

030341 Proposed Warkworth Extension F1 28 June 2011

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$$\begin{aligned}
 \text{Overall EEC ratio} &= (\text{total area of offset} + \text{total area of woodland rehabilitation}) \text{ divided by area of} \\
 &\quad \text{woodland EEC clearing} \\
 &= (1,649.4 + 2,114.) \div 764.7 \\
 &= 4.9:1
 \end{aligned}$$

3.2.2 Final landform and rehabilitation

i Environmental Assessment and Response to Submissions

Rehabilitation will be undertaken progressively across the mined area. The objectives of the rehabilitation of the mined lands are to:

- re-create approximately 780.6 ha of EEC woodland communities to a standard comparable to similar reference EECs (analogue site);
- create approximately 218 ha of trees over grass not conforming to any particular community, creating treed corridors to ensure connectivity of woodland community areas;
- re-create some 1,313 ha of grassland communities with a native component;
- provide additional habitat for threatened species; and
- create an additional north/south wildlife corridor providing connectivity to other habitat.

Within the final landform, mining infrastructure within the identified disturbance area would be removed if no longer required and the affected lands rehabilitated. This rehabilitation would be consistent with adjacent vegetation communities.

The rehabilitation of the EEC woodland communities on mined land will be guided by leading-practice knowledge of rehabilitation and revegetation professionals. Knowledge will be taken from research programmes regarding the structure and functioning of these communities in order to establish a diverse tree, shrub and ground stratum layer.

ii Changes to enhance rehabilitation

In response to discussions held with both OEH and DP&I regarding the composition and extent of the rehabilitation proposed at Warkworth mine, further enhancements were made to the project.

The final landform of the proposed Warkworth Extension, as outlined in Figure 5.5 of the EA, has been reviewed for opportunities for rehabilitation of CH Grey Box-Ironbark-Spotted Gum communities.

An additional 1,336 ha of mined lands has also been identified as suitable for the re-establishment of the Central Hunter Grey Box-Ironbark-Spotted Gum communities. This represents an approximate 271 percent increase in the area previously committed to rehabilitation of this community.

The proponent is now committed to rehabilitating a total of approximately 2,114 ha of mined lands to EEC woodland. This proposed rehabilitation combined with rehabilitation from other mines aimed at regeneration of this community will restore large areas across the valley floor. Rehabilitation combined with existing remnants and regrowth which are secured currently in previously approved offsets packages for other development in the Hunter Valley provide long term conservation certainty for this community.

The indicative final landform showing the areas to be rehabilitated can be seen in Figure 2.1. Conceptual final landform visualisations and cross sections are shown in Figures 2.2 to 2.5.

3.2.3 Non-land based compensatory measures

i Environmental Assessment and Response to Submissions

The proponent has committed to continuing the existing five-year research programme being undertaken by UNE on best practice for re-establishing the WSW community. The research is looking at a variety of aspects of this community from food webs, methods of pollination and gene dispersal, to soil structure and faunal interactions with mycorrhizal fungal associations. This ongoing research will provide leading practice advice on the enhancement, re-establishment and management of the WSW community. This research contributes to the sustainability of the proposed WSW to be protected and the knowledge gained will assist in the development of a Recovery Plan for the WSW located in the region.

ii Additional commitments

Expert ecologist, Dr David Robertson from Cumberland Ecology, has advised (refer Appendix A) that rehabilitating the overstorey of Central Hunter Grey Box-Ironbark-Spotted Gum communities is well established on mined lands, however he recommends further research on returning the ground stratum species to enable the full community to be represented in rehabilitation. Based on this recommendation, the proponent has committed to contribute up to \$500,000 to research aimed at improving rehabilitation of ground stratum plant species of the Central Hunter Grey Box-Ironbark-Spotted Gum communities. The Warkworth Rehabilitation Strategy for Central Hunter Grey Box-Ironbark Woodland is provided in Appendix B.

Other additional components to the non-land based compensatory measures since the RTS include:

- contribution of an additional \$500,000 for the research currently being undertaken by the UNE into WSW as a Stage II programme complementing the existing research programme. The Stage II programme would involve investigating seed collecting protocols, the evaluation of provenance via genetic assays and stress tests for five key species and the initial collection of seed supplies for re-establishment works;
- the preparation of a Recovery Plan for the WSW in consultation with government, including OEH and neighbouring mines including Bulga Coal and Wambo Mine; and
- trials to rehabilitate an old quarry and revegetation of WSW on the old quarry site (approximately 1 ha) within the Southern Biodiversity Area. The old quarry would be backfilled with material, including a sand layer, sourced from the extension area and the profile would be reconstructed and shaped with regard to the surrounding landscape. A revegetation trial of key WSW species would follow with guidance provided by UNE.

