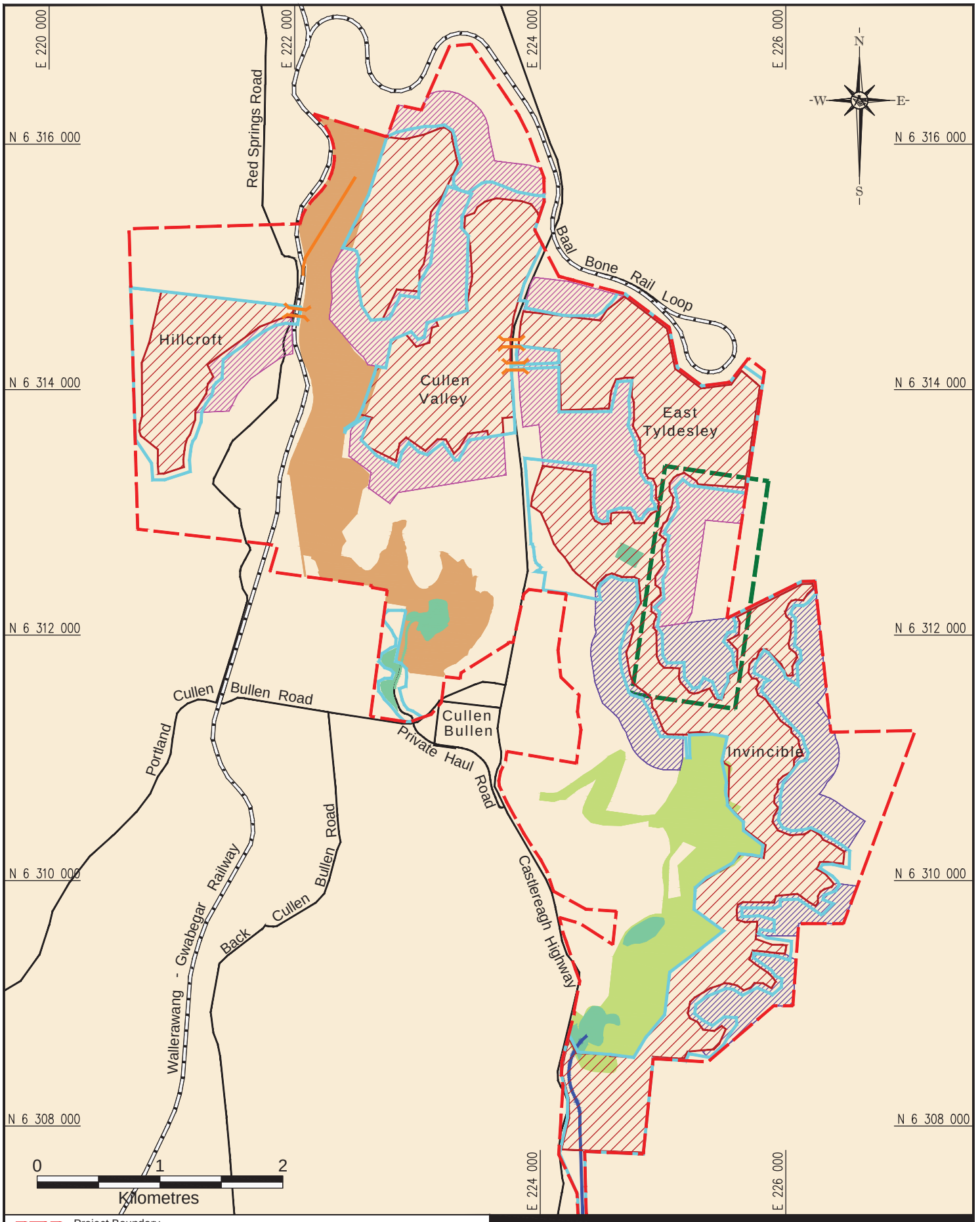


Project Boundary
Project Disturbance Boundary
Existing Cullen Valley Mine
Existing Invincible Colliery
Infrastructure
Rail Siding
Conveyor
Open Cut Coal Mining
Highwall Mining All Seams
Highwall Mining All Seams Except Lithgow
Subsidence Study Area
Bridge / Overpass

Hansen Bailey

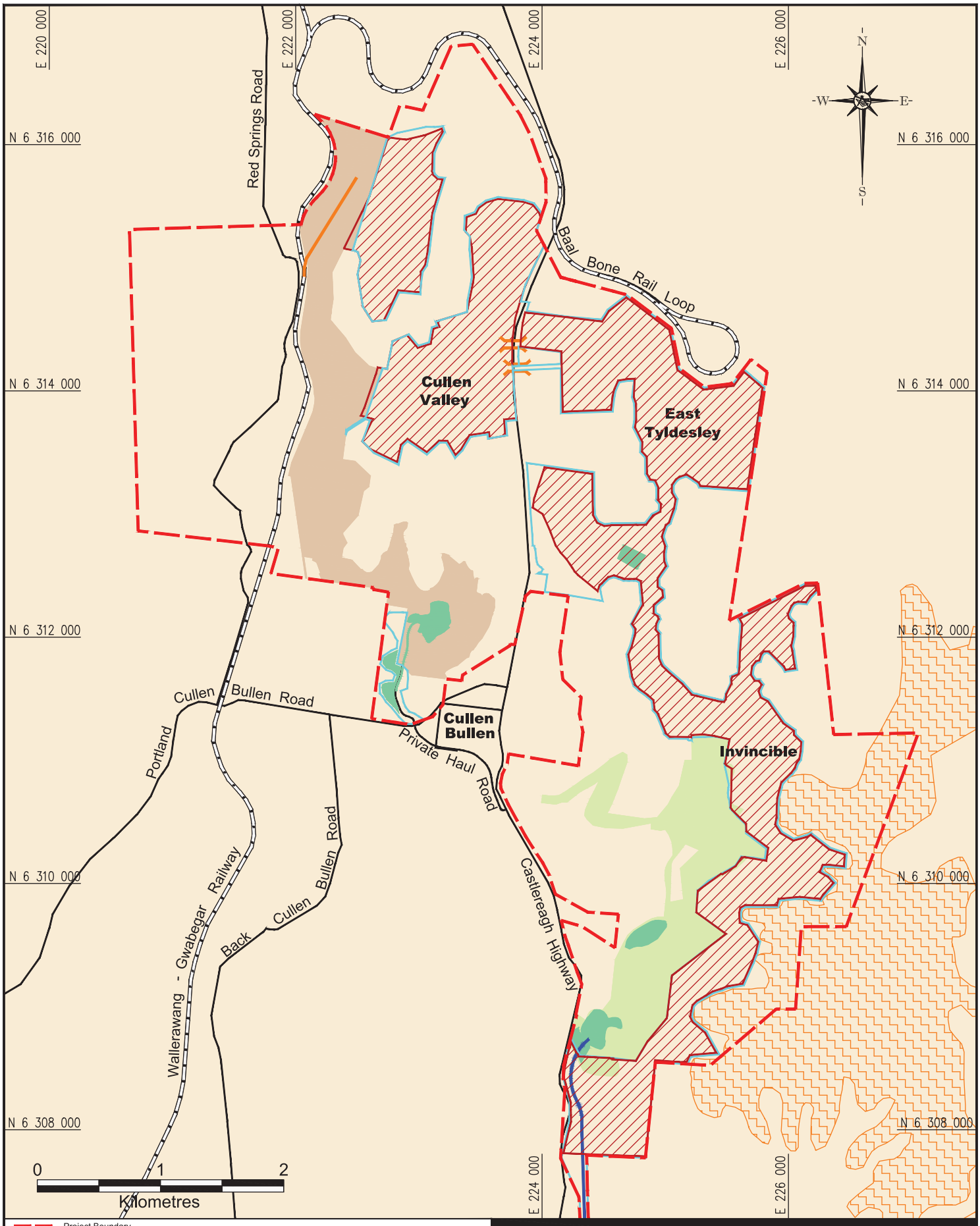
Coalpac Pty Ltd

Coordinate System: MGA Zone 56

COALPAC CONSOLIDATION PROJECT

Indicative Project Layout - Coal

Cad File: 07122X.dwg	Date: 28.11.11	Drawn: CP	Figure 7



Project Boundary
Contracted Project Disturbance Boundary
Existing Cullen Valley Mine
Existing Invincible Colliery
Infrastructure
Rail Siding
Indicative Conveyor Alignment
Contracted Open Cut Coal Mining
Single Bridge / Overpass (two highway overpass options shown)
Significant Pagoda Landform Boundary

Hansen Bailey

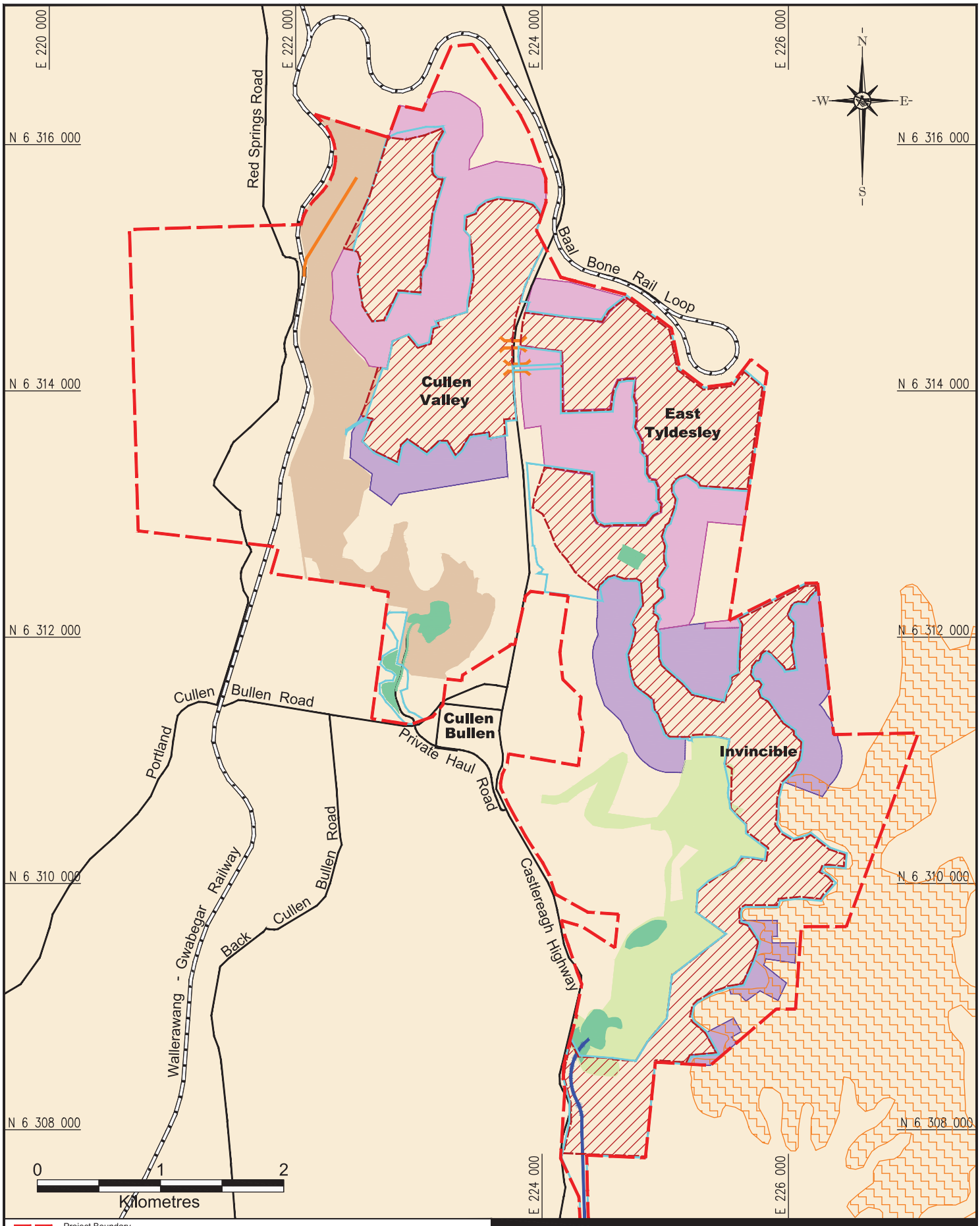
Coalpac Pty Ltd

Coordinate System: MGA Zone 56

COALPAC CONSOLIDATION PROJECT

Indicative Contracted Project Layout - Open Cut

Cad File: 09104D.dwg	Date: 06.03.13	Drawn: JD	Figure 7A



Project Boundary
Contracted Project Disturbance Boundary
Existing Cullen Valley Mine
Existing Invincible Colliery
Infrastructure
Rail Siding
Indicative Conveyor Alignment
Open Cut Coal Mining
Contracted Highwall Mining All Seams
Contracted Highwall Mining All Seams Except Lithgow
Single Bridge / Overpass (two highway overpass options shown)
Significant Pagoda Landform Boundary

Hansen Bailey

Coalpac Pty Ltd

Coordinate System: MGA Zone 56

COALPAC CONSOLIDATION PROJECT

Indicative Contracted Project Layout - Highwall Mining

Cad File: 09105D.dwg	Date: 06.03.13	Drawn: JD	Figure 7B

2.2 DETAILED DESCRIPTION OF CONTRACTED PROJECT

2.2.1 Removal of Hillcroft Mining Area

The Hillcroft mining area (proposed to include both open cut and highwall mining operations) was separated from the Cullen Valley mining area by both the Wallerawang – Gwabegar Railway Line and the Red Springs Road. Being located to the west of the Cullen Valley mining area, the removal of the Hillcroft mining area from the Contracted Project mine plan will materially contract a range of predicted environmental impacts, principally through an improvement in visual amenity, the reduction of dust generation (see **Section 3.2**), noise emissions (see **Section 3.3**) and ecological impacts (refer to **Section 3.5**).

Construction of a connecting haul road to access the mining area and associated Wallerawang-Gwabegar Rail Line overpass and Red Springs Road crossing will no longer be required. The deletion of these works from the Exhibited Project will avoid the inevitable disruption to local traffic during what was to be a relatively brief construction period.

The removal of the Hillcroft mining area reduces the coal produced from this mining area by 2.9 ROM Mt with a further highwall mining reserve loss of approximately 0.8 ROM Mt. It also reduces the total area of disturbance from the Exhibited Project by approximately 107 ha. Further, it results in the avoidance of a 74 ha area of habitat for the Capertee Stringybark tree (listed as Vulnerable under the EPBC Act and TSC Act).

Removing the Hillcroft mining area from the Exhibited Project mine plan has, however, resulted in the property also being removed as a component of the proposed Biodiversity Offset Strategy. The Hillcroft offset will be replaced with more appropriate property in the revised BOS to meet Coalpac's management commitments, in response to concerns raised by OEH and noted in the PAC Review Report (see **Section 3.5**).

As noted in **Section 2.2.7**, the Biodiversity Offset Strategy is therefore being revised to ensure that adequate biodiversity offsets will be put in place for the Contracted Project following the removal of the Hillcroft property. In revising and enhancing the proposed Biodiversity Offset Strategy, OEH has provided advice on 28 February 2013 regarding the most appropriate property selection with the objective of these being more compatible with OEH's overall strategy for the protection of biodiversity in the region.

2.2.2 Removal of the Sand Extraction Component

Removing the proposed sand extraction from within the Cullen Valley open cut mining area will result in the following improved environmental outcomes:

- Elimination of 128 truck movements per day on the Great Western Highway;
- Decreased noise and air quality impact due to:
    - Reduced equipment fleet and infrastructure operations that would otherwise have been utilised for sand extraction and processing; and
    - Reduced haulage of sand by trucks on internal haul roads;

- Avoidance of potential Acid Mine Drainage issues noted by the PAC that may have been associated with the sand extraction and processing;
- A reduction in Exhibited Project water consumption of up to 3 ML per annum during the years where the sand extraction was proposed; and
- A reduction in Scope 1 greenhouse gas emissions associated with the sand extraction operation.

2.2.3 Reduction in the Cullen Valley Mining Area

The Clandulla Geebung habitat located in the north-western section of the Cullen Valley mining area will be preserved by the Contracted Project resulting in over 320 individuals of Clandulla Geebung being avoided by the Contracted Project.

This will occur due to a contraction in the open cut disturbance footprint of the Cullen Valley mining area by a further 3.28 ha (specifically undertaken to avoid this species).

This contraction to the mine plan reduces the coal produced from this mining area by 0.5 Mt ROM with a further highwall mining reserve loss of approximately 0.1 Mt ROM.

2.2.4 Modification to Open Cut Mining Footprint for Significant Pagoda Landforms

The PAC recommended a 300 m buffer be applied to extend from pagoda landforms westward across the proposed mine site to:

- Protect foraging habitats of such threatened species as Broad-headed Snake (BHS), Brush-tailed Rock Wallaby (BRW) and Large-eared Pied Bat; and
- Protect the integrity of the Pagoda landforms in relation to slope stability, blasting effects and subsidence from highwall mining.

In response to this issue raised by the PAC, Cumberland Ecology utilised the papers of Washington and Wray (2011) and Muir (2005) to review the geological features within the Project Boundary and identify key areas within pagoda assemblages that provide higher biodiversity values and habitat features for these threatened species. Following this review, Cumberland Ecology have then identified the pagoda habitat within the Project Boundary as a Significant Pagoda Landform (SPL), defined as being:

- *"A complex that creates a continuous landform over a substantial area (typically greater than 10 hectares), comprising (as a minimum):*
    - *Large, substantial in height (typically up to 60m but may be higher), towering pagodas (either platy or smooth), that are generally prominent rock formations with associated cliff faces and deeply dissected gullies, characterised by banded ironstone and associated rock structures containing numerous overhangs and crevices, with;*

- *Associated deeply dissected wet gullies between the pagoda formations that contain a complex of habitat types for both flora and fauna, some species of which are rarely found elsewhere (e.g. Pagoda Daisy)."*

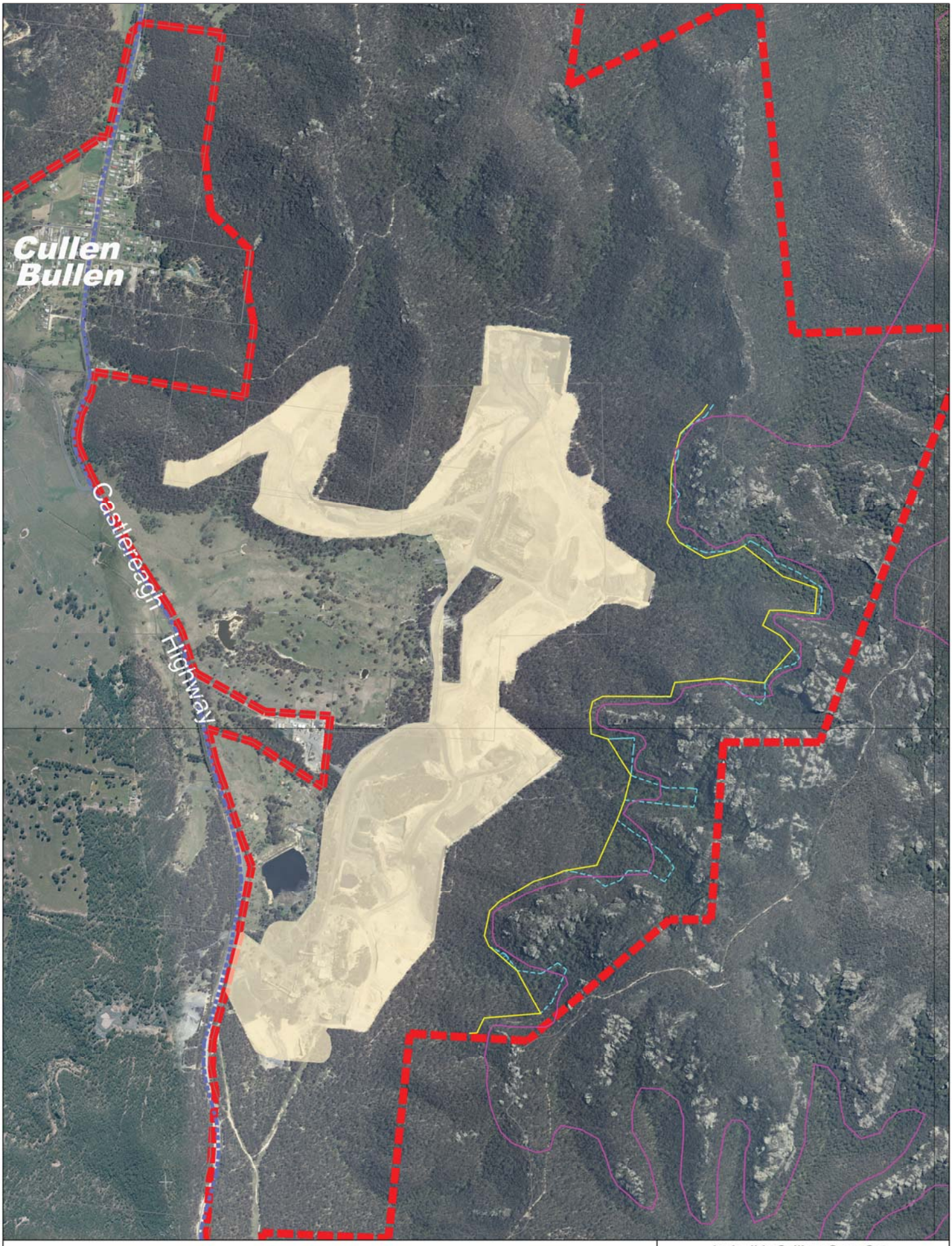
All other landforms not forming a complex of SPL are defined by Cumberland Ecology as Sandstone Outcrops, which are defined as:

> *"Outcrops of sandstone that are in situ and form a discontinuous landform with individual continuous outcrop areas of less than 10 and greater than 0.1 hectares. These outcrops may exhibit geomorphological features such as cliffs, caves, rock towers and isolated pagodas that do not form an aggregate or have deeply dissected wet gullies (SPL)"*

Analysis of *"pagoda-dependent"* flora and fauna (as suggested by the PAC) by Cumberland Ecology has shown that most such species are not restricted to pagoda landform habitats and actually occur much more widely in NSW. Those that do have a more restricted distribution are generally found outside the areas proposed for mining and are unlikely to be significantly impacted.

