Department of Planning and Environment

Our ref: DOC22/466886 Your ref: PAE-42078722

Jessie Evans
Director, Minerals & Quarry Assessments
Energy Resource Industry Assessments
12 Darcy Street Parramatta Sydney NSW 2150

By email: jessie.evans@dpie.nsw.gov.au

Subject: Dendrobium Mine Extension Project – State Significant Infrastructure (SSI-33143123) – Advice on Environmental Impact Statement (EIS)

Dear Jessie

Thank you for referring the above EIS to the Biodiversity and Conservation Division (BCD). We have reviewed the documents and advise there are key biodiversity issues that require consideration and action. These relate to assessment of the following: The Biodiversity Development Assessment Report, adherence to the avoid and minimise principles, cumulative impact assessment and underestimation of subsidence and surface to seam fracturing.

Our comments are provided at two levels:

a. Attachment A summarises the key issues
b. Attachment B which is a detailed assessment of the Biodiversity Development Assessment Report

We are currently preparing additional advice on the potential impact of the proposal on Coastal Upland Swamps, subsidence, and surface to seam fracturing. This is being prepared with the input of the Science, Economics and Insights Division and will be provided shortly.

The BDAR/EIS information needs to be field verified to finalise some of our advice. We attended the site inspection to limited areas on 1 June 2022. However, we have not been able to inspect the surface infrastructure and subsidence impact areas within the Catchment due to the excessive wet period preventing access. We are also awaiting internal clarity on the appropriate method for determining some species polygons. We aim to do site visits and provide further advice as soon as possible.

Can you please advise whether you wish us to proceed with a review the *Commonwealth EPBC Significant Impact Assessment* and undertake the bilateral assessment? We recommend however that the significant matters we have identified in this letter are addressed prior to the bilateral assessment.

If you have any questions about this advice, please contact Chris Page, Senior Team Leader via Chris.Page@environment.nsw.gov.au.

Yours sincerely

14/6/2022

Michael Saxon
Director, South East
Biodiversity and Conservation Division
Department of Planning and Environment

ATTACHMENT A

BCD Assessment Summary
Dendrobium Mine Extension Project EIS (SSI-33143123)

Key Issues

1. ***Avoidance of impacts***

The proposal does not sufficiently demonstrate that the "avoid" and "minimise" principles have been met, having regard to the SEARs, the *Biodiversity Conservation Act 2016*, and the Biodiversity Assessment Methodology (BAM). Pursuant to s 6.4(1) of the BC Act, the proponent must demonstrate appropriate and sufficient steps have been taken to avoid or minimise impact to areas with vegetation mapped with biodiversity value.

Seam to surface connective fracturing and subsidence is likely to occur across the whole project area and have a likely significant impact on NSW and Commonwealth-listed water-dependent threatened species and ecological communities including the Coastal Upland Swamp TEC, the giant burrowing frog and Littlejohn's treefrog. Reducing the impact of this to minimal levels has not been adequately addressed. Alternate mine layouts and mining methods have been used elsewhere in the region to reduce impact on biodiversity values, however these are rejected by the proponents without sufficient justification.

BCD recommends the following to address these matters:

a. Additional information is provided to demonstrate that the avoid principle has been adequately met pursuant to s6.4(1) of the BC Act.

b. Further examination of mine layouts and mining methods to reduce impact on biodiversity values.

c. Determining whether it is possible to reduce the area of vegetation clearing to avoid direct impacts to threatened fauna including the koala, Littlejohn's treefrog, gang-gang cockatoo and eastern pygmy possum which were all recorded within or adjacent to the surface clearing areas.

2. ***Upland Swamps***

The proposal does not adequately address the SEARs for Coastal Upland Swamps, and the BDAR is incomplete due to inappropriate use of the BAM and its associated addendums specifically the *Upland swamps impacted by longwall mining subsidence* (Upland Swamp Offset Policy). The accredited assessors have not calculated the maximum predicted offset liability for Coastal Upland Swamp (CUS) Threatened Ecological Community (TEC) in accordance with policy, and as a result, the offset liability for this entity has been significantly under-estimated.

In addition to this, there is some uncertainty as to whether the swamp areas have been adequately mapped and whether the offset calculations have been applied across the correct vegetation.

BCD recommends the following to address these matters:

a. The assessment of swamp impacts and offset requirements needs to be recalculated in accordance with the BAM and the Upland Swamps Offset Policy which requires offsetting the entire area of the swamp, assuming full loss of the swamp.

b. Further information is provided to justify the mapping of the swamps or the swamps. BCD should be consulted regarding this and if the mapping approach cannot be adequately justified, the advice on appropriate mapping should be sought from scientists with expertise in this community and the area re-mapped accordingly.