3.2.4 Summary of final compensatory offset package

Since the lodgement of the RTS, a number of enhancements have been made to the compensatory offset package. The final compensatory offset package is summarised below:

- Biodiversity Areas:
 - long term protection of 4,790.3 ha of offset lands, which includes:

- long term protection of 3,835.9 ha of woodland;
 - re-establishment of 718.6 ha of woodland;
 - long term protection of 1,114 ha of EECs;
 - re-establishment of 535.4 ha of EEC woodland and rehabilitation of 2,114.0 ha of EEC woodland; and
 - a commitment to securing an additional 750 ha of woody vegetation for strategic offsets within 12 months of approval.
- Rehabilitation:
 - rehabilitation of a total of some 3,347 ha of mined lands consisting of 2,114 ha of woodland EEC communities, 305 ha of trees over grassland and 928 ha of grassland;
 - Non-land based compensatory measures:
 - continuation of the five-year research programme undertaken by UNE for WSW with a contribution of an additional \$500,000 as a Stage II programme;
 - preparation of a Recovery Plan for the WSW in consultation with government and neighbouring mines;
 - trials to rehabilitate an old quarry and revegetation of WSW on the sold quarry site; and
 - contribution of \$500,000 research funding aimed at improving rehabilitation of ground stratum plant species of the Central Hunter Grey Box-Ironbark-Spotted Gum communities.

Overall, the ratio for long term protection inclusive of rehabilitation is approximately 8.7:1 when compared to the 764.7 ha of woodland cleared by the proposed Warkworth extension.

Refer to the Statement of Commitments in Appendix H for commitments relating to offsets.

3.3 Response to DP&I engaged ecology review

3.3.1 Introduction

This section provides a response to the ecological review of the proposed Warkworth Extension undertaken by Mr Travis Peake from Umwelt Australia. In providing this response, advice and input has been sought from a range of experts listed as follows:

- Appendix A – letter from Dr David Robertson from Cumberland Ecology to RTCA regarding *Addendum to final Peake review of ecological assessments of Warkworth Extension EA and HVO South modification projects*, dated August 2011;
- Appendix B – report from DnA Environmental entitled *Rehabilitating Central Hunter Grey Box-Ironbark Woodland – Warkworth Rehabilitation Strategy*, dated August 2011;

- Appendix C - letter from Dr David Robertson from Cumberland Ecology to RTCA regarding *Response to peer review by Travis Peake entitled: "review of ecological assessments for Warkworth Extension EA and HVO South modification projects*, dated August 2011;
- Appendix D – letter from Dr AnneMarie Clements from Anne Clements & Associates to Minter Ellison regarding *Potential for re-establishment of the Warkworth Sands Woodland community on Warkworth sands located within the Northern and Southern Biodiversity Area*, dated July 2011;
- Appendix E – letter from Mr James Tomlin of AGE to EMM regarding *Mt Thorley Warkworth Expansion – Warkworth Sands*, dated August 2011;
- Appendix F – report from Mr Rob Gillespie of Gillespie Economics entitled *Economic Costs and Benefits of Environmental Restrictions on the Warkworth Mine Extension*, dated February 2011; and
- Appendix G – report from Mr Rob Gillespie of Gillespie Economics entitled *Coal Mining in NSW The Issues of Alternative Coal Resources*, dated March 2011.

This section provides a summary response to Mr Peake’s assessment on the likely impacts of the proposed Warkworth Extension on ironbark and WSW.

3.3.2 Ironbark

i Availability on valley floor

As outlined in Section 6.3.4 of the EA for the proposed Warkworth Extension, the proponent held several meetings with DP&I and OEH in relation to the development of the offset package prior to lodgement of the EA for adequacy review in early March 2010. These meetings discussed the land use conflicts that effectively rule out broad acre offsets of Central Hunter Grey Box-Ironbark-Spotted Gum communities on the Hunter Valley floor. Land occupied by scattered patches of this forest and woodland type is currently used for mining, rural, urban and industrial development, viticulture, horse raising studs and Defence training activities. For this reason, the strategic regional offsets that were “like for like or better” were proposed in the Goulburn River National Park area and generally supported.

The strategic regional offsets, namely the Goulburn River, Seven Oaks and Putty Biodiversity areas, were carefully selected for a number of reasons:

- they contain freehold land containing a mixture of remnant vegetation and native vegetation with regeneration potential. These lands with the proposed change of land use and management from grazing to conservation provide current and long term potential regenerating habitat for native fauna;
- they are strategically linked to national parks and nature reserves and to conservation initiatives such as the GERI;
- they are located in a critical area of the state where climate change is anticipated to impact and will provide a transition zone especially along the 17km of riparian vegetation, for threatened fauna and non threatened fauna to move from the central western region of the state toward the east as climate change dries the inner areas; and
- they do not contain mining tenements and are not as threatened by future growth of State significant industries.

The selected sites that have been nominated as strategic offset sites satisfy all these criteria. The strategic regional offsets contain high quality habitat for all species predicted to be impacted by the proposed Warkworth Extension. The strategic regional offsets also contain examples of the critically endangered Box Gum Woodland, and extensive areas of frontage to the Goulburn River and other permanent streams that provide water for wildlife.

The OEH's Director – North East Region confirmed with the proponent on 18 November 2010 by email that:

The offsets for woodlands/forests are acceptable to DECCW (assuming all three properties are for the offsets).

The reference to woodland/forests is the Central Hunter Grey Box-Ironbark-Spotted Gum communities.

