Land and Environment Court
New South Wales

Medium Neutral Citation	Bulga Milbrodale Progress Association Inc v Minister for Planning and Infrastructure and Warkworth Mining Limited [2013] NSWLEC 48
Hearing Dates	20-24 August 2012, 10-12 September 2012, 14 September 2012, 17 October 2012, 6-8 November 2012 and 15 November 2012
Decision Date	15/04/2013
Jurisdiction	Class 1
Before	Preston CJ
Decision	1. The appeal is upheld. 2. Project application no 09_0202 for the carrying out of the Warkworth Extension Project is disapproved. 3. The exhibits, other than Exhibit W33, are returned.
Catchwords	APPEAL - objector appeal against Minister's decision to approve extension of open cut coal mine - impacts on endangered ecological communities - significant impacts not avoided or mitigated materially - reliance on offsets to compensate for impacts - offsets package inadequate - significant noise impacts on nearby residents - noise criteria for project inappropriate - noise control measures inadequate - social impacts - on balance negative social impacts on local community - economic analyses of project - input-output analysis and benefit cost analysis - economic analyses inadequate - balancing of environmental, social and economic factors - project disapproved
Legislation Cited	Environmental Planning and Assessment Act 1979 Pts 3A, 4, ss 5, 75E, 75F, 75H, 75J, 75L, 75R Environmental Planning and Assessment Amendment (Part 3A Repeal) Act 2011, Sch 1, 1.7 [2] Environment Protection and Biodiversity Conservation Act 1999 (Cth) Land and Environment Court Act 1979 ss 37(1), 39 National Parks and Wildlife Act 1974 ss 56, 69B, 69F Protection of the Environment Administration Act 1991 s 6(2)(d) Threatened Species Conservation Act 1995
Cases Cited	Associated Provincial Picture Houses, Limited v Wednesbury Corporation [1948] 1 KB 223 Australians for Sustainable Development Inc v Minister for Planning [2011] NSWLEC 33; (2011) 182 LGERA 370 Barrington-Gloucester-Stroud Preservation Alliance Inc v Minister for Planning and Infrastructure [2012] NSWLEC 197 Botany Bay City Council v Saab Corp Pty Ltd [2011] NSWCA 308 Drake v Minister for Immigration and Ethnic Affairs (No 1) (1979) 46 FLR 409; 24 ALR 577 Drake-Brockman v Minister for Planning [2007] NSWLEC 490; (2007) 158 LGERA 349 Foley v Waverley Municipal Council (1963) 8 LGRA 26 Foster v Minister for Customs (2000) 200 CLR 442 Hunter Environmental Lobby Inc v Minister for Planning [2011] NSWLEC 221

	Ironstone Community Action Group Inc v NSW Minister for Planning and Duralie Coal Pty Ltd [2011] NSWLEC 195 Kennedy v NSW Minister for Planning [2010] NSWLEC 240 Kulin Holdings Pty Ltd v Penrith City Council (1999) 103 LGERA 402 Minister for Aboriginal Affairs v Peko-Wallsend Ltd [1986] HCA 40; (1986) 162 CLR 24 Minister for Planning v Walker [2008] NSWCA 224; 161 LGERA 423 New Century Developments Pty Ltd v Baulkham Hills Shire Council (2003) 127 LGERA 316 Newbury District Council v Secretary of State for the Environment [1981] AC 578 Rivers SOS Inc v Minister for Planning [2009] NSWLEC 213; (2009) 178 LGERA 347 Telstra Corporation Ltd v Hornsby Shire Council [2006] NSWLEC 133; (2006) 146 LGERA 10 Ulan Coal Mines Ltd v Minister for Planning [2008] NSWLEC 185; (2008) 160 LGERA 20 Western Australian Planning Commission v Temwood Holdings Pty Ltd [2004] HCA 63; (2004) 221 CLR 30
Category	Principal judgment
Parties	Bulga Milbrodale Progress Association Inc (Applicant) NSW Minister for Planning and Infrastructure (First Respondent) Warkworth Mining Limited (Second Respondent)
Representation	Environmental Defender's Office (Applicant) Legal Services Branch, NSW Department of Planning & Infrastructure (First Respondent) Minter Ellison Lawyers (Second Respondent) Mr R D White (Barrister) (Applicant) Ms A M Mitchelmore (Barrister) (First Respondent) Mr N J Williams SC with Mr R C Scruby (Second Respondent)
File Number(s)	10224 of 2012

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JUDGMENT

PART 1: INTRODUCTION

A coal mine seeks to extend its operations

1 Warkworth Mining Limited ('Warkworth') operates Warkworth mine, an existing open cut coal mine located a few kilometres north east of the village of Bulga in the Hunter Valley. Warkworth is one of several coal mines in the area, others being Mount Thorley, Bulga, Wambo and Hunter Valley Operations South.

2 Mining at Warkworth began in 1981. Current mining operations are under a development consent DA 300-9-2002-I issued by the Minister for Planning in May 2003 under Part 4 of the *Environmental Planning and Assessment Act 1979* ('EPA Act'). The development consent,

which has been modified five times, permits coal mining in a specified area until 2021. The consent is subject to numerous conditions, including conditions requiring conservation of areas of native vegetation and landforms to the north, west and south west of the Warkworth mine designated as non-disturbance areas and habitat management areas.

3 Since 2003, coal prices have increased, making it economic to mine areas that were previously considered uneconomic, including parts of the areas designated as non-disturbance areas and habitat management areas under the 2003 development consent.

4 Accordingly, in 2010, Warkworth lodged a major project application (no 09_0202) for project approval under the then in force Part 3A of the EPA Act to extend the Warkworth mine ('the Project') spatially to the west and south west and temporally until 2031 to mine the underlying coal reserve. The extension of the mine would necessitate, among other physical actions:

¿ the closure and excavation of Wallaby Scrub Road, a popular local road and the northern extension of the historic Great North Road;

¿ clearing (under the 2003 development consent and for the Project) of around 766 ha of four types of endangered ecological communities ('EECs') listed under the *Threatened Species Conservation Act 1995* ('TSC Act'), being about 107 ha of Warkworth Sands Woodland and Hunter Lowland Redgum Forest; 628 ha of Central Hunter Grey Box-Ironbark Woodland and 31 ha of Central Hunter Ironbark-Spotted Gum-Grey Box Forest;

¿ removal of a significant local landform, Saddleback Ridge, separating the Warkworth mine from the village of Bulga; and

¿ emplacement of overburden from the Warkworth mine at the Mount Thawley mine immediately adjoining to the south.

Project approval is granted by the Minister

5 On 3 February 2012, the Minister for Planning and Infrastructure, by his delegate the Planning Assessment Commission of NSW ('the PAC'), conditionally approved Warkworth's project application for the Project under the former s 75J of the EPA Act. The conditions included a requirement for Warkworth to provide biodiversity offsets to compensate for the impacts of the Project on biological diversity, including on endangered ecological communities.

Local residents appeal the Minister's decision to the Court

6 Many local residents of the village of Bulga and surrounding countryside oppose the Project. Through the Bulga Milbrodale Progress Association Inc ('the Association') the residents made submissions objecting to the Project. As the Association was entitled to do under s 75L(3) of the EPA Act, the Association appealed to this Court against the Minister's decision to approve the Project.

The Court's task on the appeal

7 On the appeal, the Court re-exercises the statutory power originally exercised by the Minister to determine Warkworth's project application by either approval or disapproval. The Court stands, metaphorically speaking, in the shoes of the Minister and determines for itself, on the facts and law that exist at the time of determination of the appeal, whether to approve or disapprove the application for the Project.

8 In hearing and disposing of the appeal, the Court has all of the functions and discretions that the Minister had in respect of Warkworth's project application: s 39(2) of the *Land and Environment Court Act 1979* ('the Court Act').

9 The appeal is by way of rehearing and fresh evidence or evidence in addition to, or in substitution for, the evidence given on the making of the decision by the Minister may be given on the appeal: s 39(3) of the Court Act. The Court is required to determine the appeal on the issues raised and the evidence given on the appeal.

10 In making its decision, the Court is to have regard to the Court Act and any other Act including the EPA Act, any instrument made under any such Act, the circumstances of the case and the public interest (s 39(4) of the Court Act).

11 Because new issues may be raised and different emphasis may be placed on other issues, and new or difference evidence may be given, compared to the issues or evidence before the Minister as the original decision-maker, the preferable decision to be reached by the Court on the appeal may be different to the decision of the original decision-maker. This is the nature and consequence of external merits review of administrative decisions.

The parties' respective positions on the appeal

12 The Association submitted that the Court should refuse Warkworth's project application for the Project by reason of the Project's significant and unacceptable impacts in terms of: impacts on biological diversity, including on the endangered ecological communities, that are not avoided, mitigated, offset or otherwise compensated; noise impacts and dust emissions on the residents of Bulga and the surrounding countryside; social impacts on the community of Bulga; economic issues including that the full environmental costs are not internalised by the Project; and the public interest.

13 The Minister and Warkworth both submitted that Warkworth's project application should be approved, although on different conditions to those originally imposed by the Minister to better address the impacts of the Project that have been raised in the evidence on the appeal. They submitted that the Project as modified, if approved on the conditions proposed, would have acceptable impacts in terms of biological diversity, noise, dust, social and economic factors, and that balancing the economic, social and environmental factors, the Project is acceptable.

Outcome of appeal: project is refused

14 I have determined that Warkworth's project application for the Project should be refused, having regard to the significant, adverse, biological diversity, noise and dust, and social impacts of the Project.

15 In relation to biological diversity, I find that the Project would be likely to have significant adverse impacts on biological diversity, including on the four endangered ecological communities, but in particular on Warkworth Sands Woodland, which impacts would not be mitigated by the Project or by the proposed conditions of approval. I am not persuaded, on the evidence before the Court, that the biodiversity offsets and other compensatory measures proposed by Warkworth are appropriate or feasible or would be likely to compensate for the significant biological

diversity impacts. I find, therefore, that the Project will have significant and unacceptable impacts on biological diversity that are not able to be avoided, mitigated or compensated.

16 In relation to noise, I find, on the evidence before the Court, that the noise criteria proposed in the conditions of the Project Approval are not appropriate; the noise impacts of the Project on the residents of Bulga will be intrusive and adversely affect the reasonable use, enjoyment and amenity of the residents of the village of Bulga and the surrounding countryside; the noise mitigation strategies are unlikely to reduce noise impacts to levels that would be acceptable; and that undertaking greater noise mitigation strategies may result in greater social impacts. The approach of combining noise criteria and noise mitigation strategies for the Warkworth mine (as extended by the Project) and the Mount Thorley mine is of doubtful legal validity and would make monitoring and enforcing compliance difficult.

17 In relation to dust, whilst the levels of the air quality criteria, and the mitigation strategies, proposed in the conditions of the Project Approval, might satisfactorily address dust emissions, the approach of combining the Warkworth mine (as extended by the Project) and the Mount Thorley mine in setting the air quality criteria and the mitigation strategies would make operating the mines, managing air quality, monitoring performance, and enforcing compliance difficult. No confident conclusion can be drawn that air quality impacts particularly dust emissions from the Project will comply with the proposed conditions of the Project Approval.

18 In relation to social impacts, I find that the Project's impacts in terms of noise, dust and visual impacts and the adverse change in the composition of the community by reason of the acquisition of noise and air quality affected properties, are likely to cause adverse social impacts on individuals and the community of Bulga. The Project's impacts would exacerbate the loss of sense of place, and materially and adversely change the sense of community, of the residents of Bulga and the surrounding countryside.

19 I am not satisfied that the economic analyses relied on by Warkworth and the Minister have addressed these environmental and social factors adequately. I am also not persuaded that these economic analyses are a substitute for the consideration, assigning of weight and balancing of the relevant matters required to be undertaken by the Court in the exercise of the statutory power to determine the project application.

20 Balancing these significant adverse environmental and social impacts against the material economic and social benefits of the Project, I consider the Project has not been established to be justified on environmental, social and economic grounds. Warkworth's project application therefore should be refused. As a consequence, the Minister's decision to approve the Project is now replaced by the Court's decision to disapprove the carrying out of the Project. The Warkworth mine now will need to be confined to and operate in accordance with the 2003 development consent alone.

21 In hearing the appeal, I have been assisted by Commissioner Pearson under s 37(1) of the Court Act.

The structure of the balance of the judgment

22 The balance of the judgment will now elaborate on my reasons for determining that the

preferable decision is to disapprove Warkworth's project application. These reasons will explain why I have come to a different decision to that of the Minister and why I have not been persuaded by Warkworth and the Minister on the appeal that approval should be granted. It is not necessary, in these circumstances, to deal with such of the issues joined between the parties or between the parties' experts that have not influenced me to reach my decision to disapprove the application and I will not do so.

23 I will elaborate on my reasons in the following order:

- the merits review task on appeal;
- impacts on biological diversity;
- noise and dust impacts;
- social impacts;
- economic issues; and
- the balancing of the factors.

PART 2: THE MERITS REVIEW TASK ON APPEAL

The nature of the appeal against the Minister's decision

24 The Association appealed to the Court, under s 75L(3) of the EPA Act, against the determination of the Minister (by his delegate the PAC) under s 75J of the EPA Act to grant approval to the Project. The Association had a right to appeal because, but for Part 3A, the Project would be designated development to which the provisions of Part 4 of the EPA Act would apply (s 75L(1)(d)), and the Association was an objector who had made a submission under s 75H of the EPA Act by way of objection to Warkworth's project application for approval under Part 3A to carry out the Project (s 75L(2) of the EPA Act).

25 In determining the appeal under s 75L(3) of the EPA Act, the Court has, pursuant to s 39(2) of the Court Act, "all the functions and discretions" the Minister had in determining the project application under s 75J of the EPA Act. The appeal is by way of rehearing (s 39(3)) of the Court Act). In making its decision in respect of the appeal, the Court "shall have regard to this [the Court Act] or any other relevant Act, any instrument made under any such Act, the circumstances of the case and the public interest" (s 39(4) of the Court Act).

26 The decision of the Court is deemed to be the final decision of the Minister, "and shall be given effect to accordingly" (s 39(5) of the Court Act).

27 The conferral of power on the Court in these terms indicates that the task to be undertaken is analogous to that of the various courts and tribunals, both Commonwealth and State, in reviewing decisions of government agencies, termed merits review. Merits review has been described, in the context of appeals against administrative decisions to the Administrative Appeals Tribunal, as being to determine what is "the correct or preferable decision" on the

material before the reviewer: *Drake v Minister for Immigration and Ethnic Affairs (No 1)* (1979) 46 FLR 409; 24 ALR 577 at 589. Where the statute reposing the power, the exercise of which is under review, imposes limits on the exercise of the power, such that the power is only enlivened if certain circumstances exist or may only be exercised in a particular way if certain circumstances exist, the reviewing court must determine whether the limits on the power are satisfied. There may be only one decision reasonably available on the evidence and that decision will therefore be the correct decision. Where there is a range of decisions reasonably open and all of those would be correct, the Court chooses, on the evidence before it, what it considers to be the preferable decision. In the present case, there is a range of decisions reasonably open as to whether to approve or disapprove, and if to approve, with what modifications and on what conditions to approve, Warkworth's project application to carry out the Project.

28 The task of the Court in reviewing the decision of the Minister (by his delegate the PAC) is not to consider whether that decision was correct or preferable on the material available to the PAC, but rather to determine, based on the evidence now before the Court, what is the preferable decision.

29 Merits review of administrative decisions is not only directed to ensuring fair treatment of all persons affected by an administrative decision, it also has broader, long term objectives of improving the quality and consistency of administrative decisions, and ensuring openness and accountability (Administrative Review Council, *What decisions should be subject to merits review?* AGPS, 1999, 1.5). The benefits of merits review led the Administrative Review Council ('ARC') to recommend that, if an administrative decision is likely to have an effect on the interests of any person, in the absence of good reason, that decision should ordinarily be open to be reviewed on the merits (2.4). The ARC identified two types of decisions that by their nature are unsuitable for merits review: legislation-like decisions of broad application (which are subject to the accountability safeguards that apply to a legislative decision) or decisions that follow automatically from the happening of a set of circumstances (which leaves no room for merits review to operate) (3.1). Factors that may exclude merits review lie, first, in the nature of the decision, such as decisions of a preliminary or a procedural nature, or policy decisions of high political content; secondly, in the effect of the decision, such as decisions where there is no appropriate remedy; and thirdly, in the costs of review of the decision, such as where the decision has such limited impact that the costs of review cannot be justified (4.1, 4.2, 4.39 and 4.52).

30 The Minister's decision to approve the Project was made under the former Part 3A of the EPA Act. Part 3A was enacted to provide for particular kinds of development that, because of their nature and scale, had potential to generate high levels of adverse impact and, because of their state or regional planning significance, required a level of planning consideration beyond local consideration. However, the task conferred on the Minister under Part 3A of considering and determining to approve or disapprove the carrying out of a project is an administrative task, and none of the factors identified by the ARC as potentially making an administrative decision unsuitable for merits review are present. The availability of merits review of that decision under s 75L of the EPA Act is significant both in terms of providing an avenue for an objector representing a community affected by the decision to have the issues reconsidered and in terms

of overall accountability of the decision-making process.

The decision-making process to determine a project application

31 The exercise of the power under s 75J to approve or disapprove the carrying out of the Project requires consideration, weighting and balancing of the environmental, social and economic impacts of the Project. The range of interests affected, the complexity of the issues and the interdependence of the issues, means that decision-making involves a polycentric problem. A polycentric problem involves a complex network of relationships, with interacting points of influence. Each decision made communicates itself to other centres of decision, changing the conditions, so that a new basis must be found for the next decision: J Jowell, "The Legal Control of Administrative Discretion" [1973] *Public Law* 178, 213. Fuller uses the concept of a spider web to assist in visualising the kind of situation presented by a polycentric problem (L L Fuller, "The Forms and Limits of Adjudication" (1978) 92 *Harvard Law Review* 353, 395). A pull of one strand of the web will distribute tensions, after a complicated pattern of adjustment, throughout the web as a whole. Doubling the original pull will not simply double each of the resulting tensions but will rather create a different, complicated pattern of tensions. This would occur if the doubled pull caused one of the weaker strands to snap. This is a polycentric problem because it is many centred, each crossing of strands is a distinct centre for distributing tensions (Fuller at 395).

32 Fuller contends that polycentric problems are unsuited to solutions through adjudication. This is because the resolution of a polycentric problem involves "spontaneous and informal collaboration, shifting its forms with the task at hand" (at 371 and Jowell at 213-215). Polycentric problems cannot be resolved by identifying each issue at the start then sequentially resolving each of the originally identified issues. In a polycentric problem, the resolution of one issue will have repercussions on the other issues; the other issues may change in nature and scope depending on how the first issue is resolved.

33 A decision to approve the carrying out of a project is a polycentric problem. A decision about one issue raised by the carrying out of the project is linked by interacting points of influence to decisions about other issues, necessitating readjustment of the project (Jowell at 214).

34 This spontaneous transformation of the nature and scope of the issues in resolving polycentric problems makes classic forms of adjudication out of place and instead resolution by exercise of managerial authority, a form of executive action, more appropriate (Fuller at 371, and Jowell at 214, 218).

35 Eisenberg, in a response to Fuller, suggested two ways in which a polycentric problem might be able to be resolved through adjudication: first, if a single criterion could be made dispositive, it would be possible to determine the rights of the parties by the application of the criterion and hence by adjudication. Secondly, if all criteria could be objectively weighted and choices were not interdependent, adjudication may also be appropriate in those circumstances (M A Eisenberg, "Participation, responsiveness, and the consultative process: an essay for Lon Fuller" (1978) 92 *Harvard Law Review* 410, 425). However, Eisenberg notes that often criteria cannot be reduced to one authoritative standard or objectively weighted except by seriously impoverishing the situation. The decision the Minister must make under s 75J of the EPA Act to

approve or disprove of the carrying out of a project is a good example. The criteria to be considered are numerous, cannot be objectively weighted, and are interdependent. The decision-maker must not only determine what are the relevant matters to be considered in deciding whether or not to approve the carrying out of the project, but also subjectively determine the weight to be given to each matter. Eisenberg suggests that where this is the case, an optimal solution can normally be arrived at by vesting a single decision-maker with managerial authority; that is, authority not only to select and apply relevant criteria but also to determine how much weight each criterion is to receive, and to change those weights as new objectives and criteria may require (Eisenberg at 425).

36 The process of decision-making under s 75J of the EPA Act therefore involves: first, identification of the relevant matters needing to be considered; secondly, fact finding for each relevant matter; thirdly, determining how much weight each relevant matter is to receive, and fourthly, balancing the weighted matters to arrive at a managerial decision.

37 The first step requires analysis of the statutes which contain the power of the original decision-maker (the Minister) to make the administrative decision to disapprove or to approve, with or without conditions, the project application, and the power of the reviewer (the Court) to review on the merits that decision so as to determine the nature, scope and parameters of the powers and the matters which the decision-maker must consider (is bound to consider) and those which the decision-maker may consider (is not bound to ignore). In an application for approval to carry out a project under Part 3A, the relevant matters will include the various impacts on the environment the project is likely to have.

38 Having identified the relevant matters which must or may be considered, the decision-maker needs, as a second step, to undertake fact finding and inference drawing so as to enable consideration of these matters. On a merits review appeal, facts are found and inferences are drawn based on the evidence before the reviewer, in this case the Court. Amongst the relevant matters to be considered in determining an application for approval to carry out a project are the likely impacts of the project on the environment. The process of fact finding and inference drawing to enable consideration of these impacts includes ascertaining the nature and extent of each type of impact and the nature and efficacy of measures proposed in the application for approval, or that could be imposed as conditions of approval, to prevent, mitigate or compensate for each type of impact.

39 The third step requires the original decision-maker and the reviewer exercising the functions of the decision-maker to determine how much weight each relevant matter should receive. Occasionally, although rarely, the statutes regulating the making or reviewing of the administrative decision may dictate or indicate the weight or relative weight that should be assigned to the relevant matter. More commonly, however, the weight to be assigned is in the discretion of the decision-maker. The assigning of weight is a subjective task. The decision-maker needs to evaluate the relative importance of the relevant matters, each compared to the others. The decision-maker cannot delegate that task to others or subordinate it to the marketplace.

40 In the absence of any statutory indication of the weight to be given to the various considerations, it is generally for the decision-maker to determine the appropriate weight to be given to the

matters to be taken into account: *Minister for Aboriginal Affairs v Peko-Wallsend Ltd* [1986] HCA 40; (1986) 162 CLR 24 at 41. There are, however, limits to this proposition and a decision-maker who fails to give adequate weight to a relevant factor of great importance, or gives excessive weight to a relevant factor of no great importance may have made a decision that is manifestly unreasonable: *Associated Provincial Picture Houses, Limited v Wednesbury Corporation* [1948] 1 KB 223. The exercise of managerial authority in the sense elaborated on by Fuller and Eisenberg is, subject to the ultimate limits of *Wednesbury* unreasonableness, consistent with the approach required by *Peko-Wallsend*.

41 The fourth step requires the weighted matters to be balanced, each against the others. Because all of the matters may not be, or be capable of being, reduced to a common unit of measurement, such as money, balancing of the weighted matters is a qualitative and not quantitative exercise. The ultimate decision involves an intuitive synthesis of the various matters. Forms of economic analysis, such as cost benefit analysis, which endeavour to balance different factors by use of a common, quantitative unit, such as money, assist but are not a substitute for the intuitive synthesis required of the decision-maker. I will explain the reason for this statement when I deal with the issue of the economic analysis later in this judgment. For now, it is sufficient to say that economic analyses are not a substitute because, first, the decision-maker's statutory duty is to apply weight to and balance the relevant matters, and this cannot be subordinated to the process and outcome of economic analyses (such as by cost benefit analysis); secondly, not all relevant matters required to be considered have a market value and are therefore not able to be objectively weighted by the marketplace by assigning a monetary value; and thirdly, the assigning of non-market values to relevant matters that have no market value imperfectly captures and undervalues these matters.

42 The result of the balancing exercise, the intuitive synthesis, is a determination of whether the project ought to be approved or disapproved and, if approved, what modifications or conditions should be imposed.

43 I will now elaborate on the first of these steps, identifying the parameters of the powers to be exercised in determining, on the appeal, the project application. I will consider the second and third steps as I evaluate the relevant matters of the impacts of the Project in terms of biological diversity, noise and dust, social, and economic impacts. I will consider the fourth step in my concluding part of the judgment where I balance the matters.

Identifying the parameters of the power to determine a project application

44 The Minister's power to approve or disapprove a project application under Part 3A, and so the Court's functions on an appeal under s 75L, was conferred by s 75J of the EPA Act which provided:

> (1) If:
>
> (a) the proponent makes an application for the approval of the Minister under this Part to carry out a project, and
> (b) the Director-General has given his or her report on the project to the Minister,
>
> the Minister may approve or disapprove of the carrying out of the project.

(2) The Minister, when deciding whether or not to approve the carrying out of a project, is to consider:

(a) the Director-General's report on the project and the reports, advice and recommendations (and the statement relating to compliance with environmental assessment requirements) contained in the report, and

(b) if the proponent is a public authority-any advice provided by the Minister having portfolio responsibility for the proponent, and

(c) any findings or recommendations of the Planning Assessment Commission following a review in respect of the project.

(3) In deciding whether or not to approve the carrying out of a project, the Minister may (but is not required to) take into account the provisions of any environmental planning instrument that would not (because of section 75R) apply to the project if approved. However, the regulations may preclude approval for the carrying out of a class of project (other than a critical infrastructure project) that such an instrument would otherwise prohibit.

(4) A project may be approved under this Part with such modifications of the project or on such conditions as the Minister may determine.

(5) The conditions of approval for the carrying out of a project may require the proponent to comply with any obligations in a statement of commitments made by the proponent (including by entering into a planning agreement referred to in section 93F).

45 The statutory provision continues to apply to applications for approval to carry out a project made but not finally determined before the repeal of Part 3A: see Sch 6A, [2] of the EPA Act introduced by the *Environmental Planning and Assessment Amendment (Part 3A Repeal) Act 2011*, Sch 1, 1.7 [2].

Preconditions and relevant matters to be considered

46 Subsection (1) of s 75J of the EPA Act establishes the preconditions which must be satisfied to enliven the power to approve or disapprove of the carrying out of a project: first, the proponent must have made an application to the Minister for approval to carry out the project and, secondly, the Director-General must have given his or her report on the project to the Minister.

47 Subsection (2) of s 75J expressly states the relevant matters that the Minister is bound to consider in deciding whether to approve of the carrying out of the project. Where the proponent is not a public authority, such as Warkworth in this case, there are only two mandatory relevant matters to be considered: first, the Director-General's report on the project and, secondly, if the PAC has reviewed the project, any findings or recommendations of the PAC.

48 Subsection (3) of s 75J gives the Minister power, but does not require the Minister, to consider the provisions of any environmental planning instrument which do not apply to the project because of s 75R of the EPA Act. This facultative power in subsection (3) is necessary because s 75R(3) makes environmental planning instruments (other than State environmental planning policies) not applicable to or in respect of, an approved project. Hence, local environmental plans, such as Singleton Local Environmental Plan 1996, which would otherwise be applicable, do not apply. Section 75R(2) makes State environmental planning policies applicable but only to the declaration of a project as a project to which Part 3A applies and to the carrying out of the project. Hence, State Environmental Planning Policy (Mining, Petroleum and Extractive

Industries) 2007 ('Mining SEPP') applies to declare the Warkworth extension project as a project to which Part 3A applies and would also apply to the carrying out of the project if approval were to be granted. However, the Mining SEPP does not apply to the process of approval of the application to carry out the Project. This means that the Minister is not bound to consider the matters in cl 12 of the Mining SEPP in determining whether to approve or disapprove of the Project: *Ironstone Community Action Group Inc v NSW Minister for Planning and Duralie Coal Pty Ltd* [2011] NSWLEC 195 at [25].

49 By the operation of s 75R making such environmental planning instruments not applicable, the Minister is not bound to consider provisions of such environmental planning instruments. Nevertheless, s 75J(3) enables the Minister to consider such provisions if he wishes to in determining a project application under s 75E of the EPA Act.

50 In these proceedings, the Association submitted (Applicant's closing written submissions [172], [173]) that the objectives of the Rural 1(a) Zone under the Singleton Local Environmental Plan 1996 may be taken into account under the facultative power of s 75J(3) of the EPA Act. The objectives of the Rural 1(a) Zone are:

(a) to protect and conserve agricultural land and to encourage continuing viable and sustainable agricultural land use,

(b) to promote the protection and preservation of natural ecological systems and processes,

(c) to allow mining where environmental impacts do not exceed acceptable limits and the land is satisfactorily rehabilitated after mining,

(d) to maintain the scenic amenity and landscape quality of the area,

(e) to provide for the proper and co-ordinated use of rivers and water catchment areas,

(f) to promote provision of roads that are compatible with the nature and intensity of development and the character of the area.

51 The Association submitted that the Project is inconsistent with at least objectives (a), (b), (c) and (d). The Minister's position is that the Project is consistent with these objectives (Minister's Statement of Facts and Contentions in Reply ('SFCR') at [34]). Warkworth's position is that the Project is not in conflict with the objectives, as the impacts of the Project are within acceptable limits; the land the subject of mining will be satisfactorily rehabilitated after mining; the Project promotes the protection and preservation of natural ecological systems and processes; and the Project maintains the scenic amenity and landscape quality of the area and these will not be unacceptably impacted by the clearing and removal of Saddleback Ridge (Warkworth's SFCR at [39]).

52 The relevant matters which the Minister is bound to take into account in determining whether to approve or disapprove the Project are not only those matters which s 75J(1) and (2) of the EPA Act expressly state must be considered, but also include those matters which, by implication from the subject matter, scope and purpose of the EPA Act, are required to be considered: *Minister for Aboriginal Affairs v Peko-Wallsend Ltd* [1986] HCA 40; (1986) 162 CLR 24 at 40.

53 In identifying the implied relevant matters, the starting point is the objects of the EPA Act, provided in s 5:

> The objects of this Act are:
>
> (a) to encourage:
>
> (i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,
>
> (ii) the promotion and co-ordination of the orderly and economic use and development of land,
>
> (iii) the protection, provision and co-ordination of communication and utility services,
>
> (iv) the provision of land for public purposes,
>
> (v) the provision and co-ordination of community services and facilities, and
>
> (vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and
>
> (vii) ecologically sustainable development, and
>
> (viii) the provision and maintenance of affordable housing, and
>
> (b) to promote the sharing of the responsibility for environmental planning between the different levels of government in the State, and
>
> (c) to provide increased opportunity for public involvement and participation in environmental planning and assessment.

54 Warkworth relies on the objects stated in s 5(a)(i), (ii) and (vii) submitting that the objectives presuppose development and that necessarily involves change (T 7/11/12, p 141.40). The Minister submits that the objects in s 5 do not stipulate or imply a hierarchy (relying on *Drake-Brockman v Minister for Planning* [2007] NSWLEC 490; (2007) 158 LGERA 349 at [127] per Jagot J), and that accordingly, consideration of ESD should not obscure that the EPA Act is also concerned with the encouragement of other matters, which include the matters specified in s 5 (a)(i) and (ii).

55 One object of the EPA Act, in s 5(a)(vii), is to "encourage" ecologically sustainable development. The Association submits that the principles of ESD are a mandatory relevant matter to be considered in determining a project application for a Part 3A project.

56 In *Minister for Planning v Walker* [2008] NSWCA 224; 161 LGERA 423, Hodgson JA (with whom Campbell and Bell JJA agreed) held that it is a condition of validity of the exercise of powers under the EPA Act that the Minister consider the public interest. Although that requirement is not explicitly stated in the Act, it is so central to the task of a Minister fulfilling functions under the Act that it goes without saying. Any attempt to exercise powers in which a Minister did not have regard to the public interest could not be a bona fide attempt to exercise the powers (at 450 [39]). Hodgson JA also found that the principles of ESD are likely to come to be seen as so plainly an element of the public interest, in relation to most if not all decisions, that failure to consider them will become strong evidence of failure to consider the public interest and/or to act bona fide in the exercise of powers granted to the Minister (at 454 [56]).

57 In *Walker*, however, the Court of Appeal held that this was not already the situation at the time when the Minister made his decision to approve the concept plan in that case in 2006, hence the Minister's decision could not be avoided in that case on the basis that he had failed to

consider the principles of ESD. However, this can no longer be said to be the case today. Moreover in *Walker*, Hodgson JA (with whom Campbell JA on this point agreed) held that since the principles of ESD were not addressed by the Minister in giving his approval to the concept plan, they would need to be addressed when a project approval is sought. It was important that the Minister conscientiously address the principles of ESD in dealing with any project application (at 455 [62] and [63]).

58 Recent decisions of this Court have held, although the public interest consideration operates at a very high level of generality, it requires consideration of principles of ESD at the stage of granting approval and modification for a Part 3A project: see *Kennedy v NSW Minister for Planning* [2010] NSWLEC 240 at [77], [78]; *Australians for Sustainable Development Inc v Minister for Planning* [2011] NSWLEC 33; (2011) 182 LGERA 370 at [239]-[242]; *Hunter Environmental Lobby Inc v Minister for Planning* [2011] NSWLEC 221 at [21]; and *Barrington-Gloucester-Stroud Preservation Alliance Inc v Minister for Planning and Infrastructure* [2012] NSWLEC 197 at [169].

59 It is not necessary in these proceedings to determine whether the principles of ESD are mandatory relevant considerations in their own right, and it is sufficient to conclude that as an aspect of the public interest they may be taken into account in cases where issues relevant to the principles of ESD arise.

60 Warkworth accepted that the principles of ESD, in particular the precautionary principle, intergenerational equity, and the conservation of biological diversity and ecological integrity, are relevant matters in determining whether to approve the Project (Warkworth's closing written submissions [135]). The position of both the Minister and Warkworth was that the Project is consistent with the principles of ESD (SFCR at [28] (Minister), [22] Warkworth). The Minister submits (Minister's closing written submissions [2]) that the Association's contention that the particular impacts of the Project are inconsistent with the principles of ESD, such that an approval is not in the public interest, should not obscure the place of ESD as but one of the objects in s 5 of the EPA Act.

61 In addition to the matters which the EPA Act expressly or by implication requires the Minister (and the Court on appeal) to consider in determining whether to approve or disapprove of the carrying out of the Project under s 75J(1), s 39(4) of the Court Act requires the Court, in determining the appeal, to have regard to the Court Act and any other relevant Act, any instrument made under any such Act, the circumstances of the case and the public interest. In this appeal, the relevant Acts include the EPA Act, *National Parks and Wildlife Act 1974* ('NPW Act') and TSC Act, which are relevant to the endangered ecological communities affected by the carrying out of the Project.