3. *Cumulative impacts*

The SEARs required "*consideration of the potential cumulative impacts due to other developments in the vicinity (completed, underway or proposed*)" and referenced the DPE document, *Cumulative Impact Assessment for State Significant Projects.* However, the documentation does not sufficiently address the SEARs requirements nor demonstrate that cumulative impacts to threatened entities have been adequately identified or assessed.

The EIS indicates cumulative impact is addressed in an earlier Scoping Paper (Dec 2021) which is related to the SSI consideration and not part of the EIS package. That aside, the Dec 2021 Scoping Report, however, contains only a Cumulative Impact Assessment Scoping Table that discounts the need to consider the same subsidence and biodiversity impacts from other underground coal mine operations in the local coalfields on the basis that they are "*Outside the relevant study area*" with no explanation of the study area or justification for discounting the biodiversity issue.

On the other hand, the BDAR states that "*the Project will add to cumulative impacts from longwall mining via additional clearing and subsidence*" but does not provide any further detail. BCD concurs with the BDAR in that the Project will result in further loss of significant quantities of surface water as well as aquatic/swamp habitat within the catchment. This will have ramifications including for the persistence of several threatened species which are dependent on streams and upland swamps.

To date mining at Dendrobium has irreversibly impacted approximately 45 ha of Coastal Upland Swamp TEC. With the ongoing approved underground mining at Dendrobium and other local mine operators, the cumulative impacts will increase this area. Cumulative impact should be readily quantifiable and addressed in more detail.

BCD recommends the following to address these matters:

a. The BDAR/EIS should provide a detailed and comprehensive cumulative impact assessment for all upland swamps, streams and impacted threatened species above Dendrobium's area of operations and on the Woronora Plateau more broadly. This requires DPE's technical guideline, *Cumulative Impact Assessment for State Significant Projects,* to be specifically addressed.

4. *Significant issues regarding the Subsidence Assessment, Surface to Seam Fracturing Assessment and Geological Structures Assessment remain.*

The assessment of the potential for surface to seam connective fracturing above longwalls is inadequate. The EIS confirms very high levels of subsidence that will impact (fracture, drain, and likely destroy) upland swamps and streams. However, the assessment of the potential for faults, lineaments and other geological structures to interact with subsidence is poor. This is of concern as this interaction will potentially lead to greater fracturing and drainage of streams and swamps. There are also serious shortcomings with the swamp seepage model.

BCD recommends the following to address these matters:

a. The issue of surface to seam connective fracturing and interaction of subsidence with geological structures is referred to the Mining Expert Panel for further independent expert assessment.

b. The EIS should validate the current approach of using factors to adjust subsidence predictions based on older Incremental Profile Model (IPM) results and compare model predictions to the higher accuracy subsidence monitoring line surveys.

c. The seepage model is referred to the Mining Expert Panel for assessment.

5. *Mitigation and remediation*

Further work is required to address mitigation in accordance with the *Biodiversity Assessment Method 2020* (BAM2020) including the preparation of a detailed *Adaptive Management Plan* which provides a framework for monitoring and future Biodiversity Management Plans.

Claims that impacts to the Project area can be significantly mitigated by remediation are not accurate and should not be stated in the BDAR/EIS as, in reality, mitigation is ineffective and impacts are irreversible. The only way that impacts can be addressed is by reducing the likelihood of them occurring by re-designing the longwall mine layout.

BCD recommends the following to address these matters:

a. The BDAR is updated to address BAM2020 requirements regarding the preparation of an *Adaptive Management Plan*.

b. Seam to surface connective fracturing in the Project area is avoided rather than relying on remediation. Reducing longwall widths or mine layout can also substantially reduce remediation needs.

6. *BAM Calculator and BAM non-compliance*

There are several issues with data entered into the BAM Calculator (BAM-C) cases accompanying the BDAR as well as inconsistency between data in the BDAR and the BAM-C. Additionally, the BAM-C assessment will need to be updated to re-calculate credit requirements once other matters raised in our advice have been addressed.

To proceed with the assessment, BCD advises:

a. Review BAM-C assessment and ensure all sections are completed correctly, in accordance with the BAM. Ensure consistency between the BAM-C and the BDAR and update the BAM-C once matters raised in this submission have been addressed.

