

4 Noise

4.1 Introduction

The noise and vibration assessment for the proposed Warkworth Extension assessed potential noise impacts from Warkworth mine alone. Following public exhibition of the EA, DP&I requested in a letter dated 2 December 2010 that the proponent consider impacts from MTW as a complex. While this approach was considered to be inconsistent with the Industrial Noise Policy (INP) and provide more onerous noise limits for the operations, the proponent has worked with DP&I to establish noise criteria that offer more protection for surrounding residents than if existing criteria for the two stand alone operations were adopted.

An assessment was undertaken in the EA on Warkworth Mine, as is required under the INP. This is summarised and clarified in Section 4.2 below.

In working with DP&I on their request to consider impacts from the MTW complex two further assessments were undertaken using different methodologies. This first is termed a 'combined criteria methodology', as presented below in Section 4.3. This methodology assessed the addition of the noise levels and criteria from Warkworth and Mount Thorley mines at receivers using a set of intrusiveness $L_{eq,15minute}$ based noise criteria. The criteria are the addition of the existing noise limits from both the Warkworth Mine and Mount Thorley Mine consents. This approach to impact assessment essentially meant that receivers would be provided the same level of protection from the two operations as they currently experience from the separate sites.

Following the combined criteria methodology assessment the Department's and EMM's noise specialists convened and discussed an alternative approach to identification of properties adversely affected by the proposal. It was considered intuitive that receivers to the east of the mine would likely see a real benefit with respect to noise as Warkworth mine progresses west, and conversely receivers to the west (eg Bulga) would likely experience a marginal increase in noise. Hence, it was agreed that an approach needed to be developed that would provide a higher level of protection for receivers to the west of the mine, whilst maintaining the status quo for noise for receivers to the east. Hence, the hybrid noise limits approach described below in Section 4.4.

4.2 Warkworth Mine – stand alone noise limits

The noise and vibration assessment contained within the EA (Annex G in Volume 3) assessed potential noise impacts from Warkworth Mine as a stand-alone operation. Approved operations at Mount Thorley Mine were considered as part of the cumulative noise assessment. The assessment of noise impacts was done for Warkworth Mine alone because both Warkworth and Mount Thorley Mines operate under separate development consents and Environment Protection Licences (EPLs), despite them operating as a single mining complex, known as MTW.

This original assessment within the EA concluded that with mitigation, noise levels were predicted to exceed the consent acquisition limits at six receivers not owned by mines. These are properties located to the east and south east of Warkworth Mine. These receivers are:

- Receivers 144, 146 and 147– receivers currently within the Zone of Affectation (ZoA) for Warkworth Mine;
- Receivers 77 and 78 – receivers currently within ZoA for a neighbouring mine; and

- Receiver 153 – additional receiver falling within the ZoA as a result of the proposed extension.

Only one of the six receivers with predicted noise levels that exceeded the acquisition criteria was not within an existing ZoA previously (ie Receiver 153).

4.3 Combined noise limits

4.3.1 Background

On 2 December 2010 the proponent received a request from DP&I to address MTW as a single complex. This was a result of a concurrent application for a modification at Mount Thorley Mine, known as Abbey Green North modifications, which also assessed impacts from Mount Thorley Mine alone.

As previously stated, each mine is separately owned and has its own separate development consent. Within these development consents, there are differences in noise criteria for residences in Bulga. For example, the noise limits for residences in the Bulga village are explicitly stated in Warkworth Mine's development consent (ie 38dB(A)) and is based on a rating background level (RBL) of 33dB(A), which is derived from monitoring data in accord with developing Project Specific Noise Levels (PSNL) in the INP, as described in the 2002 Environmental Impact Statement (EIS). The Mount Thorley Mine development consent includes limits for locations 9, 10 and 15, which are located in the Bulga village. These limits are 39dB(A), 35dB(A) and 39dB(A) respectively. These Mount Thorley Mine limits are based on the minimum PSNL in the INP (ie 35db(A)) or the predicted levels from Mount Thorley Mine alone (ie 39dB(A)).

Notwithstanding the above inconsistencies between consents and the inconsistency with INP to assess MTW as a single mining complex for two separate sites, an assessment was undertaken of the combined $L_{eq,15minute}$ intrusive noise from the Mount Thorley Mine and the proposed Warkworth Extension.

4.3.2 Methodology

To assess combined noise levels from Warkworth and Mount Thorley mines at receivers, a set of intrusiveness $L_{eq,15minute}$ based noise criteria were derived. The criteria are the addition of the existing noise limits from both the Warkworth Mine and Mount Thorley Mine consents. This approach to impact assessment essentially meant that receivers would be provided the same level of protection from the two operations as they currently experience from the separate sites.

For example, Receiver 147, chosen as it is located to the east of both operations and likely to experience comparable noise contribution from each site under the prevailing weather, has an operational limit of 35dB(A) for Warkworth Mine and 35dB(A) for Mount Thorley Mine. If each mine operated at these limits, the combined noise from the two mines at this receiver could be up to 38dB(A) without either mine exceeding its operational limit. The reason the limit is higher is due logarithmic addition of 35dB(A) and 35dB(A) (ie 38dB(A)). Hence, 38dB(A) became the new operational limit for the combined operations of the two sites at this receiver. Similarly, the combined acquisition limit became 43dB(A) (ie 40dB(A) from Warkworth Mine plus 40dB(A) from Mount Thorley Mine).

The predicted combined noise level for MTW at this receiver was 44dB(A), and exceeded the combined acquisition criteria of 43 dB(A). In isolation, the predicted noise from the proposed Warkworth Extension is 40dB(A) at this receiver, compared to its acquisition criteria of 40 dB(A) meaning it was not significantly impacted and afforded acquisition rights due to Warkworth Mine. Conversely, the predicted noise level at this receiver from Mount Thorley Operations was 41dB(A), and therefore above Mount Thorley Mine's 40dB(A) acquisition limit for this receiver. In this example, combining the impact assessment as

requested by DP&I infers that Warkworth Mine would share in Mount Thorley Mine's acquisition liability of this receiver despite being a separate operation with different joint venture participants.

4.3.3 Results

The results of the combined criteria assessment demonstrated the following for the potentially worst case year of operations (ie Year 2) when all pits are expected to be active (ie Warkworth Mine with Loders pit and Abbey Green North from Mount Thorley Mine):

- a total of 41 non-mine owned properties were predicted to experience noise levels marginally (1dB to 2dB) above operational noise limits.
- a total of 12 non-mine owned properties were predicted to experience noise levels moderately (3dB to 5dB) above operational noise limits.
- a total of nine properties were predicted to experience noise levels significantly (greater than 5dB) above operational noise limits.
 - It should be noted that there are some properties predicted to exceed acquisition criteria for Warkworth Mine alone but not for the combined mining complex (eg Receiver 144). This is due to the difference in the criteria for single and combined sites. Properties afforded acquisition rights under current separate consents will retain such rights.
- the nine privately owned properties predicted to be significantly impacted are listed below along with the proportion of Warkworth Mine and Mount Thorley Mine noise contributions.
 - Receiver 77 – 93 percent Warkworth Mine and 7 percent Mount Thorley Mine;
 - Receiver 144 – 61 percent Warkworth Mine and 39 percent Mount Thorley Mine;
 - Receiver 146 – 58 percent Warkworth Mine and 42 percent Mount Thorley Mine;
 - Receiver 147 – 47 percent Warkworth Mine and 53 percent Mount Thorley Mine;
 - Receiver 149 – 7 percent Warkworth Mine and 93 percent Mount Thorley Mine;
 - Receiver 154 – 35 percent Warkworth Mine and 65 percent Mount Thorley Mine;
 - Receiver 189 – 19 percent Warkworth Mine and 81 percent Mount Thorley Mine;
 - Receiver 190 – 14 percent Warkworth Mine and 86 percent Mount Thorley Mine; and
 - Receiver 192 – 56 percent Warkworth Mine and 44 percent Mount Thorley Mine.

4.4 Hybrid noise limits

4.4.1 Background

Following the response to DP&I using the above combined criteria methodology and results presented above, DP&I's and EMM's noise specialists convened and discussed an alternative approach to identification of properties adversely affected by the proposal. It was considered intuitive that receivers to the east of the mine would likely see a real benefit with respect to noise as Warkworth mine

progresses west, and conversely receivers to the west (eg Bulga) would likely experience a marginal increase in noise. Hence, it was agreed that an approach needed to be developed that would protect receivers to the west of the mine, whilst maintaining the status quo for noise for receivers to the east. Hence, the hybrid noise limits approach described below.

4.4.2 Methodology

Following submission of the results of the assessment considering MTW as a single complex, a hybrid approach was requested by DP&I and agreed by the proponent. This hybrid approach includes:

- For receivers in the east, an interim combined criteria (using existing criteria for Warkworth Mine and Mount Thorley Mine) until mining operations cease at Mount Thorley Mine with the expiry of their development consent in 2017. It is important to note that this approach of combining criteria is distinct from an increase in mining-related noise. In fact, mining-related noise is expected to decrease for these receivers;
- For receivers to the west (including Bulga) and north (eg Maison Dieu), a single mining complex criteria for the life of the mining operations at MTW. This is a highly conservative approach as the single mining complex criteria would be equivalent to the criteria for a single operation rather than a combination of criteria from two operations.

This hybrid approach affords more protection for surrounding receivers, particularly for receivers in the west, as it provides rights to additional residents, particularly those within Bulga, not currently stated in either development consent.

4.4.3 Results

i Bulga village

For residents within Bulga village, the results of adopting noise criteria for a single mining complex (ie MTW complex) as opposed to allowing both operations to continue as they are, using their separate approval noise limits, are summarised below:

- the number of properties entitled to mitigation increases from zero to 26; and
- the number of properties entitled to acquisition rights increases from zero to one (Receiver 97).

