DRAYTON SOUTH

Acoustics Impact Assessment

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ANGLO AMERICAN METALLURGICAL COAL PTY LTD

ACOUSTICS IMPACT ASSESSMENT

DRAYTON SOUTH COAL PROJECT
ENVIRONMENTAL ASSESSMENT

REPORT J0130-47-R1
16 JULY 2012

Prepared for:
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BRIDGES Acoustics

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EXECUTIVE SUMMARY

Bridges Acoustics was commissioned by Hansen Bailey Environmental Consultants on behalf of Anglo American Metallurgical Coal Pty Ltd (Anglo American) to complete an acoustics impact assessment for the Drayton South Coal Project (the Project). The purpose of this assessment is to form part of an Environmental Assessment being prepared by Hansen Bailey to support an application for a Project Approval under Part 3A of the *Environmental Planning and Assessment Act 1979* to facilitate the development of an open cut and highwall coal mining operation and associated infrastructure.

Predicted noise levels for the Project were modelled at sensitive receivers for indicative worst case scenarios for Year 3A, 3B, 5, 10, 15, 20 and 27. Assessments were undertaken for both prevailing and neutral 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. An analysis was undertaken to investigate various noise management measures to be applied to the Project which showed that those measures proposed in this Environmental Assessment are feasible and reasonable.

For the purpose of the assessment the receivers surrounding the Drayton Complex were divided into two groups being the Drayton Mine receivers (located to the north) and the Drayton South area receivers (located to the south).

No receivers are predicted to experience significant noise levels of 5 dBA above the intrusive criteria as a result of the Project. Further to this there are no exceedances of the intrusive criteria for any Drayton South area receivers.

If the predicted operational noise level exceeds the intrusive criteria by 2 to 5 dBA, the receiver is deemed to experience moderate noise impacts. There are seven Drayton Mine receivers (390, 398, 401, 402, 403, 411 and 418) that will experience moderate noise impacts at residences. There are a further four Drayton Mine receivers (382, 419, 420 and 421) that will be subject to moderate noise impacts over an area greater than 25% of the property, however, lessor impacts are anticipated at residences.

A receiver is deemed to experience a mild noise impact if the intrusive criteria are exceeded by less than 2 dBA. There are nine Drayton Mine receivers (399, 400, 419, 420, 421, 423, 424 and 425) that will experience mild noise impacts at residences and one receiver (386) that will experience mild noise impacts over an area greater than 25% of the property. Five of these receivers (399, 400, 423, 424 and 425) will also be subject to moderate noise impacts over an area greater than 25% of the property.

Predicted noise levels will generally be slightly lower than the predicted noise levels reported in the Drayton Mine Extension Environmental Assessment for Drayton Mine receivers, as additional noise control measures have been proposed since the 2007 Environmental Assessment was prepared and subsequently included in the noise modelling for the Project.

The predicted construction noise levels will not exceed the day time intrusive criteria adopted for Drayton Mine receivers. However, it will exceed the night time criteria in the absence of noise mitigation measures and impact on a number of Drayton Mine receivers. This exceedance is primarily associated with upgrades to the Coal Handling and Preparation Plant. As such the existing Drayton Mine noise management plan will be revised to incorporate construction noise criteria and controls during the Coal Handling and Preparation Plant upgrade activities to ensure the relevant criteria is not exceeded.

Similarly, the predicted construction noise levels will not exceed the day time intrusive criteria adopted for Drayton South area receivers with exception to residences at receivers 240 and 250. Intermittent exceedances of the criteria at receivers 240 and 250 are predominantly associated with the construction of the Edderton Road realignment. Construction noise levels of 35 to 38 dBA will be experienced by these receivers during an approximately three month period. Construction noise associated with the Edderton Road realignment is not likely to be unacceptable as this work will only be undertaken during the day. This noise will be masked to a certain extent by traffic noise on the Golden Highway and the existing Edderton Road.

Anglo American will revise the existing Drayton Mine noise management plan for the Project. Ongoing monitoring will also be undertaken to confirm the predicted noise levels of the assessment. This will include the establishment of real time noise monitoring at representative receiver areas surrounding the Drayton Complex 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 for coal recovery.

The assessment found that 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 structures with the exception of receiver 226 where it is predicted that the relevant criteria would be exceeded if the Maximum Instantaneous Charge is above 500 kilograms.

Anglo American will update the existing blasting management plan to include appropriate management and mitigation measures to ensure that the 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

Bridges Acoustics was commissioned by Hansen Bailey Environmental Consultants (Hansen Bailey) on behalf of Anglo American Metallurgical Coal Pty Ltd (Anglo American) to complete an acoustics impact assessment for the Drayton South Coal Project (the Project). The purpose of this assessment is to form part of an Environmental Assessment (EA) being prepared by Hansen Bailey to support an application for a Project Approval under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to facilitate the development of an open cut and highwall coal mining operation and associated infrastructure.

Part 3A of the EP&A Act was repealed in October 2011. However the Project has been granted the benefit of transitional provisions and, as such, is a development to which Part 3A applies.

The assessment includes the following components:

- Complete a desktop review of available noise monitoring data and previous environmental assessments;
- Complete both long term and short term environmental noise surveys at representative receiver locations;
- Assess prevailing weather conditions that may affect noise propagation to receivers in the vicinity of the Project;
- Establish a software-based noise model of the Project to predict received noise levels during representative operating years;
- Assess environmental noise levels associated with proposed construction work to potentially affected receivers;
- Assess noise from road and rail traffic associated with the Project;
- Assess blasting noise and vibration levels and the potential for sleep disturbance to nearest receivers;
- Develop and recommend feasible and reasonable noise and vibration mitigation and management measures where appropriate, and assess the effectiveness of recommended measures;
- Identify receivers that may remain affected by noise or vibration from the Project after all feasible and reasonable measures have been implemented, and the magnitude and extent of any remaining impacts.

1.1 Project Description

Drayton Mine is managed by Anglo Coal (Drayton Management) Pty Ltd, which is owned by Anglo American. Drayton Mine commenced production in 1983 and currently holds Project Approval 06_0202 (dated 1 February 2008) which expires in 2017, at which time the operation would have to close.

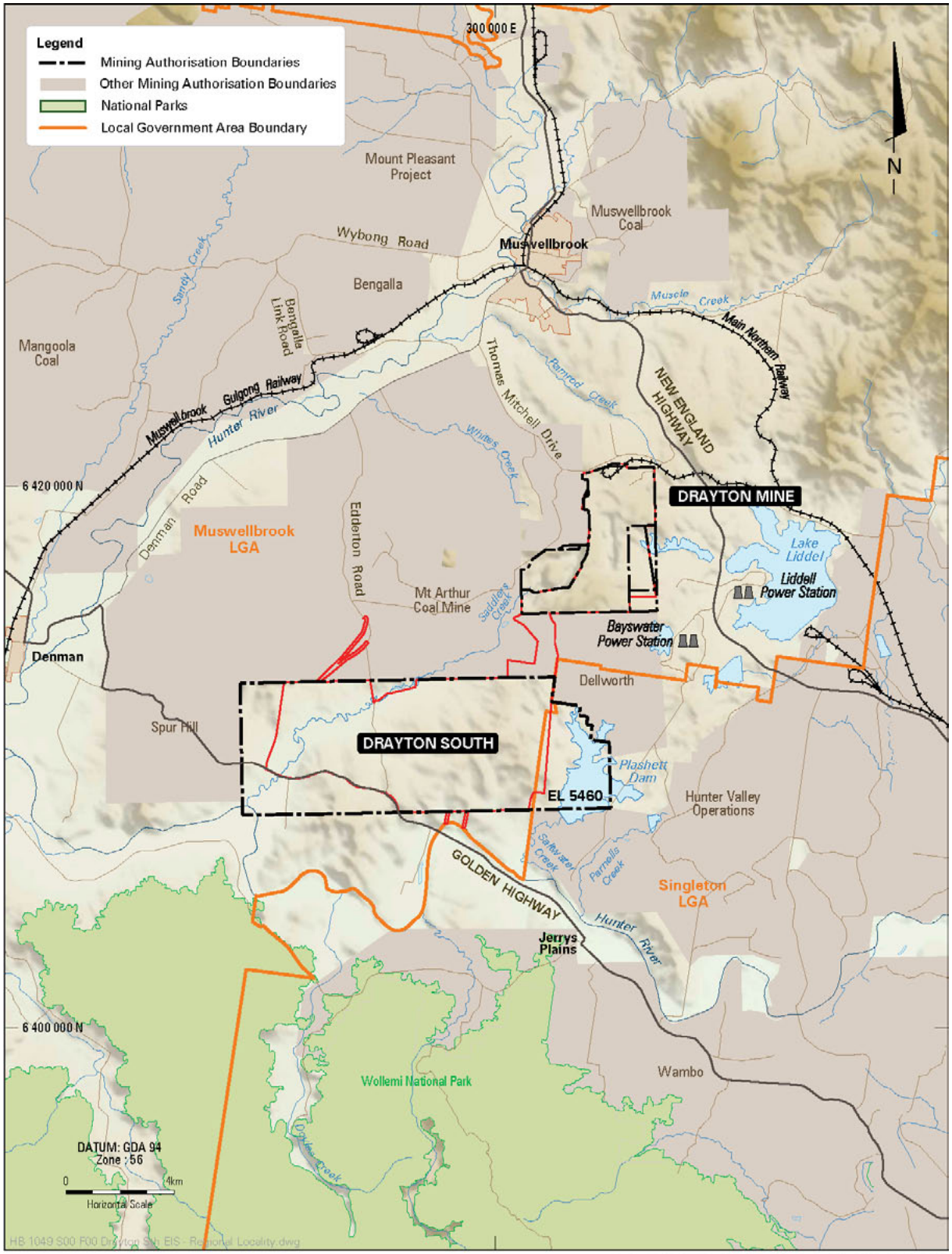
Anglo American is seeking Project Approval under Part 3A of the EP&A Act to facilitate the extraction of coal by both open cut and highwall mining methods within Exploration Licence (EL) 5460, known as the Drayton South mining area. The Project, if approved, would extend the life of Drayton Mine by a further 27 years ensuring the continuity of employment for its workforce, the ongoing utilisation of its infrastructure and the orderly rehabilitation of Drayton Mine's completed mining areas.

The Project is located approximately 10 km north west of the village of Jerrys Plains and approximately 13 km south of the township of Muswellbrook in the Upper Hunter Valley of NSW. The Project is predominately situated within the Muswellbrook Shire Local Government Area (LGA),

with the south-east portion falling within the Singleton Shire LGA. Two thoroughbred horse studs, two power stations, existing coal mines and a number of privately owned rural residential properties adjoin or are close to the Project.

A regional locality plan is shown in Figure 1 while the conceptual mine layout is shown in Figure 2.

Figure 1: Regional Locality Plan.



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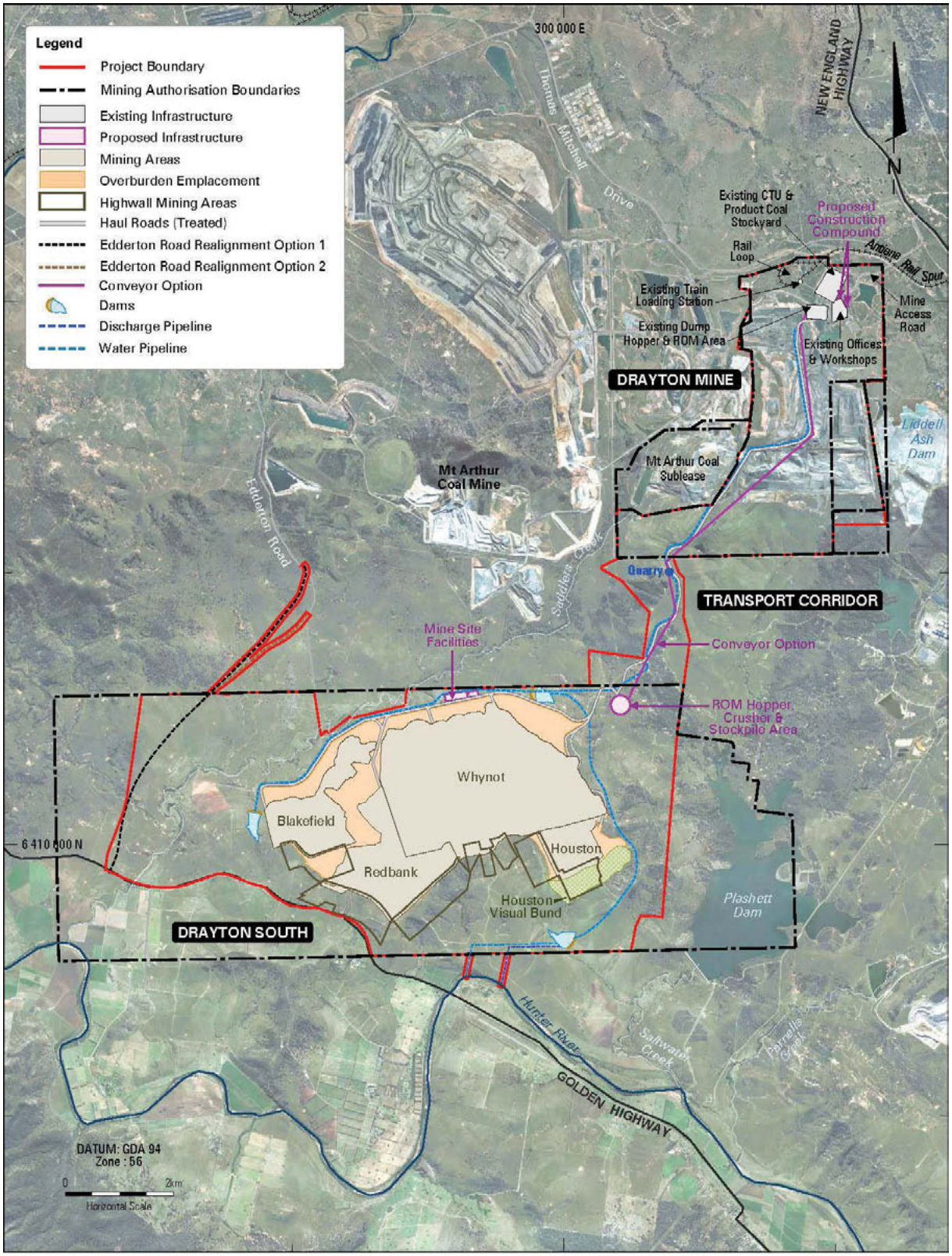
Regional Locality Plan

Figure 2: Conceptual Project Layout Plan.



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Conceptual Project Layout

The Project generally comprises:

- The continuation of operations at Drayton Mine as presently approved with minor additional mining areas within the East, North and South Pits;
- Development of an open cut and highwall mining operation extracting up to 7 Mtpa of Run of Mine (ROM) coal over a period of 27 years;
- Utilisation of the existing Drayton Mine workforce and equipment fleet (with an addition of a highwall miner and coal haulage fleet). The Drayton Mine fleet consists of a dragline, excavators, fleet of haul trucks, dozers, graders, water carts and associated supporting equipment;
- Use of Drayton Mine's existing voids for rejects and tailings disposal and water storage to allow for the optimisation of the Drayton Mine final landform;
- Utilisation of the existing Drayton Mine infrastructure including the Coal Handling and Preparation Plant (CHPP), rail loop and associated loadout infrastructure, workshops, bath houses and administration offices;
- Construction of a transport corridor between Drayton South and Drayton Mine;
- Utilisation of the Antiene Rail Spur off the Main Northern Railway to transport product coal to the Port of Newcastle for export;
- Realignment of a section of Edderton Road to avoid the Drayton South mining area; and
- Installation of water management and power reticulation infrastructure at Drayton South.

The existing Drayton Mine and Drayton South would operate concurrently, for a period of a few years, until accessible coal resources at Drayton Mine are exhausted. Simultaneous operation of Drayton Mine and Drayton South is considered in Year 3 in this assessment.

1.2 Receivers

The Project includes two main operational areas:

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

1.2.1 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 Macquarie Generation's Bayswater Power Station, while the remainder of the southern boundary adjoins 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.

1.2.2 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 Hunter Valley Energy Coal (HVEC) that would be required for the realignment of Edderton Road. Land adjoining the eastern boundary is owned by Macquarie Generation 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 the Arrowfield Estate Winery. Rural land adjoins the western boundary with much of this land owned by members of

the Wolfgang family. The northern boundary adjoins Hunter Valley Energy Coal's Mt Arthur Coal Mine and 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.

1.3 Related Studies

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

- The EA air quality and greenhouse gas assessment;
- The EA equine health impact assessment;
- The EA non-Aboriginal heritage impact assessment; and
- The EA 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 receiver 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;
- *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects* (Interim Rail Noise Guideline) (DECC, 2007) provides criteria and methods to assess noise from train movements on publicly owned rail lines;
- *Draft Rail Infrastructure Noise Guideline* (Draft RING) (Office of Environment & Heritage (OEH), 2012) provides criteria and methods to assess noise from train movements on publicly owned rail lines. While this document is only a draft for public comment, it is anticipated the final version issued in the future would be similar to the current draft;
- 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 Director-General's Requirements

The Acoustic Impact Assessment was guided by the Director-General's Requirements (DGRs) which including the following acoustic-related requirements. Relevant sections of this report that address each of the DGRs are listed with each requirement:

- A quantitative assessment of the potential:
  - Construction (section 6), operational (section 5) and transport (sections 7 and 8) noise impacts;
  - Offsite noise impacts (as above); and
  - Blasting impacts on people (section 10), livestock (excluded) and property (section 10).

The potential effects of blasting on livestock have been considered in the EA equine health impact assessment.

3 EXISTING ENVIRONMENT

The Project site covers a large area which results in different acoustic environments in various receiver 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 receiver areas near this site do not currently receive noise from the existing Drayton Mine. Receivers in Antiene near the existing Drayton Mine are therefore considered separately from other receivers.

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 Mining Complex Open Cut Expansion Project Environmental Assessment* (Mt Arthur Coal Mine EA) (Hansen Bailey, 2009) included an assessment of background noise levels at potentially affected receiver locations around Mt Arthur Coal Mine. The *Mt Arthur Coal Consolidation Project Noise and Blasting Impact Assessment* (Mt Arthur Coal Mine NIA) (Wilkinson Murray, 2009) which was attached as Appendix G to the Mt Arthur Coal Mine EA, reviewed previous noise monitoring results from 1999 to 2008 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 Extension Project Environmental Assessment* (Drayton EA) (Hansen Bailey, 2007) included an assessment of background noise levels at representative receiver 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 receiver 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 Receivers, LA90,15min.

Receiver Area	Receiver Group	Receiver 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 Receiver Group A, while remaining properties in central and eastern Antiene are combined into Receiver 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 receiver 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 10 to 20 June 2011, however significant adverse weather occurred during

this period and all data were considered weather affected and were discarded. The survey was repeated during the period 23 June to 5 July 2011 when more acceptable weather conditions were encountered.

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 1/6	38.5	35.8	34.9	51.7	48.7	46.0
Fri 1 – Sat 2/6	37.2	34.6	32.6	49.7	47.5	41.8
Sat 2 – Sun 3/6	37.4	37.2	35.2	49.4	45.6	42.6
Sun 3 – Mon 4/6	37.9	38.1	34.6	51.2	49.0	45.2
Mon 4 – Tue 5/6	(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 1/6	35.1	35.0	35.0	47.4	46.8	45.9
Fri 1 – Sat 2/6	35.2	33.1	30.7	49.7	45.9	39.6
Sat 2 – Sun 3/6	33.1	34.6	32.8	47.5	45.2	39.1
Sun 3 – Mon 4/6	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 1/6	29.5	25.8	25.3	47.5	38.9	40.6
Fri 1 – Sat 2/6	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 1/6	33.2	28.8	27.6	50.1	40.2	38.4
Fri 1 – Sat 2/6	28.1	26.3	24.6	43.0	39.1	32.4
Sat 2 – Sun 3/6	23.7	29.0	25.1	42.2	38.3	35.2
Sun 3 – Mon 4/6	26.9	29.7	26.4	51.1	37.9	38.1
Mon 4 – Tue 5/6	(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 Macquarie Generation'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 receiver locations M1 and M2 exposed to a greater length of highway which is 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 receiver 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.

Receiver Area	Rating Background Level, LA90,15min		
	Day	Evening	Night
Receiver Group C M1 – Jerrys Plains and surrounds M2 – Coolmore Stud	35	33	33
Receiver 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 in the area include:

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

Macquarie Generation 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 level 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

Macquarie Generation's Bayswater and Liddell Power Stations are approximately 7 and 6 km from nearest Antiene receivers and approximately 11 km and 15 km from receivers near Drayton South. Noise from the power stations may occasionally be audible at closest Antiene receivers 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 receiver 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 receivers 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 current Project Approval 09_0062 for Mt Arthur Coal Mine Consolidation Project dated 24 September 2010 specifies noise limits for various receiver 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

1 Reference to the Residential Assessment Zones plan in Appendix 5 of the 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 receiver 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 Receiver Group B in Antiene, which includes central Antiene receivers partly shielded from Mt Arthur Coal Mine noise and east Antiene receivers 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 receivers.

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 two sets of noise criteria for residential receivers. Intrusive criteria 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 criteria can be adjusted by one or more 'modifying factors' such as tonality or impulsiveness described in Section 4 of the INP, or alternatively the source noise levels can be adjusted to consider any modifying factors applicable to those sources. Any relevant adjustments have been applied to source noise levels in this assessment.

Amenity limits recommended in the INP depend on existing industrial noise levels and the nature of the receiver area and are designed to control the total or cumulative level of industrial noise at a sensitive receiver 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 receivers have conservatively been assigned the 'rural' amenity category although it could be argued that some Antiene receivers 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 and amenity criteria adopted for this assessment, and the method used to determine these criteria for the four receiver groups, for assessing noise from the Project alone.

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

	Noise Criteria Day/Evening/Night[1]			
Receiver 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 criteria 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

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

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

4.3 Cumulative Noise Levels

The INP recommends two sets of criteria, including the intrusive criteria which would apply to the Project operating alone and the amenity criteria which are intended to control the total noise level at a receiver location from all industrial or mining developments. Cumulative noise levels are therefore assessed to the amenity limits shown in Table 10:

- 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 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 are sourced from the INP and are therefore identical to mine operational criteria as shown in Table 10, although potential exceedances of the noise criteria for relatively short term construction activities are not expected to be as important as longer term operational noise impacts.

4.5 Sleep Disturbance

Sleep disturbance can be caused by a short, sharp sound that is noticeably louder than the typical or usual 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 should continue to be used in the absence of research to suggest an alternative. The INP Application Notes also point to the *Environmental Criteria for Road Traffic Noise* (EPA, 1999) (now superseded by the 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 11 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 11: Sleep Disturbance Criteria, Night, LA1,1min.

	Noise Criteria LA1,1min, 10pm to 7am			
Receiver 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 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 receivers. 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 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, while noise from the privately owned Antiene Rail Spur is assessed to the INP and is therefore excluded from this section.

Noise criteria are sourced from the Interim Rail Noise Guideline which recommends trigger levels of 65 LAeq,15hr during the day, 60 LAeq,9h during the night and 85 LAmax at any time. 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.

Table 1 in the Draft RING contains the same trigger levels as the Interim Rail Noise Guideline.

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. Any modifying factors that are relevant to the assessment, including low frequency penalties, have been applied to the adopted sound power levels for affected mining and transportation equipment and no separate assessment of low frequency noise levels is therefore required.

Relevant factors have been applied to the source sound power levels, rather than to received noise levels, to simplify the assessment of a large number of sources that do not require the same, or any, modifying factors.

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 recognises blast effects cannot always be controlled accurately and 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 airblast levels below 133 dBL. Windows are the building element currently regarded as most sensitive to airblast, 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 EA and in some cases observed during completion of the noise surveys. Table 12 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 12: 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 Macquarie Generation	2 mm/s
Macquarie Generation pipelines	To be confirmed by Macquarie Generation	10 mm/s
Bayswater Power Station	To be confirmed by Macquarie Generation	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 receiver locations or as contours over a receiver 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 automatically converted to ENM format terrain and source files using specially prepared software. All outputs were obtained using software equivalent to 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 specially prepared software based on ENM's intermediate calculation files used to produce the noise contours.

Noise contour figures are presented in Appendix B for the Project operating in conjunction with Drayton Mine in Year 3 and for the Project operating alone in subsequent years.

5.2 Initial Constraints Analysis

Initial noise modelling was completed to identify potentially affected receivers in the absence of noise mitigation and to identify appropriate noise control strategies. Additional modelling of alternative mine plans and equipment noise reduction strategies allowed the optimum strategies to be adopted, as assessed in this EA. The noise control strategy adopted in this EA is the result of two constraints iterations and an additional eight optimisation iterations involving combinations of the following strategies:

- No mining in exposed areas or areas too close to receiver properties;
- Restrictions on operating hours, such as daytime-only operation for specific activities and areas;
- Equipment noise control;
- Noise barriers such as walls and bunds; and
- Selection of equipment to minimise noise where possible.

Apart from a further reduction in mining areas, which would have the undesired effect of sterilising coal resources, the proposed mine plan has adopted all feasible and reasonable noise mitigation measures that are currently available.

5.3 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.

5.3.1 Gradient Winds

Weather data for the year 2005, which is the latest year for which high quality data are available from all local weather stations according to a review of available data described in the EA air quality and greenhouse gas assessment (Appendix F of the EA), were processed according to INP guidelines to determine prevailing weather conditions for this assessment. Data analysis was completed using the OEH's Noise Enhancement Wind Analysis (NEWA) program in each of 16 compass directions, with results shown in Tables 13 for Drayton Mine weather station data and Table 14 for Drayton South weather station data. Tabulated values in bold font highlight potentially noise enhancing winds that occur for 30% of the time or more in any season or time period.

Table 13: 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

Table 14: 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

Table 13 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 14 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. Modelled weather conditions for Drayton Mine and Drayton South have therefore been modelled using different sets of prevailing weather conditions to reflect topographic differences between the two areas.

5.3.2 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.

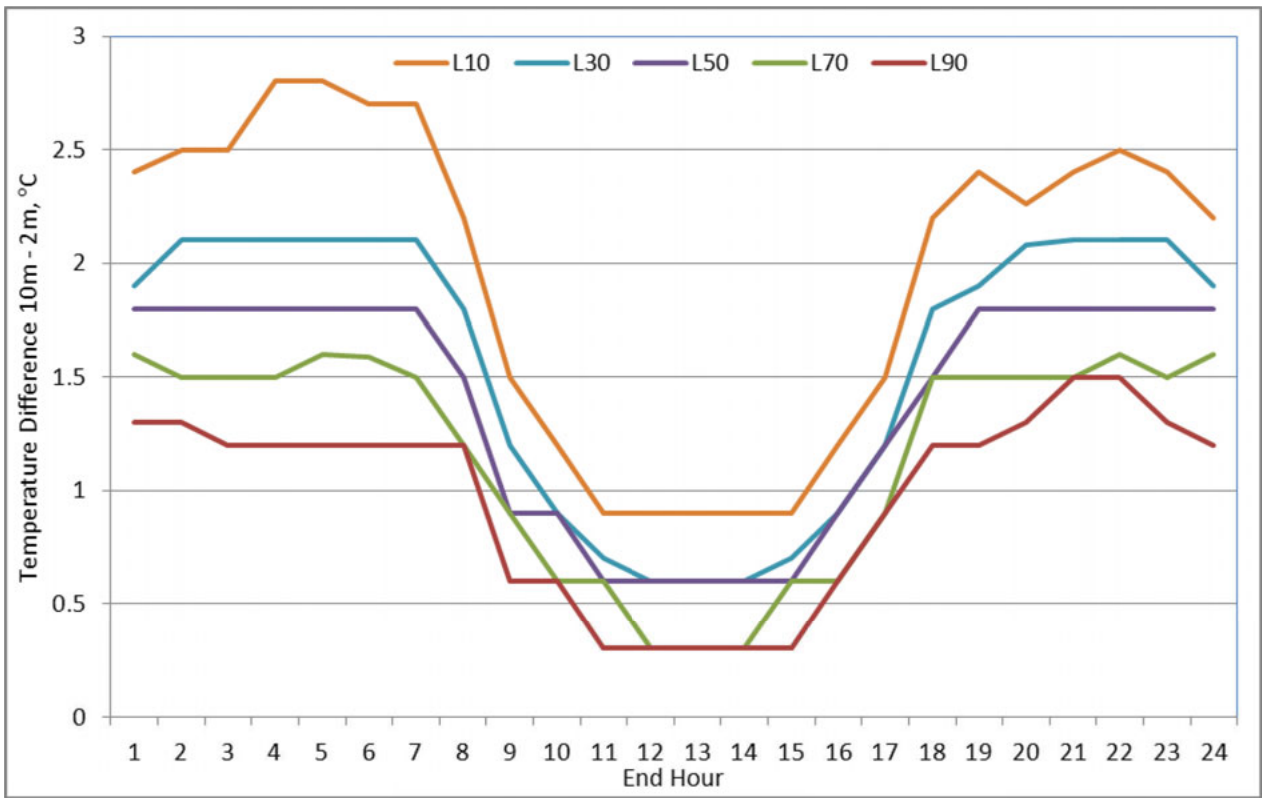
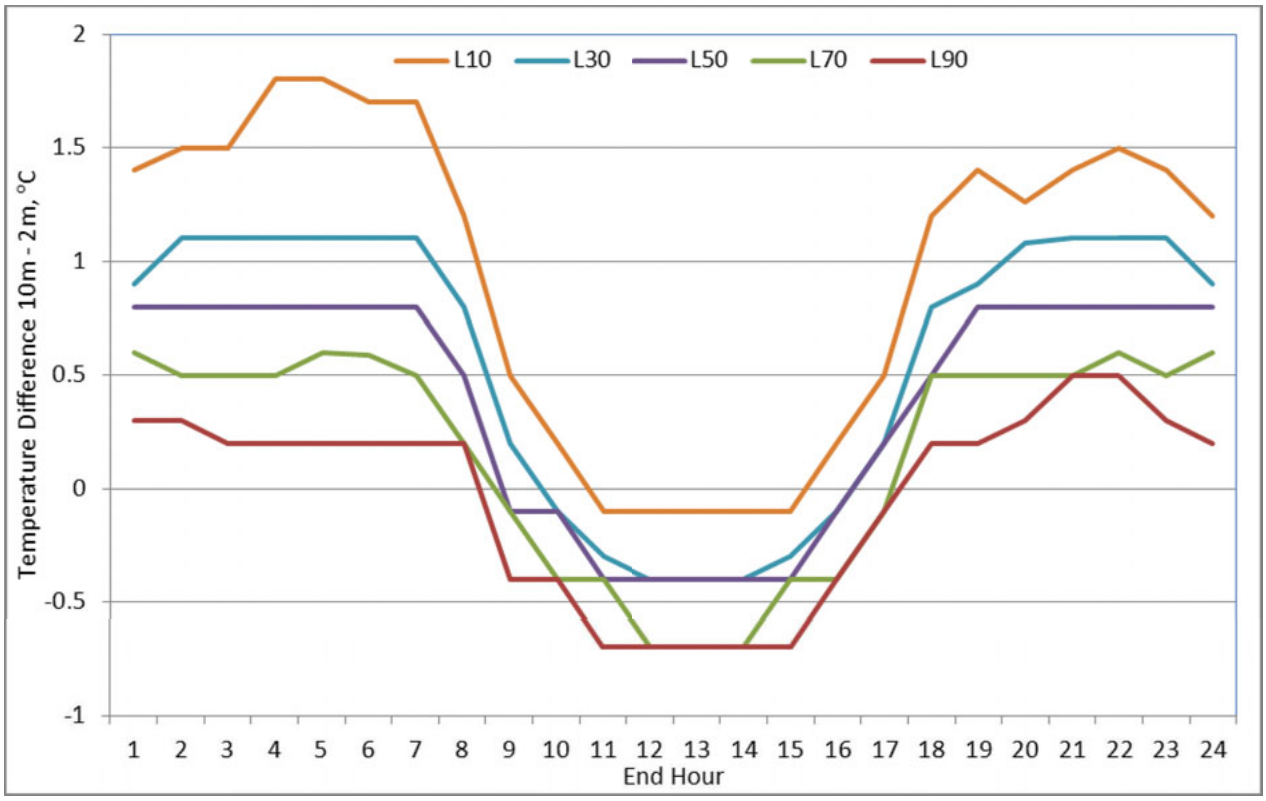


Figure 3 indicates a possible anomaly with the temperature data. The temperature difference between the 10m and 2m sensors at the Drayton South weather station is expected to be generally positive during the night, when cold dense air tends to settle below warmer air, and generally negative during the 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.

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



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 an average inversion strength. The INP default inversion strength of 3 °/100m, representing a reasonably strong but not a 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 5.3.4 below.

5.3.3 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 receiver breeze associated with a temperature inversion during the night. The INP default of a 2 m/s drainage flow from source to receiver, 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 Drayton South indicates disturbed areas associated with the Project are on the northern side of a general east-west ridgeline, with the exception of the Houston mining area in the south eastern corner of the site. Any drainage flows associated with a temperature inversion would therefore flow primarily from the south east towards Saddlers Creek, although drainage flows from the Houston mining area would flow generally from the north west towards the Hunter River.

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.

5.3.4 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 receivers 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 receivers 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.

5.3.5 Adopted Weather Conditions

Tables 15 and 16 show adopted atmospheric parameters used in this assessment for Drayton Mine and Drayton South. The adopted weather conditions represent prevailing conditions for receivers in all directions from the Project. The last row of each table shows the effective inversion strength for downwind receivers based on Equation 1 above.

Table 15: 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

Table 16: 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

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 16.

5.4 Proposed Noise Control Measures

Initial noise modelling with no mitigation measures in place indicated the need for a comprehensive set of noise control measures to minimise noise levels at closest privately owned receiver properties. Predicted noise levels in the absence of proposed control and mitigation measures are shown in Figures D1 and D2 in Appendix D for comparison purposes only. Figure D2 indicates received noise levels in the absence of the proposed mitigation measures would be clearly unacceptable from both socio-economic and environmental perspectives.

The following noise control and mitigation measures have been incorporated into the Project to reduce noise impacts on private receivers.

5.4.1 Engineering Controls for Mobile Equipment

- Excavators – All excavators would produce a sound power level of 115 dBA (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 of 115 dBA (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.
- Waste trucks, reject trucks and water carts – All large trucks/water carts would produce a sound power level of 113 dBA (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
  - gridbox attenuators (for electric drive trucks) or gearbox cover plates (for mechanical drive trucks).
- Coal trucks – Coal trucks would be on-road style machines hauling a 70 t rear tipping trailer. A sound power level of 113 dBA has been adopted for these machines based on:
  - best available exhaust silencers;
  - engine brakes would be quiet alternatives to, or quiet versions of, compression release brakes; and
  - truck and trailer tyres would have low noise tread patterns.
- Drills – The drills would produce a sound power level of 113 dBA (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 of 113 dBA (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 receiver.
- Graders – Graders would produce a sound power level of 111 dBA (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 of 107 dBA with the following control measures:
  - best available engine exhaust silencer; and
  - a flexible skirt around the brush and vacuum pickup.
- Highwall miner – The highwall miner would be electrically operated continuous miner-style machine and would produce a standard sound power level of 114 dBA with either reticulated power or an acoustically controlled container mounted diesel generator.