62 Section 39(4) of the Court Act also requires the Court to have regard to the public interest. In *Hunter Environmental Lobby Inc v Minister for Planning* [2011] NSWLEC 221, Pain J held at [21] that because the principles of ESD are an aspect of the public interest, they were relevant considerations in the circumstances of that merit review proceeding, being an objector appeal under s 75L of the EPA Act against the approval of an extension of a coal mine, as is the present case.

63 The public interest also includes community responses regarding the project for which approval is sought. In *Telstra Corporation Ltd v Hornsby Shire Council* [2006] NSWLEC 133; (2006) 146 LGERA 10, I confirmed (at [192]) that community responses are aspects of the public interest in securing the advancement of one of the express objects of the EPA Act in s 5(c), being "to provide increased opportunity for public involvement and participation in environmental planning and assessment" (see also *Kulin Holdings Pty Ltd v Penrith City Council* (1999) 103 LGERA 402 at 415; *New Century Developments Pty Ltd v Baulkham Hills Shire Council* (2003) 127 LGERA 316 at [58]). I said, however, that in considering the community responses, an evaluation must be made of the reasonableness of the claimed perceptions of adverse effect on the amenity of the locality (see also *Foley v Waverley Municipal Council* (1963) 8 LGRA 26 at 30). An evaluation of reasonableness involves the identification of evidence that can be objectively assessed to ascertain whether it supports a factual finding of an adverse effect on the amenity of the locality. A fear or concern without rational or justified foundation is not a matter which, by itself, can be considered as an amenity or social impact: *Telstra v Hornsby Shire Council* at [193] and [195].

64 Warkworth submits (closing written submissions [149]) that the evidence that the Court has heard from individual objectors cannot be regarded as representative of the Bulga community as, first, the seven deponents of affidavits were members of the applicant and, secondly, of the fifteen persons who were Bulga residents who gave evidence as individuals (as distinct from persons who objected on behalf of an organisation), the only two younger objectors were from families who had long opposed the mine, there were significant family groupings, and only one (Mr Caban) was described as directly employed in the mining industry whereas on 2006 census figures about 19 per cent of the Singleton LGA and Bulga village were employed in mining. Those limitations may be accepted, however, it is not determinative of the weight to be given to that evidence. The objectors' evidence as to the likely consequences of approval of the Project was based on experience of the noise and dust impacts of the current operations of the Mount Thorley and Warkworth mines, in particular in the period since Mount Thorley recommenced operation. There was objective evidence in support of that evidence in the form of noise monitoring data (Exhibit W4), and in the site observations recorded in Dr Stubbs' evidence (discussed below). The objectors' evidence is more than an expression of subjective fear or concern.

65 In the present proceedings, therefore, the relevant considerations are those matters expressly specified in s 75J(1) and (2) of the EPA Act; matters arising from the objects of the Act including the principles of ESD; matters specified in s 39(4) of the Court Act, including other relevant Acts, and the public interest, which includes the principles of ESD and community responses to adverse affects on amenity, where those responses reflect more than an unjustified fear or concern and where based on logically probative evidence.

66 The task for the decision-maker, including the Court on appeal, in considering a proposed development such as the Project, is first to identify the potential impacts, both positive and negative, that should be considered. The Director-General's Requirements under s 75F of the Act (Exhibit A, vol 1, tab 3) identified the issues required to be addressed in the Environmental Assessment of the Project. Those issues raised potential impacts on air quality, noise impacts, impacts on biodiversity, surface and groundwater impacts, impacts of predicted road and rail

traffic, Aboriginal and non-Aboriginal heritage, visual impacts, potential GHG emissions, waste streams, potential social impacts on the local and regional community, and assessment of the costs and benefits of the project as a whole. The Environmental Assessment Report prepared by the Department under s 75I(1), for consideration by the Minister (or delegate) in accordance with s 75J(2)(a), assessed each of those potential and actual impacts of the Project, concluding (Exhibit A, vol 2, tab 9 at 854) that while the Project would have a significant number of impacts including the clearing of 764.7ha of woodland EECs, significant noise and/or dust impacts on 16 privately owned residences and properties, and impacts on 113 Aboriginal sites, those impacts could be adequately mitigated, managed, offset and/or compensated.

67 The reasons provided by the PAC in support of its decision (as delegate of the Minister) to approve the Project (Exhibit A, TB vol 5, tab 112) noted (at 2582) the background to the proposed expansion of the current mine complex, and the "unusual challenges" presented to the PAC by the proposal which seeks to overturn previous approval conditions and the associated deed in order to mine areas that were intended to be protected in perpetuity; has a high stripping ratio which means that related environmental impacts (noise, dust, blasting and rehabilitation) are proportionately higher than many comparable mines; involves the closure of a significant public road; and has strong community and local government opposition. The PAC addressed specifically noise impacts, dust impacts, closure of Wallaby Scrub Road, biodiversity offsets, and social impacts, and concluded (at 2587) that the amended conditions would "adequately protect and manage impacts associated with the project."

68 The contentions raised by the parties identified impacts of the Project on biodiversity, economic impacts and social impacts, in particular through noise and dust, and the expert evidence focussed on those impacts. The objector evidence focussed on social impacts, in particular noise and dust, and impacts arising from the change in the community through acquisition of properties; and visual amenity impacts from removal of Saddleback Ridge.

69 In considering whether the Project should be approved, and if so, on what conditions, each of these impacts must be assessed in light of the evidence before the Court; if likely to be adverse, consideration needs to be given to whether those impacts are acceptable; or if not, whether they can be avoided, or if not avoided, mitigated. In that context, the objector evidence as to past environmental performance of the Mount Thorley-Warkworth mine complex, and the concerns raised by the objectors that the present proposal represents a departure from the previous position reflected in the Deed, and in particular, the retention of Saddleback Ridge, are relevant.

70 Having considered each of the likely impacts, the task then is to determine the weight to be given to each factor, as an exercise of managerial authority, subject to the limits identified by Mason J in *Peko-Wallsend* at 41, and to balance the factors in favour of and against granting approval. That assessment requires consideration of any conditions that might be imposed to mitigate or ameliorate any impacts.

Power to attach conditions to an approval

71 The power to approve the Project carries with it power to approve with such modifications of the Project or on such conditions as the Minister (and the Court on appeal) may determine (s 75J(4) of the EPA Act).

72 While the power to impose conditions under s 75J is not confined in the manner specified for conditions of development consent granted under Part 4 of the Act, and is wide (*Ulan Coal Mines Ltd v Minister for Planning* [2008] NSWLEC 185; (2008) 160 LGERA 20 at [74], [75]) it is not unlimited. A condition must fall within the class of conditions expressly or impliedly authorised under s 75J, which involves construction of the section and its application to the circumstances of the particular project: *Ulan Coal Mines Ltd* at [50], [51]; *Rivers SOS Inc v Minister for Planning* [2009] NSWLEC 213; (2009) 178 LGERA 347 at [133]; *Barrington-Gloucester-Stroud Preservation Alliance Inc v Minister for Planning and Infrastructure* [2012] NSWLEC 197 at [76].

73 The power to attach conditions to an approval requires that a condition be for a purpose for which the power to grant approval under Part 3A of the Act is conferred, as ascertained by a consideration of the scope and purpose of the Act, and not for an ulterior purpose; reasonably and fairly relate to the project permitted by the approval; and not be so unreasonable that no reasonable approval authority could have imposed it: *Newbury District Council v Secretary of State for the Environment* [1981] AC 578; *Western Australian Planning Commission v Temwood Holdings Pty Ltd* [2004] HCA 63; (2004) 221 CLR 30 at [57]; *Hunter Environment Lobby Inc v Minister for Planning* [2011] NSWLEC 221 at [87], [88]. The second requirement looks to the relationship between the condition attached to the approval and the permitted project, including its likely impacts on the environment: *Botany Bay City Council v Saab Corp Pty Ltd* [2011] NSWCA 308 at [9]. An approval permitting the carrying out of the project the subject of the application for approval could not have attached a condition regulating a different project on different land not the subject of the application for approval.

74 The power to impose conditions on a project approval also includes the power to require the proponent to comply with any obligations in a statement of commitments made by the proponent, including entering into a planning agreement (see s 75J(5) of the EPA Act).

PART 3: IMPACTS ON BIOLOGICAL DIVERSITY

The vegetation communities to be cleared

75 The Project involves extending the existing north pit and west pit of the Warkworth mine to the west across Wallaby Scrub Road beyond the 2003 development consent limits and also extending the west pit south to Putty Road.

76 The westward extension of north pit involves clearing and open cut mining of part of the existing Habitat Management Area 1 ('HMA 1') established under the 2003 development consent and a transition area, between HMA 1 and Habitat Management Area 2 ('HMA 2'), which had no conservation status under the 2003 development consent.

77 Habitat Management Areas ('HMAs') are required to be conserved and managed under the 2003 development consent. They are areas of value for conservation of flora and fauna and their habitat, but also contain economic coal resources. Condition 4 of Sch 4 of the 2003 development consent requires Warkworth to exclude open cut mining in the HMAs unless, in the opinion of the Minister, Warkworth has demonstrated that there is a clear justification for open cut mining on social, economic and environmental grounds. To assist the Minister in his

decision-making, Warkworth is required to:

- establish the coal reserve in the HMAs;
- investigate the options for mining this reserve;
- assess the implications of any open cut mining proposal on the offset strategy, as set out in the Flora and Fauna Management Plan, and broad conservation outcomes; and
- assess the environmental, economic and social aspects of any open cut mining proposal in the area (Condition 4(c)).

78 The Deed of Agreement entered into between Warkworth and the Minister, as required by Condition 4 of Sch 4 of the 2003 development consent, envisaged that the mechanism for Warkworth seeking the Minister's decision to approve open cut mining in the HMAs would be by planning approval under the EPA Act. In the meantime, Warkworth was required to conserve and manage the lands in the HMAs in accordance with the Flora and Fauna Management Plan.

79 The area of HMA 1 and the transition area between HMA 1 and HMA 2 is overwhelmingly comprised of two endangered ecological communities, a large patch of Warkworth Sands Woodland and surrounding areas of Central Hunter Grey Box-Ironbark Woodland.

80 The westward extension of west pit involves clearing and open cut mining of more of the existing HMA 1 (so that in total nearly half of HMA 1 would be cleared and mined) as well as of part of non-disturbance area 1 ('NDA 1').

81 NDA 1 is an area which Warkworth is required by Condition 4(b) of Sch 4 of the 2003 development consent to "[p]ermanently protect ... for conservation and exclude open cut mining". To that end, Warkworth was required to, and did, enter a Deed of Agreement with the Minister to protect the NDAs and HMAs.

82 The southern extension of west pit involves clearing and open cut mining of more of NDA 1, including the elevated Saddleback Ridge (so that in total about half of NDA 1 would be cleared and mined), as well as an area to the south of NDA 1 which has no conservation status under the 2003 development consent.

83 These areas of HMA 1 and NDA 1, and the southern area, are comprised of two endangered ecological communities, Central Hunter Grey Box-Ironbark Woodland (for about half of the area) and Warkworth Sands Woodland (very small pockets). The remainder of the vegetation is Central Hunter-Ironbark grassland.

84 In summary, the Project would result in the further clearing of endangered ecological communities, being 67.9 ha of Warkworth Sands Woodland and Hunter Lowland Redgum Forest (adding to the 38.8 ha approved to be cleared under the 2003 development consent); 378.4 ha of Central Hunter Grey Box-Ironbark Woodland (adding to the 249.1 ha approved to be cleared under the 2003 development consent); and 29 ha of Central Hunter Ironbark-Spotted Gum-Grey Box Forest (adding to the 1.5 ha approved to be cleared under the 2003 development consent).

Significance of vegetation communities to be cleared

85 As I have noted, the vegetation communities to be cleared, to a large extent, are endangered ecological communities ('EECs') listed under the TSC Act. These vegetation communities are threatened with extinction. The most at risk is the Warkworth Sands Woodland.

Warkworth Sands Woodland ('WSW')

86 WSW is a vegetation community occurring only in aeolian sand deposits ('Warkworth Sands') south east of Singleton in the Hunter Valley. Warkworth Sands have a very restricted distribution and consequently WSW, which only occurs on Warkworth Sands, has a very restricted distribution (NSW Scientific Committee's Final Determination, [1] and Joint Report of Ecology Experts (Exhibit W13), p 2). WSW has been found nowhere else in the Hunter Valley, NSW, Australia or the world. It is a unique ecological community.

87 WSW is characterised by the assemblage of flora species listed in para 2 of the Scientific Committee's Final Determination. It is "generally of woodland to low woodland structure with trees of *Angophora floribunda* and *Banksia integrifolia*, and shrubs and ground species including *Acacia filicifolia*, *Pteridium esculentum*, *Imperata cylindrica*, *Brachyloma daphnoides* and *Melaleuca thymifolia*": (at [4]).

88 The Scientific Committee, in its final determination in 2002 listing WSW as an EEC, found that WSW is now mainly confined to a small area near Warkworth, around 15 km south east of Singleton. This occurrence now comprises nearly 80% of the extant vegetation. The current WSW extent may be as little as 13% of its pre-settlement extent (at [9]).

89 Stephen Bell, a vegetation scientist called by the Association, with extensive experience in the assessment of vegetation communities in the Hunter and Central Coast region, including WSW, re-examined the pre-settlement and the current extent of WSW. Mr Bell estimated that the pre-settlement of WSW could not have exceeded 3,101 ha. This figure was arrived at by calculation, using a geographic information system, of the combined area of 12 occurrences of the Warkworth Land System (Warkworth Sands) mapped by Storey et al (1963), less the area of two occurrences at Kurri Kurri which could not have supported WSW EEC (Bell Report annexed to his affidavit of 23 July 2012, pp 30-31). However, Mr Bell considered that not all of the occurrences of Warkworth Land System mapped by Storey would have necessarily supported WSW EEC, based on analysis of the remnant vegetation that remains there. Mr Bell therefore concluded that the pre-settlement extent of WSW EEC was in the order of 800 ha (Bell Report, p 31).

90 Dr Robertson, an ecologist who prepared the ecological assessment for the Project, used an estimate of 3,038 ha (Robertson report annexed to his affidavit of 19 August 2012, Table 5.1, p 62). This figure was the estimate made by Mr Travis Peake, of Umwelt Environmental Consultants, who was engaged by the Department of Planning to review Dr Robertson's ecological assessment. Mr Peake calculated the 3,038 ha figure based on the 12 occurrences of Warkworth Land System mapped by Storey (3,733 ha) less the two Kurri Kurri occurrences which were definitely not WSW- supporting (695 ha), giving 3,038 ha (Umwelt, (2011), p 3.8 and Appendix 2).

91 Mr Bell estimated that only about 400 ha of WSW EEC now remains (Bell report, pp 33 and 73).

Dr Robertson also originally estimated the extant area of WSW EEC as being 400 ha. Dr Robertson noted that the earlier report by Travis Peake et al, "Warkworth Sands Woodland − An Endangered Ecological Community: Distribution, Ecological Significance and Conservation Status" (2002), stated that out of 800 ha of WSW estimated to remain in 2002, half was estimated to be dominated by *Eucalyptus crebra*, *Eucalyptus moluccana* and *Corymbia maculata*. Dr Robertson noted that, as these species of tree are actually dominants of other vegetation communities, half of the 800 ha was actually another forest community (Robertson report para 173, pp 61-62). Dr Robertson therefore used an estimate of 400 ha as being reasonable based on the knowledge in 2002. Warkworth, in its Preferred Project Report ('PPR'), also used the estimate of 400 ha as being the WSW remaining at the time of listing of WSW as an EEC (PPR, TB vol 1, Tab 8, p 551).

92 However, Dr Robertson suggested that, based upon more recent survey work undertaken in 2011, the estimate of remaining WSW should be increased to 464.8 ha (Robertson report, para 173 and table 5.1, pp 61-62 and Joint Report of Ecology Experts (Exhibit W13), pp 4-7). The more recent survey work was undertaken for the purposes of the ecological assessment for the Project (Cumberland Ecology 2011) and the peer review of that assessment by Umwelt (2011).

93 Mr Peake (in Umwelt (2011)) derived his estimate of 464.8 ha by examination of the detailed mapping undertaken for the ecological assessment and by field inspections of the vegetation. Mr Peake estimated the likely error in this calculation of 464.8 ha to be plus or minus 50 ha. (Umwelt (2011), Section 3.4.1.3, pp 3.8-3.9). Mr Peake estimated that 358.1 ha of WSW occurred in the Warkworth area.

94 In later evidence, however, Dr Robertson revised this estimate significantly, increasing the area of extant WSW EEC to 746.1 ha (Exhibit W18). This increase in the area of remaining WSW EEC, he said, was the result of the more accurate mapping of Warkworth Sand deposits undertaken by Dr Hazelton (a soil scientist called by Warkworth), his rechecking of previously mapped areas of WSW and other vegetation communities using this sand mapping, and his conducting statistical analyses of the composite flora data sets (Robertson report, para 189, p 65).

95 I do not accept that Dr Robertson's revised figure for the extant area of WSW EEC is accurate. The fundamental assumption of Dr Robertson, and of Dr Clements who was also called by Warkworth, was that any vegetation occurring on aeolian sands in the Warkworth area can only be WSW EEC and no other vegetation community (see Exhibit W13, p 19). This is incorrect legally and factually.

96 Legally, whilst occurrence on aeolian sands is a necessary edaphic criterion for a vegetation community to be able to be characterised as WSW EEC, it is not sufficient - other criteria in the Scientific Committee's Final Determination must also be satisfied, including the floristic criteria such as, the assemblage of species (in [2]) and the particular species dominance (in [4] and [5]). The nature, extent and duration of impacts caused by agricultural clearing, altered fire frequency, weed invasion and grazing on the vegetation may also have effected a radical transformation of the vegetation community, so that it can no longer be characterised as being WSW (as was the case with Blue Gum High Forest EEC in *Hornsby Shire Council v Vitone Developments Pty Ltd* [2003] NSWLEC 272). For example, the depauperate occurrences of

vegetation in parts of the grazing property "Archerfield" now proposed to be included in the Northern Biodiversity Area as a biodiversity offset, even though occurring on aeolian sands, have been so impacted by the agricultural clearing and grazing as to raise real doubts as to whether the vegetation could still be characterised as WSW EEC.

97 Factually, Mr Bell's evidence, including on the floristics of the vegetation in the additional areas with aeolian sands sought to be included by Dr Robertson as WSW EEC, establishes that the vegetation can better be characterised as being of other vegetation communities than WSW (see, for example, Mr Bell in Exhibit W13, p 18 and Appendix A and Bell Report, pp 42-50).

98 I am, therefore, not persuaded that the extant area of WSW EEC is as high as 746 ha but instead I find that the extant area is closer to the 464.8 ha figure that Mr Peake calculated and Dr Robertson originally determined.

99 Of this area of extant WSW EEC, the main occurrence is in a small area near Warkworth, between Wallaby Scrub Road and Wollombi Brook. This main occurrence comprises 80% of the extant vegetation of WSW EEC (Scientific Committee's Final Determination, [9] and Travis Peake, "The Vegetation of the Central Hunter Valley, NSW, Vol 2: Profiles of Vegetation Communities" (Hunter Central Rivers Catchment Management Authority, 2006) (Peake (2006)), pp 90-91).

100 Mr Peake estimated in 2011 that the area of this main occurrence at Warkworth is 358.1 ha (Umwelt (2011), p 3.7). Within this main occurrence is the only very large remnant (greater than 100 ha) of WSW EEC remaining (Peake (2006), p 89). The size and integrity, and lack of fragmentation, increases the importance of this main occurrence of WSW EEC.

101 WSW EEC is not only of value as an endangered ecological community but it also provides habitat for a number of threatened species including squirrel glider (*Petaurus norfolcensis*), speckled warbler (*Pyrrholaemus saggita*), brown treecreeper (*Climacteris picumnis* subs *victoriae*), and grey-crowned babbler (*Pomatosomus temporalis* subs *temporalis*) (Scientific Committee's Final Determination, [6]). Each of these threatened fauna have been recorded in the Warkworth Project area (Ecology Study, Annexure E to Environmental Assessment, p 5.46, Robertson report, p 132 [364] and Exhibit W15, Table of threatened fauna recorded in the Warkworth Project area).

102 The Scientific Committee finds that the current WSW is subject to ongoing threats including "open-cut coalmining, sandmining and the construction of mining infrastructure as well as pressures from agricultural clearing, altered fire frequency, weed invasion and grazing" (at [10]). These threats are real. A substantial portion (around 30%, being 106.7 of 358.1 ha) of the main occurrence of extant WSW EEC at Warkworth will be cleared and coal mined for the Project (see also Peake (2006), p 90).

103 No areas of WSW occur within a conservation reserve (at [11]). Some areas of WSW have been required to be conserved under conditions of approval for the Wambo coal mine, but these are not permanently protected as subsequent approvals can revoke the requirement to conserve the areas of WSW.

104 Mr Bell opines that because of the highly restricted nature of the distribution of WSW, both pre-

settlement and extant, extreme caution needs to be taken concerning any potential impacts upon it - 400 ha leaves very little room for error. Under the national criteria for assessing threat status to communities, WSW EEC clearly exceeds the maximum threshold for Very Restricted (less than 1,000 ha extant) and is subject to threatening processes (Bell report, p 3).

Central Hunter - Grey Box-Ironbark Woodland ('CHGBIW')

105 CHGBIW is one of three EECs that will be affected by the Project that occur on Permian sediments in the Hunter Valley (NSW Scientific Committee's Final Determination, [1]). CHGBIW has a wider distribution than WSW, occurring throughout the central Hunter Valley within the local government areas of Cessnock, Singleton and Muswellbrook (at [6]) and see Peake (2006), p 66).

106 CHGBIW typically forms a woodland to open forest on slopes and undulating hills (at [1]). It is characterised by the assemblage of species in para 2 of the Scientific Committee's Final Determination.

107 Mr Peake estimated in 2006 that the pre-settlement area of CHGBIW was 46,920 ha, of which 14,818 ha remained (Peake (2006), p 64). Mapped occurrences of the community include 27 remnants greater than 100 ha but more than 1,000 small remnants less than 10 ha, indicating a high level of fragmentation (Peake (2006), p 65) and Scientific Committee's Final Determination, [9]).

108 CHGBIW is not only of value as an endangered ecological community, but also provides habitat for an endangered population of the orchid *Cymbidium canaliculatum*, the vulnerable species of orchid *Diuris tricolor* and the tree *Eucalyptus glaucina*, and the endangered species of orchid *Pterostylis gibbosa* (Scientific Committee's Final Determination, [7]). *Diuris tricolor* has been recorded in the Warkworth area (Umwelt (2011), p 32).

109 The Scientific Committee finds that the current CHGBIW is subject to ongoing threats, including continual clearing related to open-cut coal mining and rural subdivision, and weed invasion (NSW Scientific Committee's Final Determination, [10]). These threats are real as an area of 627.5 ha of CHGBIW will be cleared and coal mined for the Project.

110 CHGBIW has very poor reservation status, not occurring in conservation reserves (except for possibly very small areas in Wollemi National Park) (Peake (2006), p 64).

Central Hunter Ironbark-Spotted Gum-Grey Box Forest ('CHISGGBF')

111 CHISGGBF is the second of the EECs that occurs on Permian sediments in the Hunter Valley that will be affected by the Project (NSW Scientific Committee's Final Determination, [1]). Like the CHGBIW, this community is distributed through the Hunter Valley in the local government areas of Cessnock, Singleton and Muswellbrook (Scientific Committee's Final Determination, [6] and Peake (2006), p 162).

112 CHISGGBF typically forms open forest to woodland (at [1]). The ecological community is characterised by the assemblage of species in para 2 of the Scientific Committee's Final Determination.

113 Mr Peake estimated in 2006 that the pre-settlement area of CHISGGBF was 46,753 ha, of which 18,306 ha remained (Peake (2006), p 160). Mapped occurrences of the community include 34 remnants greater than 100 ha and more than 1,000 small remnants less than 10 ha indicating a high level of fragmentation (Peake (2006), p 161 and Scientific Committee's Final Determination, [9]).

114 CHISGGBF is not only of value as an endangered ecological community but also provides habitat for the endangered population of orchid *Cymbidium canaliculatum*, the vulnerable species of orchid *Diuris tricolor*, and the tree *Eucalyptus glaucina*, the endangered species *Lepidium hyssopifolium*, and the critically endangered species *Persoonia pauciflora* (Scientific Committee's Final Determination, [7]).

115 The Scientific Committee found CHISGGBF is subject to ongoing threats including continual clearing related to open cut coal mining and rural subdivision, and weed invasion (at [11]). An area of 30.5 ha of CHISGGBF will be cleared and coal mined for the Project.

116 CHISGGBF has very poor reservation status, with only an area of 1.6% of the total extant community conserved in Belford National Park (Peake (2006), p 160).

Hunter Lowland Redgum Forest ('HLRF')

117 HLRF is the third of the EECs occurring on Permian sediments in the Hunter Valley affected by the Project. HLRF is found on gentle slopes arising from depressions and drainage flats on Permian sediments on the Hunter Valley floor (Scientific Committee's Final Determination, [1]).

118 The ecological community is distributed more broadly through the Hunter Valley, in the local government areas of Maitland, Cessnock, Port Stephens, Muswellbrook and Singleton (Scientific Committee's Final Determination, [3]).

119 HLRF is generally an open forest (at [5]) and is characterised by the assemblage of species in para 1 of the Scientific Committee's Final Determination.

120 Much of the pre-settlement area of HLRF has been cleared. Only about 27% (less than 500 ha) of the original distribution survives and this is highly fragmented (Scientific Committee's Final Determination, [7]).

121 HLRF is subject to ongoing threats, particularly clearing which still occurs at a higher rate, leading to fragmentation. Other threats include grazing, weed invasion and altered fire frequency (at [8]).

122 Only a small area of HLRF (less than 2% in total) is conserved in National Parks (Scientific Committee's Final Determination, [6]).

Scale and nature of impacts on biological diversity

123 The carrying out of the Project would have significant impacts on the EECs, particularly WSW and CHGBIW, and key habitats of fauna species. I will identify the key impacts.

Loss of sizeable area of WSW

124 The Project would result in the clearing and open cut mining of 106.7 ha of WSW and HLRF (Dr Robertson's revised figures include the areas of HLRF to be cleared within the area of WSW to be cleared (see Exhibit W16 as amended)). Some of this clearing has already been approved under the 2003 Development Consent (38.8 ha). The total area of WSW to be lost is significant by reference to a number of criteria.

125 An area of 106.7 ha is a sizeable area of clearing in itself. It also represents a loss of 23% of the extant area of WSW (106.7 ha of 464.8 ha remaining). The loss of around a quarter of the remaining distribution of an EEC, caused by a single project, is significant. Mr Bell opines that any development that proposes to remove around 25% of the total known distribution of WSW EEC (which is found only in the vicinity of Warkworth in the Hunter Valley of NSW), including most of the high quality examples of it, contradicts the ideals of threatened species legislation (Bell Report, p 52).

126 The loss of 106.7 ha of WSW also results in the remaining area of WSW EEC being reduced to only 12% of its pre-settlement distribution (the pre-settlement area of 3,038 ha has already been reduced to 464.8 ha, which would be further reduced to 358.1 ha by the Project, which is 12% of 3,038 ha).

127 Mr Peake, in the review of Warkworth's Ecological Assessment of the Project commissioned by the Department of Planning (Umwelt (2011)), explains the significance of this reduction. The remaining area of WSW of 464.8 ha constitutes only 15.3% of its pre-settlement area. This already represents a large historical reduction in its area of occupancy. It means that the community, once naturally restricted in its occurrence (because of its occurrence only on aeolian sands), is now highly restricted and therefore has a greatly reduced inherent ability to tolerate the impacts of further threatening processes, such as the predicted impacts associated with climate change, as it has little opportunity to migrate elsewhere over time (Umwelt (2011), p 3.19). The further reduction of the area of WSW EEC by the Project to 12% of the pre-settlement area further reduces the ability of the community to tolerate further threatening processes.

128 WSW EEC is also a short range endemic community, that is to say, it occurs across a range that is naturally very short. WSW's range was probably formerly 35 km but now is only 20 km. Communities with short ranges are naturally more susceptible to landscape-scale changes, and frequently have no place to migrate, over time, as a result of landscape-scale changes, such as those predicted to occur as a result of climate change (Umwelt (2011), p 3.20). The loss of a further 106.7 ha, caused by the Project, of such a short range endemic community is therefore more significant.

Loss of largest remnants of WSW

129 The area of 106.7 ha to be cleared and open cut mined by the Project also contains the largest remnants of WSW remaining. Mr Peake (in Peake (2006), p 89) notes that there was only one very large remnant (>100 ha) and two large remnants (40-100 ha) of WSW. These occur in the Warkworth district, either side of Wallaby Scrub Road. The remainder of occurrences of WSW are of small and medium size. Larger remnants of vegetation communities are of value because of their greater integrity and resilience.

130 The Project will directly impact the few very large and large remnants of WSW through removal of 106.7 ha of it. Mr Peake concludes that this would result in substantially increased reliance on smaller, less resilient remnants of WSW, coupled with any restoration of WSW that might be undertaken by Warkworth, to ensure that the extinction of the community is averted (Umwelt (2011), pp 3.19-3.20).

Loss of high quality WSW

131 The area of WSW to be cleared and open cut mined is in good condition. Mr Bell analysed the mapped WSW and identified three key groups: core WSW, marginal WSW and non WSW (Bell Report, pp 42-50). Most of the core WSW occurs within the area of WSW to be cleared for the Project (Bell Report, p 49 and Fig 3.17, p 53). Mr Bell finds that the Project would entail the loss of around 85 ha of high quality (core) WSW EEC, representing approximately 60% of the highest quality WSW (Bell report, pp 33, 52 and 66). The Project would also remove 20 ha of medium quality WSW. No low quality WSW would be removed (Bell report, p 66). Dr Donald and Dr Clements considered that the ordination of Dr Bell's data does not support the presence of three clusters (core WSW, marginal WSW and non WSW) (see, for example, in Joint Report of Ecology Experts (Exhibit W13), pp 16-18). However, the utility of Dr Bell's threefold identification of WSW is to grade the quality of the WSW occurrences, so as to be able to evaluate the significance of the WSW to be lost by the Project (and the WSW occurences proposed in the offsets).

132 Mr Bell notes that the majority of mapped EEC that would remain outside of the disturbance area of the Project would be of medium to low quality, equating to his definition of marginal WSW (Bell report, p 53).

133 Mr Peake (in Peake (2006), p 90) described the area of WSW between Wallaby Scrub Road and Wollombi Brook as being the "type stand" for WSW. A type stand is a stand of vegetation used as the basis for the scientific description of the vegetation community. Mr Peake describes this type stand of WSW as being in relatively good condition (Peake (2006), p 90). The Project would directly impact this type stand of WSW EEC by clearing 106.7 ha of it.

Loss of WSW remnants is permanent and irreplaceable

134 The loss of the 106.7 ha of WSW either side of Wallaby Scrub Road by clearing and open cut mining for the Project would be permanent. Warkworth does not propose to rehabilitate the mine area with the object of establishing WSW (Umwelt (2011), p 3.17 and Robertson report, p 129 [356]). Rather, Warkworth proposes to encourage restoration of other areas of vegetation in the proposed Northern and Southern Biodiversity Areas to establish WSW. This proposal for regeneration, however, does not replace WSW in the landscape where it currently exists and is of value for the reasons given earlier.

135 Furthermore, Mr Peake (in Umwelt (2011)), describes the extreme difficulty of replacing the loss of WSW that would be cleared and open cut mined by the Project with protection of the community in other locations. Mr Peake opines that, based on the highly restricted area of occupancy of WSW, the very short range over which it occurs, the very specific substrate (aeolian sands) on which it occurs, and the likely inability for this community to migrate over time

as an adaptation to likely climate change impacts, WSW can be regarded as being very close to the extreme end of the irreplaceability spectrum. This means that, because of these factors, it is extremely difficult to replace the loss of the WSW community in one location with the protection of it in another. Mr Peake notes that for small areas of clearing this might be acceptable but for the large (around 22%) reduction proposed for the Project, within the remnant woodland that supports by far the largest occurrences of WSW, this would lead to a real chance or possibility of the extinction of the community (Umwelt (2011), p 3.19).

Loss of an ecological community that is factually, critically endangered

136 Mr Peake (in Umwelt (2011)) and Mr Bell find that WSW satisfies the criteria for listing as a critically endangered ecological community under both the TSC Act and the *Environment Protection and Biodiversity Conservation Act 1999* (Cth). Although WSW has not yet been so listed under these Acts, it nevertheless satisfies the criteria for being so listed (Umwelt (2011), pp 3.10-3.11, 3.19 and Bell report, p 54). WSW has a small geographical distribution, is less than 1,000 ha in size, and is faced with demonstrable threats. The potential for WSW to be listed as critically endangered increases the significance of the loss of 106.7 ha of WSW caused by the Project.

Loss of sizeable area of CHGBIW

137 The Project would result in the clearing and open cut mining of 627.5 ha of CHGBIW. Some of this clearing has already been approved under the 2003 development consent (249.1 ha).

138 An area of 627.5 ha of CHGBIW is a very large area in itself. It also represents a loss of 4% of the extant area of CHGBIW. Mr Peake finds that the loss of such an area is large and, in its context, is likely to have a significant impact on the CHGBIW community on a local scale (Umwelt (2011), p 3.12).

Loss of permanently conserved part of NDA 1

139 Under the 2003 development consent, Warkworth was required to "permanently protect for conservation and exclude open cut mining" in the non-disturbance areas, including NDA 1. The Project involves clearing and open cut mining of around half of NDA 1. Most of the vegetation in NDA 1 which would be lost is CHGBIW EEC. CHGBIW was listed as an EEC in 2010, after the 2003 development consent was granted. Nevertheless, the 2003 development consent required the permanent conservation of the vegetation in NDA 1, which by the subsequent listing, became CHGBIW EEC. The consequence of the Project would be that a sizeable remnant of CHGBIW EEC, which by being in NDA 1 was to be conserved in perpetuity, would be lost. Currently CHGBIW has very poor reservation status, not occurring in conservation reserves (Peake (2006), p 64). The intended permanent conservation of the CHGBIW in NDA 1 was therefore of importance. The loss of this rare example of an intended to be permanently conserved remnant of CHGBIW is significant.

