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Updated Noise and Blasting Assessment

BYLONG COAL PROJECT
Supplementary Information

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Report

Bylong Coal Project – Noise and Blasting Impact Assessment Revised Mine Plan

6 July 2018

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The business of sustainability

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1 Introduction

This report details the findings of an assessment of the potential noise and blasting impacts associated with contracting the open cut mine plan associated with the Bylong Coal Project (the Project) as requested by NSW Department of Planning and Environment (DPE). This assessment has been prepared with reference to the previous assessments undertaken for the Project as part of the Noise and Blasting Impact Assessment (EIS NBIA) (Pacific Environment (PEL, 2015)) and subsequent updates to the project detailed in the Bylong Noise Report Addendum (Addendum Report) (PEL, 2016) which were prepared by Pacific Environment (now ERM).

The Revised Mine Plan for the Project which has been developed to address DPEs request generally entails reducing the footprint of the Eastern Open Cut to remain outside of the Tarwyn Park property as well as reducing the mining footprint within the Western Open Cut to retain an elevated ridgeline within this area.

This revised assessment was completed for Hansen Bailey on behalf of WorleyParsons Services Pty Limited (WorleyParsons) as the Project Manager for the Project, which is owned by KEPCO Bylong Australia Pty Ltd (KEPCO).

1.1 Overview

This Assessment has been completed in consideration of the following documents and guidelines:

- Industrial Noise Policy (INP) (EPA, 2000) with consideration of the Noise Policy for Industry (NPI) (EPA, 2017) in relation to low frequency noise assessment;
- DPE's Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments (VLAMP) (DP&E, 2014); and
- Australian and New Zealand Environment Council (ANZEC) (1990), Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration.

2 Project Updates

In light of the advice received from the Planning Assessment Committee (PAC) (now referred to as the Independent Planning Commission (IPC)) and the Heritage Council of NSW, DPE has requested KEPCO provide information in relation to the potential environmental impacts of contracting the mining footprint of the Project to remain off the Tarwyn Park property and other considerations. In relation to this, DPE has requested a high-level review of the revised mine plan to confirm whether the impacts would be equal to or less than that predicted within the EIS documentation provided to date.

The Revised Mine Plan will reduce the life of open cut mining operations by around one year, however, will continue generally consistent with the later years (Project Year (PY) 5 to PY9) of the mining operations currently proposed within the EIS. The Revised Project Disturbance Boundary will reduce, however remain within the Project Disturbance Boundary previously assessed within the EIS. No changes are proposed to the construction activities nor the underground operations assessed within the EIS. The annual run of mine (ROM) coal extraction rate of 6.5 Million tonnes per annum (Mtpa) will remain, however coal production from the open cut will marginally reduce in line with the Revised Mine Plan. The equipment fleet will also marginally reduce at peak open cut operations.

3 Noise and Vibration Criteria

Operational noise and blasting criteria were developed for the EIS NBIA (PEL, 2015) with consideration to the requirements of the INP (EPA, 2000). This revised assessment has adopted the previously developed criteria from the EIS NBIA.

The revised list of sensitive noise and blast receivers (which reflects the current status of land ownership within and surrounding the Project) is included in Appendix A.

3.1 Operational Noise

The Project Specific Noise Levels (PSNL) as developed within the EIS NBIA (PEL, 2015) are reproduced in *Table 3-1*.

Table 3-1: Operational Noise Criteria

Receiver/Land Use	Descriptor	Operational Noise Criteria, dB(A)		
		Day	Evening	Night
Residential	$L_{Aeq,15min}$	35	35	35
Places of Worship (external) (when in use)	$L_{Aeq,period}$	50 (when in use)	50 (when in use)	50 (when in use)
Area specifically reserved for passive recreation[2] (when in use)	$L_{Aeq,period}$	50	50	50
Active recreation area (when in use)	$L_{Aeq,period}$	55 (when in use)	55 (when in use)	55 (when in use)
Commercial premises	$L_{Aeq,period}$	65	65	65
Industrial premises	$L_{Aeq,period}$	70	70	70

Notes:

1. Day (7.00am-6.00pm Monday to Saturday and 8.00am-6.00pm Sundays and Public Holidays), Evening (6.00pm-10.00pm), Night (10.00pm-7.00am, unless preceding a Sunday or Public Holiday).

2. Noise criteria specified in the INP as internal limits are assessed using an external limit based on an outside to inside correction of 10 dB as specified in Section 2.2.1 of the INP.

3.2 Blasting Overpressure and Vibration

Blasting overpressure and ground vibration is assessed using the ANZEC guidelines (ANZEC, 1990). These guidelines set limits for overpressure and ground vibration levels. Where compliance is achieved, the risk of annoyance is minimised. The limits which were utilised within the EIS NBIA and have been relied upon within this assessment are presented in *Table 3-2* .

The guidelines recommend that blasting is carried out between 9.00am to 5.00pm Monday to Saturday and should not be carried out outside of these times, including on Sundays and Public Holidays.

Table 3-2: *ANZEC Guideline Blasting Limits*

	Overpressure dB (Linear Peak)	Ground Vibration PPV (mm/s)
Recommended Maximum (95% of all blasts)	115	5
Level not to be exceeded	120	10
Long term goal for ground vibration	-	2

Notes: Overpressure limits apply where measurement equipment has a cut-off frequency of 2 Hz or less. Where equipment has a high cut-off frequency, 5 dB should be added to all levels.
PPV – peak particle velocity.

Heritage items which were identified during the EIS assessments include both European Structures and Aboriginal artefacts and rock features (identified to comprise cultural value). The criteria for these items was established within the EIS based on the guideline values in British Standard (BS) 7385: Part 2 and Australian Standard (AS) 2817: Part 2, in lieu of any specific vibration limits for these items. The criteria have been set using the most stringent guideline values for risk of cosmetic damage for heritage structures, such as buildings.

A summary of the guideline vibration criteria for heritage items is provided in *Table 3-3***.**

For rock shelters and significant structures, examples from other similar mining projects suggest that a limit of 50 mm/s is appropriate. For trees with heritage significance, no set criteria exist. Therefore a guideline limit of 50 mm/s has also been used. Further blast testing, monitoring and surveying should be carried out to determine specific guideline levels.

The overpressure guideline limit is based on the value recommended in AS 2187: Part 2-2006 Appendix J for building damage, which recommends 133 dB(L) as the safe level to minimise the risk of structural or architectural damage from air blasts.

The criteria levels used in this assessment (as developed within the EIS NBIA) are intended to be guideline levels only and are not definitive levels below which damage is not guaranteed to occur.

Table 3-3: Heritage Item Guideline Blasting Limits

Item	Overpressure dB (Linear Peak)	Ground Vibration PPV (mm/s)
Sensitive Heritage Buildings and Structures	133	15
Heritage Archaeological Sites	133	15
Rock structures, Shelters and Grooves	133	50
Aboriginal Heritage (Trees)	133	50

4 Operational Noise Modelling

Noise impacts for the Revised Mine Plan have been assessed utilising a consistent approach to the NBIA and Addendum noise assessment. That is, the modelling methodology, mining equipment noise source emissions and adopted Project management and mitigation measures have been maintained consistent with the EIS NBIA (PEL, 2015) and the subsequent addendum noise assessment (PEL, 2016).