Notwithstanding the above, following a meeting with DP&I on 2 June 2011, the proponent undertook further work on the ability of securing offsets for the Central Hunter Grey Box-Ironbark-Spotted Gum which predominantly occur on the Hunter Valley floor. This included interrogation of ownership and property sales databases together with other investigations to very broadly segregate existing and proposed land uses. This exercise revealed that the most prominent competing land uses for offsets on the valley floor include:

- natural resource lands consisting of present mining tenements and authorities to prospect for coal;
- urban and rural residential lands;
- State and Commonwealth lands;
- horse studs, and
- future industrial lands

Of the lands remaining without a known competing land use and with known occurrence of Central Hunter Grey Box-Ironbark-Spotted Gum communities, there are approximately 2,800 ha. An analysis of the ownership patterns within the remaining compatible lands shows the 2,800 ha of the Central Hunter Grey Box-Ironbark-Spotted Gum communities are scattered over approximately 280 lots totalling close to 10,000 ha, meaning only 28 percent of the land is appropriate for offsetting. The average lot size is between 50-150 ha with a large number of separate ownerships.

The opportunities for offsetting Central Hunter Grey Box-Ironbark-Spotted Gum communities are limited to small, isolated landholdings and in particular are non-continuous parcels which is considered to provide low long term, strategic value given the expected continuation of competing land use scenarios in the Upper Hunter Valley. It was therefore not considered reasonable or feasible to secure up to 2,000 ha of Central Hunter Grey Box-Ironbark-Spotted Gum communities on the valley floor.

Given the above, the next logical step would be to identify the appropriate derived native grasslands for the potential re-establishment of these Ironbark communities. However derived native grassland, derived from the clearing of Central Hunter Grey Box-Ironbark-Spotted Gum communities, is not presently mapped. Grasslands are not as readily mapped as vegetated communities from aerial photography and would therefore require field verification. The exercise on mapping the Central Hunter Grey Box-Ironbark-Spotted Gum communities shows that it occurs across numerous landholdings; the grasslands derived from past clearing of this community is likely to occur across many hundreds of individually owned lands. To access these properties would require the consent of the landowner.

Such an exercise would take several months to years, depending on land access and is likely to yield a low likelihood of finding and being able to commercially secure large strategic tracts suitable for restoration or conservation.

Notwithstanding the limitations referenced above for existing woodland, the proponent reviewed all landholdings held by the separate WML joint ventures for opportunities to offset additional Central Hunter Grey Box-Ironbark-Spotted Gum communities. As stated previously, three additional areas were identified containing 57.4 ha of the Central Hunter Grey Box-Ironbark-Spotted Gum communities and 8.3.7 ha of derived grasslands. These areas have now been included into the offsets package through addition to the Southern Biodiversity Area. These areas provide considerable additional value in terms of fauna corridors.

Given the land use pressures for offsets on the Hunter Valley floor, the proponent investigated additional strategic, regional offsets in the Goulburn River National Park region, similar to the concept for the existing strategic regional offsets outlined in the EA and RTS. The proponent identified a number of properties as potential offsets, including the Bowditch Biodiversity Area which has now been included within the offsets package. As previously stated, the Bowditch Biodiversity Area is located in the same bioregion as the proposal and within an OEH priority area. Negotiations are continuing with the other properties with the aim of acquiring a minimum of 750 ha of woody vegetation in strategic locations such as the Goulburn River and Bowditch biodiversity areas.

As previously stated, the development of the revised offset package has been undertaken in consultation with government. The OEH wrote to DP&I, by email, on 11 July 2011 and on 29 August 2011, stating that overall, they are supportive of the offset package, including the commitment to acquire 750 ha of woody vegetation in strategic offsets to the acceptance of OEH within 12 months of project approval.

ii Rehabilitation of ironbark

The final landform of the proposed Warkworth Extension, as outlined in the EA was reviewed for opportunities for rehabilitation of Central Hunter Grey Box-Ironbark-Spotted Gum communities. In February 2011, the proponent made a commitment to rehabilitate 780.6 ha of woodland to the Central Hunter Grey Box-Ironbark-Spotted Gum communities. This was increased by 1,333.4 ha to 2,114 ha on in June 2011. This proposed rehabilitation combined with rehabilitation from other mines aimed at regeneration of this community will restore large areas across the valley floor. Rehabilitation combined with existing remnants and regrowth which are secured currently in previously approved mining offsets provide long term conservation certainty for this community.

Based on a recommendation from Dr Robertson regarding the need to undertake further research on returning the ground stratum species to enable the full community to be represented in rehabilitation, the proponent has committed to providing \$500,000 to research aimed at improving rehabilitation of ground stratum plant species of the Central Hunter Grey Box-Ironbark-Spotted Gum communities.

3.3.3 Warkworth Sands Woodland

i General

Mr Peake's assessment concludes that the proposed Warkworth Extension will have a significant impact on the WSW. In order to reduce impacts and provide a balance between the impact and offsets his report states that it is necessary to reduce the extent of proposed clearing of WSW. The report states that this reduction will serve to reduce or eliminate edge effects as well as the potential impacts arising from possible severance of perched aquifers.