ATTACHMENT B

Detailed BDAR Assessment
Dendrobium Mine Extension Project EIS (SSI-33143123)

Reference	Issue	Recommendation
Page 39 2.2.3.3 Swamp delineation	**1. Mapping of upland swamps and allocation of the Coastal Upland Swamp TEC** a. We have not been able to access Catchment areas to verify swamp mapping as per our standard review process due to the Catchment being closed as a result of excessive wet weather. b. The allocation of swamp vegetation as "coastal upland swamp: fringing eucalypt woodland" within the swamp mapping requires verification through independent ground truthing. c. The BDAR states that "*in many locations scattered trees are present and surrounded by swamp vegetation*". We question why the mapping process allocated individual trees or clusters of a small number of trees as a non-threatened community ('in-swamp tree'). It should be noted that the Final Determination for Coastal Upland Swamps (CUS) states that the tree line does not necessarily define the swamp and scattered trees/clumps can occur. d. The Upland Swamps Offset Policy does not specifically refer to only those swamps which meet the TEC definition. The Policy defines swamps as "…perched freshwater wetlands that occur in shallow basins of low hills or mountains". All upland swamps must be clearly mapped and included in impact assessment and offset calculations.	1a. 1b. Recommendation pending BCD site visit to verify swamp mapping. Provide GIS shapefiles of vegetation sub-communities. 1c. Update mapping to meet CUS Final Determination. 1d. The whole of the mapped swamp area must be used for deriving swamp offsets.
Page 60 Table 15 Section 2.5.1.1 BAM Calculator assessment	**2. Threatened flora survey** a. Threatened flora survey effort does not meet BAM Calculator requirements for some species. Some species were not surveyed at the correct time of year and the BDAR justifies this by saying the disturbance in these areas has flexibility to avoid threatened flora. We accept this justification for obvious flora species which are always detectable, however some species (e.g. orchids, annuals etc) may go undetected if this process is adopted. For example, the Cordeaux Dam access road	2a. Review threatened flora surveys for all candidate plant species and ensure that surveys are carried out at correct time of year.

Reference	Issue	Recommendation
Table 27	was surveyed only in August. Several threatened plants (e.g. *Cryptostylis hunteriana, Caladenia tessellata*) can only be detected in spring/summer. b. Three threatened flora species (*Cryptostylis hunteriana, Epacris purpurascens var purpurascens, and Pultenaea aristata)* have habitat within swamps. Targeted surveys were not carried out for these species within swamp areas (Table 27) and therefore must be assumed present.	Review BAM Calculator and ensure the survey tabs are correctly filled in. 2b. In lieu of targeted surveys or Expert Report, assume presence.
Page 127 Section 3.3.2	**3. Avoidance of direct impacts to surface area infrastructure (Biodiversity Assessment Development Footprint (BADF))** a. Some avoidance of biodiversity values has been demonstrated within surface infrastructure areas however the quantum of clearing for the ventilation shaft site is relatively large (14.64 ha). This area contains biodiversity values including known and potential habitat for threatened species with several species recorded within or close to this area including the koala, eastern pygmy possum, gang-gang cockatoo, greater broad-nosed bat, Littlejohn's treefrog, scarlet robin, and large bent-wing bat. b. 388 hollow-bearing trees have been recorded within the BADF. The BDAR does not address avoidance of these hollow-bearing trees nor explore options for a reduction in the quantum of clearing.	3a-b. Reduce the quantum of vegetation clearing to avoid direct impacts to threatened fauna including the koala, Littlejohn's treefrog, gang-gang cockatoo and eastern pygmy possum which were all recorded within or adjacent to surface clearing areas.
Page 127 Section 3.3.2 Avoid or minimise biodiversity impacts when designing the proposal Table 29	**4. Avoidance of subsidence related impacts (prescribed/uncertain impacts)** a. The BDAR states the revised project has a reduced layout of 60% and we acknowledge that some measures have been applied to avoid impacts to the dams, 3rd, 4th and 5th order (or above) streams and setbacks from named watercourses. However, the current Project comes with a very high percentage of expected impacts at the surface. The percentage of area within the footprint of the Project where subsidence impacts are expected has not been estimated in the EIS is likely to be far higher (see Attachment C). b. The BDAR does not sufficiently demonstrate that the "avoid" and "minimise" principles have been met. c. In its current form, the proposal is likely to have a significant impact on NSW and Commonwealth-listed water-dependent threatened species and ecological	4a-g. The longwall layout and more considered methods of mining below sensitive attributes should be examined to avoid (or significantly reduce) impacts to CUS and streams in the area. Consideration be given to reducing the width of the longwalls to limit surface to seam fracturing and related subsidence. 4b. Additional information is provided to demonstrate that the

