ABN: 69 107 169 102

Werris Creek Coal Pty Limited

NOISE & VIBRATION IMPACT ASSESSMENT

for

Werris Creek Coal Mine Life of Mine Project

Prepared by

Spectrum Acoustics Pty Ltd

Specialist Consultant Studies Compendium
Volume 1, Part 3

December 2010

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Life of Mine Project

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EXECUTIVE SUMMARY

A Noise and Vibration Impact Assessment (NVIA) has been prepared for the proposed Werris Creek Coal Mine Life of Mine Project (LOM Project) near Werris Creek, NSW.

The assessment is based on, or refers to the following Standards, policies, guidelines and documents.

- DECCW *NSW Industrial Noise Policy* (INP, 2000).
- DECCW *Environmental Criteria for Road Traffic Noise* (ECRTN, 1999).
- DECCW *Environmental Noise Control Manual* (ENCM, 1994)
- ANZECC *Technical basis for guidelines to minimise annoyance due to blast overpressure and ground vibration* (2000).
- Australian Rail Track Corporation (ARTC) Environmental pollution license EPL 3142.
- AS 2187.2-1993 *"Explosives – Storage, Transport and Use. Part 2: Use of Explosives"*

A brief summary of essential data, results and recommendations arising from this assessment is presented below.

Ambient Noise Levels

Ambient and background noise levels at three monitoring locations at the southern edge of Werris Creek (N1), to the northeast of the Project Site (N2) and on Paynes Road to the south of the Project Site (N3), are summarised in **Tables S1** to **S3**. This information provided the basis for establishing initial noise criteria for the LOM Project.

Table S1
Summary of Ambient Noise Levels, Werris Creek (N1)

Date	Leq (day)	Leq (evening)	Leq (night)	L90 (day)	L90 (evening)	L90 (night)
31-May-10	46.3	36.2	41.1	29.6	27.0	25.8
1-Jun-10	48.3	43.4	43.0	33.5	30.5	26.0
2-Jun-10	50.8	51.9	48.4	31.0	35.8	26.3
3-Jun-10	51.6	46.9	40.2	36.0	30.8	26.3
4-Jun-10	57.6	48.1	49.7	39.5	37.8	27.0
5-Jun-10	51.6	44.4	44.5	30.7	26.5	25.5
6-Jun-10	49.4	48.3	46.2	29.2	27.5	26.5
LAeq	50	49	44	--	--	--
L90	--	--	--	31	31	26

Day = 7am – 6pm, Evening = 6pm – 10pm, Night = 10pm – 6am

Table S2
Summary of Ambient Noise Levels, Haling (N2)

Date	Leq (day)	Leq (evening)	Leq (night)	L90 (day)	L90 (evening)	L90 (night)
31-May-10	47.0		40.2	36.2	24.4	21.1
1-Jun-10	44.6	43.7	41.6	31.1	26.8	21.4
2-Jun-10	45.9	48.1	43.1	32.5	37.4	21.4
3-Jun-10	44.7	45.2	41.2	33.3	31.3	21.8
4-Jun-10	42.8	43.1	41.6	29.9	24.9	19.3
5-Jun-10	45.2	47.7	42.2	31.3	34.9	19.1
6-Jun-10	44.0	44.7	40.2	32.4	30.2	19.7
LAeq	46	46	42	--	--	--
L90	--	--	--	32	30	21

Day = 7am – 6pm, Evening = 6pm – 10pm, Night = 10pm – 6am

Table S3
Summary of Ambient Noise Levels, Taylor (N3)[1]

Date	Leq (day)	Leq (evening)	Leq (night)	L90 (day)	L90 (evening)	L90 (night)
31-May-10	45.3	41.8	41.7	29.4	29.5	26.0
1-Jun-10	46.6	44.6	39.5	29.7	26.5	26.0
2-Jun-10	48.5	47.1	43.2	29.0	30.0	25.5
3-Jun-10	46.9	43.9	38.9	31.0	25.9	24.1
4-Jun-10	47.6	46.6	43.4	27.5	27.3	23.8
5-Jun-10	46.2			28.8	25.2	
6-Jun-10						
LAeq	47	45	42	--	--	--
L90	--	--	--	29	27	26

Day = 7am – 6pm, Evening = 6pm – 10pm, Night = 10pm – 6am

Operational Noise Criteria

Recommended criteria for noise emissions from the LOM Project are summarised in **Table S4**. These criteria has been derived following completion of all noise modelling and represent the levels that the LOM Project can achieve after application of all reasonable and feasible noise mitigation options.

Meteorological conditions

Wind roses generated from site meteorological data were analysed and it was found that winds from the northwest and south-southeast were a feature of the Project Site. These winds, as well as calm conditions, were adopted in the noise modelling.

[1] This receiver is outside the operational noise model area, but was chosen as being representative of ambient noise levels at receivers south of the Project Site.

Table S4
Recommended Operational Noise criteria – dB(A),$L_{eq(15\text{-}minute)}$

Receiver#	Receiver	Assessment Period	
		Daytime	Evening/night
R18	Withers	40	37
R20	Patterson	39	37
R21	Currey	39	37
R3a	Lomax	35	35
R3b	Lomax	35	35
R101	O'Brien	35	35
R102	De Haart	35	35
R103	Parsons	35	35
R104	Smith	35	35
R105	Lewis	35	35
R26	Woods	35	35
R55	Pitkin	35	35
R62	Cunningham	35	35
R98	J. Colville	35	36
R14 (N2)	Haling	39	39
R96	Davison	38	37
R17	Doolan & Hogan	35	35
R12	Fletcher	38	38
R24	P. George	35	37
R15*	Maxwell	39	40
R11	Ryan	35	39
R10	Blackwell	35	39
R9	Smith	35	37
R8	Hird	35	37
R7	Andrews	35	37
R22	Parkes	35	36
R5	R. & A. George	35	35

See **Figure 3**
*A night time criterion of 40 dB(A) has been recommended, although a predicted level of 43 dB(A) under inversion conditions places this receiver in a noise affectation zone.

In response to a request from the Department of Environment, Climate Change and Water (DECCW) a direct-measurement temperature inversion study was conducted on the Project Site during June 2010. The 90th percentile inversion strength was found to be 12^{0}C/100m and this value was also adopted in the noise model to assess potential noise impacts at night time during winter months under intense inversion conditions. Inversion strengths of 3^{0}C/100m and 6^{0}C/100m were also modelled to represent a broader range of adverse conditions that are likely to occur in the area.

Noise Mitigation

Initial noise modelling results showed excessive noise levels at many receivers under 12^{0}C/100m inversion condition. Following an iterative approach to modelling, which considered the potential noise attenuation provided by a range of noise controls, the following noise reduction measures have been recommended. Based on the practical limit of noise reduction of individual noise sources, and consideration as to the minimum fleet size necessary to achieve the proposed production level, these are deemed to represent all reasonable and feasible noise mitigation measures.

CAT 785 Haul Trucks

Apply attenuator kits to achieve 8dB noise reduction in dynamic sound power level (as advised by the manufacturer). This recommendation arose from discussion between the Proponent and the machinery manufacturer and included detailed assessment of the acoustic performance of the CAT 793D Extra Quiet (XQ) trucks. Advice from the manufacturer was that the noise suppression package that was fitted on the XQ trucks was essentially the same as would be fitted to the existing CAT 785 fleet, suggesting that similar noise reduction would be achieved. Noise test data for the XQ truck shows a pass-by sound power level of 121 dB(A) for the standard (unattenuated) 793D and 113 dB(A) sound power level for the 793D (XQ) for a loaded uphill dynamic test on 10% grade. These are the same as the values used to derive truck sound power levels for final modelling of the LOM project and therefore represent the greatest noise reduction currently achievable.

It is also noted that verifiable truck noise reduction of either 2.5-3 dB (by fitment of appropriate exhaust system) or 8 dB (by fitment of full attenuator package) could be achieved. Adoption of the 8 dB attenuation resulted in the trucks no longer being the dominant noise sources, with the dozers, drills, excavators and train loading activities contributing the majority of noise levels at assessed receivers under extreme inversion conditions. Therefore, even if more than 8 dB reduction of trucks noise levels were possible, this would not result in meaningful further noise reduction at residential receivers.

CAT Dozers (D10/D11)

Dozers will be limited to 1600 rpm in reverse (first gear) when operating in exposed locations under inversion conditions (7dB noise reduction as confirmed by extensive noise testing at the Werris Creek Coal Product Coal Storage Area and the Whitehaven CHPP at Gunnedah).

Coal Processing Area

An acoustic bund/barrier 5m high will be constructed on its north-eastern side when relocated to the northwest of its current location.

Blast Hole Drills

Restrict the number of drills operating to two (which would be operated below natural ground level under inversion conditions). Again, this recommendation arose from iterative modelling based on the original five drills proposed. The use of only two drills struck the balance between minimisation of noise emissions and viable levels of production.

Surface Plant

Drills, scrapers, an excavator and other plant items involved in surface preparation works immediately north of the open cut would not operate under extreme inversion conditions. Essentially, this restricts the operation of these items to daytime hours only. Real-time inversion monitoring will be used to guide whether a delayed start (later than 7am) would be required during winter months. This principal of a delayed start has been adopted at the Werris Creek Mine earlier in its operating life.

Acoustic and Visual Amenity Bund.

The construction of this earthen barrier to the north of the open cut would provide a direct noise barrier to mining noise generated within the open cut area. The bund would be most effective as a noise attenuation measure as mining operations move further to the north, i.e. closer to the bund

The Proponent has committed to adopting these noise reduction measures (and/or other alternate measures that achieve the same noise level reductions as part of the ongoing operation of the LOM Project) which have been incorporated into the final noise modelling.

In addition, the Proponent has committed to extending its existing noise monitoring program, which includes monthly attended noise monitoring at receivers surrounding the Project Site to include real-time noise, wind and inversion monitoring. The location of real time noise monitoring, along with procedures for managing monitoring results, should be developed and incorporated into an updated Noise Monitoring Program (NMP). The development of the updated NMP should be undertaken in consultation with DoP and DECCW.

Summary of Affected Receivers

Noise levels up to 5dB greater (noise management zone) than the existing intrusiveness criterion of 35 dB(A),$L_{eq(15minute)}$ have been predicted at receivers R18 (Withers), R20 (Patterson), R21 (Currey), R14 (Haling), R96 (Davison), R12 (Fletcher), R24 (P. George), R11 (Ryan), R10 (Blackwell), R7 (Andrews) and R22 (Parkes) under extreme inversion conditions (12^{0}C/100m) for the night time scenario.

All reasonable and feasible noise mitigation options had been adopted in the modelling that produced these results and the predicted levels have been recommended as noise criteria (as incorporated in **Table S4**).

Noise levels greater than 5 dB above the intrusiveness criterion of 35 dB(A),$L_{eq(15minute)}$ have been predicted under extreme inversion conditions (12^{0}C/100m) at receiver R15 (Maxwell) placing this receiver in a noise acquisition zone. It is understood the Proponent is negotiating an agreement with the resident and owner of R15 to permit elevated noise levels at this residence whilst the Coal Processing Area remains within its current location.

Noise levels in excess of the intrusiveness criterion have been predicted at R18 (Withers), R20 (Patterson) and R21 (Currey) as trains pass by, to and from the Rail Load-out Facility and turn-around loop. It may not be possible to reduce these short-term (less than three minutes) noise events to below the criterion. It is noted, however, that the LOM Project would not increase the maximum number of trains that have already been passing by these residences on any given day for the past five years. Notably, the LOM Project would actually result in a lesser degree of noise impact on these receivers due to the construction and use of the turn-around loop west of the Rail Load-out Facility. This would place the train locomotives much further west of these residences than currently during the train loading and when the trains are at idle waiting the re-join the main northern rail line. In particular, locomotives that would once have sat idling near R20 (Patterson) for periods of an hour or more, would be removed as a source of offensive noise at this receiver.

Sleep Disturbance

With the exception of receiver R15 (Maxwell), where a 1dB(A) exceedance of criteria was predicted during Scenario 1 operations under extreme inversion conditions (12^0C/100m), no sleep disturbance impacts have been predicted at any receiver.

Off-site Road and Rail Noise Impacts

Noise emissions from trains and off-site traffic movements associated with the LOM Project have been found to comply with relevant noise and vibration criteria.

Blasting

Calculated blast vibration levels below acceptable limits have been predicted at all receivers. With the exception of R14 (Haling), the calculated air overpressure levels would comply with the 5% exceedance blast overpressure limit of 115 dB at all receivers. Overpressure levels may exceed the 5% exceedance level of 115 dB at R14 (Haling) for blasts greater than 520 kg MIC at a distance of 1 315m or closer. Further calculations identified that the overpressure criteria would likely be met (for 1 200kg MIC blasts) when blasting is at least 1 690m from the residence.

For the first 10 years of the LOM Project, all blasts would remain at least 1 690m from R14, and as the current average blast MIC is less than 1 200kg, there would be no impact on the blasting frequency nominated in Section 2.5.5.5 (10 blasts per month). Following Year 10, it is anticipated that up to half the blasts within the LOM Project open cut would be within 1 690m of R14. Should the MIC be reduced to 520kg to achieve the airblast overpressure criteria, an additional 5 blasts per month would be required (a total of 15 blasts per month). This would not impact on the overall operation of the LOM Project.

It is important to note, however, that many blast design options are available to the Proponent's blasting contractor to reduce air overpressure. Through ongoing monitoring of blasts over the initial 10 years of the LOM Project, the most effective mitigation strategies would be identified and implemented to each blast emissions equivalent to those modelled using an MIC of 520kg.

Also of note, Receiver R14 is yet to be constructed and overpressure criteria would not be applicable until the residence has been constructed and is occupied. Once occupied, a blast monitor should be placed at this residence to monitor blast levels.

No exceedances of the maximum blast overpressure limit of 120dB have been predicted at any receiver for the range of blast sizes likely to be required.

1 INTRODUCTION

1.1 Background

Werris Creek Coal Pty Ltd ("the Proponent") has lodged an application for project approval to extend the life of the Werris Creek Coal Mine. This would be achieved by extending mining operations to the north of the currently approved mine footprint allowing extraction of the entire Werris Creek outlier of the Greta coal measures (the "life of mine" (LOM) resource). The proposed mine extension and associated modification to the operation of the Werris Creek Coal Mine are hereafter referred to as (the "Life of Mine (LOM) Project".

The Werris Creek Coal Mine is located within the North West Slopes and Plains of New South Wales approximately 4km south of Werris Creek, 11km north-northwest of Quirindi and 45km southwest from Tamworth (**Figure 1**). The existing Werris Creek Coal Mine is currently operated under Development Consent DA 172-7-2004 within Mining Lease (ML) 1563. The LOM Project would incorporate ML 1563, EL 7422 and EL 5993, on land owned by the Proponent, with this area referred to as the Project Site.

The LOM Project is considered a Major Project under *State Environmental Planning Policy (Major Projects 2005)* and therefore the Minister for Planning is the consent authority. Accordingly, a Noise and Vibration Impact Assessment (NVIA) has been conducted in accordance with relevant Department of Environment, Climate Change and Water (DECCW) guidelines for reference in the *Environmental Assessment* (EA).

For the purposes of this document, the LOM Project described and assessed would involve the following component activities and operations.

- The production and rail loading of up to 2.5Mt per annum of thermal and Pulverised Coal Injection (PCI) coal for the domestic and international markets.
- An increase in the hours of operation to 24hours a day, 7 days a week.
- A northerly extension of existing open cut mining operations and associated activities.
- The relocation of, and modification to various infrastructure to accommodate the open cut mine extension and increased production including:
  - the construction of a 'turn-around' rail loop taking off from the Werris Creek Rail Siding to the immediate west of the Rail Load-out Facility; and
  - the relocation of the coal crushing and screening infrastructure to the north of its current location; and
  - the construction of a new entrance and access road to the Project Site off Escott Road..
- Rehabilitation of the final landform amenable to a combination of agricultural and native vegetation land uses.

It is noted that a description of acoustic terms relevant to this Noise and Vibration Impact Assessment is provided as **Appendix A**.

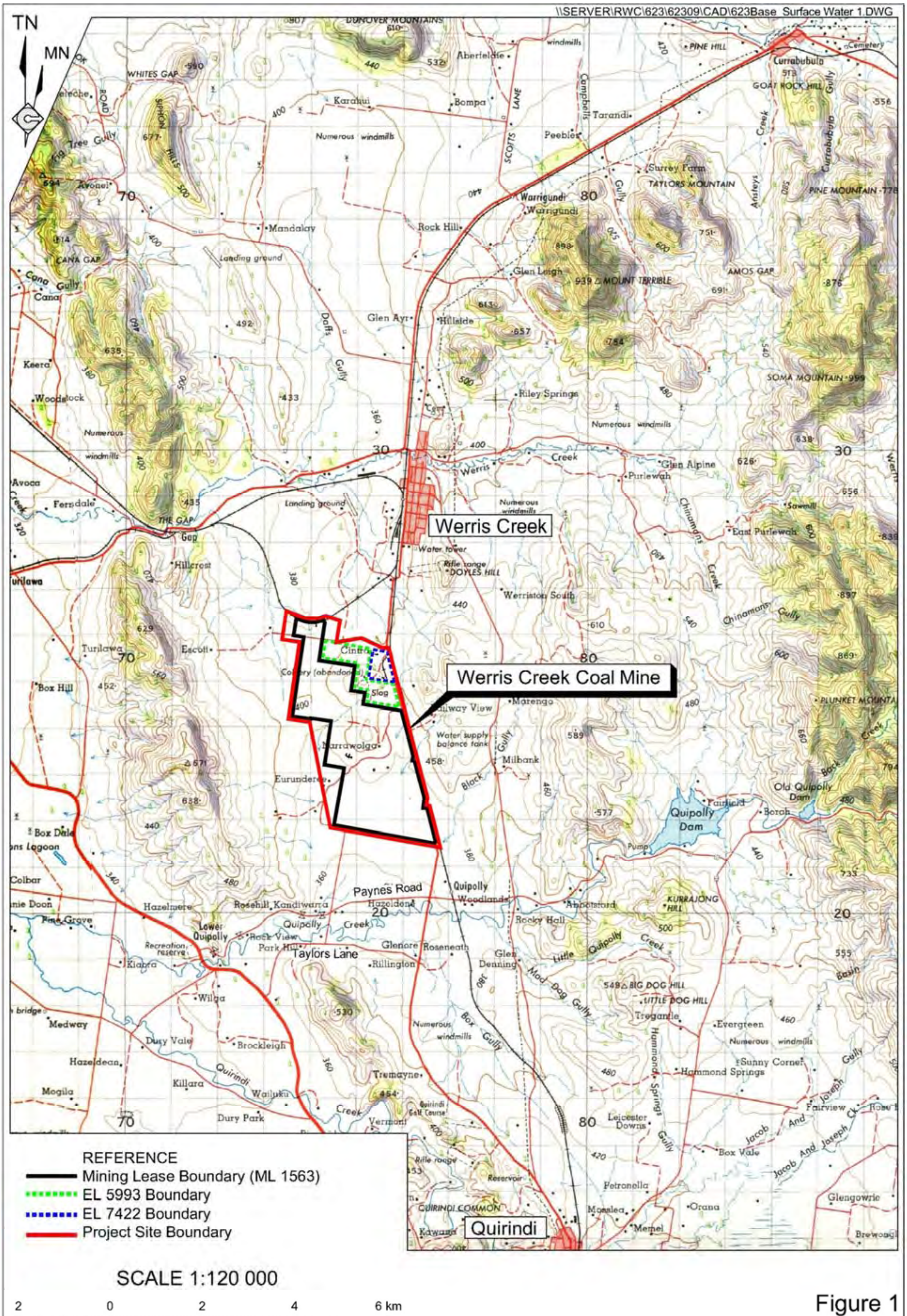


Figure 1
LOCALITY PLAN / LOCAL SETTING

1.2 Project Description

The LOM Project, if approved, would provide for a northerly continuation of the Werris Creek Coal Mine, increasing the projected mine life by 20 years, and involve the following activities (the locations of which are shown on **Figure 2**).

- Northerly extension of the approved open cut. The proposed extent of the open cut represents mining of the entire Werris Creek outlier of the Greta coal measures, as defined by the sub-crop of the basal G Seam.
- Extension of the out-of-pit overburden emplacement. The additional volume of overburden removed from the open cut would be placed over the current footprint of the Coal Processing Area and Site Administration and Facilities Area (out-of-pit emplacement) and extend north over the completed sections of the open cut (in-pit emplacement). In order to attenuate noise impacts and screen the operation visually from Werris Creek, the overburden emplacement would extend around the eastern and northeastern perimeter of the open cut. This extension of the overburden emplacement is referred to throughout as the Acoustic and Visual Amenity Bund.
- Relocation of coal processing infrastructure (Coal Processing Area). The primary reason for relocating the Coal Processing Area would be to minimise the haul distance between the open cut and the coal processing infrastructure. A relocation of the Coal Processing Area would also be required to allow for a westerly extension of the out-of-pit overburden emplacement (to increase overburden storage capacity). The relocated Coal Processing Area would have an increased ROM coal stockpile (ROM Coal Pad) capacity of 200 000t.
- Production of up to 2.5Mtpa of thermal and Pulverised Coal Injection (PCI) coal for the domestic and international markets. To improve operational flexibility, an increase in the approved hours of operation to 24 hours, 7 day per week is proposed.
- An increase in the road transport of coal to domestic markets to 100 000tpa (from 50 000tpa) to meet the needs of local customers for low ash coal;
- Increased storage capacity of the Product Coal Stockpile Area. By extending the pad to the east, the capacity of this stockpile area would be increased to approximately 250 000t.
- Relocation of the administration and workshop areas (Site Administration and Facilities Area to enable the extension of the western overburden emplacement.
- Construction of a new entrance to the Project Site off Escott Road. The new "Escott Road entrance" would provide for more direct access to the relocated coal processing infrastructure, offices and facilities. The use of Escott Road as the primary access point to the Project Site would require the existing Escott Road and the intersection of Escott Road with Werris Creek Road to be upgraded.
- Construction of a second feed point to the Rail Load-out Facility to allow for product separation and reduced inter-product contamination.

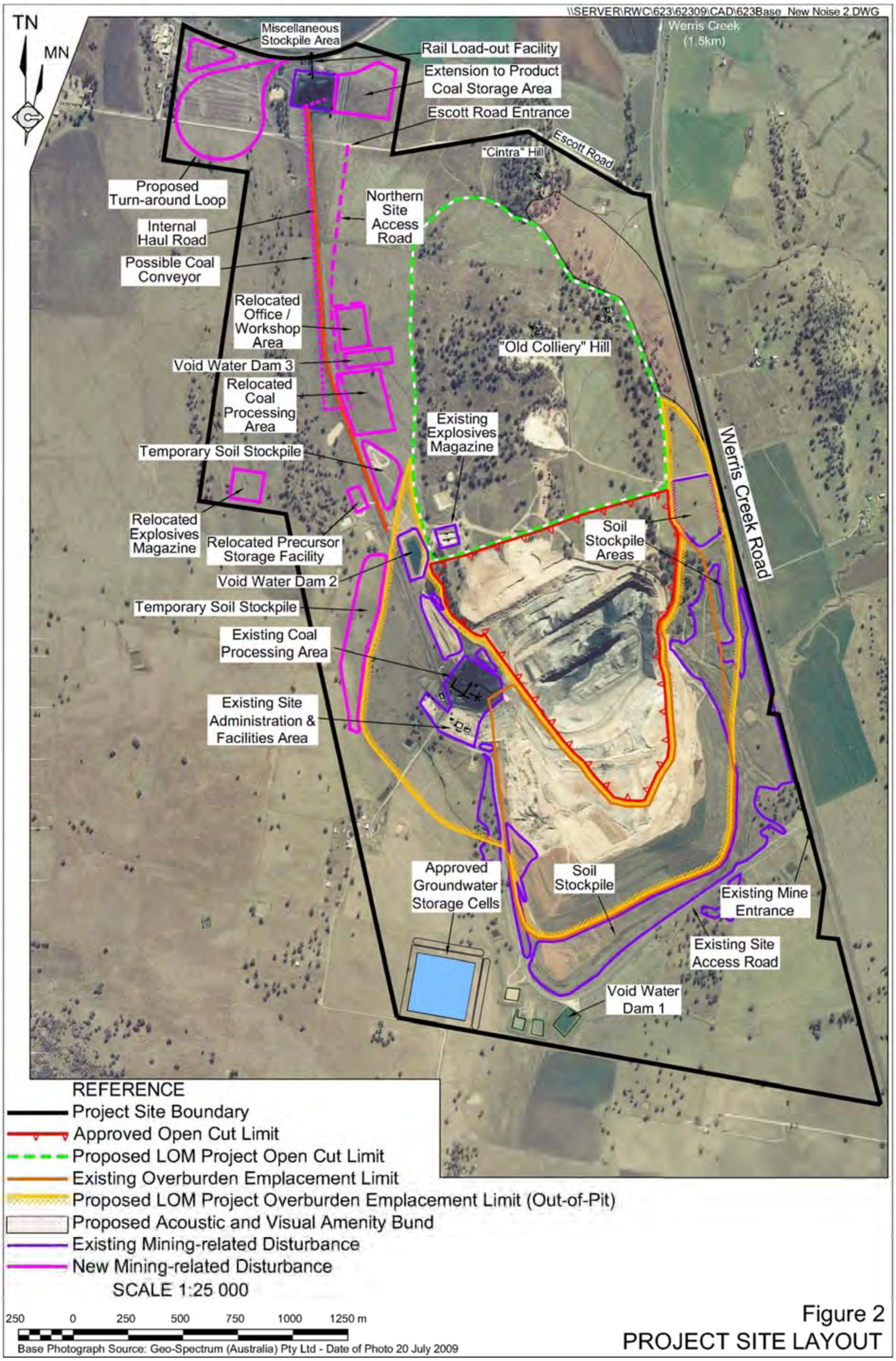


Figure 2
PROJECT SITE LAYOUT

- Construction of a 'turn around' rail loop which would take off from the Werris Creek Rail Siding to the immediate west of the Rail Load-out Facility.
- Continued dewatering the underground workings of the former Werris Creek Colliery (approved under DA 172-7-2004) to enable open cut mining through part of these workings.
- Construction of a new Void Water Dam at the northern end of the Project Site for the storage of water which accumulates in the open cut.
- The construction of a conveyor to transport coal from the Coal Processing Area to the Product Coal Stockpile Area is also being considered. The location and operation of this conveyor is identified in the *Environmental Assessment*, however, this activity remains the subject of an ongoing economic feasibility study.

While the rehabilitation objectives and methods would remain consistent with those currently implemented at the Werris Creek Coal Mine, the proposed sequence of rehabilitation, and designated land use on the final landform would be modified slightly from that approved by DA 172-7-2004.

2 THE EXISTING ENVIRONMENT

2.1 Introduction

The existing meteorological and acoustic environments have been studied to determine the atmospheric conditions under which noise modelling is required and to establish noise criteria at sensitive receptors. A summary of the relevant information is included in this section.

2.2 Meteorology

2.2.1 Data Source

Meteorological data recorded on site during the period September 2007 to August 2008 were analysed by the air quality consultant (Heggies Pty Ltd) (Heggies, 2010). The following data are the most significant with respect to noise propagation within and surrounding the Project Site.

2.2.2 Relative Humidity

Atmospheric absorption of mid to high frequency sound is strongly dependent upon Relative Humidity (RH), with absorption inversely proportional to RH. Relative humidity varies around an average value of 70% under calm daytime conditions (at 20^0C). Higher RH is experienced when the temperature drops and a value of 85% RH was adopted for modelling under cooler conditions.

2.2.3 Winds

Winds at the site meteorological station are generally southeasterly during the warmer months and northwesterly during the cooler months. For the purposes of this NVIA, only the winds up to 3m/s are to be considered under the INP. Wind roses provided by Heggies (2010) are included in **Appendix B**. Analysis of wind vector components up to 3m/s at angles of $\pm 45^0$ relative to each primary direction has found that winds from the northwest during spring and from the south-southeast during summer and autumn occurred for 30% or more of the time. A wind speed of 3m/s at 10m above ground level was adopted in the modelling of these two wind conditions. The wind roses were not broken down into the day, evening and night time periods, and it has been conservatively assumed that these prevailing winds could occur at any time during the relevant seasons.

2.2.4 Temperature Inversions

In accordance with a DECCW requirement for the LOM Project, a temperature inversion study was conducted on the Project Site during June 2010. Tiny Tag® temperature loggers were fixed to the top of 1.8m stakes located at the entrance to the "Old Colliery" property (at an elevation of 395m AHD), adjacent to Werris Creek Road, and outside the "Old Colliery" residence (at an elevation of 445m AHD), for a total vertical separation of 50m.

Temperature data was recorded at half-hourly intervals from 1 June to 24 June 2010 and later analysed and extrapolated to give equivalent linear temperature gradient per 100m. It was found that there were inversions on 20 of the 23 nights with a 90^{th} percentile equivalent linear strength of 12^0C/100m. This inversion strength was adopted in the noise modelling to determine potential night time noise impacts during the winter months.

Previous experience in the Gunnedah basin has found that a temperature inversion strength of 6^0C/100m has produced model results that correlated well with measured noise levels under what were apparent (but unmeasured) strong inversions. Further, previous noise modelling conducted for Werris Creek Mine and other mines for which no temperature inversion data have been available has adopted the default 3^0C/100m inversion strength recommended in Appendices to the INP.

In order to assess the potential noise impacts under a range of possible inversion strengths, inversion strengths of 3^0C/100m, 6^0C/100m and 12^0C/100m have been adopted in the modelling of night-time operational noise levels.

Typical calm daytime conditions of no wind, 70% RH and -1^oC/100m vertical temperature gradient (ie. dry adiabatic lapse rate, DALR) was also modelled to predict typical daytime noise levels.

2.3 Ambient Noise Levels

Excluding the noise associated with the Werris Creek Coal Mine, noise sources in the local area include agricultural operations, road traffic and other urban noise sources, as well as rail noise. An ambient noise survey was conducted at three representative locations (at the southern edge of Werris Creek (N1), to the northeast of the Project Site (N2) and on Paynes Road to the south of the Project Site (N3)) from 31 May 2010 to 6 June 2010. These logger locations and other individual receiver locations considered in the assessment are shown in **Figure 3** and described in **Table 1**.

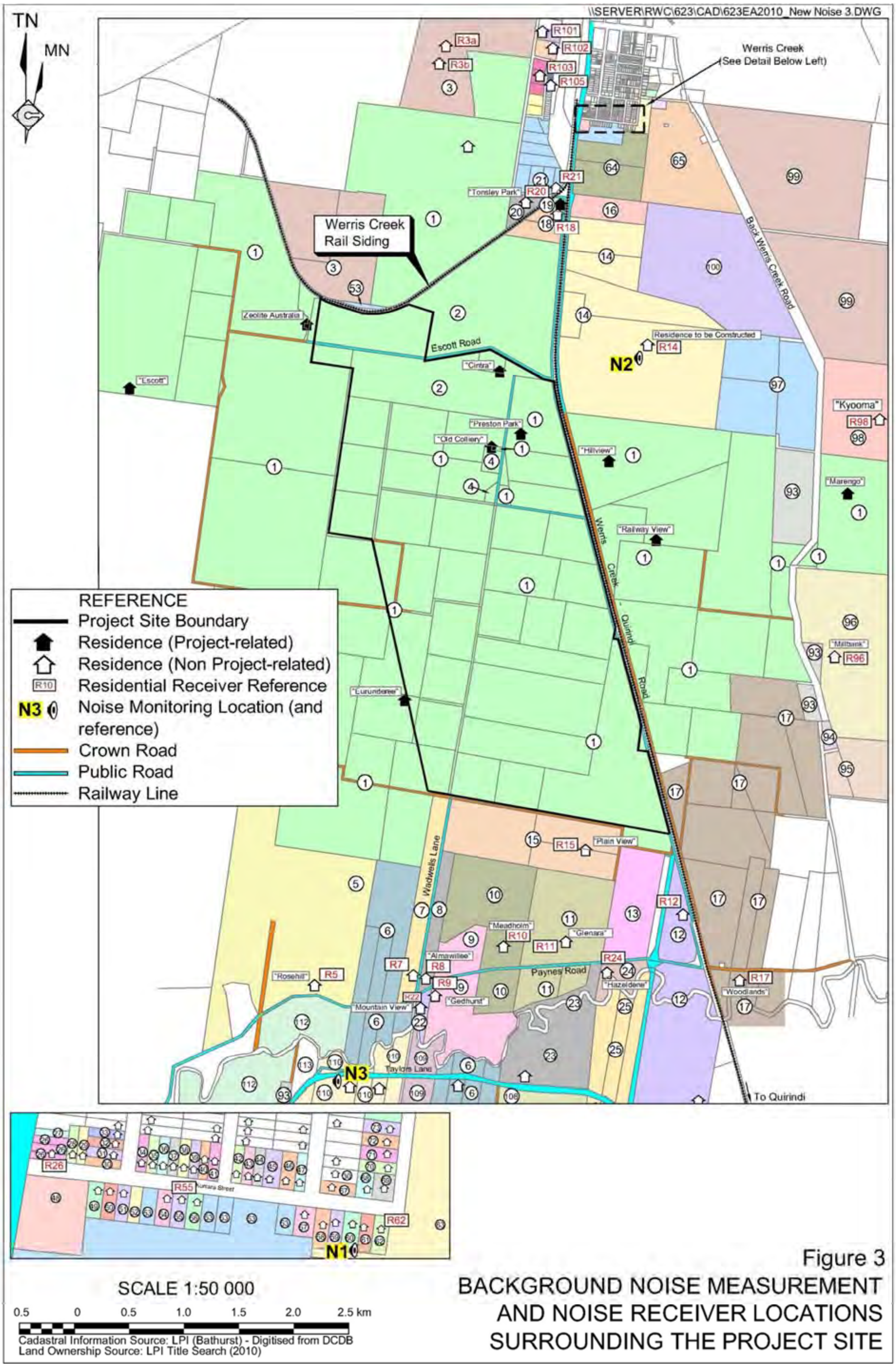


Figure 3
BACKGROUND NOISE MEASUREMENT AND NOISE RECEIVER LOCATIONS SURROUNDING THE PROJECT SITE

Table 1
Non Project-Related Residences Surrounding the Project Site

Property Reference	Property Name (if known)	Property Owner
R18		R.F. & H.T. Withers
R20	"Tonsley Park"	L. Patterson
R21		G.J. Currey
R3a		M.J. Lomax
R3b		M.J. Lomax
R101		J.L & G.D. O'Brien
R102		J.W. De Haart
R103		M.W. & T.M. Parsons
R104		F.W. Smith
R105		W.R. Lewis
R26		W.E. Woods
R55		R.M. Pitkin
R62 (N1)		P.M. & C.L. Cunningham
R99	"Werriston South"	C. Colville
R14 (N2)		T. & T. Haling (to be constructed)
R98	"Kyooma"	J. Colville
R96	"Millbank"	B. Davison
R17	"Woodlands"	M.M. Doolan & A.E. Hogan
R12		B.A. Fletcher
R24	"Hazeldene"	P. George
R15	"Plain View"	R.G. & A.R. Maxwell
R11	"Glenara"	W.H. & S.I. Ryan
R10		A. Blackwell
R9	"Gedhurst"	B.R. & A.J. Smith
R8	"Almawillee"	P.A. & T.M. Hird
R7		P.R. & J.S. Andrews
R22	"Mountain View"	L.F. & R.M. Parkes
R5	"Rosehill"	R. & A. George
R105* (N3)	"Park Hill"	N.J. Taylor
* This receiver is outside the operational noise model area, but was chosen as being representative of ambient noise levels at receivers south of the project site.		