Consequential effects of clearing of EECs for the Project

140 The clearing of 106.7 ha of WSW, 627.5 ha of CHGBIW and 30.5 ha of CHISGGBF EECs, amongst other vegetation, is likely to have a number of consequential effects. First, it would be

likely to impact on wildlife corridors and key habitats of fauna species. Mr Bell notes that Peake (2006) showed a disjointed and fragmented corridor running from Wollemi National Park, through the disturbance area of the Project and the proposed Southern Biodiversity Area to the north and north east, and onto the northern side of the Hunter River (Bell report, p 67). Mr Bell also notes that NPWS mapped key habitats ("areas of predicted high conservation value for forest faunal assemblages, endemic forest vertebrates or endemic invertebrates") adjoining to the west and slightly impinging on the disturbance area of the Project (Bell report, p 67).

141 The Director-General's Environmental Assessment Report (TB vol 2, tab 9, p 793) also notes that "one of the largest stands of remnant vegetation of the Hunter Valley floor is located immediately to the west of the complex. This vegetation forms part of a fledging vegetation corridor across the valley floor (which has been heavily cleared over the last century) between the Wollemi and Yengo National Parks to the south west of the complex and the Barrington Tops National Park, which is located on the northern edge of the valley floor".

142 Mr Peake (in Umwelt (2011), p 3.14) finds that the Project would remove a substantial amount of native vegetation and fauna habitat that would act as a movement corridor and/or large remnant for residence for numerous native fauna species. Part of this corridor would be retained within the proposed Southern Biodiversity Area including the "Springwood" property. Part would also be temporarily maintained in the proposed Buffer Lands, but there is no long term guarantee over the future of the Buffer Lands, as they can later be approved for future mining. Mr Peake opines that:

> In a worse case (but realistic) scenario, if the Southern BOA is retained in-perpetuity, along with the in-perpetuity protected Wambo Remnant Area A to the west, and if the majority of the Buffer Lands are removed for future developments, the corridor which is currently approximately 4 kilometres in width would be reduced to less than 1 kilometre. This could have a significant future impact on fauna species, although the assessment of such potential impacts is beyond the scope of this review as there is no formal proposal to develop the Buffer Lands. As it stands the reduction of the corridor width to about 2 kilometres (including the Wambo Remnant Area A, the Southern BOA and the Buffer Lands), could contribute substantially to a significant impact on a range of fauna species.

143 Mr Bell and Dr Robertson agreed in their joint report (Exhibit W13, p 4) that the Project will progressively impact upon a large patch of vegetation as the open cut mine is developed westwards. The large patch of native vegetation including WSW, CHGBIW and CHISGGBF will be reduced in size by mining. However, at no point in the future will connectivity be severed in a north south direction. A continuity of habitats will be maintained for threatened and other native fauna through the maintenance of habitats in the Southern Biodiversity Area. The proposed Buffer Land would also temporarily contribute to continuity of habitats for fauna but as this is not included in the Southern Biodiversity Area it may not be protected in the long term.

144 Mr Peake (in Umwelt (2011), p 3.14) also considered that there would be a risk that some threatened woodland birds could be significantly impacted by the Project, including the speckled warbler, brown treecreeper and grey crowned babbler (all of which are recognised by the Scientific Committee in its Final Determination for WSW as threatened species of birds for which WSW provides habitat). Each of these threatened birds were recorded in the disturbance area (Robertson report, p 17 [46]).

145 The clearing of the vegetated areas for the Project would also be likely to have other consequential effects, including edge effects and the further overall fragmentation of the WSW community (Umwelt (2011), p 3.20 and Robertson report, p 18 [49]). These consequential

effects would occur in parts of the proposed Southern Biodiversity Area to the north of the disturbance area and on the Buffer Land to the west of the disturbance area.

Conclusion on impacts on biological diversity

146 The Project would be likely to have significant impacts on EECs, particularly WSW and CHGBIW, and key habitats of fauna species. These impacts are of such magnitude as to require a consideration of the measures proposed to avoid, mitigate and offset the impacts in order to determine the acceptability of the Project.

The strategies to manage the Project's impacts on biological diversity

147 The strategies for managing the adverse impacts of a project on biological diversity are, in order of priority of action, avoidance, mitigation and offsets. Avoidance and mitigation measures should be the primary strategies for managing the potential adverse impacts of a project. Avoidance and mitigation measures directly reduce the scale and intensity of the potential impacts of a project. Offsets are then used to address the impacts that remain after avoidance and mitigation measures have been put in place (see "Principles for the Use of Biodiversity Offsets in NSW", Office of Environment and Heritage (TB vol 7, p 4117)).

148 The first strategy is to endeavour to avoid the potential impacts of a project. Avoidance of impacts may be achieved through planning and assessment of the project including suitable site selection and project design. An example would be modifying the project to avoid an area of biodiversity value, such as an endangered ecological community or habitats of threatened species or populations.

149 If after implementing all reasonable avoidance measures, there are remaining impacts, the next strategy is to undertake mitigation of the remaining impacts. Examples are implementing measures to prevent or reduce offsite impacts on areas of biodiversity value, such as edge effects, weed invasion, altered fire frequency or altered hydrological regimes.

150 If after all reasonable avoidance and mitigation measures have been implemented, there are still residual impacts, offsets can then be considered. Offsets do not reduce the likely impacts of a project, but rather compensate for the residual impacts.

151 An offsets package can involve direct offsets or other compensatory measures. Direct offsets are actions which provide a measurable conservation gain for the affected components of biological diversity, such as endangered species, populations or ecological communities. Conservation gain is the benefit that a direct offset delivers to the affected component, which maintains or increases its viability or reduces any threats of damage, destruction or extinction.

152 Other compensatory measures are actions that do not directly offset the impacts on the components of biological diversity but are expected to lead to benefits for the affected components. An example would be undertaking or funding the undertaking of research programs relating to the affected components of biological diversity.

153 In the case of the Project, Warkworth has proposed no avoidance measures and little mitigation measures to reduce the scale and intensity of the significant impacts on biological diversity particularly on the affected EEC. As a consequence, the significant impacts identified in the

preceding section remain essentially unabated. Rather, Warkworth has proposed an offsets package in order to compensate for the significant residual impacts of the Project.

No avoidance of impacts on EECs

154 The purpose of carrying out the Project is to extend mining into areas to the west of the existing mine approved under the 2003 development consent to exploit the identified economic resources of coal. These resources were previously considered to be uneconomic to mine. Some areas in which these resources are located were required to be protected permanently from coal mining under the 2003 development consent (the NDAs) but other areas were only temporarily set aside to manage their habitats (in HMAs) until mining of the resources could be justified on social, economic and environmental grounds. The project application for the Project seeks to discharge this task of justifying mining in HMA 1 as well as in about half of NDA 1 which was meant to be protected permanently from mining under the 2003 development consent.

155 Within the envelope of the disturbance area, the Project proposes to clear all of the land and open cut mine all of the economically available coal resources. There is no avoidance of impacts on the EECs and other vegetation communities within the disturbance area.

156 The Project also does not avoid impacts beyond the boundaries of the disturbance area but within Warkworth's mining lease. The proposed Southern Biodiversity Area incorporates some of the lands previously designated under the 2003 development consent as non-disturbance areas, namely the whole of NDA 2 (to the north of the disturbance area) and small parts of NDA 1 (only the western quarter of NDA 1 would be included in the Southern Biodiversity Area as the eastern half of NDA 1, including Saddleback Ridge, would be mined and the remaining quarter between the mined area and the western quarter would have its conservation status downgraded from being a NDA to being part of the Buffer Land). However, the inclusion of an already designated non disturbance area (NDA 2) within the Southern Biodiversity Area does not constitute avoidance of impacts of the Project, because any avoidance occurred by reason of the 2003 development consent. The Project merely continues that NDA designation for those parts of the land. Of course, in respect of those parts of NDA 1 that would no longer be permanently protected (being either mined by the Project or reserved for future mining in the Buffer Land), the Project would not avoid potential impacts.

157 The proposed Southern Biodiversity Area also incorporates some of the lands previously designated as habitat management areas, namely three quarters of HMA 3 to the north of the disturbance area (the eastern quarter of HMA 3 is not included), HMA 2 to the north west, and a sliver of HMA 1 (only an attenuated polygon on the far western side of HMA 1 would be included in the Southern Biodiversity Area as the eastern half of HMA 1 would be mined and the remaining area of just under a half of HMA 1 between the mined area and the western sliver would be included in the Buffer Land which, like HMAs, would only temporarily manage the habitats until future mining is justified).

158 To the extent that lands previously designated as HMAs are proposed to be included within the Southern Biodiversity Area, there would be an upgrading of their conservation status; they would be permanently protected from mining rather than temporarily managed until future

mining is justified. In this sense, it might be thought that there is avoidance of the potential impacts of any future mining. However, it is not avoidance of impacts of the Project because the Project never proposed, and did not seek to justify on social, economic and environmental grounds, open cut mining of any economic coal resources in those parts of the HMAs. Indeed, in relation to the vast majority of HMA 3 and half of the sliver of HMA 1 proposed to be included in the Southern Biodiversity Area, they are outside Warkworth's existing mining lease CCL753 boundary (HMA 3 is within Coal & Allied Operation Pty Ltd's ML1634 and HMA 1 is within Wambo Coal Pty Ltd's CCL743 and CL365) (see Exhibit W22, tab 3, Warkworth Extension Southern Biodiversity Offset Areas: Land Ownership and Mining Tenements, p 4). Warkworth would therefore not be in a position to mine these lands in any event.

159 The Southern Biodiversity Area incorporates a former grazing property "Springwood", purchased by Warkworth recently. "Springwood" lies to the north and north west of NDA 2 and north of HMA 2. Warkworth would not be able economically to open cut mine any coal resources under "Springwood" because of the intervening area of NDA 2 which Warkworth is required under the 2003 development consent to protect permanently from mining. The method of open cut mining employed by Warkworth for the Project utilises drag lines along the available strike length on a north west to south west axis parallel to the strike of the coal seams (Environmental Assessment, vol 1, p 80). The mine thereby moves westward. The existence of NDA 2 limits the northward extension along the strike of the coal seams, thereby precluding access to "Springwood" which lies to the north again of NDA 2. Hence, the inclusion of NDA 2 in the Southern Biodiversity Area is not an avoidance of impacts by the Project - the Project could not mine, and hence impact on, "Springwood".

160 Finally, the Southern Biodiversity Area includes parcels of land owned by Miller Pohang Coal Company Pty Limited, within Mount Thorley's operations CL219 and EL7712, to the south of NDA 1. These parcels include the former Giralie, Townsends, Newport and Riverview Bulga farms (Exhibit W22, tab 3, p 4). As these lands lie outside Warkworth's existing mining lease, Warkworth has no entitlement to mine any coal resources contained in the lands. The inclusion of the lands in the Southern Biodiversity Area is therefore not an avoidance of impacts of the Project.

161 The Buffer Land, as the name suggests, would serve as a buffer between the western edge of the disturbance area and the Southern Biodiversity Area, lying further to the west. The Buffer Land is within Warkworth's mining lease. Under proposed Condition 48 of Sch 3 of the Project Approval, Warkworth would be required to manage the vegetation in the Buffer Land in conjunction with the management of the vegetation within the adjoining Southern Biodiversity Area, to the satisfaction of the Director-General of Planning. However, the note to the condition makes clear, that the Buffer Land "does not form part of the conservation area, and may be the subject of a future development proposal". Accordingly, the Buffer Land is not an avoidance measure.

162 For these reasons, the Project does not put in place avoidance measures to reduce the scale and intensity of impacts on components of biological diversity and in particular on the affected EECs. To the contrary, it reverses some of the avoidance measures that were put in place by the 2003 development consent, namely the permanent protection from mining and conservation of the CHGBIW EEC and habitats for fauna in the whole of NDA 1. In so doing, the Project

increases the potential impacts.

163 The Project also does not adopt the avoidance measure recommended by Mr Peake of excising from mining all WSW occurrences beyond the mining area approved under the existing 2003 development consent (in Umwelt (2011), pp 3.20, 3.21).

164 Mr Peake considered because of the severity of the impacts of the Project on WSW EEC, there was a real risk of extinction of WSW in the medium term assuming the current management approaches were to continue and were not improved (Umwelt (2011), p 3.20). To reduce this risk, Mr Peake recommended avoidance of clearing of any WSW occurrences that have not already been approved to be cleared under the 2003 development consent. This entails not clearing west of Wallaby Scrub Road (Umwelt (2011) p 3.21 and fig 3.2). Mr Peake recommended that these WSW occurrences be included in offset areas to ensure their permanent conservation (Umwelt (2011), p 3.21).

165 Warkworth rejected this recommended avoidance measure in its PPR (TB vol 1, pp 544-554). Warkworth argued that avoidance of clearing of the remaining WSW is unnecessary and instead the impacts on WSW could be offset by regeneration of Warkworth Sands derived grassland elsewhere, which could be appropriately accepted within the proposed offsets (TB vol 1, p 533, relying on Dr Robertson's report in Appendix C, p 721). Warkworth also argued that the avoidance of clearing remaining WSW west of Wallaby Scrub Road cannot be justified from an economic efficiency perspective (p 553 relying on Mr Gillespie's report in Appendix F).

166 On the appeal, Warkworth has maintained its opposition to avoidance of clearing and mining of WSW west of Wallaby Scrub Road, essentially for the same two arguments.

167 I find neither of these arguments persuasive. The first argument confuses avoidance measures with offset measures. Avoidance measures directly reduce the scale and intensity of the potential impacts of a project on components on biological diversity. Offsets, on the other hand, do not reduce the likely impacts of a project but rather compensate for its residual impacts. Warkworth's proposal to regenerate derived grasslands with the objective of creating WSW at other locations does not reduce the impact of clearing of extant WSW in the disturbance area - it can only compensate for that impact.

168 The second argument assumes what is intended to be ultimately established by the decision-making process. Obviously, for a mineral resource, a mine needs to be located where the mineral resource occurs. However, the existence of the mineral resource does not necessitate its exploitation. There is no priority afforded to mineral resource exploitation over other uses of land, including nature conservation. There must be an assessment of all of the different, and often competing, environmental, social and economic factors in order to determine what is the preferable decision as to the use of land. Warkworth's economic analysis is a tool to assist in the decision-making process, but it is not a substitute or determinative (as I explain in Part 5 below). The question of whether there can be avoidance of impacts on components on biological diversity, including on the WSW EEC, is part of the fact finding and consideration of the relevant matters regarding environmental impacts of the Project, which occur earlier in the process of decision-making, and should not be answered by the later tasks of weighting and balancing all of the relevant matters (environmental, social and economic) to be considered by the Court as

decision-maker in arriving at the preferable decision.

169 Accordingly, available measures to avoid significant impacts of the Project on EECs and habitats of fauna are not proposed to be undertaken by Warkworth. The consequence is that there would be no reduction in the scale and intensity of these impacts.

Little mitigation of impacts on EECs

170 The Project proposes little by way of mitigation of the Project's impacts on affected EECs and habitat of fauna species. Two main categories of mitigation measures are proposed to address the impacts of clearing and mining within and adjoining the disturbance area.

171 First, because the Project would involve the total clearing and open cut mining of all of the lands within the disturbance area, there would be a reduced scope of measures to mitigate the impacts on components of biological diversity within the disturbance area. The mitigation measures proposed, therefore, only concern pre-clearing protocols and salvage of resources within the disturbance area. An example of the first type would be undertaking pre-clearance surveys to minimise the impacts on fauna, particularly threatened fauna. This mitigation measure was recommended by Mr Peake (Umwelt (2011), p 6.2) and accepted by Dr Robertson (TB vol 1, p 724) and would be required to be included by Warkworth in its Biodiversity Management Plan (under proposed Condition 49(e) of Sch 3 of the Project Approval).

172 Examples of the second type of mitigation measure would be salvaging vegetative and soil resources within the disturbance area for beneficial re-use in the biodiversity areas and/or the rehabilitation area, and collecting and propagating seed from the disturbance area. These measures would be required to be addressed by Warkworth in the Biodiversity Management Plan (required under proposed Condition 49(e)).

173 Particular components of biological diversity to be the subject of preclearance survey would be terrestrial orchids. Mr Peake expressed concern that there had not been adequate surveys for three threatened or otherwise significant terrestrial orchid species known to occur in the local area (Umwelt (2011), p 3.13). He recommended that surveys for the terrestrial orchids be conducted prior to disturbance to determine if they are present or likely to be absent. If present, a detailed management plan should be prepared which documents a program for that translocation, management and monitoring (Umwelt (2011), p 6.3). Dr Robertson believed that the survey effort had been adequate but concurred with Mr Peake's recommendations for pre-clearing surveys and the preparation and implementation of an appropriate management plan (TB vol 1, p 725). Proposed Conditions 44 and 45 of Sch 3 of the Project Approval would require Warkworth to carry out surveys for the orchids and, if orchids are identified, prepare and implement a translocation plan.

174 Secondly, in relation to impacts of the Project on vegetated areas adjoining the disturbance area, Warkworth would be required to prepare and implement a Biodiversity Management Plan that includes a detailed description of the measures to address offsite impacts, such as controlling weeds and feral pests, and erosion, and undertaking bushfire management (proposed Condition 49(e)). Proposed Condition 40 of Sch 3 of the Project Approval sets performance standards in relation to one component of biological diversity adjoining the

disturbance area, namely WSW EEC. Condition 40 would require Warkworth to:

> "ensure that the Project does not cause any more than negligible environmental consequences to the Warkworth Sands Woodland EEC adjacent to the approved mining pit to the satisfaction of the Director-General, including:
>
> (a) negligible change in the areal extent of the EEC;
>
> (b) negligible change to the functioning of the EEC;
>
> (c) negligible change to the composition or distribution of species within the EEC; and
>
> (d) negligible drainage of water from, or redistribution of water within, the perched aquifer below the EEC."

175 The Biodiversity Management Plan is required to detail the measures to be implemented to achieve these performance standards (see the note to the proposed Condition 40).

176 Mr Peake (in Umwelt (2011)) expressed particular concern about the risk of direct and indirect impacts on WSW outside of the disturbance area through the severance by mining in the disturbance area of the perched aquifers underlying the aeolian sand sheets. Mr Peake said that it was appropriate to apply the precautionary principle and assume that the aquifers are reasonably interconnected and that severance of one by mining may contribute to the decline of further areas of WSW outside of the disturbance area. The affected area could be several hectares (Umwelt (2011), p 3.20). To address this risk, Mr Peake recommended the preparation of "a detailed management plan to ensure that the severance of perched aquifers does not impact on WSW outside the approved disturbance area, including the development and implementation of appropriate practices, including the application of low permeability material to the open cut face where aquifer severance takes place, to ensure that the risk of indirect impacts on WSW through aquifer seepage is low" (Umwelt (2011), p 6.3).

177 Warkworth, in its PPR, discounted this risk, relying on the advice of a hydrologist, Mr Tomlin, that there would be no impact of mining on the perched aquifer but said that even if impacts were to occur, there would be a number of actions that could be taken to mitigate the potential impacts (TB vol 1, tab 8, p 552). Dr Robertson expressed the same view (PPR Appendix C, TB vol 1, p 720). Neither the PPR nor Dr Robertson detailed what the mitigation measures would be if there were to be hydrological impacts. The Director-General's Environmental Assessment Report (TB vol 2, pp 33-34) accepted the hydrologist's conclusion but recommended nevertheless preparation of a monitoring plan to determine the impacts on the perched aquifer as well as monitoring of groundwater dependent ecosystems.

178 Proposed Condition 30 of Sch 3 of the Project Approval would require Warkworth to prepare and implement a Water Management Plan for the Mount Thorley-Warkworth mine complex, including a Groundwater Management Plan which includes "a Warkworth Sands Woodland Perched Aquifer Management Plan that describes the measures that would be implemented to ensure compliance with the performance measure in Condition [40] below" and "a program to monitor ... the impacts of the Project on ... the ephemeral perched aquifer associated with the Aeolian sand sheets; and groundwater dependent ecosystems, including the Hunter Lowland Redgum Forest EEC and River Redgum Floodplain Woodland EEC located in the Wollombi Brook alluvium downstream of the site" (Condition 30(c) of Sch 3). Proposed Condition 40 would

require Warkworth to:

> "ensure that the Project does not cause any more than negligible environmental consequences to the Warkworth Sands Woodland EEC adjacent to the approved mining pit to the satisfaction of the Director-General, including ... (d) negligible drainage of water from, or redistribution of water within, the perched aquifer below the EEC".

179 This proposed condition sets a performance standard but it does not detail the measures to be implemented to meet the performance standard. Rather, as the note to the condition observes, the measures to be implemented to satisfy the condition would be detailed in the Biodiversity Management Plan and the Water Management Plan.

180 Proposed Condition 46 of Sch 3 of the Project Approval would require Warkworth to ensure that the Project does not have an adverse impact on the HLRF EEC and the River Redgum Floodplain Woodland EEC located in the Wollombi Brook alluvium downstream of the site.

181 There would, therefore, be requirements for mitigation measures to be put in place to address and mitigate some of the impacts of the Project on adjoining EECs, including WSW EEC, caused by severance of or interference with perched aquifers, but there is no current evidence detailing the mitigation measures that would be implemented or their potential effectiveness.

182 Together, these mitigation measures, whilst worthwhile, nevertheless do not mitigate to any great extent the significant impacts the Project would have on the EECs, particularly WSW and CHGBIW, and the habitat of fauna, within the disturbance area. This is inevitable because the Project involves the total clearing and open cut mining of the land within the disturbance area. The result is that the residual impacts of the Project, that is the impacts that would remain after the proposed mitigation measures would be put in place, would still be significant.

Warkworth's proposed offsets package

183 Because Warkworth has proposed no avoidance measures and little mitigation measures, it has had to reply primarily on offsets to compensate for the still significant residual impacts of the Project on components of biological diversity, particularly the affected EECs.

184 Warkworth proposes an offsets package which comprises a combination of direct offsets and other compensatory measures.

185 The direct offsets proposed are seven areas of existing vegetation communities which would be conserved in perpetuity. The seven areas are: the Southern Biodiversity Area (an area of 997.1 ha near to or adjoining the disturbance area); the Northern Biodiversity Area (an area of 342.2 ha around 8 km to the north of the disturbance area, separated by the HVO South open cut coal mine; Goulburn River Biodiversity Area (an area of 1439.3 ha around 100 km to the north west from the Warkworth mine); Seven Oaks Biodiversity Area (an area of 522.7 ha further west again from the Goulburn River Biodiversity Area and hence around 110 km from the Warkworth mine); Putty Biodiversity Area (an area of 378.8 ha around 55 km to the south west of the Warkworth mine); Bowditch Biodiversity Area (an area of 607 ha around 55 km to the north west of the Warkworth mine; and an additional biodiversity area of 750 ha required by proposed Condition 31 of Sch 3 of the Project Approval, in satisfaction of which Warkworth proposes an area called Rockery Glades (the sizes of the biodiversity areas are given in the Biodiversity Offset Strategy, September 2012, in Exhibit W21, tab 6, p 17 and Rockery Glades is proposed

by Dr Robertson in Exhibit W16 as amended).

186 In each of these seven areas, Warkworth proposes to "enhance" existing vegetation and, in all but the Goulburn River and the additional biodiversity areas, establish additional vegetation with the restoration of grasslands, shrublands or woodlands (see proposed Condition 31, table 15, Sch 3 of the Project Approval).

187 In addition to these seven areas, Warkworth proposes to rehabilitate the mined lands (3,347 ha) with the objectives to create vegetation that would satisfy the criteria for CHGBIW and/or CHISGGBF EECs (2,114 ha); create trees within pastured grassland not conforming to any vegetation community, and create treed communities to ensure connectivity of woodland community areas (218 ha); recreate grassland communities with a native component (1,313 ha); provide additional habitat for threatened species; and create an additional north-south wildlife corridor providing connectivity to other habitat (Biodiversity Offset Strategy, Exhibit W21, tab 6, p 41).

188 The proposed conditions of the Project Approval would require Warkworth to implement the biodiversity offset strategy for the seven biodiversity areas and the rehabilitation area (see proposed Conditions 31 and 32 of Sch 3). Warkworth would be required to ensure that the biodiversity offset strategy and/or rehabilitation strategy is focused on the re-establishment of three EECs, being WSW, CHGBIW and CHISGGBF EECs, and habitat for threatened fauna species, including threatened birds such as the brown treecreeper, grey crowned babbler and speckled warbler, threatened bats and the squirrel glider (proposed Condition 33 of Sch 3 of the Project Approval).

189 Warkworth would be required to ensure the long term security of the seven biodiversity areas by entering or causing the owner of the land within the biodiversity areas to enter a conservation agreement pursuant to s 69B of the NPW Act and to register the agreements pursuant to s 69F of the NPW Act (proposed Conditions 34 and 35 of Sch 3 of the Project Approval).

190 In relation to the rehabilitation area, Warkworth would be required to demonstrate to the satisfaction of the Director-General of Planning that CHGBIW and/or CHISGGBF can be re-established on the rehabilitation area using the process and criteria in proposed Condition 42A of Sch 3 of the Project Approval. If Warkworth is unable to demonstrate to the satisfaction of the Director-General that those two Hunter Ironbark EECs can be established on the rehabilitation area, Warkworth would be required, first, to conserve all of the Buffer Land in perpetuity by means of entry into and registering of conservation agreements under the NPW Act, to secure conservation of the remaining areas of these Hunter Ironbark EECs in the Buffer Land (although underground mining may still be allowed) and, secondly, to continue to establish woodland vegetation in the rehabilitation area although not so as to comply with the performance indicators for the Hunter Ironbark EECs (proposed Condition 43 of Sch 3 of Project Approval).

191 The other component of Warkworth's offsets package is a suite of other compensatory measures. These do not directly offset the impacts of the Project on the affected EECs or the habitats of fauna affected by clearing and mining of the disturbance area, but are proposed for the benefits they might yield for the EECs and threatened fauna. The compensatory measures are fourfold.

192 First, Warkworth would contribute an additional $500,000 to continue the five year research program undertaken by the University of New England ('UNE') for WSW as a stage 2 program (PPR TB vol 1, pp 540-541 and Biodiversity Offset Strategy in Exhibit W21, tab 6, p 15).

193 The UNE research project has been carried out on the former grazing property "Archerfield". The "Archerfield" property was originally included as an offset in the Project Approval for the HVO South coal project operated by Coal and Allied Operations Pty Ltd (see Condition 29 of the Project Approval dated 24 March 2009 in supp TB vol 3, tab 23, p 1503). Coal and Allied Operations were required to "implement a trial program to enhance the two populations of Coast banksias within the Archerfield Offset Area within the aim of restoring a functioning Warkworth Sands Woodland community" (Condition 29(b)). Subsequently, the HVO South Coal Project Approval was modified to delete the "Archerfield" property as an offset and include instead lands in the Goulburn River area. The "Archerfield" property thereby became available to be included by Warkworth as part of its offsets package for the Project.

194 Proposed Condition 38 of Sch 3 of the Project Approval would require Warkworth to continue funding the UNE research project by at least $500,000.

195 There is an element of overlap between Condition 38 and Condition 41A which requires Warkworth to demonstrate, to the satisfaction of the Director-General of Planning, that WSW can be re-established on Warkworth Sands grassland areas in the Northern and Southern Biodiversity Areas. The process and criteria required by Condition 41A would entail preparing and implementing a research program such as would be required under Condition 38. Put another way, if Warkworth demonstrates to the satisfaction of the Director-General of Planning that WSW EEC can be re-established on Warkworth Sands grassland under Condition 41A, the objective of Condition 38 would have been satisfied.

196 Secondly, Warkworth would prepare a recovery plan for WSW EEC or provide sufficient funding for the preparation of such a recovery plan (PPR TB vol 1, pp 540-541 and Biodiversity Offset Strategy in Exhibit W21, Tab 6, p 15). Mr Peake noted that a recovery plan for WSW EEC under the TSC Act had not been prepared (in Umwelt (2011), p 3.20). Proposed Condition 37 in Sch 3 of the Project Approval requires Warkworth to prepare or to fund the preparation of a recovery plan for WSW EEC to the satisfaction of the Office of Environment and Heritage (within which office the National Parks and Wildlife Service falls).

197 However, the legal power and responsibility for the preparation of a recovery plan for an endangered ecological community rests upon the Director-General of the Office of Environment and Heritage ('OEH') (formerly the Department of Environment, Climate Change and Water) and for the approval of a draft recovery plan prepared by the Director-General rests upon the Minister administering the TSC Act (see ss 56(1) and 65(2)(a) of the TSC Act). An approval authority for a project under Part 3A of the EPA Act cannot lawfully empower a proponent of the project to prepare a draft recovery plan for an EEC under the TSC Act in place of the Director-General or approve a draft recovery plan in place of the Minister. At best, a project approval under Part 3A of the EPA Act may be able to require a proponent to offer assistance to the Director-General either by way of offering to prepare a draft of a recovery plan for an EEC for the Director-General's consideration and, if the Director-General considers the draft to be satisfactory, adoption by the Director-General as a draft recovery plan for the EEC under s 56 of

the TSC Act, or to fund the Director-General to prepare a recovery plan under s 56 of the TSC Act. Either way, the proponent would not have direct power or control over the making of a recovery plan for the EEC under ss 56 and 65 of the TSC Act.

198 Thirdly, Warkworth would carry out a trial to rehabilitate an old quarry within the proposed Southern Biodiversity Area to investigate the feasibility of establishing WSW on disturbed land (PPR TB vol 1, pp 540-541 and Biodiversity Offset Strategy, Exhibit W21, tab 6, p 15). Proposed Condition 39 of Sch 3 of the Project Approval would require Warkworth to carry out this rehabilitation trial in the former quarry. There have been no previous examples of successful establishment of WSW on land disturbed by quarrying or mining (Umwelt (2011), p 3.17).

199 Fourthly, Warkworth would be required to make a contribution of $500,000 to fund research aimed at improving rehabilitation of ground stratum plant species of the CHBIGW and/or CHISGGBF EECs (PPR TB, vol 1, pp 540-541 and Biodiversity Offset Strategy, Exhibit W21, tab 6, p 14).

200 The aim of the research project would be to investigate the establishment and recovery of these two Hunter Ironbark EECs within the rehabilitation area. Proposed Condition 42 of Sch 3 of the Project Approval requires Warkworth to prepare and implement a Hunter Ironbark Research Program for the Project to the satisfaction of the Director-General of Planning and to allocate at least $500,000 towards the implementation of the program. The Program would be required to be directed towards encouraging research into the mapping and recovery of the establishment of CHGBIW and/or CHISGGBF EECs within the rehabilitation area, and in particular the ground stratum plant species of these EECs (Condition 42(c)).

201 There is also an element of overlap between Condition 42 and Condition 42A which requires Warkworth to demonstrate that CHGBIW and/or CHISGGBF can be re-established on the rehabilitation area. The process and criteria required by Condition 42A would entail preparing and implementing a research program such as would be required under Condition 42. Put another way, if Warkworth demonstrates to the satisfaction of the Director-General of Planning that CHGBIW and/or CHISGGBF EECs can be re-established on the rehabilitation area under Condition 42A, the objective of Condition 42 would have been satisfied.

Offsets package would inadequately compensate for the Project's significant impacts

Synopsis of findings on offsets package

202 Warkworth's offset package does not adequately compensate for the Project's significant impacts on the affected EECs, particularly the WSW and CHGBIW EECs, that will be lost by clearing and open cut mining. The direct offsets (being the seven biodiversity areas and the rehabilitation area on the mined lands) would not provide sufficient, measurable conservation gain for the particular components of biological diversity impacted by the Project, particularly the affected EECs. The other compensation measures would not add sufficient benefits to achieve an overall conservation outcome of improving or maintaining the viability of the affected EECs.

Remote biodiversity areas do not contain affected EECs

203 First, five of the biodiversity areas, which are remote from the Warkworth mine, do not include

any of the affected EECs, namely Goulburn River, Seven Oaks, Putty, Bowditch and the Rockery Glades Biodiversity Areas. Only the Southern and Northern Biodiversity Areas include some or all of the EECs impacted by the Project.

204 The five remote biodiversity areas were selected as offsets because they have Ironbark forest and woodland (but not the particular EECs affected by the Project) and because they provide habitats for threatened fauna (birds, bats and the squirrel glider) that are known to occur in the disturbance area (Robertson report, p 123 [334] and 132 [364] and see Exhibit W15, Table of suitable habitats for threatened fauna in the remote biodiversity areas).

205 The consequence of the non-inclusion of the EECs impacted by the Project is that these five biodiversity areas do not offset (compensate for) the impacts of the Project on these EECs. Contrary to Dr Robertson's suggestion, the existence of Ironbark forest or woodland vegetation communities in these remote biodiversity areas does not compensate for the loss of the specific EECs in the disturbance area. The ecological communities are not the same in the disturbance area compared to the remote biodiversity areas and hence there is not like-for-like offsetting (see principle 10 of the Principles for the Use of Biodiversity Offsets in NSW: TB vol 7, p 4118 and Bell Report pp 62-65, 67). It is not appropriate to trade offsets across different ecological communities. Where a project impacts on a specific ecological community, any offset must relate to that same ecological community which is impacted. The consequence is that the majority of the biodiversity areas proposed in Warkworth's offset package as direct offsets do not achieve the fundamental objective of improving or maintaining the viability of the EECs impacted by the Project.

Remote biodiversity areas not proven to provide conservation gain for threatened fauna

206 Secondly, the conservation value of the remote biodiversity areas lies in their providing habitat for threatened fauna that might be impacted by the clearing and mining of habitats of those fauna in the disturbance area. In this sense, the offsets relate to the same specific components of biological diversity being impacted by the Project. However, there is insufficient evidence to establish that the impacts on the relevant threatened fauna caused by the Project will be offset by the management and permanent protection of the remote biodiversity areas. For example, the evidence does not establish that the viability or numbers of the populations of the relevant threatened fauna in the remote biodiversity areas would improve to an extent equal to or greater than the reduction in viability or numbers of individuals in the population of the relevant threatened fauna in the disturbance area or adjoining lands. Principle 9 for the use of biodiversity offsets is that offsets should be based on a reliable, quantitative assessment of the impacts of a project on a component of biological diversity (such as on a particular threatened species of fauna) and the conservation gain to that component of biological diversity (such as the same threatened species of fauna) from the offset. The methodology must be based on the best available science, be reliable and used for calculating both the loss from the Project and the gain from the offset (principle 9 of the Principles for the Use of Biodiversity Offsets in NSW: TB vol 7, p 4118).

207 The evidence before the Court concerning the loss in biodiversity from the Project on threatened fauna and any gain in biodiversity from the remote biodiversity areas did not involve such a reliable quantitative assessment, but rather involved assertions at a generalised level of

the presence or absence of the threatened fauna concerned or their habitat.

Distinguishing extant EECs and areas to be rehabilitated as EECs

208 Thirdly, even for the two biodiversity areas which do contain some or all of the EECs impacted by the Project (the Northern and Southern Biodiversity Areas), it is important to distinguish between the areas of extant EECs which provide an immediate (or upfront) offset and the areas of derived grasslands which are intended to be rehabilitated to create EECs (long-term offsets).