Reference	Issue	Recommendation
	communities including the Coastal Upland Swamps (CUS), the giant burrowing frog and Littlejohn's treefrog. d. The proposal could potentially have a Serious and Irreversible Impact on the giant dragonfly and the broad-headed snake (however further information is required, see matter 9 below). e. A substantial area of the CUS will be impacted by the proposal. While a claimed reduction in area of mining limits impacts, there are still highly significant swamps which will be impacted. Further avoidance is possible and should be examined/adopted to meet BAM requirements. A more sensitive and nuanced approach to mining methods/layouts that prevents seam to surface fracturing and subsequent water loss to swamps is one such approach that warrants detailed examination. f. The BDAR (Table 29) states that prescribed impacts will be avoided and minimised because "*all Coastal Upland Swamps would be monitored for potential impacts via a formal monitoring program, and remediation measures undertaken as per the relevant approved management plan*". This does not constitute avoidance and the BC Act clearly requires that impacts must first be avoided before measures to offset or compensate are utilised (BC Act, s.6.4). g. Mining will avoid "key stream features". These are not defined or quantified in the BDAR. h. The BDAR/EIS discounts alternate mine layouts and mining methods based largely on arbitrary Project objectives and problems achieving "*complete avoidance*". Alternatives are also discounted on the claim that it is "*not considered to be economically viable*" but coupled with a principle of maximising access to all the resource/revenue. Alternatives (and associated avoidance) have been considered as an 'all or nothing' proposition which is not the case.	avoid principle has been adequately met as per s 6.4(1). 4g. Define and quantify the term "key stream features" in the BDAR/glossary. 4h. There is the capacity to consider more nuanced or hybrid approaches whereby the current proposal will reduce or limit the predicted subsidence impacts in the more sensitive areas within the vast Project footprint. Assess alternatives that balances a reasonable profit on investment while also reducing the degree of

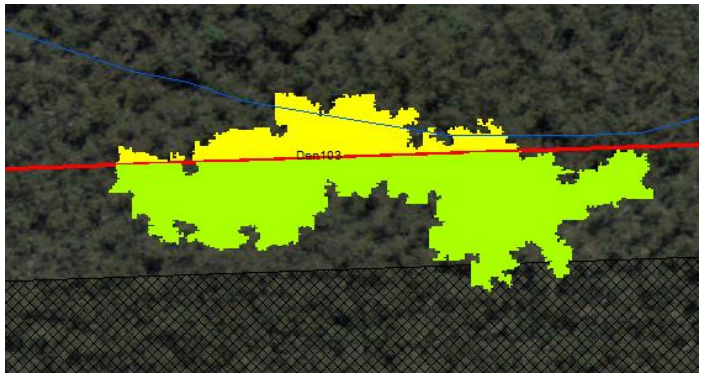
Reference	Issue	Recommendation
		impacts more than the large area of impact currently proposed.
Not addressed in the BDAR	**5. Indirect impacts** a. The critically endangered TEC Shale Sandstone Transition Forest occurs adjacent to the BADF. The BDAR does not address indirect impacts to this TEC. b. Similarly, CUS TEC (Swamp Den85) occurs in close proximity to the BADF. c. The BDAR should address whether gas emissions are likely to impact vegetation around the ventilation shaft.	5a-b. Indirect impacts on this vegetation should be addressed and mitigation measures specific to its protection and management should be included in the relevant sections of the BDAR. 5c. Provide assessment of whether any vegetation may be impacted by the ventilation shaft emissions.
Table 40 Page 164-179	**6. Prescribed impacts** a. Prescribed impacts relevant to the proposed development include habitat connectivity and water bodies, water quality and hydrological processes have not been adequately addressed. *Swamps and streams* b. Impacts to swamps and streams are addressed separately in Attachment C *Threatened flora occurring in swamps* c. We disagree with the prescribed impact assessment for threatened flora which have habitat in swamps (ie. *Cryptostylis hunteriana, Epacris purpurascens var purpurascens, and Pultenaea aristata)*. The BDAR states that targeted surveys were not carried out for these species. It then states that populations were not detected during surveys and monitoring. The BAM requires that species that are not surveyed should be assumed present, or an Expert Report prepared. The BAM Calculator case states that an Expert Report was prepared for these species however there is no Expert Report attached to the BDAR. Confusingly, the BDAR states that if they occurred, impacts to hydrological processes could have a "long-term impact" on these species.	6a.The BDAR requires further consideration of these issues. 6b. All recommendations in Attachment C to be addressed in the revised BDAR/Submissions report. 6c. Review and update prescribed impact assessment for *Cryptostylis hunteriana, Epacris purpurascens var purpurascens, and Pultenaea aristata*, including species polygons and BAM-C offset calculations.