The PAC recommended a 300 m buffer as a mitigation strategy for three threatened fauna species, including the Broad-headed Snake (BHS), Cave Roosting Bats (CRB) (Eastern Bentwing-bat and Large-eared Pied Bat), and Brush-tailed Rock Wallaby (BRW). The predicted effects of mining on these species were found to be negligible, due to the absence of the BHS and BRW (as well as suitable habitat) in the Project Boundary, and habitat for CRB is being preserved for the Contracted Project. In addition, analyses show that neither the BHS nor the BRW are likely to be protected by buffers, and that both bat species are widespread across the Blue Mountains, and in the case of the Eastern Bentwing-bat, across other landscapes further east extending to the coast. The vegetation types that support both bat species are well represented to the east of the site and within various National Parks, including the Gardens of Stone National Park and the Blue Mountains National Park.

It is proposed that additional vegetated areas adjacent to the mapped SPL's will now be sterilised from open cut mining to further protect the potential foraging habitat of associated animal species and further ensure the stability of the pagodas. The open cut mining footprint proposed for the Contracted Project is shown on **Figure 7**. The additional setback of open cut mining from the SPL results in a reduction in the open cut mining footprint of 9 ha. The contraction in the open cut mining footprint results in a 1.5 km, or 25 %, reduction in disturbance, and thus reduces edge effects adjacent to the SPL (see **Figure 8**). This contraction of the open cut mining footprint sterilises 2.1 Mt of open cut mineable ROM coal.



Legend

EA Project Boundary

Cadastre

Previous Open Cut Mining Facing SPL = 5,940m

New Open Cut Mining Facing SPL = 4,447m

Significant Pagoda Landforms

Existing Invincible Colliery

Invincible Colliery Open Cut
Mining Adjacent Significant Pagoda Landform

Coalpac Pty. Ltd.
Proprietors of Invincible Colliery and Cullen Valley Mine

Figure: 8

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2.2.5 Modification to Highwall Mining Footprint

To provide greater certainty in environmental outcomes, and in response to community and PAC concerns, highwall mining has been removed from the mine plan under pagodas complexes and clifflines in the SPL. This has been undertaken in response to community and PAC concerns, rather than being based on any scientific grounds in relation to potential geotechnical or ecological impact.

On the basis of further expert advice and peer review, no changes to highwall mining design or methods to those described in the EA are warranted in the remaining areas where highwall mining is to occur to protect any sensitive features. In these areas no noticeable impact to any surface feature will occur. This has been confirmed by further peer review, and the inclusion of additional Project Commitments as part of the Contracted Project.

The highwall mining footprint proposed for the Contracted Project has been extended in some areas to partly compensate for the reduction of the open cut mining footprint. The highwall mining footprint proposed for the Contracted Project is shown on **Figure 4** and **Figure 6**.

In addition to the changes to the proposed highwall mining footprint, site specific coal strength data has been collected and reviewed by GEONET (2013) to confirm that the assumptions made in the subsidence impact assessment in the EA are appropriately conservative (see **Section 3.6**).

2.2.6 Blast Management for Significant Pagoda Landforms & Sandstone Outcrops

In addition to the review of the open cut and highwall mining areas proposed for the Contracted Project to avoid impacts to the SPL and Sandstone Outcrops, a further review of the blast design, monitoring and response procedures has been undertaken by Terrock Consulting Engineers.

This review is discussed further in **Section 3.4** and provides additional detail on the management processes that will be implemented for the Contracted Project to allow a staged progression of open cut mining activities to occur within the blasting buffer zone recommended by the PAC in such a way as to avoid any potential for impacts to the SPL and other Sandstone Outcrops.

2.2.7 Revision to the Biodiversity Offsets Strategy

In response to the recommendations made in the PAC Review Report and comments from other regulatory agencies including DP&I and OEH, the BOS assessed in the EA has been revised for the Contracted Project.

In particular, the PAC review came to the conclusion that:

> *"For this project to proceed, adequate biodiversity offsets must be secured to compensate for the impacts. At this stage the offset package is best described as 'a work in progress', and cannot be considered adequate.*

> *The Commission's conclusion on the offset package is that it is designed to exchange a number of fragmented areas that in some instances require extensive rehabilitation and are not considered suitable for reservation, for a single area of high quality habitat that is already proposed for reservation and which adjoins like areas of high quality habitat."*

The Contracted Project BOS has further considered the comments of the PAC; the biodiversity values predicted to be impacted by the Contracted Project and reviewed potential offsets available in the region that could be used to enhance long term conservation outcomes.

To address the concerns noted by the PAC, Coalpac has held further meetings with OEH and has committed to enhancing the BO S for the Contracted Project. This will occur by acquiring further offsets to a total area of at least 1,000 ha in addition to those offsets currently held. OEH have provided further direction as to what quality that these additional offset land purchases should provide so as to maximise the biodiversity outcome for the region and a list of potential offset properties in the region that may be suitable to form part of the BOS. The acquisition of the additional 1,000 ha of offset land will achieve an overall offset ratio of at least 4:1 for forest and woodland vegetation without any contribution from rehabilitation within the Project Boundary.

The proposed BOS includes a ratio of 12:1 for White Box Woodland. The assessment of the BOS proposed for the Contracted Project was completed by Cumberland Ecology and is discussed further in **Section 3.5**.

2.2.8 Commitments and Management Plans

The implementation of the controls proposed to achieve the reductions in environmental impacts and to ensure certainty of outcomes, particularly with regard to the SPL, will be achieved by the implementation of a revised Contracted Project Statement of Commitments. This will be further assured by the terms of the Mining Operations Plan and Subsidence Management Plan to be prepared by Coalpac and approved by DTIRIS-DRE prior to any open cut or highwall mining (open cut operations only requiring the former to commence).

A revised Statement of Commitments for the Contracted Project is presented in **Appendix A**. Commitments added in the RTS are in bold text, with additions in response to the PAC Review Report highlighted in red text. Those commitments that have been superseded or are no longer relevant due to the Contracted Project are indicated in strikethrough text.

Section 4 of this report also provides additional discussion over the adoption of the recommendations made by the PAC.

3 ASSESSMENT OF CONTRACTED PROJECT

This section details the assessment processes applied to EA and the Contracted Project and includes a summary of the key environmental impact assessments completed for the Contracted Project.

3.1 OVERVIEW

The Contracted Project has been reviewed by the following expert consultants:

- Pacific Environment Limited, on air quality at **Appendix B**;
- Bridges Acoustics, on noise at **Appendix C**;
- Terrock Consulting Engineers, on blasting at **Appendix D**;
- Cumberland Ecology, on ecology at **Appendix E**;
- Dr Andy Markham, on the geomorphology of pagoda landforms at **Appendix F**;
- Dr Arthur White, for a peer review of BHS habitat and impact assessment in **Appendix G**;
- GEONET Consulting Group, on coal strength and pillar design at **Appendix H**;
- Mr Paul Maconochie GeoTek Solutions, on open cut highwall stability at **Appendix H**;
- Professor Bruce Hebblewhite, for a peer review highwall mining design stability at **Appendix H**;
- Gillespie Economics, on the economic context of the Contracted Project at **Appendix I**; and
- Professor Jeff Bennett, for a peer review of the economic impact assessment and PAC Review Report at **Appendix I**.

The above specialists respond to issues raised in the PAC Review Report as to the environmental impacts of the Contracted Project. Remodelling of air quality and noise impacts has been undertaken for Contracted Project Year 2, which was been determined to be the worst case year of greatest impact. This year of mining operations reflects the key changes to the mine plan proposed in the Contracted Project described in **Section 2.2** and is appropriate to consider the worst case environmental issues noted by the PAC in its review.

A response to each of the PAC review recommendations relevant to their respective discipline has also been provided by each specialist. These responses are discussed below in **Section 4** and are provided in full in the respective appendices of this document.

3.2 AIR QUALITY

An assessment of the air quality impacts of the Contracted Project was undertaken by Pacific Environment and is included in full in **Appendix B**.

Prior to the assessment of air quality impacts of the Contracted Project, a review of the air quality assessment methodology used in the EA (PAEHolmes, 2012 (now Pacific Environment)) was completed. The purpose of this review was to confirm that the assessment for the EA had been completed in accordance with the DGR's and best accepted practices, standards and Government Policies, guidelines and plans current at that time and to confirm the appropriate assessment methodology for the Contracted Project.

3.2.1 Review of Assessment Methodology

In their review, Pacific Environment confirmed their position that the methodology, assumptions and background data used as a basis for the air quality impact assessment in the EA were undertaken in accordance with the DGRs, to current criteria and in line with regulatory guidelines.

Additionally, the findings of their assessment were confirmed to be conservative and therefore adequate to model impacts to receivers from the Contracted Project. A review of the proposed Pine Dale Stage 2 Extension and Neubeck Coal Project (both Projects are over 2 km to the south and east of the Great Dividing Range) found that specific mine plan and emissions data was not publically available for these developments. As such, the background data adopted for the EA would remain representative of the region in which the Contracted Project is located. Further, consistent with current Government Policy, the acceptability of the cumulative impacts from these developments (if progressed) would be assessed with the Contracted Project and the acceptability of the cumulative impacts determined at that time.

In addition to the reductions in the Contracted Project mine plan outlined in **Section 2.1**, the only other change to the modelling approach was to include site specific data for silt and moisture content for haul roads, overburden emplacements, coal stockpiles, topsoil stockpiles and rehabilitation (as recommended by the PAC Review Report and measured on site in February 2013). As shown in **Table 2**, this site-specific data confirmed that the assumptions used for these factors in the EA modelling were conservative. This site specific data was used in the reassessment of air quality impacts for Year 2 of the Contracted Project to respond to comments made by the EPA and the PAC and has resulted in a reduction of predicted air quality impacts over and above that due to the mine plan changes described in **Section 2**.

Table 2
Silt and Moisture Content Values Comparison

Area	As adopted in the Exhibited Project EA	As adopted in the Contracted Project	As adopted in the Exhibited Project EA	As adopted in the Contracted Project
	Moisture content (%)		Silt content (%)	
Haul roads	N/A	N/A	5	3.4 - 3.9
ROM coal	7	7 - 8	10	3
Product coal	7	5.3	N/A	N/A
Overburden	2	4 - 5	10	4 - 5
Topsoil	2	6 - 7	8	5 - 6
Rehab	2	5 - 6	10	5 - 6

Note; Values adopted for the East Tyldesley mining area are an average of Cullen Valley Mine and Invincible Colliery results

There are various comments throughout the PAC report raising concerns about the reliance on the predictive dust management system to achieve the predicted ground level concentrations. Concerns were also raised about the on-going reliability of the dust management system itself. Such comments include (but are not limited to):

> *"…achievement of the predicted air quality levels relies on a large suite of control measures and a real-time management system, and failure of any of these could result in the exceedance of the acceptable air quality criteria in Cullen Bullen." [Section 5.1.3.3, page 30 and Section 5.1.4, page 31];*
>
> *"… calls into question the reliance on Real Time Air Quality Management Systems as the potential panacea for air quality problems from open-cut coal mines." [Section 5.1.4, page 32];*
>
> *"… the Proponent's reliance on a large suite of equipment attenuations, day to day operational variations, monitoring, predictive and reactive measures to achieve the predicted levels. … and the potential for human or equipment failure of any of these would increase the risk of increased air emissions." [Section 5.1.4, page 33];*
>
> *"As this system is essential to achieving the required air quality standards for this project, the risks associated with the exceedance of the standards must be considered high." [Section 5.1.8, page 40]; and*

> *"… the reliance on a suite of operational management action including the proposed Real Time Air Quality Management System to achieve the air quality criteria …" [Section 5.1.9, page 41].*

It is noted that there appears to be a misunderstanding by both NSW Health and the PAC as to the purpose of and to what part of the predictive dust management tool has played in the air quality impact assessment for the EA and for the Contracted Project.

In short, this predictive system as proposed plays no part in the assessment of air quality impacts. In other words, to say that the Coalpac will rely on these predictive and reactive measures to achieve the predicted concentrations (as quoted above) is incorrect and misleading. The emissions inventories calculated and used for the dispersion modelling (for the EA and for the Contracted Project), do not take into account any reliance on a predictive management technology. This tool (to be incorporated in the Air Quality Management Plan for the Contracted Project) is to be implemented as part of a management strategy to achieve further air quality emission reductions. Such a tool is used as an additional safeguard that may be applied to operational dust management for the facility, and will act to further compliment and augment dust controls and reduce potential off site effects.

Pacific Environment concluded that the PAC comment that a *"…failure of any of these could result in the exceedance of the acceptable air quality criteria in Cullen Bullen"* is incorrect and misleading.

In fact, given these proposed measures and their potential benefits to managing the air quality impacts of Coalpac mining operations are not included in the modelling, their failure or otherwise would have no impact on the results of the modelling and air quality predictions.

The only mitigation measures incorporated into the remodelling completed by Pacific Environment relate to emissions from two activities, namely haulage and wind erosion. Regarding the former, Coalpac has committed to demonstrating the level of assumed control (75%). Regarding the latter, the above discussions conclude that modelling presented in the EA is very conservative, i.e. higher predicted impacts, compared to NSW EPA recommended approach. In other words, the remodelling has not taken into consideration any further emission reductions that may be achievable at the source due to lower site-specific emission factors and good practice operational dust management, such as the use of a predictive dust management system. Such other measures that have not been explicitly modelled, but will be incorporated into an operational Air Quality Management Plan for the Contracted Project include (but are not limited to):

- Watering at truck loading and truck dumping locations, and
- Dust suppression on drill rigs.

All of these planned activities will aid in reducing actual particulate emissions below the values assumed in the modelling to date.

In relation to the submissions by NSW Health, the PAC notes that:

> *"… the real significance of the issue raised by NSW Health is that this project will cause a large increase in PM_{10}s [sic] above the existing level in Cullen Bullen (even if it complies with the NSW criteria) and this will have a direct impact on the health of the community, a community that is already socially disadvantaged and with poor health statistics compared to the rest of NSW."*

In particular, NSW Health's concerns are based on (as observed by the PAC):

> *"… a predicted incremental annual average PM_{10} in Cullen Bullen of 30 – 100%. This represents up to a doubling of the exposure to dust particles in the township and its community and thus an increase in the risk of residents experiencing respiratory problems known to be associated with coarse particulate matter exposure such as asthma. The World Health Organization guidelines indicate that an incremental exposure to PM_{10} of this magnitude could be associated with an increase mortality risk of 3%."*

The World Health Organisation (WHO) has set an air quality guideline value for annual average PM_{10} of 20 µg/m3. This guideline has been developed taking into account the most sensitive groups within the population, including those with existing respiratory and cardiovascular disease and low socioeconomic status.

The WHO has also set an interim target, based on acceptable health risks, which is used in developing countries as a way of moving towards the air quality guideline value. These populations generally have high levels of poor health and low socio-economic status. The annual average WHO guideline of 20 µg/m3 has an interim target of 70 µg/m3. The WHO claims that this difference of 50 µg/m3 increases the long-term mortality risk by 15%. In other words, every 10 µg/m3 increase in annual average is equivalent to a 3% increase in long-term mortality risk. While not explicitly stated in their submission, it is assumed this is the source of the NSW Health reference to 3% increase in mortality risk.

It is not clear that this method of extrapolation is valid and therefore it is not clear that the inferences drawn by NSW Health are accurate. Regardless of this, the assessment of the Contracted Project has shown that air quality outcomes in Cullen Bullen are predicted to be lower than the WHO guideline, which is an annual goal of 20 $\mu g/m^3$ (see **Section 3.2**).

NSW Health recommended that *"…measures be taken to minimise the increment in annual average PM10 in Cullen Bullen as far as feasible."* This has been done by way of variations in mine plans (including removal of the Hillcroft mining area and the sand mining component) and more refined representation of on-site emissions for the Contracted Project, as assessed below.

3.2.2 Assessment of the Contracted Project

In the assessment of the Contracted Project, air quality impacts for Year 2 were remodelled to reflect the removal of the Hillcroft mining area and sand extraction and processing activities. This scenario was considered to represent the worst-case impacts and best reflect the changes in the Contracted Project mine plan as described in **Section 2.1**. Of the components of the Contracted Project mine plan that have changed from that reviewed by the PAC, the most significant from an air quality perspective were considered to be:

- Removal of the Hillcroft mining area; and
- Removal of the sand extraction and processing.

A summary of those private residences that are predicted to receive air quality impacts in exceedance of the relevant criteria during Year 2 of the Contracted Project are provided below in **Table 3**. The impacts from dust emissions from the Contracted Project have materially reduced compared to those predicted for the EA, however four residences are still predicted to receive significant air quality impacts. Importantly all of these four residences are either owned by Coalpac or have a formal impact Agreement in place with Coalpac.

Table 3
Summary of Predicted Air Quality Exceedances – Contracted Project Year 2

Receiver ID	Description	PM_{10}		TSP
		24 Hour, Maximum Project Alone (50 µg/m^3) days per year above criteria)	Annual, Project Alone and other sources (30 µg/m^3)	Annual, Project Alone and other sources(90 µg/m^3)
195	KJ Blackley*	191 (105 days above)	33	70
197	BE & CE Leisemann & IL & KID Follington* (Coalpac)	402 (189 days above)	62	140
198	DA Tilley*	199 (115 days above)	65	78
199	DA Tilley*	136 (115 days above)	29	65

** Agreement in place with landholder*

With the changes to the Contracted Project mine plan proposed, TSP emission impacts to Cullen Bullen are also predicted to be reduced from those worst case levels modelled in the EA for Year 2. Pacific Environment also note that the Contracted Project would be expected to significantly reduce both 24-hour and annual average PM_{10} concentrations at Cullen Bullen. Predicted concentrations of PM_{10} in Cullen Bullen (for the Contracted Project) are well below the NSW EPA criterion of 30 $\mu g/m^3$ and also, although not a NSW regulatory requirement, are below the WHO annual goal of 20 $\mu g/m^3$ (an alternate level that has been raised by NSW Health in their consultation with the PAC for this particular project).