5.4.2 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 adopted 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 the required conveyor sound power level.

5.4.3 Noise Barriers and Acoustic Shielding

- Construct the Houston visual bund, as described in the EA, as soon as possible during establishment of the Houston mining area to reduce noise and visual impacts from subsequent Houston mining area operations;
- Initial excavation in the Houston mining area, and waste disposal to form the Houston visual bund, would occur during the daytime at the northern end of the mining area, with active mining progressing to the south to provide a face to shield mining equipment;
- Double benching would allow an excavator to work on a shielded bench below ground level and the trucks to operate at the bottom of the Houston mining area;
- Evening and night operation in the Houston mining area would commence when:
  - the mining area reaches a depth of 12 m and a 6 m bench is established for the excavator to work below ground during noise sensitive times; and
  - The bund reaches a height of at least 15 m and a lower bench is established on the northern side of the bund for use during noise sensitive times.
- Clearing, topsoil stripping/stockpiling and rehabilitation in exposed areas would occur 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.

5.5 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 receiver properties. Adopted noise control and management options are discussed in Section 4.4 and have resulted in:

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

Additional noise control options, beyond the recommended and proposed options listed in Section 5.4, 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 receiver 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 receiver to receiver. 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 receivers. 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 bucketwheel 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 receivers and is therefore not a 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 receivers 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 receivers, 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.

5.6 Operational Noise Sources

Mining operations would 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 receivers. Additional noise control measures would be fitted to trucks and other mobile equipment as described in Section 5.4, 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 receiver 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 assessment.

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 17 with sound power levels for each source in octave bands.

Table 17: Modelled Noise Sources and Sound Power Levels.

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		
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	2	118	118	112	113	112	106	104	100	97	122.7	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 tracks	1.5	108	105	108	118	120	122	120	116	96	126.8	126.0
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
H, Highwall miner	3	103	103	108	111	113	109	106	100	92	117.5	114.2
P, Pump	1	112	111	105	106	105	99	97	93	90	116.1	106.0
CHPP Sources												
ROM, ROM bin [2]	5	130	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 [2]	6	127	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 [2]	10	124	103	101	99	96	96	91	84	76	124.1	99.6
Cnl, CTU nth lower [2]	2	123	102	101	100	98	99	95	89	83	123.1	102.4
Cw, CTU west [2]	10	114	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.
2. Sound power levels for these sources include a 5 dB low frequency penalty in the 31.5 Hz band as recommended in the INP.

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.

5.7 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 3, 5, 10, 15, 20 and 27 under neutral and prevailing weather conditions.

Initial excavation of the Houston mining area in Year 3 would provide overburden material to begin construction of the Houston visual bund. In such circumstances it is unclear which of the following periods would represent the worst case situation for closest Drayton South receivers:

- Year 3A - Initial shallow excavation in the Houston mining area at the start of Year 3, with mobile equipment depositing overburden on the ground to begin forming the Houston visual bund. This period provides the most exposure for mining machines and haul trucks, however it places the overburden equipment on relatively low ground; or
- Year 3B - Deeper excavation in the Houston mining area and mobile equipment such as trucks operating on a partly constructed Houston visual bund at the end of Year 3. This period provides improved shielding for mining machines behind the bund, however it also places the overburden equipment in a higher and more exposed location on the bund.

Given some uncertainty regarding the worst case situation, this assessment considers both Year 3A and Year 3B which represent the start and end of Year 3.

Noise contour figures B1 to B20 show contours for day neutral and evening/night prevailing weather conditions in each assessed year, for Drayton Mine and Drayton South receivers, including the following noise sources:

- Mining equipment proposed for each operating year;
- Noise from the Drayton South mine infrastructure area;
- Either ROM coal transportation option:
  - Truck haulage to Drayton South ROM bin and overland conveyor to Drayton CHPP; or
  - Truck haulage 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;
- Train loading at the existing rail loadout facility and three locomotives idling on the loading loop; and
- For Figures B1 to B3 for Year 3, noise from operation of the Drayton Mine mining fleet has been added to Drayton South noise levels to determine the worst case situation at Drayton Mine receivers.

Noise contour Figures B21 and B22 show the outer envelope, or maximum noise level, for all assessed years for Drayton South receivers under day neutral and evening/night prevailing weather conditions to show the maximum extent of the noise contours for the life of the Project. Noise contour Figures B23 and B24 show predicted sleep disturbance levels, 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.

Figures B25 and B28 show noise levels from proposed construction activities to modify Drayton Mine infrastructure and construct Drayton South infrastructure, 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 and construction of Houston Dam, noise contour figures for the night period have been included.

Table 18 summarises predicted worst case noise levels from the combined Project and the existing Drayton Mine based on the detailed noise level tables presented in Appendix F. Shading in Table 18 indicates residences or properties that would be potentially affected by the Project. Residences and properties that are owned by a mining company or the Crown, or that are subject to a private agreement with Anglo American, have been excluded from the table.

Table 18: Summary of Predicted Noise Levels, Drayton Mine and Drayton South, LAeq,15min.

Residence				25% of Property Area				Criteria
Residence Ref	Day Neutral	Evening Prevail.	Night Prevail.	Property Ref	Day Neutral	Evening Prevail.	Night Prevail.	Day/ Evening/ Night
DRAYTON MINE RECEIVERS								
-	-	-	-	382	28.3	39.9	37.1	37/37/37
386	22.2	32.9	31.4	386	25.3	35.4	34.9	35/35/35
387[1]	25.0	35.8	34.4	387	25.2	36.0	35.0	37/37/37
399[1]	26.3	37.6	36.6	399	26.4	37.8	36.9	
390	28.2	39.9	38.3	390	29.0	40.6	38.8	37/37/37
398	27.7	39.4	38.2	398	28.1	39.8	38.8	37/37/37
400	25.7	36.3	36.3	400	26.0	36.9	36.7	35/35/35
401	26.2	36.7	37.2	401	26.4	36.9	37.4	35/35/35
402	27.7	38.8	38.5	402	27.7	38.9	38.5	35/35/35
403	28.0	38.8	38.6	403	28.3	38.8	38.7	35/35/35
411	30.8	34.2	40.1	411	31.0	34.9	40.0	37/37/37
418	30.1	33.5	39.3	418	30.1	33.8	39.4	37/37/37
419	29.2	32.1	37.9	419	30.5	33.6	39.4	37/37/37
420E[2]	28.9	31.8	37.4	420	29.7	33.5	39.4	37/37/37
420W[2]	29.2	32.6	38.3					
421	28.3	33.2	38.6	421	28.5	33.9	39.2	37/37/37
423	27.9	34.2	38.8	423	27.7	34.2	38.5	37/37/37
424	26.2	34.3	37.4	424	26.4	34.7	37.6	37/37/37
425	26.6	33.9	37.5	425	26.7	34.0	37.5	37/37/37
Contour Figure	B1	B2	B3	-	B1	B2	B3	-
DRAYTON SOUTH RECEIVERS								
Nil	-	-	-	Nil	-	-	-	-
Affected Residences/ Properties	0	0	0	Significant	0	0	0	-
	0	4	5	Moderate	0	5	8	-
	0	3	10	Mild	0	4	7	-

Red shading – a significant noise impact of more than 5 dBA above the intrusive criteria;
Blue shading – a moderate noise impact of 2 to 5 dBA above the intrusive criteria; and
Green shading – a mild noise impact of 2 dBA or less above the intrusive criteria.

1 Residences 387 and 399 are under common ownership.

2 Residences 420E and 420W are under common ownership on the same property.

All residences and properties are predicted to receive noise levels within the criteria during the day. When considering combined Year 3 noise from Drayton Mine and Drayton South, seven residences and an additional four properties are expected to receive moderate noise impacts less than 5 dBA above the intrusive criteria during the evening or night.

A further five residences and one additional property are expected to receive mild noise impacts of up to 2 dBA above the intrusive criteria. An additional four mildly affected residences are located on moderately affected properties.

Predicted noise levels in Table 18 are generally slightly lower than the predicted noise levels reported in the Drayton Mine Extension EA for Drayton Mine receivers, as additional noise control measures have been proposed since the Drayton EA was prepared. In particular, the stockyard conveyors have traditionally been one of the most dominant sources of noise to closest receivers due to their location at the northern end of the Drayton Mine CHPP and the technical difficulty in covering or enclosing these items. Anglo American's current proposal to replace the conveyor idlers with low noise units would achieve a reduction of approximately 5 dBA from the conveyors and an overall reduction of 0.5 to 1 dBA at receiver properties depending on their location and relative exposure to noise from the CHPP or the Drayton Mine North Pit.

For Drayton Mine receivers, the Project involves continuing use of the Drayton Mine CHPP and rail loadout system, albeit with a proposed reduction in noise from the stockyard due to installation of low noise idlers in open conveyors. The Project also involves a gradual transfer of mining activity from Drayton Mine to Drayton South as recoverable Drayton Mine coal is exhausted, which results in active mining areas moving significantly further from Drayton Mine receivers. 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 receivers, and predicted noise levels at those receivers shown in Table 18, are primarily due to existing Drayton Mine CHPP noise and remaining Drayton Mine coal mining activities that are approved to continue until 2017 or until Drayton Mine's recoverable coal resources are exhausted.

The Project would comply with the noise criteria at all privately owned Drayton South receivers during all time periods. Consultation with HVEC is recommended to resolve any issues associated with predicted noise levels over the noise criteria at Receiver 60 (Edderton Homestead).

Potential noise effects on livestock, including horses, have been assessed using the data in Table 18 as part of the Equine Health Impact Assessment which forms Appendix H of the EA.

5.8 Overland Conveyor or Haul Road Options

Predicted noise levels include the outer envelope, or maximum noise level, from both overland conveyor and haul road coal transport options within the transportation corridor. Further analysis indicated the overland conveyor option would contribute a slightly lower noise level at all Drayton Mine and Drayton South receivers, however the noise contribution from both options would be relatively insignificant compared to other Project related noise sources.

Specifically, the overland conveyor option would contribute less than 0.1 dBA to the total noise levels predicted at Drayton Mine and Drayton South receivers, while the haul road option would contribute 0.2 to 0.4 dBA at closest Drayton Mine receivers and less than 0.1 dBA at Drayton South receivers. All noise contour figures and predicted noise levels in Table 18 therefore include noise from the haul road option, while adoption of the overland conveyor option would not significantly reduce total noise levels.

5.9 Sleep Disturbance

5.9.1 Mining

Coal mining primarily involves a number of diesel powered machines operating to remove overburden and extract coal. Most machines, such as 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, however, can occur on the rail loop or on the Antiene Rail Spur if a train is required to stop or start, and a typical sound power level of 127 dBA has been adopted for train wagon bunching and train locomotives.

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 on the Project site or should occur rarely. 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 receiver areas. Train wagon bunching on the rail loop has been modelled at three representative points on the loop. Maximum noise level contours, generated from any one of these sources operating at any time rather than from all of these sources operating at the same instant, were then produced. Finally, calculated maximum noise levels were added to reasonable worst case LAeq operating noise levels under night prevailing weather conditions. Resulting contours are shown in Figures B23 and B24 in Appendix B, while additional noise contours showing maximum noise levels including wagon bunching on the Antiene Rail Spur are included in Figure B32.

5.9.2 Maximum Noise Levels – No Mitigation

Figure B23 in Appendix B shows maximum noise levels for Drayton Mine receivers from 45 LAmax to 55 LAmax for comparison with the sleep disturbance criteria. Maximum noise levels, assuming a worst case situation with the closest or loudest source occurring to each receiver, are predicted to reach:

- Significantly less than the sleep disturbance criterion at all Antiene receivers excluding potential maximum noise levels from train wagon bunching noise on the rail loop; and
- Maximum noise levels over the sleep disturbance criterion at closest Antiene receivers due to train wagon bunching:
  - Up to 57 LAmax at Residence 411;
  - Up to 55 LAmax at Residence 403;

- In the range 50 to 55 LAmax at fifteen other Antiene receivers; and
- In the range 45 to 50 LAmax at ten further Antiene receivers.

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.

5.10 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 OEH and the Department of Planning and Infrastructure (DP&I):

- Existing noise management plans should be updated following Project approval and reviewed every three years;
- Real time noise monitors should be deployed in representative receiver 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 annually. 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 therefore 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:

- Modifications to the Drayton Mine CHPP to install the proposed low noise idlers in open stockyard conveyors, install additional conveyors and transfer stations and upgrade the rail loadout system;
- Construction of the transport and services corridor including raw material quarrying and crushing, bulk earthworks, road grading and surfacing, power and communications services and an overland conveyor if the ROM coal conveyor option is adopted;

- 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 Houston Dam area.

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 19 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 19: Proposed Construction Works, Sources and Sound Power Levels.

Construction Works	Typical Construction Machines	Sound Power Level, LAeq	
		Per Machine Type	Total
Drayton Mine CHPP modifications	Excavator x1	112	117
	Truck x2	108	
	Concrete truck	108	
	Truck with a small bed-mounted crane	106	
	Small compressor	96	
	Impact wrench and other hand tools	112	
Transport corridor, haul road, overland conveyor option, 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.

Table 19 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.

6.3 Construction Noise Assessment

The construction activities listed in Table 19 may occur simultaneously, however they are located in various areas within the Project Boundary and are not expected to affect the same receiver 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 3 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, rather than the sum, of a series of five Drayton Mine CHPP construction sources distributed over work areas from the south eastern corner of the stockyard to the rail loadout facility. Each construction source has a sound power level of 117 dBA as calculated in Table 19;
- 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 19;
- 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 19;
- 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;
- 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 receiver;
- Sum the worst case construction noise levels and normal operation of Drayton Mine, as Drayton Mine would continue to operate during the construction period. While it is possible that significant CHPP equipment would need to be shut down to complete construction work in this area, any such shutdowns have not been included in the noise contours to represent the worst case.

Figure B25 in Appendix B contains reasonable worst case daytime noise contours for Drayton Mine receivers. The contours indicate acceptable noise levels from combined operation and construction activity are predicted at all Drayton Mine receivers during the day compared to the 35 LAeq,15min and 37 LAeq,15min operational noise criteria. Construction noise levels during the night as shown in Figure B26, in the absence of noise mitigation measures, would exceed the operational noise criteria at a significant number of Drayton Mine receivers. This result indicates the need for a construction noise management plan for all construction works completed outside standard working hours.

Figure B27 in Appendix B contains predicted noise level results for Drayton South receivers during the day. Construction noise levels have been assessed separate from operational noise to these receivers, as much of the construction program associated with Drayton South would be completed before the commencement of mining. The noise contours in Figure B27 indicate:

- A predicted noise level of up to 38 LAeq at closest Residences 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 receivers, 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 receivers; 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 Residence 60 owned by HVEC.

Predicted Edderton Road realignment construction noise levels are unlikely to be considered excessive by closest residents, as 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 B28 shows predicted construction noise levels at Drayton South receivers 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 receivers.

6.4 Construction Noise Control Recommendations

Predicted construction noise levels indicate the Edderton Road realignment works may cause noise levels marginally over the daytime noise criterion, while Drayton Mine CHPP upgrade works have the potential to exceed adopted operational noise criteria at a number of Drayton Mine receivers during the evening and night. Based on these results, the following noise management measures are recommended:

- 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; and
- A construction noise management plan would be required for the Drayton Mine CHPP upgrade works, including:
  - Noise criteria for each time period (day, evening and night);
  - Time restrictions for noisy activities such as heavy earthmoving, rock or concrete removal and concrete pouring;
  - Acknowledgement that quieter activities such as installation of mechanical and electrical equipment and excavation using small machines, would generally be suitable for completion during the evening and night; and
  - A construction noise monitoring plan, most likely covering evening and night work only, to identify any machines or activities that may exceed relevant noise criteria. The plan should include a communication protocol and response protocol to maximise the effectiveness of the noise surveys and minimise the potential for ongoing exceedances of the noise criteria. Existing real time noise monitoring equipment is expected to provide sufficient noise data during the construction period.

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

An average of 126 and peak of 369 construction staff would be required during the construction period, including up to 15 staff for the Edderton Road realignment works. All construction access to the Project would occur via Drayton Mine and the proposed transport corridor, with no construction access to the Project via the Golden Highway or Edderton Road except during emergencies and to access the Edderton Road realignment construction site. 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 progressively transferred from Drayton Mine to Drayton South. Drayton Mine currently has 410 full time employees and contractors while Drayton South would require an additional 55 staff due to the longer coal haulage route and highwall mining operations. All staff access would be via the existing Drayton Mine Access Road and the proposed transport corridor.

A worst case situation, from a traffic noise perspective, would include all of the additional 55 staff approaching the site from the same direction which would result in up to 55 additional car movements each way per day. No additional 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 20. 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 20.

The EA 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 20 indicate a predicted traffic noise increase of up to 0.1 dBA due to additional Project related traffic during the operational phase, and an increase of generally 0.1 dBA but up to 0.5 dBA at residences near Edderton Road during the construction period.

Table 20: 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 Receiver		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	12895	5769	2295	3594	2095	607
	Trucks	1424	1029	524	904	544	172
	Cars+Trucks	14319	6798	2819	4498	2639	779
	Noise dBA	66.4 dBA	61.2 dBA	35.5 dBA	49.1 dBA	60.2 dBA	37.1 dBA
Existing +Project Operation	Cars	12655	5750	2055	3575	2080	592
	Trucks	1400	1005	500	880	520	148
	Cars+Trucks	14055	6755	2555	4455	2600	740
	Noise dBA	66.4 dBA	61.1 dBA	35.2 dBA	49.1 dBA	60.0 dBA	36.6 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 receivers, 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 18.

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 B29 to B31 while potential sleep disturbance levels associated with wagon shunting are shown in Figure B32 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 EA 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 EA traffic report notes Drayton Mine is currently approved to produce up to 8 Mtpa of ROM coal, however a total of 5.4 Mt of ROM coal was produced by Drayton Mine in 2010.

The Main Northern Rail Line currently carries approximately 60 Mtpa of coal through Muswellbrook and delivers approximately 160 Mtpa of coal to the Port of Newcastle, according to the most recent data in the *2011-2020 Hunter Valley Corridor Capacity Strategy Consultation Document* (ARTC, 2011). A current production rate of 19 Mtpa of product coal from Mt Arthur Coal Mine and 4.77 Mtpa of product coal from Drayton Mine implies a total of 84 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 5.4 Mtpa of ROM coal and 4.77 Mtpa of product coal in 2010 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 the proposed maximum production rate of 5,232 Mtpa of product coal produced from 7 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 7 Mtpa of ROM coal from the Project should be compared to an anticipated approval for a production rate of 36 Mtpa of ROM coal from Mt Arthur Coal Mine. This comparison indicates the Project would contribute an average of approximately 16% 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 7 Mtpa and Project related trains representing up to 8% of train movements.

Notes in Appendix 2 of the Draft 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 Draft RING indicates the Project related noise increase to receivers 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 receiver 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;
- Macquarie Generation's Hunter River Pump Station;
- Bayswater and Liddell Power Stations to the east and north east; and
- Mt Arthur Coal Mine.

Noise from the existing Drayton Mine has been excluded from this part of the assessment, as future noise from Drayton Mine is assessed as part of the Project. Bengalla Mine to the north and Mangoola Mine to the north west are both located over 10 km from potentially affected receivers 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 E and Table 18, with a -3 dBA correction factor to determine LAeq,night noise levels. The highest predicted noise level in each receiver 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

Macquarie Generation 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 receivers.

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 receivers and approximately 11 km and 15 km from receivers near Drayton South. No evidence is available to indicate the power stations produce audible noise at closest Drayton Mine receivers, 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 receivers 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 receivers near the western side of Antiene. Drayton Mine receivers 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 receivers are located further from Mt Arthur Coal Mine and would also receive at least 2 dBA less than the western most receivers.

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

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 receivers near M4 and less than 25 LAeq,night has been adopted at all other Drayton South receivers.

9.6 Cumulative Industrial Noise Levels

Cumulative industrial noise levels during the night, from the Project and other industrial developments, are shown in Table 21. 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 receivers, 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 Receiver Group B in Antiene, which includes central Antiene receivers partly shielded from Mt Arthur Coal Mine noise and east Antiene receivers 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 receivers.

Table 21: 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	<37	<36	< 30	< 35	< 30	< 35
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	38	32	36	31	36

Table 21 indicates cumulative noise levels would exceed the conservative noise amenity criterion by a minor 1 dBA at the westernmost Group A receivers, specifically receivers 390 and 398, due primarily to a combination of the Project and Mt Arthur Coal Mine. A less conservative assessment, in the absence of simultaneous noise enhancement from both the Project and Mt Arthur Coal Mine, would result in a calculated noise level of up to 37 LAeq,night which is within the noise amenity criterion.

Predicted cumulative noise levels are therefore considered acceptable and no additional noise control measures are required.

10 BLAST OVERPRESSURE AND VIBRATION

Blasting would 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 receiver;
- How well the explosive charges are confined with stemming material;
- Maximum Instantaneous Charge (MIC) for the blast event;
- Topography between the blast site and receivers; 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 receivers, heritage structures, infrastructure such as roads and pipelines and livestock on adjoining rural properties.

10.1 Predicted Blast Effects

Table 22 shows calculated ground vibration and overpressure levels for closest blast events to each representative receiver location, taking into account topographical or other shielding between the blast site and the receiver where relevant. 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. Predicted levels over adopted criteria are highlighted in bold font.

Table 22: Predicted Blast Effects, No Mitigation.

MIC, kg	500	1000	1500	2000	500	1000	1500	2000	Criteria
Receiver (closest distance)	Ground Vibration, mm/s				Overpressure, dBL				mm/s, dBL
Bowfield Homestead, 1710m	1.1	1.9	2.7	3.4	107	110	112	113	10, 120
Plashett Homestead, 2700m	0.5	0.9	1.3	1.6	101	104	106	107	10, 120
Edderton Homestead, 1080m	2.3	4.0	5.6	7.0	113	116	118	119	10, 120
Strowan Homestead, 3550m	0.3	0.6	0.8	1.0	98	101	103	104	5, 115
Arrowfield Cottage, 3230m	0.4	0.7	1.0	1.2	99	102	104	105	5, 115
Woodlands Homestead, 5400m	0.2	0.3	0.4	0.5	93	96	97	99	5, 115
Randwick Homestead, 3130m	0.4	0.7	1.0	1.3	100	102	104	105	5, 115
Plashett Dam, 2270m	0.7	1.2	1.7	2.1	-	-	-	-	10, -
Hunter River Pump Stn, 4500m	0.2	0.4	0.6	0.7	-	-	-	-	2, -
Mac Gen pipeline, 3900m	0.3	0.5	0.7	0.9	-	-	-	-	10, -
Bayswater Power Stn, 6800m	0.1	0.2	0.3	0.4	-	-	-	-	2, -
226 Arrowfield, 690m [1]	4.7	**8.2**	**11**	**14**	114	**117**	**118**	**120**	5, 115
227 Coolmore Office, 1610m [1]	1.2	2.1	2.9	3.7	103	106	108	109	5, 115
Private Receiver 250, 2990m	0.5	0.8	1.1	1.4	100	103	105	106	5, 115

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

Results in Table 22 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 structures with the exception of 226 Arrowfield, where it is predicted that the relevant criteria would be exceeded if the MIC is above 500 kg.

Up to 20 blast events per month or 5 blasts per week would be required for the proposed production rate. As a reduction in blast size may be required in Project areas close to 226 Arrowfield, such as in the southern sections of the Redbank and Houston mining areas, up to 40 smaller blast events per month or 10 events per week may be required when mining in these areas.

10.2 Proposed Blast Management Measures

Initial calculations described above have indicated exceedances of relevant vibration and overpressure criteria may occur in the absence of mitigation measures. The following mitigation and management measures are recommended to control and minimise blast effects to any sensitive receiver:

- 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 other 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. Recommended vibration and overpressure limits for each building or structure would be included in the Blast Management Plan. Items or structures included in this recommendation include all homesteads with heritage significance and the Hunter River Pump Station;
- Consultation with Macquarie Generation is recommended in relation to potential blast effects on Bayswater and Liddell Power Stations;
- All blasts should be monitored, at receiver locations or alternative representative locations, to confirm acceptable blast impacts and to assist in predicting future blast effects as the blast sites approach sensitive receivers;
- Electronic detonators should be used where necessary to provide accurate timing and firing patterns to minimise the chance of excessive ground vibration;
- Blasts requiring a reduced MIC to meet vibration criteria could include one or more of the following options:
  - Lower density explosives;
  - Deck loading;
  - Reduced hole diameter;
  - Reduced blast area; or
  - Reduced blast bench height.
- Blasts requiring a reduced overpressure level to meet relevant criteria could include one or more of the following options:
  - Appropriate aggregate of sufficient depth could be used for stemming material to contain the blast energy;
  - Sufficient burden (distance between rows) could be designed to minimise the risk of face blowout;
  - Each blast could be oriented, where possible, to avoid facing towards the most sensitive receiver;
  - The hole pattern could be designed to fire the closest holes first, to minimise the risk of overpressure reinforcement;
  - Weather conditions, specifically wind speed and direction and cloud cover, should be monitored before each blast and any weather related effects should be considered when predicting overpressure levels and designing the blast pattern.
- 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 22 as part of the Equine Health Impact Assessment which forms Appendix H of the EA. Blast events designed and detonated according to an appropriate Blast Management Plan are expected to meet appropriate criteria at all sensitive receivers.

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 receiver to the quarry is Bayswater Power Station located approximately 4700 m to the east, followed by Edderton homestead located approximately 6550 m 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 a number of privately owned receivers near Drayton Mine are predicted to receive moderate or mild noise impacts, as shown in the shaded areas of Table 18. Worst case noise levels from the Project, during the initial years during the transition from Drayton Mine to Drayton South, would be similar to existing Drayton Mine noise levels as additional coal haulage noise would be approximately offset by additional noise control measures proposed for the CHPP. Noise levels from Drayton South alone would be lower than existing noise levels at Drayton Mine receivers, as mining equipment would be relocated from Drayton Mine and CHPP noise levels would be slightly lower than at present.

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 receivers. Periods of more audible noise may occur depending on weather conditions during the night, however such conditions are expected to occur rarely.

Construction noise levels are expected to be acceptable at all potentially affected residences during the day. Proposed construction activities during the night have the potential to exceed relevant operational noise criteria and a detailed Construction Noise Management Plan is recommended for all work outside normal construction hours.

Sleep disturbance from potential impact sources from the Project, such as dozer track slap and train wagon bunching, is unlikely to occur at any privately owned property compared to the recommended criterion. 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 receivers. This issue is currently the subject of discussion with the community and action by Anglo American to identify opportunities to reduce train noise. 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.

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, so low frequency noise impacts are unlikely to occur at any privately owned receiver. Cumulative noise levels, with simultaneous operation of the Project and other industrial developments in the region, have very little potential to exceed relevant criteria given the lack of simultaneous strongly noise enhancing weather conditions for all developments. Predicted

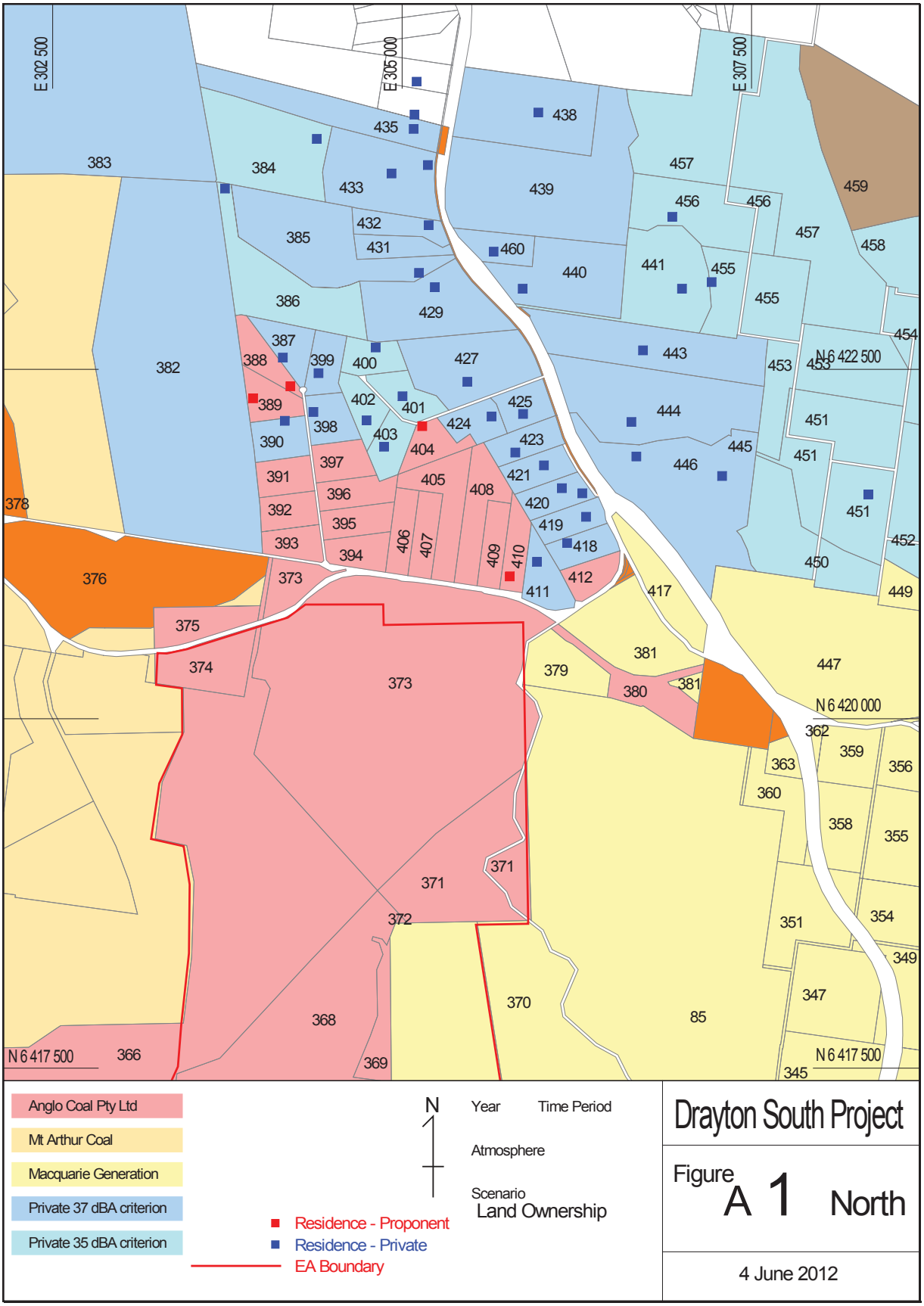
cumulative noise levels, assuming a theoretical worst case situation with strongly noise enhancing weather conditions from all industrial developments, would exceed relevant noise criteria by up to 1 dBA at two Drayton Mine receivers which is considered acceptable.

Blasting associated with the Project would require careful control of blast parameters, and management of blast times to avoid periods of unsuitable weather conditions, to produce acceptable blast effects at all sensitive receivers at all times. Control of blast parameters is primarily required for blast events in the southern sections of the Redbank and Houston Mining Areas close to the 226 Arrowfield property.

