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ANGLO AMERICAN COAL

ACOUSTIC IMPACT ASSESSMENT

DRAYTON SOUTH COAL PROJECT
ENVIRONMENTAL IMPACT STATEMENT

REPORT J0130-100-R1
1 APRIL 2015

Prepared for:
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TABLE OF CONTENTS

EXECUTIVE SUMMARY

Bridges Acoustics was commissioned by Hansen Bailey on behalf of Anglo American Coal (Anglo American) to complete an acoustics impact assessment to form part of an Environmental Impact Statement being prepared by Hansen Bailey for the Drayton South Coal Project (the Project).

For the purpose of the assessment the assessed receptors were divided into two groups being the Drayton Mine receptors (located to the north) and the Drayton South area receptors (located generally to the south). Noise level criteria and the significance of any predicted noise levels above the criteria were determined from relevant NSW government policies and guidelines.

Predicted noise levels for the Project were modelled at sensitive receptors for indicative worst case scenarios for Years 4, 6 and 12 under both neutral and prevailing weather conditions. Additional model scenarios were undertaken to determine construction and sleep disturbance noise levels from the Project to ensure these issues were comprehensively assessed against relevant criteria. Predicted noise levels for both construction and operational activities include all feasible and reasonable noise management and mitigation measures.

No receptors are predicted to experience significant noise impacts of more than 5 dBA above relevant criteria as a result of the Project.

Two Drayton Mine receptors (402 and 403) are predicted to experience a moderate noise impact of 2 to 5 dBA above relevant criteria in the worst assessed year. An additional 7 Drayton Mine receptors (390, 398, 401, 411, 418, 421 and 423) are predicted to experience a negligible noise impact of up to 2 dBA above relevant criteria in the worst assessed year. All of these receptors experience some noise from existing operations at Drayton Mine, with the Project predicted to reduce noise levels at all of these receptors as mining activity is relocated from Drayton Mine to the more remote Drayton South.

All Drayton South receptors including the Coolmore Stud and Woodlands Stud properties are predicted to experience noise levels within relevant criteria and, in many cases, below existing background noise levels.

Predicted noise levels from construction activities within the Drayton South Project area will not exceed relevant operational noise criteria at any receptor. Proposed construction work associated with the realignment of Edderton Road would meet relevant construction noise criteria at all receptors.

Anglo American will revise the existing Drayton Mine noise management plan for the Project. Ongoing noise monitoring will also be undertaken to confirm compliance with the predicted noise levels in the assessment, including establishment of real time noise monitors at representative locations to enable ongoing noise management.

The Project is likely to require an average of up to five blast events per week during daylight hours to prepare overburden for removal and coal for recovery. The assessment found that blasting associated with the Project is predicted to produce ground vibration and overpressure levels within relevant disturbance criteria at all privately owned residences and structures.

Anglo American will update the existing Drayton Mine blasting management plan to include appropriate management and mitigation measures to ensure that relevant criteria are met for all privately owned residences, heritage structures and infrastructure.

GLOSSARY

The following acoustical terms are used in this report:

Sound Pressure	Small air pressure variations above and below normal atmospheric pressure that are perceived by human ears as sound;
Sound Power	Sound energy emitted by a source, measured in watts (W) or expressed on a decibel scale with 0 dB representing 1 picowatt (1 pW) of sound power. While both sound pressure (in pascals) and sound power (in watts) can be expressed on a decibel scale, they are not interchangeable or directly comparable. Sound power levels are most commonly expressed as unweighted decibels (dBL), particularly when referring to sound power levels in frequency bands, but can be expressed as A-weighted decibels (dBA).
Frequency	The rate of sound pressure or sound power fluctuations per second, expressed as cycles per second or hertz (Hz). Human ears in good condition can typically detect sound pressure in the frequency range 20 Hz to 20,000 Hz (20 kHz), depending on sound level;
Decibels, dB	A noise level unit based on a logarithmic scale of Pascals of sound pressure above and below atmospheric pressure, or watts of sound power. Expressing a sound level in decibels implies root-mean-squared (RMS) unless explicitly stated otherwise. Human ears in good condition can typically detect sound pressures from the threshold of perception at 0 dB (20 uPa) to the approximate threshold of pain at 140 dB (200 Pa). An increase of 10 dB is perceived as an approximate doubling of sound level by an average human ear;
dBL	Linear decibels, the same as dB but used to explicitly define a decibel scale in the absence of any weighting within the audible range;
dBA	A-weighted decibels, where the A weighting means frequencies below 500Hz and above 10kHz are artificially reduced to approximate the frequency response of an average human ear. Most sound monitoring instruments include an A-weighting option, enabling direct measurement of noise levels in dBA;
LA90	The A-weighted noise level exceeded 90% of the time (which can be thought of as the quietest 10% of the time) over a defined measurement period, usually 15 minutes or one hour, and widely accepted as the background noise level; and
LAeq	The A-weighted equivalent continuous, or logarithmic average, noise level over a defined time period either measured or predicted at a specific location.

1 INTRODUCTION

Drayton Mine is located approximately 13 km south of the township of Muswellbrook in the Upper Hunter Valley of NSW as shown in Figure 1. Drayton Mine has been operating in the Muswellbrook community for over 30 years and runs out of coal in 2015. Bridges Acoustics was commissioned by Hansen Bailey on behalf of Anglo American Coal (Anglo American) to complete an Acoustic Impact Assessment as part of the Environmental Impact Statement (EIS) for the Drayton South Coal Project (the Project).

The Project will allow for the continuation of the existing Drayton Mine for up to 15 years, by developing an open cut mining area within EL 5460. The Project will extract up to 6.4 Million tonnes per annum (Mtpa) of export quality thermal coal by utilising existing Drayton Mine assets and infrastructure.

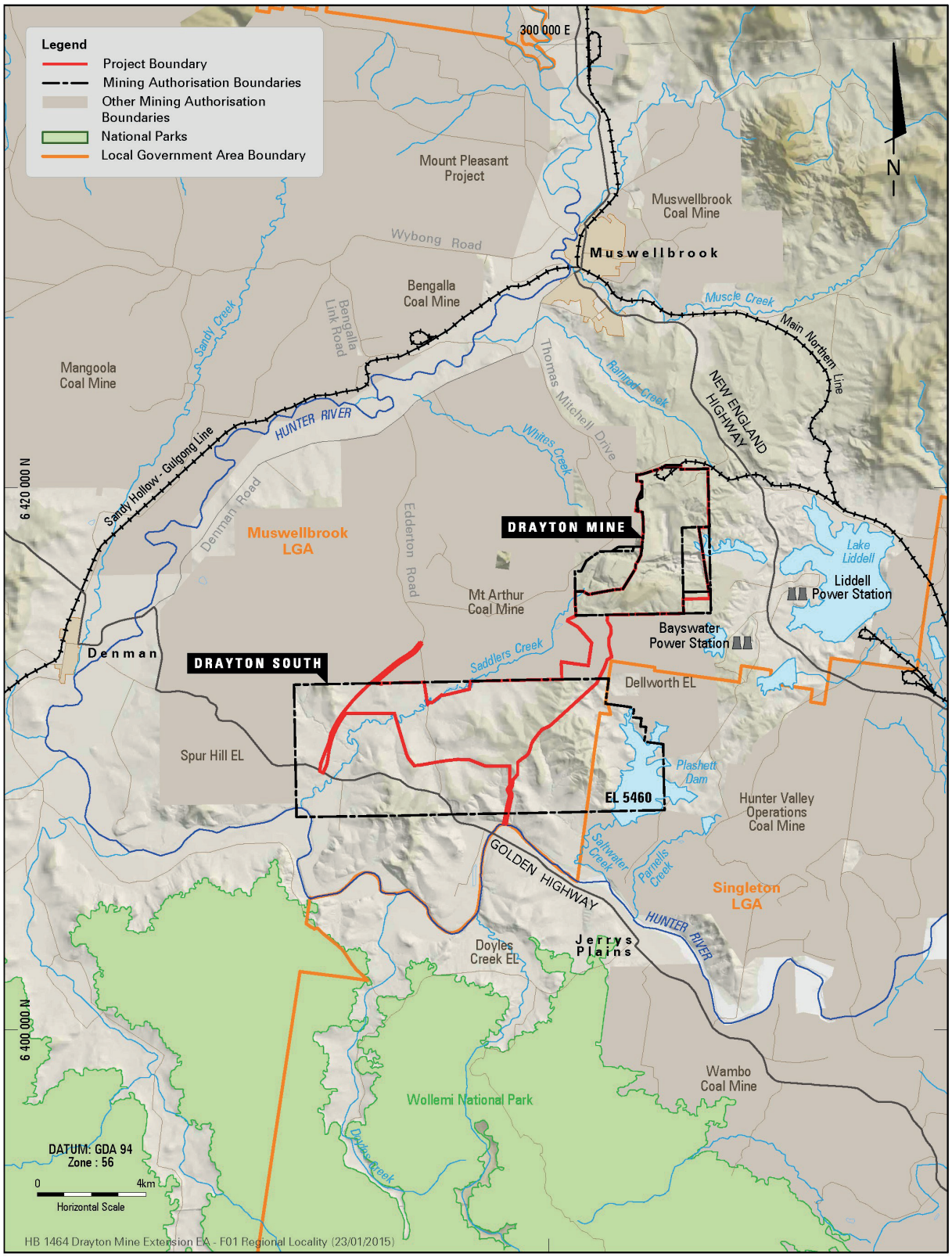
The Project addresses the reasons provided by the NSW Planning Assessment Commission (PAC) for the refusal of the previous application. The mine plan is defined by ridgelines nominated in the 'Drayton South Coal Project PAC Review Report' for the previous application issued in December 2013. The Project will remain behind the ridgelines nominated by the PAC. Significantly, this at least doubles the buffer setback distance from the Coolmore and Woodlands thoroughbred horse studs and is at least 2 km from the horse stud operational areas.

The Project generally includes:

- Continuation of operations at Drayton Mine as currently approved with minor additional mining within the existing East, North and South Mining Areas for a period of 15 years;
- Development of a new open cut mining area within EL 5460 mining up to 6.4 Mtpa of Run-Of-Mine (ROM) coal;
- Ongoing employment of a workforce of up to 500 full time equivalent employees;
- Utilisation of the existing Drayton Mine equipment fleet;
- Storage of water, and emplacement of tailings and rejects generated by the Project in existing Drayton Mine voids;
- Utilisation of the existing Drayton Mine infrastructure including the CHPP, rail loop and associated infrastructure, workshops, bath houses and administration offices;
- Construction of a transport corridor to the new mining area;
- Continued utilisation of the Antiene Rail Spur off the Main Northern Railway Line to transport product coal to the Port of Newcastle for export;
- Realigning and upgrading a section of Edderton Road;
- Continuation of mutually beneficial arrangements with neighbours Macquarie Generation and Mt Arthur Coal Mine;
- Installation of further water management and power reticulation infrastructure to support the new mining areas; and
- Progressive rehabilitation of disturbed areas as mining operations are completed.

Figure 2 illustrates the conceptual layout of the Project.

Figure 1: Regional Locality Plan.



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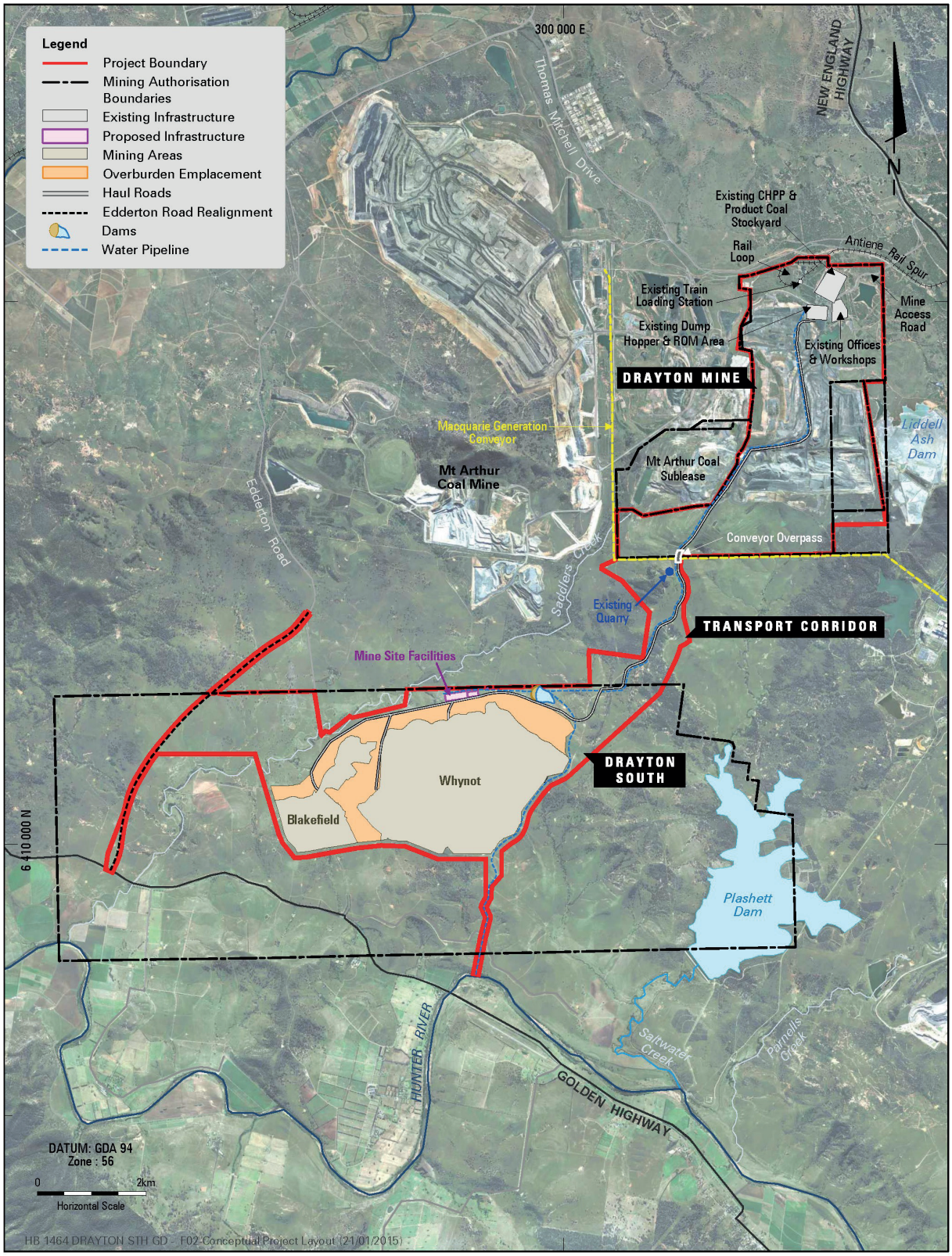
Regional Locality

FIGURE 1

Figure 2: Conceptual Project Layout Plan.



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Conceptual Project Layout

FIGURE 2

1.1 Receptors

The Project includes two main operational areas:

- The existing Drayton Mine; and
- The Drayton South area and transport corridor to Drayton Mine.

1.1.1 Drayton Mine

The northern boundary of Drayton Mine adjoins the Antiene Rail Spur and Thomas Mitchell Drive, with the Antiene rural residential area located on the northern side of Thomas Mitchell Drive. Drayton Mine's eastern boundary and part of the southern boundary adjoins AGL Macquarie's Bayswater Power Station, while the remainder of the southern boundary adjoins the proposed Transport Corridor and Drayton South and the western boundary adjoins Mt Arthur Coal Mine.

A land ownership plan for the area around Drayton Mine, showing land owned by Anglo American, other mining companies and private individuals or companies, is included in Figure A1 in Appendix A and in the relevant noise contour figures in Appendix B.

1.1.2 Drayton South

Drayton South is predominately located on rural land owned by Anglo American, with the exception of a small parcel of land owned by NSW Energy Coal (NSWEC) that would be required for the realignment of Edderton Road. Land adjoining the eastern boundary is owned by AGL Macquarie and contains Plashett Dam, Bayswater Power Station and Liddell Power Station. The village of Jerrys Plains and a number of rural residential properties are located to the south east. The southern boundary adjoins the Hunter River, Coolmore Stud, Woodlands Stud and Hollydene Estate. Rural land adjoins the western boundary with much of this land owned by members of the Wolfgang family. The northern boundary adjoins NSW Energy Coal's Mt Arthur Coal Mine and the proposed Transport Corridor to the existing Drayton Mine.

A land ownership plan for the area around Drayton South showing land owned by Anglo American, other mining companies and private individuals or companies, is included in Figure A2 in Appendix A and in the relevant noise contour figures in Appendix B.

1.2 Related Studies

Studies to be read in conjunction with this assessment include the following:

- The EIS air quality and greenhouse gas assessment;
- The EIS equine health impact assessment;
- The EIS non-Aboriginal heritage impact assessment; and
- The EIS traffic and transport impact assessment.

All data regarding traffic flows on roads in the vicinity of the Project, including existing traffic flows associated with Drayton Mine and proposed traffic flows associated with the Project, have been sourced from *Drayton South Traffic and Transport Impact Assessment* (the traffic report) (DC Traffic Engineering Pty Ltd, 2012) except where noted.

2 REGULATORY FRAMEWORK

This assessment investigates the noise and blasting impacts associated with the Project in accordance with current NSW Environment Protection Authority (EPA) guidelines and policies:

- The *NSW Industrial Noise Policy* (INP) (EPA, 2000) is intended to guide noise investigations from existing or proposed industrial developments including coal mines. The INP recommends procedures to determine:
  - background noise levels at receptor properties;
  - existing noise levels from an industrial site;
  - recommended, not mandatory, noise criteria for existing and proposed operations;
  - predicted noise levels from proposed developments; and
  - negotiation options if recommended noise criteria are not or may not be met.
- *Interim Construction Noise Guideline* (ICNG) (DECC, 2009) provides criteria, recommended hours and methods for assessing noise from construction work;
- The *NSW Road Noise Policy* (RNP) (DECCW, 2011) provides recommended noise criteria and assessment procedures for road traffic noise, including project-related traffic, from public roads but excludes noise produced by vehicle movements on the project site. The RNP also contains recommended sleep disturbance criteria;
- *Rail Infrastructure Noise Guideline* (RING) (EPA, 2013) provides criteria and methods to assess noise from train movements on publicly owned rail lines;
- *Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments* (VLAMP) (DPE, 2014);
- The *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration* (Blasting Guideline) (Australian and New Zealand Environment and Conservation Council (ANZECC), 1990) recommends residential ground vibration and overpressure limits and time restrictions for blasting;
- *Mining Near Prescribed Dams – Management and Monitoring Matters* (DSC4C) Dam Safety Committee (DSC), June 2010 provides conservative criteria with regard to blasting near dam wall embankments;
- *Assessing Vibration – a Technical Guide* (Vibration Guideline) (DEC, 2006) provides recommended criteria and methods for assessing vibration, primarily from construction activities such as pile driving but excluding vibration associated with blasting; and
- *DIN 4150 Part 3 – Structural Vibration: effects of vibration on structures* (DIN 4150) (ISO, 1999).

2.1 Secretary's Requirements

The Acoustic Impact Assessment was guided by the Secretary's Requirements. Relevant requirements, and sections of this report that address each of the requirements, are listed below:

- An assessment of the likely impacts of the development on the environment, focusing on the specific issues identified below, and including:
  - A description of the existing environment likely to be affected by the development (section 3), using sufficient baseline data (section 3.2);
  - An assessment of the likely impacts for all stages of the development (section 5.6), including appropriate worst case scenarios and consideration of any cumulative impacts (section 9), taking into consideration any relevant laws, environmental planning instruments, guidelines, policies, plans and industry codes of practice (section 2);

- A description of the measures that would be implemented to avoid, minimise, mitigate and/or offset the likely impacts of the development (section 5.3), and an assessment of:
  - Whether these measures are consistent with industry best practice, and represent the full range of reasonable and feasible mitigation measures that could be implemented (section 5.3);
  - The likely effectiveness of these measures, including performance measures where relevant (section 5.6); and
  - Whether contingency measures (including Trigger Action Response Plans) would be necessary to manage any residual risks;
- A description of the measures that would be implemented to monitor and report on the environmental performance of the development if it is approved (section 5.9);

- An assessment of noise and blasting issues, including:
  - A detailed assessment of the likely operational noise impacts of the development (section 5.6) (including construction noise (section 6)) under the NSW Industrial Noise Policy, paying particular attention to the obligations in chapters 8 and 9 of the policy;
  - If a claim is made for specific construction noise criteria for certain activities, then this claim must be justified (section 4.4) and accompanied by an assessment of the likely construction noise impacts of these activities under the Interim Construction Noise Guideline (section 6.3);
  - As assessment of the likely road noise impacts of the development under the NSW Road Noise Policy (section 7);
  - A detailed assessment of the likely blasting impacts of the development (including noise, vibrations, overpressure, visual and odour) on people, livestock, heritage items, infrastructure and significant natural features, having regard to the relevant ANZEC guidelines and relevant agency requirements (see Attachment 2) (section 10).

The potential effects of blasting on livestock have been considered in the EIS equine health impact assessment, while any visual and odour impacts associated with blasting have been addressed in the EIS Visual impact assessment report and the EIS Air quality and greenhouse gas impact assessment report, respectively.

3 EXISTING ENVIRONMENT

The Project site covers a large area which results in different acoustic environments in various receptor areas. In particular, the existing acoustic environment in Antiene to the north includes existing noise from Drayton Mine and Mt Arthur Coal Mine including both rail loops, while the Drayton South Project area is a greenfield site and receptor areas near this site do not currently receive noise from the existing Drayton Mine. Receptors in Antiene near the existing Drayton Mine are therefore considered separately from other receptors.

3.1 Drayton Mine

Background noise data for Antiene have been reported in previous environmental assessments for both Mt Arthur Coal Mine and Drayton Mine.

3.1.1 Mt Arthur Coal Mine EA

The *Mt Arthur Coal Open Cut Modification Environmental Assessment* (Mt Arthur Coal Mine EA) (Resource Strategies, 2013) included an assessment of background noise levels at potentially affected

receptor locations around Mt Arthur Coal Mine. The *Mt Arthur Coal Open Cut Modification Noise and Blasting Assessment* (Mt Arthur Coal Mine NIA) (Wilkinson Murray, 2013) which was attached as Appendix G to the Mt Arthur Coal Mine EA, reviewed previous noise monitoring results from 1999 to 2009 and concluded:

- Antiene Estate background noise levels are 32 / 35 / 33 dBA (Day/Evening/Night); and
- East Antiene background noise levels are 36 / 35 / 34 dBA (Day/Evening/Night).

Some noise contribution from Drayton Mine may have been included in the measured background noise levels reported in the Mt Arthur Coal Mine EA but must be excluded from the measured levels when determining noise criteria for the Project. This requirement precludes further use of Mt Arthur Coal Mine background noise data for this assessment.

3.1.2 Drayton EA

The *Drayton South Project Environmental Assessment* (Drayton EA) (Hansen Bailey, 2007) included an assessment of background noise levels at representative receptor properties based on results from regular noise monitoring completed by Drayton Mine staff and Spectrum Acoustics. Discussions with the EPA (then Department of Environment and Conservation (DEC)) resulted in a more conservative approach, by taking the lowest rather than the median background level in each time period, being adopted for the Drayton EA noise assessment.

Background noise levels at each receptor were determined in the EA based on proximity to a background noise monitoring location, wooded areas and Mt Arthur Coal Mine, the New England Highway and Thomas Mitchell Drive. Properties in the approximate centre of the Antiene rural residential area which are relatively remote from main roads and partly shielded from Mt Arthur Coal Mine noise, or in the eastern part of Antiene remote from both the New England Highway and Mt Arthur Coal Mine, were assigned lower background noise levels as shown in Table 1. Adopted background levels were determined for the most sensitive night period and were applied in the Drayton EA during all time periods.

Table 1: Adopted Background Noise Levels at Antiene Receptors, LA90,15min.

Receptor Area	Receptor Group	Receptor Properties	Adopted Background Level, LA90,15min
Western Antiene	A	382, 383, 387, 390, 398, 399	32
Central Antiene	B	384, 386, 400, 401, 402, 403	30
Near the New England Highway	A	385, 411, 418, 419, 420, 421, 423, 424, 425, 427, 429, 431, 432, 433, 435, 438, 439, 440, 443, 444, 445, 446, 460	32
Eastern Antiene	B	441, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459	30

Properties in western Antiene and near the New England Highway are combined into Receptor Group A, while remaining properties in central and eastern Antiene are combined into Receptor Group B, for the purposes of assigning noise criteria in this assessment.

3.2 Drayton South – Long Term Noise Survey

A background noise survey was completed at four representative receptor locations shown in Figure A2 in Appendix A:

- Location M1 South East – In Jerrys Plains township on the eastern corner of Pagan Street and Pearse Street;

- Location M2 South – Adjacent to the Strowan residence on land owned by Coolmore Australia;
- Location M3 South West – Adjacent to a private residence on Property 250 to the south west of the Project; and
- Location M4 North West – Near the northern boundary of Anglo American owned land approximately 300m west of Edderton Road.

Acoustic Research Laboratories EL-315 Type 1 or EL-215 Type 2 noise monitors were installed at each location for the period 23 June to 5 July 2011.

Each noise monitor was programmed to measure and store 15 minute percentile statistics which have been further processed according to INP guidelines to determine background and ambient noise levels. Summaries of results are shown in Tables 2 to 5. Entries in Tables 2 to 5 in brackets show weather affected data that have been excluded from the median Rating Background Level (RBL) and average LAeq calculations. More complete results from the noise monitors, in the form of daily charts showing data in 15 minute intervals, are attached in Appendix E.

Table 2: Measured Noise Levels, Location M1 South East, dBA.

Day, Date	Background Level, LA90,15min			Ambient Level LAeq,15min		
	Day	Evening	Night	Day	Evening	Night
Thu 23 – Fri 24/6	-	31.1	31.8	-	48.9	44.7
Fri 24 – Sat 25/6	37.2	33.0	32.6	48.9	49.8	44.4
Sat 25 – Sun 26/6	35.1	36.1	35.3	49.6	46.1	43.2
Sun 26 – Mon 27/6	(38.4)	31.4	30.3	(51.1)	48.3	44.1
Mon 27 – Tue 28/6	33.5	33.0	33.9	51.2	47.7	45.1
Tue 28 – Wed 29/6	36.4	32.5	(32.8)	51.9	45.5	(46.1)
Wed 29 – Thu 30/6	39.6	37.5	36.1	50.4	48.0	45.7
Thu 30 – Fri 1/7	38.5	35.8	34.9	51.7	48.7	46.0
Fri 1 – Sat 2/7	37.2	34.6	32.6	49.7	47.5	41.8
Sat 2 – Sun 3/7	37.4	37.2	35.2	49.4	45.6	42.6
Sun 3 – Mon 4/7	37.9	38.1	34.6	51.2	49.0	45.2
Mon 4 – Tue 5/7	(39.7)	32.3	(30.7)	(51.4)	46.0	(42.0)
Weekly Median / Average	37.2	33.8	34.2	50.6	47.8	44.5

Table 3: Measured Noise Levels, Location M2 South, dBA.

Day, Date	Background Level, LA90,15min			Ambient Level LAeq,15min		
	Day	Evening	Night	Day	Evening	Night
Thu 23 – Fri 24/6	-	33.8	33.4	-	44.5	44.5
Fri 24 – Sat 25/6	36.8	32.9	33.0	47.8	47.6	42.4
Sat 25 – Sun 26/6	33.5	33.2	31.9	46.6	46.4	40.3
Sun 26 – Mon 27/6	(34.4)	29.2	29.0	(49.7)	46.3	43.6
Mon 27 – Tue 28/6	32.6	31.0	32.6	46.8	47.8	45.0
Tue 28 – Wed 29/6	35.4	30.7	(32.7)	49.8	42.8	(42.5)
Wed 29 – Thu 30/6	37.9	34.9	34.8	51.1	45.4	45.1
Thu 30 – Fri 1/7	35.1	35.0	35.0	47.4	46.8	45.9
Fri 1 – Sat 2/7	35.2	33.1	30.7	49.7	45.9	39.6
Sat 2 – Sun 3/7	33.1	34.6	32.8	47.5	45.2	39.1
Sun 3 – Mon 4/7	33.1	35.1	-	46.1	48.7	-
Weekly Median / Average	35.1	33.2	32.8	48.4	46.4	43.5

Table 4: Measured Noise Levels, Location M3 South West, dBA.

Day, Date	Background Level, LA90,15min			Ambient Level LAeq,15min		
	Day	Evening	Night	Day	Evening	Night
Thu 23 – Fri 24/6	-	25.1	19.7	-	40.0	37.7
Fri 24 – Sat 25/6	26.8	21.7	20.1	44.7	36.8	34.6
Sat 25 – Sun 26/6	28.7	27.9	26.5	47.1	40.1	38.5
Sun 26 – Mon 27/6	(30.3)	22.7	21.4	(48.4)	41.4	35.0
Mon 27 – Tue 28/6	27.4	28.0	24.8	48.0	41.7	39.5
Tue 28 – Wed 29/6	32.0	25.5	(25.1)	50.1	39.7	(39.0)
Wed 29 – Thu 30/6	31.7	29.8	26.3	47.7	40.6	37.9
Thu 30 – Fri 1/7	29.5	25.8	25.3	47.5	38.9	40.6
Fri 1 – Sat 2/7	27.9	-	-	47.9	-	-
Weekly Median / Average	28.7	25.7	24.8	47.8	40.1	38.1

Table 5: Measured Noise Levels, Location M4 North West, dBA.

Day, Date	Background Level, LA90,15min			Ambient Level LAeq,15min		
	Day	Evening	Night	Day	Evening	Night
Thu 23 – Fri 24/6	-	21.8	24.5	-	32.8	37.6
Fri 24 – Sat 25/6	27.7	21.5	22.9	41.8	38.6	41.7
Sat 25 – Sun 26/6	24.7	22.2	25.1	43.8	36.7	35.0
Sun 26 – Mon 27/6	(27.9)	18.2	18.6	(43.2)	34.9	36.5
Mon 27 – Tue 28/6	25.8	22.8	25.2	42.4	35.7	37.2
Tue 28 – Wed 29/6	32.8	26.0	(27.5)	47.8	39.8	(46.6)
Wed 29 – Thu 30/6	37.5	29.1	27.0	59.4	39.9	39.3
Thu 30 – Fri 1/7	33.2	28.8	27.6	50.1	40.2	38.4
Fri 1 – Sat 2/7	28.1	26.3	24.6	43.0	39.1	32.4
Sat 2 – Sun 3/7	23.7	29.0	25.1	42.2	38.3	35.2
Sun 3 – Mon 4/7	26.9	29.7	26.4	51.1	37.9	38.1
Mon 4 – Tue 5/7	(33.3)	32.2	(35.4)	(46.8)	46.8	(45.1)
Weekly Median / Average	27.7	26.2	25.1	51.4	40.0	37.8

3.3 Drayton South - Short Term Noise Survey

A series of short term noise measurements, over 15 minute periods, was completed in conjunction with the long term noise surveys to identify sources of background and ambient noise at each monitoring location. A Svan 912AE sound level meter was used to measure 1/3 octave percentile noise levels over 15 minute periods at each location while survey staff noted dominant and audible noise sources. Results from the surveys are summarised in Table 6 with measured or estimated noise contributions shown for selected audible sources.

Table 6: Short Term Noise Survey Results, All Locations, dBA.

Location	Period Date Time	Measured Noise Levels			Audible Noise Sources
		LAmax	LAeq	LA90	
Group C M1 South East	Day 1 10/6 14:25	58	46	37	Traffic, birds, occasional wind
	Day 2 10/6 16:45	69	52	42	Traffic, birds, local cars
	Evening 1 10/6 21:15	62	49	36	Traffic, distant dogs
	Evening 2 23/6 20:00	63	47	29	Traffic, distant insects/frogs
	Night 1 11/6 02:10	61	40	32	Mining to north east (< 23), dogs, air conditioner on Telstra exchange
	Night 2 24/6 02:15	63	44	35	Traffic, dogs, mining to north east (<26)
Group C M2 South	Day 1 10/6 13:55	53	46	41	Mower, traffic, wind, birds
	Day 2 10/6 17:07	57	45	38	Traffic, birds
	Evening 1 10/6 20:50	59	48	36	Traffic, distant insects
	Evening 2 23/6 19:15	57	44	35	Traffic, distant insects
	Night 1 11/6 01:45	54	36	31	Air conditioner, insects, industrial noise to east (< 24)[1], traffic
	Night 2 24/6 01:45	58	36	33	Traffic, insects, mining to north east (< 25), house water pump
Group D M3 South West	Day 1 10/6 13:35	57	42	28	Traffic, birds
	Day 2 10/6 17:35	61	43	31	Traffic, air conditioner, horses
	Evening 1 10/6 20:25	55	44	30	Air conditioner, traffic, birds
	Evening 2 23/6 18:50	57	43	31	Traffic, frogs/insects
	Night 1 11/6 00:35	56	36	30	Air conditioner, intermittent traffic
	Night 2 24/6 01:15	59	34	24	Traffic, insects/frogs, Mt Arthur Coal Mine (22)
Group D M4 North West	Day 1 10/6 13:10	64	38	30	Wind, traffic, birds, animals
	Day 2 10/6 18:05	57	43	29	Traffic, plane, distant insects
	Evening 1 10/6 19:45	55	40	27	Traffic, distant insects
	Evening 2 23/6 18:15	55	39	29	Traffic, wind, animals, distant insects, plane
	Night 1 11/6 01:07	61	41	28	Mt Arthur Coal Mine (28), animals, traffic
	Night 2 24/6 00:45	55	30	26	Mt Arthur Coal Mine (28), horses, distant birds and insects

1 This industrial noise source heard at M2 during the night was not sufficiently audible to determine the source. Potential sources are AGL Macquarie's Hunter River Pump Station or Hunter Valley Operations.

3.4 Drayton South - Adopted Background Levels

Background noise levels tend to vary substantially due to seasonal and other factors, with generally higher levels to the south east (M1) and south (M2) compared to the other two locations (south west M3 and north west M4). The dominant sources of background noise at M1 and M2 are Golden Highway traffic, distant insects and distant mining or other industrial noise, although traffic tends to be the dominant source for much of the time. Noise from individual vehicles tends to be audible for longer periods of time, with receptor locations M1 and M2 exposed to a greater length of highway and this section of the highway on relatively flat ground. In contrast, locations M3 and M4 are less affected by highway noise due to the undulating terrain and, for M4 in particular, increased distance from the highway.

Noise from Hunter Valley Operations was occasionally audible at M1 and may have influenced the background noise level at this location. Table 7 shows background levels adopted for this assessment for two receptor groups, with adopted background noise levels for M1 and M2 taken from the M2 noise monitoring results to minimise any influence from intermittent Hunter Valley Operations noise.

Table 7: Adopted Rating Background Levels.

Receptor Area	Rating Background Level, LA90,15min		
	Day	Evening	Night
Receptor Group C M1 – Jerrys Plains and surrounds M2 – Coolmore Stud	35	33	33
Receptor Group D M3 – Woodlands Stud, private properties M4 – private properties	30	30	30

3.5 Existing Industrial Noise Levels

Noise levels from existing industrial sources, including mines, must be determined in order to derive appropriate noise amenity criteria. Significant sources of industrial noise that have the potential to be audible at assessed receptors include:

- Hunter Valley Operations to the east;
- AGL Macquarie's Hunter River Pump Station;
- AGL Macquarie's Bayswater and Liddell Power Stations; and
- Mt Arthur Coal Mine.

Existing noise from Drayton Mine has been excluded from this part of the assessment, as future noise from Drayton Mine is assessed as part of the Project.

3.5.1 Hunter Valley Operations

Noise from Hunter Valley Operations was noted at M1 and M2 during the short term noise survey and would have affected the results of the long term noise survey to a minor extent. Measured noise levels during the short term survey indicated mining noise contributed up to 26 dBA at M1 and up to 25 dBA at M2 during the night.

Hunter Valley Operations is approximately 4.6 km from Jerrys Plains and does not have a direct line of sight to the township. Mining noise was not audible during the day and evening at M1 or M2.

3.5.2 Hunter River Pump Station

AGL Macquarie operates the Hunter River Pump Station on the north bank of the Hunter River to pump water to Plashett Dam or to Bayswater Power Station for power station cooling. An industrial noise source was just audible at M2 during the night and, although the noise level was too low to allow reliable identification of the source, it is possible that the Hunter River Pump Station was the source of this noise.

A noise level of 24 dBA estimated at M2 during the night survey on 11 June 2011 has been attributed to the Hunter River Pump Station for the purposes of determining noise amenity criteria and the cumulative noise assessment in this report. A similar noise levels is assumed to occur at Location M1 at a similar distance from the Hunter River Pump Station.

3.5.3 Bayswater and Liddell Power Stations

AGL Macquarie's Bayswater and Liddell Power Stations are approximately 7 and 6 km from nearest Antiene receptors and approximately 11 km and 15 km from receptors near Drayton South. Noise from the power stations may occasionally be audible at closest Antiene receptors but has not been noted as a significant noise source. Environment Protection Licence (EPL) 779 for Bayswater Power Station and EPL 2122 for Liddell Power Station have been reviewed and do not specify noise limits at receptor properties.

In the absence of evidence that noise from the power stations is audible at potentially affected properties near the Project, an assumed worst case noise level of 25 LAeq,15min has been attributed to closest Antiene receptors from both power stations combined.

3.5.4 Mt Arthur Coal Mine

Mt Arthur Coal Mine undertakes open cut and underground mining operations adjacent to the western boundary of Drayton Mine and the northern boundary of Drayton South. Condition 2 of the modified Project Approval 09_0062 for Mt Arthur Coal Mine Open Cut Consolidation Project dated 26 September 2014 specifies noise limits for various receptor areas. Table 2 in the Project Approval is reproduced in Table 8 below.

Table 8: Mt Arthur Coal Mine Noise Limits (Table 2 of Project Approval 09_0062), dBA.

Location		Day LAeq,15min	Evening LAeq,15min	Night LAeq,15min	Night LA1,1min
A	Antiene Estate[1]	37	40	38	45
B	Skelletar Stock Route, Thomas Mitchell Drive, Denman Road East	39	38	37	45
C	Racecourse Road	41	40	39	45
D	Denman Road North-West, Roxburgh Vineyard (North-East), Roxburgh Road	37	36	35	45
E	South Muswellbrook	39	39	39	45
F	Denman Road West, Roxburgh Vineyard (West)	37	36	35	45
G	East Antiene[1]	41	40	39	45
H	South of Mine	35	35	35	45

1 Reference to the Residential Assessment Zones plan in Appendix 5 of the Mt Arthur Coal Project Approval indicates 'Antiene Estate' refers to Properties 387, 390, 398, 399, 400, 401, 402, 403, while 'East Antiene' refers to all other Antiene properties.

Higher noise criteria for 'East Antiene' properties reflect higher background noise levels due to New England Highway traffic rather than higher predicted noise levels from Mt Arthur Coal Mine, as Mt Arthur Coal Mine is further from East Antiene properties. Reasonable worst case noise levels due to Mt Arthur Coal Mine are therefore assumed to be the noise limits listed in Table 8 for Antiene Estate.

Noise survey results at M4 also provide an indication of Mt Arthur Coal Mine noise levels with an estimated 28 LAeq,15min measured from Mt Arthur Coal Mine during the night at this location. A reasonable worst case noise level of 30 dBA has been adopted for Mt Arthur Coal Mine at M4 and less than 25 dBA has been adopted at M1 to M3 inclusive.

3.5.5 Combined Industrial Noise Levels

Existing industrial noise levels during the night to representative receptor areas, excluding noise from Drayton Mine which is included in the Project, are shown in Table 9. Day and evening noise levels from all industrial developments would be lower than the night levels and have not been specifically assessed. Mt Arthur Coal Mine's noise contribution at Receptor Group B in Antiene, which includes central Antiene receptors partly shielded from Mt Arthur Coal Mine noise and east Antiene receptors more remote from the New England Highway and Mt Arthur Coal Mine, has been conservatively estimated at 2 dBA lower than Mt Arthur Coal Mine's noise contribution at more exposed receptors.

The noise levels discussed above are all LAeq,15min levels, which means the average noise level in a representative worst case 15 minute period including significant noise enhancement during the evening and night. As weather conditions tend to vary from time to time and would not remain strongly noise enhancing for an entire night, the average noise level over a night is lower than the reported LAeq,15min noise levels. A conservative correction factor of -3 dBA has been adopted to estimate LAeq,night noise levels from the reported LAeq,15min levels.

Table 9: Existing Industrial Noise Levels, Night, dBA.

Industrial Noise Source	Existing Noise Levels, LAeq,15min					
	Group A Antiene	Group B Antiene	Group C		Group D	
			M1	M2	M3	M4
Hunter Valley Operations	-	-	23	22	-	-
Hunter River Pump Station	-	-	21	21	-	-
Bayswater and Liddell Power Stations	22	22	-	-	-	-
Mt Arthur Coal Mine	35	33	< 22	< 22	< 22	27
Combined Industrial Noise Level, Night	35	33	26	25	< 22	27

4 CRITERIA

4.1 Mining Noise

The INP contains Project Specific Noise Levels (PSNLs), which are the target noise levels recommended in the INP below which noise impacts are considered unlikely, for residential receptors. Intrusive PSNLs are set 5 dBA above the adopted RBL in each time period and are designed to limit the relative audibility of mining or industrial operations. These PSNLs can be adjusted by one or more 'modifying factors' such as tonality or impulsiveness described in Section 4 of the INP.

Amenity limits recommended in the INP depend on existing industrial noise levels and the nature of the receptor area and are designed to control the total or cumulative level of industrial noise at a sensitive receptor such as a residence. Amenity criteria are set to the amenity limits in cases where limited industrial noise is currently received, or to lower levels to ensure the cumulative impact of existing and proposed noise sources does not exceed the amenity limit for each time period.

For the purposes of determining appropriate noise amenity criteria, all assessed receptors have conservatively been assigned the 'rural' amenity category although it could be argued that some Antiene receptors should be assigned a higher category due to almost continuous traffic noise from the New England Highway and Thomas Mitchell Drive. Table 10 shows the intrusive PSNLs and amenity criteria adopted for this assessment and the method used to determine these criteria for the four receptor groups, for assessing noise from the Project alone.

Table 10: Adopted Operational Noise Criteria, Project Noise Only.

	Noise Criteria Day/Evening/Night[1]			
Receptor Group	A Antiene	B Antiene	C South	D West
Background level LA90,15min (Section 2)	32/32/32	30/30/30	35/33/33	30/30/30
Intrusive PSNLs LAeq,15min (LA90 + 5)	37/37/37	35/35/35	40/38/38	35/35/35
Amenity limit LAeq,period (INP, rural)	50/45/40	50/45/40	50/45/40	50/45/40
Existing industrial level (Table 9)	35/35/35	33/33/33	26/26/26	27/27/27
Amenity criteria LAeq,period (INP Table 2.2)	50/45/38	50/45/40	50/45/40	50/45/40

1 Day (7am to 6pm), Evening (6pm to 10pm), Night (10pm to 7am). Night ends, and day begins, at 8am on Sundays and public holidays.

4.2 Where Criteria May be Exceeded

PSNLs listed in Table 10 should be considered the levels above which some acoustic impact may be noticed by receptors. Higher noise levels at a receptor do not necessarily imply the noise is unacceptable at that receptor. The INP describes strategies to deal with potential exceedances of the PSNLs such as:

- best practice noise mitigation measures applied to individual plant items and mine operating procedures designed to mitigate remaining noise impacts;
- negotiation of offset arrangements with the affected community;
- adoption of alternative noise criteria based on achievable noise levels where all feasible and reasonable noise mitigation measures have been implemented and the affected community has been consulted, considering other factors such as social worth attached to the development and historical noise levels from existing related developments; and
- acquisition of properties where the predicted or measured noise impacts are unacceptable and other options cannot reasonably be negotiated.

The NSW government's *Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments* (VLAMP) also describes appropriate consultation, mitigation and acquisition procedures where the PSNLs cannot be met at one or more residential receptors. The VLAMP recommends mitigation and/or acquisition offers to landowners for four separate levels of noise impact as shown in Table 11.

Table 11: VLAMP Noise Impact Categories and Recommended Responses.

Noise Impact Category	Project Noise Level at Residential Receptor	Recommended Mitigation/Acquisition Offer
Negligible	0-2 dBA above PSNL at residence	Not a discernible noise impact – no offer required
Marginal	3-5 dBA above PSNL and Project contributes less than 1 dBA at residence	Mechanical ventilation and air conditioning
Moderate	3-5 dBA above PSNL and Project contributes more than 1 dBA at residence	Mechanical ventilation and air conditioning, façade upgrade
Significant	More than 5 dBA above PSNL at residence	Mechanical ventilation and air conditioning, façade upgrade, property acquisition
Significant	More than 5 dBA above amenity limit over 25% of land area	Property acquisition

4.3 Cumulative Noise Levels

The amenity limits recommended in the INP are intended to control the total noise level at a receptor from all industrial and mining developments. Cumulative noise levels are therefore assessed to the amenity limits shown in Table 10 which are:

- 50 LAeq,11hr during the day;
- 45 LAeq,4 hr during the evening; and
- 40 LAeq,9hr during the night.

4.4 Construction Noise

Construction noise levels from most developments are normally assessed to the *Interim Construction Noise Guideline* (ICNG). Section 1.2 of the ICNG states it does not apply to industrial sources, including construction associated with quarrying and mining, and suggests this activity should be assessed under the INP. Section 1.3 of the INP, however, specifically excludes construction noise.

A future revision of the INP is expected to address this gap. As the ICNG is the most recent policy document, noise criteria applied to proposed construction work directly associated with mine infrastructure are sourced from the INP and are therefore identical to mine operational criteria as shown in Table 10.

Realignment of Edderton Road would be required to avoid the proposed mining area. As road reconstruction work would occur away from the mining area and is not directly related to mine infrastructure, construction noise associated with Edderton Road construction works would be assessed to the criteria recommended in the ICNG. Table 2 of the ICNG recommends two management levels during normal construction hours of 7 am to 6 pm Monday to Friday and 8 am to 1 pm Saturday:

- A 'noise affected' level of 10 dBA above the background noise level, or 40 LAeq,15min; and
- A 'highly noise affected' level of 75 LAeq,15min.

4.5 Sleep Disturbance

Sleep disturbance can be caused by a short, sharp sound that is noticeably louder than the typical noise level within a bedroom. Historically, sleep disturbance criteria were sourced from the *Environmental Noise Control Manual* (EPA, 1985) and the INP Application Notes suggest the historical noise criterion of 15 dBA above the night background noise level may be overly conservative however should continue to be used in the absence of an alternative supported by research. The INP Application Notes also point to the *NSW Road Noise Policy* (RNP) for guidance on noise-induced sleep disturbance effects.

The RNP acknowledges the effects of noise on sleep disturbance have not yet been conclusively determined. Nevertheless, Section 5.4 of the RNP states:

> *From the research on sleep disturbance to date it can be concluded that:*
>
> - *maximum internal noise levels below 50–55 dB(A) are unlikely to awaken people from sleep;*
> - *one or two noise events per night, with maximum internal noise levels of 65–70 dB(A), are not likely to affect health and wellbeing significantly.*

The suggested awakening criteria of 50-55 dBA inside a bedroom are approximately equivalent to an external noise level of 60-65 dBA assuming bedroom windows remain partly open for ventilation. Similarly, the suggested health criteria of 65-70 dBA inside a bedroom are approximately equivalent

to an external noise level of 75-80 dBA assuming bedroom windows remain partly open for ventilation.

Table 12 shows relevant sleep disturbance criteria, including the historical criteria and more recent guidance in the RNP. Sleep disturbance criteria apply during the night period 10pm to 7am, at a point 1m outside a potentially affected bedroom window.

Table 12: Sleep Disturbance Criteria, Night, LA1,1min.

	Noise Criteria LA1,1min, 10pm to 7am			
Receptor Group	A Antiene	B Antiene	C South	D West
Background level LA90,15min (Section 2)	32	30	33	30
Historical Criteria LA1,1min (LA90 + 15)	47	45	48	45
RNP Awakening Criteria	60 - 65			
RNP Health Criteria	75 - 80			

Noise levels within the conservative historical criteria are considered unlikely to cause sleep disturbance, while noise levels less than 60 LA1,1min are unlikely to cause awakening reactions according to the RNP. Where noise levels are predicted to exceed the historical criterion, further information regarding maximum noise levels such as time of night and number of events is required to assess the potential effect of noise on sleep.

4.6 Road Traffic Noise

The Project would not generate significant traffic on the Golden Highway and Edderton Road after construction work associated with the realignment of Edderton Road is completed, as all vehicular access to the Project would occur via Thomas Mitchell Drive and the Drayton Mine Access Road. Traffic noise criteria primarily apply to operational traffic, as construction related traffic only occur for a relatively brief period compared to the life of the Project.