Operational year 3 (or PY5) has been selected for the purposes of demonstrating the worst case noise impacts for the Revised Mine Plan. Whilst the overburden and coal production rates are greater in PY6 to PY8, the mining activity in each of these years is almost exclusively in one mining area (Eastern Open Cut) and will be considerably further away from the nearest sensitive private receivers located to the north of the Project. When considering the two mining areas (Eastern Open Cut (Pit 1) and Western Open Cut (Pit 5)) operating simultaneously, PY5 has the highest amount of activity and distribution of the equipment fleet, while being closest to the sensitive receivers surrounding Bylong village.

4.1 Key Source Changes

An assessment scenario has been developed representative of the Revised Mine Plan and equipment locations for a worse case assessment year as experienced by noise sensitive receivers for the initial open cut mining years. The changes are summarised below:

- PY5 has been selected as representative of worse case impacts to sensitive receivers (2020 mine year in the EIS NBIA) according to the coal production schedule summary. Modelling based on the mine plan and suggested equipment locations for the worst case year PY5;
- Overburden emplacement, open cut mining area topography and haul road alignments for the PY5 scenario has been updated in the noise model;
- Open cut mining equipment and associated equipment noise sources have been shifted to the Revised Mine Plan locations and haul routes; and
- Haul road activity adjustment due to construction of southern haul road across Lee Creek earlier in mine life to enable overburden emplacement from Eastern Open Cut (Pit 1).

Noise source locations are included in Appendix B. Sound power levels for the equipment fleet remain consistent with the EIS NBIA and Addendum noise assessment.

4.2 Assessment Methodology

Noise modelling has been undertaken using the International Organization for Standardization 9613 Acoustics – Attenuation of sound during propagation outdoors (ISO, 1996) and CONCAWE's Special Task Forces in Noise Propagation (CONCAWE, 1981) algorithms, as implemented within the CadnaA 4.3 acoustic modelling package. The noise modelling takes into consideration the sound power level of the proposed site operations, activities and equipment, and applies adjustments for attenuation from geometric spreading, acoustic shielding from intervening ground topography, ground effect, meteorological effects and atmospheric absorption.

The modelling of operational noise impacts included each of the meteorological conditions assessed as part of the EIS NBIA.

Table 4-1 reproduces the meteorological conditions included in the EIS NBIA and consistently utilised within the revised assessment.

Table 4-1: Meteorological Modelling Conditions

			Modelling Parameters			
ID	Period	Meteorological Conditions	Wind	Pasquil-Gifford Stability Class	Relative Humidity	Air Temperature
1	Day	Neutral	No Wind	D	70%	20°C
2	Day	Gradient Wind	3 m/s ESE	D	70%	20°C
3	Day	Gradient Wind	3 m/s S	D	70%	20°C
4	Day	Gradient Wind	3 m/s WSW	D	70%	20°C
5	Evening/ Night	Neutral	No Wind	D	90%	10°C
6	Evening/ Night	Gradient Wind	3 m/s S	D	90%	10°C
7	Evening/ Night	Gradient Wind	3 m/s SE	D	90%	10°C
8	Evening/ Night	Gradient Wind	3 m/s WSW	D	90%	10°C
9	Evening/ Night	Temperature Inversion	No Wind	F	90%	10°C
10	Evening/ Night	Temperature Inversion and Drainage Flow	2 m/s SSE	F	90%	10°C

4.3 Results

Predicted noise levels for impacted receivers (where noise impacts are equal to or greater than 35 dB(A)) for each period of the day and meteorological conditions described in *Table 4-1* are presented in *Table 4-2* for PY5. The results are inclusive of adopted mitigation measures (as stipulated in Section 5.4 of the EIS NBIA). Detailed noise modelling results at sensitive receivers are presented in Appendix C.

Colour coding indicates exceedances of the PSNL as described in the DPE VLAMP.

Predicted low frequency noise contributions for the 63Hz and 125Hz octave bands were assessed utilising a methodology developed based on the at time draft industrial noise guideline (EPA, 2015) and presented in the Bylong Coal Project Addendum Assessment (PEL, 2016) and EIS Response to Submissions (Hanson Bailey, 2016). Review of the predicted low frequency spectrum at each receiver for the Revised Mine Plan, did not identify a low frequency impact at any of the remaining sensitive receivers.

Table 4-2: Predicted Impacts for Revised Mine Plan – PY5

		Predicted Noise Level LAeq,15min dB(A)									
Period		Day	Day	Day	Day	Eve/` Night	Eve/ Night	Eve/ Night	Eve/ Night	Eve/ Night	Eve/ Night
Condition ID		1	2	3	4	5	6	7	8	9	10
Receiver ID	Criteria LAeq 15min										
56	35	29	35	35	25	30	37	37	26	37	35
57A	35	27	34	34	23	29	36	35	24	36	34
57C	35	27	34	34	23	29	36	35	24	36	34
58	35	30	37	37	26	32	38	38	27	38	37
60	35	33	39	39	32	34	40	40	32	40	40
151[3]	35	29	28	26	26	31	27	27	27	38	31
158[3]	35	28	26	25	25	30	26	26	27	37	30

Note: 1. Period: Day (7.00am-6.00pm Monday to Saturday and 8.00am-6.00pm Sundays and Public Holidays), Evening (6.00pm-10.00pm), Night (10.00pm-7.00am, unless preceding a Sunday or Public Holiday).

2. Cells are shaded light blue for negligible impacts and blue for moderate impacts.

3. KEPCO has reached the relevant agreement to purchase this property.

4.4 Discussion

As a result of the mining operations within the Revised Mine Plan generally shifting mining further towards the south in PY5, slight reductions in noise impacts are predicted for receivers to the north of the Project. When comparing the overall predicted noise levels against previously proposed PY3, noise levels at impacted receivers located to the north have reduced on average by 1 dB. At receivers to the south and east of the Project noise levels have remained consistent with noise levels previously predicted for PY5 and following years mining operations.

*Table 4-3 p*resents a summary of the receivers which are predicted to receive moderate or negligible impacts (using the greatest predicted noise level) and the type of treatment in consideration of the DPE VLAMP.

In comparison to the outcomes of the EIS NBIA, the number of privately owned residences with significant impacts reduces by 1, that is receiver 60 is no longer significantly impacted.

Table 4-3: Impact Significance

Receiver ID	Impact Significance					Treatment
	Year 5 Proposed	Year 3 Previously Assessed	Year 5 Previously assessed	Year 9 Previously assessed	UG Previously assessed	
56	Negligible	Negligible	Negligible	-	-	-
57A	-	-	Negligible	-	-	-
57C	-	-	Negligible	-	-	-
58	Moderate	Moderate	Moderate	-	-	At property mitigation
60	Moderate[#]	Significant	Moderate	Moderate	Negligible	At property mitigation
151*	Moderate	Moderate	Moderate	Moderate	-	At property mitigation
158*	Negligible	-	Moderate	Negligible	-	At property mitigation

Notes: # Previously assessed within the EIS NBIA and Addendum noise assessment to be significantly affected by noise from the Project.
* KEPCO has reached the relevant agreement to purchase this property.

5 Blast Overpressure and Vibration Assessment

Blasting impacts for the Revised Mine Plan with reduced open cut mining footprint have been assessed utilising an approach consistent with methodology adopted for the EIS NBIA (PEL, 2015).