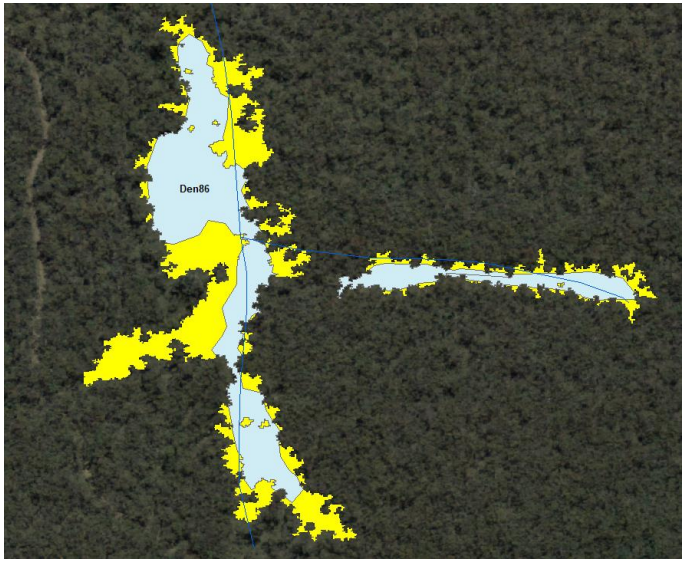
Reference	Issue	Recommendation
	Water dependent fauna d. The predicted impacts to connectivity/hydrological processes of aquatic/swamp habitat at a local scale as well as more broadly at the ecosystem/Woronora Plateau scale could potentially be significant. e. The Woronora Plateau is a stronghold for three threatened frogs, and the area is a climate and bushfire refuge due to the water content of the swamps. Recent genetic studies have shown that Littlejohn's Tree Frog is now split into two species in the Illawarra; with *Litoria littlejohni* on the Woronora Plateau split off from the populations in Morton National Park and Budderoo National Park which are now identified as *Litoria watsoni*. This information is pertinent, since the risk of extinction of *Litoria littlejohni* is heightened due to the mining impacts on the plateau. The existing impacts and undermined swamps in the Dendrobium lease, coupled with the proposed Area 5 mining could effectively split the Woronora plateau frog populations over time by alteration of the hydrology in a strip from east to west (refer to Figure 4 in Attachment C for illustrated example). This cumulative impact could have severe implications for the persistence of the species in the future as genetic mixing will become more difficult, and habitat will be reduced. *Loss of connectivity/hydrological processes which exacerbate impacts to climate refugia, eg. koala habitat* f. Koalas are known to retract to areas along creek lines where there is greater water availability in drought, and this is partly due to the microclimate and temperature, but also due to the koala food tree species being more palatable and less water stressed (thus having less toxins in their leaves). With reduced water availability and altered hydrology across the catchment, all koala habitat within sufficient proximity to the mining could be indirectly impacted. This will have far reaching consequences since the Woronora Plateau and Picton area is identified in the NSW Koala Strategy as one of the strongholds for the persistence of the species into the future.	6d-e. Further avoidance of impacts to Littlejohn's treefrog and giant burrowing frog required. 6f. Assess prescribed impacts in context of connectivity and hydrological impacts to koalas and other species which may use the area as climate refugia.

Reference	Issue	Recommendation
	Impact on east flowing streams from mine water g. The BAM (Section 7.2.2) requires the BDAR to address design measures to mitigate prescribed impacts including "controlling the quality of water released from the site to avoid or minimise downstream impacts on threatened entities." An assessment of these impacts, and associated design measures were not addressed in the BDAR. h. American Creek receives unfiltered and untreated 'overflow' water from mining sediment ponds during periods of heavy rainfall and this has not been addressed with adequate monitoring plans, avoidance or remediation. This water contains calcium carbonate and is entering streams above the high tide mark, where the salinity may impact certain species. i. The pipeline to Marley Place is proposed to be doubled in size so that more mine water can be expelled to that location. This could impact on terrestrial biodiversity and should be addressed in the BDAR.	6g-i. Wastewater discharges from the Dendrobium extension and together with that of the brine from the Appin mines, should reflect ANZECC (2000) guidelines, as has been the case for both the Bulli Seam-Appin Mines project and Russell Vale. These should be put in place prior to any extraction, following any new approval. 6g-i. Assess impacts to terrestrial biodiversity with regard to mine water entering east-flowing creeks and address in BDAR.
Page 185 Section 4.7	**7. Cumulative impacts** a. We have significant concerns regarding cumulative impacts to CUS and streams, some of which have already been addressed in Attachment A and under matter 6 (prescribed impacts) in this Attachment. Refer also to Attachment C for further overview of these cumulative impacts as well as implications for the broader development. b. The BDAR acknowledges that cumulative impacts have and will continue to occur because of additional clearing and subsidence. The BDAR does not provide an assessment of the significance of these cumulative impacts, nor measures/mechanisms to avoid them. Inadequate consideration has been given to potential cumulative impacts due to other developments in the vicinity (completed, underway or proposed).	7. Address Cumulative Impacts with reference to the *Cumulative Impact Assessment Guidelines for State Significant Projects*, DPE, November 2021. 7a. All recommendations in Attachment C to be addressed in the revised BDAR/Submissions report. The BDAR should include a cumulative impact assessment and consider all relevant past, present and reasonably foreseeable actions, and programs and policies that are likely to impact water