Relevant road traffic noise criteria are listed in Table 3 in the RNP. Noise criteria for Situation 3 "Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments", which applies to road traffic on the New England Highway and Thomas Mitchell Drive, are 60 LAeq,15hr during the day and 55 LAeq,9hr during the night for residential receptors. The LAeq,15hr and LAeq,9hr parameters refers to the average traffic noise level over an entire 15 hour day or 9 hour night. Recommended noise criteria apply to all traffic including vehicles associated with the Project and other vehicles on the roads.

Construction work associated with the Edderton Road realignment would generate traffic on Edderton Road, the Golden Highway and Denman Road. Traffic noise criteria for these roads would be the same as the operational traffic noise criteria discussed above.

4.7 Rail Traffic Noise

Rail noise criteria in this section apply to train movements on publicly owned rail lines such as the Main Northern Railway and on the privately owned Antiene Rail Spur which currently serves Drayton Mine and would continue to serve the Project.

Noise criteria are sourced from the *Rail Infrastructure Noise Guideline* (RING) which recommends trigger levels of 65 LAeq,15hr during the day, 60 LAeq,9h during the night and 85 LAmax at any time for receptors near the Main Northern Line. Similarly, condition L2.2 of EPL 3142 issued to the Australian Rail Track Corporation (ARTC), which regulates train movements on all railways

controlled by ARTC, specifies noise level objectives of 65 LAeq,15hr day, 60 LAeq,9hr night and 85 LAmax at one metre from the façade of affected residential premises.

The RING also recommends noise criteria for train movements on private rail lines serving industrial premises such as the Antiene Rail Spur. Section 1.4.5 of the RING refers to Appendix 3 which recommends the amenity limits shown in Table 10 above be adopted at all receptors near the Antiene Rail Spur.

4.8 Low Frequency Noise

Section 4 of the INP recommends low frequency noise levels should be considered in the normal operational noise criteria by the addition of a 'modifying factor' to either a source sound power level or a received noise level. A modifying factor of 5 dBA is recommended where there is a significant low frequency component at the receptor, while a significant low frequency component is defined in the INP as a dBC – dBA difference of more than 15 dB.

4.9 Blast Overpressure and Vibration

Current noise and vibration criteria for occupied buildings such as residences, schools and hotels are recommended in the Blasting Guideline. Recommended noise and vibration limits are:

- Overpressure 115 dBL; and
- Ground vibration 5mm/s Peak Particle Velocity (PPV).

The Blasting Guideline allows higher limits of 120 dBL and 10mm/s PPV for up to 5% of the total number of blasts on a site in a 12 month period. Recommended blasting criteria apply during the hours 9am to 5pm Monday to Saturday, excluding public holidays, and are designed to minimise disturbance to occupants.

The majority of occupied buildings can withstand much greater vibration levels, typically well over 20 mm/s, before the onset of superficial or cosmetic damage. Vibration levels well over 25 mm/s would typically be required to cause structural damage to these buildings. Appendix J4 of *Australian Standard 2187.2-2006 Explosives – Storage and use, Part 2: Use of explosives* suggests a vibration criterion of 15 mm/s at 4 Hz, rising to 50 mm/s at 40 Hz and above, would protect occupied buildings constructed of lightweight materials such as timber frames and plasterboard lining. The Standard recommends a vibration criterion of 50 mm/s for industrial and heavy commercial buildings. The recommended vibration criterion of 5 mm/s and upper limit of 10 mm/s for occupied buildings is therefore adequate to protect these buildings from even superficial or cosmetic damage.

Similarly, occupied buildings routinely withstand wind pressures, including strong wind gusts, so are not particularly sensitive to overpressure. Appendix J5 of the Standard states "From Australian and overseas research, damage (even of a cosmetic nature) has not been found to occur at air blast levels below 133 dBL. Windows are the building element currently regarded as most sensitive to air blast, and damage to windows is considered improbable below 140 dBL". The recommended criterion of 115 dBL, and upper limit of 120 dBL, is therefore adequate to protect occupied buildings from damage due to overpressure.

4.9.1 Non-Aboriginal Heritage and Other Items

Non-Aboriginal heritage and other items that are potentially sensitive to blasting impacts exist in the area, as described in the non-Aboriginal heritage report included in the EIS. Table 13 shows known items and suggested ground vibration criteria for each item, while the location of each item is shown in Figure A3 in Appendix A.

Table 13: Vibration Sensitive Items and Recommended Vibration Criteria.

Non-Aboriginal Heritage or Other Item	Comments	Suggested Vibration Criteria
Bowfield Homestead	Owned by a mining company	10 mm/s
Plashett Homestead	Owned by a mining company	10 mm/s
Edderton Homestead	Owned by a mining company	10 mm/s
Strowan Homestead	Dilapidation survey recommended	5 mm/s
Arrowfield Cottage	-	5 mm/s
Woodlands Homestead	Dilapidation survey recommended	5 mm/s
Randwick Homestead	Dilapidation survey recommended	5 mm/s
Plashett Dam	Conservative suggestion within Dam Safety Committee Guideline DSC4C (DSC, June 2010)	10 mm/s
Hunter River Pump Station	To be confirmed by AGL Macquarie	2 mm/s
AGL Macquarie pipelines	To be confirmed by AGL Macquarie	10 mm/s
Bayswater Power Station	To be confirmed by AGL Macquarie	2 mm/s

5 OPERATIONAL NOISE

5.1 Noise Assessment Method

Noise levels from operation of the Project including mining and processing equipment, coal transportation and rail loadout, have been assessed using a comprehensive model of the site based on RTA Technology's Environmental Noise Model (ENM) software. ENM is a general purpose noise modelling package that combines terrain and noise source information with other input parameters such as weather conditions to predict noise levels at specific receptor locations or as contours over a receptor area. It is recognised in NSW as the most appropriate choice for situations involving complex topography and a large number of individual noise sources and where a detailed assessment of the effects of atmospheric conditions on noise propagation is required.

The standard ENM package includes data input modules to allow terrain and noise source information to be entered and amended, plus an initial setup page containing terrain and source lists and modelled weather conditions for each scenario. All terrain and source files were prepared for this assessment using a combination of AutoCad and Excel based data then converted to ENM format terrain and source files. All outputs were obtained using ENM's standard sectioning and contouring algorithms and are presented on a base landownership plan supplied by Hansen Bailey. Tabulated noise levels at residences, and noise levels over 25% of contiguous property areas, have been produced by software from ENM's intermediate calculation files used to produce the noise contours. Noise contour figures are presented in Appendix B.

5.2 Weather Conditions

Atmospheric conditions including temperature, relative humidity, wind speed, wind direction and vertical temperature gradient can all affect noise propagation and received noise levels at some distance from a source. The INP recommends noise enhancing winds or temperature inversions that occur for at least 30% of the time in any season or time period should be considered when predicting noise levels.

5.2.1 Gradient Winds

Weather data for the year 2005 were processed according to INP guidelines to determine prevailing weather conditions for this assessment. Data analysis was completed using the EPA's Noise Enhancement Wind Analysis (NEWA) program in each of 16 compass directions, with results shown in Table 14 for Drayton Mine weather station data and Table 15 for Drayton South weather station data. Shaded values highlight potentially noise enhancing winds that occur for 30% of the time or more in any season or time period.

Table 14: Noise Enhancing Winds 2005, Drayton Mine Weather Station.

Wind Direction	Occurrence of Noise Enhancing Winds, % of Season and Time Period											
	Summer			Autumn			Winter			Spring		
	Day	Even.	Night	Day	Even.	Night	Day	Even.	Night	Day	Even.	Night
N	12	7	7	6	2	4	10	6	10	10	5	7
NNE	10	6	5	4	1	1	5	2	3	8	4	4
NE	14	11	10	10	6	3	4	1	1	11	7	6
ENE	20	22	23	20	22	13	8	5	3	16	18	17
E	18	20	27	23	32	20	10	10	4	18	23	22
ESE	15	13	21	20	27	19	8	8	4	15	18	18
SE	15	14	21	21	27	18	8	8	4	15	17	16
SSE	16	18	23	22	31	19	8	9	4	16	20	18
S	10	15	16	15	24	14	6	8	3	12	16	14
SSW	7	5	4	6	5	4	4	3	2	8	5	5
SW	8	5	4	5	2	3	11	7	8	11	5	8
WSW	11	6	7	7	4	7	16	11	17	13	7	12
W	12	7	8	9	4	9	17	12	20	14	8	13
WNW	12	8	8	9	4	9	17	12	20	15	8	14
NW	15	9	10	10	4	9	20	13	20	17	8	14
NNW	15	9	11	8	3	8	17	11	18	15	8	11

Green shading – winds occur more than 30% of the time in that direction, season and time period.

Table 14 shows potentially noise enhancing winds can occur a significant proportion of the time from the east or from the south-south-east during autumn evenings, based on data from the Drayton Mine weather station. Significant winds do not occur during the day or night.

Table 15 shows significant winds occur from the south during autumn evenings and nights and generally from the north-west quadrant during winter nights, based on data from the Drayton South weather station.

Despite the two weather stations being located only 14 km apart, they would not necessarily indicate the same weather conditions given significant differences in topography between the two areas. Noise levels at receptors near Drayton Mine and Drayton South have therefore been calculated using different sets of prevailing weather conditions to reflect topographic differences between the two areas.

Table 15: Noise Enhancing Winds 2005, Drayton South Weather Station.

Wind Direction	Occurrence of Noise Enhancing Winds, % of Season and Time Period											
	Summer			Autumn			Winter			Spring		
	Day	Even.	Night	Day	Even.	Night	Day	Even.	Night	Day	Even.	Night
N	9	7	15	14	8	19	21	21	41	13	12	24
NNE	7	6	10	10	7	12	12	18	21	9	12	12
NE	6	5	6	9	5	4	7	10	8	6	8	5
ENE	10	10	16	15	14	9	10	15	5	8	13	11
E	11	11	24	17	27	18	10	19	5	10	15	17
ESE	9	6	19	16	18	21	9	14	6	9	10	13
SE	9	6	19	17	17	27	9	15	8	9	9	14
SSE	10	7	25	17	21	35	11	18	12	10	14	18
S	10	12	29	19	33	36	11	24	13	12	18	21
SSW	7	8	18	13	20	27	7	13	11	9	13	15
SW	6	6	11	9	10	23	7	9	11	9	7	12
WSW	8	6	13	11	8	21	14	13	28	13	10	20
W	9	6	15	12	6	22	19	15	37	13	8	26
WNW	8	7	15	11	7	17	18	18	34	13	13	25
NW	9	8	15	11	7	14	17	18	32	14	13	23
NNW	10	9	16	13	9	16	21	20	39	15	15	26

Green shading – winds occur more than 30% of the time in that direction, season and time period.

5.2.2 Temperature Inversions

Weather data from the Drayton South weather station included 10 minute air temperature data measured at 2 m and 10 m above the ground. Analysis of these data can indicate the presence of a temperature inversion however the measured temperature difference over an 8 m interval close to the ground cannot reasonably be extrapolated to the 100 m height interval that is required for long distance noise propagation calculations. Drayton South weather station data were analysed using the following procedure:

- Separate the data by season and continue with only the winter data;
- Calculate the temperature difference reported by the 10m and 2m temperature sensors for each 10 minute period;
- Separate the data by hour; and
- For each hour, calculate representative percentiles of the temperature difference for further review.

Figure 3 shows percentiles from L10 (the highest 10%) to L90 (the lowest 10%) of the temperature difference, by hour, from the Drayton South weather station for the winter period. The L70, or the lowest 30%, is the most relevant percentile as it indicates the 30% threshold for temperature inversions to be considered significant according to the INP.

Figure 3: Temperature Inversions from Drayton South Weather Station 2005.

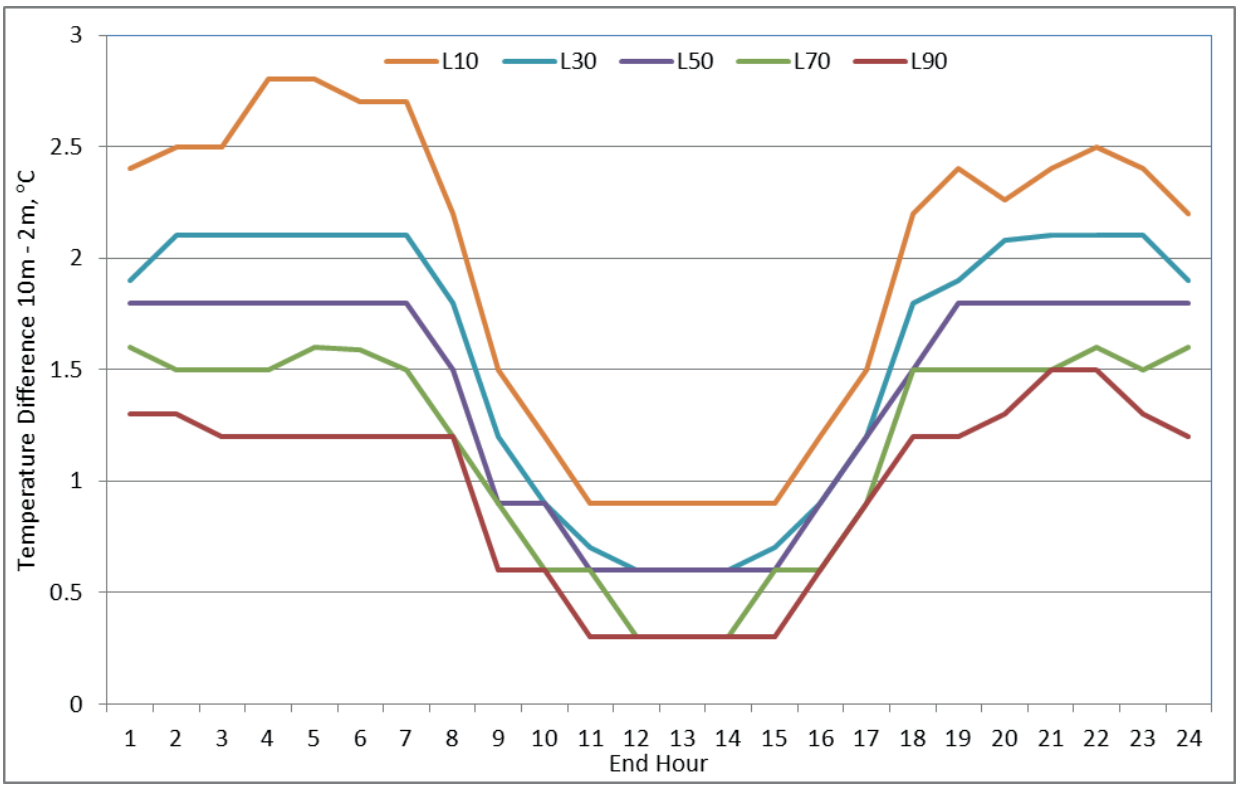


Figure 4: Temperature Inversions from Drayton South Weather Station (Corrected).

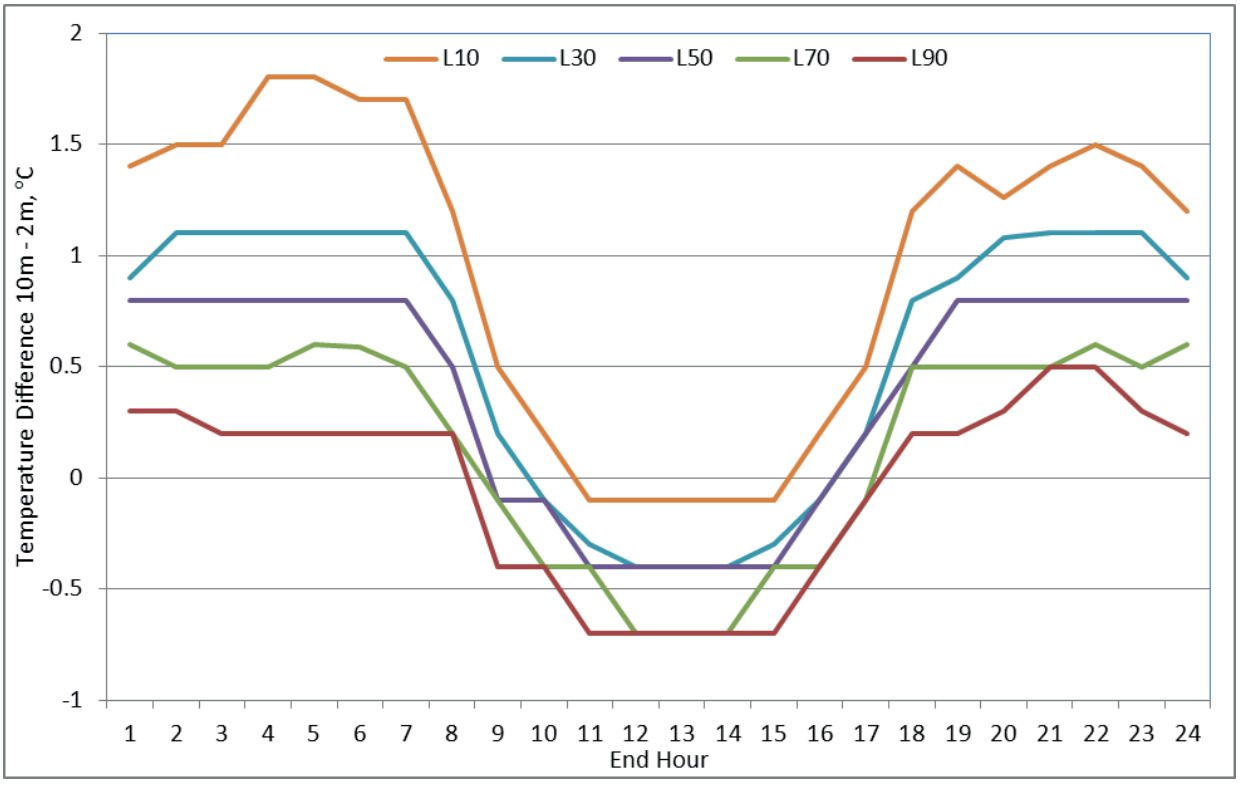


Figure 3 indicates a possible anomaly with the temperature data. The temperature difference between the 10m and 2m sensors at the Drayton South weather station is expected to be generally positive during the night, when cold dense air tends to settle below warmer air, and generally negative during the day as the sun heats the air close to the ground. In other words, a temperature inversion is generally expected at night and a temperature lapse (the opposite of an inversion) during the day. The temperature difference would at least be expected to reach zero during the day rather than remain positive as shown in Figure 3. Possible reasons for this anomaly include a small calibration error in one or both of the temperature sensors, or perhaps a difference between the enclosures containing the sensors.

With a lapse or at least no temperature difference expected during the day, the data in Figure 3 indicate a calibration error between the sensors in the range 0.9 to 1 °C. Subtracting a nominal 1 °C from all temperature difference data provides the results in Figure 4.

Corrected results in Figure 4 show the L70 (lowest 30%) temperature difference is typically in the range 0.5 to 0.6 °C during the hours 6pm to 6am, which approximates the dusk to dawn period in winter. This indicates temperature inversions occur for more than 30% of the time in winter and therefore require assessment according to the INP.

Data in Figure 4 represent the temperature difference over a small 8 m height interval close to the ground. This temperature difference cannot reasonably be extrapolated to an interval of around 100m above the ground that would be required to determine the effect of an inversion on noise propagation. Figure 4 indicates the proportion of time an inversion exists, rather than the average inversion strength. The INP default inversion strength of 3 °/100m, representing a reasonably strong but not worst case inversion strength, has been adopted for this assessment although weather conditions equivalent to a stronger inversion have also been considered as discussed in Section 5.2.4 below.

5.2.3 Drainage Flows

Cold air drainage flows associated with a temperature inversion during the night tend to run downhill and would therefore flow in different directions over various areas of the Project area depending on local terrain.

A detailed inspection of topography in the area north of Drayton Mine shows a low ridge separating the Ramrod Creek catchment from the Antiene residential area, extending at least 10 m above a direct line of sight from mining areas to residences. This ridge would have little effect on gradient winds, at least for the purposes of this assessment, but would prevent cold air drainage flows from causing a source to receptor breeze associated with a temperature inversion during the night. The INP default of a 2 m/s drainage flow from source to receptor, normally associated with an inversion where the source is on higher ground, has therefore not been included in this assessment.

Inspection of the terrain generally south of the Drayton South area indicates disturbed areas associated with the Project are on the northern side of a general east-west ridgeline. Any drainage flows associated with a temperature inversion would therefore flow primarily from the south east towards Saddlers Creek, away from receptors in the vicinity of Jerrys Plains and the horse studs.

Currently available noise model software, including ENM, cannot consider different wind directions over different areas of the site simultaneously. Weather parameters designed to adequately assess noise enhancement, while representing a compromise between the expected situation and the capabilities of available software, have been adopted for this assessment.

5.2.4 Strong Temperature Inversions

In the absence of data clearly indicating the typical strength of temperature inversions that occur in the Project area, it is possible that inversions stronger than 3 °C/100 m may occur from time to time.

Temperature inversions tend to increase received noise levels because they refract sound 'rays' down towards the ground. Winds also cause increased noise levels for receptors down wind, for the same reason. Research indicates the effects of inversions and winds are approximately cumulative and the noise model software adopts this approach by combining inversions and winds into an equivalent inversion strength or an equivalent radius of curvature for sound rays. For the 'rural' terrain category in ENM software as used for this assessment, the equivalent inversion strength used for determining received noise levels is calculated by:

Equivalent Inversion °/100m = Inversion °/100m + 2.5 x Wind speed m/s. *Equation 1.*

According to Equation 1, a 3m/s wind is equivalent to a 7.5 °/100 m inversion for receptors downwind of the source. Based on Equation 1, a night scenario with a 3 m/s wind includes stronger noise enhancement than the INP default 3 °C/100m inversion strength. The approach adopted in this assessment therefore satisfies the recommendations in the INP while simultaneously assessing the effects of strong noise enhancement that may occasionally occur.

The Mt Arthur Coal Mine Noise Impact Assessment (NIA) in Appendix G of the Mt Arthur Coal Mine EA discusses prevailing weather conditions that have been found to correlate well with noise monitoring results. Section 7.2 of the Mt Arthur Coal Mine NIA referred to a previous noise model calibration exercise based on modelled and measured noise levels from Mt Arthur Coal Mine. A temperature inversion strength of 4 °C/100m, with no wind, was found to provide the best correlation between modelled and measured noise levels for Mt Arthur Coal Mine. This result does not necessarily apply to the Project due to differences in topography from Mt Arthur Coal Mine to the Project area, however it indicates prevailing weather conditions based on a 3 m/s wind are stronger, and more conservative, than the weather conditions adopted in recent Mt Arthur Coal Mine noise assessments.

5.2.5 Adopted Weather Conditions

Tables 16 and 17 show adopted atmospheric parameters used in this assessment for Drayton Mine and Drayton South. The adopted weather conditions represent prevailing conditions for receptors in all directions from the Project. The last row of each table shows the effective inversion strength for downwind receptors based on Equation 1 above.

Table 16: Modelled Weather Conditions – Drayton Mine.

Atmospheric Parameter	Day	Evening			Night
	Neutral	Neutral	SE Wind	NW Wind	Inversion
Temperature, °C	20	15			10
Relative Humidity, %	70	80			90
Wind Speed, m/s	0	0	3	3	0
Wind Direction	-	-	135	315	-
Temp Gradient, °C/100 m	-2	-1			3
Effective Inversion, °C/100m	-2	-1	6.5	6.5	3

The evening and night periods have been combined for Drayton South given the similarity between prevailing weather conditions in these two time periods. Noise contour figures for prevailing weather conditions during the evening and night have been prepared by taking the outer envelope, or maximum noise level, of each set of weather conditions for the relevant time period. For example, the evening/night noise contours shown in Appendix B for Drayton South represent the maximum of the three sets of evening and night weather conditions (SSE wind, NW wind and inversion) listed in Table 17.

Table 17: Modelled Weather Conditions – Drayton South.

Atmospheric Parameter	Day	Evening/Night		
	Neutral	SSE Wind	NW Wind	Inversion
Temperature, °C	20	10		
Relative Humidity, %	70	90		
Wind Speed, m/s	0	3	3	0
Wind Direction	-	157	315	-
Temp Gradient, °C/100 m	-2	0	0	3
Effective Inversion, °C/100m	-2	7.5	7.5	3

5.3 Proposed Noise Control Measures

Anglo American has committed to best practice noise control and mitigation for the Project where required to meet the PSNLs. The following noise control and mitigation measures have been incorporated into the Project noise model to determine achievable noise levels and identify any likely noise impacts on private receptors.

5.3.1 Engineering Controls for Mobile Equipment

- Excavators – all excavators would produce a sound power level as low as 115 dBA if required (compared to 122 dBA from a standard machine) with the following best practice modifications:
  - best available exhaust silencers;
  - quieter aerodynamic radiator fan blades and temperature-based fan speed control;
  - radiator acoustic louvres;
  - cooling air inlet plenums or louvres; and
  - covers over various ventilation and other openings not fitted with louvres.
- Front end loaders and wheel dozers – loaders and wheel dozers would produce a sound power level as low as 115 dBA if required (compared to 121 dBA standard) with the following best practice modifications:
  - best available exhaust silencers;
  - quieter aerodynamic radiator fan blades and temperature based fan speed control;
  - radiator acoustic louvres if required; and
  - engine bay side cover plates and air inlet louvres to enclose the engine.
- Haul trucks and water carts – all large trucks/water carts would produce a sound power level as low as 113 dBA if required (compared to 122 dBA standard) with the following best practice modifications:
  - best available exhaust silencers;
  - quieter aerodynamic radiator fan blades and temperature-based fan speed control;
  - radiator acoustic louvres;
  - engine bay side and belly plates; and
  - grid box attenuators (for electric drive trucks) or gearbox cover plates (for mechanical drive trucks).
- Drills – the drills would produce a sound power level as low as 113 dBA if required (compared to 119 dBA standard) with the following best practice modifications:
  - best available exhaust silencers;

  - quieter aerodynamic radiator fan blades and temperature-based fan speed control;
  - radiator acoustic louvres; and
  - acoustically lined engine and compressor covers.
- Dozers – all dozers would produce a sound power level as low as 113 dBA if required (compared to 118 dBA from the engine and 132 dBA from the tracks during high speed reverse for a standard machine) based on the following best practice modifications and management measures:
  - best available exhaust silencers;
  - quieter aerodynamic radiator fan blades and temperature-based fan speed control;
  - radiator acoustic louvres;
  - engine bay side covers; and
  - operator training and careful control of machine speed to avoid track noise during the night or when track noise is likely to be excessive at any sensitive receptor.
- Graders – graders would produce a sound power level as low as 111 dBA if required (compared to 113 dBA for a standard machine) based on the following best practice modifications:
  - best available exhaust silencers.
- Sweeper – the sweeper would produce a sound power level as low as 107 dBA if required with the following control measures:
  - best available engine exhaust silencer; and
  - a flexible skirt around the brush and vacuum pickup.

5.3.2 Engineering Controls for CHPP Equipment

- Conveyors – Existing conveyors that can be enclosed have been enclosed. Conveyors that cannot be enclosed include those that deliver coal to a stacker, or receive coal from a reclaimer, as an enclosure would interfere with the stacker's tripper or reclaimer's chute. The following best practice noise control measures have been modelled for unenclosed stockyard conveyors to achieve a best practice sound power level of 76 dBA per metre or 96 dBA per 100m:
  - Replacement of the standard idler rollers with low-noise idlers with machined surfaces to control concentricity and surface roughness;
  - Installation of windshields (steel plates) on the outer bearing brackets to cover and shield noise from the outer idler bearings if required;
  - Investigate and if appropriate install resilient idler bearing supports to minimise stringer and frame vibration; and
  - Regularly monitor the condition of the idler bearings and repair or replace noisy bearings to maintain low noise levels.

5.3.3 Noise Barriers and Acoustic Shielding

- Clearing, topsoil stripping/stockpiling and rehabilitation in exposed areas would occur only during the day;
- Drilling and drill pad preparation would occur at least 6 m below the natural surface during the evening and night; and
- Overburden emplacement would occur in lower, better shielded areas during the evening and night as the mining areas approach the southern Project boundary, with the top of the Overburden Emplacement Areas (OEAs) constructed during the day or in noise reducing atmospheric conditions during the evening and night, if required to meet the PSNLs.

5.4 Additional Noise Control Options

A significant focus of this assessment has been to identify noise control options that have the potential to offer lower noise levels at receptor properties. Adopted noise control and management options are discussed in Section 5.3 and have resulted in:

- no potentially affected receptors near Drayton South; and
- no new potentially affected receptors, and a typical noise reduction of 0.5 to 1 dBA at all receptors compared to previous and current noise levels, near the existing Drayton Mine.

Additional noise control options, beyond the recommended and proposed options listed in Section 5.3, were considered but have not been adopted due primarily to the technical limitations of each option:

- Noise bunds around the stockyard would provide an effective reduction in noise during relatively neutral atmospheric conditions. However, noise enhancing conditions involve refraction of noise towards the ground which has the effect of curving the noise over a barrier. This effect is strongest if the barrier is near the midpoint of the source to receptor distance. Therefore, noise barriers such as earth mounds or walls constructed around the stockyard would be effective at reducing noise during the day and under neutral weather conditions, when noise reduction is least required, and would be less effective or ineffective during noise enhancing weather conditions when noise control is most needed. As noise enhancing weather conditions and sources further from the barrier both require a taller barrier, the combination of long Drayton Mine stockyard conveyors and noise enhancing weather conditions would make any practical noise barrier largely ineffective. In addition, noise issues associated with construction of a noise barrier around the stockpiles may outweigh the benefits such a barrier would provide, with a larger barrier offering minor additional operational benefits but more significant construction noise impacts;
- Enclosed conveyors were also considered, however they cannot be installed in the stockyard as an enclosure would prevent a stacker from collecting coal off the conveyor and would prevent a reclaimer from depositing coal onto a conveyor. All other conveyors of significant length are already enclosed or otherwise shielded at Drayton Mine;
- Other sources of noise associated with Drayton CHPP and Drayton Mine are individually of low significance. Detailed noise model results indicate conveyors, as a group, produce approximately 50% of the total received noise level although this proportion varies from one receptor to the next. Reclaimers are generally amongst the most significant individual sources of noise and are the second most significant group at Drayton Mine due to their location close to receptors. Noise measurements and observations at Drayton Mine in November 2011 indicate the dominant source of noise on a reclaimer is the action of coal travelling through the bucket wheel chutes to the reclaimer conveyor. This source is technically difficult to control as any chute lining materials apart from hard steel would have a very short life when subjected to abrasion from coal;
- Noise from the reclaimers can be significantly reduced, in theory, by operating them from south to north which places them immediately south of and shielded by a large coal stockpile. As the reclaimers must be transferred from stockpile to stockpile at the northern end of the stockyard, this option is not technically possible for much of the time. The optimum practical situation, with each stockpile having a dedicated reclaimer, would still require the reclaimers to operate from north to south for approximately half of the time which would make this option ineffective; and
- Noise reduction options may be available for some other CHPP sources, however all other sources collectively produce relatively insignificant noise compared to the conveyors and reclaimers. A reduction in noise applied to an insignificant noise source would achieve an insignificant reduction in total noise at receptors and is therefore not an economically viable option. For example, transfer stations are the third most significant group of sources after conveyors and reclaimers. The complete removal of noise from all transfer stations, even if such an outcome were possible, would achieve a total noise reduction of only 0.3 dBA at the closest

receptors as noise from all transfer stations operating together is approximately 12 dBA lower than total noise from all CHPP and mining sources. This example highlights the need to apply any noise control measures to the most dominant sources to achieve a noticeable noise reduction at receptors, which in practical terms limits the assessment of options to conveyors and reclaimers.

In the absence of further practical noise control options for conveyors and reclaimers, and the ineffectiveness of all other possible control options, no additional noise control options are considered practical or effective and no further options are proposed.

5.5 Operational Noise Sources

Mining operations require a number of items of mobile equipment to uncover, extract and transport coal. Sound power levels for mining and on-site transportation equipment were based on existing mobile plant sound power levels measured by Spectrum Acoustics at Drayton Mine and on sound level measurements taken by Global Acoustics, Wilkinson Murray and others around best practice noise controlled equipment on other mine sites such as the nearby Mt Arthur Coal Mine and Bengalla Mine.

The existing Drayton Mine truck fleet has been progressively fitted with more effective exhaust silencers to minimise noise from Drayton Mine's North Pit as the mining area progresses towards Antiene receptors. Additional noise control measures would be fitted to trucks and other mobile equipment as described in Section 5.3, or new equipment would be purchased with noise control measures applied, as the equipment is transitioned from Drayton Mine to Drayton South.

Modelled sound power levels for coal handling and processing equipment are based on measurements taken at Drayton Mine in November 2011. Noise measurements were taken around a selection of conveyors, a stacker, a reclaimer, the Coal Treatment Unit (CTU), the ROM bin and the three crusher stations to quantify sound power levels produced by these components.

Minor items of equipment that are unlikely to be audible at any receptor under any weather conditions, such as light vehicles, have previously been shown to have no appreciable effect on received noise levels and have been omitted from the noise model.

Figures showing noise source locations for Drayton Mine, Drayton South and the transport corridor are attached as Appendix C. The figures show the modelled location of each source where the actual location is the small cross at the lower left corner of each text entity. Source heights above local ground level have been determined based on the estimated height of the acoustic centre for each source type and are shown in Table 18 with sound power levels for each source in octave bands.

Table 18: Modelled Noise Sources and Sound Power Levels.

Code, Source, Height above ground, m		Octave Band Centre Frequency, dBL [1]									dBL	dBA
		31.5	63	125	250	500	1k	2k	4k	8k	Total	Total
Mining Sources												
B, Dragline	12	119	117	115	108	111	110	106	100	87	122.9	113.9
E, Large excavator	5	119	120	116	111	110	111	108	105	98	124.2	115.2
e, Small excavator	4	119	120	116	111	110	111	108	105	98	124.2	115.2
L, Loader	3	121	117	122	113	107	108	109	103	96	125.8	114.6
T, Truck 789 or 830E	3	119	118	112	113	112	106	104	100	97	123.1	113.0
t, Coal truck	3	119	118	112	113	112	106	104	100	97	123.1	113.0
Tj, Truck reject	3	119	118	112	113	112	106	104	100	97	123.1	113.0
D, Drill	2	113	113	113	113	110	107	107	99	91	120.0	113.2
Z, Dozer, no tracks	2	108	105	108	111	112	108	105	99	87	117.4	113.2
Zt, Dozer, with track noise	1.5	108	105	108	118	120	122	120	116	96	126.8	126.0

Code, Source, Height above ground, m		Octave Band Centre Frequency, dBL [1]									dBL Total	dBA Total
		31.5	63	125	250	500	1k	2k	4k	8k		
z, Wheel dozer	2	121	117	122	113	107	108	109	103	96	125.8	114.6
G, Grader	2	112	113	115	113	110	100	101	98	90	120.0	110.8
W, Watercart	3	119	118	112	113	112	106	104	100	97	123.1	113.0
S, Sweeper	2	95	104	104	103	105	103	99	94	83	111.3	106.9
CHPP Sources												
ROM, ROM bin	5	125	121	113	106	98	91	86	82	78	130.6	102.9
Pri, Primary sizers	3	104	103	106	106	105	103	101	99	92	113.0	108.5
Sec, Secondary sizers	6	109	106	105	103	105	103	100	95	87	113.6	107.4
Ter, Tertiary sizer/screen	6	122	107	108	108	108	107	102	94	84	127.3	110.7
Tr, Transfer	4	101	99	103	97	98	97	95	88	80	107.9	101.4
Cnu, CTU nth upper	10	119	103	101	99	96	96	91	84	76	124.1	99.6
Cnl, CTU nth lower	2	118	102	101	100	98	99	95	89	83	123.1	102.4
Cw, CTU west	10	109	96	94	92	90	89	85	80	73	114.2	93.3
Sk, Stacker	5	99	98	99	98	101	96	97	94	88	107.2	103.1
R, Reclaimer	4	102	101	102	101	104	99	100	97	91	110.2	106.1
TL, Train loadout	4	110	100	97	97	98	99	101	100	94	112.0	106.3
Loc, Locomotive	3	100	100	101	97	93	90	89	80	75	106.2	96.2
WS, Workshop	3	102	106	110	118	114	111	106	101	92	120.9	116.1
C1, Drayton convey. 100m	1	94	92	93	94	94	92	88	80	72	101.2	96.1
C5, Drayton convey. 500m	1	101	99	100	101	101	99	95	87	79	108.2	103.1
ROM conveyor 500m	1	100	102	104	103	105	104	102	94	87	111.7	108.3

1. dBL means unweighted, as opposed to A-weighted, sound power levels.

Many mobile sources have been modelled in multiple locations for a proportion of the time at each location, such as four locations for 25% of the time at each location. Such sources are indicated in the source location figures in Appendix C with a '/2' or '/4' after the source code, indicating the source operates at that location for 50 % or 25 % of the time respectively.

5.6 Predicted Mining Noise Levels

Noise levels from the Project have been modelled for representative operating scenarios, time periods and weather conditions. Noise contour figures showing predicted noise levels from the Project have been produced for years 4, 6 and 12 under neutral and prevailing weather conditions and are attached in Appendix B.

Noise contour Figures B1 to B9 show contours for day neutral and evening/night prevailing weather conditions in each assessed year, for Drayton Mine and Drayton South receptors, including the following noise sources:

- Mining equipment proposed for each operating year;
- Noise from the Drayton South mine infrastructure area;
- Truck haulage of coal direct to the Drayton CHPP;
- Normal operation of the Drayton Mine CHPP including the raw coal and product coal stackers, reclaimers and conveyors;
- A fleet of four trucks hauling reject material from the CHPP to Drayton Mine's North Pit representing the reasonable worst case reject disposal option; and
- Train loading at the existing rail loadout facility and three locomotives idling on the loading loop.

Figures B10 and B11 show noise levels from proposed construction activities to construct proposed Drayton South infrastructure such as main haul roads, vehicle hardstands and the Mine Infrastructure Area, including relocation of a section of Edderton Road. Since construction work is generally proposed to occur 24 hours per day, excluding realignment of Edderton Road, noise contour figures for the night period have been included.

Noise contour Figures B12 to B15 show predicted sleep disturbance levels at Drayton Mine receptors, with and without possible impact noise from train wagon bunching on the Drayton Mine rail loadout loop, for comparison with the relevant sleep disturbance criteria.

Table 19 summarises predicted worst case noise levels from the Project based on the detailed noise level tables presented in Appendix D, with shading indicating receptors that would be potentially affected by the Project. Receptors that are owned by a mining company or the Crown that are subject to a private agreement with Anglo American or that are predicted to receive noise levels below the PSNLs, have been excluded from the table.

Table 19: Summary of Predicted Noise Levels, LAeq,15min.

Receptor		Residence			25% of Property Area			PSNL Day/ Evening/ Night
Time Period		Day	Evening	Night	Day	Evening	Night	
Owner	Property	Predicted Noise Level, LAeq,15min, All Years						
172	390	28	39	37	28	40	38	37/37/37
173	398	27	39	37	27	39	38	37/37/37
175	401	25	36	36	25	36	36	35/35/35
176	402	27	38	38	27	38	38	35/35/35
177	403	27	38	38	27	38	38	35/35/35
178	411	30	33	39	30	34	39	37/37/37
179	418	30	32	38	30	33	38	37/37/37
182	421	28	32	38	28	32	38	37/37/37
184	423	27	33	38	27	33	38	37/37/37
Contour Figure		B7	B8	B9	B7	B8	B9	-
Affected Residences/ Properties		0	0	0	0	0	0	Significant
		0	2	2	-	-	-	Moderate
		0	3	5	-	-	-	Negligible

Red shading – a significant noise impact of more than 5 dBA above the PSNL;
Blue shading – a moderate noise impact of 2 to 5 dBA above the PSNL; and
Green shading – a negligible noise impact of up to 2 dBA above the PSNL.

All potentially affected receptors listed in Table 19 are located in Antiene generally north of Drayton Mine. No Drayton South receptors are included in Table 19 as predicted noise levels are within the PSNLs at all Drayton South receptors.

The table indicates two receptors (402 and 403) are predicted to receive moderate noise impacts of up to 3 dBA above the PSNLs with an additional 7 receptors predicted to receive negligible noise impacts of up to 2 dBA above the PSNLs during reasonable worst case operating and weather conditions. This result includes the benefit of all feasible and reasonable noise control and mitigation measures being implemented and, for Drayton Mine receptors, represents a reduction in noise level compared to the previous and current situation including mining within the Drayton Mine North Pit.

For Drayton Mine receptors, the Project involves continuing use of the Drayton Mine CHPP and rail loadout system. With a transfer of mining activity from Drayton Mine to Drayton South as recoverable Drayton Mine coal is exhausted, active mining areas would move significantly further

from Drayton Mine receptors and mining noise would become inaudible at those receptors. ROM coal transportation from mining areas to the CHPP would continue to occur, however the coal would be transported from Drayton South rather than from mining areas within Drayton Mine.

Potentially affected Drayton Mine receptors, and predicted noise levels at those receptors shown in Table 19, are primarily due to existing Drayton Mine CHPP noise and intermittent noise from trucks hauling reject material to the North Pit for disposal.

The Project is predicted to comply with the PSNLs at all privately owned Drayton South receptors during all time periods. Consultation with NSWEC is recommended to resolve any issues associated with predicted noise levels at Receptor 60 (Edderton Homestead).

Potential noise effects on livestock, including horses, have been assessed using the data in Table 19 as part of the EIS Equine Health Impact Assessment.

5.7 Low Frequency Noise

The INP recommends a 5 dBA penalty be applied to predicted noise levels where a significant low frequency component exists, defined as a dBC – dBA difference of 15 dB or more. The Project noise model was used to calculate an octave band spectrum to determine dBA and dBC noise levels and corrected dBA levels including the recommended 5 dBA low frequency penalty were determined for each Drayton South receptor. Results are shown in Table 20 for the most sensitive night period, with bold font highlighting noise levels that include a low frequency correction.

Table 20: Low Frequency Noise Analysis, LAeq,15min Night

Assessed Year		4	6	12	4	6	12	4	6	12	PSNL Night
Owner ID	Residence ID	Calculated Noise Level dBA			Calculated Noise Level dBC			Corrected Noise Level dBA			
4	60	47	47	41	56	56	50	47	47	41	N/A[1]
21	217N	26	27	30	41	43	45	**31**	**32**	**35**	38
21	217S	26	28	30	42	44	46	**31**	**33**	**35**	38
21	219C	28	29	32	43	44	46	**33**	**34**	32	38
21	219E	28	29	32	43	44	46	**33**	**34**	32	38
21	219W	28	29	32	43	44	46	**33**	**34**	32	38
21	227C	21	27	26	39	41	42	**26**	27	**31**	38
21	227E	21	24	27	36	39	41	**26**	**29**	27	38
21	227W	23	26	26	42	40	43	**28**	26	**31**	38
21	228	24	26	29	39	42	44	**29**	**31**	**34**	38
23	250	26	27	25	42	43	42	**31**	**32**	**30**	35
24	226N	24	28	26	43	44	43	**29**	**33**	**31**	38
24	226S	22	27	26	41	40	43	**27**	27	**31**	38
37	209	24	26	28	40	42	44	**29**	**31**	**33**	35
38	211	24	25	27	40	42	43	**29**	**30**	**32**	35

1 No PSNLs are listed for Residence 60 as it is owned by NSW Energy Coal.

Corrected noise levels in Table 20 remain below the PSNLs at all receptors.

5.8 Sleep Disturbance

5.8.1 Mining

Coal mining primarily involves a number of diesel powered machines operating to remove overburden and extract coal. Most machines, such as haul trucks, have very little potential to produce a noise character that is likely to disturb sleep. Other machines such as draglines and dozers can produce intermittent louder noise depending on working conditions, machine condition and operator actions.

Tracked dozers generally work in the forward direction, either pushing material with the blade or ripping hard ground with the rear-mounted ripping tines. Forward operation, particularly under load, tends to produce noise from the engine and exhaust but very little noise from the tracks. As a dozer reverses, however, lack of tension in the tracks tends to cause them to droop between the drive sprocket and the rear idler and this lack of tension can cause a regular impact noise. The level of noise a dozer can produce in reverse depends on a number of factors including machine type, condition, speed and ground conditions, with a sound power level in the range 125 to 130 dBA representing a typical maximum for this source.

Draglines are generally a very quiet method of moving waste material, as a single dragline can effectively replace one or two excavators and a fleet of trucks. Collectively, the excavators and trucks produce a higher sound power level than the dragline, while some of the trucks tend to work in more exposed parts of an established mine for at least part of their route. However, a dragline can occasionally produce brief but relatively loud noise if the spreader bar or drag chains impact the bucket's sides or arch bar, or if the bucket is used to chop the opposite pit face. Bucket impacts can produce a sound power level in the range 125 to 130 dBA.

Other sources of potential sleep disturbance include raw coal being dumped from a truck or loader into a steel ROM hopper, vehicle horns and equipment start alarms. A ROM hopper can produce up to 120 dBA while quieter vehicle horns and alarms can produce a sound power level in the range 110 to 115 dBA. Locomotive horns can produce a sound power level in the range 125 to 130 dBA, although horns would not normally be required while a train is operating on the rail loop. Train wagon bunching, which is a series of impacts in the wagon couplings along the length of the train as locomotive traction force is applied or stopped, can occur on the rail loop or on the Antiene Rail Spur if a train is required to stop or start. A typical sound power level of 127 dBA has been adopted for train wagon bunching and train locomotive horns.

This discussion indicates a number of noise sources can potentially produce noise levels in the 125 to 130 dBA range, although such sources should not normally occur given Anglo American's commitment to adopt best practice noise control measures. A theoretical worst case assessment, assuming dragline bucket noise in each pit and dozer track noise on prestrip areas, has been modelled by placing a number of sources of each type in the noise model at locations closest to receptor areas. Train wagon bunching on the rail loop has been modelled at three representative points on the loop. Calculated maximum noise levels were added to reasonable worst case LAeq operating noise levels under night prevailing weather conditions.

5.8.2 Maximum Noise Levels – No Mitigation

Predicted maximum noise levels from any of the potential sources discussed above, and from all mine related sources excluding train wagon bunching which is expected to occur rarely, are shown in Table 21 for Drayton Mine receptors. Results in the table indicates train wagon bunching, if it occurs, has the potential to exceed the conservative sleep disturbance criterion at a number of Drayton Mine receptors. All other maximum noise sources are predicted to produce less than the criterion and are therefore unlikely to disturb sleep.

Table 21: Summary of Sleep Disturbance Noise Levels, Drayton Mine Receptors, LAmax.

Receptor		Predicted Noise Level, LAmax		LAmax Criterion
Owner	Property	Including Train Wagon Bunching	Excluding Wagon Bunching	
171	387	48	< 45	47
	399	51	< 45	47
172	390	52	< 45	47
173	398	53	< 45	47
174	400	51	< 45	45
175	401	53	< 45	45
176	402	54	< 45	45
177	403	55	< 45	45
178	411	66	< 45	47
179	418	61	< 45	47
180	419	56	< 45	47
181	420	55	< 45	47
182	421	54	< 45	47
184	423	54	< 45	47
185	424	53	< 45	47
186	425	52	< 45	47
187	427	52	< 45	47
188	429	48	< 45	47
198	444	49	< 45	47
200	446	49	< 45	47

Maximum noise levels have also been calculated to Drayton South receptors by adopting a sound power level of 130 dBA for all dozer and dragline sources, assuming either loud dozer track or dragline bucket impacts may occur, then summing the results with the calculated average (LAeq,15min) noise levels for each assessed year. Predicted noise levels reach 36 LAmax at Receptor 219W which is 11 dBA below the conservative criterion, with lower maximum noise levels at all other receptors. Sleep disturbance is therefore considered very unlikely at all Drayton South receptors.

Current noise management plans for operation of the Antiene Rail Spur and the rail loading loop, intended to minimise noise from infrastructure and train movements, would be reviewed to ensure all feasible and reasonable noise mitigation measures have been considered. In particular, management measures to minimise wagon bunching events during train movements on the train loading loop would be reviewed and any additional measures that have the potential to further minimise such events would be incorporated into the plans.

5.9 Recommended Noise Monitoring

Project noise levels should be monitored to confirm the predicted noise levels. The noise monitoring strategy would vary from year to year as the mine progresses and as such, development of a detailed monitoring strategy for the life of the Project is not appropriate at this stage. However the following recommendations would be considered by Anglo American when updating and extending the current noise monitoring program unless otherwise agreed with relevant regulatory agencies:

- Existing noise management plans should be updated following Project approval and reviewed every three years;

- Real time noise monitors should be deployed in representative receptor areas or at reference locations closer to the Project to enable ongoing noise management. Data from the real time noise monitors should be transmitted to an on-site office or control room for monitoring and action. A Trigger Action Response Plan (TARP) should be developed and implemented as part of the updated Noise Management Plan to detail the actions required upon detection of noise levels over the intrusive criteria, taking into account factors such as time of day, equipment operating locations and weather conditions.
- Quarterly operator attended noise monitoring should occur at a minimum of four locations during normal mining operations to confirm Project noise levels. The monitoring locations should vary from time to time as the mine progresses and should be reviewed every three years in conjunction with the management plan review. Noise surveys should include two non-consecutive 15 minute noise measurements, and associated observations to identify and quantify dominant sources of noise, during the day, evening and night at each location. Long term quarterly noise monitoring, using unattended monitors for a period of a few days to a week, does not allow Project related noise to be reliably distinguished from other sources such as traffic and is not recommended; and
- Summary results from the real time noise monitors, and detailed results from the quarterly noise surveys, should be reported in the Annual Review.