As such, Mr Peake's first recommendation is to excise all WSW west of Wallaby Scrub Road from the proposed Warkworth Extension. Specifically he recommends:

Excise all WSW from west of Wallaby Scrub Road (i.e. outside of the 2003 Extension Area) from the disturbance area in a manner that ensures that impacts on WSW are reduced to a level that is already approved under the 2003 Extension Area. In doing so, the final disturbance boundary and associated mining controls should ensure that there is reduced risk of edge effect impacts on adjoining WSW or impacts caused through severance of the perched aquifer.

Central to Mr Peake's recommendation is the offset ratios he considers are required to compensate for mining on land containing WSW. The ratios seem to be based on Mr Peake's own opinion rather than on scientific evidence or Government policy. Mr Peake recommends a ratio of 6:1 'upfront' and 9:1 in the longer term.

The ratios are ultimately based on a number of opinions held by Mr Peake which are unsubstantiated by any evidence or are outside Mr Peake's area of expertise to form an expert opinion on. The principal contested opinions are:

- the risk of extinction;
- the risk of failure in regenerating WSW;
- edge effect impact on WSW from disturbance of the perched aquifer; and
- the use of precautionary principle in avoiding impacts on WSW.

As Mr Peake's recommended ratios cannot be achieved he recommends that the area of impact be reduced by excising the proposed mining area west of Wallaby Scrub Road.

ii Risk of extinction

In relation to Mr Peake's claim of WSW being at risk of extinction, it is Dr Robertson's contrary view that the proposed offset package for WSW would in fact reduce the risk of its extinction in the long term and not materially change the risk of extinction in the short term given the area of the community. This is based on the proponent's offset package for the clearing of 103.5 ha (assuming Wallaby Scrub Road is closed and not relocated) that consists of:

- 130.1 ha of intact WSW (1.3:1 ratio); and
- 234.4 ha of re-establishment of WSW on previously cleared and in-situ Warkworth Sands (an additional 2.3:1 ratio).

These offsets will be conserved in the long term in secure tenure. It will immediately increase the total area of secured WSW. Following regeneration of WSW, which Mr Peake himself considers to have good prospects of success, the amount of secured WSW will increase substantially compared to the area that presently exists.

A quantitative analysis of the impacts of clearing and the gains from offsets has also been undertaken, comparing the 2003 extension with the current proposal. This was undertaken to put into context the current assessment with previous assessments of the acceptable level of impact on WSW i.e. the granting of the 2003 extension approval.

As such this analysis contained the following scenarios:

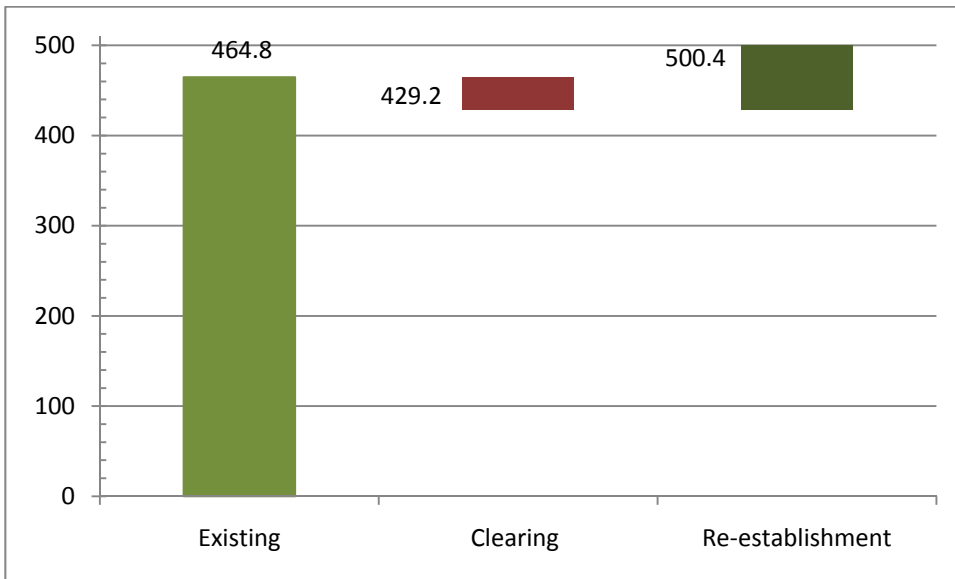
- Scenario 1a provides an analysis of the impacts and offsets for the 2003 extension based on data available at the time;
- Scenario 1b provides an analysis of the impacts and offsets for the 2003 extension based on new data on the occurrence of the WSW based on the 2011 Peake review; and
- Scenario 2 provides an analysis of the impacts and offsets for the current proposal based on new data on the occurrence of the WSW based on the 2011 Peake review.