Noise levels were continuously monitored at 15-minute statistical intervals using Svan 949 sound level meters as environmental noise loggers in accordance with relevant EPA guidelines and AS1055-1997 "Acoustics - Description and measurement of environmental noise".

Tables 2 to **4** present summaries of the background noise monitoring results (L90 Rating Background Levels (RBL) and existing LA_{eq}) recorded at the monitoring locations. Location N1 is representative of receivers in Werris Creek closest to the LOM Project, N2 is a residence to be constructed east of the Project Site that does not have existing noise criteria and N3 is representative of receivers south of the Project Site.

The RBL is the median of the daily L90 levels (ABL) in each assessment period (day/evening/night), over all valid days in the monitoring period. The existing LA_{eq} in each assessment period (day/evening/night) is the logarithmic mean of data measured during the relevant period. Measured noise data are presented graphically in **Appendix C**.

Table 2
Summary of Ambient Noise Levels, Werris Creek (N1)

Date	Leq (day)	Leq (evening)	Leq (night)	L90 (day)	L90 (evening)	L90 (night)
31-May-10	46.3	36.2	41.1	29.6	27.0	25.8
1-Jun-10	48.3	43.4	43.0	33.5	30.5	26.0
2-Jun-10	50.8	51.9	48.4	31.0	35.8	26.3
3-Jun-10	51.6	46.9	40.2	36.0	30.8	26.3
4-Jun-10	57.6	48.1	49.7	39.5	37.8	27.0
5-Jun-10	51.6	44.4	44.5	30.7	26.5	25.5
6-Jun-10	49.4	48.3	46.2	29.2	27.5	26.5
LAeq	50	49	44	--	--	--
L90	--	--	--	31	31	26

Day = 7am – 6pm, Evening = 6pm – 10pm, Night = 10pm – 6am

Table 3
Summary of Ambient Noise Levels, Haling (N2)

Date	Leq (day)	Leq (evening)	Leq (night)	L90 (day)	L90 (evening)	L90 (night)
31-May-10	47.0		40.2	36.2	24.4	21.1
1-Jun-10	44.6	43.7	41.6	31.1	26.8	21.4
2-Jun-10	45.9	48.1	43.1	32.5	37.4	21.4
3-Jun-10	44.7	45.2	41.2	33.3	31.3	21.8
4-Jun-10	42.8	43.1	41.6	29.9	24.9	19.3
5-Jun-10	45.2	47.7	42.2	31.3	34.9	19.1
6-Jun-10	44.0	44.7	40.2	32.4	30.2	19.7
LAeq	46	46	42	--	--	--
L90	--	--	--	32	30	21

Day = 7am – 6pm, Evening = 6pm – 10pm, Night = 10pm – 6am

Table 4
Summary of Ambient Noise Levels, Taylor (N3)[2]

Date	Leq (day)	Leq (evening)	Leq (night)	L90 (day)	L90 (evening)	L90 (night)
31-May-10	45.3	41.8	41.7	29.4	29.5	26.0
1-Jun-10	46.6	44.6	39.5	29.7	26.5	26.0
2-Jun-10	48.5	47.1	43.2	29.0	30.0	25.5
3-Jun-10	46.9	43.9	38.9	31.0	25.9	24.1
4-Jun-10	47.6	46.6	43.4	27.5	27.3	23.8
5-Jun-10	46.2			28.8	25.2	
6-Jun-10						
LAeq	47	45	42	--	--	--
L90	--	--	--	29	27	26

Day = 7am – 6pm, Evening = 6pm – 10pm, Night = 10pm – 6am

[2] This receiver is outside the operational noise model area, but was chosen as being representative of ambient noise levels at receivers south of the project site.

3 NOISE AND VIBRATION CRITERIA

3.1 Introduction

This section of the report summarises the noise and vibration criteria for potentially affected non-project related residences.

As this is a continuation of an existing mining operation, this assessment does not consider a construction period, during which higher noise limits may be allowable for a short period of time.

3.2 Operational Noise Criteria

The INP specifies two noise criteria:

- an *intrusiveness criterion* which limits L_{Aeq} noise levels from the industrial source to a value of 'background plus 5dB';and
- an *amenity criterion* which aims to protect against excessive noise levels where an area is becoming increasingly developed.

Since there is no existing major industry dominating noise levels at any residences near the Project Site, and road traffic noise is not continuous, only the intrusiveness criteria were considered in setting the project-specific operational noise limits. The existing criterion of **35dB(A),$L_{eq(15\text{-minute})}$** (day, evening and night) at receivers considered in the original acoustic assessment for the Werris Creek Coal Mine (Spectrum Acoustics, 2005) have been retained. This is the lowest intrusiveness criterion that can be established under the INP. The ambient noise levels at Taylor (N3) confirm the appropriateness of this criterion, given that a minimum background level of 30 dB(A),L_{90} is adopted under the INP.

Noise monitoring undertaken at locations N1 and N2 suggests that an intrusiveness criterion of greater than 35dB(A) may be applicable to some residences. However, as mining operations may have contributed to background level at these locations at the time of monitoring, and applying the precautionary principle, all remaining receivers have also been assigned a noise criteria of 35dB(A),$L_{eq(15\text{-minute})}$ (day, evening and night).

It is noted that for assessment purposes, residences R26, R55 and R62 reflect the most exposed residences within the residential area of Werris Creek. Compliance at these residences will imply compliance at all other residences within Werris Creek.

3.3 Sleep Disturbance Criteria

To help protect against people waking from their sleep, the DECCW recommends that 1-minute L_{A1} noise levels (effectively, the maximum noise level from impacts, etc) should not exceed the background level by more than 15dB when measured/computed at a building facade. The "sleep disturbance" criterion is only applicable to night time noise emissions.

The sleep disturbance criterion applicable for the LOM Project at each non project-related residence is equal to the intrusiveness criterion plus 10dB(A), ie. **45dB(A),$L_{1(1\text{-minute})}$**.

3.4 Road Traffic Noise Criteria

In NSW, noise from vehicle movements associated with an industrial source is assessed in terms of the INP if the vehicles are on the industrial site (the Project Site in this case). If the vehicles are on a public road, the *NSW Environmental Criteria for Road Traffic Noise* (ECRTN) applies. The LOM Project would produce additional traffic on Werris Creek Road (a collector road) and Taylor's Lane (a local road) due to haulage of product coal to local markets. The greatest potential for noise impacts is at residences on Taylor's Lane.

Table 5 shows ECRTN traffic noise criteria for the case where a development creates additional traffic on a local road.

Table 5
Road Traffic Noise Criteria

Type of Development	Recommended Criteria – dB(A)	
	Day (7.00am to 10.00pm)	Night (10.00pm to 7.00am)
11. Land use developments with potential to create additional traffic on existing local roads.	$L_{Aeq(1hr)}$55	$L_{Aeq(1hr)}$50

3.5 Rail Traffic Criteria

3.5.1 Train Noise Level Criteria

With very occasional exception, the LOM Project would require a maximum of three return train movements per day on the Main Northern Rail Line between the Project Site and Port Newcastle. On very rare occasions, a fourth return rail movement may be added. This is equivalent to current rail transport from the Werris Creek Coal Mine, although the number of days on which the maximum number of train movements would occur would increase to accommodate the proposed increase in maximum production. While the LOM Project would not increase existing train noise levels at any receiver, a quantitative assessment of train noise impacts against relevant rail noise criteria has been conducted.

The Australian Rail Track Corporation (ARTC) operates the Main Northern Railway Line which is included under Environment Protection Licence (EPL) 3142. The EPL does not contain environmental noise limits but states the objective of progressive reduction of noise levels from rail lines through Pollution Reduction Programs (PRPs).

Section U1.1 of EPL 3142 provides the goals presented in **Table 6** to work towards in developing a PRP:

Table 6
EPL3142 Pollution Reduction Program Goals

Descriptor	Design Goal
$L_{eq,\ (15\ hour)}$, day	65dB(A)
$L_{eq,\ (9\ hour)}$, night	60dB(A)
$L_{max\ (24\ hour)}$	85dB(A)

These criteria would be applicable if ARTC was required to assess train noise levels on the Main Northern Railway Line.

3.5.2 Train Vibration Level Criteria

Various authorities have set maximum limits on allowable ground and building vibration in different situations. In this Report, vibration criteria were obtained from the DECCW publication *"Assessing Vibration: A Technical Guideline"* (AVTG).

DECCW limits are for vibration in buildings, and relate to personal comfort and not structural integrity of the building. Based on procedures set out in *Appendix B* of the AVTG, a maximum allowable vibration velocity of 2.82mm/s applies to train-induced ground vibration, which is typically at frequencies greater than 10Hz.

3.6 Blasting Criteria

3.6.1 Annoyance Criteria

Noise and vibration levels from blasting are assessable against criteria proposed by the Australian and New Zealand Environment and Conservation Council (ANZECC) in their publication *"Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration – September 1990"*.

These criteria are summarised as follows.

- The recommended maximum overpressure level for blasting is 115dB.
- The level of 115dB may be exceeded for up to 5% of the total number of blasts over a 12-month period, but should not exceed 120dB at any time.
- The recommended maximum vibration velocity for blasting is 5mm/s Peak Vector Sum (PVS).
- The PVS level of 5mm/s may be exceeded for up to 5% of the total number of blasts over a 12-month period, but should not exceed 10mm/s at any time.
- Blasting should generally only be permitted during the hours of 9am to 5pm Monday to Saturday, and should not take place on Sundays and Public Holidays.
- Blasting should generally take place no more than once per day.

These criteria are typically adopted by DECCW when issuing Environment Protection Licences for projects involving blasting.

3.6.2 Building Damage Criteria

Building damage assessment criteria are nominated in AS 2187.2-1993 *"Explosives – Storage, Transport and Use Part 2: Use of Explosives"* and summarised in **Table 7**.

Table 7
Blasting Criteria to Limit Damage to Buildings (AS 2187)

Building Type	Vibration Level (mm/s)	Airblast Level (dB re 20 μPa)
Sensitive (and Heritage)	5	133
Residential	10	133
Commercial/Industrial	25	133

The annoyance (ANZECC) criteria are more stringent than the building damage criteria and will be taken as the governing criteria for the LOM Project.

4 ASSESSMENT METHODOLOGY

4.1 Operational Noise

4.1.1 Introduction

Assessment of operational noise was conducted using RTA Technology's *Environmental Noise Model* v3.06 (ENM) software. The noise sources were modelled at their known (for stationary sources such as the Coal Processing Area and Rail Load-out Facility) or most exposed (for mobile sources such as haul trucks and excavators) positions and noise contours and/or point calculations were generated for the surrounding area. Daytime and evening/night time scenarios have been considered separately.

4.1.2 Noise Sources and Attenuation Measures

Sound power levels of operational noise sources are shown in **Appendix D**. Sound power levels for all existing plant items were established from measurements taken on the Project Site during July 2010. Preliminary modelling with no management or engineering noise controls in place showed excessive noise levels (greater than 40 dB(A)) at a large number of receivers under severe temperature inversion conditions. Following an iterative approach to modelling, which considered the potential noise attenuation provided by a range of noise controls, the following noise reduction measures have been recommended. Based on the practical limit of noise reduction of individual noise sources, and consideration as to the minimum fleet size necessary to achieve the proposed production level, these are deemed to represent all reasonable and feasible noise mitigation measures.

CAT 785 Haul Trucks

Apply attenuator kits to achieve 8dB noise reduction in dynamic sound power level (as advised by the manufacturer). This recommendation arose from discussion between the Proponent and the machinery manufacturer and included detailed assessment of the acoustic performance of the 793D Extra Quiet (XQ) trucks. Advice from the manufacturer was that the noise suppression package that was fitted on the XQ trucks was essentially the same as would be fitted to the existing CAT 785 fleet, suggesting that similar noise reduction would be achieved. Noise test data for the XQ truck shows a pass-by sound power level of 121 dB(A) for the standard (unattenuated) 793D and 113 dB(A) sound power level for the 793D (XQ) for a loaded uphill dynamic test on 10% grade. These are the same[3] as the values used to derive truck sound power levels for final modelling and therefore represent the greatest noise reduction currently achievable.

[3] Measured uphill and downhill sound power levels for an unattenuated 785 truck were 121 dB(A) and 125 dB(A) respectively. Both of these were assumed to reduce by 8dB upon application of the attenuation package to give 113dB(A) uphill (equal to the result for the XQ) and 117 dB(A) downhill. The logarithmic average of 116dB(A) was adopted as the baseline for calculating $L_{Aeq(15\text{-minute})}$ equivalent point sources at 350m spacing along the haul roads.

It is also noted that verifiable truck noise reduction of either 2.5-3 dB (by installation of appropriate exhaust system) or 8 dB (by installation of full attenuator package) could be achieved. Adoption of the 8 dB attenuation resulted in the trucks no longer being the dominant noise sources, with the dozers, drills, excavators and train loading activities contributing more to the noise levels at assessed receivers under extreme inversion conditions. Therefore, even if more than 8 dB reduction of trucks noise levels were possible, this would not result in meaningful further noise reduction at residential receivers.

CAT Dozers (D10/D11)

Dozers will be limited to 1600 rpm in reverse (first gear) when operating in exposed locations under inversion conditions (7dB noise reduction as confirmed by extensive noise testing at the Werris Creek Coal Product Coal Storage Area and the Whitehaven CHPP at Gunnedah).

Coal Processing Area

An acoustic bund/barrier 5m high will be constructed on its north-eastern side when relocated to the northwest of its current location.

Blast Hole Drills

Restrict the number of drills operating to two (which would be operated below natural ground level under inversion conditions). Again, this recommendation arose from iterative modelling based on the original five drills proposed. The use of only two drills struck the balance between minimisation of noise emissions and viable levels of production.

Surface Plant

Drills, scrapers, an excavator and other plant items involved in surface preparation works immediately north of the open cut would not operate under extreme inversion conditions. Essentially, this restricts the operation of these items to daytime hours only. Real-time inversion monitoring will be used to guide whether a delayed start (later than 7am) would be required during winter months. This principal of a delayed start has been adopted at the Werris Creek Mine earlier in its operating life.

Acoustic and Visual Amenity Bund.

The construction of this earthen barrier to the north of the open cut would provide a direct noise barrier to mining noise generated within the open cut area. The bund would be most effective as a noise attenuation measure as mining operations move further to the north, ie. closer to the bund

The application of the noise controls noted above lowered the predicted worst case night time noise levels by approximately 5 to 7 dB for the modelled scenarios and have been included in the modelling results presented in this NVIA. Further significant noise reduction is not considered feasible using current best practice. For example, completely removing the two drills from the noise model for Scenario 4 only reduced received noise levels by a further 0.5 dB in Werris Creek, suggesting that there would be no real benefit in exploring mitigation options for the drills. Similarly small changes in modelled noise levels occurred upon varying the number, and sound power level, of excavators in most scenarios.

Once all the individual noise attenuation measures were considered, a ranking of the noise contribution from the noise sources on the Project Site at critical receiver areas showed similar noise contributions from many sources (reflecting the similarity in the sound power level of each piece of equipment – see **Appendix D**). This suggests that there are no further dominant noise sources which can be attenuated to result in a significant reduction in total mine noise. This notwithstanding, the following scenarios considering the implementation of further restrictions on mine fleet was undertaken to determine whether these reduction could have a significant impact on received noise levels.

- 2 excavators instead of 5.
- Removal of all drills.
- Reduced truck numbers.

This modelling did not result in a reduction in the noise levels received at the most affected residences likely to be differentiated by human hearing (<2dB(A)). The lack of significant noise reduction is attributable to the almost uniform noise levels generated by the mining fleet across the Project Site creating a "mine hum". The only way to reduce this "mine hum" such that a difference in the noise level is likely to be recognised at the residential receivers surrounding the Project Site, would be to significantly reduce the mining fleet (by more than 1/3) which, the Proponent advises, would impact on the viability of the mine, i.e. further fleet reduction is not feasible.

The major contributing noise sources are, understandably, the haul trucks and dozers operating at or above natural ground level (including the emplacement areas), as well as operation of mobile and fixed plant within the Coal Processing Area. The sound power reductions quoted above (and presented in **Appendix D**) represent the maximum reductions reasonably and feasibly achievable for these noise sources.

Section 4B.3.6.1.2 of the *Environmental Assessment* presents a comprehensive review of the noise mitigation measures considered and demonstrates that the noise mitigation measures nominated above represent all reasonable and feasible mitigation measures.

4.1.3 Modelled Scenarios

Noise source location diagrams for four operational scenarios are shown in **Appendix E**. These scenarios are approximately equally spaced in time and provide for an assessment of noise from the LOM Project at approximately Years 2, 7, 12 and 15. As discussed above, and indicated on the figures of **Appendix E**, each operational scenario is broken down into daytime (all sources operating) and night time (no surface preparation works) scenarios.

The main features, in terms of source numbers are as follows.

- There are three excavators (two Hitachi 3600's and one 1900) and ten CAT 785 haul trucks hauling coal and overburden for during the night time in Scenario 1.
- There are five excavators (two Hitachi 3600's and three 1900's) and thirteen CAT 785 haul trucks hauling coal and overburden for during the day time in Scenarios 2 to 4.
- There are only two drills operating in the pit at any one time.

As discussed in Section 2.2, modelling was conducted for the following atmospheric conditions.

- *Daytime lapse:* 20^0C air temp, 70% relative humidity (R.H.), no wind, -1^0C/100m vertical temperature gradient (dry adiabatic lapse rate, DALR).
- *Inversion:* 5^0C air temp, 85% R.H., inversion strengths of $+3/6/12^0$C/100m.
- *Prevailing winds*: 20^0C, 70% R.H., 3m/s winds from the northwest and south-southeast.

4.2 Sleep Disturbance

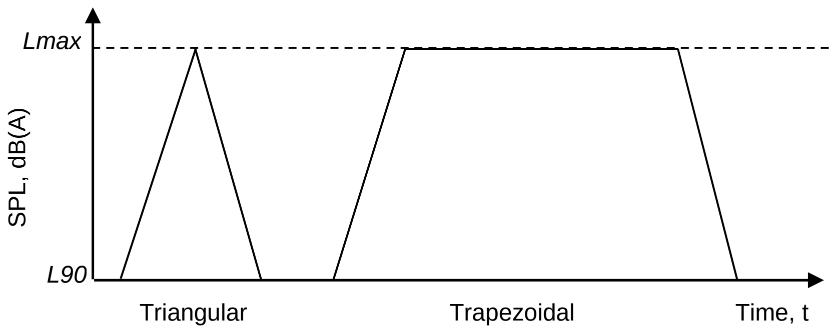
A potential for sleep disturbance would occur due to general impact noise from the coal crushing and screening plant and coal (train) loading operations. Sound power levels of modelled L_{Amax} noise sources (as an estimation of L_{A1} levels) are shown in **Appendix D**. Impact noise was modelled using the ENM program under the noise-enhancing atmospheric conditions discussed in Section 4.1.

4.3 Rail and Road Traffic Noise

Additional road traffic generated by the LOM Project would be of an intermittent rather than constant nature. There are many methods available for calculating the cumulative noise impact arising from intermittent signals of various shapes. The methodology employed in this section was sourced from the US Environmental Protection Agency document No. 550/9-74-004 *"Information on Levels of Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, March 1974".*

The document refers to 'triangular' and 'trapezoidal' time signals, which are illustrated in **Figure 4**. A triangular time signal rises from the background level to a peak noise level and then immediately begins to subside. A trapezoidal time signal rises from the background level to a maximum level and sustains that level for a period of time before subsiding.

Figure 4
Triangular and trapezoidal time signals



The value of L_{eq},T for a series of identical trapezoidal time patterns having maximum levels of L_{max} is given by **Equation 1**. A trapezoidal time signal is a good approximation to the SPL signal of a train as it passes an observation point.

$$L_{eq},T = 10\log\left[\frac{N\tau}{T}\left(\frac{1}{\frac{(\tau-\xi)\Delta L}{10}+\frac{\xi}{2}}\right)\left\{10^{\frac{Lb}{10}}\left(\frac{(\tau-\xi)}{2.3}\right)\left(10^{\frac{\Delta L}{10}}-1\right)+10^{\frac{L\max}{10}}\left(\frac{\xi}{2}\right)\right\}\right] \qquad (1)$$

where,

- L_{max} = maximum train noise at residence, dB(A)
- L_b = background noise level, dB(A)
- ΔL = L_{max} - L_b
- T = assessment period (minutes)
- τ = duration of noise from each train (minutes)
- ξ = duration of Lmax, and
- N = number of trains during assessment period.

Similarly, road traffic on Taylor's Lane generated by the LOM Project would be intermittent rather than constant with each passing vehicle approximated by a triangular time signal (see **Figure 4**). The value of L_{eq},T for a series of triangular time patterns having maximum levels of L_{max} is given by **Equation 2.**

$$L_{eq},T = L_b + 10\log\left[1+\frac{n\tau}{T}\left(\frac{10^{\frac{\Delta L}{10}}-1}{2.3}-\left(\frac{\Delta L}{10}\right)\right)\right] \qquad (2)$$

where,

- L_{max} = maximum vehicle noise at residence, dB(A)
- L_b = ambient equivalent noise level, dB(A)
- ΔL = L_{max} - L_b
- T = assessment period (minutes)
- τ = "10dB-down" duration per vehicle, and
- n = number of vehicles during assessment period.

4.4 Rail Vibration

Vibration levels from laden and unladen coal trains have been widely studied in the Hunter Valley. A thorough assessment conducted in 1997 (*Noise and Vibration Assessment, Jerrys Plains Rail Spur, Wilkinson Murray Pty Limited*) found that the ground vibration level from coal trains is well below the criterion of 2.82 mm/s at approximately 20m from the track. Numerous measurements conducted by Spectrum Acoustics at locations 20m from passing coal trains have recorded ground vibration levels no greater than 1 mm/s. Given the generally low ground vibration levels produced by coal trains on the Main Northern Railway Line, rail vibration has not been considered further in this assessment.

4.5 Blasting

4.5.1 Introduction

The following sections provide standard equations for predicting blast overpressure and ground vibration levels, sourced from the United States Bureau of Mines. Historical blast data from 2009 and 2010 have been analysed to modify the standard equations and produce specific blast vibration and overpressure 'site-laws' for use in prediction of future blast levels at residential receivers.

4.5.2 Blast Overpressure

Unweighted airblast overpressure levels (OP) are predicted from **Equation 3** below.

$$OP = 165 - 24(\log_{10}(D) - 0.3\log_{10}(Q)), \quad \text{dB} \qquad (3)$$

where *D* is distance from the blast to the assessment point (m) and
Q is the weight of explosive per delay (kg).

Equation 1 for blast overpressure is a function of two variables (*D* and *Q*) which can be combined into a single variable (*D*/*Q*^0.3) called the 'scaled distance' (*SD*). **Figure 5** shows 2009 and 2010 blast overpressure data plotted against *SD*.

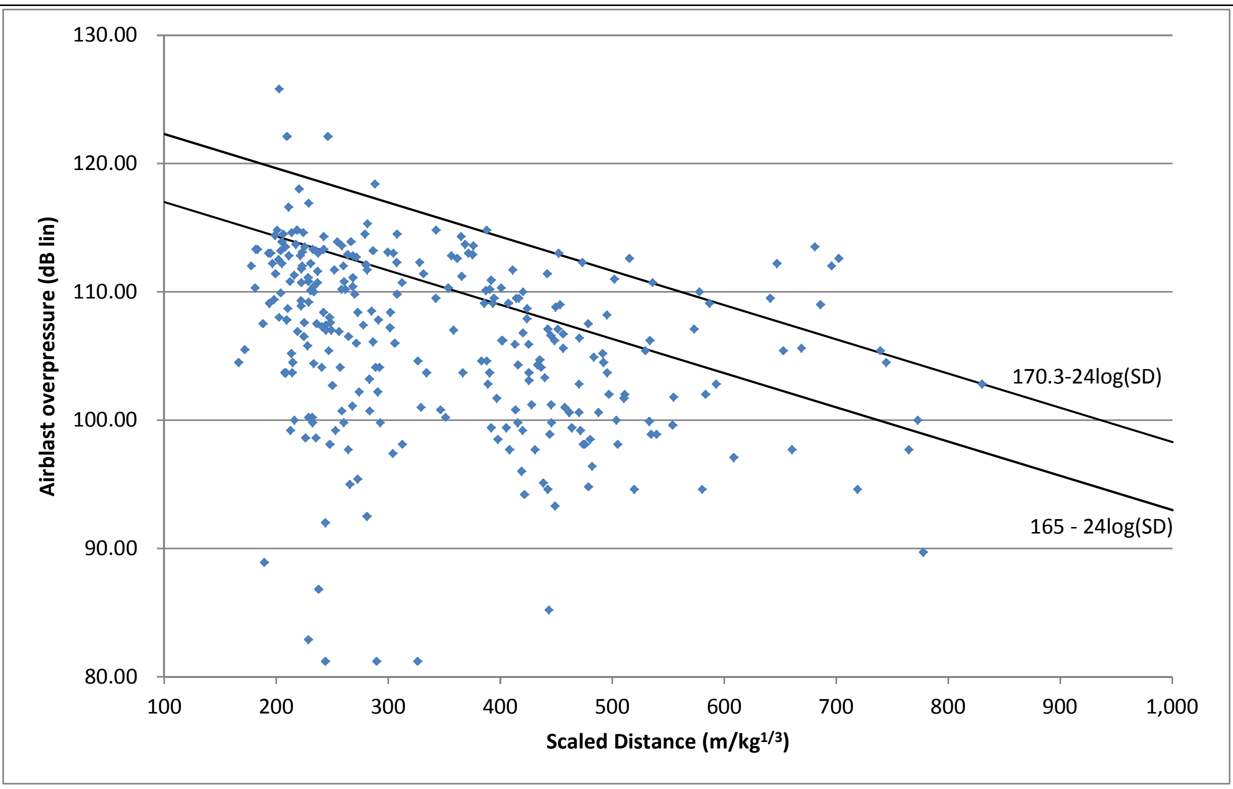


Figure 5
Blast Overpressure Data 2009/10

4.5.3 Blast Vibration

The basic equations for calculation of peak particle vibration (PPV) levels from blasting are as follows:

$$\mathrm{PPV} = 1140\left(\frac{D}{Q^{0.5}}\right)^{-1.6}$$, mm/s (for average ground type) (4)

$$\mathrm{PPV} = 500\left(\frac{D}{Q^{0.5}}\right)^{-1.6}$$, mm/s (for hard rock) (5)

where *D* and *Q* are defined as in **Equation 3**.

Figure 6 shows 2009 and 2010 blast vibration data plotted against *SD*.

Based on the above analysis, the 5% exceedance site laws for blast overpressure and ground vibration for the purpose of predicting emissions from the LOM Project are:

- OP(95%) = 170.3 – 24log(*SD*)
- PPV(95%) = 553 x $SD^{-1.06}$

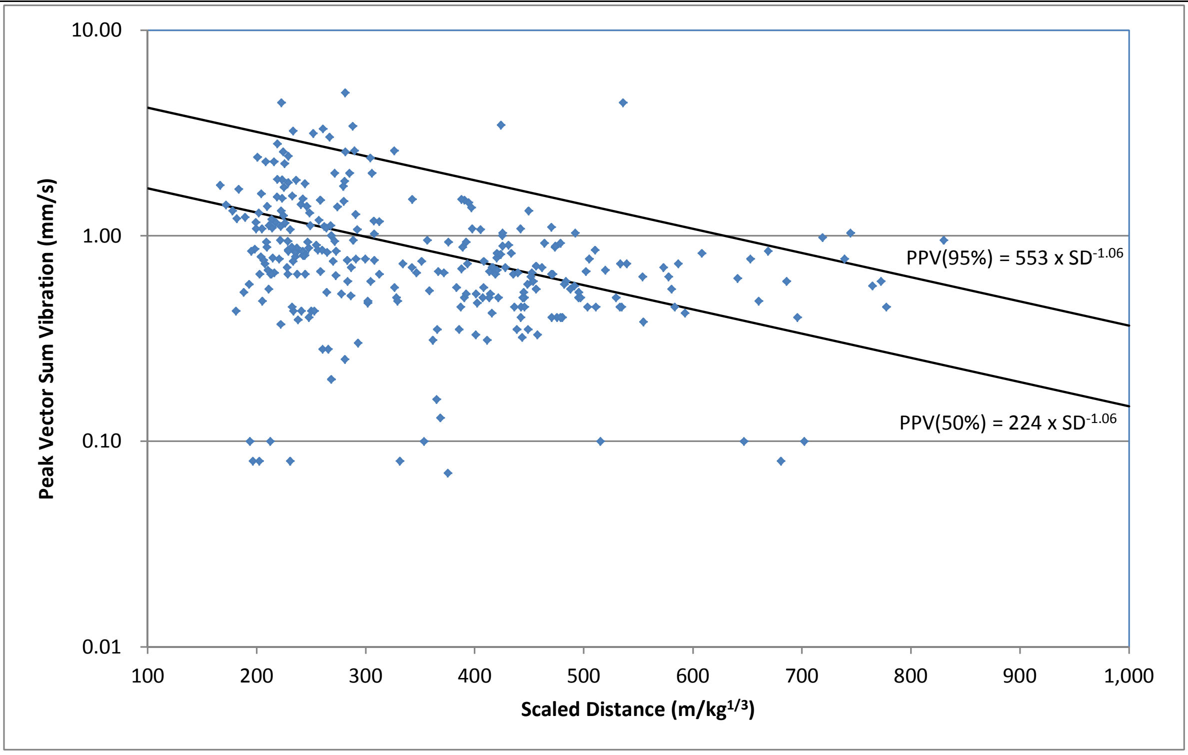


Figure 6
Blast Vibration Data 2009/10

5 IMPACT ASSESSMENT

5.1 Introduction

This section of the NVIA presents predicted noise and vibration levels and provides mitigation recommendations where criterion exceedances are predicted. In all tables of results that follow, any predicted exceedances of the relevant criteria are highlighted in bold type. Criterion exceedances greater than 5 dB are also shaded grey.

5.2 Operational Noise

5.2.1 Predicted Noise Levels - Scenario 1

Predicted night time operational noise levels for Scenario 1 at all assessed receivers are shown in **Table 8** and predicted daytime noise levels are shown in **Table 9**. Notably, Receiver R55 (Pitkin) is located at the most exposed location on the southern edge of the urban area of Werris Creek. Compliance with this receiver implies compliance at all remaining residences within the urban area of Werris Creek. Noise contours for these scenarios are shown as **Figures F1** to **F6** in **Appendix F**.

Table 8
Predicted Night time Noise Levels (Scenario 1) – dB(A),$L_{eq(15\text{-}minute)}$

Rec #	Receiver	Meteorological Condition					Criterion dB(A)
		Inversion (°C/100m)			Wind (3 m/s)		
		3	6	12	NW	SSE	
R18	Withers	29	33	**37**	24	29	35
R20	Patterson	29	33	**37**	24	29	35
R21	Currey	29	33	**37**	23	27	35
R3a	Lomax	27	30	33	<20	28	35
R3b	Lomax	26	29	33	<20	28	35
R101	O'Brien	26	28	32	<20	26	35
R102	De Haart	26	28	32	<20	26	35
R103	Parsons	27	29	33	<20	27	35
R104	Smith	28	29	33	<20	28	35
R105	Lewis	27	31	34	20	27	35
R26	Woods	27	30	34	<20	27	35
R55	Pitkin	27	31	34	21	26	35
R62	Cunningham	27	31	34	22	26	35
R98	J. Colville	30	31	34	30	20	35
R14	Haling	32	34	**38**	32	<20	35
R96	Davison	29	33	**37**	34	<20	35
R17	Doolan & Hogan	30	32	34	35	<20	35
R12	Fletcher	32	**36**	**38**	**38**	<20	35
R24	P. George	30	32	**37**	35	<20	35
R15	Maxwell	34	**37**	**43**	**38**	<20	35
R11	Ryan	32	35	**39**	**36**	<20	35
R10	Blackwell	32	35	**39**	35	20	35
R9	Smith	31	35	**37**	32	<20	35
R8	Hird	31	35	**37**	32	<20	35
R7	Andrews	31	35	**37**	32	<20	35
R22	Parkes	30	34	**36**	31	<20	35
R5	R. & A. George	27	30	32	25	<20	35

Table 9
Predicted Daytime Noise Levels (Scenario 1) – dB(A),$L_{eq(15\text{-}minute)}$

Rec #	Receiver	Meteorological Condition			Criterion dB(A)
		Neutral	NW wind 3 m/s	SSE wind 3 m/s	
R18	Withers	23	21	35	35
R20	Patterson	23	21	35	35
R21	Currey	22	20	34	35
R3a	Lomax	20	<20	30	35
R3b	Lomax	20	<20	30	35
R101	O'Brien	<20	<20	29	35
R102	De Haart	<20	<20	29	35
R103	Parsons	<20	<20	30	35
R104	Smith	<20	<20	31	35
R105	Lewis	<20	<20	30	35
R26	Woods	21	<20	31	36
R55	Pitkin	21	20	30	36
R62	Cunningham	22	21	30	36
R98	J. Colville	23	31	20	35
R14	Haling	23	33	**38**	35
R96	Davison	21	**37**	<20	35
R17	Doolan & Hogan	24	34	<20	35
R12	Fletcher	24	**38**	21	35
R24	P. George	20	35	<20	35
R15	Maxwell	24	**39**	20	35
R11	Ryan	23	35	<20	35
R10	Blackwell	23	34	20	35
R9	Smith	21	31	20	35
R8	Hird	21	31	20	35
R7	Andrews	21	31	<20	35
R22	Parkes	20	30	<20	35
R5	R. & A. George	<20	25	<20	35

5.2.2 Discussion of Results - Scenario 1

Noise criterion exceedances less than 5dB have been predicted at receivers R18 (Withers), R20 (Patterson), R21 (Currey), R14 (Haling), R96 (Davison), R12 (Fletcher), R24 (P. George), R11 (Ryan), R10 (Blackwell), R7 (Andrews) and R22 (Parkes) under worst case conditions for the night time scenario, placing these receivers in a noise 'management zone'.