6 CONSTRUCTION NOISE

6.1 Construction Activities

The following construction works would be required as part of the Project:

- Construction of the transport and services corridor including raw material quarrying and crushing, bulk earthworks, road grading and surfacing, power and communications services;
- Construction of Drayton South roads and a mine infrastructure area including workshop, staff amenities and equipment storage buildings;
- Realignment of part of Edderton Road to avoid proposed mining areas; and
- Construction of water management and power supply systems, generally along the transport corridor and in the vicinity of Drayton South mining areas.

The earthmoving phase for each construction activity typically produces the highest sound power level and is therefore considered in this assessment.

6.2 Construction Noise Sources

Table 22 shows typical construction noise sources required to complete the proposed works, assuming all machines operate continuously at full power to present a worst case assessment.

Table 22 indicates activities likely to produce the highest total sound power level are construction of the transport corridor and the initial haul roads and building foundations, as both of these activities require a number of inherently noisy heavy earthmoving machines.

Table 22: Proposed Construction Works, Sources and Sound Power Levels.

Construction Works	Typical Construction Machines	Sound Power Level, LAeq	
		Per Machine Type	Total
Transport corridor, haul road, water and power services	Rock crusher/screens	120	120
	Dozer x2	119	123
	Truck x4 [1]	111	
	Excavator x3 [1]	117	
	Grader x2	115	
	Roller x2	113	
	Mobile crane	108	
	Concrete truck	108	
	Concrete pump	110	
Drayton South roads, dams, workshop and amenities	Dozer x2	119	123
	Truck x4 [1]	111	
	Excavator x3 [1]	117	
	Grader x2	115	
	Roller x2	113	
	Mobile crane	108	
	Concrete truck	108	
	Concrete pump	110	
Edderton Road realignment	Dozer x1	116	122
	Truck x4 [1]	111	
	Excavator x3 [1]	117	
	Grader x2	115	
	Roller x2	113	
	Concrete truck	108	
	Concrete pump	110	

1 Excavators and trucks may be replaced by scrapers, resulting in a similar sound power level.

6.3 Construction Noise Assessment

The construction activities listed in Table 22 may occur simultaneously, however they are located in various areas within the Project Boundary and are not expected to affect the same receptor properties. A reasonable worst case construction noise scenario therefore includes all activities occurring simultaneously. Noise levels for this worst case construction scenario have been calculated using the Project noise model, based on Year 4 terrain and the construction sources listed above. Noise contours were calculated using the following procedure, with all sources located a nominal 2m above the ground:

- Calculate the maximum level from a series of fifteen transport corridor construction sources distributed along the corridor. Each construction source has a sound power level of 123 dBA as calculated in Table 22;
- Calculate noise levels from a rock crushing and screening system operating in the quarry adjacent to the proposed transport corridor;
- Calculate the maximum level from a series of seventeen Edderton Road realignment construction sources distributed along the proposed road alignment. Each construction source has a sound power level of 122 dBA as calculated in Table 22;

- Calculate noise levels produced by construction of the Drayton South Mine Infrastructure Area (MIA), based on a sound power level of 123 dBA assumed to occur in the approximate centre of the MIA; and
- Sum the five sets of results described above for the day period, and four sets of results excluding the Edderton Road realignment works for the evening and night period, to determine noise levels that would occur with simultaneous construction activity in the worst case locations for each receptor.

Figure B10 in Appendix B contains predicted noise level results for Drayton South receptors during the day. Construction noise levels have been assessed separate from operational noise to these receptors, as much of the construction program associated with Drayton South would be completed before the commencement of mining. The noise contours in Figure B10 indicate:

- A predicted noise level of up to 38 LAeq at closest Receptors 240 and 250, primarily due to construction work at the southern end of the Edderton Road realignment. Noise levels in the range 35 to 38 LAeq are expected to occur intermittently at these receptors, for a period of perhaps 3 months, during normal daytime construction hours;
- Predicted noise levels within the normal operational criteria at all other privately owned receptors; and
- A predicted noise level up to 41 LAeq, due to a combination of the Edderton Road realignment and construction of the Drayton South MIA, at Receptor 60 owned by NSWEC.

Predicted noise levels at all privately owned receptors are within the 40 LAeq,15min 'noise affected' construction noise criterion, therefore Edderton Road realignment construction noise levels are unlikely to be considered excessive by closest residents. The work would only occur during the day and audible construction noise would be at least partly masked by noise from passing traffic on the Golden Highway and the current Edderton Road alignment.

Figure B11 shows predicted construction noise levels at Drayton South receptors during the evening and night, with typical construction works occurring within the Drayton South MIA and transport corridor and no construction work associated with the Edderton Road realignment. The figure indicates construction noise levels would be acceptable, due primarily to the extended distance from the construction sites to closest receptors.

6.4 Construction Noise Control Recommendations

Construction noise levels are predicted to be acceptable at all receptors. Nevertheless, a construction noise management plan is recommended for the Edderton Road realignment works to ensure all feasible and reasonable noise control measures are identified and implemented for these works.

Given the location of the Drayton South MIA remote from all privately owned receptors, no construction noise management measures are recommended for this work.

7 ROAD TRAFFIC NOISE

Noise levels from vehicles travelling within the Project are included in the noise model, while noise from vehicles travelling on public roads such as Thomas Mitchell Drive and the New England Highway is assessed in this section.

7.1 Existing Traffic Flows

The New England Highway near Thomas Mitchell Drive currently carries approximately 14,000 vehicles per day of background traffic flows. Denman Road currently carries approximately 6,700

and 3,900 vehicles per day east and west of Thomas Mitchell Drive, respectively, with heavy vehicles comprising 12% to 19% of all Denman Road traffic. Thomas Mitchell Drive carries 2,500 and 4,400 vehicles per day at the eastern and western ends, respectively, with heavy vehicles comprising 16% to 26% of all traffic.

The Golden Highway between Jerrys Plains and Edderton Road currently carries approximately 2,600 vehicles per day, while Edderton Road carries between 680 and 760 vehicles per day with heavy vehicles accounting for approximately 19% of all traffic.

7.2 Construction Traffic Flows

The majority of construction activities are proposed to be undertaken by the existing Drayton Mine workforce with up to an additional 15 staff for the Edderton Road realignment works. Up to 270 truck visits per month, or an average of 12 truck visits per day assuming a busy 22 day month, are expected to be required during the construction period. Up to 12 truck visits or 24 truck movements per day have been considered in this assessment.

Approximately 80% of traffic movements associated with the construction and operational phases of the Project would use the New England Highway and the eastern end of Thomas Mitchell Drive, with the remaining 20% of traffic movements using the western end of Thomas Mitchell Drive and Denman Road. Up to 15 cars and an assumed 12 trucks per day associated with the Edderton Road realignment works would approach the site primarily from the northern end of Edderton Road, however up to 5 car movements on the Golden Highway could be expected during the construction period.

7.3 Operational Traffic Flows

The majority of operational staff required for the Project would be transferred from Drayton Mine to Drayton South. The Project would require up to 500 full time equivalent employees which is consistent with existing operations at Drayton Mine. All staff access would be via the existing Drayton Mine Access Road and the proposed transport corridor.

As staffing levels would be consistent with the existing operation, no additional car or truck movements are expected to be required after completion of all proposed construction activities associated with the Project.

7.4 Calculated Traffic Noise Levels

Calculated traffic noise levels for the existing situation and during the proposed construction and operational phases of the Project are shown in Table 23. Traffic noise calculations are based on the Calculation of Road Traffic Noise (CoRTN) method developed by the United Kingdom Department of Transport (UKDoT), with adjustments to the base method to determine an average (LAeq) noise level. Existing and proposed traffic flows on assessed roads in the vicinity of the Project are also shown in Table 23.

The traffic report indicates the morning peak traffic period occurs from approximately 6:15 am to 7:15 am, which is primarily within the 'night' period before 7am. An estimated 17% of daily traffic occurs during the night on Edderton Road, based on analysis of Figure 9 in the EA traffic report. As this proportion is consistent with expectations, the same night proportion is assumed to apply to all assessed roads in the vicinity of the Project. The traffic noise calculations therefore include an assumption that 83% of the Annual Average Daily Traffic (AADT) occurs in a 15 hour day.

Calculated noise levels in Table 23 indicate an increase of generally 0.1 dBA but up to 0.5 dBA at residences near Edderton Road during the construction period.

Table 23: Calculated Traffic Noise Levels, Existing and Project Traffic, Day, LAeq,15hr.

Scenario	Vehicle Type, Noise Level	Traffic Flows And Noise Level From Assessed Roads					
		New England Highway	Denman Road	Thomas Mitchell Drive East	Thomas Mitchell Drive West	Golden Highway	Edderton Road
Closest Receptor		Mus'brook 15m	Mus'brook 15m	Res 418, 135m	110m	Jerr'Plains 10m	Res 60 280m
Existing Traffic incl Drayton Mine	Cars	12600	5695	2000	3520	2080	592
	Trucks	1400	1005	500	880	520	148
	Cars+Trucks	14000	6700	2500	4400	2600	740
	Noise dBA	66.3 dBA	61.1 dBA	35.1 dBA	49.0 dBA	60.0 dBA	36.6 dBA
Existing +Project Const-ruction	Cars	12600	5695	2000	3520	2080	592
	Trucks	1424	1029	524	904	544	172
	Cars+Trucks	14024	6724	2524	4424	2624	764
	Noise dBA	66.3 dBA	61.2 dBA	35.3 dBA	49.1 dBA	60.1 dBA	37.1 dBA

Calculated traffic noise levels exceed the arterial road traffic noise criterion at closest suburban residences to the New England Highway and Denman Road, and are equal to the criterion at closest residences to the road in Jerrys Plains. However, as the Project's contribution to calculated total noise levels is insignificant at all receptors, no traffic noise control or management measures are recommended.

8 RAIL TRAFFIC NOISE ASSESSMENT

Noise produced by trains is considered in three separate stages:

- As a component of normal operational and mining noise when a train is being loaded at Drayton Mine;
- As an intermittent operational noise source while the train is travelling along the privately owned Antiene Rail Spur which is shared with Mt Arthur Coal Mine; and
- As rail traffic while the train travels on the public rail network from the Antiene Rail Spur to the Port of Newcastle.

Noise levels from train movements on the Drayton Mine Rail Loop are included in the Project noise model, with a reasonable worst case noise contribution from trains included in the results presented in Table 19.

Noise levels from intermittent train movements on the Antiene Rail Spur, based on one train movement on the eastern section of the Antiene Rail Spur in a 15 minute period, are shown in Figures B12 to B14 while potential sleep disturbance levels associated with wagon shunting are shown in Figure B15 in Appendix B.

Noise levels from train traffic on the Main Northern Rail Line from the Antiene Rail Spur to the Port of Newcastle are assessed in this section.

8.1 Existing and Proposed Rail Traffic

Section 2.4.2 of the traffic report notes an average of 12 trains per day currently travel between Muswellbrook and Newcastle, equivalent to 24 train movements per day. Section 6.1 of the traffic report notes Drayton Mine is currently approved to produce up to 8 Mtpa of ROM coal, however a total of 5.5 Mt of ROM coal was produced by Drayton Mine in 2013.

The Main Northern Rail Line currently carries approximately 65 Mtpa of coal through Muswellbrook and delivers approximately 165 Mtpa of coal to the Port of Newcastle, according to the most recent data in the *2014-2023 Hunter Valley Corridor Capacity Strategy Consultation Document* (ARTC, 2014). A current production rate of 19 Mtpa of product coal from Mt Arthur Coal Mine and 4.2 Mtpa of product coal from Drayton Mine implies a total of 88 Mtpa currently carried by the Main Northern Rail Line immediately east of the Antiene Rail Spur. The Project would therefore represent approximately 6% of all coal train movements on the Main Northern Rail Line from the Antiene Rail Spur to the Port of Newcastle.

Recent Drayton Mine coal production of 5.5 Mtpa of ROM coal and 4.2 Mtpa of product coal in 2013 required an average of less than 2 train visits or 4 train movements per day. The Project would similarly require an average of 2 train visits or 4 train movements per day to transport product coal produced from up to 6.4 Mtpa of ROM coal. Additional annual train movements would be required to transport product coal, however the maximum number of train movements per day is unlikely to increase as a result of the Project.

8.2 Proposed Rail Traffic Noise

A proposed production rate of up to 6.4 Mtpa of ROM coal from the Project should be compared to the approved production rate of 36 Mtpa of ROM coal from Mt Arthur Coal Mine. This comparison indicates the Project would contribute an average of approximately 15% of all train movements on the Antiene Rail Spur with both coal mines operating at full capacity. Assuming all trains produce a similar noise level while travelling at a similar speed on the eastern end of the Antiene Rail Spur, train noise associated with the Project would be approximately 8 dBA below total train noise levels from combined Project and Mt Arthur Coal Mine train movements.

The Project would contribute up to 0.4 LAeq to existing rail traffic noise levels from the Main Northern Rail Line, assuming a production rate of 6.4 Mtpa and Project related trains representing up to 8% of train movements.

Notes in Appendix 2 of the *Rail Infrastructure Noise Guideline* (RING) state, in part:

> *Notes*
>
> 1. *A project-related noise increase is an increase of more than 0.5 dB over the day or night periods.*
> 2. *The geographical extent of the rail noise assessment ideally should be where project-related rail noise increases are less than 0.5 dB. This roughly equates to where project-related rail traffic represents less than 10 per cent of the total line or corridor rail traffic.*

As Project related rail traffic would be less than 10% and would contribute less than 0.4 dBA at any point on the Main Northern Rail Line, the RING indicates the Project related noise increase to receptors near the Main Northern Rail Line is insignificant and does not require more detailed consideration.

9 CUMULATIVE NOISE LEVELS

Noise levels from existing industrial sources including coal mines, operating in conjunction with the Project, have been assessed to receptor properties and compared to the noise amenity criteria shown in Table 10. Other industrial developments with the potential to produce significant environmental noise include:

- Hunter Valley Operations to the east;
- AGL Macquarie's Hunter River Pump Station;

- Bayswater and Liddell Power Stations to the east and north east; and
- Mt Arthur Coal Mine.

Bengalla Mine to the north and Mangoola Mine to the north west are both located over 10 km from potentially affected receptors and have therefore not been considered in this assessment.

Project noise levels calculated in this assessment are LAeq,15min levels, which means the average noise level in a representative worst case 15 minute period including significant noise enhancement during the evening and night. As weather conditions tend to vary from time to time and would not remain strongly noise enhancing for an entire night, the average noise level over a night is lower than the reported LAeq,15min noise levels. A conservative correction factor of -3 dBA has been adopted to estimate LAeq,night noise levels from the reported LAeq,15min levels.

9.1 Project Noise Levels

Noise levels from the Project have been determined from the noise level tables in Appendix D and Table 19, with a -3 dBA correction factor to convert LAeq,15min to LAeq,night noise levels. The highest predicted noise level in each receptor group is included in the cumulative noise level assessment.

9.2 Hunter Valley Operations

Noise from Hunter Valley Operations was noted at M1 and M2 during the short term noise survey and would have affected the results of the long term noise survey to a minor extent. Measured noise levels during the short term survey indicated mining noise contributed up to 26 LAeq,15min at M1 and up to 25 LAeq,15min at M2 during the night. Mining noise was not audible during the day or evening at M1 or M2.

Adopted 15 minute noise levels are approximately equivalent to 23 LAeq,night at M1 and 22 LAeq,night at M2.

9.3 Hunter River Pump Station

AGL Macquarie operates the Hunter River Pump Station on the north bank of the Hunter River to pump water to Plashett Dam or to Bayswater Power Station for power station cooling. It is possible that the Hunter River Pump Station may be audible at times to closest receptors.

An industrial noise level of 24 dBA estimated at M2 during the night noise survey may have been caused by the Hunter River Pump Station, or may have been due to Hunter Valley Operations. This assessment assumes the Hunter Valley Pump Station has the potential to produce a noise level of 24 LAeq,15min during the night under noise enhancing weather conditions at both M1 and M2 which is approximately equivalent to an amenity level of 21 LAeq,night.

9.4 Bayswater and Liddell Power Stations

Macquarie Generation's Bayswater and Liddell Power Stations are approximately 7 km and 6 km from nearest Drayton Mine receptors and approximately 11 km and 15 km from receptors near Drayton South. No evidence is available to indicate the power stations produce audible noise at closest Drayton Mine receptors, however such noise may occasionally occur and has been conservatively assumed to occur in this assessment.

In the absence of evidence that noise from the power stations is audible at potentially affected properties near the Project, an assumed worst case noise level of 25 LAeq,15min during the night has

been adopted at closest Drayton Mine receptors from both power stations combined. The adopted level is approximately equivalent to 22 LAeq,night.

9.5 Mt Arthur Coal Mine

Noise levels from Mt Arthur Coal Mine are discussed in Section 3.5.4 of this report. Noise levels from Mt Arthur Coal Mine are expected to reach the levels listed in Table 8 for Antiene Estate, under noise enhancing weather conditions, at Drayton Mine receptors near the western side of Antiene. Drayton Mine receptors in Group B near Pamger Drive are located on lower ground and would be partly shielded from Mt Arthur Coal Mine noise. Remaining Group B receptors are located further from Mt Arthur Coal Mine and would also receive at least 2 dBA less than the western most receptors.

A noise level of 35 LAeq,night has been adopted for Group A receptors, based on a level of 38 LAeq,15min for 'Antiene Estate' receptors in Table 8, with a lower level of 33 LAeq,night for Group B receptors.

Noise survey results at M4 also provide an indication of current noise levels, with an estimated 28 LAeq,15min measured from Mt Arthur Coal Mine during the night at this location. A reasonable worst case noise level of 30 LAeq,night, which is equivalent to 5 dBA above the measured level, has been adopted for Mt Arthur Coal Mine at receptors near M4 and less than 25 LAeq,night has been adopted at all other Drayton South receptors.

9.6 Cumulative Industrial Noise Levels

Cumulative industrial noise levels during the night, from the Project and other industrial developments, are shown in Table 24. Calculated noise levels assume simultaneous noise enhancement from all sources of noise, which is considered unlikely to occur where winds in a particular direction are a significant contributor to noise enhancement. Group A receptors, for example, would receive the adopted noise levels from Mt Arthur Coal Mine during a light westerly breeze, which would not significantly enhance noise from the Project. Conversely, the greatest noise enhancement from the Project occurs during the evening under south easterly wind conditions, which are unlikely to enhance noise from Mt Arthur Coal Mine. The calculated cumulative noise levels are therefore theoretical worst case noise levels that might not actually occur.

Day and evening noise levels from all other industrial developments would generally be lower than the night levels and have not been specifically assessed. Mt Arthur Coal Mine's noise contribution at Receptor Group B in Antiene, which includes central Antiene receptors partly shielded from Mt Arthur Coal Mine noise and east Antiene receptors more remote from the New England Highway and Mt Arthur Coal Mine, has been conservatively estimated at 2 dBA lower than Mt Arthur Coal Mine's noise contribution at more exposed receptors.

Table 24: Existing Industrial Noise Levels, Night, dBA.

Industrial Noise Source	Existing Noise Levels, LAeq,night					
	Group A Antiene	Group B Antiene	Group C		Group D	
			M1	M2	M3	M4
The Project	< 36	< 35	< 25	< 29	< 24	< 24
Hunter Valley Operations	-	-	23	22	-	-
Hunter River Pump Station	-	-	21	21	-	-
Bayswater and Liddell Power Stations	22	22	-	-	-	-
Mt Arthur Coal Mine	35	33	< 25	< 25	< 25	30
Combined Industrial Noise Level, Night	39	37	30	31	28	31
Amenity Limits	40	40	40	40	40	40

Table 24 indicates cumulative noise levels would remain within the noise amenity limits at all receptors. Predicted cumulative noise levels are therefore considered acceptable and no additional noise control measures are required.

10 BLAST OVERPRESSURE AND VIBRATION

Blasting will be required to prepare overburden for removal and may be required for coal extraction. Blasting procedures would be substantially the same as those currently used at Drayton Mine. Blast effects including ground vibration and overpressure depend on the following factors:

- Ground conditions including rock types and layers;
- Groundwater conditions including extent and depth;
- Distance from the blast site to a receptor;
- How well the explosive charges are confined with stemming material;
- Maximum Instantaneous Charge (MIC) for the blast event;
- Topography between the blast site and receptors; and
- Atmospheric conditions including wind speed, wind direction and vertical temperature gradient.

A typical blast includes a number of separate charged holes which are detonated in a specific pattern to maximise the effectiveness of the blast. The MIC is determined by the weight of explosive material per hole multiplied by the maximum number of holes detonated simultaneously within the firing pattern and is typically in the range 1000 kg to 2000 kg for large open cut coal mines such as the Project.

Blast effects have been calculated using the equations in Appendix J of *Australian Standard 2187.2-2006 Explosives – Storage and use, Part 2: Use of explosives*. Common values of K = 1140 and B = 1.6 have been adopted for the ground vibration coefficients, although some adjustment to these parameters may be appropriate based on initial blast monitoring results.

A comprehensive Blast Management Plan would be prepared including management measures to minimise impacts on all sensitive receptors, heritage structures, infrastructure such as roads and pipelines and livestock on adjoining rural properties.

10.1 Predicted Blast Effects

Blast effects have been calculated to receptor locations as presented in Table 25 for the closest blast locations and as contours over the receptor area as presented in Figures B16 to B18 in Appendix B for each assessed year. Calculated ground vibration levels in Table 25 and in the figures are based on two typical MIC values and on the distance from the closest blast site to the receptor location, with no influence from terrain or variation in geological conditions.

Overpressure levels in Table 25 have been calculated using the equations in AS 2187. Blast locations will generally not be visible from any receptor, however the calculated overpressure levels conservatively assume a direct line of sight from a blast to all moderately shielded receptors. A nominal -5 dBL correction has been applied to the calculated overpressure level to well shielded receptors 226 and 227.

Table 25 shows calculated ground vibration and overpressure levels for closest blast events to each representative receptor location. Results have been calculated in the absence of mitigation measures and should be compared with the 5 mm/s and 115 dB criteria for occupied residences and the alternative criteria listed in Table 12 for heritage and other sensitive structures. Calculated overpressure levels assume a typical well confined bench blast.

Table 25: Predicted Blast Effects, No Mitigation or Topographic Shielding.

MIC, kg	500	1000	1500	2000	500	1000	1500	2000	Criteria
Receptor (closest distance)	Ground Vibration, mm/s				Overpressure, dBL				mm/s, dBL
Bowfield Homestead, 1.8 km	1.0	1.8	2.5	3.1	106	109	111	112	10, 120
Plashett Homestead, 3.8 km	0.3	0.5	0.7	0.9	97	100	102	103	10, 120
Edderton Homestead, 1.0 km	2.4	4.2	5.8	7.3	113	116	118	119	10, 120
Strowan Homestead, 4.6 km	0.2	0.4	0.5	0.7	95	98	99	100	5, 115
Arrowfield Cottage, 4.7 km	0.2	0.4	0.5	0.7	94	97	99	100	5, 115
Woodlands Homestead, 5.5 km	0.2	0.3	0.4	0.5	92	95	97	98	5, 115
Randwick Homestead, 3.3 km	0.4	0.7	0.9	1.2	99	102	103	105	5, 115
226 Hollydene, 1.8 km [1]	1.0	1.8	2.5	3.1	101	104	106	107	5, 115
227 Coolmore Office, 3.2 km [1]	0.4	0.7	1.0	1.2	94	97	99	100	5, 115
Private Receptor 250, 4.3 km	0.3	0.4	0.6	0.8	96	98	100	101	5, 115
Plashett Dam, 3.9 km	0.3	0.5	0.7	0.9	-	-	-	-	10, -
Hunter River Pump Stn, 6.2 km	0.1	0.2	0.3	0.4	-	-	-	-	2, -
Mac Gen pipeline, 5.3 km	0.2	0.3	0.4	0.5	-	-	-	-	10, -
Bayswater Power Stn, 6.4 km	0.1	0.2	0.3	0.4	-	-	-	-	2, -

1 Overpressure level has been reduced by 5 dBL due to significant topographical shielding.

Results in Table 25 indicate blasting associated with the Project is predicted to produce ground vibration and overpressure levels well below the relevant amenity criteria at all privately owned residences and sensitive structures. Up to 5 blasts per week are assumed to be required for the proposed production rate.

The overpressure contours in Figures B16 to B18 were calculated using the Project noise model with a sound power level of 223 dBL and 226 dBL in the lowest 31.5 Hz octave band for an MIC of 1000 kg and 2000 kg respectively. The sound power levels were selected to ensure the noise model results and AS 2187 calculations agree for receptor locations with a line of sight to the blast source. The overpressure contours represent the maximum level from a number of nominal blast sources distributed around the advancing southern edge of the active mining area and include the effect of topographical shielding where relevant. The figures confirm no ground vibration or overpressure impacts are predicted at any sensitive receptor.

The predicted overpressure levels in Table 25, generally in the range 90 to 115 dBL peak, are very different from and cannot be compared to mining noise levels expressed in dBA. Overpressure occurs at very low frequencies and for extremely short time periods, both of which tend to reduce our perception of the impacts as human ears are less sensitive to low frequencies and short duration sound. An overpressure level of 90 dBL appears, subjectively, similar to a mild and distant thunderclap, while an overpressure level of 115 dBL appears similar to a moderate yet still distant thunderclap. Assuming overpressure primarily occurs in the range 10 Hz to 16 Hz, an overpressure level equal to the of 115 dBL peak criterion appears similar to a maximum noise level in the range 28 to 53 dBA for a period of less than one second.

10.2 Proposed Blast Management Measures

Initial calculations described above have indicated blast effects would meet relevant vibration and overpressure criteria. The following mitigation and management measures are nevertheless recommended to control and minimise blast effects to any sensitive receptor:

- Blasting should not occur closer than 500m to any occupied or sensitive building or structure unless adequate controls are implemented to minimise the risk of fly rock;

- A qualified geotechnical, building or engineering expert should inspect and assess all identified buildings or structures of heritage or industrial significance, to determine appropriate ground vibration and overpressure limits and record the current condition of each building or structure, unless the owner of each building or structure has sufficient technical information available to set relevant blasting criteria. Recommended vibration and overpressure limits for each building or structure would be included in the Blast Management Plan;
- All blasts should be monitored, at receptor locations or alternative representative locations, to confirm acceptable blast impacts and to assist in predicting future blast effects as the blast sites approach sensitive receptors;
- Electronic detonators should be used where necessary to provide accurate timing and firing patterns to minimise the chance of excessive ground vibration; and
- The Blast Management Plan should include detailed procedures and notification requirements for any temporary road closures that may be required during blast events close to public roads.

Potential blast effects on livestock, including horses, have been assessed using the data in Table 25 and the blast effect contours in Appendix B as part of the EIS Equine Health Impact Assessment. Blast events designed and detonated according to an appropriate Blast Management Plan are expected to meet appropriate criteria at all sensitive receptors.

10.3 Proposed Construction Blasting

Some blast events may be required to extract material from an existing quarry adjacent to the proposed transport corridor. Material extracted from the quarry would be used to construct roads, provide suitable foundations for buildings and other similar applications related to the Project.

Blasting within the quarry is assumed to require an MIC of less than 100 kg. The nearest sensitive receptor to the quarry is Bayswater Power Station located approximately 4.7 km to the east, followed by Edderton homestead located approximately 6.6 km to the south west.

Calculations indicate a peak ground vibration level of 0.06 mm/s and an overpressure level of 88 dB at Bayswater Power Station, assuming an MIC of 100 kg for a quarry blast. These results indicate blast impacts are unlikely to occur during material extraction activities at the quarry and blast monitoring during this phase of the Project is not recommended.

11 CONCLUSION

This assessment shows up to seven privately owned receptors within the Antiene rural residential area near Drayton Mine are predicted to receive negligible noise impacts of up to 2 dBA above relevant PSNLs, with an additional two privately owned receptors predicted to receive moderate noise impacts of up to 3 dBA above relevant PSNLs as shown in the shaded areas of Table 19. Noise levels from the Project would be lower than existing noise levels from Drayton Mine at all receptors, as mining equipment would be relocated from Drayton Mine to the more remote Drayton South area.

The Project includes all feasible and reasonable mitigation measures applied to the Drayton South mining area and, consequently, environmental noise levels are predicted to meet relevant noise criteria at all Drayton South receptors. Periods of more audible noise within the PSNLs may occur depending on weather conditions during the night, however such conditions are expected to occur rarely and over relatively short time periods.

Construction noise levels are expected to be acceptable at all potentially affected residences. A detailed Construction Noise Management Plan is recommended for all work outside normal construction hours to ensure noise levels remain within relevant operational criteria that apply at those times.

Train wagon bunching events and locomotive movements on the Drayton Mine rail loadout loop or on the Antiene Rail Spur have the potential to disturb the sleep of a number of Drayton Mine receptors. Ongoing consultation with the community and rail service providers is recommended to identify and implement all feasible and reasonable management measures to avoid or minimise locomotive noise and wagon bunching events. Given the train wagon bunching events can generally be avoided, predicted maximum noise levels are expected to be acceptable.

Other potential sources of sleep disturbance from the Project, such as dozer track slap and dragline bucket impacts, have a minor potential to cause sleep disturbance depending on the operating location of each source and are unlikely to occur given the proposed management measures to control such sources where required.

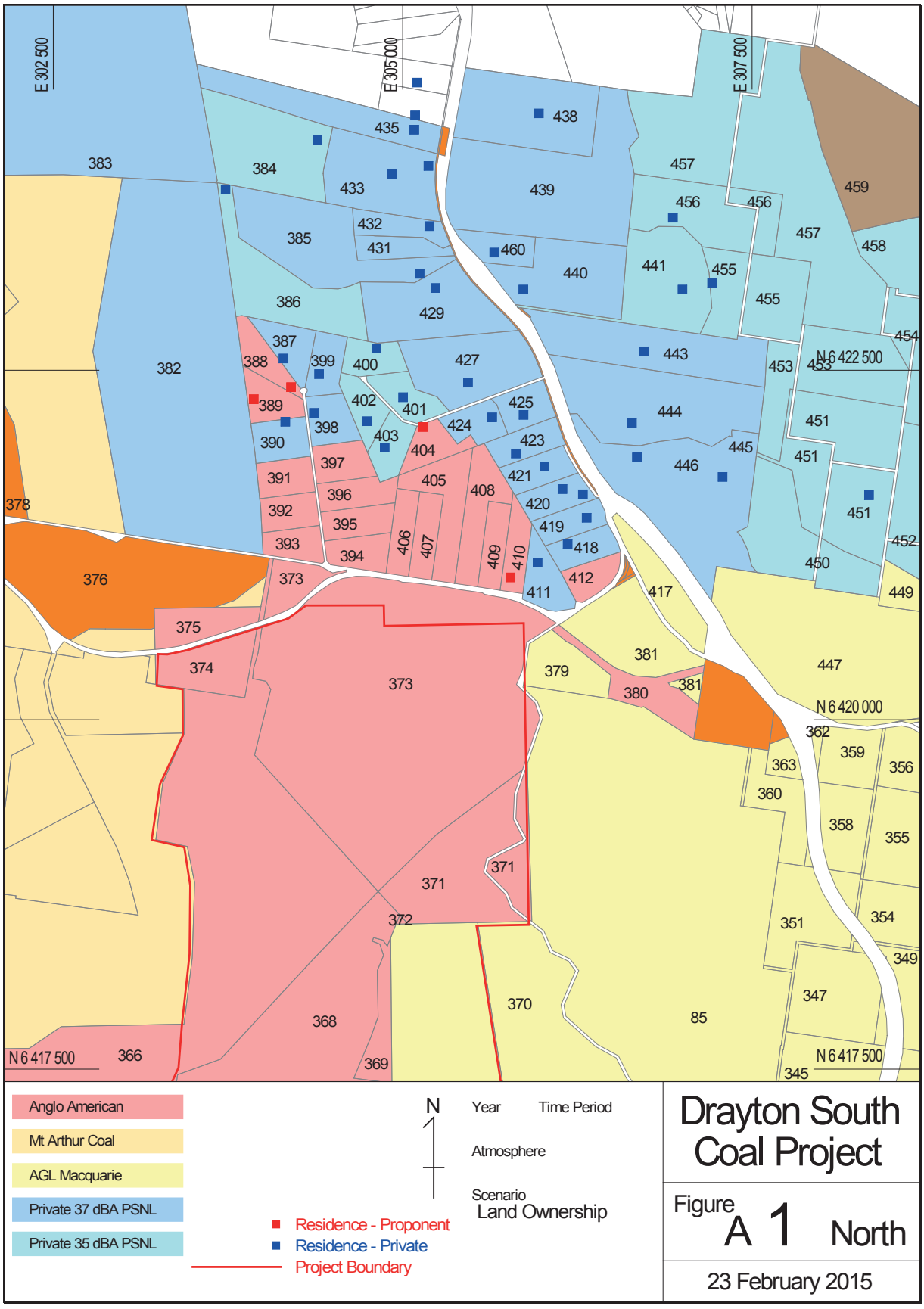
Noise from road traffic associated with construction activities and ongoing operation of the Project would be an insignificant contributor to total traffic noise levels from all arterial roads in the vicinity of the Project. No traffic noise mitigation measures are required or have been recommended.

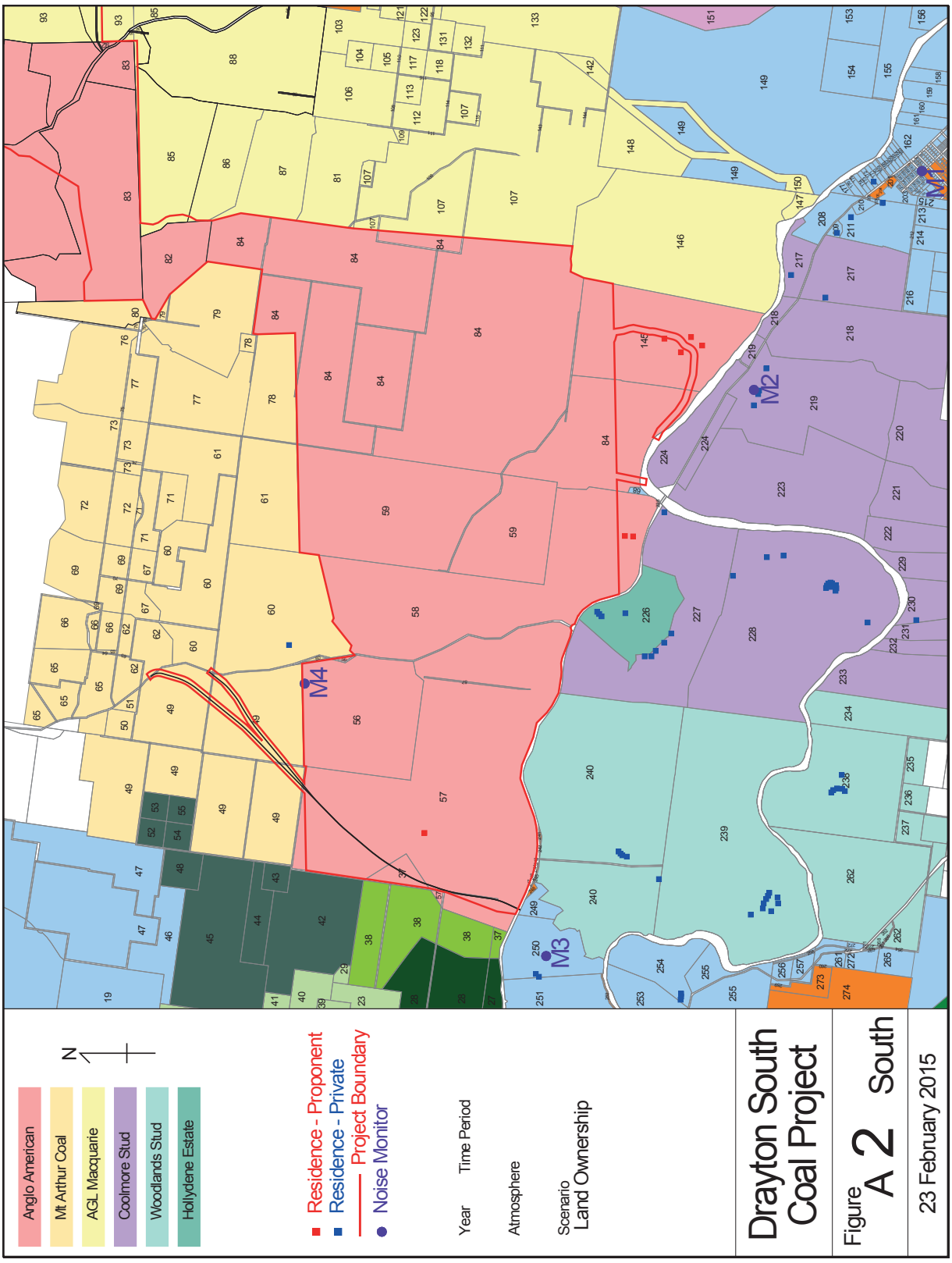
Low frequency noise levels from the Project are implicitly controlled by the intrusive noise criteria, as intended by the INP, with all low frequency noise levels within relevant criteria. Predicted cumulative noise levels, assuming a theoretical worst case situation with strongly noise enhancing weather conditions from all industrial developments, would remain within relevant noise amenity criteria for the conservative 'rural' category at all receptors.

Blasting associated with the Project is predicted to meet relevant criteria at all sensitive receptors. A review of suggested blast criteria and blast management measures for structures such as the Hunter River Pump Station is recommended to ensure its integrity and ongoing operation. A Blast Management Plan recommended for the Project would include relevant criteria, management measures and monitoring strategies to ensure ongoing compliance with adopted criteria.

APPENDIX A – LAND OWNERSHIP PLANS

FIGURE	LANDOWNERSHIP PLAN
A1 North	Landownership plan, Drayton Mine
A2 South	Landownership plan, Drayton South
A3 South	Assessed heritage and items sensitive to blasting, Drayton South

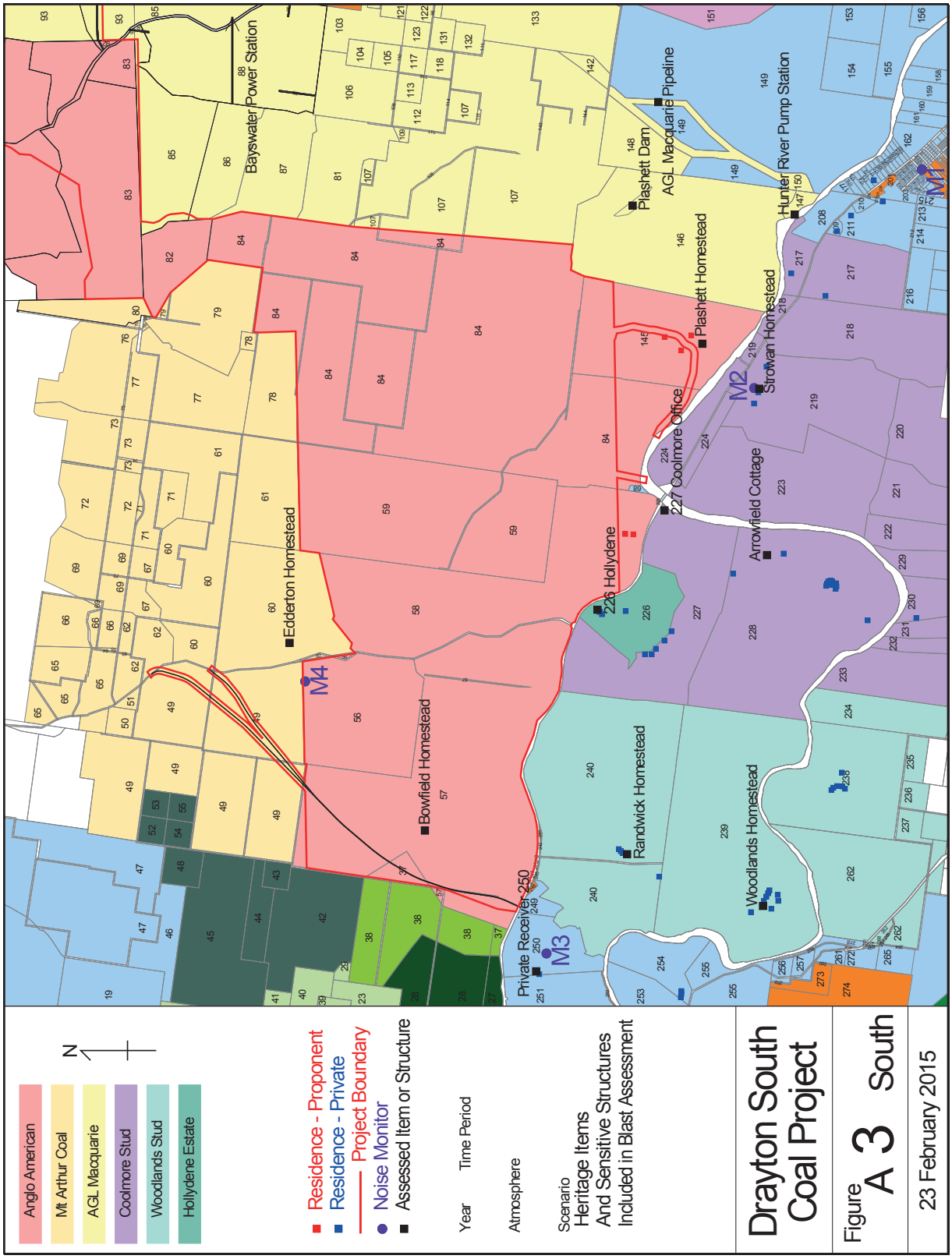

E 302 500
E 305 000
E 307 500
N 6 422 500
N 6 420 000
N 6 417 500
Anglo American
Mt Arthur Coal
AGL Macquarie
Private 37 dBA PSNL
Private 35 dBA PSNL
N
Year
Time Period
Atmosphere
Scenario
Land Ownership
Residence - Proponent
Residence - Private
Project Boundary
Drayton South Coal Project
Figure A 1 North
23 February 2015



Drayton South Coal Project

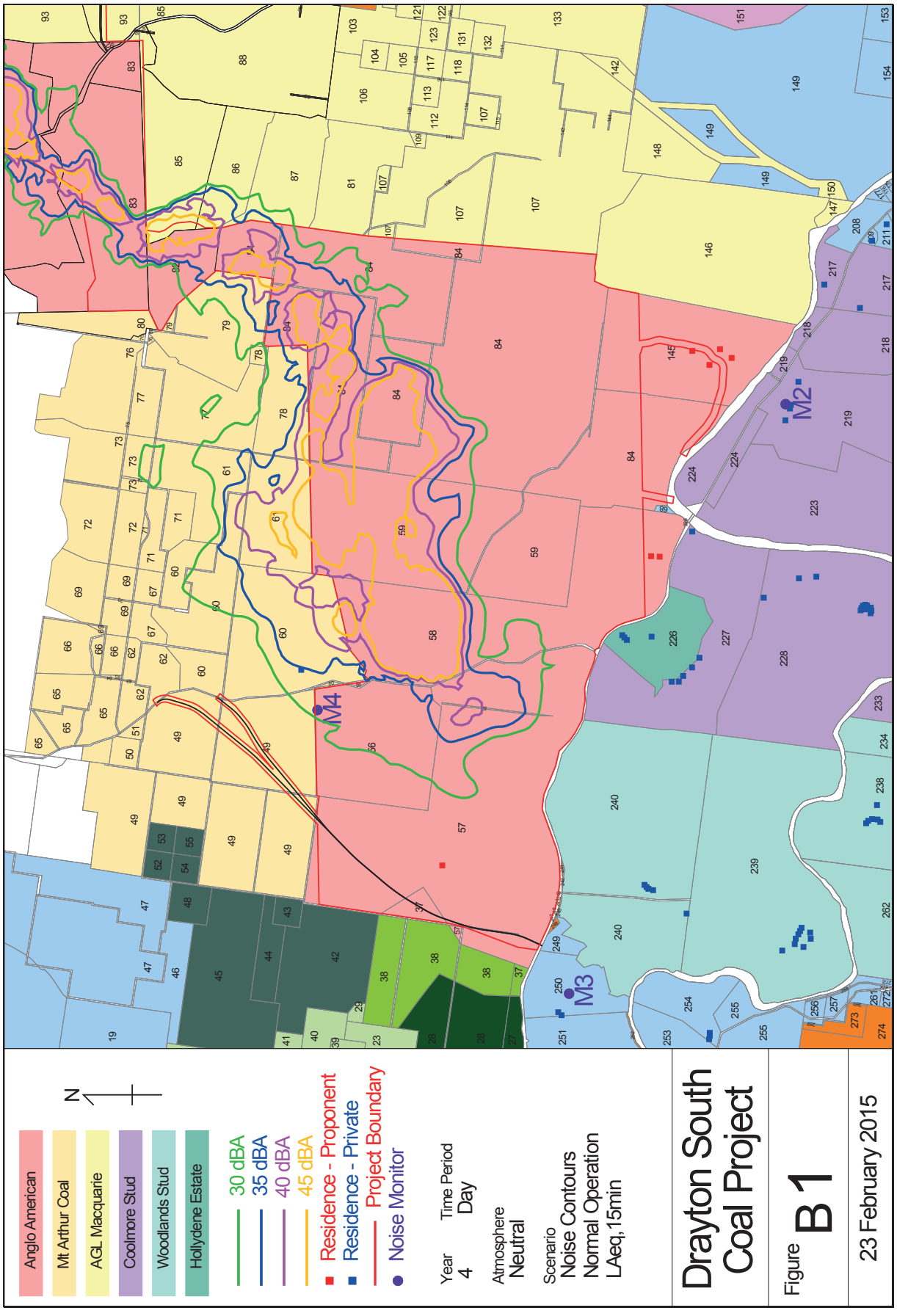
Figure A 2 South

23 February 2015


Anglo American
Mt Arthur Coal
AGL Macquarie
Coolmore Stud
Woodlands Stud
Hollydene Estate
N
Residence - Proponent
Residence - Private
Project Boundary
Noise Monitor
Assessed Item or Structure
Year
Time Period
Atmosphere
Scenario
Heritage Items
And Sensitive Structures
Included in Blast Assessment
Drayton South
Coal Project
Figure A 3 South
23 February 2015
Bayswater Power Station
Plashett Dam
AGL Macquarie Pipeline
Hunter River Pump Station
Plashett Homestead
Strowan Homestead
Coolmore Office
Arrowfield Cottage
Hollydene
Edderton Homestead
Bowfield Homestead
Randwick Homestead
Woodlands Homestead
Private Receiver 250
M1
M2
M3
M4