209 Warkworth included in its calculations of offsets and offset ratios for the areas of the EECs in the Northern and Southern Biodiversity Areas not only extant EECs but also derived grasslands which, according to Warkworth, could be rehabilitated to become EECs. This approach greatly increased the areas said to be EECs included in the offsets and increased the offset ratios.

210 Yet the two types of vegetation communities are different. Extant EECs immediately deliver conservation gains or benefits but rehabilitated EECs not only take time to deliver the same degree of benefits as extant EECs but there are risks that the rehabilitation may not be successful in achieving EECs at all or EECs of a quality which would deliver the same degree of benefits as extant EECs. The two types need to be distinguished in any assessment of the adequacy of the offsets and not conflated into a single figure.

211 The importance of distinguishing upfront offsets from long term offsets in order to better understand the size and timing of conservation benefits derived from the offsets was recognised by Mr Peake in his review of the Project's ecological assessment. It underpinned his recommendation that there should be an avoidance of impacts of the Project on WSW by not clearing any further WSW occurrences beyond the areas approved for mining under the 2003 development consent.

212 Mr Peake found that the risk associated with the restoration program for WSW in the Northern Biodiversity Area failing, and the time it would take for it to be ultimately successful, coupled with the fact that the Project would remove 22% of the extant occurrences of WSW, means that either a more substantial offset of extant WSW should be obtained or a significant reduction of the impacts on WSW should be achieved (Umwelt, (2011), pp 3.18-3.19). Mr Peake concluded that increasing the upfront offset of extant WSW was not achievable and accordingly recommended reducing the impact on WSW by avoiding further clearing of remaining WSW occurrences (Umwelt (2011), pp 3.19-3.22).

Area of extant WSW EEC in offsets less than estimated

213 Fourthly, the precise areal extent of the extant EECs and the derived grasslands to be rehabilitated in the Northern and Southern Biodiversity Areas was in contest. The contest matters because it affects the conservation gain derived from the proposed offsets. For reasons given below, I find that the areas of extant WSW in both the Northern and Southern Biodiversity Areas are less than estimated by Warkworth's ecology experts in their evidence on the appeal.

214 In the ecology study in the environmental assessment for the Project (Annexure E), Dr Robertson estimated that in the Northern Biodiversity Area the areas of the vegetation communities were, for extant EECs, 19.5 ha of WSW and 103.8 ha of CHGBIW and, for derived

grasslands, 195.8 ha of Warkworth Sands grassland and 23.1 ha of derived grassland (p 5.61).

215 In the Southern Biodiversity Area, Dr Robertson estimated the areas of extant EECs were 85.4 ha of WSW, 32.5 ha of HLRF, 368.7 ha of CHGBIW, and of derived grassland were 32.8 ha of Warkworth Sands grassland and 140.1 ha of derived grassland (p 5.57).

216 Mr Peake, in his review of the Project's ecological assessment, reviewed the estimates of mapped EECs and adopted Dr Robertson's estimates given above (Umwelt (2011), Appendix 3 table).

217 Warkworth's PPR did not change these estimates but noted that additional areas of EECs and other vegetation communities were proposed to be added to the Southern Biodiversity Area. The addition of the "Springwood" property to the Southern Biodiversity Area added 18.1 ha of WSW and 22.4 ha of CHGBIW, as well as 5.8 ha of Warkworth Sands grassland and 54.1 ha of derived grassland. The inclusion of 7.1 ha from the Buffer Land into the Southern Biodiversity Area added a further 7.1 ha of WSW. The inclusion of three parcels within the mining lease in the Southern Biodiversity Area added 57.4 ha of CHGBIW and 83.7 ha of derived grasslands.

218 The result of these additions was that the PPR's proposed Southern Biodiversity Area had, for extant EECs, 110.6 ha of WSW, 32.5 ha of HLRF and 448.5 ha of CHIBIW and, for derived grasslands, 38.6 ha of Warkworth Sands grassland and 277.9 ha of derived grassland. The estimate for the Northern Biodiversity Area remained the same as proposed in the Ecology Study.

219 The areas of extant and to be rehabilitated WSW on both the Northern and Southern Biodiversity Areas would, therefore, become 130.1 ha of extant WSW and 234.4 ha of Warkworth Sands grassland (PPR TB vol 1, p 545).

220 Warkworth's recent Biodiversity Offset Strategy for the Project (produced to comply with the conditions of the Project Approval granted by the Minister) uses the same estimates of extant EECs and derived grasslands in the Northern Biodiversity Area (Exhibit W21, tab 6, p 24). For the Southern Biodiversity Area, the Biodiversity Offset Strategy uses the same estimates of derived grassland areas of 38.6 ha for Warkworth Sands grassland and 277.9 ha of derived grassland and the same estimates of 110.6 ha of extant WSW and 32.5 ha of extant HLRF. However, the Biodiversity Offset Strategy uses the estimates of 410.7 ha of CHGBIW and 57.4 ha of CHISGGBF, which together total 468.1 ha of Hunter Ironbark EECs, which is 19.6 ha greater than the estimate in the PPR because of the addition of 19.6 ha to the Southern Biodiversity Area as required by the Project Approval granted by the Minister (see Exhibit W21, tab 6, p 19).

221 Mr Bell considered that Warkworth had overestimated and over mapped the areas of extant WSW in the Northern and Southern Biodiversity Areas (Bell report, pp 49, 61-62, 65-66 and 72 and Exhibit W13, p 18).

222 Mr Bell concludes that there are 10 ha of extant WSW in the Northern Biodiversity Area (which he found to be of low quality) compared to 19.6 ha estimated by Warkworth most recently in the Biodiversity Offset Strategy, and 85 ha of extant WSW in the Southern Biodiversity Area (which he found to comprise 30 ha of high quality, 31 ha of medium quality and 24 ha of low quality)

compared to 110.6 ha estimated by Warkworth in the Biodiversity Offset Strategy.

223 Against these estimates, Dr Robertson and Dr Clements (in their evidence on the appeal), dramatically increased the estimated areas of extant EECs in the Northern and Southern Biodiversity Areas. Dr Robertson's amended estimates (in Exhibit W16) for the Northern Biodiversity Area were, for extant EECs, 92.0 ha of extant WSW (up from 19.5 ha previously estimated by Warkworth) and 31.2 ha of CHGBIW (down from 103.8 ha previously estimated by Warkworth) and, for derived grasslands, 196.1 ha of Warkworth Sands grassland (similar to 195.8 ha previously estimated by Warkworth) and 22.8 ha of derived grassland (also similar to 23.1 ha previously estimated by Warkworth).

224 The critical change can be seen to be the reclassification of around 72.5 ha of areas previously mapped as CHGBIW to be instead WSW (Robertson report, p 121 [330]). The core reason for increasing WSW was the belief of Dr Robertson and Dr Clements that any vegetation community that occurs on aeolian sands must be WSW EEC (see, for example, Exhibit W13, pp 18-19). Because Dr Hazelton's analysis revealed that the distribution of aeolian sands was more extensive, Dr Robertson and Dr Clements considered that the area of WSW EEC should be increased by the same extent. The belief that any vegetation community that occurs on aeolian sands must necessarily be WSW EEC is incorrect. Occurrence of aeolian sands substrate is a necessary condition but it is not sufficient for a vegetation community to be classified as WSW EEC; the vegetation community must also satisfy the floristic and other criteria in the Scientific Committee's Final Determination listing WSW as an EEC.

225 Further, I accept Mr Bell's evidence, including his floristic analysis, that much of the vegetation that Dr Robertson now classifies as WSW, does not meet the floristic and other criteria in the Scientific Committee's Final Determination for WSW EEC and in fact comprises other vegetation communities (see, for example, Bell report pp 34-50 and Bell in Exhibit W13, pp 18, 19 and Appendix A). Mr Bell considered that the vegetation dominated by Ironbark eucalypts in the Northern Biodiversity Area share more species with CHGBIW EEC and/or CHISGGBF EEC than with WSW EEC (Exhibit W13, p 19).

226 Mr Bell's analysis is supported by the earlier ecological assessments of Dr Robertson and Mr Peake and the more recent Biodiversity Offset Strategy that would classify the 72.5 ha that Dr Robertson now seeks to classify as WSW EEC as CHGBIW, based essentially on the floristic and other criteria for the CHGBIW EEC compared with those for WSW EEC. I do not accept the evidence of Dr Robertson and Dr Clements that the vegetation in the 72.5 ha should now be classified as WSW EEC.

227 I find, therefore, that the areas of extant WSW and CHGBIW should remain as previously estimated, most recently in the Biodiversity Offset Strategy, namely 19.5 ha of WSW and 103.8 ha of CHGBIW. The area of extant WSW is higher than Mr Bell's estimate of 10 ha but I have erred in favour of the previous estimates. The derived grassland areas should remain as previously estimated, most recently in the Biodiversity Offset Strategy.

228 For the Southern Biodiversity Area, Dr Robertson's revised estimates (in Exhibit W16) were, for extant EECs, 243.4 ha of WSW (including HLRF) (up from 110.6 ha of WSW and 32.5 ha of HLRF previously estimated by Warkworth), 366.2 ha of CHGBIW and CHISGGBF (down from a

total of 468.1 ha previously estimated by Warkworth for both these Hunter Ironbark EECs) and, for derived grasslands, 39.1 ha of Warkworth Sands grassland (similar to 38.6 ha previously estimated by Warkworth) and 277.1 ha of derived grassland (similar to 277.9 ha previously estimated by Warkworth).

229 Again, the difference lies in the reclassification of around 100.3 ha of vegetation communities previously classified as Hunter Ironbark EECs to become WSW EEC. The justification again is that these areas of Hunter Ironbark vegetation communities occur on aeolian sands and therefore must be, by that fact alone, WSW EEC. I disagree for the reasons given earlier.

230 Dr Robertson also combines the areas of two different EECs, WSW and HLRF EECs, in his estimate of WSW EEC. This is inappropriate as the two vegetation communities have been listed as distinct EECs by the NSW Scientific Committee. It is inappropriate to trade offsets between different EECs. Conflation of the two EECs is relevant to the Southern Biodiversity Area where HLRF EEC occurs.

231 I find, therefore, the areas of extant EECs in the Southern Biodiversity Area should remain as previously estimated, most recently in the Biodiversity Offset Strategy, being 110.6 ha of WSW, 32.5 ha of HLRF, 410.7 ha of CHGBIW and 57.4 ha of CHISGGBF (the last two EECs combining to make 468.1 ha). The area of extant WSW EEC of 110.6 ha is greater than Mr Bell's estimate of 85 ha but again I have erred in favour of the previous estimates. The derived grassland areas remain as previously estimated.

Offset area and offset ratio for extant EECs too low

232 Fifthly, a consequence of these findings is that the areas of extant WSW EEC, which can provide immediate conservation gain, and the offset ratio for extant WSW EEC would both be much lower than Warkworth has submitted (relying on Dr Robertson and Dr Clements' evidence). The areas of extant CHGBIW and CHISGGBF EECs would be greater on my findings than Warkworth has submitted, but the offset area and offset ratios for extant CHGBIW and CHISGGBF EECs would still be too low.

233 For WSW EEC, Warkworth proposed offsets (only the Northern and Southern Biodiversity Areas contain WSW) which would provide, in total, 130.1 ha of WSW EEC (far less than the 335.39 ha suggested by Dr Robertson). This reduces the offset ratio from Dr Robertson's 3.14:1 (335.39 ha offset to 106.7 ha cleared) to 1.2:1 (130.1 ha offset to 106.7 ha cleared). Even if the HLRF EEC is included in the offset area with WSW EEC (which I find to be inappropriate), the offset ratio would still only be 1.5:1. These offset ratios are far too low.

234 Mr Peake (in Umwelt (2011)) considered that the factors creating the real risk of extinction of WSW in the medium term, together with the fact that the Project's removal of 22% of the community will significantly exacerbate this risk, drive the need for a substantial offset ratio in order to guarantee the survival of the community (with a reasonable margin of error) in the short to medium term. Mr Peake recommended an upfront offset ratio (that is, the ratio of the area of extant EEC in the offsets to the area of EEC cleared) of 6:1 as an appropriate minimum, and a long term offset ratio (that is, a ratio of the combined area of extant EEC and rehabilitated EEC to the area of cleared area EEC) of 9:1 (Umwelt (2011), p 3.20).

235 I agree with Mr Peake. There is a clear need for a far higher offset ratio for extant WSW, as well as for the extant and rehabilitated WSW. As Mr Peake concluded, however, an upfront offset ratio of 6:1 would require some 640 ha of extant WSW, which is not achievable given that only 646.8 ha of WSW remains today. Mr Peake's recommendation was, therefore, that the Project's impacts on extant WSW must be reduced and the only way this could be achieved is to avoid clearing any WSW occurrences beyond what had already been approved under the 2003 development consent.

236 Mr Bell arrived at a similar conclusion to Mr Peake that any further clearing of WSW occurrences should be avoided and that it is not appropriate to offset such a naturally rare community as WSW EEC (Bell report, pp 3-4). I also agree with Mr Bell.

237 In relation to the Hunter Ironbark EECs, the proposed offsets (again, only the Northern and Southern Biodiversity Areas contain these EECs) would provide 514.5 ha of CHGBIW, which is less than the area of CHGBIW to be cleared by the Project (627.5 ha), giving an offset ratio of 0.8:1; and 57.4 ha of CHISGGBF compared to 30.4 ha to be cleared by the Project, giving an offset ratio of 1.9:1. Both Mr Peake (in Umwelt (2011)) and Dr Robertson (for example in W16) considered that for offsetting purposes it is appropriate to combine CHGBIW and CHISGGBF EECs due to their floristic similarities. If this is done, the offset ratio would be 0.87:1 (571.9 ha offset to 657.9 ha cleared). On these figures, the proposed offsets of extant Hunter Ironbark EECs to be provided by Warkworth are clearly inadequate. There would be a net conservation loss for these EECs.

Lower habitat quality of WSW EEC in offsets

238 Sixthly, the habitat quality of the extant EECs in the offsets does not meet the habitat quality of the extant EECs to be cleared in the disturbance area. As I have found earlier, the extant WSW in the disturbance area is of high quality (around 80%) and the balance is of medium quality (around 20%). There is no low quality WSW in the disturbance area. The extant WSW in the offset areas, however, is of lower quality. On Mr Bell's analysis of the areas of extant WSW in the Northern and Southern Biodiversity Areas, 31% is of higher quality, 33% is of medium quality and 36% is of low quality (Bell report, p 66).

239 Because the offset site has lower habitat quality than that of the impact site, the offset site would need to be managed and resourced over a defined period of time so that its habitat quality is improved to meet the quality of habitat originally impacted by the Project. The consequence would be that the offset site would not immediately yield the conservation benefits that the impact site has yielded, but rather there would be a time lag before the offset site can do so and, of course, a risk that it might not do so at all or to the same extent as the impact site.

Risk and uncertainty that derived grasslands would not become EECs

240 Seventhly, there is a real risk and uncertainty that the derived grassland communities in the Northern and Southern Biodiversity Areas which Warkworth proposes to rehabilitate will become mature EECs. I have found that the combined area of Warkworth Sands grassland in the Northern and Southern Biodiversity Areas is 234.4 ha and of derived grassland is 301 ha. Warkworth intends to rehabilitate the areas of Warkworth Sands grassland to become WSW

EEC and the areas of derived grassland to become CHGBIW EEC and grassland (see Exhibit W16 for example).

241 However, I find that there is a real risk and uncertainty that all of these areas would be rehabilitated to create the intended EECs. There is no current example of a recognised area of WSW EEC which has been created by rehabilitation from derived grassland. The research program being undertaken by UNE in the Northern Biodiversity Area has not progressed sufficiently to have actually re-established WSW EEC or to have clearly demonstrated that restoration of WSW EEC would be completely successful (Umwelt (2011), p 3.21, Bell report, p 57, Bell in Exhibit W13, p 12).

242 Indeed, one of the compensatory measures proposed by Warkworth, and which would be required by proposed condition 38 of Sch 3 of the Project Approval, is for Warkworth to provide funding ($500,000) to support the ongoing implementation of the existing WSW Research Program being undertaken by UNE. This accepts that the Research Program has not yet proven that WSW EEC can be successfully established and that further research is required.

243 The scientific literature, referred to by Mr Bell, cautions against too readily assuming that restoring fully functioning ecosystems, let alone endangered ecological communities, is achievable. Mr Bell found no example in the scientific literature of successfully restored EECs in NSW (Bell report, pp 56-58).

244 I do not accept Dr Robertson's and Dr Clements' opinions that the WSW Research Project is "highly likely to be successful". They are not based on sound scientific evidence proving successful restoration of WSW EEC. The UNE research program has not yet proven successful restoration of WSW EEC. At best, the evidence of the UNE research program, based on plantings of some of the characteristic species of WSW EEC in 2009 and 2010, indicates that as at March 2012, 62% of individuals planted in April 2009 have survived (TB vol 3, tab 60, pp 1675-1747 and Exhibit W22, vol 2, tab 18, p 355 ff). The survival of these planted individuals does not mean that a fully functioning ecological community of WSW has been established. Their opinions are also affected by the belief (which I have found to be incorrect) that any vegetation community that regenerates on aeolian sands must be WSW EEC.

245 Principle 5 of the Principles for the Use of Biodiversity Offsets in NSW requires that offsets must be underpinned by sound ecological principles. Offsets must ensure the long term viability and functionality of the component of biological diversity concerned, such as an ecological community. Reconstruction of ecological communities involves high risks and uncertainties for biodiversity outcomes and for this reason is generally less preferable than enhancing extant habitat of the ecological community. (TB vol 7, pp 4117-4118).

246 The timeframe required for certainty of success of rehabilitation is not short (likely to be several decades) and will be much longer than the timeframe over which the WSW EEC would be impacted by the Project (Umwelt (2011), p 3.21).

247 In these circumstances, Mr Bell concludes that areas of Warkworth Sands grassland to be rehabilitated as WSW EEC should not be accepted as offsets until a successful restoration project has been achieved and assessed independently to confirm a mature example of WSW EEC has been created. Only then should clearing of extant WSW EEC be permitted. (Bell

report, pp 4, 56). Bell cites Bekessy et al (2010) that biodiversity offsetting should operate as a savings (rather than lending) bank, such that accrued biodiversity values should be demonstrated before they are used to offset biodiversity losses. This process would overcome timelag and measures of success issues that underlie uncertainty in ecosystem restoration (Bell report, p 56 citing Bekessy S A, Wintle B A, Lindenmayer D B, McCarthy M A, Coyvan M, Burgman M A and Possingham H P (2010), "The biodiversity bank cannot be a lending bank", *Conservation Letters*, 3: 151-158).

248 Principle 8 of the Principles for the Use of Biodiversity Offsets in NSW requires that offsets should be agreed prior to the impact occurring. Offsets should minimise ecological risks from timelags and that the feasibility of the offset action should be demonstrated prior to the approval of the impact (TB vol 7, p 4118).

249 I find that the real risk and uncertainty of, and the considerable timeframe required for, restoration of WSW EEC on the Warkworth Sands grassland in the Northern and Southern Biodiversity Areas reduces the conservation benefits of those areas of Warkworth Sands grassland as offsets for the extant WSW that would be cleared in the disturbance area.

250 The same concerns and conclusions apply to restoration of the other areas of derived grassland in the Northern and Southern Biodiversity Areas and, even more so, in the rehabilitation area, to create CHGBIW and/or CHISGGBF EECs. I similarly find that those areas of derived grassland are of reduced benefit as offsets for the extant areas of CHGBIW and CHISGGBF EECs to be cleared in the disturbance area.

251 The consequence of these findings is that these areas of Warkworth Sands grassland and derived grassland in the Northern and Southern Biodiversity Areas do not provide long-term offsets that improve or maintain the viability of the EECs that would be impacted by the Project.

Other compensatory measures offer insufficient conservation benefits

252 The other component of Warkworth's offset package, the other compensatory measures, also do not lead to sufficient benefits for the EECs that will be impacted by the Project. The other compensatory measures proposed by Warkworth are funding research and rehabilitation of WSW ($500,000) and of Hunter Ironbark EECs (also $500,000), carrying out a trial rehabilitation of WSW on an old quarry, and preparing a recovery plan for WSW.

253 The benefits these compensatory measures might yield would not be clearly additional to the benefits that the direct offsets might yield. Warkworth would be required to establish that WSW EEC can be re-established on Warkworth Sands grassland and Hunter Ironbark EECs on the mined area to be rehabilitated (under proposed Conditions 41A and 42A of Sch 3 of the Project Approval). The process and criteria required by proposed Conditions 41A and 42A would entail preparing and implementing a research program such as would be required to be funded by Warkworth under proposed Conditions 38 and 42. The requirement for Warkworth to prepare a recovery plan for WSW is of doubtful legal validity in the terms presently proposed and may or may not be of benefit to the Director-General of OEH who has the legal responsibility to prepare the recovery plan for WSW EEC.

254 In any event, these other compensatory measures would meet but a small proportion of the

offset requirements for the impacts of the Project on the EECs in the disturbance area. They provide no immediate conservation gain but rather might yield long-term benefits for the ecological communities. They do not, therefore, address the problem that the direct offsets do not deliver, at least in the short and medium term, an overall conservation outcome that improves or maintains the viability of the impacted EECs.

Conclusion on offsets package

255 The overall conclusion, therefore, is that Warkworth's offset package of direct offsets and other compensatory measures would not adequately compensate for the significant impacts that the Project would have on the extant EECs in the disturbance area. This is a fundamental matter to be considered in the decision-making process, to which significant weight should be assigned.

PART 4: NOISE AND DUST IMPACTS

The competing positions on noise and dust impacts

256 The Association's case is that as a direct result of impacts from noise and a deterioration in air quality from the existing operations, Bulga residents are experiencing substantial negative impacts on health and wellbeing, including stress, anxiety, sleep deprivation, impacts on family relationships and friendships, solastalgia (a feeling of loss of place), and impacts on their socialising and recreational activities in the community (Applicant's SFC at [75]). As a result of increased noise limits under the Project, those impacts will be exacerbated and the cumulative impacts of dust and noise on the health and wellbeing of Bulga residents cannot be mitigated.

257 Warkworth's position is that the current performance of the mine is not the subject of the present proceedings, and that in any event the mine is in compliance with noise and air quality requirements (Warkworth's SFCR at [36]). Warkworth contends that the mitigation strategies proposed as part of the Project will adequately mitigate noise and dust impacts (SFCR at [38]).

258 The Minister contends that, notwithstanding the occurrence of a small number of non-compliances in the period between 2004 and 2011, the Warkworth and Mount Thorley mines are operating substantially in accordance with the noise and dust conditions in their existing development consents (Minister's SFCR at [33]). The Minister contends that the proposed conditions tighten existing noise limits, set appropriate noise and dust criteria, provide mitigation measures and set acquisition criteria for certain properties, and that the conditions are suitable to ensure that noise and dust impacts are acceptable and the Project will not have a significant impact on health and wellbeing of the residents of Bulga (Warkworth's SFCR at [33](c)(iii), (iv)).

Noise impacts: an introduction to the issues and their resolution

259 The Warkworth mine generates noise, as do the other mines in the surrounding area. It is clear that the extension of the mine to the west, bringing it closer to Bulga, will continue and increase noise impacts, which are estimated to be at their highest in the early years of the Project when both Mount Thorley and Warkworth mines are operating (Ishac report [30]). Whether or not the removal of Saddleback Ridge will exacerbate those impacts is disputed. The issues are whether those impacts are acceptable, or if not, whether they can be mitigated, and whether any residual

impacts are outweighed, in the overall assessment of the Project, by other factors.

260 The first task is to identify the likely noise impacts of the Project. That task is made more complex by the presence of other mines in the locality. In addition to the Mount Thorley mine, which has one open pit (Loders) and two box cuts (Abbey Green North & South), the Bulga open cut and underground mine complex is to the south, Wambo open cut and underground mine complex is to the north east, and Hunter Valley Operations (South) mine complex is to the north (DP& I Environmental Assessment Report, TB vol 2, tab 9 pp 792-3). The changing operations of those mines, and consequent changing conditions of approval for those projects, have consequences for establishing background levels for noise against which the noise produced by the Project could be measured, and on which appropriate noise criteria for the Project could be based, and also in assessing the cumulative noise impacts.

261 Having identified as far as possible the likely noise impacts of the Project, the next task is to consider whether they are acceptable. In many respects, for example in identifying the extent of impacts from low frequency noise in the overall assessment of noise impacts, there was limited data to support firm conclusions. The determination of acceptability is assisted by reference to accepted standards, such as are published in the NSW Industrial Noise Policy ('INP'). Then, the task is to consider whether conditions can be imposed to avoid or mitigate likely adverse impacts, and whether any such conditions are enforceable.

262 The approach adopted by Warkworth and the Minister was to set, in the Warkworth approval, combined noise criteria for the Mount Thorley-Warkworth mine complex. The proposed conditions of the Project Approval (Exhibit W33) impose requirements on Warkworth to take steps to limit emission of noise, including by attenuation of vehicles, and provide rights for the owners of residences to request mitigation and acquisition where the noise levels are expected to exceed the levels imposed.

263 One issue with this approach is whether these proposed conditions adequately mitigate expected impacts, or, as the applicant contends, themselves give rise to other unacceptable impacts, in particular adverse social impacts. Another issue is whether the approach of combining the noise criteria for the Project with a different mine, even if it is open as a matter of law (an issue which is discussed below) confounds the task of identifying the actual noise impacts of the mine the subject of the approval and determining whether there has been compliance with the conditions of that approval.

264 For the reasons below, I am not satisfied that the likely noise impacts of the Project as permitted by the proposed noise criteria in the conditions of approval are acceptable. The evidence as to noise impacts from the present operations of the Warkworth and Mount Thorley mines is that the noise is either at or, at times, above levels established in the 2003 Warkworth consent; it has annoying characteristics, and it is disruptive. The proposed noise criteria assume a continuation of those noise impacts for the extended period of operation of the mine, and as the mine moves closer to Bulga. I am not satisfied that the proposed revised noise conditions (Exhibit W33) set appropriate noise criteria or are adequate to mitigate noise impacts. Those conditions set noise criteria based on generalised background levels greater than those that apply at many locations and above the project-specific noise levels which are acceptable by application of the INP.

265 As a result of the degree and extent of noise impacts, the conditions also require the undertaking of works for noise mitigation or acquisition of numerous noise-affected properties. If appropriate background levels and criteria based on application of the INP are used, there would be a material increase in the number of noise affected properties requiring noise mitigation or acquisition. The degree and extent of noise mitigation and acquisition that would be required to address adequately the noise impacts of the Project are sufficiently great as to be evidence of the unacceptability of the noise.

266 The noise criteria in the conditions also rely on the activities of another mine in different ownership, which operates in accordance with a separate consent. Even if there were power to impose such conditions, the difficulty in ensuring compliance would mean that they should not be imposed.

Noise impacts of existing operations

267 The 2003 Warkworth consent imposes noise criteria, and mitigation and acquisition criteria, based on the operations of the Warkworth mine, setting operational limits at 38 dB(A), and creating an entitlement to request mitigation measures for identified properties at noise levels exceeding the operational limit and acquisition at 43 dB(A). The existing consent for the Mount Thorley mine (2009 modification) similarly establishes separate noise criteria, with 35 dB(A) and 40 dB(A) for operational and acquisition limits respectively. The proposed conditions for the Project refer to the "Mount Thorley-Warkworth mine complex", and combine the Warkworth and Mount Thorley mines for the purposes of setting the noise criteria, on the basis that, although separately owned and operated, Mount Thorley and Warkworth mines are managed in practice as one operation.

268 Evidence as to the impacts of the presently approved mining operations comes from the residents and from independent monitoring undertaken on behalf of the Department of Planning at the request of Bulga residents in accordance with the conditions of the Warkworth and Mount Thorley approvals. That evidence confirms that the present operations of both mines generate substantial noise.

269 The Department commissioned an assessment by Sinclair Knight Merz ('SKM') for the period December 2011 - January 2012 (TB vol 7 p 4380), which involved both attended and unattended noise monitoring, at eight locations in Bulga (being two in Wambo Road, five in Inlet Road, and one in Noses Peak Road). The SKM report of April 2012 (TB vol 7, tab 277) noted (6.1.1) that operational mine noise at all of the residential properties on which the report focussed was generally caused by constant truck engines from either Warkworth or Mount Thorley mines, or both. Other regular sources of operational mine noise were dozer trucks and miscellaneous bangs, likely generated by diggers during the loading of trucks.

270 This evidence as to the type of noise generated by the existing operations is confirmed by the residents. Mr Lamb states (aff at [23]) that often at nights he can hear "...distinctive noises from surrounding mines, including sheaves of the dragline, squeals, reversing beepers and the clank of trucks". Mr Upward's evidence was that, having worked in the mines, he can distinguish each individual noise of the machinery, and can hear "...dozers, trucks, the shovel dipper door, reversing beeping, the dropping of rocks into an empty truck, trucks accelerating, often so loud I

can hear the gears changing" (aff at [24]). Mrs Leslie stated that the mining noise regularly wakes her in the night and she has trouble getting back to sleep; she can hear "...banging, crashing, the droning of trucks, getting louder as acceleration increases, vehicles going up the slag heap, accelerating and dumping" (aff at [8]). Mr Hedley states that in the evenings he can hear "...bulldozer tracks, dragline and shovel buckets impact noises, truck operations and reversing beepers" (aff at [20]). Ms Melanie Caban referred in oral evidence to "a low hum sound which reverberates through your head, along with a loud clang of rocks being thrown in truck bodies, shovel bucket doors squealing, horns beeping, rattle of bulldozer tracks clacking, high pitched tone of drilling machines, revving and changing of gears in trucks..." (T 22.8.12 p 8). In her oral evidence Ms Danielle Hanson stated that her morning "...started at 3.30 this morning, which is not uncommon, with the sound of dozers, shovels, beeping, everything else" (T 22.8.12 p 43).

271 The SKM report noted that for two of the eight locations monitored, the operational criteria applicable to noise from Warkworth was 38 dB(A) LAeq (15 minute); and 35 dB(A) LAeq (15 minute) for the remainder. The noise criteria applicable to noise from Mount Thorley for all eight locations was 35 dB(A) LAeq (15 minute) (TB vol 7, p 4387-8). The SKM report recorded 72, 15 minute attended monitoring events, and a single exceedence of consent conditions based on a 15 minute equivalent energy noise. The report noted that noise levels were observed to be equal to the operational criteria on numerous occasions at all sites, and that operational noise at all sites regularly exceeded the project criteria for a short time but did not generally constitute an exceedence of the 15 minute LAeq limits (6.1.2, p 4406). The unattended directional ("Barnowl") monitoring at Putty Road recorded 14 short term exceedences, all around dawn; and ten potential exceedences while other noise sources were present. Three of the events lasted for half an hour and a single event lasted for 45 minutes. The report noted that noise levels at four of the monitoring locations were likely to be approximately 2 dB(A) higher, given that the Barnowl site is located further from the mine (6.2, p 4406).

272 The timing of the monitoring on which the SKM report was based is significant. There was a hiatus in operations at the Mount Thorley mine from mid 2006 to mid 2010 with next to no activity at the Mount Thorley main pit with the exception of haulage to the coal preparation plant and the coal preparation plant itself, which were areas on the east side of the site away from Bulga residences. From mid 2010, operations at Mount Thorley recommenced with a relatively small fleet including one shovel, with larger plant arriving in November 2011; and full operations resumed in March 2012, when the dragline arrived and there was a full complement of truck fleet (Ishac's report at [34]-[36]). The period December 2011 - January 2012 during which SKM monitored noise levels was, therefore, a period during which noise levels would not have reached the levels permitted under both consents, and experienced by residents at the time of the hearing. The evidence of the residents, including Mr Krey (aff at [24], [25]), Mr Upward (aff at [21]) and Mr Mitchell (aff at [21]) was that noise impacts have increased since late 2011. Mr Ishac, an acoustic engineer called by Warkworth, accepted that the lull in activities at Mount Thorley provided noise respite that was recognised only once operation in the main pit of Mount Thorley recommenced (Ishac report pp 16-17).

273 The Court heard evidence on the site view on 21 August 2012 from Mrs Leslie and Mr Graeme O'Brien that on the evening of 20 August and in the early hours of 21 August 2012 there were

noise events that woke them up and kept them awake for significant periods. That evidence was confirmed by monitoring data provided by Warkworth for the period Sunday 19 to Wednesday 22 August 2012 for the Putty Road and Scout Hall Barnowls (Exhibit W4). That data shows for the "selected source" (red), levels at Putty Road rising from 2.00am to a spike just before 8.00am of approximately 55 dB(A) on Monday 20 August, and a similar pattern, starting from higher levels above 30 dB(A) to a peak of just under 55 dB(A) on Tuesday 21 August. The data for the Scout Hall monitor shows a similar rise in levels from 2.00am on Monday 20 August to a peak at just above 40 dB(A) at approximately 7.00am; levels between 35-40 dB(A) between 4.00am-8.00am and a peak of 45 dB(A) at 10.00pm, on 21 August. Mr Ishac's oral evidence was that the latter spike was not mine-related because it was unusual, and would probably have been from a passing vehicle. Mr Ishac agreed that the data supported Mrs Leslie's evidence that she was woken at 4.00am on Monday 21 August until 6.00am. He commented that the noise levels from all sources was also up at that time.

274 Mr Ishac responded (report pp 15-18) to the affidavit evidence of Mr Lamb, Mr Upward, Mr Krey, Mr Caban, Mr Hedley, Mr Mitchell, and Mrs Leslie, commenting that the predicted noise levels in the PPR for their residences are expected to be equivalent to current or historic levels for the concurrent operation of the two mines. For Mr Upward, Mr Krey, and Mr Caban, that is at 38 dB(A) or up to 40 dB(A); and Mr Hedley's property at 41 dB(A) is subject to the mitigation condition.

275 Even if it can be accepted that the mines are operating within the noise limits required under the existing consents or proposed under the new conditions, I am satisfied, based on the evidence of the residents which was supported by the available monitoring data, that the noise levels of the present operations of the mine are at a level sufficient to impact on amenity, including sleep disruption.

Noise impacts of the extended operations

276 The assessment of noise impacts of the proposed extension undertaken in the EA (Annexure G) was on the basis of potential impacts of Warkworth as a stand-alone operation, with consideration of the approved operations at Mount Thorley as part of the cumulative noise assessment (PPR TB vol 1, tab 8, p 557). The EA modelled three mine plan years for the proposed extension, Years 2, 9 and 21, with Year 2 being the early stage of mining when both Mount Thorley and Warkworth are in operation; Year 9 the year in which mining is forecast to have progressed through Saddleback Ridge; and Year 21 when the mine is at its furthest point west (EA Red volume p 192-3). The EA noted (EA Red p 195) that 13 receivers to the west and north west, and 26 receivers to the north and east, would exceed the operational criteria, and noise levels for 7 receivers would exceed the likely property acquisition criteria. Six of those receivers were already within an acquisition zone for Warkworth or a neighbouring mine or both.