The extensive noise management and mitigation measures discussed in Section 4.1.2 represent all available reasonable and feasible attenuation measures. Accordingly, since the residual exceedances are less than 5dB, and only occur under strong inversion conditions, this report recommends adoption of the predicted levels as noise criteria for the LOM Project for all receivers except R18, R20 and R21. The applicable noise criteria for these receivers are discussed further in Sections 5.2.4 and 5.2.6.

An exceedances greater than 5dB has been predicted at R15 (Maxwell) under worst case inversion conditions, placing this receiver in a noise 'affectation zone'. Acquisition of this property, or an agreement with the owner / resident of this location, may be required in order for the LOM Project to proceed as proposed. It is understood that the Proponent has commenced negotiations with the owner of this property to obtain an agreement in relation to received noise levels up to 43dB.

5.2.3 Predicted Noise Levels - Scenario 2

Predicted night time operational noise levels for Scenario 2 at all assessed receivers are shown in **Table 10** and predicted daytime noise levels are shown in **Table 11**. Noise contours for these scenarios are shown as **Figures F7** to **F12** in **Appendix F**.

Table 10
Predicted Night time Noise Levels (Scenario 2) – dB(A),$L_{eq(15\text{-}minute)}$

Rec #	Receiver	Meteorological Condition					Criterion dB(A)
		Inversion (^oC/100m)			Wind (3 m/s)		
		3	6	12	NW	SSE	
R18	Withers	30	34	**36**	24	28	35
R20	Patterson	30	34	**36**	24	28	35
R21	Currey	29	33	35	23	28	35
R3a	Lomax	28	30	33	<20	27	35
R3b	Lomax	28	30	33	<20	27	35
R101	O'Brien	26	29	32	<20	25	35
R102	De Haart	26	29	32	<20	25	35
R103	Parsons	27	30	33	<20	26	35
R104	Smith	28	30	34	<20	28	35
R105	Lewis	27	30	33	<20	26	35
R26	Woods	27	30	33	20	25	35
R55	Pitkin	27	30	33	20	25	35
R62	Cunningham	27	30	33	21	24	35
R98	J. Colville	30	34	**36**	30	<20	35
R14	Haling	32	34	**37**	32	27	35
R96	Davison	29	33	35	33	<20	35
R17	Doolan & Hogan	25	28	34	30	<20	35
R12	Fletcher	27	**31**	**36**	32	<20	35
R24	P. George	26	30	35	31	<20	35
R15	Maxwell	29	33	**38**	33	<20	35
R11	Ryan	28	32	**36**	32	<20	35
R10	Blackwell	28	32	**36**	32	<20	35
R9	Smith	27	31	35	30	<20	35
R8	Hird	27	31	35	30	<20	35
R7	Andrews	27	31	35	30	<20	35
R22	Parkes	27	30	35	29	<20	35
R5	R. & A. George	24	28	31	25	<20	35

Table 11
Predicted Daytime Noise Levels (Scenario 2) – dB(A),$L_{eq(15\text{-minute})}$

Rec #	Receiver	Meteorological Condition			Criterion dB(A)
		Neutral	NW wind 3 m/s	SSE wind 3 m/s	
R18	Withers	25	25	**39**	35
R20	Patterson	25	25	**39**	35
R21	Currey	25	24	**38**	35
R3a	Lomax	20	<20	34	35
R3b	Lomax	20	<20	34	35
R101	O'Brien	<20	<20	33	35
R102	De Haart	20	<20	33	35
R103	Parsons	21	<20	34	35
R104	Smith	23	<20	35	35
R105	Lewis	21	<20	34	35
R26	Woods	24	21	35	36
R55	Pitkin	24	22	35	36
R62	Cunningham	25	22	34	36
R98	J. Colville	20	34	<20	35
R14	Haling	35	**36**	**38**	35
R96	Davison	23	**38**	<20	35
R17	Doolan & Hogan	<20	32	<20	35
R12	Fletcher	<20	35	<20	35
R24	P. George	<20	33	<20	35
R15	Maxwell	<20	**37**	<20	35
R11	Ryan	<20	34	<20	35
R10	Blackwell	<20	34	<20	35
R9	Smith	<20	30	<20	35
R8	Hird	<20	30	<20	35
R7	Andrews	<20	30	<20	35
R22	Parkes	<20	30	<20	35
R5	R. & A. George	<20	24	<20	35

5.2.4 Discussion of Results - Scenario 2

Table 10 shows a reduced range of criterion exceedances as compared with **Table 8** which is attributable to the northerly advance of the mine and consequent reduction in noise levels at the residences located along Paynes Road to the south.

Daytime noise levels in **Table 11** have increased slightly at R18 (Withers), R20 (Patterson) and R21 (Currey) due to the closer proximity of the sources at natural ground level, most notably the topsoil scrapers.

As noted in Section 5.2.2, all reasonable and feasible noise management and mitigation measures have been proposed. Accordingly, since the residual exceedances remain less than 5dB, this report recommends adoption of the predicted levels as noise criteria for the LOM Project under adverse conditions (both day and night time) for receivers R20 and R21. Noise criteria for receiver R18 is discussed further in Section 5.2.6.

5.2.5 Predicted Noise Levels - Scenario 3

Predicted night time operational noise levels for Scenario 3 at all assessed receivers are shown in **Table 12** and predicted daytime noise levels are shown in **Table 13**. Noise contours for these scenarios are shown as **Figures F13** to **F18** in **Appendix F**.

Table 12
Predicted Night time Noise Levels (Scenario 3) – dB(A),$L_{eq(15\text{-}minute)}$

Rec #	Receiver	Meteorological Condition					Criterion dB(A)
		Inversion (^{o}C/100m)			Wind (3 m/s)		
		3	6	12	NW	SSE	
R18	Withers	30	34	**37**	24	31	35
R20	Patterson	30	34	**37**	24	31	35
R21	Currey	29	34	**37**	23	30	35
R3a	Lomax	28	30	34	<20	29	35
R3b	Lomax	28	30	34	<20	29	35
R101	O'Brien	27	30	32	<20	27	35
R102	De Haart	27	30	32	<20	27	35
R103	Parsons	28	31	33	<20	28	35
R104	Smith	29	32	34	<20	28	35
R105	Lewis	28	31	33	<20	28	35
R26	Woods	27	31	34	20	27	35
R55	Pitkin	28	31	34	21	27	35
R62	Cunningham	28	31	35	22	26	35
R98	J. Colville	29	33	**36**	30	<20	35
R14	Haling	33	36	**39**	32	29	35
R96	Davison	28	31	35	29	<20	35
R17	Doolan & Hogan	26	30	34	30	<20	35
R12	Fletcher	25	**31**	**36**	32	<20	35
R24	P. George	26	32	35	30	<20	35
R15	Maxwell	29	34	**38**	33	<20	35
R11	Ryan	28	33	**36**	31	<20	35
R10	Blackwell	28	33	**36**	31	<20	35
R9	Smith	27	30	35	28	<20	35
R8	Hird	27	30	35	28	<20	35
R7	Andrews	26	30	34	28	<20	35
R22	Parkes	26	30	34	27	<20	35
R5	R. & A. George	22	27	29	21	<20	35

As noted in Section 5.2.2 and 5.2.4, all reasonable and feasible noise management and mitigation measures have been proposed. Accordingly, since the residual exceedances do not exceed 5dB, this report recommends adoption of the predicted noise levels as noise criteria for the LOM Project under adverse conditions (both day and night time) for receiver R18.

Table 13
Predicted Daytime Noise Levels (Scenario 3) – dB(A),$L_{eq(15\text{-minute})}$

Rec #	Receiver	Meteorological Condition			Criterion dB(A)
		Neutral	NW wind 3 m/s	SSE wind 3 m/s	
R18	Withers	31	30	**40**	35
R20	Patterson	31	30	**39**	35
R21	Currey	30	29	**39**	35
R3a	Lomax	25	20	34	35
R3b	Lomax	25	20	34	35
R101	O'Brien	25	23	33	35
R102	De Haart	25	23	33	35
R103	Parsons	26	23	34	35
R104	Smith	28	25	35	35
R105	Lewis	26	23	34	35
R26	Woods	28	25	35	36
R55	Pitkin	28	25	35	36
R62	Cunningham	29	25	34	36
R98	J. Colville	<20	33	<20	35
R14	Haling	**37**	**39**	**37**	35
R96	Davison	20	34	<20	35
R17	Doolan & Hogan	<20	29	<20	35
R12	Fletcher	<20	32	<20	35
R24	P. George	<20	30	<20	35
R15	Maxwell	<20	34	<20	35
R11	Ryan	<20	31	<20	35
R10	Blackwell	<20	30	<20	35
R9	Smith	<20	27	<20	35
R8	Hird	<20	27	<20	35
R7	Andrews	<20	27	<20	35
R22	Parkes	<20	27	<20	35
R5	R. & A. George	<20	23	<20	35

5.2.6 Predicted Noise Levels - Scenario 4

Predicted night time operational noise levels for Scenario 4 at all assessed receivers are shown in **Table 14** and predicted daytime noise levels are shown in **Table 15**. Noise contours for these scenarios are shown as **Figures F19** to **F24** in **Appendix F**.

5.2.7 Discussion of Results - Scenario 4

The results in **Tables 14** and **15** do not predict any additional increase in noise levels received at the nominated receivers and hence the noise criteria recommended in the previous sections would suffice.

Table 14
Predicted Night time Noise Levels (Scenario 4) – dB(A),$L_{eq(15\text{-}minute)}$

Rec #	Receiver	Meteorological Condition					Criterion dB(A)
		Inversion (°C/100m)			Wind (3m/s)		
		3	6	12	NW	SSE	
R18	Withers	29	33	**37**	25	34	35
R20	Patterson	29	33	**37**	25	34	35
R21	Currey	28	33	**37**	24	34	35
R3a	Lomax	27	30	34	<20	32	35
R3b	Lomax	27	30	34	<20	32	35
R101	O'Brien	25	29	33	<20	30	35
R102	De Haart	25	29	33	<20	30	35
R103	Parsons	26	30	34	<20	30	35
R104	Smith	27	31	35	<20	31	35
R105	Lewis	26	30	34	<20	30	35
R26	Woods	27	31	34	21	31	35
R55	Pitkin	27	31	34	22	31	35
R62	Cunningham	27	30	34	23	30	35
R98	J. Colville	27	30	33	30	<20	35
R14	Haling	32	35	**39**	33	<20	35
R96	Davison	27	30	34	32	<20	35
R17	Doolan & Hogan	27	30	33	32	<20	35
R12	Fletcher	30	**33**	**36**	34	<20	35
R24	P. George	27	31	35	33	<20	35
R15	Maxwell	32	35	**38**	**36**	<20	35
R11	Ryan	30	32	**36**	33	<20	35
R10	Blackwell	30	32	**36**	33	<20	35
R9	Smith	29	32	35	30	<20	35
R8	Hird	29	32	35	30	<20	35
R7	Andrews	29	32	35	30	<20	35
R22	Parkes	28	31	34	30	<20	35
R5	R. & A. George	25	27	30	24	<20	35

Table 15
Predicted Daytime Noise Levels (Scenario 4) – dB(A),$L_{eq(15\text{-minute})}$

Rec #	Receiver	Meteorological Condition			Criterion dB(A)
		Neutral	NW wind 3 m/s	SSE wind 3 m/s	
R18	Withers	30	28	**37**	35
R20	Patterson	30	28	**37**	35
R21	Currey	29	27	**37**	35
R3a	Lomax	24	20	33	35
R3b	Lomax	24	20	33	35
R101	O'Brien	23	<20	32	35
R102	De Haart	23	<20	32	35
R103	Parsons	24	21	33	35
R104	Smith	25	22	34	35
R105	Lewis	24	21	33	35
R26	Woods	25	24	34	36
R55	Pitkin	25	24	34	36
R62	Cunningham	25	25	34	36
R99	C. Colville	20	30	<20	35
R98	J. Colville	<20	31	<20	35
R14	Haling	<20	**38**	<20	35
R96	Davison	<20	33	<20	35
R17	Doolan & Hogan	<20	30	<20	35
R12	Fletcher	<20	33	<20	35
R24	P. George	<20	32	<20	35
R15	Maxwell	<20	**36**	<20	35
R11	Ryan	<20	33	<20	35
R10	Blackwell	<20	32	<20	35
R9	Smith	<20	29	<20	35
R8	Hird	<20	29	<20	35
R7	Andrews	<20	29	<20	35
R22	Parkes	<20	28	<20	35
R5	R. & A. George	<20	25	<20	35

5.2.8 Summary of Noise Modelling Predictions

Table 16 contains the intrusiveness criteria and the maximum predicted daytime and evening/night time noise levels from **Tables 8** to **15** for each of the surrounding receivers.

Table 16
Maximum Predicted Noise Levels and PSNLs – dB(A),$L_{eq(15\text{-minute})}$

Rec #	Receiver	Assessment Period			
		Daytime		Evening/night	
		Predicted	PSNL	Predicted	PSNL
R18	Withers	**40**	35	**37**	35
R20	Patterson	**39**	35	**37**	35
R21	Currey	**39**	35	**37**	35
R3a	Lomax	34	35	34	35
R3b	Lomax	34	35	34	35
R101	O’Brien	33	35	33	35
R102	De Haart	33	35	33	35
R103	Parsons	34	35	34	35
R104	Smith	35	35	35	35
R105	Lewis	34	35	34	35
R26	Woods	35	35	34	35
R55	Pitkin	35	35	34	35
R62	Cunningham	34	35	35	35
R98	J. Colville	34	35	**36**	35
R14	Haling	**39**	35	**39**	35
R96	Davison	**38**	35	**37**	35
R17	Doolan & Hogan	34	35	35	35
R12	Fletcher	**38**	35	**38**	35
R24	P. George	35	35	**37**	35
R15	Maxwell	**39**	35	**43**	35
R11	Ryan	35	35	**39**	35
R10	Blackwell	34	35	**39**	35
R9	Smith	31	35	**37**	35
R8	Hird	31	35	**37**	35
R7	Andrews	31	35	**37**	35
R22	Parkes	30	35	**36**	35
R5	R. & A. George	25	35	32	35

5.2.9 Rail Pass-by Noise

The Proponent leases the Werris Creek Rail Siding from ARTC to enable coal trains to access the Rail Load-out Facility. Given the short duration of each individual event, the $L_{eq\ (15\text{-minute})}$ noise level generated by the slow passage of the coal train along the Werris Creek Rail Siding[4] has been calculated at the nearest residences as follows.

- R20: 50dB(A).
- R18: 43dB(A).
- R21: 57dB(A).

L_{max} noise levels would be at least 15dB(A) higher.

[4] The noise generated by the idling loco during coal loading to the train is included in the noise modelling results presented in **Tables 4B.13** to **4B.16** of the *Environmental Assessment*.

It may not be possible to reduce these short-term (less than three minutes) noise events to below the criterion. It is noted, however, that the LOM Project would not increase the maximum number of trains that have already been passing by these residences each day for the past five years. Notably, the LOM Project would actually result in a lesser degree of noise impact on these receivers due to the construction and use of the turn-around loop west of the Rail Load-out Facility. This would place the train locomotives much further west of these residences than currently during the train loading and when the trains are at idle waiting the re-join the main northern rail line. In particular, locomotives that would once have sat idling near R20 (Patterson) for periods of an hour or more, would be removed as a source of offensive noise at this receiver.

5.2.10 Recommended Noise Emission Criteria

Noise emission criteria up to 5dB above the intrusiveness criteria have previously been adopted by a consent authority, provided it has been demonstrated that all reasonable and feasible noise reduction has been applied to bring excessive noise levels down to a level no greater than ‘PSNL + 5dB’. The results summarised in **Table 16** are based upon application of all reasonable and feasible noise reduction measures as discussed in Sections 4.1.2 and 4.1.3.

Table 17 contains the recommended operational noise criteria for the LOM Project based on the predicted noise levels after application of all reasonable and feasible noise control, and a minimum intrusiveness criterion of 35 dB(A).

5.2.11 Real-time Noise Management

Ongoing assessment of received noise levels will be critical to ensuring compliance with the recommended criteria of **Table 17** at each receiver. The Proponent has committed to the installation and operation of suitable real-time noise and atmospheric data monitoring network to enable operations to be managed in such a way as to ensure compliance.

Subject to current operating conditions and the existence of specific community concerns regarding noise, a mobile real-time noise monitor with audio recording capabilities would be utilised to capture noise data in the areas of greatest concern. Management software would be developed to determine whether noise levels were approaching the recommended operational criteria (see **Table 17**), or if adverse meteorological conditions with respect to noise emissions were prevailing (or developing in the case of inversion conditions). In each case, warning messages would be sent to appropriate site personnel.

Upon receipt of a warning message, real-time data and audio files would be reviewed to determine the source of the offending noise and, if necessary, management controls such as relocation or suspension of the offending activity would be implemented.

The process by which real-time data would be used as a noise management tool would be fully documented in a revised Noise Management Plan (NMP) for the LOM Project.

Table 17
Recommended Operational Noise criteria – dB(A),$L_{eq(15\text{-minute})}$

Rec #	Receiver	Assessment Period	
		Daytime	Evening/night
R18	Withers	40	37
R20	Patterson	39	37
R21	Currey	39	37
R3a	Lomax	35	35
R3b	Lomax	35	35
R101	O'Brien	35	35
R102	De Haart	35	35
R103	Parsons	35	35
R104	Smith	35	35
R105	Lewis	35	35
R26	Woods	35	35
R55	Pitkin	35	35
R62	Cunningham	35	35
R98	J. Colville	35	36
R14	Haling	39	39
R96	Davison	38	37
R17	Doolan & Hogan	35	35
R12	Fletcher	38	38
R24	P. George	35	37
R15*	Maxwell	39	40
R11	Ryan	35	39
R10	Blackwell	35	39
R9	Smith	35	37
R8	Hird	35	37
R7	Andrews	35	37
R22	Parkes	35	36
R5	R. & A. George	35	35

*A night time criterion of 40 dB(A) has been recommended, although a predicted level of 43 dB(A) under inversion conditions places this receiver in a noise affectation zone.

5.3 Sleep Disturbance Assessment

Predicted sleep disturbance impact noise levels (maximum over the four operational scenarios) at all non-project related residences are shown in **Table 18**.

Table 18
Predicted Maximum Noise Levels – dB(A),$L_{1(1\text{-minute})}$

Rec #	Receiver	Meteorological Condition			Criterion dB(A)
		Inversion 12^0C/100m	NW wind 3 m/s	SSE wind 3 m/s	
R18	Withers	41	26	40	45
R20	Patterson	41	26	40	45
R21	Currey	41	26	40	45
R3a	Lomax	38	24	38	45
R3b	Lomax	38	24	38	45
R101	O'Brien	38	23	37	45
R102	De Haart	38	23	37	45
R103	Parsons	37	24	37	45
R104	Smith	38	25	38	45
R105	Lewis	37	24	37	45
R26	Woods	38	24	37	45
R55	Pitkin	37	23	37	45
R62	Cunningham	37	23	37	45
R99	C. Colville	34	23	22	45
R98	J. Colville	33	33	<20	45
R14	Haling	42	34	21	45
R96	Davison	39	36	<20	45
R17	Doolan & Hogan	37	37	<20	45
R12	Fletcher	41	41	22	45
R24	P. George	39	38	<20	45
R15	Maxwell	**46**	42	21	45
R11	Ryan	41	39	<20	45
R10	Blackwell	41	37	<20	45
R9	Smith	39	35	<20	45
R8	Hird	39	35	<20	45
R7	Andrews	39	35	<20	45
R22	Parkes	38	35	<20	45
R5	R. & A. George	34	27	<20	45

With the exception of receiver R15 (Maxwell), where a 1dB(A) exceedance of criteria was predicted during Scenario 1 operations, the predicted maximum noise levels in **Table 18** are all below the sleep disturbance criterion. In most cases, the maximum level from individual plant items is less than 5dB above the total LA_{eq} level emitted by the mine. This is typically described as "mine hum". The greatest differences between LA_{eq} and LA_{max} levels are generally closest to the Rail Load-out area, where activities associated with train loading produce levels that emerge above the LAeq level, although still below the sleep disturbance criterion.

Notably, during Scenario 1 receiver R15 (Maxwell) is also predicted to be subject to operational noise levels more than 5dB(A) greater than the 'intrusiveness' noise criterion. It is understood the Proponent is negotiating an agreement with the resident and owner of R15 to permit elevated noise levels at this residence.

5.4 Rail Noise Assessment

5.4.1 Introduction

Rail noise from trains generated by the LOM Project would potentially impact on two classes of residential receiver:

- rural receivers where the trains would pass by reasonable quickly at speed; and
- suburban receivers generally closer to the rail line than rural receivers, and where the trains would travel at lower 'town' speeds.

5.4.2 Rural Receivers

Figure 7 shows predicted train pass-by noise levels out to a distance of 50m from the centre line of a passing coal train based on **Equation 2** and sound power levels provided in **Appendix A** for coal trains in motion. The closest residence to the Main Northern Railway Line is R12 (Fletcher) at a distance of approximately 20m.

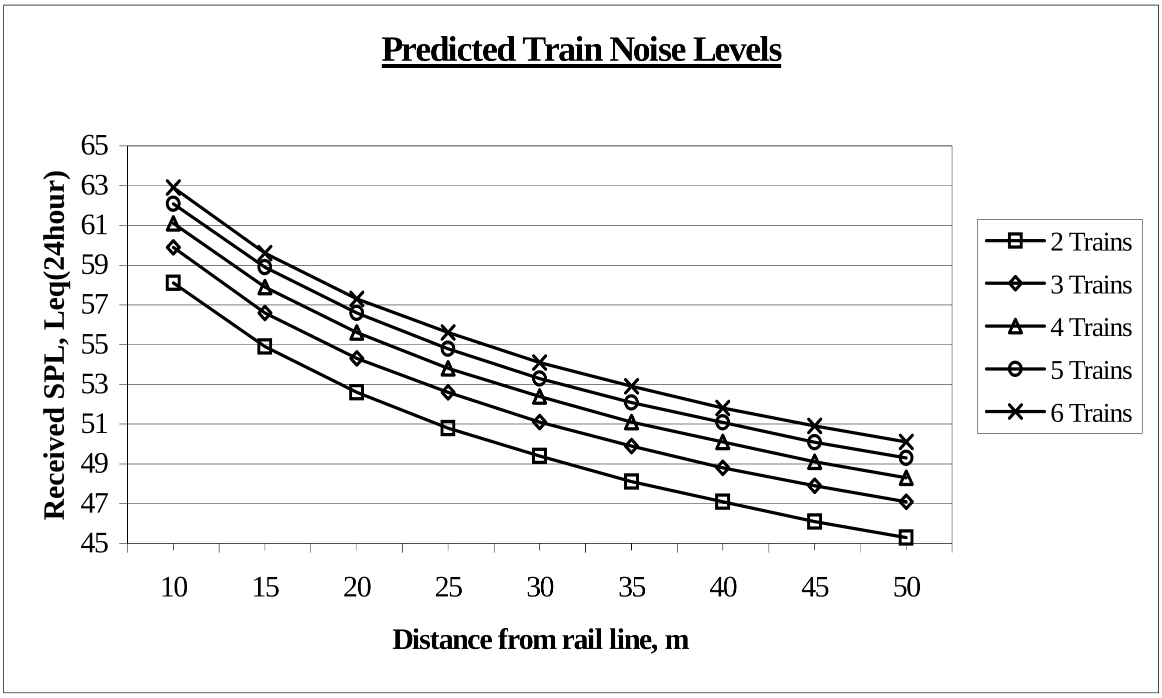


Figure 7
PREDICTED TRAIN NOISE LEVELS

The LOM Project would generate a maximum of four trains per day, to transport the 2.5Mtpa of product coal. The maximum number of daily train movements could occur at any time, so statistically five would occur during the day and three at night. Reference to **Figure 7** suggests levels of 57 dB(A),$L_{eq(15hour)}$ during the day and 53 dB(A),$L_{eq(9hour)}$ during the night, when adjusted appropriately from 24-hour values in **Figure 6**.

These worst case predicted levels are below the design goals of 65 dB(A),$L_{eq(15hour)}$ during the day and 60 dB(A),$L_{eq(9hour)}$ during the night as discussed in Section 3.6.1. It is also noted that the LOM Project would not increase the maximum number of daily train movements generated by the currently approved Werris Creek Coal Mine.

5.4.3 Suburban Receivers

Attended train noise monitoring was conducted by Spectrum Acoustics at Scone, NSW, over a 24-hour period during February 2010. The monitoring location was near a residential facade at 15m from the rail line. A summary of the types and numbers of train pass-by's, and calculated noise levels for the day and night time periods is shown in **Table 19**.

Table 19
Measured Train Noise Levels in Scone, February 2010

Train type	Number	$L_{Aeq(period)}$
Day (7am – 10pm)		
Passenger	6	46.3
Wheat	5	56.0
Freight	3	47.3
Coal	4	51.1
TOTAL Day trains	**18**	**57.9**
Night (10pm – 7am)		
Passenger	2	39.4
Wheat	1	42.3
Freight	1	43.6
Coal	6	55.5
TOTAL Night trains	**10**	**56.1**

The results in **Table 19** show that at only 15m from the Main Northern Rail Line in Scone, the night time noise contribution of approximately 56 dB(A),$L_{eq(9hour)}$ from six train pass-by's was 4dB below the night time design goal of 60 dB(A),$L_{eq(9hour)}$. The noise level from the worst case three night time train pass-by's that are likely to be generated by the LOM Project (on days when the maximum number of rail movements are generated) would be 53dB(A), $L_{eq(9hour)}$ which is 7dB below the night time design goal.

Further, the total noise contribution from 28 train movements over the 24-hour monitoring was below the ARTC design goals. It is concluded from these results that a similar number of train movements through Quirindi, Willow Tree, Ardglen, Murrurundi, Blandford, Wingen, Parkville and Aberdeen would also be below the ARTC design levels at 15m from the rail line. South of Aberdeen, a significant number of coal trains from the Hunter Valley Coalfields join the Main Northern Rail Line. A full assessment of train noise levels on the Newcastle side of Scone is beyond the scope of this assessment.

5.5 Blasting Assessment

Closest distances from several receivers to the site of future blasts and the calculated blast overpressure (OP) and vibration (PPV) levels for various typical MIC values are summarised in **Table 20**.

Table 20
Predicted Blast Overpressure and Vibration Levels

Receiver		Distance (m)	MIC (kg)					
			400		800		1200	
			OP	PPV	OP	PPV	OP	PPV
R20	Patterson	1740	111	1.4	113	1.7	115	1.9
R55	Pitkin	2680	107	0.9	109	1.1	110	1.2
R14	Haling	1315	114	1.8	116	2.3	118	2.6
R96	Davison	2580	107	0.9	109	1.1	111	1.3
R15	Maxwell	2525	107	0.9	109	1.1	111	1.3

The results in **Table 20** show that the 5% exceedance vibration criterion of 5mm/s would not be exceeded at any receiver for the range of likely blast sizes. Overpressure levels may exceed the 5% exceedance level of 115 dB at R14 (Haling) for blasts greater than 520 kg MIC at the nearest distance of 1 315m. This residence is yet to be constructed and vibration criteria would not be applicable until the residence has been constructed and is occupied. Once occupied, a blast monitor should be placed at this residence to monitor blast levels.

Figure 8 shows blast MIC as a function of distance to achieve compliance with the 5% exceedance overpressure (OP) limit of 115 dB at (R14 (Haling). The range of distance values in **Figure 8** span the shortest distance to R14 (Haling) (1 315m) to the distance at which the 115dB level is achieved at this receiver for a 1 200kg MIC blast (1 690m).

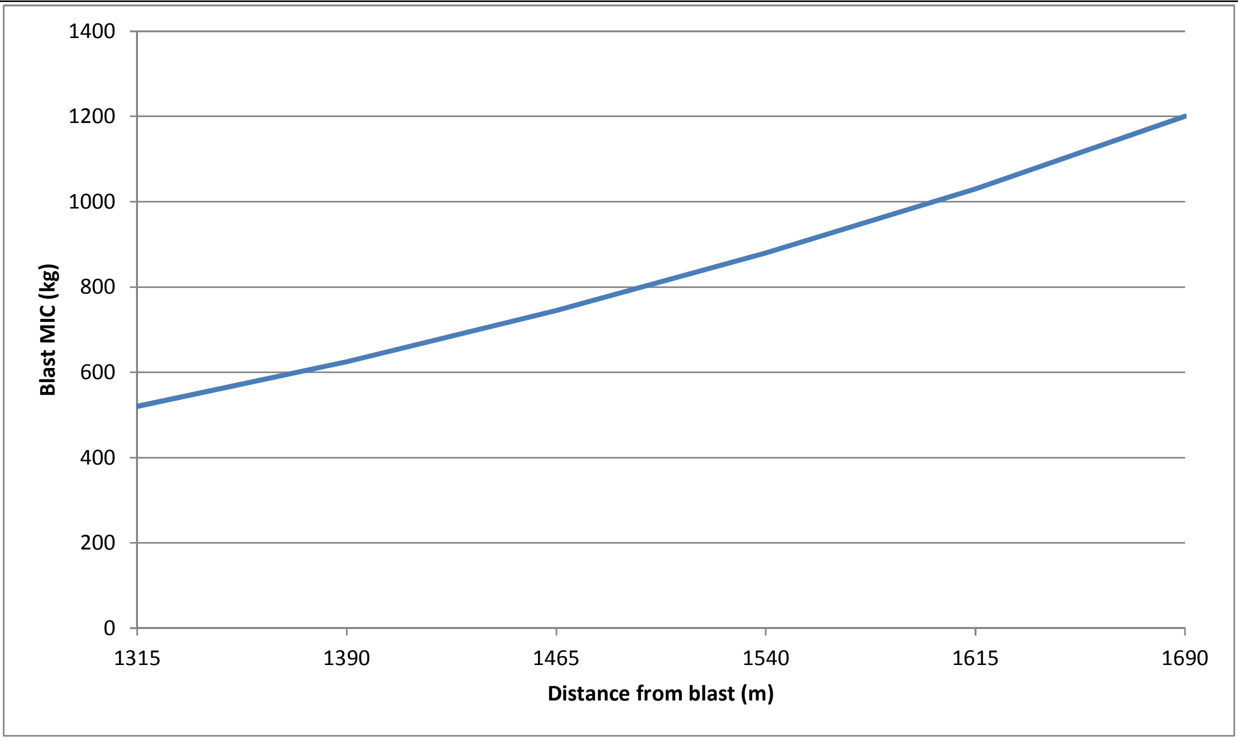


Figure 8
MIC VS DISTANCE TO ACHIEVE 5% OP LIMIT AT R14 (HALING)

For the first 10 years of the LOM Project, all blasts would remain at least 1 690m from R14, and as the current average blast MIC is less than 1 200kg, there would be no impact on the blasting frequency (10 blasts per month). Following Year 10, it is anticipated that up to half the blasts within the LOM Project open cut would be within 1 690m of R14. Should the MIC be reduced to 520kg to achieve the airblast overpressure criteria, an additional 5 blasts per month would be required (a total of 15 blasts per month). This would not impact on the overall operation of the LOM Project.

It is important to note, however, that many blast design options are available to the Proponent's blasting contractor to reduce air overpressure. Through ongoing monitoring of blasts over the initial 10 years of the LOM Project, the most effective mitigation strategies would be identified and implemented to each blast emissions equivalent to those modelled using an MIC of 520kg.

Also of note, Receiver R14 is yet to be constructed and overpressure criteria would not be applicable until the residence has been constructed and is occupied. Once occupied, a blast monitor should be placed at this residence to monitor blast levels.

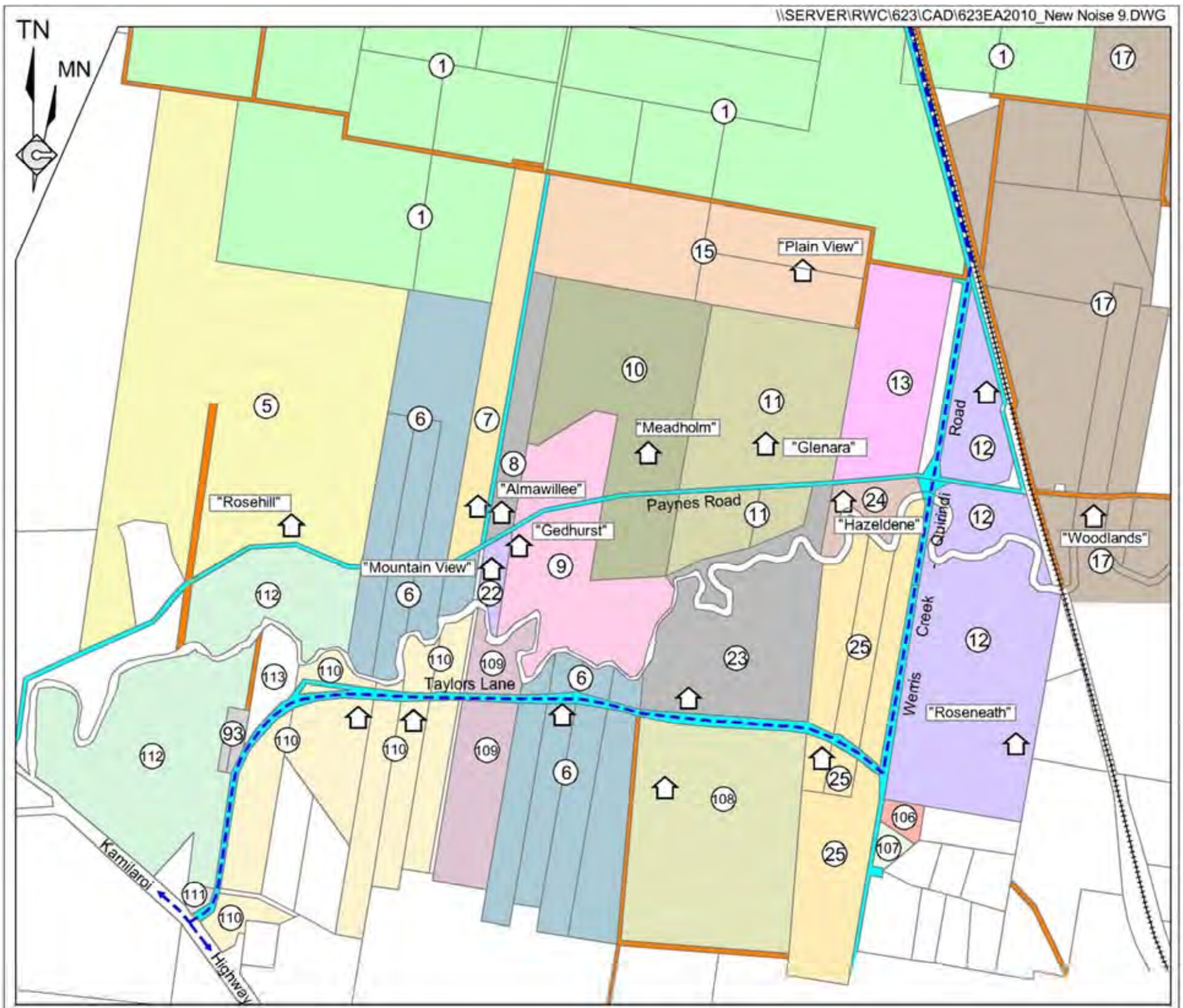
5.6 Road Traffic Noise Assessment

The following provides an overview of the proposed road transport operations.