A full comparison of the Year 2 air quality impact levels predicted in the Air Quality Impact Assessment as reviewed by the PAC (PAEHolmes 2012) and for the Contracted Project is presented in **Appendix B**.

A response to the PAC recommendations in relation to air quality are summarised below in **Section 4**, with a further discussion in **Appendix B**.

3.3 NOISE

An assessment of the noise impacts of the Contracted Project was undertaken by Bridges Acoustics and is included in full in **Appendix C**.

Prior to the reassessment of noise impacts of the Contracted Project, a review of the noise assessment methodology used in the EA (Bridges Acoustics, 2012) was completed. The purpose of this review was to confirm that the assessment for the EA was completed in accordance with the DGR's and best accepted practices, standards and government policy guidelines and plans at that time and to confirm the assessment methodology was appropriate for the Contracted Project.

3.3.1 Review of Assessment Methodology

In their review, Bridges confirmed their position that the methodology, assumptions and background data used as a basis for the acoustic impact assessment in the EA was undertaken in accordance with the DGRs, to contemporary criteria and in line with regulatory guidelines. In particular, the review focussed on ensuring consistency and compliance with the assessment methodologies required by the NSW Industrial Noise Policy (NSW INP) by adopting the following:

- Methods for the determination of background noise levels;
- Determination of appropriate Project Specific Noise Levels (PSNLs) for the day, evening and night periods according to the procedure defined in the NSW INP;
- Determination of prevailing weather conditions based on measured weather data from two local weather stations operated by Coalpac;
- Adopting all noise control and management measures that could reasonably be adopted;

- Calculation of predicted noise levels considering all operating plant and equipment operating simultaneously in reasonable worst case locations and the effect of prevailing weather conditions where relevant;
- Identification of all receivers that are predicted to experience noise levels over the adopted criteria during one or more time periods, after all reasonable noise control measures have been adopted;
- A review of the blasting history associated with the existing mining operations and prediction of vibration and noise effects from proposed blasts;
- An assessment of road traffic noise levels compared to currently approved traffic levels and relevant traffic noise criteria; and
- An assessment of rail traffic noise levels compared to relevant noise criteria.

The PAC has questioned the appropriateness of adopting a background noise level of 30 dBA for the Exhibited Project. The INP has adopted the general principle of setting noise criteria 5 dBA above the background level to control the relative audibility of the proposed noise source, which is consistent with previous practise in NSW and current practice in other states and countries.

An increase of 5 dBA above the background noise level is considered a reasonable compromise between the needs of an industrial development and the amenity of the surrounding community. The compromise of 5 dBA above the background level recommended in the INP does not require the new noise source to be inaudible. The INP also recommends two exceptions to this general rule:

- For areas with significant existing industrial noise, the amenity criteria would become the limiting criteria for a project which would effectively reduce the gap between the background noise level and the noise criteria. In areas with high existing industrial noise levels, the criteria for a new industry can be below the existing background noise level to effectively control the total noise level from all industries. This situation did not arise at any receiver associated with the project; and
- For very quiet areas with low background noise levels, the INP recommends a minimum background noise level of 30 dBA which results in a minimum noise criterion of 35 dBA outside a residence (excluding any modifying factors as defined in the INP). This is approximately equivalent to 25 dBA inside a residence with all windows and doors open, or less than 20 dBA inside a residence with the windows and doors closed. An internal noise level of 25 dBA complies with the recommended levels of 25 dBA for sleeping areas and 30 dBA for living areas in AS2107:2000 Acoustics: Recommended Design Sound Levels and Reverberation Times for Building Interiors (Standards Australia, 2000).

It is concluded that the recommended minimum background noise level of 30 dBA adopted for the assessment included in the EA and the Contracted Project below is consistent with the relevant Australian Standard and NSW Government policy.

The acoustic noise assessment in the EA and RTS included a range of assumptions as to noise management measures and commitments for the Exhibited Project, including:

- Best practice noise control for coal processing and mobile equipment;
- A number of strategically placed noise barriers (including an earth bund along the western side of the rail siding); and
- Active management of mining noise using predictive and real time monitoring systems.

Bridges Acoustics has confirmed that such mitigation and response management strategy practices are common place in mining and other large scale developments and that it is appropriate that Coalpac have committed to these practices. Each is included in the Contracted Projects Statement of Commitments (see **Appendix A**) and each has been applied to the assessment below.

3.3.2 Assessment of Contracted Project

Of the components of the Contracted Project mine plan that had changed from that reviewed by the PAC, the most significant from an acoustic perspective were considered to be:

- Removal of the Hillcroft mining area; and
- Removal of the sand extraction and processing.

To assess the above changes, noise levels for Year 2 of the Contracted Project were therefore recalculated for all receivers and properties. It was considered that the other changes of the Contracted Project mine plan were unlikely to have any significant effect on noise levels at any receiver locations, although as with the air quality reassessment, they would result in other minor reductions in predicted impact.

The reassessment of noise impacts for Year 2 of the Contracted Project found that there would be a reduction in the number of impacted receivers and that some residences and properties would now be in a lower noise affectation category. A summary of the noise impact predictions for the Contracted Project is provided below in **Table 4** and **Table 5** for private receivers and properties, respectively. Each of the properties where significant noise impacts (i.e. greater than 5 dBA above the intrusive criteria) are predicted are either owned by, or are subject to an impact agreement with Coalpac. That is, there are now no properties predicted to receive significant amenity impacts with which Coalpac does not have an agreement in place.

A comparison of the Year 2 noise levels predicted in the Acoustic Impact Assessment as reviewed by the PAC (Bridges Acoustics, 2012) and for the Contracted Project is presented in **Appendix C**.

Table 4
Predicted Noise Level Exceedance of Intrusive Criteria at Private Residences

Receiver ID	Description	Intrusive Criteria Day / Night	Predicted Maximum Noise Level
Significant Impact			
194	JGQ Nominees Pty Ltd*	37 / 35	45.3
195	KJ Blackley*	37 / 35	43.8
197	BE & CE Leisemann & IL & KID Follington* (Coalpac)	37 / 35	40.4
Moderate Impact			
144	DA & DM Muldoon	35	38.0
179	RK Dickens	35	39.7
198	DA Tilley*	37 / 35	39.7
199	DA Tilley*	37 / 35	39.5
201	Coalpac (formerly KD & RL Kellam)	37 / 35	39.4
217N	Crown	37 / 35	37.2
349	RM Crane	35	37.8
367	JR Gracey	35	38.9
372	RE Gilmore	35	39.3
392	IG Palmer	35	38.4
412	V & F Fava, C Rositano, F Tedesco & E Todorello	35	38.4
Mild Impact			
142	PG Desch & KC Farrugia	35	35.7
143	DB Speirs	35	36.4
364	JR Gracey	35	36.7
368	RA Fuller	35	35.8
373	WF Fitzgerald	35	36.6
383	BS Bretherton & B Chandwick	35	36.9

Receiver ID	Description	Intrusive Criteria Day / Night	Predicted Maximum Noise Level
384	A Tabone	35	35.9
385	Ceedive Pty Ltd	35	35.7
386	TJ Griffiths	35	37.0
388	VA McFadden	35	35.8
391	MG Bulkeley	35	36.7
403	BR & E Brown	35	36.0
404	BR & E Brown	35	35.6
426	JWJ & SM Taylor	35	36.3

** Agreement in place with landholder*

Table 5
Predicted Noise Level Exceedance of Intrusive Criteria over 25% Contiguous Property

Receiver ID	Description	Intrusive Criteria Day / Night	Predicted Maximum Noise Level
Significant Impact			
170	Coalpac (formerly BE Nakhle)	37 / 35	61.3
194	JGQ Nominees Pty Ltd *	37 / 35	46.7
195	KJ Blackley*	37 / 35	43.8
197	BE & CE Leisemann & IL & KID Follington* (Coalpac)	37 / 35	67.2
198,199	DA Tilley*	37 / 35	46.6
200	BE & CE Leisemann & IL & KID Follington*	37 / 35	49.1
217	Crown	37 / 35	41.5
Moderate Impact			
144	DA & DM Muldoon	35	38.7
201	Coalpac (formerly KD & RL Kellam)	37 / 35	39.4
205,206	D Dino & J Seraglio	35	38.9

Receiver ID	Description	Intrusive Criteria Day / Night	Predicted Maximum Noise Level
216	BM Emmott	37 / 35	37.6
349	RM Crane	37 / 35	37.1
370	JA, SE Byron & DC Hutton	35	38.2
371	MA & JL Taylor	35	37.2
372	RE Gilmore	35	37.5
374-376, 390,391	MG Bulkeley	35	38.0
392	IG Palmer	35	38.1
412-414	V & F Fava, C Rositano, F Tedesco & E Todorello	35	38.3
411,415,416, 420-425	SJ & DS Taylor	35	39.0
Mild Impact			
203,204,364, 365,367	JR Gracey	35	36.1
209	DJ Ryan	35	36.7
210	FC & K Tilley	35	35.2
348	RE Gilmore & MG & PJ Bulkeley	35	35.1
350	Tanwind Pty Ltd	37 / 35	35.2
362	RE Gilmore & MG & PJ Bulkeley	37 / 35	36.9
368,369	RA Fuller	35	36.5
373	WF Fitzgerald	35	36.5
383	BS Bretherton & B Chandwick	35	36.5
384	A Tabone	35	35.9
385	Ceedive Pty Ltd	35	35.2
386	TJ Griffiths	35	37.0
387	JR Embleton & KJ Kelly	35	36.6
388,409	VA McFadden	35	36.3
403-405	BR & E Brown	35	36.2

Receiver ID	Description	Intrusive Criteria Day / Night	Predicted Maximum Noise Level
406	P W Griffiths	35	36.0
408	RH Griffiths	35	35.3
410	PJ & SL McFadden	35	36.1
417-419	AP & KA Brown	35	36.6

** Agreement in place with landholder*

The Contracted Project has been demonstrated to have a reduced impact on the nearby community than the Exhibited Project as proposed in the EA. The Contracted Project would:

- Reduce the number of affected residences and properties by:
  - Up to a 25% reduction of those in the Significant impact category, and
  - Up to a 33% reduction of those in the Moderate and Mild impact categories.
- Reduce mining noise levels generally to the west and north-west of the Project Boundary which would place some residences and properties in a lower noise affectation category.

In regard to Cullen Bullen School, the predicted noise levels from the Contracted Project during day and evening periods under prevailing weather conditions will remain below 35 LAeq, 1 hour outside the classrooms and below 25 LAeq, 1 hour within the classrooms with windows and doors open. These levels would therefore remain at least 10 dBA below the recommended noise criteria for the school and remain consistent with the recommendations of the PAC.

In addition to the above piece of work Bridges Acoustics has also provided comment on other PAC recommendations related to noise. These are summarised below in **Section 4**, with a further discussion in **Appendix C**.

3.4 BLASTING

An assessment of the blasting impacts of the Contracted Project was undertaken by Terrock Consulting Engineers (Terrock) and is included in full in **Appendix D**.

Prior to the reassessment of mine blasting impacts of the Contracted Project, a review of the blasting assessment methodology used in the EA (Bridges Acoustics, 2012) was completed. The purpose of this review was to confirm that the assessment for the EA was completed in accordance with the DGR's and best accepted practices, standards and government policy guidelines and plans current at that time and to confirm the appropriate assessment methodology for the Contracted Project.

3.4.1 Review of Assessment Methodology

In their review Terrock confirmed that the methodology, assumptions and background data used as a basis for the blast impact assessment in the EA were undertaken in accordance with the DGRs, to current criteria and regulatory guidelines.

Further to this Terrock note several inconsistencies in the PAC Review Report and the incorrect application of Structural Damage Criteria and blast vibration criterion for public infrastructure to determine blast vibration impacts to:

- Aboriginal rock shelter heritage sites;
- SPL and Sandstone Outcrops;
- Housing and other structures; and
- Public utilities.

Further detail on the inconsistencies in the PAC Review Report in the consideration of blasting impacts as noted by Terrock is provided in **Appendix D**.

3.4.2 Assessment of the Contracted Project

Coalpac has a long history of controlled mine blasting near sensitive receptors such as the SPL, Sandstone Outcrops, railway lines and cuttings, and mine office buildings. Terrock has analysed Coalpac's monitoring records for blasts occurring:

- Near the Wallerawang-Gwabegar Rail Line cutting,
- Adjacent to SPL and Sandstone Outcrops, and
- In close proximity of the Invincible Colliery offices.

In summary, Terrock conclude that the following has been demonstrated by existing Coalpac operations:

> *"Blast vibration can be controlled to a specified limit using accepted blast design principles and implementation of the design;*
> *Blasting has been conducted to within 32m of the rail lines and 43m from the office complex without causing even threshold damage;*
> *Blasting has been successfully conducted to within 57m of the Sandstone Outcrops at the Cullen Valley Mine, without applying vibration reduction techniques, and*
> *The effectiveness of a controlled and closely monitored blasting program close to sensitive receptors at the Cullen Bullen township".*

Terrock notes that blast design for ground vibration (Peak Particle Velocity (PPV)) control has been proven to be effective on site and should be part of the Blast Management Plan. It has been shown that blasting closer than 100m to Sandstone Outcrops can occur without detrimental impacts.

Terrock also notes that without any additional control measures, currently approved overpressure limits and ANZEC guidelines for ground vibration can be complied with at houses in the Cullen Bullen township.

In response to the concerns of the PAC and the community over the impact of mine blasting on sensitive features, Terrock propose a definitive investigation procedure to further demonstrate and prove the science on which to provide a rational basis for determination of the standoff distance(s) and ground vibration limits required for the protection of the SPL and Sandstone Outcrops. It is concluded to be logical that a PPV limit be the preferred basis for protection of the SPL and Sandstone Outcrops rather than a stand-off distance, because it is easy to routinely measure and report, and it is also the relevant controlling parameter.

Coalpac acknowledge that the commitment to carry out blasting with negligible impact to the SPL and Sandstone Outcrops will require a significant level of monitoring, modelling, and measurement in order to demonstrate and prove current understanding of the ground response to blasting on site. The below blast management program has been provided by Terrock and will be incorporated into the Blast Management Plan for the Contracted Project.

Blast Management Program

Terrock identified that the southern extension at Invincible Colliery is the logical place to further confirm and refine the site factor (Kv) for the strata close to the SPL (Site Factor Kv Exercise). Additional arrays of blast monitors will be located to the east of the site to measure PPV for all blasts, and conduct sufficient strain measurements to confirm the relationship between PPV and strain for blasts on the various horizons as operations progress to the south.

The data will be gathered, collated and analysed to confirm and refine a Scaled Distance Site Law to increase the confidence of initial blast design when moving to the east towards the SPL.

Coalpac also proposes to conduct a multi-disciplinary investigation which includes analysing the effects of controlled and closely monitored blasts to prove and demonstrate the appropriateness of a 100 mm/s non-damaging limit for the SPL and Sandstone Outcrops.

A program of reduced vibration limits and intensive monitoring (Non-damaging Limit Exercise) will permit a regulated, measured approach as each successive blast nears the Sandstone Outcrop.

Based on previous blasting experience the Non-damaging Limit Exercise could commence with blasts at 200m from the Sandstone Outcrop in question with an interim PPV limit of 50 mm/s. The Non-damaging Limit Exercise will begin at 200m from a Sandstone Outcrop and move closer until vibration trigger levels (50 mm/s PPV) show that the rock mass is remaining stable.

As information is gathered over time, and the response of the rock mass is monitored through mapping and photogrammetry (as examples), blast designers can then initiate design changes progressively, keeping below trigger levels at all times and ensuring negligible impacts. Once blasting at the interim target limit of 50 mm/s PPV has proven to have no impact, the target limit may be incrementally increased in steps to say 75 mm/s PPV and 100 mm/s PPV. The stability of the Sandstone Outcrop in response to measured ground vibration levels will be established through rock mechanics hazard map (Hazmap) assessment before advancing to a higher level of vibration.

Coalpac proposes to undertake these exercises in the first year of operation of the Contracted Project. During this time other mining faces will be advanced concurrently but will not approach within 200 m of the SPL and Sandstone Outcrops before the blast management program is completed.

The data gathered in the proposed blasting exercises will be used to introduce a refined blast management program for operations adjacent to the SPL and Sandstone Outcrops. The main steps of such a program are outlined below:

1. Collation and analysis of data gathered from the Site Factor Kv and the Non-destructive Limit Exercises to provide reliable site specific parameters to support predictive modelling with confidence;
2. Predictive modelling will be carried out initially to limit predicted levels to 100 mm/s PPV or other agreed limit. These will be the trigger levels at which re-design or reduced design parameters will be implemented;
3. Establish the condition of the SPL and Sandstone Outcrops by enacting Commitments 7 and 8 of the Exhibited Project EA and produce a Hazard Map to identify and classify zones in terms of stability;
4. Prior to advancing blasting towards the SPL, install geophones on solid rock at the top and bottom of the pagodas at the nearest point to the blasting face. Install strain gauges at the base of the SPL and Sandstone Outcrops near the geophone and record the rock mass response to blasting using photogrammetric techniques.

5. It is recommended that the Proponent should present to an Independent Review Committee, with suitable technical and regulatory representation, to monitor the performance of the blast management program within 200 m of the SPL and Sandstone Outcrops but also with respect to Residences, Cemetery, Aboriginal and Non-Aboriginal Heritage Sites on a quarterly basis for the first 2 years. The frequency of the meetings could reduce to biannual after 2 years.

By following the above approach proposed by Terrock (to be incorporated in the Contracted Project Blast Management Plan), areas may be identified where the stand-off can be safely reduced to 50m, if supported by the science and with appropriate management checks and controls. Terrock also argue that:

> *"…both 50m and 100m extraction distances are equally arbitrary, i.e. distance is not the governing factor. The mechanisms by which the SPL and Sandstone Outcrops may be affected are ground vibration and static and dynamic instability. In sections of the faces with no potential for instability, it could be argued that a 50m extraction limit may be appropriate if supported by the science, with ground vibration limit as the control and present no greater risk than the 100m extraction limit."*

A response to the PAC recommendations in relation to the blasting are summarised below in **Section 4**, with a further discussion in **Appendix D**.

3.5 ECOLOGY

An assessment of the ecological impacts of the Contracted Project was undertaken by Cumberland Ecology and is included in full in at **Appendix E**.

As part of this assessment, in light of comments by the PAC seeking additional protection of '*Pagoda Landforms*', Cumberland Ecology have defined SPL's and their associated ecology. This aspect of Cumberland's work has been peer reviewed by Dr Andrew Markham of Hydrobiology from a geomorphological perspective and consultation with Dr Stephen Bell of East Coast Flora Survey Vegetation Assessment & Mapping from a botanical perspective.

Further, Cumberland Ecology engaged Dr Arthur White of Biosphere Environmental Consultants and consulted with Dr Jonathon Webb to provide an authoritative view over the presence or otherwise of the BHS and the habitat value provided by the area within the Contracted Project Boundary.

To conclude the ecological impact assessment of the Contracted Project Cumberland Ecology has revised the proposed Biodiversity Offsets Package for it to ensure that it adequately offsets any unavoidable residual ecological impacts. Each element of the revised BOS has been discussed with OEH, who have provided new direction over both an appropriate quantum of offset and the most appropriate additional lands to be included in it in consideration of their regional conservation priorities.