A summary of this analysis is provided in Table 3.3 and it shows the following results:

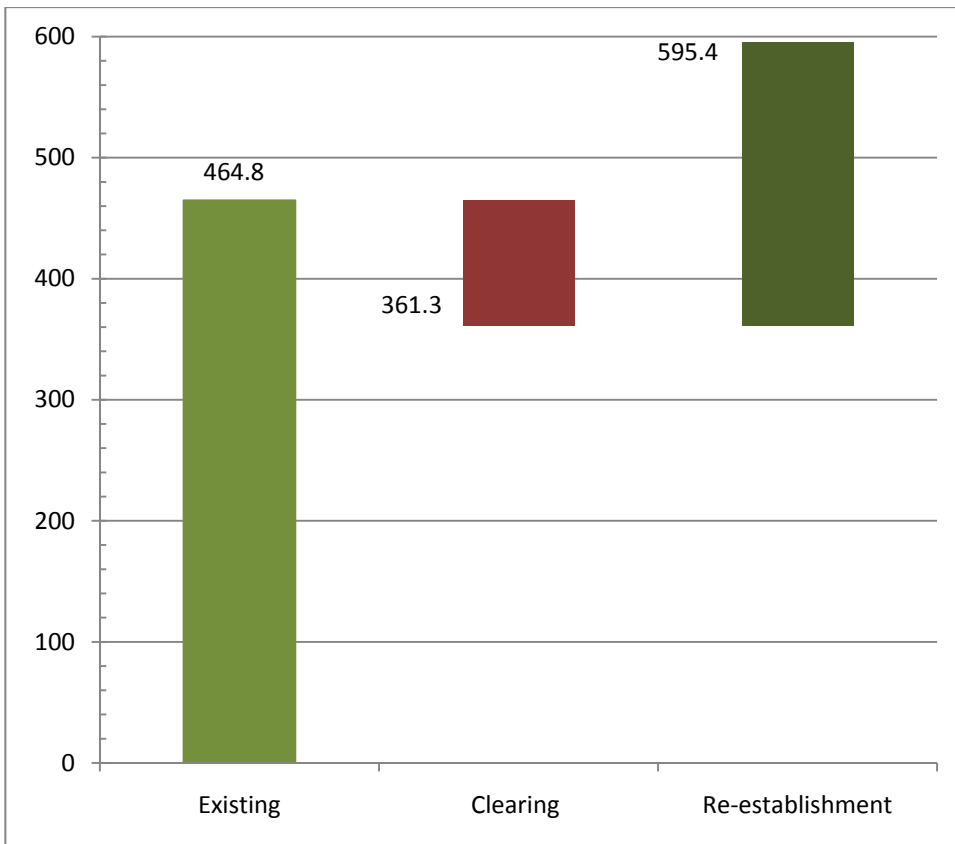
- the amount of WSW left after clearing (excluding offsets):
 - Scenario 1a was 11.8 percent of the pre-European occurrence; or
 - Scenario 2 results in 11.9 percent of the pre-European occurrence.
- the offsets (excluding rehabilitation) of WSW provided:
 - Scenario 1a offsets equate to 2.3 percent of the pre-European occurrence; or
 - Scenario 2 offsets equate to 4.3 percent of the pre-European occurrence.
- with the inclusion of re-establishment of WSW, the amount of WSW conserved within offsets:
 - Scenario 1a increases to 4.6 percent of the pre-European occurrence; or
 - Scenario 2 increases to 12 percent of the pre-European occurrence.
- in total, the amount of WSW that would be remaining after clearing, conserved within offsets and re-established:
 - Scenario 1a would result in an 8.9 percent increase (ie 108.9 percent) in the occurrence of WSW remaining; or
 - Scenario 2 would result in a 28.1 percent increase (ie 128.1 percent) in the occurrence of WSW remaining.

Based on current data, the 2003 offset package has estimated that there will be 500.4 ha of WSW in the long term (following regeneration) of which approximately 50 percent would be conserved in land subject to offset agreements. Under the proposed package, it is estimated that there will be 595.4 ha of WSW in the long term (following regeneration) which constitutes 128 percent of the area of known WSW, of which approximately 81 percent would be contained within land subject to offset agreements. Accordingly under the proposed package there will be more WSW provided in the long term (95 ha more) and more of the community contained within land subject to offset agreements.

One of the arguments advanced by Mr Peake to support avoidance of WSW west of Wallaby Scrub Road is that it would increase the risk of extinction and that the original or pre-European extent of the community is now thought to be much less (calculated by Mr Peake as 3,038 ha) than when it was recommended for listing by Mr Peake. Mr Peake then suggests there was some 6,153.8 ha originally (pre-European) when the community was listed with some 800 ha remaining at the time of the listing. Based on a review of *Warkworth Sands Woodland – An Endangered Ecological Community Distribution, Ecological Significance and Conservation Status* (Peake, et al) in which Mr Peake was involved with and is available on the Hunter



Existing approval (2003 Extension)



Proposed Warkworth Extension

Figure 3.3 WSW clearing and offsets – current proposal compared to 2003 extension

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Table 3.3 Summary of Warkworth Sands Woodland data scenarios analysis