> *Domestic coal would be transported by road to local destinations including the Newcastle Pacific Carbon facility. The delivery of coal to these domestic markets would be by a range of truck configurations carrying an average of 30t. Based on the despatch of up to 100 000t of coal per year and an average truck capacity of 30t, it is anticipated that between 0 and 50 truck movements would occur daily (0 to 25 loads per day), averaging approximately 12 truck movements (6 loads) per day over 6 days per week throughout the life of the mine.*
>
> *The majority of heavy vehicles would turn right onto Werris Creek Road and right again at Taylor's Lane to the south of the Project Site. The trucks would travel west on Taylor's Lane before joining the Kamilaroi Highway and either continuing south and bypassing Quirindi, or travelling north towards Gunnedah. Domestic supplies destined for Tamworth or further north on the New England Highway would make their way through Werris Creek*

Figure 9 presents the land ownership and residences located along the transport route to the Kamilaroi Highway.

The closest residence to the transport route is R6 (Kapcejevs) at 42m from the centre of Taylor's Lane. Based on **Equation 2** and using a maximum pass-by sound power level of 108 dB(A), the predicted traffic noise level of this receiver from 10 truck movements in a 1-hour period is 48.4 dB(A). This is approximately 6.5dB below the daytime criterion and 1.5 dB below the night time criterion.



LAND OWNERSHIP REFERENCE

1	Werris Creek Coal Pty Limited
5	R. & A. George
6	R. & R.A. Kapcejevs
7	P.R. & J.S. Andrews
8	P.A. & T.M. Hird
9	B.R. & A.J. Smith
10	D.I Athelston Bowd
11	W.H. & S.I. Ryan
12	B.A. Fletcher
13	P.R. Jackson
15	R.G. & A.R. Maxwell
17	M.M. Doolan & A.E. Hogan
22	L.F. & R.M. Parkes
23	A.L. McCulloch
24	P. George
25	S.A. Wren
93	The State of New South Wales
106	M.R & J.G. Potter
107	I.J. & J.A. Morgan
108	R.J. & C.F. Pursehouse
109	F.L. Halliger
110	N.J. Taylor
111	Nungaroo Local Aboriginal Land Council
112	J.E. Anderson
113	Ref. Not Held

REFERENCE
- Project Site Boundary
- "Eurunderee" Residence (Project-related)
- "Gedhurst" Residence (Non Project-related)
- Primary Road Transport Route
- Crown Road
- Public Road
- Railway Line

SCALE 1:35 000

500 0 500 1000 1500m

Cadastral Information Source: LPI (Bathurst) - Digitised from DCDB
Land Ownership Source: LPI Title Search (2010)

Figure 9
LAND OWNERSHIP AND RESIDENCES ALONG THE PRIMARY ROAD TRANSPORT ROUTE

APPENDICES

Appendix A **Definition of Acoustical Terms**

Appendix B **Site Wind Rose 2007 – 2008**

Appendix C **Noise Logger Data Charts**

Appendix D **Noise Source Sound Power Levels**

Appendix E **Noise Source Locations**

Appendix F **Operational Noise Level Contours**

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Appendix A

Description of Acoustical Terms

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DESCRIPTION OF TERMS

Scope

This section of the report aims to convey an understanding of several commonly used acoustical terms. Various terms are explained in plain language and the effects of certain atmospheric phenomena on noise propagation are discussed. Noise level percentiles are explained with the aid of a diagram of a hypothetical noise signal.

The descriptions in this section are not formal definitions of the terms. Formal definitions may be found in AS1633-1985 “Acoustics – Glossary of terms and related symbols”.

General Terms

Sound Power Level

The amount of acoustic energy (per second) emitted by a noise source. Usually written as “Lw” or “SWL”, the Sound Power Level is expressed in decibels (dB) and cannot be directly measured. Lw is usually calculated from a measured sound pressure level.

Sound Pressure Level

The “noise level”, in decibels (dB), heard by our ears and/or measured with a sound level meter. Written as “SPL”, the sound pressure level generally decreases with increasing distance from a source. Noise levels are often written as dB(A) rather than dB. The “A-weighting” is a correction applied to the measured noise signal to account for the ear’s ability to hear sound differently at different frequencies. For example, 40dB at 500Hz (speech frequency) is clearly audible but 40dB at 50Hz (very low bass) would be far less audible. The A-weighted sound pressure level therefore represents the measured (or predicted) noise level as it would be heard by the typical human ear.

Temperature Inversion

An atmospheric state in which the air temperature increases with altitude. Sound travels faster in warmer air than in cold air, so that during an inversion the top of a “sound wave” would move faster than the bottom. This bends (refracts) sound back towards the ground just as light bends upon entering and exiting a glass prism. The result is a “trapping” of sound energy near the ground and an increase in noise levels.

Wind Shear

A moving air mass would experience a “friction drag” at the ground in much the same way as a lava flow would flow quickly on top and “roll over” the lava beneath which must drag along the ground. This increasing wind speed with altitude is called “wind shear”.

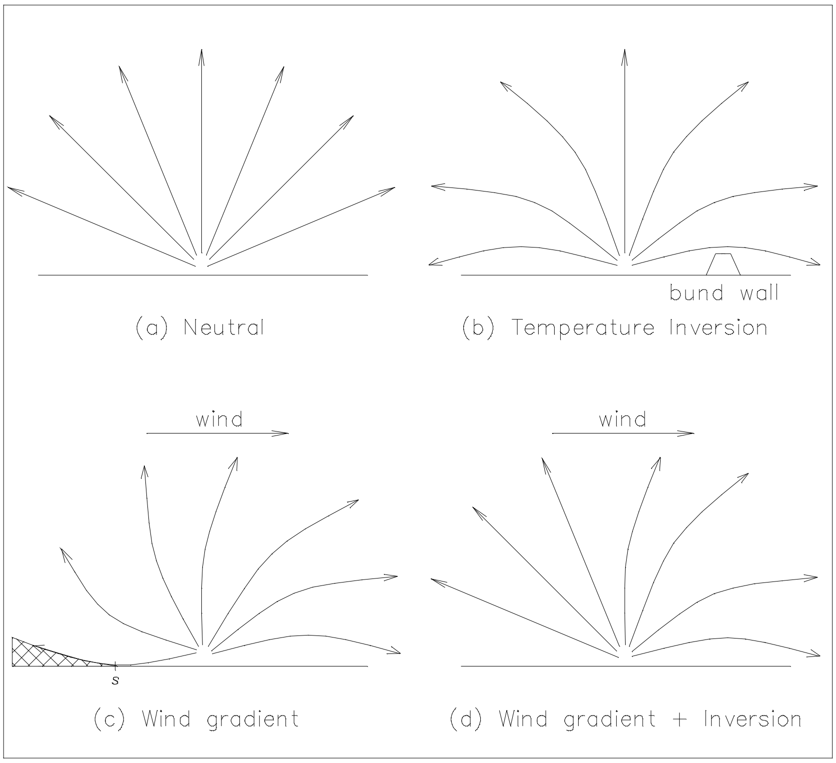
For a sound wave travelling down wind, the top of the wave moves faster than the bottom and the wave bends towards the ground. However, for a wave travelling into the wind the top of the wave is slowed down more than the bottom is and the wave bends upwards. **Figure A1** shows several examples of how atmospheric effects can bend sound waves.

Figure A1 shows that sound rays can be refracted over a barrier (usually a bund wall or small hill) during a temperature inversion, increasing noise levels in the 'shadow zone'.

Neutral Atmospheric Conditions

An atmosphere that is at a temperature of approximately 23°C from ground level to an altitude of 200m or more. There are no fluctuations in density or humidity and no wind. Such conditions rarely occur, as temperature would usually vary with altitude and there is always movement in various directions in different layers of the atmosphere.

Figure A1
Sound refraction under temperature and wind gradients.



Prevailing Atmospheric Conditions

Atmospheric conditions (with regards to potential effects on noise propagation) which are characteristic of the study area. These would typically include seasonal wind directions and velocities. Temperature inversions would be included as prevailing if they occur, on average, for more than 2 nights per week in winter.

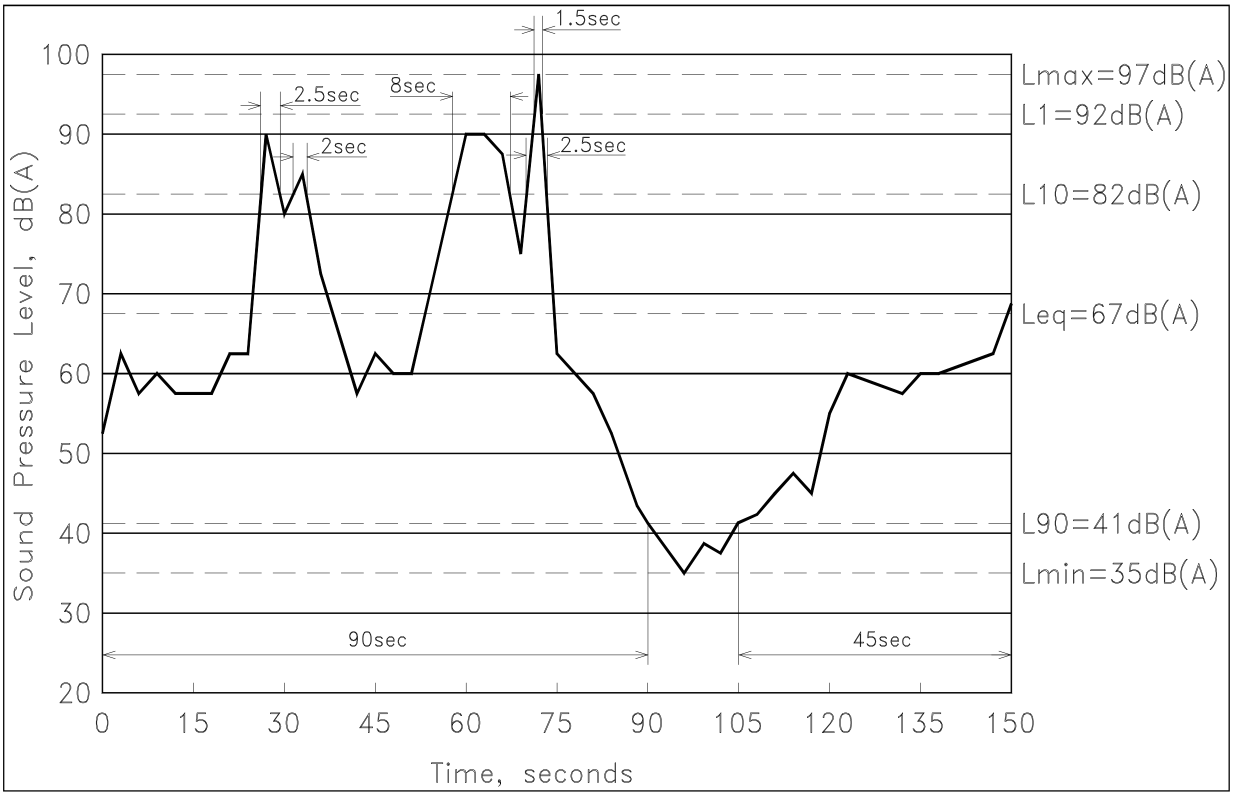
Adverse Atmospheric Conditions

Adverse conditions would include simultaneous winds and temperature inversions, even if the inversions occur for less than 2 nights per week in winter. This represents the worst case scenario for potential noise enhancement due to atmospheric effects.

Noise Levels Percentiles

A noise level percentile (L_n) is the noise level (SPL) in decibels which is exceeded for "n" % of a given monitoring period. Several important L_n percentiles would be explained by considering the hypothetical time signal in **Figure A2**.

Figure A2
Hypothetical time-trace of 150-second sound signal.



The signal in **Figure A2** has a duration of 2.5 minutes (ie. 150 seconds) with noises occurring as follows.

- The person holding the instrument is standing beside a road and hears crickets in nearby grass at a level of around 60dB (A).
- At about the 30 second mark a motorcycle passes on the road, followed by a car.
- At 60 seconds a truck passes.
- After the truck passes it sounds its air horn at the 73 second mark.
- The crickets are frightened into silence and the truck fades into the distance.
- All is quiet until 105 seconds when the crickets slowly start to make noise, reaching full pitch by 120 seconds.
- The measurement stops at 150 seconds, just when an approaching car starts to become audible.

L_1 Noise Level

Near the top of **Figure A2**, there is a dashed line at 92dB(A). A small spike of 1.5 seconds duration extends above this line at around 73 seconds. Since 1.5 seconds is 1% of the signal duration (150 seconds), the L_1 (or L_{A1} to signify A-weighting) noise level of this sample is 92dB(A). The L_1 percentile is often called the *average peak noise level* and is used by the NSW Department of Environment Climate Change and Water[5] (DECCW) as a measure of potential disturbance to sleep.

L_{10} Noise Level

The dashed line at 82dB(A) is exceeded for four periods of duration 2.5 seconds, 2 seconds, 8 seconds and 2.5 seconds, respectively. The total of these is 15 seconds, which is 10% of the total sample period. Therefore, the L_{A10} noise level of this sample is 82dB(A). The L_{10} percentile is called the *average maximum noise level* and has been widely used as an indicator of annoyance caused by noise.

L_{90} Noise Level

In similar fashion to L_1 and L_{10}, **Figure A2** shows that the noise level of 41dB(A) is exceeded for 135 seconds (90 + 45 =135). As this is 90% of the total sample period, the L_{A90} noise level of this sample is 41dB(A). The L_{90} percentile is called the *background noise level*.

L_{eq} Noise Level

Equivalent continuous noise level. As the name suggests, the L_{eq} of a fluctuating signal is the continuous noise level which, if occurring for the duration of the signal, would deliver equivalent acoustic energy to the actual signal. L_{eq} can be thought of as a kind of 'average' noise level. Recent research suggests that L_{eq} is the best indicator of annoyance caused by industrial noise and the DECCW *NSW Industrial Noise Policy* takes this into consideration.

L_{max} and L_{min} Noise Levels

These are the maximum and minimum SPL values occurring during the sample. Reference to **Figure A2** shows these values to be 97dB(A) and 35dB(A), respectively.

[5] Formerly Environment Protection Authority, EPA.

Appendix B

Site Wind Roses September 2007 to August 2008

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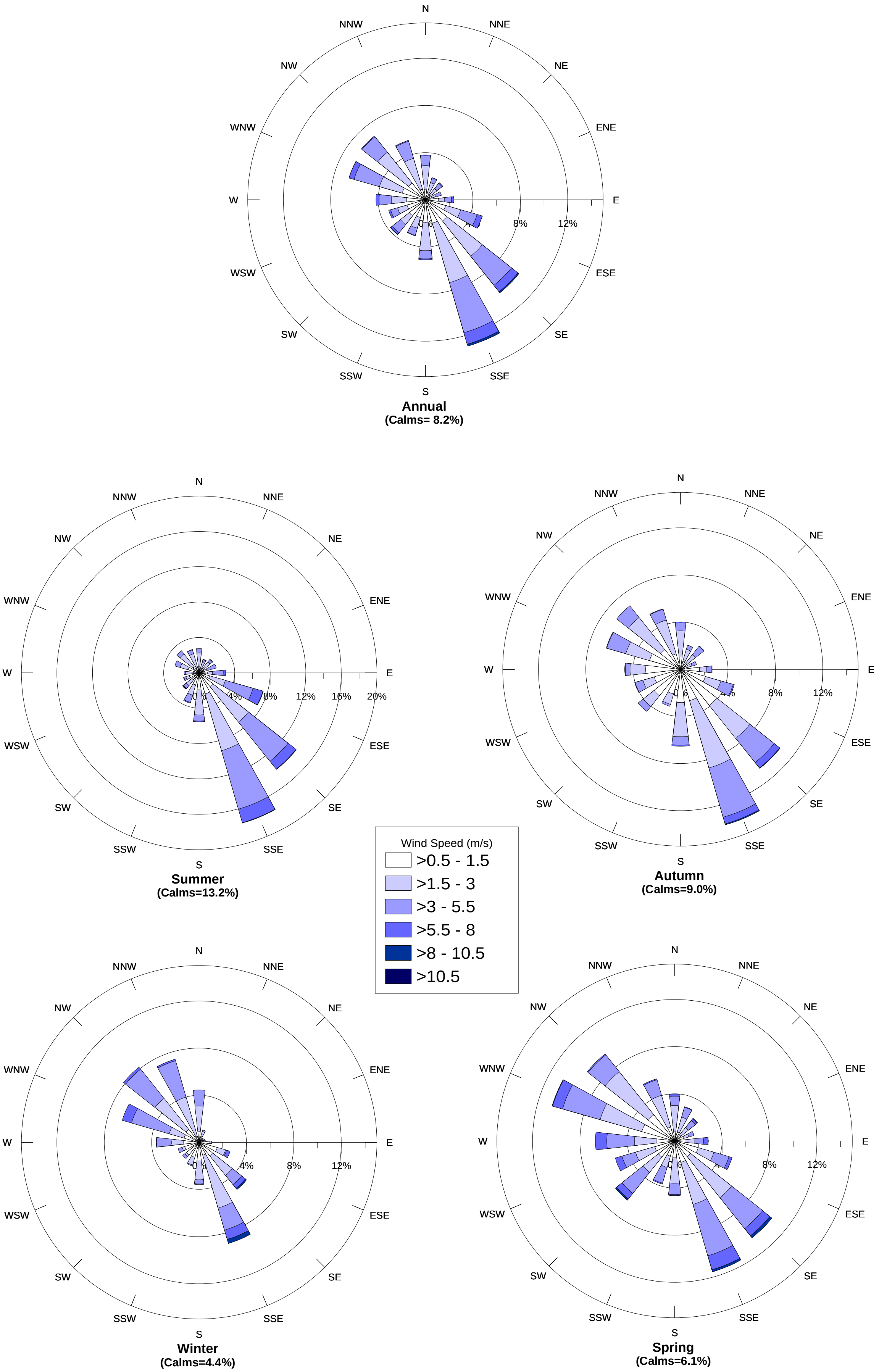
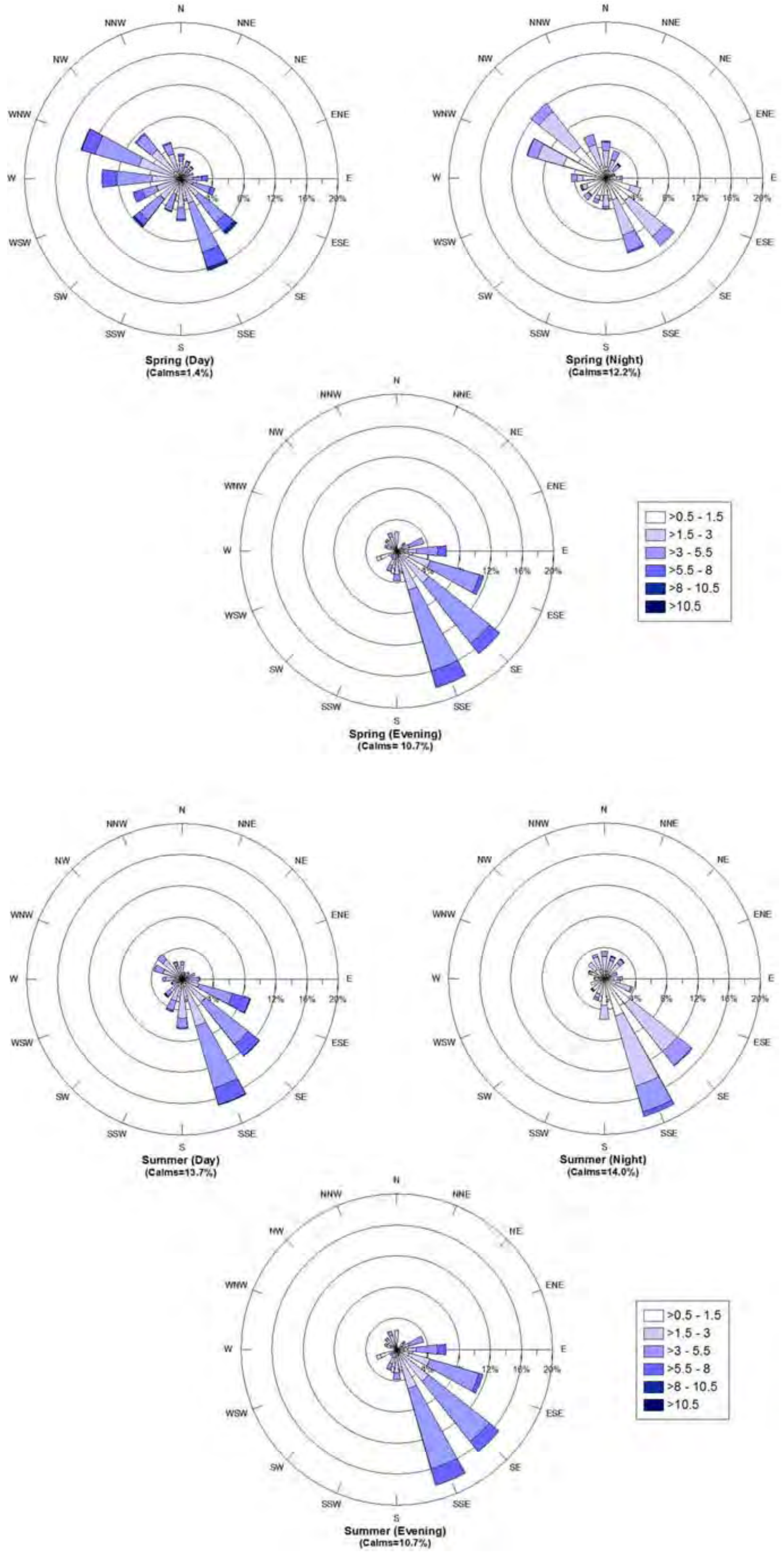
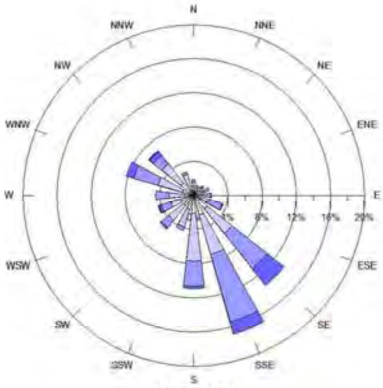
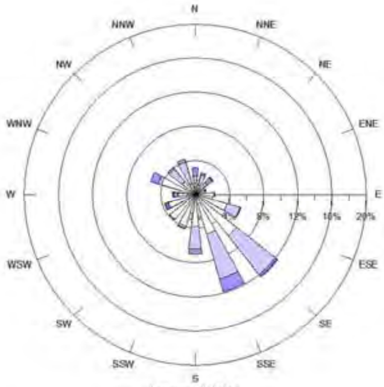

N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
4%
8%
12%
16%
20%
Annual
(Calms= 8.2%)
Summer
(Calms=13.2%)
Autumn
(Calms=9.0%)
Winter
(Calms=4.4%)
Spring
(Calms=6.1%)
Wind Speed (m/s)
>0.5 - 1.5
>1.5 - 3
>3 - 5.5
>5.5 - 8
>8 - 10.5
>10.5

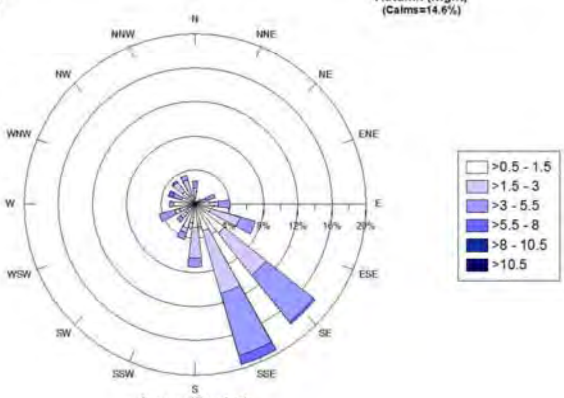

N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
4%
8%
12%
16%
20%
Spring (Day)
(Calms=1.4%)
Spring (Night)
(Calms=12.2%)
Spring (Evening)
(Calms= 10.7%)
>0.5 - 1.5
>1.5 - 3
>3 - 5.5
>5.5 - 8
>8 - 10.5
>10.5
Summer (Day)
(Calms=13.7%)
Summer (Night)
(Calms=14.0%)
Summer (Evening)
(Calms=10.7%)



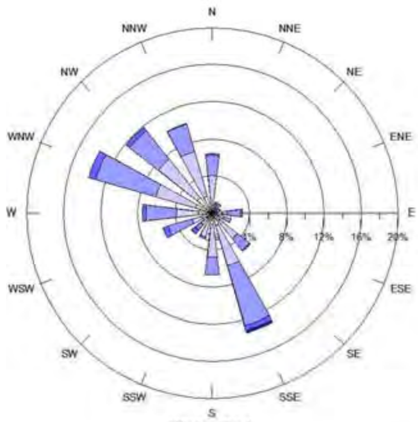
Autumn (Day)
(Calms=3.2%)



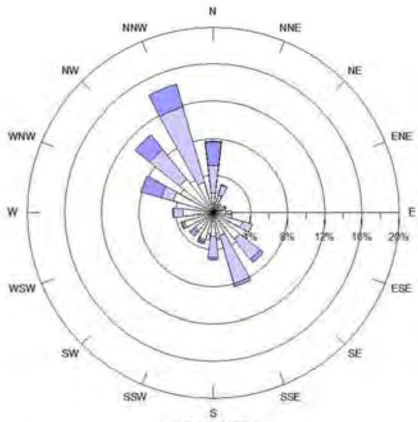
Autumn (Night)
(Calms=14.6%)



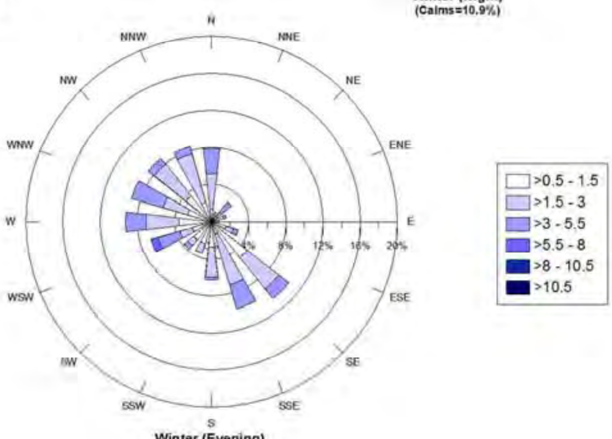
Autumn (Evening)
(Calms=4.1%)



Winter (Day)
(Calms=4.2%)



Winter (Night)
(Calms=10.9%)



Winter (Evening)
(Calms= 6.8%)

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Appendix C

Noise Logger Data Charts

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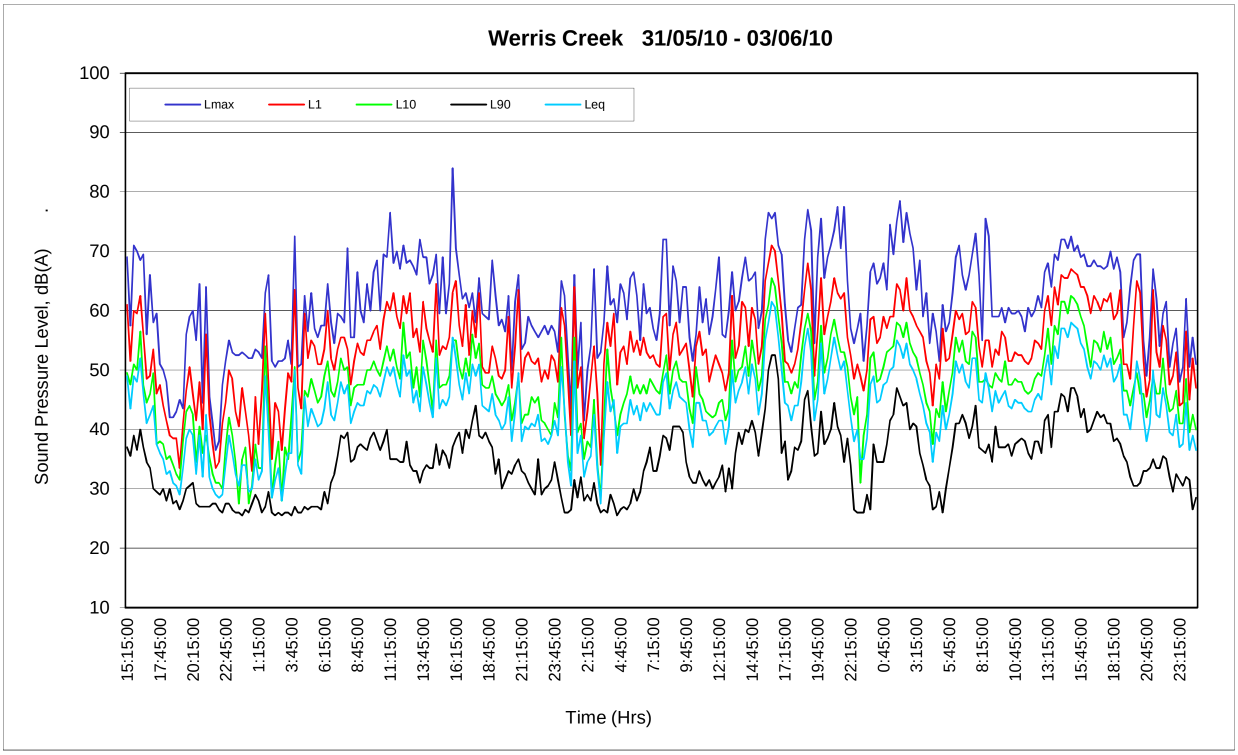
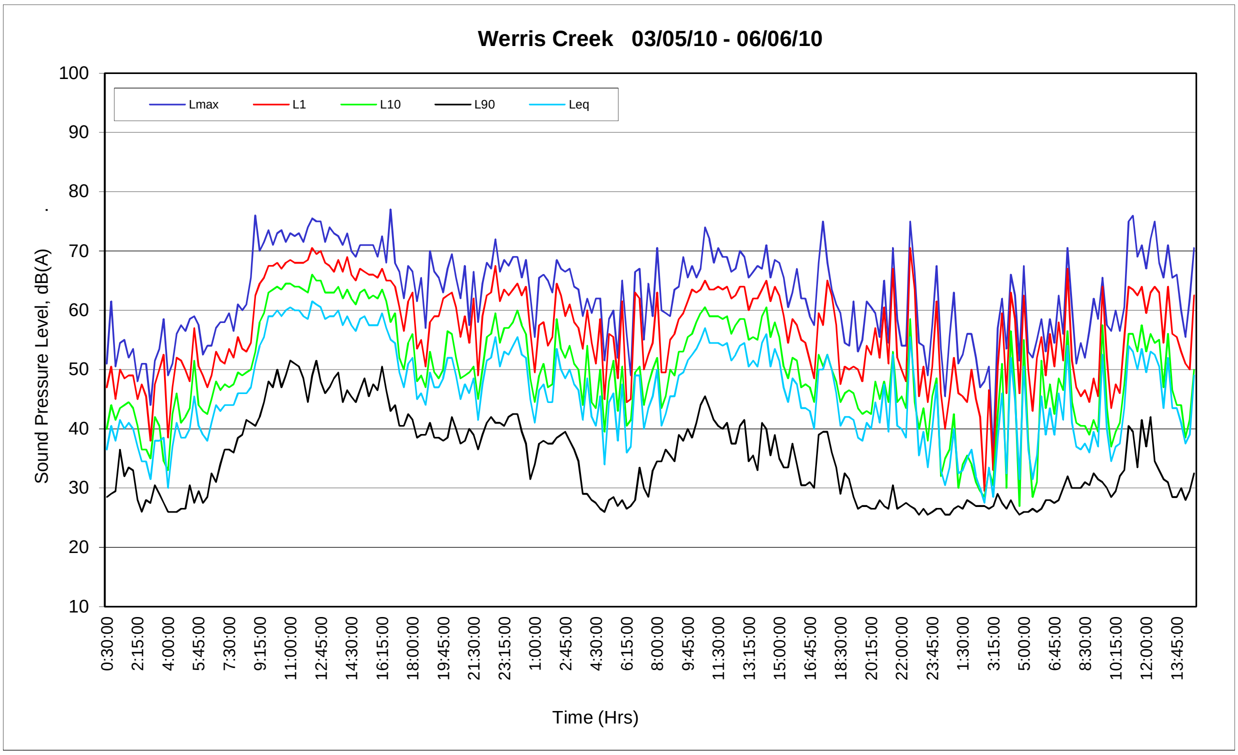

Werris Creek 31/05/10 - 03/06/10
Lmax
L1
L10
L90
Leq
Sound Pressure Level, dB(A)
100
90
80
70
60
50
40
30
20
10
15:15:00
17:45:00
20:15:00
22:45:00
1:15:00
3:45:00
6:15:00
8:45:00
11:15:00
13:45:00
16:15:00
18:45:00
21:15:00
23:45:00
2:15:00
4:45:00
7:15:00
9:45:00
12:15:00
14:45:00
17:15:00
19:45:00
22:15:00
0:45:00
3:15:00
5:45:00
8:15:00
10:45:00
13:15:00
15:45:00
18:15:00
20:45:00
23:15:00
Time (Hrs)