Reference	Issue	Recommendation
		resources and swamps. Where impacts from a new project are considered small, these need to be considered with the impacts from existing development and the cumulative impact must be assessed to determine if a threshold of acceptable total impact may be crossed.
Page 186 Section 4.9 Appendix 11	**8. Serious and Irreversible Impacts (SAII)** a. The SAII assessment appears to be based on BAM 2017, and not BAM 2020 as required. *Broad-headed snake:* b. The SAII assessment states that the BADF has avoided potential shelter habitat (ie. cliff faces) and large areas of surface rock and therefore, the project is unlikely to have a direct impact on important habitat features. However, the TBDC states that tree hollows can be important habitat for broad-headed snakes during summer months. 388 hollow-bearing trees will be cleared from the BADF. Also note that broad-headed snakes can move up to 1km from shelter areas (Meagan Hinds (BCD), pers. com). These issues need to be addressed in the SAII assessment. *Giant dragonfly:* c. The SAII assessment references Cardno (2022) as providing further information on the giant dragonfly, however the Cardno Report states that the dragonfly is being addressed elsewhere. d. We have concerns about the habitat mapping for the giant dragonfly (refer to matter 9g below).	8a. Update the SAII assessment to comply with BAM 2020. 8b. Reduce quantum of clearing within BADF to reduce the number of hollow bearing trees to be cleared. Update SAII assessment to address direct impact of clearing hollow bearing trees. 8c. Update BDAR to accurately reflect giant dragonfly assessment. Clarify where further information exists on the giant dragonfly. 8e. Provide BCD with draft report on giant dragonfly.

Reference	Issue	Recommendation
	e. We understand that South 32 have a draft report regarding a "*statewide survey of the giant dragonfly*". We have not seen this report and we request this be submitted to BCD to assist with our review of the EIS. f. We were unable to access the giant dragonfly assessment in the BAM-C. We require access to verify assessment.	8f. Re-submit BAM-C case for giant dragonfly and ensure BCD is added as a case-party.
Page 214 Section 6.3.2 Figure 9 Table 40	**9. Species polygons** a. The BAM states: "*for threatened species assessed by area, the assessor must use the change (loss) in the vegetation integrity (VI) score of each vegetation zone in the species polygon to measure the direct impact on the habitat condition for the species. The change in the VI score across the area of habitat within a species polygon is used in Subsection 10.1.3 to determine the offset requirement for the species*." We acknowledge that the BAM does not contain detailed advice on the preparation of species polygons for prescribed impacts. Many of the species polygons in the BDAR are for species that are not expected to be impacted by subsidence and therefore an offset is not required. The BDAR, and associated GIS files should clearly show the actual species polygon used for offsetting where applicable (ie. those species impacted by subsidence as well as those with direct impacts). This will assist in meeting the above BAM explanation which describes the purpose of species polygons. b. We are yet to finalise our review of species polygons for candidate species. We will provide further advice as soon as possible. *Swamps* c. Issues relating to swamp mapping have been addressed in matter 1. d. Section 6.3.2 of the BDAR states that "*subsidence induced groundwater impacts have not been observed in upland swamps further than 60m from longwalls*". To determine biodiversity credits, swamps within 60m of longwalls were included in the	9a Update species polygons to show actual areas to be offset as a result of subsidence impacts. Note, species polygons for those entities that are not to be offset can be retained as a separate appendix to the BDAR. This will enhance clarity and readability of the BDAR. Provide consistent naming for Figures in BDAR and GIS files. 9c-d. Update the area of swamp offset mapping. The whole of the mapped swamp is part of the swamp offset polygon regardless of

Reference	Issue	Recommendation
	swamp polygon used to quantify offsets. Some swamps occurred on the 60m boundary and areas outside that boundary were excluded from the area to be offset. It is not logical to say that only the part of the swamp within the 60m width of the longwall will be impacted given the hydrology of swamps is linked and continuous.  Above example: Yellow shows that part of the swamp outside the 60m buffer. Green shows the area within the 60m buffer. Only the green area is proposed to be offset. *Giant dragonfly – preliminary advice* g. The giant dragonfly polygon is much smaller than the mapped swamp polygons. The image below shows the mapped swamp in yellow and the giant dragonfly polygon in blue. It is not clear why the dragonfly is only expected to use part of the swamp and claims that habitat is limited to certain subcommunities are unsubstantiated. The TBDC states that habitat constraints are "within 500m of swamps". e. We have raised the issue of only offsetting swamps within the 60m "cut-off boundary" in matter 9d above. The TBDC states that habitat constraints are within	whether it is in the 60m width or just outside.