Item	Scenario 1a#			Scenario 1b			Scenario 2		
	Area (ha)	% remaining	% pre-European	Area (ha)	% remaining	% pre-European	Area (ha)	% remaining	% pre-European
WSW pre-European	3,076.9	-	-	3,038	-	-	3,038	-	-
WSW remaining (ie existing)	400	-	13%	464.8	-	15.3%	464.8	-	15.3%
WSW to be cleared	35.6	8.9%	1.2%	35.6	7.7%	1.2%	103.5	22.3%	3.4%
WSW left after clearing	364.4	91.1%	11.8%	429.2	92.3%	14.1%	361.3	77.7%	11.9%
WSW offset of existing vegetation	71.2	17.8%	2.3%	71.2	15.3%	2.3%	130.1	28%	4.3%
WSW left to be re-established	71.2	17.8%	2.3%	71.2	15.3%	2.3%	234.1	50.4%	7.7%
WSW left following clearance and re-establishment	435.6	108.9%	14.2%	500.4	107.7%	16.5%	595.4	128.1%	19.6%
WSW conserved within a Coal & Allied offset including re-establishment	142.4	35.6%	4.6%	142.4	30.6%	4.7%	364.2	78.4%	12%
WSW conserved within Bulga mine and Wambo mine offsets	119.7	29.9%	3.9%	119.7	25.8%	3.9%	119.7	25.8%	3.9%
WSW not conserved within an offset	173.5	43.4%	5.6%	238.3	51.3%	7.8%	111.5	24%	3.7%

Notes: 1.Scenario 1a – 2003 development consent based on 2003 data.

2.Scenario 1b – 2003 development consent based on 2011 data.

3.Scenario 2 – current proposal based on 2011 data.

Based on 'Warkworth Sands Woodland – An Endangered Ecological Community Distribution, Ecological Significance and Conservation Status (Peake et al, 2002) on Hunter Botanic Gardens website, for the 800ha remaining in 2002, approximately 50 percent is regarded as *Eucalypt crebra/moluccan* and *corymbia maculata*, a different community. Accordingly, the pre-European extent of 6,153.8ha inferred by Mr Travis Peake in the 2011 review has been halved on this basis.

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Region Botanic Gardens website, for the 800 ha remaining in 2002, approximately 50 percent is reported as *Eucalypt crebra/moluccana* and *corymbia maculata*; a different community. Given this, the 800 ha remaining at the time of listing can be inferred as 400 ha and the pre-European extent of 6,153.8 ha can be inferred as 3,076.9 ha. This compares with the 3,038ha of pre-European now reported by Mr Peake (2011).

Based on the above, the remaining area and the pre-European extent reported by Mr Peake using 2011 data appears to be not that dissimilar to when it was listed.

Irrespective, Figure 3.3 and Table 3.3 demonstrate that under the current proposal, there would be increases in the area and percentage of WSW compared to present. Also, the percentage of the pre-European extent would be greater than that achieved under the existing mining consent given in 2003.

Mr Peake, as well as experts Dr Robertson and Dr Clements, all acknowledge that WSW can regenerate on WSG.

iii Regeneration of Warkworth Sands Woodland

In relation to the regeneration of WSW, while Mr Peake provides evidence that WSW is regenerating at Bulga Mine (based on his own survey results), and seem to concur with Dr Robertson's view that the community has historically regenerated (refer to Figures 2.2, 2.3 and 2.4 in the RTS) on Coal & Allied land, he still states that there is a risk that the regeneration of WSW may fail.

It is Dr Robertson's view that regeneration of WSW has a high chance of success, particularly when backed by research programmes as that being undertaken by UNE. This is because there is already compelling evidence that heavily cleared sand landscapes regenerated unaided to form the WSW at the subject site today. The EA provided compelling evidence from historic aerial photographs to show that the sands vegetation has regenerated from essentially grassland to woodland since the 1960s as grazing was removed. Peake acknowledges this and agrees with the finding. Dr Robertson states that if best practice methods are used to aid the regeneration, then this would greatly increase the probability of successful regeneration.

Dr Robertson's opinion on the likely success of WSW regeneration is supported by Dr Clements who is an expert in restoration ecology, particularly restoration of woodland communities on sand deposits. Dr Clements has prepared a letter advising of the prospects for re-establishment of WSW at the Northern Biodiversity Area and the Southern Biodiversity Area. Upon reviewing background documents, and inspecting the sites, Dr Clements formed the view that a well-planned programme of rehabilitation, restoration and re-construction of the WSW will lead to appropriate conservation outcomes. Dr Clements stated that the Biodiversity Areas contained sand deposits and remnant WSW meaning that re-establishment of WSW ecosystems is feasible and achievable. She states that the key assets in the proposed re-establishment of WSW include:

- sands in the Warkworth area with and without native vegetation cover;
- pioneer species colonising existing disturbed sands (such as the former orchard and the steep slopes of the quarry in the Southern Biodiversity Area); and
- relatively intact soils and associated trees, shrubs and groundcovers (seed sources, host areas of soil fungi) on a series of regularly spaced dune crests and swales in the Southern Biodiversity Area and small patch of the Northern Biodiversity Area.

Dr Clements' report is provided in Appendix D.

Drs Robertson and Clements views have been accepted by OEH in their correspondence to DP&I dated 11 July 2011. The correspondence stated that given the limited distribution of WSW and limited availability of extant offsets, OEH accepts that the rehabilitation of WSW within the offset package will result in an increase in the extent of the EEC.

iv Perched Aquifer

In relation to the perched aquifer which underlies most of the WSW, Mr Peake indicates that severance of the perched aquifer can be controlled. However, he also states that there is a risk that disturbance of the aquifer and suggest that this would have a direct and indirect impact on the quality of the woodland.