5.1 Methodology

Overpressure and ground vibration levels were calculated based on a set of conservative site laws. The calculations are indicative only and predictions should be further developed as part of the blast design and development of specific site laws.

A detailed blasting design has not yet been completed for the updated open cut. Therefore, a conservative approach was taken to predict overpressure and vibration levels using the maximum instantaneous charge (MIC) of 410 kg, 1000 kg and 3500 kg. The initial MIC of 410 kg was selected based on a typical hole depth of 15 m and hole diameter of 229 mm, taken from the preliminary blasting design in the Project's feasibility study (RPM/QCC Resources/PB, 2014).

Blasting overpressure and vibration have been calculated at the nearest sensitive receivers according to Australian Standard AS 2187: Part 2-2006 "Explosives – Storage and Use – Part 2: Use of Explosives" and the US Bureau of Mines.

The air blast overpressure levels (OP) are predicted from the equation below:

$$OP = 164.35 - 24\left(\log D - \frac{1}{3} logQ\right)$$

The PPV for average ground type are predicted from the equation below:

$$PPV = K * \left(\frac{D}{\sqrt{Q}}\right)^{-1.6}$$

For both equations, D is distance in meters from the blast to the assessment point, Q is the weight in kg of explosive per day or MIC and K is the site based factor.

5.2 Results

Appendix D presents predicted blasting impacts on blast sensitive receivers within and surrounding the Project.

The Eastern Open Cut mining area footprint contractions have resulted in the Former Bylong Catholic Church & Cemetery no longer being located within the disturbance area. Blasting activities will now be located more than 1 kilometre (km) from these features. Predicted blasting impacts at this receiver location are below the 15mm/s vibration and/or 133dB overpressure criteria for heritage receivers at MIC mass up to 3500kg. Accordingly, the closest blasting activities to this feature will be able to be appropriately managed to ensure they do not damage the building and cemetery.

Further to this, the contracted mining footprint also significantly reduces the predicted blast impacts to the Tarwyn Park Homestead and Stables. The closest blasting activities will now be located more than 1.4 km from these sensitive heritage items. Predicted blasting impacts at these receiver locations are below the 15mm/s vibration and/or 133dB overpressure criteria for heritage receivers at MIC mass up to 3500kg. The blast design work completed for the Response to PAC Review Report by Terrock Consulting (2017) (to demonstrate blasting activities can be designed to ensure no structural damage to nearby heritage items) will be reviewed and updated as part of the Blast Management Plan to be developed for the Project (post-approval).

The Aboriginal heritage sites to be avoided for the Revised Mine Plan (three artefact scatters and an isolated find) will be located more than 150 m from the closest blasting activities. These sites are located on the surface and are unlikely to be significantly impacted by blasting activities associated with the Revised Mine Plan.

Table 5-1: Predicted Blasting Impacts Former Bylong Catholic Church and Tarwyn Park Complex

Description	Vibration, mm/s			Overpressure, dB(L)		
	MIC-410kg	MIC-1000kg	MIC-3500kg	MIC-410kg	MIC-1000kg	MIC-3500kg
Former Bylong Catholic Church & Cemetery (1915)	2.14	4.38	11.92	113	116	120
Tarwyn Park Homestead	1.17	2.39	6.51	109	112	117
Tarwyn Park Stables	1.35	2.75	7.50	110	113	117
Tarwyn Park Horse Burials	1.26	2.57	7.01	110	113	117

6 Mitigation and management measures

Noise and blasting management and mitigation measures were developed within the EIS NBIA and Addendum noise assessment. This assessment has confirmed that consistent management and mitigation measures committed to within the EIS and supporting approvals documentation remains appropriate.

6.1 Operational noise management

Noise mitigation measures were developed in the EIS to reduce noise impacts utilising a reasonable and feasible approach. Key aspects of noise mitigation included noise source mitigation on mining infrastructure and the mobile equipment fleet, management of operations to avoid working in the North Western Overburden Emplacement Area during noise enhancing meteorological conditions.

In addition to these key noise control measures, noise management is required to ensure that the Project operates within the criteria and to reduce the potential for increased noise emissions to occur. A noise management plan (NMP) and accompanying monitoring plan is proposed to ensure impacts are appropriately monitored and managed.

The requirements for both the NMP and monitoring plan as detailed within the EIS NBIA (PEL, 2015) continue to remain appropriate for the Revised Mine Plan for the Project.

6.2 Blast Management

Consistent with the recommendations within the EIS NBIA (PEL, 2015) and to ensure blast impacts at sensitive locations are managed appropriately, a Blast Management Plan (BMP) will be developed for the Project. Further, trial blasts should be designed and monitored to confirm site specific conditions and validate local propagation characteristics (develop site specific “site laws”) and confirm the MICs and blast designs to meet vibration and overpressure limits.

Regular condition surveys will provide ongoing information as to the in-situ condition of the heritage structures and features identified.

The undertaking of these measures will ensure that blasting occurs in a manner that mitigates potential impacts at sensitive locations.

7 Conclusion and Recommendations

This report details the findings of an assessment of the potential noise and blasting impacts associated with contracting the open cut mine plan associated with the Project as requested by DPE. This assessment has been prepared with reference to the previous assessments undertaken for the Project as part of the EIS NBIA and subsequent updates to the project detailed in the Addendum Report.

The Revised Mine Plan for the Project which has been developed to address DPEs request generally entails reducing the footprint of the Eastern Open Cut to remain outside of the Tarwyn Park property as well as reducing the mining footprint within the Western Open Cut to retain an elevated ridgeline within this area.

As a result of the Revised Mine Plan, mining operations are generally shifted further south which results in slight reductions in noise impacts are predicted for receivers to the north of the Project. When comparing the overall predicted noise levels against the PY3 operations within the EIS NBIA, noise levels at impacted receivers have reduced on average by 1 dB.

At receivers located to the south and east of the Project, noise levels have remained consistent with noise levels previously predicted for PY5 and following years mining operations.

With regard to privately owned land subject to land acquisition in accordance with DPE VLAMP, this NBIA has confirmed that receiver 60 is no longer predicted to be significantly impacted by noise from the Project and is now predicted to experience moderate noise impacts. Receiver 58 and Receiver 60 are the only remaining receivers to experience moderate noise impacts as a result of the Revised Mine Plan for the Project. Receivers 56, 57A and 57C are predicted to experience negligible noise impacts (consistent with the EIS mine plan) as a result of the Revised Mine Plan for the Project.

The contraction to the footprint of the Eastern Open Cut mining area has enabled the Former Bylong Catholic Church & Cemetery to be retained throughout the life of the Project. Predicted blasting impacts at the church and cemetery is predicted to be below the 15mm/s vibration and/or 133dB overpressure criteria for heritage receivers. Additionally, blast impacts at the Tarwyn Park Homestead and Stables are significantly reduced when compared to impacts presented in the EIS with vibration and overpressure levels now below the criteria for heritage receivers for all blast MIC scenarios assessed. Negligible blasting impacts will occur to Aboriginal heritage items due to the project disturbance boundary only comprising of surface artefact sites. Which will be managed in accordance with the Aboriginal Heritage Management Plan to be developed for the Project.

Accordingly, blast impacts will be able to be appropriately designed and managed to ensure that these items are not structurally compromised. It is recommended that noise management and mitigation measures adopted within the EIS are appropriate and should be maintained to manage the noise impacts for the revised mine plan for the Project.