Prior to the assessment of the ecological impacts of the Contracted Project, a review of the ecology assessment methodology used in the EA was completed. The purpose of this review was to confirm that the assessment for the EA had been completed in accordance with the DGR's and best accepted practices, standards and Government Policies guidelines and plans current at that time and to confirm the appropriate assessment methodology for the Contracted Project.

3.5.1 Review of Assessment Methodology

In his review of the PAC report, Dr David Robertson of Cumberland Ecology has raised a number of concerns in relation to the PAC's assessment of the Exhibited Project. The key issues discussed by the PAC in relation to their review of ecological impacts included:

- Impacts to pagoda structures and associated habitat;
- The significance of vegetation on Permian sediments;
- The assessment of mitigation options for flora and fauna, particularly for additional threatened species;
- Values of the Exhibited Project area for threatened bat species;
- Compatibility with the Gardens of Stone 2 (GOS2) proposal; and
- The effectiveness of rehabilitation proposed for the Exhibited Project.

Each of these issues is summarised below and discussed in full in **Appendix E**.

Impacts to pagodas and associated habitat

A central issue for the PAC in its review was the high conservation value of the pagoda landforms. After a review of a technical paper (Washington & Wray, 2011), and public submissions from the Blue Mountains Conservation Society and the Colong Foundation, the PAC Review Report states that:

> "...*the Commission concludes that the significance of the pagoda landform is at the top of the scale and thus the pagoda landform should be afforded special significance status and the highest possible level of protection*".

In their review of pagoda landforms present within the Project Boundary, Cumberland Ecology has adopted the definition used by Washington and Wray to map the extent of SPL and other Sandstone Outcrop features and comment on their ecological values. The fact that the pagoda landscape as defined by Washington and Wray is a highly significant landscape unit has not been disputed by Coalpac or by Cumberland Ecology and as such, the Contracted Project mine plan has been specifically designed to provide greater protection for direct impact to these features.

Based on the description of pagoda landforms provided by Washington and Wray (2011) and seemingly adopted by the PAC, SPL in the region within and surrounding the Project Boundary have been defined by Cumberland Ecology as:

> *"A complex that creates a continuous landform over a substantial area (typically greater than 10 hectares), comprising (as a minimum):*
>
> - *Large, substantial in height (typically up to 60m but may be higher), towering pagodas (either platy or smooth), that are generally prominent rock formations with associated cliff faces and deeply dissected gullies, characterised by banded ironstone and associated rock structures containing numerous overhangs and crevices, with;*
> - *Associated deeply dissected wet gullies between the pagoda formations that contain a complex of habitat types for both flora and fauna, some species of which are rarely found elsewhere (e.g. Pagoda Daisy)."*

This definition was used for identification and mapping of SPL throughout the region. In order to gain an appreciation of the distribution of SPL in the region, the distribution and boundaries of SPL were mapped using Aerial Photographic Interpretation (API) and through the review of literature and existing maps provided in management plans of nearby National Parks. This mapping focused on the actual landforms defined as SPL and did not include intervening lands. As such it is at a substantially finer scale resolution than the indicative, broad scale mapping of Washington and Wray (2011). This mapping identified a SPL in an area in the southeast corner of the Invincible mining area. The SPL boundary line was then used in the mine planning process for the Contracted Project to guide the revision of the maximum open cut and highwall mining footprints and avoid any potential for both direct and indirect impacts to SPL and associated habitat.

Where sandstone cliffs, rock towers, outcrops and pagodas occur in isolation (and therefore do not form a complex of a continuous nature), they have been defined as Sandstone Outcrops. These features are defined by Cumberland Ecology as:

> *"Outcrops of sandstone that are in situ and form a discontinuous landform with individual continuous outcrop areas of less than 10 and greater than 0.1 hectares. These outcrops may exhibit geomorphological features such as cliffs, caves, rock towers and isolated pagodas that do not form an aggregate or have deeply dissected wet gullies (SPL)."*

Sandstone Outcrops do not exhibit the characteristics of SPL (i.e. they do not exhibit clusters of pagodas or have deeply dissected wet gullies).

Uncommon, isolated rocks and boulders less than 0.1 ha located within the Contracted Project Disturbance Boundary are afforded no special significance.

The definitions of the geomorphology of the pagodas and mapping were peer reviewed by Dr Andy Markham of Hydrobiology. In particular, this review considered the:

- Definitions and descriptions of pagodas and pagoda landforms as applied by Cumberland Ecology; and
- Approach used in the discussion of pagoda landforms in the PAC Review Report.

Markham considered the definition of the term 'pagoda' as defined by Washington and Wray (2011), their extent, physiography and the morphological processes involved in their formation. It was noted that:

> *"From an impact assessment perspective, the geomorphic values of a geomorphological feature and the risks to those values from the proposed activity need to be considered. The geomorphological values of the pagodas might include aesthetic/recreational (form), morphological process of erosion and deposition (process) and ecological (habitat) values that are created and supported by these processes."*

On consideration of the Cumberland Ecology definition of SPL, Markham concluded:

> *"...the classification from a geomorphological perspective (SPLs) is considered to be a reasonable classification of a landform unit in the context of the Project."*

It was also noted that from an impact assessment perspective, the classification allows the values associated with pagoda complexes to be more clearly defined and accurately mapped (both inside and outside the Project Boundary) as a geomorphological unit when compared to the more broadly defined 'pagoda country' as referred to by Washington and Wray (2011).

The SPL represent agglomerations of morphological features including sandstone cliffs and outcrops but are considered distinct from these features which, in isolation, do not exhibit the specific range of values attributed to the SPL and Sandstone Outcrops, in particular, the variety of habitat types, topographic variability, and their striking visual appearance. The pagoda country of Washington & Wray (2011) encompasses an area containing both SPL and sandstone features such as cliffs and outcrops (although it is noted that both the Lidsdale-Newnes and Ben Bullen State Forest SPL extend, in places, beyond the boundaries of the defined pagoda country in those areas demonstrating more clearly defined mapping). While the SPL are intended to represent a geomorphological unit, pagoda country represents an area in which these units are found, with intervening lands that may not contain any of the commonly associated geomorphological features.

Dr Stephen Bell was also consulted on Cumberland Ecology's analysis of flora and fauna of the SPL and Sandstone Outcrops. Dr Bell supported the majority of the ecological analysis of the Cumberland Ecology report (**Appendix E**), however three key points were raised by Dr Bell, being:

- The classification of SPLs excludes areas containing pagoda landforms less than 10ha;
- The suggested use of recent mapping of vegetation communities by DEC (2006) and OEH (2012) that are associated with pagoda landforms to aid in the mapping of SPLs regionally; and
- The assessment of OEH Atlas records of pagoda landform flora species does not account for the possibility of data entry error or misidentification.

A discussion on each of the above points raised by Dr Bell is included in the Cumberland Ecology report for the Contracted Project (**Appendix E**).

Vegetation on Permian Sediments

According to Enclosure 3 of the OEH letter dated 6th November, the PAC requested the following information from OEH:

> *"OEH's response to an assertion by the Colong Foundation for Wilderness that the underlying geology of the Project Area (Permian sediments of the Illawarra Group that have produced rolling and flattish terrain of higher nutrient levels) is different to surrounding areas and that this has implications for the conservation value of the Project Area"*

Cumberland Ecology has reviewed this assertion and it supports the proposition that some of the forest and woodland communities on the lower slopes occur on soils derived from Permian sediments that may contain higher levels of nutrients than soils derived from the Narrabeen Group sandstones. Cumberland Ecology notes that increased fertility does mean that vegetation can produce more food, and so support more insect prey for bats and other fauna, than areas of lower fertility. Permian geology in the region, and thus the vegetation on Permian-derived soils, was also reviewed and assessed by Cumberland Ecology to be widespread in the region, extending from the northern extent of the Wollemi National Park to Lithgow, and such soils are present in a number of existing conservation reserves, including the Gardens of Stone National Park, Turon National Park, Ben Bullen State Forest, Sunny Corner State Forest; and Wolgan State Forest. Cumberland Ecology also note that the assertion that Permian-derived soils are somehow unique to the Project Boundary appears to be incorrect (see **Appendix E**).

Further, of the eight vegetation communities mapped by Cumberland Ecology that occur on the Permian sediments, only the Capertee Rough-barked Apple - Red Gum - Yellow Box Grassy Woodland is listed as endangered (under the EPBC Act) and the Contracted Project mine plan has been modified to protect the most extensive remnants of this community.

The biodiversity offset package for the Contracted Project is proposed to be enhanced by:

- Reduction in the total area of disturbance;
- The exclusion of Contracted Project mine rehabilitation from offset ratio calculations; and
- The acquisition of additional offset lands of approximately 1,000 ha, in consultation with OEH and DP&I.

This will result in a minimum offset ratio for forest and woodland vegetation of 4:1. One target for acquisition of the additional area of lands required will therefore be forest and woodland vegetation located on Permian sediments, so as to boost the area of such vegetation held in conservation.

Mitigation of Flora and Fauna Species Impacts

According to Enclosure 1 of the OEH letter dated 6 November, the PAC requested the following information from OEH:

> *"…with regard to potential impacts of highwall mining on pagodas and adjacent areas, OEH's views on options for mitigating impacts to flora and fauna associated with these areas, including an assessment of critical habitat in proposed high wall areas."*

It is notable that the PAC asked OEH for *"options for mitigating impacts to flora and fauna"*, including *"critical habitat*". OEH responded by stating that *"critical habitat"* has a specific meaning under the TSC Act and that no critical habitat exists for any species in the Project Boundary. OEH therefore wrote:

> *"The following assessment has taken the PAC's reference to critical habitat to mean habitat that is crucial to the survival of local populations of particular species based on knowledge of their specific requirements."*

No definition was in turn given by OEH for *"crucial"* (and the term is not referred to in the TSC Act, EPBC Act or threatened species survey guidelines), but the Oxford Dictionary meaning is "decisive or critical" and so Cumberland Ecology has proceeded on the assumption that this term would refer to habitat which was essential for the survival of local populations.

For the purposes of threatened species assessments below, Cumberland Ecology has confirmed that the term *"local populations"* has a meaning under Section 5A of the EP&A Act and refers to populations that occur within the subject land (or Contracted Project Boundary). The OEH Enclosure 1 to the letter dated 6 November 2012 lists the following species for consideration as important local threatened species:

- Brush-tailed Rock Wallaby (BRW);
- Broad-headed Snake (BHS); and
- Cave Roosting Bats (Eastern Bentwing-bat and Large-eared Pied Bat).

Survey has confirmed that there are no local populations of the BRW within the Project Boundary. Although suitable habitat is available fox predation has discouraged its presence.

Despite targeted surveys there have been no sightings of the BHS within the Project Boundary. As part of its assessment of the Contracted Project, Cumberland Ecology consulted with Dr Jonathon Webb, a recognised expert in the BHS, who has also independently surveyed the Ben Bullen State Forest for the snake. Dr Webb noted that potential BHS habitat in the Ben Bullen area is in poor condition. He also suggests that any population that may have previously occurred may have been the subject of past collections of the species made by illegal reptile collectors.

Aerial survey maps of the proposed mining leases areas and immediate surrounds were also examined to determine the extent of sandstone escarpment areas and to determine potential access to each area by the BHS. Having located all potential habitat areas within the Project Boundary, the sites were visited on the 6 February 2013 so that each area could be "ground-truthed" to validate or refute the presence of habitat for the BHS in each area. SPL and sandstone outcrops were deemed to contain potential habitat for the BHS if they also contained:

- Medium to tall forest within 250 m of the sandstone outcrop;
- Loose, exfoliated pieces of sandstone that were not underlain by organic matter or on soil, that could be used as refuge habitat by either the BHS or their prey; and
- Deep fissures or cracks that could be used as shelter habitat by either the BHS or their prey.

During the assessment of the Exhibited project there has been an unsubstantiated sighting of the BHS approximately 1 km to the east of the Contracted Project Boundary. This area was visited during the habitat assessment for the Contracted Project by Dr Arthur White, a herpetologist with over 30 years' experience in survey of reptiles and frogs, including the BHS. As summarised in the Cumberland Ecology report (**Appendix E**), Dr White commented on the habitat at the location of the snake record as follows:

> *"...the site was devoid of sandstone and was not habitat for the Broad-headed Snake". Dr White also noted during the habitat assessment that "the area in question is frequented by bushwalkers and trail bikers and the snakes are not observed. The relative lack of prey species along most of the sandstone areas also implies that the snakes are likely to be very scarce in this area".*

Dr Arthur White and Dr Jonathon Webb's comments on the distribution of the BHS and the potential for it to occur within the Contracted Project Boundary are included in **Appendix E**. There is no verified population of the BHS within the Project Boundary. There is however potential habitat for the snake albeit of poor quality.

In their response to the PAC questioning, OEH exclusively discuss standoff zones as a means for mitigating impacts to threatened species, and have modelled various standoff zones (i.e. undisturbed vegetation buffers) that could be kept between the proposed open cut mining areas and pagoda habitats. OEH appear to have assumed that the only way to mitigate the impacts of mining is with the use of buffers (standoff zones) and the zones considered range from 50 m, (as proposed in the Exhibited Project mine plan) through to 780 metres. The latter distance is the greatest distance a BHS has been measured as travelling from an escarpment in Morton National Park, 160 km to the south of the Project Boundary, in different habitats to those that occur on site.

In reviewing the main threats to the BHS, and in consultation with Drs Webb and White, Cumberland found that the main threat to the snake is from illegal collection of snakes by poachers. As such the snake is now missing from much of its original habitat, including areas of ostensibly suitable land. As such, a standoff distance will not protect against this threat.

In reviewing impacts to the BRW, Cumberland Ecology note that the species is absent from many ostensibly suitable sites and understand that its absence is largely if not entirely due to predation by foxes. Hence, irrespective or of any standoffs zones the BRW is unlikely to return to habitats in the local area unless foxes are controlled.

As shown on **Figure 7**, SPL areas only occur in the southeast of the Project Boundary and do not occur in the north and north-west of the Project Boundary. For this reason, when OEH maps and analyse what is purported to be *"geodiversity features and alternative standoff zones"* they have mapped broad areas of potential standoff zones around areas where there are clearly no SPL. They have then extended boundaries out to 318 m or 780 m from such areas to consider benefits for wildlife.

The OEH Enclosure 1 to the PAC states that the Threatened Species Profile Database (TSPD) of OEH is the repository for threatened species information used by the Biometric Tool for Property Vegetation Planning and BioBanking. OEH stated that for the BHS, BRW and the two threatened bats, the TSPD prescribes a 500 m buffer between cliffs and escarpments and proposed developments. Cumberland Ecology reviewed the literature on each of these threatened species on the TSPD and noted that each has a list of priority actions to recover the species and noted that none of the priority actions specify such a large buffer area. In addition, no buffers are suggested for any of the species priority actions. Cumberland Ecology staff made inquiries about the 500 m buffer and have consulted with OEH staff on this matter. To date the provenance of this recommendation has not been confirmed, nor the information upon which it is based.

It is also noted by Cumberland Ecology that the Project is a State Significant Development (SSD) proposal. As such, assessments do not need to consider the Biometric Tool for Property Vegetation Planning. The Biometric Tool has been developed for use in rural areas and is not applied to SSDs. Similarly, BioBanking does not apply to the Project as the proponent has not elected to use BioBanking.

According to Enclosure 2 of the OEH letter dated 6 November, the PAC requested the following information from OEH:

> *"…with regard to reports by Special Interest Groups of additional threatened species that were not reported in the Environment Assessment, OEH's response to the significance of these species, and suggested steps to avoid, mitigate or manage the impacts to them."*

In Enclosure 2, OEH noted that Cumberland Ecology had listed and considered all of the threatened fauna considered likely to use the habitats within the Project Boundary.

OEH wrote that a representative of the Special Interest Groups had identified a number of plant species from within the Project Boundary that were not discussed by Cumberland Ecology in the EA and that these included "rare" plants (*"ROTAP"*, or rare or threatened Australian plants) after a publication by Briggs and Leigh (1995).

OEH also note that the ROTAP species are not listed threatened species. However, OEH then state that:

> *"…considering their restricted distribution and the general lack of information on the reservation status of three of these species, OEH considers that potential impacts to them are of concern. Moreover, in the absence of detailed assessment information, OEH cannot gauge the significance of predicted or potential impacts resulting from the Project."*

For the purposes of the Contracted Project and to respond to the assertions of OEH in their correspondence included in the PAC Review Report, Cumberland Ecology analysed:

- The distribution of the ROTAP species in question; and
- All other species mentioned by SIGs and the PAC as being reliant upon or strongly associated with pagodas.

The results of the Cumberland review show that the majority of ROTAP species occur well beyond the Contracted Project Disturbance Boundary and therefore will not be directly impacted. The results also show clearly that the distributions of such species are:

- Not restricted to SPL. These species occur in many other areas, including those with different geology and geomorphology;
- Not particularly close to the area proposed to be mined; and
- Quite unlikely to be significantly directly impacted by mining.

Similarly, OEH identified six threatened plants that it believes may have been unsurveyed for and so missed within the mining area. Cumberland Ecology has prepared assessments for these species, including maps and species profiles for each which are include in full in **Appendix E**. These species include *Acacia bynoeana*, *Prostantera stricta*, *Darwinia peduncularis*, *Persoonia acerosa*, *Thesium australe* and *Euphrasia arguta*.

Value of the Project Area for Threatened Bat Species

The letter from Peter Christie to the PAC on 4 December 2012 contained the following statements about bat habitat:

> *"OEH has presented information to the Department of Planning and Infrastructure and to the PAC with regard to the considerable known and potential value of foraging and breeding habitats within and adjacent to the Project Area for the threatened bat species Large-eared Pied Bat (Chalinolobus dwyeri) and Eastern Bentwing Bat (Miniopterus schreibersii oceanensis). At the 7 November meeting, OEH also presented information that demonstrated a large portion of the Project Area consists of wet and dry grassy forests and woodlands that are characteristic of the Southern Tablelands, and that consequently the Proponent had over-represented Sydney Sandstone vegetation types that typically occur on less fertile soils.*
>
> *It has been asserted by the Proponent that the latter vegetation types are well represented within the large areas of NPWS Estate to the east of the Project Area, which therefore provide considerable alternative habitat for these bat species. However, given the relative fertility of soils upon which they occur and the resulting greater productivity of these ecosystems (including macroinvertebrate prey items), habitats within the Project Area are likely to be of greater foraging value for bats than Sydney Sandstone vegetation types. OEH therefore considers that a lack or unsatisfactory level of avoidance of foraging habitat by the Project may have significant implications for local threatened bat populations. Suggested avoidance and mitigation of impacts to foraging habitat (in the form of supportable standoff zones) were presented to the PAC at the 7 November meeting."*

Cumberland Ecology has completed species profiles and mapped the known occurrences of both bat species of concern to OEH (see **Appendix E**). These additional analyses show that both bat species are widespread across the Blue Mountains, and in the case of the Eastern Bentwing-bat, across other landscapes further east, extending to the NSW coast. On this basis, Cumberland Ecology maintain the view that vegetation types that support both threatened bat species are well represented to the east of the site and within various National Parks, including the Gardens of Stone National Park and the Blue Mountains National Park.

In their analysis, Cumberland Ecology also note that the species profiles and mapped records for both species of concern to OEH suggests that the species and their local populations would be secure, even in a worst case scenario whereby the entire mine site is not rehabilitated (which is not proposed). This is not only because extensive habitats are conserved on the region, but because broad areas of forest and woodland will remain unmined in the Project Boundary, being avoided by the Contracted Project mine plan.