In addition, the proponent has agreed to offer an additional property to the west of Warkworth Mine acquisition rights (ie Receiver 87). This is the last remaining privately owned residences east of Wollombi Brook (and north of Putty Road) in the Bulga area.

This is demonstrated in Table 4.1 and shown in Figure 4.2.

ii East of Mount Thorley Warkworth

For receiver locations to the east of MTW, it is considered reasonable to adopt the combined noise criteria approach (ie addition of the noise limits in the two development consents). This is because, in practice, Warkworth Mine is progressing in a westerly direction away from these receivers and in reality will mean a reduction in noise exposure at residences to the east over time.

However, in doing so, properties would retain acquisition or mitigation rights if impacted by either Warkworth Mine or Mount Thorley Mine development consents separately. To identify these properties,

the most recent modelling and assessment for the Abbey Green North modifications is compared with the results presented for the proposed Warkworth Extension. The Mount Thorley Mine (Abbey Green North) assessment predictions shows that Receivers 148, 150, 151 and 153 (Warkworth Mine numbering) and 16b (Mount Thorley Mine numbering – not included in Warkworth assessment - located approximately 600 m east-south-east of location 149) are significantly impacted by Mount Thorley Mine and would retain their acquisition rights despite predictions that noise exposure would reduce over time as mining moves westward. The results in Table 4.3 identifying these properties as only ‘marginally’ affected under either of the two methodologies adopted herein.

Mount Thorley Mine has a greater proportionate impact on Receivers 148, 150, 151, 153 and 16b than Warkworth Mine. The remaining properties with acquisition and mitigation liabilities in Table 4.3 have a greater proportionate impact by Warkworth Mine.

4.5 Comparison of results

A comparison of the two methods, ie combined noise limits and hybrid noise limits is summarised in Tables 4.1 and 4.2 which shows the numbers of properties predicted to exceed criteria for the combined noise limits and DP&I’s complex criteria respectively. It is evident that the DP&I’s whole of complex criteria results in a larger number of properties being afforded protection rights since a greater number are shown to exceed criteria. Importantly, this is not a result of increased mining-related noise, but a virtue of tightening the noise criteria in the DP&I’s approach.

The results demonstrate that beyond the existing and initial stages (ie Year 2), the number of properties predicted to exceed criteria dramatically reduces. This is due to the cessation of mining at Mount Thorley Mine.

Table 4.1 Summary of operational noise limit exceedances – combined noise limits criteria

Noise exceedance	Management approach	No. of affected private properties			
		Existing (approx)	Year 2	Year 9	Year 21
		Warkworth + Loders pit	Warkworth + Loder pit + AGN ³	Warkworth only	Warkworth only
Marginally affected residences (1 to 2dB)	Noise mitigation at source	40	41	11	5
Moderately affected residences (3 to 5dB)	Noise mitigation, including mitigation at residence	6	12	7	1
Significantly affected residences (>5dB) ¹	Acquisition	3	9	1	3
Significantly affected land (>5dB on 25% of land))	Acquisition	6	6	6	4 ²

Notes: 1.An additional three properties (Receivers 148, 150 and 153 to the east) will also be added to the list of significantly affected properties. These were not identified in the combined assessment of MTW complex, but these properties are currently within the ZoA for Mount Thorley Mine and therefore will retain those rights.

2.Estimated based on results for Receiver 128 for vacant lots I and J within the Vacant Land Assessment provided to DP&I on 3 February 2011.

3.AGN – Abbey Green North within Mount Thorley Mine.

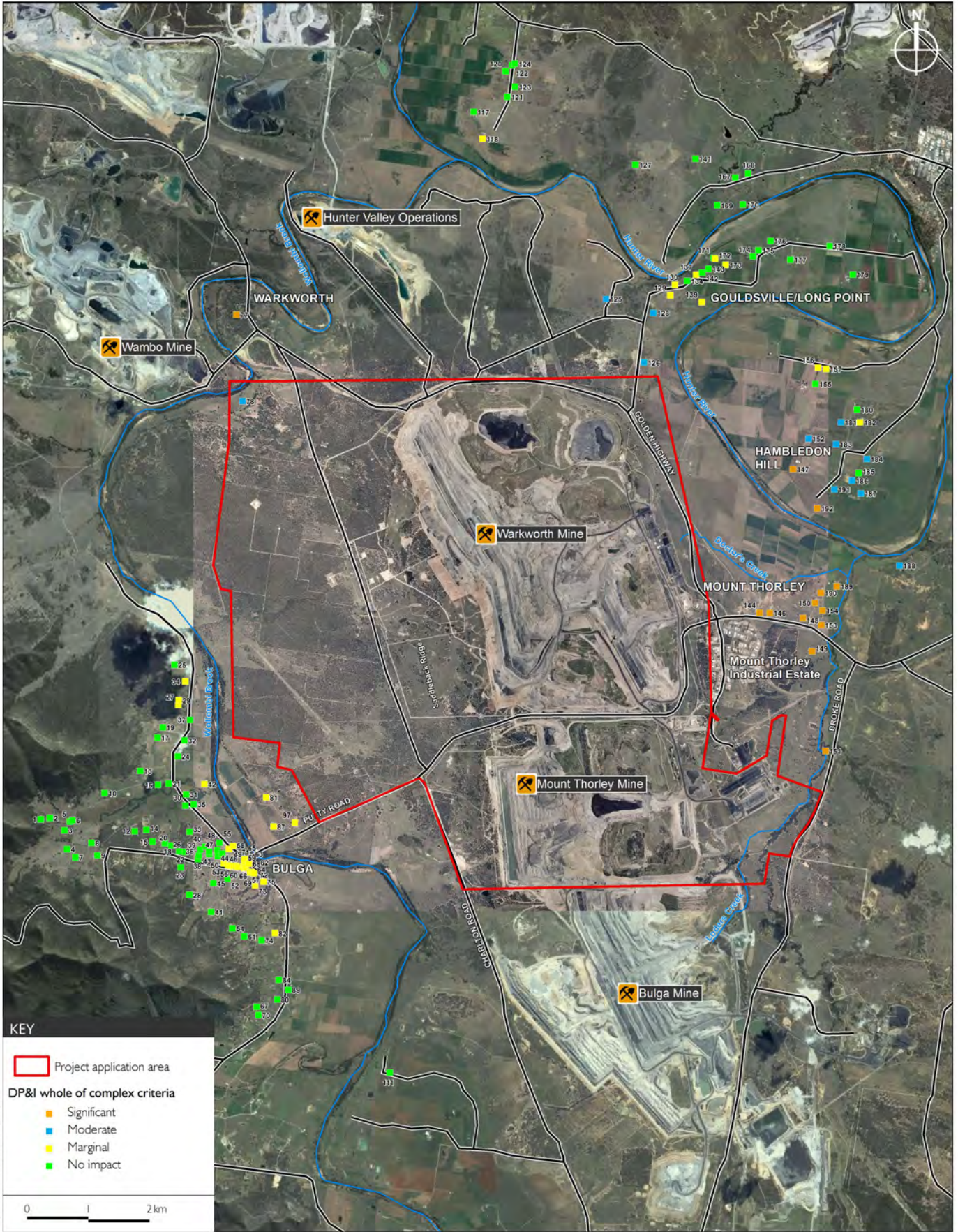
Table 4.2 Summary of operational noise limit exceedances – hybrid noise limits criteria (DP&I)

Noise exceedance	Management approach	No. of affected private properties			
		Existing (approx) Warkworth + Loders pit	Year 2 Warkworth + Loders pit+ AGN ³	Year 9 Warkworth only	Year 21 Warkworth only
Marginally affected residences (1 to 2dB)	Noise mitigation at source	50	50	13	11
Moderately affected residences (3 to 5dB)	Noise mitigation, including mitigation at residence	32	39	14	4
Significantly affected residences (>5dB) ¹	Acquisition	5	11	2	3
Significantly affected land (>5dB on 25% of land)	Acquisition	6	6	6	4 ²

Notes: 1. An additional three properties (Receivers 148, 150 and 153 to the east) will also be added to the list of significantly affected properties. These were not identified in the combined assessment of MTW complex, but are currently in the ZoA for Mount Thorley Mine and therefore will retain those rights. Similarly, although predicted to be only moderately impacted, Receiver 87 to the west of the mine will be given acquisition rights as this is the only remaining privately owned residence between Warkworth Mine and Wollombi Brook.

2. Estimated based on results for Receiver 128 for vacant lots I and J within the Vacant Land Assessment provided to DP&I on 3 February 2011.