APPENDIX B – NOISE AND BLASTING CONTOUR FIGURES

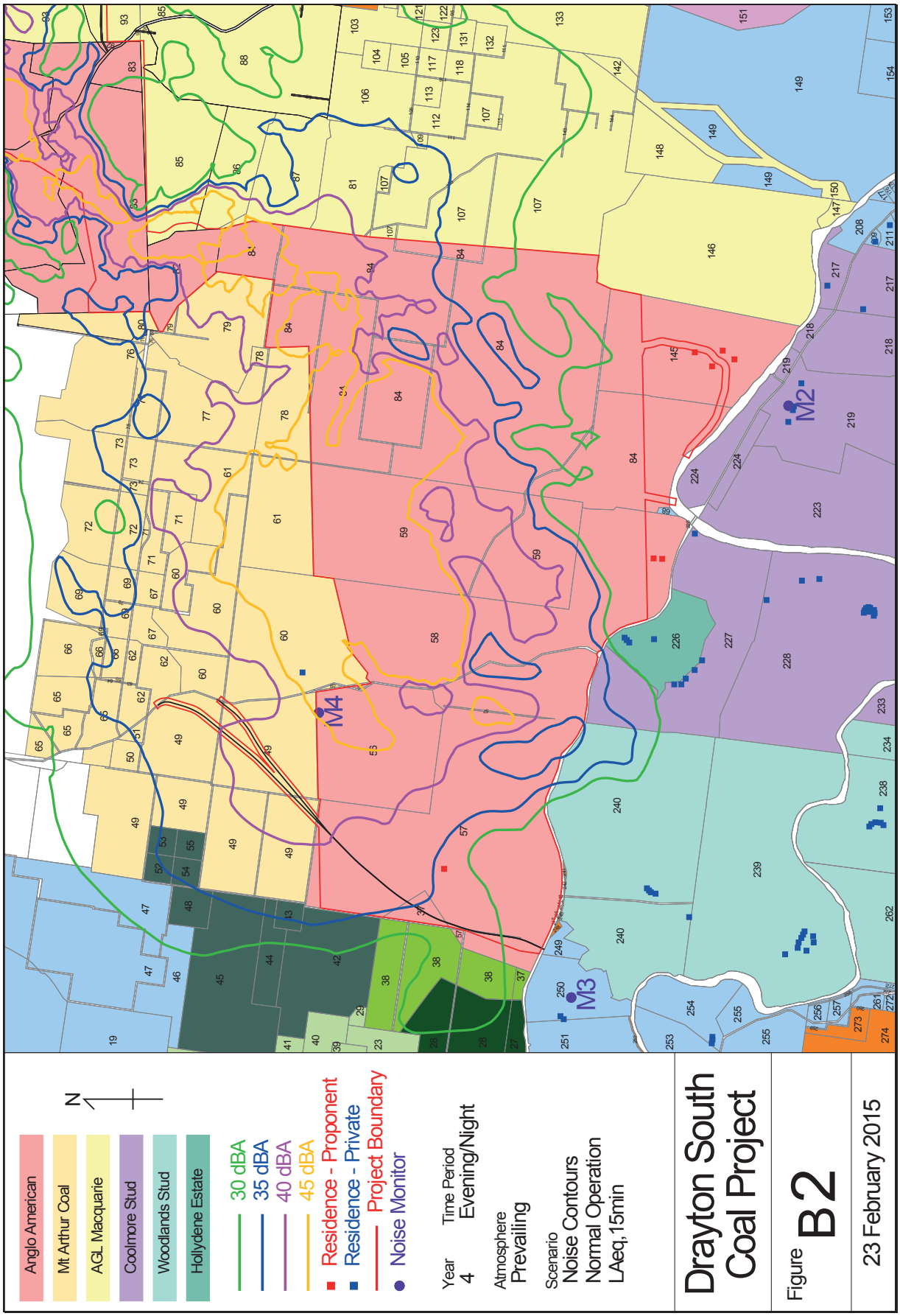
FIGURE	NOISE CONTOURS – NORMAL OPERATION		
B1 Drayton South	Year 4	Day	Neutral weather conditions
B2 Drayton South	Year 4	Evening/night	Prevailing weather conditions
B3 Drayton South	Year 6	Day	Neutral weather conditions
B4 Drayton South	Year 6	Evening/night	Prevailing weather conditions
B5 Drayton South	Year 12	Day	Neutral weather conditions
B6 Drayton South	Year 12	Evening/night	Prevailing weather conditions
B7 Drayton Mine	All years	Day	Neutral weather conditions
B8 Drayton Mine	All years	Evening	Prevailing weather conditions
B9 Drayton Mine	All years	Night	Prevailing weather conditions
FIGURE	NOISE CONTOURS – CONSTRUCTION		
B10 Drayton South	Year 1	Day	Neutral weather conditions
B11 Drayton South	Year 1	Evening/Night	Prevailing weather conditions
FIGURE	NOISE CONTOURS – ANTIENE RAIL SPUR		
B12 Drayton Mine	All years	Day	Neutral weather conditions
B13 Drayton Mine	All years	Evening	Prevailing weather conditions
B14 Drayton Mine	All years	Night	Prevailing weather conditions
B15 Drayton Mine	All years	Night Sleep Disturbance	Prevailing weather conditions
FIGURE	BLASTING CONTOURS – NORMAL OPERATION		
B16 Drayton South	Year 4	Day	Neutral weather conditions
B17 Drayton South	Year 6	Day	Neutral weather conditions
B18 Drayton South	Year 12	Day	Neutral weather conditions

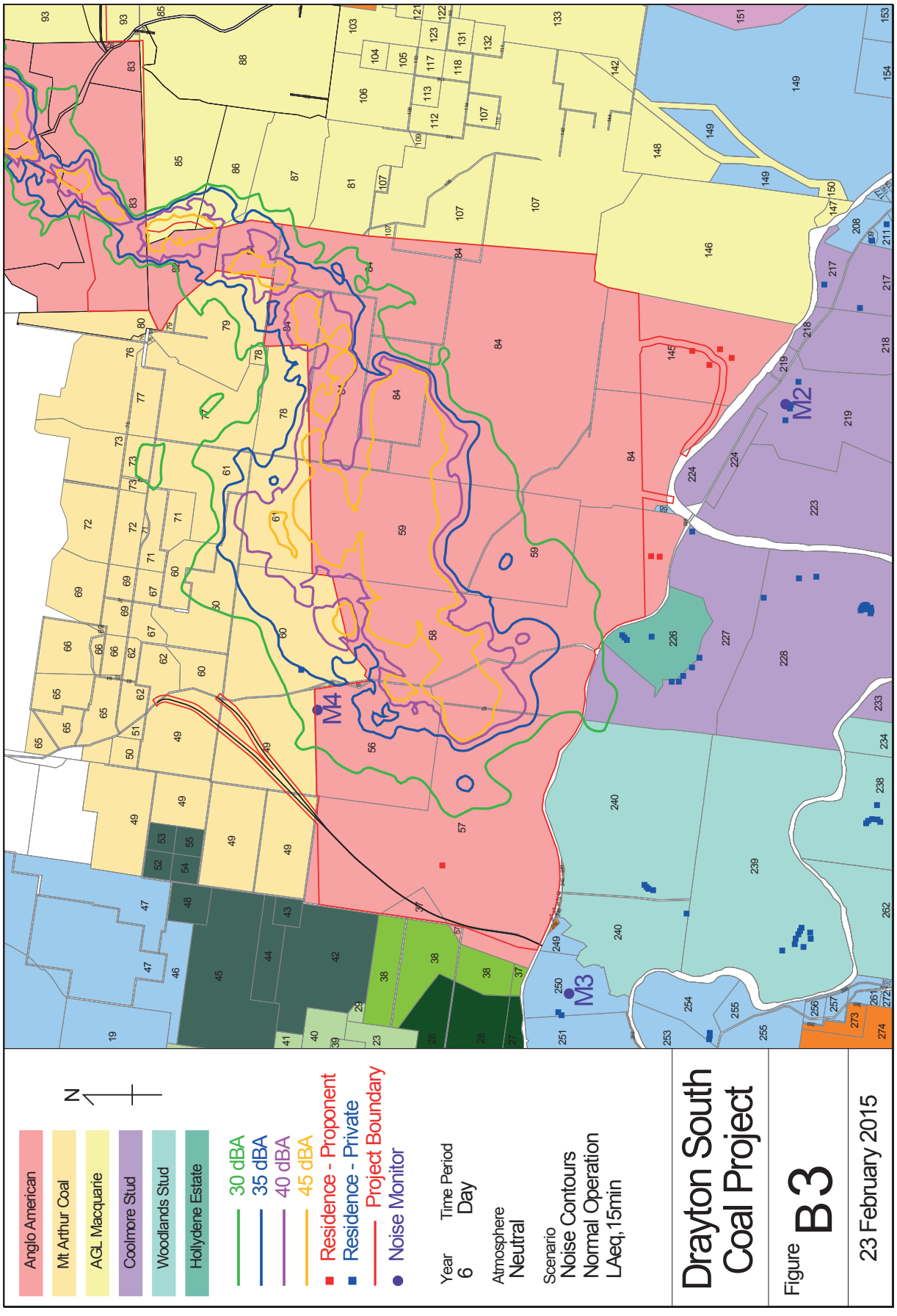


Drayton South Coal Project

Figure B1

23 February 2015

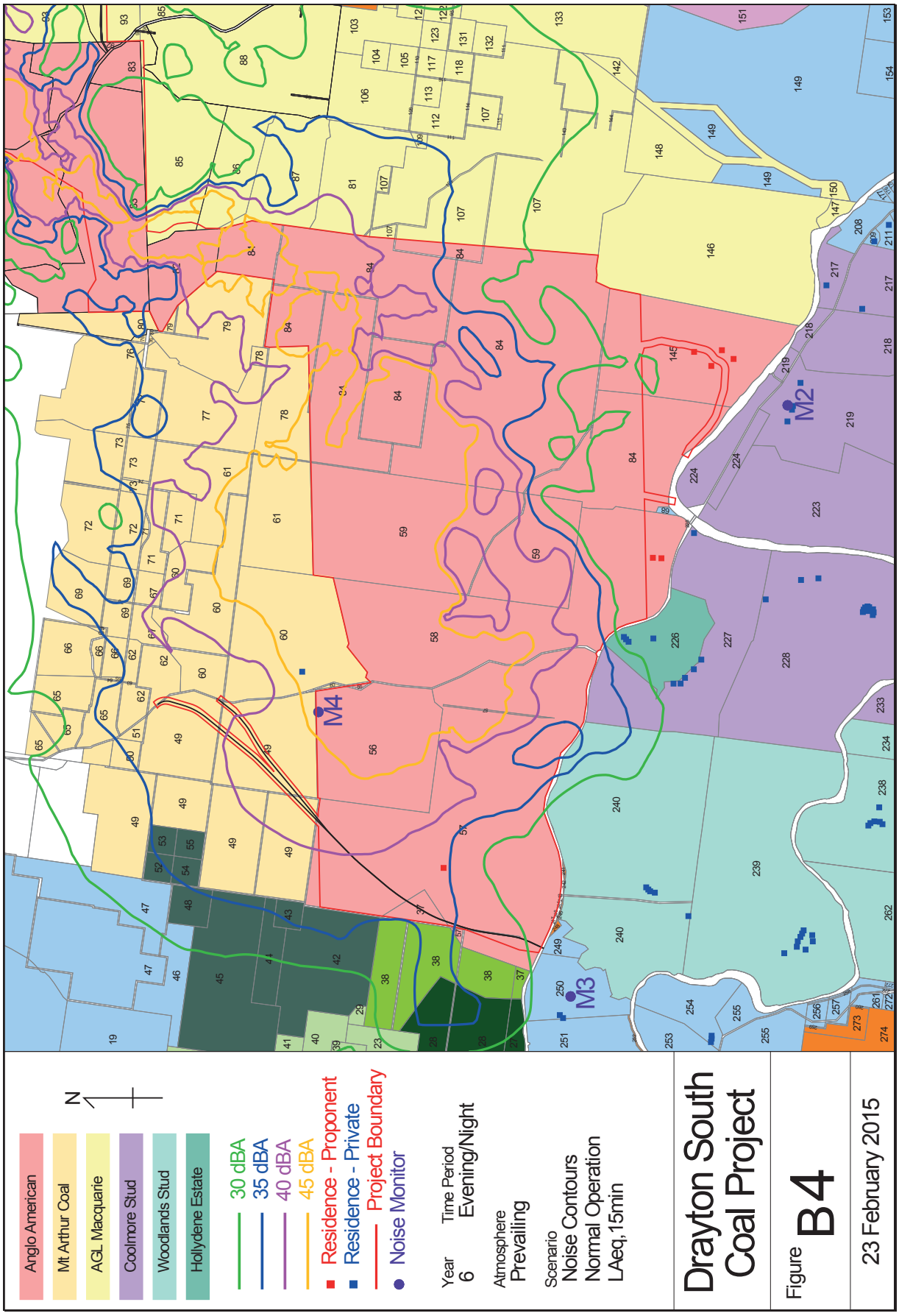

Anglo American
Mt Arthur Coal
AGL Macquarie
Coolmore Stud
Woodlands Stud
Hollydene Estate
N
30 dBA
35 dBA
40 dBA
45 dBA
Residence - Proponent
Residence - Private
Project Boundary
Noise Monitor
Year
4
Time Period
Evening/Night
Atmosphere
Prevailing
Scenario
Noise Contours
Normal Operation
LAeq,15min
M1
M2
M3
M4
Drayton South Coal Project
Figure B2
23 February 2015

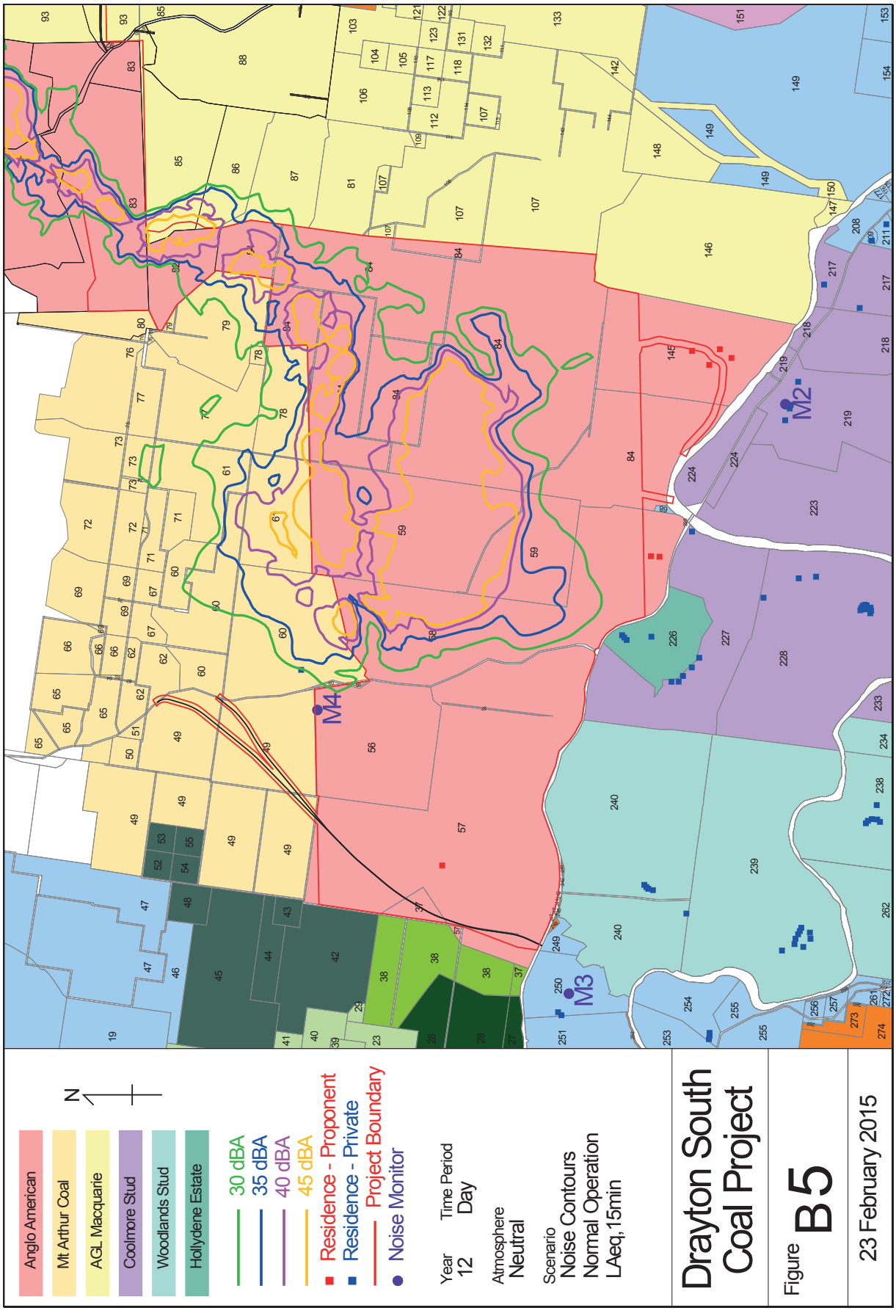


Drayton South Coal Project

Figure B3

23 February 2015

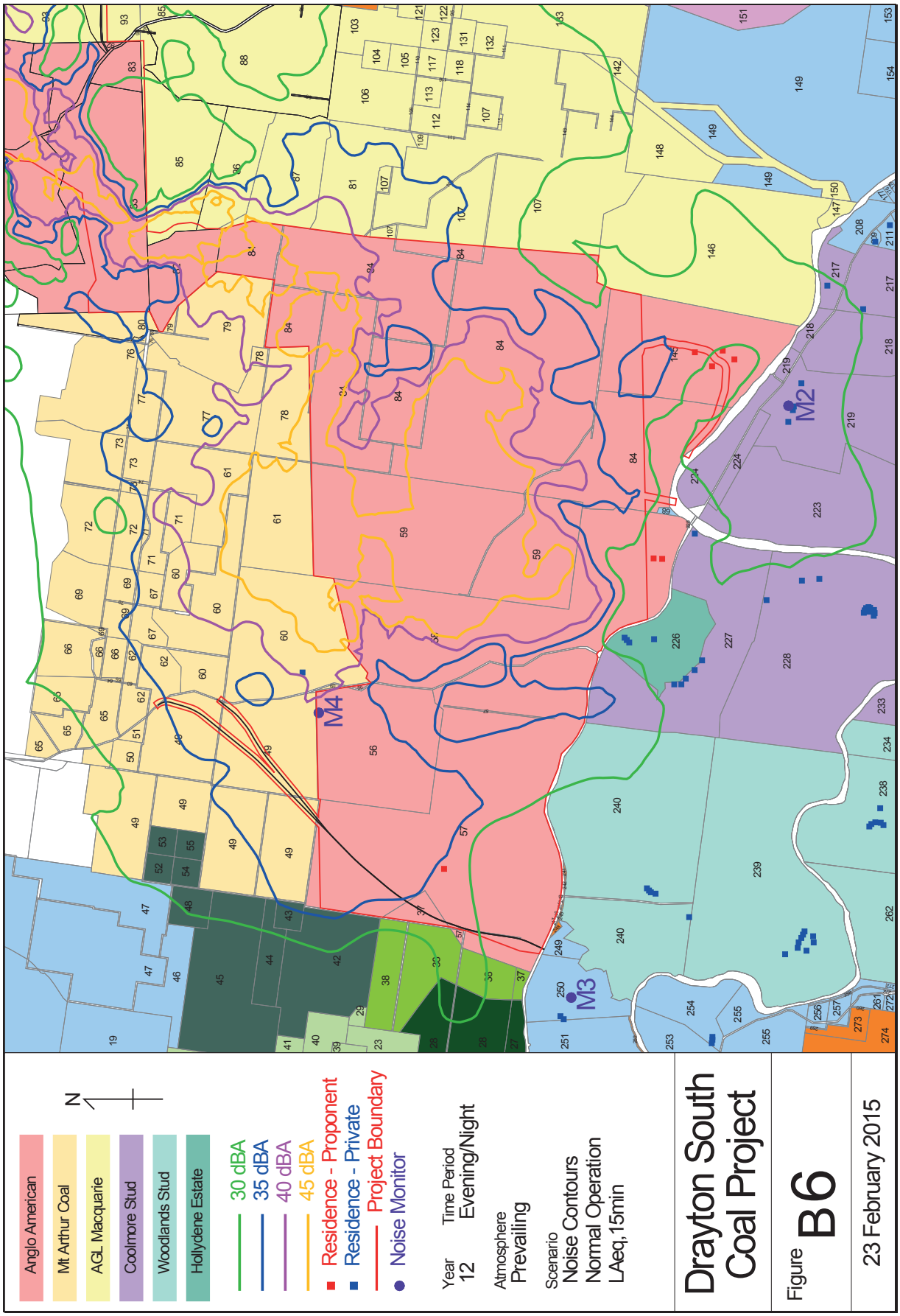

Anglo American
Mt Arthur Coal
AGL Macquarie
Coolmore Stud
Woodlands Stud
Hollydene Estate
N
30 dBA
35 dBA
40 dBA
45 dBA
Residence - Proponent
Residence - Private
Project Boundary
Noise Monitor
Year 6
Time Period Evening/Night
Atmosphere Prevailing
Scenario Noise Contours Normal Operation LAeq,15min
M1
M2
M3
M4
Drayton South Coal Project
Figure B4
23 February 2015

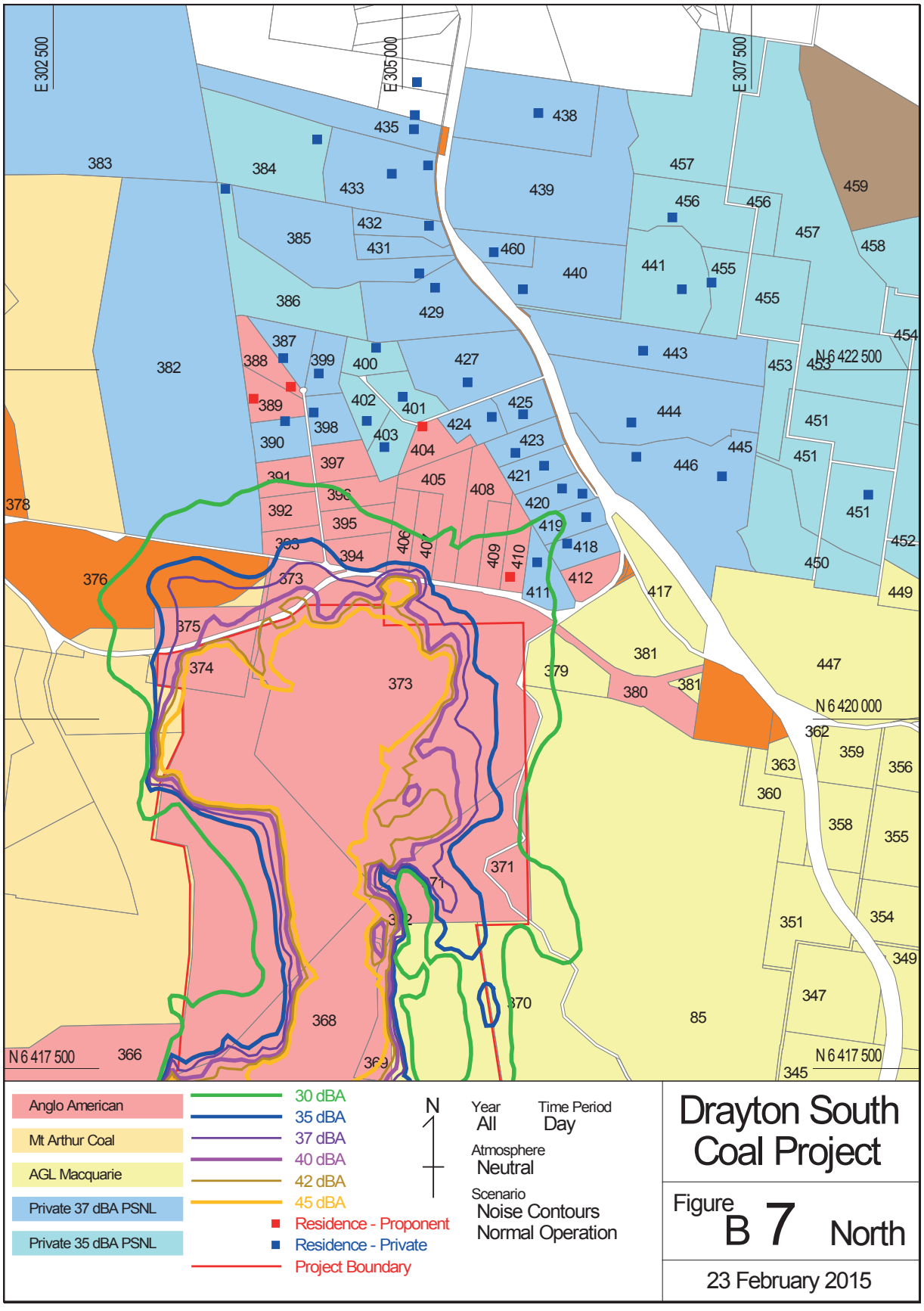


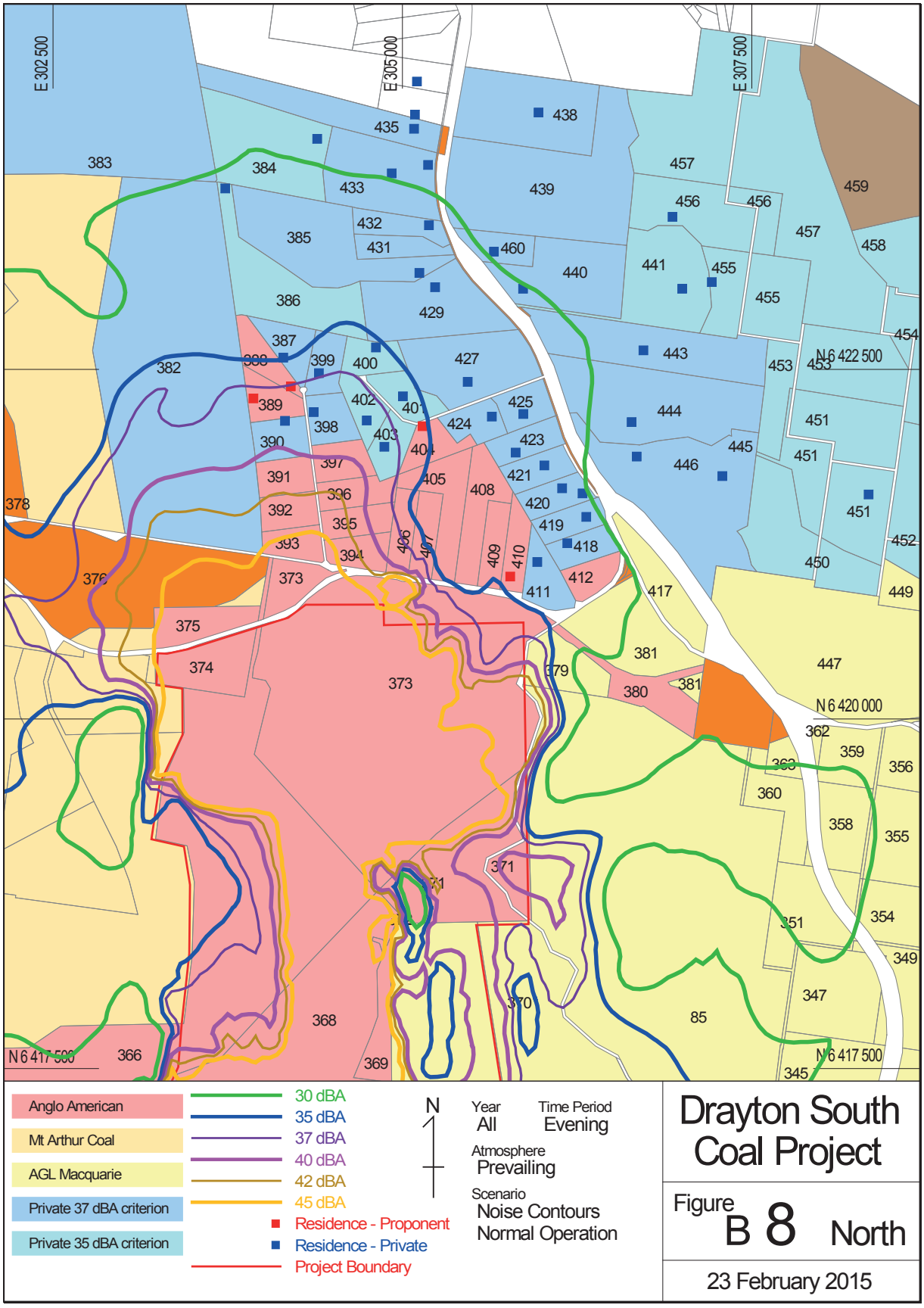
Drayton South Coal Project

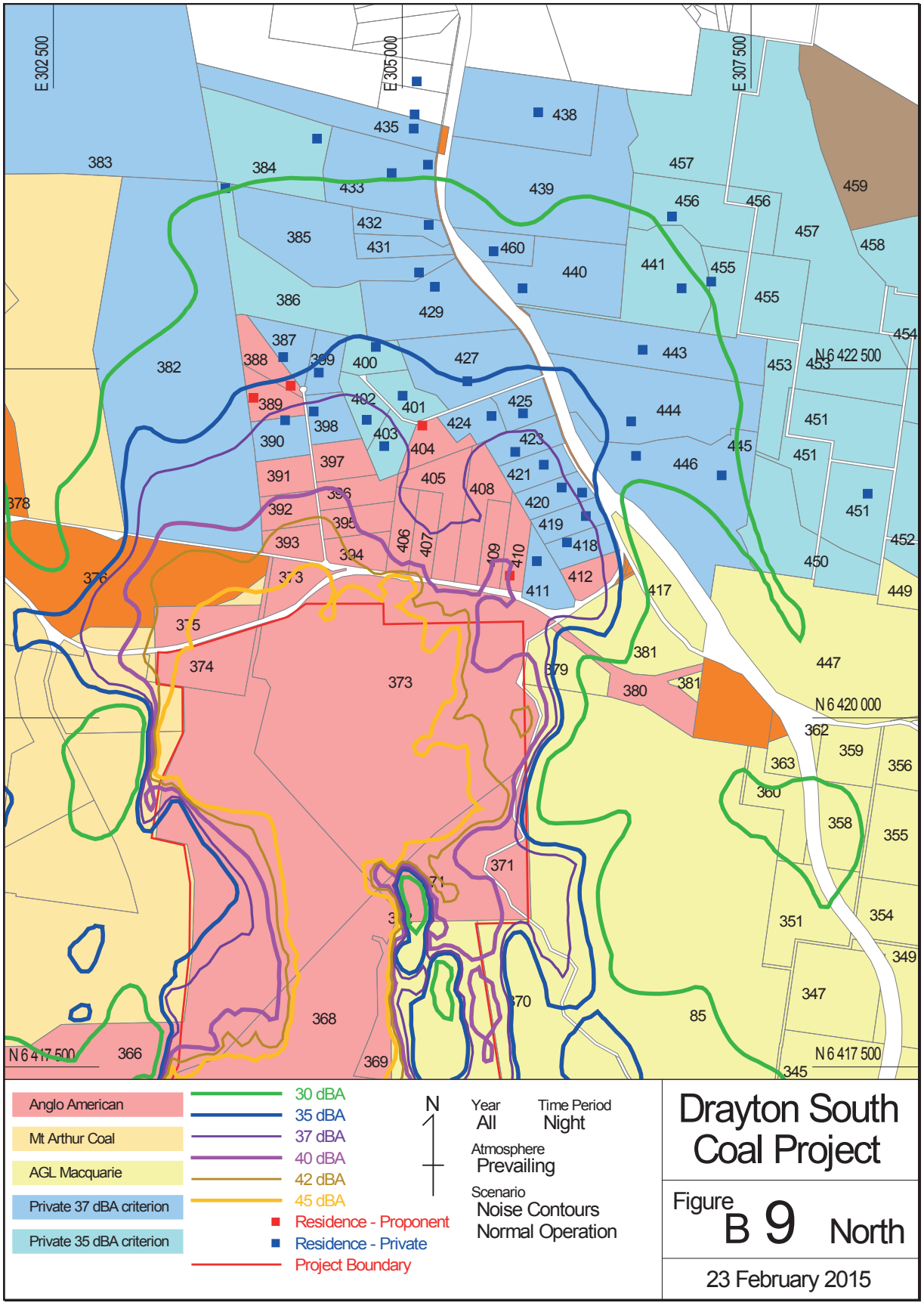
Figure B5

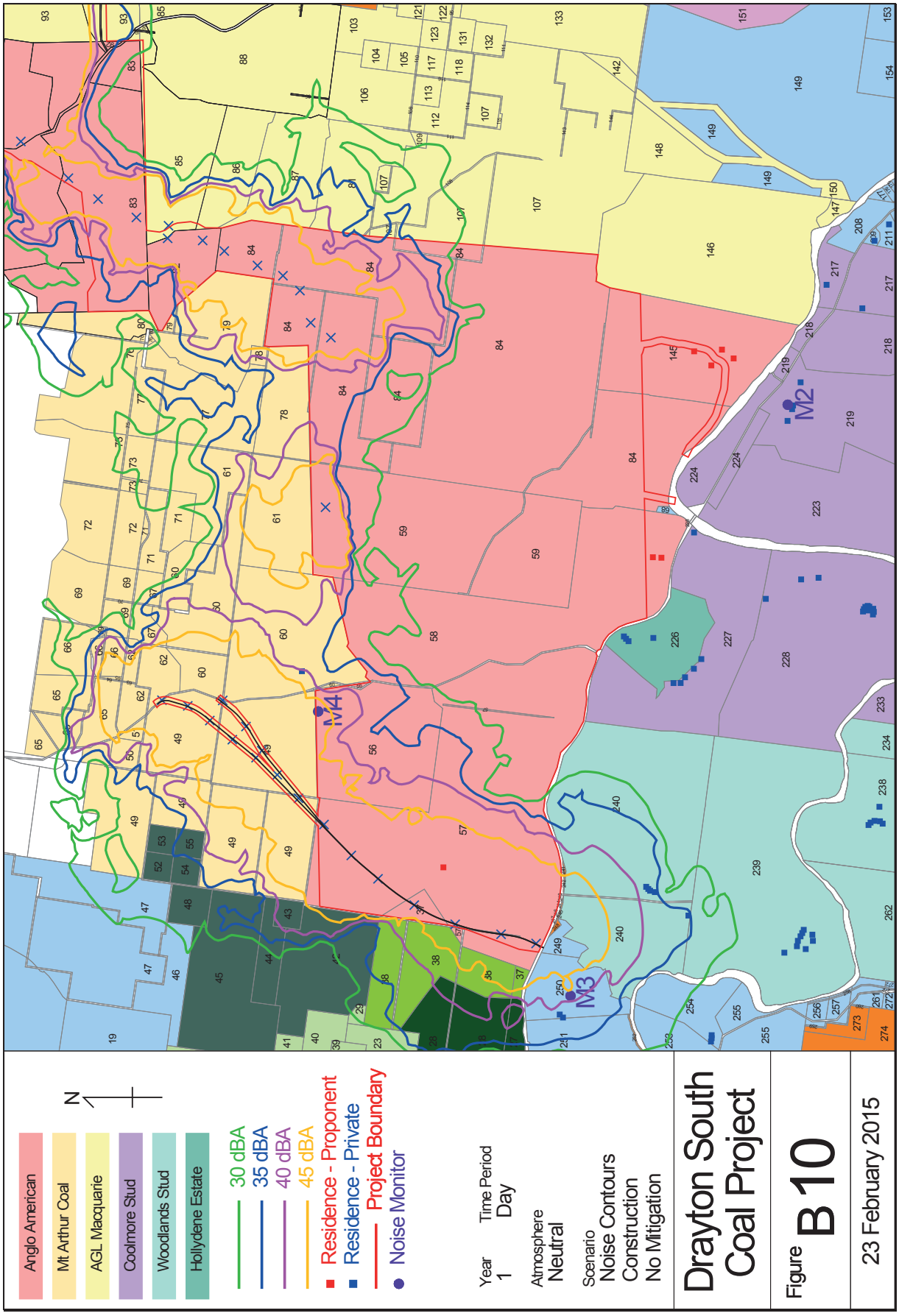
23 February 2015

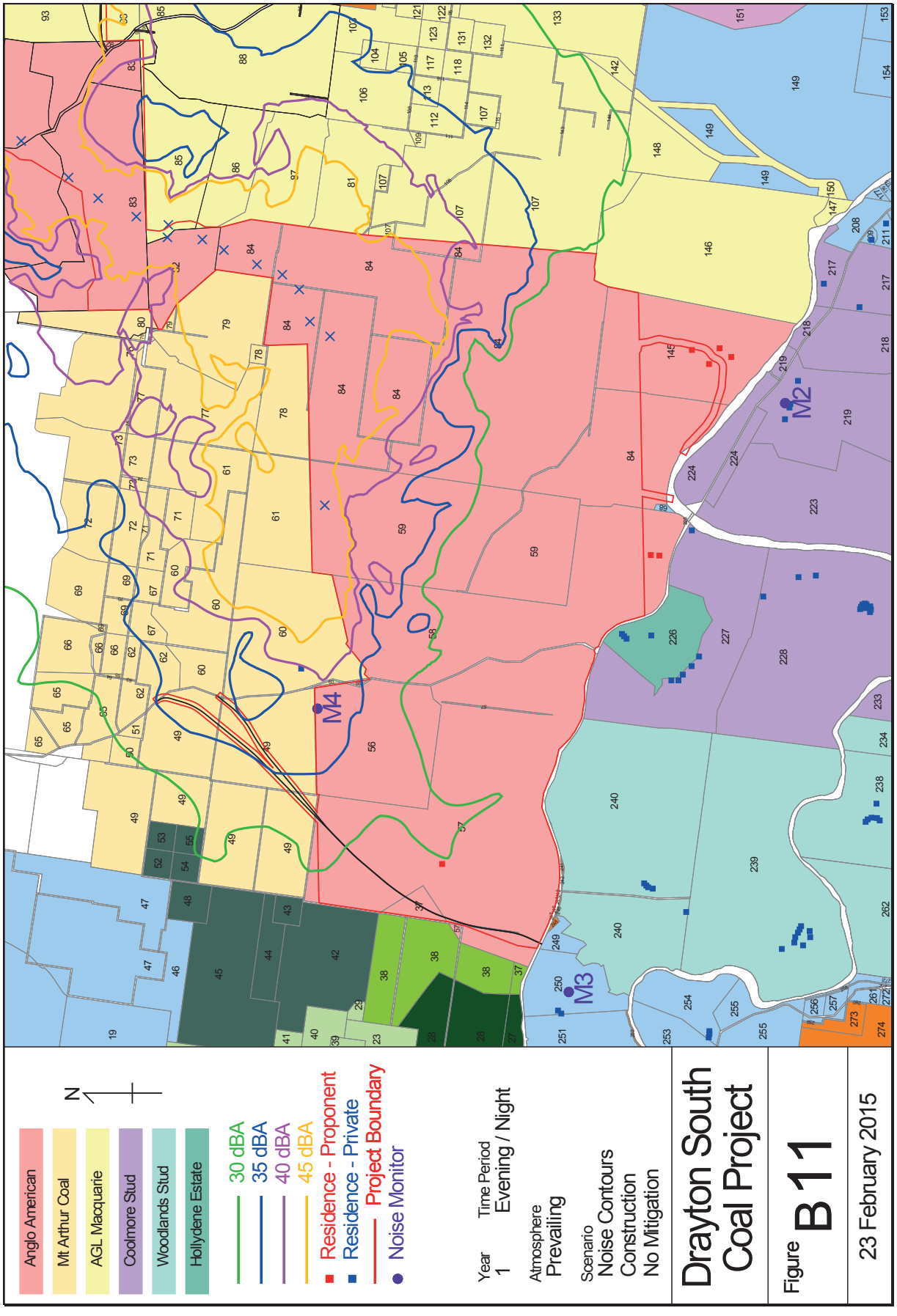

Anglo American
Mt Arthur Coal
AGL Macquarie
Coolmore Stud
Woodlands Stud
Hollydene Estate
N
30 dBA
35 dBA
40 dBA
45 dBA
Residence - Proponent
Residence - Private
Project Boundary
Noise Monitor
M1
M2
M3
M4
Year
12
Time Period
Evening/Night
Atmosphere
Prevailing
Scenario
Noise Contours
Normal Operation
LAeq,15min
Drayton South
Coal Project
Figure
B6
23 February 2015

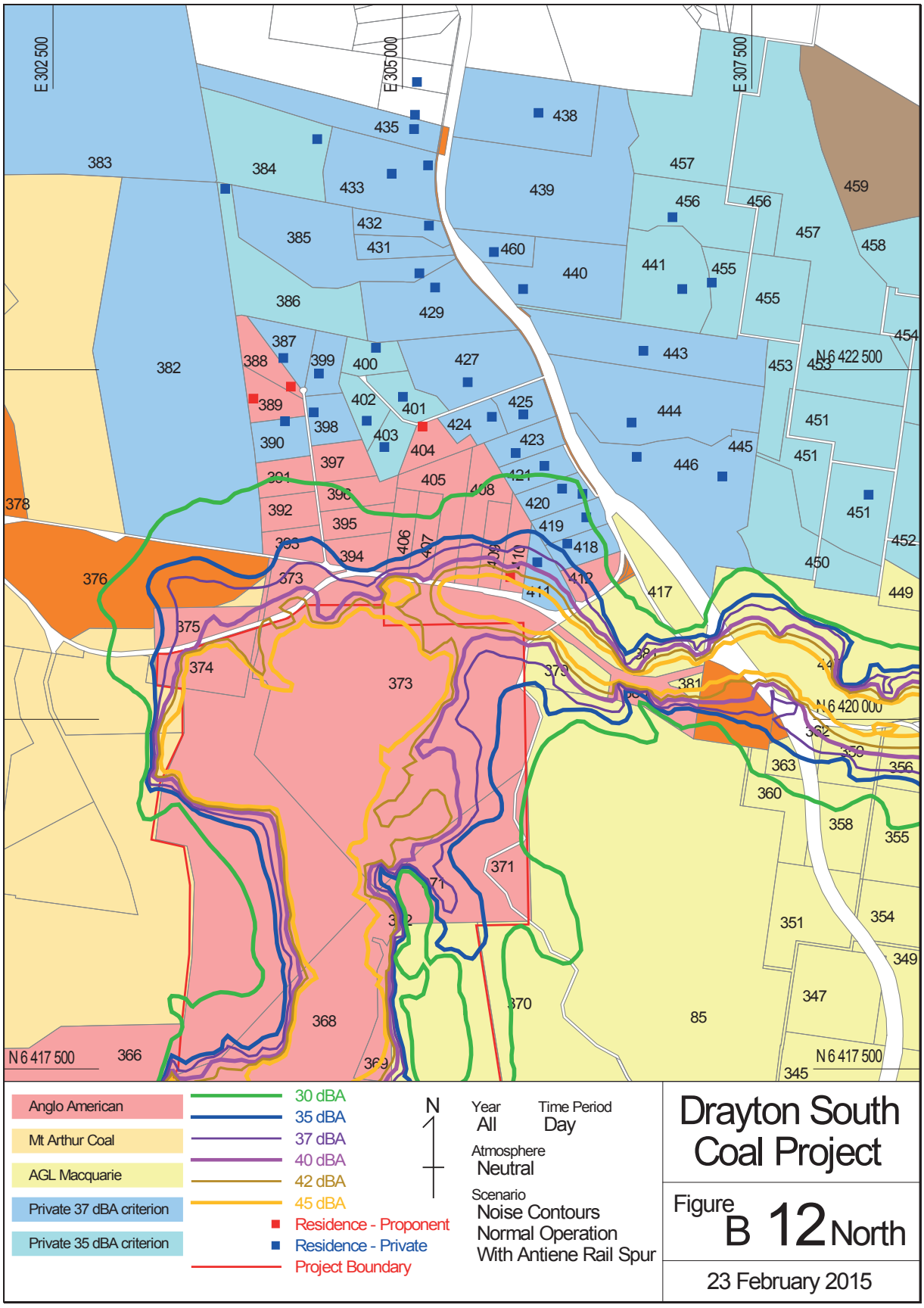

E 302 500
E 305 000
E 307 500
N 6 422 500
N 6 420 000
N 6 417 500
N 6 417 500
Anglo American
Mt Arthur Coal
AGL Macquarie
Private 37 dBA PSNL
Private 35 dBA PSNL
30 dBA
35 dBA
37 dBA
40 dBA
42 dBA
45 dBA
Residence - Proponent
Residence - Private
Project Boundary
N
Year
All
Time Period
Day
Atmosphere
Neutral
Scenario
Noise Contours
Normal Operation
Drayton South Coal Project
Figure B 7 North
23 February 2015

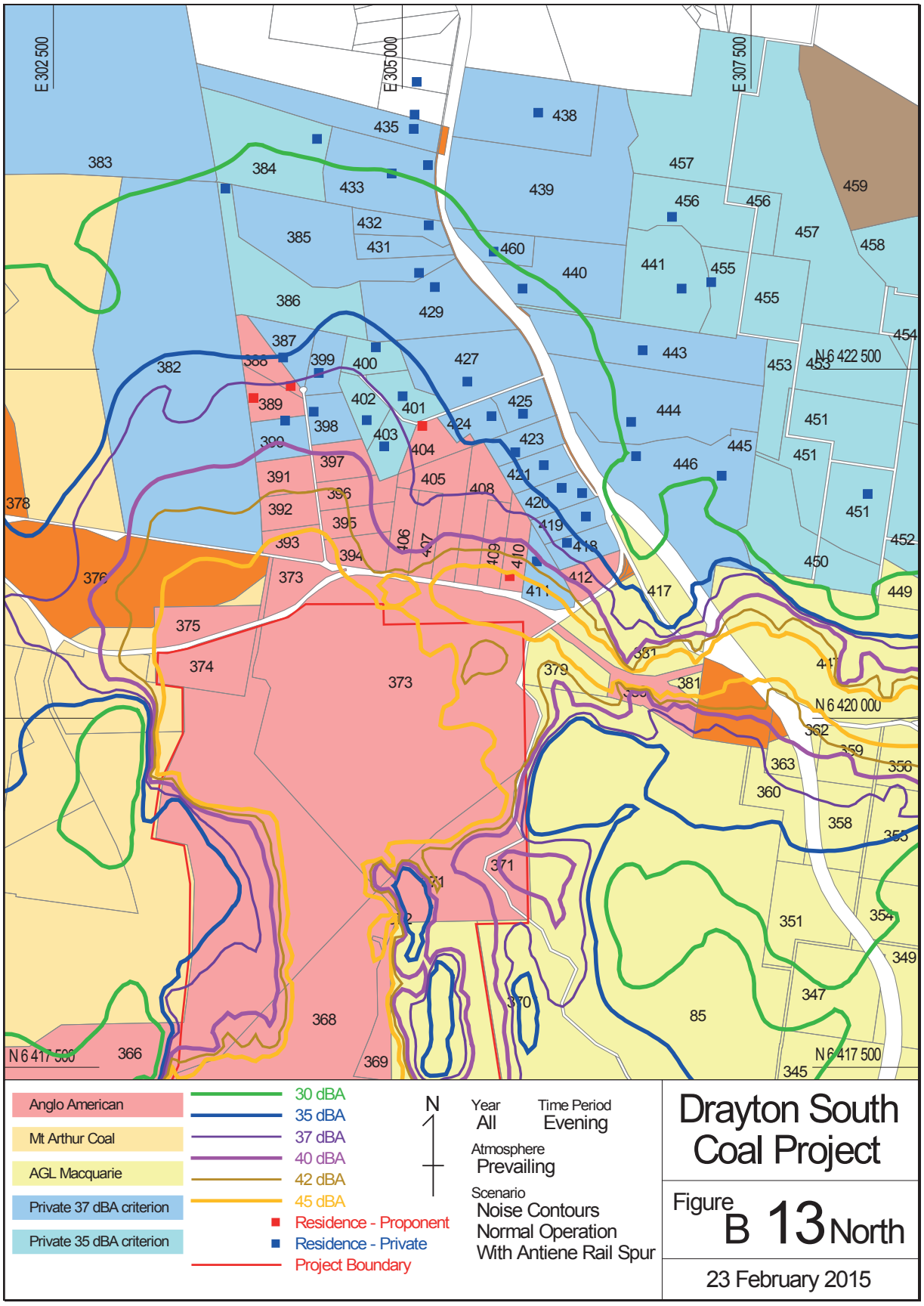

E 302 500
E 305 000
E 307 500
N 6 422 500
N 6 420 000
N 6 417 500
Anglo American
Mt Arthur Coal
AGL Macquarie
Private 37 dBA criterion
Private 35 dBA criterion
30 dBA
35 dBA
37 dBA
40 dBA
42 dBA
45 dBA
Residence - Proponent
Residence - Private
Project Boundary
N
Year
All
Time Period
Evening
Atmosphere
Prevailing
Scenario
Noise Contours
Normal Operation
Drayton South Coal Project
Figure B 8 North
23 February 2015