Compatibility with the Gardens of Stone Stage 2 Proposal

The PAC refuted claims made in the EA and Ecological Impact Assessment that rehabilitation would be successful for the Exhibited Project and drew the following conclusions:

> *"…The rehabilitated areas cannot be returned to their pre-existing landforms across the Project area"*;
>
> *"…The biodiversity characteristics of rehabilitated areas cannot replicate the existing characteristics and will inevitably be less diverse and species rich"; and*
>
> *"…The [Planning Assessment] Commission is not in a position to comment on the merits or otherwise of the Gardens of Stone Stage 2 reservation proposal. However, the Commission is in a position to conclude that the Project and reservation of Garden's of Stone Stage 2 are incompatible if reservation is intended to include Ben Bullen State Forest, either now or in the foreseeable future. The Commission is also of the view that significant scarring of the landscape will remain for decades, if not permanently".*

In the formal submission to the PAC, OEH stated that:

> *"Given the level of biodiversity loss and topographical change as a result of mining, OEH has strong doubts that the proposed rehabilitation of the mine will contribute to the achievement of Gardens of Stone 2 reservation proposal. Accordingly, OEH does not support the addition of rehabilitated areas to the National Parks and reserves system at this time."*

Further, OEH confirmed that its interest was in the reservation of the entirety of BBSF east of the Castlereagh Highway and north of Cullen Bullen. OEH stated on page 10 of its formal submission that it:

> *"…notes the Proponents' allusion to the relative small proportion of the GOS2 proposal that would be affected by the Project (p.154). OEH assert that although the proportions are low (given the large extent of the GOS2 proposal), the impact of the Project on land of high reservation priority is nonetheless very large. Further, OEH reiterate that all of Ben Bullen State Forest is of reservation priority to OEH, and not just the area identified by the Colong Foundation that lies east of the Castlereagh Highway."*

Coalpac and Cumberland Ecology have consulted with OEH regarding the status of such a proposal but no information (especially mapping) has been forthcoming from OEH. Further, it is also noted that no details of a formal proposal for GOS2 were presented by OEH to the PAC. The only available proposal for GOS2 that Cumberland Ecology are aware of is one proposed by the Colong Foundation (a SIG).

In meetings with the proponent during February and March 2013, both OEH and the Office of the Minister for the Environment and Heritage advised that there is no existing proposal generated by Government or under consideration by Government, to extend the Gardens of Stone National Park. OEH and the Office of the Minister for the Environment further advised that no decision regarding the specific issue of the future conservation plans for BBSF would be made until after the project application had been determined.

This position is inconsistent with the PAC Review Report which states that "the OEH proposal is for the reservation of the whole of BBSF" and further, that this proposal is "a high priority for OEH".

Coalpac submit that, on the basis of this advice, the question of the future reservation of the BBSF should be assigned no special status within the context of the planning assessment and determination process for the Contracted Project.

Despite this advice from OEH, and to respond to the issues raised by OEH and the PAC, the ecological impacts to the Ben Bullen State Forest and GOS2 were reconsidered by Cumberland Ecology. In total, the Contracted Project will result in:

- The progressive removal and rehabilitation of approximately 11% of Ben Bullen State Forest over 21 years; and
- The progressive removal and rehabilitation of approximately 1.3% of the previously proposed GOS2 area. As noted above, the Contracted Project will not impact any SPL. It will also not remove any pagoda 'villages' or Sandstone Outcrops within the Project Boundary. Of the 673 ha proposed to be disturbed by the Contracted Project open cut mining operations, approximately 470 ha are located within the Baal Bone and Long Swamp Division (BBLSD) of the previously proposed GOS2 area. This constitutes approximately 6.03% of the total area of BBLSD as described in the previous GOS2 proposal.

Rehabilitation of the mining impacts for the Contracted Project

As stated in the EA and the RTS, Cumberland Ecology reiterates their position that:

> *"…the rehabilitation to date at Cullen Valley Mine has demonstrated forest and woodland is being rehabilitated and that the mined landscape is being restored to a landscape that, while not a facsimile of the original, is comparable topographically. This has been independently verified by annual monitoring conducted from 2010-2012 (Ecobiological 2010, 2012). We also note the monitoring of rehabilitation has shown a considerable diversity of native plant species. We observe that as the rehabilitation has undisturbed forest and woodland upslope there is a high probability that seeds will disperse into rehabilitation and boost species diversity long term. Under the proposal, the Contracted Project would entail open cut mining of a similar nature, although high points in the landscape including SPLs, cliffs and caves, will not be mined by open cut methods."*

The Contracted Project would entail open cut mining activities of a similar nature, although more elevated points in the landscape (including SPL and other Sandstone Outcrops) will not be mined by open cut methods.

Cumberland Ecology also maintains that the PAC conclusion that the landscape will be permanently, significantly and visibly scarred, and that the biodiversity significantly diminished in the long term, is neither justifiable nor warranted.

3.5.2 Assessment of the Contracted Project

The Contracted Project ecological assessment involved a number of components in order to consider the issues that had been raised by the PAC in their review of the exhibited EA and RTS for the Exhibited Project. This included:

- An additional literature review of various documents either referred to by the PAC or in submissions considered by the PAC;
- Database analysis of public records held for species associated with pagoda habitat that had been discussed by the PAC;
- Definition, review and mapping of SPL;
- Testing the assertions made by the PAC and other regulatory agencies;
- Site inspections; and
- Consultation with experts and peer reviewers.

Impacts on Significant Pagoda Landform Ecology

In order to complete an assessment of the potential impacts of the Contracted Project on SPL, Cumberland Ecology reviewed the extent of these features in the region. This assessment showed that at least 25,800 ha of SPL as defined by Cumberland Ecology are present in the region, extending from Northern Wollemi Park to Lithgow. Of the total area of SPL mapped in the region, approximately 113 ha (0.44%) occurs within the Project Boundary.

The proposed open cut mining footprint of the Contracted Project will not disturb the area of SPL mapped within the Project Boundary and will not disturb other areas of sandstone cliffs, caves and rock outcrops. Buffer zones between these features and the maximum open cut and highwall mining footprints proposed for the Contracted Project have also been provided to reduce the risk of indirect impacts to SPL from blasting and subsidence.

Impacts on Biodiversity More Generally

The Contracted Project will result in the removal of approximately 762 ha of native vegetation from the communities listed below in **Table 6**. The threatened flora species and Rare or Threatened Australian Plant (ROTAP) species recorded from within the Project Boundary or with the potential to occur are not predicted to experience significant impacts from the Contracted Project following the implementation of proposed impact mitigation and compensatory measures.

In particular, the Contracted Project avoids the Clandulla Geebung habitat located in the north-western section of the Cullen Valley mining area and protects the deep gully vegetation associated with the SPL.

Table 6
Vegetation Disturbance within the Contracted Project Disturbance Boundary

Vegetation Community (Status)	Area of Vegetation within Project Boundary (ha)	Total to be cleared within the Contracted Project Disturbance Boundary (ha)	Total Avoided (%)
Tableland Gully Snow Gum - Ribbon Gum Grassy Forest	0.9	0.0	100%
Tableland Gully Snow Gum - Ribbon Gum Grassy Forest Low Diversity Derived Native Grassland	23.4	0.0	100%
Tableland Gully Ribbon Gum Blackwood Applebox Forest	111.8	91.2	18%
Tableland Gully Ribbon Gum Blackwood Applebox Forest Derived Native Grassland	16.6	15.0	10%
Capertee Rough-barked Apple - Red Gum - Yellow Box Grassy Woodland (EPBC)	46.2	15.0	68%
Capertee Rough-barked Apple - Red Gum - Yellow Box Grassy Woodland Derived Native Grassland (EPBC)	0.3	0.3	0%
Capertee Rough-barked Apple - Red Gum - Yellow Box Woodland: non grassy	0.1	0.1	6%
Capertee Rough-barked Apple Red Gum Yellow Box Woodland Derived Native Grassland (TSC EEC)	2.0	2.0	2%
Exposed Blue Mountains Sydney Peppermint - Silvertop Ash Shrubby Woodland	679.1	295.2	57%
Tableland Scribbly Gum – Narrow-leaved Stringybark Shrubby Open Forest	332.4	74.8	77%
Tableland Broad-leaved Peppermint - Brittle Gum - Red Stringybark Grassy Woodland	13.7	0.0	100%
Tableland Broad-leaved Peppermint - Brittle Gum - Red Stringybark Grassy Woodland Low Diversity Derived Native Grassland	215.2	0.0	100%
Tableland Slopes Brittle Gum – Broad-leaved Peppermint Grassy Forest	260.9	182.9	30%
Tableland Slopes Brittle Gum – Broad-leaved Peppermint Grassy Forest Derived Native Grassland	57.1	49.2	14%
Tableland Gully Mountain Gum - Broad-leaved Peppermint Grassy Forest	51.7	18.0	65%
Tableland Gully Mountain Gum Broad-leaved Peppermint Grassy Forest Derived Native Grassland	12.8	12.4	3%

Vegetation Community (Status)	Area of Vegetation within Project Boundary (ha)	Total to be cleared within the Contracted Project Disturbance Boundary (ha)	Total Avoided (%)
Tableland Gully Mountain Gum Broad-leaved Peppermint Grassy Forest Low Diversity Derived Native Grassland	2.8	0.9	70%
Cox's Permian Red Stringybark - Brittle Gum Woodland	92.0	5.1	95%
Pagoda Rock Sparse Shrubland	32.9	0.0	100%
TOTAL	**1,951.9**	**761.9**	**61%**

Mammals expected to be impacted by habitat disturbance for the Contracted Project include the Yellow-bellied Glider, Squirrel Glider and Spotted-tailed Quoll. A suite of threatened microbats including the hollow dependant Eastern False Pipistrelle, Eastern Freetail-bat, Yellow-bellied Sheathtail-bat and Greater Broad-nosed Bat and cave dwelling Large-eared Pied Bat and Eastern Bent-wing Bat are also expected to be impacted. As a result of the reduction in the total area of disturbance of 196 ha or 20% from the EA assessed by the PAC the impact on mammal species from the Contracted project will be materially less than that of the Exhibited Project. For the species of fauna of particular concern to the PAC the following specific conclusions are formed:

- **Brush-tailed Rock Wallaby** - The Contracted Project will not impact on a population of the BRW and in fact the commitment to annual fox baiting program may encourage its re-colonisation of the SPL over time.
- **Broad Headed Snake -** While the BHS was not recorded within the Project Boundary, it is one of a number of species that was considered to have the potential to occur within the Contracted Project area of disturbance. Consultations with experts and additional targeted surveys have failed to confirm its presence. Further, the habitat within the Contracted Project Boundary has been confirmed by the pre-eminent experts to be of poor quality for the BHS. It is concluded that the Contracted Project will have no significant impact on the distribution and survival of the Broad Headed Snake. Further, it is concluded that the contraction of the project from the SPL and the proposed habitat enhancements which form part of the Contracted Project may encourage its re-habitation of the SPL.
- **Cave Roosting Bats -** The Contracted Project will not impact directly (or in any way significantly) on the roosting habitat of cave dwelling bats. Further, as these bats foraging habitat is so widespread and the disturbance to such habitat by the Contracted Project so limited, Cumberland Ecology are of the view that any local population of cave dwelling bats will not be significantly impacted by the Contracted Project.

Biodiversity Offset Strategy

The BOS has been revised for the Contracted Project due to the contraction of the mine plan and removal of the Hillcroft property offset. From the outset, Coalpac has proposed an offset package, committing to the achievement of an offset ratio for forest woodland of at least 3.6:1 for the Exhibited Project.

With the exclusion of the Hillcroft property as a proposed offset, a total area of 2,040 ha is currently held by Coalpac to provide offsets for the Contracted Project. In response to the PAC criticism of relying on mine rehabilitation as a component of any offset strategy Coalpac has agreed with OEH that it will achieve the ratio of 4:1 excluding its mine rehabilitation.

In recognition of a shortfall in the required offset ratio that the above creates, Coalpac has consulted with OEH over the purchase of additional targeted properties to achieve the committed total ratio excluding mine rehabilitation of 4:1 for native vegetation and is currently reviewing the list of properties in the region that are considered suitable for conservation as provided by OEH. This will require the acquisition and offsetting of at least an additional 1,007 ha of land to increase the total Contracted Project Biodiversity Offset Package to 3,047 ha (rounded down). This is summarised in **Table 7**. To ensure that the additional offset properties provide the greatest conservation value in the long term, the following values noted by the PAC and OEH will be targeted:

- Areas of forest and woodland present on the site would preferably correspond to vegetation classes Tableland Wet Sclerophyll Forest and Southern Tableland Dry Sclerophyll Forest as classified by Keith (2004);
- Property located predominantly on Permian sediments;
- Property adjacent to or have connectivity with existing NSW conservation estate;
- Property with the potential to provide habitat for the;
    - Broad-headed Snake;
    - Cave-dwelling bats (Large-eared Pied Bat and Eastern Bentwing-bat); and
    - Brush-tailed Rock Wallaby;
- Property that provides habitat for fauna species potentially impacted by the Contracted Project.

Following the completion of the Contracted Project mine plan and revision of the BOS, Coalpac have undertaken a high level review of a number of potential offset properties in the region with appropriate values that could potentially be acquired for inclusion. A list of the properties that have been considered in this review and the respective values of each are provided below in **Table 8**. The commitment to achieve a 4:1 offset ratio is comparable to other recently approved mining projects in NSW, including Ulan Coal Mine (4:1 ratio), Duralie Coal Mine (3.3:1 ratio) and Maules Creek Coal Mine (4.3:1 ratio).

Table 7
Revised Biodiversity Offset Package (without mine rehabilitation)

Vegetation Type	Contracted Project Disturbance Boundary (ha)	Proposed Offset (ha)	Proposed Offset Ratio
CEEC & EEC	17.2	221.7	12.9
Non CEEC & EEC (native only)	744.7	2,825.7	3.8
Total	**761.9**	**3,047.4**	**4.0**

Table 8
Potential Offset Properties for Contracted Project BOS

Property Reference	Ecological Values
1.	This property is 200 ha in size and does not border a National Park. It contains approximately 140 ha of intact vegetation and 60 ha of cleared and semi-cleared land. The intact vegetation does not correspond to any impacted vegetation classes by Keith (2004). Property occurs on Permian and Triassic sediments. The BHS and BRW have been recorded within 5 km of the property.
2.	This property is 540 ha in size and does not border a National Park, but is adjacent to Crown Land with Sandstone Outcrops. Property occurs on Permian and Triassic sediments. Property contains approximately 260 ha of intact vegetation and 280 ha of cleared land. Vegetation classes do not correspond to impacted vegetation classes in the Project Boundary and valleys would require revegetation. *Eucalyptus cannonii* has been recorded within 5 km of the property.
3.	This property is 580 ha in size and does not border a National Park, but is adjacent to Crown Land with Sandstone Outcrops.. Property occurs on Permian and Triassic sediments. The property contains approximately 135 ha of intact vegetation and 409 ha of cleared land. Vegetation classes do not correspond to impacted vegetation classes in the Project Boundary and valleys would require revegetation. This property adjoins vegetation with rock outcrops occurring between this property (reference 3) and another potential property nearby (property 2). *Eucalyptus cannonii*, BHS and BRW have been recorded within 5 km of the property.
4.	This property is 579 ha in size and does not border a National Park, though adjoins intact vegetation that connects to Capertee National Park. The property contains approximately 529 ha of intact vegetation and 50 ha of cleared land. Property occurs on Permian and Lower to middle Devonian. Vegetation classes do not correspond to impacted vegetation classes in the Project Boundary.
5.	This property is 2,559 ha in size and does not border a National Park though is of adequate size to become one in its own right. Property is adjacent to Crown Land with Sandstone Outcrops and occurs on Tertiary, Triassic and Quaternary (overlying Permian) geology.). The majority of the valley floor is cleared and covers 1200ha and would require revegetation. The slopes and higher country have not been cleared and cover 1359 ha of native vegetation. Some of the vegetation corresponds to Southern Tableland Dry Sclerophyll Forest, an impacted vegetation class in the Project Boundary.

Property Reference	Ecological Values
6.	This property is 50 ha in size and borders on Gardens of Stone National Park. Property occurs on Permian and Lower to middle Devonian. This property is completely forested. Vegetation classes on the property do not correspond to impacted vegetation classes in the Project Boundary. Eucalyptus cannonii, Large-eared Pied Bat has been recorded within 5km of the property.
7.	This property is 236 ha in size and borders Kandos State Forest. Property occurs on Permian and Lower to middle Devonian. The property contains approximately 20 ha of cleared land and 216 ha of native vegetation. Some of the vegetation on the property corresponds to Southern Tableland Dry Sclerophyll Forest, a class of vegetation impacted by the Contracted Project. *Eucalyptus cannonii*, Eastern Bentwing-bat and Large-eared Pied Bat has been recorded within 5 km of the property.
8.	This property is 400 ha in size and borders Gardens of Stone National Park. Located approximately 8km north of the Project Boundary. The property occurs on Permian and Lower to middle Devonian. The property contains approximately 93 ha of cleared land and 306.83 ha of native vegetation. Some of the vegetation on the property corresponds to Southern Tableland Dry Sclerophyll Forest, a class of vegetation impacted by the Contracted Project. Valleys would require revegetation. *Eucalyptus cannonii* has been recorded within 5 km of the property.

Note: Property names withheld due to commercial sensitivity; these are available to regulators on request

In addition to the above properties, OEH has recently provided Coalpac with a list of an additional 25 properties that they have variously prioritised for addition to the NSW conservation estate.

Additional Biodiversity Management Commitments

In addition to the impact mitigation commitments made in the EA and RTS, Coalpac has increased measures to further reduce impacts to a key species of concern to OEH and the PAC. Additional considerations to reduce potential impacts to the BHS include:

- Conducting preclearance surveys in selected areas in winter when snakes may be sheltering under rocks;
- Ensuring that there remains undisturbed forest around some portions of the SPL to allow animal movement and foraging (as there will be to the north, east and south of the proposed mining area);
- The placement of artificial shelter sites on Sandstone Outcrops and in the SPL as these have been shown to increase the occurrence of both snakes and their preferred food, the Velvet Gecko;
- Maintaining some hollow trees at the bases of the Sandstone Outcrops and the SPL (Cumberland Ecology have verified that hollow trees will remain within the standoff zone between the Sandstone Outcrops and the SPL and the edge of the proposed open cut); and

- Developing vegetation communities in rehabilitation within the mined areas in an attempt to replicate the vegetation cleared.

A fox baiting program will be implemented for the life of the mine so as to reduce fox predation pressure on small native mammals, including, potentially, the BRW, if it recolonises the SPL habitat or other Sandstone Outcrops in the Project Boundary.

All of the major cliff lines and caves associated with the Sandstone Outcrops and all of the SPL habitats for bat species will be protected from direct and indirect impacts of mining operations. Foraging habitats cleared by mining will be rehabilitated so that in the long term the species is able to reuse disturbed areas. Monitoring will be conducted over the life of the Contracted Project to verify that cave-dwelling bat species remain and utilise the habitats within the Project Boundary and in adjacent areas.

A response to the PAC recommendations in relation to ecology are summarised below in **Section 4**, with a further discussion in **Appendix E**.

3.6 MINING METHOD STABILITY

Due to the PAC questioning the conclusions within the EA and RTS documents that both open cut and highwall mining as designed would have negligible impacts on the pagoda complexes or other sensitive natural and man-made features, additional assessment and peer review has been conducted.

3.6.1 Open Cut Mining

With regard to open cut mining slope stability in proximity to the SPL and Sandstone Outcrops, Mr Paul Maconochie of GeoTek Solutions has conducted a review. Mr Paul Maconochie is highly experienced geotechnical engineer with more 30 years practical experience specialised in open cut mining stability.

The Maconochie review has assessed the slope stability of the SPL and Sandstone Outcrops next to proposed open cut mining areas. This assessment has focussed on the geotechnical stability of the open cut highwalls and the SPL and Sandstone Outcrops immediately behind them while the open cut highwalls are at their maximum exposure (i.e. a worst case scenario).

