectivity as there very few Emu records or road kills in this area. • The Crowleys Road property access overpass **ch63.634** has been nominated for future consideration to upgrading to cater for Emus. This structure falls outside the priority Emu crossing zone and is therefore unlikely to provide effective Emu crossing opportunities. • The northern most structure identified in the Emu strategy is a 4.0m arch ch66.190. This structure falls outside of the priority Emu crossing zone. It is unlikely to provide effective connectivity as there very few Emu records or road kills in this area. The EPA welcomes the opportunity to participate in the development of a monitoring proposal for the coastal Emu. The EPA supports the supports maintaining an open landscape and endorses the proposal to plant grasses under bridges, including the approaches for up to 40m.	
Threatened frog management plan	The EPA recommends the Wallum Froglet is also included in this list as the RMS has previously encountered project delays when this species was detected during pre-clearing surveys. Early identification represents potential project savings and better planning for mitigation. For this reason, this species was included in the DGRs for targeted survey. The issues surrounding identification of potential or likely threatened fauna habitat cited during the adequacy assessment require resolving in the Preferred Infrastructure Report. It is difficult to target potential habitat for survey when	

	these areas have not been identified to a suitable level of detail in the EIS. The EPA recommends that habitat searches should not be restricted to optimal habitat in the study area. Giant Barred Frogs have been located in sub-optimal habitat on both the Sapphire to Woolgoolga upgrade and the Tintenbar to Ewingsdale upgrade. Targeted searches for this species should be broadened.	
Koala management plan	The EPA notes that additional surveys for Koala are currently being undertaken in accordance with the new guidelines: Policy 4 (page 72) of the Queensland Government's *Nature Conservation (koala) Conservation Plan 2006 and Management Program 2006-2016*. The results of these additional studies will assist in targeting the development of project mitigation in the appropriate sections of the upgrade. The placement of the Koala culverts will need to reflect areas where there are known populations or likely movement corridors for dispersing young or displaced Koalas. Koalas will not use the structures in a regular manner as part of their home range so the aim of the structures should be to facilitate dispersal and maintain population viability.	
Glider management plan	Placement of mitigation structures and widened medians needs to consider the likely conservation status of the adjacent land. Whilst the EIS document state that adjacent land use was considered in locating structures, this has been a problem in the past (fopr example, the illegal clearing of trees on adjacent private land at the proposed glider crossing on the Kempsey Bypass). It recommended that the RMS places a covenant on clearing trees in these situations before transferring adjacent land to private landholders. It is recommended that widened medians must not be cleared for access tracks or ancillary sites.	
Table 5-4	This table needs to be expanded to include all impacted key threatened species management plans for both federally and state listed species.	
Page 436	It should be noted that the following reference, *"Koalas have been detected using land bridges, under bridges and larger culverts (eg minimum 2.4 x 1.2 metres..."* is extracted from a monitoring study of a box culvert of dimensions 2.4 x 1.2 x *20m* under a two lane road. This information should be noted in the context that the culverts proposed on this project vary between 45 -100m in length and are typically >70m and, as such, may not be readily applicable.	

Page 438	The EPA recommends that the following commitment *"until such time as the effectiveness of mitigation measures can be demonstrated to have been achieved over a minimum of three successive monitoring periods following establishment of vegetation…."* is extended to include five monitoring periods in accordance with the statement in the EIS Appendix B, page 546. This monitoring period could be reduced if DP&I is satisfied that the mitigation measure have proven to meet their design objectives.	
	Assessing changes to habitat usage, to identify if this is a result of the project – The EPA supports the rationale provided by Benchmark Environmental Management in the Nambucca Heads to Urunga Ecological Monitoring Program which states that *"The impacts resulting from vegetation clearing are not relevant to assessing the effectiveness of fauna underpass or exclusion fence mitigation measures. Therefore, it will be necessary to collect the baseline monitoring data after the vegetation clearing phase in order to eliminate or control this variable so that its effects cannot be confused or confounded with those of the independent variable".* Changes to habitat usage should be verified via baseline surveys.	
Appendix A Page 475 Table A-2 Species specific connectivity goals	EPA previously provided comment on this Table in a review of the Biodiversity Working Paper dated 10 September 2012. The RMS response included a commitment to updating this Table to reflect the EPA comments. Unfortunately some of these comments were not included in the EIS. Therefore EPA reiterates the following: Rufous Bettong, Brush-tailed Phascogale, Long-nosed Potoroo and Common Planigale also require structures to facilitate dispersal. The current goals for these species aim at maintaining viable populations by preventing road kill. The EPA recommends the connectivity goals are updated to also include facilitation of dispersal and maintain habitat connectivity. Koala and Spotted-tailed Quoll – Monitoring results from the Bonville upgrade illustrate that a 3.0m x 3.0m x 80m long culvert will convey Koalas. However, the same culvert also repelled 60% of attempted Koala crossings which may have indirectly led to these animals being funnelled to the end of the fencing run and onto the road. The AMBS' Investigation of the Impact of Roads on Koalas 2011 highlights the importance of extending exclusion fencing beyond habitat edges and into	