277 In December 2010, following public exhibition of the EA, and as a result of the concurrent application for a modification at Mount Thorley (the Abbey Green North modifications), the Department requested Warkworth to consider impacts from Mount Thorley and Warkworth mines as a complex (TB vol 1, tab 8, p 557). The noise assessment in the PPR for the extension of the mine was undertaken on that basis. The PPR notes that in Year 2, with all Warkworth and Mount Thorley pits operating, predicted noise levels would be 1-2 dB above operational noise

limits for 41 non-mine owned properties; 3-5 dB above for 12 non-mine owned properties; and greater than 5 dB above for nine of the properties. The PPR provides data as to the proportion of Mount Thorley and Warkworth mine noise contributions for the nine privately owned residences considered likely to be significantly impacted, all but one of which is in Mount Thorley: the proportion of noise contributions made by the Warkworth mine (as opposed to Mount Thorley) range from 7 per cent to 93 per cent (PPR TB vol 1, tab 8, p 559). The PPR does not provide similar information for Bulga residences.

278 The PPR adopted what it described as a hybrid approach, being combined criteria, using existing criteria for Warkworth and Mount Thorley mines, for receivers to the east, and a single mining complex criteria for receivers to the west, including Bulga, and to the north (PPR, TB vol, 1 tab 8, p 560). Table 4.3 of the PPR (pp 567-582) shows in tabular form the single site criteria for each receiver, the combined criteria for the two sites, the predicted worst case Leq (15 minute) noise level of Warkworth + Mount Thorley, and the extent of exceedence for both the combined criteria and the hybrid complex criteria. For the 81 Bulga residences, the predicted worst case Leq (15 minute) noise level with both Mount Thorley and Warkworth mines operating ranges from 32 to 44 dB(A). The predicted worst case Leq (15 minute) noise level would equal or exceed the combined Leq (15 minute) operational criteria for both mines (which is 40 dB(A) for all residences except for 5 residences where the level is 42 dB(A)) for 45 residential receivers (that is, 56% of Bulga residences). The predicted worst case Leq (15 minute) noise level for both mines would equal or exceed the 38 dB(A) Leq (15 minute) operational noise limit set in the 2003 Warworth consent for Warkworth mine for 68 residential receivers (that is, 84% of the Bulga residences).

279 The Director-General's Environmental Assessment Report (TB vol 2, tab 9, p 809 ff) assessed the impacts of noise of the Mount Thorley-Warkworth mine complex and the mitigation measures proposed. The assessment was based on Warkworth implementing mitigation measures, which included:

- relocation of haul trucks from the high wall to in-pit haul routes;
- reduction of mobile equipment operating during night-time on critical haul routes;
- reduction of dozers operating on elevated overburden emplacement areas at night;
- noise suppression of the haul truck fleet;
- placement of noise suppressed haul trucks on critical haul routes; and
- cladding of the Warkworth CPP.

280 The EAR continued:

> The Department notes that noise suppression of the haul truck fleet is a key assumption of the noise model. The Department also notes that Warkworth has not been at the forefront of continual improvement in relation to noise mitigation. Given the importance of this factor in the management of predicted noise impacts, Warkworth has provided a specific commitment to the progressive implementation of noise suppression of the haul truck fleet, with 50% of the truck fleet to be attenuated by Year 2, and 80% by Year 6. To ensure that appropriate noise mitigation measures are applied, the Department has included specific conditions requiring Warkworth to implement, validate and report on these and other noise attenuation works.

The assessment indicates that with the proposed mitigation measures in place, and with reference to the new more stringent noise criteria, the project would result in an increase in the total number of residences experiencing exceedences of the applicable noise criteria by up to 13 private properties (in Year 2) under the worst case operating scenario (refer to Table 4).

Table 4 reports the predicted exceedences in the context of the Department's preferred management approach in relation to noise exceedences, how these impacts relate to the existing scenario, and the likely duration of the expected impact.

Table 4: Summary of Operational Noise Limit Exceedences

Noise Exceedence	***Management Approach***	***No. of Affected Private Properties***			
		Existing	***Yr 2***	***Yr 9***	***Y21***
Marginally affected residences (1-2dB exceedence)	Noise mitigation at source	50	50	13	11
Moderately affected residences (3-5dB exceedence)	Noise mitigation, including mitigation at residence	~30	37	12	2
Significantly affected residences (>5dB exceedence)	Acquisition	5	11	2	3
Significantly affected land (>5dB exceedence on >25% of land)	Acquisition	6	6	6	4
Total Private Properties Exceeding New Noise Criteria		**~91**	**104**	**33**	**20**

281 The EAR noted that Warkworth had committed to the implementation of a proactive and reactive noise management system, including the use of real time weather data to guide mining and overburden emplacement activities, and proactive mine planning to provide contingencies, such as during prevailing weather conditions.

282 The PAC accepted that there are substantial noise impacts from the Project (TB vol 5, tab 112, p 2583). One factor which the PAC noted was relevant to the noise impacts is the high stripping ratio, which means that the noise impacts are sustained for longer per tonne of coal extracted than at many comparable mines, thus causing a greater overall noise impact on the community. Secondly, the PAC accepted, based on submissions made, that many decisions to acquire residential property and businesses in the vicinity of Bulga or to remain in the vicinity of Bulga

had been made on the basis that the western extent of mining was firmly limited to the boundaries in the 2003 approval, which fixed the proximity of noise-generating activities in relation to the residences. The PAC's response accepted that there would be impacts from the western expansion of the mine, and considered that it was appropriate to require improved control over noise-generating activity at the mine complex, for example, by imposition of controls including purchase, retro-fitting and maintenance of noise attenuation equipment and improved practice during adverse meteorological conditions, and what it described (p 2584) as improved control of impacts on receivers, being an increased number of properties to be offered an option for acquisition.

Contribution of Saddleback Ridge to noise attenuation

283 The Director-General's Environmental Assessment Report (TB vol 2, p 810) accepted that there is no technical basis to support the claim that substantial noise attenuation is achieved by the ridgeline, and that modelling had shown that the ridge does not provide appreciable noise mitigation under adverse meteorological conditions as they neutralise any mitigation effect provided by the ridge.

284 Mr Ishac's expert report addressed the contribution to noise amelioration made by Saddleback Ridge (part 2.4, p 13). His modelling was based on the mine plan figures, which showed that for Year 2 the mining equipment operates east of Saddleback Ridge in areas similar to current operations; in Year 21 when mining is furthest to the west, equipment positions are shown west of Saddleback Ridge; and in between is Year 9 where some mining equipment is located on Saddleback Ridge. A comparison of predicted noise levels for Years 9 and 21 with Year 2 shows the differences between received noise with and without Saddleback Ridge for Bulga residences. That showed marginal increases of 1 dB to 3 dB between Year 2 and either Year 9 or Year 21 noise levels under prevailing weather, and higher increases during calm weather conditions of up to 5 dB. Mr Ishac noted that that finding was affected by Mount Thorley operating in the early, but not the latter, years. Mr Ishac was of the opinion that this demonstrates that the ridge is more beneficial during calm weather conditions when noise from the mine is significantly lower and below typical background noise levels. His experience is that noise benefits of topography during calm weather conditions are virtually nullified during adverse winds or temperature inversion conditions. Mr Ishac concluded that the main buffer for Bulga residences is the distance to the mine. In Year 21 Bulga village is approximately 2.6 km to the mine disturbance area and 2.8 km from proposed mining areas. That distance is associated with a loss factor of 85 dB, which is higher than the probable noise loss factor associated with the effects of a ridge which are typically in the order of 10 dB or lower under adverse weather conditions.

285 The applicant did not lead expert evidence to challenge this evidence. On the basis of Mr Ishac's evidence, I accept that Saddleback Ridge may make some contribution to noise attenuation, particularly in calmer meteorological conditions, and that the proposal to remove it by the expansion of mining operations to the west from Year 2 onwards will increase noise impacts to some extent. While it may be accepted that Saddleback Ridge does not provide substantial noise attenuation, of greater significance is its contribution to screening the visual impact of the mine, an environmental benefit acknowledged in the EIS for the 2003 development consent (TB vol 5, tab 114, p 2615-6). The significance of the removal of Saddleback Ridge is

considered below as an element of the social impact of the proposed Project.

The noise criteria proposed in conditions of Project Approval

286 The revised conditions of approval (Exhibit W33) reflect the recommendations in the EAR, and require Warkworth to:

- prepare and implement an Environmental Management Strategy (Condition 1 of Sch 5) and a Noise Management Plan (Condition 8 of Sch 3);
- ensure that new trucks and equipment are commissioned as noise suppressed units and progressively attenuate the noise of the existing fleet by the end of 2015 (Condition 5 of Sch 3);
- operate according to specified operating conditions (Condition 7 of Sch 3), and specified noise criteria (Condition 3 of Sch 3);
- monitor and report on compliance (Conditions 5(b) of Sch 3, and 1(f), 3(d) of Sch 5);
- review the noise criteria during 2015 (Condition 7(g) of Sch 3), and other management plans (Condition 3(h) of Sch 5); and
- provide for the taking of further action if noise criteria are not met, including remediation (Condition 2 of Sch 5), and acquisition on request of affected properties (Conditions 2 and 4 of Sch 3).

287 Conditions 1, 2, 3 and 4 of Sch 3 establish the scheme for dealing with noise affected properties. The 20 properties identified in Table 1 in Condition 1 are the worst noise affected properties where no mitigation measures can reduce the noise impacts to a satisfactory level, and Warkworth will be required to acquire those properties on the written request of the owners.

288 Table 3 in Condition 3 sets the noise criteria for land other than the noise affected land in Table 1, including 72 specifically identified properties in Bulga, as well as "all other privately owned land" in Bulga. Condition 3 requires Warkworth to ensure that the noise generated at the Mount Thorley-Warkworth mine complex does not exceed those criteria at any residence on privately-owned land, other than where there is a written agreement with the owner to generate higher noise levels. Appendix 12 sets out the meteorological conditions under which the noise criteria apply. An "exceedence" is defined in Condition 3 to occur "when valid attended noise data from compliance monitoring (collected in accordance with the requirements in Appendix 12) indicates the noise generated by the Mount Thorley-Warkworth mine complex has exceeded the criteria set out in Table 3".

289 Appendix 12 specifies (para 1) that the noise criteria applies under all meteorological conditions except during periods of rain or hail; when average wind speed at microphone height exceeds 5 m/s; when windspeeds are greater than 3 m/s measured at 10m above ground level; or when temperature inversion conditions are greater than 3°C/100m. The determination of meteorological conditions is, however, done at the mine site, except for wind speed at microphone height (para 2). Appendix 12 also specifies that only attended monitoring is to be used to evaluate compliance with the conditions of approval (para 3). Accordingly, the unattended directional monitoring ('Barnowl') sites, are not to be used for compliance monitoring which record data in real time. Appendix 12 specifies that, unless otherwise agreed with the

Director-General, compliance monitoring is to be carried out in accordance with the relevant requirements for reviewing performance in the INP, including the requirements relating to monitoring locations (para 4).

290 Condition 4 of Sch 3 provides that if there are "sustained exceedences" of the noise acquisition criteria in Table 4 of Sch 3, which are set at a LAeq (15 minute) level of 43 dB(A) for day, evening and night at all privately owned land in Bulga, measured at any residence on privately-owned land, or on more than 25 per cent of privately-owned land, Warkworth must acquire the land on the written request of the owner. A "sustained exceedence" is defined in Condition 4 to occur "when valid attended noise data from compliance monitoring (collected in accordance with the requirements in Appendix 12) indicates the noise generated by the Mount Thorley-Warkworth mine complex has exceeded the noise criteria set in Table 4 for 10% or more of an individual day, evening or night assessment period (as those periods are defined in the NSW Industrial Noise Policy) and this has occurred on 3 occasions or more during any 30 day period."

291 Condition 2 of Sch 3 makes provision for implementation of additional noise mitigation measures at 41 specified residences, identified in Table 2. Those properties do not include the properties listed in Table 1, and for Bulga residences includes the properties for which Table 3 establishes noise criteria at 41 or 42 dB(A). Warkworth would be required, on the written request of the owner, to implement additional noise mitigation measures such as double-glazing, insulation, and airconditioning.

292 The proposed noise conditions reflect the intention that both Warkworth and Mount Thorley will continue to operate until 2017, when Mount Thorley will cease operation. Year 2 is regarded in the PPR as the potentially worst case year of operations, when all pits are expected to be operative at Warkworth and Mount Thorley (PPR TB vol 1, tab 8, p 559). Noise levels from Warkworth are expected to increase as the extended mine moves westwards given the relatively closer proximity to Bulga.

293 The evidence of Mr Ishac was that had the noise criteria remained separate for the Warkworth and Mount Thorley mines, the allowable combined noise level would be 40 dB(A) and 45 dB(A) for operational and acquisition limits at Bulga residences respectively, derived from the logarithmic addition of both noise limits (Ishac report [20]). The hybrid approach assumes a single mining complex and sets 38 dB(A) Leq (15 minute) for intrusive noise contribution from the complex. Mr Ishac summed up the benefits of the hybrid noise criterion as being an increase from zero to 26 in the number or properties entitled to mitigation, and an increase from zero to one in the number of properties entitled to acquisition rights (Ishac report [24]).

294 The combined noise criteria for the Mount Thorley-Warkworth mine complex in Sch 3 are proposed to apply until Mount Thorley ceases operation. Once (in the opinion of the Director-General) extraction of coal at Mount Thorley approved under the development consent DA 43/95 has been substantially completed, Condition 3 ceases to be operative and is replaced by Condition 2 in Appendix 10, which provides alternative noise criteria based on Warkworth alone.

295 The acceptability of the Project's noise impacts, if operating at the noise levels permitted by the proposed conditions of approval, depends, in part, on the acceptability of the noise levels set by the conditions. An accepted standard against which the noise levels set by the conditions can

be assessed for their acceptability is the INP. The INP explains the processes to be followed to fix project-specific noise levels and noise limits in conditions of approval.

INP process for determining appropriate noise criteria

296 It was common ground that the starting point for determining appropriate noise levels for the Project is the INP published by the EPA in 2000 (TB vol 7, tab 273). The INP notes (at 1.4, p 2) that assessment of noise impact is complex and subjective, and the INP outlines processes "to help strike a feasible and reasonable balance between the establishment and operation of industrial activities and the protection of the community from noise levels that are intrusive or unpleasant".

297 The INP provides that noise management involves the following main steps:

> 1. Determining the project specific noise levels for intrusiveness and amenity that are relevant to the site or the area (*Section 2*).
>
> 2. Measuring and determining existing background and ambient noise levels, using the method relevant to the expected level of impact (as outlined in *Section 3*).
>
> 3. Where the proposed development is expected to produce annoying noise characteristics, adjustments are to be applied to the noise levels produced by the development in question (as outlined in *Section 4*).
>
> 4. Predicting or measuring the noise levels produced by the development in question, having regard to meteorological effects (such as wind, temperature inversions) (see *Section 5*).
>
> 5. Comparing the predicted or measured noise level with the project-specific noise levels and assessing impacts (*Section 6*).
>
> 6. Considering feasible and reasonable noise mitigation strategies where the project-specific noise levels are exceeded (*Section 7*).
>
> 7. Negotiation between the regulatory/consent authority and the proponent and between the community and the proponent to evaluate the economic, social and environmental costs and benefits from the proposed development against the noise impacts (*Section 8*).
>
> 8. The regulatory/consent authority sets statutory compliance levels that reflect the achievable and agreed noise limits for the development (*Section 9*).
>
> 9. Monitoring of environmental noise levels from the development to determine compliance with the consent/licence conditions (*Section 11*).

298 The first step of determining the project-specific noise levels involves selection of the industrial noise criteria. The industrial noise criteria set out in Section 2 of the INP are "best regarded as planning tools" and are intended "to protect at least 90 per cent of the population living in the vicinity of industrial noise sources from the adverse effects of noise for at least 90 per cent of the time." (INP, 1.4.1 p 3). The INP sets two separate noise criteria to meet environmental noise objectives: one to control intrusive noise impacts in the short term for residences, and the other to protect and maintain noise level amenity for particular land uses for residences and other land uses (INP, 1.4.4, p 4). The evidence of Mr Parnell, a noise specialist in the Department of Planning, was that in his experience, the controlling criteria for mines will be the intrusiveness criteria; the amenity criteria is superfluous for mines but useful for other industrial operations eg Newcastle port.

299 Selection of the intrusiveness criterion starts with measurement of the background noise. At the project approval stage, a long-term method is used to determining background noise. This

involves two steps: first, determining the assessment background level for each day, evening and night period using the tenth percentile methods and, second, determining the rating background level, which is the median assessment background level over all days for each period (INP, 3.1.1, p 22 and Table 3.1, p 23). The base measure is LA90 (15 minute). The long term method for determining background noise is designed to ensure that the criterion for intrusive noise will be achieved for at least 90% of the time periods over which annoyance reactions may occur (taken to be periods of 15 minutes) (INP, 3.1.1, p 22).

300 After determining the rating background level, the intrusiveness criteria is determined. The intrusiveness criterion essentially means that the equivalent continuous (energy-average) A-weighted sound pressure level of the source over 15 minutes LAeq (15 minute) should not be more than 5 dB above the measured rating background level (INP, 1.4.4, p 5 and 2.1, p 14).

301 Amenity criteria are intended to protect the noise amenity of an area to limit continuing increases in noise levels. The INP provides that the "maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels in Table 2.1. Meeting the acceptable noise levels in Table 2.1 will protect against noise impacts such as speech interference, community annoyance and, to some extent, sleep disturbance." (INP, 2.2, p 15).

302 The amenity criterion is based on noise criteria specific to land use and associated activities (INP, 1.4.4, p 5). At Table 2.1 of the INP (p 16), for a residential receiver in a rural noise amenity area (which are both applicable to Bulga), acceptable LAeq noise levels are 50 dB(A) for day, 45 dB(A) for evening, and 40 dB(A) for night and recommended maximum levels are 55 dB(A) for day, 50 dB(A) for evening, and 45 dB(A) for night. "Day" is defined as 7.00am-6.00pm Monday to Saturday and 8.00am-6.00pm Sundays and public holidays; "evening" as 6.00pm-10.00pm; and "night" as 10.00pm-7.00am Monday to Saturday and 10.00pm-8.00am Sundays and public holidays (INP, pp 56 and 58).

303 After assessing intrusiveness and amenity, it is necessary to set the project-specific noise levels. The INP provides that for a particular project, "the more stringent of the intrusive or the amenity criteria sets the project- specific noise levels for that project". (INP, 1.4.4, p 5).

304 The third step in the INP process for noise management is to take account of any annoying noise characteristics. The INP notes that where a noise source contains certain characteristics, such as tonality, impulsiveness, intermittency, irregularity or dominant low frequency content, it can cause greater annoyance than other noise at the same noise level (INP, 4.1, p 28). Of critical relevance to the Project is low frequency noise. The INP defines low frequency noise as "noise containing major components within the low frequency range (20 Hz-250 Hz) of the frequency spectrum" (INP, 4.2, p 28). The INP outlines the correction factors to be applied to the source noise level at the receiver, before comparison with the noise criteria specified, to account for the additional annoyance caused by these modifying factors (including low frequency noise (INP, 4.1, p 28)). Table 4.1 of the INP (p 29) requires, for low frequency noise, a correction of 5 dB to be added to the measured or predicted noise levels if the difference between the C-weighted and A-weighted levels over the same time period is 15 dB or more.

305 The fourth step in the process specified in the INP is to account for the effect of meteorology on

noise levels. The project-specific noise levels are expected to apply under weather conditions characteristic of an area. These conditions may include calm, wind and temperature inversions (INP, 1.4.4, p 5).

306 Section 5 of the INP outlines the process for assessing the amount by which noise is increased by the effects of certain meteorological conditions. The INP notes (5.1, p 31) that temperature inversions (atmospheric conditions where temperatures increase with height above ground level) and where there is a wind gradient (that is wind velocities increasing with height) with wind direction from the source to the receiver, typically increase noise levels by 5 to 10 dB, or as much as 20 dB in extreme conditions. Figure 5.1 provides the procedure for assessing the amount by which noise is increased by inversion effects, confined to the night noise assessment period as this is when temperature inversions usually occur and disturbance to sleep is possible (INP, 5.2, p 31-32).

307 After determining the project-specific noise levels, the fifth step in the INP process is to predict the noise levels from the industrial noise source, which can then be compared with the project-specific noise levels to determine the noise impacts (see Section 6 of the INP, pp 36-37).

308 When the predicted noise level from the industrial noise source exceeds the project-specific levels, mitigation measures that will reduce noise levels to meet the project-specific noise levels need to be considered (INP, 7.1, p 38). This is the sixth step in the INP process.

309 There are three main mitigation strategies for noise control: controlling noise at the source (using best management practice and best available technology economically achievable); controlling the transmission of noise (through the use of barriers and land-use controls, which attenuate noise by increasing the distance between source and receiver); and controlling noise at the receiver.

310 Controlling noise at the source involves, first, application of best management practice but then, when best management practice fails to achieve the required noise reduction by itself, use of best available technology economically available (INP, pp 38-39). Best management practice is the adoption of particular operational procedures that minimise noise while retaining productive efficiency. The INP suggests, as an example for open cut mines, that application of best management practice may involve "restricting movement of trucks on ridgelines and exposed haul routes where their noise can propagate over a wide area, especially at night. This means restricting night-time movement of spoil to areas shielded by barriers or mounds, and reserving large-scale spoil movements for daytime" (INP, 7.2, p 38). Another practice suggested by the INP is scheduling the use of noise equipment at the least sensitive time of day (INP, 7.2, p 38). Use of the best available technology economically available involves ensuring that equipment, plant and machinery that produce noise incorporate the most advanced and affordable technology to minimise noise output (INP, 7.2, p 39). Examples of use include adjusting reversing on heavy equipment to limit acoustic range to the immediate danger area; using equipment with efficient muffler design; using quieter engines; and active noise control (INP, 7.2, p 39).

311 Controlling noise in transmission includes use of barriers, such as earth mounds or bunds (INP, 7.3, p 39). Land use planning is a strategic approach to noise mitigation involving isolation, by

strategic planning, of future sensitive land uses, such as residential development, from future noise-producing industries, such as extractive industries and open cut mines. (INP, 7.3, pp 39-40). It is of no assistance for existing land uses near industries, as is the case here.

312 Controlling noise at the receiver is expensive when many receivers require treatment (INP, 7.4, p 40). The two major controls are insulation and double-glazing of windows. For these to be effective, the residence needs airconditioning or a sophisticated ventilation system that does not compromise the effect of the noise insulation. The most extreme control is property acquisition (INP, 7.4, p 40).

313 The INP provides a preference ranking for particular noise mitigation strategies, from most preferred to least preferred, of land-use controls to separate noise-producing industries from sensitive areas; control at the source; control in transmission; and receiver controls, which are "the least-preferred option, as it protects only the internal environment of the receiver and not the external noise environment" (INP, 7.5, p 40-41).

314 The seventh and eighth steps in the INP process, where applied to a consent authority's determination of whether to approve a noise-producing project and, if so, the noise limits and noise mitigation strategies to be imposed in the conditions of approval, include an evaluation of the acceptability of setting noise limits in the conditions at levels greater than the project-specific noise levels. Section 9 of the INP notes that a consent authority in determining whether to grant approval to a noise producing project and if so, on what conditions, will undertake the analytical process specified in the INP, including taking into account the assessed noise impact (which includes the impact of the noise source and any additional impact caused by meteorological conditions), mitigation measures required to achieve the project-specific noise levels, and whether the final noise level proposed is acceptable (INP, 9.1, p 47).

315 The INP notes that it is important that the noise limit fixed by the conditions of approval apply under the typical meteorological conditions determined by the INP to be relevant to the assessment site (INP, 9.1, p 47). However, the noise limits may be expressed to not apply under typical meteorological conditions, such as particularly intense, non-standard temperature inversions. The INP gives an example of an approval condition for a development where F-class inversions (normally associated with non-arid areas such as the Hunter Valley) are a feature of the area. The Condition specifies the meteorological conditions under which the noise limits apply and do not apply:

> The noise limits apply under all meteorological conditions except
>
> during rain and wind speeds greater than 3 m/s; and
>
> from 6 pm to 7am during intense inversions, which are indicated by cloud cover less than 40 per cent and wind speeds less than 1.0 m/s.
>
> Note: Wind data should be collected at 10 m height.

316 The INP notes that the latter point in the Condition excludes non-standard inversions (which are intense inversions - G-class in the example given, compared to the standard F-class inversion) (INP, 9.2, pp 47-48).

The process followed for setting noise criteria in the Project Approval

317 Mr Parnell explained the process the Department followed in setting the noise limits in the conditions in the Project Approval (affidavit affirmed on 7 September 2012). Mr Parnell stated that the noise levels set in the originally proposed conditions address both intrusive noise criteria and amenity noise criteria, as addressed in the INP.

318 Intrusive noise criteria are set relative to the background noise levels and are used to contain the emergence of industrial noise over the surrounding noise levels. As a starting point, the project-specific noise levels ('PSNLs') were established at 5 dB(A) above the rating background level ('RBL') or 30 dB(A), whichever was the higher (aff at [14]). The measurement period for intrusive noise criteria is 15 minutes Leq (15 minute) (aff at [15]).

319 Mr Parnell explained how the intrusive noise criteria in the proposed conditions were established, (aff at [20]-[21]) starting with the PSNL:

> For Bulga, the RBL [rating background level] was calculated to be 33 dB(A) in the Environmental Impact Assessment in 2002. In assessing the Project, I considered that calculation of the RBL to still represent valid background levels. The PSNL was therefore 33 + 5 = 38 dB(A).
>
> On the basis of my experience with the EPA, and more recently in my interaction with the EPA in assessing projects for the Department, I consider there is the established practice between the Department and the EPA is [sic] to follow the protocols below for setting the intrusive noise criteria for a project:
>
> (a) If the predicted noise levels at a receiver are less than the PSNL: Set criteria for the receiver at predicted level with a minimum level of 35 dB(A).
>
> (b) If the predicted noise levels at a receiver are the same as the PSNL: Set criteria at the PSNL. For Bulga, this would be 38 dB(A) at night.
>
> (c) If the predicted noise levels at a receiver are 1-2 dB above the PSNL: Set criteria at the predicted level, provided reasonable and feasible mitigation measures have been implemented. For Bulga this would be 39-40 dB(A) at night.
>
> (d) If the predicted noise levels at a receiver are 3-5 dB(A) above the PSNL: Set criteria at predicted level but assign treatment rights (the right to obtain mitigation measures on request) to the property. For Bulga this would be 41-43 dB(A) at night.
>
> (e) If the predicted noise levels at a receiver are greater than 5 dB(A) above the PSNL: Assign acquisition rights to the property. For Bulga, this would be greater than 43 dB(A) at night.

320 This approach was reflected in Conditions 1 to 3 of Sch 3 of the Project Approval, where the noise criteria for the Project are set in Condition 3 and acquisition rights and mitigation rights are provided in Conditions 1 and 2 (aff at [22]).

321 The amenity noise criteria are set to protect the noise amenity of the surrounding noise catchment. These are land use specific and are set to protect at least 90% of the population from being highly annoyed (aff at [16]). The purpose is to cap the noise levels at an acceptable level and to limit any background noise creep that would occur if only the intrusive noise criteria were adopted and multiple industries moved into the area (aff at [17]). The amenity noise criteria average the noise over each of three periods, the day, evening and night periods (Leq (period)). The objective for a rural area for a night period is for all cumulative industrial noise to be 40 dB (A) averaged over the 9 hour period (aff at [18]). The Department therefore set an amenity (cumulative) noise criterion for the night period of 40 dB(A) LAeq (period) for Bulga and all other privately owned land (in former Condition 5 of Sch 3). The amenity (cumulative) noise criteria for the other periods of day and evening were higher (reflecting the higher ambient noise in these periods), being 45 dB(A) LAeq (period) for evening period for both Bulga and all other privately owned land and for day period 55 dB(A) LAeq (period) for Bulga and 50 dB(A) LAeq (period) for all other privately owned land. The amenity (cumulative) noise acquisition criteria were set at 5

dB(A) LAeq (period) above each of these amenity noise criteria (in former Condition 6 of Sch 3).

322 Mr Parnell stated (aff at [19]) that there is not a strict arithmetical relationship between the Leq (15 minute) level and the Leq (period) level due to the differing time domains and the variability that can occur in the meteorological conditions over time. In assessing mine noise, there is a general rule of thumb of a 3 dB(A) difference between the Leq (15 minute) level and the Leq (period) level for mine noise. Hence, 43 dB(A) Leq (15 minute) approximates 40 dB(A) Leq (period).

323 Mr Parnell stated that in fixing the amenity (or cumulative) noise criteria the Department determined to treat the Warkworth mine and the Mount Thorley mine as a single mine complex. The other mine in the area that could have a cumulative noise impact on the residents of Bulga is the Bulga mine (aff at [34]). In order for the Mount Thorley-Warkworth mine complex to exceed amenity (cumulative) noise criteria in concert with another mine, such as the Bulga mine, one or more mines would need to exceed their intrusive noise criteria for the whole 9 hour night period (aff at [35]).

324 Mr Parnell gives an example, using the intrusive noise criterion for the night period for all other privately owned land in Bulga for the Mount Thorley-Warkworth mine complex of 38 dB(A) (in Condition 3 of Sch 3 of the Project Approval) and the equivalent intrusive noise criterion in the development consent for the Bulga mine of 36 dB(A) LAeq (15 minute). Adding logarithmically these two intrusive noise criteria gives a result of Leq (15 minute) of 40 dB(A). Applying the rule of thumb, 40 dB(A) Leq (15 minute) approximates 37 dB(A) Leq (period). That level would be 3 dB(A) below the amenity (cumulative) noise criteria for all other privately owned land of 40 dB(A) and 8 dB(A) below the amenity (cumulative) noise acquisition criteria of 45 dB(A) (aff at [36]).

325 Mr Parnell further stated that, in his experience, he has not seen or heard of a situation where the cumulative noise criteria have been breached before the intrusive noise criteria as a result of mining activity. Hence, he has never been in a position where it was necessary to assess compliance with the cumulative noise conditions from mining activity, as there has not been a situation where these limits were breached (aff at [38]).

326 No doubt as a result of Mr Parnell's experience, the Department in its revision of the conditions of approval deleted these conditions setting amenity (cumulative) noise criteria and cumulative noise acquisition criteria for the Project. The Project now only needs to comply with intrusive noise criteria and the proposed conditions only set intrusive noise criteria for operations, mitigation and acquisition.

The Project Approval noise criteria and mitigation strategies differ from those of the INP

327 The approach adopted by the Minister in establishing the noise criteria in the proposed conditions differs from the approach required by the INP in five significant respects. First, for many residences, a higher background noise level has been used than is supported by the measurement evidence. As both intrusiveness criteria and amenity criteria are dependent on background noise, the result of using higher background levels has been to increase the project-specific noise levels. Secondly, the project-specific noise levels are not the lower of the intrusive criterion and the amenity criterion, as required by the INP, but have been increased to equate with the predicted noise levels for the Project. Thirdly, the noise limits in the conditions do not

apply under all meteorological conditions typical to the area, as required by the INP. Fourthly, the approval conditions do not account for annoying noise characteristics, such as low frequency noise. Fifthly, the noise limits in the conditions of approval are not specific to only the Project but are combined with another mine project not the subject of the approval.

328 One consequence of these differences in approach to setting noise limits in the approval is that the noise limits are greater, and hence noise emissions from the Project at the greater noise levels permitted will have greater noise impacts, including intrusiveness and on amenity. In my view, these greater noise impacts are unacceptable. A second consequence flows from the setting of noise limits at too high levels. If the noise limits were to be reduced to the levels that would result from application of the INP, more extensive noise mitigation strategies would be required. In particular, many more properties would need to have mitigation works undertaken, such as insulation, double glazing of windows and airconditioning, or be acquired by Warkworth. The extent of controls at the noise receivers and the impacts those controls will cause, are sufficiently great as to be unreasonable in my view.

329 I will now elaborate on the five respects in which the approach of the Project Approval differs from that of the INP.

Establishing too high background levels

330 The INP addresses the importance of establishing background levels before intrusive noise can be assessed (3.1, p 22). The respondents relied on the selection of 33 dB(A) as the background noise level based on a noise survey taken at six representative monitoring stations as part of the preparation of the 2002 EIS, and results of monitoring in 2008 which suggested that the 2002 data remained representative of background noise (Minister's Notes in relation to Noise Conditions dated 7 September 2012 [6]). The Department was satisfied that this method of establishing background noise levels, and the levels themselves, were "reasonable and consistent with guidance levels provided by Australian Standards and the INP" (Minister's Notes in relation to Noise Conditions dated 7 September 2012 [6], referring to TB vol 2, tab 9, p 810). In his affidavit Mr Parnell stated (at [20]) that in assessing the Project, he had considered that calculation of the RBL to still represent valid background levels. In assessing the noise impact assessment prepared on behalf of Warkworth, Mr Parnell had noted that "[l]evels adopted as background noise levels are generally within 3-4 dB(A) of the minimum accepted RBL of 30 dB (A) recommended in the INP as a basis for calculation of intrusive noise criteria" (Parnell aff, Annexure D, at 2.1).

331 However, the evidence establishes that the background noise level for some residences to the north of Bulga village is 30 dB(A) rather than 33 dB(A). The 2002 Noise and Vibration Study undertaken on behalf of Warkworth by ERM (Supp TB vol 4, p 2199), included data from two noise logger locations in Bulga (N6) and to the north of Bulga (N5). Relying on table 2.2 of the ERM 2002 report, residences close to N5 would have a background noise level of 30 dB(A) during the day and night, and 31 dB(A) in the evening. The correlation of Figures 2.1 and 2.2 of the 2002 ERM report with the mapping of residences in Exhibit W20 confirms that a number of residences to the north of Bulga village, being numbers 25, 27, 29, 34 and 42, would be in that locality. If that is correct, and the background is 30 or 31 dB(A), applying the INP would lead to an intrusive noise level for those residences of 35 or 36 dB(A), rather than 38 dB(A).

332 This variation in background noise levels in one part of the Bulga area likely to be affected by noise of the Project raises doubts as to the reliability of the adopted background noise levels for other parts of that area. The six monitoring stations used in preparation of the 2002 EIS for the original mine are not distributed over all of the area likely to be affected by the current Project. The residents' evidence is that there are differences in noise levels and the characteristics of the noise at different receivers to those at or near the monitoring stations.