Blasting mitigation measures committed to within the EIS and subsequent approvals documents including trial blasts, ongoing blast monitoring and conditions surveys continue to be appropriate and continue to be maintained for the Revised Mine Plan to ensure the potential for impacts from blasting is minimised.

8 References

Australian and New Zealand Environment Council (ANZEC) (1990), *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration*.

Australian Standard AS 1055:1997, *Acoustics – Description and measurement of environmental noise.*

Australian Standard AS 2187:2006, *Explosives – Storage and Use – Part 2: Use of Explosives.*

British Standard, 1993, *BS 7385-2 Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration.*

CONCAWE Report No. 4/81, Manning C.J., 1981, *The propagation of noise from petroleum and petrochemical complexes to neighbouring communities.*

Department of Planning and Environment (2014) *Voluntary Land Acquisition and Mitigation Policy For State Significant Mining, Petroleum and Extractive Industry Developments*.

Hansen Bailey (2016) *Bylong Coal Project Response to Submissions*

International Standards Organisation (1996), ISO 9613-2:1996, *Acoustics -- Attenuation of sound during propagation outdoors -- Part 2: General method of calculation.*

NSW Environmental Protection Authority (2000), *Industrial Noise Policy* (INP).

NSW Environmental Protection Authority (2015), *Draft Industrial Noise Guideline*

Pacific Environment Limited (2015) *Bylong Coal Project Noise and Blasting Impact Assessment*.

Pacific Environment Limited (2016) *Bylong Coal Project Noise and Blasting Addendum Assessment*.

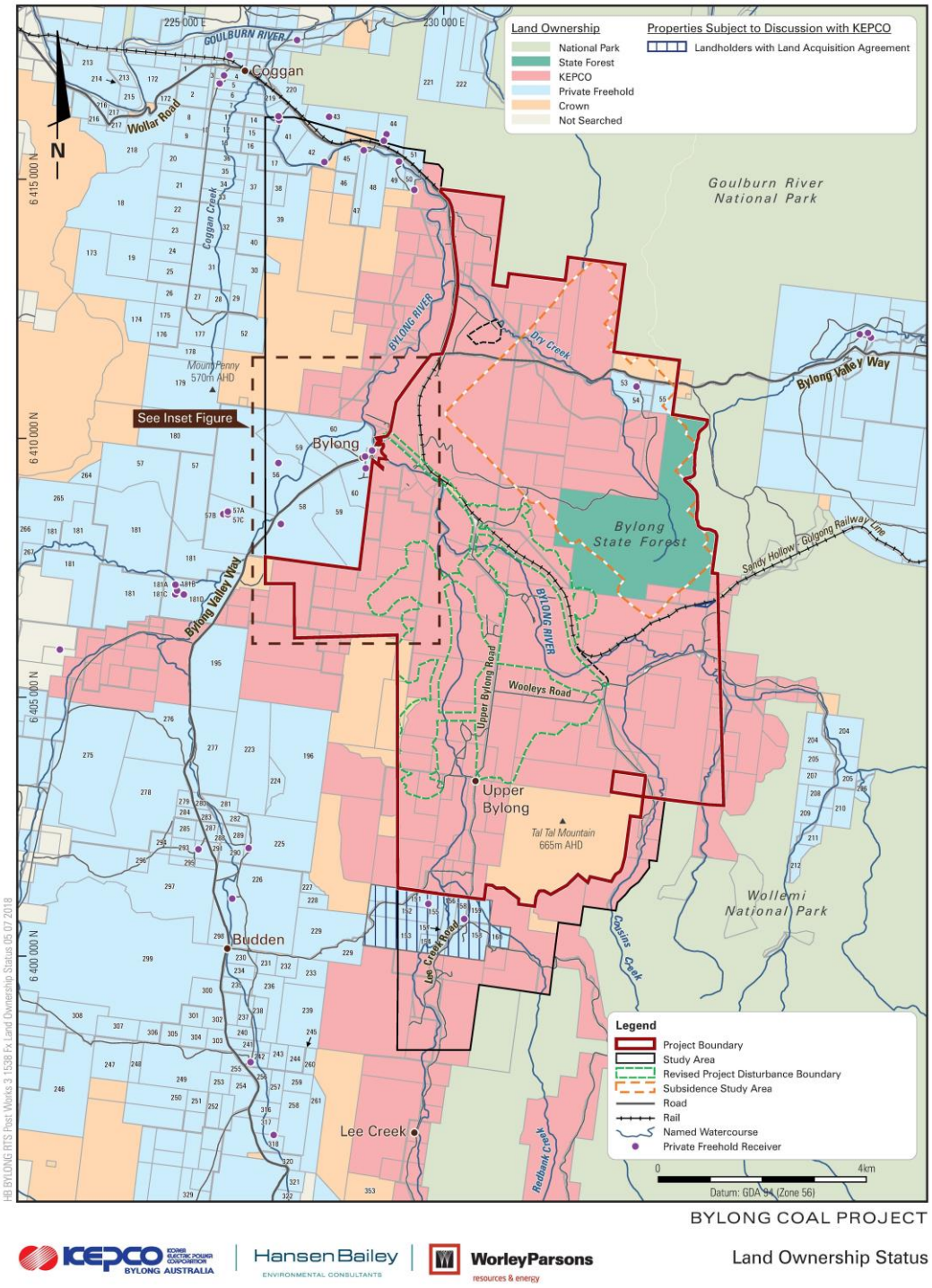
RungePincockMinarco, QCC Resources & Parsons Brinckerhoff, (2014) *Bylong Coal Project – Feasibility Study* [ref: 2172857B-MNG-REP-001 RevC]

Terrock Consulting Engineers (2017) *Blast Management Strategy for Tarwyn Park Farm Complex*