Reference	Issue	Recommendation
	500 m of swamps. These issues must be resolved before a species polygon for the giant dragonfly can be prepared.  Above example: Yellow shows the mapped swamp, blue shows the giant dragonfly polygon.	
Page 196- Section 5.1 Table 47 Section 5.2	**10. Mitigation** *Need for Adaptive Management Plan* a. The BAM and the BAM Operational Manual Stage 2 refer to the need for an *Adaptive Management Plan*. This Plan must be included in the BDAR and address all requirements of BAM 8.4(2), 8.5, including collection of baseline data, trigger values for when adaptive management actions should be initiated…etc. The BDAR does not provide such a Plan. b. The *Adaptive Management Plan* should also include a program to evaluate and publicly report on the outcomes of proposed actions. c. Based on our experience reviewing monitoring results from previous mining, impacts to swamps and streams does not have tangible impacts. Clear and	10a-e Prepare an *Adaptive Management Plan* in accordance with BAM 8.5. This must be part of the BDAR and will form the basis of the BMP/Extraction Plan post-approval. Sufficient detail must be provided in the BDAR to ensure the Plan achieves intended outcomes.

Reference	Issue	Recommendation
	unambiguous thresholds should be provided in the *Adaptive Management Plan* within the BDAR, including a section on what constitutes a "*greater than negligible impact*" and appropriate actions if thresholds are exceeded. d. Similarly, monitoring of impacts to terrestrial biodiversity from subsidence often has "inconclusive outcomes". The Plan should include an evaluation of risks and consequences to biodiversity where monitoring fails to provide conclusive evidence or where there is an inability to carry out monitoring (e.g. due to floods/fire). Where negative/uncertain consequences are likely, the precautionary principle should be adopted and appropriate measures to ameliorate these consequences must be implemented. e. The Plan should include details for a robust BACI experimental design to contrast changes at the impact site to changes at a reference site. *Need for separate Biodiversity Management Plan (BMP)* f. A separate Biodiversity Management Plan (BMP) is not proposed. We disagree with this given the significant biodiversity issues on site as well as the proposed biodiversity monitoring required. The *Adaptive Management Plan* should provide a detailed framework for future BMPs. *Remediation of swamps and streams.* g. The BDAR states that reasonable and feasible rehabilitation measures (e.g. grouting, erosion control measures) will be undertaken. However, remediation cannot be relied upon as an effective post-mining mitigation or management mechanism and impacts to streams and swamps should first be avoided by a redesign of the longwall mine layout before remediation measures are considered. In particular, consideration should be given to reducing the longwall panel width. Claims that impacts from Area 5 can be significantly mitigated by remediation are inaccurate and should not be in the BDAR. Further detail on this can be found in Attachment C.	10f-i Review BDAR in context of comments provided.

Reference	Issue	Recommendation
	General comments h. The wording in the following "method" is vague and non-binding: eg. "*Monitoring to consider the expansion of the current Dendrobium Amphibian/Swamp Monitoring Program*". Provide more definitive language. i. The biodiversity monitoring program only appears to include giant burrowing frog and Littlejohn's tree frog. Include red-crowned toadlet in monitoring program or justify why it should be excluded.	
Page 218 Section 7.1	**11. Satisfying the Biodiversity Offset obligation** a. All offset options presented are supported. b. The offset requirements will increase as a result of correct application of the BAM/Upland Swamps Offset Policy.	11b. The Biodiversity Offset Strategy must be updated to address the updated offset requirement.
Appendix 10 Table 87 Coastal Upland Swamp Swamps Offset Liability Amended BAM-C composition and structure scores	**12. Approach to Upland Swamp offset liability - partial impacts** *Partial impacts – BAM* a. Partial impacts are described in the BAM, including section 8.1.1 which states that the future value of attributes may be amended to reflect the impacts from partially clearing a vegetation zone, including areas such as asset protection zones and easements. The BAM also states that if it is likely that vegetation will continue to degrade, full loss should be assumed. b. Use of the partial impact assessment is not appropriate based on the reasons stated below. *Partial impact assessment (BDAR and BAM-C)* c. The BDAR has stated the vegetation is likely to be impacted to the point that it may transition to a different vegetation type. d. The BDAR reasons that partial clearing is an appropriate method for assessing offset requirements in these circumstances without recognising the unique ecological values that swamps contain, as well as the permanent and irreversible damage that can occur as a result of longwall mining. The End of Panel Report for Longwall 17 (Niche 2021) states there have been "trends of significant decline in Total Species Richness in swamps over time, loss of wetland flora species,	12a-i. Review the BDAR and update assessment of swamp impacts and the offset liability in accordance with the BAM and the Upland Swamps Offset Policy.