333 The consequence of adoption of too high background noise levels is not only to increase the project-specific noise levels (and the still higher noise levels set in the proposed conditions of approval), but also to apply less noise mitigation strategies. The proposed conditions of approval make the undertaking of noise mitigation or acquisition of properties dependent on the noise generated at the Mount Thorley-Warkworth mine complex exceeding specified criteria. Those criteria are based on the adopted background noise levels plus 5 dB(A) for the intrusiveness criterion plus the margins applicable for either mitigation (3-5 dB(A)) or acquisition (>5 dB(A)). Using the example of the residences to the north of Bulga, adoption of a background noise level of 33 dB(A) for the night period results in a noise mitigation criterion of 41 dB(A), (that is, assigning a right to obtain mitigation measures if the noise generated by the Mount Thorley-Warkworth mine complex is greater than 41 dB(A), being 33 plus 5 plus 3 dB(A)) and a noise acquisition criterion of 43 dB(A) (that is, assigning a right to have the property acquired if noise generated is greater than 43 dB(A), being 33 plus 5 plus 5 dB(A)). However, if a lower background noise level is used, such as 30 dB(A) measured for the night period, the noise mitigation criterion would be 38 dB(A) and the noise acquisition criterion would be 40 dB(A). A lowering of the noise mitigation and acquisition criteria increases the number of properties likely to require mitigation or acquisition.

Setting the criteria based on what the mine can achieve, not what is acceptable

334 The setting of criteria by reference to the predicted level above the PSNL is based on the approach adopted by the 2004 Commission of Inquiry under the then s 119(1) of the EPA Act into the environmental aspects of the proposed extension of coal mining operations at the Mount Owen mine. The PSNL had been assessed for that project at 35 dB(A). The then Department of Environment and Conservation (DEC) and Department of Infrastructure Planning and Natural Resources (DINPR) had considered an exceedence of up to 2 dB(A) as minor; between 2 dB(A) and 5 dB(A) as marginal; and greater than 5 dB(A) as significant (Exhibit W3, p 40). The Commission of Inquiry agreed with DIPNR that the applicant should be required to acquire properties affected by noise levels over 40 dB(A) if the owner requested, and recommended that residences predicted to be affected by project noise levels above 37 dB(A) and up to 40 dB(A) should be able to request strategies such as double glazing, insulation and air conditioning (Exhibit W3, p 40). This approach by the Commission of Inquiry has been followed by the Department of Planning and other mine proponents in setting noise limits and criteria for noise mitigation and acquisition of noise-affected properties in development consents and project approvals for mines. (Minister's notes re Applicant's proposed conditions, [6]-[7]).

335 The justification provided in these proceedings for regarding predicted exceedences of 1-2 dB (A) as minor, and setting the noise limits to permit higher levels of noise, was that measurement, and perception, of noise, are difficult, and that there should be latitude given that

these are conditions that need to be enforced (Williams subs T 8/11/12, p 227.20). Indeed, the reality is that the Project cannot achieve, by controlling noise at the source or the transmission of noise, the project-specific noise levels that would be derived by application of the INP. The noise limits proposed in the conditions have therefore been increased beyond what would be the project-specific noise levels to match the predicted noise levels of the Project.

336 The INP does contemplate that it may, in some instances, be appropriate to set noise limits for a development above the project-specific noise limits recommended by the INP (1.4.7, p 6). Part 9 of the INP states that determining an approval condition should take into account the assessed noise impact (including additional impact caused by meteorological conditions); mitigation measures required to achieve project-specific noise levels; identification of a practical limit on noise control; consideration of trade offs; and whether the final noise proposed is acceptable (INP, 9.1, p 47). In particular, there needs to be an evaluation of the acceptability of setting noise limits in the approval conditions above the project-specific noise levels.

337 The approach adopted by the Department of Planning and Warkworth in setting the noise limits in the approval conditions is not consistent with the approach recommended by the INP. There should be first a correct identification of the project-specific noise levels, derived from application of the INP. In the case of the Project, these would be lower at many locations than the noise limits proposed in the approval conditions. Next, the predicted noise levels, after applying all feasible and reasonable mitigation strategies, should be calculated. Then there should be an assessment that quantifies the remaining or residual noise impacts of the Project that exceed the project-specified noise levels, after applying feasible and responsible mitigation strategies.

338 Finally, there should be an evaluation of the acceptability of the residual noise impacts. The evaluation of acceptability should take into account:

(a) characteristics of the area and receivers likely to be affected, such as the extent of the areas and the numbers of receivers likely to be affected by noise level above the project-specific noise levels, the daily activities of the community (in particular, effects such as sleep disturbance and level of annoyance), the potential change in the ambient noise level as a result of the Project, cumulative noise impacts in the area, and whether parts of the area that are already moderately or badly affected by noise will be more affected;

(b) characteristics of the project and its noise, such as the noise characteristics of the activity, the extent to which any remaining noise impact exceeds the project-specific noise levels, the circumstances and times when the project-specific noise levels are likely to be exceeded, the circumstances and times when the source noise levels are likely to be below the project-specific noise levels (for example when wind blows source noise away from the receiver), the accuracy with which impacts can be predicted and the likelihood that the impacts will occur in the manner predicted, and the economic benefit and social worth of the project for the local area, the region or the nation;

(c) the feasibility of additional mitigation or management measures; and

(d) equity issues in relation to the costs borne by some for the benefit of others, the long term cumulative increase in noise levels, and the opportunity to compensate effectively those affected (INP, 8.2.1, pp 43-44).

339 Whilst some of these factors were taken into account by the Department and Warkworth, all of the factors were not taken into account in setting the noise limits in the approval conditions. There has been no evaluation of the acceptability of setting those noise limits for the Project above the project-specific noise levels recommended by the INP. The twin reasons given, that setting higher limits accords with the departmental practice since 1994 and with what is able to

be achieved by the Project, are not cogent reasons for departing from project-specific noise levels recommended by the INP.

340 In my view, consideration of the factors suggested in the INP for evaluating the acceptability of the residual impacts supports a conclusion that setting the noise limits above the project-specific levels recommended by the INP is unacceptable.

341 In relation to the characteristics of the area and receivers likely to be affected, there is a wide area and there are numerous receivers likely to be affected by noise from the Project above the project-specific noise levels. This is firstly illustrated by the fact that the predicted worst case Leq (15 minute) noise level for both Warkworth and Mount Thorley mines would equal or exceed the operational noise limit set for the Warkworth mine in the 2003 Warkworth consent for 84% of Bulga residences and the proposed combined operational criteria for both mines for 56% of Bulga residences.

342 This is secondly illustrated by the location and number of properties that would need to have controls at the receiver, either by way of mitigation treatment to the residential dwelling or acquisition of the property. The majority of the 20 properties identified as subject to acquisition on request for noise or noise and air are located in Mount Thorley, to the east of the mine; two are located in Warkworth, to the north, and three in Bulga on Putty Road to the east of Wollombi Creek. Of the 41 properties identified as subject to mitigation measures on request for noise or noise and air, over half are located in Bulga: 11 on Wambo Road to the north, 11 on Inlet Road to the south west, and three on Wambo Road to the south of Bulga village. The remainder are located in Maison Dieu, to the north of the mine, Gouldsville/Long Point to the north east, and eight are located in Hambledon Hill, to the north east of the mine.

343 The evidence establishes that noise emitted by existing operations interferes with the daily activities of receivers, including sleep disturbance and annoyance. The residual impacts of noise exceeding the project-specific noise levels could only exacerbate such interference. The residual impacts would be cumulative upon an already adversely affected noise environment.

344 In relation to the characteristics of the Project and its noise, the noise characteristics of the Project include low frequency content which increases annoyance. The residual noise impacts exceed project-specific noise levels by a sufficient extent as to justify undertaking controls at numerous receivers, such as by mitigation treatment and acquisition. The project-specific noise levels are likely to be exceeded at any time throughout the day, evening and night, as the Project operates continuously 24 hours a day, each day and there is no restriction on the nature or location of noise-producing activities throughout the day. As indicated below, the noise criteria do not operate during certain meteorological conditions, but this does not mean that noise levels will be below project-specific noise levels at that time - indeed, it is likely they may be above (such as at times of extreme temperature inversions). Under the proposed conditions there will be great difficulty in monitoring compliance with the noise limits proposed in the conditions. There is not reasonable certainty that the Project could comply with those limits, let alone if the limits were set at the lower project-specific noise levels. There is, therefore, considerable uncertainty in the prediction of residual impacts.

345 In relation to additional mitigation measures, those measures proposed in the conditions are

unlikely to be efficacious in mitigating or managing noise from the source to a sufficient extent, or in a sufficiently timely manner, to reduce noise at receivers to the project-specific noise levels.

346 In relation to equity issues, the costs resulting from the residual impacts will be borne by the residents of Bulga who are the noise receivers, but the benefits of the Project will be enjoyed by others, including Warkworth. The burdened residents of Bulga will not be compensated effectively by Warkworth. There will not be full internalisation by Warkworth of the external costs of the Project, occasioned by its noise impacts, on the Bulga residents. Even the residents who are eligible to and do request noise treatment of their houses to control noise at the receiver will not receive compensation for the reduction in amenity and enjoyment from the noise treatment (such as not being able to open windows or use outdoor recreation areas). If they are eligible to and do request acquisition of their properties, compensation will not be on a value to owner basis or address the subjective or emotional loss occasioned by being dispossessed of their home. The long term cumulative increase in noise levels caused by the expansion of the Warkworth mine, as well as the Mount Thorley mine and other mines in the area, is not addressed.

347 In my view, the case has not been made for setting the noise limits for the Project at the levels proposed in the approval conditions above the project-specific noise levels recommended by the INP. Furthermore, even if the project-specific noise levels recommended in the INP were to be applied in the approval conditions, the Project would be unable to comply with these limits, triggering far more extensive noise mitigation at receivers and acquisition of receivers' properties, which would itself lead to unacceptable impacts.

Insufficient accounting for the effect of meteorology on noise levels

348 The INP requires that the noise limits in the approval conditions (which ordinarily should be the project-specific noise levels) should apply under all weather conditions characteristic of the area. These may include conditions of calm, wind and temperature inversions (INP, 1.4.4, p 5; 5.1, p 31 and 9.1, p 47). To ensure that the noise limits in the approval conditions do apply under typical meteorological conditions, the INP recommends inclusion of a condition of approval to this effect. However, the INP recognises that the approval condition may exclude application of the noise limits in non-standard meteorological conditions (INP, 9.2, p 48).

349 The proposed conditions of approval purport to adopt this approach. Conditions 3 and 4 of Sch 3 provide that the noise criteria therein stated apply in the meteorological conditions set out in Appendix 12. Paragraph 1 of Appendix 12 states that the noise criteria apply under all meteorological conditions except those specified in the paragraph, which are:

(a) during periods of rain or hail;

(b) average wind speed at microphone height exceeds 5 m/s;

(c) wind speeds greater than 3 m/s measured at 10 m above ground level; and

(d) temperature inversion conditions greater than 3°C/100 m

350 That is a change from the conditions approved by the Minister, which simply stated in the notes to the conditions that "noise generated from the Mount Thorley-Warkworth mine complex is to be measured in accordance with the relevant requirements, and exemptions (including certain

meteorological conditions)" of the INP.

351 Except for measuring wind speed at microphone height (subpara (b)), the data used is that recorded by the meteorological station located on the site, not at the receivers (para 2).

352 The INP identifies two situations where meteorological conditions may increase noise levels: during temperature inversions and where there is a wind gradient with wind direction from the source to the receiver (INP, 5.1, p 31). These two types of meteorological conditions are included in the first example of a condition of approval given in the INP (pp 47-48). However, to be an exception, the inversion or the wind gradient must be non-typical or non-characteristic of the area. Conditions of wind and temperature inversion which are typical or characteristic of an area should not be excepted. The INP's example is of a development where F-class inversions (normally associated with non-arid areas such as the Hunter Valley) are a feature of the area. The Condition given applies the noise limits in all meteorological conditions (including during F-class inversions) except where there is a non-standard intense inversion (a G-Class inversion in the example given). The INP's example also exempts application of the noise limits when there are source-to-receiver wind speeds (at 10m height) which are greater than 3 m/s (INP, 9.2, p 48).

353 The assessment of potential for temperature inversions and of wind effects undertaken as part of the Noise and Vibration Study for the 2010 Environmental Assessment (Annexure G) concluded from monitoring in 2006-2008 that F-class inversions occurred for only 10% of winter nights, which is below the 30% threshold where temperature inversions are considered to be a "feature" of the area. While that meant that this factor did not need to be included in the noise impact assessment, the prediction of noise levels included consideration of the effects of a 3° C/100 m temperature inversion. The wind in the Project area was assessed as above the INP threshold of 3 m/s or below at 10 m height occurring for 30% of more of the time in any assessment period in any season. The modelling included a drainage wind of 2 m/s and a 3° C/100 m temperature inversion for Year 2, when [the] mining plant will operate on Saddleback Ridge (Annexure G to EA, p 27).

354 I accept that the modelling for the noise assessment incorporated the relevant factors identified in the INP, including F-class temperature inversions which although not found to be a feature of the area, are identified in the INP as being a feature of the Hunter Valley generally.

355 The relevance of Appendix 12 comes in determining compliance with the noise criteria in Tables 3 and 4.

356 Subparagraph (a) of para 1 of Appendix 12 makes the noise criteria not applicable during periods of rain or hail. The exclusion of periods of rain is consistent with the INP's recommendation that noise monitoring should not be conducted when rainfall occurs (provided the proponent is able to show that sound levels due to rain are at least 10 dB(A) below the noise levels (that is, background and/or ambient) under investigation) (INP, 3.4, p 26 and Appendix B, B 1.1, pp 68-69). The EA in this case does not show that sound levels due to rain are at least 10 dB(A) below the background or ambient noise levels. But in any event, the INP only recommends excluding noise monitoring during rain rather than making the noise criteria for a project not applicable.

357 Subparagraph 1(b) excepts application of the noise criteria where "average wind speed at microphone height exceeds 5 m/s". The INP recognises that wind can create extraneous noise on noise-monitoring equipment and suggests that an upper limit of 5 m/s at the microphone position is commonly applied during noise measurement to reduce this effect (INP, 5.3.2, p 35). However, again this is an issue of measurement of the noise generated by the Project at a receiver and does not provide a basis for exempting the Project from complying with the noise criteria. Put another way, if the average wind speed at microphone height at a particular receiver exceeds 5 m/s, it may not be possible to establish whether the noise generated at the Mount Thorley-Warkworth mine complex exceeds the criteria in the conditions of approval, but that does not justify making the criteria not applicable. I note that the example condition given in the INP does not include an exception for wind near the ground at the microphone position.

358 Subparagraph 1(c) reflects the default wind speed and height provided in the INP for assessing noise impacts of gradient winds (INP, 5.3.2, p 35). The INP recognises that winds at these speeds can noticeably increase noise received downwind of a noise source but may not increase ambient noise levels to the point where they mask noise from the source and make it unnoticeable. However, the subparagraph does not specify that the exclusion of wind speed greater than 3 m/s only applies when the wind direction is from source to receiver.

359 The exception in subparagraph 1(d) ("temperature inversion conditions greater than 3°C/100 m") is drafted so as to continue the application of the noise criteria in an F-class inversion, but not for more intense inversions (G-class or above).

360 While these exclusions might be inspired by the approach adopted in the INP for noise prediction and noise monitoring, they do not operate to exclude noise monitoring to determine compliance with the noise criteria during the excluded meteorological conditions but rather operate to exclude the applicability of the noise criteria during those conditions. This lessens the incentive for the mine to conduct its operations so as to keep noise emissions below the specified noise criteria. That would be the case in particular during periods of predicted continued rain when the noise criteria would not apply and there would be no limits to the noise the mine complex could emit.

361 Further, the weather data, other than wind speed at microphone height, is taken at the mine, and not at the receiver, and it is therefore possible for experience of actual noise impacts at the receivers to be different, and potentially non-compliant. While Appendix 12 is drafted with greater precision than the conditions as approved by the Minister, it does not provide any assurance that the mine complex would meet the noise criteria at all times.

Insufficient accounting for annoying noise characteristics

362 The INP requires modifying factor corrections to be applied to the noise from the source measured or predicted at the receiver before comparison with the noise criteria (see Section 4 of INP). The particular modifying factor affecting noise from the Project is the low frequency content. The SKM report (Ishac report, Appendix C) concluded that two of the eight locations monitored (345 Wambo Road and 339 Inlet Road) were significantly impacted by low frequency noise, as over 30% of results exceeded the INP criteria; and a further two (129 Wambo Road and 5a Noses Peak Road) were moderately affected by low frequency noise (6.3.2, p 33).

363 The noise criteria in the proposed conditions of approval have not been set having regard to, and do not refer to, low frequency noise. Low frequency noise is taken into account in evaluating compliance with the noise criteria in the conditions of approval. Conditions 3 and 4 of Sch 3 provide that Appendix 12 sets out "the requirements for evaluating compliance with these criteria" specified in these conditions. Paragraph 4 of Appendix 12 requires compliance monitoring to be carried out in accordance with the relevant requirements for reviewing performance set out in the INP (in Section 11) relating to, amongst other matters, "modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration". One of the penalties for modifying factors would be to apply a correction of 5 dB to the source noise level at the receiver if the difference between the C-weighted and A-weighted levels over the same period is 15 dB or more (INP, Table 4.1, p 29). Making this correction may result in the corrected source noise level at the receiver exceeding the noise criteria in the proposed conditions of approval for that receiver.

364 The difficulty with this approach in the proposed approval would be evaluating compliance of the Project in practice. Appendix 12 requires that attended monitoring only is to be used to evaluate compliance. The conditions do not specify the number of attended monitoring stations, the location of the monitoring stations, the frequency of attended monitoring or the duration of attended monitoring on any occasion. Appendix 12 simply states monitoring is to be carried out in accordance with the requirement for reviewing performance in Section 11 of the INP. While this section of the INP provides guidance, it does not prescribe the number or location of monitoring stations, or the frequency or duration of attended monitoring.

365 Condition 8 of Sch 3 of the proposed approval requires the preparation and implementation of a noise management plan. This plan must describe the measures to be implemented to ensure compliance with the relevant conditions of approval, such as a monitoring program that uses attended monitoring measures to evaluate performance of the Mount Thorley-Warkworth mine complex, including a minimum of four days of attended monitoring per quarter at locations agreed by the Director-General or more regularly where required (Condition 8(b), (c) and (d)). Therefore, the number and locations of attended monitoring stations and the frequency of attending monitoring would be determined through preparation of the noise management plan. However, this does not assist the Court, exercising the functions of the approval authority, in determining now whether there will be sufficient attended monitoring to evaluate adequately compliance with the noise criteria. It defers to later, and to the satisfaction of a different person, that determination. Moreover, comparison of the minimum requirement of four days of attended monitoring every 3 months at locations agreed by the Director-General (in Condition 8(d)) with the definition of "sustained exceedence" (in Condition 4) which requires noise generated by the Mount Thorley-Warkworth mine complex not to exceed the noise criteria for 10% or more of an individual day, evening or night on 3 or more occasions during any 30 day period, suggests that the attended monitoring required is unlikely to establish a "sustained exceedence" as there would not be 3 or more occasions of attended monitoring in 30 days at any location.

366 The evidence of attended monitoring in the past is insufficient to allow the Court to draw any inference that attended monitoring in the future is likely to evaluate adequately compliance with the noise criteria. Past attended monitoring has been at too few locations on too few occasions.

Combining the noise criteria for different mines

367 While there are concerns as to the way in which the noise criteria have been set in variance to the approaches recommended in the INP, of more fundamental concern is the decision to combine the noise criteria for the Warkworth and Mount Thorley mines. This has no precedent in the INP.

368 The Mount Thorley and Warkworth mines have separate, but cross linked, ownership and operate under separate consents. The mines have been operated under single management as an integrated mine complex since 2004, sharing employees and surface infrastructure, and are connected by a series of haul roads (with bridges over Putty Road), conveyors and pipelines; coal, overburden, tailings and water is moved between the two mines (DP&I Environmental Assessment Report, TB vol 2, tab 9, p 792). The proposed extension involves the transfer of overburden and coal between the two mines, and the continuation of the use of the Mount Thorley coal preparation plant and other mining infrastructure currently used for the integrated Mount Thorley-Warkworth operations after mining ceases at Mount Thorley in 2017 (Ishac report [10]).

369 The Abbey Green modification to the Mount Thorley consent, approved in May 2012, extends the Mount Thorley pit to the west closer to Bulga village (Williams subs, T 8/11/12, p 229). Evidence as to the modelling undertaken for setting the noise limits for Mount Thorley was not before the Court (Williams subs, T 8/11/12, p 228). However, Annexure G to the EA (Vol 3), the PPR, and the data in Exhibit W30, provide a basis for an understanding of the Mount Thorley noise criteria in relation to one of the residential receivers (65), which is located close to the intersection of Wambo Road and Putty Road, and thus for an understanding of how the combined criteria would work. Table 11 of Annexure G (p 49) includes the operational limit of 38 dB(A), and worst case figures of 38 dB(A) in Year 9 (day, adverse meteorological conditions) and Year 21 (night, adverse meteorological conditions). Based on the PPR table 4.3, the predicted worst case was 38 dB(A) for Warkworth alone; and for the combined Warkworth and Mount Thorley, 42 dB(A). The data provided by Mr Ishac (Exhibit W30) that includes the Abbey Green modification shows that for receiver 65, Mount Thorley would be 40 dB(A). On a logarithmic basis, subtracting 38 from 42, Mount Thorley (including Abbey Green) would be 40 dB(A). Warkworth submits (Williams subs T 8/11/12, p 235) that the level of 40 dB(A) would be the predicted noise from Mount Thorley alone, and would satisfy the INP criteria. On that basis, the residents of receiver 65 would be in the same position as they would be if Mount Thorley had been assessed as one project with its predicted noise level of 40 dB(A), and Warkworth as one project with a noise level of 38 dB(A). However, under the proposed conditions, more properties become subject to the mitigation or acquisition entitlements.

370 The PPR recognises that the approach of combining Mount Thorley and Warkworth is inconsistent with the INP (TB vol 1, tab 8, p 557), and highlights the difficulties in the approach. Each mine is separately owned and has its own separate consent, and within those consents there are differences in noise criteria for residences in Bulga. For example, for locations 9, 10 and 15 located in Bulga village, the limits under the Mount Thorley consent are 39 dB(A), 35 dB (A) and 39 dB(A) respectively whereas under the Warkworth 2003 consent all have a noise limit of 38 dB(A) (TB vol 1, tab 8, p 558).

371 The difficulty with accepting the combined criteria is that compliance with two different consents for two different mines is assumed; and while it may be accepted that in practice the two mines are operated as a single entity, the legal separation remains. There is no evidence before the Court as to any contractual or other arrangements between the two mines. No condition has been put forward that would specify what is the noise limit for the Warkworth mine operations alone. To test the operation of the combined criteria, Condition 3 sets 42 dB(A) LAeq (15 minute) as the criteria for receiver 65. If the operational limit for Warkworth alone is 38 dB(A), Mount Thorley would have to adjust its noise to be no greater than 40 dB(A) in order to meet that level. If noise is emitted from Warkworth transferring overburden onto Mount Thorley land which takes up most of the 42 dB(A) allowed for the combined operation, then that would impact on Mount Thorley's ability to continue operations. That would be beyond the reach of any approval granted to Warkworth for its operations. The combined approach also opens up the possibility that a receiver which would otherwise have an acceptable noise level of 38 dB(A) (consistent with the INP), may be subject to a higher level of noise because a project that is not the subject of the application is included in the calculation. It would be possible for receiver 65, for example, to be subject to noise at 42 dB(A) from Warkworth alone if Mount Thorley was not emitting noise; and that would be in excess of the limits on the 2003 consent, and above the level contemplated under the INP.

372 Warkworth submits that in a practical sense that is not how it would operate (Williams subs, T 8/11/12, p 244.15). Warkworth submits that the combined approach is justified, for two reasons: first, the higher number of residences that become entitled to request mitigation or acquisition than would otherwise be the case for Warkworth alone on the 2003 consent; and secondly, because the expectation is that the noise levels will drop once operations at Mount Thorley cease.

373 In my view, it is not sufficient to rely either on a present arrangement for the combined management and operation of the two mines, or on the expectation that noise impacts may improve some years hence. The Court is required to assess the likely noise impacts of the mine that is the subject of the present application, namely Warkworth, and any conditions imposed on a project approval must relate to that project, and be capable of implementation by whomever is carrying out the activities authorised by the approval: *Hub Action Group Inc v Minister for Planning & Orange City Council* [2008] NSWLEC 116; (2008) 161 LGERA 136 at [118]. A condition imposed on an approval granted in these proceedings could not purport to impose obligations on the operator of a separate mine that is subject to its own consent. It is unlikely that any such condition would have a sufficient nexus with the project that is the subject of the present approval and proceedings so as to satisfy the second limb of the *Newbury* test requiring conditions of consent to fairly and reasonably relate to the proposed project: *Hub Action Group* at [125]. Further, any approval granted in these proceedings for the proposed extension could not require, or preclude, the operator of Mount Thorley seeking approval to alter its operations, or to extend its operations past the expected cessation in 2017. The legal inability of Warkworth to control the operations of Mount Thorley mine is recognised in proposed Condition 7(i) of Sch 3, which requires Warkworth "to use its best endeavours to procure the lodgement of an application to modify the Mount Thorley Mine Development Consent as soon as reasonably practicable so that it has noise conditions in similar terms to this approval".

374 Even if there were power to impose a condition that required for its practical implementation an adjustment to operations of a separate mine, or which depended on the operations of a separate mine in achieving compliance, the difficulty in ensuring compliance with such a condition would be a reason not to impose it. On the evidence before the Court, the real time Barnowl monitors located in Bulga would be unable to distinguish noise generated by Warkworth transferring overburden to Mount Thorley from the noise generated by Mount Thorley operations behind. Attended monitoring would be required at more locations and at a frequency substantially higher than that proposed, which is the minimum four days per quarter proposed in Condition 8(d). However, even attended monitoring will have difficulty in distinguishing the sources of noise generated.

Increased noise mitigation and acquisition of noise receivers

375 The proposed conditions (Exhibit W33) include conditions entitling owners of identified privately owned land to request acquisition of their land, or mitigation measures, such as noise treatment of their residences.

376 In appropriate circumstances, it may be desirable to include requirements for undertaking mitigation measures or acquisition of noise affected properties, as a response to identified likely adverse impacts: see, for example, *Ironstone Community Action Group Inc v NSW Minister for Planning and Duralie Coal Pty Ltd* [2011] NSWLEC 195. However, the acceptability of such mitigation and acquisition measures depends on their extent and impacts. In this case, 20 properties are so badly noise affected that the owners are given an entitlement to have their properties acquired at the outset of the Project (Condition 1 of Sch 3). A further 41 properties are sufficiently noise affected as to give the owners an entitlement to have noise treatment on their residence at the outset of the Project (Condition 2). There is also the potential for all privately owned land in Bulga to be acquired if "the noise generated at the Mount Thorley-Warkworth mine complex causes sustained exceedences" of the noise criteria (Condition 4). This might be unlikely because of the high levels at which the noise criteria have been set in the approval conditions (for the reasons given earlier) and the difficulty in ever proving that a "sustained exceedence" has occurred (having regard to the definition and the unlikelihood of the attended monitoring required by the conditions ever establishing a "sustained exceedence").

377 If the noise criteria had been set at the project-specific noise levels as recommended by the INP, and the noise mitigation and acquisition criteria had been set at some margins above that level, more properties would become entitled to request noise mitigation and acquisition, adding to the 61 existing properties already so entitled.

378 Hence, under both the proposed noise criteria in the conditions, and under any noise criteria determined in accordance with the INP, large numbers of persons will be so affected by noise as to give rise to mitigation treatment or acquisition of their properties. In my view, these numbers are sufficiently large as to be evidence of the unacceptability of the noise impacts of the Project. The Project's externalities in terms of noise impacts are sufficiently large in terms of the number of persons and properties affected, areas of extent, and effect, and are insufficiently internalised by the Project, as to be unacceptable.

379 Further, as explained in Part 4 dealing with social impacts, the mitigation strategies proposed,

such as double glazing, airconditioning and the acquisition of homes, themselves have an adverse impact on residential amenity, and potential social impacts of a change in the composition of the community arising from residents leaving Bulga following acquisition of their property.

380 It was common ground that properties acquired by Warkworth are likely to be occupied by mine employees; and that such residences will be subject to noise levels exceeding those considered acceptable under the conditions applicable to privately owned land. The conditions attempt to provide some safeguard for tenants who may occupy properties owned by the mine, such as may occur following acquisition by Warkworth from a private landowner. Proposed Condition 2A of Sch 3 requires that Warkworth terminate a tenancy agreement at the request of a tenant on land owned by Warkworth if noise levels exceed 40 dB(A) LAeq over the night time period; and/or particulate matter concentrations at the residence on the land exceed the criteria listed in Tables 12, 13 and 14. While Condition 2A, added during the course of the proceedings, provides some protection, it does not overcome the possibility that some individuals will be living in residences subject to noise levels that exceed those regarded as appropriate under the INP. It is doubtful whether, even if there is power to impose conditions that leave open that possibility, it is appropriate in the exercise of discretion to do so.

Association's proposed noise conditions

381 The Association has proposed conditions (Exhibit Z) which set lower noise limits that only apply to the Warkworth mine and to the Mount Thorley-Warkworth mine complex, and which would apply to all land including mine-owned properties. The Association also has deleted conditions requiring mitigation measures and acquisition in its proposed conditions.

382 The Association's proposed conditions set the noise criteria limit at 38 dB(A), and 35 dB(A) for those properties for which the background noise level is 30 dB(A). The Minister agreed with Warkworth's position that the noise limits proposed by the applicant amount to a constructive refusal of the application, as they set levels that cannot reasonably be achieved by the Project.

383 Both respondents opposed the Association's proposal to set noise criteria for Warkworth alone. Warkworth's position was that it had originally opposed the Department's proposal for hybrid conditions for the Mount Thorley-Warkworth mine complex, however it has now accepted proceeding on that basis. While Warkworth's position is that it is not possible now to separate the two mines because of difficulty with enforcing compliance, and the number of properties that have been assigned mitigation or acquisition rights, there are figures based on modelling that would enable separate figures to be provided in each of the Project Approvals, and Warkworth would use its best endeavours to achieve those limits (Williams subs, T 15/11/12, p 328.25).

384 Whatever may be the merits of the Association's proposed conditions, including separate provision for the Warkworth mine, it would not be appropriate to impose conditions that could not be met by the proponent of the Project.

Conclusion on noise impacts

385 At the noise levels proposed in the approval conditions, the noise impacts of the Project on the residents of Bulga, including the impact of the noise source on receivers, taking account of

annoying noise characteristics and the effect of meteorological conditions, are likely to be significant, intrusive and reduce amenity. The noise mitigation strategies proposed in the approval conditions are not likely to reduce noise levels to the project-specific noise levels recommended by the INP or to levels that have acceptable impacts on the residents. The significant residual impacts are unacceptable, taking into account social and economic factors. Further, the extensive noise control at receivers, being mitigation treatment and acquisition of properties in Bulga, is likely to cause social impacts. The combining of noise criteria for the Warkworth and Mount Thorley mines in the proposed approval conditions is of doubtful legal validity but in any event is likely to be difficult to monitor or enforce compliance. Hence, no confident conclusion can be drawn that the noise impacts of the Project will be acceptable.

Dust and Air Quality

386 The open cut mining operations at Mount Thorley and Warkworth generate emissions of particulate matter (PM) in a range of sizes, from the handling of dusty materials including soil, overburden and coal, and the combustion of diesel fuel in diesel powered earthmoving equipment with blasting (Holmes aff at 3.2). The evidence of Dr Nigel Holmes, an atmospheric physicist called by Warkworth, was that PM can give rise to health effects, and nuisance effects (4.6). Air quality assessment of a coal mine project is undertaken by reference to criteria for four categories of PM, three of which are defined in terms of the sizes of particles, namely total suspended particulate matter (TSP), particles with a size range 0 to 10 µm (PM10), and particles with a size range of 0-2.5µm (PM2.5). The PM10 and PM2.5 categories have the potential to give rise to health effects (aff at 4.10). Particles larger than 10 micrometres are essentially prevented from entering the human respiratory system by the nature of the respiratory system (4.14); and it is the PM2.5 particles that cause most of the health effects (aff at 4.15), partly because they are able to penetrate more effectively into the deeper parts of the respiratory system and partly because they are more likely to be created either by the combustion of fuels or by chemical reactions that occur in the air when gaseous pollutants such as nitrogen oxides and sulphur oxides are further oxidised to form very small particles. The fourth category of PM is deposited dust, which is used to assess the potential for nuisance impacts to occur (aff at 4.11).

387 The Director-General's Environmental Assessment Report (TB vol 2, tab 9) noted (p 816) that the assessment of air quality for the Project had been undertaken on the basis that all dust emissions associated with the operations of the Mount Thorley-Warkworth mining complex were treated as "project-related" emissions. The assessment modelled TSP, PM10, and deposited dust for mining scenarios in Years 2, 9 and 21; and cumulative emissions of the project operating in conjunction with the nearby Wambo, HVO South and Bulga mines. The assessment included an assessment of cumulative 24-hour PM10 impacts.

388 The Director-General's Environmental Assessment Report noted that the modelling was based on a number of existing and proposed mitigation measures that Warkworth could implement to reduce dust, including:

- minimising disturbance areas;
- watering of haul roads and coal stockpiles;
- limiting the development of minor roads and rehabilitating disused roads;
- revegetating topsoil stockpiles;

- restricting blasting to only occur during favourable conditions;
- minimising dragline and loading/dumping drop heights;
- dust control systems on drill rigs, eg dust aprons, extraction systems and/or water sprays;
- using adequate stemming in blast drill holes;
- suspension of operations in adverse conditions; and
- progressive rehabilitation of disturbed areas.

389 The Director-General's Environmental Assessment Report accepted that there were 8 privately-owned properties including one residence likely to be significantly affected by dust at some stage during the project; 22 private residences likely to experience moderate dust impacts; and 41 mine-owned properties predicted to be significantly or moderately affected by dust during the project (pp 818-9). The Director-General's Environmental Assessment Report noted that there was limited scope to reduce or mitigate impacts further through traditional mitigation measures without significantly down-scaling mining operations or sterilising significant coal resources (p 819). The Department recommended, given what it described as the relatively significant number of privately-owned properties predicted to be affected as a result of the Project, that Warkworth be required to develop and implement an active dust management system, and recommended conditions requiring acquisition on request of the eight significantly affected properties. The Department also recommended that Warkworth undertake additional dust mitigation measures at residences predicted to be significantly or moderately affected.