Appendix A

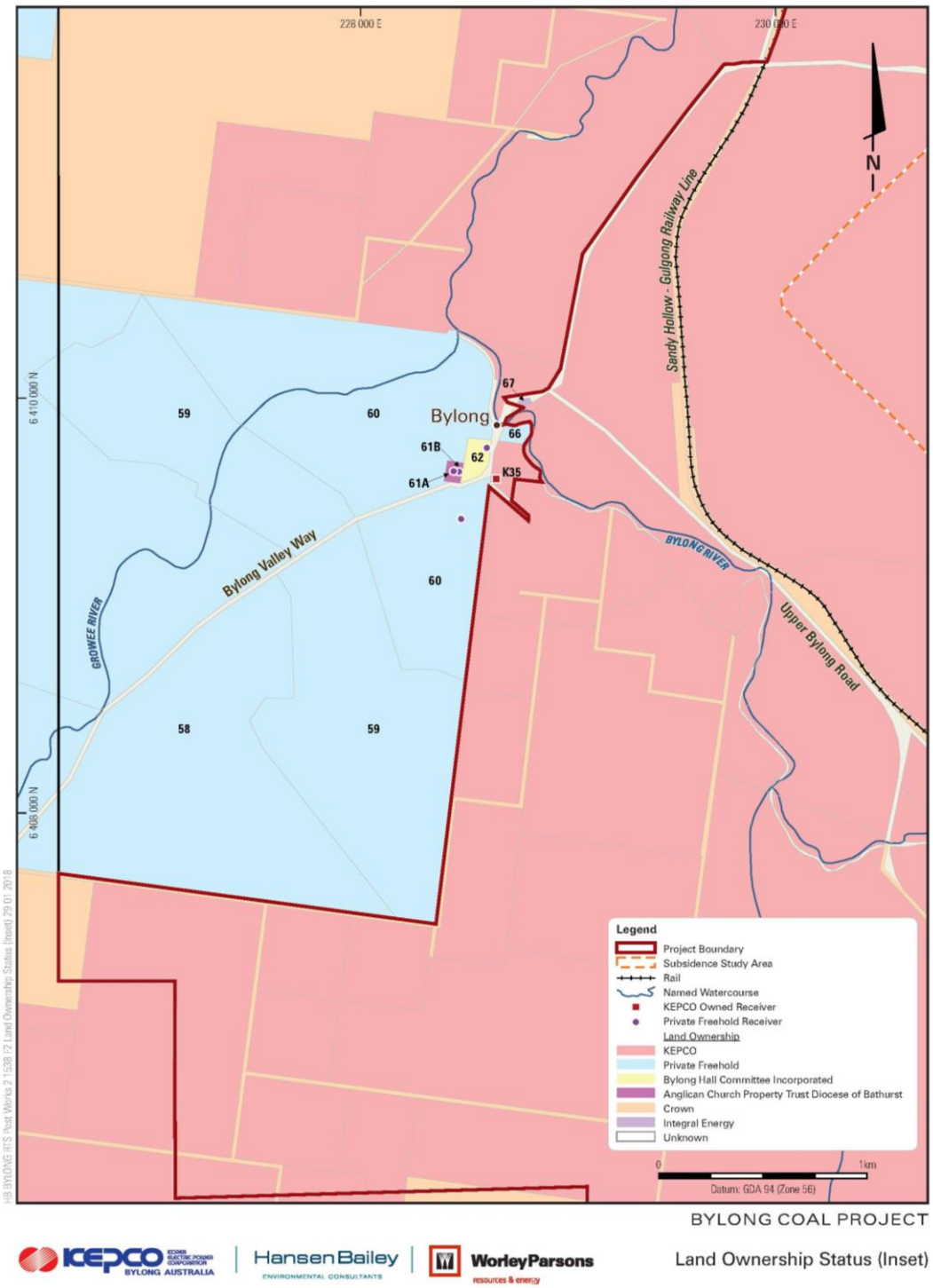
Noise and Blast Sensitive Receivers

A1 Receiver Locations



BYLONG COAL PROJECT

Land Ownership Status


228 000 E
230 000 E
6 410 000 N
6 408 000 N
N
Sandy Hollow - Gulgong Railway Line
Bylong
59
60
61B
62
61A
67
66
K35
Bylong Valley Way
GROWEE RIVER
BYLONG RIVER
Upper Bylong Road
58
59
60
Legend
Project Boundary
Subsidence Study Area
Rail
Named Watercourse
KEPCO Owned Receiver
Private Freehold Receiver
Land Ownership
KEPCO
Private Freehold
Bylong Hall Committee Incorporated
Anglican Church Property Trust Diocese of Bathurst
Crown
Integral Energy
Unknown
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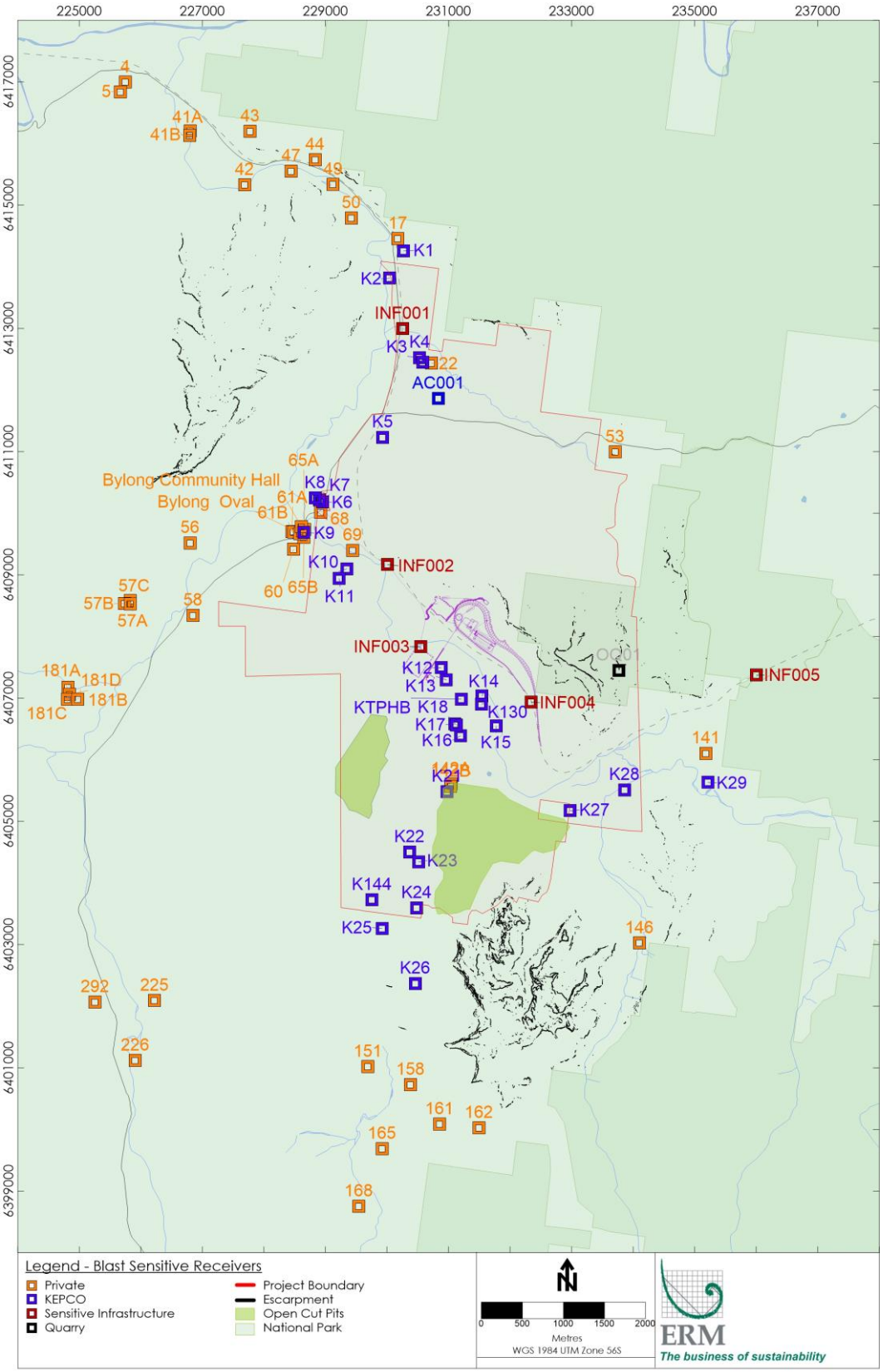
1km
Datum: GDA 94 (Zone 56)
H:\B BYLONG RTS Post Works 2 1538 f2 Land Ownership Status (Inset) 29 01 2018
BYLONG COAL PROJECT
KEPCO BYLONG AUSTRALIA
Hansen Bailey ENVIRONMENTAL CONSULTANTS
WorleyParsons resources & energy
Land Ownership Status (Inset)