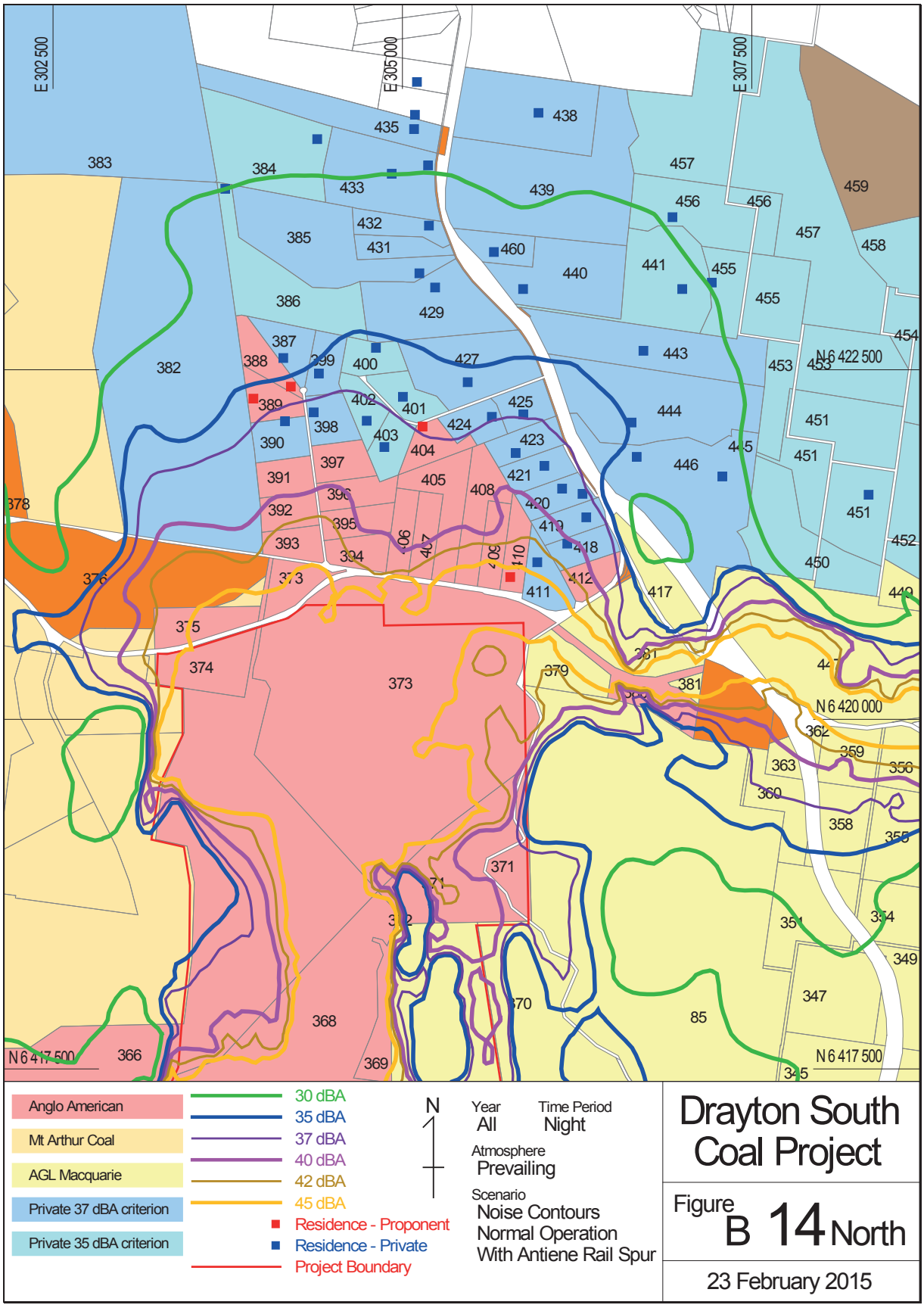

E 302 500
E 305 000
E 307 500
N 6 422 500
N 6 420 000
N 6 417 500
Anglo American
Mt Arthur Coal
AGL Macquarie
Private 37 dBA criterion
Private 35 dBA criterion
30 dBA
35 dBA
37 dBA
40 dBA
42 dBA
45 dBA
Residence - Proponent
Residence - Private
Project Boundary
N
Year
All
Time Period
Night
Atmosphere
Prevailing
Scenario
Noise Contours
Normal Operation
Drayton South Coal Project
Figure B 9 North
23 February 2015

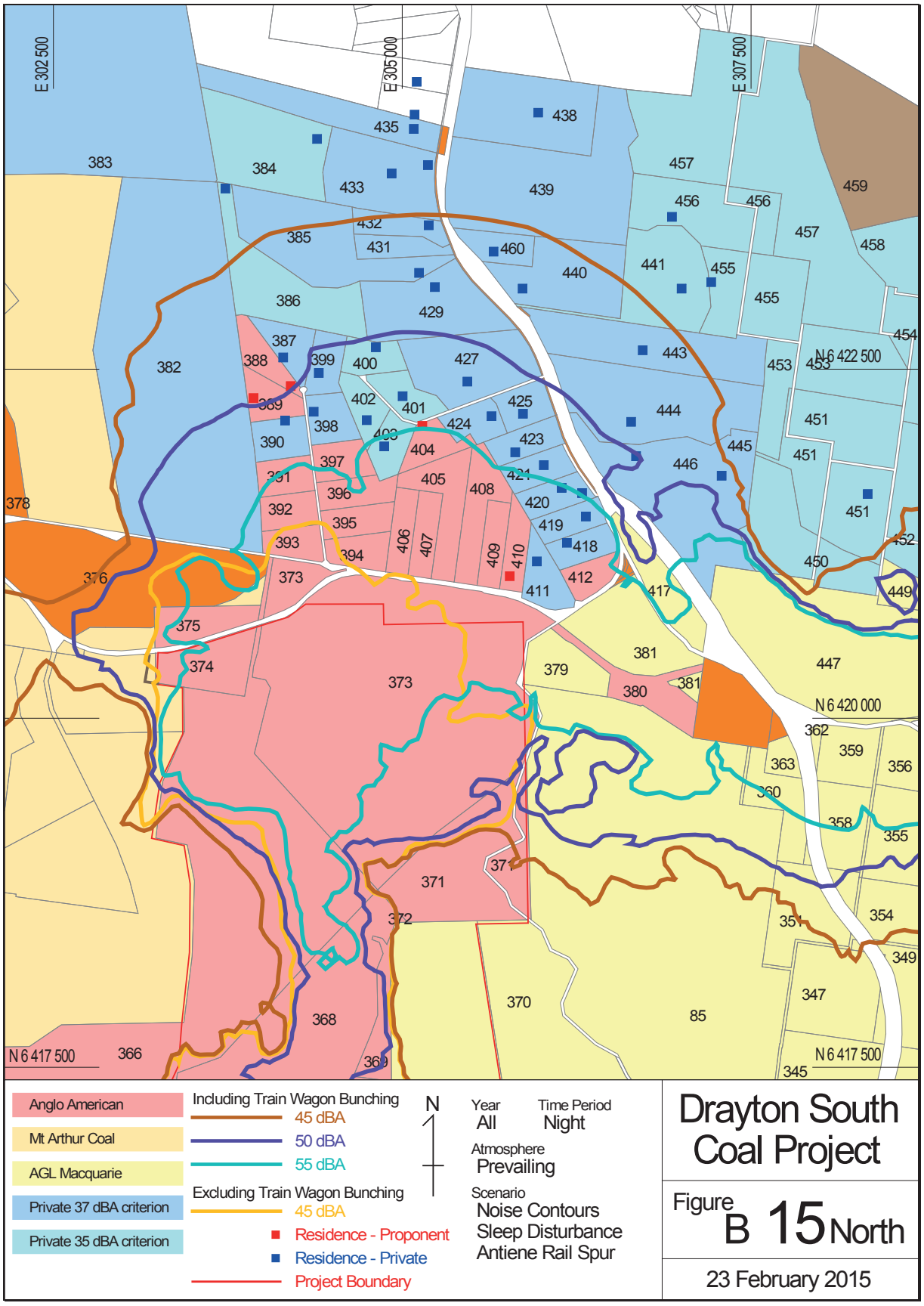

Anglo American
Mt Arthur Coal
AGL Macquarie
Coolmore Stud
Woodlands Stud
Hollydene Estate
N
30 dBA
35 dBA
40 dBA
45 dBA
Residence - Proponent
Residence - Private
Project Boundary
Noise Monitor
M1
M2
M3
M4
Year 1
Time Period Day
Atmosphere Neutral
Scenario Noise Contours Construction No Mitigation
Drayton South Coal Project
Figure B10
23 February 2015

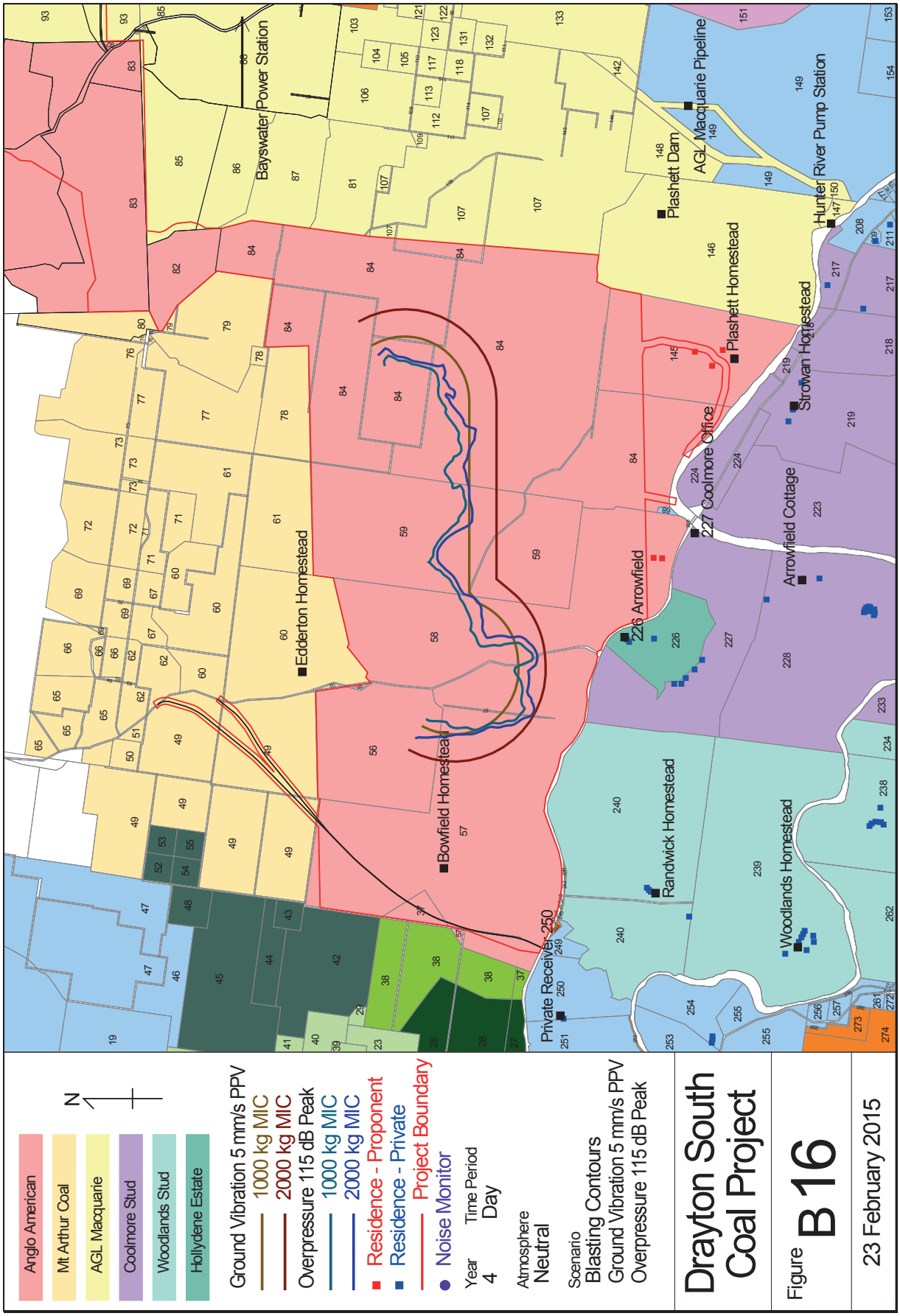

Anglo American
Mt Arthur Coal
AGL Macquarie
Coolmore Stud
Woodlands Stud
Hollydene Estate
30 dBA
35 dBA
40 dBA
45 dBA
Residence - Proponent
Residence - Private
Project Boundary
Noise Monitor
N
Year 1
Time Period Evening / Night
Atmosphere Prevailing
Scenario Noise Contours Construction No Mitigation
Drayton South Coal Project
Figure B11
23 February 2015
M2
M3
M4

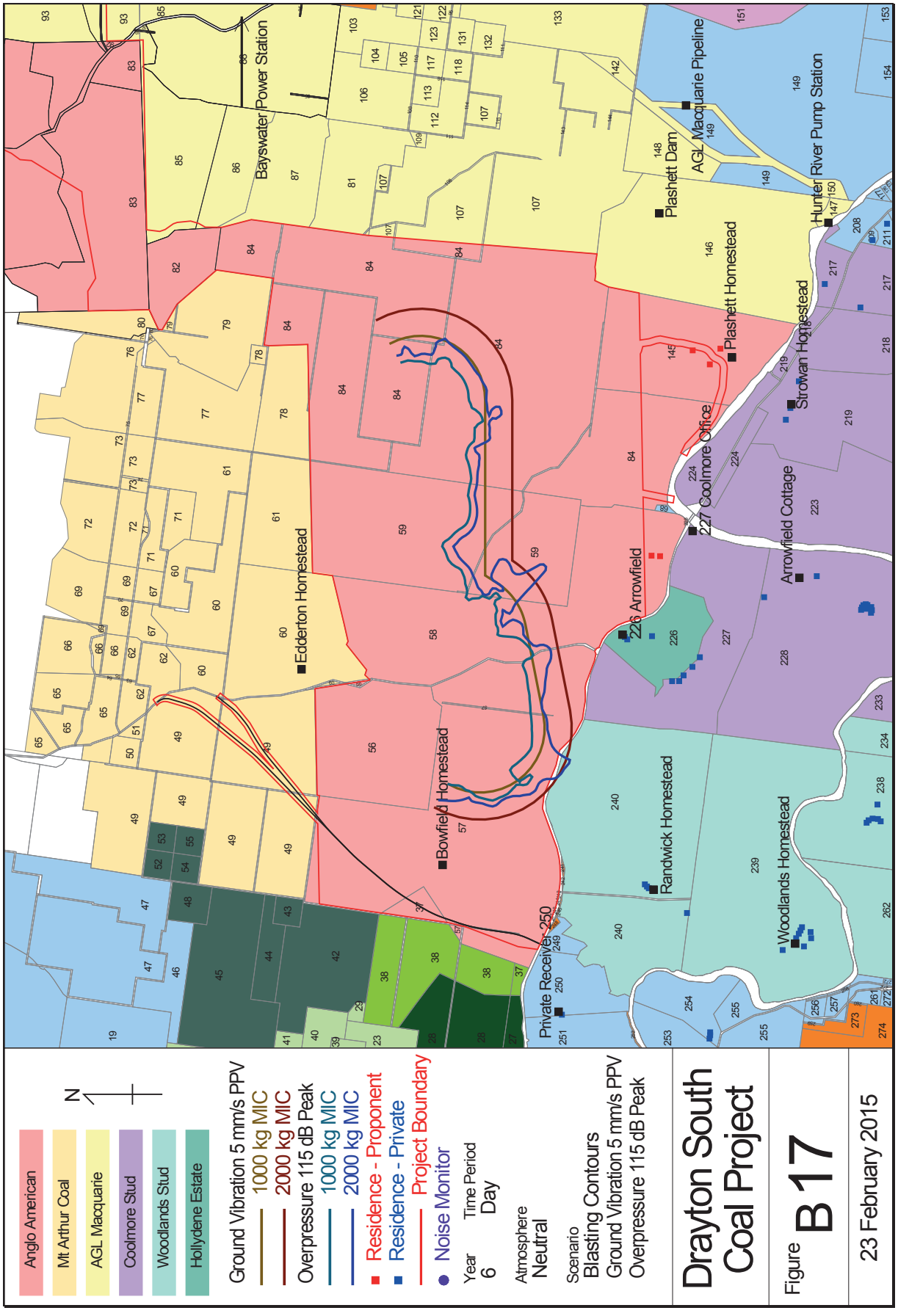

E 302 500
E 305 000
E 307 500
N 6 422 500
N 6 420 000
N 6 417 500
Anglo American
Mt Arthur Coal
AGL Macquarie
Private 37 dBA criterion
Private 35 dBA criterion
30 dBA
35 dBA
37 dBA
40 dBA
42 dBA
45 dBA
Residence - Proponent
Residence - Private
Project Boundary
N
Year
All
Time Period
Day
Atmosphere
Neutral
Scenario
Noise Contours
Normal Operation
With Antiene Rail Spur
Drayton South Coal Project
Figure B 12 North
23 February 2015

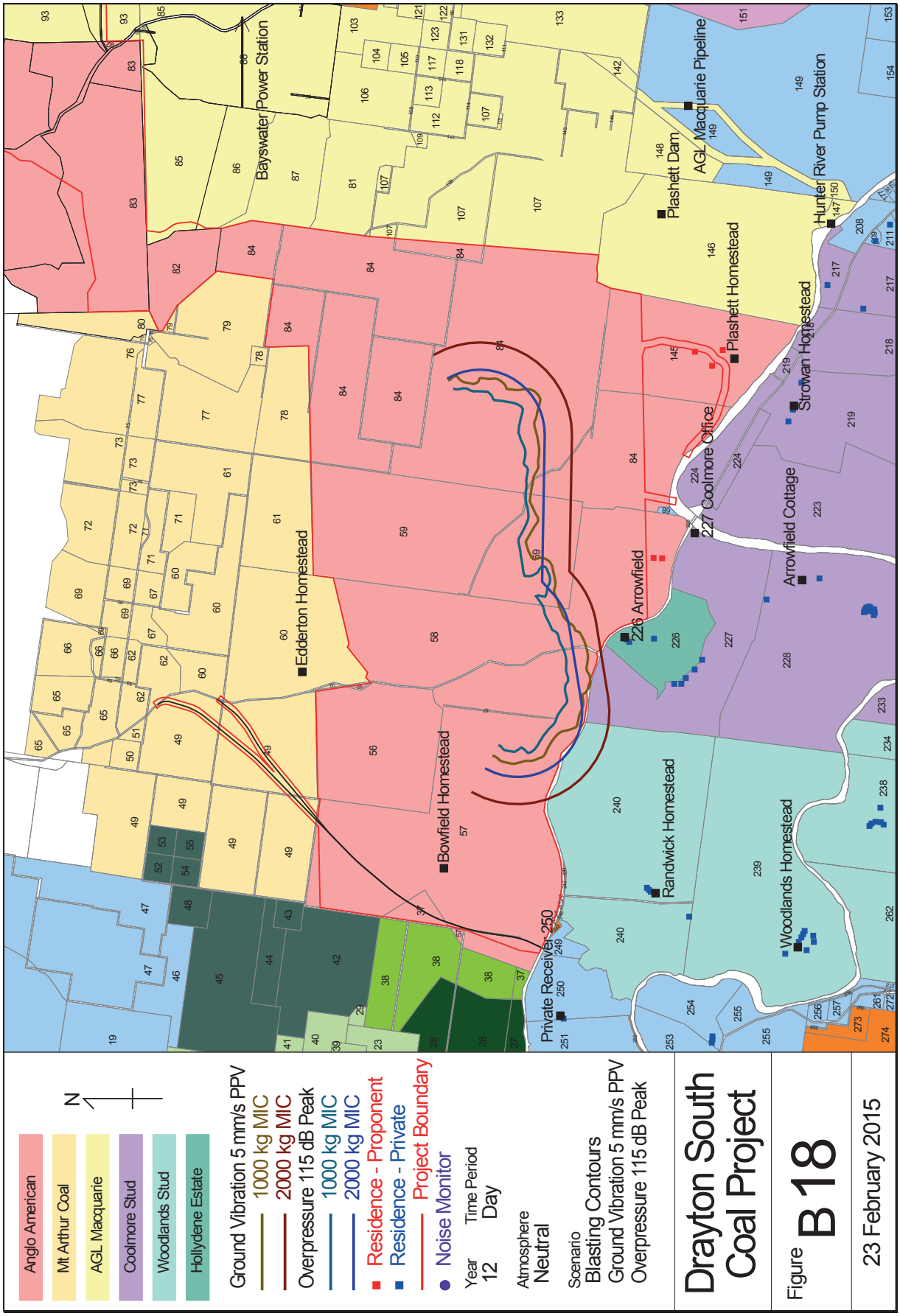

E 302 500
E 305 000
E 307 500
N 6 422 500
N 6 420 000
N 6 417 500
Anglo American
Mt Arthur Coal
AGL Macquarie
Private 37 dBA criterion
Private 35 dBA criterion
30 dBA
35 dBA
37 dBA
40 dBA
42 dBA
45 dBA
Residence - Proponent
Residence - Private
Project Boundary
N
Year
All
Time Period
Evening
Atmosphere
Prevailing
Scenario
Noise Contours
Normal Operation
With Antiene Rail Spur
Drayton South Coal Project
Figure B 13 North
23 February 2015


E 302 500
E 305 000
E 307 500
N 6 422 500
N 6 420 000
N 6 417 500
Anglo American
Mt Arthur Coal
AGL Macquarie
Private 37 dBA criterion
Private 35 dBA criterion
30 dBA
35 dBA
37 dBA
40 dBA
42 dBA
45 dBA
Residence - Proponent
Residence - Private
Project Boundary
N
Year
All
Time Period
Night
Atmosphere
Prevailing
Scenario
Noise Contours
Normal Operation
With Antiene Rail Spur
Drayton South Coal Project
Figure B 14 North
23 February 2015


E 302 500
E 305 000
E 307 500
N 6 422 500
N 6 420 000
N 6 417 500
Anglo American
Mt Arthur Coal
AGL Macquarie
Private 37 dBA criterion
Private 35 dBA criterion
Including Train Wagon Bunching
45 dBA
50 dBA
55 dBA
Excluding Train Wagon Bunching
45 dBA
Residence - Proponent
Residence - Private
Project Boundary
N
Year
All
Time Period
Night
Atmosphere
Prevailing
Scenario
Noise Contours
Sleep Disturbance
Antiene Rail Spur
Drayton South Coal Project
Figure B 15 North
23 February 2015

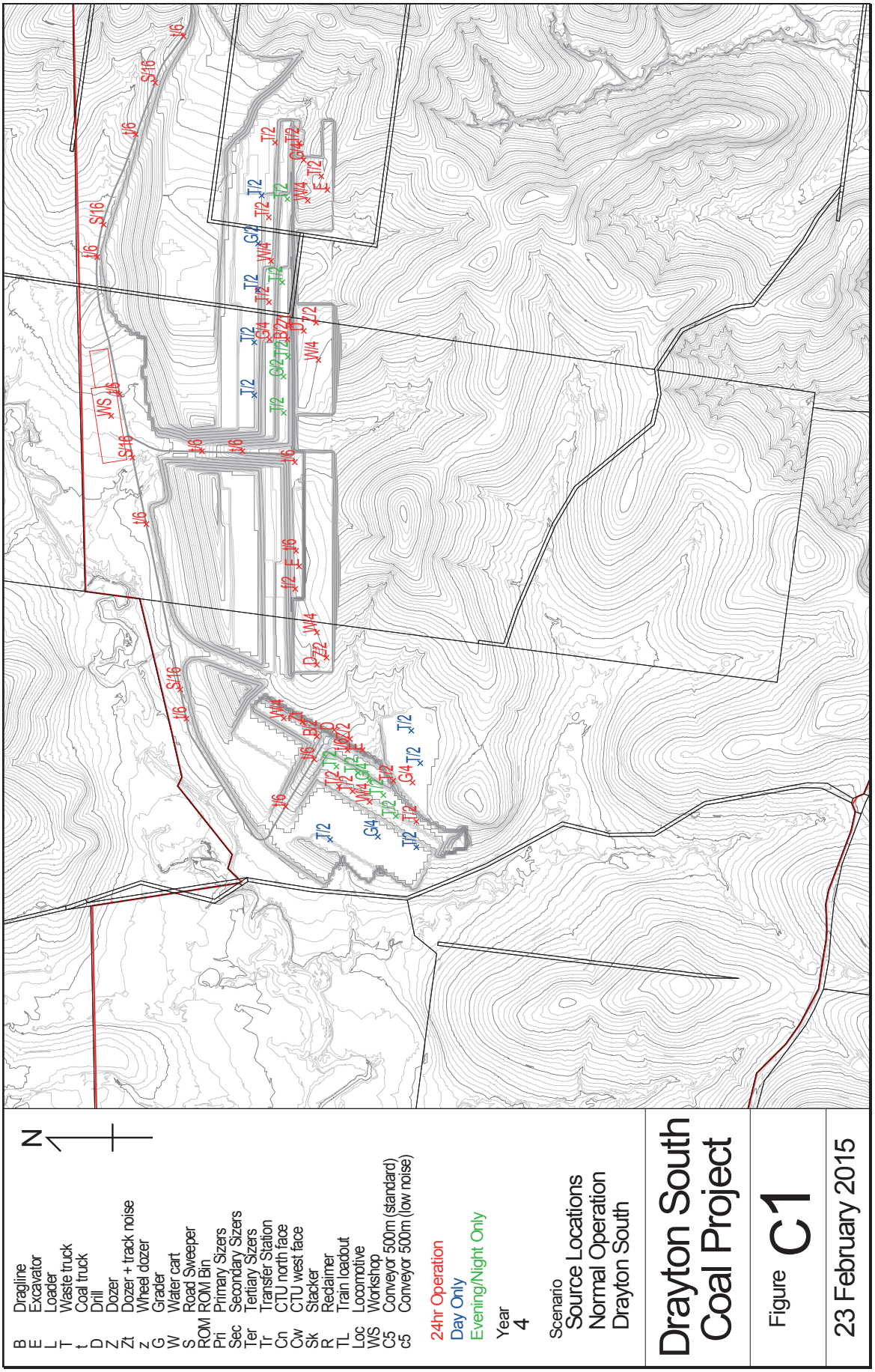

Anglo American
Mt Arthur Coal
AGL Macquarie
Coolmore Stud
Woodlands Stud
Hollydene Estate
N
Ground Vibration 5 mm/s PPV
1000 kg MIC
2000 kg MIC
Overpressure 115 dB Peak
1000 kg MIC
2000 kg MIC
Residence - Proponent
Residence - Private
Project Boundary
Noise Monitor
Year 4
Time Period Day
Atmosphere Neutral
Scenario Blasting Contours Ground Vibration 5 mm/s PPV Overpressure 115 dB Peak
Drayton South Coal Project
Figure B16
23 February 2015
Bayswater Power Station
Edderton Homestead
Bowfield Homestead
Private Receiver 250
Randwick Homestead
226 Arrowfield
Woodlands Homestead
Arrowfield Cottage
227 Coolmore Office
Strowan Homestead
Plashett Homestead
Plashett Dam
AGL Macquarie Pipeline
Hunter River Pump Station

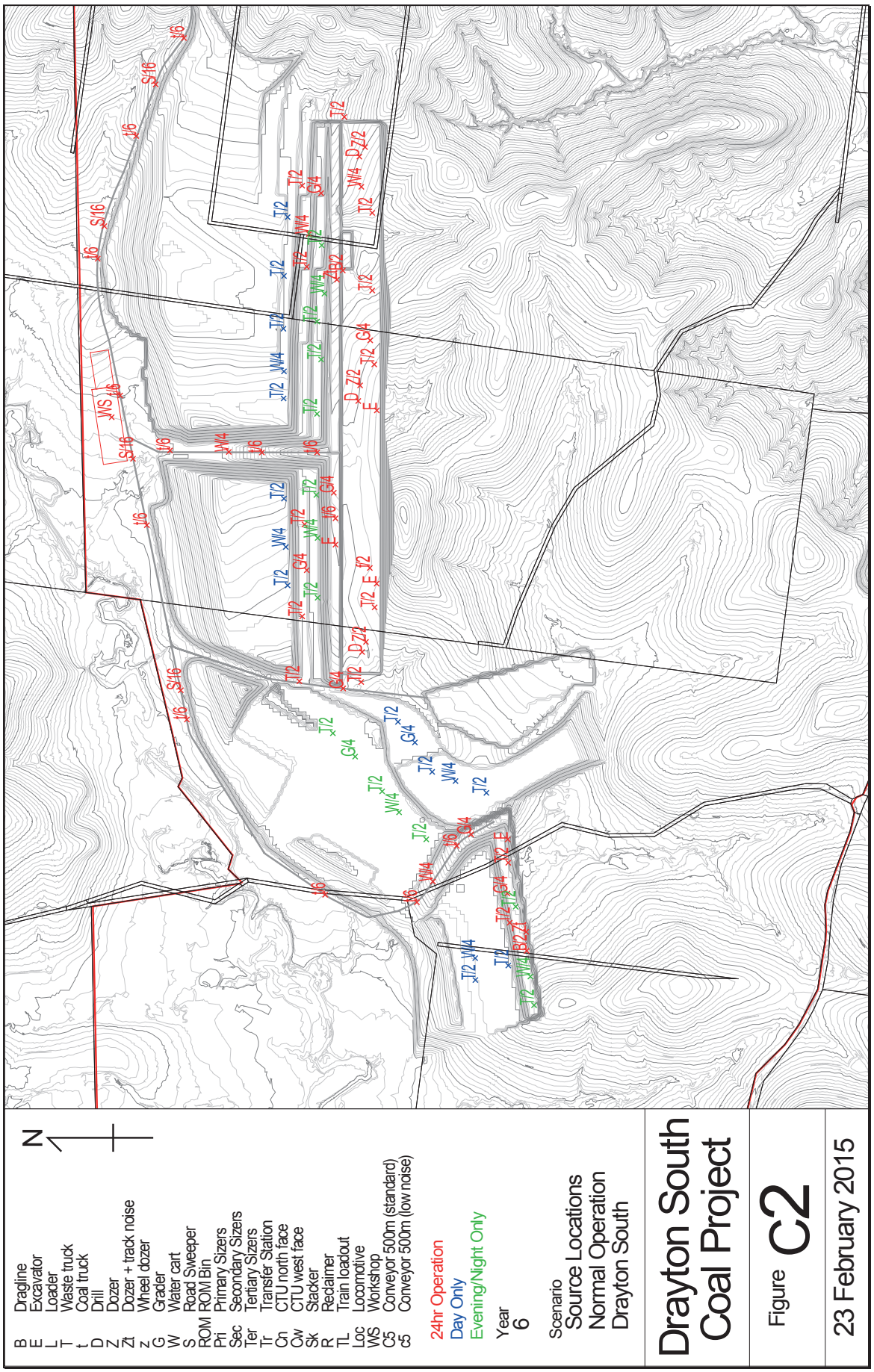

Bayswater Power Station
Plashett Dam
AGL Macquarie Pipeline
Hunter River Pump Station
Plashett Homestead
Strowan Homestead
Edderton Homestead
226 Arrowfield
227 Coolmore Office
Arrowfield Cottage
Bowfield Homestead
Randwick Homestead
Woodlands Homestead
Private Receiver 250
Anglo American
Mt Arthur Coal
AGL Macquarie
Coolmore Stud
Woodlands Stud
Hollydene Estate
N
Ground Vibration 5 mm/s PPV
1000 kg MIC
2000 kg MIC
Overpressure 115 dB Peak
1000 kg MIC
2000 kg MIC
Residence - Proponent
Residence - Private
Project Boundary
Noise Monitor
Year 6
Time Period Day
Atmosphere Neutral
Scenario
Blasting Contours
Ground Vibration 5 mm/s PPV
Overpressure 115 dB Peak
Drayton South Coal Project
Figure B17
23 February 2015

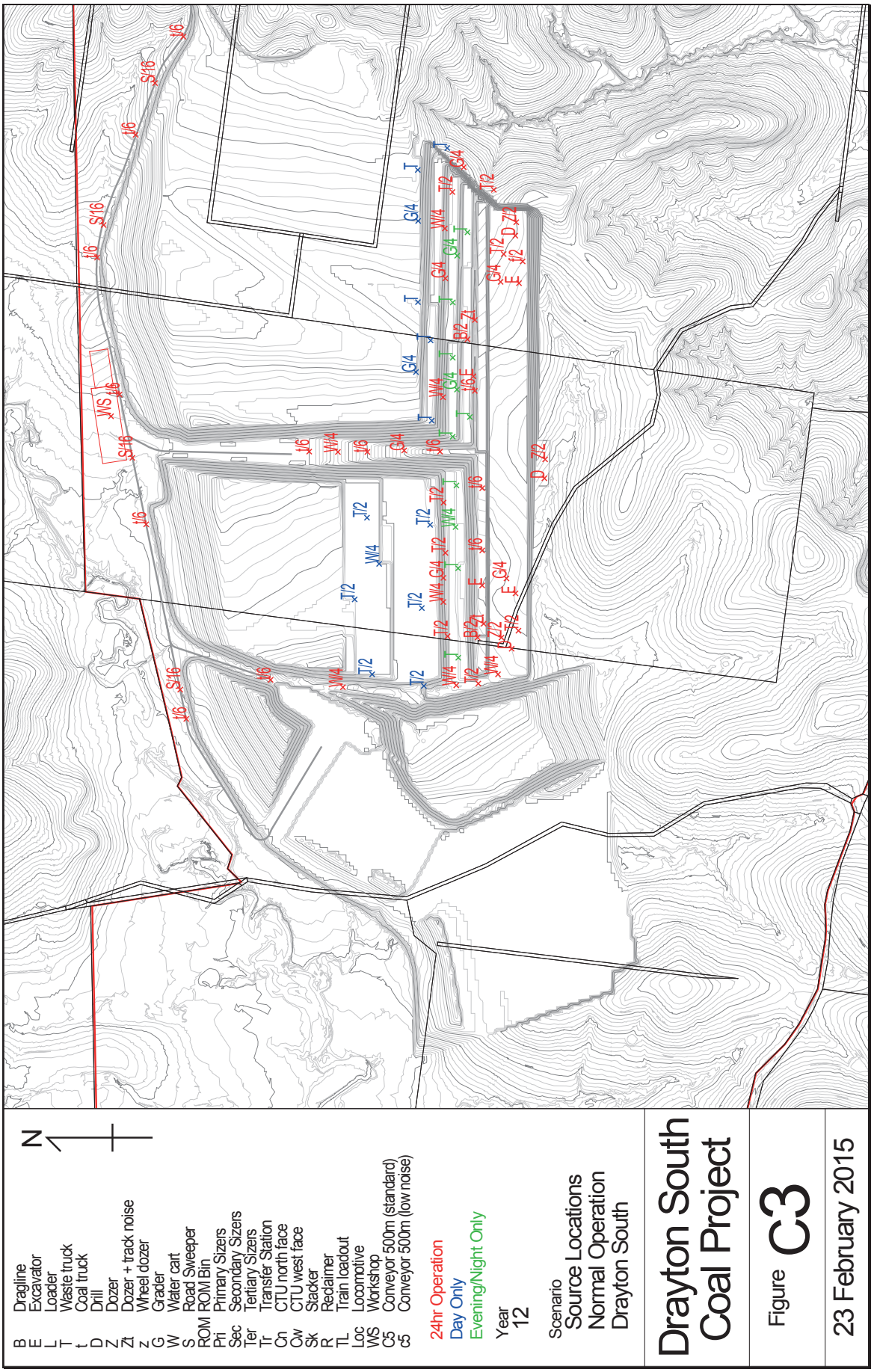

Anglo American
Mt Arthur Coal
AGL Macquarie
Coolmore Stud
Woodlands Stud
Hollydene Estate
N
Ground Vibration 5 mm/s PPV
1000 kg MIC
2000 kg MIC
Overpressure 115 dB Peak
1000 kg MIC
2000 kg MIC
Residence - Proponent
Residence - Private
Project Boundary
Noise Monitor
Year 12
Time Period Day
Atmosphere Neutral
Scenario
Blasting Contours
Ground Vibration 5 mm/s PPV
Overpressure 115 dB Peak
Drayton South Coal Project
Figure B18
23 February 2015
Bayswater Power Station
Edderton Homestead
Bowfield Homestead
Private Receiver 250
226 Arrowfield
Randwick Homestead
Woodlands Homestead
Arrowfield Cottage
227 Coolmore Office
Plashett Homestead
Strowan Homestead
Plashett Dam
AGL Macquarie Pipeline
Hunter River Pump Station

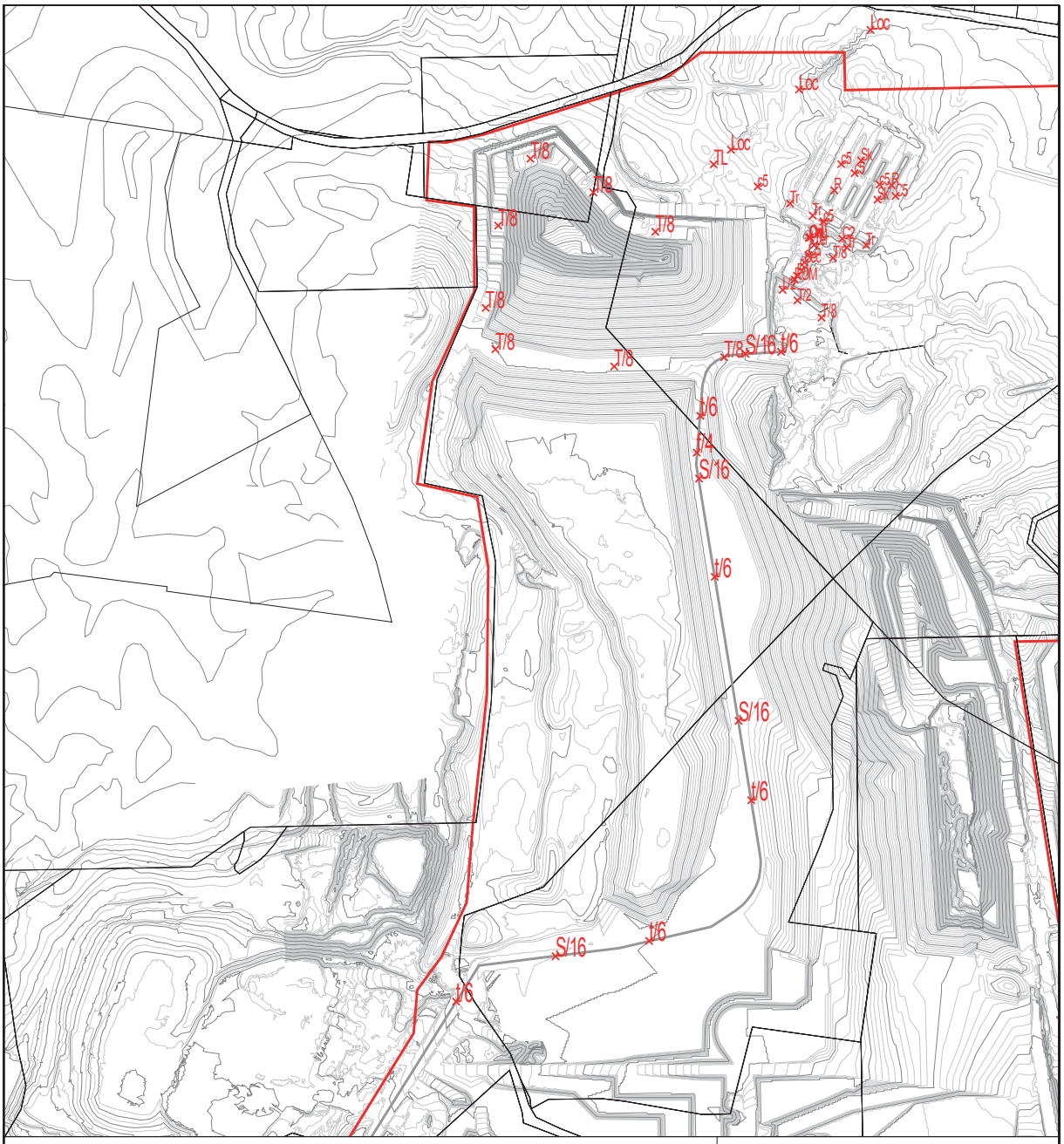
APPENDIX C – SOURCE LOCATION FIGURES

FIGURE	NOISE SOURCE LOCATION FIGURE	
C1 Drayton South	Year 4	Drayton South
C2 Drayton South	Year 6	Drayton South
C3 Drayton South	Year 12	Drayton South
C4 Drayton Mine	All years	Drayton Mine CHPP
C5 Central	All years	Transport Corridor
FIGURE	BLASTING SOURCE LOCATION FIGURE	
C6 Drayton South	Year 4	Drayton South
C7 Drayton South	Year 6	Drayton South
C8 Drayton South	Year 12	Drayton South


B Dragline
E Excavator
L Loader
T Waste truck
t Coal truck
D Drill
Z Dozer
Zt Dozer + track noise
z Wheel dozer
G Grader
W Water cart
S Road Sweeper
ROM ROM Bin
Pri Primary Sizers
Sec Secondary Sizers
Ter Tertiary Sizers
Tr Transfer Station
Cn CTU north face
Cw CTU west face
Sk Stacker
R Redaimer
TL Train loadout
Loc Locomotive
WS Workshop
C5 Conveyor 500m (standard)
c5 Conveyor 500m (low noise)
24hr Operation
Day Only
Evening/Night Only
Year
4
Scenario
Source Locations
Normal Operation
Drayton South
Drayton South Coal Project
Figure C1
23 February 2015


B Dragline
E Excavator
L Loader
T Waste truck
t Coal truck
D Drill
Z Dozer
Zt Dozer + track noise
z Wheel dozer
G Grader
W Water cart
S Road Sweeper
ROM ROM Bin
Pri Primary Sizers
Sec Secondary Sizers
Ter Tertiary Sizers
Tr Transfer Station
Cn CTU north face
Cw CTU west face
Sk Stacker
R Reclaimer
TL Train loadout
Loc Locomotive
WS Workshop
C5 Conveyor 500m (standard)
c5 Conveyor 500m (low noise)
24hr Operation
Day Only
Evening/Night Only
Year
6
Scenario
Source Locations
Normal Operation
Drayton South
Drayton South Coal Project
Figure C2
23 February 2015


B Dragline
E Excavator
L Loader
T Waste truck
t Coal truck
D Drill
Z Dozer
Zt Dozer + track noise
z Wheel dozer
G Grader
W Water cart
S Road Sweeper
ROM ROM Bin
Pri Primary Sizers
Sec Secondary Sizers
Ter Tertiary Sizers
Tr Transfer Station
Cn CTU north face
Cw CTU west face
Sk Stacker
R Reclaimer
TL Train loadout
Loc Locomotive
WS Workshop
C5 Conveyor 500m (standard)
c5 Conveyor 500m (low noise)
24hr Operation
Day Only
Evening/Night Only
Year
12
Scenario
Source Locations
Normal Operation
Drayton South
N
Drayton South Coal Project
Figure C3
23 February 2015



B	Dragline	ROM	ROM Bin
E	Excavator	Pri	Primary Sizers
L	Loader	Sec	Secondary Sizers
T	Reject truck	Ter	Tertiary Sizers
t	Coal truck	Tr	Transfer Station
D	Drill	Cn	CTU north face
Z	Dozer	Cw	CTU west face
Zt	Dozer + tracks	Sk	Stacker
z	Wheel dozer	R	Reclaimer
G	Grader	TL	Train loadout
W	Water cart	Loc	Locomotive
S	Road Sweeper	WS	Workshop

C5 Conveyor 500m (standard)
c5 Conveyor 500m (low noise)

24hr Operation
Day Only
Evening/Night Only

Year
All

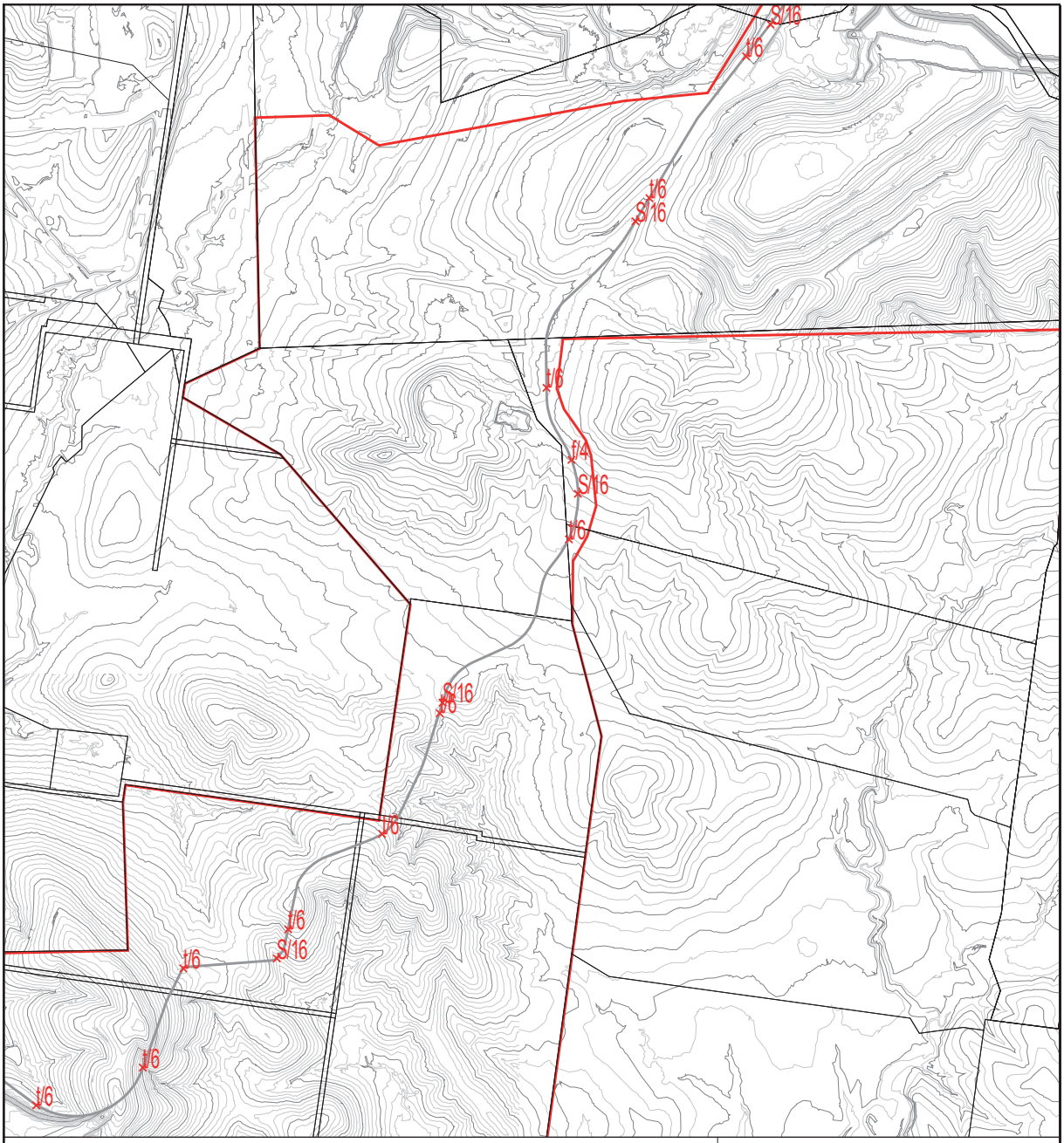
Scenario
Source Locations
Normal Operation
Drayton Mine

N

Drayton South Coal Project

Figure C4

23 February 2015



B	Dragline	ROM	ROM Bin
E	Excavator	Pri	Primary Sizers
L	Loader	Sec	Secondary Sizers
T	Waste truck	Ter	Tertiary Sizers
t	Coal truck	Tr	Transfer Station
D	Drill	Cn	CTU north face
Z	Dozer	Cw	CTU west face
Zt	Dozer + tracks	Sk	Stacker
z	Wheel dozer	R	Reclaimer
G	Grader	TL	Train loadout
W	Water cart	Loc	Locomotive
S	Road Sweeper	WS	Workshop

C5 Conveyor 500m (standard)
c5 Conveyor 500m (low noise)

24hr Operation
Day Only
Evening/Night Only

Year
All

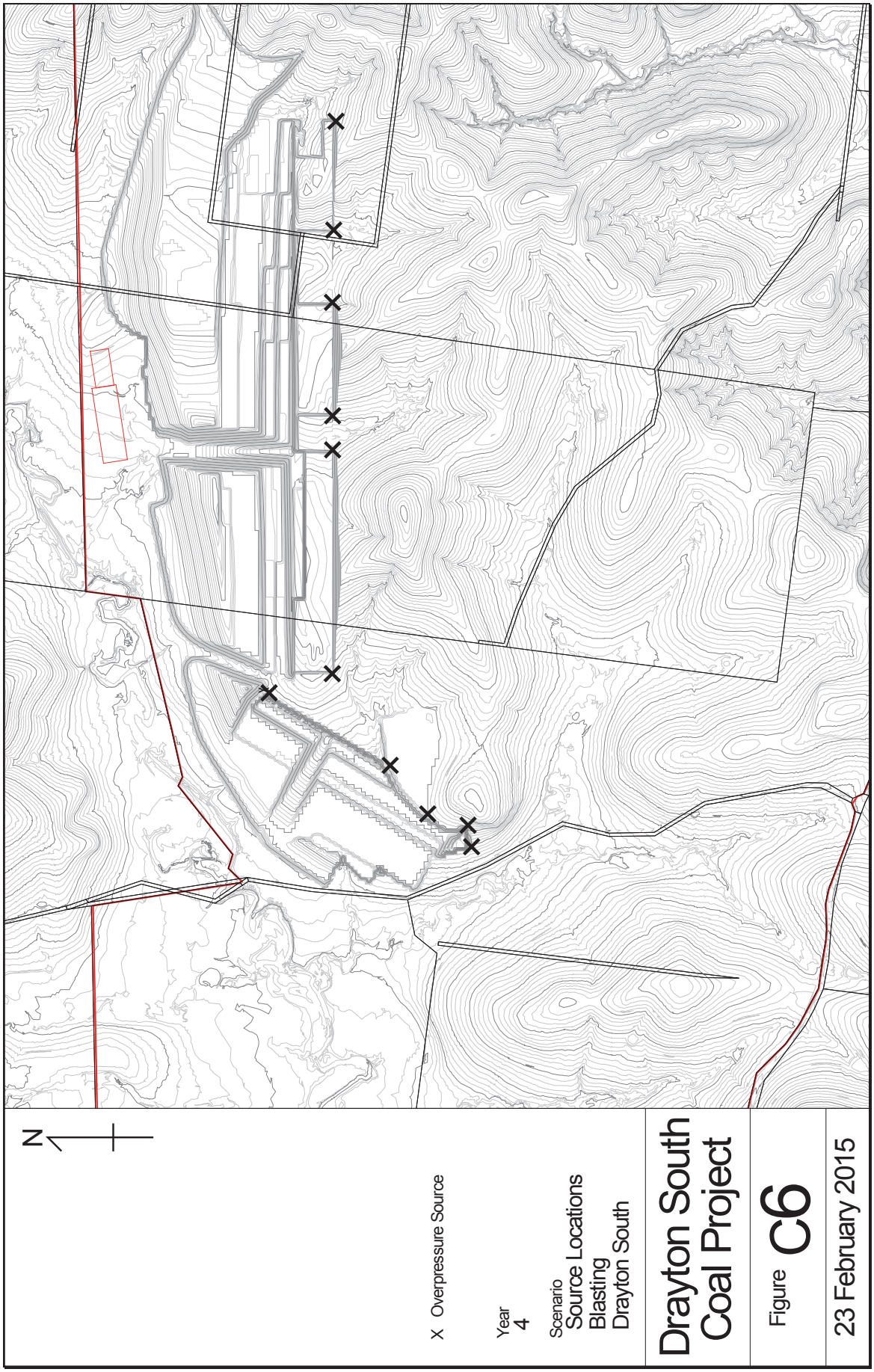
Scenario
Source Locations
Normal Operation
Transport Corridor

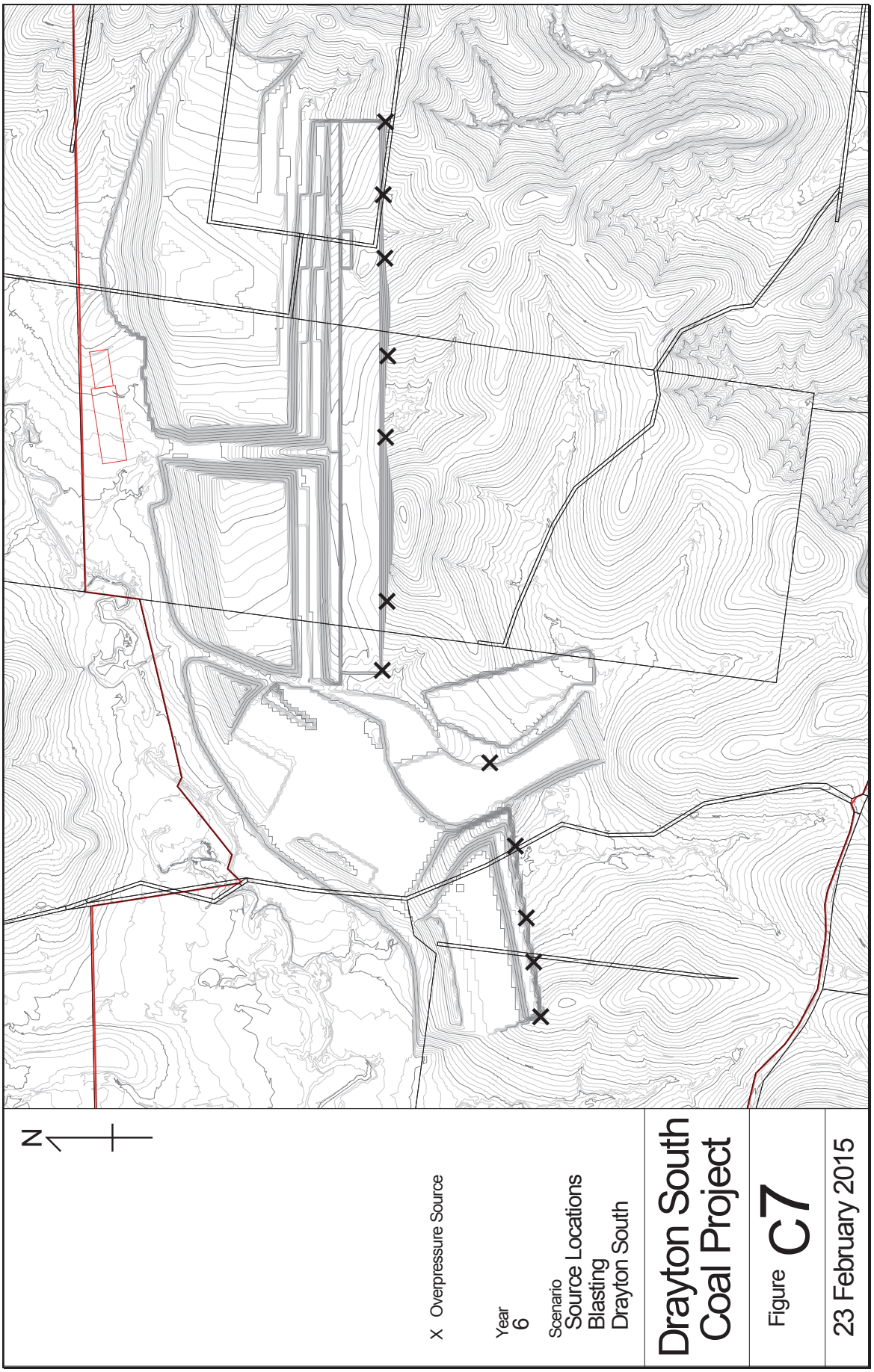
N

Drayton South Coal Project

Figure C5

23 February 2015


N
X Overpressure Source
Year
4
Scenario
Source Locations
Blasting
Drayton South
Drayton South
Coal Project
Figure C6
23 February 2015


N
X Overpressure Source
Year
6
Scenario
Source Locations
Blasting
Drayton South
Drayton South
Coal Project
Figure C7
23 February 2015


N
X Overpressure Source
Year
12
Scenario
Source Locations
Blasting
Drayton South
Drayton South
Coal Project
Figure C8
23 February 2015

APPENDIX D – PREDICTED NOISE LEVEL TABLES

TABLE DESCRIPTION

D1 Operational noise levels to Drayton South receptors, LAeq,15min

D2 Operational noise levels to Drayton Mine receptors, LAeq,15min

Receptors omitted from the tables are predicted to receive less than 35 LAeq,15min for Drayton Mine receptors and 30 LAeq,15min for Drayton South receptors, during all time periods and assessed weather conditions. Construction and sleep disturbance noise levels, or intermittent noise levels from train movements on the Antiene Rail Spur, are not included.