Slope stability analyses considered potential failure mechanisms based on the known geology of the site, and the geometry of the excavation of highwalls proposed in the Contracted Project mine plan. A representative site was selected from within the mine footprint on the basis it would be a near-worst case scenario highwall (i.e. highest highwall and adjacent SPL within the Project Boundary). In this location, the highwall crest was positioned 60m from the base of the cliff face of the SPL.

The analyses showed that the minimum global Factor of Safety (FoS) for the profile assessed was 1.36. Maconochie notes that the normally accepted FoS for a short-term mining slope under which people will work is 1.2 and for a slope carrying critical infrastructure required for the life of mine the design FoS would be about 1.3.

This indicates that this near-worst case highwall design analysed by Maconochie, and which is proximate to the SPL, has been found to be stable, and have a more conservative FoS of 1.36 (note this is higher than the 1.3 FoS against instability that would typically be applied to protect critical infrastructure). This FoS is further increased once the highwall is backfilled as part of the normal mining process.

Maconochie further notes that given that the final mining highwall proximal to the SPL is only expected to be fully exposed for periods of 8 to 12 weeks before backfilling begins.

Backfilling against the highwalls is part of the normal excavation and backfilling sequence that has been utilised for over 10 years at these mines. Backfilling ensures the stability of the excavated highwall face by acting as a buttress effectively supporting the newly created excavation, and significantly increasing the FoS on the highwall slope.

It is considered that the temporary highwall design (with the lowest FoS of 1.36 at the representative location assessed) is appropriate and will not lead to instability of the overlying cliffs.

A suggested method for the monitoring of SPL and Sandstone Outcrop exposures and inclusion in the Contracted Project Slope Stability Management Plan was also provided. This was focused on the following key criteria:

- Rock strength;
- Bedding orientation and spacing;
- Joint orientation and spacing;
- Whether any faults are present and if so, their orientation;
- Groundwater seepage; and
- The nature and significance of any rockfalls in the advancing highwall.

Maconochie recommends that this process would be undertaken by the mine geologist with support from statutory officials (including the Open Cut Examiner) as part of a specific checklist that would trigger specific action responses (or Trigger, Action, Response Plan (TARP)).

The results and recommendations of this review are discussed further in **Appendix H**.

As all proposed open cut mining is down slope of any sensitive natural features, the only other concern over their ongoing integrity as a consequence of open cut mining is the management of mine blasting impact. A prescriptive process for the management of this activity so as to ensure negligible impact to any sensitive feature is described in detail in **Section 3.4**.

3.6.2 Highwall Mining

Dr Ian Clark of GEONET developed a generic highwall mining plan in the Exhibited Project EA for the most critical area of mining in the Ben Bullen State Forest where subsidence sensitive landscapes must be preserved.

The PAC concerns in this area are summarised below.

> *"The Commission finds that the risks of subsidence-induced damage to the pagodas and escarpments are real and that the level of uncertainty is such that no confidence can be placed in the assertion that the risks can be managed successfully at all times under all operating conditions. The Commission also notes that stability problems arising from highwall mining may only become apparent in the longer term.*
>
> *The strategy proposed to overcome the defects noted above is to collect the required data as part of the mine planning process and revise the estimates and detailed proposals as part of that process. The problem with this is that the Commission is being asked to recommend approval for extensive use of a specific mining technique that carries significant levels of impact risk for natural features of special significance within the project area without the data necessary to properly assess the magnitude of that risk. Deferring a decision of this nature to a subsequent planning process without public scrutiny has been rejected previously by both the Commission and the NSW Land and Environment Court."*

This section addresses these concerns by providing evidence on site specific coal strength data required to underpin highwall mining designs. It further includes a peer review analysis of the highwall designs to demonstrate that the minimum factor of safety commitment of the proponent is appropriately conservative. The analysis concludes that the risk to natural features is negligible and that the design methodology should permit approval.

One of the main areas of concern noted by the PAC was a paucity of site specific coal strength data. Coalpac commissioned additional coal strength testing of samples from the site. Dr Ian Clark of GEONET was commissioned to undertake an assessment of additional coal strength data from samples tested from both Invincible Colliery and Cullen Valley Mine to compare this site specific data with the assumptions used in the geotechnical modelling of highwall mining stability conducted for the EA.

In the GEONET review of the additional seam Uniaxial Compressive Strength (UCS) data, it was concluded that the mass coal strength used for the highwall mining study for the EA was appropriate and as such it conservatively assessed the predicted subsidence impacts associated with that mining method. Specifically GEONET stated that:

> *"…the original input parameters used for the EA* [GEONET 2012] *provide a conservative, absolutely plausible and defensible estimate of the coal strength. The results presented in the geotechnical stability assessment can therefore be considered to provide an accurate, best estimate of the anticipated deformation behaviour that may accompany highwall mining."*

Further to the above additional work by Dr Ian Clark of GEONET, Professor Bruce Hebblewhite was commissioned to provide a review of the highwall mining study in the EA, with an emphasis on the mining and geotechnical aspects of the project, particularly with regard to pillar design and stability issues, surface subsidence effects and impacts proposed by GEONET (2012). Professor Hebblewhite's report is contained in **Appendix H** with a summary of his findings provided below.

As a general comment in his report, Professor Hebblewhite highlights that a major area of advancement in the Australian underground mining industry has been in mining operating systems and management practices. Mining companies now are far more proactive in identifying inherent risks (be they geotechnical or other) and adopting a proactive risk management approach to the mining operation. He states that Australia leads the world in the adoption of modern risk management approaches to mine management. He further states that the result of these technical, scientific and management advances across the Australian underground mining industry is that a modern mining operation can be successfully conducted in an environment containing a range of complex hazards; where inter-related performance measures are put in place to ensure that all appropriate stakeholder considerations are linked into the management systems and the mine performs according to agreed compliance measures.

Professor Hebblewhite goes on to comment on the three design methodologies applied by GEONET and confirms that they are "...*highly appropriate and based on good geotechnical practice*". More specifically, he notes that:

- That Coal strength data assumptions used for highwall pillar design are appropriately based on sound principles appropriate for pillar design and are conservative;
- A minimum Factor of Safety (FoS) of 1.3 has been applied for web pillar designs (i.e. no pillars have a FoS below 1.3). It was also noted that a more conservative pillar design was proposed in specific sensitive areas, further increasing the FoS;
- The three stage pillar/mine design approach (using empirical, 2D and 3D numerical design) is considered to be a very comprehensive and appropriate design methodology; and
- The design principle used for the critical span between barrier pillars to ensure that intervening web pillars are not overloaded is geotechnically appropriate for the region of the Contracted Project.

- As part of the Hebblewhite review, GEONET was asked to provide further information and explanation on two additional issues (see **Appendix H**), being:
    - The FoS of the barrier pillars (being the larger squat pillars that separate individual panels or groups of parallel highwall mining drives) was calculated under worst case load conditions; and
    - The definition of the actual FoS for each barrier pillar under worst case conditions to further provide further certainty on the long term stability aspects of the highwall mining panels proposed and the effects of variable highwall mining pillar widths.

This extreme worst case loading condition consisted of the maximum overburden thickness (i.e. maximum pillar load) in the Contracted Project highwall mining area (i.e. the GEONET study area as described in the EA) and an assumption that the web pillars between highwall mining drives provide no support. This worst case analysis is far more conservative than the actual highwall mining design proposed and provides a 'stress test' to confirm the barrier pillar design is more than adequate.

The results of this worst case loading condition scenario showed that the barrier pillar FoS ranged from 1.6 to 3.7. These calculated limiting FoS present the absolute minimum and are indeed artificially low values since the presence of the web pillars (which are in fact included in the design) will provide additional support to the overburden under the stress arch. Knowing that the web pillars have a minimum FoS of 1.3 (and in most cases significantly higher than 1.3) the FoS for the individual barrier pillars was then calculated as part of the overall layout.

The results show that the FoS for the individual barrier pillars are predominantly in excess of 5 and range up to 10, with some very small localised areas between 4.4 and 5. GEONET concludes that the proposed designs will provide more than adequate long term stability.

Professor Hebblewhite concludes that an approval of the overall proposed mining operation is a suitable and recommended approach. The mining method does not carry any excessively more significant risks than other underground mining methods.

Despite all of the above, to provide additional certainty for the community and regulators in regard to the protection of the SPL, no highwall mining is now proposed under the rock formations of the SPL in the Project Boundary.

3.7 ECONOMICS

Gillespie Economics completed an economic impact assessment for the Contracted Project, which was peer reviewed by Dr Jeff Bennett. Copies of both reports are included in **Appendix I**.

Prior to the assessment of economic impacts of the Contracted Project, a review of the economic assessment methodology used in the EA (Gillespie Economics 2012) was completed in the context of the observations and conclusions of the PAC which was also peer reviewed by Dr Bennett.

The purpose of this review was to confirm that the economic impact study undertaken for the EA and reviewed by the PAC was completed in accordance with the DGR's and the relevant assessment policies and guidelines.

3.7.1 Review of Assessment Methodology

As required by the DGRs under the EP&A Act and applicable Government policies, the comments in the RTS and the economic assessment of the Exhibited Project have been based upon the use of:

- Benefit Cost Analysis (BCA), to assess the project's impacts on the well-being of the Australian people;
- Input Output Analysis (IOA), to predict the changes to the structure of the regional and state economies that would result from the project expenditures; and
- Threshold Value Analysis to consider the qualitatively assessed environmental costs against the quantified net economic benefit of the project.

In addition to the planning law requiring that the economic assessment of the project be assessed by the application of the principles of the BCA, it is also the opinion of Gillespie Economics and the peer reviewer Dr Bennett that the BCA is the appropriate methodology for the economic assessment of the project.

The PAC did not accept the Gillespie Economics (2012) report, either in its application of the BCA as an appropriate economic assessment tool, nor did it accept the conclusions.

Benefit Cost Analysis

Gillespie Economics note that the DGRs for the Project confirm the requirement of NSW legislative and policy requirements to use BCA for the assessment the economic aspects of developments. BCA applications in NSW are guided by their theoretical underpinnings in neoclassical welfare economics as well as the NSW Treasury (2007) and the NSW DP&I draft *Guidelines for Economic Effects and Evaluation in EIA* (James and Gillespie 2002).

These references guide the economic assessment completed for the EA and for the Contracted Project. Gillespie Economics notes that draft guidelines, recently prepared by NSW Treasury for the economic assessment of coal mining and coal seam gas proposals (NSW Treasury 2012), embody the principles and practice of BCA. NSW Treasury confirms in its submission to the DP&I dated 31 January 2013 that:

> *"Cost Benefit Analysis is the standard evaluative technique for development projects and is prescribed in the NSW Government Guidelines for Economic Appraisal. BCA is widely used for evaluations by governments globally and by international organisations such as the World Bank and the OECD. The BCA framework is the preferred assessment approach for strategic land use situations involving possible conflicts between agriculture and mining and coal seam gas developments, per the recently released draft guidelines."*

Triple Bottom Line

Despite the NSW Government policy and legislative framework requiring the use of the BCA, the PAC (misguidedly) raises the questions whether "*TBL* (Triple Bottom Line) *cost benefit analysis*" should have been employed. The PAC conclude that if TBL should have been employed then the economic analysis in the EA falls well short. The PAC has apparently given substantial weight to, and placed reliance on, the propositions from the Institute of Sustainable Futures (ISF) made in support of a submission from the Total Environment Centre (TEC). Gillespie reports, and Bennett concurs, that the ISF wrongly proceeds from a base that the appropriate methodology for the economic assessment of the Exhibited Project is by the TBL approach. The ISF attempts to justify its position by reference to the NSW Coal and Gas Strategy Scoping Paper (Scoping Paper) which is a paper (Gillespie notes) prepared to "*encourage community and industry feedback on the directions and issues to be addressed in the Coal & Gas Strategy*" (DoP 2010). The Scoping Paper is not a government policy, guideline or plan to aid economic assessment under the EP&A Act.

Gillespie reports that TBL is a form of multi-criteria analysis (MCA) and not a form of economic analysis. Gillespie makes references to critiques of TBL (such as Dobes and Bennett (2009)), which point out the lack of a consistent conceptual framework in TBL analysis, significant problems in its practical application, and the strong likelihood of TBL analyses being open to manipulation by vested interests to secure an assessment that is favourable to their preferred outcome. Gillespie points to Vanclay (2004), who is the author that the ISF relies on for support of the application of TBL, and who concludes that *"It would appear that the advocates of TBL and the institutions that have adopted TBL are ignorant of SIA* [Social Impact Assessment] *and other forms of impact assessment. The view presented here is that TBL is a fad that presents little that is new..."*

Without justification, the PAC observes that *"...although the economic analysis may have been conducted within the applicable guidelines and bounds of economic theory, the facts of this particular project are sufficiently unusual to test the limits of the approach"*. Gillespie reports that the BCA is the appropriate methodology for the economic assessment of this or any such project and this position is confirmed by Treasury (2012) in its' draft *Guidelines for the use of Cost Benefit Analysis in mining and coal seam gas proposals*'.

PAC Economic Issues

The Gillespie Economics report responds to the PAC Review Report questioning or challenging the application or omission of a number of issues or principles applied by Gillespie Economics in the EA. This was based on the PAC assertion that the inappropriate application or failure to address such issues resulted in Gillespie economics arriving at an inappropriate conclusion as to the economic effects of the project.

These assertions related to the following:

- Ongoing demand for electricity in NSW;
- Economics of energy resources and how the market mechanism is used to determine the demand for coal resources;
- Transition from non-renewable to renewable sources of energy;
- Application of the assessment methodologies adopted for the EA Economic Assessment, including the consideration of the base case (i.e. "without" the Project) as a comparative assessment tool, and the inconsistent assessment of benefits and costs;
- Consideration of greenhouse gas emissions associated with the Exhibited Project in the Economics Assessment;
- Inclusion of the costs associated with the proposed biodiversity offsets in the BCA;
- Values of the pagoda landforms;
- Influence of the 'world parity price' in the valuation of coal from the Exhibited Project;
- Distribution of costs and benefits of the Exhibited Project; and
- Extent to which electricity consumers will benefit from the Exhibited Project (in relation to electricity prices).

After reviewing the PAC position, Gillespie and Bennet conclude that the work performed for the EA remains valid.

3.7.2 Assessment of the Contracted Project

Gillespie Economics has completed an Economic Assessment of the Contracted Project which is included in **Appendix I**. This was based on a revised financial model of the Contracted Project provided by Coalpac and information from Hansen Bailey on the environmental impacts of the Contracted Project.

Gillespie Economics report that the *"...Contracted Project is estimated to have net benefits to Australia of in the order of $1,330M" "*

While the major environmental, cultural and social impacts have been quantified and included in the Contracted Project BCA, any other residual environmental, cultural or social impacts that remain unquantified would need to be valued at greater than between $1,330M for the Contracted Project to be questionable from an Australian economic efficiency perspective.

The net production benefits of the Contracted Project would be distributed between a number of stakeholders including:

- Coalpac, in the form of net profits;
- The MPPS (and WPS), in the form of lower cost coal ($744M, present value) which is ultimately passed on to electricity consumers through lower priced electricity;
- The NSW government, in the form of royalties (estimated at $199M, present value) which is subsequently used to fund provision of government infrastructure and services across NSW, including the region;
- The Commonwealth Government, in the form of company tax (estimated at $116M, present value) which is subsequently used to fund provision of government infrastructure and services across Australia and NSW, including the region; and
- The local region, from the establishment of a Voluntary Planning Agreement to fund local community projects.

Additionally, noise and dust impacts will be internalised by Coalpac through the acquisition of (or provision of compensation for) significantly or moderately adversely affected properties and provision of mitigation measures for those located in noise management zones or considered to be in the high visual impact zone. Impacts on native vegetation will also be internalised through a biodiversity offset package of suitable land. The Scope 1 and Scope 2 greenhouse gas costs from the Contracted Project are internalised into the operating costs of Coalpac via the carbon tax.

As well as resulting in net benefits to Australian the Contracted Project is also considered to provide net benefits to NSW.

Regional Economic Impact Assessment

The annual regional economic impact associated with the Contracted Project is estimated at up to:

- $219M in annual direct and indirect regional output or business turnover;
- $105M in annual direct and indirect regional value added;
- $30M in annual direct and indirect household income; and

- 293 direct and indirect jobs.

The annual NSW economic impact associated with the Contracted Project (refer to Table 3) is estimated at up to:

- $275M in annual direct and indirect regional output or business turnover;
- $133M in annual direct and indirect regional value added;
- $48M in annual direct and indirect household income; and
- 519 direct and indirect jobs.

These estimated annual regional and NSW impacts would be felt for the life of the Contracted Project.

3.7.3 Economic Impact Assessment Peer Review

The peer review of the Gillespie Economics report for the Contracted Project by Dr Jeff Bennett at **Appendix I** *"...involved a consideration of the methods used in the assessment including the validity of their application*" and *"...benchmarking the Gillespie economics analysis against the established principles of accepted welfare economics generally and cost benefit analysis in particular."*

Methodology

Dr Bennett found that *"...both the CBA and IOA techniques are appropriate to the separate and distinct tasks they addressed and are well established both in theory and practice"* and that *"…the Gillespie Economics application of Threshold Value Analysis in the Coalpac context is correct"*.

Dr Bennett also found that *"…the Gillespie Economics analysis has used conceptually sound techniques that are appropriate to the tasks addressed. The analysis has been performed competently within the bounds of the constraints to data collection. Decision makers who are to judge the merits of the Project should feel confident of this analysis as a basis for their deliberations."*

PAC Economic Issues

Dr Bennett considers the 'PAC Report Economic Assessment Issues by supporting the approach taken by Gillespie Economics concluding as follows.

- Supporting the use of BCA as the most appropriate tool for the analysis of the economic efficiency of the Project;
- Rejecting the use of 'triple bottom line accounting' (TBLA).
- Rejecting any relevance potential loss of reduction in demand for steaming coal and financial viability for the miner noting that "*the role of the public sector decision maker is rather to assess the impacts of the proposed project on the well-being of the whole community, not just the financial impacts for the proponent"*;

- Rejecting apparent PAC asserted inconsistencies involving;
    - The use of the 'mine versus no mine' comparison which is consistent with the use of BCA; and,
    - Application of the appropriate spatial scale of analysis relating to the costing greenhouse gas (GHG) emissions that arise from the proposal where the Gillespie Economics approach was to include only the GHG emissions involved in the mining process and the transportation of the coal to the power stations where it is to be burnt and to port where it is to be exported;
- Supporting the treatment of the costs of offsets as surrogates for the costs of lost vegetation and biodiversity that results from mining subject to very good substitutes being provided;
- Noting that BCA involves the estimation of the true costs and benefits to the whole of society that result from a change in the use of resources. The values involved are measures of economic surplus both gained and lost. This type of analysis does not replicate an analysis of financial viability. In BCA, the transference of money between parties is not necessarily a measure of value;
- Noting that prices paid in markets may not reflect the true value of resources. This can occur when market prices are distorted through factors such as a lack of competition supporting the use of the concept of a 'shadow price' of coal to reflect the true scarcity value of that resource;
- Noting that the use of the negotiated price between single seller and single buyer in the Coalpac case is inappropriate for inclusion in the BCA;
- BCA is primarily focused on the efficiency consequences of alternative resource uses enabling decision makers to assess if the benefits relative to the no-mine situation exceed the additional costs associated;
- It is important to recognise that the equity or distributional impacts of the proposed project are not normally integrated into BCA. Gillespie Economics appreciates this in its review of the PAC findings and correctly notes that concerns regarding the impacts of the mine on individuals or groups within society as raised by the PAC are not matters for the BCA; and
- The results of the BCA lead to the conclusion that there are sufficient gains to be enjoyed from the project that those incurring losses could be fully compensated and the beneficiaries would still enjoy net gains.