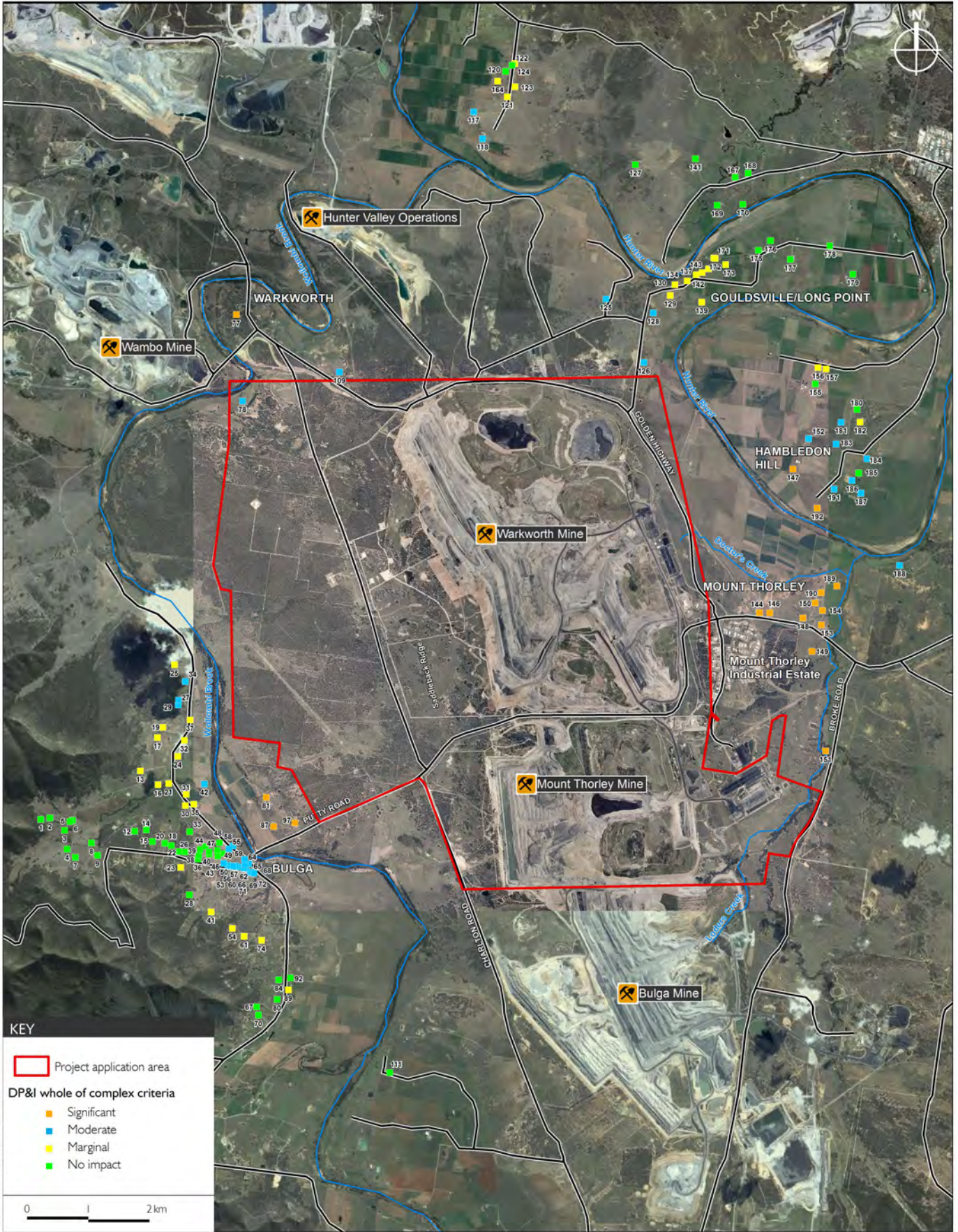
3. AGN – Abbey Green North within Mount Thorley Mine.



030341 EA F1 Rev A 29 August 2011

Noise impacts on receivers adopting current combined criteria for Warkworth and Mount Thorley – worst case weather year 2 operations

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030341 EA F1 Rev A 29 August 2011

Noise impacts on receivers adopting DP&I hybrid whole of complex criteria – worst case weather year 2 operations

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Table 4.3 Combined Leq,15minute noise assessment – Year 2 Night Warkworth Extension Plus Mount Thorley Mine, dB(A)

Privately Owned Receiver	Warkworth Single Site Leq,15minute Noise Limits (from EA), dB(A)	Mount Thorley Single Site Leq,15minute Noise Limits (from consent) , dB(A)	Warkworth and Mount Thorley Two-Site Combined Leq,15minute Criteria, dB(A)	Predicted worst case Leq,15minute Noise Level Warkworth + Mount Thorley Mine, dB(A)	Exceedance (marginal/moderate/significant)				
	Operational	Acquisition	Operational	Acquisition	Operational	Acquisition	Leq,15minute	Combined Criteria	Hybrid Complex Criteria
1 Bulga	38	43	35	40	40	45	32	OK	OK
2 Bulga	38	43	35	40	40	45	33	OK	OK
3 Bulga	38	43	35	40	40	45	35	OK	OK
4 Bulga	38	43	35	40	40	45	35	OK	OK
5 Bulga	38	43	35	40	40	45	35	OK	OK
6 Bulga	38	43	35	40	40	45	35	OK	OK
7 Bulga	38	43	35	40	40	45	34	OK	OK
8 Bulga	38	43	35	40	40	45	36	OK	OK
9 Bulga	38	43	35	40	40	45	34	OK	OK

Addition of two single site criteria

Single Warkworth site criteria for Bulga & Maison Dieu and Combined criteria for East receivers (Criteria used in red text)

Table 4.3 Combined Leq,15minute noise assessment – Year 2 Night Warkworth Extension Plus Mount Thorley Mine, dB(A)

Privately Owned Receiver	Warkworth Single Site		Mount Thorley Single Site		Warkworth and Mount Thorley Two-Site Combined		Predicted worst case		Exceedance (marginal/moderate/significant)		
	Leq,15minute Noise Limits (from EA), dB(A)	Warkworth Single Site Noise Limits (from consent) , dB(A)	Leq,15minute	Acquisition	Leq,15minute	Acquisition	Leq,15minute	Acquisition	Leq,15minute Noise Level Warkworth + Mount Thorley Mine, dB(A)	Combined Criteria	Hybrid Complex Criteria
10	Bulga	38	43	35	40	45	40	45	36	OK	OK
12	Bulga	38	43	35	40	45	40	45	38	OK	OK
13	Bulga	38	43	35	40	45	40	45	39	OK	marginal
14	Bulga	38	43	35	40	45	40	45	38	OK	OK
15	Bulga	38	43	35	40	45	40	45	38	OK	OK
16	Bulga	38	43	35	40	45	40	45	39	OK	marginal
17	Bulga	38	43	35	40	45	40	45	40	OK	marginal
18	Bulga	38	43	35	40	45	40	45	39	OK	marginal
19	Bulga	38	43	35	40	45	40	45	40	OK	marginal

Combined Criteria
Addition of two single site criteria
Single Warkworth site criteria for Bulga & Maison Dieu and Combined criteria for East receivers (Criteria used in red text)

Table 4.3 Combined Leq,15minute noise assessment – Year 2 Night Warkworth Extension Plus Mount Thorley Mine, dB(A)

Privately Owned Receiver	Warkworth Single Site Leq,15minute Noise Limits (from EA), dB(A)	Mount Thorley Single Site Leq,15minute Limits (from consent) , dB(A)	Warkworth and Mount Thorley Two-Site Combined Leq,15minute Criteria, dB(A)	Predicted worst case Leq,15minute Noise Level Warkworth + Mount Thorley Mine, dB(A)	Exceedance (marginal/moderate/significant)				
	Operational	Acquisition	Operational	Acquisition	Combined Criteria				
20	Bulga	38	43	35	40	45	39	OK	Hybrid Complex Criteria Addition of two single site criteria Single Warkworth site criteria for Bulga & Maison Dieu and Combined criteria for East receivers (Criteria used in red text)
21	Bulga	38	43	35	40	45	39	OK	
22	Bulga	38	43	35	40	45	39	OK	
23	Bulga	38	43	35	40	45	39	OK	
24	Bulga	38	43	35	40	45	40	OK	
25	Bulga	38	43	35	40	45	40	OK	
26	Bulga	38	43	35	40	45	39	OK	
27	Bulga	38	43	35	40	45	41	marginal	
28	Bulga	38	43	39	40	45	38	OK	OK

Table 4.3 Combined Leq,15minute noise assessment – Year 2 Night Warkworth Extension Plus Mount Thorley Mine, dB(A)

Privately Owned Receiver	Warkworth Single Site Leq,15minute Noise Limits (from EA), dB(A)	Mount Thorley Single Site Leq,15minute Limits (from consent) , dB(A)	Warkworth and Mount Thorley Two-Site Combined Leq,15minute Criteria, dB(A)	Predicted worst case Leq,15minute Noise Level Warkworth + Mount Thorley Mine, dB(A)	Exceedance (marginal/moderate/significant)
29	38	35	40	41	marginal
30	38	35	40	40	OK
31	38	35	40	40	OK
32	38	35	40	39	OK
33	38	35	40	39	OK
34	38	35	40	41	marginal
35	38	35	40	40	OK
36	38	35	40	40	OK
37	38	35	40	39	OK

Operational	Acquisition	Operational	Acquisition	Operational	Acquisition	Leq,15minute	Combined Criteria	Hybrid Complex Criteria
	43	35	40	40	45	41	marginal	moderate
	43	35	40	40	45	40	OK	marginal
	43	35	40	40	45	40	OK	marginal
	43	35	40	40	45	39	OK	marginal
	43	35	40	40	45	39	OK	marginal
	43	35	40	40	45	41	marginal	moderate
	43	35	40	40	45	40	OK	marginal
	43	35	40	40	45	40	OK	marginal
	43	35	40	40	45	39	OK	marginal

Addition of two single site criteria

Single Warkorth site criteria for Bulga & Maison Dieu and Combined criteria for East receivers (Criteria used in red text)

Table 4.3 Combined Leq,15minute noise assessment – Year 2 Night Warkworth Extension Plus Mount Thorley Mine, dB(A)

Privately Owned Receiver	Warkworth Single Site Leq,15minute Noise Limits (from EA), dB(A)	Mount Thorley Single Site Leq,15minute Limits (from consent) , dB(A)	Warkworth and Mount Thorley Two-Site Combined Leq,15minute Criteria, dB(A)	Predicted worst case Leq,15minute Noise Level Warkworth + Mount Thorley Mine, dB(A)	Exceedance (marginal/moderate/significant)						
	Operational	Acquisition	Operational	Acquisition	Combined Criteria						
38 Bulga	38	43	35	40	45	38	35	40	45	38	OK
39 Bulga	38	43	35	40	45	38	35	40	45	40	OK
40 Bulga	38	43	35	40	45	38	35	40	45	40	OK
41 Bulga	38	43	39	40	45	38	39	42	45	39	OK
42 Bulga	38	43	35	40	45	38	35	40	45	41	marginal
43 Bulga	38	43	35	40	45	38	35	40	45	40	OK
44 Bulga	38	43	35	40	45	38	35	40	45	40	OK
45 Bulga	38	43	35	40	45	38	35	40	45	39	OK
46 Bulga	38	43	35	40	45	38	35	40	45	40	OK