	cleared paddocks to reduce the risk of funnelling fauna onto the road. Alternatively, fauna fence returns should run further along habitat edges away from the road. A primary Emu connectivity goal should also include "maintain connectivity to other subgroups for breeding opportunities". The EPA recommends that all threatened frog species should include "prevent and minimise road kill" as well as maintaining access to important habitat. (Note, this commitment to include frog fencing (for all threatened frogs) is made on page 490).	
Page 482, 486, Table A-3	The statement *"that bridges with a minimum below bridge vertical height of 3.6 metres and up to 5.5 metres would present the minimum underpass design for emus"* and the dot point on page 486 describing locations of these *bridges* is inconsistent with Table A-4 which describes these structures as 5.5m *archways*. A bridge is preferable to an archway of similar clearance as it provides a better sense of openness and view to opposite habitat. Also, see earlier comments.	
Page 486	The EPA agrees that the location of the majority of Emu structures appear to be well placed to facilitate Emu passage, but height may be an issue. Please see previous notes regarding Emu connectivity in this section of the Upgrade. The EPA understands the entire known Emu section will be fenced and there will be no additional structures provided (other than a proposed land bridge if required). Please elaborate on this commitment regarding the fencing proposal and flexibility in structure design and placement.	
Page 498	In the section relating to design principles for Emu fencing it is recommended that fencing continues 1km beyond the crossing structure. Given the frequency of Emu structures covered by the Emu strategy this equates, or nearly equates to fencing the entire Emu area. The EPA wishes to confirm that this understanding is correct; that is, there are no gaps in the fencing. Table A-5 clearly indicates that fauna fencing will be included from ch35000 to ch80200.	
Table A-5	At a planning workshop on 12 September 2012 the RMS agreed to provide an additional field in this table to highlight whether the proposed structure met the fauna connectivity structure design principles. It would be beneficial to gain an understanding of where the design principles are not met and to explore the	

	reasons behind this. This is especially pertinent in areas of threatened species habitat that will not have adequate connectivity provided. Following Table A-5, the EPA wishes to highlight the following three areas where the EPA recommends additional fauna connectivity in areas of threatened species habitat within key regional wildlife corridors: **Area 1 - Halfway Creek Area:** 1. **Grays Road overpass (ch15.66)** is ideally located between a regional corridor linking Sherwood Nature Reserve to the west and Yuraygir State Conservation Area and National Park to the east. There are abundant terrestrial threatened species records and suitable habitat for Brush-tailed Phascogale, Common Planigale, Spotted-tailed Quoll and Rufous Bettong. This is a reflection of the tall, old growth forest at this location. The current dimensions of this road overpass are 66m x 9m. The EPA recommends converting the structure to a dual use overpass with an additional 11m of low habitat to provide crossing opportunities for fauna. Upgrading this structure is advantageous as the overpass structure is already ideally located in suitable habitat and could be upgraded for fauna use in lieu of an additional structure in the same wildlife corridor further north (at ch17.75). An additional structure further north would necessitate a significant increase in proposed fill height whereas this proposal will not affect the cut/fill balance. **Area 2 - Clarence River North Arm to Devils Pulpit upgrade:** 1. There are very few connectivity structures in this entire area of low fill height. The only functional connectivity structures provided (that is,,structures that meet the connectivity design principles) are bridges over waterways and generally these structures have very low clearance. An existing structure at **ch99.73** is proposed at 2.4m height. The EPA recommends increasing the height to 3.0m to encourage fauna use. This structure is located within a biodiversity hotspot within the Mororo/Bundjalung regional corridor. Focal terrestrial species include the Koala, Spotted-tailed Quoll and Brush-tailed Phascogale. The EPA	