Mr Peake's view on potential impacts on the perched aquifer is not consistent with that of the groundwater experts, AGE and is outside of his area of expertise. Mr Tomlin of AGE has modelled the impacts of disturbance to the perched aquifer as a result of mining. His assessment shows that the groundwater flows in a direction away from the proposed disturbance area and that drawdown of the aquifer as a result of mining would be minor. Modelling shows that 30 m from the disturbance boundary the drawdown in the sand aquifer would be about 200 mm. Given that the vegetation is naturally adaptive to fluctuating water levels within the sand sheet (as per Dr Robertson), Mr Tomlin states that this relatively small zone reduction in groundwater levels is not significant. Mr Tomlin further states that the most appropriate response is a more detailed hydrogeological study in the area near the proposed excavation. This study would include installation of a network of shallow monitoring bores to the base of the sand sheet to measure groundwater levels, hydraulic gradients, flow rates, and the permeability of the sands. This detailed information could then be used to assess the most appropriate mitigation method, if any is required. Should mitigation be required, a potential method would be to apply a low permeability material to the upper levels of the mine face to reduce the seepage from the sandsheet. Thus, it is evident that significant impacts on the perched aquifer are unlikely and, if mitigation is needed, it could be readily implemented.

v Precautionary Principle

In his assessment, Mr Peake applies the precautionary principle in relation to the regeneration prospects for WSW and the impacts of disturbance to the perched aquifer. Use of the precautionary principle is only warranted when there is real uncertainty about a possible impact. As demonstrated by Dr Robertson and Mr Tomlin in their respective technical reports and specifically in items iv below, no such uncertainty exists to either factor. In addition, use of the precautionary principle in this specific way is inappropriate because it does not consider other aspects of the proposed Warkworth Extension.

The precautionary principle is part of the principles of ecologically sustainable development (ESD) and ESD requires a balancing of all of the limbs of the ESD test, of which the precautionary principle is but one. This involves, amongst other things, balancing negative impacts against economic benefits by the final decision maker. In summary, Mr Peake was requested to provide an expert opinion on ecology and it is the decision maker's role, not an individual specialist, to weigh all of the evidence and to apply the principles of ESD to the final decision.

Even when Mr Peake has applied the precautionary principle, that being in respect of the impact on the perched aquifer and the regeneration potential of WSW, he has applied it incorrectly.

The precautionary principle¹ is stated as follows:

- (a) the precautionary principle-namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

In the application of the precautionary principle, public and private decisions should be guided by:

- (i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and
- (ii) an assessment of the risk-weighted consequences of various options,

Mr Peake, a botanist, raises concerns in relation to the impact of mining on the perched aquifer. This is despite advice from an expert hydrogeologist, Mr Tomlin, that there will not be any impact. Further, even if aquifer damage was to occur, there is a number of actions that would be taken to mitigate potential impacts. Similarly, even Mr Peake, considers that there are good prospects of the regeneration being successful. Dr Clements, a leading restoration expert considers that the prospects are extremely high of a successful outcome if it is properly resourced.

Even if it were appropriate to apply the precautionary principle at this stage of the process (which it is not), there is no basis, given the evidence provided, upon which the precautionary principle can be relied upon to justify excising all WSW west of Wallaby Scrub Road from the proposed Warkworth Extension.

Dr Robertson has assessed Mr Peake's review and he is concerned about aspects of the analysis and conclusions drawn in relation to WSW. He states that excising WSW west of Wallaby Scrub Road is unnecessary and is not the only way by which the security of the remaining vegetation can be addressed. Dr Robertson clearly states that the impacts to WSW can be mitigated by regeneration of the WSG, which should be appropriately accepted within the proposed offset.

A copy of Dr Robertson's response to the Mr Peake's review is contained in Appendix C.

In relation to economic considerations, an assessment was undertaken by Mr Robert Gillespie of Gillespie Economics of the economic impact of Mr Peake's recommendation to avoid the WSW west of Wallaby Scrub Road. A copy of Mr Gillespie's report is contained within a letter provided to DP&I on 27 May 2011 (copy of which is contained in Appendix F). Mr Gillespie's assessment indicates that while there would be economic benefits of conserving the WSW west of Wallaby Scrub Road, there would be significant economic costs. His assessment indicates that the costs to society would more than outweigh the benefits in the amount of \$311 million. Mr Gillespie's assessment clearly indicates that the avoidance of WSW west of Wallaby Scrub Road cannot be justified from an economic efficiency perspective.

The work undertaken by Mr Gillespie was based on royalties as calculated are based on the existing royalty payment methodology. If the new methodology, as proposed in the 2011 State Budget, is adopted, the total royalties paid to the state would increase, increasing the benefits calculated by Mr Gillespie.

Further work was undertaken by Mr Gillespie to examine the consequences of obtaining an equivalent volume of coal to that underlying the WSW from another source in NSW. This report is provided in

¹ see Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.