Hybrid Complex Criteria
 Addition of two single site criteria
 Single Warkworth site criteria for Bulga & Maison Dieu and Combined criteria for East receivers (Criteria used in red text)

OK
 marginal
 marginal
 marginal
 moderate
 marginal
 marginal
 marginal
 marginal

Table 4.3 Combined Leq,15minute noise assessment – Year 2 Night Warkworth Extension Plus Mount Thorley Mine, dB(A)

Privately Owned Receiver	Warkworth Single Site Leq,15minute Noise Limits (from EA), dB(A)	Mount Thorley Single Site Leq,15minute Limits (from consent) , dB(A)	Warkworth and Mount Thorley Two-Site Combined Leq,15minute Criteria, dB(A)	Predicted worst case Leq,15minute Noise Level Warkworth + Mount Thorley Mine, dB(A)	Exceedance (marginal/moderate/significant)
47	Bulga	38	43	40	OK
48	Bulga	38	43	40	OK
49	Bulga	38	43	40	OK
50	Bulga	38	43	41	marginal
52	Bulga	38	43	40	OK
53	Bulga	38	43	41	marginal
54	Bulga	38	43	39	OK
55	Bulga	38	43	41	marginal
56	Bulga	38	43	41	marginal
					Combined Criteria
					Addition of two single site criteria
					Hybrid Complex Criteria
					Single Warkorth site criteria for Bulga & Maison Dieu and Combined criteria for East receivers (Criteria used in red text)

Table 4.3 Combined Leq,15minute noise assessment – Year 2 Night Warkworth Extension Plus Mount Thorley Mine, dB(A)

Privately Owned Receiver	Warkworth Single Site Leq,15minute Noise Limits (from EA), dB(A)	Mount Thorley Single Site Leq,15minute Limits (from consent) , dB(A)	Warkworth and Mount Thorley Two-Site Combined Leq,15minute Criteria, dB(A)	Predicted worst case Leq,15minute Noise Level Warkworth + Mount Thorley Mine, dB(A)	Exceedance (marginal/moderate/significant)			
	Operational	Acquisition	Operational	Acquisition	Combined Criteria			
57	Bulga	38	43	40	45	41	marginal	moderate
58	Bulga	38	43	40	45	41	marginal	moderate
59	Bulga	38	43	40	45	41	marginal	moderate
60	Bulga	38	43	40	45	41	marginal	moderate
61	Bulga	38	43	40	45	39	OK	marginal
62	Bulga	38	43	40	45	41	marginal	moderate
63	Bulga	38	43	40	45	41	marginal	moderate
64	Bulga	38	43	40	45	41	marginal	moderate
65	Bulga	38	43	40	45	42	marginal	moderate

Hybrid Complex Criteria
 Addition of two single site criteria
 Single Warkworth site criteria for Bulga & Maison Dieu and Combined criteria for East receivers (Criteria used in red text)

Table 4.3 Combined Leq,15minute noise assessment – Year 2 Night Warkworth Extension Plus Mount Thorley Mine, dB(A)

Privately Owned Receiver	Warkworth Single Site Leq,15minute Noise Limits (from EA), dB(A)	Mount Thorley Single Site Leq,15minute Limits (from consent) , dB(A)	Warkworth and Mount Thorley Two-Site Combined Leq,15minute Criteria, dB(A)	Predicted worst case Leq,15minute Noise Level Warkworth + Mount Thorley Mine, dB(A)	Exceedance (marginal/moderate/significant)				
	Operational	Acquisition	Operational	Acquisition	Operational	Acquisition	Leq,15minute	Combined Criteria	Hybrid Complex Criteria
66	Bulga	38	43	35	40	45	41	marginal	moderate
67	Bulga	38	43	35	40	45	37	OK	OK
68	Bulga	38	43	35	40	45	42	marginal	moderate
69	Bulga	38	43	35	40	45	41	marginal	moderate
70	Bulga	38	43	35	40	45	37	OK	OK
71	Bulga	38	43	35	40	45	41	marginal	moderate
72	Bulga	38	43	35	40	45	41	marginal	moderate
73	Bulga	38	43	35	40	45	41	marginal	moderate
74	Bulga	38	43	35	40	45	40	OK	marginal

Addition of two single site criteria

Single Warkworth site criteria for Bulga & Maison Dieu and Combined criteria for East receivers (Criteria used in red text)

Table 4.3 Combined Leq,15minute noise assessment – Year 2 Night Warkworth Extension Plus Mount Thorley Mine, dB(A)

Privately Owned Receiver	Warkworth Single Site Leq,15minute Noise Limits (from EA), dB(A)	Mount Thorley Single Site Leq,15minute Limits (from consent) , dB(A)	Warkworth and Mount Thorley Two-Site Combined Leq,15minute Criteria, dB(A)	Predicted worst case Leq,15minute Noise Level Warkworth + Mount Thorley Mine, dB(A)	Exceedance (marginal/moderate/significant)			
75	Bulga	38	43	40	45	42	marginal	moderate
77	Warkworth	38	43	40	45	46	significant	significant
78	Warkworth	38	43	40	45	43	moderate	moderate
80	Bulga	38	43	40	45	38	OK	OK
81(AGL)	Bulga	38	43	40	45	44	marginal	significant
82	Bulga	38	43	40	45	41	marginal	moderate
84	Bulga	38	43	40	45	38	OK	OK
87	Bulga	38	43	40	45	43	marginal	moderate
89	Bulga	38	43	40	45	39	OK	marginal

Combined Criteria
 Addition of two single site criteria
Hybrid Complex Criteria
 Single Warkworth site criteria for Bulga & Maison Dieu and Combined criteria for East receivers (Criteria used in red text)

Table 4.3 Combined Leq,15minute noise assessment – Year 2 Night Warkworth Extension Plus Mount Thorley Mine, dB(A)

Privately Owned Receiver	Warkworth Single Site Leq,15minute Noise Limits (from EA), dB(A)	Mount Thorley Single Site Leq,15minute Limits (from consent) , dB(A)	Warkworth and Mount Thorley Two-Site Combined Leq,15minute Criteria, dB(A)	Predicted worst case Leq,15minute Noise Level Warkworth + Mount Thorley Mine, dB(A)	Exceedance (marginal/moderate/significant)				
	Operational	Acquisition	Operational	Acquisition	Combined Criteria				
					Hybrid Complex Criteria				
97 Bulga	38	43	39	40	42	45	44	marginal	significant
111 Bulga	38	43	35	40	40	45	34	OK	OK
117 Far Nth	35	40	35	40	38	43	38	OK	moderate
118 Far Nth	35	40	35	40	38	43	39	marginal	moderate
120 Far Nth	35	40	35	40	38	43	35	OK	OK
121 Far Nth	35	40	35	40	38	43	37	OK	marginal
122 Far Nth	35	40	35	40	38	43	35	OK	OK
123 Far Nth	35	40	35	40	38	43	37	OK	marginal
124 Far Nth	35	40	35	40	38	43	36	OK	marginal

Addition of two single site criteria

Single Warkworth site criteria for Bulga & Maison Dieu and Combined criteria for East receivers (Criteria used in red text)

Table 4.3 Combined Leq,15minute noise assessment – Year 2 Night Warkworth Extension Plus Mount Thorley Mine, dB(A)

Privately Owned Receiver	Warkworth Single Site		Mount Thorley Single Site		Warkworth and Mount Thorley Two-Site Combined		Predicted worst case		Exceedance (marginal/moderate/significant)
	Leq,15minute Noise Limits (from EA), dB(A)	Operational	Acquisition	Leq,15minute consent), dB(A)	Acquisition	Operational	Leq,15minute Noise Level Warkworth + Mount Thorley Mine, dB(A)	Leq,15minute Noise Level Warkworth + Mount Thorley Mine, dB(A)	
	Operational	Acquisition	Operational	Acquisition	Operational	Acquisition	Leq,15minute	Combined Criteria	Hybrid Complex Criteria
125 NE	37	43	35	40	39	45	42	moderate	moderate
126 NE	37	43	35	40	39	45	44	moderate	moderate
127 NE	37	40	35	40	39	43	37	OK	OK
128 NE	37	43	35	40	39	45	42	moderate	moderate
129 NE	37	43	35	40	39	45	41	marginal	marginal
130 NE	37	40	35	40	39	43	40	marginal	marginal
134 NE	37	40	35	40	39	43	37	OK	OK
137 NE	37	40	35	40	39	43	40	marginal	marginal
139 NE	37	40	35	40	39	43	40	marginal	marginal

Addition of two single site criteria

Single Warkworth site criteria for Bulga & Maison Dieu and Combined criteria for East receivers (Criteria used in red text)

Table 4.3 Combined Leq,15minute noise assessment – Year 2 Night Warkworth Extension Plus Mount Thorley Mine, dB(A)

Privately Owned Receiver	Warkworth Single Site		Mount Thorley Single Site		Warkworth and Mount Thorley Two-Site Combined		Predicted worst case Leq,15minute Noise Level Warkworth + Mount Thorley Mine, dB(A)	Exceedance (marginal/moderate/significant)	
	Leq,15minute Noise Limits (from EA), dB(A)	Operational	Acquisition	Leq,15minute consent), dB(A)	Operational	Acquisition			Leq,15minute Criteria, dB(A)
	Operational	Acquisition	Operational	Acquisition	Operational	Acquisition	Leq,15minute	Combined Criteria	Hybrid Complex Criteria
141 NE	35	40	35	40	38	43	36	OK	OK
142 NE	37	40	35	40	39	43	39	OK	OK
143 NE	36	40	35	40	39	43	39	OK	OK
144 East	35	44	43	44	44	47	49	significant	significant
146 East	35	42	41	42	42	45	48	significant	significant
147 Nor-East	35	40	35	40	38	43	44	significant	significant
148 East	39	40	37	40	41	43	43	marginal	marginal
149 East	36	40	39	40	41	43	46	significant	significant
150 East	36	40	37	40	40	43	42	marginal	marginal