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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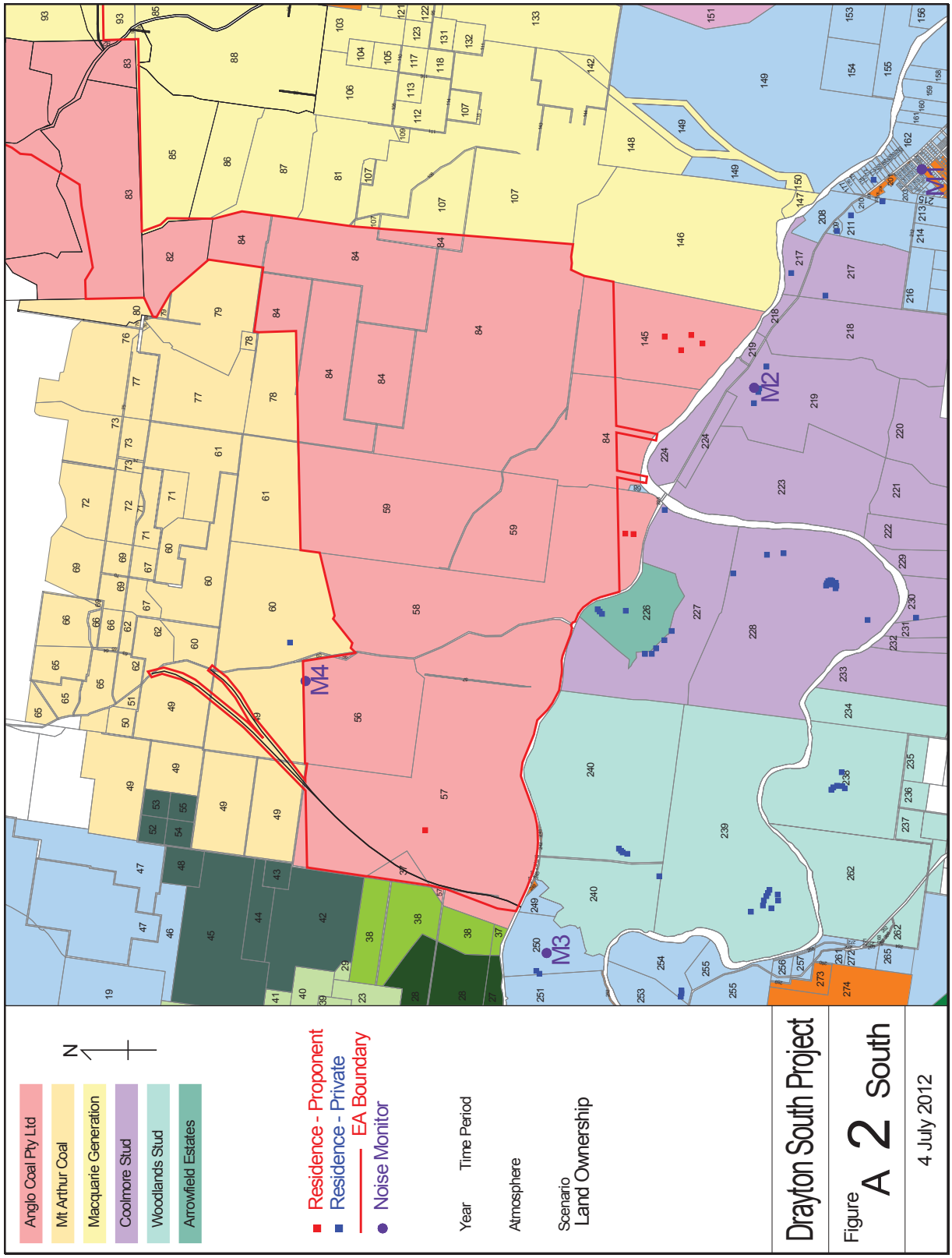
N 6 417 500
N 6 417 500
Anglo Coal Pty Ltd
Mt Arthur Coal
Macquarie Generation
Private 37 dBA criterion
Private 35 dBA criterion
Residence - Proponent
Residence - Private
EA Boundary
N
Year
Time Period
Atmosphere
Scenario
Land Ownership
Drayton South Project
Figure A 1 North
4 June 2012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Macquarie Generation
Coolmore Stud
Woodlands Stud
Arrowfield Estates
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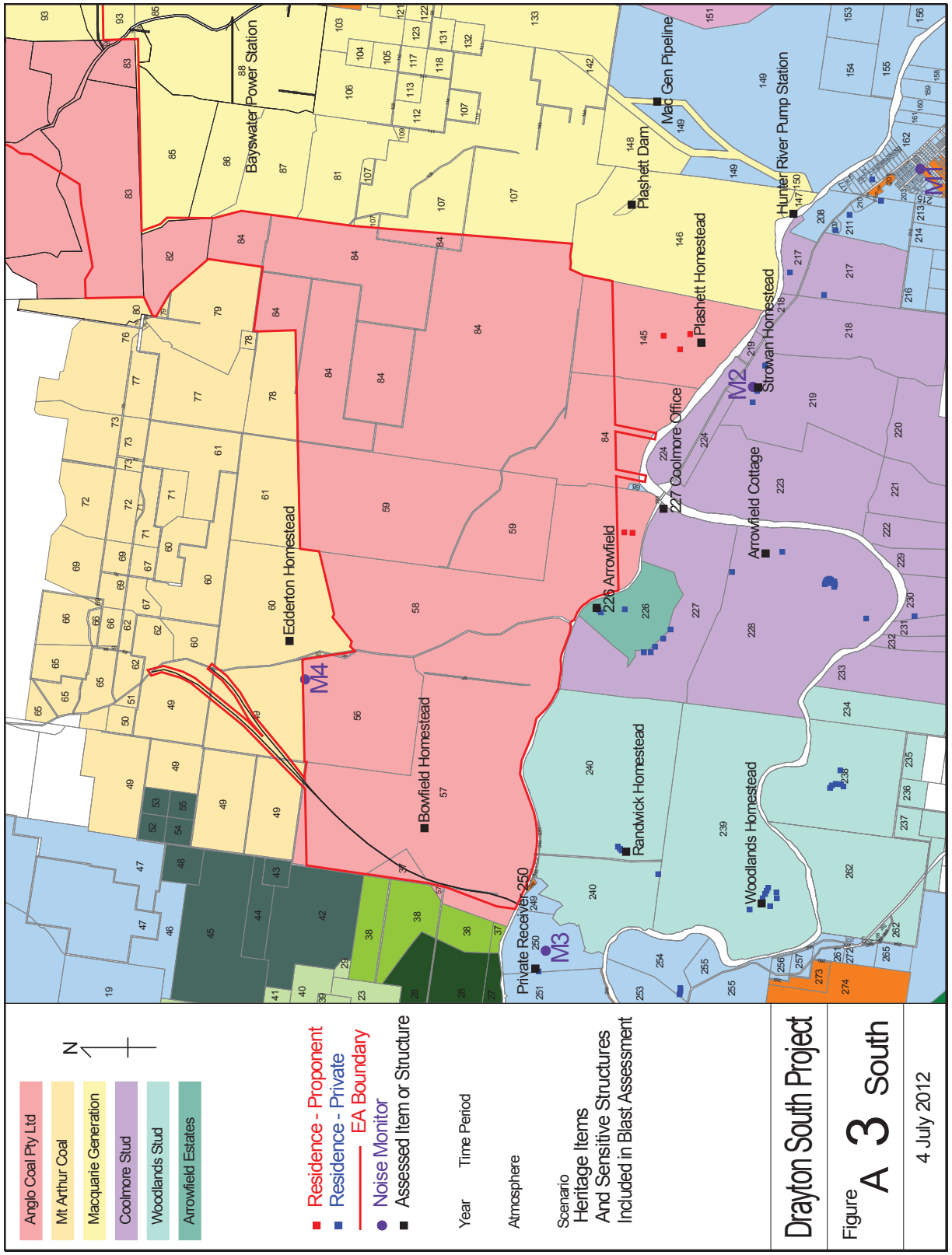
Residence - Proponent
Residence - Private
EA Boundary
Noise Monitor
Year
Time Period
Atmosphere
Scenario
Land Ownership
Drayton South Project
Figure A 2 South
4 July 2012
M1
M2
M3
M4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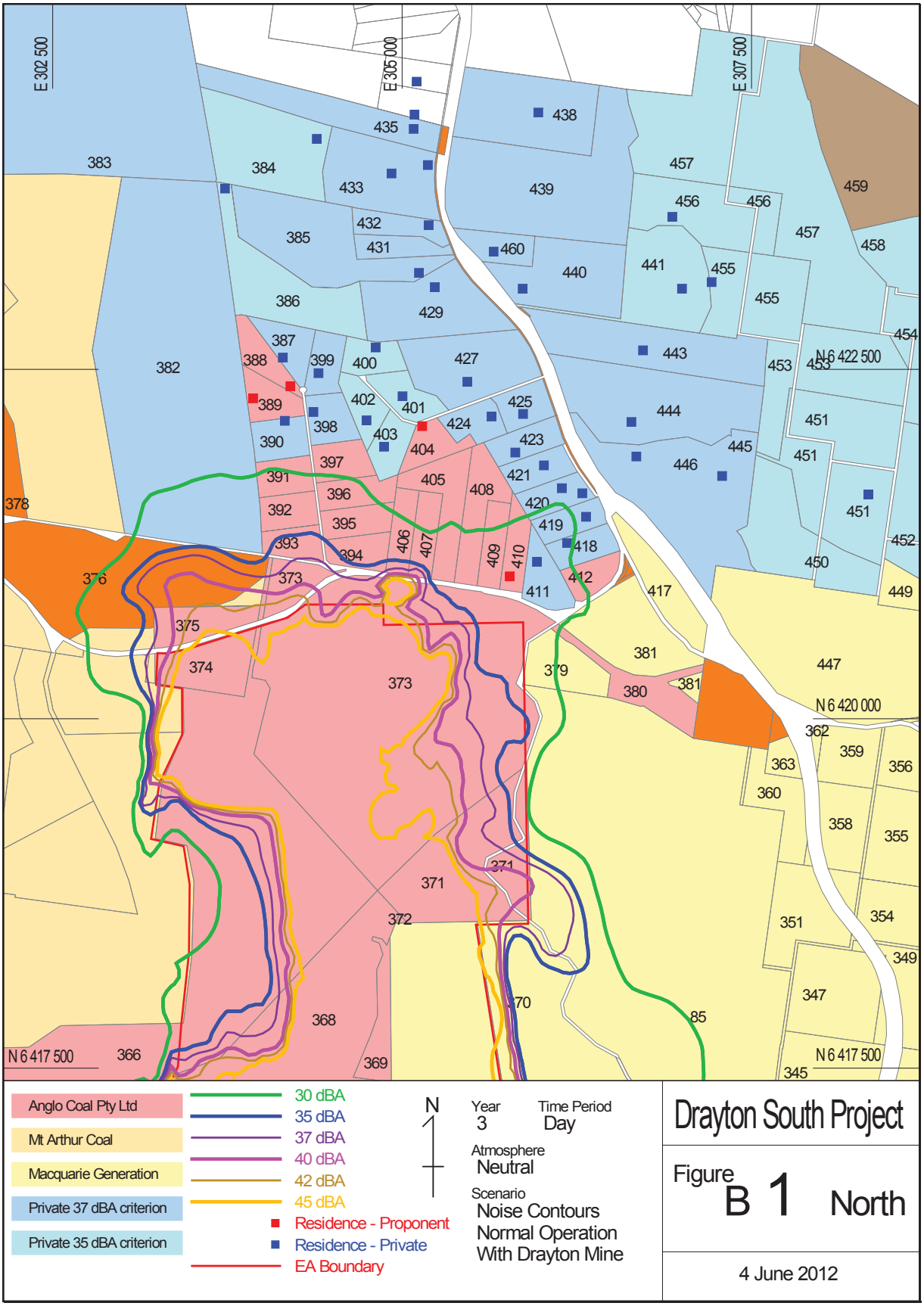
Mt Arthur Coal
Macquarie Generation
Coolmore Stud
Woodlands Stud
Arrowfield Estates
N
Residence - Proponent
Residence - Private
EA Boundary
Noise Monitor
Assessed Item or Structure
Year
Time Period
Atmosphere
Scenario
Heritage Items
And Sensitive Structures
Included in Blast Assessment
Drayton South Project
Figure A 3 South
4 July 2012
Bayswater Power Station
Mac Gen Pipeline
Plashett Dam
Hunter River Pump Station
Plashett Homestead
Strowan Homestead
Coolmore Office
Arrowfield Cottage
226 Arrowfield
Edderton Homestead
Bowfield Homestead
Randwick Homestead
Woodlands Homestead
Private Receiver 250
M1
M2
M3
M4

APPENDIX B – NOISE CONTOUR FIGURES

FIGURE	NOISE CONTOURS – NORMAL OPERATION WITH DRAYTON MINE		
B1 North	Year 3	Day	Neutral weather conditions
B2 North	Year 3	Evening	Prevailing weather conditions
B3 North	Year 3	Night	Prevailing weather conditions
FIGURE	NOISE CONTOURS – NORMAL OPERATION		
B4 North	Years 5-27	Day	Neutral weather conditions
B5 North	Years 5-27	Evening	Prevailing weather conditions
B6 North	Years 5-27	Night	Prevailing weather conditions
B7 South	Year 3A	Day	Neutral weather conditions
B8 South	Year 3A	Evening/night	Prevailing weather conditions
B9 South	Year 3B	Day	Neutral weather conditions
B10 South	Year 3B	Evening/night	Prevailing weather conditions
B11 South	Year 5	Day	Neutral weather conditions
B12 South	Year 5	Evening/night	Prevailing weather conditions
B13 South	Year 10	Day	Neutral weather conditions
B14 South	Year 10	Evening/night	Prevailing weather conditions
B15 South	Year 15	Day	Neutral weather conditions
B16 South	Year 15	Evening/night	Prevailing weather conditions
B17 South	Year 20	Day	Neutral weather conditions
B18 South	Year 20	Evening/night	Prevailing weather conditions
B19 South	Year 27	Day	Neutral weather conditions
B20 South	Year 27	Evening/night	Prevailing weather conditions
B21 South	All years	Day	Neutral weather conditions
B22 South	All years	Evening/night	Prevailing weather conditions
FIGURE	NOISE CONTOURS – SLEEP DISTURBANCE		
B23 North	All years	Night	Prevailing weather conditions
B24 South	All years	Night	Prevailing weather conditions
FIGURE	NOISE CONTOURS – CONSTRUCTION		
B25 North	Year 1	Day	Neutral weather conditions
B26 North	Year 1	Evening/Night	Prevailing weather conditions
B27 South	Year 1	Day	Neutral weather conditions
B28 South	Year 1	Evening/Night	Prevailing weather conditions
FIGURE	NOISE CONTOURS – ANTIENE RAIL SPUR		
B29 North	All years	Day	Neutral weather conditions
B30 North	All years	Evening	Prevailing weather conditions
B31 North	All years	Night	Prevailing weather conditions
B32 North	All years	Night Sleep Disturbance	Prevailing weather conditions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E 307 500
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N 6 417 500
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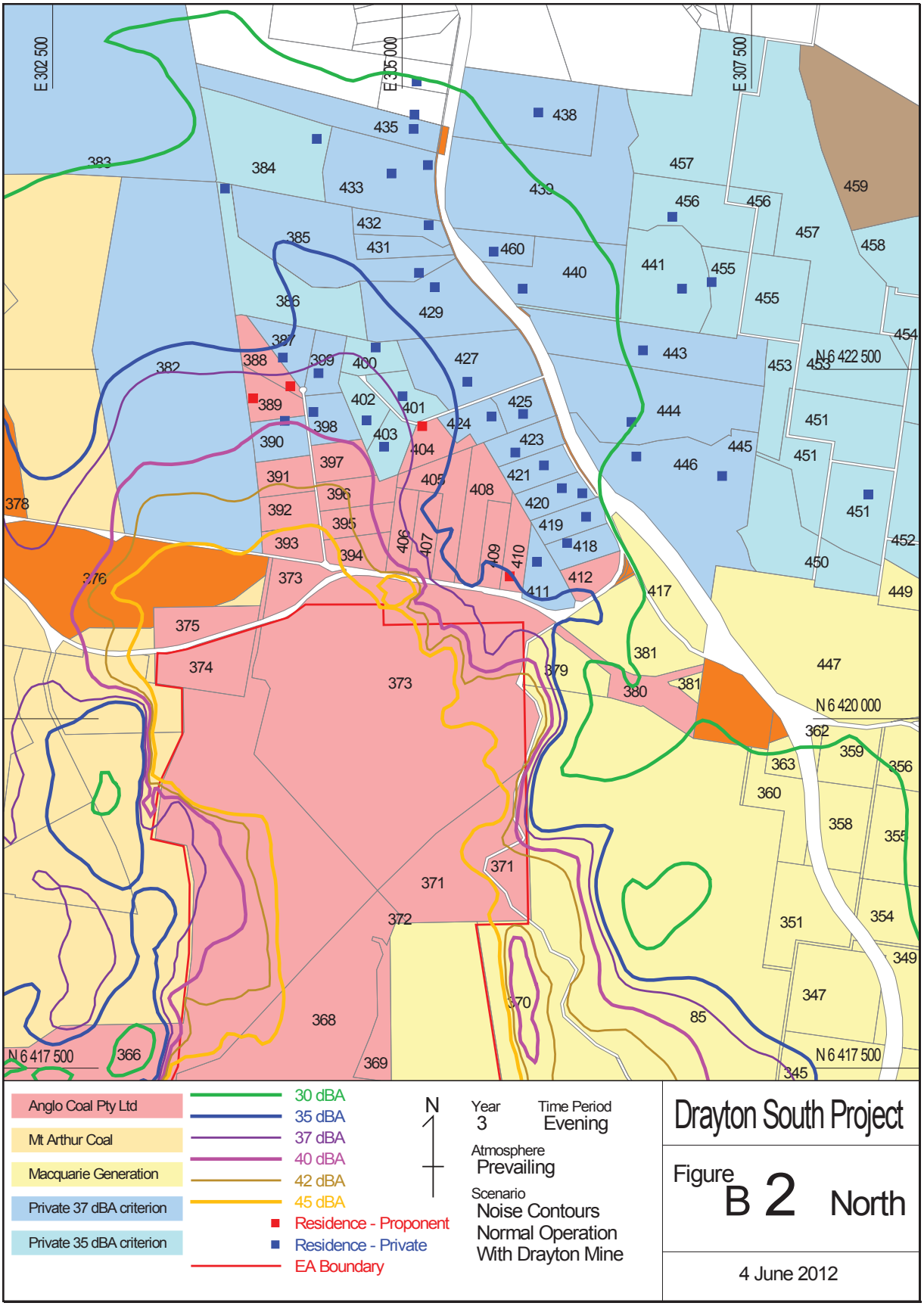
Mt Arthur Coal
Macquarie Generation
Private 37 dBA criterion
Private 35 dBA criterion
30 dBA
35 dBA
37 dBA
40 dBA
42 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
N
Year
3
Time Period
Day
Atmosphere
Neutral
Scenario
Noise Contours
Normal Operation
With Drayton Mine
Drayton South Project
Figure
B 1
North
4 June 2012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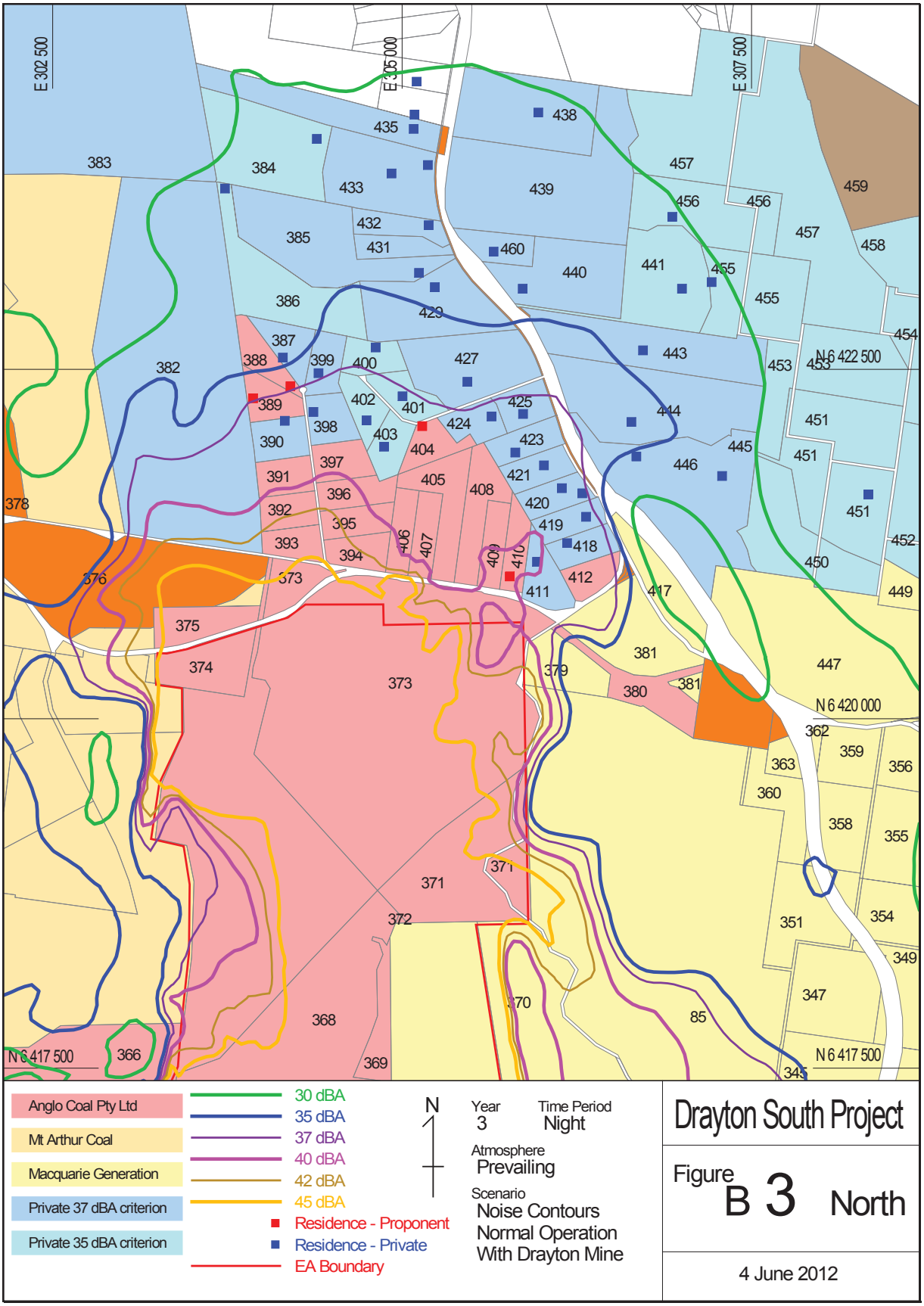
Private 35 dBA criterion
30 dBA
35 dBA
37 dBA
40 dBA
42 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
N
Year
3
Time Period
Evening
Atmosphere
Prevailing
Scenario
Noise Contours
Normal Operation
With Drayton Mine
Drayton South Project
Figure B 2 North
4 June 2012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Macquarie Generation
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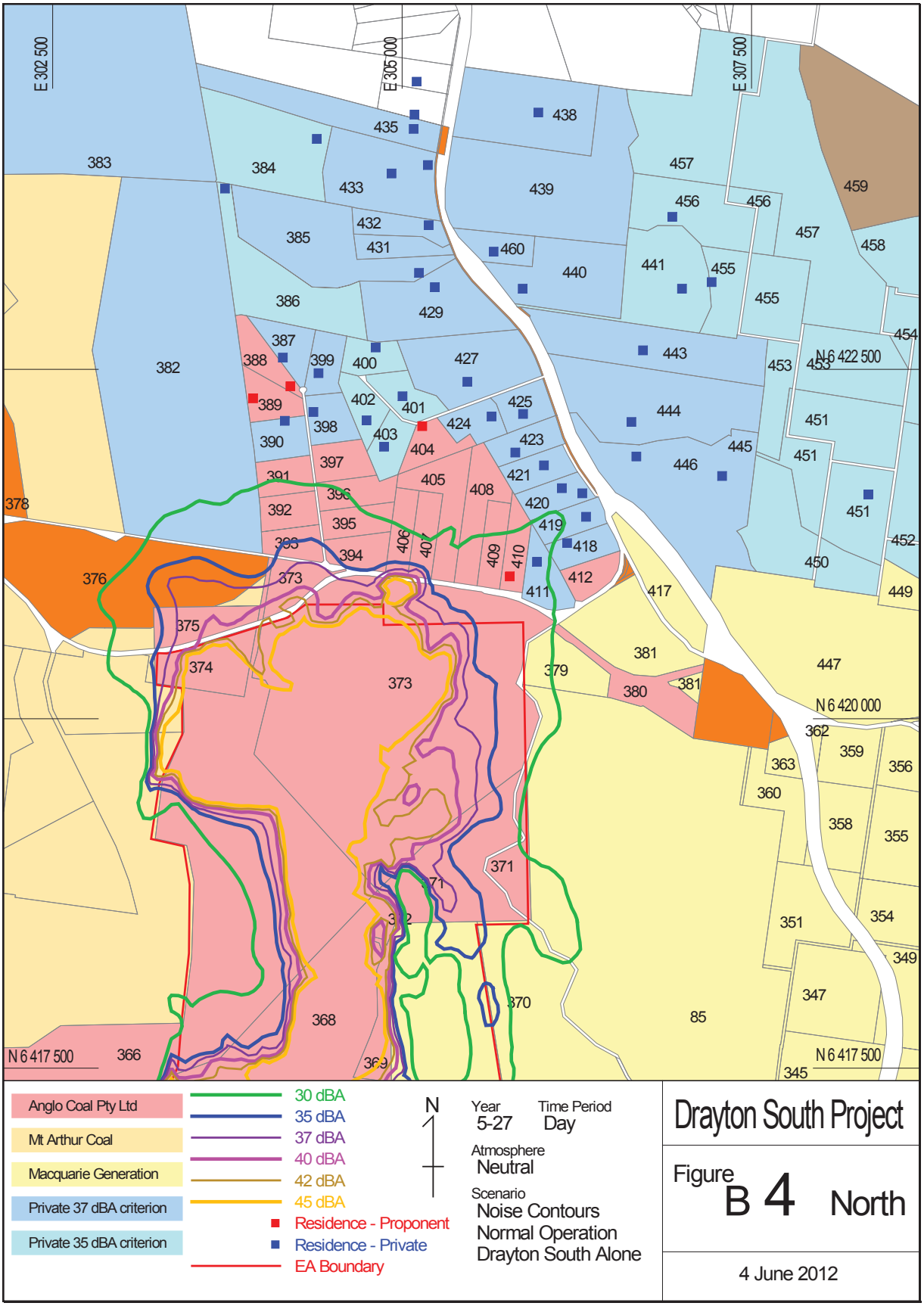
Private 35 dBA criterion
30 dBA
35 dBA
37 dBA
40 dBA
42 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
N
Year
3
Time Period
Night
Atmosphere
Prevailing
Scenario
Noise Contours
Normal Operation
With Drayton Mine
Drayton South Project
Figure
B 3
North
4 June 2012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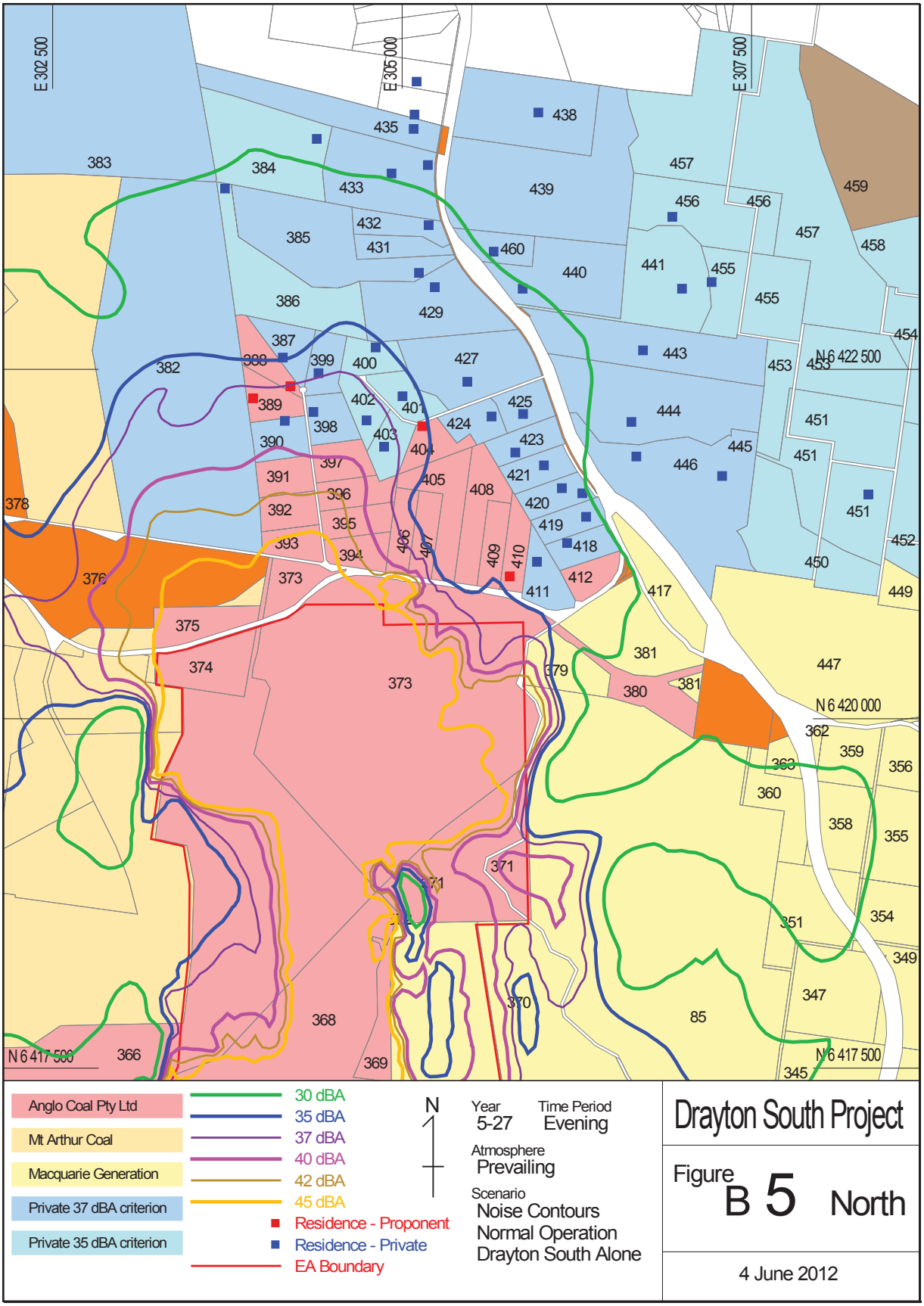
Macquarie Generation
Private 37 dBA criterion
Private 35 dBA criterion
30 dBA
35 dBA
37 dBA
40 dBA
42 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
N
Year
5-27
Time Period
Day
Atmosphere
Neutral
Scenario
Noise Contours
Normal Operation
Drayton South Alone
Drayton South Project
Figure B 4 North
4 June 2012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30 dBA
35 dBA
37 dBA
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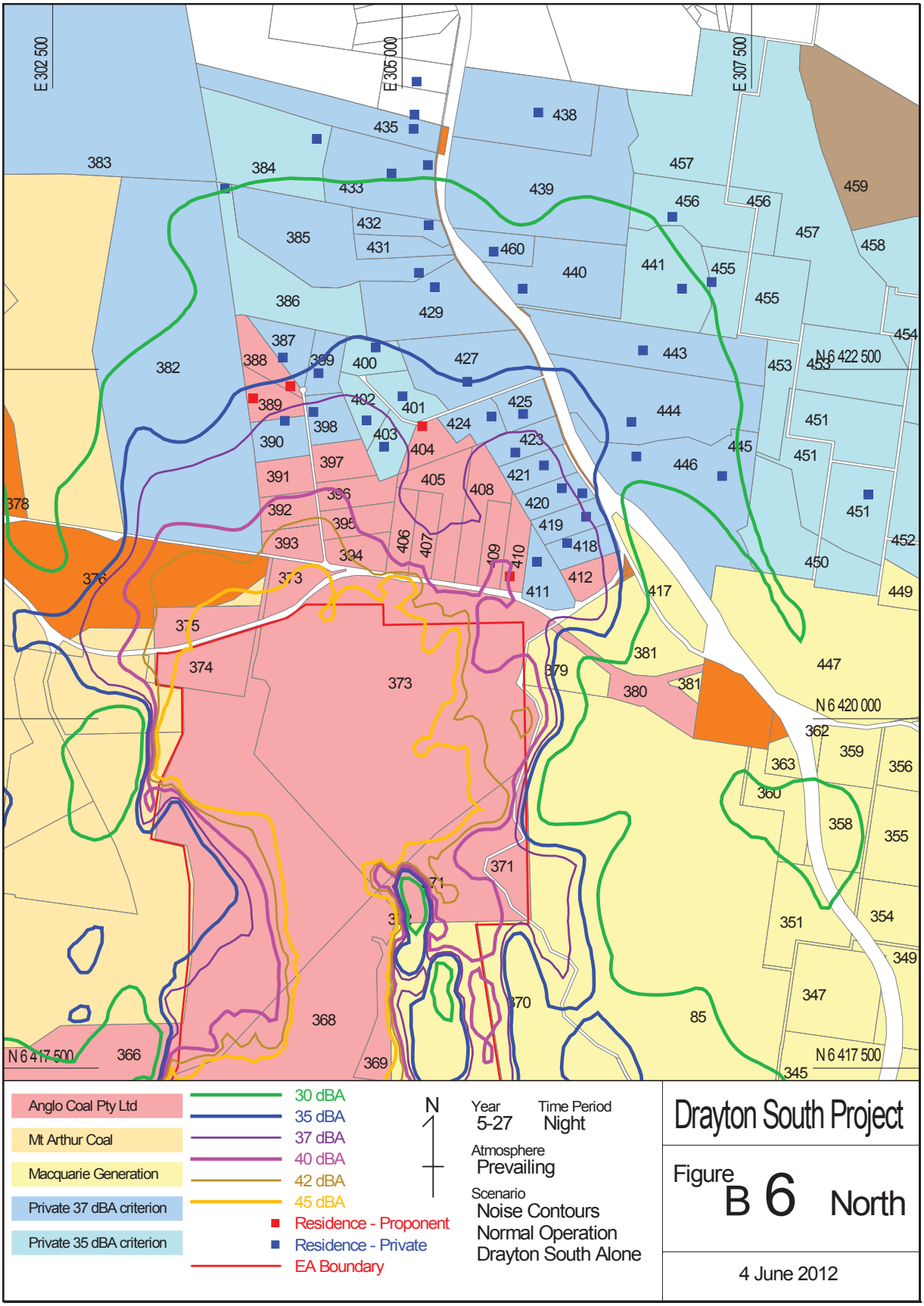
42 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
N
Year
5-27
Time Period
Evening
Atmosphere
Prevailing
Scenario
Noise Contours
Normal Operation
Drayton South Alone
Drayton South Project
Figure
B 5
North
4 June 2012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Macquarie Generation
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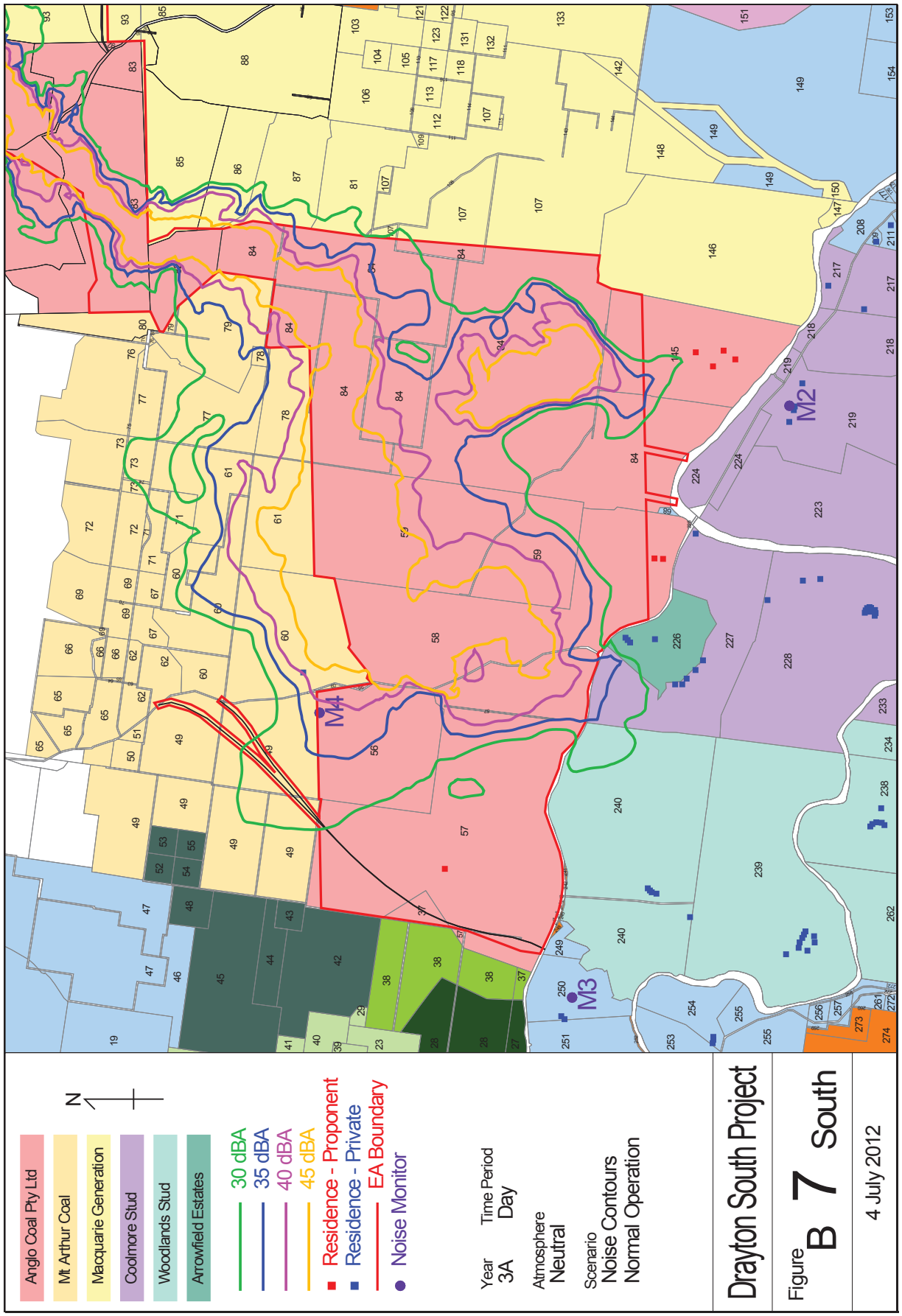
Private 35 dBA criterion
30 dBA
35 dBA
37 dBA
40 dBA
42 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
N
Year
5-27
Time Period
Night
Atmosphere
Prevailing
Scenario
Noise Contours
Normal Operation
Drayton South Alone
Drayton South Project
Figure B 6 North
4 June 2012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Woodlands Stud
Arrowfield Estates
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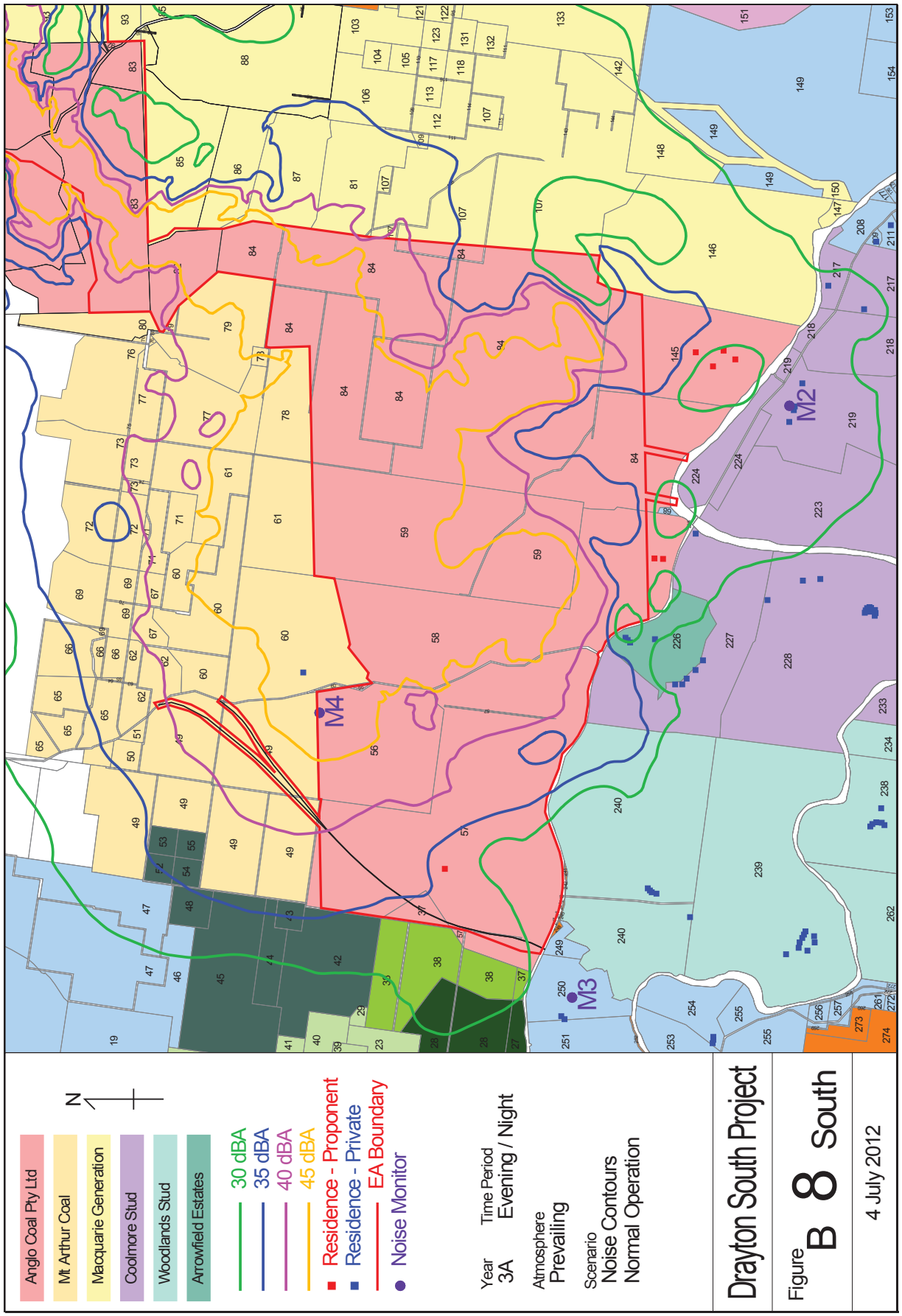
35 dBA
40 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
Noise Monitor
Year 3A
Time Period Day
Atmosphere Neutral
Scenario Noise Contours Normal Operation
M2
M3
M4
Drayton South Project
Figure B 7 South
4 July 2012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Woodlands Stud
Arrowfield Estates
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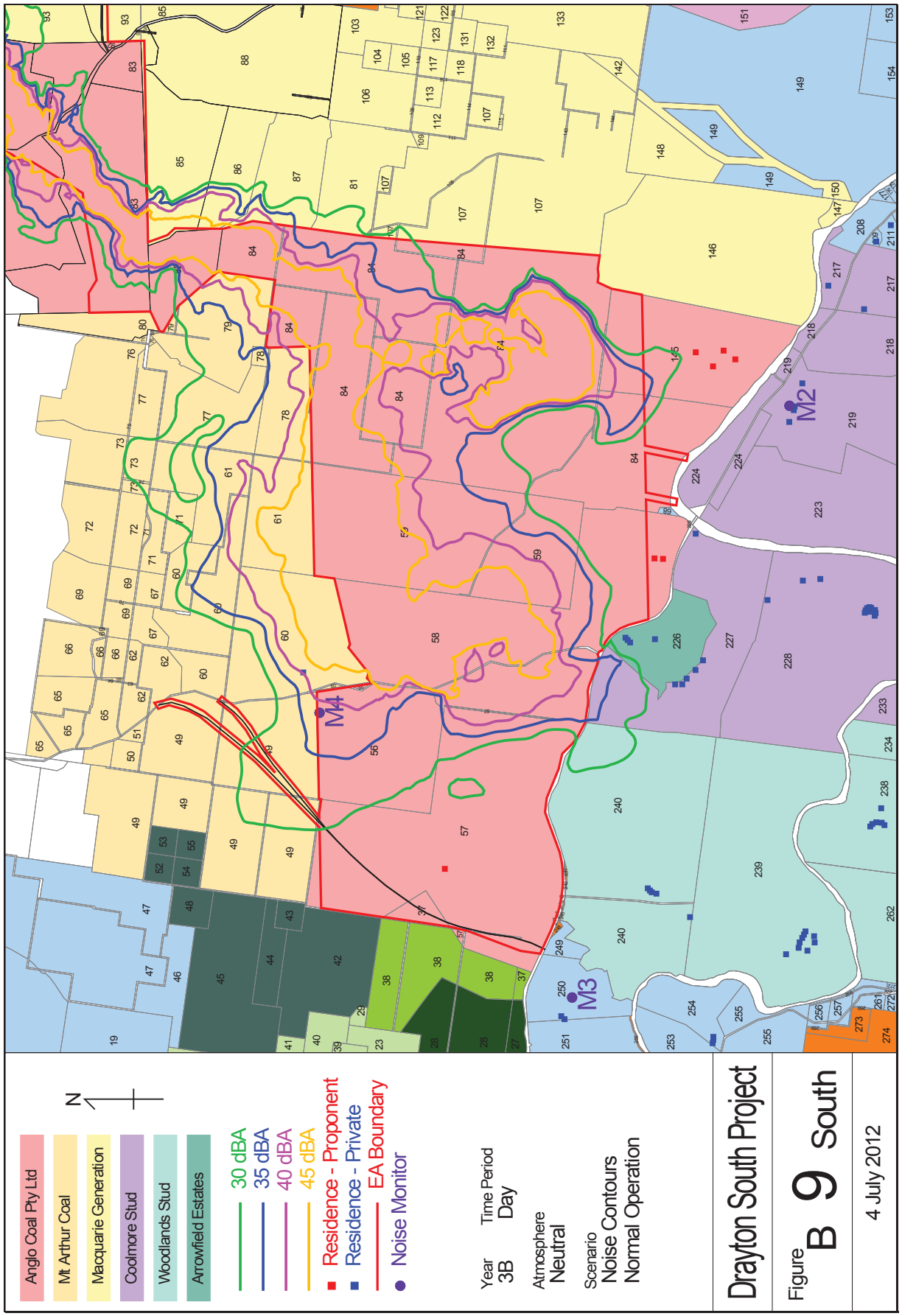
35 dBA
40 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
Noise Monitor
Year
3A
Time Period
Evening / Night
Atmosphere
Prevailing
Scenario
Noise Contours
Normal Operation
Drayton South Project
Figure
B 8 South
4 July 2012
M2
M3
M4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Woodlands Stud
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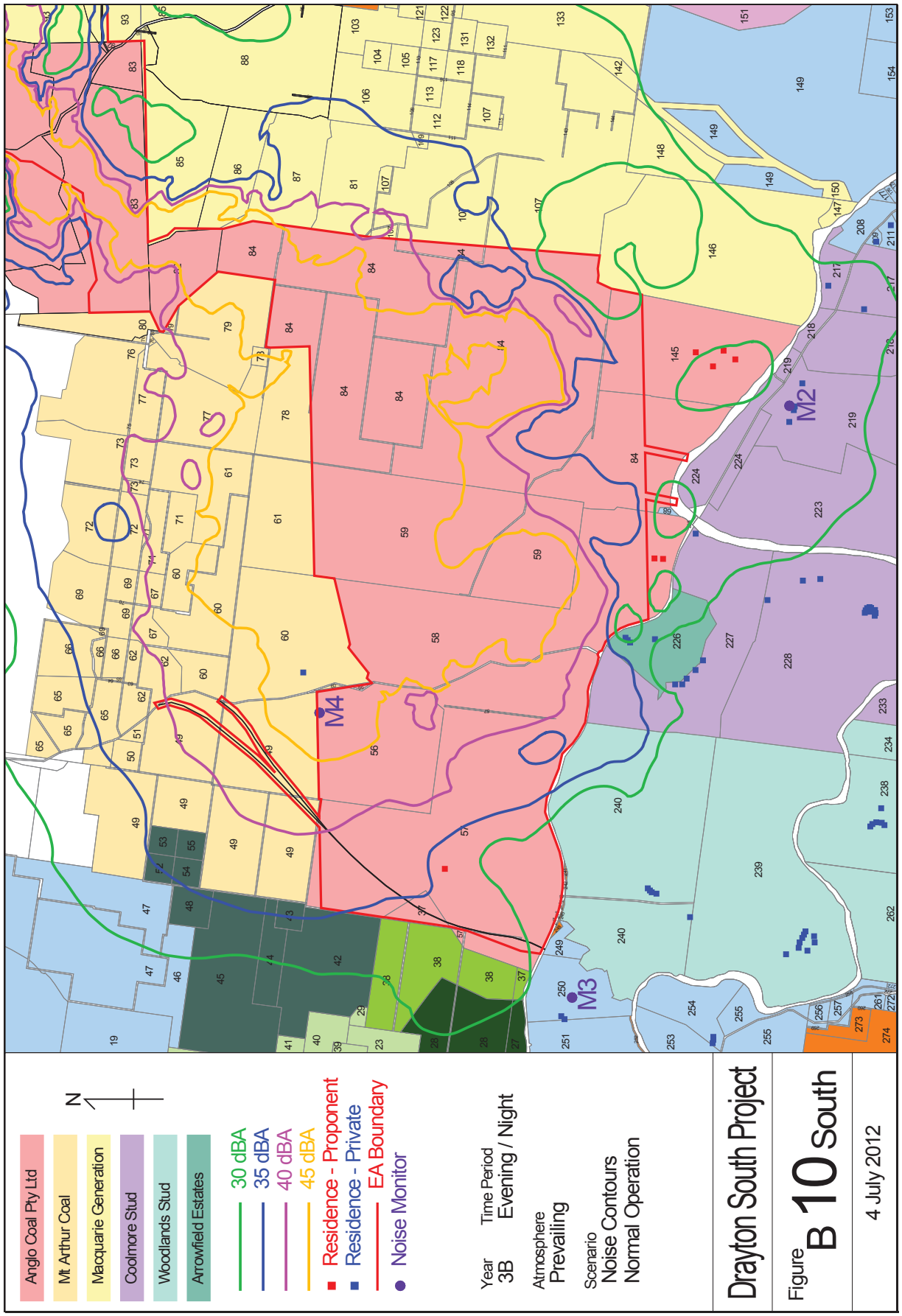
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
Noise Monitor
Year 3B
Time Period Day
Atmosphere Neutral
Scenario Noise Contours Normal Operation
M2
M3
M4
Drayton South Project
Figure B 9 South
4 July 2012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Macquarie Generation
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Woodlands Stud
Arrowfield Estates
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35 dBA
40 dBA
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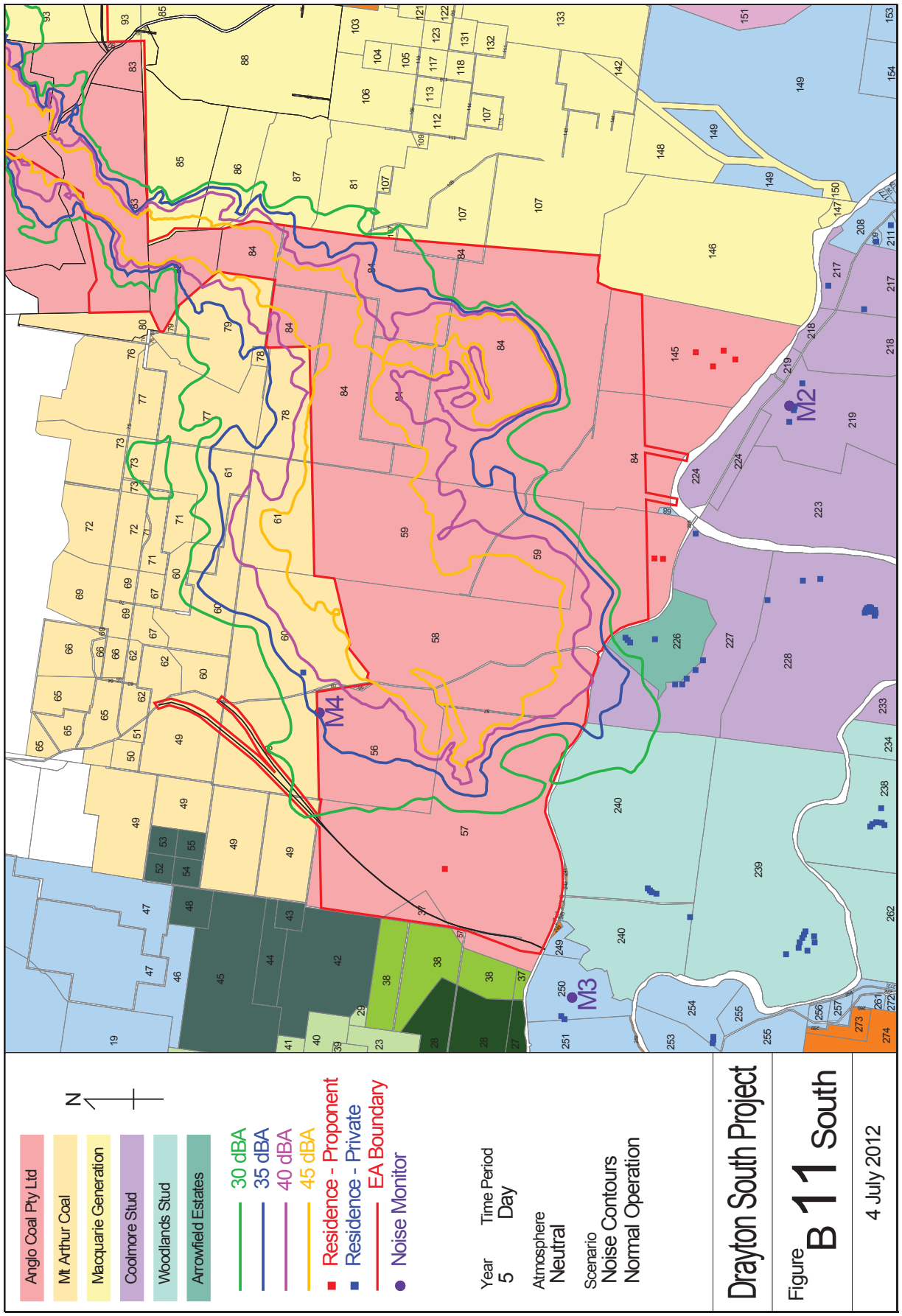
Residence - Proponent
Residence - Private
EA Boundary
Noise Monitor
Year 3B
Time Period Evening / Night
Atmosphere Prevailing
Scenario Noise Contours Normal Operation
Drayton South Project
Figure B 10 South
4 July 2012
M2
M3
M4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Macquarie Generation
Coolmore Stud
Woodlands Stud
Arrowfield Estates
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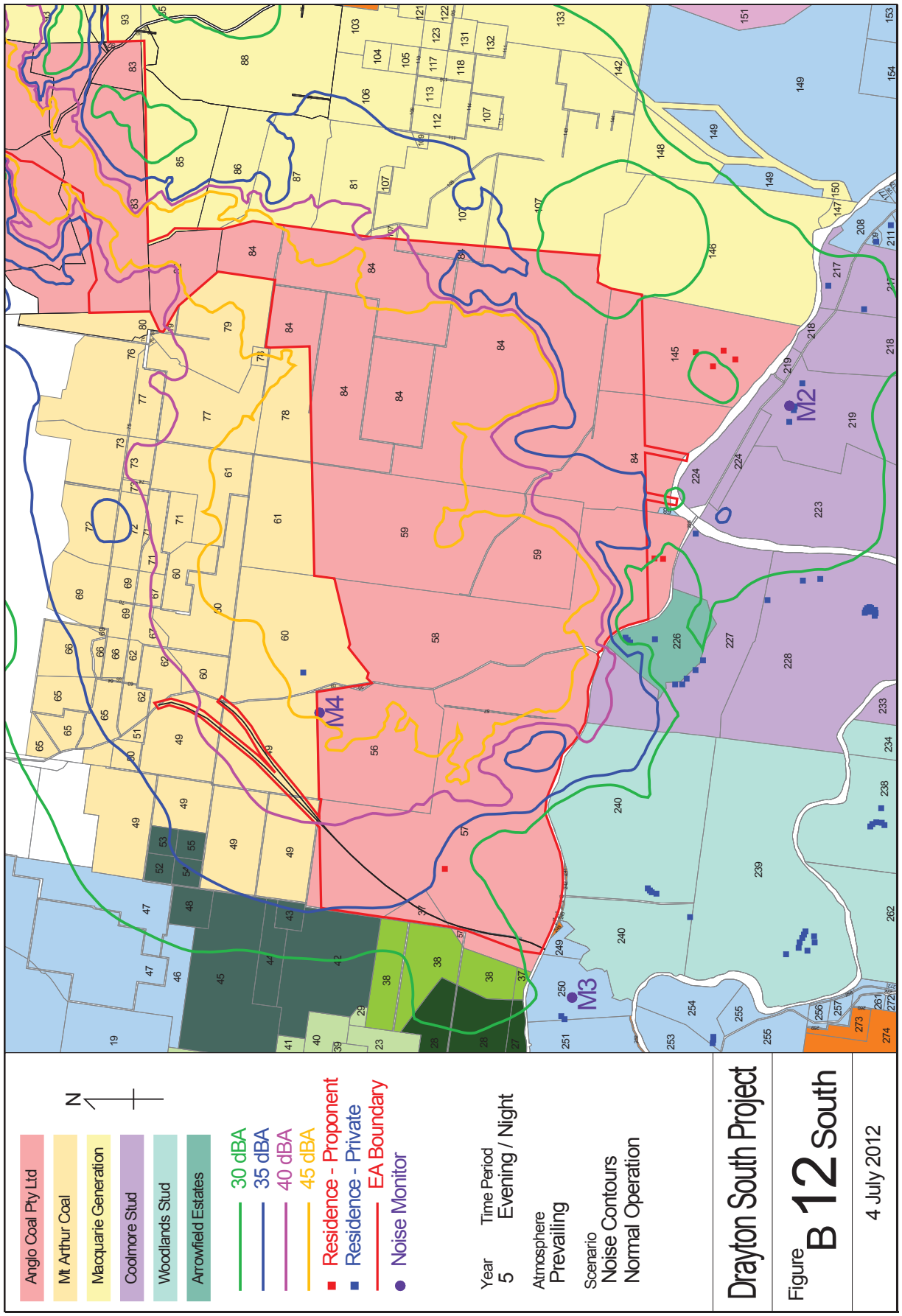
35 dBA
40 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
Noise Monitor
Year 5
Time Period Day
Atmosphere Neutral
Scenario Noise Contours Normal Operation
M1
M2
M3
M4
Drayton South Project
Figure B 11 South
4 July 2012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Macquarie Generation
Coolmore Stud
Woodlands Stud
Arrowfield Estates
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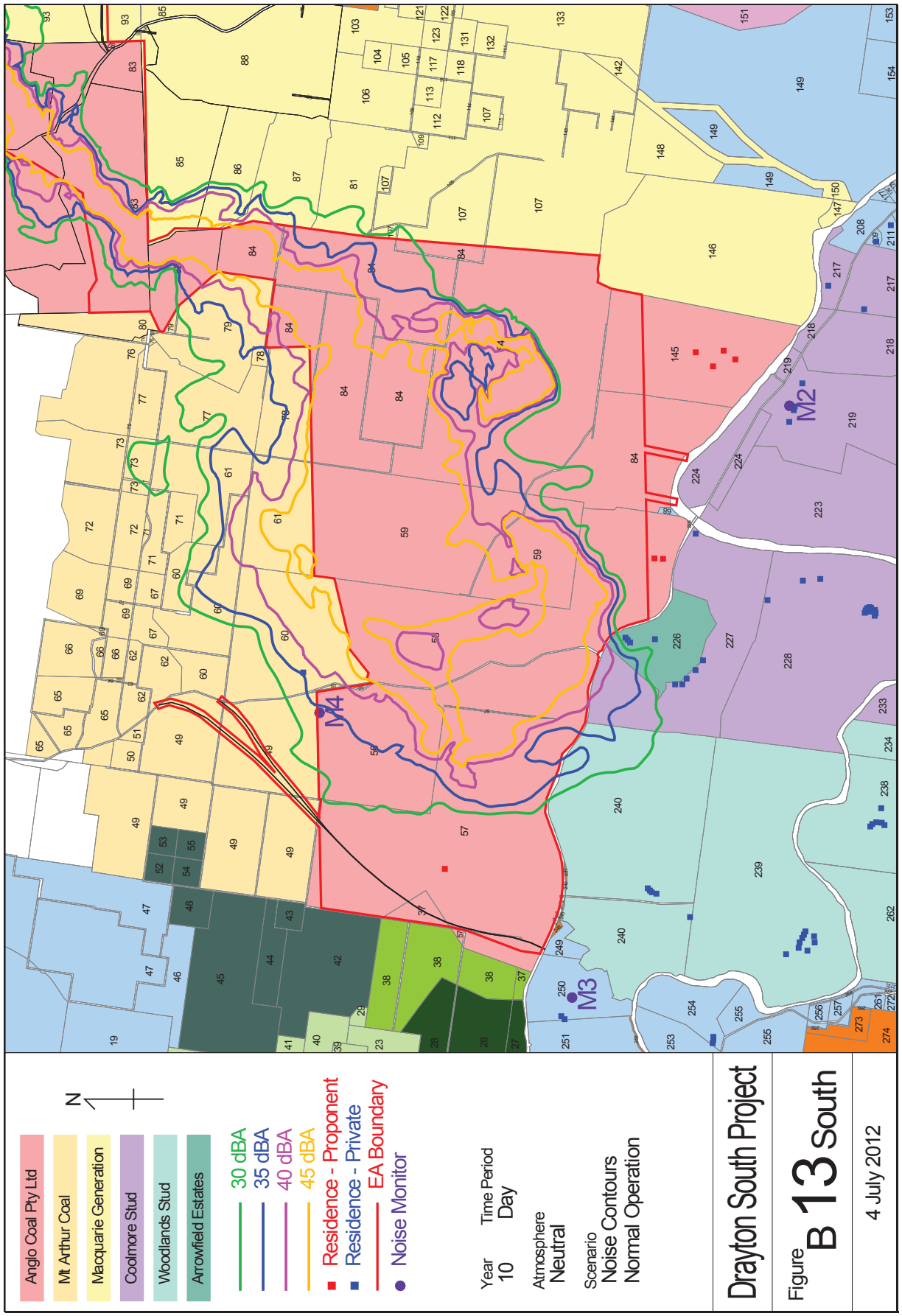
30 dBA
35 dBA
40 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
Noise Monitor
Year 5
Time Period Evening / Night
Atmosphere Prevailing
Scenario Noise Contours Normal Operation
M1
M2
M3
M4
Drayton South Project
Figure B 12 South
4 July 2012