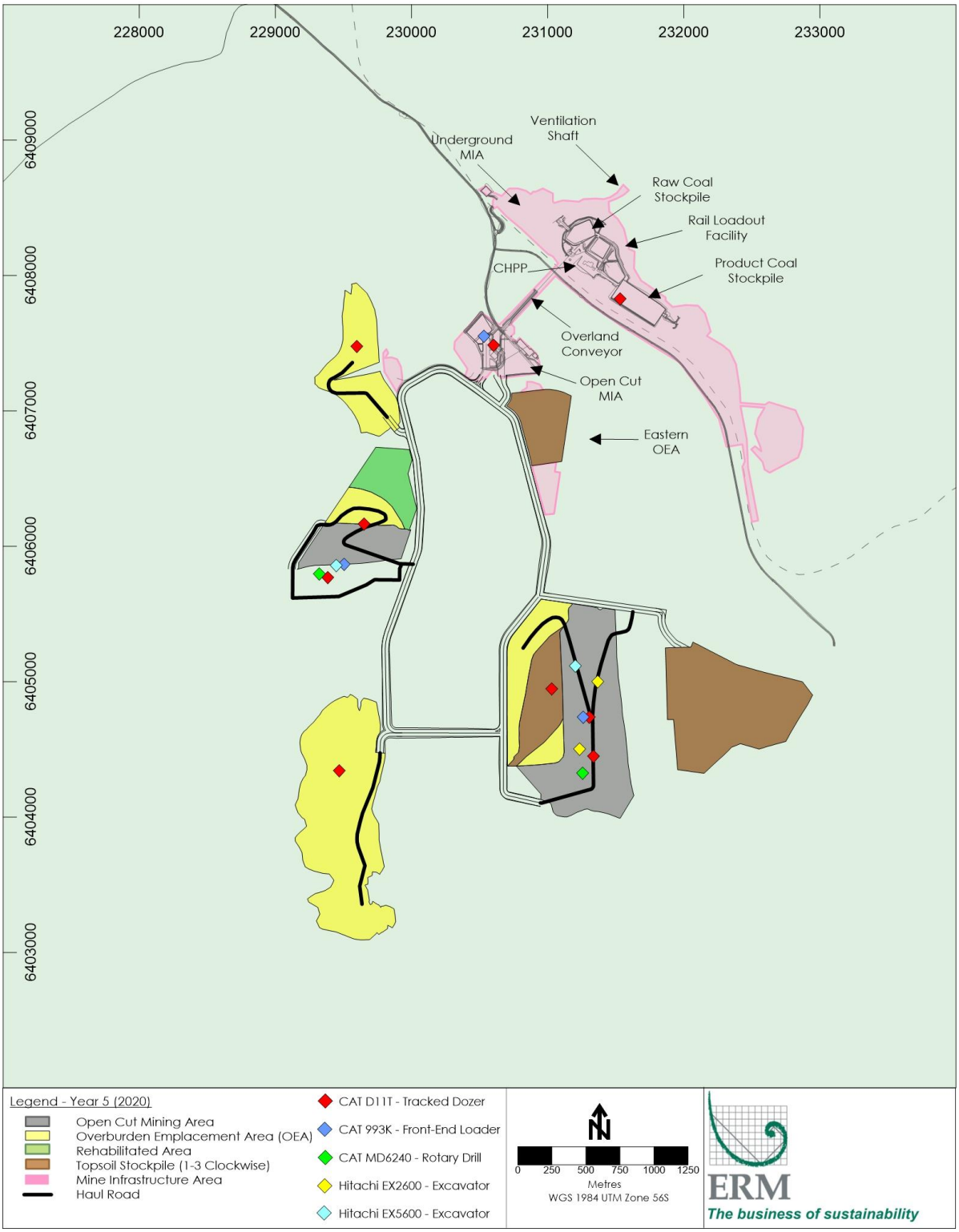
A2 Blast Sensitive Receiver Locations



Appendix B

Noise Source Locations

B1 Noise Sources



Haul Truck Apportionment

Route	Number
EASTERN OPEN CUT	
WASTE to INPIT	3
WASTE to NWOEA	2
WASTE to SWOEA	3
TOPSOIL to SE STOCKPILE	2
COAL to ROM	3
WESTERN OPEN CUT	
WASTE to INPIT	2
WASTE to NWOEA	2
TOPSOIL to NE STOCKPILE	2
COAL to ROM	3

Notes: assumes 75% utilisation rate

Appendix C

Operational Noise Predictions Year 3

C1 Noise Modelling results

Period		Predicted Noise Level LAeq,15min dB(A)									
Condition ID		Day	Day	Day	Day	Eve/` Night	Eve/ Night	Eve/ Night	Eve/ Night	Eve/ Night	Eve/ Night
Receiver ID	Criteria L_{Aeq} 15min	1	2	3	4	5	6	7	8	9	10
		Year 3									
4	35	15	21	21	14	15	22	22	14	22	19
5	35	15	22	22	15	16	23	23	15	23	20
41A	35	16	23	23	16	17	24	24	17	24	21
41B	35	16	23	23	16	17	24	24	17	24	21
42	35	17	24	24	20	18	25	25	21	25	22
43	35	16	23	23	20	17	24	24	21	24	21
44	35	18	25	25	24	19	26	26	24	26	23
47	35	18	25	25	22	18	26	26	23	26	23
49	35	18	25	25	25	19	27	27	26	27	24
50	35	19	26	26	26	20	28	28	27	28	25
56	35	29	35	35	25	30	37	37	26	37	35
57A	35	27	34	34	23	29	36	35	24	36	34
57B	35	27	34	34	23	29	35	35	24	35	34
57C	35	27	34	34	23	29	36	35	24	36	34
58	35	30	37	37	26	32	38	38	27	38	37
60	35	33	39	39	32	34	40	40	32	40	40
61A	35	32	38	38	31	33	39	39	31	39	39
61B	35	32	38	38	31	33	39	39	32	39	39
65A(K)	35	32	39	39	33	34	40	40	34	40	39
63(K)	35	32	39	39	34	34	40	40	34	40	39
68(K)	35	31	38	38	34	33	39	39	35	39	38
69(K)	35	35	41	41	38	37	42	42	39	42	42
141(K)	35	29	25	34	36	31	27	36	38	38	36
146(K)	35	26	22	22	32	27	23	23	34	34	27
151(K)	35	29	28	26	26	31	27	27	27	38	31
158(K)	35	28	26	25	25	30	26	26	27	37	30
161(K)	35	26	22	22	24	28	23	23	25	35	27
162(K)	35	23	20	20	22	25	20	20	23	32	24
165(K)	35	23	20	19	19	24	20	20	20	31	24
168(K)	35	22	21	19	19	24	20	20	20	31	24
349(K)	35	18	16	14	14	19	15	15	15	27	19
348(K)	35	19	16	15	15	20	16	16	16	28	20
181A	35	25	33	31	22	27	34	33	23	34	32
181B	35	25	33	31	21	27	34	33	22	34	32