Addition of two single site criteria

Single Warkworth site criteria for Bulga & Maison Dieu and Combined criteria for East receivers (Criteria used in red text)

Table 4.3 Combined Leq,15minute noise assessment – Year 2 Night Warkworth Extension Plus Mount Thorley Mine, dB(A)

Privately Owned Receiver	Warkworth Single Site		Mount Thorley Single Site		Warkworth and Mount Thorley Two-Site Combined		Predicted worst case Leq,15minute Noise Level Warkworth + Mount Thorley Mine, dB(A)	Exceedance (marginal/moderate/significant)
	Leq,15minute Noise Limits (from EA), dB(A)	Operational	Acquisition	Leq,15minute consent), dB(A)	Operational	Acquisition		
	Operational	Acquisition	Operational	Acquisition	Operational	Acquisition	Leq,15minute	Combined Criteria
151 East	36	40	39	40	41	43	42	marginal
152 Nor-East	35	40	35	40	38	43	42	moderate
153 East	38	40	37	40	41	43	42	marginal
154 East	36	40	37	40	40	43	44	significant
155 Nor-East	38	40	35	40	40	43	40	OK
156 Nor-East	37	40	35	40	39	43	40	marginal
157 Nor-East	37	40	35	40	39	43	40	marginal
167 East	35	40	35	40	38	43	33	OK
168 East	35	40	35	40	38	43	35	OK

Hybrid Complex Criteria
 Addition of two single site criteria
 Single Warkworth site criteria for Bulga & Maison Dieu and Combined criteria for East receivers (Criteria used in red text)

marginal
 moderate
 marginal
 significant
 OK
 marginal
 marginal
 OK
 OK

Table 4.3 Combined Leq,15minute noise assessment – Year 2 Night Warkworth Extension Plus Mount Thorley Mine, dB(A)

Privately Owned Receiver	Warkworth Single Site		Mount Thorley Single Site		Warkworth and Mount Thorley Two-Site Combined		Predicted worst case		Exceedance (marginal/moderate/significant)	
	Leq,15minute Noise Limits (from EA), dB(A)	Acquisition	Operational	Acquisition	Leq,15minute consent) , dB(A)	Leq,15minute Criteria, dB(A)	Leq,15minute Warkworth + Mount Thorley Mine, dB(A)	Leq,15minute Noise Level	Exceedance	Exceedance
	Operational	Acquisition	Operational	Acquisition	Operational	Acquisition	Leq,15minute	Leq,15minute	Combined Criteria	Hybrid Complex Criteria
169 East	35	40	35	40	38	43	38	38	OK	OK
170 East	35	40	35	40	38	43	37	37	OK	OK
171 East	35	40	35	40	38	43	32	32	OK	OK
172 East	35	40	35	40	38	43	39	39	marginal	marginal
173 East	35	40	35	40	38	43	39	39	marginal	marginal
174 East	35	40	35	40	38	43	38	38	OK	OK
175 East	35	40	35	40	38	43	38	38	OK	OK
176 East	35	40	35	40	38	43	37	37	OK	OK
177 East	35	40	35	40	38	43	38	38	OK	OK

Additional notes:
 Addition of two single site criteria
 Single Warkworth site criteria for Bulga & Maison Dieu and Combined criteria for East receivers (Criteria used in red text)

Table 4.3 Combined Leq,15minute noise assessment – Year 2 Night Warkworth Extension Plus Mount Thorley Mine, dB(A)

Privately Owned Receiver	Warkworth Single Site		Mount Thorley Single Site		Warkworth and Mount Thorley Two-Site Combined		Predicted worst case Leq,15minute Noise Level Warkworth + Mount Thorley Mine, dB(A)	Exceedance (marginal/moderate/significant)	
	Leq,15minute Noise Limits (from EA), dB(A)	Operational	Acquisition	Leq,15minute consent), dB(A)	Operational	Acquisition			Leq,15minute Criteria, dB(A)
	Operational	Acquisition	Operational	Acquisition	Operational	Acquisition	Leq,15minute	Combined Criteria	Hybrid Complex Criteria
178 East	35	40	35	40	38	43	36	OK	OK
179 East	35	40	35	40	38	43	36	OK	OK
180 East	35	40	35	40	38	43	38	OK	OK
181 East	35	40	35	40	38	43	41	moderate	moderate
182 East	35	40	35	40	38	43	40	marginal	marginal
183 East	35	40	35	40	38	43	42	moderate	moderate
184 East	35	40	35	40	38	43	41	moderate	moderate
185 East	35	40	35	40	38	43	30	OK	OK
186 East	35	40	35	40	38	43	42	moderate	moderate

Addition of two single site criteria

Single Warkworth site criteria for Bulga & Maison Dieu and Combined criteria for East receivers (Criteria used in red text)

5 Blasting

5.1 Introduction

In the meeting between the proponent and DP&I on 17 August 2011, DP&I requested the proponent consider how some potential impacts associated with blasting could be managed. Specifically DP&I requested that the proponent consider how fumes associated with blasting could be managed.

5.2 Management of fumes

As discussed in Section 10.7 of the EA (Volume 1), blasting at MTW is managed in accordance with EP 9.2 and the blast and vibration monitoring programme. These procedures will continue to be implemented at MTW.

Specifically in relation to fume, Environmental procedure EP 9.2 states:

Blasting design:

Individual blasts must be designed to contain the blast and minimise overpressure and vibration consistent with achieving an acceptable blast performance. Blast design must take into account the need to limit the environmental impacts associated with blasting such as proximity to roads and wet conditions which may cause fume. Significant factors will be the size of individual charges, the nature of stemming material and weather conditions.

Blasting and Road Closures:

Public roads within 500 metres of the site of a blast must be closed during the blast and until they are confirmed clear of dust, fume affecting visibility and free of fly-rock. The MTW has Putty Road & Jerrys Plains Road – Short term Temporary Traffic Closure for Blasting (Singleton Shire Council approved by the Singleton Council with conditions.

Weather Conditions:

On the day of blasting wind speed, direction and temperature is monitored at least 1 hr before the blast, 2 minutes prior to the blast and during the blast. If the weather conditions are unfavourable then there is a procedure for delaying blasting until better weather conditions. If the variability in wind speed and direction is beyond the limits for the site, the blast must not be fired without the approval of a Mining Superintendent or Manager Mining. Standard operational control does not note fume as a hazard of postponing a shot.

The standard operational control for blasts includes the requirement to assess the category of any fume based on colour when required. Shots are videoed until all dust, fumes and gasses have dispersed. All fume events reported to the site environmental co-ordinator.

In the event of the complaint regarding fume, if there was a blast at MTW at the time of the complaint, site will respond information such as:

- Time;
- Name of blast;
- Location of blast;

- If more than one blast, their proximity and timing;
- Weather conditions; such as, wind direction and speed at the time of the blast;
- Stills from video of the blast; and
- If overpressures and vibration criteria are exceeded.

6 Air quality and greenhouse gas

6.1 Introduction

Since the lodgement of the RTS, the proponent has undertaken a rigorous process with DP&I and OEH in relation to air quality. On 2 December 2010, DP&I requested that all existing and proposed air emissions at MTW be assessed.

In a meeting between the proponent and DP&I on 17 August 2011, DP&I requested the proponent consider how they would provide a duty of care to tenants in mine owned properties subject to dust levels above acquisition criteria. They also requested the proponent consider how GHG emissions may be managed onsite.

These matters are addressed below.

6.2 Air quality

In relation to DP&I's request for an assessment for MTW complex, the proponent prepared an air quality assessment for the combined operations of Warkworth Mine and Mount Thorley Mine to understand the air shed in the vicinity of these operations. The assessment considered PM₁₀ Annual Average, PM₁₀ 24 hour as well as cumulative PM₁₀ 24 hour. The results of this assessment were consistent with the results presented in assessment presented in the EA. The dispersion modelling conducted for the assessment included the most up to date information available at the time of writing and replicated the modelling conditions used in the Warkworth Extension assessment. Detailed mine plan information was provided by Mount Thorley mine to allow for more refined predictions compared to the cumulative assessment in the EA which used the 1995 EIS data.

The modelling results indicated that the incremental impacts for the combined operations of MTW may result in an additional two exceedances of the maximum 24-hour average DECCW criterion compared with the EA, however, the number of days that this is predicted to occur is below the DoP requirements. These were Receivers 77 and 151. Receiver 77 is currently within an existing Zone of Affection (ZoA) for noise impacts from mining operations.

Conversely, the number of residences predicted to be impacted by annual average PM₁₀ concentrations has been reduced in this assessment. The modelling of the combined operations indicated that one receiver (109) was predicted to experience cumulative annual average PM₁₀ concentrations above the 30 µg/m³ in Year 2. In the EA, an additional two receivers (77 and 102) were predicted to experience annual average PM₁₀ concentrations above the DECCW criterion. This reduction was most likely due to the refinement of operations at Mount Thorley Mine in the cumulative modelling.

Two additional commitments are proposed by WML in relation to providing a duty of care to tenants in mine owned properties (refer to Statement of Commitments in Appendix H). These are as follows:

- The proponent will provide a copy of the NSW Health fact sheet entitled 'Mine Dust and You' to landowners and tenants in mine owned residences identified in the predictions in the EA that dust emissions generated from the project are likely to be greater than the relevant air quality criteria at any time during the life of the project.
- In addition to providing the fact sheet, tenancy agreements for WML owned residences will include acknowledgement of mining impacts, including dust and health impacts, in the terms of

agreement. The agreements also facilitate the temporary vacation of WML owned residence if required due to mining impacts. The proponent will enable tenants to terminate their tenancy agreement without compensation based on mining impacts given reasonable notice. The proponent will also provide quarterly air quality monitoring reports on the Coal & Allied website and commit to providing the report to tenants where requested.