Anglo Coal Pty Ltd
Mt Arthur Coal
Macquarie Generation
Coolmore Stud
Woodlands Stud
Arrowfield Estates
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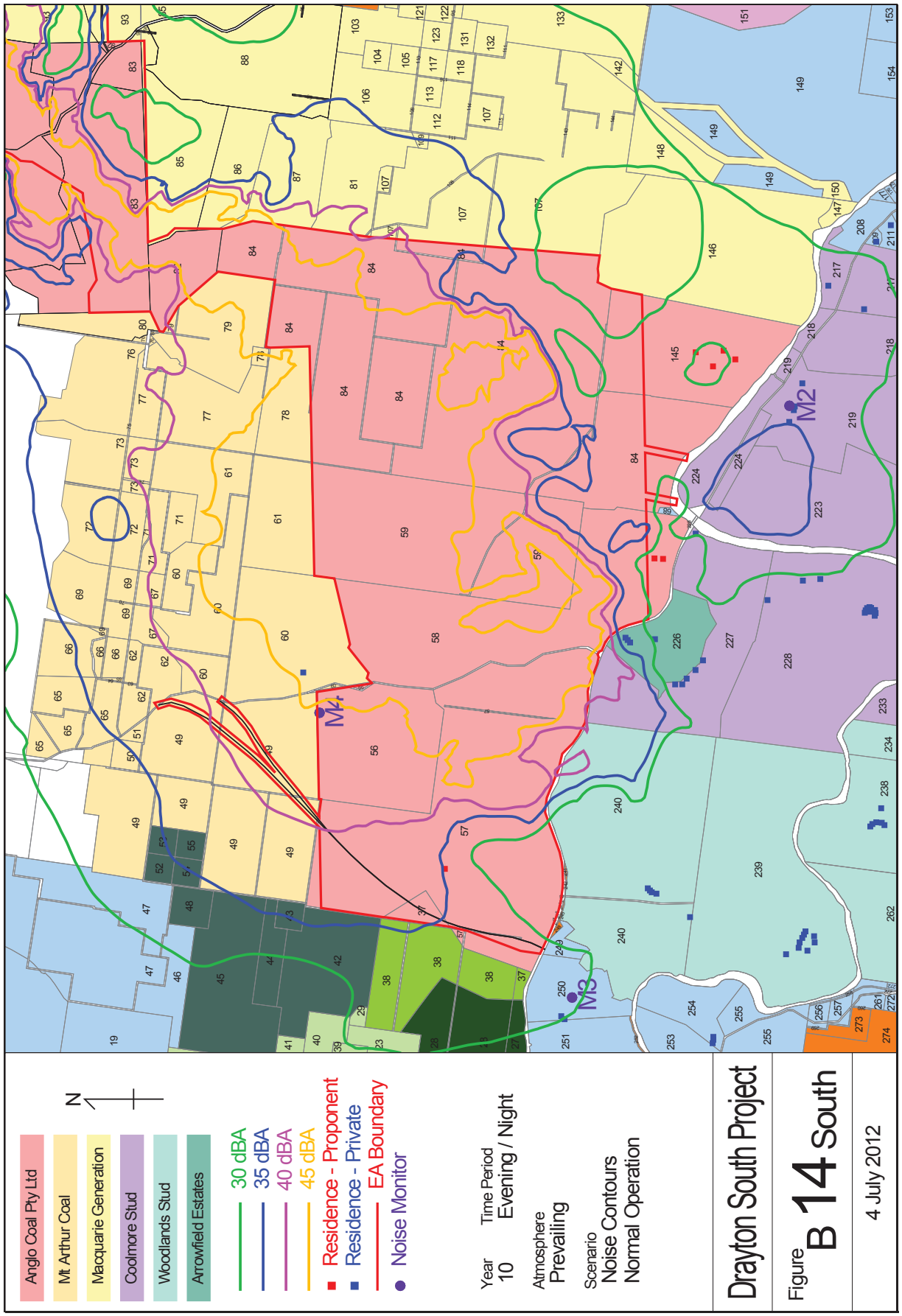
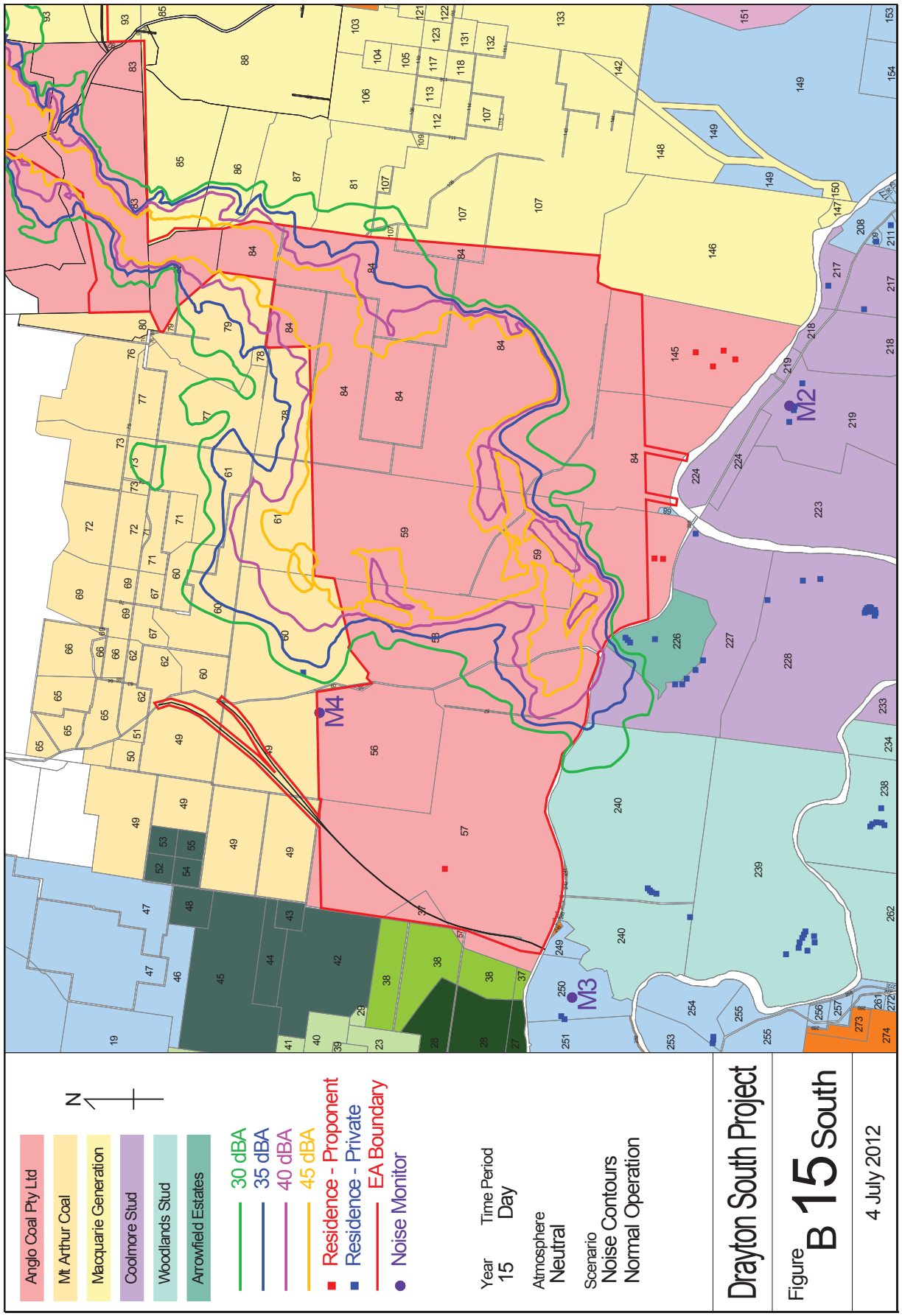
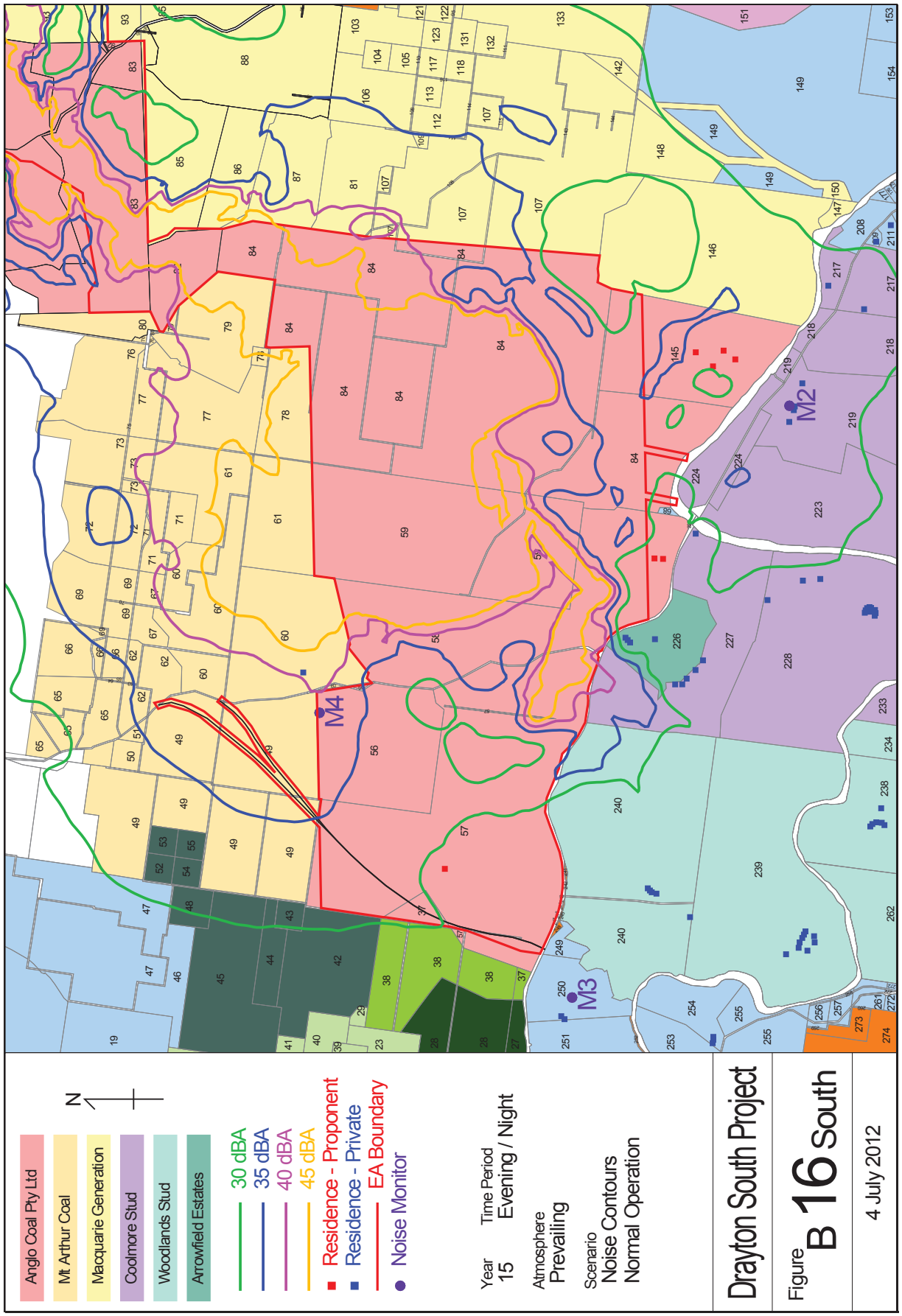
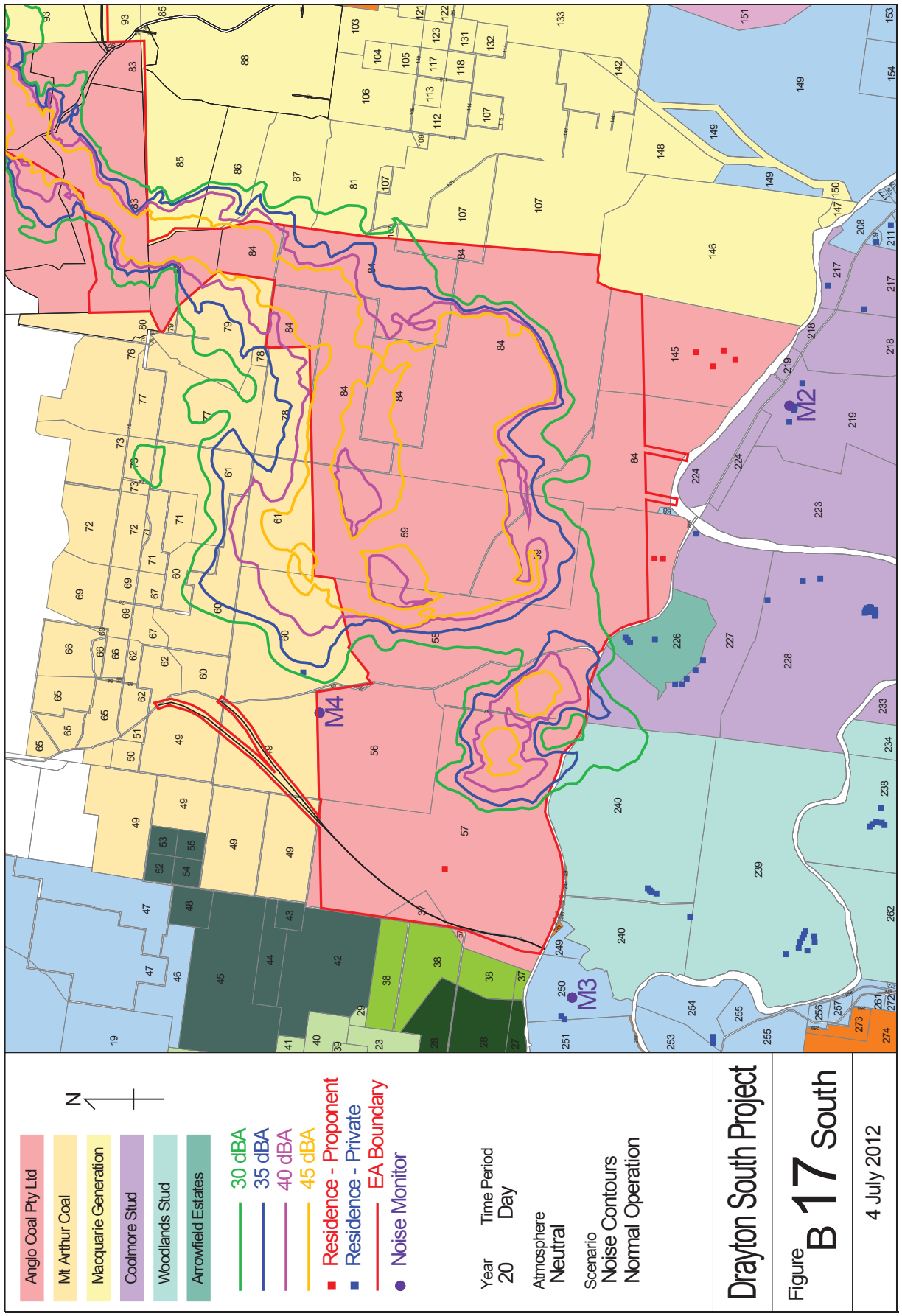
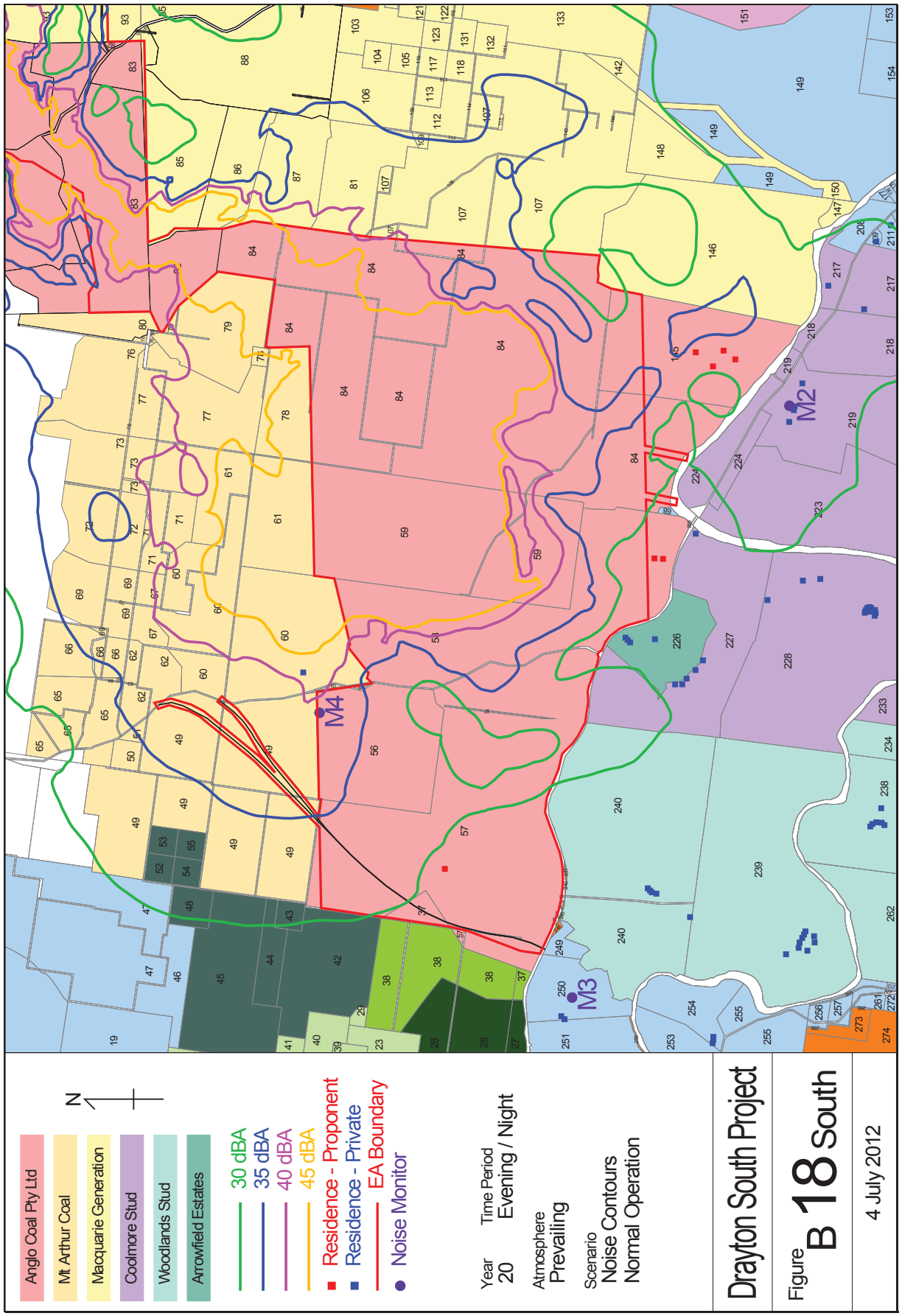
30 dBA
35 dBA
40 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
Noise Monitor
Year 10
Time Period Day
Atmosphere Neutral
Scenario Noise Contours Normal Operation
M2
M3
M4
Drayton South Project
Figure B13 South
4 July 2012