	understands the fill height in this area is low making it difficult to fit in fauna culverts >1.8m (or 2.4m maximum in some instances).Nonetheless, biodiversity connectivity is important and there are two structures at **ch100.640** and **ch101.100**, culvert heights 1.8m and 2.4m respectively, where consideration should eb given to increasing culvert height to 3.0m to provide functional connectivity. 2. There is no fauna connectivity provided between **ch104** and **ch105.5.** This is an area of low terrain linking Bundjalung State Conservation Area to Devils Pulpit State Forest. A dedicated structure, preferably at least 3.0m X 3.0m x 50m, should be considered for this location. **Area 3 - Devils Pulpit Upgrade to Oakey Creek:** 1. This area north of the Devils Pulpit upgrade is entirely vegetated and links large tracts of public land, namely Tabbimoble State Forest/Nature Reserve and Bundjalung National Park. This corridor represents the largest regional wildlife corridor within the project study area. The only functional connectivity provided will be at several bridges and the proposed landbridge at Tabbimoble Nature Reserve (72.6 x 12.2m). The existing RCBC structures on the Devils Pulpit upgrade will provide only limited wildlife connectivity. The EPA understands that the two Tabbimoble bridge crossings on that project have not been designed to include fauna friendly passage. Therefore there are several priority areas requiring additional connectivity structures. The first priority area is immediately north of the Devils Pulpit upgrade at **ch112.000**. Placement of a 3 x 3 x 50m fauna culvert at this location will still result in >2km distance to the nearest functional fauna connectivity structure. 2. The next priority area is at **ch117.500** which is located halfway between Tabbimoble Floodway N°1 bridge and the proposed fauna landbridge (which is primarily proposed as an emergency fire fighting access). The EPA recommends placement of a 3 x 3 x 50m fauna culvert at this location. 3. The next priority area is at **ch120.500** which is located halfway between the proposed fauna landbridge and a potential bridge at Oakey Creek. The EPA recommends placement of a 3 x 3 x 50m fauna culvert at this	

	location. This proposal is reliant on the replacement of the currently designed low box culvert (1.8m) at Oakey Creek to a small plank bridge with fauna passage included. Therefore the EPA is also recommending the upgrade of this structure at Oakey Creek.	
Page 547	Baseline monitoring – 12 months prior. The EPA agrees broadly with the aims of the monitoring study (see previous notes regarding provision of dispersal opportunities). It is already known that the adjacent populations will be impacted by the project and this will affect baseline population data collected once clearing and construction commence. The only value in these surveys is to establish population presence. A comprehensive baseline survey should be undertaken once clearing is complete and the project is nearing completion. At this point the effectiveness of fauna crossing structures and fencing can be measured relative to the recovering adjacent populations.	
Page 548	Performance measures should be set to measure the long term performance of the target populations. Data should be compared to a control in order to monitor impacts/mitigation success. If it is known that fauna are in a suitable area of habitat prior to construction and this is confirmed again post-construction, then it is reasonable to expect fauna to utilise the structure if it is necessary for their survival. If they do not then the impacts/barrier effects have not been mitigated the barrier effect. Over time, it can be expected that changes will be noticed to population dynamics, habitat usage and possibly changes in the vegetation itself (and therefore habitat) resulting from the exclusion or negative impacts on the species brought about by the road.	
Page 555	The EPA recommends that a key objective of the Strategy should be to target the identification and subsequent purchase of appropriate land on a like for like basis that is then dedicated to the national park reserve system as the first priority for biodiversity offsets. National park additions afford the greatest level of conservation protection and security as well as providing improvements in existing park configuration and management for biodiversity, including threatened species. The EPA believes additions to the reserve system provide strategic conservation outcomes that are best achieved by consolidating large	