Dr Bennett notes that *"...Gillespie Economics makes comment on the PAC's discussion of the impact on the price of electricity resulting from changes to the electricity generation sector arising because of the potential removal of Coalpac coal from the market. The PAC argues that purchases of coal represent only one element of the costs of electricity generation and that there are many different sources of electricity to the grid." As such, the PAC concluded that there would be negligible impact on electricity prices from the withdrawal of Coalpac coal"*.

Dr Bennett says that he finds *"...this argument to be unconvincing and agree with Gillespie Economics that a move away from the proposed mine and the subsequent structure of electricity generation would be a movement away from the least cost solution to the provision of electricity problem."*

Dr Bennett concludes that *"This implies a price rise for consumers given that the supply of domestic electricity is not infinitely elastic. Even if the changes in price involved are relatively small, the cumulative effects across the population of electricity consumers could well be significant. However, it should be noted that this debate is irrelevant to the CBA as it involves spill over effects into subsequent markets which are not included in the CBA"*

Conclusion

Dr Bennett concludes his peer review of the Gillespie Economics report by stating that

> *"In summary, the Gillespie Economics economic assessment of the Contracted Project has used conceptually appropriate tools of economic analysis and that those tools have been applied in an acceptable manner. I therefore find that the assessment delivers an accurate picture of the economic impacts of the proposed mine. My opinion is that the environmental costs of the Contracted Project that are not incorporated into the Gillespie Economics CBA are less than the $1.3b net social benefit estimated by that CBA of the proposed mine."*

4 CONSIDERATION OF PAC RECOMMENDATIONS

This section provides a discussion on those recommendations provided in the PAC Review Report that will not be fully adopted by Coalpac for the Contracted Project.

The recommendations on individual issues made by the PAC in their Review Report (as requested by the Minister) as to *"…appropriate measures to avoid, minimise and/or offset impacts…"* of the Exhibited Project as considered by the PAC are reproduced in **Appendix J**, which includes a summary of Coalpac's response to each.

While it was noted by the PAC in its' Review Report that the recommendations *"…represent the minimum requirements or limitations that the Commission considers necessary to deal with the individual impacts identified…"* and *"…that these individual recommendations have been provided should not be interpreted as modifying the Commission's conclusion and recommendation on the project as a whole"*. Of the 83 recommendations made by the PAC in their review Eleven (11) are considered inconsistent with the current DGRs or the environmental impact assessment policies of NSW and two (2) are no longer relevant due to changes to the Contracted Project as described in **Section 2**.

Of the remaining 70 Coalpac adopts 57 (81%) in full. A further ten (10) recommendations are adopted with qualification.

Three (3) PAC recommendations would result in significant impacts on the viability of the Project and are considered both inappropriate and unwarranted and thus cannot be accepted by Coalpac.

Each recommendation not adopted in full by Coalpac is discussed further below including those concerning policy issues which will require further consideration by Government.

4.1 AIR QUALITY

4.1.1 PAC Recommendation 2

> *"The Commission recommends the current acquisition criterion for PM10s, 150 µg/m3 24-hour average from all sources, should be reviewed from a health perspective given the NEPC criteria of 50 µg/m3 and more recent advice from NSW Health about mortality and morbidity impacts. This should be done in consultation with NSW Health and the EPA prior to any final approval for the Coalpac project."*

Coalpac notes this is not a Project specific recommendation and is in fact an impact assessment policy issue for the consideration of the NSW Government.

The air quality impact assessment of the Exhibited Project as reviewed by the PAC and the assessment completed for the Contracted Project (see **Section 3.2**) were undertaken with reference to current air quality criteria that apply in NSW and, as required in accordance with the requirements of the DGRs, taking "...*into account relevant guidelines, policies and plans … relevant to the environmental assessment of this project*" including those listed in the attachment to the DGRs. It is also noted that the air quality criteria adopted within NSW are amongst the most stringent compared to other OECD countries.

4.1.2 PAC Recommendation 3

> *"The Commission recommends the NSW long-term acquisition criterion for annual average particulate matter less than 10 microns (PM_{10}) of 30 µg/m3 should be reviewed against the WHO goal of 20 µg/m3 for this parameter."*

These criteria recommended by the PAC are a rejection of the standards applied by Planning legislation, guidelines and principles applicable to this project. This is an issue of policy for the NSW government to determine.

The air quality impact assessment of the Exhibited Project as reviewed by the PAC and the assessment completed for the Contracted Project (see **Section 3.2**) were undertaken with reference to current air quality criteria that apply in NSW and in accordance with the DGRs.

Despite the above it is noted that when one does compare the predicted are quality within the township of Cullen Bullen to the WHO goal of 20 µg/m^3. This is a matter for the relevant government departments such as NSW Health, EPA and the DP&I.

However, it is noted that the Contracted Project meets this more stringent goal within the township of Cullen Bullen.

4.1.3 PAC Recommendation 12

> *"The Commission recommends that an evaluation should be conducted of Real Time Air Quality Management Systems (RTAQMS) including their effectiveness in controlling emissions from open-cut mines. This should include investigation of the relationship between suppression of peak emission levels and the effect (if any) on annual average emission levels from open-cut mines in NSW."*

Coalpac notes this is not a project specific recommendation and is in fact an impact assessment policy issue for the consideration of the NSW Government.

While an initiative such as this could be undertaken in the future with Coalpac's involvement, it is not within the scope of an air quality impact assessment for a single development and would be inappropriate as a condition of approval for the Contracted Project.

If an evaluation of RTAQMS were to be completed in the future, it would likely require both monitoring and management data to be collected over a period of time and across a number of operating open cut coal mines before any analysis could be undertaken. It is assumed that such an investigation would be a matter for the relevant government departments to scope and coordinate. Coalpac would be willing to make its monitoring data set available for such an exercise.

4.2 NOISE

4.2.1 PAC Recommendation 13

> *"The Commission recommends the proposed review of the Industrial Noise Policy include a review of the minimum default background noise level of 30dBA."*

Coalpac notes this is not a project specific recommendation and is in fact an impact assessment policy issue for the consideration of the NSW Government.

The noise impact assessment of the Exhibited Project as reviewed by the PAC and the assessment completed for the Contracted Project (see **Section 3.3**) were undertaken with reference to current noise impact assessment policies and criteria that apply in NSW (including the INP) and in accordance with the requirements of the DGRs.

It is not within the scope of a noise impact assessment to comment on the acceptability or otherwise of the Government "guidelines, policies and plans" for any environmental effect. This includes noise to which the INP applies and particularly minimum background noise levels of 30 dBA under the INP. It is however noted that for this particular project that the background noise level in and around Cullen Bullen is approaching 30 dBA.

4.2.2 PAC Recommendation 14

> *"The Commission recommends the cumulative noise, including the project and ambient noise, at the Cullen Bullen school should not exceed 45 LAeq(1hr) at any time during a school day."*

Coalpac accepts this recommendation with qualification. Coalpac will manage its noise sources to ensure its contribution to this criterion remains below the criterion.

The acoustics impact assessment indicates that the Contracted Project would produce a noise level at least 10 dBA below relevant classroom noise criteria and would therefore have an insignificant effect on classroom noise levels.

The PAC has recommended control of cumulative ambient noise which includes noise from the Contracted Project and from other environmental noise sources (such as Castlereagh Highway traffic) at the Cullen Bullen School. It is clearly not possible for Coalpac to commit to manage noise sources outside its control, as would be required to meet the PAC proposed recommendation.

4.2.3 PAC Recommendation 17

> *"The Commission recommends that once the conveyor is completed, road haulage of coal to MPPS should only occur for a minimal period in emergency situations where there are no other reasonable options and only with written approval from the Department. Haulage should be restricted to 0700 to 2100 and none on Sundays or Public Holidays."*

Coalpac accepts this recommendation with qualification.

As emergency situations would generally extend over a relatively brief period such as a few days or weeks, any delays in obtaining DP&I approval would effectively remove or limit Coalpac's desired ability to haul coal by road when required in an 'emergency' (i.e. when lack of supply to MPPS poses a risk to the stability of NSW electricity production).

Rather than the strategy recommended by the PAC, Coalpac suggests a single, in-principle approval to transport coal by road during agreed and well defined situations with appropriate notification to relevant regulatory agencies and the local community.

It must be recognised that such an event is highly unlikely to occur.

4.2.4 PAC Recommendation 25

> *"The Commission recommends that operating hours should be limited to the following times until all noise mitigation measures have been implemented and demonstrated to be effective and certified by an independent acoustic expert that they meet the noise criteria. These noise mitigation measures include; the noise sound suppression on mobile plant and stationary equipment, earthen bund walls, conveyor, bridge over the Castlereagh Highway, location of infrastructure within the project footprint and the real time monitoring and management system.*

- *Monday to Saturday*
  - *7.00 am to 6.00 pm – for mining coal processing activities;*
  - *7.00 am to 9.30 pm – for haulage and transportation from Invincible Colliery exit;*
  - *7.00 am to 5.30 pm Monday to Friday and 7.00 am to 5.00 pm on no more than 30 Saturdays annually – Coal haulage from Cullen Valley Mine, Hillcroft and East Tyldesley.*
  - *10.00 pm to 7.00 am – non-audible equipment maintenance activities.*
  - *9.00 am to 5.00 pm - blasting.*
- *Sunday*
  - *8.00 am to 6.00 pm – for mining and all associated activities;*
  - *6.00 pm to 7.00 am – non-audible equipment maintenance activities.*
  - *No blasting*
  - *And at no time on public holidays.*

Note: these times may be further restricted by specific recommendations, for example near the Cullen Bullen cemetery."

Coalpac accepts this recommendation with the following qualification to be consistent with existing approved practices and the Contracted Project (amended sections are highlighted in bold font):

- To the fourth sub-dot point of point 1; and second dot sub-point of Point 2; replace 'non-audible' with '**less than 35 dBA($L_{Aeq15min}$) monitored at private receivers'**; and
- To the third sub-dot point of point one to be consistent with the Contracted Project and existing approvals (amended section highlighted in bold font):
    - 7.00 am to **9.30 pm** Monday to Friday and 7.00 am to 5.00 pm on no more than 30 Saturdays annually – Coal haulage **from Cullen Valley Mine**.

4.2.5 PAC Recommendation 26

"The Commission recommends that operating hours should be limited to the following times after all noise mitigation measures have been implemented and certified by an independent acoustic expert that they meet the predicted noise outcomes. These noise mitigation measures include; the noise sound suppression on mobile plant and stationary equipment, earthen bund walls, conveyor, bridge over the Castlereagh Highway, location of infrastructure within the project footprint and the real time monitoring and management system.

- *Monday to Saturday*
    - *24-hours – for mining (other than blasting) and coal processing;*
    - *7.00 am to 9.30 pm – for haulage and transportation from Invincible Colliery exit; Coal haulage from Cullen Valley Mine, Hillcroft and East Tyldesley only in emergencies with written approval from DOPI.*
    - *10.00 pm to 7.00 am – non-audible equipment maintenance activities.*
    - *9.00 am to 5.00 pm - blasting.*
- *Sunday*
    - *24-hours – for mining (other than blasting) and coal processing;*
    - *No road haulage;*
    - *No blasting*
    - *And at no time on public holidays.*

Notes:

Temporary night time operation should be permitted only after an initial compliance certification following three months operation. This should be repeated and reconfirmed following twelve months of operation before longer term night time operation is permitted.

> *Where mining is carried out in different sectors and some sectors show compliance and others show non-compliance then the above night operating times should be permitted for those sectors only where there is full compliance with the noise criteria.*
>
> *These times may be further restricted by specific recommendations, for example the cemetery."*

Coalpac accepts this recommendation with the following qualifications:

- To the fourth sub-dot point of dot point 1; replace 'non-audible' with 'less than 35 dBA(LAeq15min) monitored at private receivers';
- In relation to the third dot point: a suggested rewording of that part of PAC Recommendation 26 is to remove the words "*Hillcroft and East Tyldesley"* and leave it as "Coal haulage exiting from Cullen Valley Mine." This has been made to clarify the point of exit of the product coal from the mine onto the public road network;
- For this same dot point: Coal haulage only in emergencies with *notification* to DOPI (DP&I): Coalpac would prefer an in-principle approval to haul coal by road in emergency situations with appropriate and timely notification to regulatory authorities. Any delay in obtaining written approval for road haulage of coal would remove Coalpac's ability to respond to emergency situations;
- Any such process for the notification (to regulators and the community) and management of the temporary reinstatement road haulage in the event of emergency would be approved in advance by DP&I; and
- Recommendation 26 appears to preclude mining and coal processing on public holidays. It is normal practice, and considered appropriate, to permit a 24/7 mining operation to continue mining and coal processing on public holidays.

4.2.6 PAC Recommendation 27

> *"The Commission recommends a NSW policy for acquisition of properties subjected to excessive noise or air emissions by new developments should be completed as soon as practical."*

Coalpac notes this is not a project specific recommendation and is in fact an impact assessment policy issue for the consideration of the NSW Government.

4.2.7 PAC Recommendation 29

> *"The Commission recommends the responses to real time monitoring that show an exceedence or potential exceedence of noise requirements should be included in an annual report made available to Council, relevant agencies and the public."*

Coalpac accepts this recommendation with the following qualifications:

Coalpac will modify operations where real time predictive monitoring forecasts exceedances (e.g. due to noise enhancing weather conditions, or other causes) and stop relevant operations where noise criteria are forecast to be exceeded after all other noise mitigation measures have been exhausted. In the unlikely event of a noise exceedance still occurring, Coalpac will immediately notify the relevant regulator and report on this and the relevant forecast details in its Annual Environmental Management Report.

4.2.8 PAC Recommendation 31

> *"The Commission recommends a comprehensive evaluation of the effectiveness of real time monitoring and proactive and reactive management systems used for air and noise management in mines in NSW."*

Coalpac notes this is not a project specific recommendation and is in fact an impact assessment policy issue for the consideration of the NSW Government.

This would appear to be a recommendation by the PAC for attention by Government in a policy context and not directed specifically at Coalpac. While an initiative such as this could be undertaken in the future with Coalpac's involvement, is not within the scope of a noise impact assessment for a single development and should not be a condition of approval for the Contracted Project.

If an evaluation of real-time monitoring, management and response systems were to be completed in the future, it would likely require both monitoring and management data to be collected over a period of time and across a number of operating open cut coal mines before any analysis could be undertaken.

Such an investigation would be a matter for the relevant government departments to scope and coordinate.

4.2.9 PAC Recommendation 36

> *"The Commission recommends no mining or coal haulage occurs within a 1.5km radius of the Cullen Bullen cemetery on any Saturday, Sunday or Public Holiday."*

Coalpac rejects this recommendation.

This recommendation is considered particularly onerous for Coalpac with the source and potential benefits of the arbitrarily defined 1.5 km suggested limit not known. The suggested setback distance for mining and coal haulage on weekends and public holidays would affect a significant proportion of the East Tyldesley mining area and the proposed main haul road from the existing Cullen Valley mine across the Castlereagh Highway overpass bridge to the East Tyldesley Coal Handing and Preparation Plant (ETCPP). The suggested 1.5 km setback would therefore affect mining operations in at least half of the Contracted Project.

However, the Contracted Project SOC 48 largely addresses the intent of PAC Recommendation 36 by committing to the following measures:

- Blasts required for any mining activities within 500 m of the Cullen Bullen General Cemetery (the closest point being a distance of 250 m from the centre of the cemetery) will be designed to manage vibration and overpressure levels;
- No blasting will occur on days when formal services are scheduled at Cullen Bullen General Cemetery; and no mining or coal haulage within a 1,500 m radius will occur within two hours of formal services at Cullen Bullen General Cemetery; and
- No mining operations will occur on weekends and Public Holidays within a radius of 350 m from the centre of the Cullen Bullen General Cemetery (see **Appendix C**).

4.3 BLASTING

4.3.1 PAC Recommendation 38

> *"The Commission recommends that there should be no impacts to the pagodas and cliff lines from blasting. The Commission does not accept that a 50m buffer will guarantee this outcome, but is unable to determine a satisfactory buffer distance from the available information. To accommodate this situation the Commission recommends that no blasting occur within 300m of the pagodas or cliff lines without an independent geotechnical surveyor certifying that the blasting proposed will not cause impact to the pagodas or cliff lines. In any event a minimum stand-off distance of 100m must be maintained for blasting from all pagodas, cliffs and other rocky outcrops."*

Coalpac rejects this recommendation.

However, Coalpac agrees that there should be negligible impacts to the SPL from blasting as described in detail in this report.

Significant discussion on the impracticality of imposing this arbitrarily defined 300 m distance is included in **Section 3.4**, **Section 3.5**, and **Section 3.6**. The treatment of SPL in the Contracted Project Boundary provides a finer control to limit impacts on these features, compared to the blunt setback instrument proposed by the PAC.

In consideration of the intent of this recommendation, the Contracted Project's SOC 43 states:

> *"Coalpac will design all blasts in accordance with the Blast Management Plan for the Contracted Project, such that there shall be negligible impact or damage to the SPL and Sandstone Outcrops. As mining advances towards these features, blast monitoring will be conducted with the aim of determining 'safe' or 'non-damaging' vibration levels at the SPL and Sandstone Outcrop beginning 200 m from their base. Prior to the eastern advance of the Invincible mining area toward the SPL, the stability of the rock mass will be assessed and a Hazard Map produced to identify unstable features."*

4.3.2 PAC Recommendation 40

> *"The Commission recommends that the Department review the mechanism used to assess complaints of blast damage to private property with a view to providing the residents with confidence that their claims are being assessed by a qualified person who is transparently independent from the Proponent."*

Coalpac notes this is not a project specific recommendation and is in fact an impact assessment policy issue for the consideration of the NSW Government.

4.4 HIGHWALL MINING

4.4.1 PAC Recommendation 46

> *"The Commission recommends that highwall mining not be permitted under the pagodas or escarpments in the project area."*

Coalpac accepts this recommendation as qualified below.

This recommendation should be amended to *"… not be permitted under the defined pagodas or escarpments within the SPL in the Project Boundary."*

The SPL has been accurately mapped. No highwall mining will be carried out under the significant rock features within the SPL (see **Section 3.5**). As such, SPL areas will be protected from the impacts of open cut and highwall mining.

The Hebblewhite (2013) review concluded that approval of highwall mining is suitable and recommended and presents no greater risk than underground mining methods (see **Section 3.6**). It recommends a monitoring program and the rigorous Subsidence Management Plan process to direct and regulate the detailed mine design required before highwall mining can be carried out in the Project Boundary.

4.5 ECOLOGY

4.5.1 PAC Recommendation 47

> *"The Commission recommends that to provide adequate protection for threatened species and other fauna that use the pagoda landform, a minimum setback distance of 300m be maintained from the open-cut highwall to the pagodas and the escarpments."*

Coalpac rejects this recommendation.

This recommendation from the PAC has been fully examined and is disputed in relation to blasting, geomorphology and ecology in **Section 3.4**, **Section 3.5**, and **Section 3.6**, respectively. Appropriate minimum buffers are proposed, combined with a suite of other mitigation measures that will protect threatened species (and ROTAP plants) associated with pagodas, cliffs and caves described in detail in **Section 3.5**.

4.5.2 PAC Recommendation 49

> *"The Commission recommends that concerns about the adequacy of the flora assessment and identification of the vegetation associations present in the Project area be resolved to the satisfaction of OEH prior to approval of any extension to open-cut mining in the Project area and prior to any assessment of adequacy or otherwise of the biodiversity offset package."*

Coalpac accepts this recommendation as qualified below.

This recommendation should be '*in consultation with OEH and to the satisfaction of DP&I*' (and not OEH) as the determining authority for the Contracted Project.

4.5.3 PAC Recommendation 51

> *"The Commission recommends that calculation of edge effects be required to the satisfaction of OEH before the project is submitted for determination."*

Coalpac accepts this recommendation as qualified below.