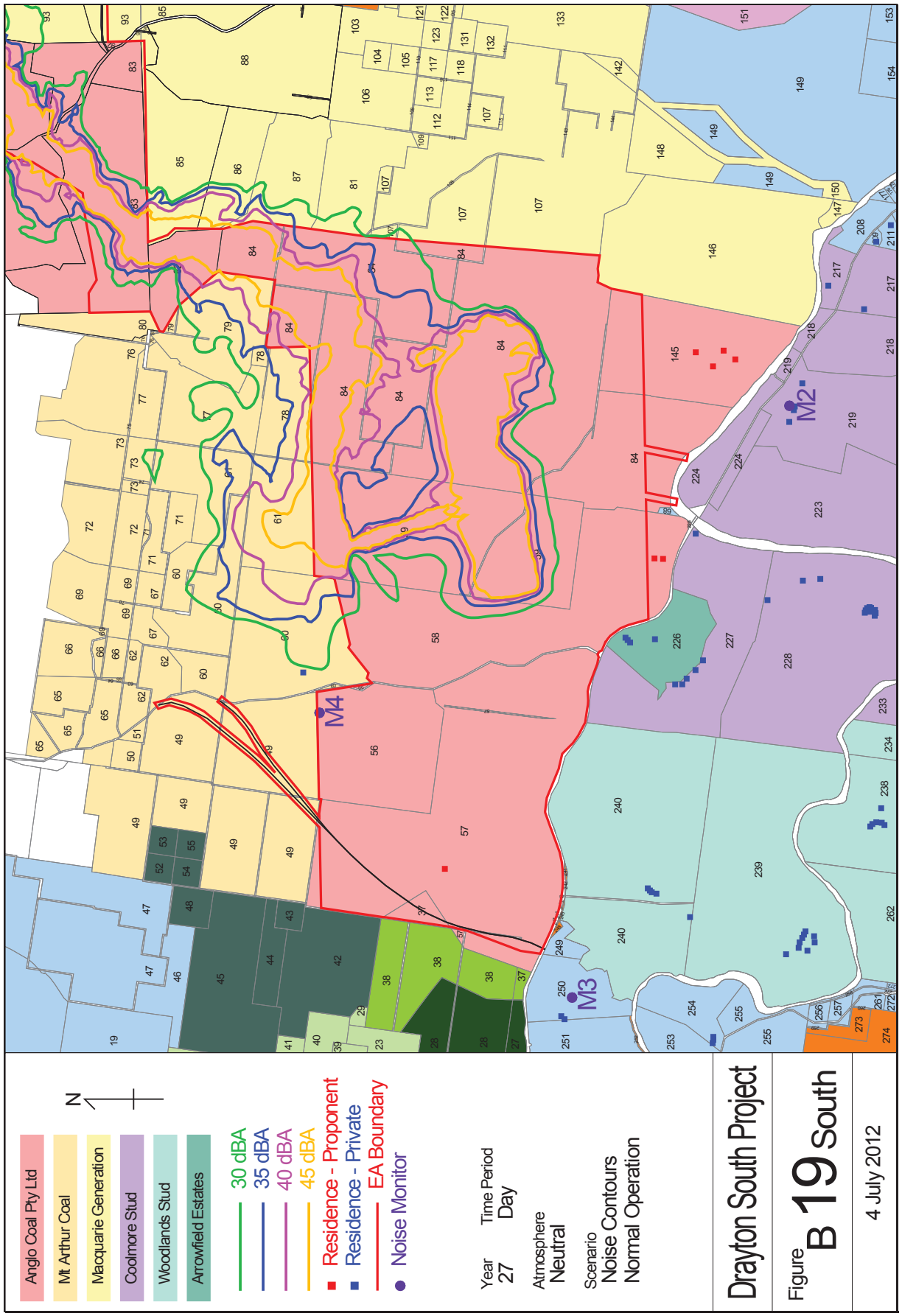

Anglo Coal Pty Ltd
Mt Arthur Coal
Macquarie Generation
Coolmore Stud
Woodlands Stud
Arrowfield Estates
N
30 dBA
35 dBA
40 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
Noise Monitor
M1
M2
M3
Year
10
Time Period
Evening / Night
Atmosphere
Prevailing
Scenario
Noise Contours
Normal Operation
Drayton South Project
Figure B 14 South
4 July 2012

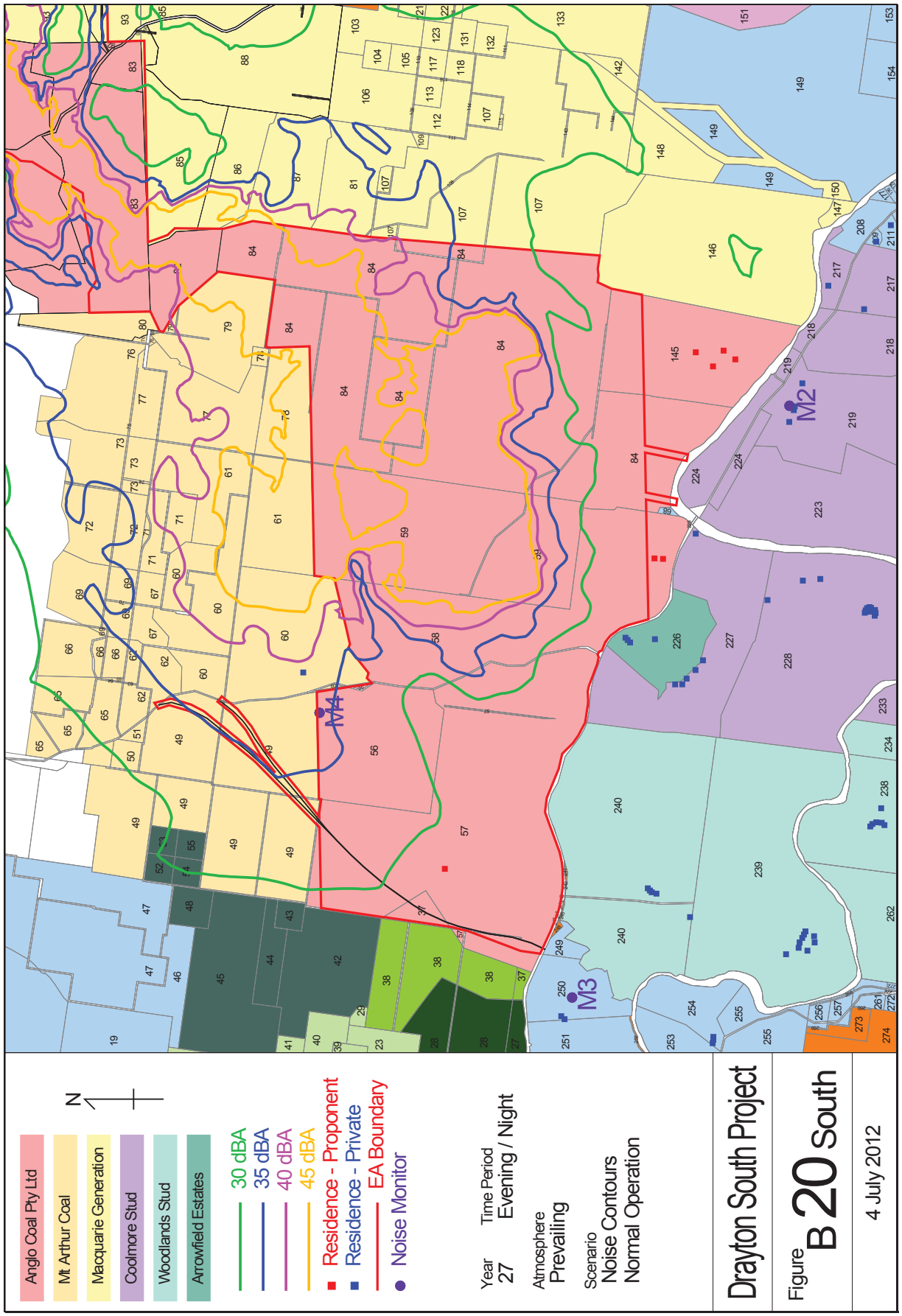

Anglo Coal Pty Ltd
Mt Arthur Coal
Macquarie Generation
Coolmore Stud
Woodlands Stud
Arrowfield Estates
N
30 dBA
35 dBA
40 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
Noise Monitor
Year 15
Time Period Day
Atmosphere Neutral
Scenario Noise Contours Normal Operation
M2
M3
M4
Drayton South Project
Figure B 15 South
4 July 2012

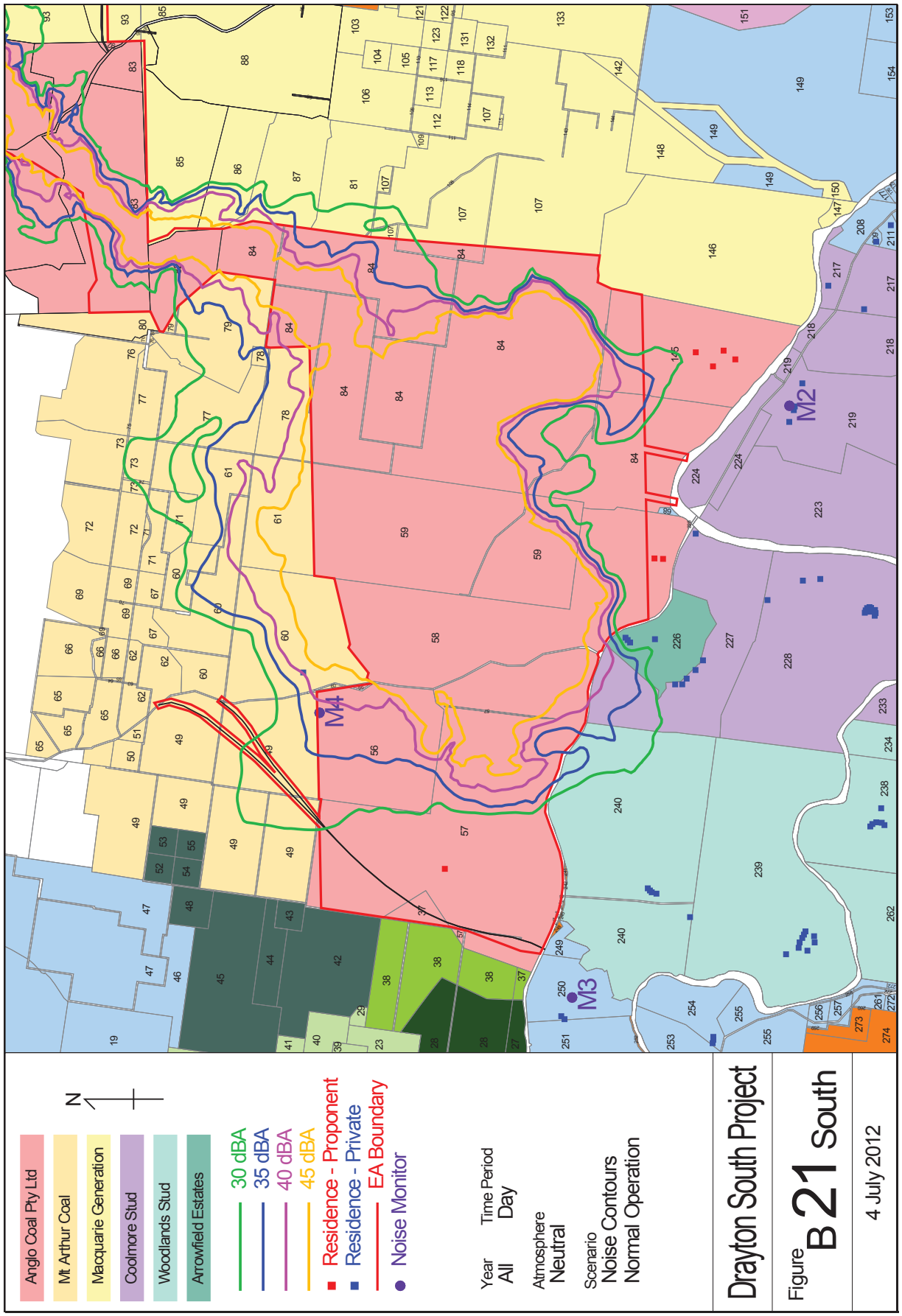

Anglo Coal Pty Ltd
Mt Arthur Coal
Macquarie Generation
Coolmore Stud
Woodlands Stud
Arrowfield Estates
N
30 dBA
35 dBA
40 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
Noise Monitor
Year
15
Time Period
Evening / Night
Atmosphere
Prevailing
Scenario
Noise Contours
Normal Operation
Drayton South Project
Figure B 16 South
4 July 2012
M2
M3
M4

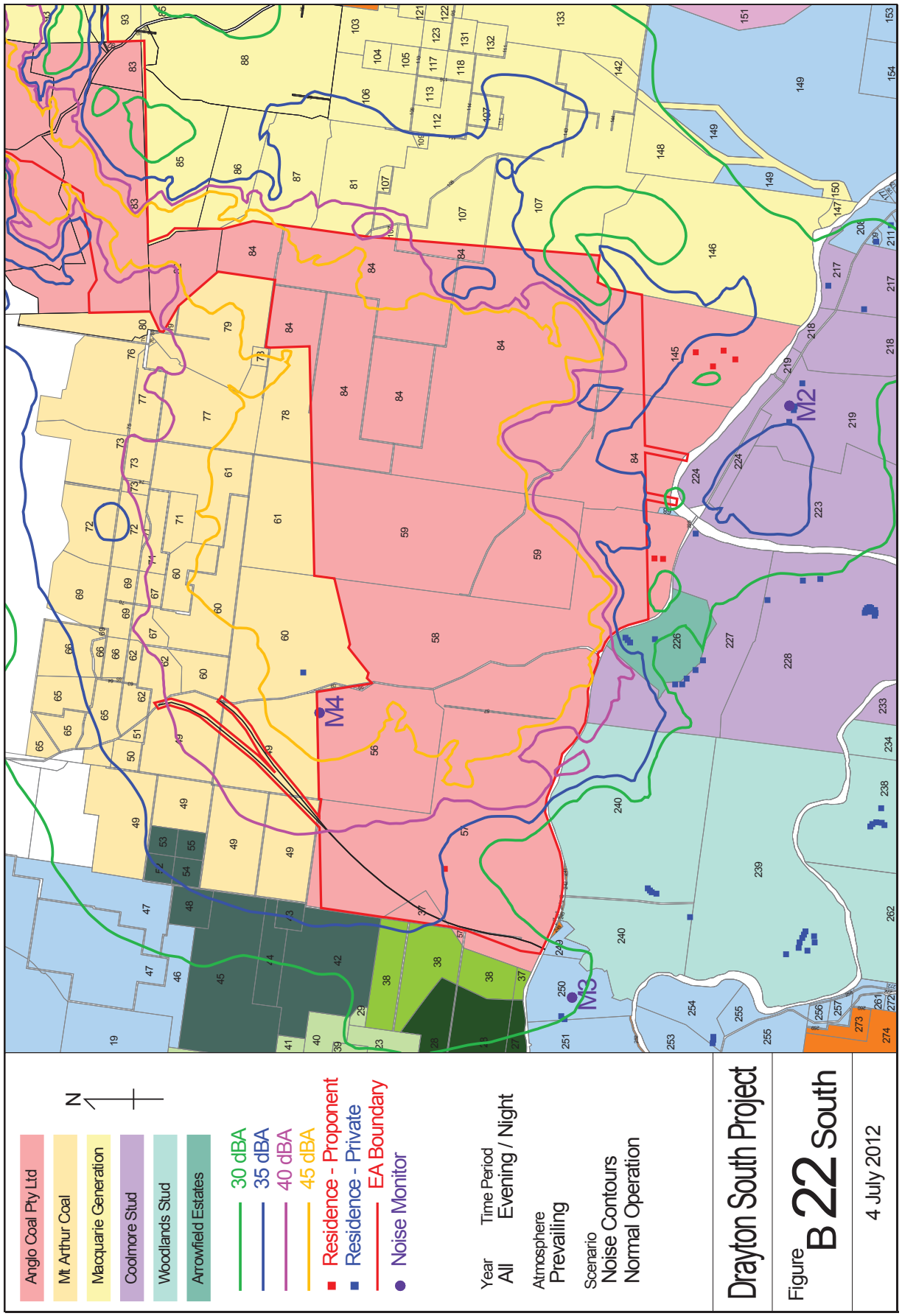

Anglo Coal Pty Ltd
Mt Arthur Coal
Macquarie Generation
Coolmore Stud
Woodlands Stud
Arrowfield Estates
N
30 dBA
35 dBA
40 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
Noise Monitor
Year 20
Time Period Day
Atmosphere Neutral
Scenario Noise Contours Normal Operation
M2
M3
M4
Drayton South Project
Figure B 17 South
4 July 2012

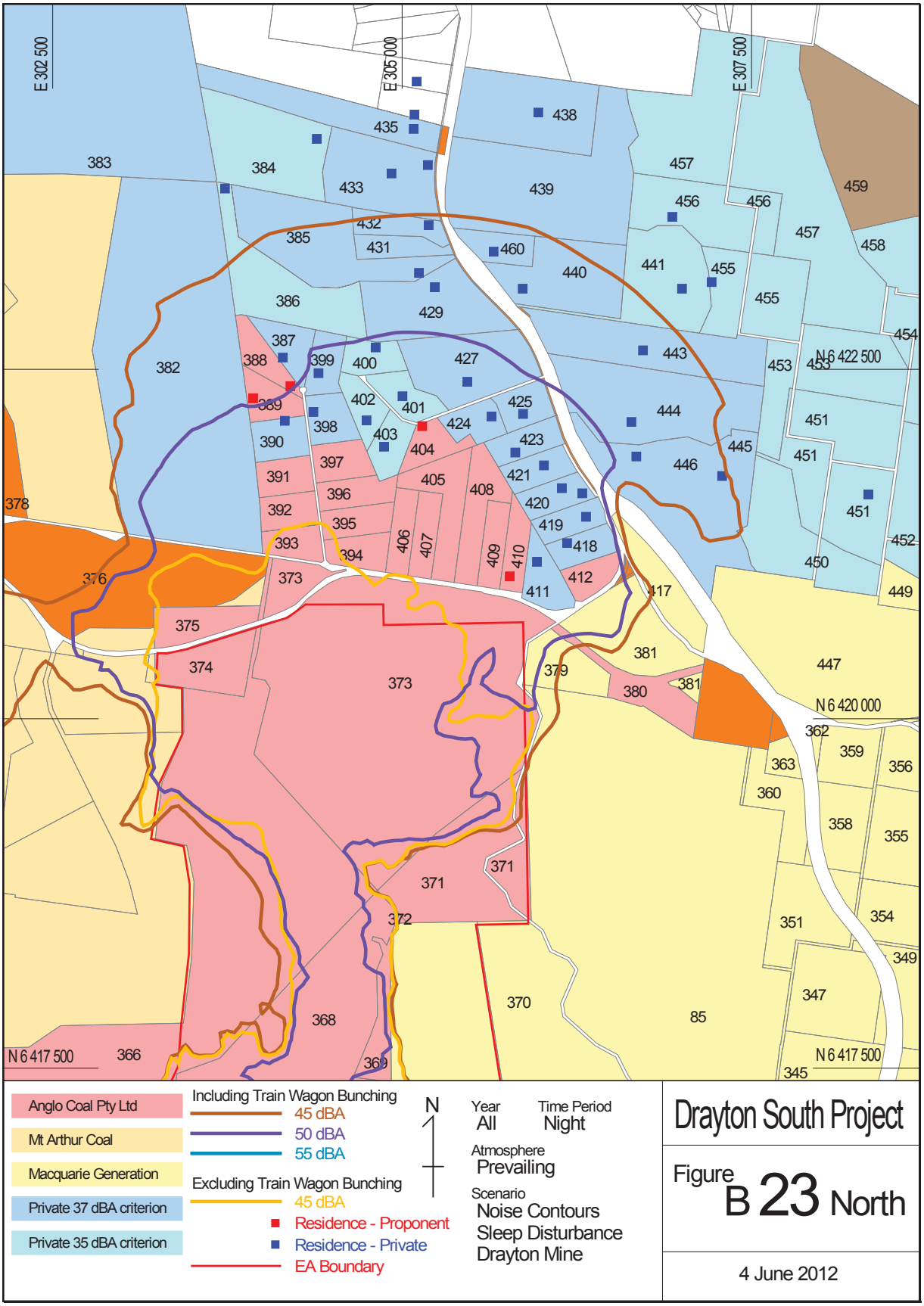

Anglo Coal Pty Ltd
Mt Arthur Coal
Macquarie Generation
Coolmore Stud
Woodlands Stud
Arrowfield Estates
N
30 dBA
35 dBA
40 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
Noise Monitor
Year
20
Time Period
Evening / Night
Atmosphere
Prevailing
Scenario
Noise Contours
Normal Operation
M2
M3
M4
Drayton South Project
Figure B 18 South
4 July 2012

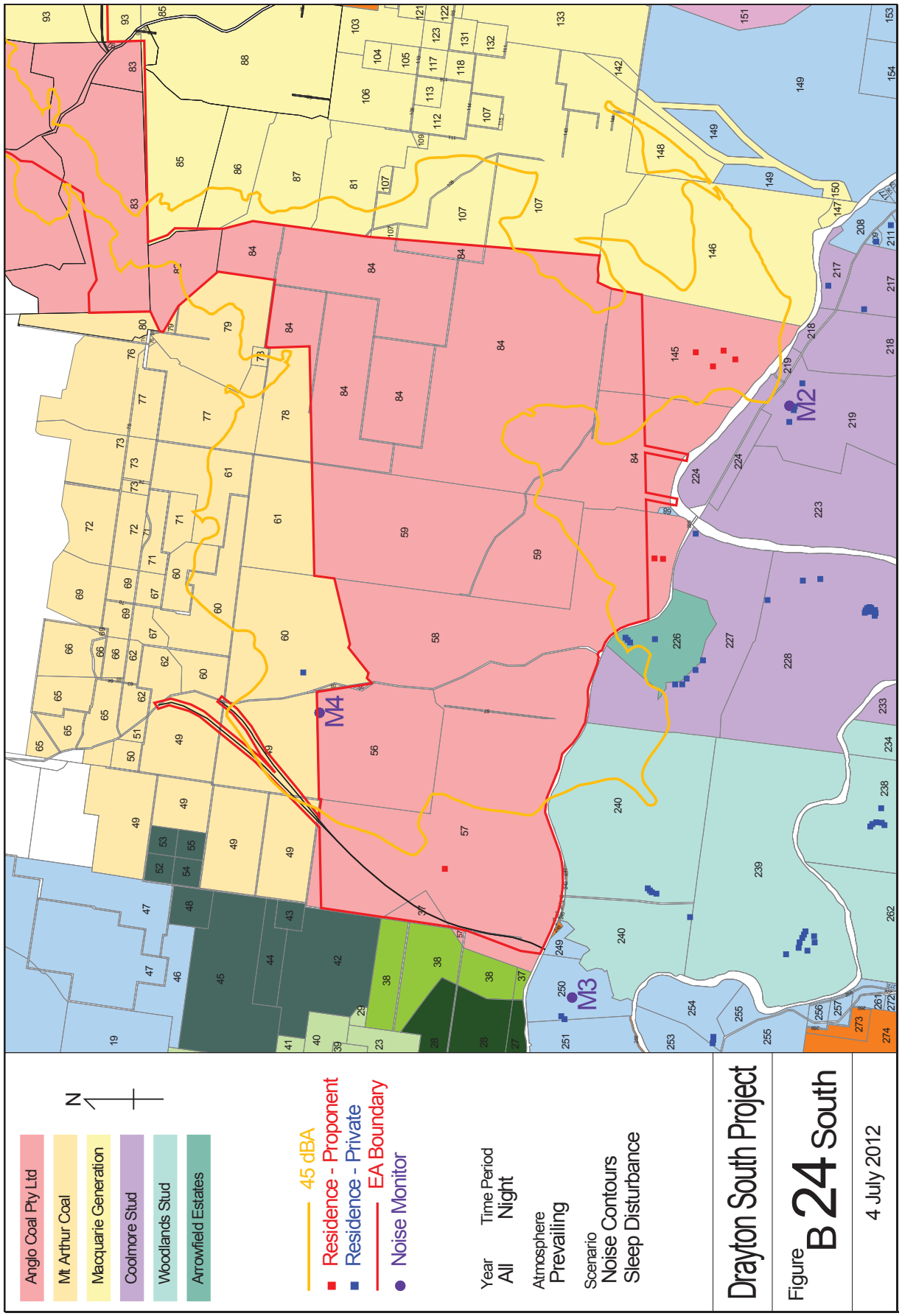

Anglo Coal Pty Ltd
Mt Arthur Coal
Macquarie Generation
Coolmore Stud
Woodlands Stud
Arrowfield Estates
N
30 dBA
35 dBA
40 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
Noise Monitor
Year
27
Time Period
Day
Atmosphere
Neutral
Scenario
Noise Contours
Normal Operation
M2
M3
M4
Drayton South Project
Figure B 19 South
4 July 2012