Werris Creek 03/05/10 - 06/06/10
Lmax
L1
L10
L90
Leq
Sound Pressure Level, dB(A)
100
90
80
70
60
50
40
30
20
10
0:30:00
2:15:00
4:00:00
5:45:00
7:30:00
9:15:00
11:00:00
12:45:00
14:30:00
16:15:00
18:00:00
19:45:00
21:30:00
23:15:00
1:00:00
2:45:00
4:30:00
6:15:00
8:00:00
9:45:00
11:30:00
13:15:00
15:00:00
16:45:00
18:30:00
20:15:00
22:00:00
23:45:00
1:30:00
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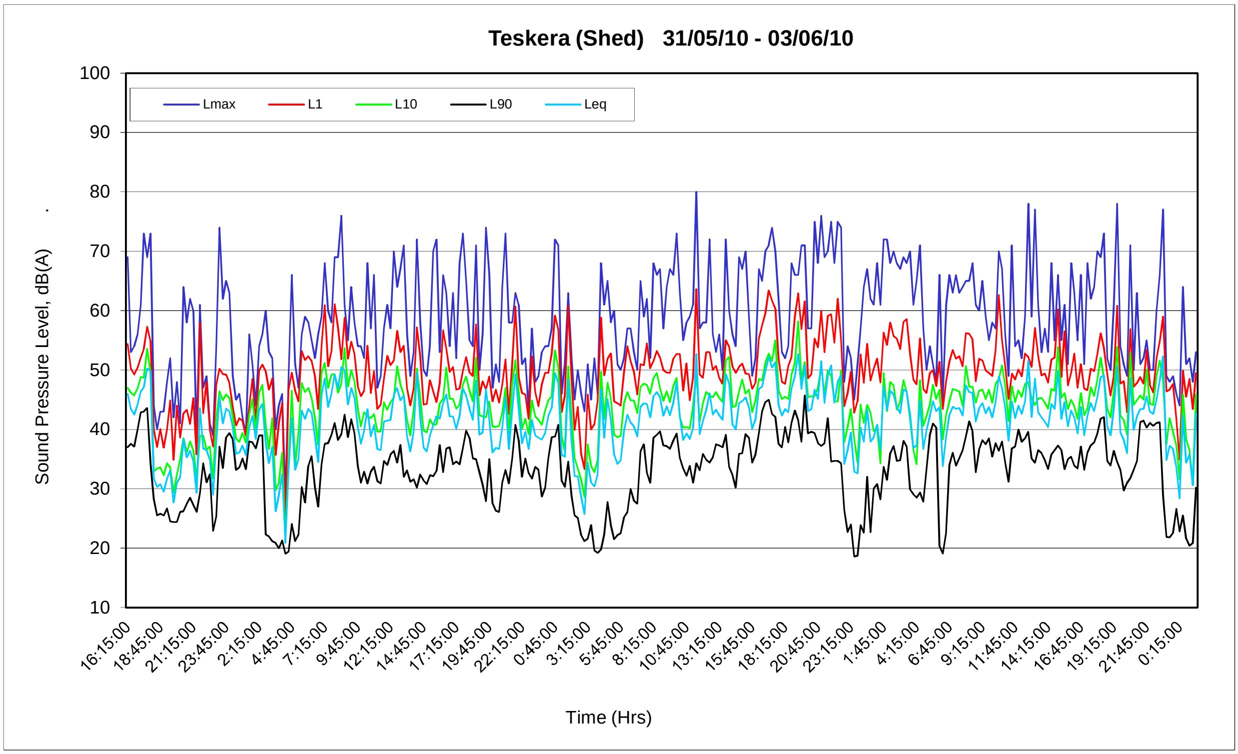
6:45:00
8:30:00
10:15:00
12:00:00
13:45:00
Time (Hrs)


Teskera (Shed) 31/05/10 - 03/06/10
Lmax
L1
L10
L90
Leq
Sound Pressure Level, dB(A)
100
90
80
70
60
50
40
30
20
10
16:15:00
18:45:00
21:15:00
23:45:00
2:15:00
4:45:00
7:15:00
9:45:00
12:15:00
14:45:00
17:15:00
19:45:00
22:15:00
0:45:00
3:15:00
5:45:00
8:15:00
10:45:00
13:15:00
15:45:00
18:15:00
20:45:00
23:15:00
1:45:00
4:15:00
6:45:00
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11:45:00
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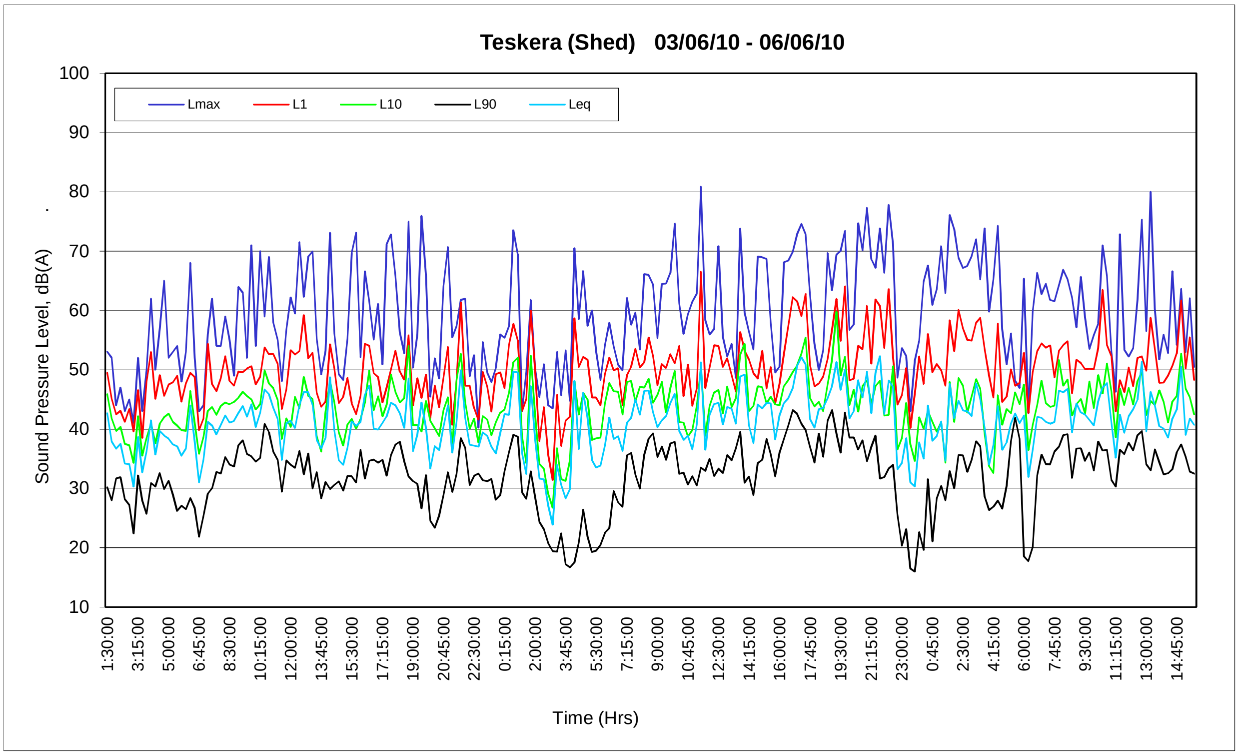
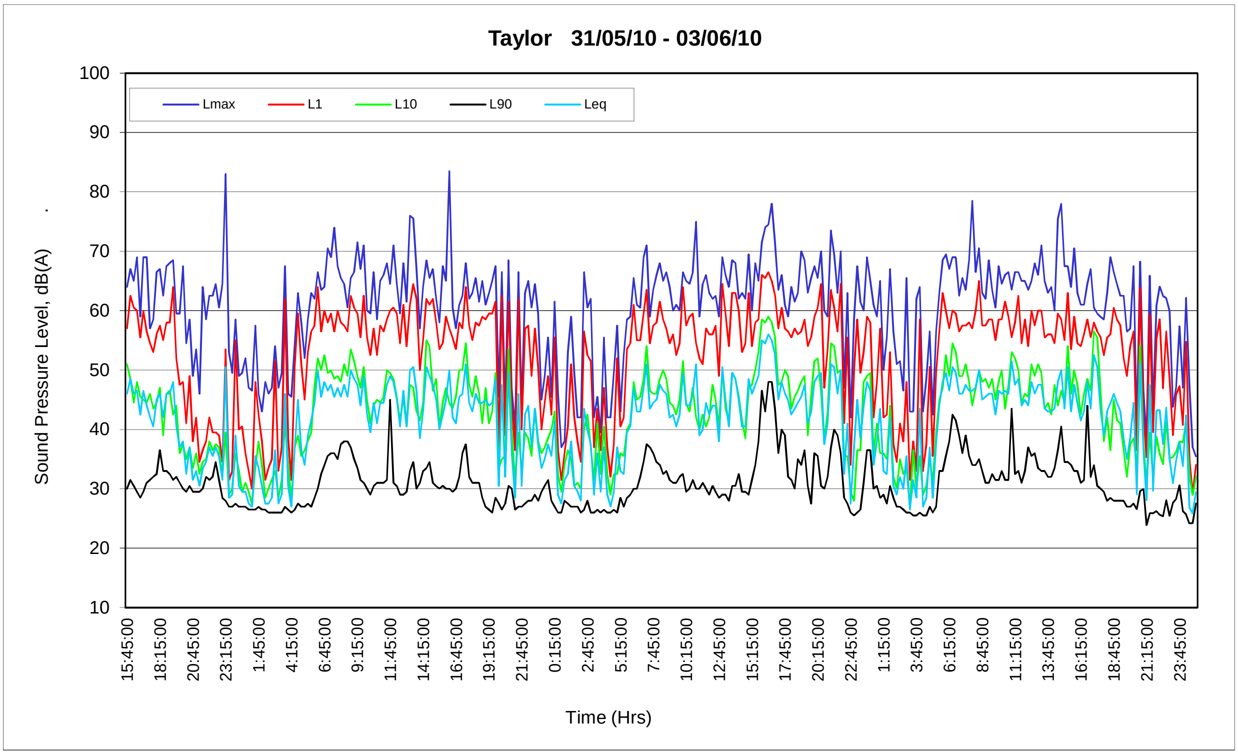
16:45:00
19:15:00
21:45:00
0:15:00
Time (Hrs)


Teskera (Shed) 03/06/10 - 06/06/10
Lmax
L1
L10
L90
Leq
Sound Pressure Level, dB(A)
100
90
80
70
60
50
40
30
20
10
1:30:00
3:15:00
5:00:00
6:45:00
8:30:00
10:15:00
12:00:00
13:45:00
15:30:00
17:15:00
19:00:00
20:45:00
22:30:00
0:15:00
2:00:00
3:45:00
5:30:00
7:15:00
9:00:00
10:45:00
12:30:00
14:15:00
16:00:00
17:45:00
19:30:00
21:15:00
23:00:00
0:45:00
2:30:00
4:15:00
6:00:00
7:45:00
9:30:00
11:15:00
13:00:00
14:45:00
Time (Hrs)


Taylor 31/05/10 - 03/06/10
Lmax
L1
L10
L90
Leq
Sound Pressure Level, dB(A)
100
90
80
70
60
50
40
30
20
10
15:45:00
18:15:00
20:45:00
23:15:00
1:45:00
4:15:00
6:45:00
9:15:00
11:45:00
14:15:00
16:45:00
19:15:00
21:45:00
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2:45:00
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7:45:00
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20:15:00
22:45:00
1:15:00
3:45:00
6:15:00
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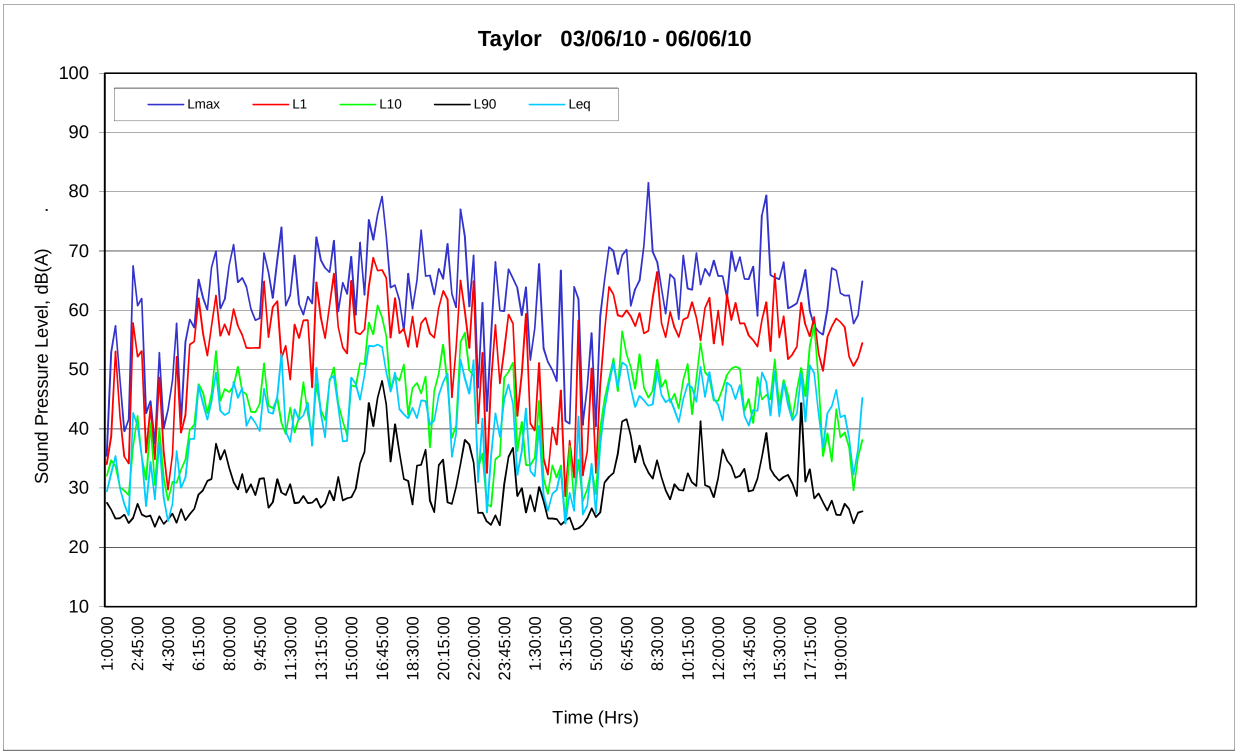
21:15:00
23:45:00
Time (Hrs)


Taylor 03/06/10 - 06/06/10
Lmax
L1
L10
L90
Leq
Sound Pressure Level, dB(A)
100
90
80
70
60
50
40
30
20
10
1:00:00
2:45:00
4:30:00
6:15:00
8:00:00
9:45:00
11:30:00
13:15:00
15:00:00
16:45:00
18:30:00
20:15:00
22:00:00
23:45:00
1:30:00
3:15:00
5:00:00
6:45:00
8:30:00
10:15:00
12:00:00
13:45:00
15:30:00
17:15:00
19:00:00
Time (Hrs)

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Appendix D

Noise Source Sound Power Levels

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Table D1
Noise Source Sound Power Levels, Lw

Operational noise sources	($L_{Aeq(15min)}$)	(L_{Amax})
Dozer at stockpile[1]	107	114
Crushing plant	114	116
Dozer on dump[1]	107	114
Overburden truck (attenuated)[2]	108	116
Excavator	116	120
Drill	114	114
2 x Topsoil scrapers	118	121
Water cart	111	118
Front end loader	108	114
Semi-trailer (coal haulage per 500m)	98	103
Rail Load-out	102	114
Locos idling on rail loop	102	106

[1] Based on measurements taken at Werris Creek Mine. May be either attenuated D10 or other dozer with limited reverse speed.
[2] As modelled in the acoustic assessment and calculated per 350m of haul road.

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Appendix E

Noise Source Locations

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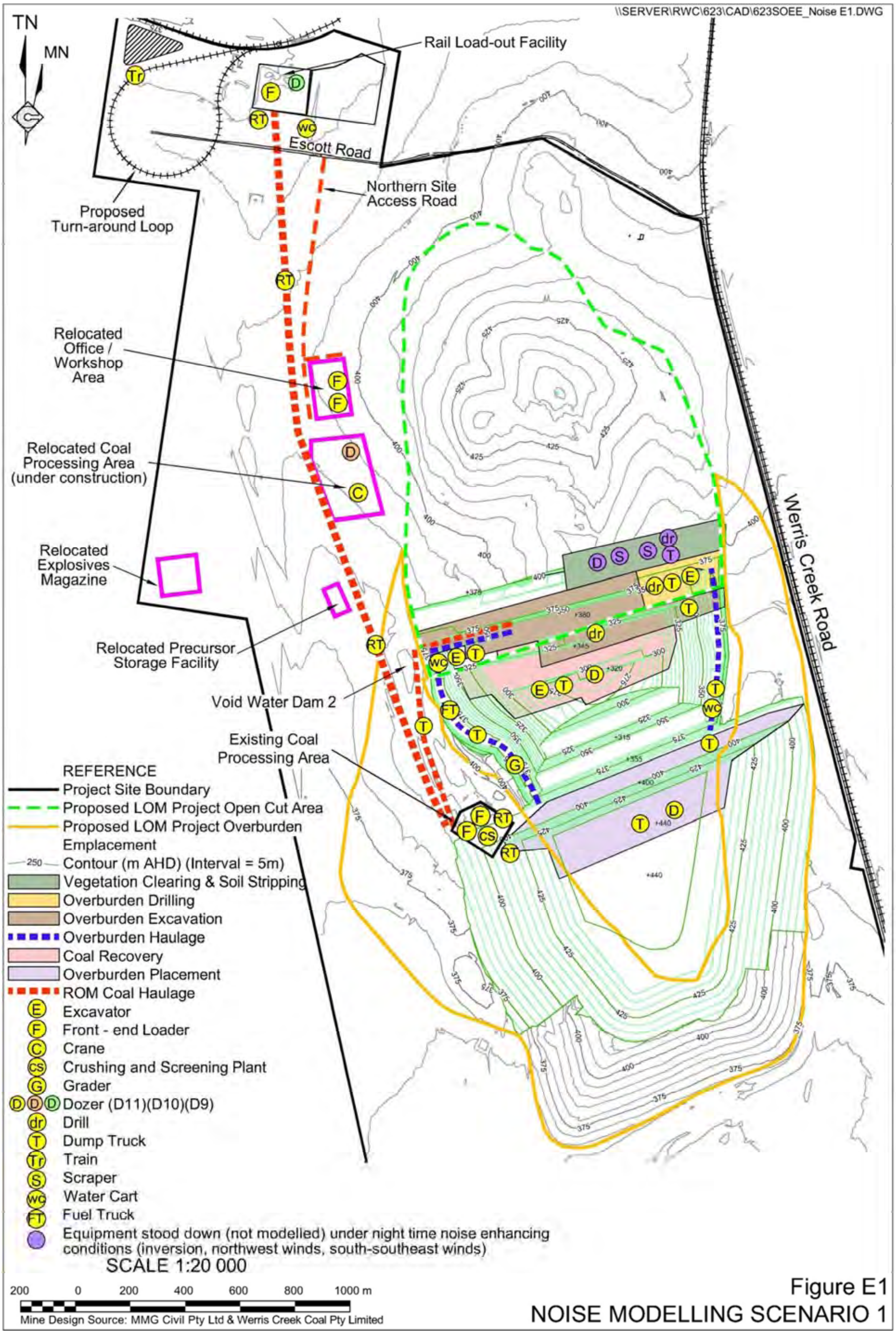

Figure E1
NOISE MODELLING SCENARIO 1

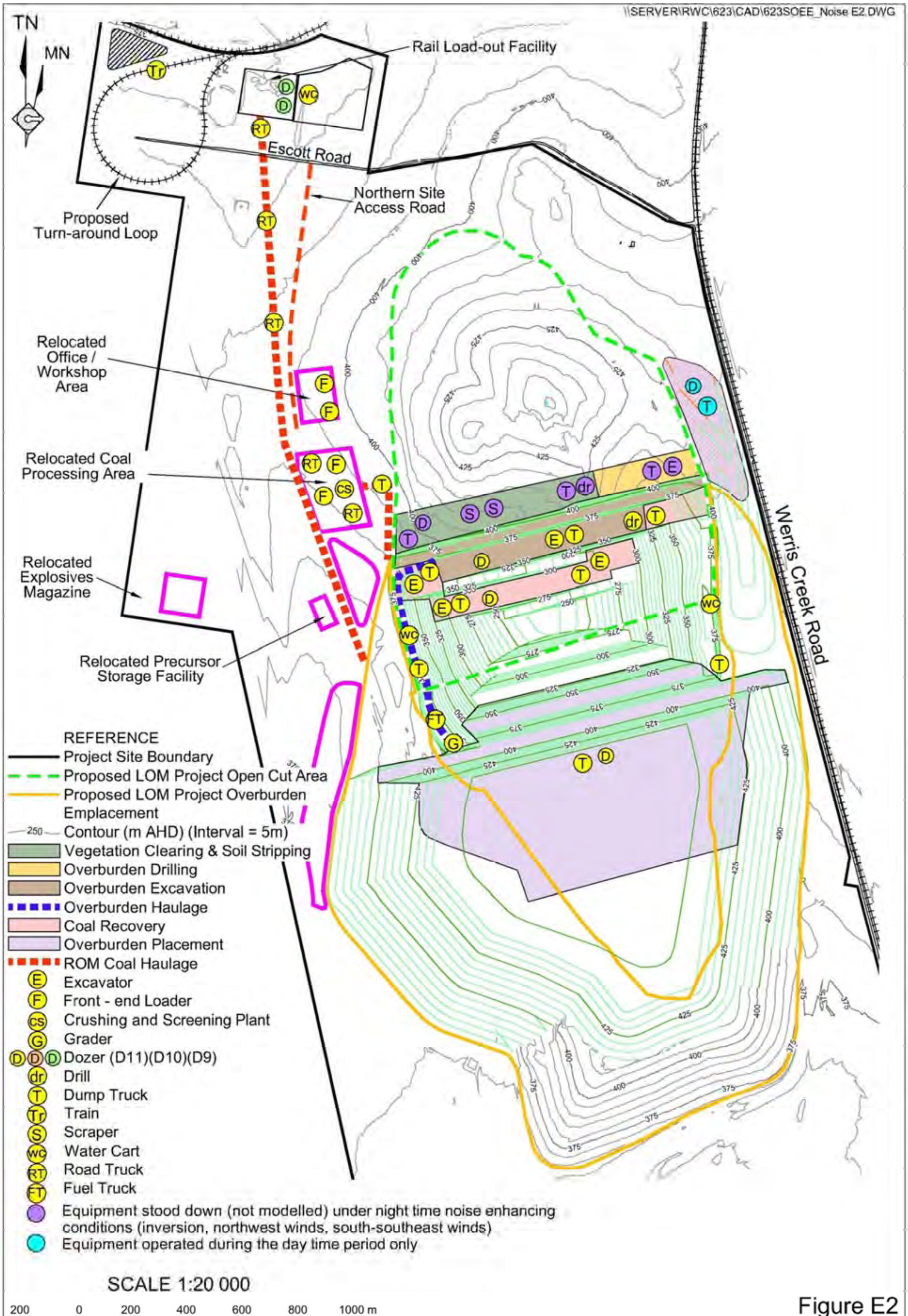

Figure E2
NOISE MODELLING SCENARIO 2

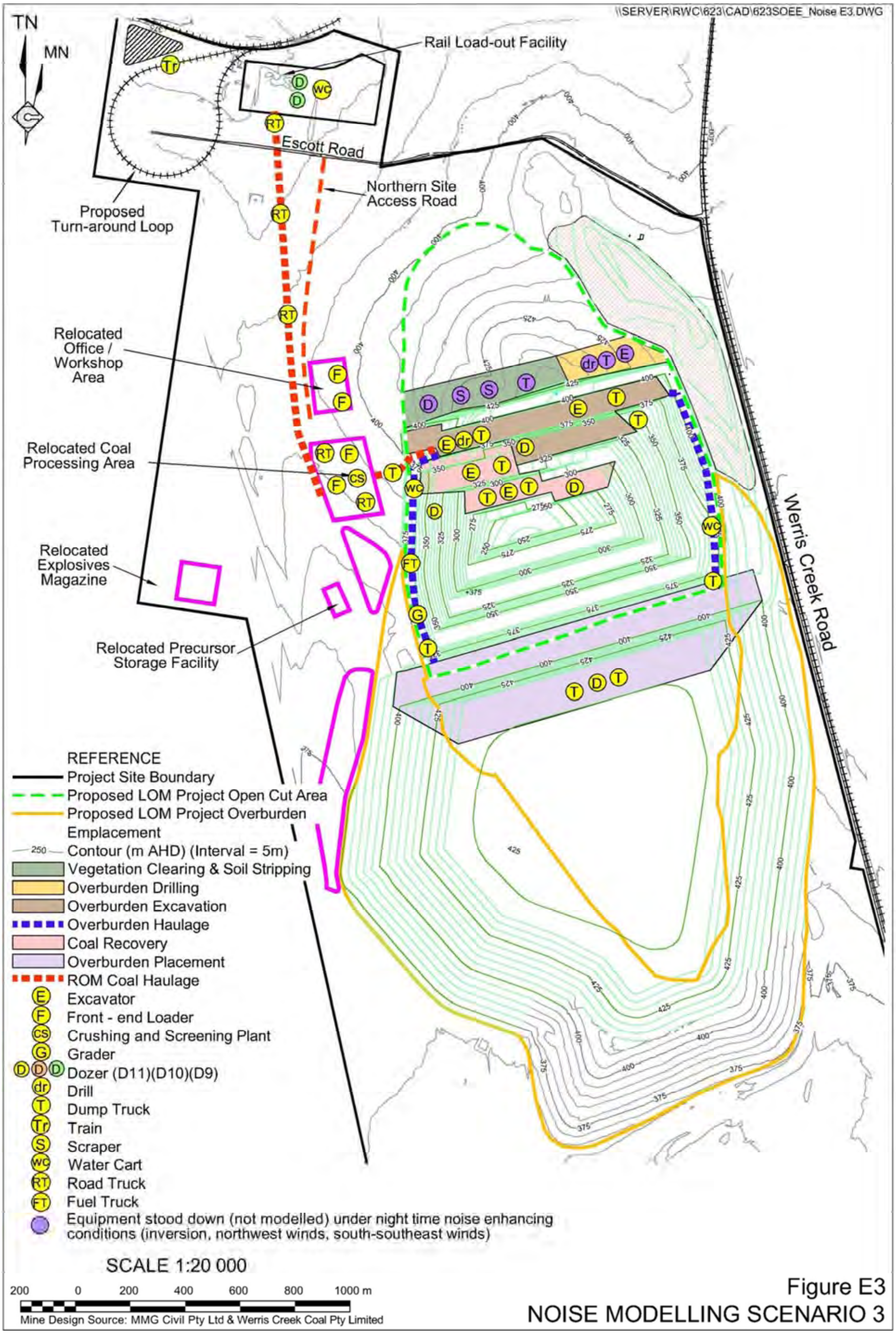

Figure E3
NOISE MODELLING SCENARIO 3

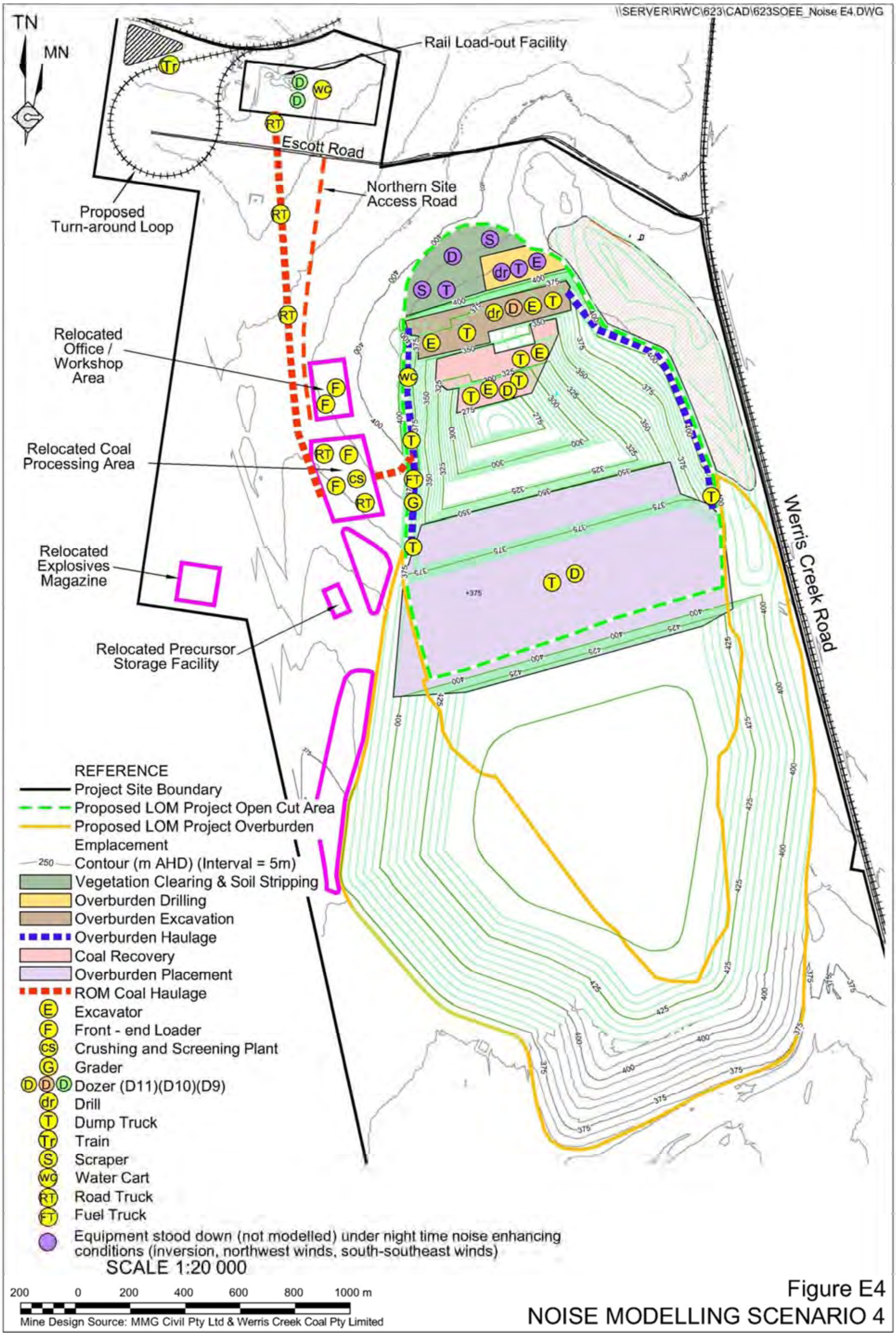

Figure E4
NOISE MODELLING SCENARIO 4

Appendix F

Operational Noise Level Contours

(No. of pages excluding this page = 24)

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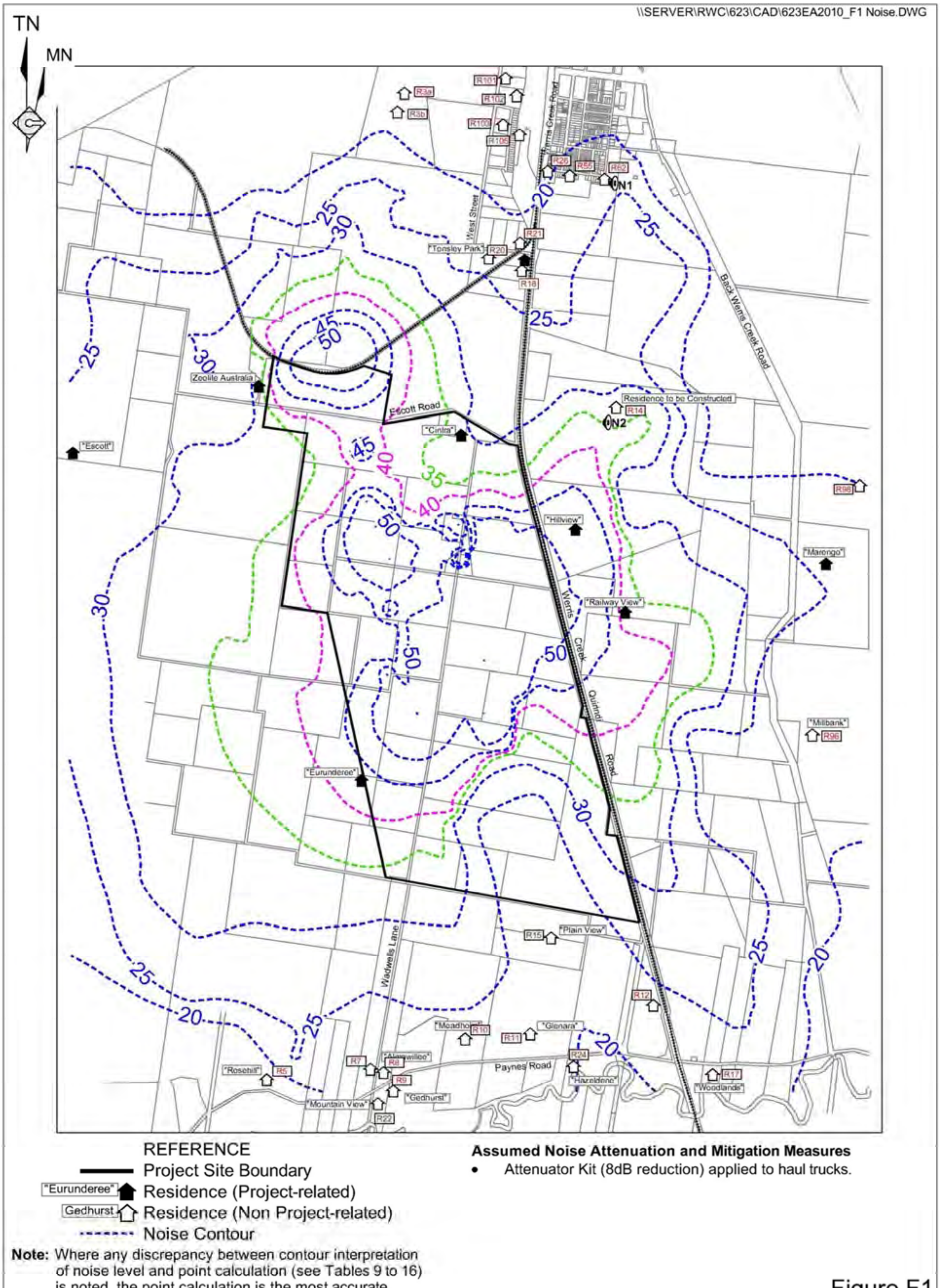


Figure F1
NOISE CONTOUR PLOTS FOR SCENARIO 1, DAYTIME OPERATIONS (CALM CONDITIONS)