Reference	Issue	Recommendation
	dieback of swamp vegetation, trends of significant changes to composition with wetter species becoming less common post-impact". e. Table 87 of the BDAR provides a partial clearing scenario with amended scoring for future means. Given the acknowledged uncertainty around how subsidence impacts swamp vegetation it is difficult to understand how these amended scoring values were derived. *Upland Swamps Offset Policy* f. The Upland Swamps Offset Policy states that when predicting the offset liability, it is the loss of the upland swamp ecological community, including the threatened species that rely on that community, which must be calculated to determine the offset liability. The loss of swamps is likely to lead to loss of several threatened species, and potentially many non-threatened swamp dependent species as well. g. The Upland Swamps Offset Policy states that *"Upland swamps are features of high environmental value that are at high risk of impact from mining related subsidence which, once expressed, are permanent and irreversible."* h. The Upland Swamp Offsets Policy states that the offset liability should be assessed as a potential maximum (i.e. worst case scenario), given the uncertainty in the prediction of subsidence and consequent high likelihood of significant environmental impacts. This is consistent with the precautionary principle. We consider the worst-case scenario is full loss of all swamps underneath and within 60m of longwalls. In other words, full conversion of swamp PCTs to non-swamp PCTs and potentially, full loss of the CUS TEC. i. As such, the use of partial clearing in the assessment of swamp offsets is not appropriate, and not consistent with the BAM, nor the Upland Swamps Offset Policy.	
Case 00030230 /BAAS17033/21/ 00030231	**13. BAM – Calculator** *Case 00030230 /BAAS17033/21/ 00030231*	

Reference	Issue	Recommendation
	a. Zone composition data for all shrubs is "0". This is incorrect as shrubs were recorded in plots. The implication of this is the VI score for the plots is incorrect and credit values will therefore be incorrect. b. Olive whistler, rose-crowned fruit dove and superb fruit dove are listed as potential ecosystem credit species in the BDAR (Table 13), but are not listed in BAM-C. c. Shortcuts have been taken in the completion of the habitat suitability and habitat survey tabs (e.g. geographic limitations, habitat constraints have not been accurately applied). d. The "Habitat survey" tab dismisses a number of species by allocating the "no (expert report)" category which removes the species from further assessment. This is not an appropriate way to deal with direct impacts. There are no Expert Reports provided in the BDAR. In accordance with the BAM, all candidate species need to be either assumed present, surveyed in accordance with survey guidelines, and at the specified time of year, or an Expert Report needs to be prepared. e. Table 17 in the BDAR and the candidate species in the BAM-C need to be checked for consistency (eg. BDAR says *Astrotricha crassifolia* was surveyed, BAM-C says an Expert Report was prepared). *Case 0030234/BAAS17033/21/00030235* a. This case assessed the prescribed and indirect impacts of the development. Credit values for a number of entities were derived, however some of these are not expected to have prescribed or indirect impacts so credit values will not need to be offset for these entities. b. We disagree with the application of partial impacts through allocation of "future mean values" in the future VI scores (as per matter 12). This must be updated to reflect appropriate application of the BAM/Upland Swamps Offset Policy. c. Regarding species credits for giant burrowing frog, red-crowned toadlet and Littlejohn's tree frog, BAM-C only shows PCT 1083 as providing habitat for these species which is inconsistent with the BDAR. BAM-C must be amended to accurately show areas from all associated PCTs.	13 – the matters identified need to be addressed in a revised BDAR

Reference	Issue	Recommendation
	d. It appears that species not impacted by subsidence were removed from the assessment by stating the species was not present (expert report). This method is appropriate only for entities which are unlikely to be impacted by prescribed/indirect impacts. *Case 00031189/BAAS17033/22/00031190* a. This BOAMS case was prepared to separately determine the credit requirement for the giant dragonfly. b. We were unable to open this case in BOAMS. Regardless, we consider further work on the dragonfly is required as per matters 8 and 9. As such, updates to this case are likely to be required.	
General comment	**14. Submission of BDAR** a. Section 6.15 of the BC Act states "*a biodiversity assessment report cannot be submitted in connection with a relevant application unless the accredited person certifies in the report that the report has been prepared on the basis of the requirements of (and information provided under) the biodiversity assessment method as at a specified date and that date is within 14 days of the date the report is so submitted".* b. The BDAR and BAM-C credit calculations are dated 28/3/2022.	14. The BDAR and the credit calculations in the BAM Calculator should be finalised within 14 days of the report being submitted.
	15. Matters of National Environmental Significance a. Due to time constraints, we were unable to review the section on MNES. We will review this section and carry out the bilateral assessment at DPE's (Planning and Assessment) request.	

References

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