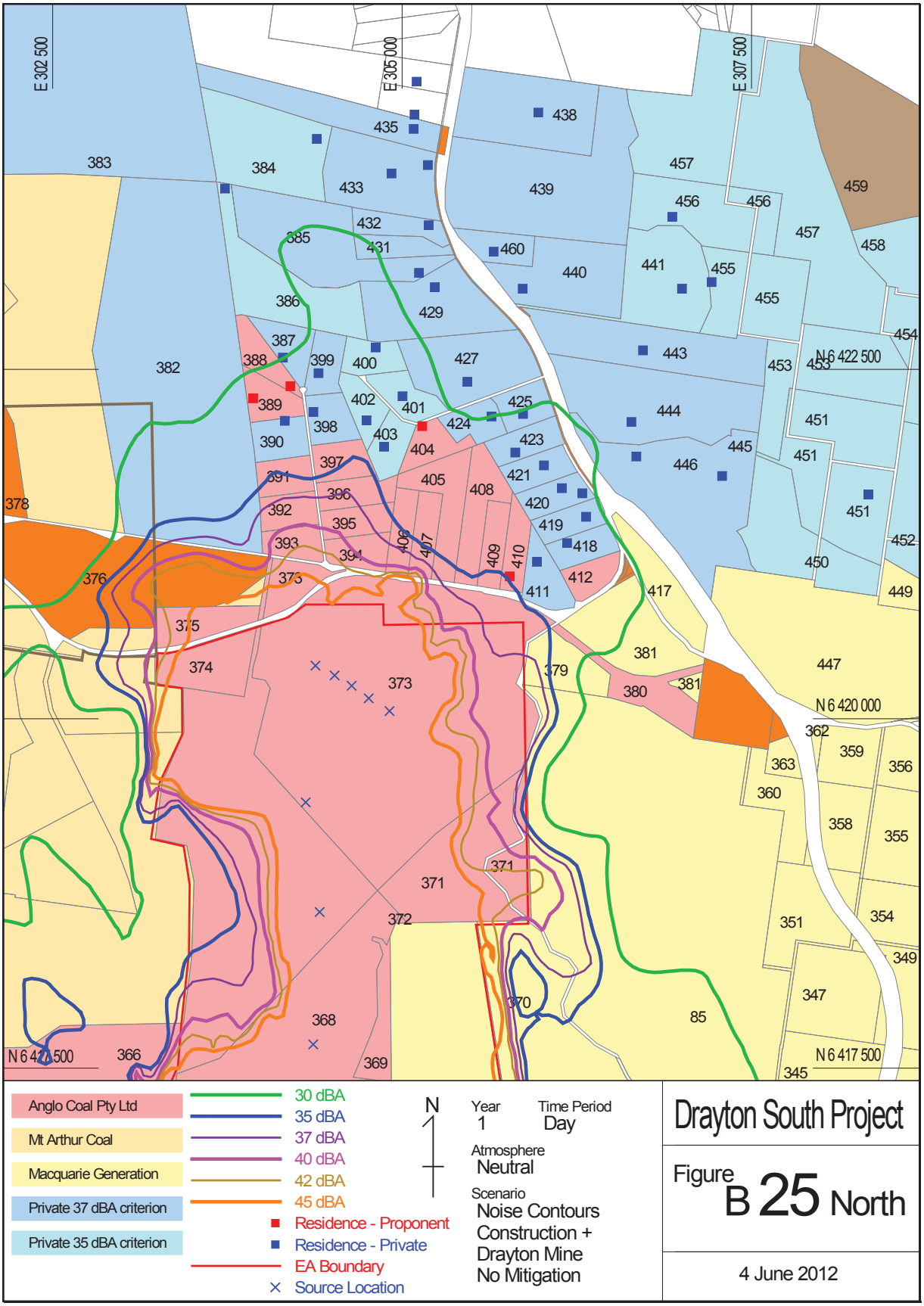

Anglo Coal Pty Ltd
Mt Arthur Coal
Macquarie Generation
Coolmore Stud
Woodlands Stud
Arrowfield Estates
N
30 dBA
35 dBA
40 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
Noise Monitor
Year
27
Time Period
Evening / Night
Atmosphere
Prevailing
Scenario
Noise Contours
Normal Operation
Drayton South Project
Figure B 20 South
4 July 2012
M1
M2
M3
M4

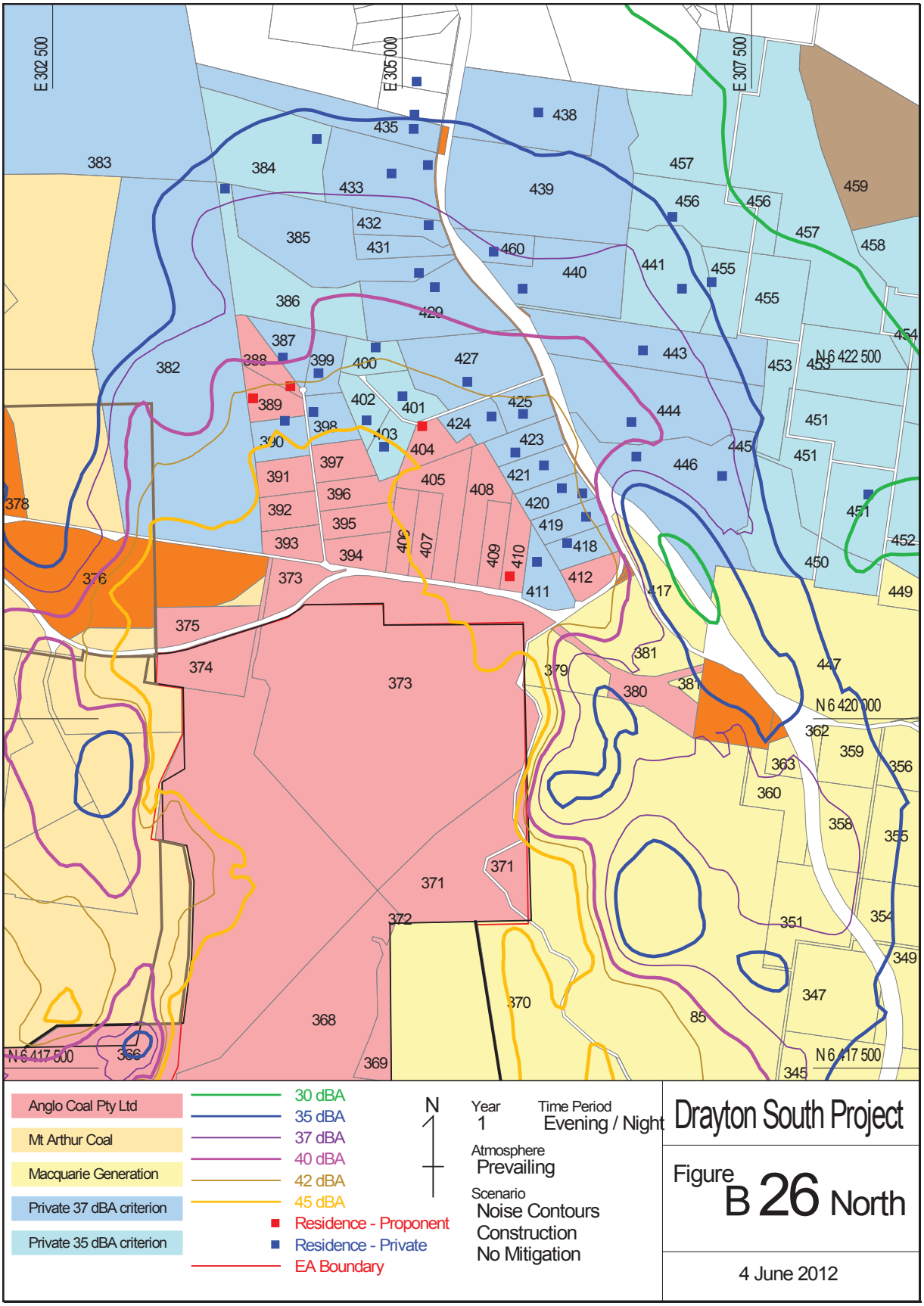

Anglo Coal Pty Ltd
Mt Arthur Coal
Macquarie Generation
Coolmore Stud
Woodlands Stud
Arrowfield Estates
N
30 dBA
35 dBA
40 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
Noise Monitor
Year All
Time Period Day
Atmosphere Neutral
Scenario Noise Contours Normal Operation
M2
M3
M4
Drayton South Project
Figure B 21 South
4 July 2012

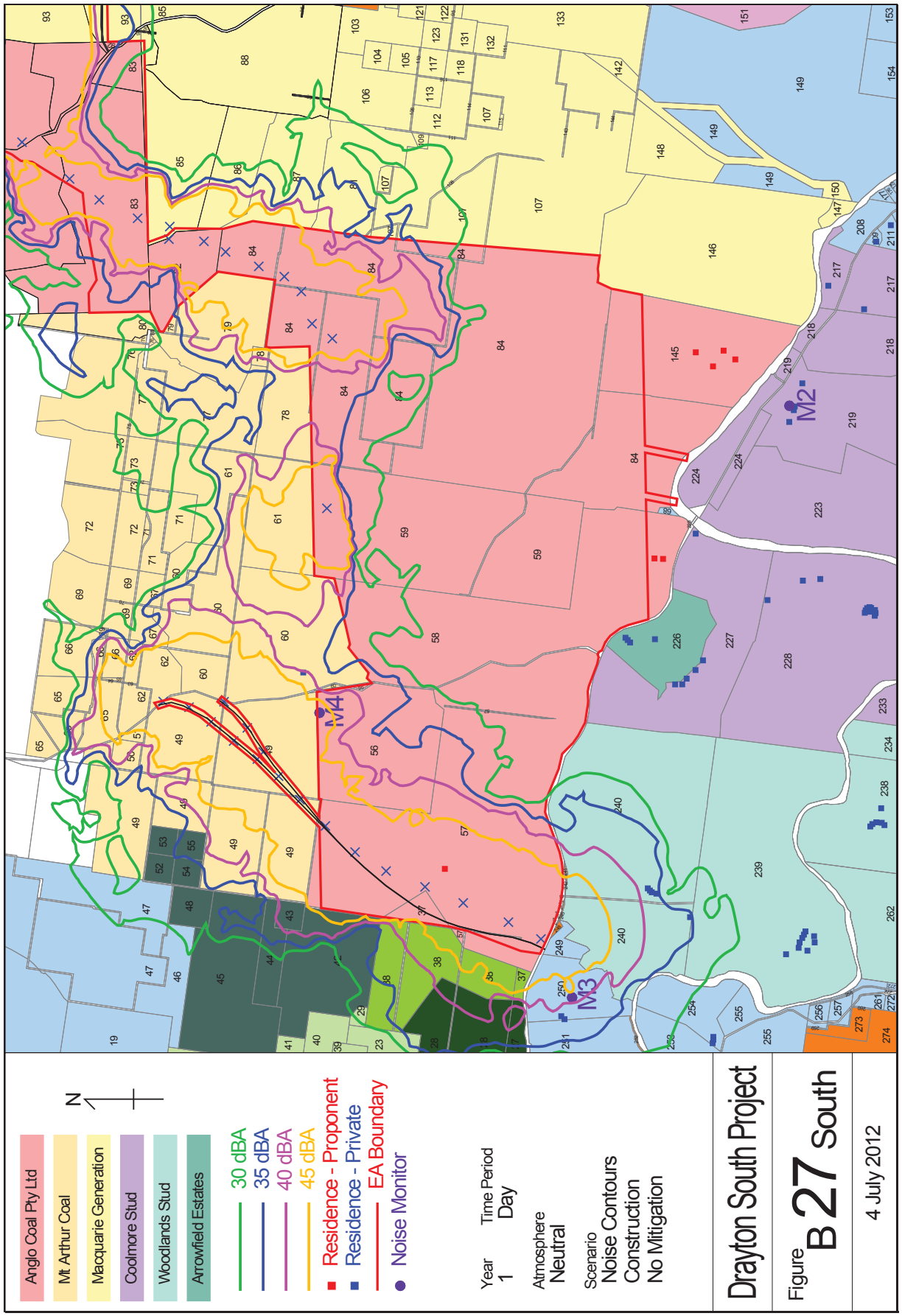

Anglo Coal Pty Ltd
Mt Arthur Coal
Macquarie Generation
Coolmore Stud
Woodlands Stud
Arrowfield Estates
N
30 dBA
35 dBA
40 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
Noise Monitor
Year
All
Time Period
Evening / Night
Atmosphere
Prevailing
Scenario
Noise Contours
Normal Operation
Drayton South Project
Figure B 22 South
4 July 2012
M2
M3
M4

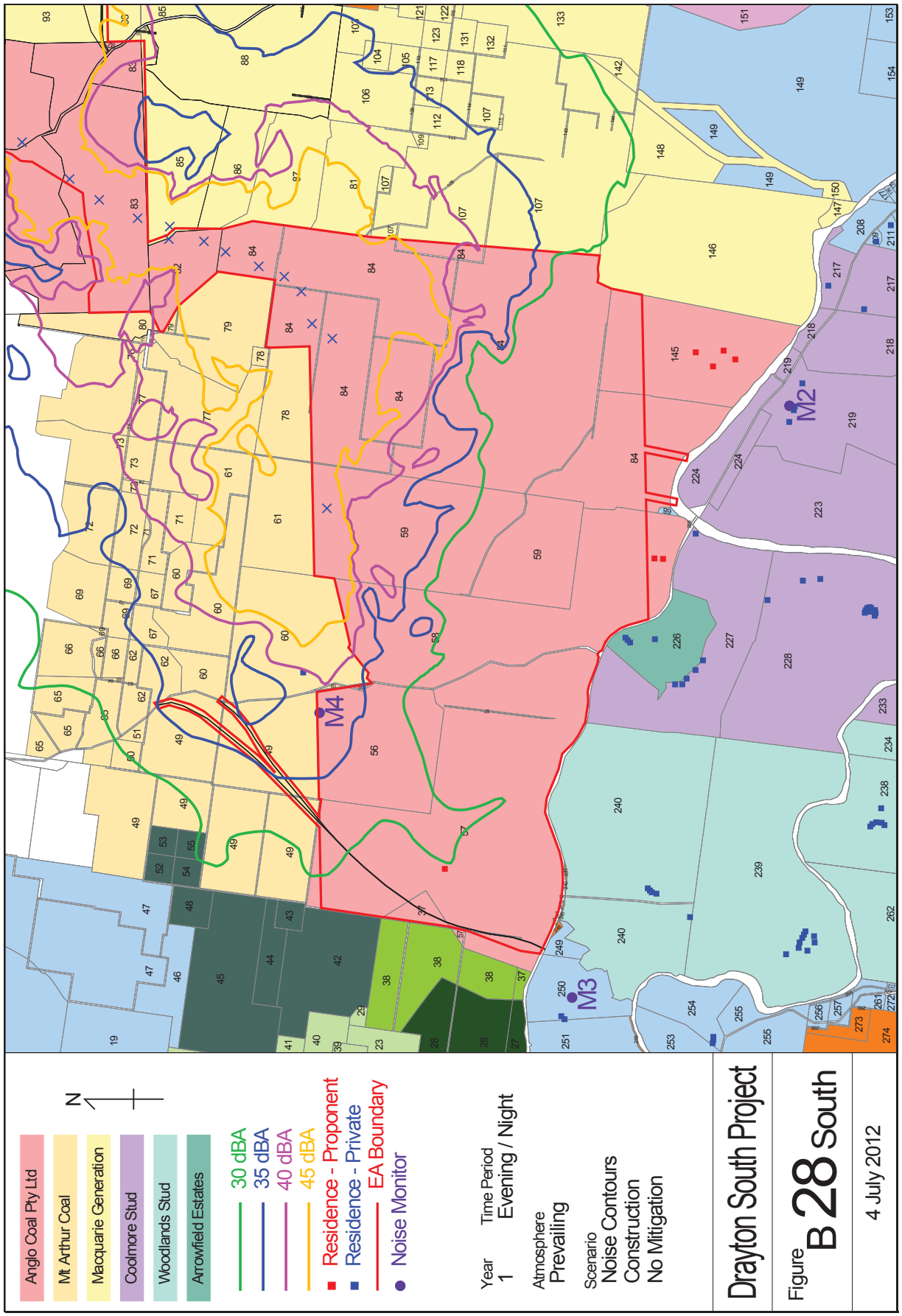

E 302 500
E 305 000
E 307 500
N 6 422 500
N 6 420 000
N 6 417 500
N 6 417 500
Anglo Coal Pty Ltd
Mt Arthur Coal
Macquarie Generation
Private 37 dBA criterion
Private 35 dBA criterion
Including Train Wagon Bunching
45 dBA
50 dBA
55 dBA
Excluding Train Wagon Bunching
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
N
Year
All
Time Period
Night
Atmosphere
Prevailing
Scenario
Noise Contours
Sleep Disturbance
Drayton Mine
Drayton South Project
Figure B 23 North
4 June 2012

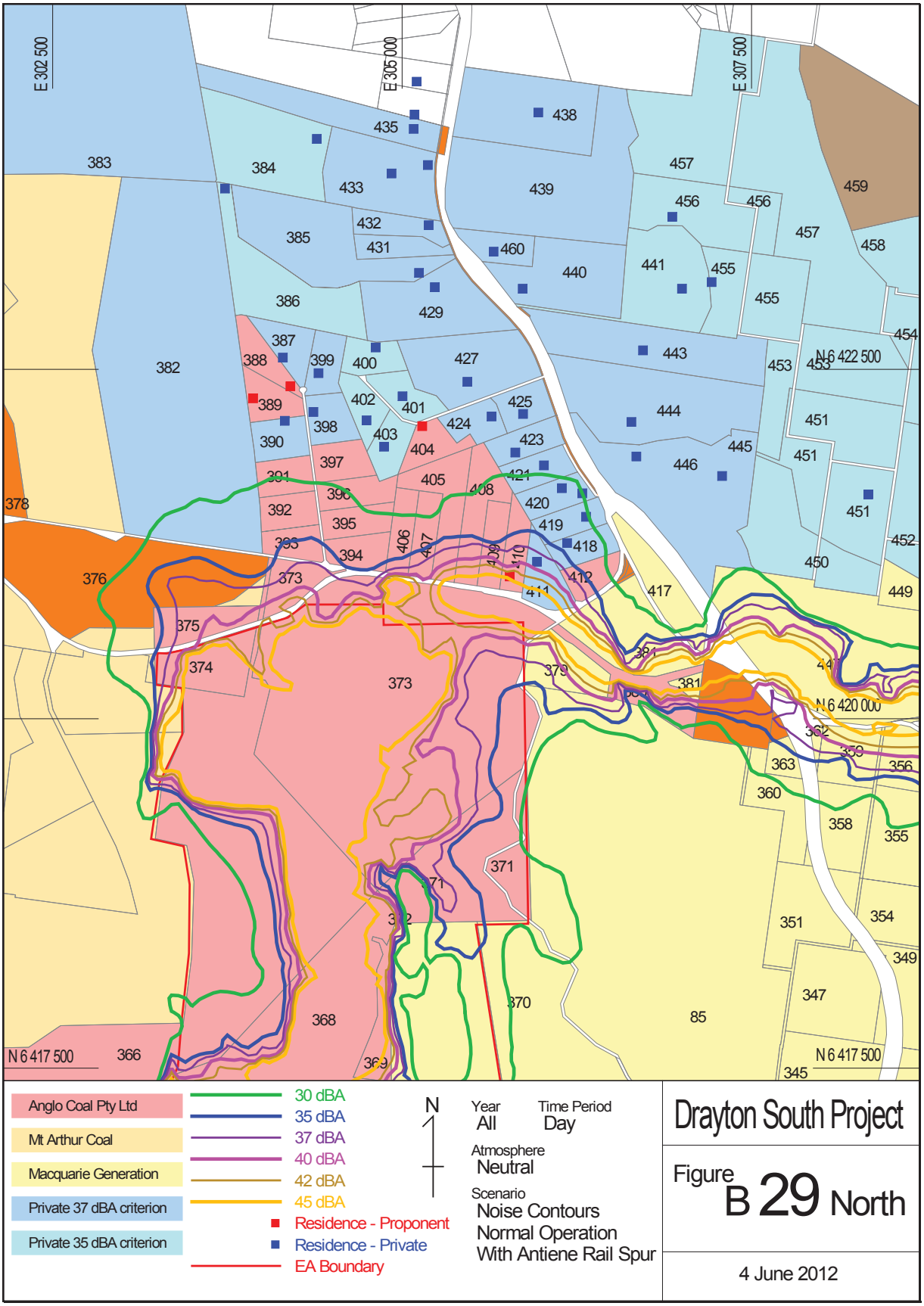

Anglo Coal Pty Ltd
Mt Arthur Coal
Macquarie Generation
Coolmore Stud
Woodlands Stud
Arrowfield Estates
N
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
Noise Monitor
Year All
Time Period Night
Atmosphere Prevailing
Scenario Noise Contours Sleep Disturbance
M2
M3
M4
Drayton South Project
Figure B 24 South
4 July 2012

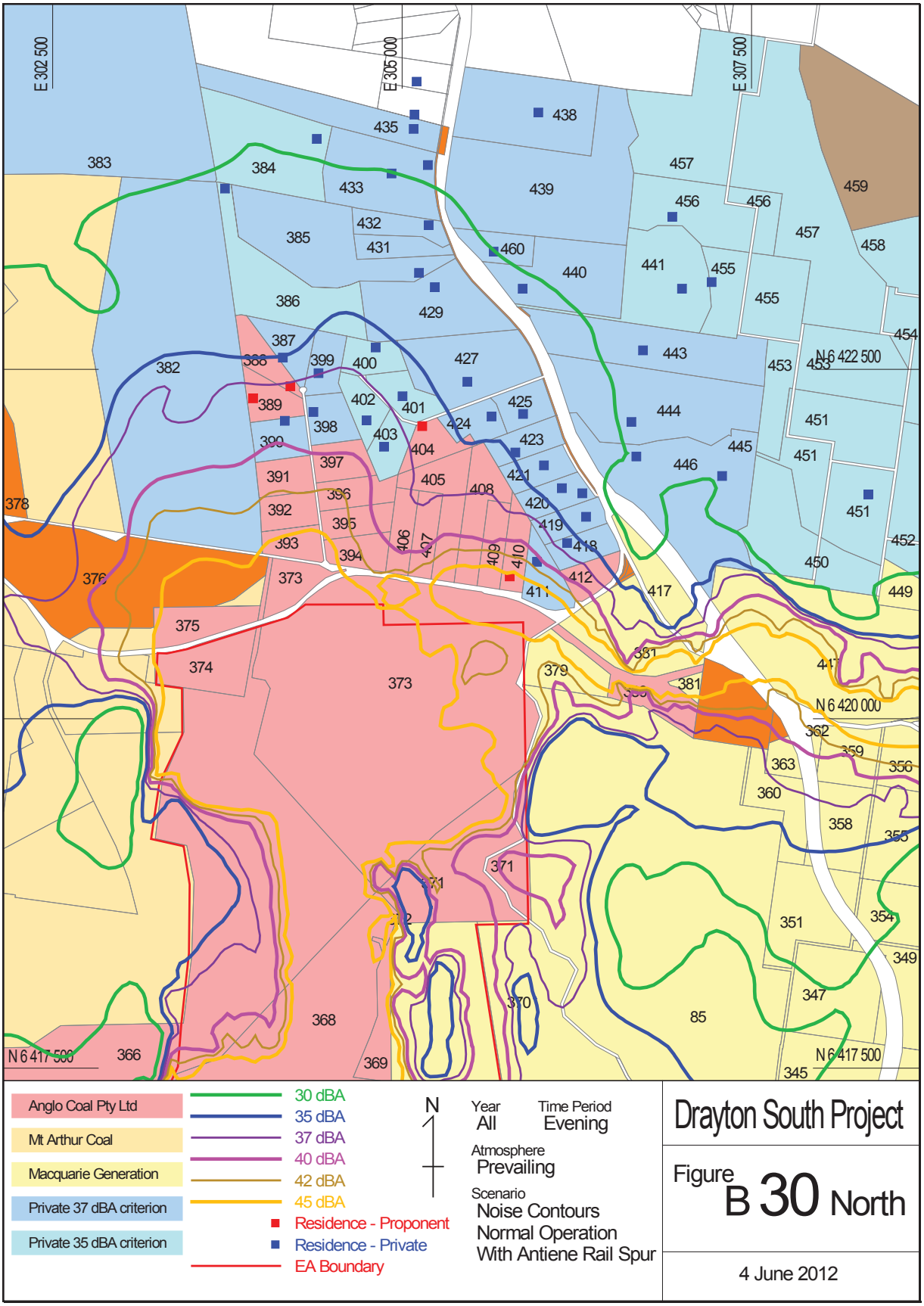

E 302 500
E 305 000
E 307 500
N 6 422 500
N 6 420 000
N 6 417 500
Anglo Coal Pty Ltd
Mt Arthur Coal
Macquarie Generation
Private 37 dBA criterion
Private 35 dBA criterion
30 dBA
35 dBA
37 dBA
40 dBA
42 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
Source Location
N
Year
1
Time Period
Day
Atmosphere
Neutral
Scenario
Noise Contours
Construction +
Drayton Mine
No Mitigation
Drayton South Project
Figure B 25 North
4 June 2012

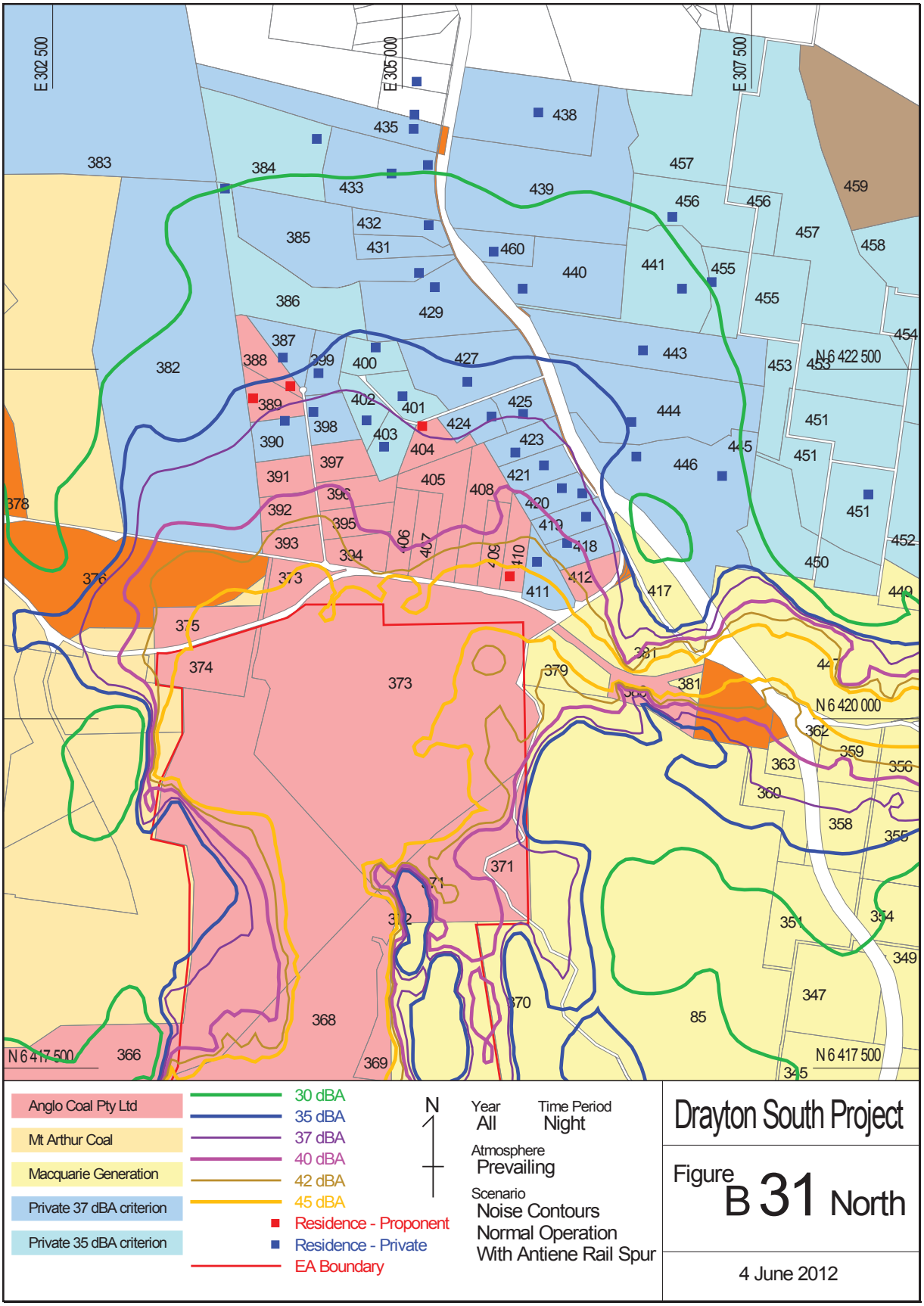

E 302 500
E 305 000
E 307 500
N 6 422 500
N 6 420 000
N 6 417 500
Anglo Coal Pty Ltd
Mt Arthur Coal
Macquarie Generation
Private 37 dBA criterion
Private 35 dBA criterion
30 dBA
35 dBA
37 dBA
40 dBA
42 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
N
Year
1
Time Period
Evening / Night
Atmosphere
Prevailing
Scenario
Noise Contours
Construction
No Mitigation
Drayton South Project
Figure B 26 North
4 June 2012

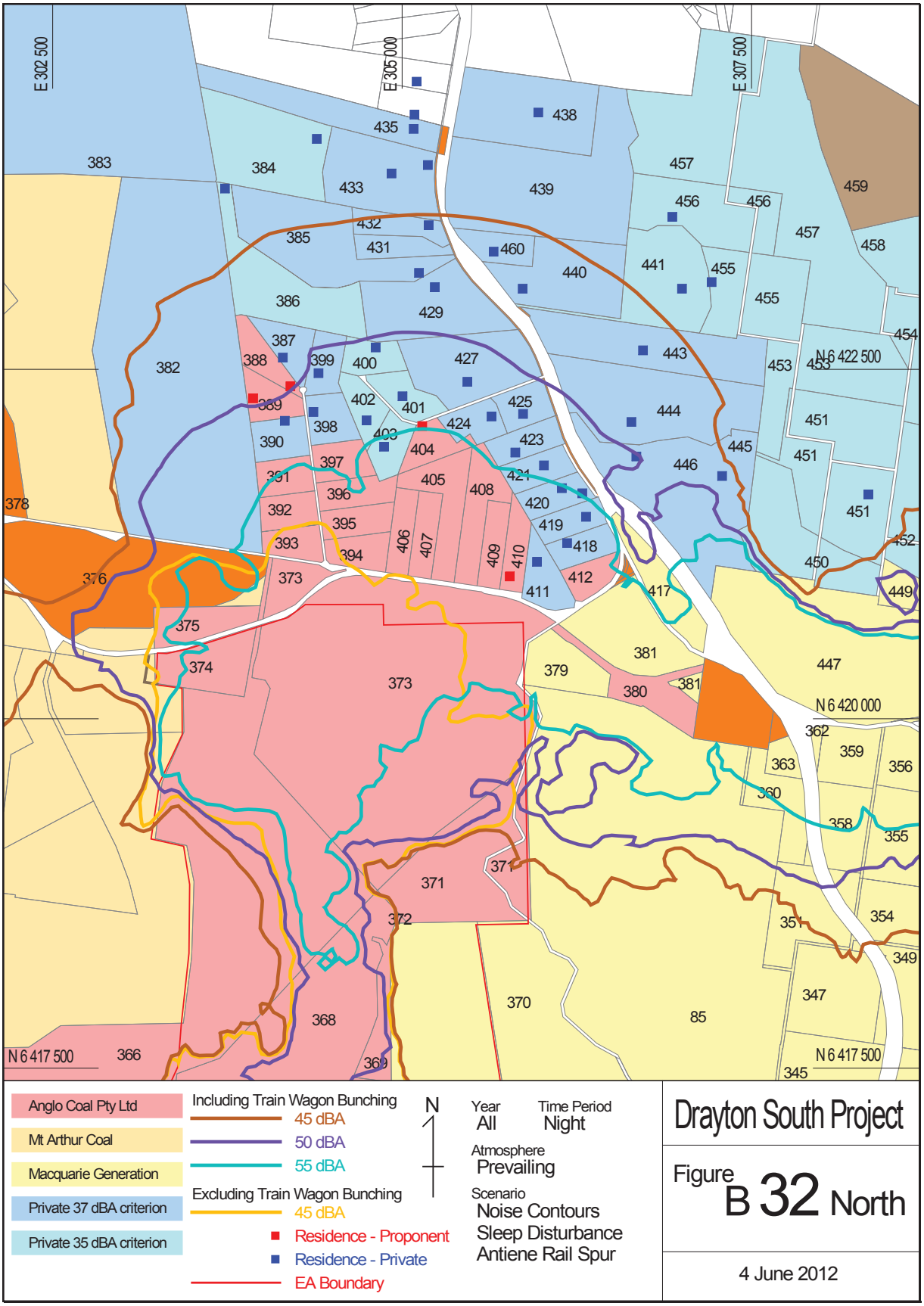

Anglo Coal Pty Ltd
Mt Arthur Coal
Macquarie Generation
Coolmore Stud
Woodlands Stud
Arrowfield Estates
30 dBA
35 dBA
40 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
Noise Monitor
N
Year 1
Time Period Day
Atmosphere Neutral
Scenario Noise Contours Construction No Mitigation
M2
M3
M4
Drayton South Project
Figure B 27 South
4 July 2012


Anglo Coal Pty Ltd
Mt Arthur Coal
Macquarie Generation
Coolmore Stud
Woodlands Stud
Arrowfield Estates
30 dBA
35 dBA
40 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
Noise Monitor
N
Year 1
Time Period Evening / Night
Atmosphere Prevailing
Scenario Noise Contours Construction No Mitigation
Drayton South Project
Figure B 28 South
4 July 2012
M2
M3
M4


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 Coal Pty Ltd
Mt Arthur Coal
Macquarie Generation
Private 37 dBA criterion
Private 35 dBA criterion
30 dBA
35 dBA
37 dBA
40 dBA
42 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
N
Year
All
Time Period
Day
Atmosphere
Neutral
Scenario
Noise Contours
Normal Operation
With Antiene Rail Spur
Drayton South Project
Figure B 29 North
4 June 2012

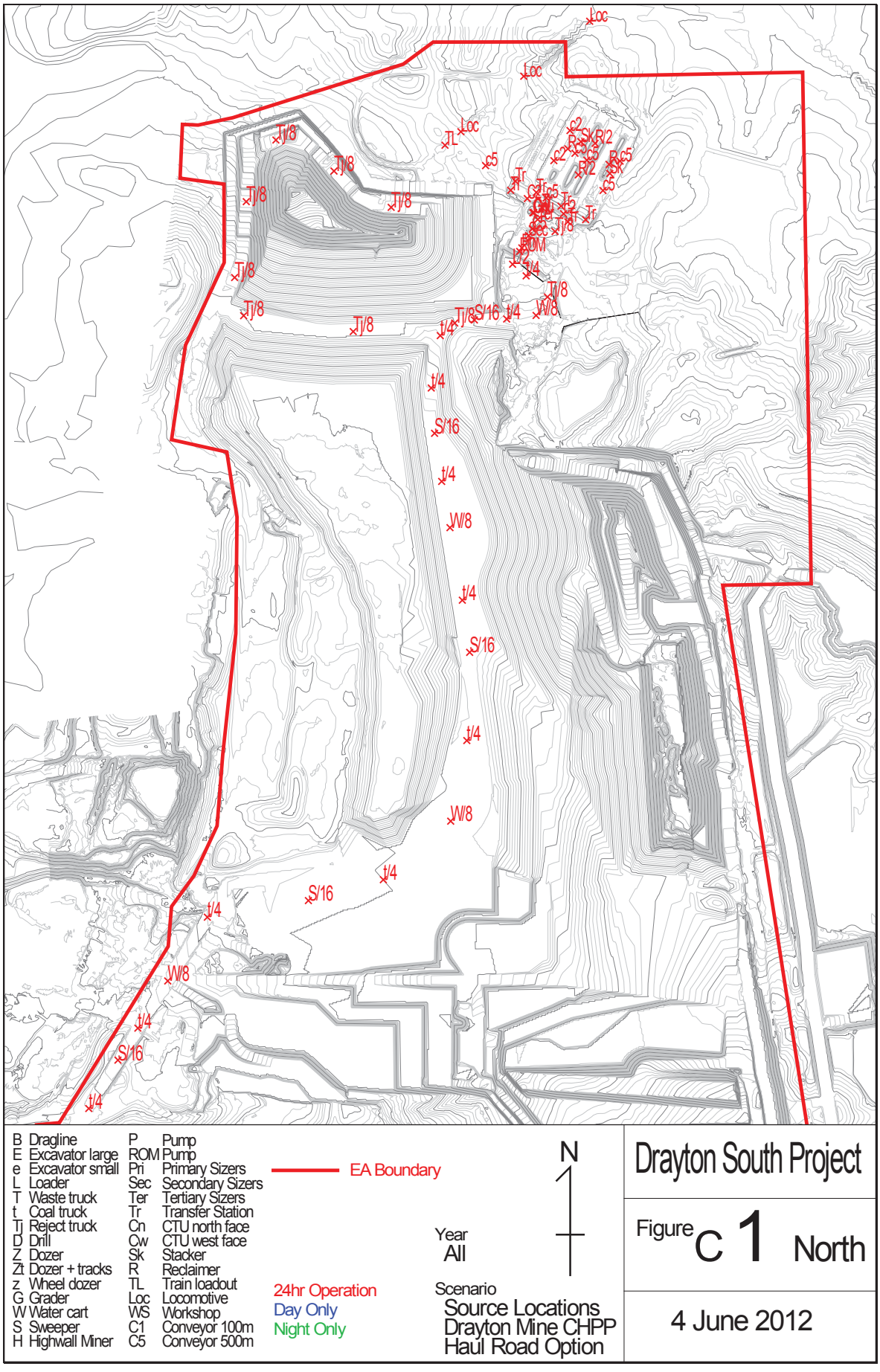

E 302 500
E 305 000
E 307 500
N 6 422 500
N 6 420 000
N 6 417 500
Anglo Coal Pty Ltd
Mt Arthur Coal
Macquarie Generation
Private 37 dBA criterion
Private 35 dBA criterion
30 dBA
35 dBA
37 dBA
40 dBA
42 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
N
Year
All
Time Period
Evening
Atmosphere
Prevailing
Scenario
Noise Contours
Normal Operation
With Antiene Rail Spur
Drayton South Project
Figure B 30 North
4 June 2012