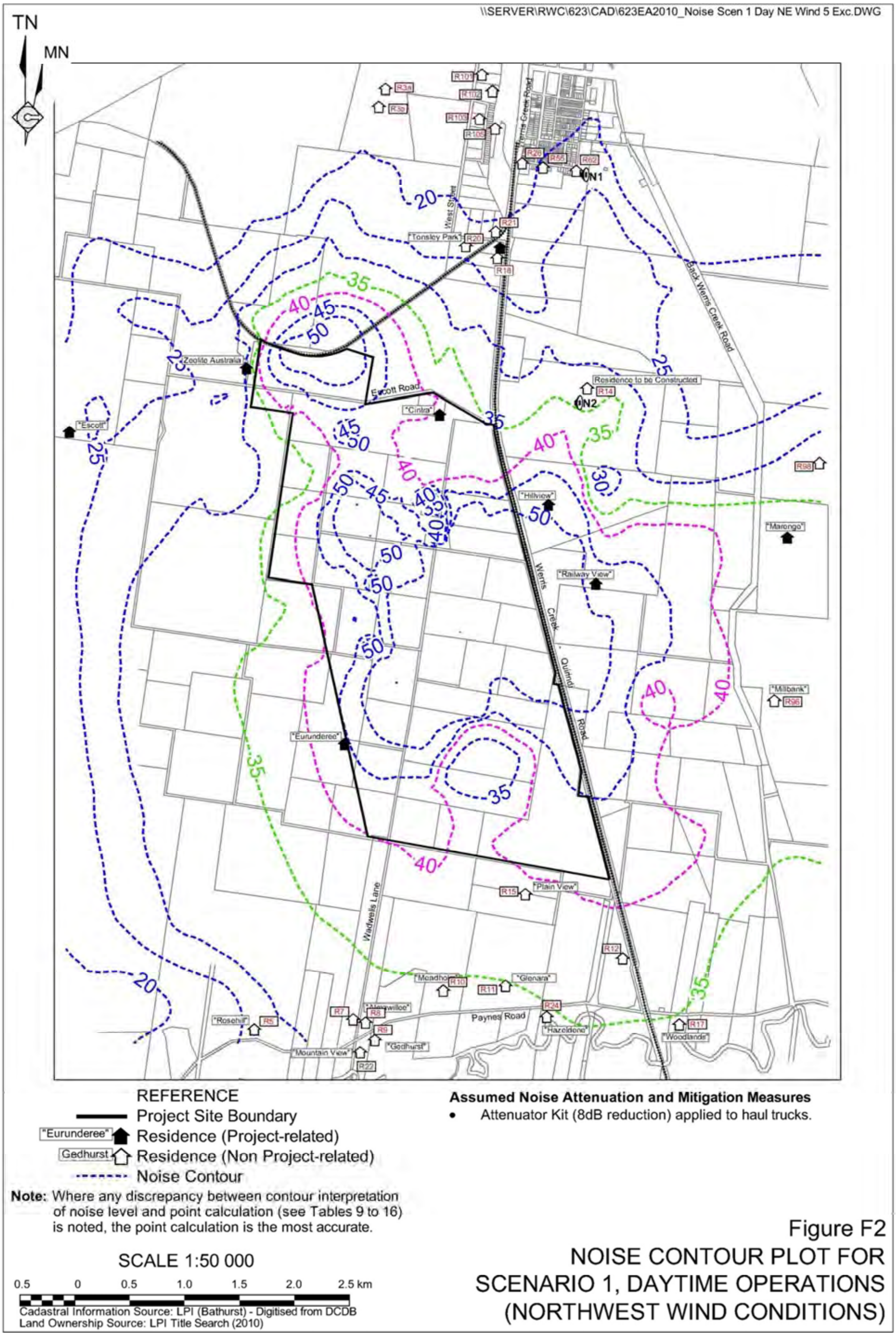


Figure F2
NOISE CONTOUR PLOT FOR SCENARIO 1, DAYTIME OPERATIONS (NORTHWEST WIND CONDITIONS)

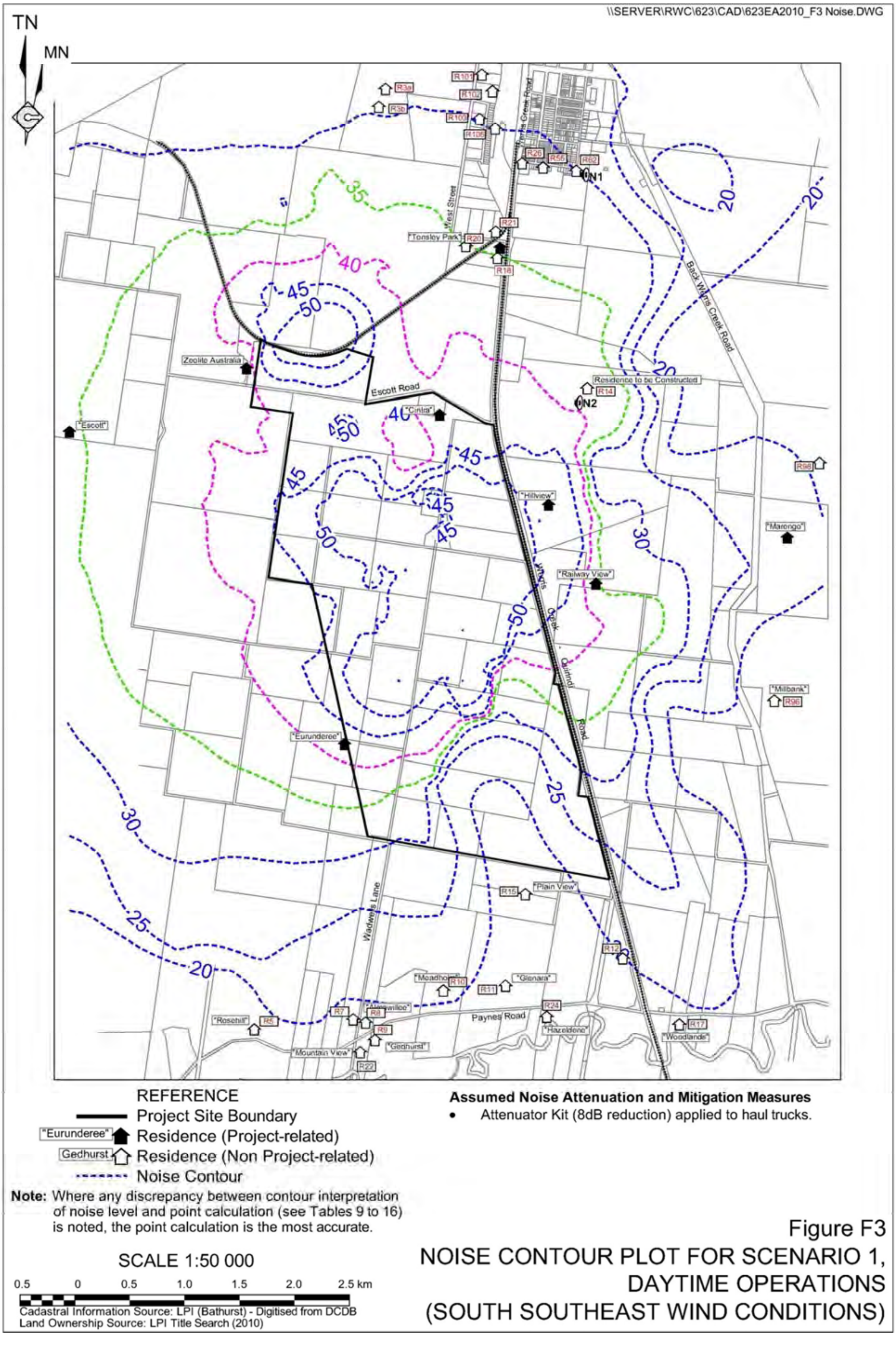
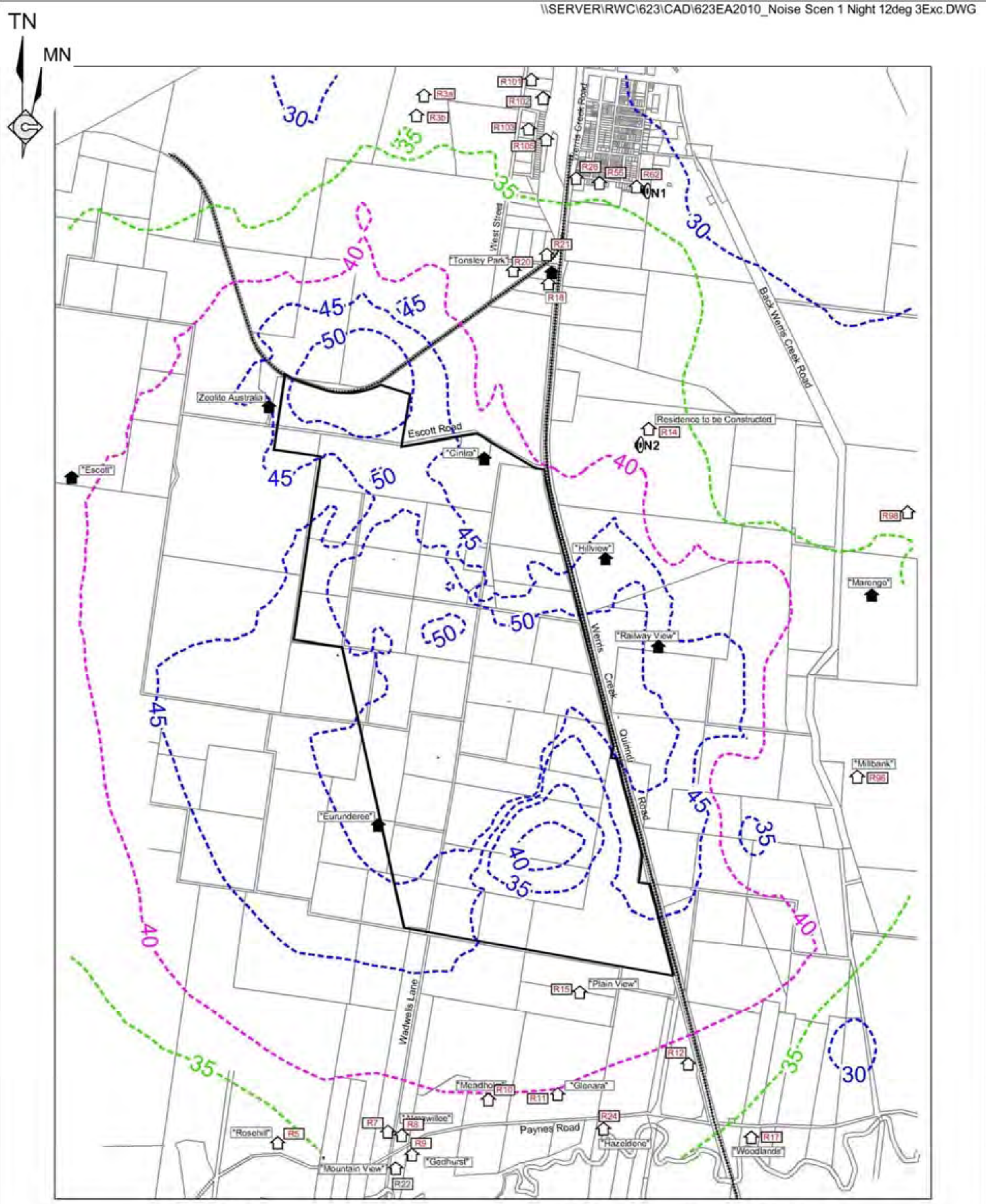


Figure F3
NOISE CONTOUR PLOT FOR SCENARIO 1, DAYTIME OPERATIONS (SOUTH SOUTHEAST WIND CONDITIONS)



REFERENCE

- Project Site Boundary
- "Eurunderee" Residence (Project-related)
- Gedhurst Residence (Non Project-related)
- Noise Contour

Note: Where any discrepancy between contour interpretation of noise level and point calculation (see Tables 9 to 16) is noted, the point calculation is the most accurate.

SCALE 1:50 000

0.5 0 0.5 1.0 1.5 2.0 2.5 km

Cadastral Information Source: LPI (Bathurst) - Digitised from DCDB
Land Ownership Source: LPI Title Search (2010)

Assumed Noise Attenuation and Mitigation Measures

- Attenuator Kit (8dB reduction) applied to haul trucks.
- Dozers limited to 1600rpm in reverse (first gear).
- Surface mining equipment operating in advance of the open cut stood down.
- Haul truck and excavator number reduced to 10 and 3 respectively.

Figure F4
NOISE CONTOUR PLOT FOR SCENARIO 1, NIGHT TIME OPERATIONS (12° INVERSION CONDITIONS)

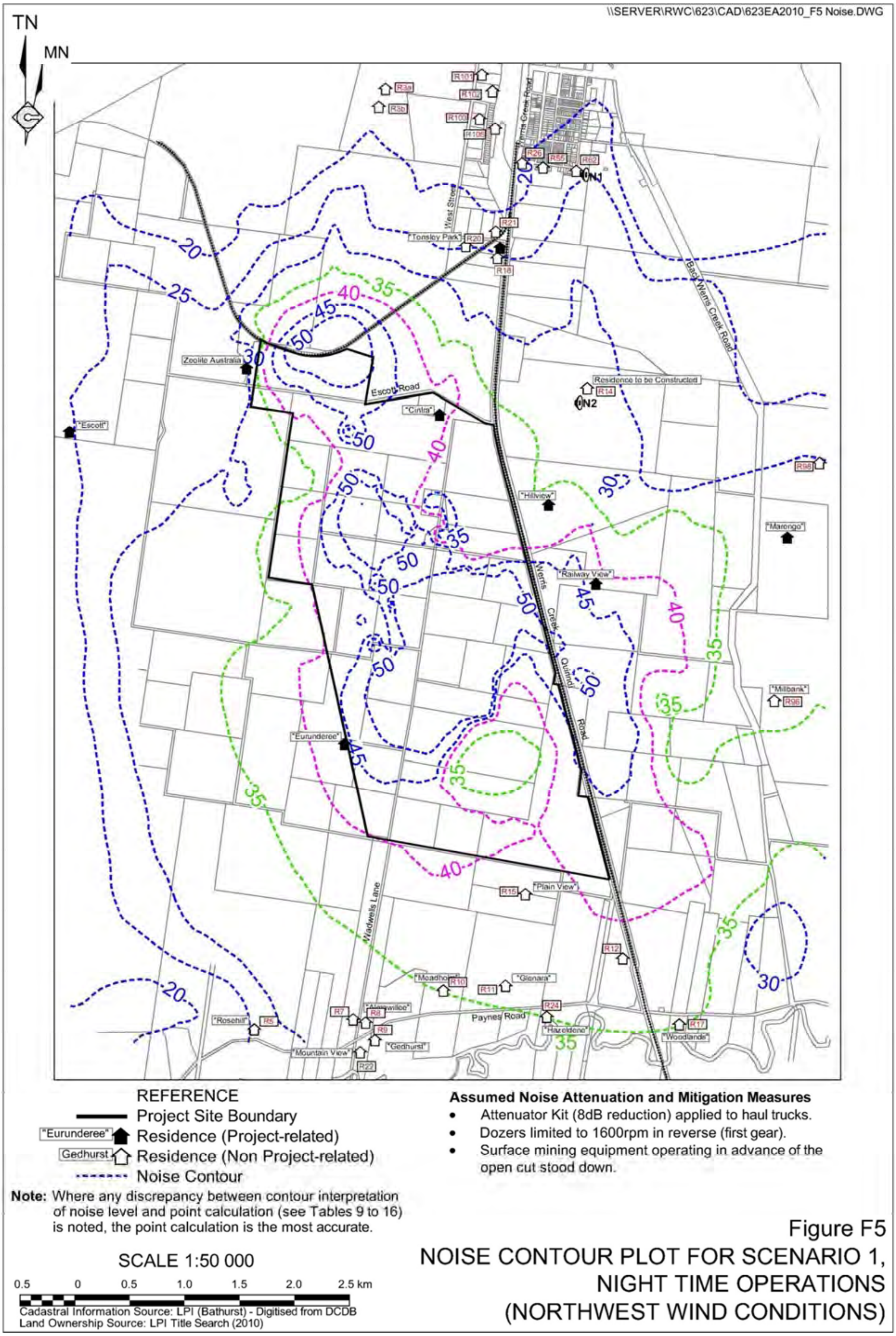
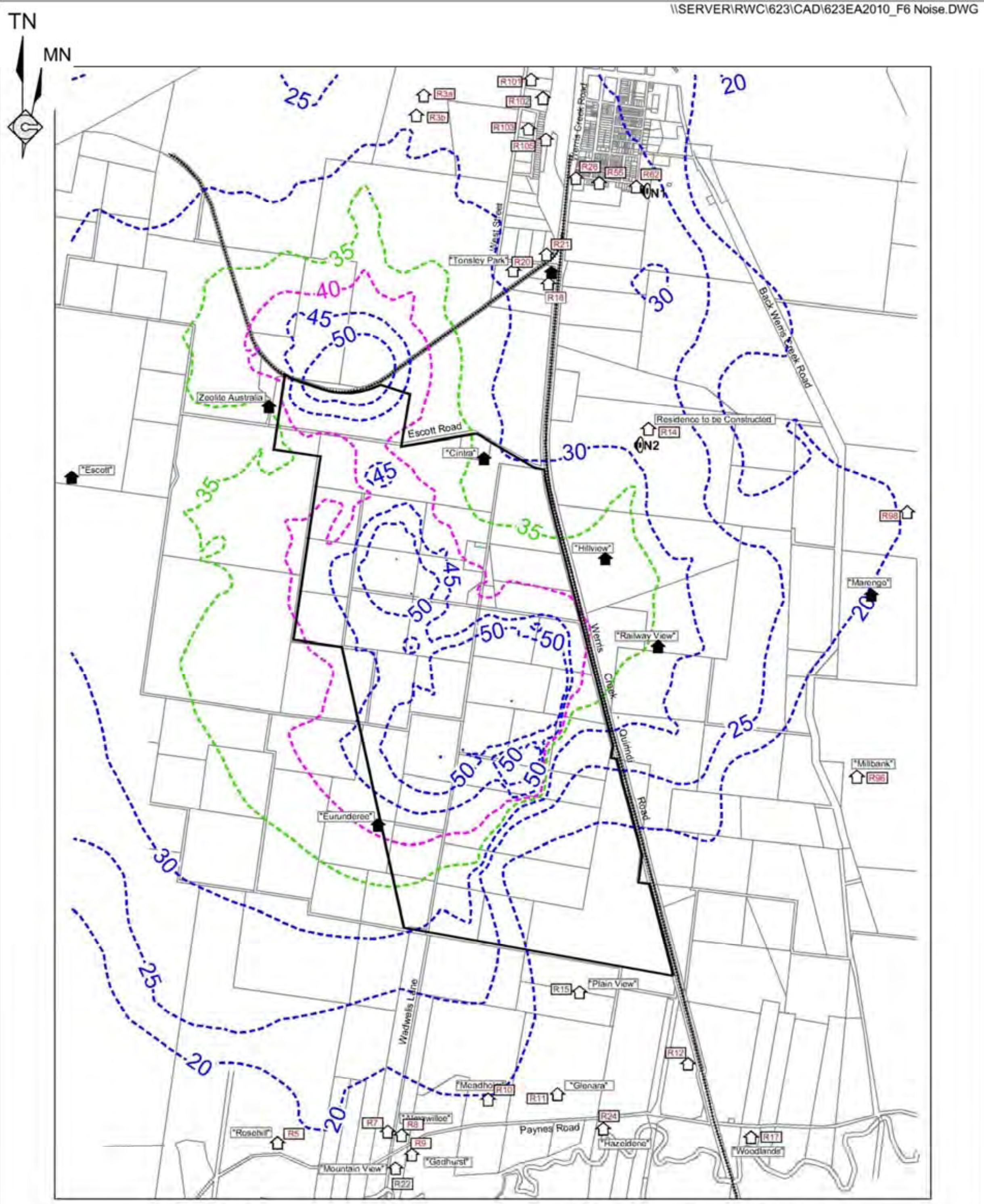


Figure F5
NOISE CONTOUR PLOT FOR SCENARIO 1,
NIGHT TIME OPERATIONS
(NORTHWEST WIND CONDITIONS)



REFERENCE

- Project Site Boundary
- "Eurunderee" Residence (Project-related)
- Gedhurst Residence (Non Project-related)
- Noise Contour

Note: Where any discrepancy between contour interpretation of noise level and point calculation (see Tables 9 to 16) is noted, the point calculation is the most accurate.

SCALE 1:50 000

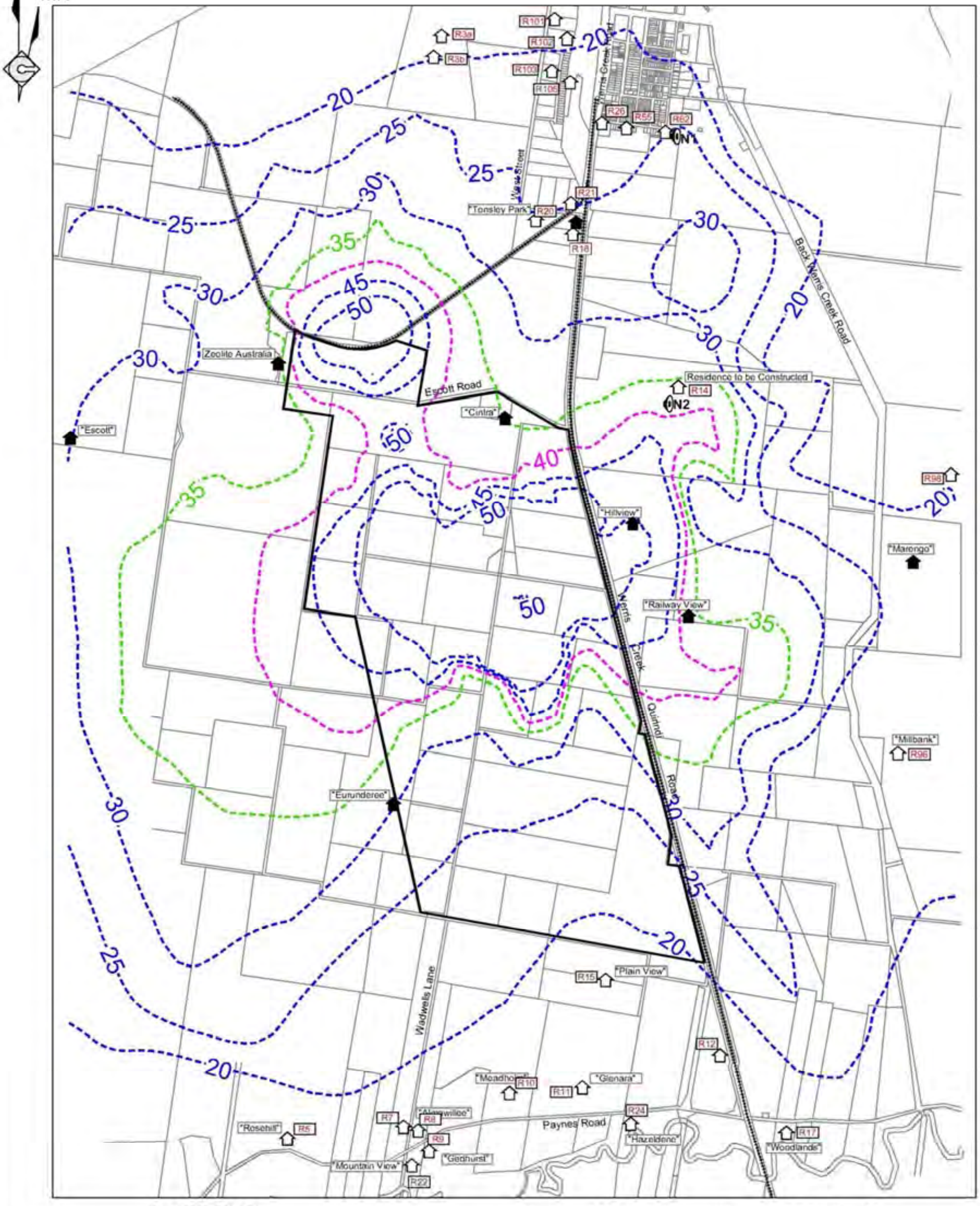
0.5 0 0.5 1.0 1.5 2.0 2.5 km

Cadastral Information Source: LPI (Bathurst) - Digitised from DCDB
Land Ownership Source: LPI Title Search (2010)

Assumed Noise Attenuation and Mitigation Measures

- Attenuator Kit (8dB reduction) applied to haul trucks.
- Dozers limited to 1600rpm in reverse (first gear).
- Surface mining equipment operating in advance of the open cut stood down.

Figure F6
NOISE CONTOUR PLOT FOR SCENARIO 1, NIGHT TIME OPERATIONS (SOUTH SOUTHEAST WIND CONDITIONS)



REFERENCE

- Project Site Boundary
- "Eurunderee" Residence (Project-related)
- Gedhurst Residence (Non Project-related)
- Noise Contour

Note: Where any discrepancy between contour interpretation of noise level and point calculation (see Tables 9 to 16) is noted, the point calculation is the most accurate.

SCALE 1:50 000

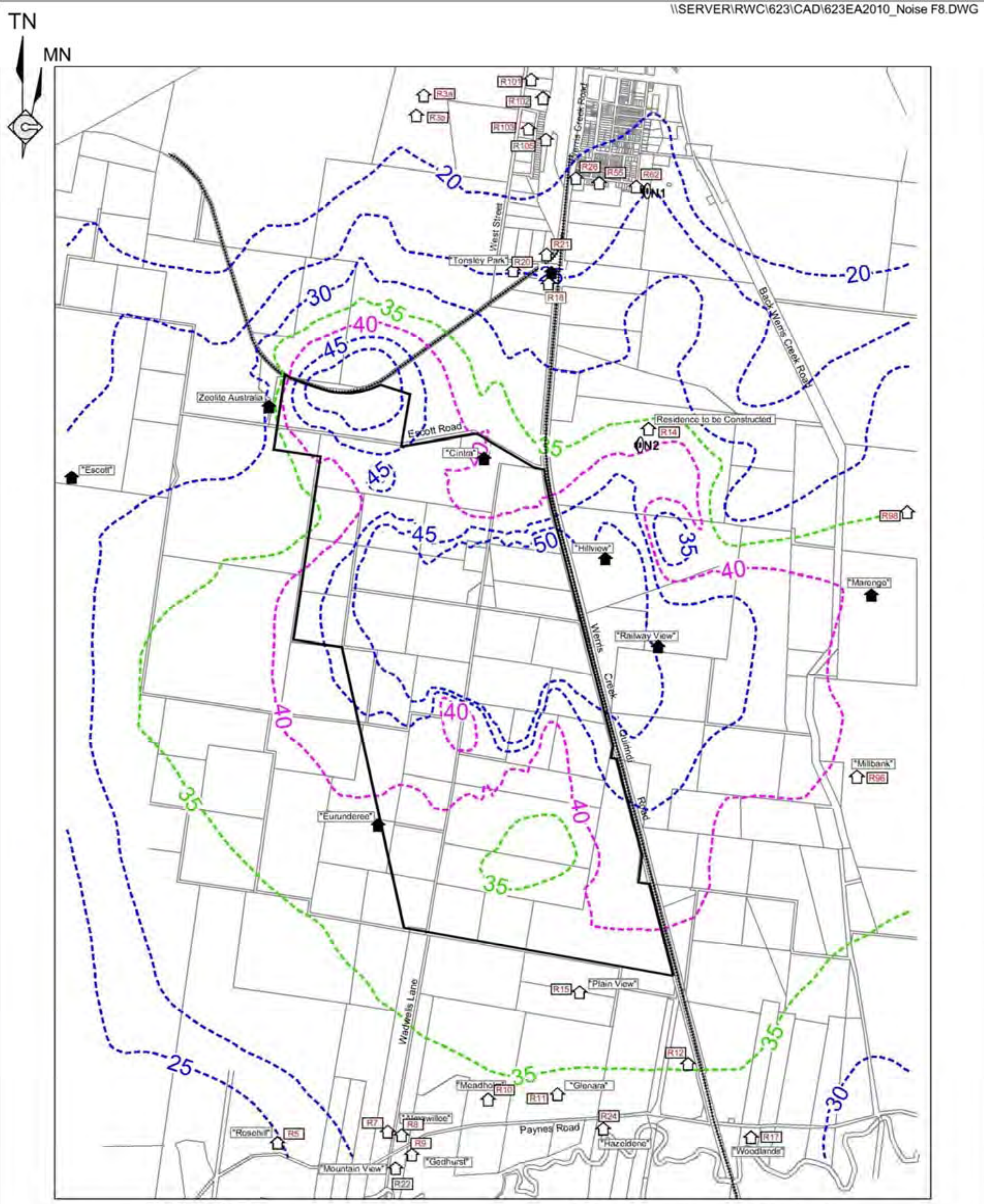
0.5 0 0.5 1.0 1.5 2.0 2.5 km

Cadastral Information Source: LPI (Bathurst) - Digitised from DCDB
Land Ownership Source: LPI Title Search (2010)

Assumed Noise Attenuation and Mitigation Measures

- Attenuator Kit (8dB reduction) applied to haul trucks.
- 5m high noise barrier constructed on the northeastern side of the coal processing infrastructure.
- Advancing open cut does not move beyond 410mAHD contour until acoustic and visual amenity bund completed.

Figure F7
NOISE CONTOUR PLOT FOR SCENARIO 2, DAY TIME OPERATIONS (CALM CONDITIONS)



REFERENCE

- Project Site Boundary
- "Eurunderee" Residence (Project-related)
- Gedhurst Residence (Non Project-related)
- Noise Contour

Note: Where any discrepancy between contour interpretation of noise level and point calculation (see Tables 9 to 16) is noted, the point calculation is the most accurate.

SCALE 1:50 000

0.5 0 0.5 1.0 1.5 2.0 2.5 km

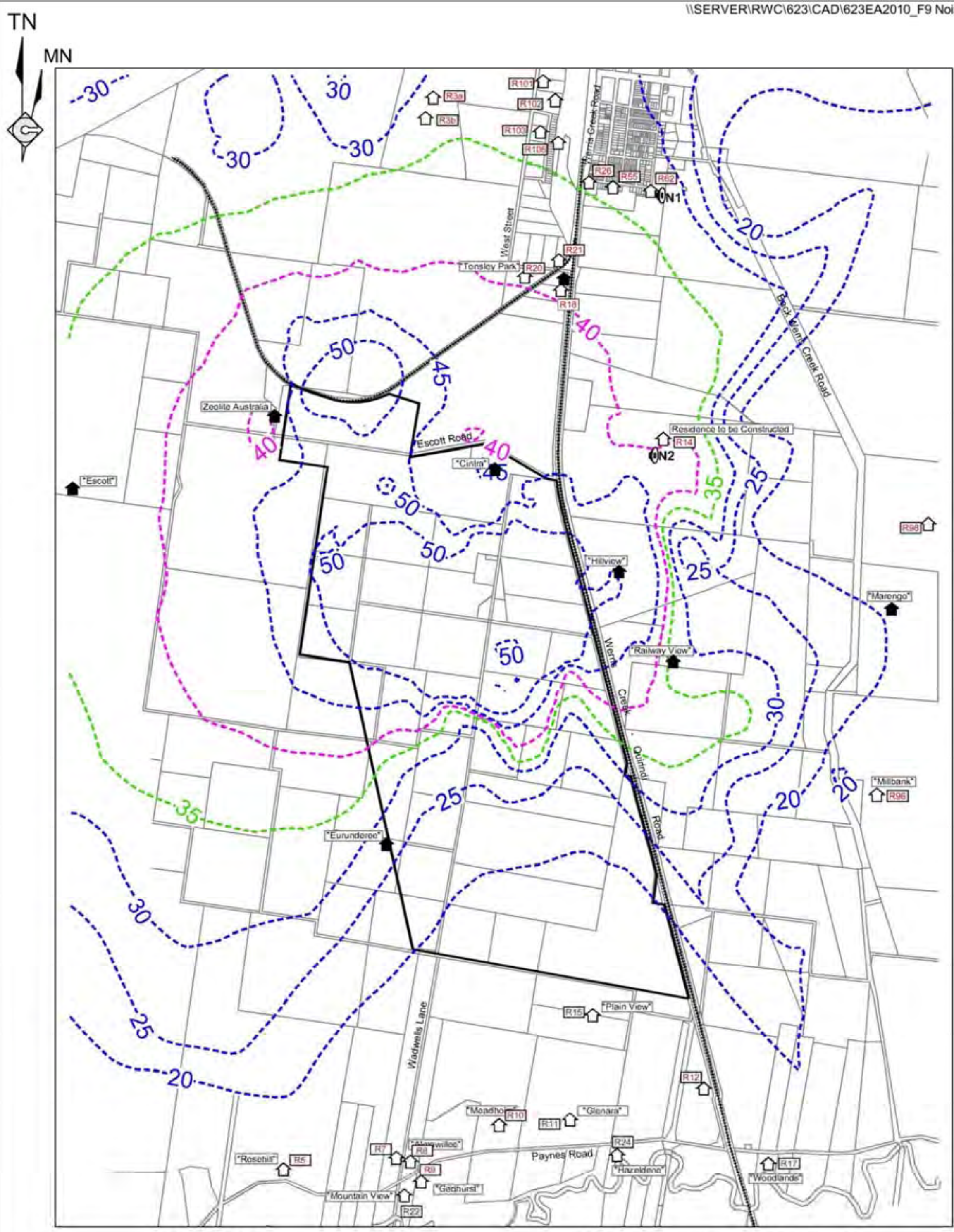
Cadastral Information Source: LPI (Bathurst) - Digitised from DCDB
Land Ownership Source: LPI Title Search (2010)

Assumed Noise Attenuation and Mitigation Measures

- Attenuator Kit (8dB reduction) applied to haul trucks.
- 5m high noise barrier constructed on the northeastern side of the coal processing infrastructure.
- Advancing open cut does not move beyond 410mAHD contour until acoustic and visual amenity bund completed.

Figure F8
NOISE CONTOUR PLOT FOR SCENARIO 2, DAYTIME OPERATIONS (NORTHWEST WIND CONDITIONS)

\\SERVER\RWC\623\CAD\623EA2010_F9 Noise.DWG



REFERENCE
- Project Site Boundary
- "Eurunderee" Residence (Project-related)
- Gedhurst Residence (Non Project-related)
- Noise Contour

Note: Where any discrepancy between contour interpretation of noise level and point calculation (see Tables 9 to 16) is noted, the point calculation is the most accurate.

SCALE 1:50 000

0.5 0 0.5 1.0 1.5 2.0 2.5 km

Cadastral Information Source: LPI (Bathurst) - Digitised from DCDB
Land Ownership Source: LPI Title Search (2010)

Assumed Noise Attenuation and Mitigation Measures
- Attenuator Kit (8dB reduction) applied to haul trucks.
- 5m high noise barrier constructed on the northeastern side of the coal processing infrastructure.
- Advancing open cut does not move beyond 410mAHD contour until acoustic and visual amenity bund completed.