The Exhibited Project EA considered edge effects and they have been reconsidered in **Section 3.5**. The majority of edges to be created by mining will be upslope of mining, meaning that edge effects such as erosion will not impact retained native vegetation.

Based upon the results of current mining, edge effects are not considered likely to be extensive, and have been diminished by at least 1.5 km in the Contracted Project mine plan.

This recommendation should be '*in consultation with OEH and to the satisfaction of DP&I*' (and not OEH) as the determining authority for the Contracted Project.

4.5.4 PAC Recommendation 52

> *"The Commission recommends that the cumulative impacts on the biodiversity values of Ben Bullen State Forest and the region of this project, together with the proposed Pine Dale Stage 2 Extension, be considered before any assessment of this project is finalised."*

Coalpac notes this is not a project specific recommendation and is in fact an impact assessment policy issue for the consideration of the NSW Government.

The Pinedale Stage 2 Project received DGRs on 10 February 2012; however the limited availability of predicted ecological impacts at this time makes a definitive assessment of cumulative impacts prior to any determination of the Contracted Project unreasonable.

However, the ecological impact assessment for the EA concluded that 'extensive areas of undisturbed forest and woodland will remain within Ben Bullen State Forest and the region in which the project is to occur'.

This conclusion remains relevant for the Contracted Project. No threatened species, endangered ecological communities or habitats/species of conservation significance will be significantly impacted by the Contracted Project. The land within the Contracted Project Disturbance Boundary is proposed to be rehabilitated to forest and woodland in the longer term.

4.5.5 PAC Recommendation 53

> *"The Commission recommends that the following three principles be accepted as underpinning assessment of biodiversity impacts for this project:*
>
> - *rehabilitation cannot restore the existing vegetation associations or ecological balance of the area;*
> - *rehabilitation to mature woodland is unproven for open-cut mines in NSW; and*
>
> *the impacts on biodiversity from this project are incompatible with reservation proposals for Gardens of Stone Stage II".*

Coalpac notes this is not a project specific recommendation and is in fact an impact assessment policy issue for the consideration of the NSW Government.

It is asserted that forest and woodland can be reinstated in the Contracted Project Disturbance Boundary, based upon the current rehabilitation work done on site, and information available from other mining development sites. While rehabilitation is not likely to provide a facsimile of the original vegetation, it is asserted that rehabilitation can provide new habitats for many native plants and animals and restore an ecological balance in the area in the long term. The BOS committed to for the Contracted Project will also result in the offsetting of at least 3,000 ha of forest and woodland vegetation.

It is agreed that rehabilitation on open cut mines in NSW requires further research work and development. However, mature woodland can occur on mined land, as evidenced by a number of examples on un-remediated gold mining sites in NSW and Victoria, including examples of mining within the Blue Mountains.

In regards to the third dot point regarding the Government proposal for GOS2, Coalpac, Hansen Bailey and Cumberland Ecology have consulted with OEH on this matter on numerous occasions, and no information has been forthcoming. It is also noted that no details of a proposed GOS2 were presented by OEH to the PAC.

In meetings with the proponent during February and March 2013, both OEH and the Office of the Minister for the Environment and Heritage advised that there is no existing proposal generated by Government or under consideration by Government, to extend the Gardens of Stone National Park. OEH and the Office of the Minister for the Environment further advised that no decision regarding the specific issue of the future conservation plans for BBSF would be made until after the project application had been determined.

This position is inconsistent with the PAC Review Report which states that "the OEH proposal is for the reservation of the whole of BBSF" and further, that this proposal is "a high priority for OEH".

Coalpac submit that, on the basis of this advice, the question of the future reservation of the BBSF should be assigned no special status within the context of the planning assessment and determination process.

The only proposal for a GOS2 of which we are aware is the one proposed by the Colong Foundation (i.e. a SIG).

It is also noted that the PAC was not directed by the Minister for Planning to consider this proposal. The future reservation of the BBSF should not be a matter to be considered in the assessment of this project.

Secondly, it is noted that the SPL present within the Project Boundary (see **Section 3.5**) will not be impacted by the Contracted Project and the Contracted Project will only disturb a small proportion of the land within the Colong Foundation proposal. Moreover, it is noted that there are many old mining areas now located within National Parks and other conservation reserves in NSW and in other areas of Australia.

4.5.6 PAC Recommendation 54

> *"The Commission recommends that, given the considerable uncertainties concerning the likelihood of rehabilitation on this project area being capable of delivering a satisfactory biodiversity outcome, rehabilitation not be given credence as a mitigation strategy in the assessment."*

Coalpac notes this is not a project specific recommendation and is in fact an impact assessment policy issue for the consideration of the NSW Government.

It is maintained that rehabilitation should be a valid part of any mitigation for mining impacts of the Contracted Project. This mitigation approach is consistent with other recently approved mining developments in NSW, which have been permitted to count rehabilitation as a credible part of their mitigation strategies and have had rehabilitation areas counted as part of biodiversity offsetting, with a 50% discount applied to factor in time lag and limitations of rehabilitation.

Moreover, Cullen Valley Mine and Invincible Colliery have demonstrated a good track record for rehabilitation with some rehabilitation approaching 11 years in age. The current rehabilitation has restored pre-mining landform and has re-established a good vegetative cover of native woodland and open forest plant species.

Despite these points, the Contracted Project offset ratio of 4:1 is not based on the use of rehabilitated land from within the Contracted Project Disturbance Boundary.

4.5.7 PAC Recommendation 55

> *"The Commission recommends that, until the baseline biodiversity characteristics of the site have been resolved to the satisfaction of OEH, assessment of the adequacy or otherwise of the revised offset package should not proceed. The Commission also recommends that particular attention be given in the assessment to the essential nature of the trade-off being proposed, i.e. it is a proposal designed to exchange a number of fragmented areas that generally require extensive rehabilitation work and are currently not considered suitable for reservation, for a single area of high quality habitat that adjoins other areas of high quality habitat and is already proposed for reservation."*

Coalpac notes this is not a project specific recommendation and is in fact an impact assessment policy issue for the consideration of the NSW Government.

The baseline biodiversity characteristics of the site have been reconsidered by Cumberland Ecology for the Contracted Project in light of the remapping of vegetation by OEH. The OEH mapping was considered but was found to be flawed in a number of respects, particularly with regard to the presence of the critically endangered Box Gum Woodland. Cumberland Ecology remains of the view that Box Gum Woodland occurs in the Project Boundary and the main occurrences of it have been avoided by the Exhibited Project (as reviewed by the PAC) and Contracted Project mine plans.

The proposed Biodiversity Offset Strategy (see **Section 3.5**) is robust and will adequately compensate for the unavoidable residual impacts of the Contracted Project. The commitment by Coalpac to an overall ratio of 4:1 is comparable with other recently approved mining projects in NSW.

4.6 WATER

4.6.1 PAC Recommendation 60

"The Commission recommends two years of baseline monthly monitoring should be conducted in Cullen and Dulhuntys Creeks for the following parameters.

- *Physical/chemical - pH, temperature, electrical conductivity, turbidity, dissolved oxygen, total*
- *Suspended solids, oil and grease, major cations and anions, and*
- *Dissolved metals - iron, manganese, nickel, cobalt and zinc."*

Coalpac accepts this recommendation as qualified below.

Coalpac has been conducting monthly monitoring of Cullen Creek and Dulhunty's Creek since October 2011 (i.e. slightly less than 2 years at present). This monitoring program includes the parameters described above and will continue to be undertaken for the Contracted Project as previously committed to in the EA.

This data should be cautiously referred to as baseline as the village of Cullen Bullen, Baal Bone Colliery, Cullen Valley Mine and Invincible Mine currently are located within this catchment area.

4.6.2 PAC Recommendation 62

"The Commission recommends the Proponent should collaborate with other surrounding operations to develop and implement a coordinated monitoring program and report exceedences of trigger levels."

Coalpac accepts this recommendation as qualified below.

Coalpac generally accepts this recommendation. Coalpac has already sought and will continue to seek to share monitoring data with other surrounding operating operations to implement a coordinated monitoring program. It is noted that while Coalpac can commit to good faith participation in any such program, it is not in a position to compel other operators to participate in such a scheme.

Further, the reporting of any exceedances of impact trigger levels by Coalpac should only relate to those impacts resulting from the Contracted Project.

4.6.3 PAC Recommendation 63

"The Commission recommends the predicted changes in weather due to climate change in NSW should be included in the water balance modeling for the life of the project unless it can be demonstrated the modelling to date has been conservative enough to account for this."

Coalpac accepts this recommendation as qualified below.

Should the Contracted Project be approved, operations would continue for 21 years. Any potential impacts from climate change within this timeframe due to global warming are unlikely to affect the water balance undertaken for the Contracted Project.

Further, it is considered that the water balance modelling undertaken for the Contracted Project is based on conservatively high runoff coefficients for all catchments within the mine site. For example, the adopted runoff coefficients for moderately disturbed (rehabilitation areas) and significantly disturbed (active mining / overburden emplacement) catchments are 90% and 212% greater, respectively, than the adopted runoff coefficient for natural catchments. The runoff coefficients adopted in WRM (2012) will result in runoff volumes predicted by the water balance model being substantially over-predicted, giving a conservative estimate of the behaviour of the proposed water management system.

The *NSW Climate Impact Profile*, prepared by the Department of Environment, Climate Change and Water NSW (DECCW, 2010), makes the following statement regarding the impact of climate change on average annual runoff in the Western Region of NSW (in which the Contracted Project is located:

> *"A minor increase in average annual run-off is about as likely as not and run-off is likely to be redistributed across the seasons, with increases in summer and autumn and decreases in spring and winter."*

The above statement indicates that any increase in annual runoff due to climate change is likely to be small, and rather than significant increases in runoff all year round, there is likely to be a redistribution of runoff, with less runoff occurring in Spring and Winter, and more occurring in Autumn and Summer.

Such a redistribution of runoff is unlikely to impact greatly on the proposed water management system, particularly considering the proposed new mine water dams at the Contracted Project site have been sized to prevent spills occurring, based on the conservatively high runoff coefficients used in the water balance model, and a minor increase in average annual runoff is unlikely to affect the behaviour of these dams. Further the (DECCW, 2010) study states that:

> "The modelled run-off totals show significant variation, and there are no clear patterns about whether short, medium or long duration droughts are going to be more or less severe. The estimates range from 15% drier to 15% wetter. The averaged results indicate there will about as likely as not be no significant change compared to current drought severity."

The water balance modelling indicated that the Contracted Project site would need to extract water from the flooded underground workings beneath the mine to satisfy water demands over the life of the Contracted Project. A minor increase in average annual runoff would only serve to reduce the reliance on the flooded underground workings for makeup water, and the above DECCW (2010) study indicates that periods of drought are unlikely to significantly change from existing conditions.

The DECCW (2010) study provides expected percentage changes to seasonal runoff for a 2030 scenario in the NSW Western Region, although the +/- variation in the predicted runoff for each season is substantial.

It is considered that the results of the existing, highly conservative water balance modelling of WRM (2012) are appropriate. The adopted runoff coefficients in the water balance model should be verified based on recorded data collected over the first few years of Contracted Project life, and the predicted DECCW (2010) 2030 climate change seasonal runoff variations are then applied to the verified runoff coefficients to allow assessment of the impact of the climate change on the water management system. This work could be completed prior to Year 5 of the Contracted Project, to allow for any required modifications to the water management system that may be identified.

4.6.4 PAC Recommendation 64

> *"The Commission recommends that the acid generating material located at the existing Invincible Colliery Tailings Drying Area should be remediated, in consultation with DRE within three years and in accordance with the approved Rehabilitation Management Plan."*

Coalpac accepts this recommendation as qualified below.

The Contracted Project SOC 80, states that Coalpac will remediate the potentially acid generating coarse reject material located at the existing Invincible Colliery Tailings Drying Area in consultation with DTIRIS-DRE and in accordance with the approved Rehabilitation Management Plan.

4.6.5 PAC Recommendation 65

> *"The Commission recommends that all washery rejects are treated as potential acid forming material and managed separately from general overburden emplacement in accordance with the Rehabilitation Management Plan."*

Coalpac accepts this recommendation as qualified below.

Coalpac will prepare a consolidated site Rehabilitation and Landscape Management Plan in consultation with DRE for the Contracted Project.

Potentially acid generating materials assessed in the geochemical assessment in the EA included the Marrangaroo Sandstone and the Lithgow seam. As described in **Section 2.2.2**, the quarrying of Marrangaroo Sandstone is no longer proposed as part of the Contracted Project.

As described in the EA, the only future potential acid-generating material is the Lithgow seam. The Lithgow seam will be clearly stockpiled separately prior to processing at the CHPP. Similarly, the Lithgow seam rejects produced after processing will be stockpiled separately. These materials will be disposed of as described in Section 4 of the EA (i.e. deep in pit and covered with 5 m of inert material. Where seams are blended with the Lithgow seam, these in total will be managed as being derived from the Lithgow seam.

The Contracted Project SOC 81, states that Coalpac will continue to separate potentially acid forming washery reject material and manage this separately from general overburden emplacement in accordance with the Rehabilitation and Landscape Management Plan.

4.7 UNDERGROUND COMBUSTION

4.7.1 PAC Recommendation 66

"The Commission recommends that the Proponent's Plan of Management dated 27 September 2012 forms part of any approval, subject to:

- *inclusion of monitoring and auditing requirements;*
- *targets such as those set out by Professor Cliff in his report dated 6 December 2012;*
- *odour management controls;*
- *bushfire management controls; and*
- *DRE's approval."*

Coalpac adopts this recommendation as qualified below.

Coalpac is accepting of the general content of this recommendation; however it should refer to the latest Mining Operations Plan (MOP) for Cullen Valley Mine which includes a Plan of Works to address the subsurface heating issue as agreed with DTIRIS-DRE and as listed in the Contracted Project SOC 12. The Cullen Valley Mine MOP has been revised in consultation with DTIRIS-DRE since publication of the PAC recommendations.

4.7.2 PAC Recommendation 67

"The Commission recommends endorsement of DRE's requirement for extinguishment of all subsurface combustion in overburden emplacement areas and underground mine workings to occur before mining is conducted within 1 km of these areas."

Coalpac adopts this recommendation with qualification, noting that the MOP for Cullen Valley Mine has recently been modified in consultation with DITIRIS-DRE to include an appended Plan of Works to address the subsurface heating issue (Olsen 2013).

4.8 TRAFFIC & TRANSPORT

4.8.1 PAC Recommendation 68

> *"The Commission recommends that the concerns about the proposed 13% increase in heavy vehicle movements on the Great Western Highway raised by Blue Mountains City Council and Lithgow City Council be referred to the RMS for advice as part of any further assessment of the project."*

This recommendation is no longer relevant to the Contracted Project.

As noted in **Section 2.2.2**, the removal of the proposed sand extraction component from the Contracted Project will result in the associated 128 additional truck movements per day on the Great Western Highway no longer being required. As such, PAC recommendation 68 is considered to be no longer applicable.

4.8.2 PAC Recommendation 71

> *"The Commission recommends that the Proponent satisfies the Department that Transport of sand cannot be undertaken by rail in whole or in part."*

This recommendation is no longer relevant to the Contracted Project.

As noted in **Section 2.2.2**, sand extraction has been removed from the Contracted Project description and approval for this component is no longer sought.

5 JUSTIFICATION

5.1 OVERVIEW

In response to concerns raised by the PAC and other stakeholders, Coalpac has developed a Contracted Project, which addresses the concerns of stakeholders while maximising the value of the coal resource for the NSW community.

In the Contracted Project, Coalpac has:

- Reduced the scale and intensity of the Contracted Project by removing mining in the Hillcroft area, and removing the sand mining proposal in addition to a number of other contractions and improvements to avoid areas of more sensitive biodiversity (see **Appendix E**);
- Adopted new or varied Commitments for the operation of the Contracted Project to ensure the use of best practice measures to minimise impacts from the development on the local community (see **Appendix B** and **Appendix C**); and
- Enhanced the biodiversity offset package to make an allowance for the purchase of additional lands with biodiversity values consistent to that being disturbed and the dedication of this land in perpetuity for biodiversity protection (see **Appendix E**).

As reported by the relevant expert consultants in their respective reports with this response, the contraction, validation and improvement of the Contracted Project results in:

- Improved air quality impacts generally surrounding the entire Project Boundary including in Cullen Bullen (see **Appendix B**);
- Reduced noise emissions generally to the north-west and around Cullen Bullen (see **Appendix C**);
- Avoidance and further protection of Significant Pagoda Landforms, particularly the rock formations, and the immediately adjacent habitat; and
- Protection of an additional 3.2 hectares of critically endangered Clandulla Geebung species and 74 ha of the vulnerable Capertee Stringybark (see **Appendix E**).

The combined environmental savings result in the further reduction of the open cut mining area by 196 ha to a total of 762 ha within the Contracted Project Disturbance Boundary, representing a 20% reduction. This reduction results in the sterilisation of 11.6 Mt of ROM coal previously proposed for recovery in the Exhibited Project. This tonnage reduction applies to both open cut and highwall mining methods, and also reduces the economic benefits that would have resulted from the conduct of the Exhibited Project as considered by the PAC.

Overall, the Benefit Cost Analysis found that the economic impacts from the Contracted Project are reduced as compared to the Exhibited Project, but are still of Regional, State and National significance producing a benefit of $1,330M.

The annual regional economic impact associated with the Contracted Project is estimated at up to:

- $219M in annual direct and indirect regional output or business turnover;
- $105M in annual direct and indirect regional value added;
- $30M in annual direct and indirect household income; and
- 293 direct and indirect jobs.

The annual NSW economic impact associated with the Contracted Project (refer to Table 3) is estimated at up to:

- $275M in annual direct and indirect regional output or business turnover;
- $133M in annual direct and indirect regional value added;
- $48M in annual direct and indirect household income; and
- 519 direct and indirect jobs.

When measured in accordance with the NSW Government economic assessment guidelines the net benefits to Australia in the order of $1,330M for the Contracted Project, exceed any residual environmental and social costs. On this basis the Contracted Project is considered to be desirable and justified from an economic efficiency perspective.

5.2 ENVIRONMENTAL PLANNING CONCLUSION

The Contracted Project mine plan is an appropriate compromise to the 'Optimal Mine Recovery Plan' and justifiably sacrifices a material proportion of the remaining otherwise recoverable coal to meet environmental and social requirements. The Contracted Project provides economic benefits for the community of Australia and of NSW. These benefits include:

- Maintaining and expanding employment in the Lithgow region, including a workforce of 120 personnel and 293 direct and indirect jobs (largely within the Lithgow LGA); and
- Benefits of $1,330M which far outweighs the social and environmental costs.

The continuation of mining at the Coalpac Mines enables the continued supply of an appropriate quality and priced thermal coal to the MPPS, at a time when there is uncertainty as to the continuity and cost effective availability of such coal from other suppliers. Ensuring stability of coal supply to MPPS is important to ensure secure and cost competitive supply of power to the NSW electricity grid. Additionally, it is important for ensuring continuity of supply to other domestic customers. It also provides access to export markets the sales from which further increase the benefit of extracting the coal resource for the community.

Environmental costs from past mining and from the Contracted Project are identified with certainty and are shown to be capable of being acceptably managed by:

- Avoidance of specific areas through mining exclusion areas;
- Operational controls;
- Offset land acquisition; and
- Management plans to be established, and approved by the DP&I and other Government agencies.

Ecological costs are minimised and are offset by a comprehensive BOS.

It is noted that there is no current policy in place to reserve the land to be disturbed by the Contracted Project in the NSW conservation estate.

The Contracted Project is demonstrated to be justified and should be approved, when considered in accordance with the principles of Ecologically Sustainable Development and the requirements to be applied for the environmental planning assessment of such developments under the EP&A Act, on the basis that the economic benefit of $1,330M significantly outweighs the residual environmental and social costs of the Contracted Project.

* * *

For

Hansen Bailey

James Bailey

Director

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