390 The conditions now proposed (Exhibit W33) include provision for air quality affected properties to request acquisition (Condition 1 in Sch 3) or air quality mitigation (Condition 2 in Sch 3). Eight properties have acquisition entitlements in Table 1 and another eight properties have air quality mitigation entitlements in Table 2. The mitigation measures in Condition 2 include air filters, a first flush roof drainage system and/or airconditioning.

391 Condition 21 of Sch 3 sets the air quality criteria for all land other than the air quality affected land in Table 1. The criteria are long term assessment criteria for particulate matter PM10, short term impact assessment criterion for particulate matter (PM10) and long term impact assessment criteria for deposited dust (maximum increase in deposited dust level and maximum total deposited dust level) (Tables 9, 10, 11 in Condition 21). The incremental increase in deposited dust is required to be dust to the Project on its own (see note (b) to Condition 21). I note that Condition 21 is drafted so as to require Warkworth to ensure "that all reasonable and feasible avoidance and mitigation measures are employed" so that PM emissions do not exceed the criteria established in Tables 9, 10 and 11, rather than requiring compliance with the criteria. As was the case in *Ironstone Community Action Group Inc v NSW Minister for Planning and Duralie Coal Pty Ltd* [2011] NSWLEC 195 at [195], I see no reason why this Condition should not require compliance with the criteria, in common with the conditions relating to noise.

392 Condition 22 establishes an entitlement to request acquisition if particulate matter emissions exceed those criteria at any residence on privately-owned land, or on more than 25 percent of any privately-owned land. Extraordinary events, such as dust storms, are excluded (note d). Increases in deposited dust levels over the criteria must be due to the Project on its own (note b).

393 Condition 23 in Sch 3 would require Warkworth to operate in accordance with specified

operating conditions, which include operating a comprehensive air quality management system on site, minimising air quality impacts during adverse meteorological conditions and extraordinary events, and minimising off-site odour, fume and dust emissions, and visible off-site air pollution. Warkworth would be required under Condition 24 of Sch 3 to prepare and implement an Air Quality and Greenhouse Gas Management Plan that includes an air quality monitoring program.

394 The air quality criteria in Conditions 21 and 22 do not include criteria for PM2.5. The Association submits that specific criteria for PM2.5 are required, because Bulga homes are surrounded by open cut mines and suffer repeated exposure to dust, including PM2.5, from multiple sources, which will continue. The Association submits that the Court should conclude that it cannot know what levels of dust emissions will be experienced by the residents of Bulga and that any exposure to PM2.5 could be harmful to human health (Applicant's closing written submissions, [144]-[146]).

395 The Director-General's Environmental Assessment Report considered PM2.5 (TB vol 2, tab 9, p 816), and noted that there are no current adopted Australian or NSW air quality criteria for PM2.5, although the National Environmental Protection Council ('NEPC') has developed provisional "advisory reporting standards" of 8 microgram/cubic metre (annual average) and 25 microgram/cubic metre (24 hour). The Report noted that the assessment did include modelling of PM2.5 which indicated that the PM2.5 impact area would be similar to the PM10 impact area; the Department was satisfied that PM2.5 impacts would be similar to the PM10 impacts, and that separate consideration of PM2.5 was not necessary or warranted.

396 Dr Holmes conceded in cross-examination that the modelling had not included modelling of the cumulative concentration of PM2.5 in the Bulga area. His evidence was that the levels of PM2.5 experienced in Bulga emitted from the Warkworth and Mount Thorley mines were likely to be low, based on studies in the Hunter Valley which had found that 95% of particulate matter liberated was greater than 2.5 micrometres, because most of the mine-related PM is mechanically generated, and significant force and energy is required to create particles of that size by mechanical processes (Holmes aff at [4.17]). I accept that evidence, and the approach of the Director-General's Environmental Assessment Report of considering the evidence concerning PM10 emissions derived from the Warkworth operations.

397 That evidence was based on modelling undertaken for the 2010 Environmental Assessment, and further reports provided in 2011 dealing with cumulative 24-hour PM10 concentrations for Year 2 including Mount Thorley operations, and for Years 2, 9 and 21 (Holmes aff at [6.2]). The analysis of the wind roses in the 2010 EA (Appendix H) showed that winds blow predominantly from the north-north east or from the south-south east. Dr Holmes' opinion was that given that most of the dust emissions sources associated with the Project are located to the north east of Bulga, one would expect that the transport of dust from Warkworth mine to Bulga would be small, and most of the PM emissions would be transported to the north-north west or south-south east, as was shown by the modelling results in the 2010 air quality assessment (aff at 7.1). Additional monitoring data sets from monitors in Bulga (at the tavern) and Wallaby Scrub Road (to the north of Bulga village) (locations of Bulga in Holmes' oral evidence 23/8/12; Wallaby Scrub Road in Fig 1 Holmes aff) for the period 1 July 2011 to 20 July 2012 recorded low PM10 levels both for the mine and from all sources, at 14.7 and 13.0 micrograms/cubic

metre respectively, or less than 50% of the 30 microgram/cubic metre limit ([7.3]). Dr Holmes assessed that PM10 data together with wind speed and wind direction data and concluded that the Warkworth mine contributes no more than 5.8% of PM10 material at the Bulga monitoring site and 11.8% at the Wallaby Scrub Road site (Holmes, [7.9]-[7.12]).

398 Dr Holmes addressed the contribution of Saddleback Ridge, and his evidence was (aff at 8.1) that the main effect of Saddleback Ridge is to reinforce the general wind flows that already exist, and its effect on airflows would be expected to be negligible except in areas close to the ridge, and its effect on air quality at Bulga or other residential areas would be very small. Dr Holmes considered (in oral evidence) that once Saddleback Ridge is removed, the critical factor in determining deposition of dust would be the frequency of winds from Warkworth to Bulga.

399 I accept that there are existing impacts in Bulga from dust. Mr Hedley, Mr Lamb and Mr Mitchell identified concerns relating to dust deposits on the roof, and in gutters (Mr Hedley aff at [22]) and in water tanks (Mr Lamb aff at [32]). Mr and Mrs O'Brien gave evidence on site, and at Singleton Court, about dust deposition on their grape vines, on outdoor furniture, and on the roof (T 22/8/12, pp 18-19). Dr Tuan Au, a medical practitioner in Singleton, gave evidence of his testing of lung function of primary and high school students and his concern at the numbers with low lung functioning. The extent to which these impacts can be attributed to the Warkworth mine, rather than the cumulative impacts of the operations of several mines in the area, is less clear. I accept, based on the evidence of Dr Holmes, that prevailing wind directions limit the amount of PM material distributed from Warkworth to Bulga, and thus that dust impacts in Bulga village may be a factor of the cumulative impact of the Warkworth mine in combination with the other mines in the area. In the context of assessing the impacts of the proposal presently before the Court, I am satisfied that the avoidance and mitigation measures identified in the proposed conditions would, subject to the qualification noted below, satisfactorily address PM, including dust emissions. Those conditions set criteria for PM10, which would necessarily include PM2.5.

400 The qualification to this conclusion is that, as is the case for noise, the proposed conditions set criteria based on the combined Mount Thorley and Warkworth mine operations. Dr Holmes was of the opinion (aff at 6.5) that this makes the assessment criteria more stringent and benefits surrounding receivers, because with separate approvals each of the mines was limited by the 24 hour, 150 microgram/cubic metre PM10 limit but with a single approval they must jointly meet the same limit; each mine must be below the level so that cumulatively they can meet it.

401 While that may be how the conditions should work, in practice, Conditions 21 and 22 suffer from the same defects as those in relation to noise, both in attempting to regulate, and rely on, activities at a different mine, and in determining compliance. Combining the air quality criteria for the Warkworth and Mount Thorley mines is of doubtful legal validity but in any event is likely to be difficult to monitor and enforce compliance.

402 The problem is particularly acute for determining compliance with the criterion of maximum increase in deposited dust level because the incremental increase in concentrations can only be due to the Project on its own. Yet the Project operates in conjunction with the Mount Thorley mine and all other conditions regarding air quality require air quality to be managed for the Mount Thorley-Warkworth mine complex. Evaluating compliance with this criterion will be difficult.

403 As with the noise impacts, no confident conclusion can be reached that the air quality impacts of the Project will be acceptable in practice.

PART 5: SOCIAL IMPACTS

Social impacts: the parties' competing positions

404 The Association contends that the Project will have a significant social impact on Bulga village as a community, contrary to the public interest and the principle of intergenerational equity. The principal issues are whether the Project will exacerbate existing experiences of solastalgia, and whether there is a risk that Bulga village as a community will be destroyed. Solastalgia, or "loss of place", is, according to Professor Glenn Albrecht (who was called by the Association), a condition caused by the gradual erosion of the sense of belonging to a particular place and a feeling of distress about its transformation. At issue is whether people will be forced to leave Bulga as a result of the environment, social and economic impacts. The Association contends that the social impact on Bulga village has been underestimated in the EA, and that the project will ultimately result in the destruction of Bulga village as a result of the environmental, social and economic impacts, as has been the case in the neighbouring villages of Warkworth, Ravensworth and Camberwell.

405 Warkworth's position (SFCR [33] ff) is that the social impact of the Project on Bulga village has been accurately estimated in the EA; the Project will not have a significant social impact on the health and wellbeing of the residents of Bulga; the Project will provide a significant social benefit to the local region and the State more generally; and the Project accords with the public interest. Warkworth contends that the mitigation strategies proposed adequately mitigate noise and dust impacts.

406 The Minister's position (SFCR [33]) is that while the Project would result in a range of impacts on the Bulga village, these impacts are acceptable when compared to the standards and performance measures commonly applied to mining projects in NSW, and the conditions of the Project Approval contain a broad suite of measures aimed at ensuring that the noise and dust impacts are acceptable. The Minister submits that while there is no question that by living in the close vicinity of the Warkworth, Mount Thorley and Bulga mines, and near Wambo and HVO South mines, the residents of Bulga experience at a local level impacts which are not experienced by the broader community, it cannot be said that the residents of Bulga have not obtained benefits from mining, particularly in the form of employment.

407 Both Warkworth and the Minister place their reliance on the objective data as to social impacts provided in the evidence of Dr Judith Stubbs, a social planner and social scientist called by Warkworth. Dr Stubbs disputes the utility of the concept of solastalgia in considering the social impacts of the Project, and relies on the objective social benefits that mining has had in the Hunter Valley. Warkworth submitted that the evidence given by residents as to their experience cannot be regarded as representative of the community, and that the subjective experience of the residents is only relevant in so far as it is reasonably based. The Minister submits that a focus on those aspects of the residents' concerns for which there is objective evidence does not entail a denial of the lived experience attested to by individual residents, but rather enables

those experiences to be placed in a tangible and assessable context.

Social impacts: the resolution in summary

408 In my view, neither Dr Stubbs nor Professor Albrecht provide a comprehensive assessment of the full range of likely social impacts, and consideration of both the objective data for the broader community, and the experiential evidence from residents of the impacts at the local level, is required to have a complete picture of the likely social impacts of the Project.

409 I am satisfied, for the reasons below, that although the existing mine, along with the other mines in the area, have positive impacts (in particular in terms of employment in the community as a whole), those mines also have negative social impacts on the local community, and that it would be reasonable to expect those positive and negative impacts to continue for the duration of the Project.

Positive social impacts

410 Turning first to the objective data, Dr Stubbs relied upon indicators of community wellbeing (Appendix B to her affidavit sworn on 4 August 2012) which included statistics relating to seven local government areas, being Singleton (in which the Warkworth mine is located), Muswellbrook, Dungog, Upper Hunter Shire, Cessnock, Maitland, and Port Stephens, as well as for the Hunter Valley (excluding Newcastle Level 4 Statistical Area), and benchmarked against NSW where possible. The indicators related to age, employment, occupation, and education of the population; composition of households; housing tenure; household income; SEIFA scores (2006); and published health and crime data. Dr Stubbs was of the opinion that there is no evidence that noise is having a substantial or tangible impact on the health and wellbeing of Bulga residents and there is no evidence of the quantum of such concerns among the total population of Bulga (Exhibit W8, pp 8-9). Dr Stubbs said (Exhibit W8, p 9) that her research indicates that relevant published health and wellbeing indicators are largely positive for Bulga and for Singleton LGA, compared with relevant areas not proximate to open cut coal mines such as Dungog LGA, and many of those benefits appear to be related to mining; population turnover is relatively low in Bulga and property values appear to have increased; and localities in closer proximity to open cut coal mining in Singleton and Muswellbrook LGAs show relatively lower levels of disadvantage and higher income than average. In Dr Stubbs' opinion (Exhibit W8, p 12), the evidence provided by objective or quantifiable indicators of health and community wellbeing indicated that the localities of Singleton LGA and Bulga village have, in net terms, benefited from mining, including open cut mining. In her opinion, the subjective negative social impacts expressed by some residents are balanced against such tangible positive social impacts for the whole of the communities of Bulga and Singleton LGA.

411 In Appendix D to her report, Dr Stubbs outlined the methods of analysis she used to test the impact of proximity of open cut coal mines on a range of social indicators. The first method used data on population growth, change of address in the last five years, and proximity to open cut coal mines. The second used indicators compiled for ten small towns in the Hunter Valley: the towns of Camberwell, Ravensworth and Warkworth, all approximately 1 km from the edge of the nearest open cut coal mine; eight towns in the Hunter Valley similar in size and location to Bulga (Broke, Jerrys Plains, Parkville, Wingen, Sandy Hollow, North Rothbury, Paterson, and

Gresford) which range in distance from 5 to 40 km to the edge of the nearest open cut coal mine; and three localities similar to Camberwell and Warkworth in size and location (Allynbrook, Bandon Grove and Glen William, between 40 to 70 km from the edge of the nearest open cut coal mine).

412 Dr Stubbs concluded (Appendix D, p 1) based on the first method of analysis that there is no evidence that increasing proximity to an open cut coal mine is associated with population decline, or with greater population turnover when a five kilometre radius is considered. However, Dr Stubbs suggested that when a larger radius is considered, there is a trend for greater population stability with increasing distance form an open cut coal mine. Based on the second method of analysis, Dr Stubbs concluded that meaningful relationships were found for employment in mining, with greater employment in mining in towns closer to open cut coal mines; median household income, with larger values for towns closer to open cut coal mines; and disadvantage, with a greater reduction of disadvantage over time for towns closer to open cut coal mines.

413 While the data which formed the basis of Dr Stubbs' evidence was not disputed, there are a number of reasons why her opinion as to the conclusions that can properly be drawn from that data as to social impact more generally should not readily be accepted in isolation from other factors. Dr Stubbs' focus of attention on the data available for her selected indicators of employment, age, education, and published health and crime data as provided in Appendix B, is too limited, in a number of respects.

414 First, the comparisons based on LGAs ignore the distributional aspects of social impacts of mining, namely that while it can be accepted that there are benefits from coal mining in the form of measures such as employment for Singleton LGA as a whole, costs of a different kind may be borne by the local community. Dr Stubbs acknowledged in oral evidence that the environmental and visual costs of the Project will be borne by the Bulga community but said that 19-20 percent of people in Bulga are in mining, and, in her opinion, the balancing of costs and benefits includes having younger people with employment.

415 Dr Stubbs' acceptance that the environmental and visual impacts are already being borne by the Bulga community is consistent with the observations recorded in Appendix E to her report from site visits to Bulga and other small communities carried out on 17-18 July 2012 between 8.30pm and 11.00pm (Appendix E, p 1) in Ravensworth, Camberwell, Warkworth, Broke, Jerrys Plains, Sedgefield, Glendon, Elderslie and Belford. For Bulga, the observations at 10.30pm were of a faint glow to the east from mining; discernible mine noise with individual sounds heard against a background rumble; no highway traffic; and the perception of "an industrial environment" (Appendix E, p 18). Noticeable ambient light from mining activities was recorded at Ravensworth and Camberwell, and mining noise, both as a rumbling noise and with distinctive sounds (Ravensworth, Camberwell), and as a discernible hum or rumble (Warkworth, Broke). The perception was described as "busy industrial environment" for Ravensworth, and Camberwell; "an industrial environment" for Broke; and "an urban environment" for Warkworth. These observations of noise and light, which would not ordinarily be experienced in a rural environment, support the residents' evidence of existing adverse impacts both in Bulga and in other similar small communities.

416 Secondly, Dr Stubbs' focus on objective measures does not take into account the social impacts of the change in the nature of the community, or the speed of that change. The evidence of Ms Beverley Smiles (T 22/8/12, p 39-40) was based on her experience living in the village of Wollar in the far western end of the Hunter Valley, where the approval of the Wilpinjong open cut coal mine within 5 km of the village has resulted in the purchase of the majority of properties in the area including large broad scale farms, small holdings, most of the houses in the village and the village store. Ms Smiles stated that this has destroyed a close knit community, the bush fire brigade has become unviable, the school only has a few families remaining and many other community functions have ceased to exist. While there has not been a major drop in the population of the community because mineworkers have been installed in the purchased properties, the new members of the community work 12 hour shifts and do not have the time or capacity to take on some of the voluntary tasks that create the social fabric of a community.

417 Mr Hubert Upward and Mr John Lamb gave oral evidence as to their experience of Warkworth village. Mr Lamb, as president of the Bulga fire brigade, stated that as Warkworth village declined it went from having an active fire brigade with two vehicles 20 years ago to the transfer of remaining members to the Bulga brigade, and that the village in effect of community activities with the fire brigade or community hall had ceased to exist (T 22/8/12, p 89). Mr Upward's evidence was that following the establishment of the Wambo, Lemington, United and Warkworth mines from the early seventies to the eighties, Warkworth village people began to complain about noise and dust; the mines offered acquisitions, and as neighbours' properties fell into the hands of the mines and became rented or demolished, the remaining residents feared for the loss of their village and sought acquisition; as the village shrank the school closed, and the last to go was the service station and general store (T 22/8/12, pp 87-88).

418 Thirdly, Dr Stubbs' rejection of the residents' evidence as relied upon by Professor Albrecht is not consistent with the approach to social impact assessment identified in her expert report as the proper approach to adopt. That approach, as outlined in Appendix B to her expert report, incorporates the concept of "community wellbeing", which, Dr Stubbs notes Appendix B, p 1), is generally regarded as having both tangible or quantifiable outcomes as well as more experiential or self-assessed elements of quality of life or life satisfaction as part of multi-method studies. Dr Stubbs' report does not include consideration of experiential or self-assessed aspects of the quality of life for Bulga residents. Further, Dr Stubbs conceded that she had not looked at cumulative impacts in terms of tangible impacts in her expert report. Dr Stubbs accepted that there is no evidence of any alternative view to that presented by the respondents to Professor Albrecht, however she referred to the evidence of tangible benefits, for example in employment.

419 Hence, although I accept that there are likely to be positive social impacts, particularly in the broader community in the Singleton LGA and the Hunter region, I do not agree that there will be positive social impacts at the local level to the extent suggested by Dr Stubbs.

Negative social impacts: solastalgia

420 The Association relies on the evidence of Professor Glenn Albrecht that the residents of Bulga are experiencing solastalgia and on the evidence of the residents themselves. Professor Albrecht has qualifications in philosophy and social science, and describes himself as an

environmental philosopher with both theoretical and applied interests in the relationship between ecosystem and human health (aff at [1]). In his affidavit affirmed on 6 July 2012, Professor Albrecht states that solastalgia has its etymological origins in the concepts of nostalgia, solace and desolation. Professor Albrecht describes solastagia in the following terms:

> I therefore describe solastalgia as the pain or sickness caused by the ongoing loss of solace and the sense of desolation connected to the present state of one's home and territory. It is the 'lived experience' of negative environmental change manifest as an attack on one's sense of place. It is characteristically a chronic condition tied to the gradual erosion of the sense of belonging (identity) to a particular place and a feeling of distress (psychological desolation) about its transformation (loss of wellbeing). In direct contrast to the dislocated spatial and temporal dimensions of nostalgia, it is the homesickness you have when you are still located within your home environment (aff [12]).

421 Professor Albrecht's evidence was that solastalgia is an apt descriptive term for the combined environmentally-induced desolation and powerlessness that impacts on people in the zone of affectation of coal mines and power stations. Professor Albrecht relied on previous research work in the Hunter Valley; lay evidence in the form of affidavits provided by residents; and qualitative data from Bulga residents who had voluntarily responded to a set of research questions. Professor Albrecht's opinion (aff at [24]) was that given that the Bulga region has been in close proximity to existing open cut coal mines, it did not surprise him that residents of the greater Bulga locale "express serious reservations about the personal and social impacts of the proposed mine extension". The language used in the objector submissions was evidence that the objectors are suffering, among other distress/stress-related issues, solastalgia (aff at [30]).

422 Professor Albrecht and Dr Stubbs agreed (Exhibit W8, p 1) that solastalgia is a useful concept in understanding the lived experiences of residents in a "deep" and qualitative way. They disagreed on the extent to which a qualitative methodology based on lived experience should be augmented by other methods.

423 Dr Stubbs' position (Exhibit W8, pp 1-2) was that solastalgia as applied to the assessment of social impacts for the purpose of these proceedings is limited and unhelpful as it does not test the reasonableness, reality or prevalence of the subjective experiences among Bulga residents; it has no apparent relationship to tangible or objective social impacts, and is not predictive of such impacts. Despite some reported solastalgia among the 10 out of 17 residents sampled by Professor Albrecht, the area in fact has low population turnover, generally more positive than average social indicators, and increasing property sale prices in the years since lodgement of the application for approval of the Project. More comprehensive surveys of solastalgia provide at best a 'snap shot' of residents' feelings about open cut mining and does not consider community resilience and adaptation over time to change affecting communities nor what people will actually do in response to such feelings.

424 A central element of Professor Albrecht's evidence as to solastalgia was his reliance on the interview responses from Bulga residents. Professor Albrecht and Dr Stubbs disagreed on the weight to be given to those responses. In Dr Stubbs' opinion (Exhibit W8, p 11), the survey was not random or representative, and had significant risk of bias.

425 The interview questions and responses were in evidence (Exhibits W9, W10). In his affidavit, Professor Albrecht stated (at [34]) that he had generated the set of questions about the impact of large scale environmental change, which were the same as those asked of residents in other

parts of the Upper Hunter Valley affected by open-cut mining in previous research he had undertaken, and that the questions had previously been approved for research purposes by a properly constituted human ethics committee at the University of Newcastle. Professor Albrecht quoted from some of the 17 responses ([37]), and concluded ([38]) that what those testimonies revealed was "deep solastalgic distress about the damage that has already been done to their loved landscape and deep anxiety that this level of distress could get even worse as the mine expands towards the edge of the town".

426 It was common ground that the interview responses did not purport to be a comprehensive survey of residents in the Bulga village, and both Dr Stubbs and Professor Albrecht acknowledged in oral evidence that neither had undertaken a representative or random survey of residents in Bulga village related to the Project. In my view, less reliance should be placed on the interview responses. The numbers were small, and as conceded by Professor Albrecht in oral evidence (T 24/8/12), the respondents were self selected, with questions sent to objectors and others who had expressed an interest. The interview forms included prompts, according to Professor Albrecht, because the questions had initially been designed for use by an interviewer with training. I accept the submission of Warkworth that this must qualify Professor Albrecht's position that the language used by people is significant in obtaining a degree of insight into their feelings (aff at [25]).

427 Warkworth submits (closing written submissions [158]) that Professor Albrecht's views are of no utility in determining the issues raised in the present proceedings. Warkworth submits that to the extent that Professor Albrecht's report identifies whether various residents oppose the Project because they do not want their local environment to change, the report cannot rise higher than the evidence of those residents; and to the extent that the report purports to extrapolate from the reactions of various individuals to generalisations about the Bulga community, it is flawed because the interview respondents were self selecting; the questionnaire contained prompts inviting respondents to use language that Professor Albrecht regards as indicative of solastalgia; and the survey could not be regarded as representative of the Bulga community.

428 The Association submits that the resident evidence demonstrates that there has been a negative experience of the community to environmental change already, and that is Professor Albrecht's concept of solastalgia. It does not matter what label is attached to it, but clearly that is something that has been experienced by local people (T 17/10/12, p 47.15). There was no attempt to test the opinions expressed by local residents, and no interview of local residents by Dr Stubbs, and while there was a lot of evidence from Bulga residents who oppose the Project, there was no evidence from any Bulga resident who supported the development (T 17/10/12, p 47.42).

429 I accept that limitations of the methodology adopted by Professor Albrecht in his recording of concerns of Bulga residents limit the weight that can be placed on his assessment of the interview responses, and thus on his reliance on the concept of solastalgia to assess the social impacts of the proposed mine extension. I do not accept, however, that the concerns expressed by Bulga residents in the interview responses can be discounted. The interview responses are part of the larger picture of evidence from the community, including the affidavit evidence, and oral evidence provided on the site view and given in Singleton courthouse. While it is correct to say, as Warkworth submitted, that the assessment of the Project is not a referendum, that

evidence is consistent in terms of the nature of the adverse impacts already experienced, and concerns for exacerbation of those impacts if the Project is approved.

430 As discussed above, the objector evidence is relevant to a consideration of impacts on amenity and the public interest more generally where it is more than an expression of subjective fear or concern, and is based in specific, concrete likely effects of the proposed development: *Telstra v Hornsby Shire Council* at [193]-[195]. That evidence is relevant in these proceedings to consideration of noise impacts, air quality, visual impacts, and more generally on the social impacts on the community.

Social impacts from adverse noise and dust impacts

431 The type and extent of noise impacts have been considered in Part 3 above. The resident evidence, which is supported by the monitoring data and the SKM report, establishes that the noise impacts of the Warkworth mining operations are real and disruptive. I accept the resident evidence that the noise impacts are affecting family relationships: Mr Krey felt that his wife is more affected by the noise than he is and this causes friction in their relationship (aff at [25]); Mr Upward stated that the noise imposes on time he spends with his wife relaxing in the evening; he has had trouble getting to sleep in the last 12 months and he is often woken by loud mining noises (aff at [21]-[22]); Mr Caban often has trouble sleeping because of the mining noise, and often averages only a few hours sleep (aff at [25]); and Mr Hedley stated (aff at [19]) that during last summer because of the constant noise from the mine they had to close all their windows and use air conditioning to keep the house cool; and he no longer sleeps with his bedroom windows open. In my assessment, approval of the Project on the conditions regarding noise proposed will only increase the noise impacts and their effect on amenity and family relationships.

432 The type and extent of air quality impacts, particularly dust deposition, have also been considered in Part 3 above. The resident evidence is that existing mining operations at Mount Thorley-Warkworth mine complex are having impacts on amenity, which leads to social impacts. Approval of the Project on the proposed conditions regarding air quality (which combine the air quality criteria for the Warkworth and Mount Thorley mines) would lead to difficulties in monitoring and enforcing compliance. Any lack of compliance with the air quality criteria would result in air quality impacts, and hence social impacts, on the residents of Bulga.

433 While the present conditions, and those proposed, include the entitlement for some owners to request mitigation measures in relation to noise or air quality, I accept that for some residents those measures are inconsistent with their decision to live in Bulga: for example, the evidence of Mr Wayne Riley that he and others had chosen to work and live in a beautiful rural setting and enjoy the outdoors (T 22/8/12, p 67.2), and Mr Peter Cooke (T 22/8/12, p 79.35) that if you are told you have to stay inside for your health and can't dry your clothes on the clothesline there is not much sense in living in the bush. Acquisition of noise or dust affected properties also has an adverse social impact, causing friction within the community (based on the evidence of Mr Mitchell, aff at [11], Mr Garry Bailey (T 22/8/12, p 48.20)), and within families (based on the evidence of Ms Caban, T 22/8/12, p 8.5).

Social impacts from adverse visual impacts

434 The visual impact of the mine was also the subject of objector evidence. Mr Lamb refers to seeing the lights from the mines which reduce his ability to see and recognise stars (aff at 24). Mr Krey states (aff at 26) that he finds the lights shining directly at them into their bedroom and living room to be intrusive and annoying; they do not have blinds on their windows as they considered it wasn't necessary for the country lifestyle. Mr Krey states (aff at 17) that being able to physically see the overburden heap is a constant reminder of the mines. Mr Upward states (aff at 23) that seeing the spoil heaps during the day and the mining lights in the evening is a constant reminder of the mines and has taken away from the country rural night time aspect of Bulga; the once scenic views he enjoyed from his property have given way to ugly spoil heaps. Mr Mitchell stated (aff at 12) that having experienced changes to the landscape of Bulga over the last 25 years, he feels upset that Bulga has lost its ambience and peaceful rural feel.

435 The Director-General's Environmental Assessment Report noted (TB vol 2, tab 9, p 844) that the visual impact assessment undertaken on behalf of Warkworth had not considered the visual impacts of night lighting, but expressed the view that because the Project is located in a well established mining region the potential night lighting impacts would generally be consistent with existing land uses. The Department considered that the areas with potentially greater night lighting impacts would correlate with the areas of potentially high visual impact. The western viewing locations would have views of the Mount Thorley overburden emplacement area and, following removal of Saddleback Ridge, potential views of the Warkworth overburden emplacement area; however, vegetation along Wollombi Brook would assist in screening views of the Warkworth overburden emplacement areas from the west (p 845). Approximately 33 residences in the Bulga/Inlet Road region would potentially experience moderate to high visual impacts, with a further 24 residences in the Bulga/Putty Road region potentially being subject to moderate visual impacts (p 845), giving a total of 57 residences experiencing moderate or above visual impacts, a sizeable number. The Department recommended the imposition of conditions which incorporate Warkworth's proposed mitigation measures (including progressive rehabilitation of overburden and tree planting), and require Warkworth to prepare a visual management plan, notify land owners of their entitlement to additional site-specific visual assessment and landscaping treatments, and implement all reasonable and feasible measures to reduce visual impacts (p 849).

436 It was apparent on the Court's view of the Bulga area that the Warkworth mine, and the other mines including Mount Thorley, dominate the landscape in scale and nature. The Court's view included a view from properties in Inlet Road, with Saddleback Ridge shielding the view of the Warkworth operations. The photo montages produced as part of the visual impact assessment of the Project (EA vol 4, pp 48-51) support the concerns expressed by the objectors that as the extension proceeds through Saddleback Ridge more of the mine will be visible to residences in Bulga looking north east. I accept Warkworth's submission (closing written submissions [195]) that the screening effect of Saddleback Ridge from more elevated properties in Bulga, such as that owned by Ms Caban, is more limited; however, I am satisfied that its removal would be a factor in the visual impact of mining operations.

437 Professor Albrecht also posited that the loss of Saddleback Ridge is of symbolic significance. He notes that Bulga is an Aboriginal name meaning a single peaking mountain range and the Saddleback Ridge is of symbolic significance. He notes that Bulga is an Aboriginal name

meaning a single peak in a mountain range and the Saddleback Ridge is the symbolic single peak at stake in this case. The loss of Saddleback Ridge entails the loss of Bulga as place of its people (Exhibit W8, p 15). This opinion was corroborated by the evidence of Bulga residents who placed importance on the retention of Saddleback Ridge in the landscape (see also Exhibit W8, p 6).

438 Warkworth submits that the proposed conditions provide for implementation of mitigation measures, including the preparation and implementation of a Visual Impact Management Plan which is to describe additional mitigation measures to reduce the visibility of mining operations from residences likely to have significant direct views (Condition 69, Sch 3); notification of owners of residences identified in the Visual Impact Management Plan of their entitlement to request additional visual mitigation measures (Condition 70, Sch 3); and a requirement to implement those additional mitigation measures, such as landscaping treatments or vegetation screens (Condition 71, Sch 3). No evidence was provided as to what visual impact mitigation measures might be provided and how effective they might be in the context of the scale of the mining operations proposed in the rural residential environment. Warkworth also submitted (subs [196]) that the approved extension of the Mount Thorley mining operations to the north of Putty Road will have some visual impacts at Bulga in any event. However, in the context of the scale of the operations proposed and their eventual distance from Bulga, I am not persuaded that any visual impact of the Mount Thorley mine extension would be sufficient to discount the visual impacts of the Project, in particular those arising from the removal of Saddleback Ridge.

439 In my view, the Project will have adverse visual impacts of sufficient magnitude and on a sufficiently large number of properties as to have social impacts on the residents of Bulga.

Social impacts from adverse change in composition of the community

440 The experts considered the issue of social impacts arising from a change in the composition of the Bulga community. Dr Stubbs and Professor Albrecht disagreed as to whether the Project would ultimately result in the destruction of Bulga village as a community because people would be forced to leave as a result of the environmental, social and economic impacts.

441 Dr Stubbs stated that she had assessed the statistical likelihood of the social destruction of Bulga village and the history of other villages in the Upper Hunter and found that Bulga village is highly unlikely to decline and certainly not cease due to the Project, particularly if acquired properties are immediately re-let or re-sold (Exhibit W8, p 5). Dr Stubbs accepted that while a change in the nature of the population (even if the population numbers do not change) can have an impact in terms of the character of an area, she said that each five years there is a 40 per cent turnover in population, and the area has been changing for some time in any event.

442 Professor Albrecht's evidence was that a "community" is not defined simply by the number of people. People have self selected Bulga for the rural lifestyle, and so the community is built around people who share a common set of values. If the turnover is sufficiently high and there is a change in the type of people, the fabric of the community is affected, for example by reducing the degree of involvement by residents with voluntary organisations. In his opinion, sheer numbers do not give a sense of the community (Albrecht oral evidence, T 24/08/12, p 23).

443 The objector evidence supports Professor Albrecht's evidence that the Warkworth mine is

having, and the Project will have, an adverse impact on the character of the Bulga community. That includes the evidence of Mr Krey, who notes that the community has become increasingly divided and anxious with news of the Project (aff at 20), and who fears that if the Project is approved people will start to leave Bulga and the community will be lost forever (aff at 29). Mr Caban stated (aff at 33) that since about 2005 he has noticed the culture of Bulga has changed. The dust, blasting impacts and mining noise have impacted on his family, his marriage, his friendships and the sense of community in Bulga, and he fears that if the Project is approved things are going to get worse (aff at 36).

444 Dr Stubbs and Professor Albrecht disagreed on the marginal impacts of the proposed extension of the Warkworth mine. In Dr Stubbs' opinion (Exhibit W8, p 13), the extent to which the reported serious social impacts from existing operations for some residents would be exacerbated by the Warkworth extension proposal is questionable. Dr Stubbs noted that the total open cut area in Bulga State Suburb would increase from 9% to 11% of total area, and from 4.5% to 4.7% of total area for the Singleton LGA. For Professor Albrecht, on the other hand, the major changes to the landscape, for example the loss of Saddleback Ridge are significant (Exhibit W8, p 13). In my view, the marginal impact of the Project as an extension of an existing mine has to be considered in its landscape and the area of adverse effect on the local residents and community (the affected catchment area); not in statistical suburbs or local government areas whose boundaries bear no relationship to the affected catchment area. In this affected catchment area, the marginal impacts are more significant.