Entries in the tables are shaded using the following colours:

- Red – a significant noise impact of more than 5 dBA above the PSNLs;
- Blue – a moderate noise impact of 2 to 5 dBA above the PSNLs and
- Green – a mild noise impact of up to 2 dBA above the PSNLs.

Noise contours show noise levels over 25% of property area are at least 5 dBA below the significant impact criterion recommended in the VLAMP, therefore noise levels over 25% of each property area have not been calculated.

Table D1: Operational Noise Levels at Drayton South Receptors, LAeq,15min

Scenario		Day Neutral			Evening/Night Prevailing			PSNLs Day/ Evening/Night
Assessed Year		4	6	12	4	6	12	
Owner ID	Residence ID	Predicted Noise Level at Residence, LAeq,15min						
4	60	34	35	30	47	47	41	N/A[1]
21	217N	9	11	16	26	27	30	40/38
21	217S	9	10	14	26	28	30	40/38
21	219C	11	13	15	28	29	32	40/38
21	219E	11	12	15	28	29	32	40/38
21	219W	11	13	16	28	29	32	40/38
21	227C	16	17	18	21	27	26	40/38
21	227E	13	15	17	21	24	27	40/38
21	227W	17	18	20	23	26	26	40/38
21	228	12	13	15	24	26	29	40/38
23	250	15	16	12	26	27	25	35/35
24	226N	19	22	21	24	28	26	40/38
24	226S	17	19	19	22	27	26	40/38
37	209	9	9	14	24	26	28	35/35
38	211	8	9	13	24	25	27	35/35

1 No PSNLs are listed for Residence 60 as it is owned by NSW Energy Coal.

Table D2: Operational Noise Levels to Drayton Mine Receptors, LAeq,15min

Receptor		Residence			25% of Property Area			Criteria
Time Period		Day	Evening	Night	Day	Evening	Night	Day/ Evening/ Night
Owner	Property	Predicted Noise Level, LAeq,15min, All Years						
166	382	-	-	-	27	39	36	37/37/37
168	384	20	29	29	20	30	29	35/35/35
169	385	23	32	33	24	34	33	37/37/37
170	386	21	31	30	24	34	34	35/35/35
171	387	24	35	33	24	35	34	37/37/37
	399	25	37	36	26	37	36	
172	390	28	39	37	28	40	38	37/37/37
173	398	27	39	37	27	39	38	37/37/37
174	400	25	35	35	25	36	36	35/35/35
175	401	25	36	36	25	36	36	35/35/35
176	402	27	38	38	27	38	38	35/35/35
177	403	27	38	38	27	38	38	35/35/35
178	411	30	33	39	30	34	39	37/37/37
179	418	30	32	38	30	33	38	37/37/37
180	419	29	31	37	30	32	39	37/37/37
181	420E	29	31	37	29	32	39	37/37/37
	420W	29	31	37				
182	421	28	32	38	28	32	38	37/37/37
184	423	27	33	38	27	33	38	37/37/37
185	424	25	33	36	26	33	36	37/37/37
186	425	26	32	36	26	33	36	37/37/37
187	427	24	33	35	24	34	35	37/37/37
188	429	23	32	33	24	34	34	37/37/37
189	431	-	-	-	23	33	33	37/37/37
190	432	22	31	32	23	32	32	37/37/37
191	433E	20	29	30	21	31	31	37/37/37
	433W	20	30	30				
192	435	19	29	29	19	29	29	37/37/37
193	438	18	27	28	18	27	28	37/37/37
194	439	-	-	-	19	27	29	37/37/37
195	440	22	30	32	22	30	33	37/37/37
196	441	21	25	31	22	27	32	35/35/35
197	443	23	27	33	24	30	34	37/37/37
198	444	26	28	34	25	29	35	37/37/37
200	446	23	27	32	24	27	32	37/37/37
201	450	-	-	-	20	25	28	35/35/35
204	453	-	-	-	18	21	28	35/35/35
205	455	20	23	30	19	22	29	35/35/35
206	456	20	24	29	19	24	28	35/35/35
209	460	21	30	31	21	30	31	37/37/37

APPENDIX E – DETAILED NOISE SURVEY RESULTS

Environmental noise level charts on the following pages show 15 minute percentile statistics from noise monitors at four representative receptor locations in June and July 2011, with each chart showing a 24 hour period beginning at 7:00am. Each chart includes:

Lmax - The highest line on the chart, shown with a light green line. The Lmax is the maximum dBA noise level measured in each 15 minute period.

L1 - The second highest line on the chart, shown with a violet line and representing the loudest 1 percent of the time (9 seconds) in each 15 minute period.

L10 - The third highest line on each chart, shown as a grey line and representing the loudest 10% of the time (90 seconds) during each 15 minute period.

Leq - the equivalent continuous (acoustic average) noise level in each 15 minute period, shown as a red line. The Leq can be above or below the L10 line and can, in extreme cases, extend above the L1 line. Sections of line shown dotted indicate periods affected by wind over 5m/s or rain.

Period Leq - the equivalent continuous (acoustic average) noise level in each day, evening or night period, calculated from the average of all 15 minute Leq values in that time period excluding those affected by wind over 5m/s or rain. The Period Leq line is shown as a heavy red line.

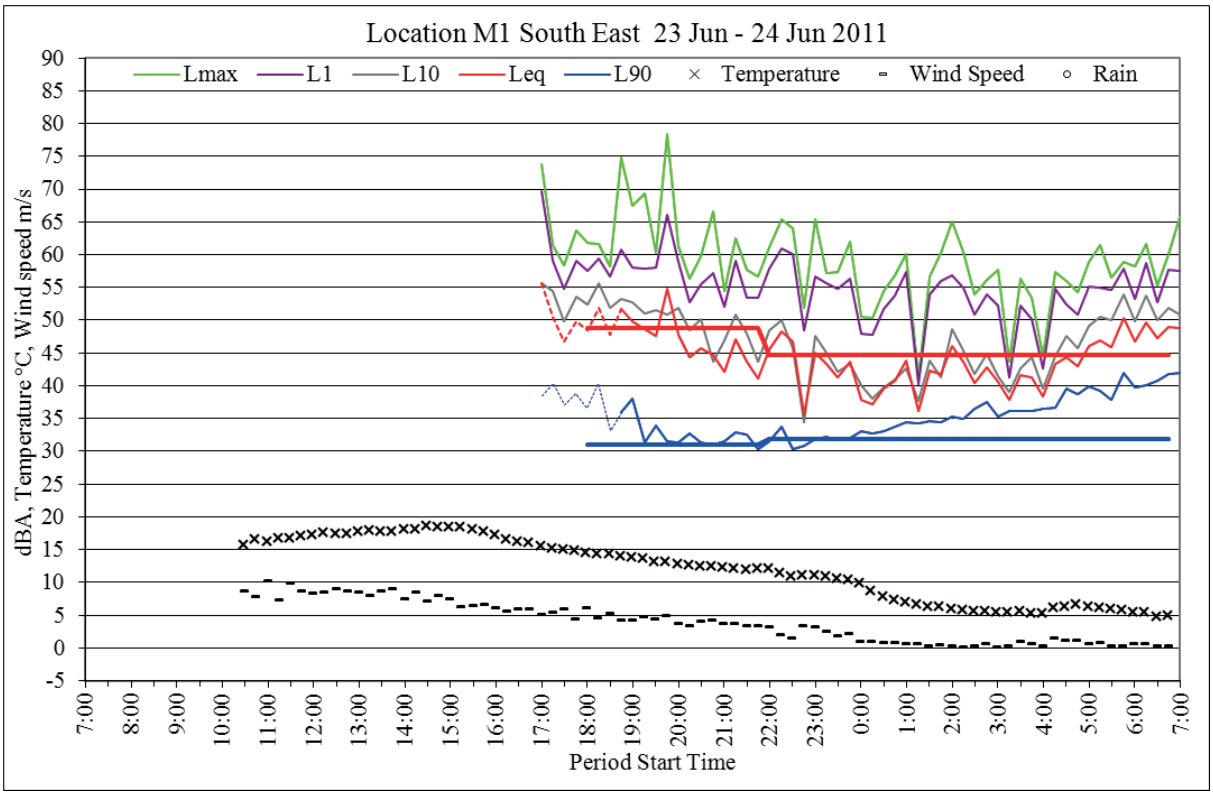
L90 - the lowest dBA line on the chart, shown by a blue line, representing the quietest 10 percent of the time in each 15 minute period and accepted as the background noise level. Sections of line shown dotted indicate periods affected by wind over 5m/s or rain.

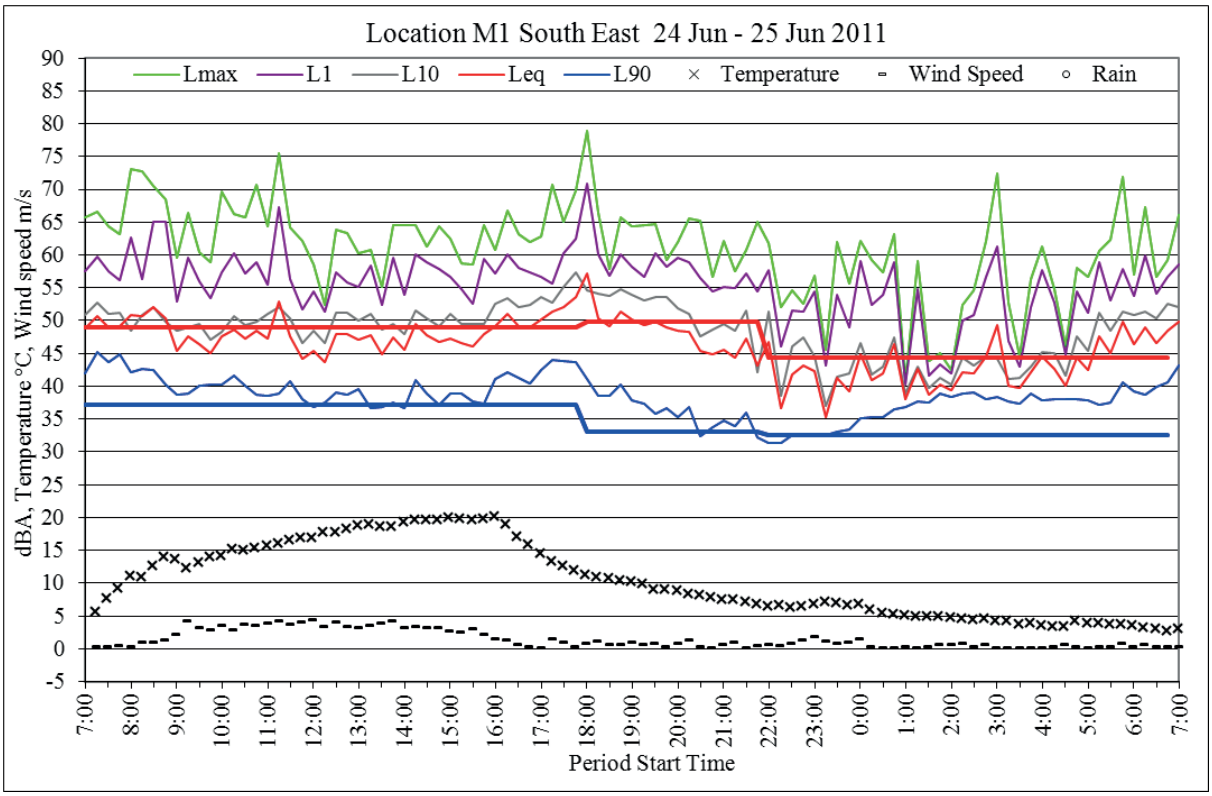
Period L90 - The 'L90 of the 15 minute L90s' for each day, evening and night period, representing the Assessment Background Levels (ABLs) for each period. The Period L90 represents the lowest 10% of all 15 minute L90 values in that time period, excluding those affected by wind or rain, and is shown as a heavy blue line.

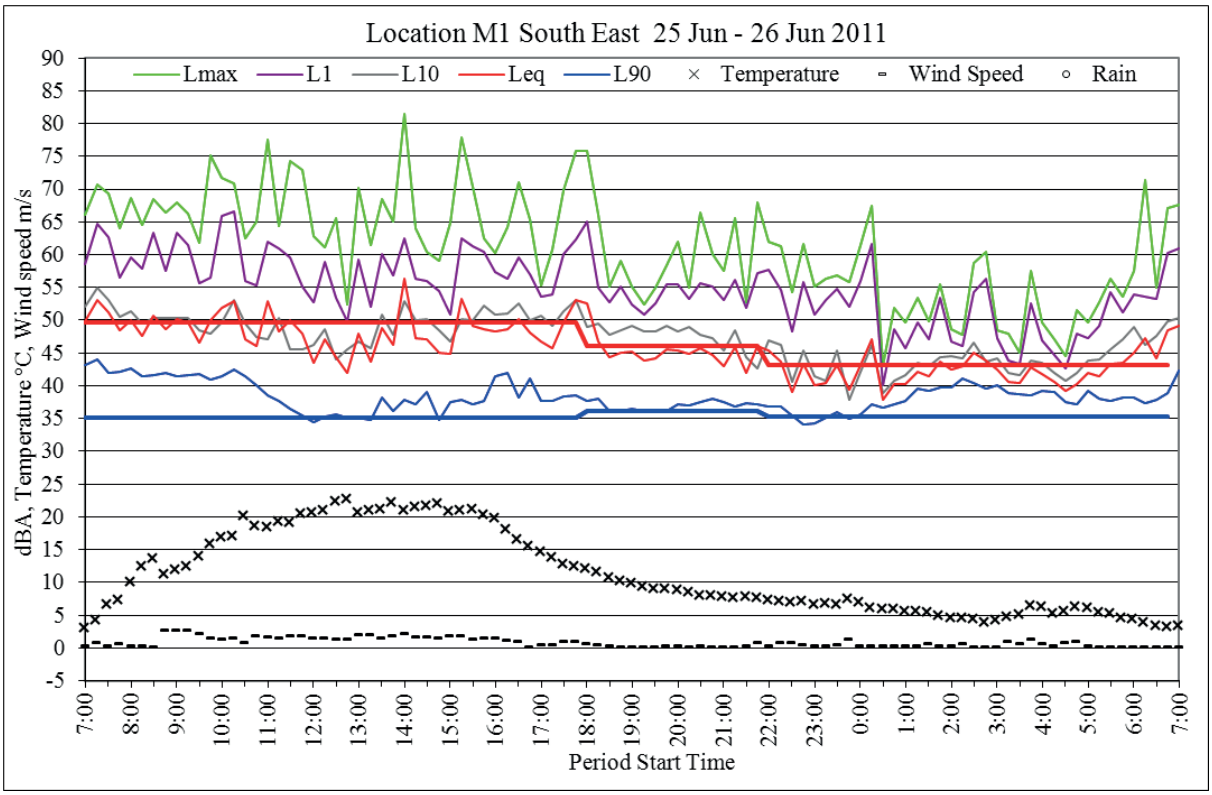
Temperature - Air temperature measured at 10m above the ground in Singleton Heights, which is the closest weather station for which data were available during this time period, indicated by a cross symbol.

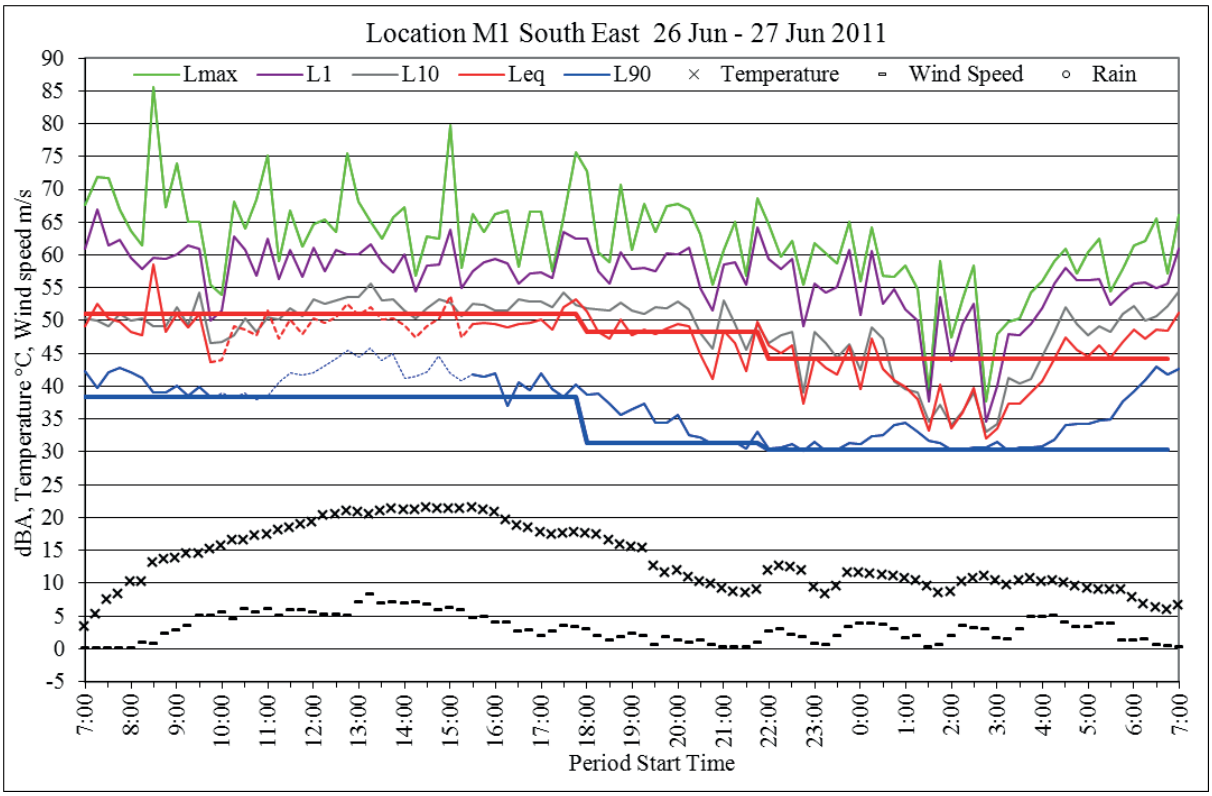
Wind Speed - Wind speed measured at 10m above the ground in singleton Heights and indicated by small horizontal lines.

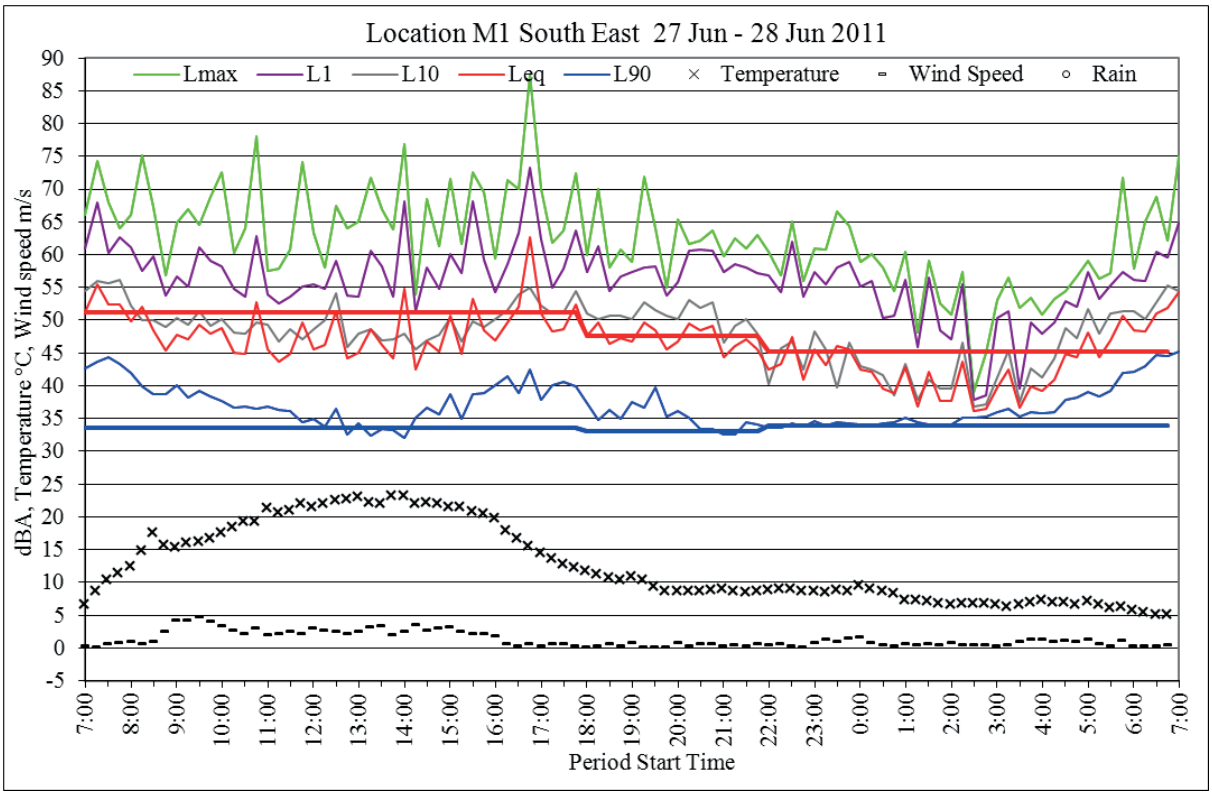
Rain - The occurrence of rain in a 15 minute period, indicated by a small circle at the bottom of each chart.

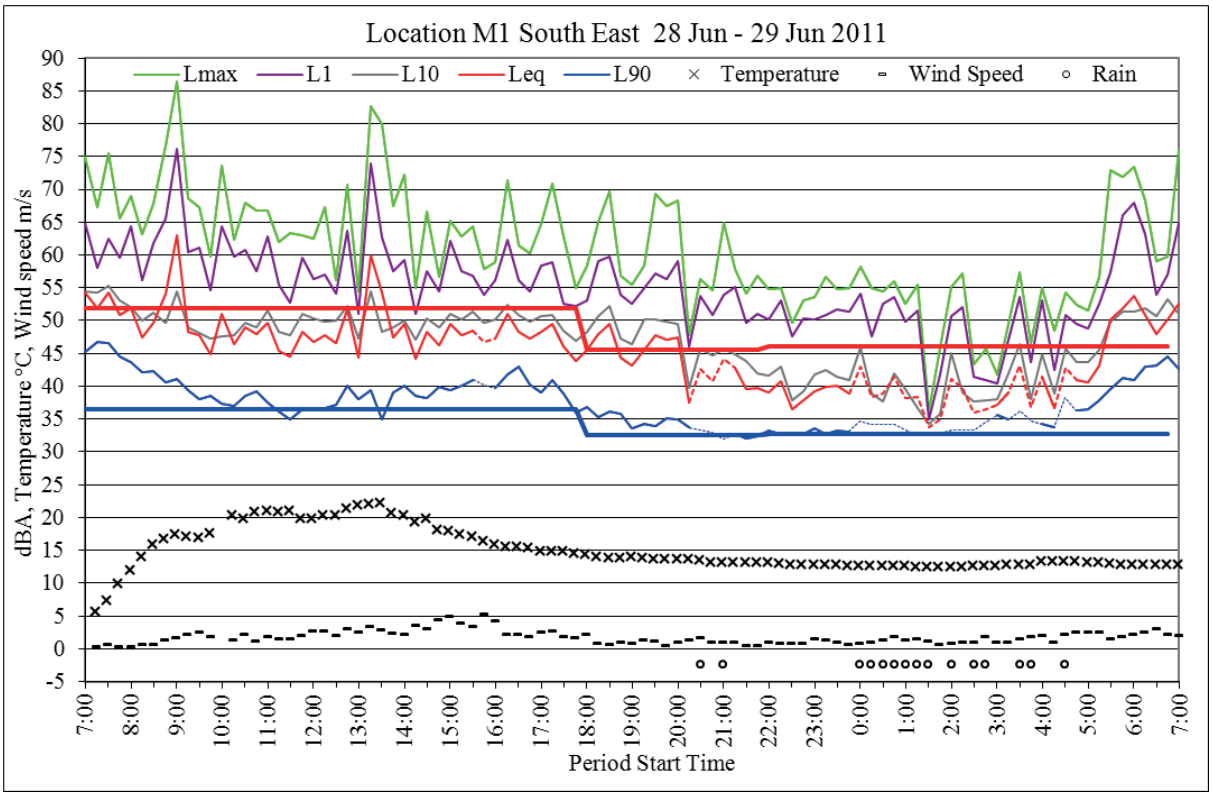

Location M1 South East 23 Jun - 24 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

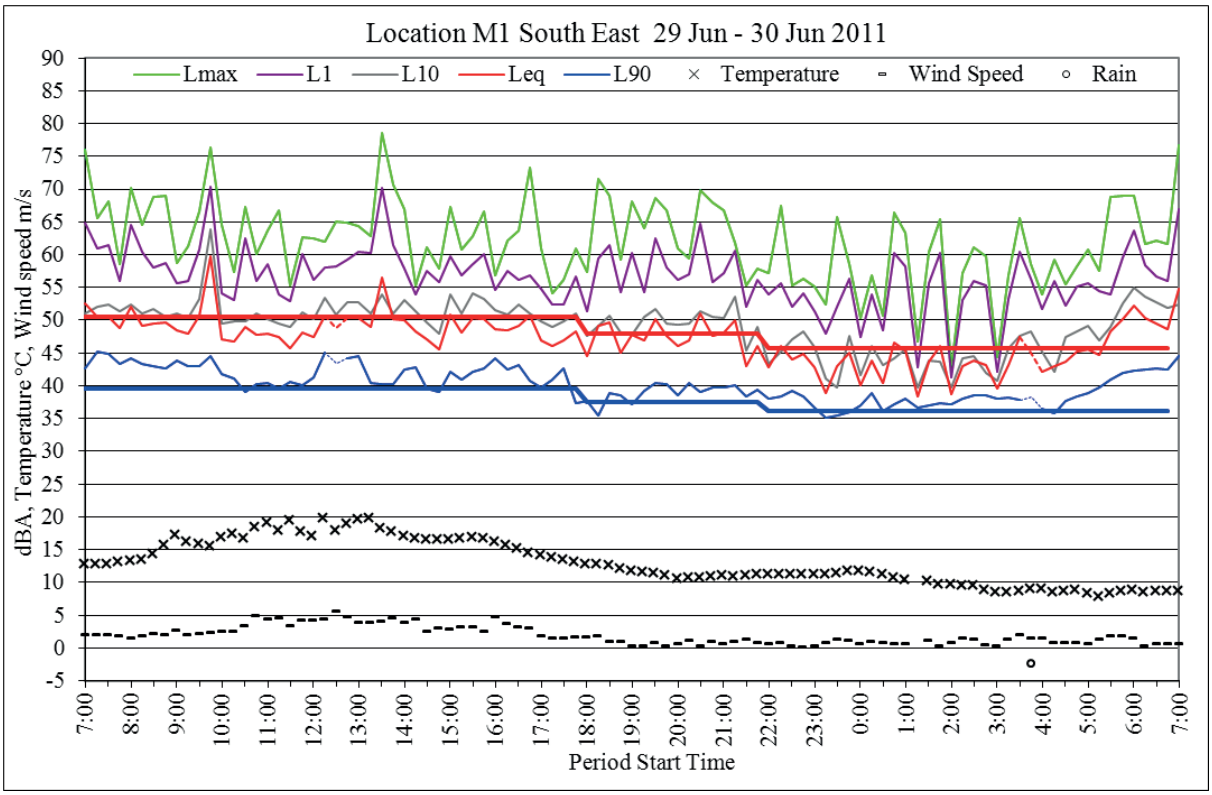

Location M1 South East 24 Jun - 25 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

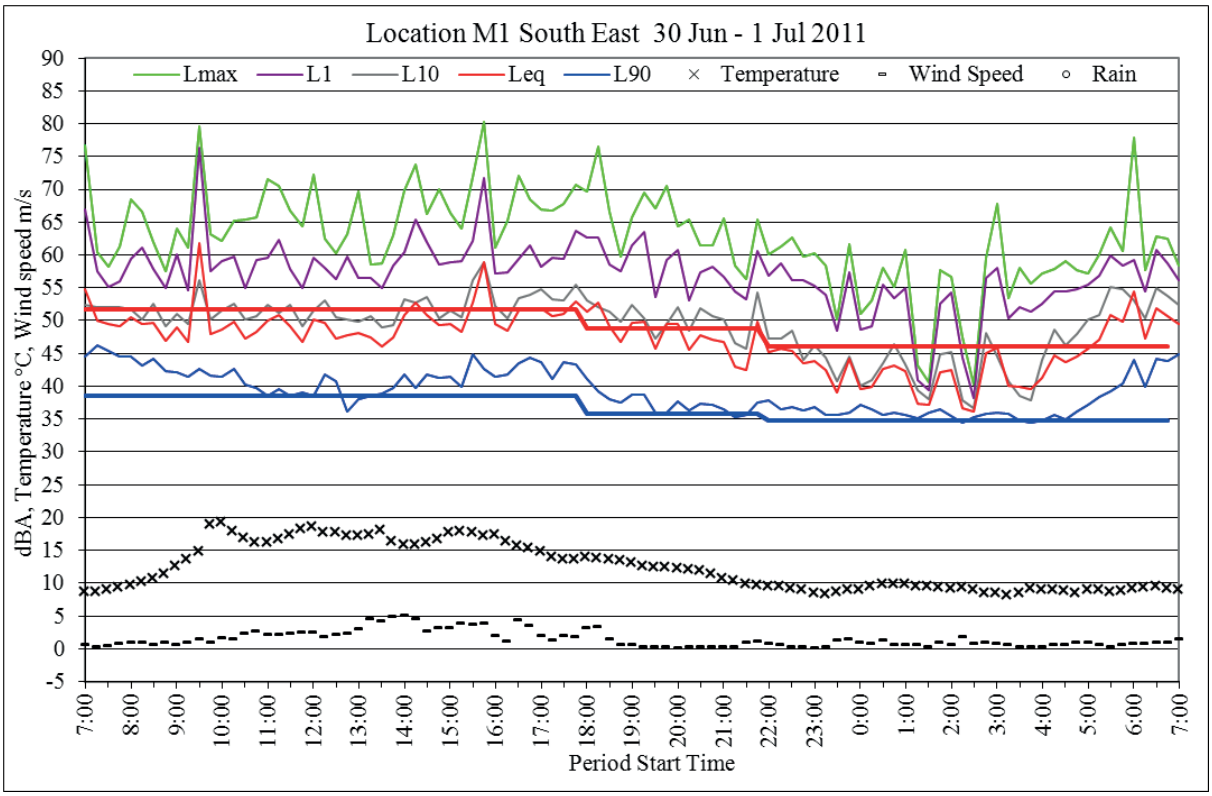

Location M1 South East 25 Jun - 26 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

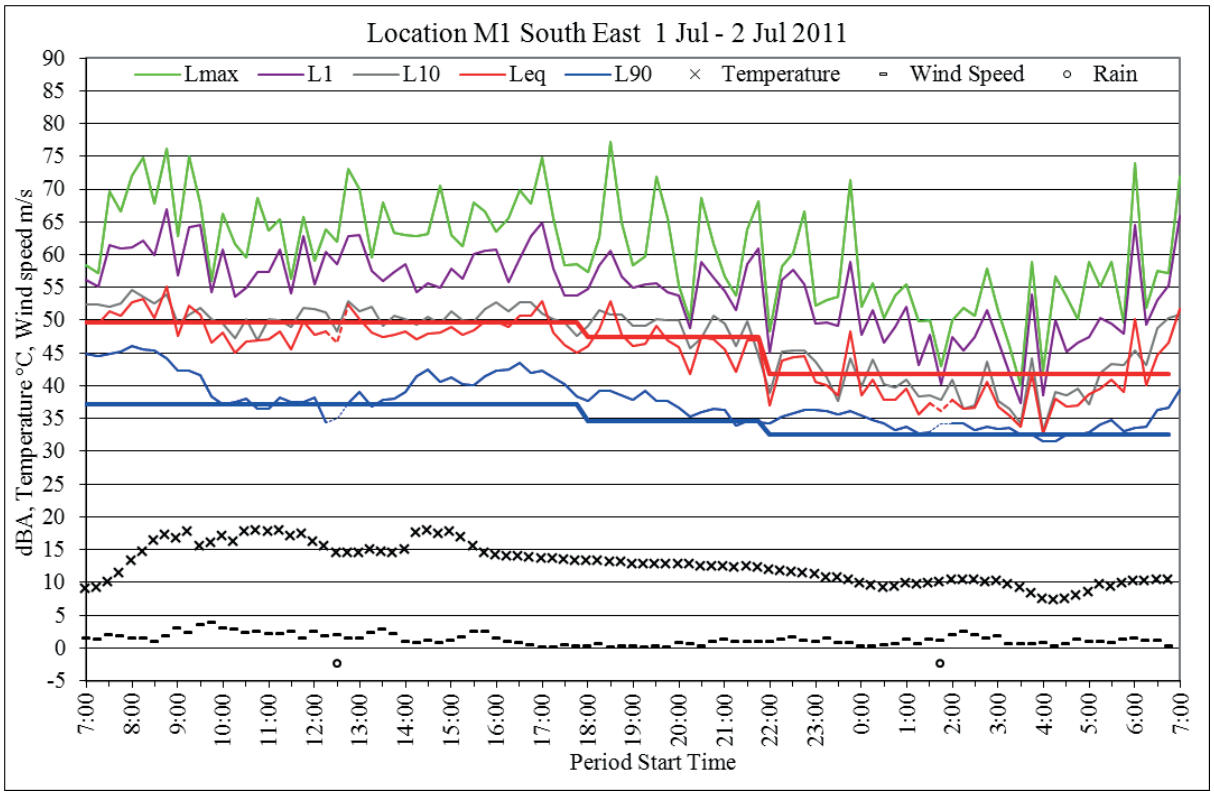

Location M1 South East 26 Jun - 27 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

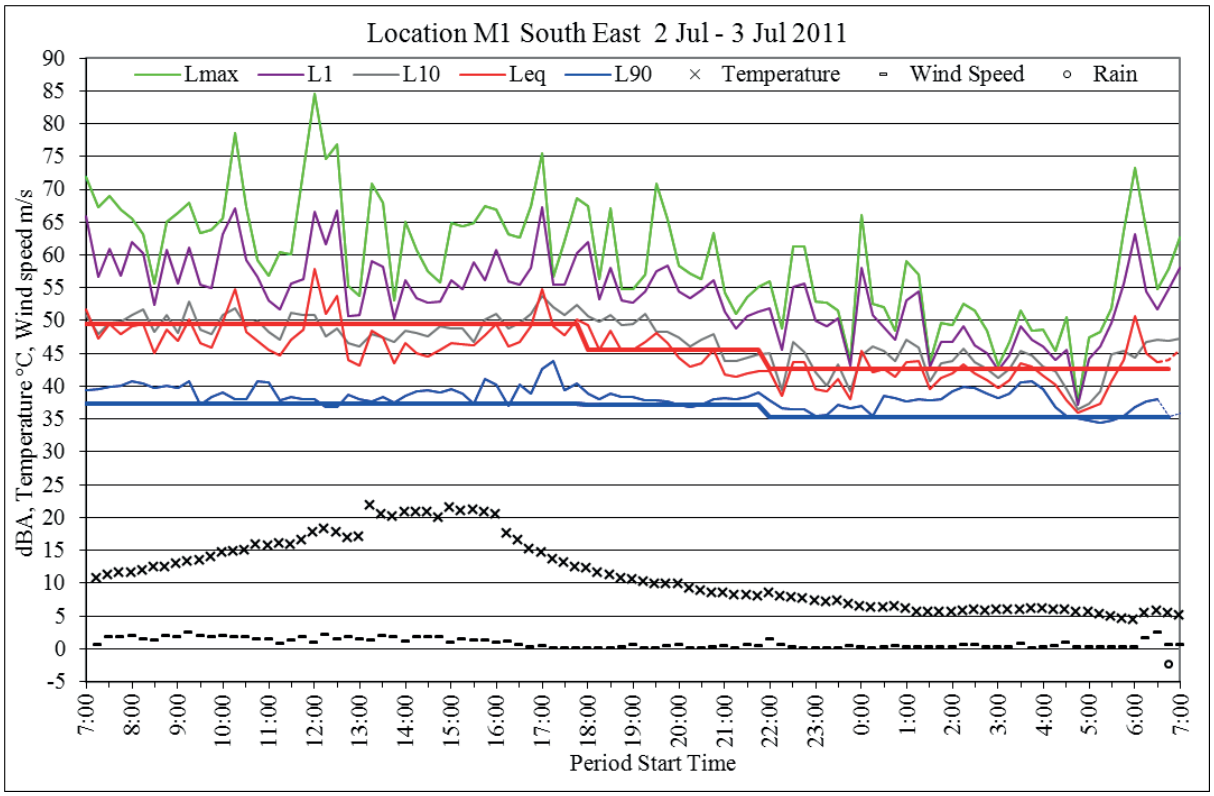

Location M1 South East 27 Jun - 28 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

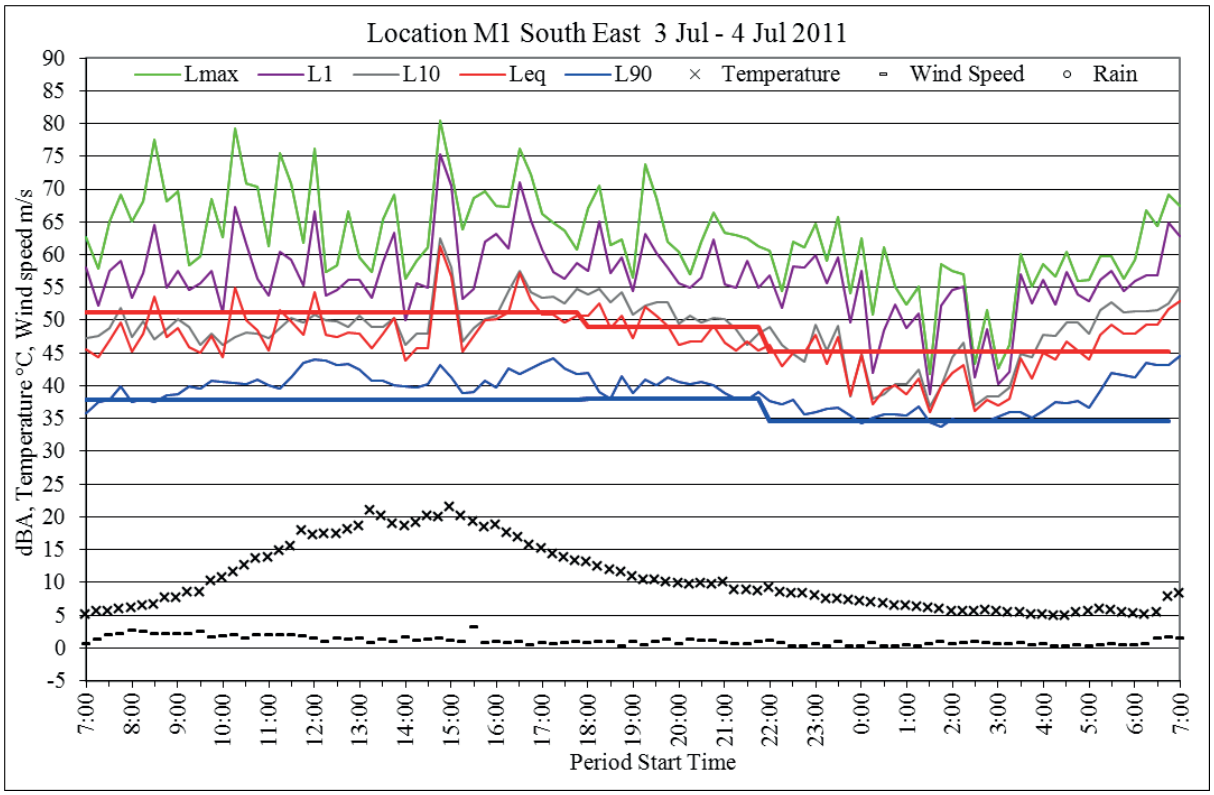

Location M1 South East 28 Jun - 29 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

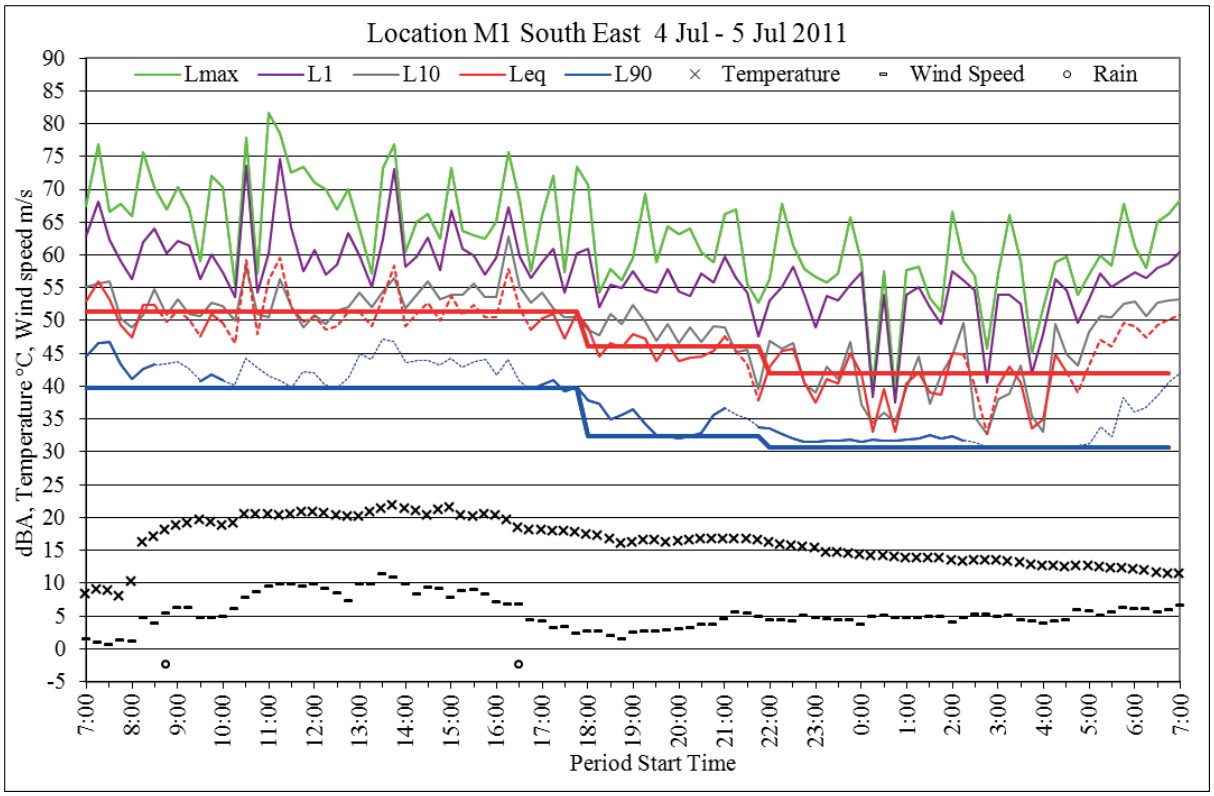

Location M1 South East 29 Jun - 30 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