Period		Predicted Noise Level LAeq,15min dB(A)									
		Day	Day	Day	Day	Eve/` Night	Eve/ Night	Eve/ Night	Eve/ Night	Eve/ Night	Eve/ Night
Condition ID Receiver ID	Criteria L_{Aeq} 15min	1	2	3	4	5	6	7	8	9	10
Year 3											
181C	35	25	32	31	21	27	34	33	22	34	32
181D	35	25	32	31	21	27	34	32	22	34	32
225	35	22	29	19	19	24	27	19	19	31	27
226	35	22	29	18	18	23	25	19	19	30	25
242	35	19	23	15	15	20	17	15	15	27	20
292	35	22	30	18	18	24	27	19	19	31	27
317	35	12	12	8	8	12	8	8	8	20	12
17	35	20	27	27	27	21	29	29	29	29	26
Bylong Oval	35	32	38	38	33	34	40	40	33	40	39
62 Comm Hall	35	32	38	38	33	33	39	39	34	39	39
53 Quarry	35	26	24	33	33	28	32	35	35	35	33

Notes (K) Kepco owned

Appendix D

Blasting Impacts

D1 Blasting impacts

Predicted Blasting Impacts Overpressure and Ground Vibration Levels for Residential Receivers

Receiver ID	Approx. Distance m	Vibration, mm/s				Overpressure, dB(L)			
		Criteria	MIC-410kg	MIC-1000kg	MIC-3500kg	Criteria	MIC-410kg	MIC-1000kg	MIC-3500kg
4	12593	5	0.04	0.08	0.21	115	87	90	94
5	12486	5	0.04	0.08	0.22	115	87	90	94
17	8964	5	0.07	0.14	0.37	115	90	93	98
22	6898	5	0.10	0.21	0.56	115	93	96	101
41A	11465	5	0.04	0.09	0.25	115	88	91	95
41B	11396	5	0.05	0.09	0.25	115	88	91	95
42	10343	5	0.05	0.11	0.29	115	89	92	96
43	11146	5	0.05	0.10	0.26	115	88	91	96
44	10451	5	0.05	0.11	0.29	115	89	92	96
47	10353	5	0.05	0.11	0.29	115	89	92	96
49	10002	5	0.06	0.11	0.31	115	89	92	97
50	9417	5	0.06	0.13	0.34	115	90	93	97
53	5913	5	0.13	0.26	0.72	115	95	98	102
56	5723	5	0.14	0.28	0.76	115	95	98	103
57A	5909	5	0.13	0.26	0.72	115	95	98	102
57B	5962	5	0.13	0.26	0.71	115	95	98	102
57C	5882	5	0.13	0.27	0.73	115	95	98	102
58	4925	5	0.17	0.35	0.96	115	97	100	104
60	4597	5	0.19	0.40	1.08	115	97	100	105
61A	4853	5	0.18	0.36	0.99	115	97	100	104
61B	4839	5	0.18	0.36	0.99	115	97	100	104

Receiver ID	Approx. Distance m	Vibration, mm/s				Overpressure, dB(L)			
		Criteria	MIC-410kg	MIC-1000kg	MIC-3500kg	Criteria	MIC-410kg	MIC-1000kg	MIC-3500kg
65A(K)	4785	5	0.18	0.37	1.01	115	97	100	104
68(K)	4931	5	0.17	0.35	0.96	115	97	100	104
69(K)	4163	5	0.23	0.46	1.26	115	98	101	106
141(K)	2558	5	0.49	1.01	2.75	115	103	107	111
146(K)	2046	5	0.71	1.44	3.93	115	106	109	113
151(K)	2741	5	0.44	0.90	2.46	115	103	106	110
158(K)	2813	5	0.42	0.87	2.36	115	102	106	110
161(K)	3414	5	0.31	0.64	1.73	115	100	104	108
162(K)	3534	5	0.30	0.60	1.64	115	100	103	108
165(K)	3926	5	0.25	0.51	1.39	115	99	102	106
168(K)	4926	5	0.17	0.35	0.96	115	97	100	104
181A	6269	5	0.12	0.24	0.66	115	94	97	102
181B	6201	5	0.12	0.24	0.67	115	94	97	102
181C	6209	5	0.12	0.24	0.67	115	94	97	102
181D	6051	5	0.12	0.25	0.69	115	94	98	102
225	4774	5	0.18	0.37	1.01	115	97	100	104
226	5477	5	0.15	0.30	0.81	115	96	99	103
242	7196	5	0.09	0.19	0.53	115	93	96	100
292	5694	5	0.14	0.28	0.76	115	95	98	103
317	8088	5	0.08	0.16	0.44	115	91	95	99
349(K)	7221	5	0.09	0.19	0.52	115	93	96	100
348(K)	6683	5	0.11	0.22	0.59	115	93	97	101
Bylong Oval	4766	5	0.18	0.37	1.02	115	97	100	104
Bylong Community Hall	4851	5	0.18	0.36	0.99	115	97	100	104

Predicted Blasting Impacts Overpressure and Ground Vibration Levels for Heritage and Infrastructure Receivers

Description	Receiver ID	Approx. Distance m	Vibration, mm/s				Overpressure, dB(L)			
			Criteria	MIC-410kg	MIC-1000kg	MIC-3500kg	Criteria	MIC-410kg	MIC-1000kg	MIC-3500 kg
Sandstone Cavity	CUL 001	3830	50	0.26	0.53	1.44	133	87	90	94
Sandstone Cavity	CUL 002	3941	50	0.25	0.51	1.38	133	87	90	94
Sandstone Cavity	CUL 003	2901	50	0.40	0.83	2.25	133	90	93	98
Sandstone Formation	CUL 004	2902	50	0.40	0.83	2.25	133	93	96	101
Sandstone Cavity	CUL 005	2883	50	0.41	0.83	2.27	133	88	91	95
Sandstone Cavity	CUL 006	3138	50	0.36	0.73	1.98	133	88	91	95
Sandstone Formation	CUL 007	3319	50	0.33	0.67	1.81	133	89	92	96
Sandstone Cavity	CUL 008	2702	50	0.45	0.93	2.52	133	88	91	96
Sandstone Cavity	CUL 009	2749	50	0.44	0.90	2.45	133	89	92	96
Possible occupation area	CUL 010	180	50	34.71	70.84	192.99	133	89	92	96
Sandstone Platform	CUL 011	104	50	83.68	170.76	465.19	133	89	92	97
Sandstone Formation	CUL 012	4051	50	0.24	0.48	1.32	133	90	93	97
Sandstone Cavity	CUL 013	4146	50	0.23	0.47	1.27	133	95	98	102
Sandstone Cavity	CUL 015	2694	50	0.46	0.93	2.53	133	95	98	103