6.3 Greenhouse gas

Warkworth Mine undertook a coal seam gas (CSG) pilot programme, which was referenced in Section 9.11 of the Air Quality Study (EA Volume 3), to assess the potential to abate GHG emissions through commercial gas production. Specifically, the CSG pilot programme involved research and development testing the technical and commercial viability to pre-drain coal seams and capture the methane prior to open cut mining. To our knowledge, this is the first pilot programme of this nature where degassing is taking place ahead of open cut mining for the purpose of climate change mitigation.

The CSG pilot programme provided a number of key learnings. Proving the pilot is technically viable however does not guarantee that it is commercially viable as it is primarily dependent upon future carbon pricing. Given the research and development nature of the pilot programme, the CSG pilot programme does not provide specific greenhouse gas mitigation for the Warkworth Extension. What it does provide however, is significant learnings for climate change mitigation for future developments at Coal & Allied mines.

In a letter to DP&I on 3 February 2011, Rio Tinto Coal Australia committed to a number of specific initiatives to be implemented for the proposed Warkworth Extension to reduce GHG emissions. These commitments were reiterated in a letter to DP&I on 23 February 2011 and included:

- implementation of a detailed energy monitoring programme. This would include monitoring the electricity and diesel usage on-site to identify the main sources of GHG emissions and apply appropriate reduction mechanisms where possible; and
- undertake regular maintenance of diesel powered equipment to ensure operation at peak efficiency; and
- provide funding of research programmes to develop advanced technology focussing on reducing GHG emissions and carbon capture technologies.

7 Aboriginal cultural heritage

7.1 Introduction

Subsequent to the lodgement of the RTS in August 2010, DP&I requested further information on Aboriginal cultural heritage aspects of the proposed Warkworth Extension (Annex F of Volume 3 of the EA). The information requested comprised:

- further details on the Bulga Bora Ground and the Wollombi Brook Aboriginal Cultural Heritage Conservation Area;
- further details regarding consultation with Aboriginal stakeholders;
- additional information regarding reports referenced in the assessment and previous section 90 permits within the existing Warkworth Mine;
- copies of Aboriginal Heritage Information Management System (AHIMS) site cards recorded in the proposed Wollombi Brook Aboriginal Cultural Heritage Conservation Area; and
- various supplementary maps of heritage sites and extents associated with the proposed Warkworth Extension.

The proponent has provided the requested information to DP&I within the Warkworth Extension EA Supplementary Aboriginal Cultural Heritage report as well as in electronic format. The requested information is summarised in the sections below.

7.2 Wollombi Brook Aboriginal Cultural Heritage Conservation Area

On 14 March 2011, the proponent was contacted by two Aboriginal stakeholders with confidential and culturally sensitive information about the Bulga Bora Ground, near the Warkworth Mine. The proponent subsequently arranged a meeting with Kylie Seretis (DP&I) and Sarah Paddington (OEH) with the two Aboriginal stakeholders at DP&I's offices on 21 March 2011. The Bulga Bora Ground is located on the western side of the Warkworth Mine lease but outside of the proposed Warkworth Extension area. It will be contained within the proposed Wollombi Brook Aboriginal Cultural Heritage Conservation Area.

The key issue arising from the meeting was to determine whether or not the culturally sensitive areas associated with the Bora Ground as described in the information provided by the two Aboriginal stakeholders were protected within the boundary of the Wollombi Brook Aboriginal Cultural Heritage Conservation Area. The proponent invited the two Aboriginal stakeholders to inspect the Bulga Bora Ground area to ascertain if the culturally sensitive areas they had identified were incorporated within the boundary of the proposed Wollombi Brook Aboriginal Cultural Heritage Conservation Area. The inspection confirmed that those elements of the culturally sensitive areas situated on Coal & Allied owned lands were located within the Wollombi Brook Aboriginal Cultural Heritage Conservation Area and would not be disturbed by any current or future development activities. The proponent submitted a confidential draft report on the outcomes of the inspection to DP&I, OEH and the two Aboriginal stakeholders in June 2011.

7.3 Consultation with Aboriginal stakeholders

During 2010 the proponent continued comprehensive consultation with the Cultural Heritage Working Group (CHWG) with respect to the Warkworth Extension EA over five meetings, two workshops and site inspections. The Supplementary Report provided an updated chronology of consultation with details of these consultation events.

In summary, the consultation activities held since the lodgement of the EA in April 2010 include CHWG meetings held on 22 April, 8 July, 30 September and 25 November 2010, site tours of the Warkworth Extension and Wollombi Brook Aboriginal Cultural Heritage Conservation Area on 8 July 2010 and 26 November 2010, and a Warkworth Extension and Wollombi Brook Aboriginal Cultural Heritage Conservation Area management planning workshop on 25-26 November 2010.

Much of these consultations have focused on the development of a draft plan of management and associated community governance processes for the Wollombi Brook Aboriginal Cultural Heritage Conservation Area. These consultations are ongoing. The Warkworth Extension EA Supplementary Aboriginal Heritage report provided extracts of minutes and presentations of these CHWG meetings, site visits information and associated documents pertaining to the Warkworth Extension EA.

7.4 Additional investigations and information within existing Warkworth mine

The DP&I requested confirmation on the location of the area covered by the McCardle reports referenced in the Aboriginal Cultural Heritage assessment (Annex F of the EA). The proponent confirmed that the McCardle Cultural Heritage reports relate to the Warkworth Mine Stage 2 section 87 and section 90 Aboriginal Heritage Impact Permit (AHIP) surface collections and excavations salvage projects conducted within the existing Warkworth Mine development consent area (DA 300-9-2002-i).

The proponent, within the Warkworth Extension EA Supplementary Aboriginal Cultural Heritage Report, provided copies of these reports along with the more recent PN10 (AHIMS 37-6-1786) grinding grooves sites excavation report and the McCardle Warkworth Mine Non Disturbance Area 2 Conservation Area Assessment Report (2009). The latter report is a full coverage survey reassessment conducted over the northern-eastern most section of the proposed Wollombi Brook Aboriginal Cultural Heritage Conservation Area, previously sample surveyed by AMBS for the Warkworth 2002 EIS, to inform conservation management planning discussions with the CHWG.

The proponent also provided further additional information on previous section 90 AHIP consents #2801 and #1103070. The information provided included:

- three maps showing section 90/ section 87 AHIP areas and Aboriginal Cultural Heritage (ACH) sites salvaged between 2005 and 2010 at the Warkworth Mine;
- an excel spreadsheet listing details of the ACH sites salvaged under section 90/ section 87 AHIPs between 2005 and 2010 at the Warkworth Mine; and
- copies of the AHIP consent documents issued by OEH between 2005 and 2010 at the Warkworth Mine.

The DP&I also requested unedited DVD footage of the Warkworth Sands Excavation Project as well as a copy of Perry (2002) Aboriginal Cultural Assessment for Warkworth Coal Mine report. It should be noted that the video footage recorded as part of the Warkworth Sands Excavation Project was a collaborative initiative between Coal & Allied and the CHWG (with joint copyright) with the express purpose of providing an archival record of the project and other cultural information (including interviews with elders

and footage of other important cultural sites and landscapes in the area) for the Aboriginal community. As such, the proponent, out of respect of the CHWG's wish to maintain the confidentiality of their cultural and intellectual property, first sought the CHWG's consent to provide DP&I with a copy of this information. The proponent also sought legal advice to ensure that the proponent (and DP&I) did not inadvertently infringe on any copyright or intellectual property rights held by CHWG stakeholders in sharing this information with DP&I.

Following consultation with the CHWG, the proponent subsequently provided a copy of the above information, including Perry (2002), to DP&I.

7.5 AHIMS site cards and relevant information regarding identified sites

Upon review of the information within the EA and RTS, the DP&I requested clarification of the AHIMS numbers for all sites within the project area in order to update Table 9.2 in the EA. The Warkworth Extension EA Supplementary Aboriginal Cultural Heritage report provided detailed clarification of the differences between the sites data sets presented in Table 9.2 of the EA (and associated information contained within the technical report in Annex F). Table 9.2 lists only those extant sites located within the proposed Warkworth Extension Mining Disturbance Zone, the adjacent Potential Future Development Zone (outside of the extension application area) and the proposed Wollombi Brook Aboriginal Cultural Heritage Conservation Area.

Additionally, the report provided information relating to the AHIMS site cards issued by OEH to date as well as provided clarification regarding the contexts for groups of finds including areas with potential for subsurface archaeological deposits. The report stated that previous studies undertaken by AECOM (2009) and SCARP (2009) describe four sites as having potential for sub-surface archaeological deposits. MTW 28, an artefact scatter (200 m in diameter), is located within the Wollombi Brook Aboriginal Cultural Heritage Conservation Area. The remaining three sites, MTW 50 (isolated artefacts 10 m in diameter), MTW 60 (artefact scatter 100 m in diameter) and MTW 65 (isolated artefacts 20 m in diameter) are located within the proposed Warkworth Extension area.

7.6 Various supplementary information and maps

To support the information provided to the DP&I, the proponent submitted a revised Figure 9.1 to provide clarification on the extant and non-extant sites within the vicinity of the project.

As stated previously, Table 9.2 and Figure 9.1 within the EA present information for only those extant sites located within the proposed Warkworth Mine Extension Mining Disturbance Zone, Potential Future Development Zone and the proposed Wollombi Brook Aboriginal Cultural Heritage Conservation Area. The updated Figure 9.1 provided to DP&I contains sites to the north east of Wallaby Scrub Road (including the 'sand sheet' area) within the proposed Warkworth Extension area which are non-extant sites that have been salvaged and destroyed under various section 87 and section 90 AHIP consents within the existing Warkworth Mine development consent area. The associated salvage reports for these sites (eg McCardle Cultural Heritage Pty. Ltd 2008a, 2008b, and 2009 and also ERM 2004 and 2005) were provided to DP&I.