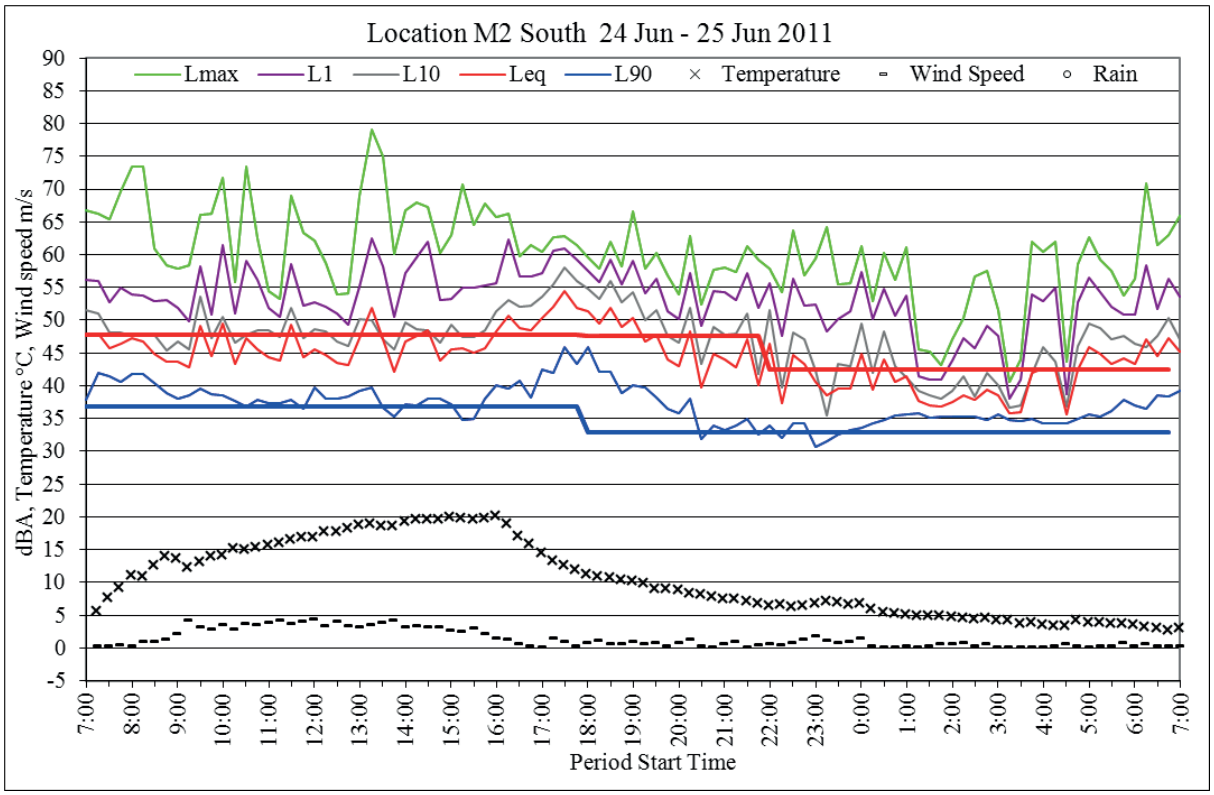

Location M1 South East 30 Jun - 1 Jul 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

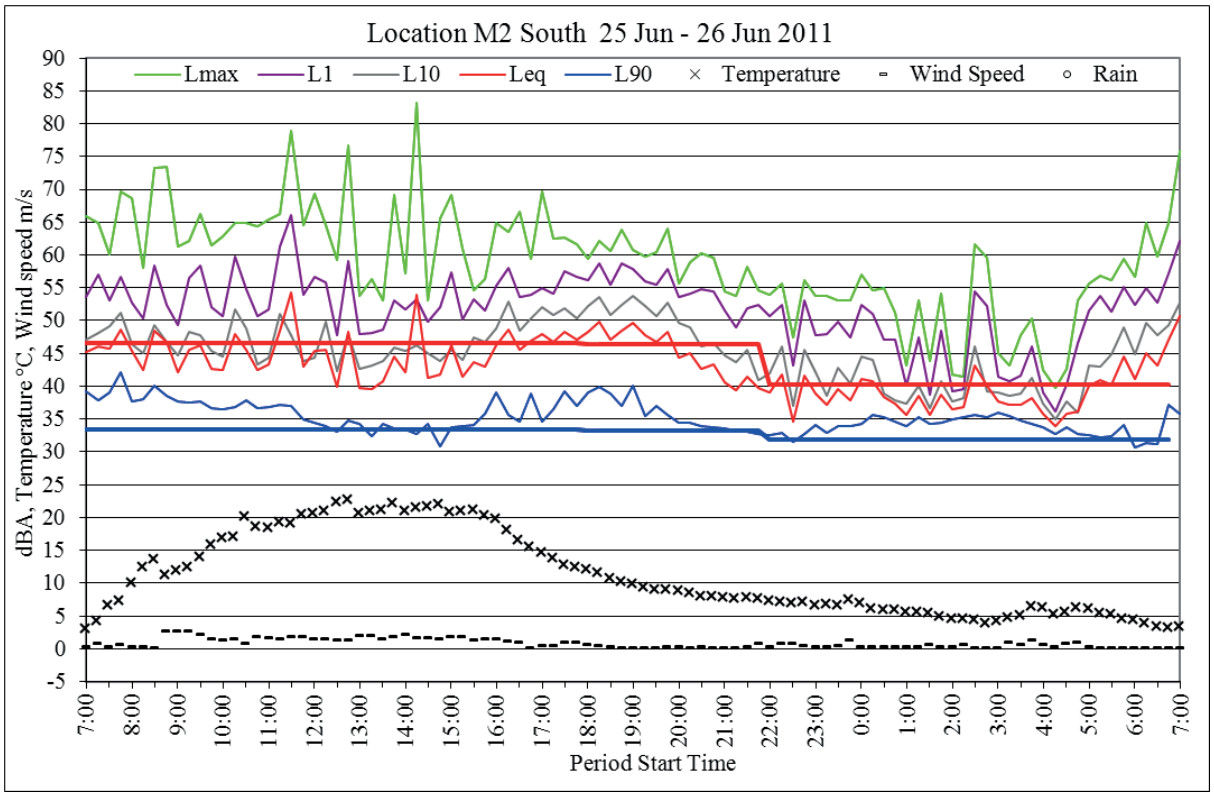

Location M1 South East 1 Jul - 2 Jul 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

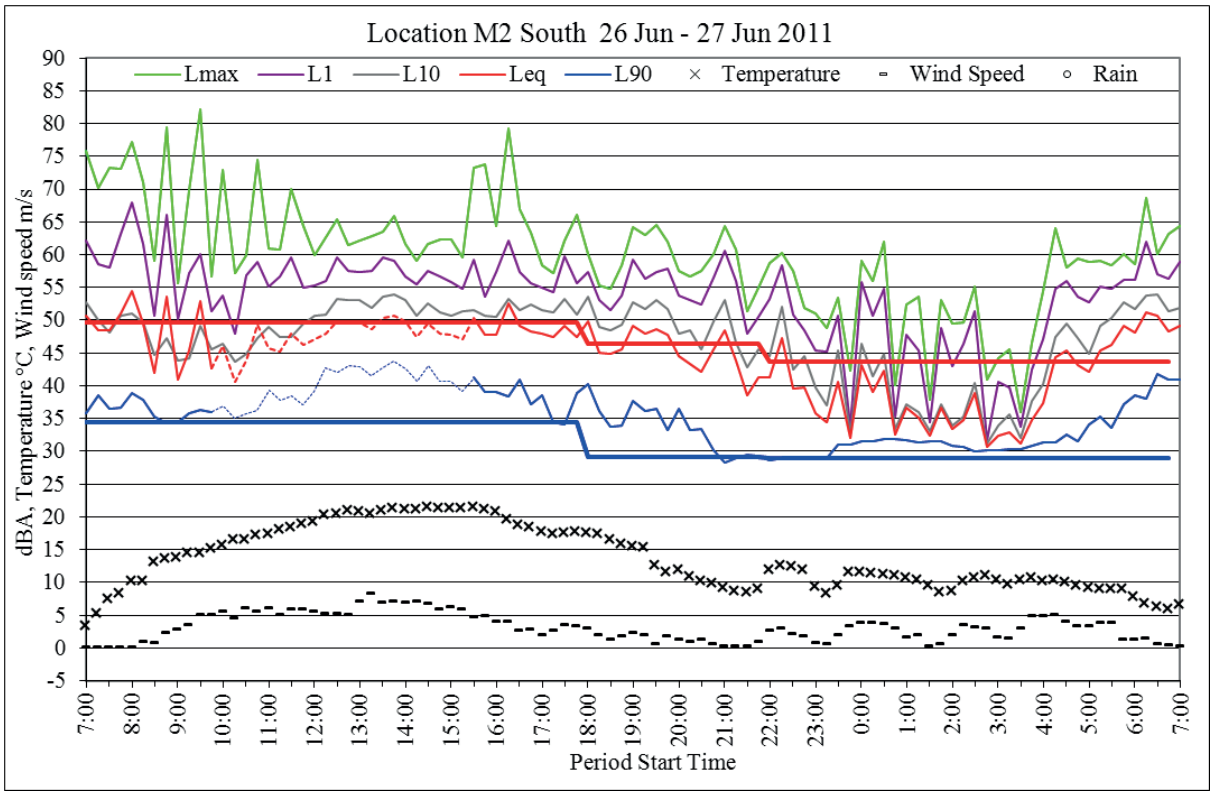

Location M1 South East 2 Jul - 3 Jul 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

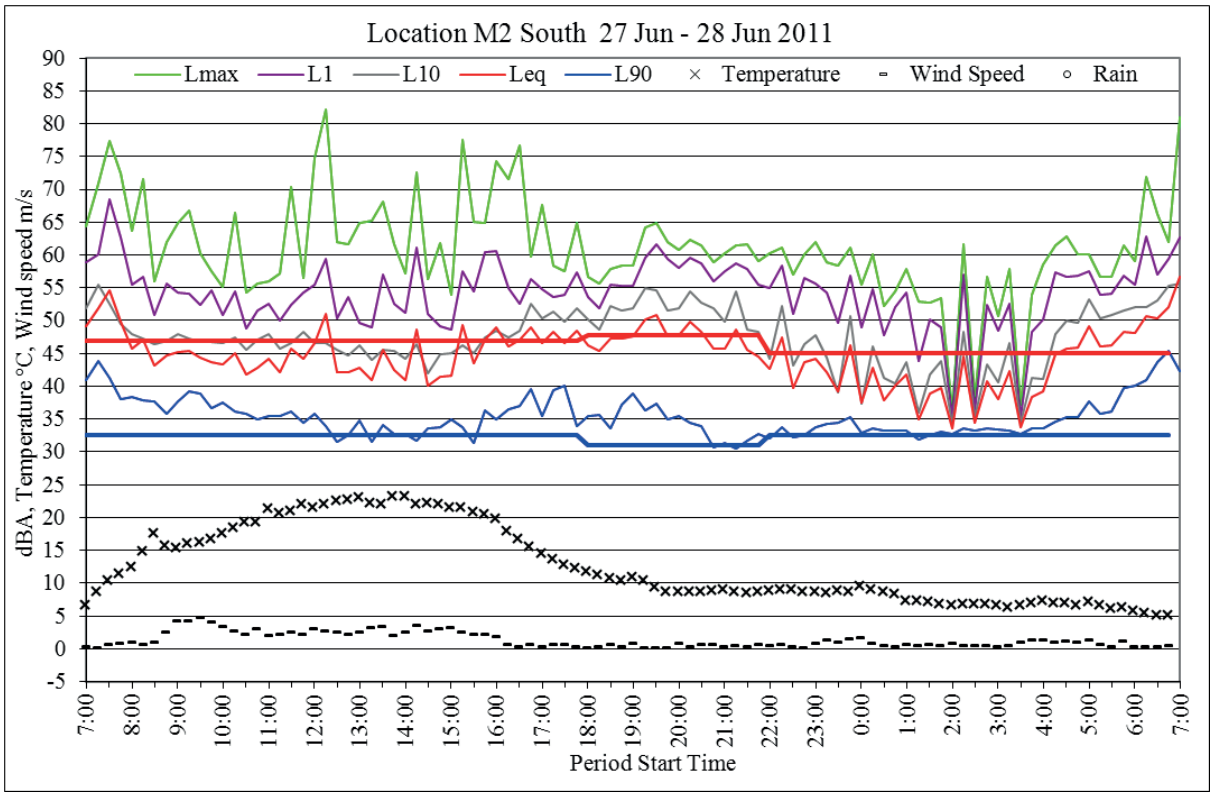

Location M1 South East 3 Jul - 4 Jul 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

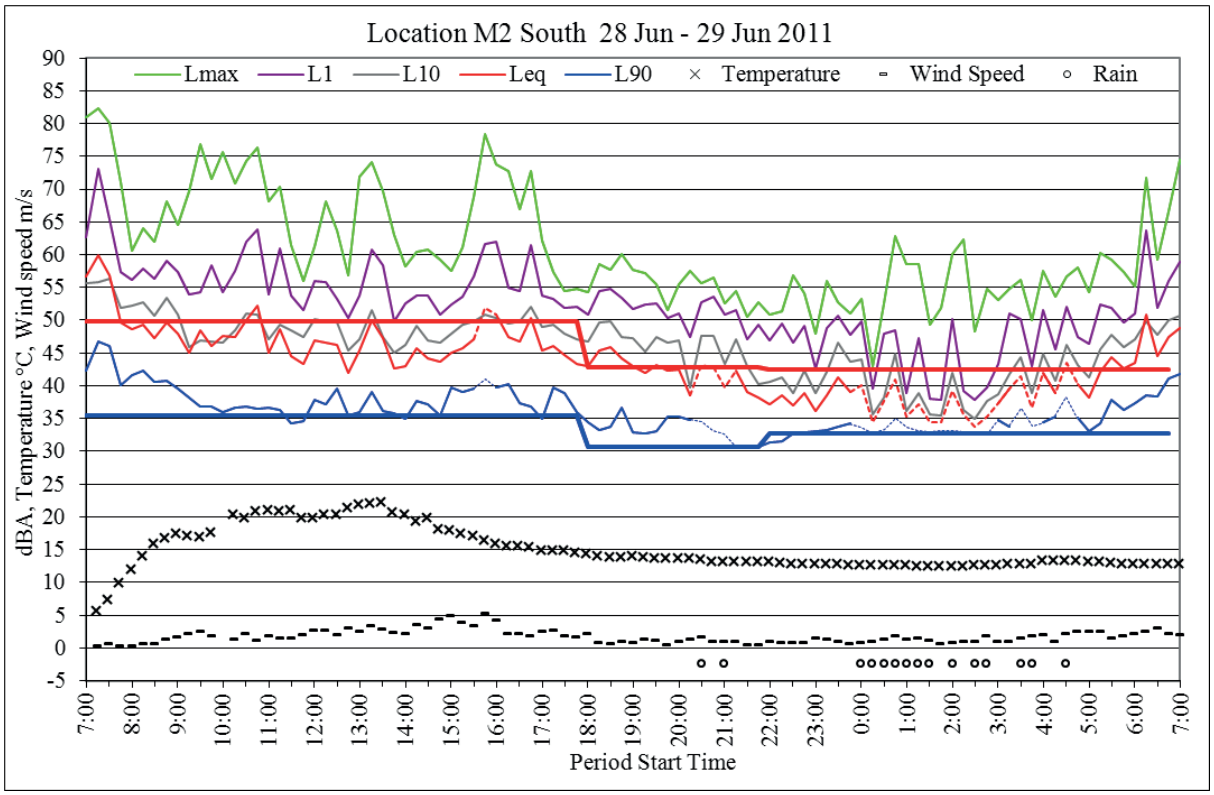

Location M1 South East 4 Jul - 5 Jul 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

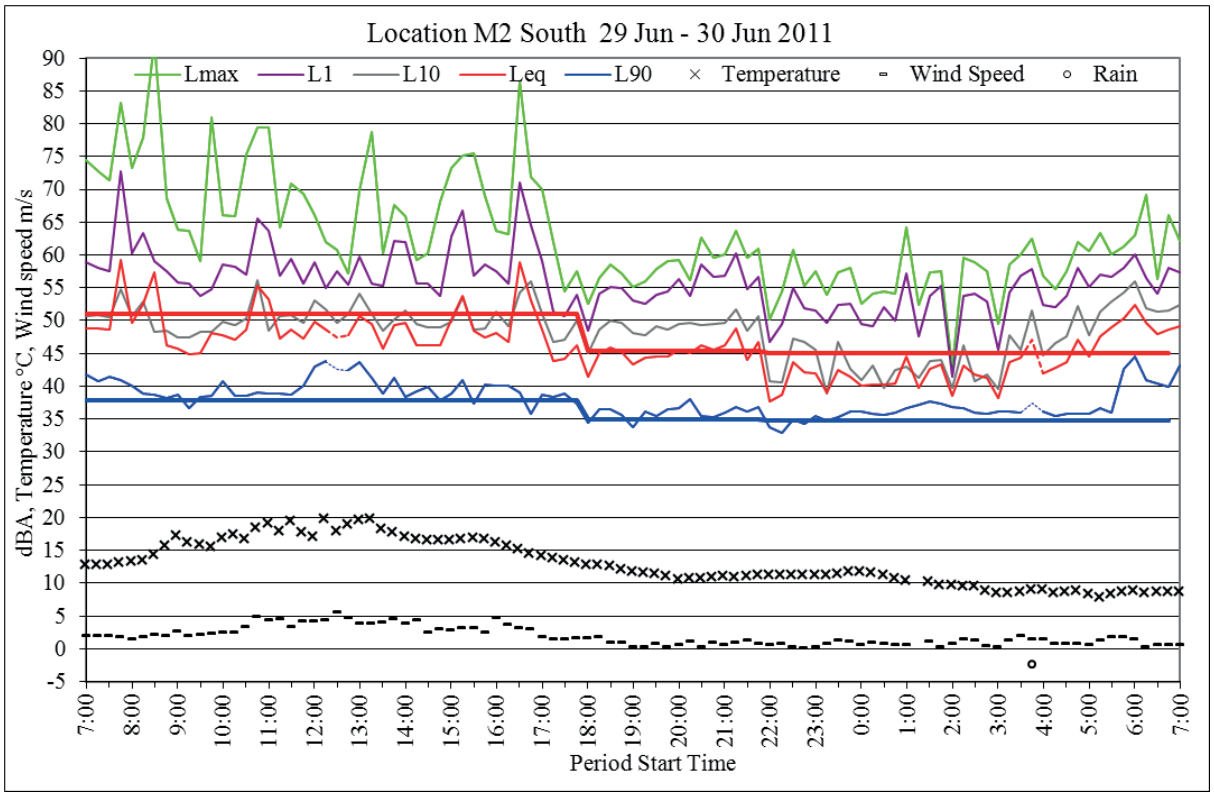

Location M2 South 24 Jun - 25 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

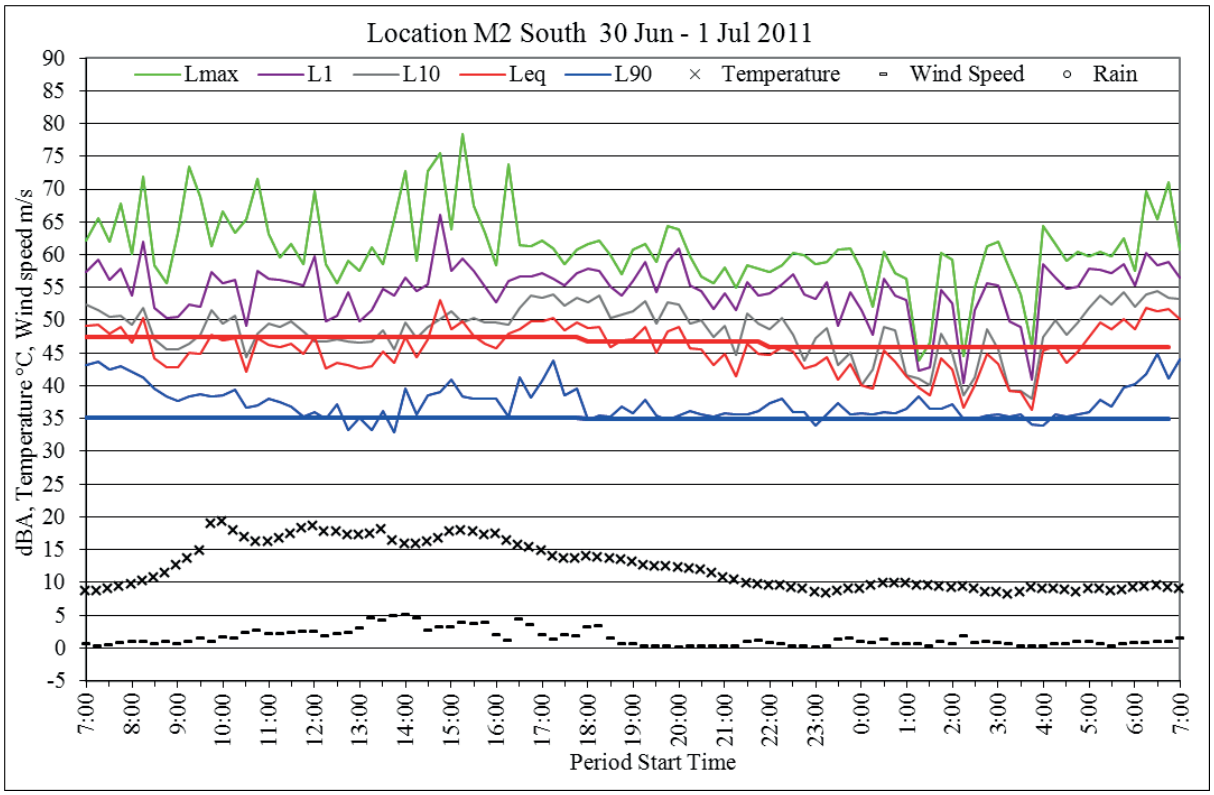

Location M2 South 25 Jun - 26 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

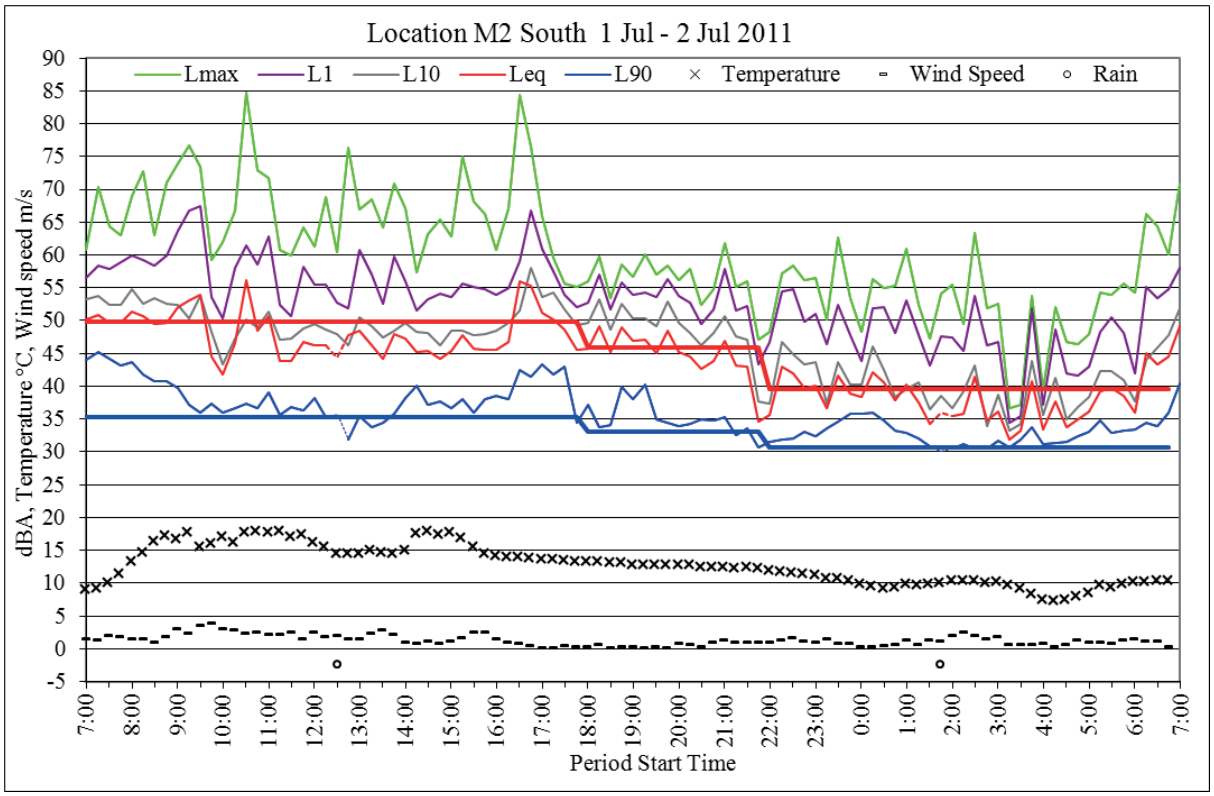

Location M2 South 26 Jun - 27 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

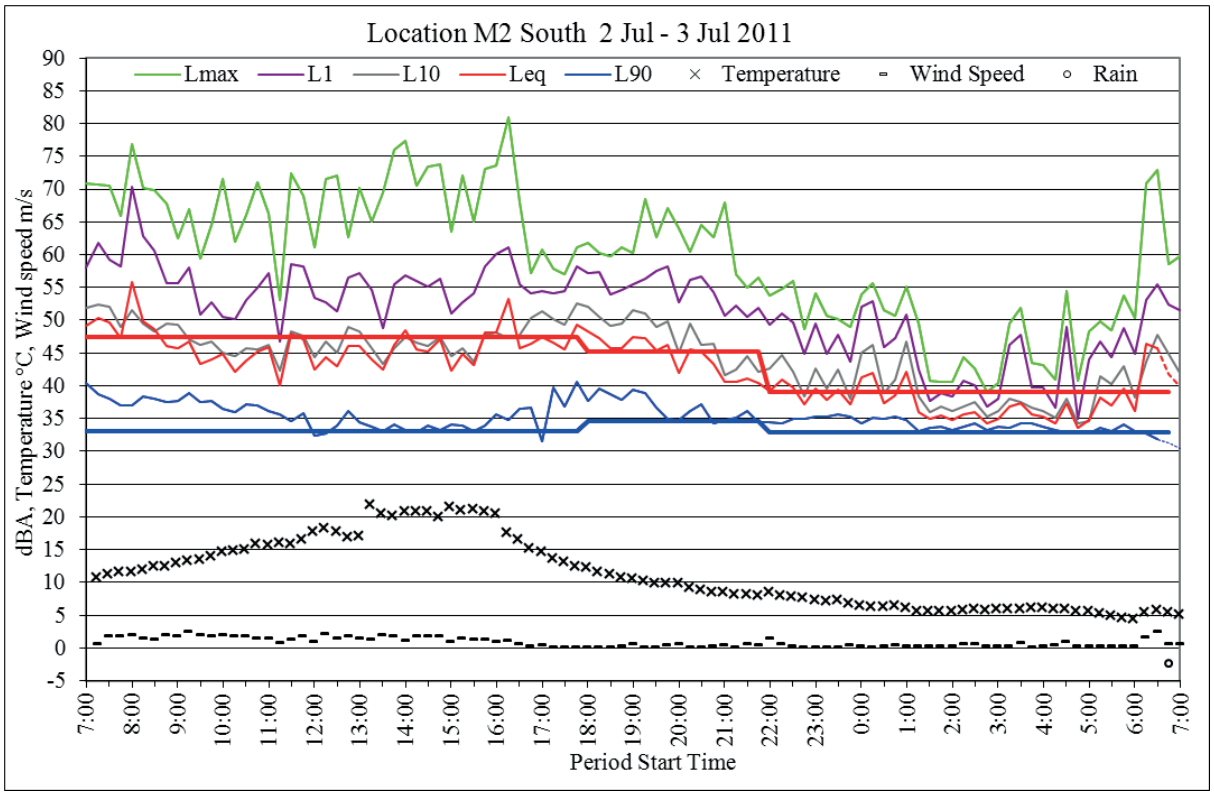

Location M2 South 27 Jun - 28 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

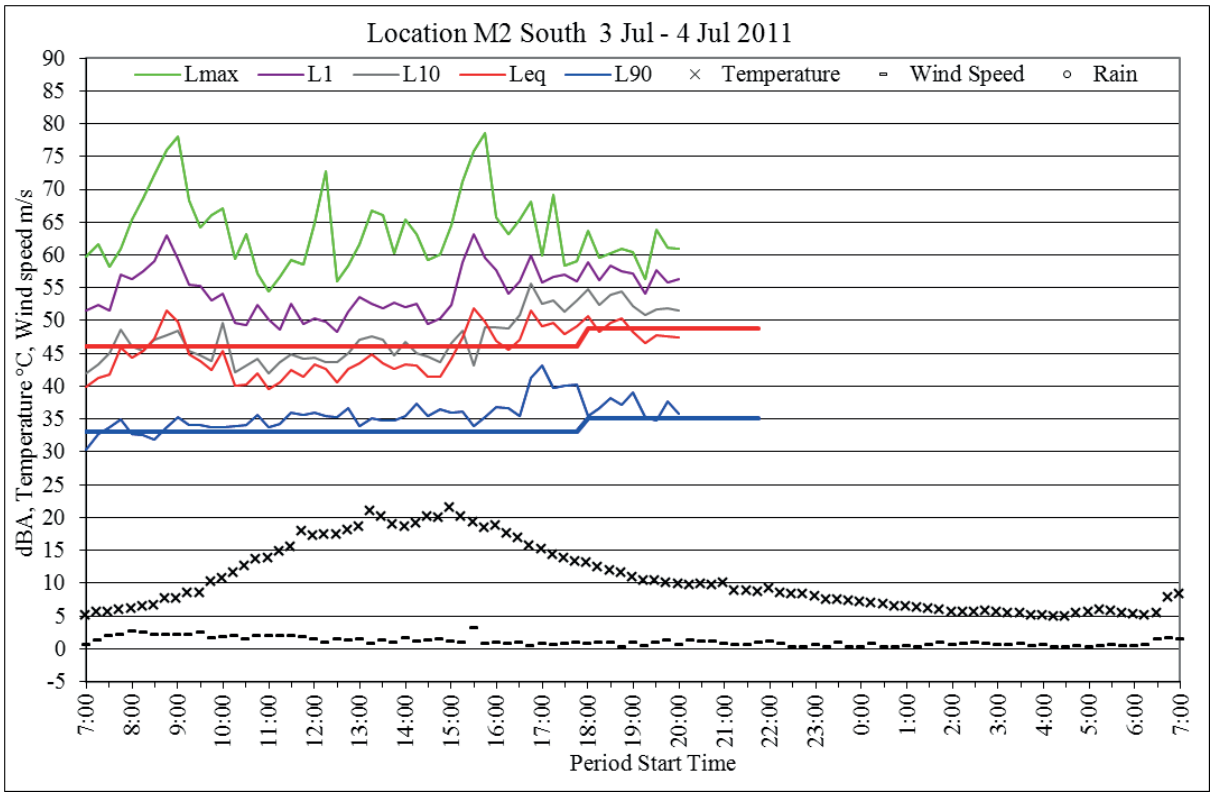

Location M2 South 28 Jun - 29 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

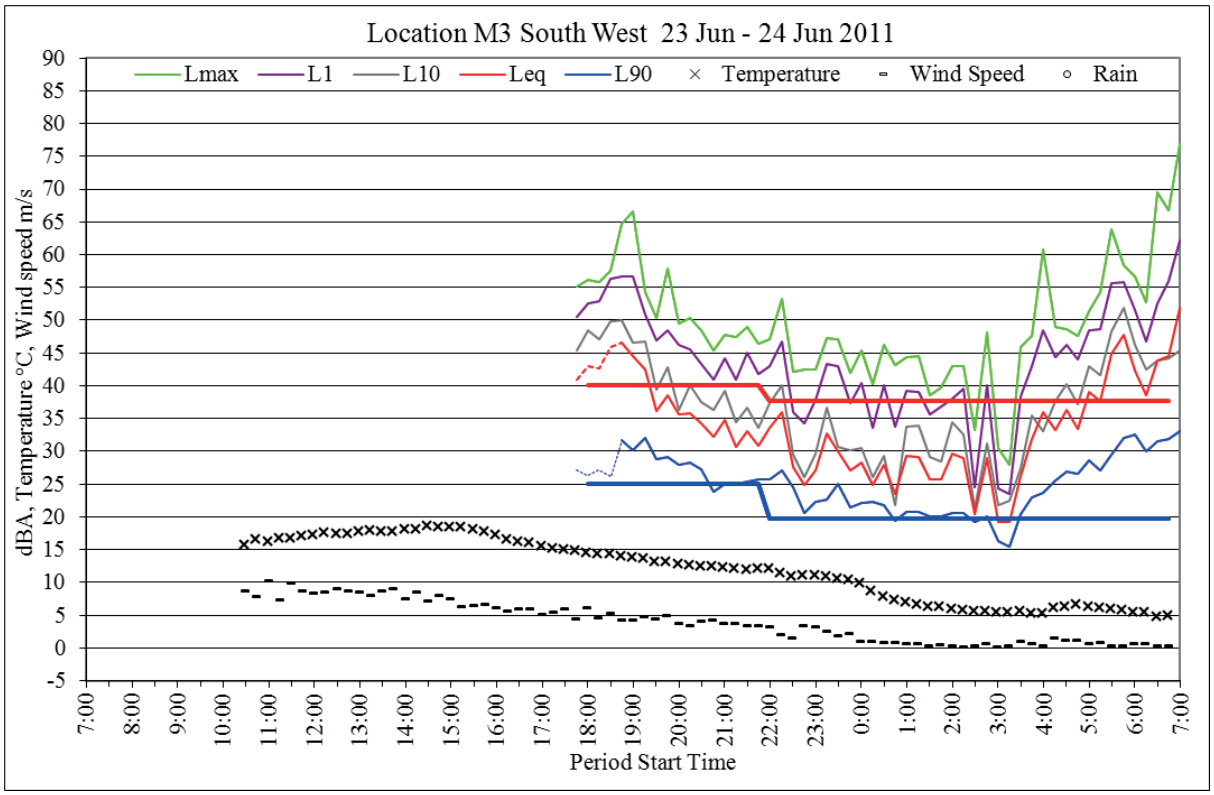

Location M2 South 29 Jun - 30 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

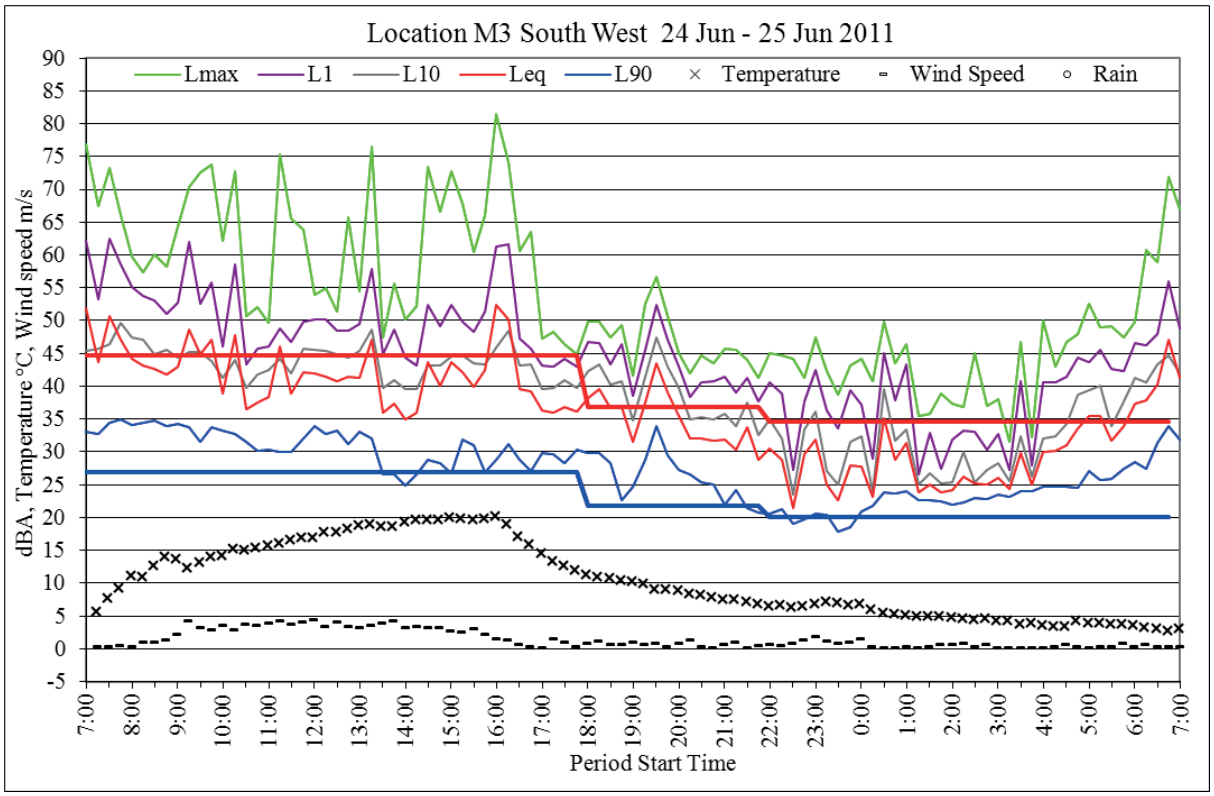

Location M2 South 30 Jun - 1 Jul 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

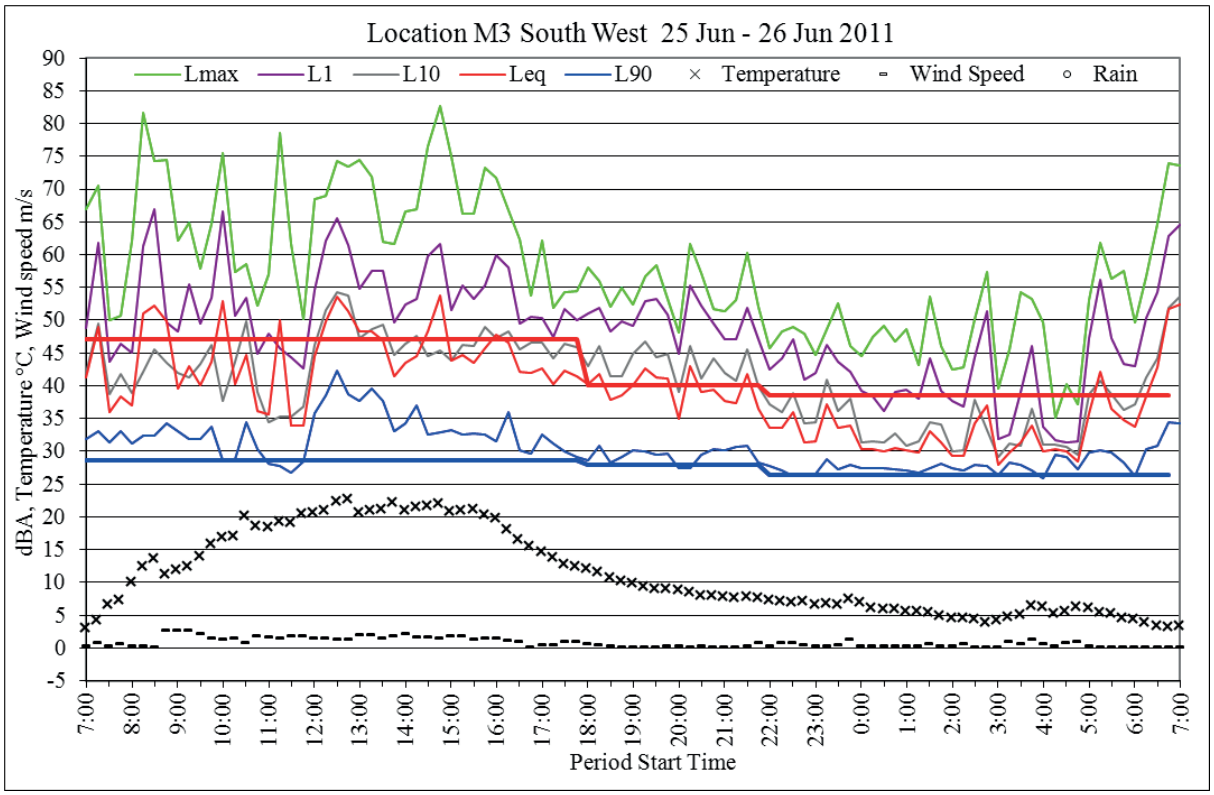

Location M2 South 1 Jul - 2 Jul 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

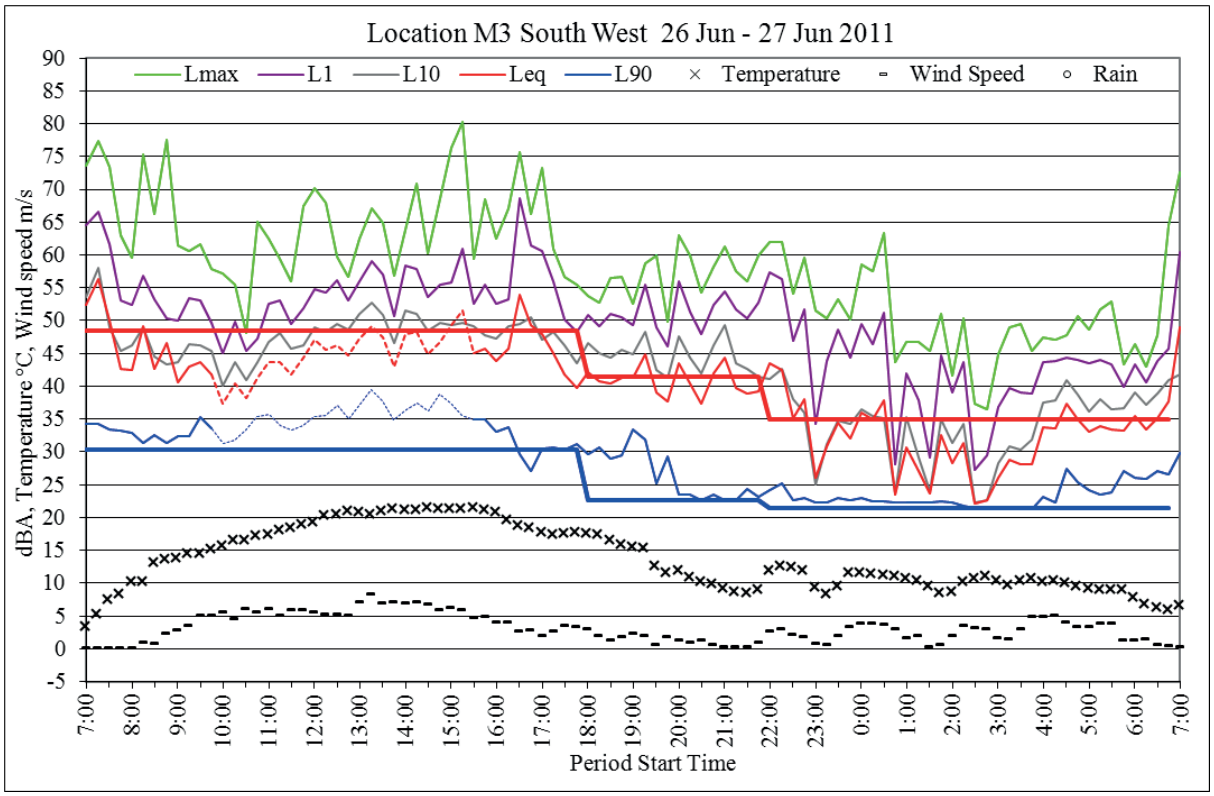

Location M2 South 2 Jul - 3 Jul 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

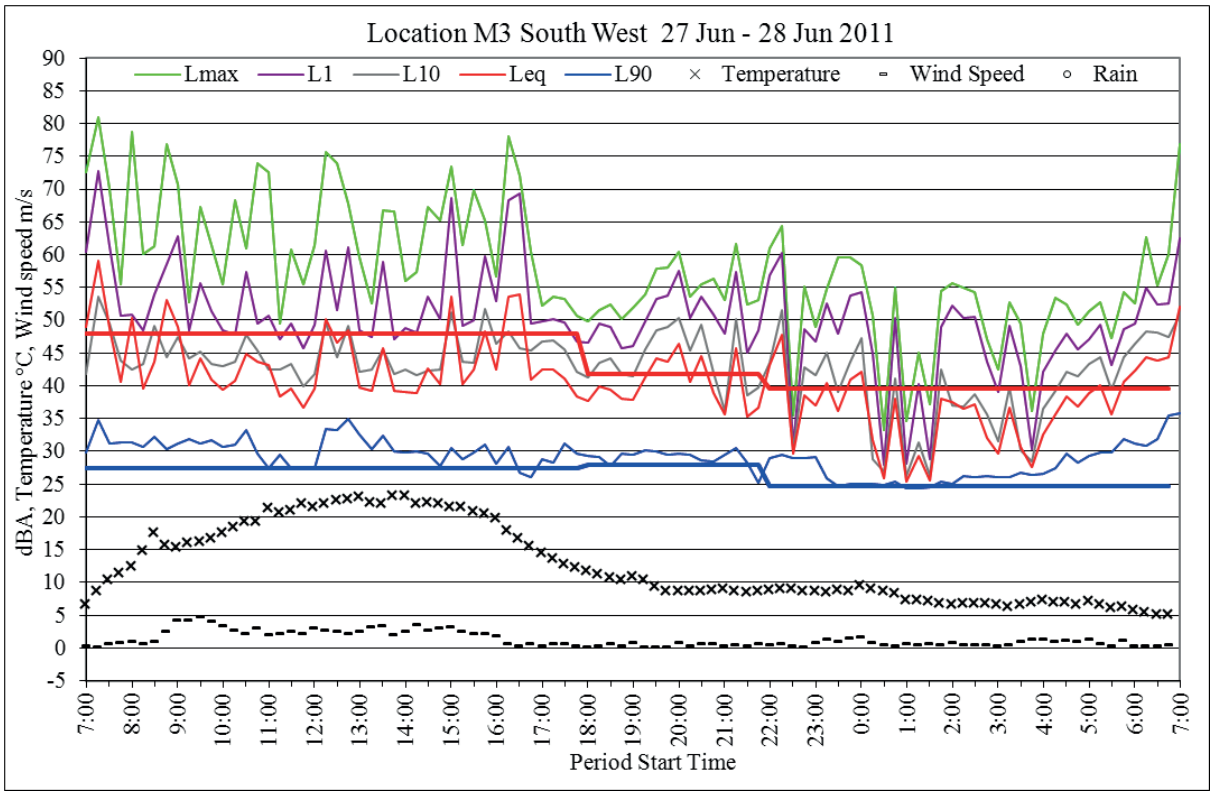

Location M2 South 3 Jul - 4 Jul 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