Figure F9
NOISE CONTOUR PLOT FOR SCENARIO 2, DAY TIME OPERATIONS (SOUTH-SOUTHEAST WIND CONDITIONS)

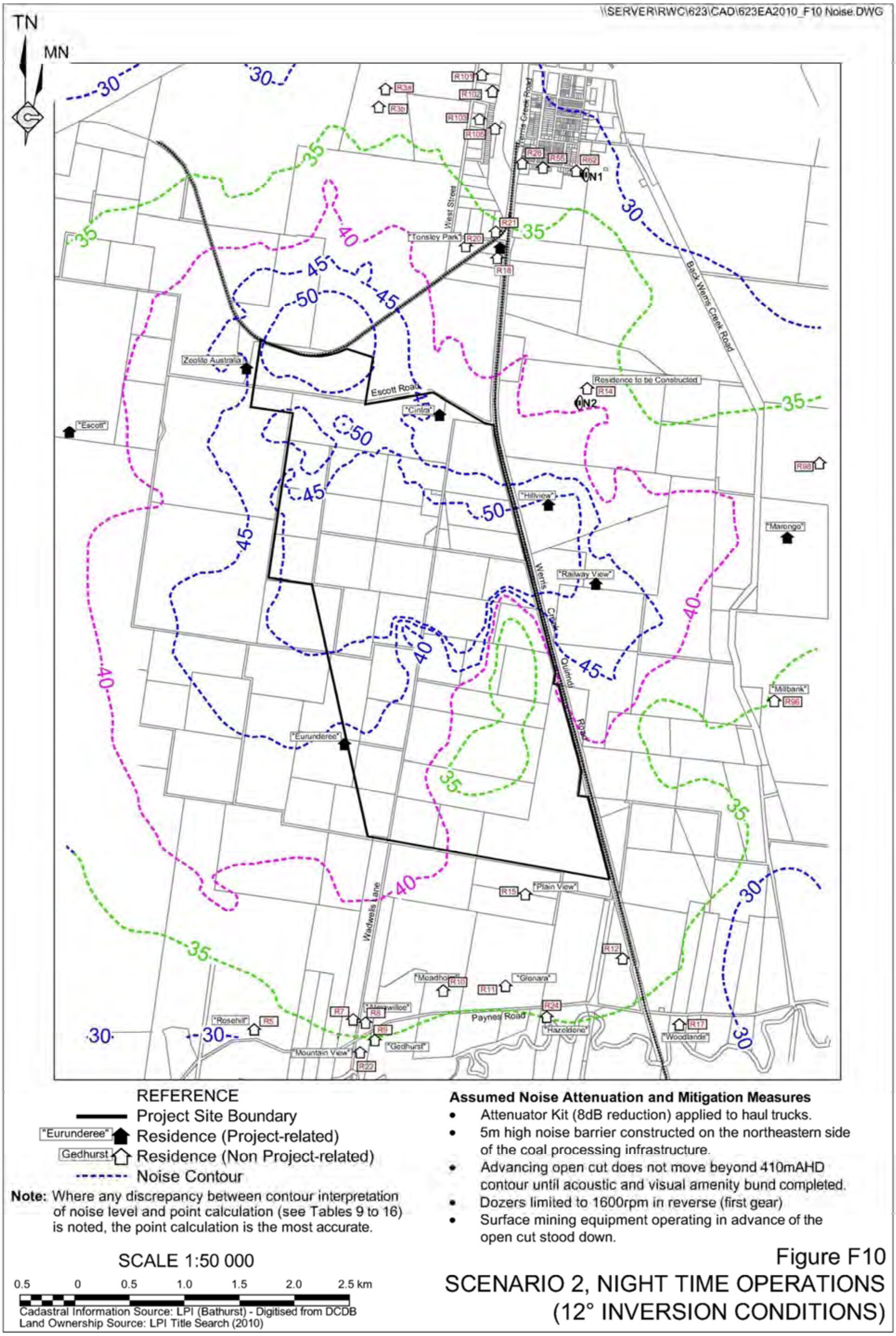
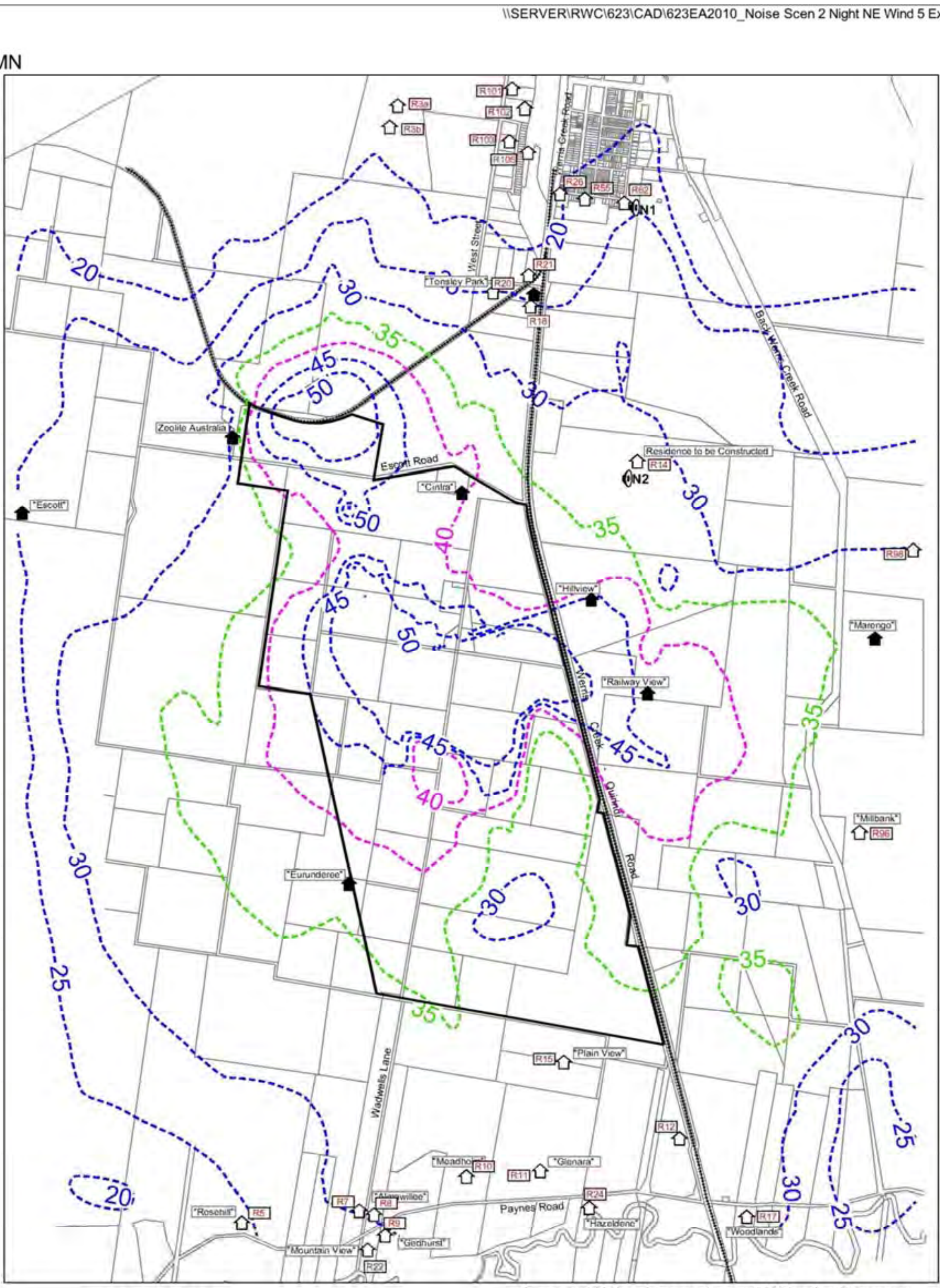


Figure F10
SCENARIO 2, NIGHT TIME OPERATIONS
(12° INVERSION CONDITIONS)



REFERENCE
- Project Site Boundary
- "Eurunderee" Residence (Project-related)
- Gedhurst Residence (Non Project-related)
- Noise Contour

Note: Where any discrepancy between contour interpretation of noise level and point calculation (see Tables 9 to 16) is noted, the point calculation is the most accurate.

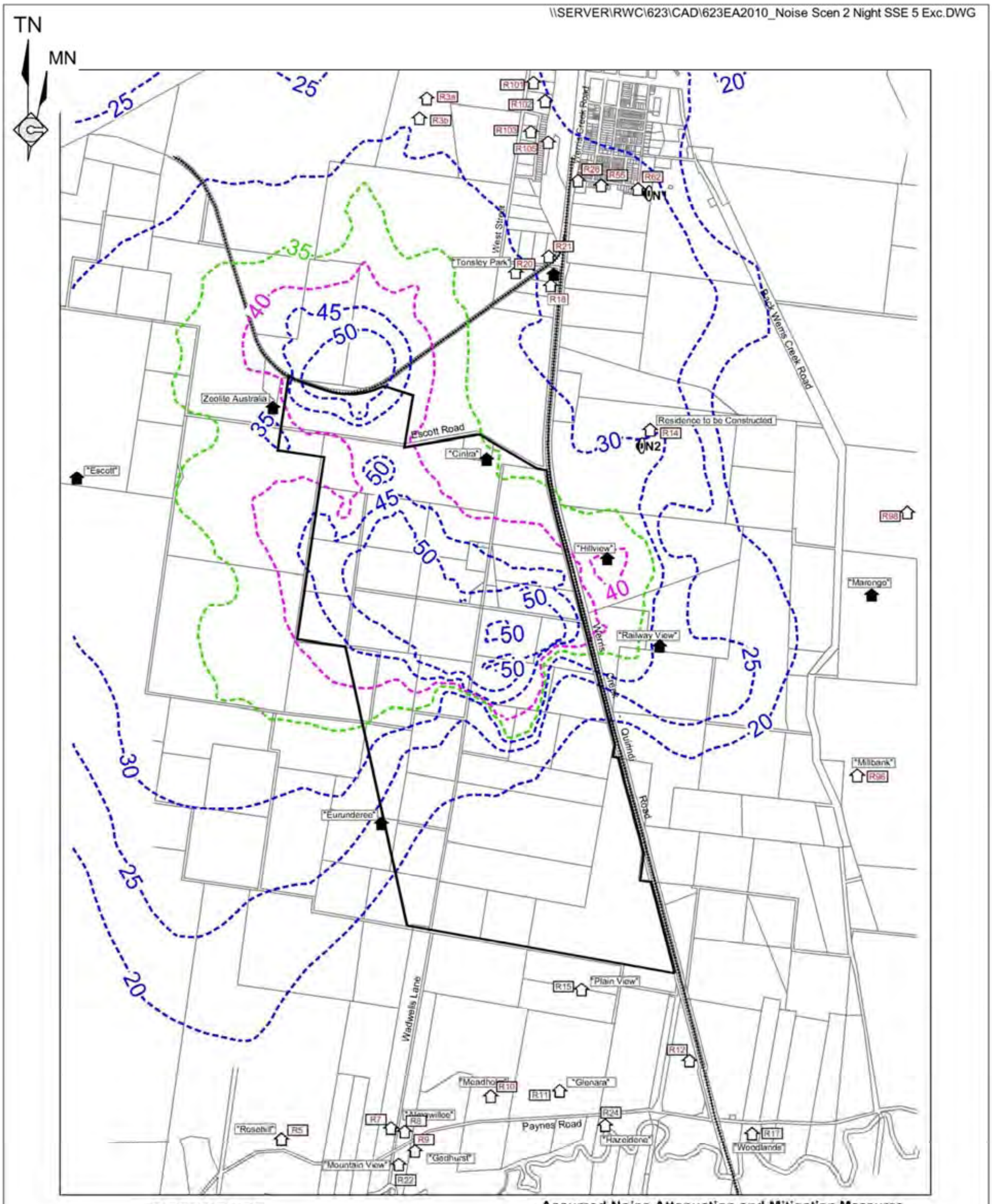
SCALE 1:50 000

0.5 0 0.5 1.0 1.5 2.0 2.5 km

Cadastral Information Source: LPI (Bathurst) - Digitised from DCDB
Land Ownership Source: LPI Title Search (2010)

Assumed Noise Attenuation and Mitigation Measures
- Attenuator Kit (8dB reduction) applied to haul trucks.
- 5m high noise barrier constructed on the northeastern side of the coal processing infrastructure.
- Advancing open cut does not move beyond 410mAHD contour until acoustic and visual amenity bund completed.
- Dozers limited to 1600rpm in reverse (first gear).
- Surface mining equipment operating in advance of the open cut stood down.

Figure F11
NOISE CONTOUR PLOT FOR SCENARIO 2, NIGHT TIME OPERATIONS (NORTHWEST WIND CONDITIONS)



REFERENCE

- Project Site Boundary
- "Eurunderee" Residence (Project-related)
- Gedhurst Residence (Non Project-related)
- Noise Contour

Note: Where any discrepancy between contour interpretation of noise level and point calculation (see Tables 9 to 16) is noted, the point calculation is the most accurate.

SCALE 1:50 000

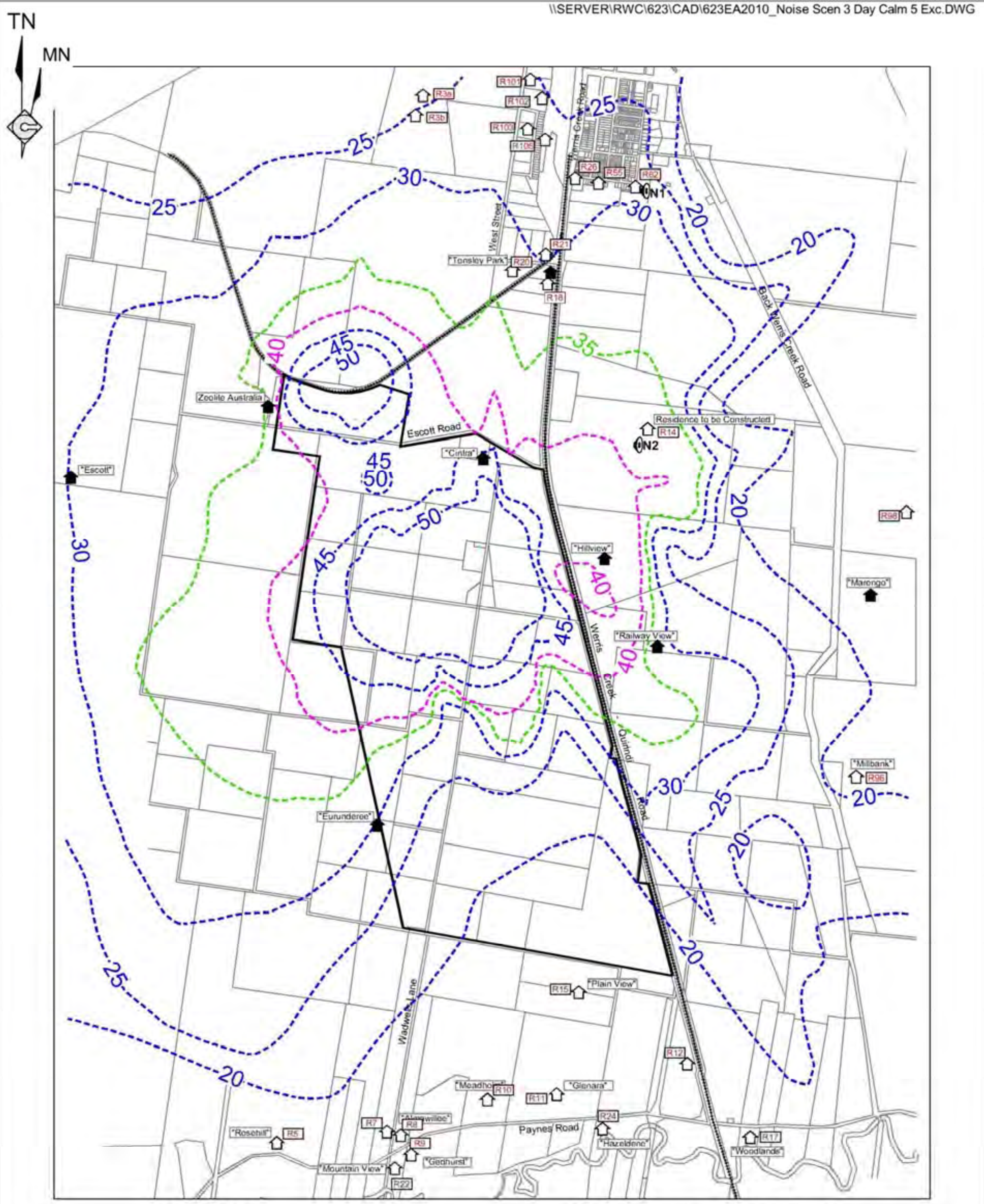
0.5 0 0.5 1.0 1.5 2.0 2.5 km

Cadastral Information Source: LPI (Bathurst) - Digitised from DCDB
Land Ownership Source: LPI Title Search (2010)

Assumed Noise Attenuation and Mitigation Measures

- Attenuator Kit (8dB reduction) applied to haul trucks.
- 5m high noise barrier constructed on the northeastern side of the coal processing infrastructure.
- Advancing open cut does not move beyond 410mAHD contour until acoustic and visual amenity bund completed.
- Dozers limited to 1600rpm in reverse (first gear).
- Surface mining equipment operating in advance of the open cut stood down.

Figure F12
NOISE CONTOUR PLOT FOR SCENARIO 2, NIGHT TIME OPERATIONS (SOUTH-SOUTHEAST WIND CONDITIONS)



REFERENCE

- Project Site Boundary
- "Eurunderee" Residence (Project-related)
- Gedhurst Residence (Non Project-related)
- Noise Contour

Note: Where any discrepancy between contour interpretation of noise level and point calculation (see Tables 9 to 16) is noted, the point calculation is the most accurate.

SCALE 1:50 000

0.5 0 0.5 1.0 1.5 2.0 2.5 km

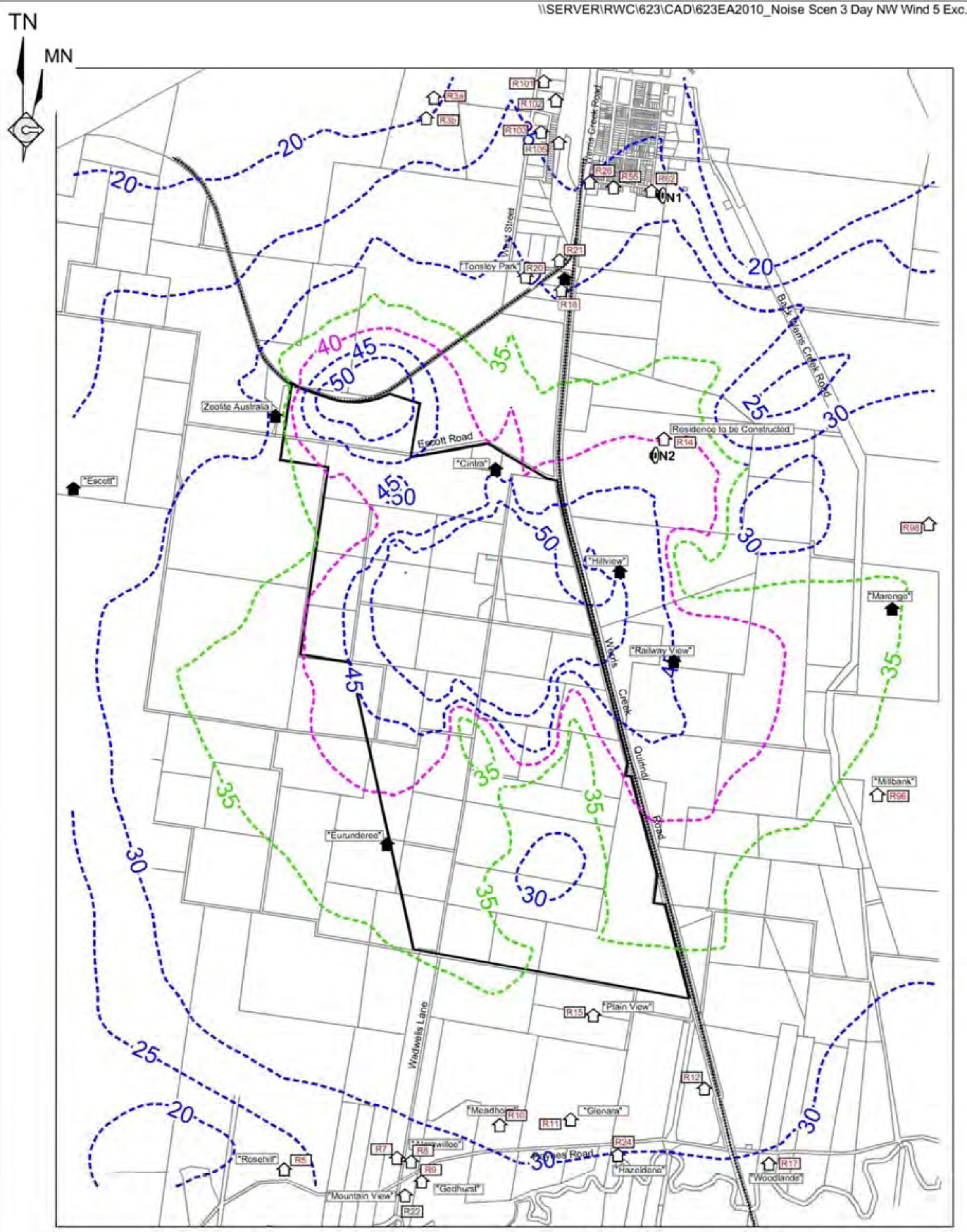
Cadastral Information Source: LPI (Bathurst) - Digitised from DCDB
Land Ownership Source: LPI Title Search (2010)

Assumed Noise Attenuation and Mitigation Measures

- Attenuator Kit (8dB reduction) applied to haul trucks.
- 5m high noise barrier constructed on the northeastern side of the coal processing infrastructure.

Figure F13
NOISE CONTOUR PLOT FOR SCENARIO 3, DAY TIME OPERATIONS (CALM CONDITIONS)

\\SERVER\RWC\623\CAD\623EA2010_Noise Scen 3 Day NW Wind 5 Exc.DWG



REFERENCE
Project Site Boundary
"Eurunderee" Residence (Project-related)
Gedhurst Residence (Non Project-related)
Noise Contour

Note: Where any discrepancy between contour interpretation of noise level and point calculation (see Tables 9 to 16) is noted, the point calculation is the most accurate.

SCALE 1:50 000

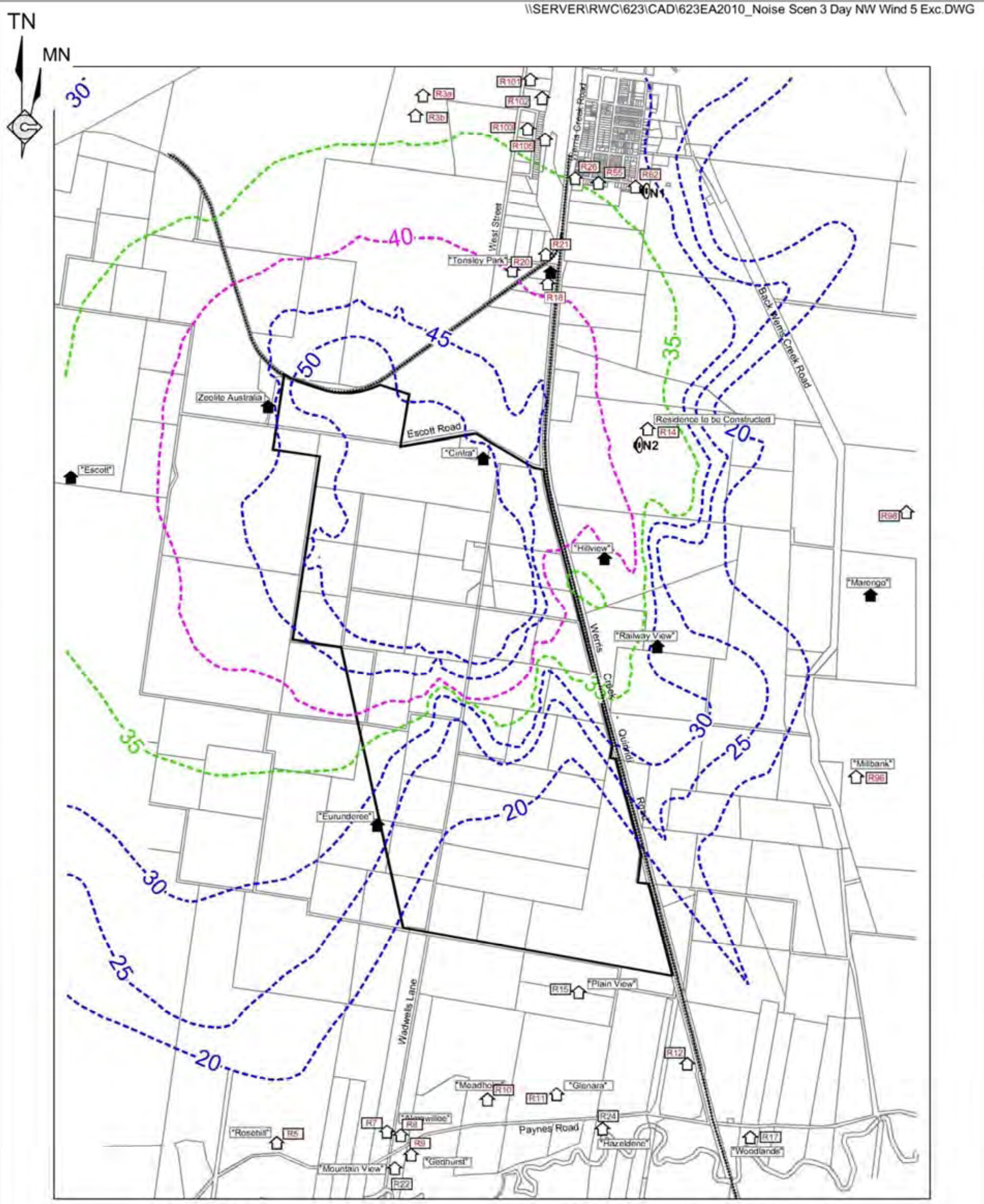
0.5 0 0.5 1.0 1.5 2.0 2.5 km

Cadastral Information Source: LPI (Bathurst) - Digitised from DCDB
Land Ownership Source: LPI Title Search (2010)

Assumed Noise Attenuation and Mitigation Measures

- Attenuator Kit (8dB reduction) applied to haul trucks.
- 5m high noise barrier constructed on the northeastern side of the coal processing infrastructure.

Figure F14
NOISE CONTOUR PLOT FOR SCENARIO 3, DAY TIME OPERATIONS (NORTHWEST WIND CONDITIONS)



REFERENCE

Project Site Boundary

"Eurunderee" Residence (Project-related)

Gedhurst Residence (Non Project-related)

Noise Contour

Note: Where any discrepancy between contour interpretation of noise level and point calculation (see Tables 9 to 16) is noted, the point calculation is the most accurate.

SCALE 1:50 000

0.5 0 0.5 1.0 1.5 2.0 2.5 km

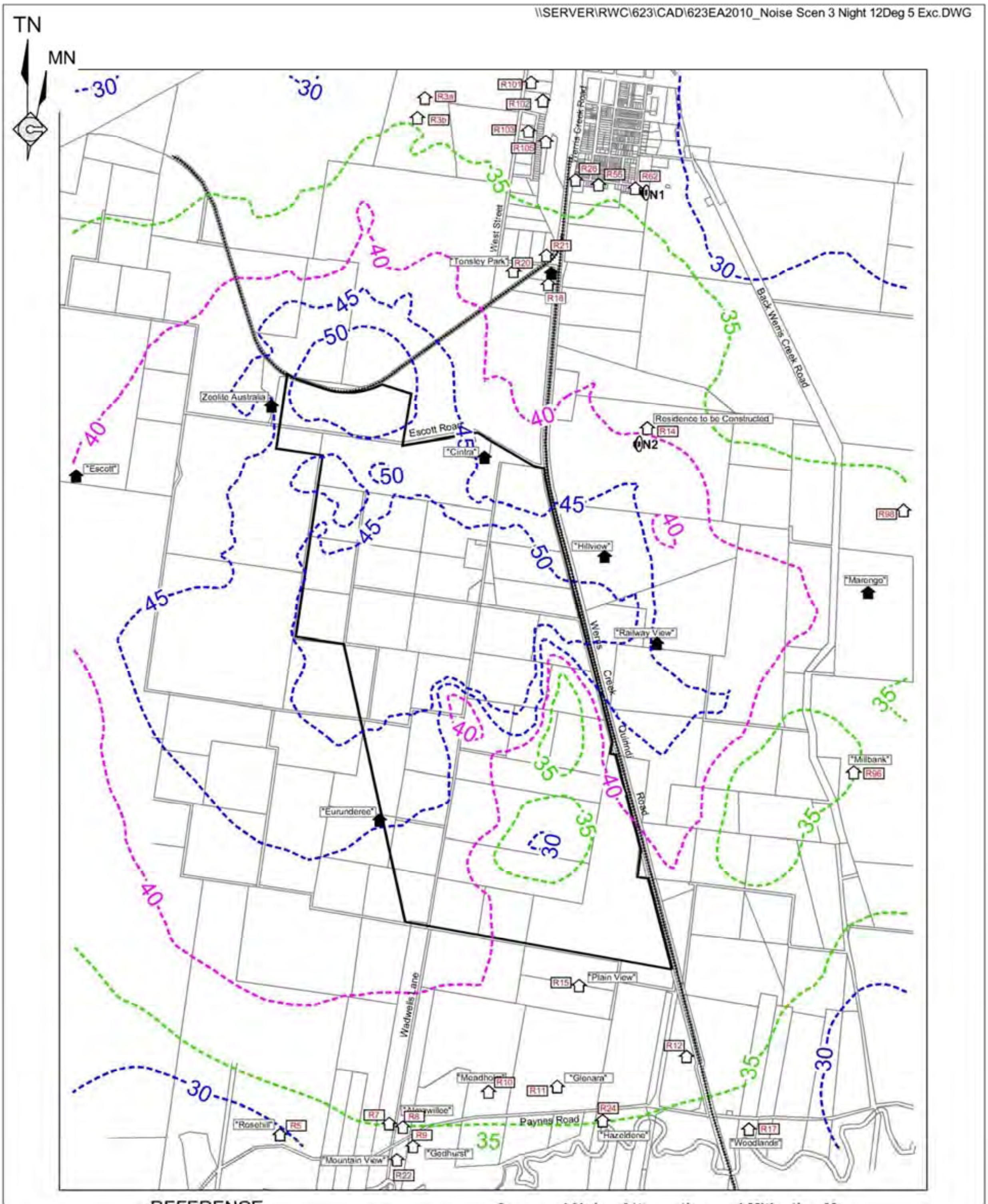
Cadastral Information Source: LPI (Bathurst) - Digitised from DCDB
Land Ownership Source: LPI Title Search (2010)

Assumed Noise Attenuation and Mitigation Measures

- Attenuator Kit (8dB reduction) applied to haul trucks.
- 5m high noise barrier constructed on the northeastern side of the coal processing infrastructure.

Figure F15

NOISE CONTOUR PLOT FOR SCENARIO 3, DAY TIME OPERATIONS (SOUTH-SOUTHEAST WIND CONDITIONS)



REFERENCE

- Project Site Boundary
- "Eurunderee" Residence (Project-related)
- Gedhurst Residence (Non Project-related)
- Noise Contour

Note: Where any discrepancy between contour interpretation of noise level and point calculation (see Tables 9 to 16) is noted, the point calculation is the most accurate.

SCALE 1:50 000

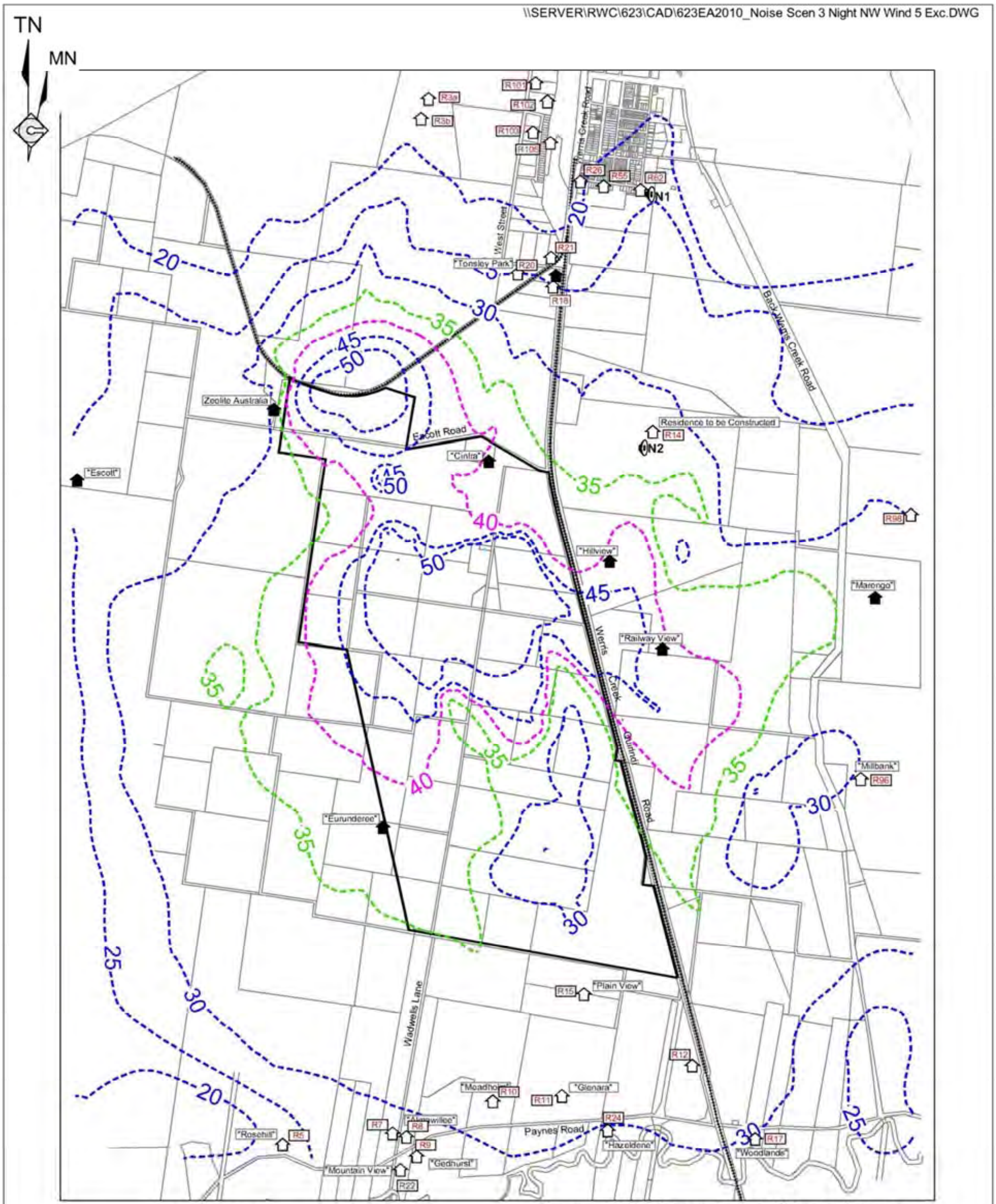
0.5 0 0.5 1.0 1.5 2.0 2.5 km

Cadastral Information Source: LPI (Bathurst) - Digitised from DCDB
Land Ownership Source: LPI Title Search (2010)

Assumed Noise Attenuation and Mitigation Measures

- Attenuator Kit (8dB reduction) applied to haul trucks.
- 5m high noise barrier constructed on the northeastern side of the coal processing infrastructure.
- Advancing open cut does not move beyond 410mAHD contour until acoustic and visual amenity bund completed.
- Dozers limited to 1600rpm in reverse (first gear)
- Surface mining equipment operating in advance of the open cut stood down.