	parcels of land, corridors etc... adjacent to existing reserves. The EPA is working collaboratively with National Parks and Wildlife Service to prepare a candidate list of suitable biodiversity offset properties for this project. The EPA will endeavour to provide this list to the RMS at the earliest possible opportunity. The above key objective is shown to be accepted and supported by the RMS in its commitment to follow Principle 4 on page 573 which states the *"RMS acknowledges the NSW State plan's commitment to continue to build and establish national parks and nature reserves as the primary biodiversity conservation mechanism"*. The Delivery of Options – Option A on page 575 should be updated to reflect this commitment. Currently, this option highlights pursuit of conservation covenants on private land which is only then followed by a commitment from the RMS to *"consult with OEH to pursue opportunities to purchase land that may be suitable for reserve estate with the OEH"*. As mentioned above, the greatest conservation gains will be achieved by the RMS targeting acquisition of national park estate in the first instance. Whilst an objective of the Strategy nominates *"Successfully securing the long-term (in perpetuity) protection and management of lands containing threatened species and ecological communities and habitat for threatened species (key habitat)"* this could also include the use of non-government conservation agencies which may be subject to future mining claims and do not require an Act of Parliament to revoke.	
Page 556	Should the statement *"it is considered that on average that the edge zone is 60% less suitable"* read as 40% less suitable?	
Page 577 Calculation of offset targets	Importantly this section will need to be updated to reflect the methodology and outputs from the SEWPaC biodiversity offset calculator. The EPA agrees with using the Biometric vegetation types and habitat types (for species credits where applicable) to target offset properties. Following from the recent Minister's Conditions of Approval for the Warrell Creek to Urunga Upgrade, the EPA suggests applying a 4:1 offset ratio to threatened species habitat directly impacted by the project. This would apply to both threatened fauna and flora and hence would remove the suggested *threatened flora* impact offset ratio of 2:1 (on page 578) and replace it with 4:1. The 4:1 ratio would also apply to edge affected areas consistent with the rationale that the	

	remaining biodiversity values will be partially impacted by the new road.	
Page 479 Forest Management Zones	The following comment was made by the EPA in its review of the Warrell Creek to Urunga Biodiversity Offset Strategy. The EPA position is reiterated here: The EPA does not support the approach proposed for offsetting the areas of State Forest impacted by the project. The EPA considers that the biodiversity offsetting process should remain transparent and focused on quantifying the exact nature of the biodiversity values being impacted at that time i.e. the EPA believes all biodiversity impacts should be assessed and offset equally irrespective of land tenure. In this context the EPA recommends the following approach to offsetting the biodiversity impacts on State Forest lands: 1. Update calculations of biodiversity impact (areas and values) irrespective of land tenure, including confirming the area of EEC impacted and apply any additional threatened species habitat ratios for non-endangered native vegetation. 2. Based on these areas apply the 2:1 and 4:1 ratios to calculate the quantum of area required. 3. Assess offset land for biodiversity values and other criteria, including the newly acquired State Forest Land. 4. Include the new State Forest land towards the total offset if it meets the agreed criteria i.e. must be in an equivalent or better condition than impacted areas, meet the *like for like* principle and the proposed management regime must be equal to or better that that prevailing over the impacted State Forest.	
Page 599 Priority 2	The EPA has historically agreed to offsetting using a sectional approach; however this only occurred within project sections, not between project sections. It is noted that the RMS has flagged an approach to acquire offset properties anywhere between Ballina and Port Macquarie. This is a concern at this early stage in planning. The EPA are guided by the OEH biodiversity offsetting policy which provides	

	scope to convert ecosystem credits to a regional conservation priority as identified in a regional conservation plan or similar. As such it is feasible to embark down this path to seek alternatives, but only after all local offset searches have been exhausted. Clearly the alternative must already be identified as a high conservation priority. The EPA recommends Priority 2 is replaced by restricting searches for offset land to the following three broad locations: Woolgoolga to Glenugie, Glenugie to Iluka, Iluka to Ballina for the various impacts associated with those areas. Priority 3 could then include offsetting outside of the areas nominated in priority 2.	
Appendix K Emu genetics pilot study	The EPA draws attention to the excellent work undertaken in the Emu genetics pilot study. A total of 27 individual Emus were genotyped - which has provided a baseline database for further genetic viability studies and future monitoring of potential genetic isolation impacts brought about the highway. This work was made possible by the contribution of 27 genetic samples by NPWS - collected over a period of six years and the addition of three RMS feather samples collected in 2012. It can be seen that the highway barrier presents an unknown but likely risk to the survival of the coastal Emu. The extent of the potential risk presented by the highway upgrade can be more fully understood by undertaking the additional genetic sampling and laboratory analysis to describe the: 1. levels of genetic variation in the Coastal Emu population, and hence its robustness, and 2. partitioning of genetic diversity across the region, and hence the current level of genetic exchange between sub groups. The EPA supports the view of Dr Shannon Smith that *"comprehensive documentation of the current levels and patterns of genetic variation will allow future investigation into the influence of road construction on dispersal and gene flow. These baseline data are critical to monitoring the impacts of the planned highway upgrade".*	