E 302 500
E 305 000
E 307 500
N 6 422 500
N 6 420 000
N 6 417 500
Anglo Coal Pty Ltd
Mt Arthur Coal
Macquarie Generation
Private 37 dBA criterion
Private 35 dBA criterion
30 dBA
35 dBA
37 dBA
40 dBA
42 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
N
Year
All
Time Period
Night
Atmosphere
Prevailing
Scenario
Noise Contours
Normal Operation
With Antiene Rail Spur
Drayton South Project
Figure B 31 North
4 June 2012

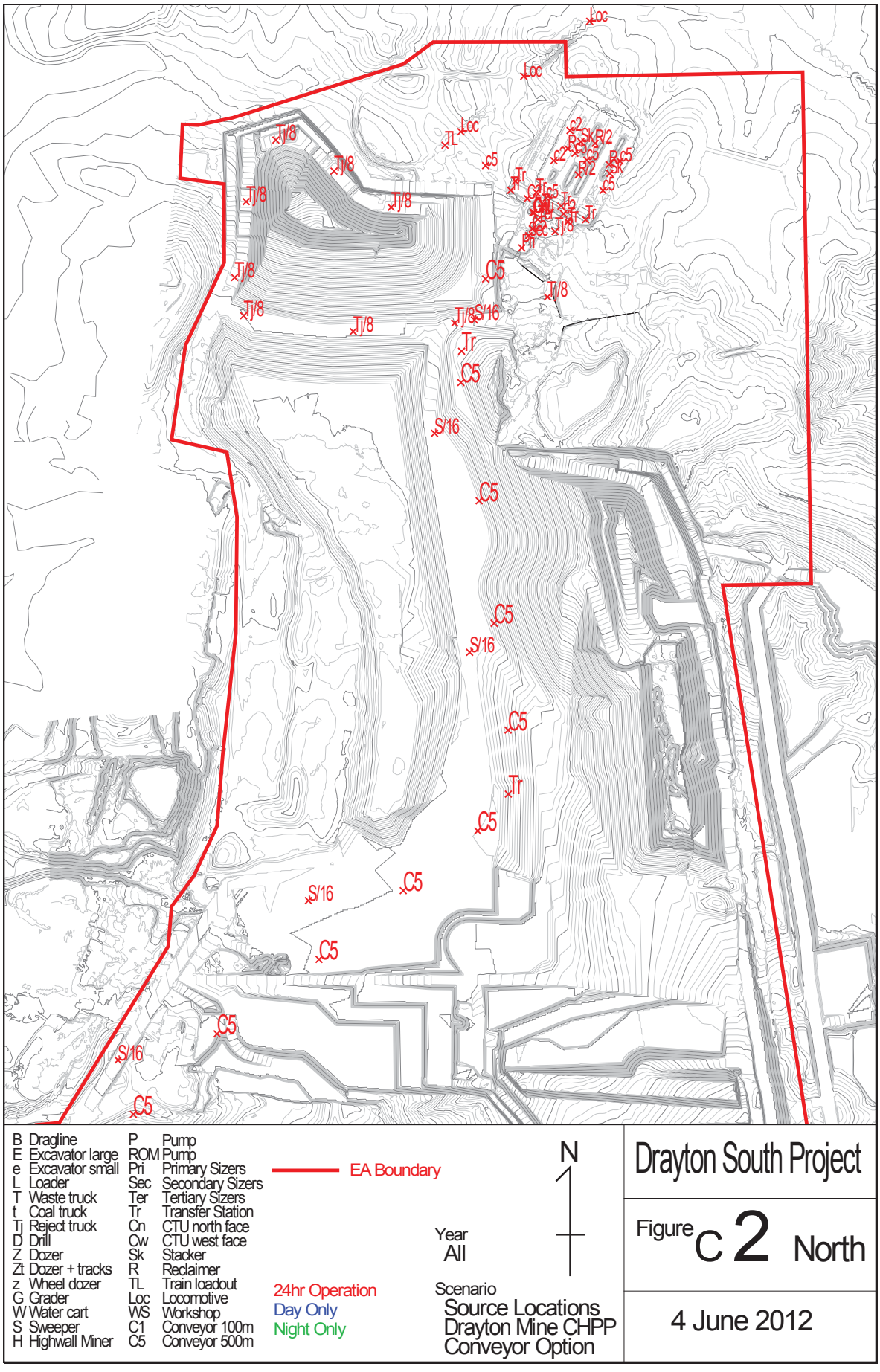

E 302 500
E 305 000
E 307 500
N 6 422 500
N 6 420 000
N 6 417 500
N 6 417 500
Anglo Coal Pty Ltd
Mt Arthur Coal
Macquarie Generation
Private 37 dBA criterion
Private 35 dBA criterion
Including Train Wagon Bunching
45 dBA
50 dBA
55 dBA
Excluding Train Wagon Bunching
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
N
Year
All
Time Period
Night
Atmosphere
Prevailing
Scenario
Noise Contours
Sleep Disturbance
Antiene Rail Spur
Drayton South Project
Figure B 32 North
4 June 2012

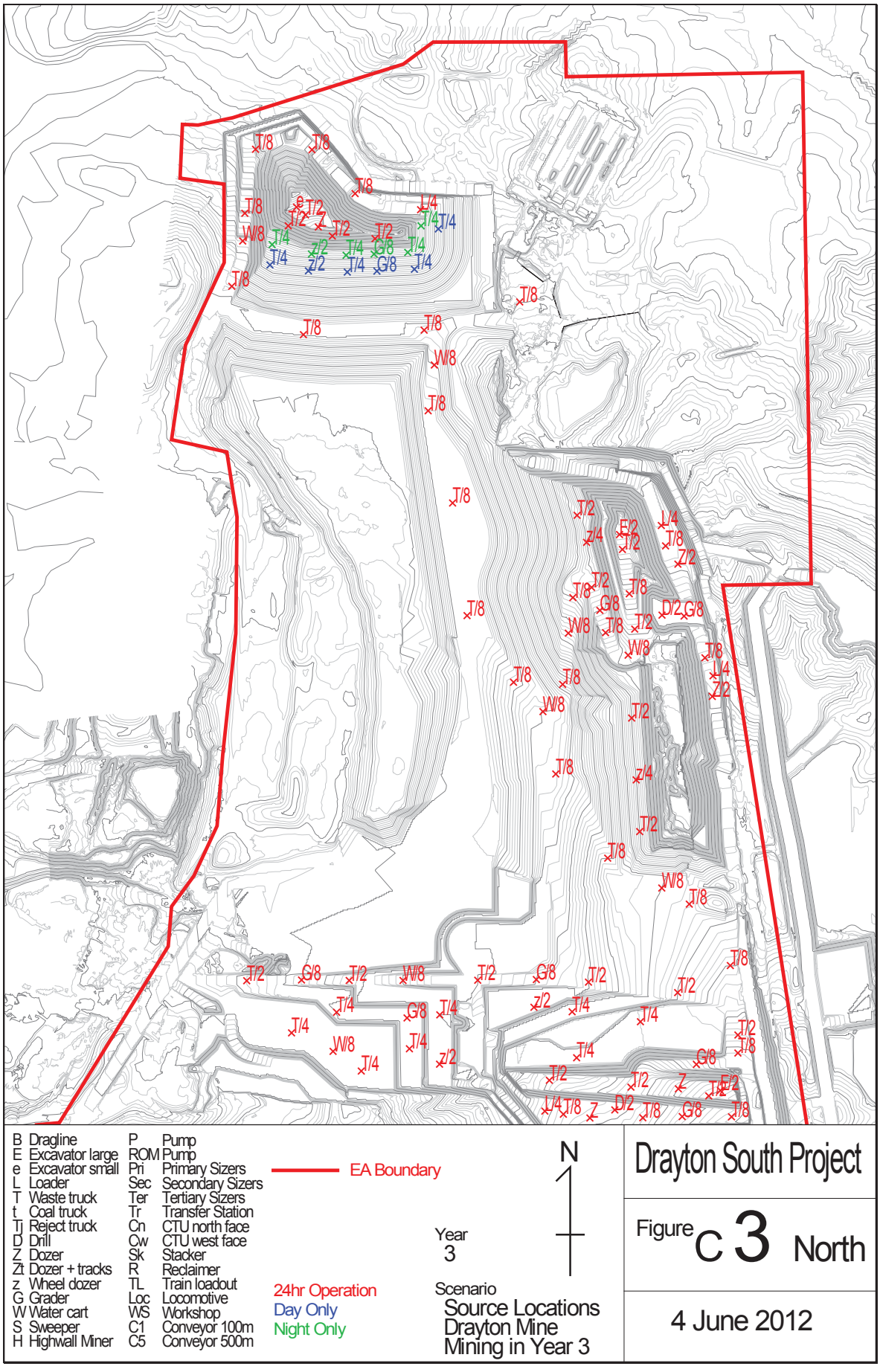
APPENDIX C – NOISE SOURCE LOCATION FIGURES

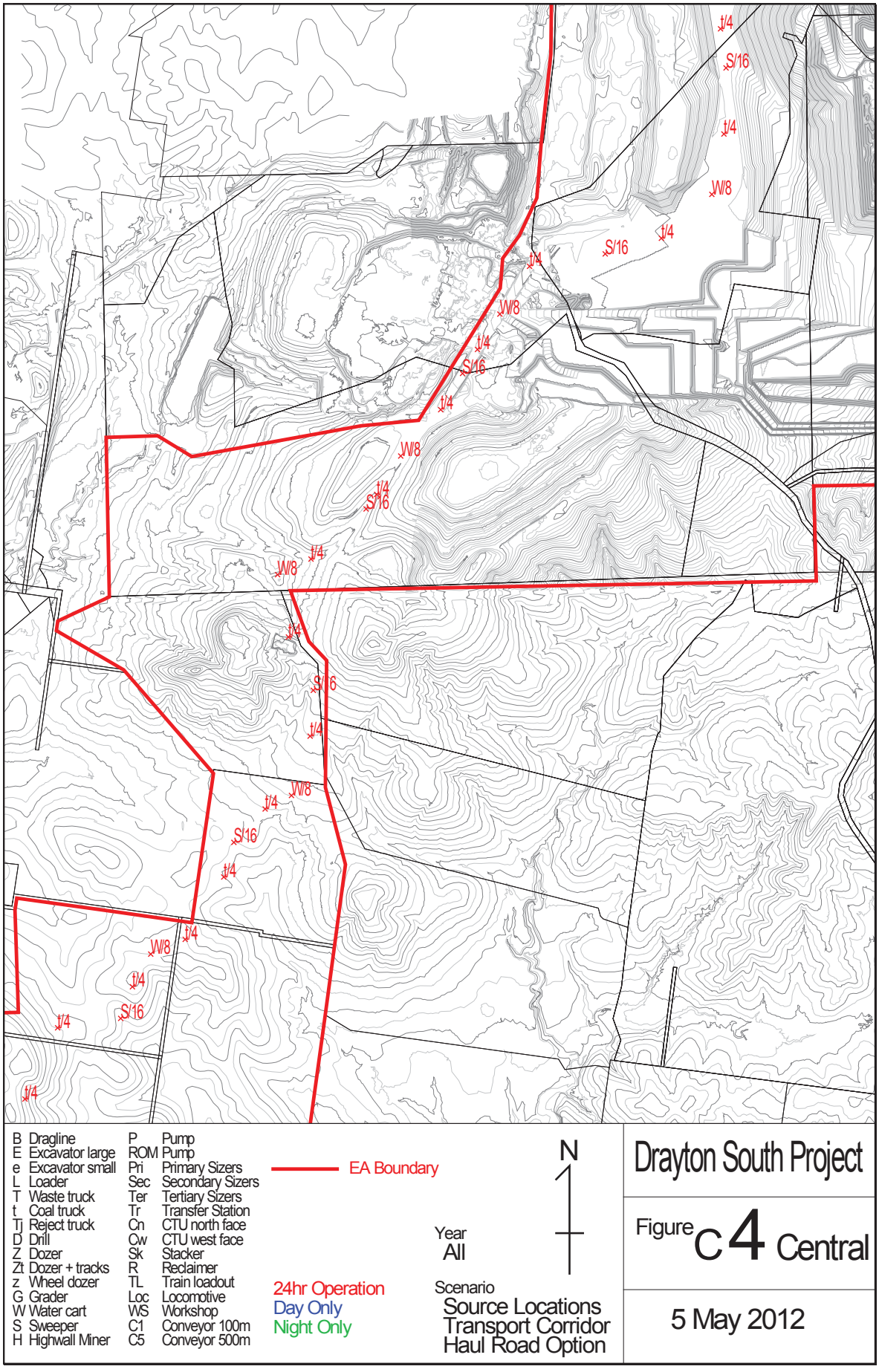
FIGURE	NOISE SOURCE LOCATION FIGURE	
C1 North	All years	Drayton Mine CHPP and haul road option
C2 North	All years	Drayton Mine CHPP and conveyor option
C3 North	Year 3	Drayton Mine – additional Drayton Mine Year 3 sources
C4 Central	All years	Transportation corridor – haul road option
C5 Central	All years	Transportation corridor – conveyor option
C6 South	Year 3A	Drayton South
C7 South	Year 3B	Drayton South
C8 South	Year 5	Drayton South
C9 South	Year 10	Drayton South
C10 South	Year 15	Drayton South
C11 South	Year 20	Drayton South
C12 South	Year 27	Drayton South
C13 North	All years	Antiene Rail Spur

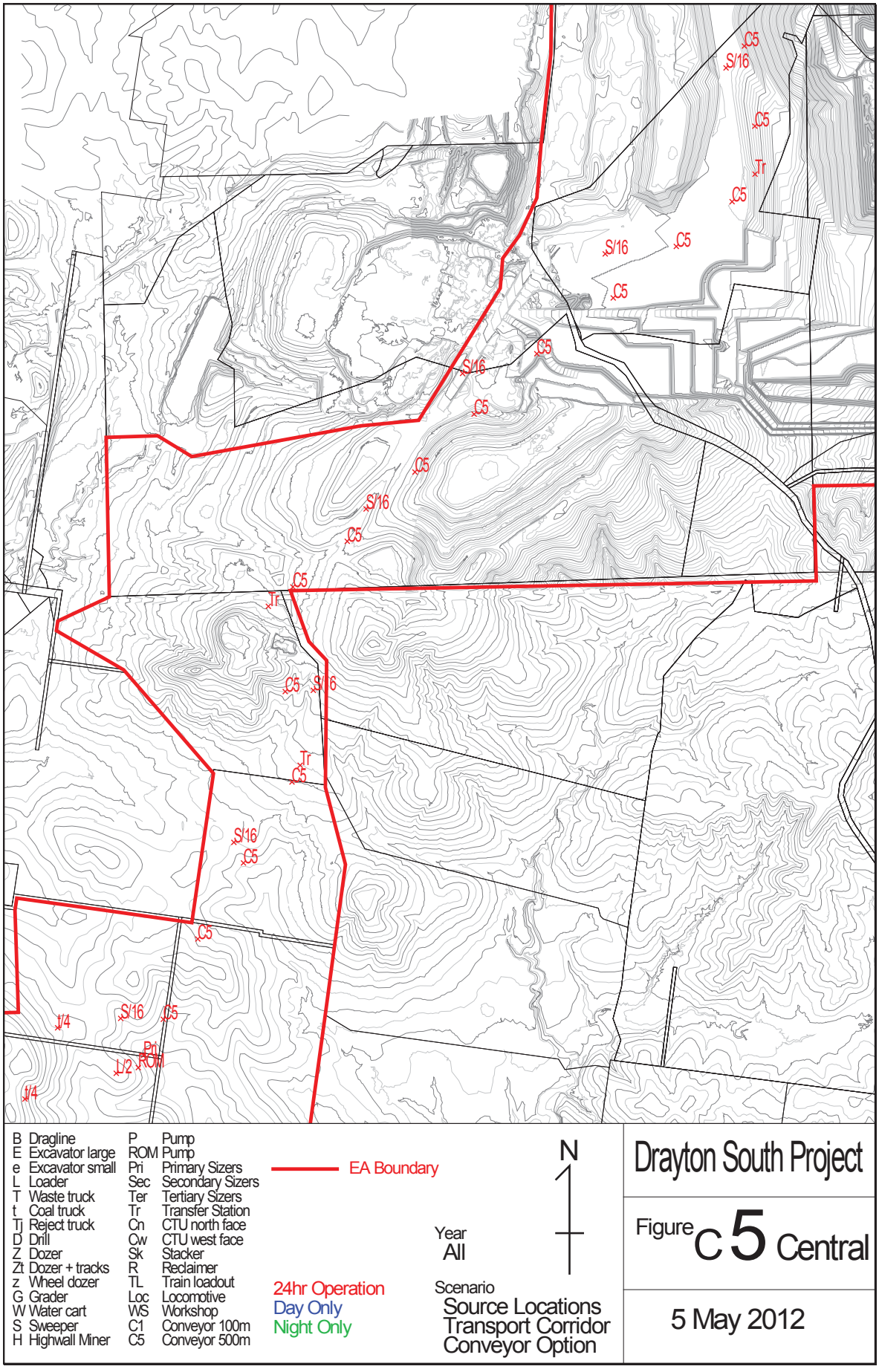


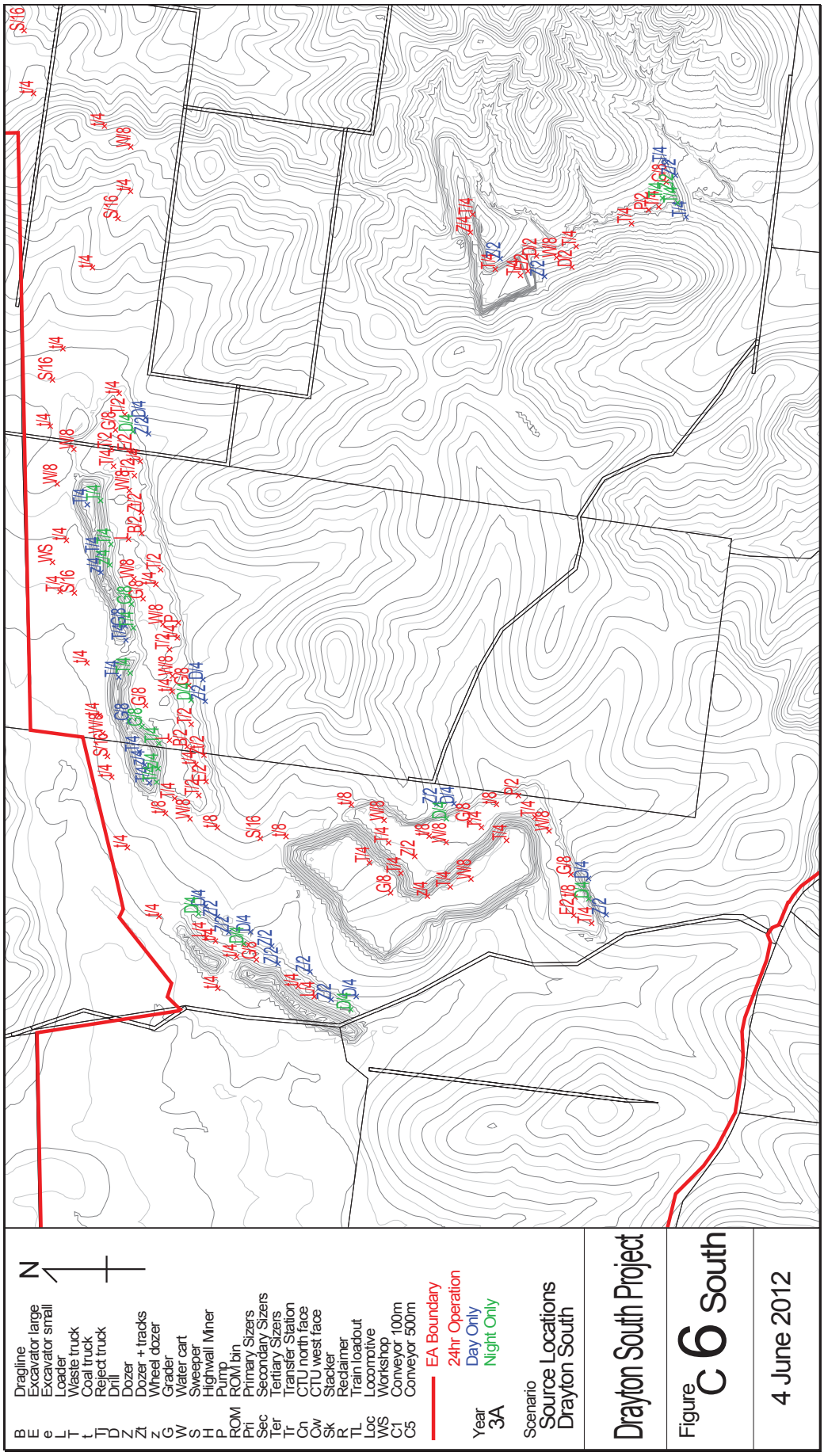
BRIDGES Acoustics

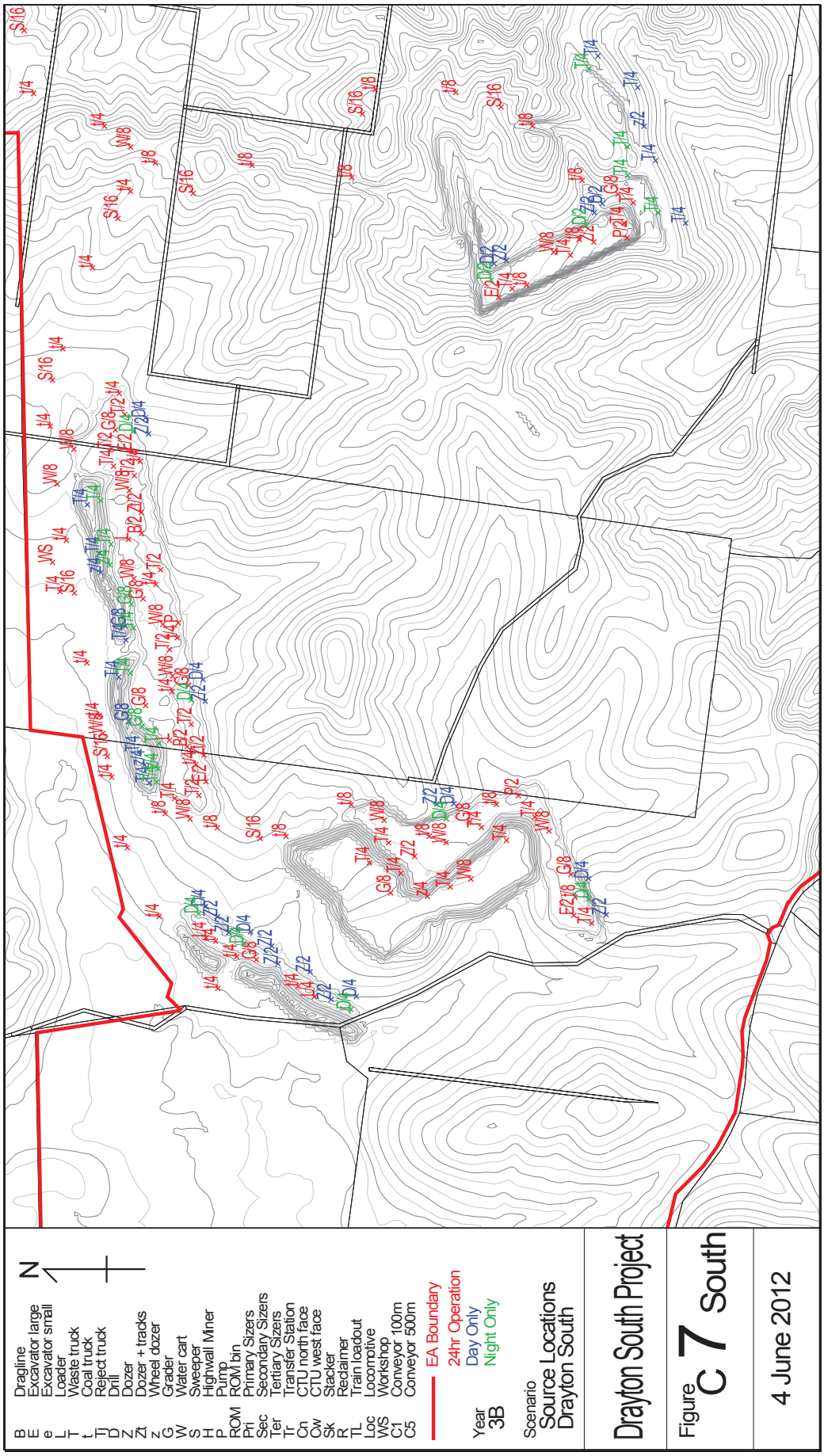

B Dragline
E Excavator large
e Excavator small
L Loader
T Waste truck
t Coal truck
Tj Reject truck
D Drill
Z Dozer
Zt Dozer + tracks
z Wheel dozer
G Grader
W Water cart
S Sweeper
H Highwall Miner
P Pump
ROM Pump
Pri Primary Sizers
Sec Secondary Sizers
Ter Tertiary Sizers
Tr Transfer Station
Cn CTU north face
Cw CTU west face
Sk Stacker
R Reclaimer
TL Train loadout
Loc Locomotive
WS Workshop
C1 Conveyor 100m
C5 Conveyor 500m
EA Boundary
24hr Operation
Day Only
Night Only
N
Year
All
Scenario
Source Locations
Drayton Mine CHPP
Conveyor Option
Drayton South Project
Figure C 2 North
4 June 2012

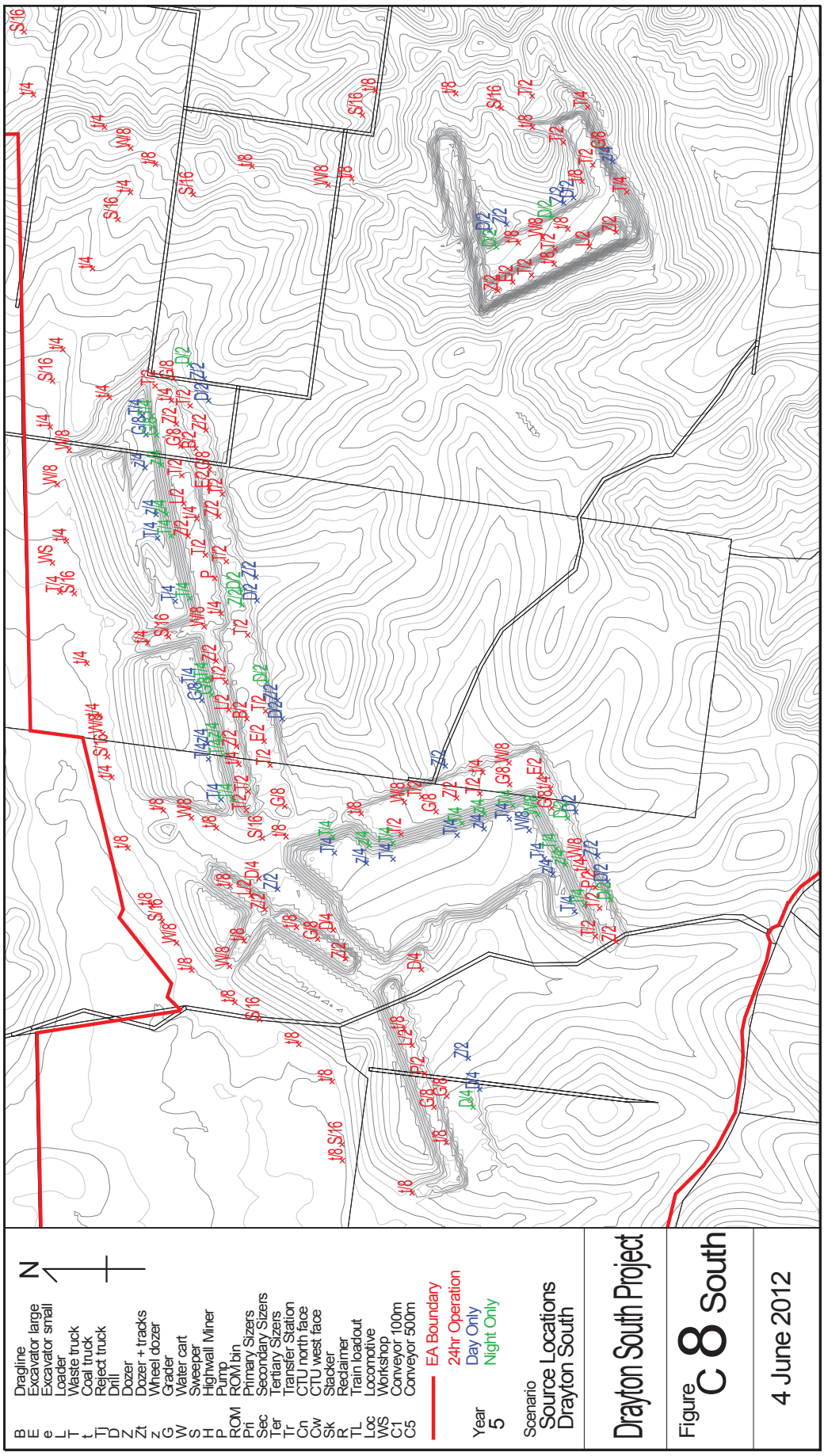

B Dragline
E Excavator large
e Excavator small
L Loader
T Waste truck
t Coal truck
Tj Reject truck
D Drill
Z Dozer
Zt Dozer + tracks
z Wheel dozer
G Grader
W Water cart
S Sweeper
H Highwall Miner
P Pump
ROM Pump
Pri Primary Sizers
Sec Secondary Sizers
Ter Tertiary Sizers
Tr Transfer Station
Cn CTU north face
Cw CTU west face
Sk Stacker
R Reclaimer
TL Train loadout
Loc Locomotive
WS Workshop
C1 Conveyor 100m
C5 Conveyor 500m
EA Boundary
24hr Operation
Day Only
Night Only
N
Year 3
Scenario
Source Locations
Drayton Mine
Mining in Year 3
Drayton South Project
Figure C 3 North
4 June 2012

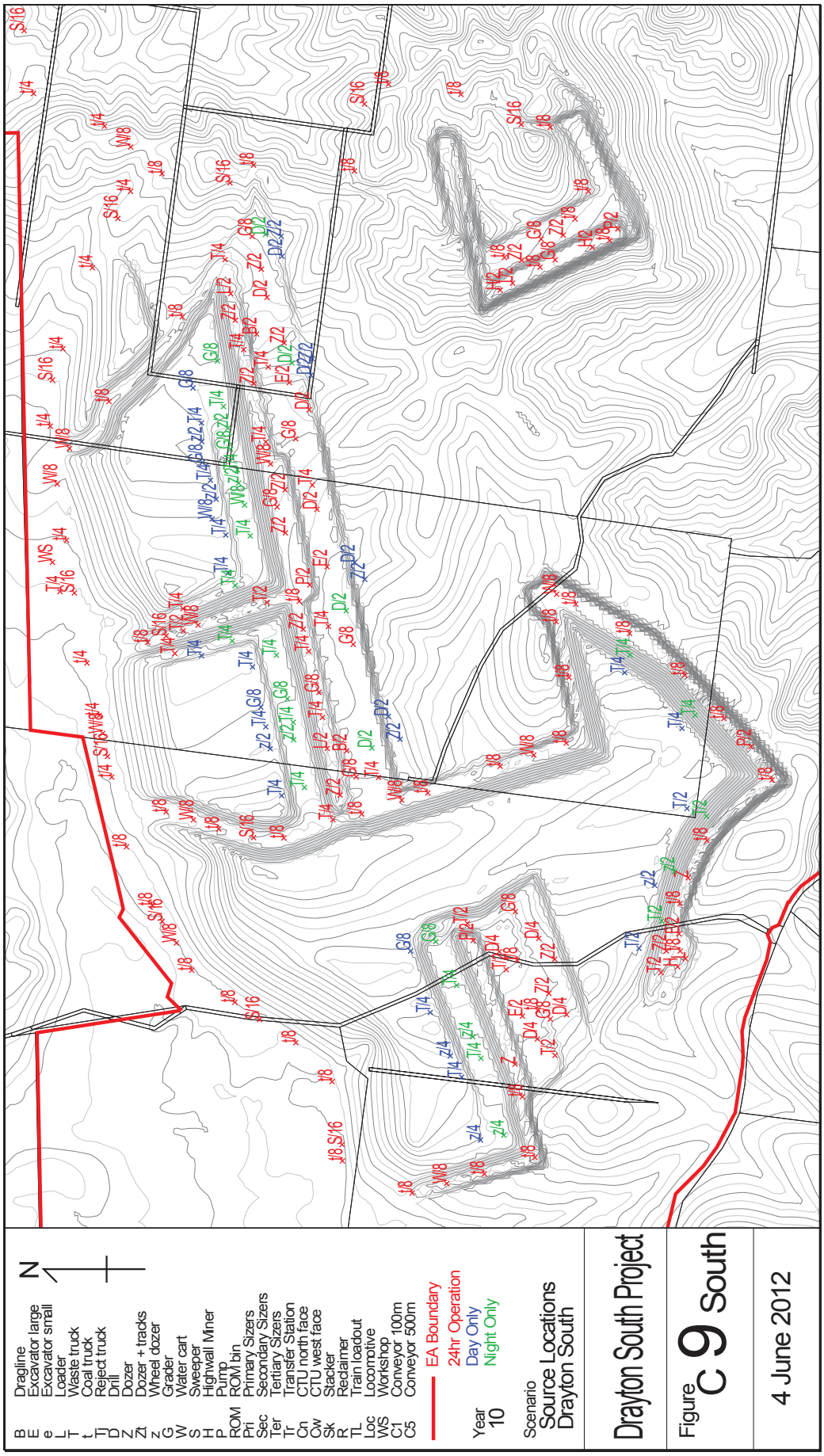

t/4
S/16
t/4
W/8
S/16
t/4
t/4
W/8
t/4
S/16
t/4
W/8
S/16
t/4
W/8
t/4
S/16
t/4
W/8
t/4
S/16
t/4
W/8
t/4
S/16
t/4
B Dragline
E Excavator large
e Excavator small
L Loader
T Waste truck
t Coal truck
Tj Reject truck
D Drill
Z Dozer
Zt Dozer + tracks
z Wheel dozer
G Grader
W Water cart
S Sweeper
H Highwall Miner
P Pump
ROM Pump
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
C1 Conveyor 100m
C5 Conveyor 500m
EA Boundary
24hr Operation
Day Only
Night Only
N
Year
All
Scenario
Source Locations
Transport Corridor
Haul Road Option
Drayton South Project
Figure C4 Central
5 May 2012