The proponent also provided various documents following discussions with DP&I and these reports were:

- 2010 Warkworth Sands West ground penetrating radar evaluation report (Georadar Research);
- 2004 ERM Bulga Bora Ground historical and archaeological assessment report; and
- AHIMS site cards for Bulga Bora Ground #37-6-0055 & 37-6-0056.

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8 Visual

In the meeting between the proponent and DP&I on 17 August 2011, DP&I requested the proponent consider how visual impacts could be mitigated through tree or vegetation planting on public land such as road reserves.

As part of the EA, a visual assessment was undertaken to ascertain the likely visual impacts of the proposed Warkworth Extension. The visual assessment found visual impact from the proposed Warkworth Extension to be low to moderate. It found that elevated locations in Bulga have some views of Saddleback Ridge which is located within the proposed Warkworth Extension area. Currently there is some effective screening from existing vegetation.

The EA detailed a number of commitments designed to mitigate visual impact and these included:

- WML commit to conducting site specific visual assessments for significantly affected landowners at elevated locations at Bulga;
- where the site specific assessment confirms the potential for significant impact, develop on site mitigation on consultation with the landholder, which may include such measures as on site visual screening;
- overburden will be rehabilitated with grasses and woodland. Woodland planting will be extended on the eastern face to achieve a similar mosaic to the existing rehabilitation on the landscape;
- the overburden heights will be maintained on average at current consent limits, which are RL 160 m AHD for Warkworth Mine and RL 155 m AHD for Mount Thorley Mine; and
- annual survey of overburden heights and rehabilitation areas as part of the annual operating plan.

Since the EA was publicly exhibited, in a letter to DP&I on 25 February 2011, the proponent also committed to the preparation of a Visual Management Plan to identify the privately-owned land that is likely to experience visual impacts during the proposed Warkworth Extension. The plan would describe the mitigation measures that could be implemented to reduce the visibility of the mine from these properties including mitigation measures identified in Section 6 of visual assessment contained in Annex I of the EA (Volume 4), as well as the timing for implementation of the strategies.

The Visual Management Plan would also identify where planting could be undertaken on public land, including road reserves and other public spaces, to reduce visual impacts of the proposed Warkworth Extension, subject to the consent of the appropriate authority. These plantings on public land may also assist in screening Warkworth Mine from private properties. Any proposal to undertake planting on public land would be undertaken in consultation with Council and Bulga residents.

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9 Other matters raised

9.1 Introduction

It the meeting between DP&I and Rio Tinto Coal Australia on 17 August 2011, DP&I requested RTCA respond to some specific queries relating to commitments around consulting with the RFS, upgrading of the Broke Road and Golden Highway intersection, apportioning the liability for transferring offsets for HVO South and consideration of alternatives to the proposed mining method for the proposed Warkworth Extension.

In addition, the proponent has commenced the process of entering into a voluntary planning agreement with Singleton Council with respect to contributions to cover for the increase in the demand for public amenities and public services as a result of the proposed Warkworth Extension.

These matters are addressed below.

9.2 Voluntary Planning Agreement

A VPA provides an alternative to the levying of development contributions under section 94 of the EP&A Act. They are an agreement entered into by a planning authority (such as DP&I or Singleton Council) and a developer. Under the agreement a developer agrees to provide or fund:

- public amenities and public services
- affordable housing
- transport or other infrastructure.

Contributions can be made through:

- dedication of land
- monetary contributions
- construction of infrastructure
- provision of materials for public benefit and/or use.

A VPA cannot be entered into unless public notice has been given and an explanatory note is made available for inspection for at least 28 days.

In December 2010, the proponent wrote to Singleton Council to formally initiate discussions in relation to a VPA. In that letter, the proponent advised that their position was to relocate Wallaby Scrub Road based on feedback from the community. The proponent subsequently received a letter from Council dated 14 December 2010 reiterating Council's resolved position for the retention of the existing Wallaby Scrub Road.

At a meeting between the proponent, DP&I and Singleton Council on 5 September 2011, DP&I provided feedback of their likely recommendation for closure of Wallaby Scrub Road without relocation. Based on this likely recommendation, DP&I advised that the proponent and Singleton Council should enter into

discussions in relation to VPA for any increase in the demand for public amenities and public services within the area caused by the proposed Warkworth Extension.

The proponent has developed proposed commitments that would form the basis of a VPA based on recent precedents in other local government areas as provided in Table 9.1 below. These commitments are subject to approval by the Coal & Allied Board and Warkworth Joint Venture participants and WML.

Table 9.1 Commitments to form basis of VPA

Column 1	Column 2
<p>Development Contribution</p> <p>Proposed Warkworth Extension Community Contribution</p>	<p>Payment Details</p> <p>Singleton Council may elect either:</p> <p>a) \$500,000 per annum for the additional mine life (11 years), commencing on 26 May 2021 (indexed annually according to CPI from 2021) and the final payment being made in the final calendar year of expiry of the project approval for the proposed Warkworth Extension.</p> <p>OR</p> <p>b) \$238,000 per annum for the additional mine life (11 years) spread over 21 years (indexed annually from commencement according to CPI), commencing from start of works under the new Project Approval and the final payment being made in the final calendar year of expiry of the project approval for the proposed Warkworth Extension.</p> <p>Council will prioritise the contribution towards expenditure in the local communities proximal to the Warkworth Extension, and specifically Bulga Village.</p> <p>A community representative committee will be established, including WML representatives, to make recommendations to Council regarding these contributions.</p>
<p>Council Roads Management Costs</p>	<p>Prior to closure of Wallaby Scrub Road:</p> <ul style="list-style-type: none"> • \$60,000 per annum (indexed annually from commencement according to CPI) towards maintaining Wallaby Scrub Road until closure. • \$160,000 per annum (indexed annually from commencement according to CPI) towards maintaining other Council roads. <p>After closure of Wallaby Scrub Road:</p> <ul style="list-style-type: none"> • \$220,000 per annum (indexed annually from commencement according to CPI) towards maintaining other Council roads. <p>Final payment under this clause to be made in the final calendar year of expiry of the project approval for the proposed Warkworth Extension.</p>
<p>Contribution to upgrade of Broke Road and Golden Highway Intersection</p>	<p>WML will make a contribution (dollars at the time of payment) to the Roads and Traffic Authority of up to \$1,000,000 towards the upgrade of the Broke Road & Golden Highway Intersection.</p>

Note: This contribution plan was made on a without prejudice basis and is subject to approval by the Coal & Allied Board, Warkworth Joint Venture participants and WM) securing mining access to the full footprint of the proposed Warkworth Extension proposed by the WML Environmental Assessment in conjunction with DP&I's recommendation for closure of Wallaby Scrub Road without relocation

Any compensation for the closure of Wallaby Scrub Road is a separate matter to be addressed by the proponent and Council outside the planning regime (ie under different legislation). While this agreement is not required until closure (nominally Year 2017) the proponent has stated that they would be prepared to enter into a reasonable agreement with Council at the same time as the VPA.

9.3 Broke Road and Golden Highway intersection

The proponent met with the RTA in Newcastle on 20 January 2010 to discuss the potential impacts to the intersection of Broke Road and Golden Highway. As discussed within the EA and Annex K of the EA:

The crash record at the Broke Road/ Golden Highway intersection is quite poor and includes two fatal crashes. These fatal crashes involved right-turning vehicles from Broke Road and westbound vehicles on the Golden Highway. Traffic is likely to divert through this intersection via Broke Road should Wallaby Scrub Road be closed due to the proposal. The level of service at this intersection is predicted to fall into an unsatisfactory level (F) regardless of whether the proposed Warkworth Extension proceeds or not.

Several options for the upgrade of the Broke Road/ Golden Highway intersection were discussed, which included installation of a roundabout, traffic lights or a seagull intersection with channelisation.

An upgrade to this intersection is not part of the proposal, however as listed in Table 9.1 above, the proponent commits to making a contribution (dollars at the time of payment) to the RTA of up to \$1,000,000 towards the upgrade of the Broke Road and Golden Highway Intersection (refer to Statement of Commitments in Appendix H) in the event of closure of Wallaby Scrub Road and no relocation. Such a contribution would have considerable and widespread community benefit given the poor level of services provided by the intersection and two recorded fatalities.

9.4 Rural Fire Service consultation

The closure of Wallaby Scrub Road will result in additional travel time for vehicles travelling from west of Wallaby Scrub Road north toward Muswellbrook (and vice versa).

As stated in Chapter 14.3.5 of the EA, the majority of users of Wallaby Scrub Road (over 75 per cent of through traffic use Wallaby Scrub Road via Charlton Road) would experience a 3.5 minute increase in travel time if it were to be closed. However, Wallaby Scrub Road users with an origin or destination west of Wallaby Scrub Road/Putty Road intersection (around 23 per cent), which include the Bulga RFS [travelling north to Jerrys Plain] or Jerrys Plain RFS (travelling south to Bulga) would experience an increase in travel time of approximately 6 minutes.

As stated in Chapter 14.3.6 of the EA, the RFS has crews at both Bulga (located to the south and west of Wallaby Scrub Road) and Jerrys Plains (located to the north of Wallaby Scrub Road). It is understood that the Bulga office of OEHS provides for, amongst other things, the implementation of the NPWS Fire Management Plan for the Yengo and Wollemi National Parks, which include the contribution of both the Bulga and Jerrys Plains RFS.

Following the closure of Wallaby Scrub Road in Year 7, these services would utilise the Golden Highway resulting in an increase in travel time of approximately 6 minutes. As stated in Chapter 14.3.6 of the EA, a proposed mitigation option to address this issue includes the development of a road closure management plan in conjunction with relevant stakeholders such as the local community, emergency services, RFS and SC to develop strategies to minimise potential impacts (e.g. RFS training or equipment support, boundary rezoning etc)

Accordingly, the following commitment was made by the proponent in the EA in relation to this matter (refer to Statement of Commitments in Appendix H):

Development of a road closure management plan in conjunction with relevant stakeholders such as the local community, emergency services, RFS and SC to develop strategies to minimise potential impacts.