Appendix G. Mr Gillespie's report concludes that a basic fundamental of mineral economics is the difference between 'resources' and 'reserves'. Put simply, in addition to the geological characteristics of a mineral deposit the determination of 'reserves' depend upon a range of tangible factors (including the availability of physical and human infrastructure) and less tangible or 'governance quality' factors (including tax rates, contractual certainty under law and property rights) that determine the investment climate for any given proposal. The key point is that for any 'resource' to be classified as a 'reserve' that is capable of being used the sum of these factors must be positive, meaning that it erroneous to consider all the state's mineral resources to be interchangeable.

vi Conclusion

In conclusion, it is the expert opinion of Drs Robertson and Clements that the proposed offset package will provide long term security for WSW. This is supported by the NSW Government's responsible Department for the State's biodiversity, OEH, in their letter to DP&I dated 11 July 2011.

Mr Peake, a botanist, questions the ability for WSW to be regenerated and raises concerns about impacts on the perched aquifer that underlies the community from mining. This view is disputed by Mr Tomlin, an expert hydrogeologist and Dr Clements, an expert restoration ecologist of sand based communities.

Dr Clements is of the clear view that WSW can be successfully regenerated on WSG and Mr Tomlin is of the clear view that the drawdown of groundwater in the perched aquifer as a result of mining would not be significant and could, in any case, be appropriately managed if required. There is also anecdotal evidence that the WSW proposed to be cleared was previously cleared and returned without any management intervention. The proponent is proposing re-establishment on existing sands supported by best available research through the University of New England.

While Mr Peake uses the precautionary principle in his assessment, it should only be applied when genuine uncertainty exists and, in this case, all expert ecologists believe WSW regeneration is possible and the hydrogeological evidence indicates little risk to the perched aquifer. Further, the precautionary principle is only one limb of ESD, which a proper application by the decision maker would require consideration of other impacts or benefits such as social and economic benefits. An assessment of the economic benefits as a result of the proposed Warkworth Extension undertaken by Mr Gillespie clearly indicates that the proposal will benefit society. An assessment has been undertaken of the impact of reservation of the WSW west of Wallaby Scrub Road (as recommended by Mr Peake) clearly states that it cannot be justified from an economic perspective. While reservation of the WSW would have some economic benefits, the costs to society are clearly outweighed by the benefits.

A comparison of the 2003 offset package and the proposed offset package indicates that the current proposed package will lead to the long term provision of more WSW (95 ha more). More importantly under the proposed offset package, 75 percent of WSW would be conserved and managed in offset sites, compared to 50 percent under the 2003 offset package. Overall this will result in a better environmental outcome for the WSW.

As previously stated, this view has been accepted by OEH in their correspondence to DP&I dated 11 July 2011. The correspondence stated that given the limited distribution of WSW and limited availability of extant offsets, OEH accepts that the rehabilitation of WSW within the offset package will result in an increase in the extent of the EEC.

Overall, OEH stated within correspondence on 11 July 2011 and 29 August 2011 that it is supportive of the offset package. This includes acceptance of Rio Tinto Coal Australia's strategic approach to offsetting Ironbark vegetation including acceptance of a condition of approval of securing an additional 750 ha of woody vegetation in strategic regional offsets within 12 months of approval, to the acceptance of OEH.

3.4 HVO South

A modification of the Hunter Valley Operations (HVO) South project approval is also under determination by the DoPI. Under this modification, it is proposed to reallocate remnant woodland vegetation and native enhancement areas (140ha) at the Archerfield Biodiversity Enhancement Area (Archerfield) to an alternative site within the Goulburn River Biodiversity Area. Archerfield is provided to offset impacts caused by the clearing of native remnants (48ha) and regrowth (92ha) vegetation for the HVO South Coal Project. The modification proposed would allow Archerfield to be used as part of the Northern Biodiversity Offset Area.

The HVO South Coal Project Approval required approximately 140ha of remnant vegetation to be conserved for the life of the development. Coal & Allied is proposing to utilise an area of 140ha of remnant Narrow-leaved Ironbark Woodland within the Goulburn River Biodiversity Area. This area has a high biodiversity value and ability to regenerate for a net positive impact on biodiversity. The Goulburn River Biodiversity Area offers greater habitat complexity and strategic conservation outcomes than that provided by the current offset arrangements at Archerfield.

The ability to transfer the Archerfield Biodiversity Enhancement Area as part of the Northern Biodiversity Area for the proposed Warkworth Extension has long term strategic conservation outcomes. The Northern Biodiversity Area has a high biodiversity value and ability to regenerate for a net positive impact on WSW. The Northern Biodiversity Area provides an increase in the area of conservation from 140ha to 342ha. This area will offer long term protection of 123.3ha of woodland, including almost 20ha of WSW as well as conservation, re-establishment and long term protection of some 195.8ha of WSW.

Coal & Allied considered options for offsetting impacts for both the HVO South Coal Project and the proposed Warkworth Extension using an integrated approach aimed at achieving the best conservation outcomes for the impacts from their activities on EECs and threatened species to provide a net positive impact. The combination of the Northern Biodiversity Area increasing the conservation of Archerfield to 342ha with the inclusion of the HVO South offset of 140ha into the Goulburn River Biodiversity Area allows the development of both local and regional strategies to maintain and improve the conservation management and connectivity of ecosystems and habitats.

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