On balance, negative social impacts are likely

445 I am satisfied that approval of the Project would have some positive social impacts, particularly in the form of continuing employment in the local and broader community, but there will be significant negative social impacts arising from continuation of adverse impacts of noise and dust, visual impacts, and adverse impacts arising from a change in the composition of the Bulga community. Those impacts must be taken into account in the consideration of all the relevant factors in determining whether the Project should be approved.

PART 6: ECONOMIC ISSUES

Economic issues: the parties' competing positions

446 The Department's approach to consideration of the economic justification for the Project was set out in an Addendum to the Director-General's Environmental Assessment Report (January 2012) (TB vol 2, tab 11) which was prepared in response to issues and comments raised by the PAC during its review of the Project. That report noted that coal mining is a significant contributor to the NSW economy with total production worth $13.3 billion in 2009-10. It also noted that coal mining in NSW employs approximately 19,000 people and indirectly creates up to another 70,000 jobs in mine and non-mine related industries (p 953). The main mining lease area at Warkworth still contains very large amounts of in-ground thermal and semi-soft coking coal, and is one of the Hunter Coalfield's largest coal resources. The current mining planning indicates that these resources would support economic extraction of coal to 2056 (p 954-5). The Department was satisfied that underground mining would not be efficient, as it would only be

able to extract approximately 19% of the available resource in the areas that have open cut potential; and that not mining west of Wallaby Scrub Road would sterilise approximately 140 million tonnes of coal within the proposed 21 year consent limit, or 326 million tonnes of coal in total (including coal resources beyond the 21 year limit), a coal resource with a value of approximately $14 billion, or $32 billion for the total resource (p 956). The Director-General's Environmental Assessment Report noted that Mount Thorley and Warkworth presently employ 860 people together; employment under the Project would fluctuate between 860 and 1220 people, with an average of 1000 (p 793, 798).

447 Warkworth relied on the two economic assessments of the Project provided in the EA, a Benefit Cost Analysis (BCA) prepared by Gillespie Economics (December 2009) (EA vol 5, Annexure O), which incorporated a Choice Modelling study, and an Input-Output Analysis (IO) prepared by the Hunter Valley Research Foundation ('HVRF') (October 2009) (EA vol 5, Annexure P); and on evidence from Dr Andrew Searles, Principal Researcher at the HVRF and Associate Professor in Health Research Economics at the University of Newcastle, Mr Robert Gillespie, Principal of Gillespie Economics, and Professor Jeffrey Bennett of the Australian National University and Principal of the consultancy group Environmental and Resource Economics. Warkworth submits (closing written submissions [231]-[232]) that there are significant economic positives to the Project being, on the IO, a stimulus of about $16 billion to the Hunter economy, and on the BCA, an uncontested net production benefit of over $1 billion. Warkworth submits that there are significant employment benefits, estimated in the IO to amount to the creation, directly and indirectly, of about 44,000 jobs the value attributed to the creation of additional jobs at the mine alone is estimated in the BCA at $286 million; the BCA provides a way to consider the social and ecological impacts of the Project that need to be considered against these benefits; and those impacts are substantially outweighed by the large economic and employment related benefits of the Project.

448 The Minister submits that, in view of the significant economic benefits associated with the Project, the Court would not be satisfied that any of the residual costs associated with the development would outweigh those benefits; the global net production benefit of the Project is $1.971 billion, reduced in accordance with the proportion of foreign ownership of Warkworth to a net production benefit of approximately $1.15 billion; Choice Modelling is one method of assigning a monetary value to residual environmental, social and cultural impacts of the Project in a BCA; and, regardless of the methodological approach taken to quantify those impacts, they are unlikely to reach the values necessary for the Project to become undesirable from an economic efficiency perspective.

449 The Association submits (closing written submissions [150], [161]) that the ESD principle of improved valuation requires the proponent to integrate into the valuation of the Project the cost of all environmental factors, including the externalities of the Project as referred to in s 6(2)(d) of the *Protection of the Environment Administration Act 1991*, and that Warkworth has failed to assess the economic impacts of the Project in its entirety. The Association submits that the BCA does not factor in all of the costs arising from the Project: it fails to accurately measure and include noise, vibrations, dust, air quality and amenity impacts, non-use values attached to rural communities, and ecosystem services; it overstates the benefits from the social value of employment and the economic value of offsets; and it fails to include costs arising from

increased CO2 emissions and the increase in worldwide consumption of coal. The Association further submits that there are methodological errors in the Choice Modelling relating to: the description of the EECs to be cleared; the failure to present a 'no mine' scenario; the failure to advise survey respondents of the previous conditions of consent and the fact that Saddleback Ridge would be lost; and surveying only New South Wales and not Australia.

Economic issues: the resolution in summary

450 For the reasons which follow, I am not satisfied that the economic analyses provided on behalf of Warkworth support the conclusion urged by both Warkworth and the Minister, namely that the economic benefits of the Project outweigh the environmental, social and other costs.

451 The IO analysis is a limited form of economic analysis, assessing the incremental difference in economic impacts between approving or disapproving the extension of the Warkworth mine. The deficiencies in the data and assumptions used affect the reliability of the conclusions as to the net economic benefits of approval. More fundamentally, however, the IO analysis does not assist in weighting the economic factors relative to the various environmental and social factors, or in balancing the economic, social and environmental factors. The weighting and balancing of the relevant matters to be considered are essential tasks for an approval authority when exercising its statutory power to determine a project application.

452 The BCA, and the Choice Modelling on which the BCA depends, are also deficient. They do not consider all of the relevant matters that need to be considered by an approval authority in determining a project application, the relevant matters at the level of particularity required, or in accordance with the factual findings and inferences I have made in relation to the relevant matters. The Choice Modelling study, which provides the values for the non-market benefits and costs, was deficient in limiting the survey respondents to residents of New South Wales, and providing inaccurate, indiscriminate and uninformative information to survey respondents which affected their choices and values. The BCA also cannot displace the tasks of the approval authority to weight and balance all of the relevant matters so as to determine whether the preferable decision is to approve or disapprove of the project application.

453 At best, the two forms of economic analysis provided, the BCA and the IO, provide some information about some of the relevant matters that are to be considered in the ultimate task of weighting and balancing in determining whether or not the Project should be approved.

The Input-Output Analysis

454 The IO analysis undertaken by the HVRF assessed the incremental difference in economic impacts between two scenarios, a "base case", whereby the mine is not extended and reaches its life of mine (LOM) in 2021, and a "Project case", whereby the mine is extended as proposed and reaches its LOM in 2031. The economic impacts measured were the value of goods and services (outputs) and the number of jobs created in the Hunter Region. The modelling focussed on the mine's operation phase, and its capital works phase. The inputs to the modelling included expenditures to operate the mine, employment at the mine and expenditures on capital works. Only the expenditures with a reasonable likelihood of being spent within the Hunter Region were included in the modelling. The expenditures and employment figures directly associated with the

mine were referred to as initial impacts, and using those impacts, the flow-on impacts throughout the Hunter Region's economy were calculated (EA vol 5, Annexure P, Method). In his affidavit Dr Searles stated that the IO model provides a descriptive snapshot of a particular economy at a point in time, and that assessments using IO models estimate the economic impact of a change in economic activity caused by either an increase or decline in spending associated with a specific industry (aff at [1.8]). IO modelling assumes that each industry in an economy is related to every other industry; the relationship between industries may be strong (eg coal and transport are closely related) or weak, and the strength of the relationship between all industries is represented by multipliers. The multiplier represents the aggregate impact of a change in expenditure, that is, the impacts additional to the initial impact are captured by the value of the multiplier, and are referred to as "flow-on" impacts (aff at [1.9] and [1.10]). The results of the analysis are shown in terms of the value of the goods and services which are generated and the number of jobs created.

455 Dr Searles' conclusion from the IO modelling was that the incremental difference of the operation and capital works components of the Project case over the Base case in terms of total output is the generation of an additional $16,754 million in output; that is, a further $16,754 million in output will be generated in the Hunter Region economy over 2011 to 2031 because of the extension of the mine (aff at [1.17]). The Project would generate an additional 44,675 jobs (defined as lasting for one year and being full-time) (aff at [1.19]).

456 Dr Richard Denniss, Executive Director of the Australia Institute and Adjunct Associate Professor at the Crawford School of Economics and Government at the Australian National University, was called on behalf of the Association. Dr Denniss' evidence was that the HVRF IO analysis was constrained both by the accuracy of the data used to describe the linkages between the sectors of the regional economy and by the assumptions on which the model was based. Dr Denniss was critical of Dr Searles' reliance on survey data from 2001, and of the assumption that the jobs associated with the mine expansion would go to people who are currently unemployed, which he considered unlikely due to the skilled nature of the work and widespread acceptance of a shortage of skilled labour in the mining industry.

457 Dr Searles' opinion was that the 2001 survey data was a reasonable reflection of the Hunter Region's current economy because the transitions that have been occurring over the last decade have been gradual (aff at [1.28]); and that data was collected after major structural shifts in the Hunter Region economy had taken place in the 1980s and 1990s, typified by the closure of BHP steel-making in 1999 (aff at [1.32], [1.34]). Dr Searles relied on ABS data which showed that while the unemployment rate in the Hunter Region has been falling since 2001, unemployment was still 5.4% in May 2012 which was higher than reported in NSW overall at 4.9%. In his opinion, that suggested that there is a pool of available labour in the Hunter Region (aff at [1.54], [1.55]). HVRF survey data also indicated that there is a substantial pool of available labour (aff at [1.56]). Dr Searles accepted that there are, from time to time, skills shortages in some areas in the Hunter Region and referred to the provision of skills training, including the Mining Skills Centre established by TAFE in Muswellbrook (aff at [1.59], [1.60]). Dr Searles was of the opinion that while some workers may transfer from a non-mining industry to the mining industry, that shift creates another job opportunity elsewhere in the economy that could be filled by an unemployed person, a person not actively seeking work who is enticed into

the workforce due to the availability of jobs, or a new entrant to the workforce such as a school or other education leaver (aff at [1.64]).

458 Dr Searles and Dr Denniss were in agreement that the IO analysis can double count but disagreed on how the IO analysis double counts (Exhibit W12, point 2(a)). Dr Denniss' opinion was that it is inappropriate to use an IO model to estimate the number of "jobs created" by the Project, and that a computable general equilibrium model (CGE) would be superior. A CGE model, which starts from the pool of labour that presently exists, would have generated fundamentally different, and smaller, benefits to the broader community (aff at [52]-[54]).

459 Having considered the criticisms made by Dr Denniss as to the assumptions underlying the HVRF IO analysis, and Dr Searles' responses, I am not persuaded that it is appropriate to accept the conclusions drawn in the IO analysis as to the quantum of economic benefit derived in the form of economic output and jobs created in the Hunter region. The Project is an extension of an existing mine, and the issue is the continued employment of mine workers for a further, finite, period of time commencing in 2021. I accept the evidence of Dr Denniss that it cannot be assumed that the absolute amount of employment in coal mining and transport, and the relative level of employment between coal mining and transport, will remain stable at 2001 levels until 2030, given the investment in new coal infrastructure that has been built since 2001 and is planned to be built before 2030, and changes in technology which change the average capital/labour ratio (aff at [10]). That level of uncertainty is confirmed when the pattern of new mine development and extension in the locality of Warkworth, as evidenced by the consents and approvals in evidence (Exhibit W22) is considered.

460 The IO analysis assumes that there are unemployed resources available within the Hunter region to meet any increase in workforce demand, and that the workforce will not be drawn away from any other activity. I accept Dr Denniss' evidence that the assumption of the IO model that there is a ghost pool of highly skilled yet unemployed people in the Hunter region, from which labour for the extension of the existing mine would be drawn, is unrealistic. I accept Dr Denniss' evidence that, to a considerable extent, employment generated from the extension of the Warkworth mine would involve currently employed skilled workers transferring from other industries, but the vacancy thereby created in the other industries may not necessarily be filled, partly because of a shortage of skilled workers and partly because the remuneration is inferior to that offered in the mining industry. That is consistent with the evidence accepted by the HVRF researchers, as referred to by Dr Denniss in his affidavit at [18], that there are skills shortages in the Hunter region, in particular for tradespersons.

461 Even if I were to accept Dr Searles' evidence that there are indications that the Hunter region is not at full employment capacity, there is uncertainty, conceded by Dr Searles, as to the skill level in any available pool of workers who might be expected to be employed over the extended period of mine operations.

462 Both Dr Denniss and Dr Searles accepted that all economic models have limitations (Exhibit W12, point 3(a)). At best, the IO analysis supports a conclusion that continued employment for the extended operation of the mine would have an economic benefit in the Hunter Region, but the quantum of that benefit is not certain.

463 There is another, more fundamental issue with the IO analysis. The IO analysis only looks to economic impacts, not environmental or social impacts, and then only to economic impacts measured by reference to goods and services with a market value, not those without a market value. It provides, therefore, some information but only on one set of matters relevant to be considered by the approval authority in determining the project application. The IO analysis is not a substitute for the decision-making process that the approval authority must undertake in determining the project application, and the conclusions the IO analysis reaches cannot be substituted for the fact finding, weighting and balancing of all of the relevant environmental, social and economic matters required to be considered by the approval authority. The conclusions the IO analysis reaches on the economic benefits of approving the Project, evaluated for their reliability and given appropriate weight, need to be balanced against all other environmental, social and economic benefits and costs.

Benefit Cost Analysis

The parties' experts' competing evidence on the BCA

464 The Benefit Cost Analysis (BCA) incorporated a non-market valuation (Choice Modelling) study providing estimates of monetary values for the main intangible environmental, cultural and social impacts of the proposal (Annexure O, p 4). The BCA concluded that the total net production benefit from the operation of the proposed mine extension to 2031 would be in the order of $1,971 million, which would be distributed primarily to Warkworth and its shareholders, the NSW government via royalties, and the Commonwealth government in the form of company tax. The external costs associated with the Project were identified as greenhouse gas generation, impact on highly significant Aboriginal heritage, clearing of ecologically endangered vegetation communities and traffic and transportation impacts. External benefits were identified as additional employment and ecological offsets, with an estimated value of $604 million. The BCA concluded that the Project was estimated to have net benefits to the community of $1,862 million and was therefore desirable and justified from an economic efficiency perspective (EA vol 5, Annexure O, pp 2-3).

465 Evidence was provided by Mr Robert Gillespie and Professor Jeffrey Bennett on behalf of Warkworth, and by Mr Roderick Campbell and Professor John Quiggin on behalf of the Association. It was common ground between the experts that the most appropriate scope for the BCA was a national, rather than a New South Wales, perspective (Exhibit W5, p 2; W11, point 1). The central points of disagreement related to whether all relevant costs and benefits had been included in the analysis, and how the non-market impacts had been assessed.

466 Professor Quiggin was of the opinion that the costs arising from the burning of the coal mined should be included. Professor Bennett and Mr Gillespie disagreed, on the basis that these costs cannot be attributed to the Project as defined in the EA, and that if they are to be included, the consumer and producer surplus arising from the burning of that coal should also be taken into account, which would require assumptions about where and how that coal would be burnt and how the electricity generated would be used (Exhibit W11, T 10/9/12, p 11.20ff). The parties' experts also disagreed as to the proper basis for projecting the price of CO2. Professor Quiggin considered that the GHG emissions generated by burning coal should be valued at a cost of $23 per tonne, increasing in line with the discount rate. To determine that rate, Professor Quiggin

applied the Hotelling rule, which suggests that the price of a natural resource, which would include a permit to emit carbon, would rise at roughly the rate of discount applicable to the person making the decisions (T 10/9/12, p 8.20). Professor Bennett and Mr Gillespie considered that the Hotelling rule, which Professor Bennet described as a theoretical guiding principle applicable to the pricing of non-renewable natural resources (T 10/9/12, p 12.27ff), was not applicable: they had observed that the price of non-renewable natural resources such as oil, coal, copper, had not increased at the interest rate over time, and they did not expect the price of carbon, installed through government policy, to rise through time because people will find ways of dealing with GHG emissions that involve not having to pay the price (T 10/9/12, pp 12.42; 13.10ff). Professor Quiggin, Professor Bennett and Mr Gillespie agreed that if the Hotelling rule is applied to the price of carbon, it should also be applied to the price of coal (Exhibit W11, point 3).

467 Mr Campbell, Professor Bennett and Mr Gillespie disagreed as to whether the BCA had appropriately taken into account the costs of the Project, in particular the social and environmental impacts. Professor Bennett and Mr Gillespie relied on the Choice Modelling study undertaken as part of the BCA (Annexure A to BCA, EA vol 5, Annexure O). The Choice Modelling method was explained (pp 20-21) as using questionnaires that describe a hypothetical policy scenario that will cause environmental, cultural and social changes, and present survey respondents with a series of questions (choice sets) where each question shows the outcome of two or more alternative policy scenarios including a 'status quo' or 'no policy change' scenario. The outcomes are described in terms of different levels of a cost to be borne by the survey respondents and several non-marketed attributes, and respondents choose their preferred option from the alternatives. By choosing between alternative options, respondents make trade offs between the non-market attributes and the associated payments. The environmental and social attributes included in the Choice Modelling questionnaire for the Project were: impact on mine site EEC vegetation in hectares; impact on the area of EEC planted in the region in hectares; impact on area of existing EEC protected in the region in hectares; impact on highly significant Aboriginal sites in terms of number; impact on rural families in the small rural community in terms of number; and the number of years that the mine will provide 975 jobs (p 23-24).

468 The results of the Choice Modelling study were incorporated in the BCA, at $34 million per impacted highly significant Aboriginal heritage site, and $460,000 per hectare of EEC cleared of the 764.7ha total clearing including current approvals (Annexure O, p 9); at $113,000 per ha of planting of EEC and $320,000 per ha of protection of EEC (Annexure O, p 10); and at $31 million per year as community values associated with the employment provided by the Project (Annexure O, p 11).

469 While there is value in attempting to quantify and take into account non-market, environmental, social and cultural costs (and benefits) of a proposed development in preparing a BCA, I agree with the Association that the Choice Modelling study and the BCA undertaken for the Project have a number of deficiencies which lessen their usefulness.

Distribution of Choice Modelling survey too limited

470 First, I accept the evidence of Mr Campbell that confining the distribution of surveys to NSW

households was too limited, and that the broader Australian community could well place values on the ecological and Aboriginal cultural heritage impacts of the Project (Exhibit W5, para 6, 15). The value of Aboriginal cultural heritage and endangered ecological communities and their biota is not restricted to NSW but extends throughout Australia. The nation-wide concern and campaigns to protect natural areas in Tasmania (such as Franklin-Gordon Rivers, Lemonthyme and Southern Forests, and more recently, the Tarkine) and in Queensland (Daintree and the Wet Tropics) are illustrations.

Deficiencies in information provided to survey respondents

471 Secondly, the information provided to survey respondents was not, in my view, sufficiently accurate to enable them to make informed and meaningful choices. Using ecological impacts as the first example, the questionnaire advised the survey respondents that continuation of the mine as currently planned would result in clearing of native vegetation, which comprises three EECs; 35,000 ha of EECs occur in the Hunter Valley in an unprotected state and 500 ha are conserved in protected areas; and that in 22 years' time, 900 ha of the three EECs will be cleared (TB vol 7, tab 276, p 4358). This information is inaccurate, indiscriminate and uninformative.

472 It is inaccurate in that there are four, not three, EECs affected by clearing and the total area to be cleared (under the existing consent and the Project Approval) is less than stated (around 765 ha instead of 900 ha). It is indiscriminate in that it groups the four disparate and heterogeneous EECs to be cleared by the Project, and the many disparate and heterogeneous EECs in the Hunter Valley, in both their protected and unprotected states, into one homogeneous category of "EECs". Each EEC listed under the TSC Act is different, with different ecological attributes and making different contributions to conservation of biological diversity and ecological integrity, and hence has different value. The differences needed to be explained so that respondents could consider valuing them differently. A critical omission is the failure to inform respondents that one of the EECs to be cleared, the WSW, is endemic to the particular area and will be proportionately affected by clearing to a far greater extent than any of the other EECs.

473 It is uninformative not only in failing to inform respondents of these matters but also of other information relevant to valuing the EECs to be cleared, including at a general level, what are endangered ecological communities, why their conservation is important, and what are the threats to their long-term survival, and more particularly, what are the relative condition and quality of the EECs to be cleared compared to equivalent EECs in the Hunter Valley, what are the relative condition and quality of the EECs to be cleared compared with those which would remain, and what are the threats to these EECs and whether and to what extent the Project exacerbates, abates or otherwise affects the EECs and their on-going survival. The survey respondents were also not provided with factual findings and inferences of the kind I made in Part 3 as to the value of and impacts on the EECs to be cleared by the Project. Information about these matters affects the survey respondents' knowledge and understanding and hence the choices they would make. Unless the respondents are well-informed of the EECs and the impact of the Project on them, they are not able to make a knowledgeable and informed choice and thereby ascribe proper values.

474 These deficiencies in the information provided to the survey respondents therefore materially affect the reliability of the choices made and values ascribed by the respondents.

475 It is not an answer to that to say, as Warkworth submits, that the questionnaire was conservative in proceeding on the basis that 900 ha was to be cleared when in fact a total of 760 ha is to be cleared (subs at [230](a)). This may have increased the total value of EECs lost by an amount equal to the additional 140 ha multiplied by the value per hectare for an EEC. However, it cannot be known whether this increase in value of EECs lost would be more than offset by the effect of the deficiencies in the information provided and the valuation made based on that information.

476 Another example is that concerning impact on small rural communities, where survey respondents were advised that if the mine continues as currently planned some of the properties in the small rural community will be adversely impacted by noise and dust; that on request these properties would be purchased by the mine; that acquired properties may then be rented to mine employees or others or remain vacant; that this would result in a change in the population mix and/or a reduction in the population of the small rural community; and that if the mine continues as currently planned an additional 15 families out of a total of 175 would be displaced from the small rural community (TB vol 7, tab 276, p 4360). This information does not reflect factual findings and inferences of the kind I have made in Part 4 as to the social impacts caused by adverse noise, air quality and visual impacts on the individual residents and the community of Bulga. It also does not include information concerning other impacts arising from noise and dust, including those arising from undertaking mitigation measures and acquisition as proposed in the conditions.

477 As acknowledged by Professor Bennett and Mr Gillespie (Exhibit W5, p 8-9) the context provided for this attribute in the questionnaire means that the value obtained from the CM study is only applicable to: families who are significantly adversely affected by noise and dust to the extent that they obtain the right to request acquisition of their properties, who trigger this right and who have their properties acquired; families in the Bulga Village and the adjoining areas on the west side of Wollombi Brook; and to between 1-15 impacted families. The survey respondents are also not informed of the significance of the true impact to the residents of Bulga. Again, the deficiencies in the information provided means that the survey respondents were not able to make a knowledgeable and informed choice and ascribe proper value to the social impacts of the Project.

478 As acknowledged by Professor Bennett and Mr Gillespie, the estimates of value obtained from Choice Modelling studies are context specific, and relate to the circumstances described in the survey questionnaire (Exhibit W5, p 8). The Choice Modelling survey was undertaken before the EA was prepared (Gillespie, T 23/8/12, p 81.33). I accept the evidence of Mr Gillespie that the questionnaire was based on discussions with Warkworth about what the impacts of the Project were likely to be, and that it takes a while to actually implement the questionnaire. However, I am not persuaded that the responses can be regarded as reliable or meaningful in the absence of a complete understanding and presentation of the facts.

Values in Choice Modelling survey inadequate

479 Thirdly, the Choice Modelling survey attributed values to each of the choices, ranging from zero up to $625, and did not ask respondents what they were prepared to pay. Professor Bennett's explanation was that the levels were determined based on focus group discussions (T 23/8/12, p 92.35); it has been established in the literature that a direct question of how much a respondent is willing to pay offers the opportunity for them to behave strategically, to overstate their willingness to pay; and that one of the advantages of Choice Modelling is providing respondents with a choice situation in which they establish trade offs between environmental goods and a payment but they are never actually asked that question which is subject to potential for misrepresentation (T 23/8/12, p 91.40ff). I agree with Mr Campbell that modelling a situation based on a willingness to pay of survey respondents presented with a range of levels that, as Professor Bennett described (T 23/8/12, p 92.28) and Mr Gillespie accepted (T 23/8/12, p 93.18) has nothing to do with the costs, is of limited assistance in the situation confronting a decision-maker (T 23/8/12, p 93.1). It has also not been established what information was provided to the focus group, so as to establish whether that information was deficient in ways such as I have raised earlier. If so, the levels determined, based on the focus group discussions, will be too low. This obviously matters as it affects the survey respondents' choices which are based on the levels given in the questionnaire.

All relevant matters, at level of particularity required, not considered

480 Fourthly, while the economists identified, in consultation with Warkworth, likely benefits and costs associated with the Project, those likely benefits and costs may not represent the range of matters that are relevant for the determinative task of an approval authority. I have identified above matters relevant to biodiversity and ecological integrity, including the EECs, noise and dust, and social impacts, which were not included in the Choice Modelling survey or BCA.

481 Further, the level of particularity with which a matter is identified, for the purposes of ensuring that all relevant matters are taken into consideration, is important: *Foster v Minister for Customs* (2000) 200 CLR 442 at [23], per Gleeson CJ and McHugh J. It is for the decision-maker, having regard to the proper identification of the relevant matters, to determine the level of particularity at which a particular matter must be considered, and whether the relevant state of satisfaction is reached in relation to matters described in qualitative terms: *Foster v Minister for Customs* at [38] per Gaudron and Hayne JJ; *Drake-Brockman v Minister for Planning & Anor* [2007] NSWLEC 490; (2007) 158 LGERA 349 at [128]-[129]. In this instance, for example, the level of particularity identified for consideration of noise and dust impacts is clearly inadequate to encompass the range and diversity of such impacts which I have found to be likely to arise if the Project is approved.

Other non-market impacts and values not considered

482 Fifthly, the experts agreed that it is difficult and not practical to measure all non-market impacts of projects. They agreed that no estimate of environmental/ecosystem services was included in the BCA, and that it is difficult to say whether there would be any impact on environmental services values as a result of the Project (Exhibit W5, p 2). I agree with Mr Campbell that there are non-market values that have either not been, or have inadequately been, taken into consideration in the BCA, including impacts of noise and dust, impacts on amenity values, and ecosystem services (aff, second dot point). The omission of these non-market values is a

deficiency of this BCA.

Polycentricity of issues not considered

483 Sixthly, the information provided to, and the choices made by, the survey respondents also do not account for the polycentricity of the issues. As explained in Part 2 of the judgment, a polycentric problem, such as determining whether to approve or disapprove a mining project, cannot be resolved by identifying each issue and sequentially resolving it; the resolution of one issue has repercussions on the other issues. Yet, this technique is employed in the Choice Modelling survey. The survey respondents considered and made choices regarding each issue separately and sequentially, with no consideration being given to the repercussions of the choices they made on the other issues. This limits the reliability and utility of the choices made, and the values derived from the choices.

Different weighting and balancing to that required

484 Seventhly, the approach in the BCA and Choice Modelling is to attribute weight to each of the factors considered in both absolute terms, by assigning a dollar value, and in relative terms, by providing a range of dollar amounts from which the respondents can choose, with no open-ended option. That approach confines the Court to the economists' assessment of particularity and value, in a context where there is no evidence available to the Court to assign its own. It also seeks to supplant the Court's essential task, exercising the functions of the approval authority, of applying the appropriate weight to the relevant matters, on the facts as found by the Court.

Issues of equity or distributive justice not considered

485 Eighthly, the BCA and Choice Modelling have not considered issues of equity or distributive justice. Instead, they are concerned only with the aggregation of costs and benefits, not how or why these are allocated. (Joint Report of Economic Experts (Exhibit W5), p 2).

486 Distributive justice involves the just distribution or allocation of the benefits and burdens of economic activity. Principles of distributive justice vary according to what is the subject matter of distribution (such as resources, income, wealth, opportunities, jobs, welfare and utility); the entities to whom a distribution is to be made (such as natural persons, corporations, groups of persons, and non-human living organisms or ecological communities); and the basis on which a distribution is to be made (such as equality, wealth maximisation, or according to individual characteristics or free transactions). Issues of distributive justice not only apply within generations (intra-generational equity) but also extend across generations (inter-generational equity). In the context of environmental justice, distribution of environmental risks and harm should be equitable or fair.

487 The BCA and Choice Modelling failed to have regard to issues of distributive justice. First, while the BCA and Choice Modelling considered some of the entities to whom a distribution of benefits would be made if the Project were to be approved, such as Warkworth and its shareholders (profits of the mine), the NSW Government (royalties and State taxes), the Commonwealth Government (company and income taxes), local councils (community infrastructure contributions) and employees and contractors (remuneration for goods and

services provided), they did not have adequate regard to the entities to whom a distribution of burdens would be made.

488 One of these entities is the people of Bulga who would suffer the burdens of significant adverse noise, dust, visual and social impacts, as well as degradation of the natural environment of the local area. There was consideration of some individuals of Bulga village regarding some impacts but not of all of the affected people for all of the impacts.

489 Another entity is the broader community in the State and the nation who would suffer from the reduced natural and cultural environment of Bulga village and surrounds in the event of the Project being approved. For example, present and future members of the broader community would suffer a diminution of recreational value (degradation of the Bulga village and its environment); scenic value (diminution of the beauty of the landscape and its natural components); cultural value (loss of European cultural heritage such as the historic Wallaby Scrub Road; Aboriginal cultural heritage, such as Aboriginal sites and objects; and natural heritage such as EECs); scientific value (such as loss of extant EECs and habitat of threatened fauna); and other values.

490 Further entities are the components of biological diversity, such as the EECs and threatened fauna within the disturbance area, which would also suffer the burdens of the Project. The clearing and open cut mining of the EECs and habitats would unacceptably disturb "the integrity, stability, and beauty of the biotic community". There is an ethical dimension to these land use impacts on the biotic community; it is not exclusively an economic problem (Aldo Leopold, *A Sand County Almanac* (1966) Oxford University Press at 262).

491 Secondly, the BCA and Choice Modelling did not address the equity or fairness in either the distribution of the benefits and burdens of these entities or the nature and extent of the distributed benefits and burdens.

492 In an assessment of the equity or fairness of the Project's distribution of benefits and burdens, assistance can be gained by consideration of two distinct principles of ecologically sustainable development, inter-generational equity and intra-generational equity. The principle of inter-generational equity provides that the present generation should ensure that the health, diversity and productivity of the environment are maintained or advanced for the future generations (see s 6(2)(b) of the *Protection of the Environment Administration Act 1991*). The principle of intra-generational equity involves people within the present generation having equal rights to benefit from the exploitation of resources as well as from the enjoyment of a clean and healthy environment: see *Telstra v Hornsby Shire Council* at [117]. A decision-maker should conscientiously address the principles of ESD in dealing with any application for a project under the former Part 3A of the EPA Act: see *Minister for Planning v Walker* at [62], [63].

493 With respect to inter-generational equity, the BCA and Choice Modelling did not consider adequately, or accord sufficient weight to, this principle of ESD. This is a traditional limitation of cost benefit analysis in not considering the issue of inter-generational equity: see Laurence H Tribe, "Ways Not To Think About Plastic Trees: New Foundations for Environmental Law" (1974) 83 *Yale Law Journal* 1315, 1319-1320. The BCA and Choice Modelling did not directly determine whether the Project, if approved, would maintain or enhance the health,

diversity and productivity of the local environment at Bulga for the benefit of future generations or the value of doing so.

494 With respect to intra-generational equity, the BCA and Choice Modelling failed to consider adequately the burdens that would be imposed on some entities, including the people of Bulga and the components of biological diversity in the Bulga environment, and on the ability of those entities to live in and enjoy a clean and healthy environment.

495 These failures to consider adequately inter-generational and intra-generational equity limit the utility of the BCA and Choice Modelling to the Court for the purposes of evaluating, weighting and balancing the relevant matters to be considered in determining the Project Application.

Conclusion on economic analyses

496 Warkworth accepted in submissions that both the IO analysis and the BCA provide only models, and that they are a guide to, but not a determinant of, an assessment of the impacts of the Project. Warkworth submitted that while different modelling might have been done, the evidence provided by the Association's experts cannot show that had different modelling been done, the benefits of the Project would not have been substantial (subs at [208]). That may be so, however the economic analyses provided on behalf of Warkworth suffer from the difficulty identified by Eisenberg (at [35] above) in resolution of polycentric problems, by attempting to objectively weight criteria and assuming that choices are not interdependent. Having regard to the limitations of the economic analyses as discussed above, I am of the view that the results of those analyses are of limited value in deciding whether I can reach a state of satisfaction as to the nature and extent of impacts in considering each and all of the relevant matters, the weight I should assign to each matter, and the balancing of the matters, to determine whether the Project should be approved or disapproved.

PART 7: BALANCING OF RELEVANT MATTERS AND DETERMINATION

497 The final task of the Court, exercising the power to determine the application for approval of the Project, after fact finding and assigning weight to the relevant matters, is to balance the matters to determine whether the preferable decision is to approve or disapprove of the carrying out of the Project.

498 I have found, amongst other things, that the Project would have significant and unacceptable impacts on biological diversity, including on endangered ecological communities, noise impacts and social impacts; that the proposed conditions of approval are inadequate in terms of the performance criteria set and the mitigation strategies required to enable the Project to achieve satisfactory levels of impact on the environment, including the residents and community of Bulga; and that the proposed conditions of approval, including by combining the Warkworth mine with the Mount Thorley mine, are likely to make monitoring and enforcing of compliance difficult, thereby raising the possibility that the Project's impacts may be greater and more adverse than allowed by the conditions of approval.

499 These matters must be balanced against the economic benefits and positive social impacts in the broader area and region, which are substantial. In my view, balancing all relevant matters,

the preferable decision is to disapprove of the carrying out of the Project. The consequence will be that Warkworth can still carry out the existing mine, as authorised under the development consent DA 300-9-2002-1, granted in 2003, as modified from time to time, but would not be able to extend the mine under the Project Approval granted by the Minister (by his delegate the PAC) on 3 February 2012. The existing consent authorises mining until 2021 in the existing approved area.

500 Accordingly, the orders of the Court are:

(1) The appeal is upheld.

(2) Project application no 09_0202 for the carrying out of the Warkworth Extension Project is disapproved.

(3) The exhibits, other than Exhibit W33, are returned.

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