9.5 HVO and Warkworth offset liability

The modification of the HVO South Project Approval proposes to reallocate the Archerfield Property provided as a 'Biodiversity Enhancement Area' to offset impacts caused by the clearing of native remnants (48 ha) and regrowth (9 2ha) for the HVO South Coal Project to an alternative site within the Goulburn River Biodiversity Area. The modification proposed would allow Archerfield to be used as part of the Northern Biodiversity Offset Area for the proposed Warkworth Extension.

In terms of offset liability, WML will provide for an area of 140 ha of remnant Narrow- leafed Ironbark woodland within the Goulburn River Biodiversity Area to offset the ecological impacts of HVO South (Coal & Allied's Hunter Valley South Coal Project PA 06-0261). The long term management of the 140 ha within the Goulburn River Biodiversity Area will be as described in Biodiversity Management Plan prepared for all of the offsets for the proposed Warkworth Extension including the Goulburn River Biodiversity Area. All ongoing matters associated with the HVO South commitment to provide 140 ha are incorporated into the Goulburn River Biodiversity Area and will be provided for by WML as part of the proposed Warkworth Extension approval.

9.6 Alternatives to project

In Section 5.15 of the EA (Volume 1), three mining alternatives were considered for Warkworth Mine, including mining under the current consent, mining under a new Project Approval for an open cut mine and mining under a new Project Approval for an underground mine. Based on an analysis of these alternatives, the option for seeking a new Project Approval for an open cut mine was deemed to be the preferred option. This option is still the preferred option.

9.6.1 Alternative mining methodologies

At the meeting on 17 August, DP&I requested consideration be given to auger mining at Warkworth Mine as an alternative to the proposed extension of the open cut. Auger mining is a surface mining technique used to recover additional coal from a seam located behind a highwall produced either by stripping or open-pit mining. It is generally only employed when open cut mining has been exhausted and the removal of overburden to access additional coal no longer becomes economically feasible. It only allows for the recovery of a small percentage of coal due to seam thickness, highwall stability and the need for pillars to remain in place. The proponent is not aware of any applications for auger mining since new guidelines were produced (CTR-001). The new guidelines basically require either very conservative (low recovery) assumptions be adopted, or a full analysis more typical of longwall.

As demonstrated in section 5.15.2 of the EA (Volume 1), the continuation of open cut mining at Warkworth Mine, as proposed, is the most economical feasible mining option. Given this and the disadvantages with auger mining, it is not considered to be a feasible alternative to the proposal.

9.6.2 Alternative sources of coal

An issue that arises in relation to applications for new coal mines or extensions to coal mines is that there are alternative coal resources located elsewhere either currently being mined or that could be mined and therefore it is not necessary for the mine the subject of the application to be approved. This issue is considered by Mr Gillespie in a paper contained in Appendix G.

This is a simplistic view that ignores the fundamentals of mineral economics, in particular the difference between 'resources' and 'reserves'. Resources are the volume of a mineral present in the ground but which may not be able to be mined due to certain constraints. In contrast, reserves are those mineral

deposits that have proven capacity to be developed under current or forecast financial, infrastructure, regulatory and other influencing conditions. It follows that the volume of reserves that are available to society is much smaller than the resources present.

There are many factors apart from the geological characteristics of a mineral deposit that determine whether it can be classified as a reserve and therefore has the potential to be mined. These include tangible factors like the availability of physical and human infrastructure both in the locality and at the potential mine site itself. As important are less tangible or 'governance quality' factors which determine the investment climate for minerals within a particular jurisdiction, such as NSW, including tax rates, contractual certainty under law and property rights. In combination, these tangible and governance factors are often as important as geological ones in determining whether resources can be developed. Therefore, it is fallacious to consider all of the state's mineral resources to be interchangeable.

The same argument can be illustrated through economic principles. Firstly, for there to be no consequence of simply relying on 'alternative coal resources elsewhere', it must be assumed that all coal resources are homogenous and all existing and future mining operations are homogenous in production.

Under perfectly elastic supply, if a mine that proposed to produce a certain volume of coal does not supply that quantity of coal, another mine will step in to supply it at the same cost. This essentially assumes either:

- spare capacity at existing mines and hence they can increase output without a rise in costs;
- expansion of existing mines or development of new mines is possible with no increase in costs; or
- high levels of stocks or inventories which can be run down to supply the market (a short term response only).

However, none of these assumptions hold. Because of the high level of capital investment in coal mines, as far as possible most mines try to operate at close to physical capacity of their capital equipment (ABARE 1991). Spare capacity in the existing industry is therefore likely to be modest and without additional capital investment, additional production at existing mines will encounter rapidly rising marginal costs.

Expansion of existing mines or development of new mines inevitably involves significant capital investment. Current and expected prices for coal are a significant determinant of investment decisions of mining companies. At the current and expected prices for coal, the proponents currently seeking approval for expansion of an existing mine or development of a new mine are those that consider that they can obtain an appropriate return on their investment. Those with existing mining operations or access to greenfield sites who are not currently seeking approval for expansion or new mine development are those that are likely to be at a cost disadvantage relative to others or are facing capital or other constraints.

In reality, the supply curve for coal is upward sloping, representing increasing costs of production of different existing and potential operations. Demand for coal is also relatively inelastic and hence shifts in supply can result in sharp changes in prices. All other things being equal, a constraint on supply from a single mine or mining region will contract future supply (relative to what it would be otherwise). More expensive producers of coal will come into production leading to a price increase and a contraction in overall quantity. This will result in foregone producer surplus benefits that would have been associated with the cheaper coal production and a loss in consumer surplus as a result of the price rise.

Whether these costs to society (foregone producer and consumer surpluses) are outweighed by the environmental benefits (avoided environmental impacts) is an empirical issue that is the subject of benefit cost analysis of project proposals. For the proposed Warkworth Extension it was found that production benefits (producer surplus) of the project outweigh the environmental costs. Consequently, to not proceed with the Project would result in net costs to society although distributional issues still need to be considered to ensure the local community and sectional interests do not bear a disproportionate share of the costs.

More expensive producers of coal, whether they be associated with expansion of an existing mine or establishment of a new mine, will also have a range of potential environmental externalities. If these more expensive producers of coal are located in NSW, they will require some form of environmental assessment. Whether or not the environmental impacts of these mines are greater or less than cheaper coal producers currently seeking approval is not known but what is certain is that if the costs of production increase, with inelastic demand community welfare will diminish. Prices for coal will rise and this will be passed on through domestic electricity production and steel production and ultimately to consumers. There will be a reduction in returns to shareholders and payments to government. Given that NSW competes in a competitive global coal market if the next cheapest producers of coal are located overseas or interstate then there will be reduction in the state's share of the market.

10 Conclusion

This PPR describes further rigorous assessments and undertakings by the proponent since the lodgement of the RTS in response to requests from DP&I and OEH. This PPR proposes significant improvements to the project to reduce potential impacts and to provide better outcomes for the environment and community.

The environmental improvements made to the project largely relate to ecological aspects, particularly the offset package. The offset package has been significantly enhanced with the inclusion of additional offset lands for the long-term protection of woodland. The proponent has committed to a substantial increase in the land to be rehabilitated to EEC ironbark communities following completion of mining as part of the final landform.

The additional and/or increased Biodiversity Areas will provide strategic regional offsets to compensate for the loss of woodland and to provide habitat for a range of threatened fauna species potentially impacted by vegetation clearance. The properties are strategically located in relation to conservation reserves and/or large tracts of Crown land and some occur within the Great Eastern Ranges corridor.

The proponent has also committed to several non land-based initiatives such as the continuation of the existing Stage I UNE research programme regarding WSW as well as funding Stage II and participating in the development of a recovery plan for WSW. For the Ironbark communities, the proponent has committed to contributing up to \$500,000 to research aimed at improving rehabilitation of ground stratum plant species of the Central Hunter Grey Box-Ironbark-Spotted Gum communities.

As discussed in this PPR, the existing research demonstrates that regeneration of WSW is both feasible and achievable. The improved long-term viability of WSW is supported by experts in their field, including an expert in restoration ecology. More importantly under the also proposed offset package, 75 percent of WSW would be conserved and managed in offset sites, compared to 50 percent under the 2003 offset package. Overall this will result in a better environmental outcome for the WSW.

The proposal has also incorporated significant operational improvements which provide better outcomes for the community. By the end of the first year of operation under a new approval, the Warkworth Mine will have 40 percent of the truck fleet attenuated to reduce noise, with this increasing progressively with 80 percent attenuated by the end of Year 6. This commitment is a substantial capital investment made by the proponent towards creating a better environment for the neighbouring community.

Further, the community of Bulga will be entitled to more stringent noise limits from the combined Warkworth and Mount Thorley mines, with many residents eligible for on-site mitigation measures upon request.

An economic assessment was undertaken of the proposed Warkworth Extension and reported in the EA. The outcome was that the benefits significantly outweigh the costs and the project is clearly in the public interest. The improvements to the proposed Warkworth Extension described in this PPR provide further support to the strong justification for the project to proceed.

The proponent has developed proposed commitments that would form the basis of a VPA based on recent precedents in other local government areas to cover the increase in the demand for public amenities and public services as a result of the proposed Warkworth Extension. The commitments made include (but are not limited to) monetary contributions for Council to prioritise towards expenditure in the local communities proximal to the Warkworth Extension, and specifically Bulga Village. It also includes a significant contribution of up to \$1,000,000 to the RTA towards the upgrade of the Broke Road

and Golden Highway Intersection in the event of closure of Wallaby Scrub Road and no relocation. Such a contribution would have considerable and widespread community benefit given the poor level of services provided by the intersection and two recorded fatalities.