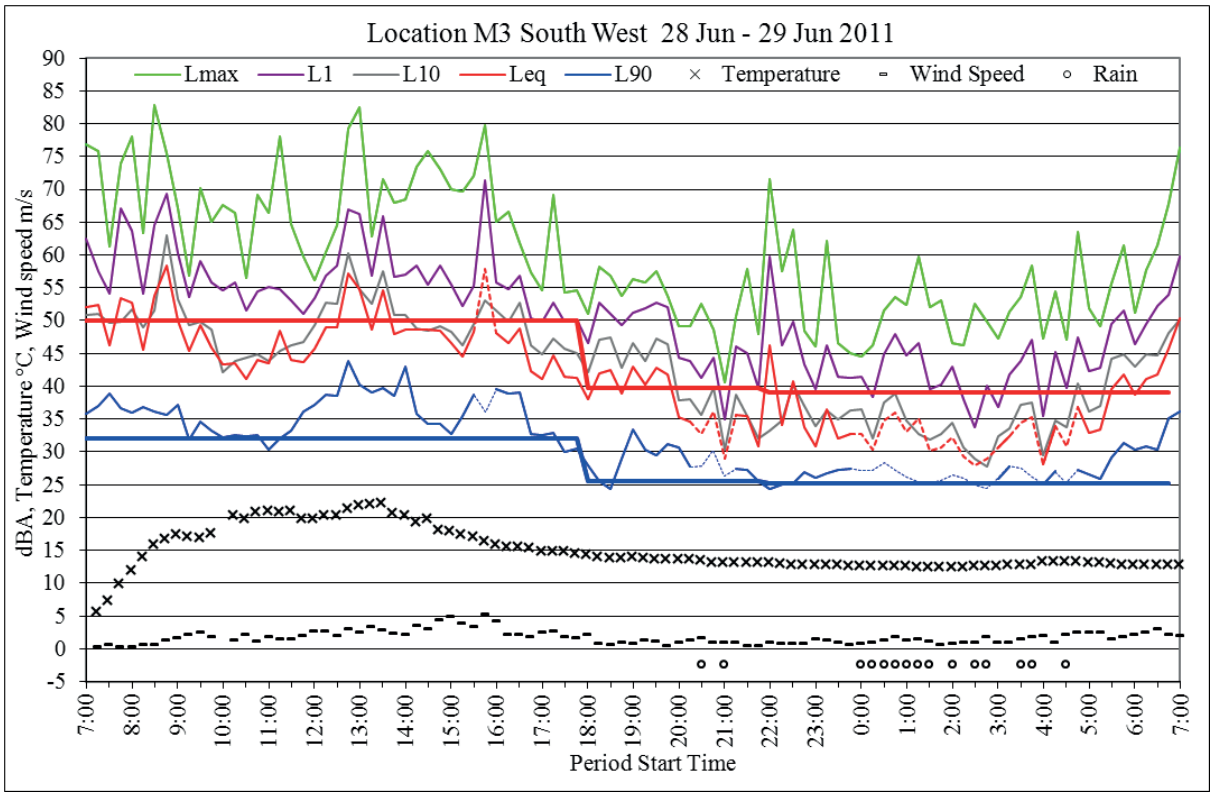

Location M3 South West 23 Jun - 24 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

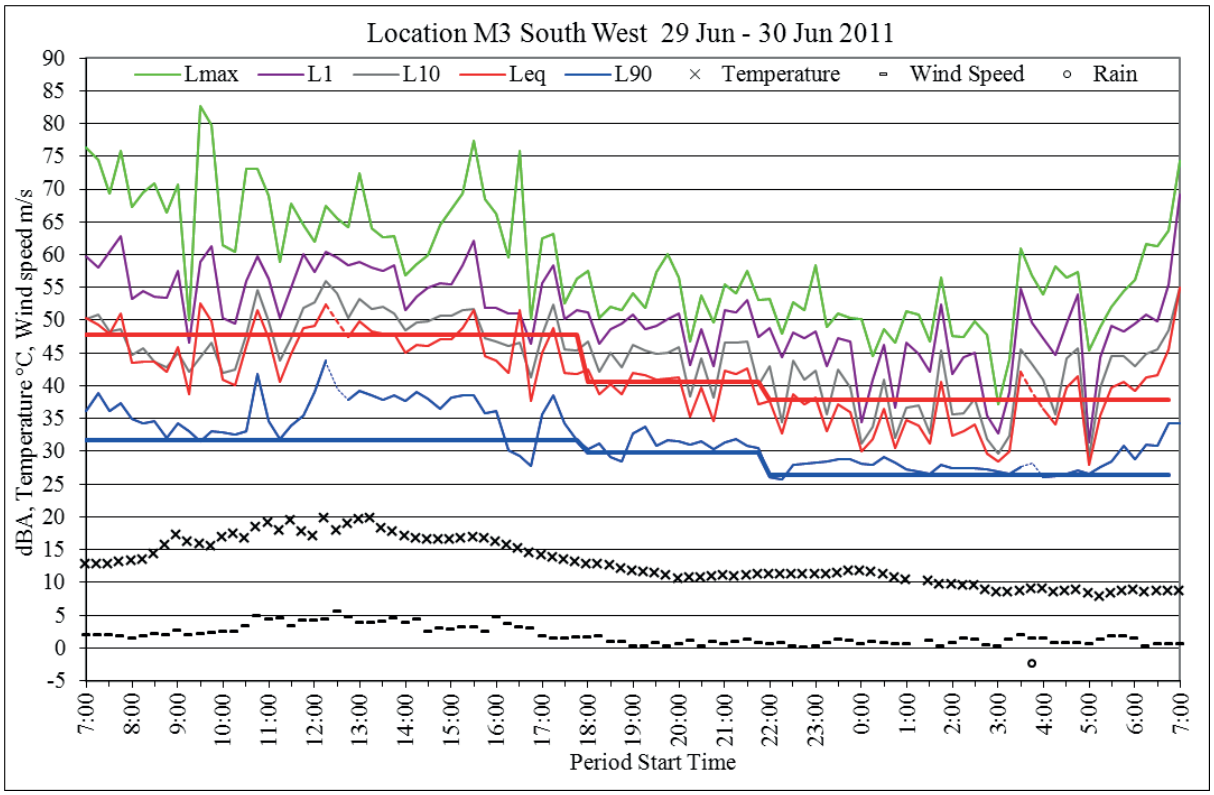

Location M3 South West 24 Jun - 25 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

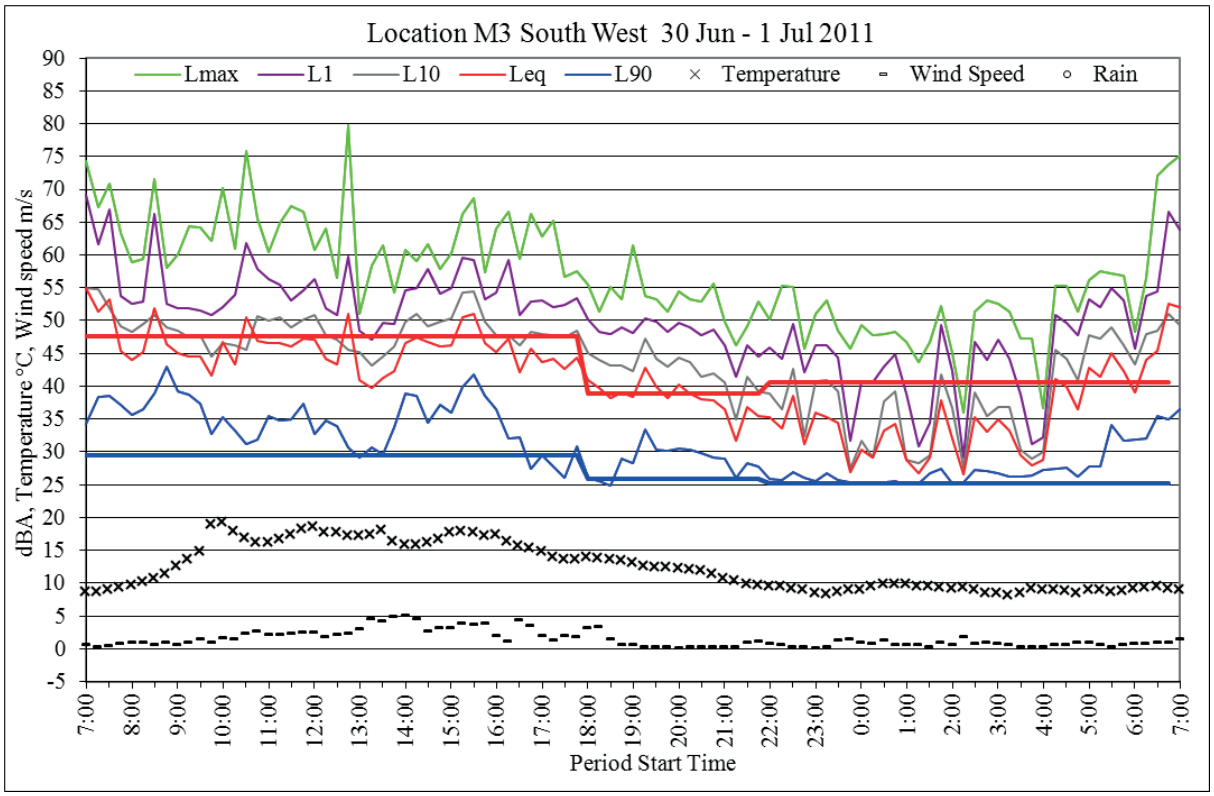

Location M3 South West 25 Jun - 26 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

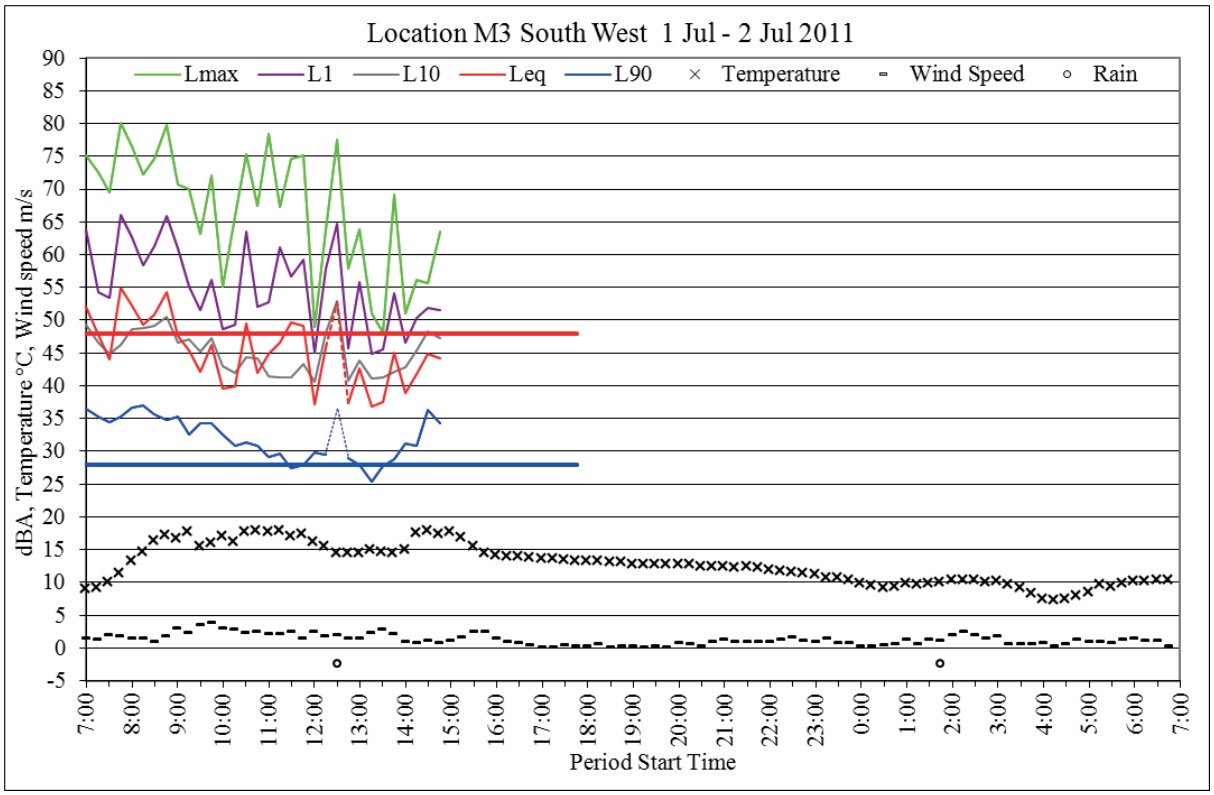

Location M3 South West 26 Jun - 27 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

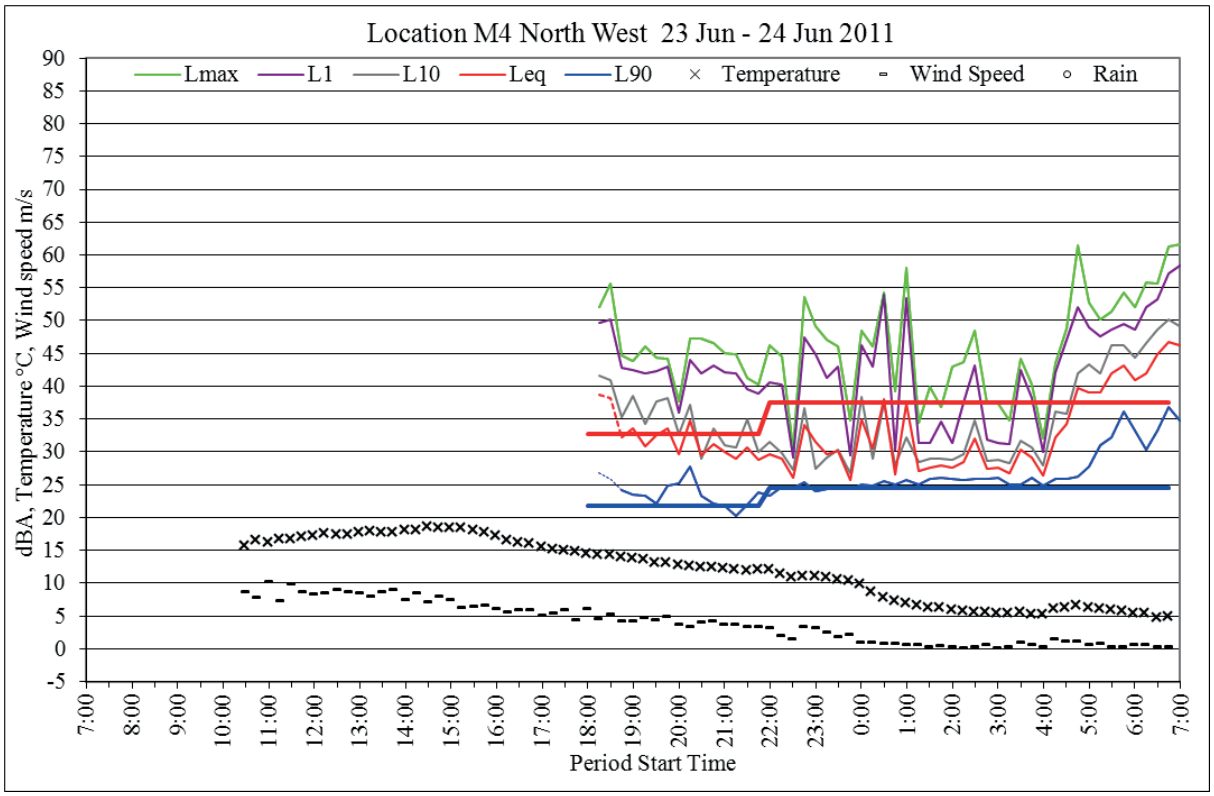

Location M3 South West 27 Jun - 28 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

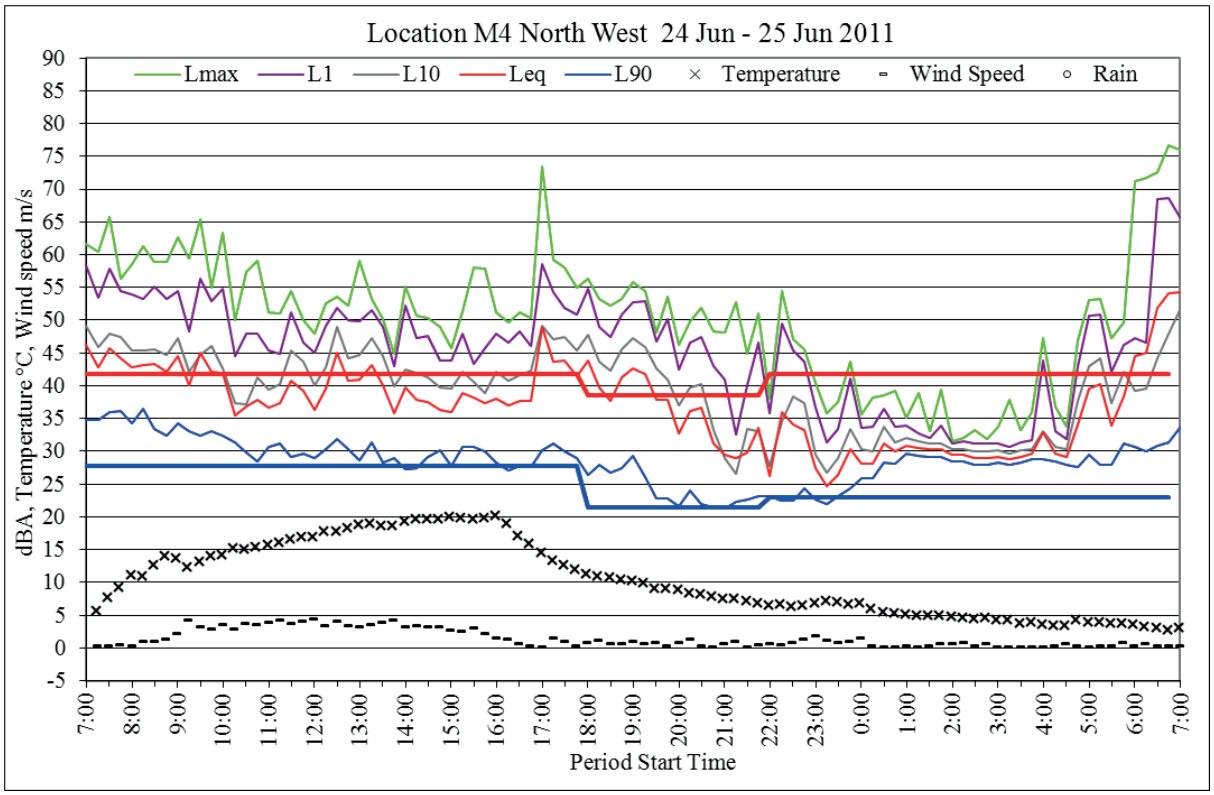

Location M3 South West 28 Jun - 29 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

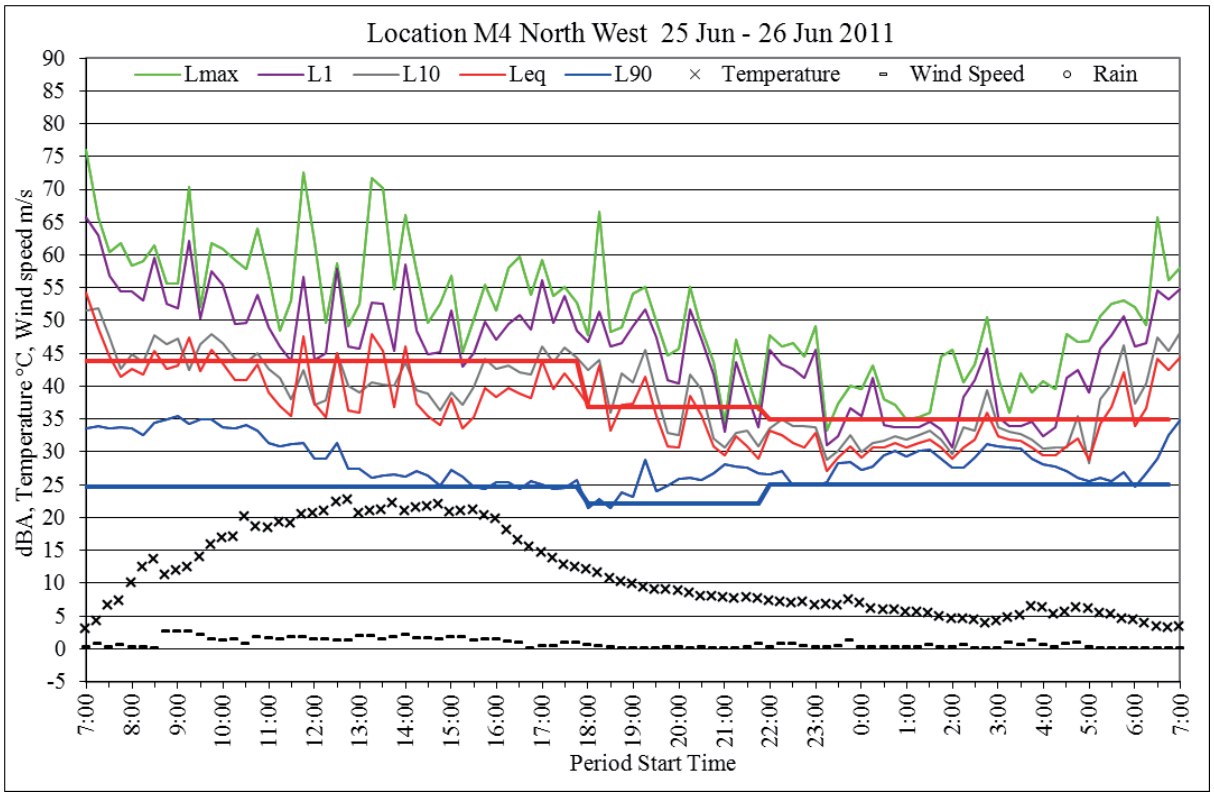

Location M3 South West 29 Jun - 30 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

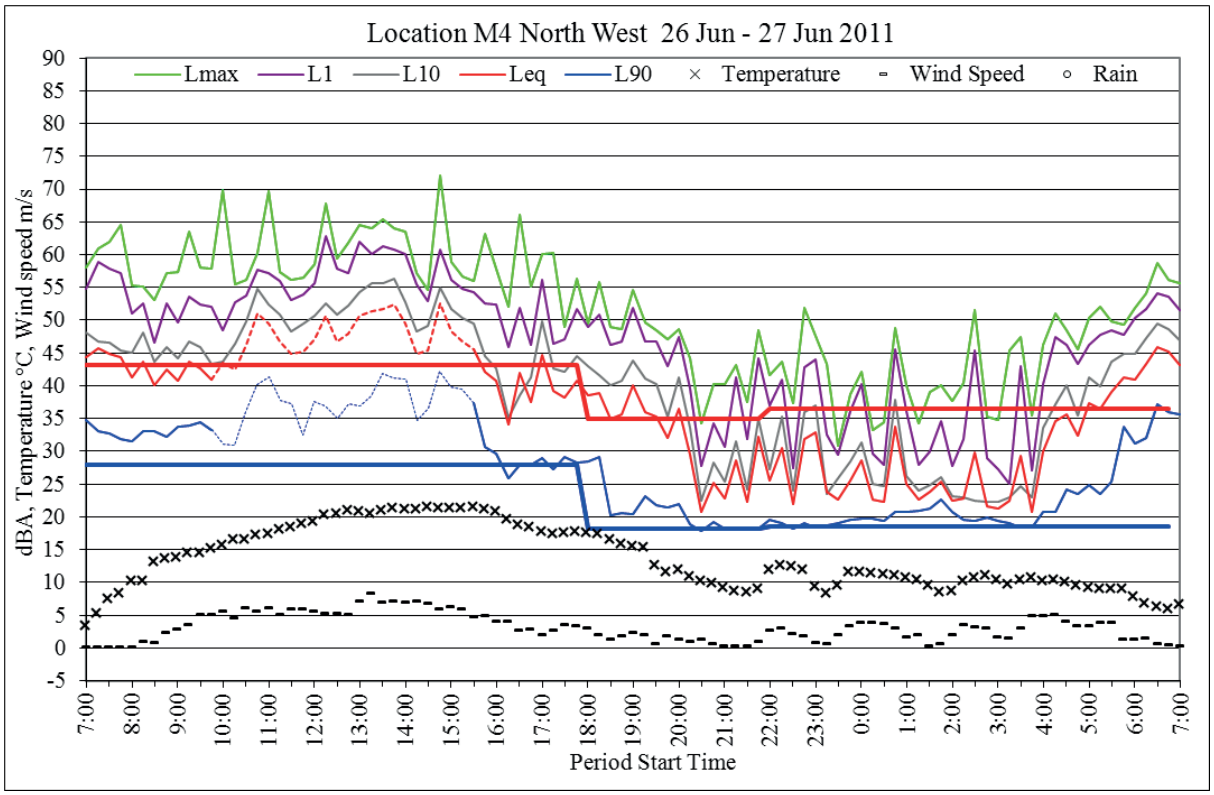

Location M3 South West 30 Jun - 1 Jul 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

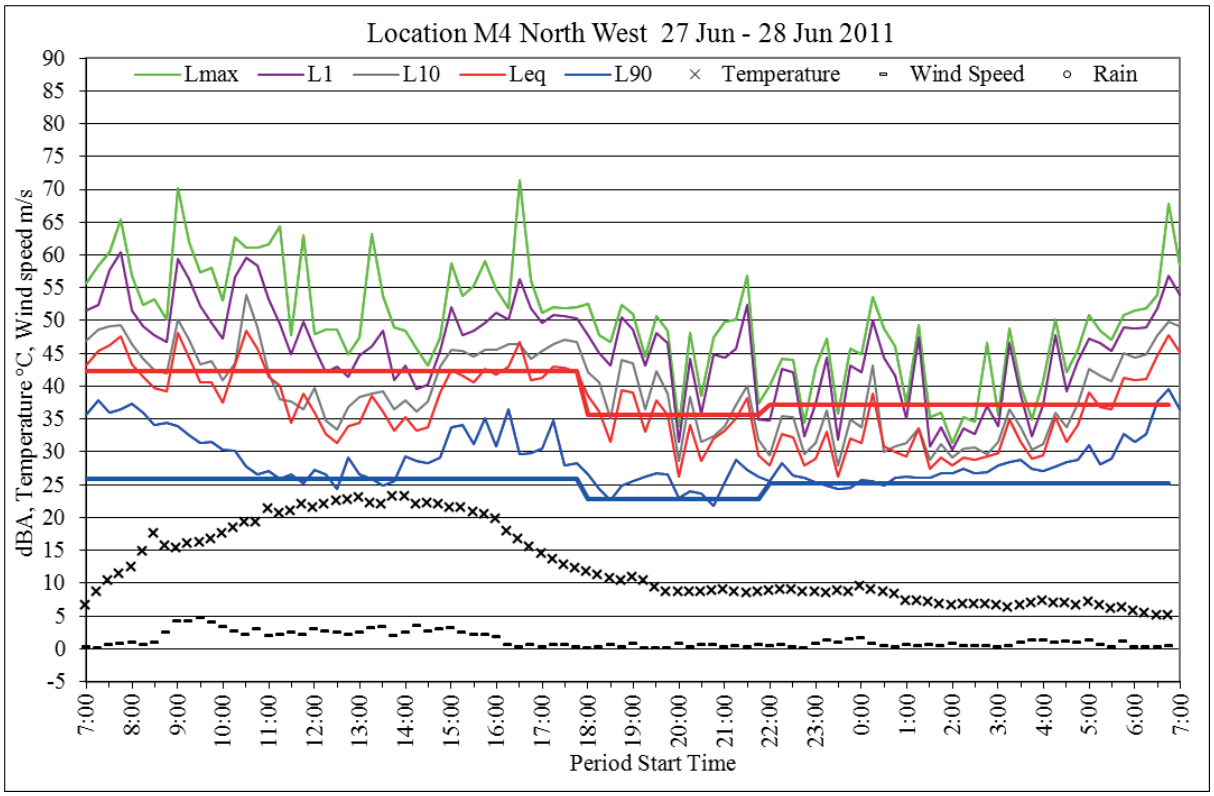

Location M3 South West 1 Jul - 2 Jul 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

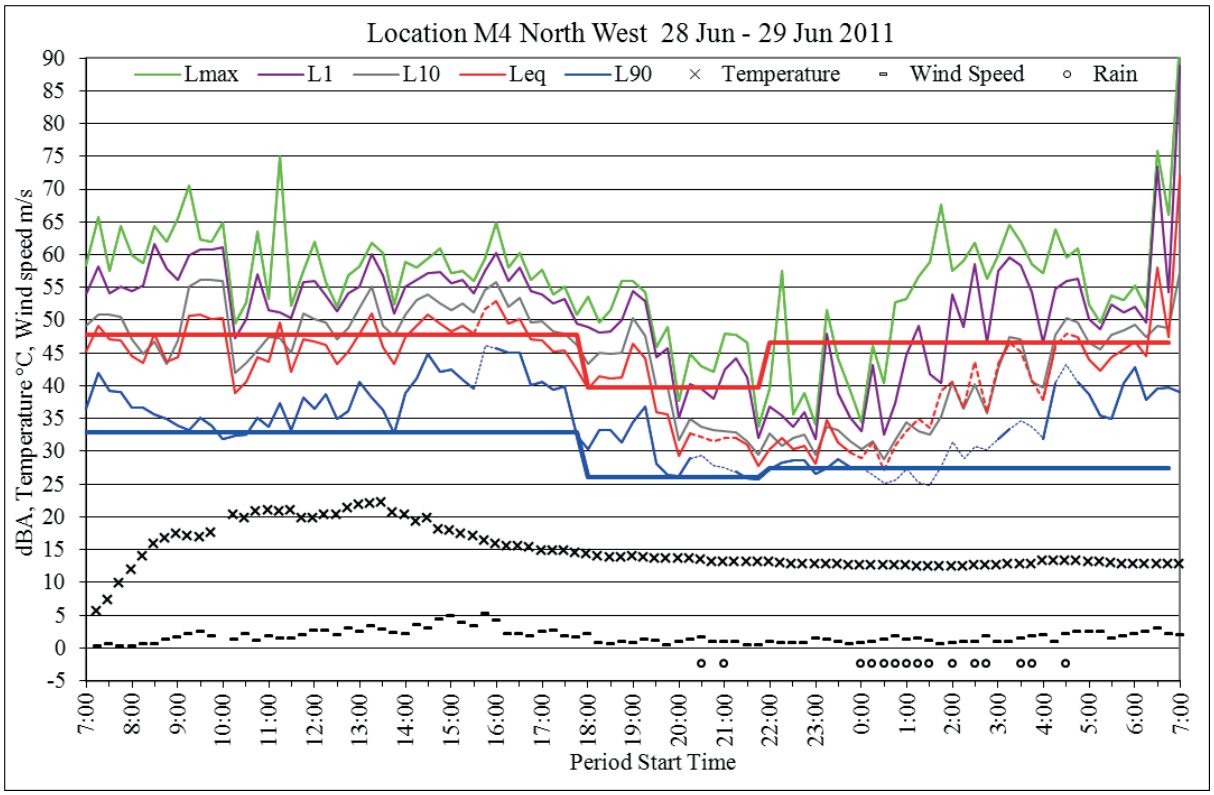

Location M4 North West 23 Jun - 24 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

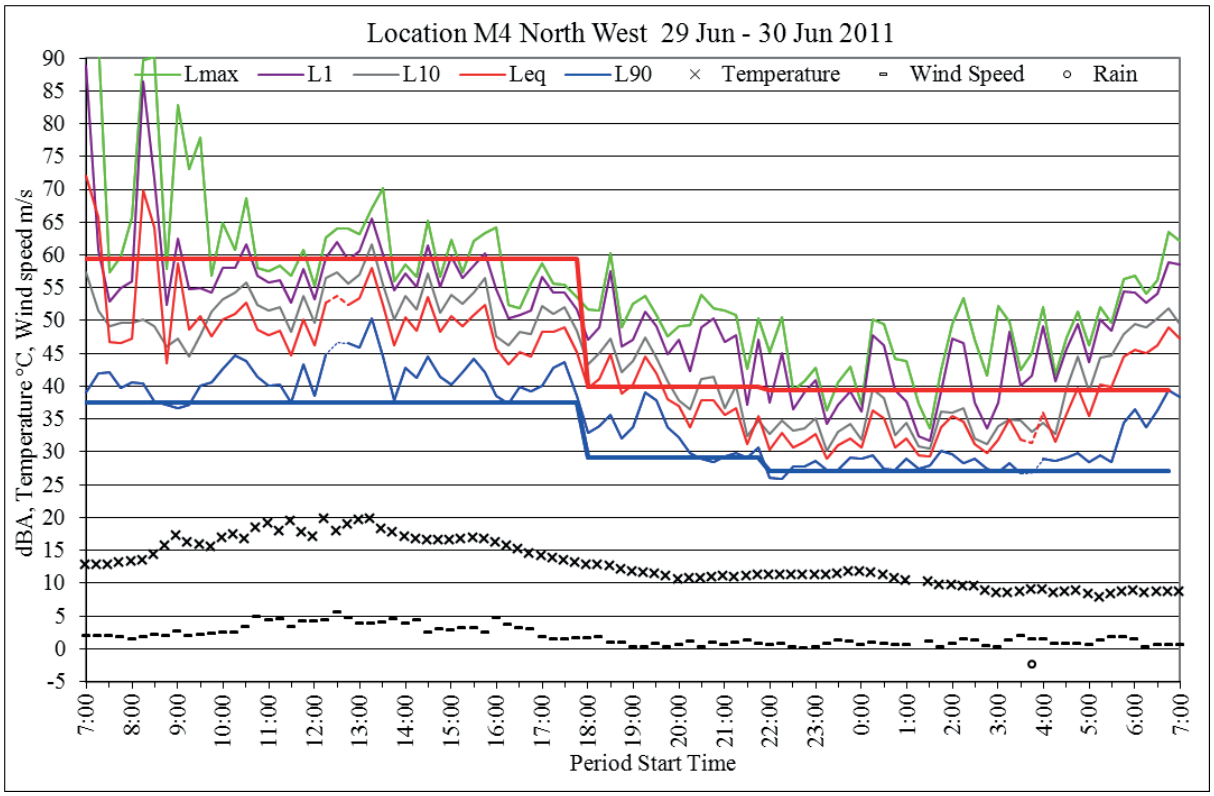

Location M4 North West 24 Jun - 25 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

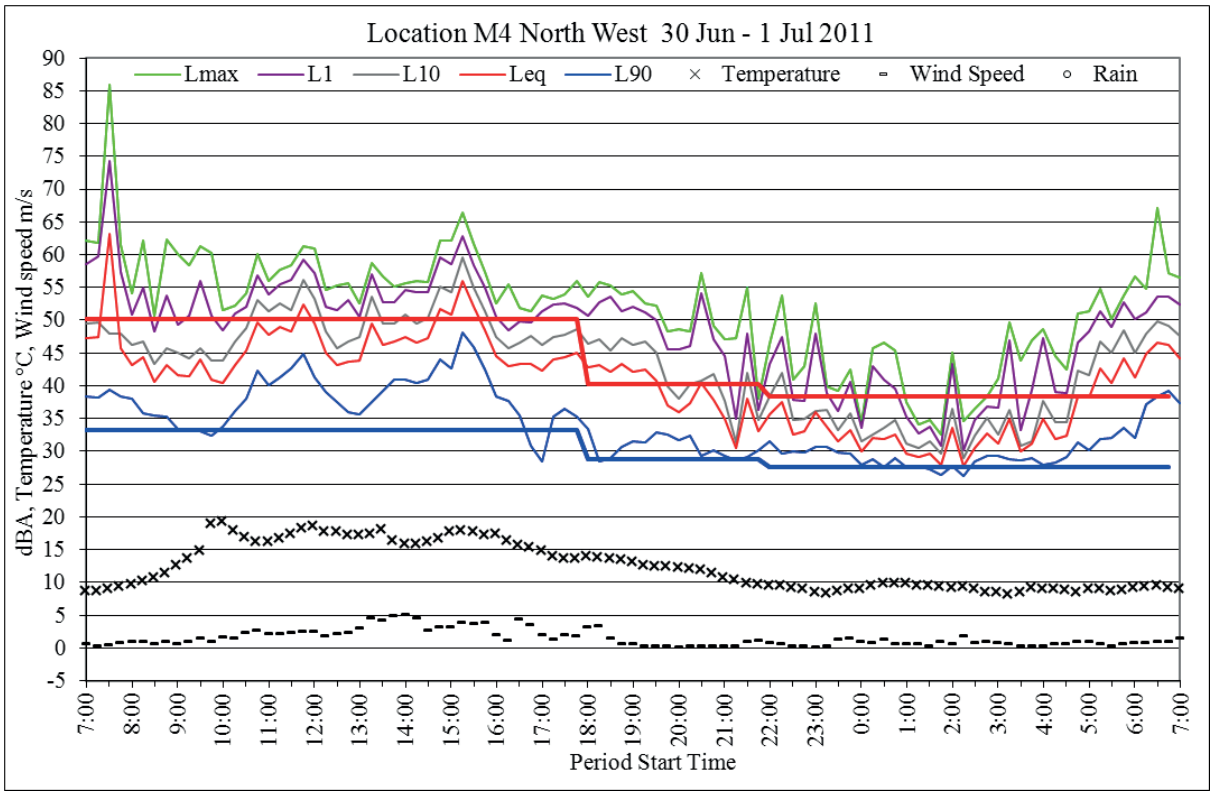

Location M4 North West 25 Jun - 26 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

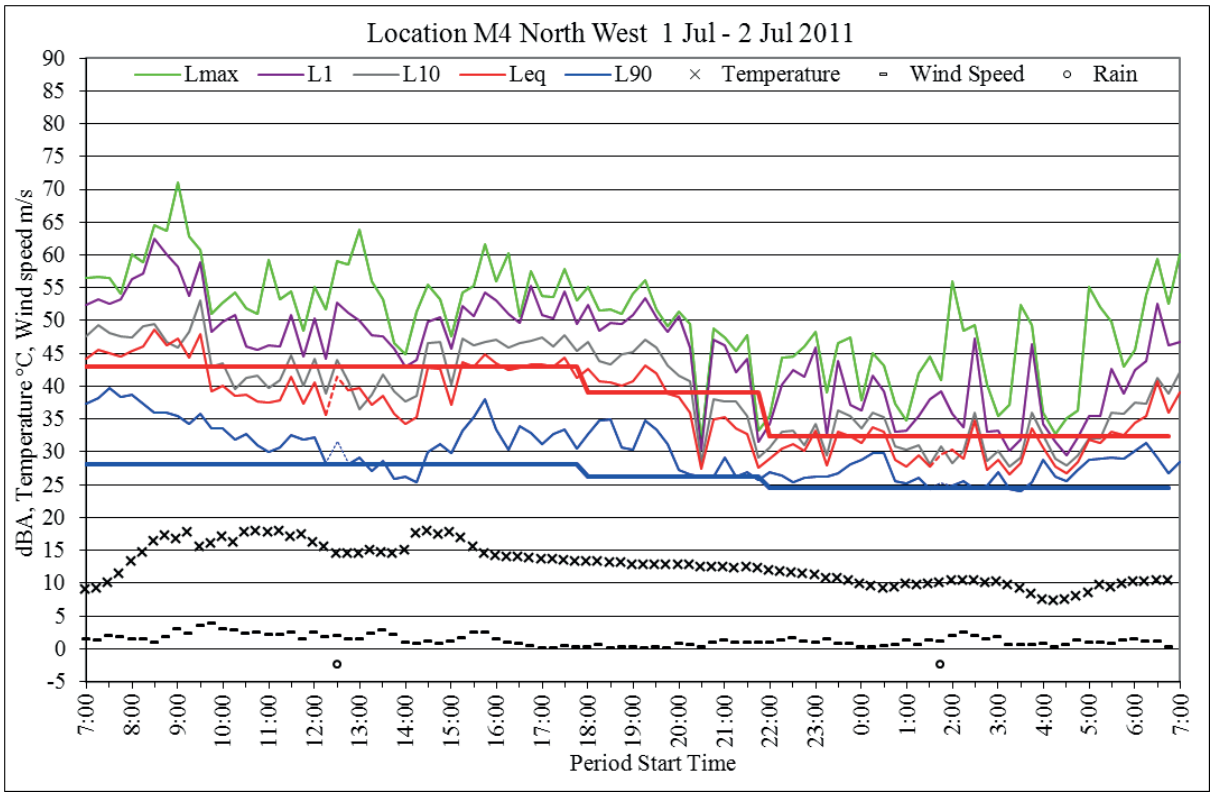

Location M4 North West 26 Jun - 27 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

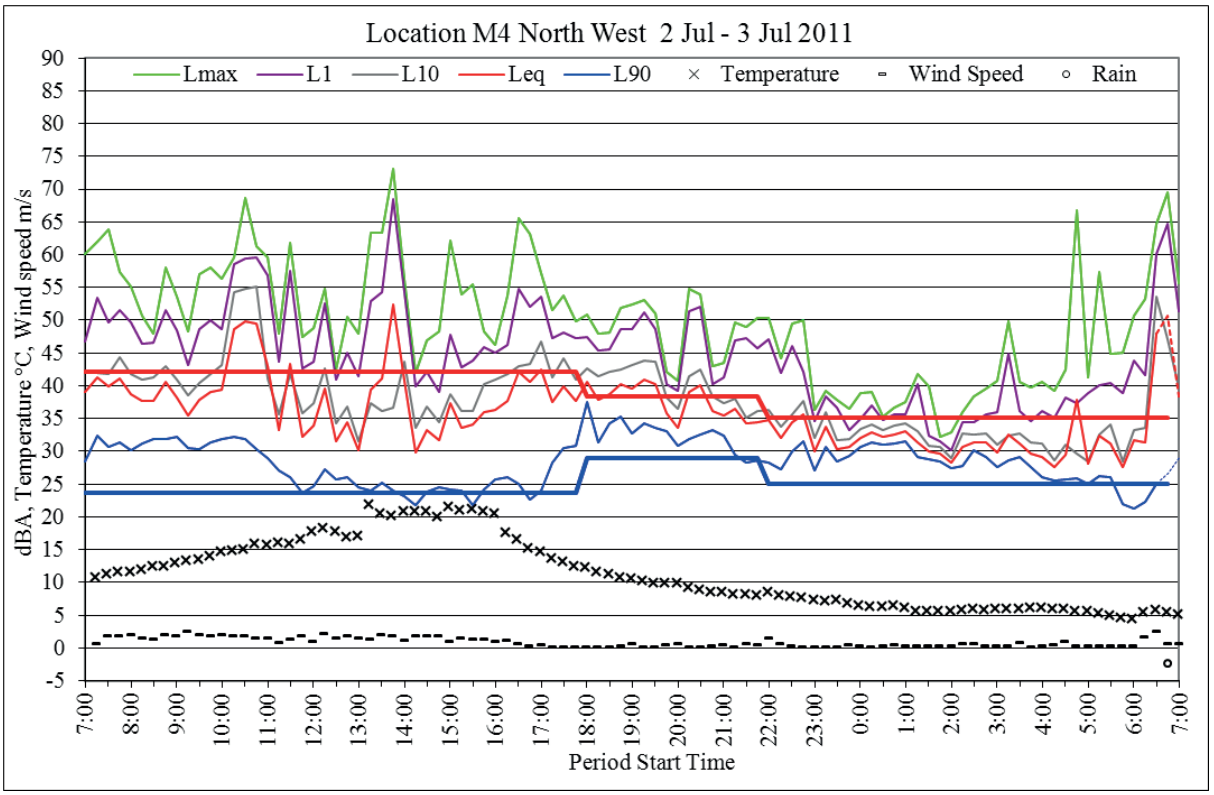

Location M4 North West 27 Jun - 28 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

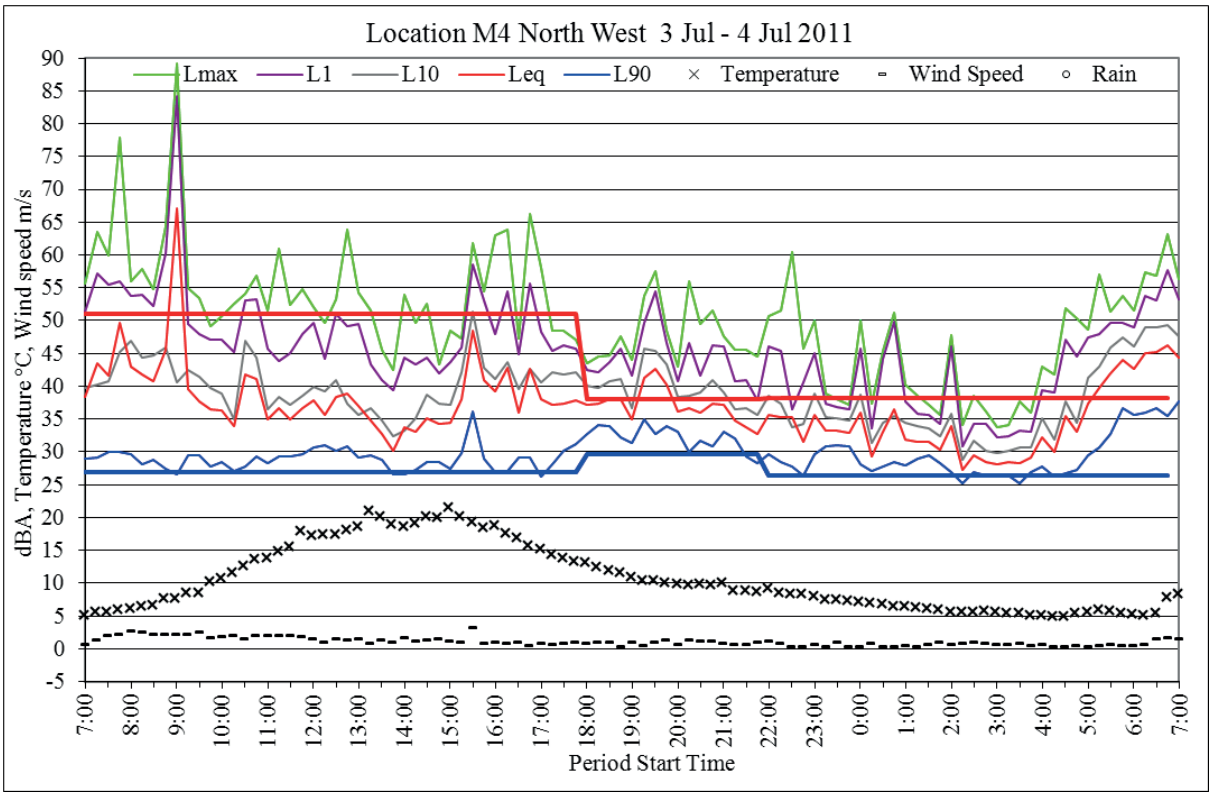

Location M4 North West 28 Jun - 29 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

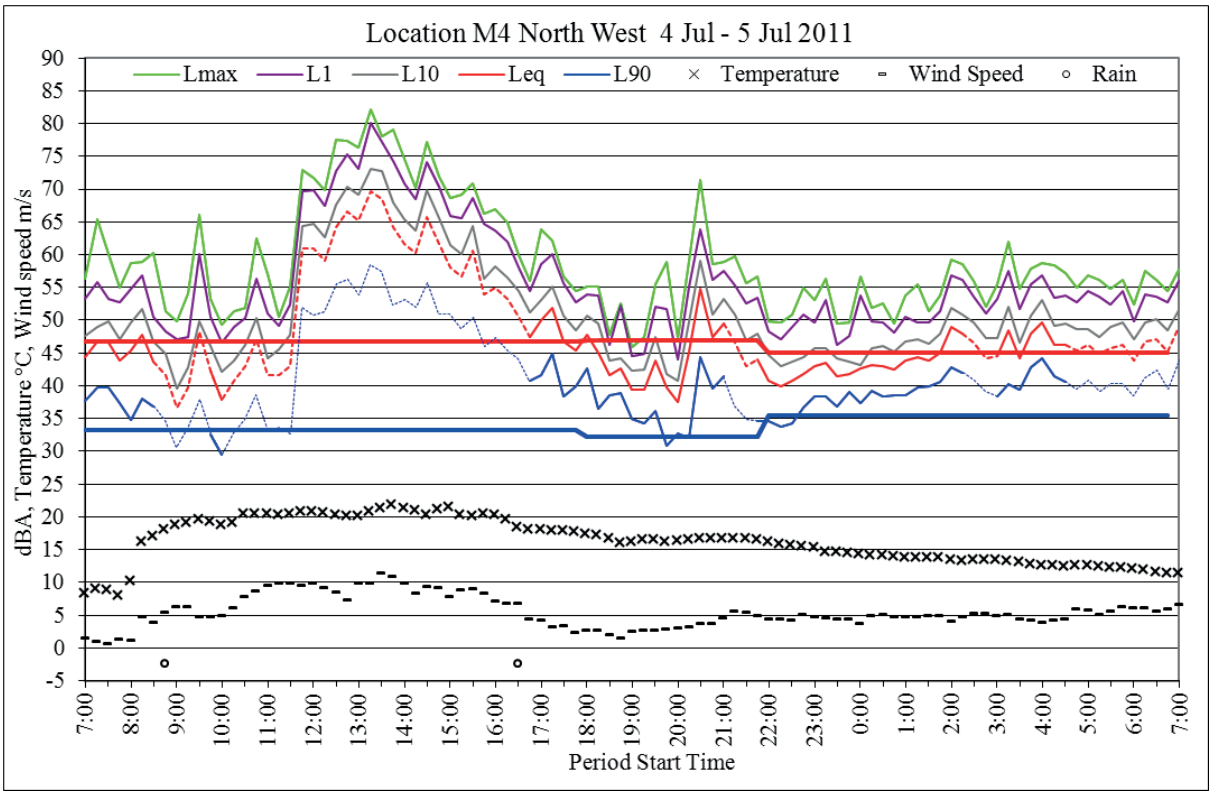

Location M4 North West 29 Jun - 30 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time


Location M4 North West 30 Jun - 1 Jul 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time


Location M4 North West 1 Jul - 2 Jul 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time


Location M4 North West 2 Jul - 3 Jul 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time


Location M4 North West 3 Jul - 4 Jul 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time


Location M4 North West 4 Jul - 5 Jul 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
-5
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
Period Start Time