Figure F16
SCENARIO 3, NIGHT TIME OPERATIONS (12° INVERSION CONDITIONS)



REFERENCE

- Project Site Boundary
- "Eurunderee" Residence (Project-related)
- Gedhurst Residence (Non Project-related)
- Noise Contour

Note: Where any discrepancy between contour interpretation of noise level and point calculation (see Tables 9 to 16) is noted, the point calculation is the most accurate.

SCALE 1:50 000

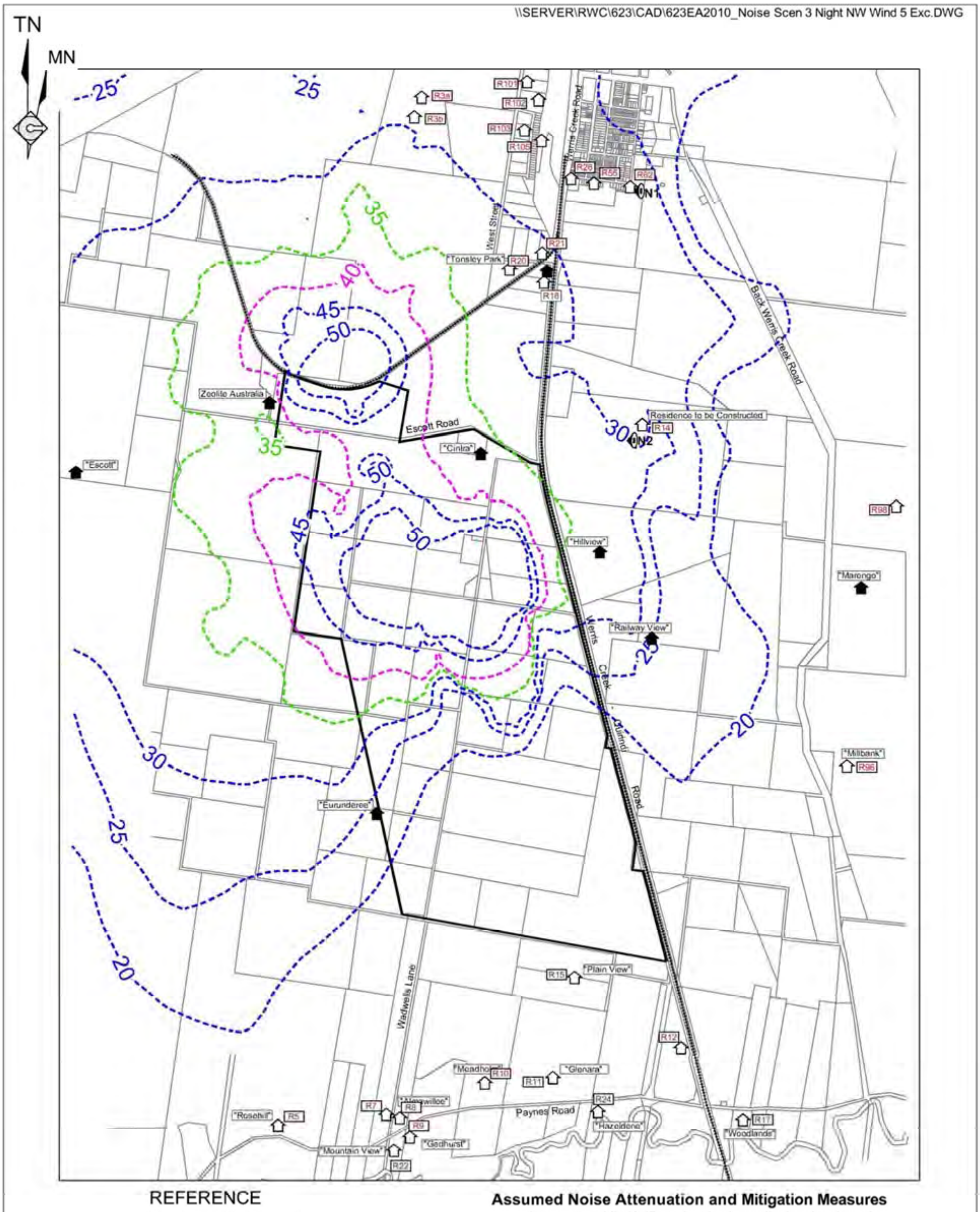
0.5 0 0.5 1.0 1.5 2.0 2.5 km

Cadastral Information Source: LPI (Bathurst) - Digitised from DCDB
Land Ownership Source: LPI Title Search (2010)

Assumed Noise Attenuation and Mitigation Measures

- Attenuator Kit (8dB reduction) applied to haul trucks.
- 5m high noise barrier constructed on the northeastern side of the coal processing infrastructure.
- Advancing open cut does not move beyond 410mAHD contour until acoustic and visual amenity bund completed.
- Dozers limited to 1600rpm in reverse (first gear).
- Surface mining equipment operating in advance of the open cut stood down.

Figure F17
NOISE CONTOUR PLOT FOR SCENARIO 3, NIGHT TIME OPERATIONS (NORTHWEST WIND CONDITIONS)



REFERENCE
Project Site Boundary
"Eurunderee" Residence (Project-related)
Gedhurst Residence (Non Project-related)
Noise Contour

Note: Where any discrepancy between contour interpretation of noise level and point calculation (see Tables 9 to 16) is noted, the point calculation is the most accurate.

SCALE 1:50 000

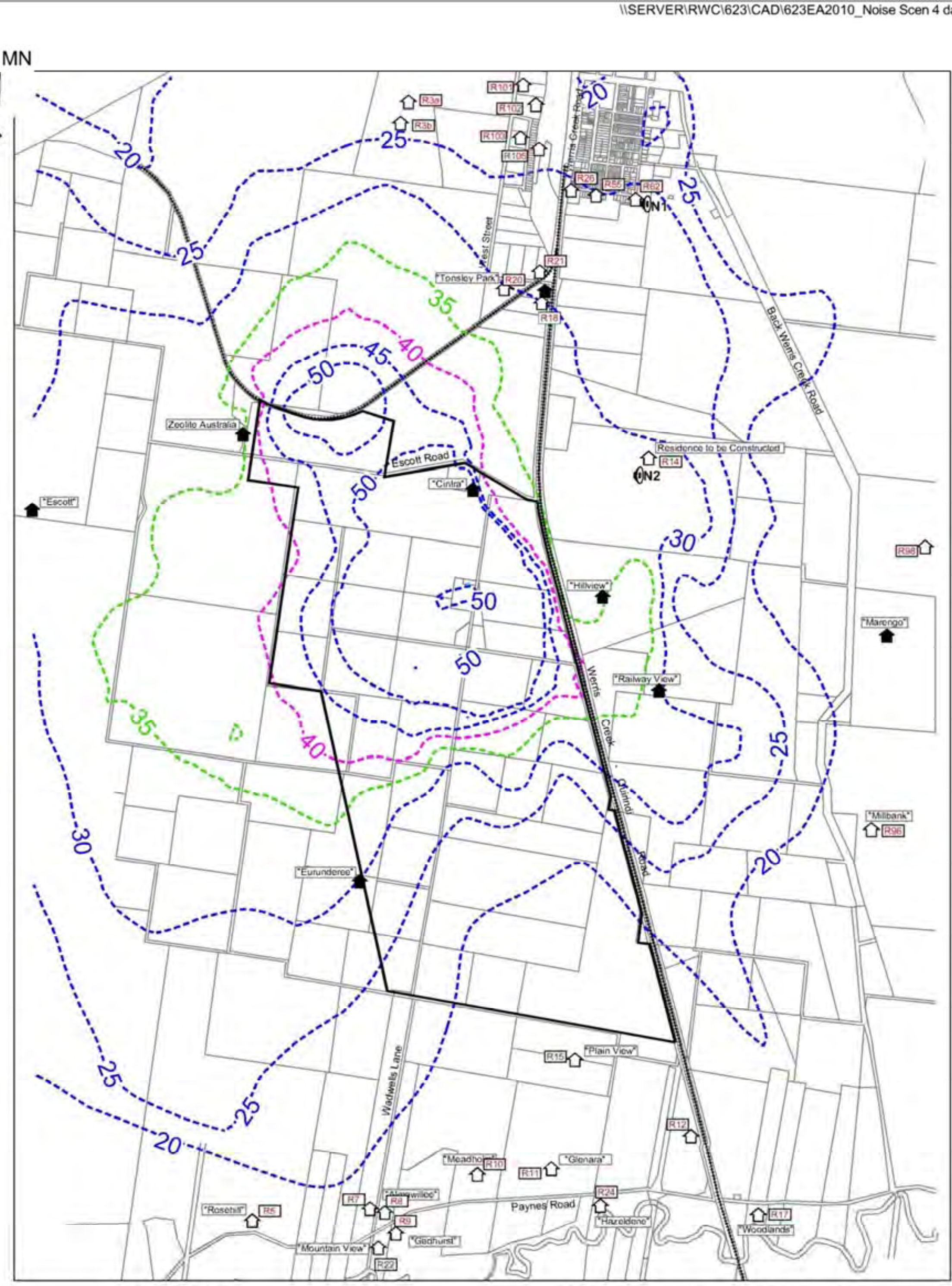
0.5 0 0.5 1.0 1.5 2.0 2.5 km

Cadastral Information Source: LPI (Bathurst) - Digitised from DCDB
Land Ownership Source: LPI Title Search (2010)

Assumed Noise Attenuation and Mitigation Measures

- Attenuator Kit (8dB reduction) applied to haul trucks.
- 5m high noise barrier constructed on the northeastern side of the coal processing infrastructure.
- Dozers limited to 1600rpm in reverse (first gear).
- Surface mining equipment operating in advance of the open cut stood down.

Figure F18
NOISE CONTOUR PLOT FOR SCENARIO 3, NIGHT TIME OPERATIONS (SOUTH SOUTHEAST WIND CONDITIONS)



REFERENCE
Project Site Boundary
"Eurunderee" Residence (Project-related)
Gedhurst Residence (Non Project-related)
Noise Contour

Note: Where any discrepancy between contour interpretation of noise level and point calculation (see Tables 9 to 16) is noted, the point calculation is the most accurate.

SCALE 1:50 000

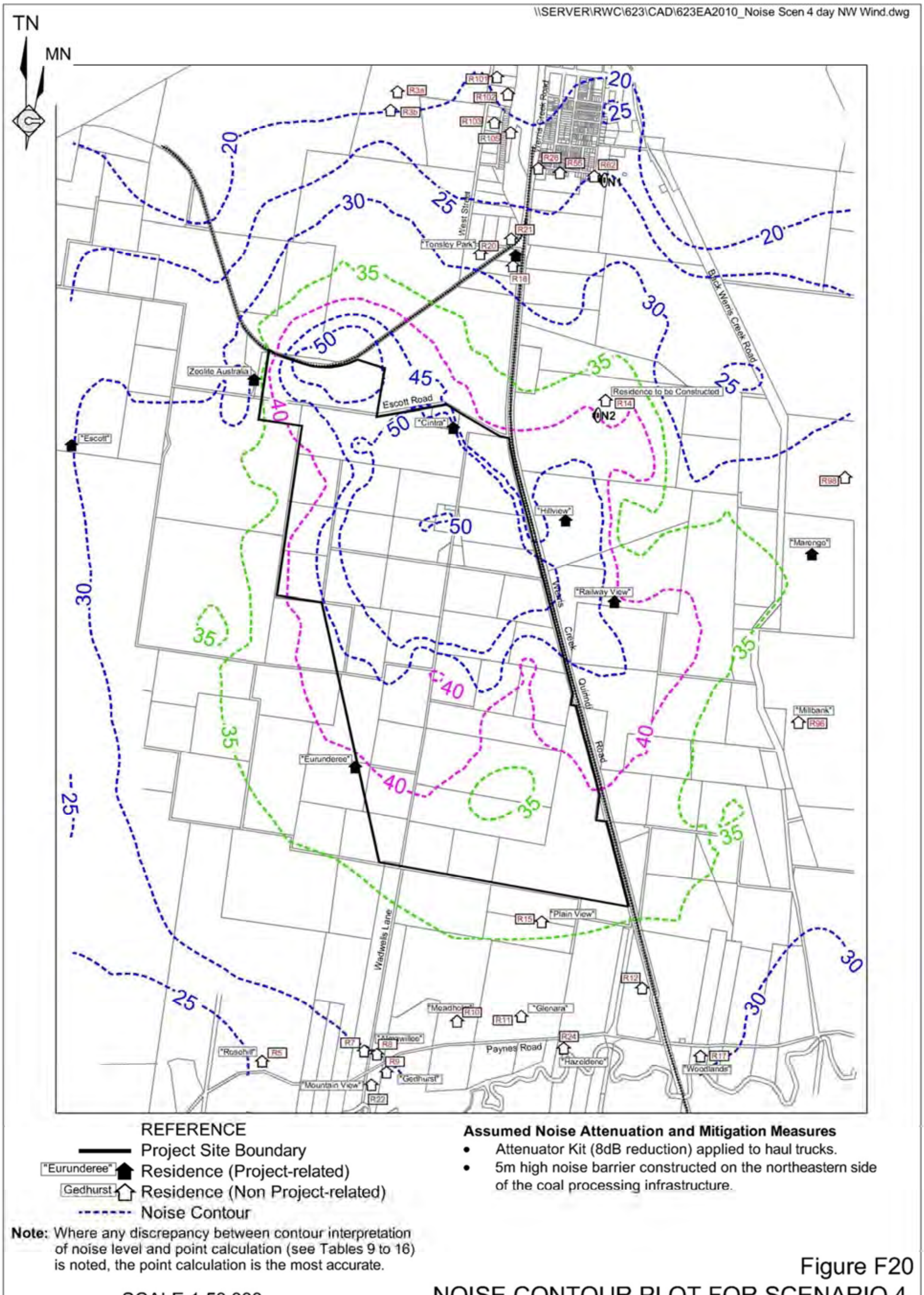
0.5 0 0.5 1.0 1.5 2.0 2.5 km

Cadastral Information Source: LPI (Bathurst) - Digitised from DCDB
Land Ownership Source: LPI Title Search (2010)

Assumed Noise Attenuation and Mitigation Measures

- Attenuator Kit (8dB reduction) applied to haul trucks.
- 5m high noise barrier constructed on the northeastern side of the coal processing infrastructure.

Figure F19
NOISE CONTOUR PLOT FOR SCENARIO 4, DAY TIME OPERATIONS (CALM CONDITIONS)



Note: Where any discrepancy between contour interpretation of noise level and point calculation (see Tables 9 to 16) is noted, the point calculation is the most accurate.

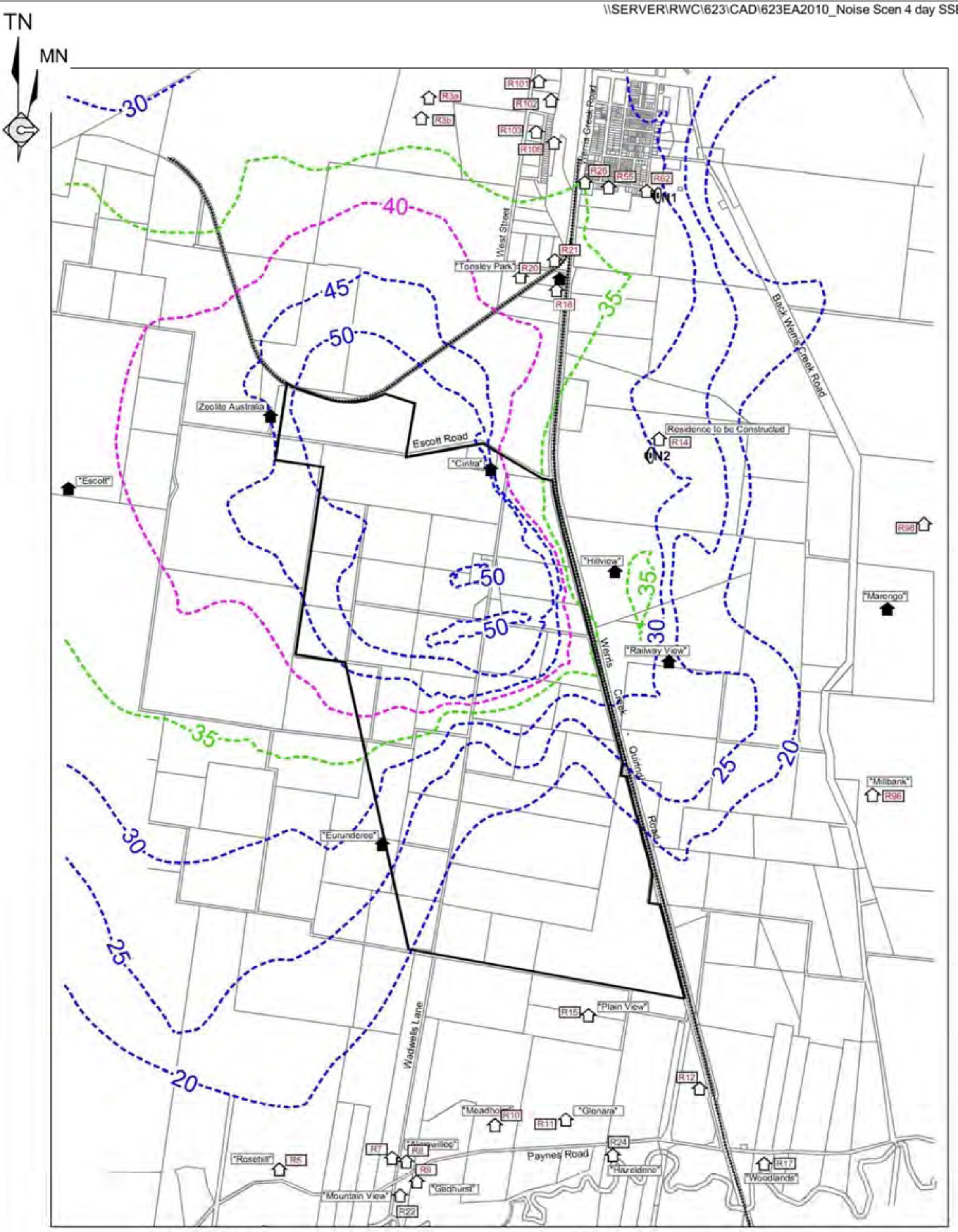
Assumed Noise Attenuation and Mitigation Measures

- Attenuator Kit (8dB reduction) applied to haul trucks.
- 5m high noise barrier constructed on the northeastern side of the coal processing infrastructure.

Cadastral Information Source: LPI (Bathurst) - Digitised from DCDB
Land Ownership Source: LPI Title Search (2010)

Figure F20
NOISE CONTOUR PLOT FOR SCENARIO 4, DAY TIME OPERATIONS (NORTHWEST WIND CONDITIONS)

\\SERVER\RWC\623\CAD\623EA2010_Noise Scen 4 day SSE Wind



REFERENCE

- Project Site Boundary
- "Eurunderee" Residence (Project-related)
- Gedhurst Residence (Non Project-related)
- Noise Contour

Note: Where any discrepancy between contour interpretation of noise level and point calculation (see Tables 9 to 16) is noted, the point calculation is the most accurate.

SCALE 1:50 000

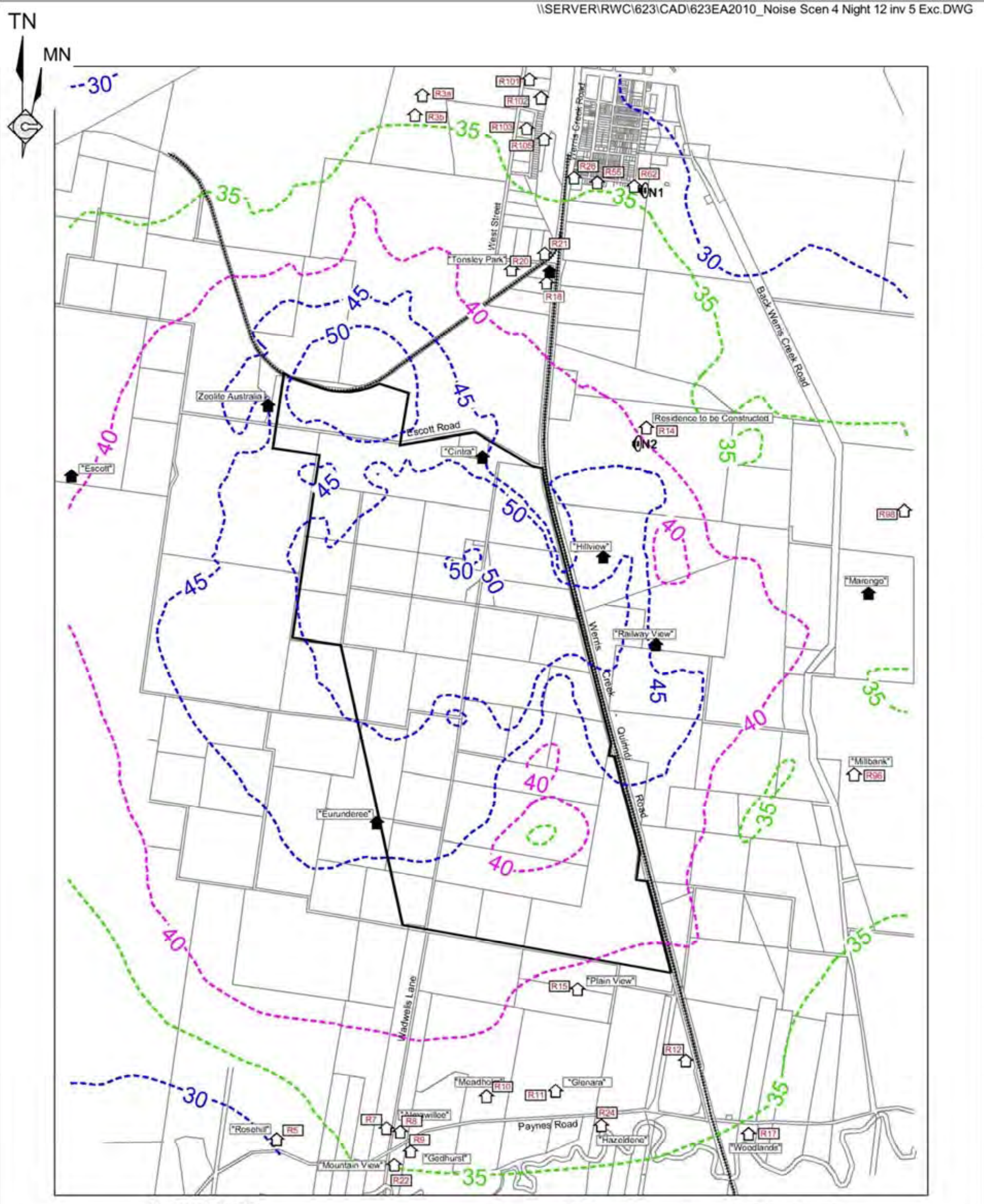
0.5 0 0.5 1.0 1.5 2.0 2.5 km

Cadastral Information Source: LPI (Bathurst) - Digitised from DCDB
Land Ownership Source: LPI Title Search (2010)

Assumed Noise Attenuation and Mitigation Measures

- Attenuator Kit (8dB reduction) applied to haul trucks.
- 5m high noise barrier constructed on the northeastern side of the coal processing infrastructure.

Figure F21
NOISE CONTOUR PLOT FOR SCENARIO 4, DAY TIME OPERATIONS (SOUTH SOUTHEAST WIND CONDITIONS)



REFERENCE
- Project Site Boundary
- "Eurunderee" Residence (Project-related)
- Gedhurst Residence (Non Project-related)
- Noise Contour

Note: Where any discrepancy between contour interpretation of noise level and point calculation (see Tables 9 to 16) is noted, the point calculation is the most accurate.

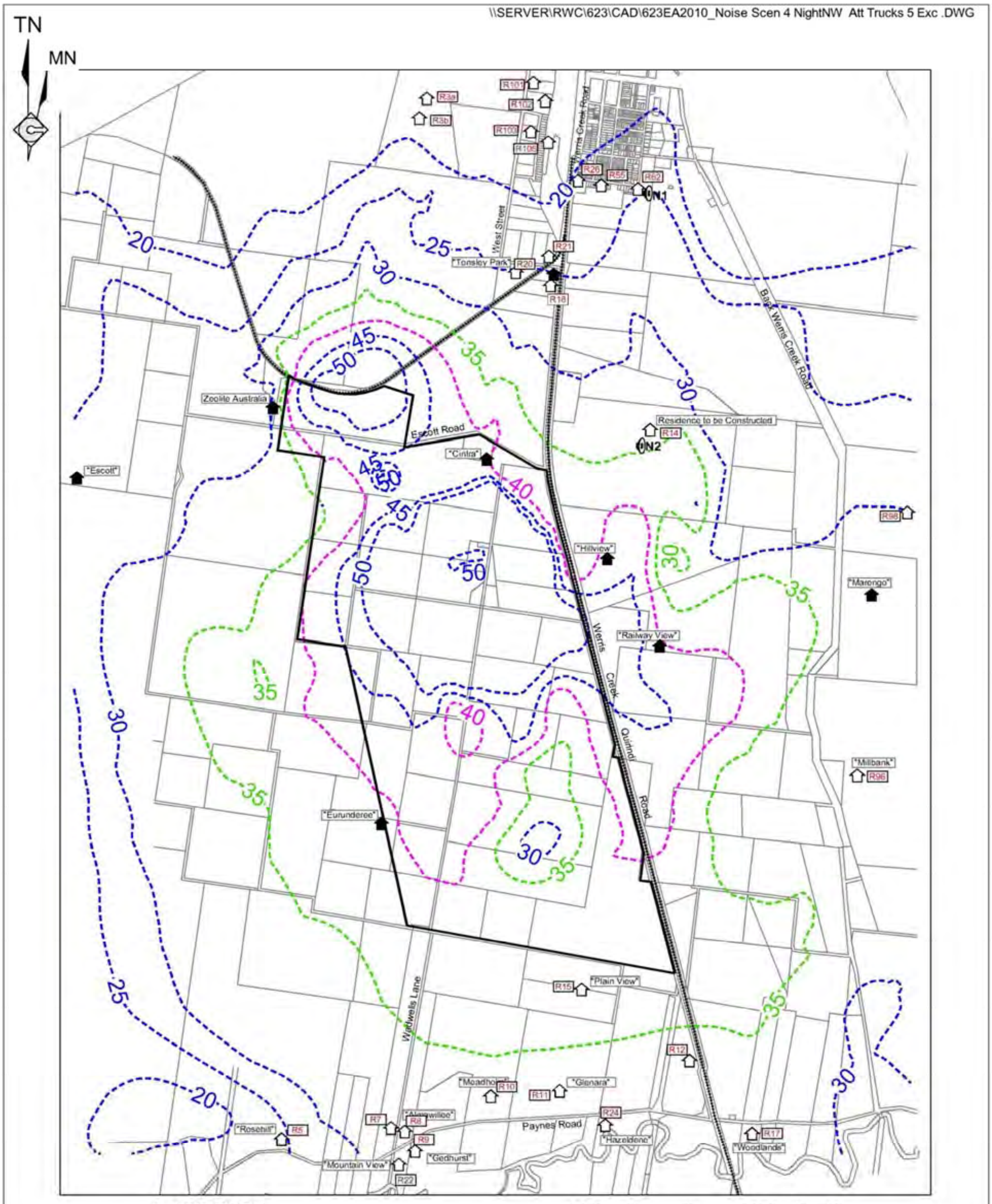
SCALE 1:50 000

0.5 0 0.5 1.0 1.5 2.0 2.5 km

Cadastral Information Source: LPI (Bathurst) - Digitised from DCDB
Land Ownership Source: LPI Title Search (2010)

Assumed Noise Attenuation and Mitigation Measures
- Attenuator Kit (8dB reduction) applied to haul trucks.
- 5m high noise barrier constructed on the northeastern side of the coal processing infrastructure.
- Dozers limited to 1600rpm in reverse (first gear)
- Surface mining equipment operating in advance of the open cut stood down.

Figure F22
NOISE CONTOUR PLOT FOR SCENARIO 4, NIGHT TIME OPERATIONS (12° INVERSION CONDITIONS)



REFERENCE

- Project Site Boundary
- "Eurunderee" Residence (Project-related)
- Gedhurst Residence (Non Project-related)
- Noise Contour

Note: Where any discrepancy between contour interpretation of noise level and point calculation (see Tables 9 to 16) is noted, the point calculation is the most accurate.

SCALE 1:50 000

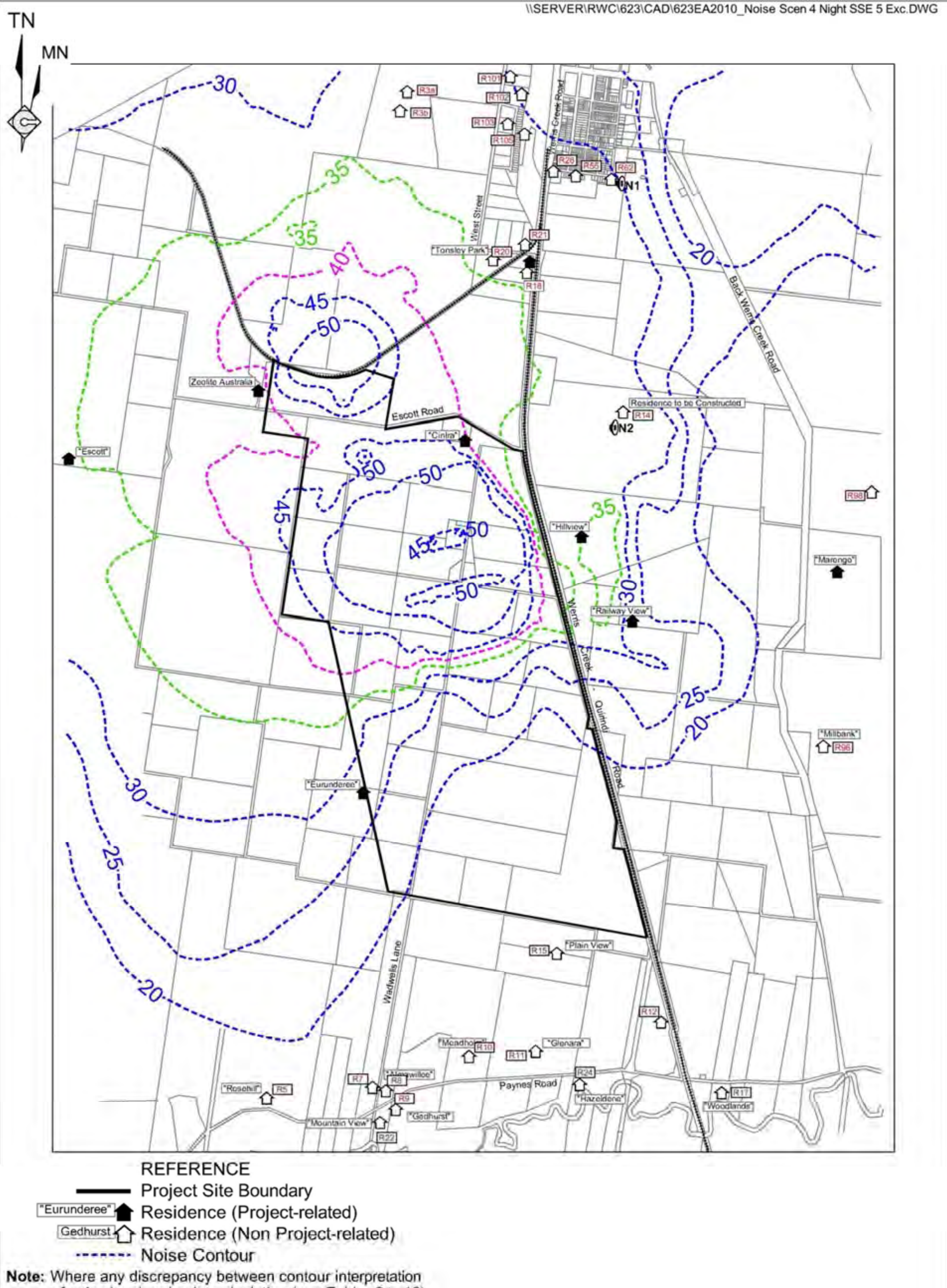
0.5 0 0.5 1.0 1.5 2.0 2.5 km

Cadastral Information Source: LPI (Bathurst) - Digitised from DCDB
Land Ownership Source: LPI Title Search (2010)

Assumed Noise Attenuation and Mitigation Measures

- Attenuator Kit (8dB reduction) applied to haul trucks.
- 5m high noise barrier constructed on the northeastern side of the coal processing infrastructure.
- Dozers limited to 1600rpm in reverse (first gear)
- Surface mining equipment operating in advance of the open cut stood down.

Figure F23
NOISE CONTOUR PLOT FOR SCENARIO 4, NIGHT TIME OPERATIONS (NORTH WEST WIND CONDITIONS)



Note: Where any discrepancy between contour interpretation of noise level and point calculation (see Tables 9 to 16) is noted, the point calculation is the most accurate.

Cadastral Information Source: LPI (Bathurst) - Digitised from DCDB
Land Ownership Source: LPI Title Search (2010)

Figure F24
NOISE CONTOUR PLOT FOR SCENARIO 4, NIGHT TIME OPERATIONS (SOUTH-SOUTHEAST WIND)