Description	Receiver ID	Approx. Distance m	Vibration, mm/s				Overpressure, dB(L)			
			Criteria	MIC-410kg	MIC-1000kg	MIC-3500kg	Criteria	MIC-410kg	MIC-1000kg	MIC-3500kg
Sandstone Cavity	CUL 016	2652	50	0.47	0.95	2.60	133	95	98	102
Sandstone Cavity	CUL 017	4302	50	0.22	0.44	1.20	133	95	98	102
Sandstone Cavity	CUL 018	5627	50	0.14	0.29	0.78	133	95	98	102
Sandstone Cavity	CUL 019	4304	50	0.22	0.44	1.20	133	97	100	104
Sandstone Cavity	CUL 020	3625	50	0.28	0.58	1.57	133	97	100	105
Sandstone Cavity	CUL 021	3887	50	0.25	0.52	1.41	133	97	100	104
Sandstone Cavity	CUL 022	3940	50	0.25	0.51	1.38	133	97	100	104
Sandstone Cavity	CUL 023	3165	50	0.35	0.72	1.96	133	97	100	104
Sandstone Cavity	CUL 024	3030	50	0.38	0.77	2.10	133	97	100	105
Sandstone Cavity	CUL 025	3580	50	0.29	0.59	1.61	133	97	100	104
Sandstone Cavity	CUL 026	3521	50	0.30	0.61	1.65	133	98	101	106
Sandstone Cavity	CUL 027	2577	50	0.49	1.00	2.72	133	103	107	111
Sandstone Cavity	CUL 028	3266	50	0.33	0.68	1.86	133	129	132	137
Sandstone Cavity	CUL 029	3140	50	0.36	0.73	1.98	133	130	133	138
Sandstone Cavity	CUL 030	3102	50	0.36	0.74	2.02	133	106	109	113
Sandstone Cavity	CUL 031	4731	50	0.19	0.38	1.03	133	103	106	110

Description	Receiver ID	Approx. Distance m	Vibration, mm/s				Overpressure, dB(L)			
			Criteria	MIC-410kg	MIC-1000kg	MIC-3500kg	Criteria	MIC-410kg	MIC-1000kg	MIC-3500kg
Sandstone Cavity	CUL032	4751	50	0.18	0.38	1.02	133	102	106	110
Sandstone Cavity	CUL033	4764	50	0.18	0.37	1.02	133	100	104	108
Rail Culvert	INF001	7505	80	0.09	0.18	0.49	133	100	103	108
Rail retaining wall	INF002	3781	80	0.26	0.54	1.47	133	99	102	106
Road Bridge	INF003	2372	80	0.56	1.14	3.10	133	97	100	104
Rail Culvert	INF004	1639	80	1.01	2.06	5.61	133	94	97	102
Rail Tunnel Entrance	INF005	3927	80	0.25	0.51	1.39	133	94	97	102
Grinding Groove	GG01	4399	50	0.21	0.42	1.16	133	94	98	102
Grinding Groove	GG02	4390	50	0.21	0.43	1.16	133	97	100	104
Grinding Groove	GG03	4359	50	0.21	0.43	1.17	133	96	99	103
Grinding Groove	GG04	4565	50	0.20	0.40	1.09	133	93	96	100
Modified Tree	MT04	5041	50	0.17	0.34	0.93	133	95	98	103
Modified Tree	MT05	238	50	22.15	45.20	123.13	133	91	95	99
Modified Tree	MT06	243	50	21.35	43.57	118.69	133	93	96	100
Modified Tree	MT07	174	50	36.52	74.53	203.04	133	93	97	101
Modified Tree	MT08	226	50	24.00	48.98	133.43	133	97	100	104

Description	Receiver ID	Approx. Distance m	Vibration, mm/s				Overpressure, dB(L)			
			Criteria	MIC-410kg	MIC-1000kg	MIC-3500kg	Criteria	MIC-410kg	MIC-1000kg	MIC-3500kg
Ochre Quarry	OQ01	2619	50	0.48	0.97	2.65	133	97	100	104
Rockshelter	RS01	3587	50	0.29	0.59	1.60	133	91	94	98
Rockshelter	RS02	5667	50	0.14	0.28	0.77	133	91	94	99
Boulder	RS03	173	50	36.88	75.27	205.05	133	93	96	100
Rockshelter	RS04	7306	50	0.09	0.19	0.51	133	93	96	101
Rockshelter	RS05	7292	50	0.09	0.19	0.51	133	95	98	102
Rockshelter	RS06	3038	50	0.38	0.77	2.09	133	96	99	104
Rockshelter	RS07	3119	50	0.36	0.74	2.00	133	96	99	104
Rockshelter	RS08	2577	50	0.49	1.00	2.72	133	96	99	104
Rockshelter	RS09	2722	50	0.45	0.91	2.49	133	97	100	104
Rockshelter	RS10	2865	50	0.41	0.84	2.29	133	99	102	106
Rockshelter	RS11	21604	50	0.02	0.03	0.09	133	99	102	107
Rockshelter	RS12	7187	50	0.09	0.19	0.53	133	106	109	114
Rockshelter	RS13	3367	50	0.32	0.65	1.77	133	107	110	115
Cliff	CLI01	6621	50	0.11	0.22	0.60	133	109	112	117
Cliff	CLI02	2366	50	0.56	1.14	3.12	133	112	115	120
Cliff	CLI03	377	50	10.58	21.58	58.80	133	115	118	123
Cliff	CLI04	417	50	9.00	18.37	50.05	133	113	116	120
Cliff	CLI05	1402	50	1.30	2.64	7.20	133	113	116	121
Cliff	CLI06	1059	50	2.03	4.14	11.28	133	92	95	99

Description	Receiver ID	Approx. Distance m	Vibration, mm/s				Overpressure, dB(L)			
			Criteria	MIC-410kg	MIC-1000kg	MIC-3500kg	Criteria	MIC-410kg	MIC-1000kg	MIC-3500kg
Former Bylong Anglican Church & Cemetery (1876)	EH001	4852	15	0.18	0.36	0.99	133	97	100	104
Former Bylong Catholic Church & Cemetery (1915)	EH002	1023	15	2.14	4.38	11.92	133	113	116	120
Bylong Station House	EH003	6927	15	0.10	0.21	0.56	133	93	96	101
Sunnyside Homestead (1864)	EH004	4582	15	0.19	0.40	1.08	133	97	100	105
Tarwyn Park Homestead	EH005	1493	15	1.17	2.39	6.51	133	109	112	117
Brigdelo School (1914)	EH008	8964	15	0.07	0.14	0.37	133	90	93	98
Homestation (1840s)	EH010	5034	15	0.17	0.34	0.93	133	96	100	104
Cheese Factory Remains	EH011	1971	15	0.75	1.53	4.18	133	106	109	114
Harley Hill Farm Complex (1900)	EH012	1203	15	1.65	3.38	9.20	133	111	114	119

Description	Receiver ID	Approx. Distance m	Vibration, mm/s				Overpressure, dB(L)			
			Criteria	MIC-410kg	MIC-1000kg	MIC-3500kg	Criteria	MIC-410kg	MIC-1000kg	MIC-3500kg
Harley Hill Cottage (1930s)	EH013	293	15	15.84	32.33	88.08	133	126	129	133
Tarwyn Park Potential Archaeological Deposit	EH014	1476	15	1.19	2.43	6.63	133	109	112	117
Potential Archaeological Deposit 1	EH015	2332	15	0.57	1.17	3.19	133	104	108	112
Swiss Cottage	EH016	163	15	40.63	82.90	225.85	133	132	135	140
Bylong Hall	EH017	4874	15	0.18	0.36	0.98	133	97	100	104
Potential Archaeological Deposit 2	EH018	2334	15	0.57	1.17	3.19	133	104	108	112
Tarwyn Park Stables	EH019	1366	15	1.35	2.75	7.50	133	110	113	117
Potential Archaeological Deposit 3 (chimney remains)	EH020	343	15	12.33	25.16	68.55	133	124	128	132
Tarwyn Park Horse Burials	EH021	1425	15	1.26	2.57	7.01	133	110	113	117
Bylong Station Stables	EH022	6958	15	0.10	0.20	0.55	133	93	96	100

Notes (K) Kepco owned