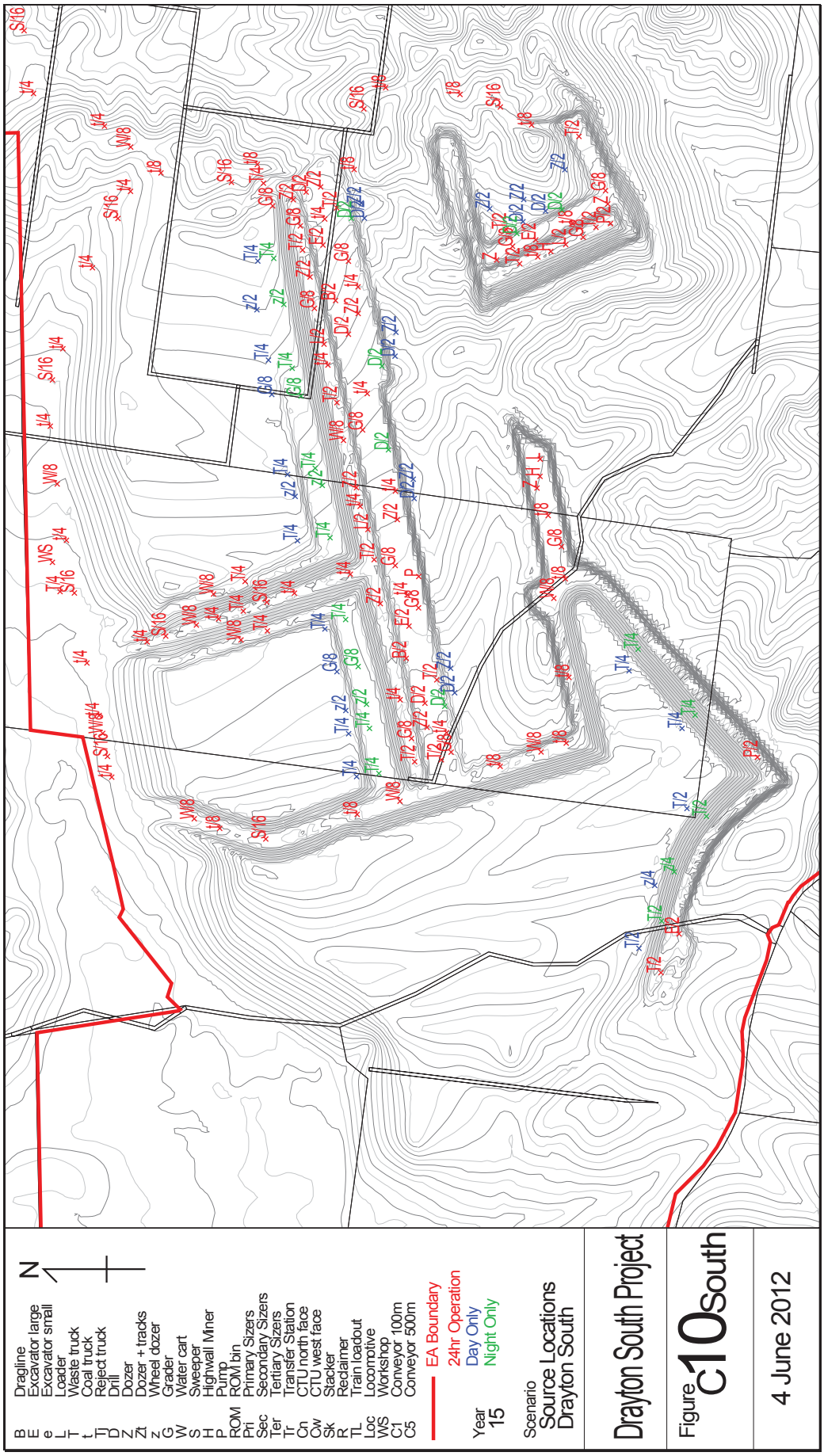

C5
S/16
Tr
B Dragline
E Excavator large
e Excavator small
L Loader
T Waste truck
t Coal truck
Tj Reject truck
D Drill
Z Dozer
Zt Dozer + tracks
z Wheel dozer
G Grader
W Water cart
S Sweeper
H Highwall Miner
P Pump
ROM Pump
Pri Primary Sizers
Sec Secondary Sizers
Ter Tertiary Sizers
Tr Transfer Station
Cn CTU north face
Cw CTU west face
Sk Stacker
R Reclaimer
TL Train loadout
Loc Locomotive
WS Workshop
C1 Conveyor 100m
C5 Conveyor 500m
EA Boundary
24hr Operation
Day Only
Night Only
N
Year
All
Scenario
Source Locations
Transport Corridor
Conveyor Option
Drayton South Project
Figure C5 Central
5 May 2012

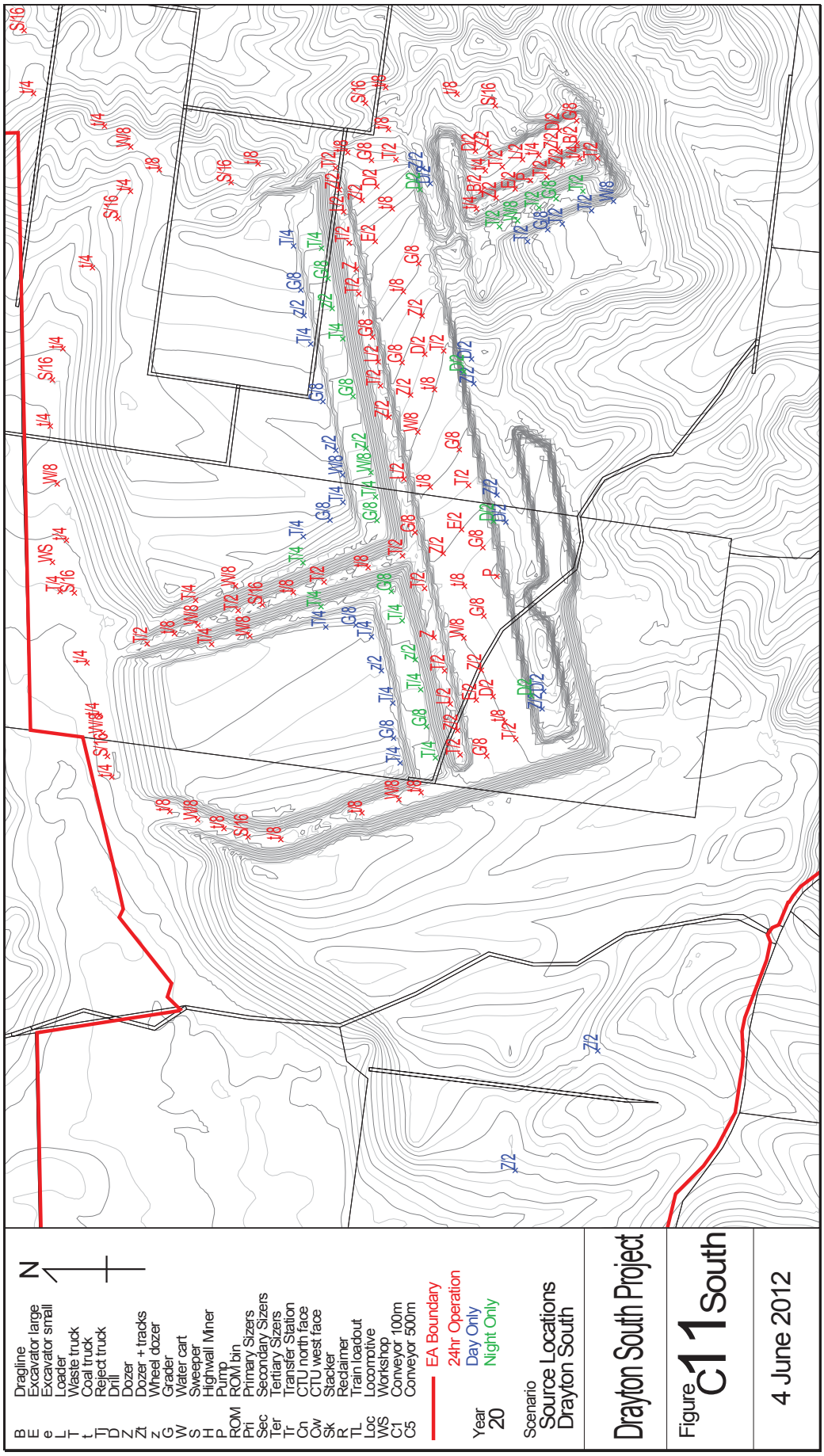

B Dragline
E Excavator large
e Excavator small
L Loader
T Waste truck
t Coal truck
Tj Reject truck
D Drill
Z Dozer
Zt Dozer + tracks
z Wheel dozer
G Grader
W Water cart
S Sweeper
H Highwall Miner
P Pump
ROM ROM bin
Pri Primary Sizers
Sec Secondary Sizers
Ter Tertiary Sizers
Tr Transfer Station
Cn CTU north face
Cw CTU west face
Sk Stacker
R Reclaimer
TL Train loadout
Loc Locomotive
WS Workshop
C1 Conveyor 100m
C5 Conveyor 500m
N
EA Boundary
24hr Operation
Day Only
Night Only
Year 3A
Scenario Source Locations Drayton South
Drayton South Project
Figure C 6 South
4 June 2012

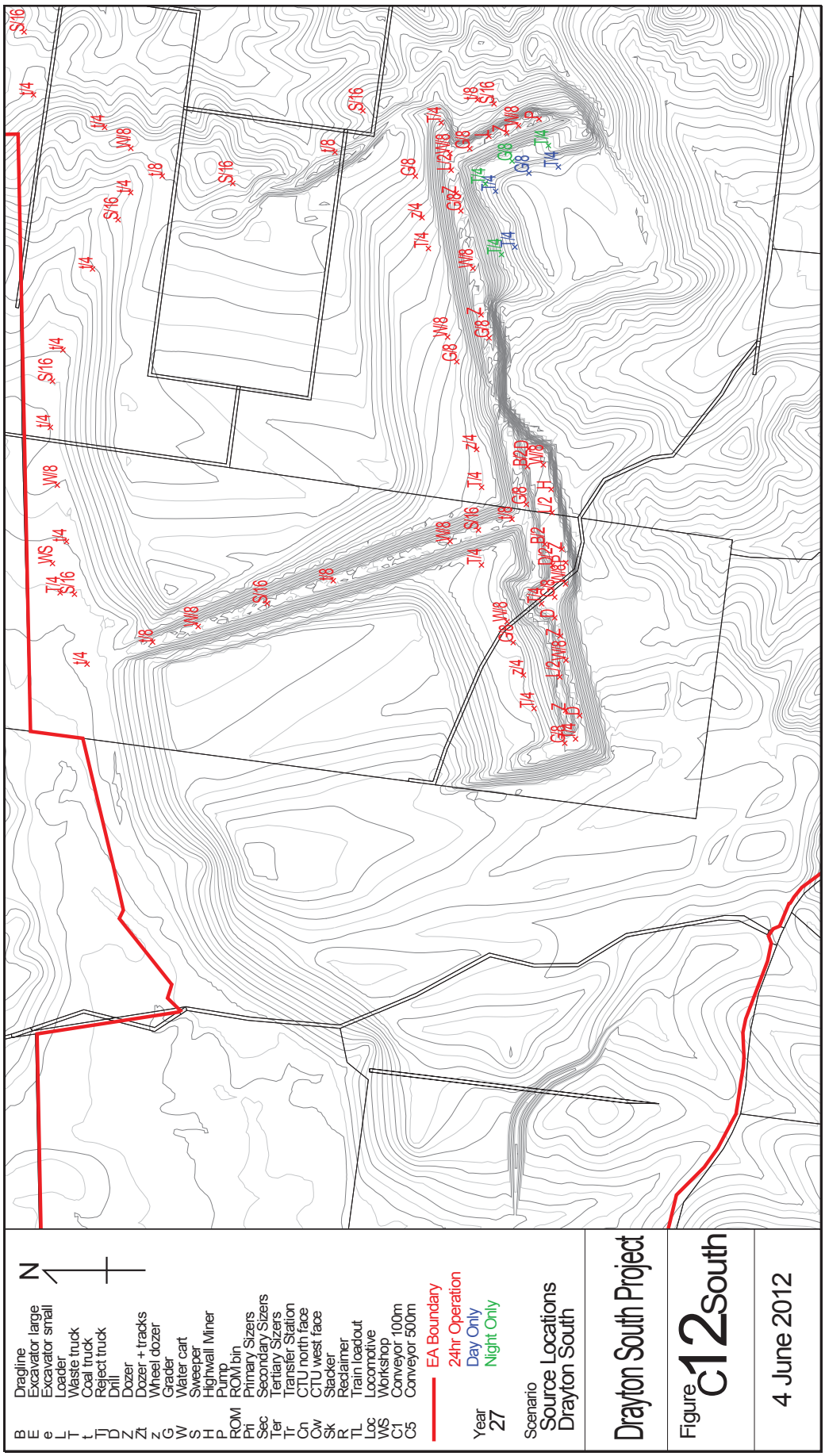

N
B Dragline
E Excavator large
e Excavator small
L Loader
T Waste truck
t Coal truck
Tj Reject truck
D Drill
Z Dozer
Zt Dozer + tracks
z Wheel dozer
G Grader
W Water cart
S Sweeper
H Highwall Miner
P Pump
ROM ROM bin
Pri Primary Sizers
Sec Secondary Sizers
Ter Tertiary Sizers
Tr Transfer Station
Cn CTU north face
Cw CTU west face
Sk Stacker
R Reclaimer
TL Train loadout
Loc Locomotive
WS Workshop
C1 Conveyor 100m
C5 Conveyor 500m
EA Boundary
24hr Operation
Day Only
Night Only
Year
3B
Scenario
Source Locations
Drayton South
Drayton South Project
Figure
C 7 South
4 June 2012

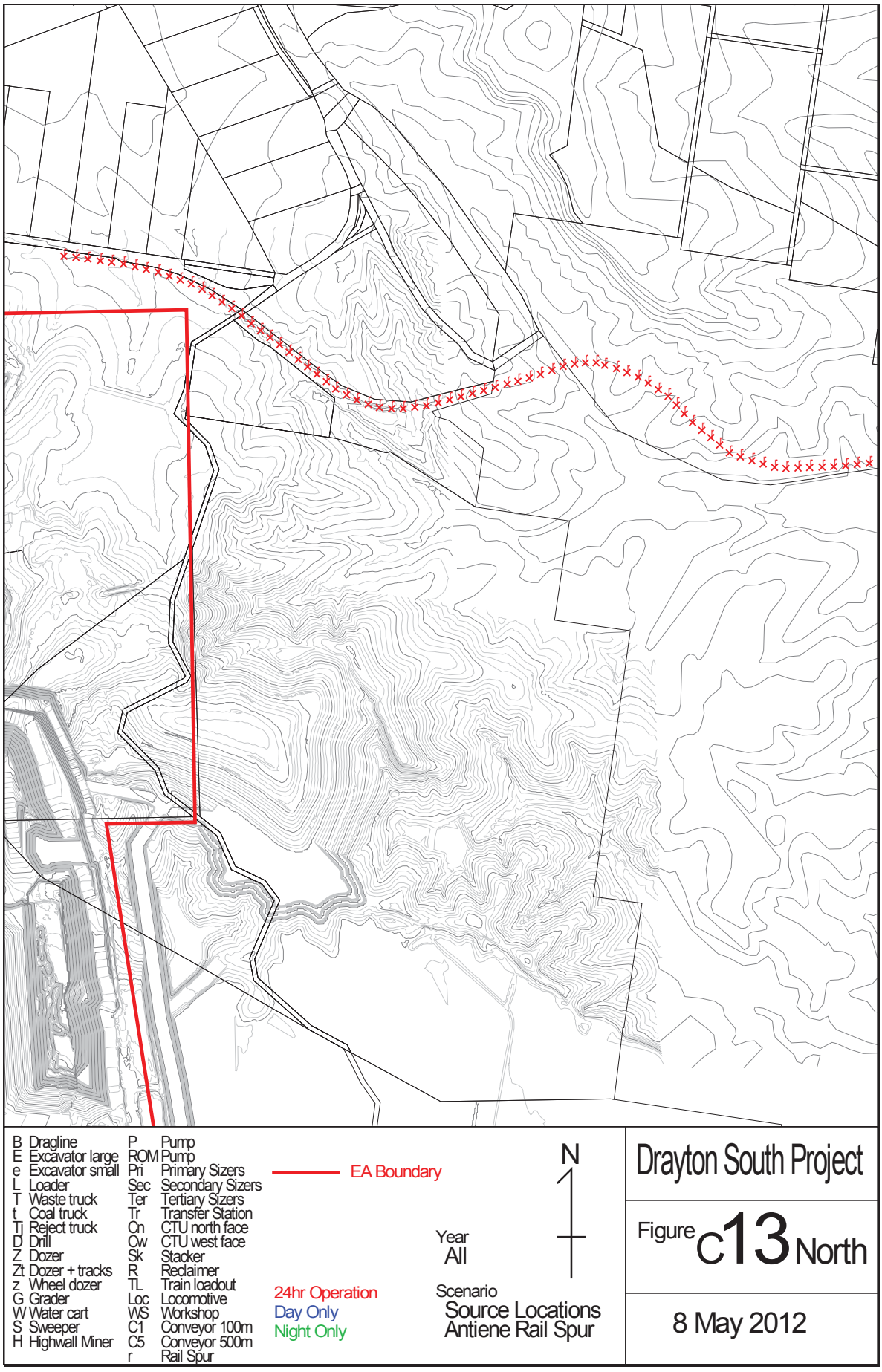

N
Dragline
Excavator large
Excavator small
Loader
Waste truck
Coal truck
Reject truck
Drill
Dozer
Dozer + tracks
Wheel dozer
Grader
Water cart
Sweeper
Highwall Miner
Pump
ROM bin
Primary Sizers
Secondary Sizers
Tertiary Sizers
Transfer Station
CTU north face
CTU west face
Stacker
Reclaimer
Train loadout
Locomotive
Workshop
Conveyor 100m
Conveyor 500m
EA Boundary
24hr Operation
Day Only
Night Only
Year
5
Scenario
Source Locations
Drayton South
Drayton South Project
Figure C 8 South
4 June 2012


N
B Dragline
E Excavator large
e Excavator small
L Loader
T Waste truck
t Coal truck
Tj Reject truck
D Drill
Z Dozer
Zt Dozer + tracks
z Wheel dozer
G Grader
W Water cart
S Sweeper
H Highwall Miner
P Pump
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
C1 Conveyor 100m
C5 Conveyor 500m
EA Boundary
24hr Operation
Day Only
Night Only
Year 10
Scenario Source Locations Drayton South
Drayton South Project
Figure C 9 South
4 June 2012


N
B Dragline
E Excavator large
e Excavator small
L Loader
T Waste truck
t Coal truck
Tj Reject truck
D Dril
Z Dozer
Zt Dozer + tracks
z Wheel dozer
G Grader
W Water cart
S Sweeper
H Highwall Miner
P Pump
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
C1 Conveyor 100m
C5 Conveyor 500m
EA Boundary
24hr Operation
Day Only
Night Only
Year 15
Scenario Source Locations Drayton South
Drayton South Project
Figure c10 South
4 June 2012


N
B Dragline
E Excavator large
e Excavator small
L Loader
T Waste truck
t Coal truck
Tj Reject truck
D Dril
Z Dozer
Zt Dozer + tracks
z Wheel dozer
G Grader
W Water cart
S Sweeper
H Highwall Miner
P Pump
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
C1 Conveyor 100m
C5 Conveyor 500m
EA Boundary
24hr Operation
Day Only
Night Only
Year 20
Scenario Source Locations Drayton South
Drayton South Project
Figure C11 South
4 June 2012

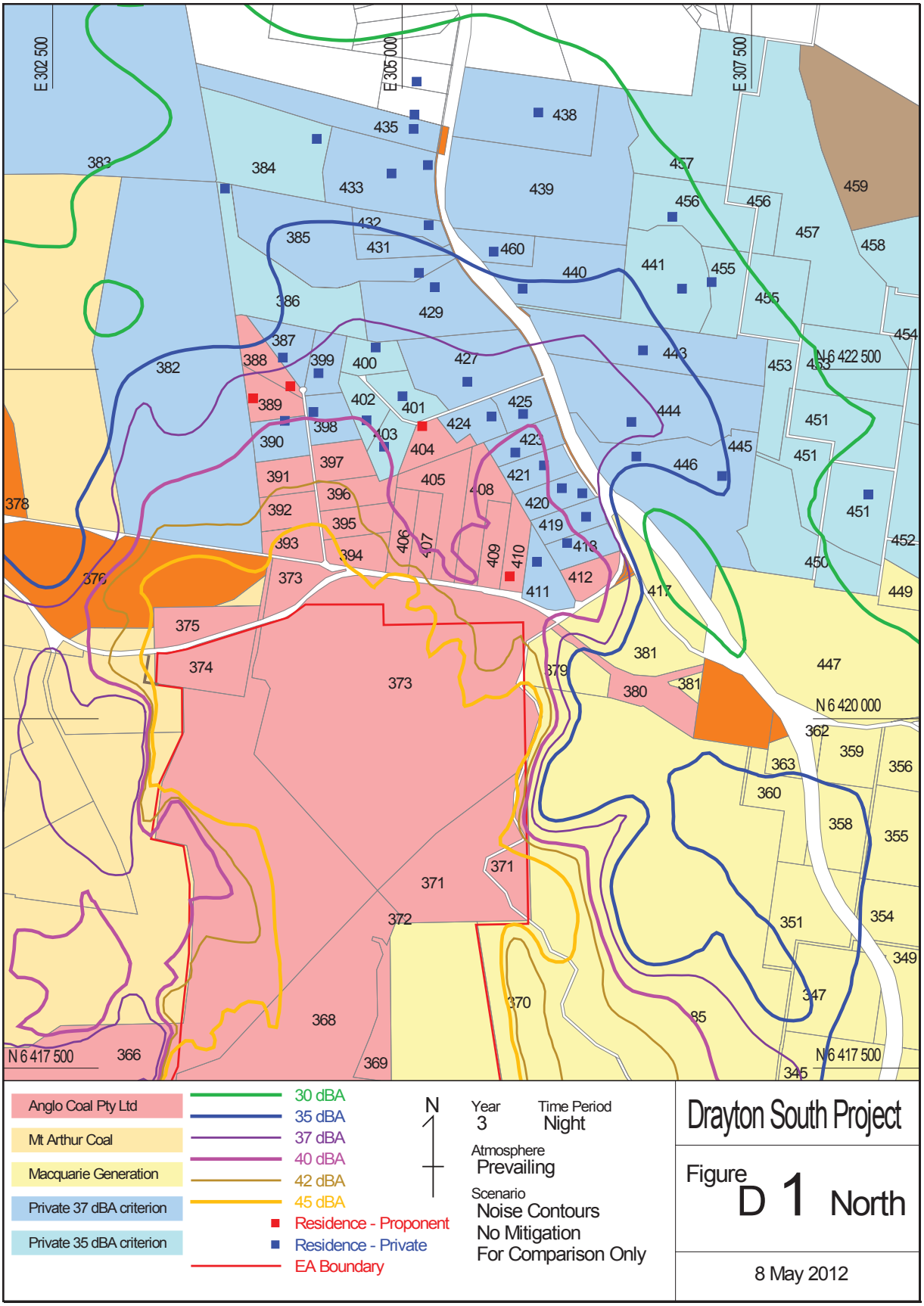

N
B Dragline
E Excavator large
e Excavator small
L Loader
T Waste truck
t Coal truck
TD Reject truck
Dr Drill
Zt Dozer
z Dozer + tracks
G Wheel dozer
W Grader
S Water cart
H Sweeper
P Highwall Miner
ROM Pump
Pri ROM bin
Sec Primary Sizers
Ter Secondary Sizers
Tr Tertiary Sizers
Cn Transfer Station
Cw CTU north face
Sk CTU west face
R Stacker
TL Redaimer
Loc Train loadout
WS Locomotive
C1 Workshop
C5 Conveyor 100m
Conveyor 500m
EA Boundary
24hr Operation
Day Only
Night Only
Year
27
Scenario
Source Locations
Drayton South
Drayton South Project
Figure C12 South
4 June 2012

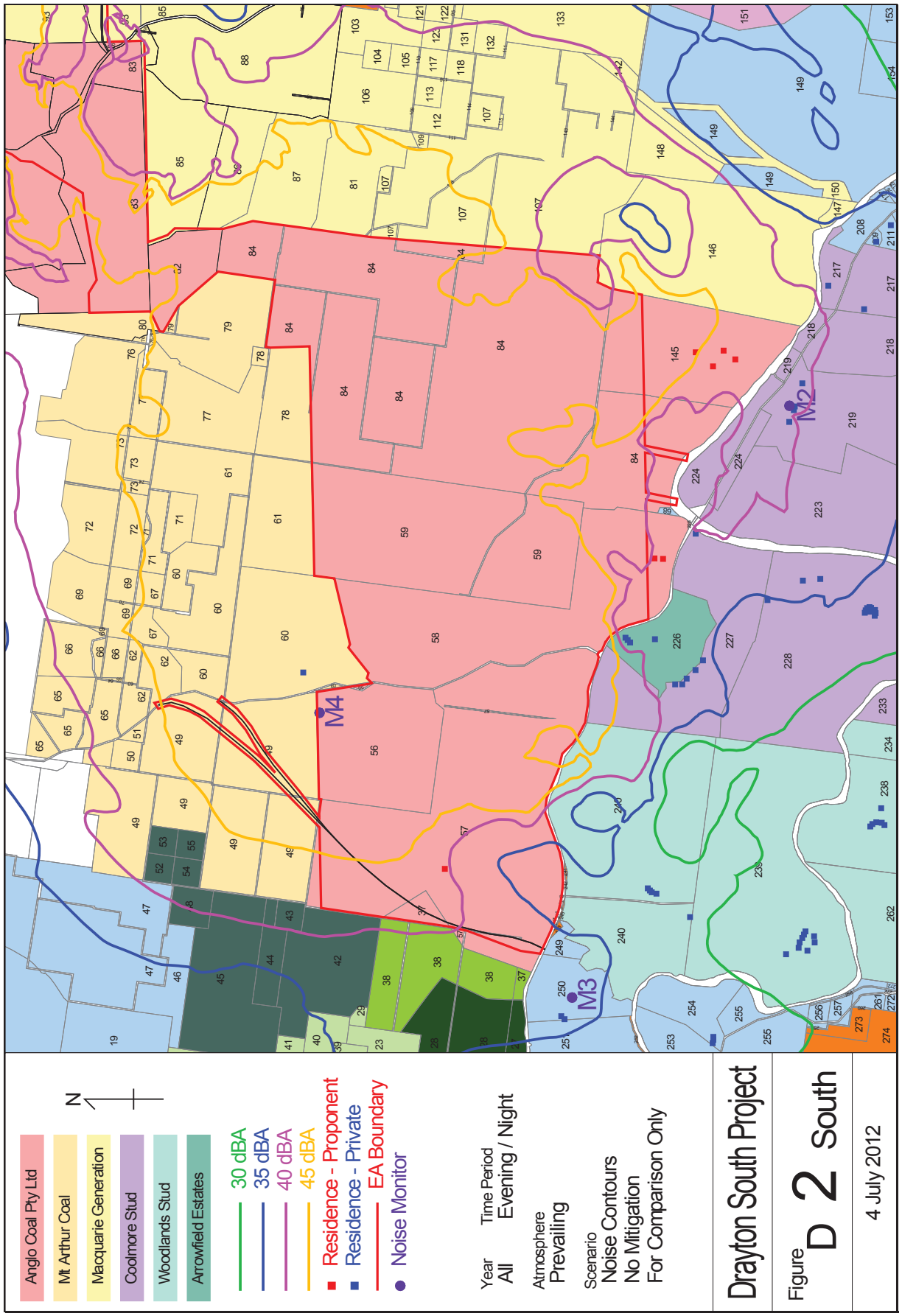

B Dragline
E Excavator large
e Excavator small
L Loader
T Waste truck
t Coal truck
Tj Reject truck
D Drill
Z Dozer
Zt Dozer + tracks
z Wheel dozer
G Grader
W Water cart
S Sweeper
H Highwall Miner
P Pump
ROM Pump
Pri Primary Sizers
Sec Secondary Sizers
Ter Tertiary Sizers
Tr Transfer Station
Cn CTU north face
Cw CTU west face
Sk Stacker
R Reclaimer
TL Train loadout
Loc Locomotive
WS Workshop
C1 Conveyor 100m
C5 Conveyor 500m
r Rail Spur
EA Boundary
24hr Operation
Day Only
Night Only
N
Year
All
Scenario
Source Locations
Antiene Rail Spur
Drayton South Project
Figure C13 North
8 May 2012

APPENDIX D – NO MITIGATION NOISE CONTOUR FIGURES

FIGURE	NOISE CONTOURS – NO MITIGATION (FOR COMPARISON ONLY)		
D1 North	All years	Night	No noise mitigation, prevailing weather
D2 South	All years	Night	No noise mitigation, prevailing weather

Noise contour figures for the 'no-mitigation' case do not represent proposed noise levels associated with the Project. The noise contour figures have been presented for comparison purposes only.


E 302 500
E 305 000
E 307 500
N 6 422 500
N 6 420 000
N 6 417 500
Anglo Coal Pty Ltd
Mt Arthur Coal
Macquarie Generation
Private 37 dBA criterion
Private 35 dBA criterion
30 dBA
35 dBA
37 dBA
40 dBA
42 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
N
Year
3
Time Period
Night
Atmosphere
Prevailing
Scenario
Noise Contours
No Mitigation
For Comparison Only
Drayton South Project
Figure D 1 North
8 May 2012


Anglo Coal Pty Ltd
Mt Arthur Coal
Macquarie Generation
Coolmore Stud
Woodlands Stud
Arrowfield Estates
N
30 dBA
35 dBA
40 dBA
45 dBA
Residence - Proponent
Residence - Private
EA Boundary
Noise Monitor
M1
M2
M3
M4
Year
All
Time Period
Evening / Night
Atmosphere
Prevailing
Scenario
Noise Contours
No Mitigation
For Comparison Only
Drayton South Project
Figure D 2 South
4 July 2012

APPENDIX E – PREDICTED NOISE LEVEL TABLES

TABLE DESCRIPTION

E1 Operational noise levels at Drayton Mine residences, LAeq,15min

E2 Operational noise levels over 25% of Drayton Mine property areas, LAeq,15min

E3 Operational noise levels at Drayton South residences, LAeq,15min

E4 Operational noise levels over 25% of Drayton South property areas, LAeq,15min

Table E1: Operational Noise Levels at Antiene Residences, LAeq,15min

Scenario, Years		Drayton South Project Alone Years 5 to 27			Drayton South and Drayton Mine Year 3			Criteria Day/ Evening-Night
Time Period		Day	Evening	Night	Day	Evening	Night	
Owner	Residence	Predicted Noise Level, LAeq,15min						
168	384	19.5	29.2	28.9	20.9	31.2	30.8	35/35/35
169	385	22.9	32.4	32.8	24.1	33.9	34.4	37/37/37
170	386	21.0	31.2	29.9	22.2	32.9	31.4	35/35/35
171	387	24.0	34.9	33.4	25.0	35.8	34.4	37/37/37
	399	25.4	36.7	35.6	26.3	37.6	36.6	37/37/37
172	390	27.5	39.2	37.4	28.2	39.9	38.3	37/37/37
173	398	26.9	38.6	37.3	27.7	39.4	38.2	37/37/37
174	400	24.6	35.3	35.2	25.7	36.3	36.3	35/35/35
175	401	25.2	35.8	36.1	26.2	36.7	37.2	35/35/35
176	402	26.8	38.1	37.6	27.7	38.8	38.5	35/35/35
177	403	27.1	38.1	37.6	28.0	38.8	38.6	35/35/35
178	411	30.4	33.0	39.2	30.8	34.2	40.1	37/37/37
179	418	29.7	32.3	38.3	30.1	33.5	39.3	37/37/37
180	419	28.7	31.0	37.0	29.2	32.1	37.9	37/37/37
181	420E	28.5	30.5	36.5	28.9	31.8	37.4	37/37/37
	420W	28.7	31.2	37.3	29.2	32.6	38.3	
182	421	27.7	31.6	37.6	28.3	33.2	38.6	37/37/37
184	423	27.3	32.7	37.8	27.9	34.2	38.8	37/37/37
185	424	25.4	32.8	36.3	26.2	34.3	37.4	37/37/37
186	425	25.9	32.4	36.4	26.6	33.9	37.5	37/37/37
187	427	24.1	33.0	35.0	25.2	34.5	36.3	37/37/37
188	429	22.7	32.3	33.0	23.9	33.9	34.5	37/37/37
190	432	21.6	31.0	31.5	22.9	32.9	33.3	37/37/37
191	433E	19.7	29.2	29.6	21.0	31.4	31.6	37/37/37
	433W	20.2	29.7	29.8	21.5	31.7	31.7	
192	435	19.0	28.6	28.9	20.3	30.7	30.8	37/37/37
193	438	17.9	26.6	28.0	19.4	29.0	30.3	37/37/37
195	440	22.1	30.2	32.4	23.3	32.1	34.0	37/37/37
196	441	20.9	24.6	30.8	22.2	26.7	32.1	35/35/35
197	443	23.3	27.1	32.7	24.3	29.1	34.2	37/37/37
198	444	25.5	27.9	34.4	26.3	30.1	35.8	37/37/37
200	446	23.2	26.8	32.1	24.5	28.0	33.6	37/37/37
205	455	19.7	22.8	29.5	21.1	25.1	30.8	35/35/35
206	456	19.6	24.4	29.1	20.9	26.4	30.6	35/35/35
209	460	21.3	29.7	31.0	22.5	31.8	33.0	37/37/37

Residences and properties omitted from the tables are predicted to receive less than 35 LAeq,15min for Antiene receivers and 30 LAeq,15min for Drayton South receivers, during all time periods and 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 5 dBA or more above the intrusive criteria;
- Blue – a moderate noise impact of less than 5 dBA above the intrusive criteria; and
- Green – a mild noise impact of 2 dBA or less above the intrusive criteria.

Table E2: Operational Noise Levels over 25% of Antiene Property Areas, LAeq,15min

Scenario, Years		Drayton South Project Alone Years 5 to 27			Drayton South and Drayton Mine Year 3			Criteria Day/ Evening-Night
Time Period		Day	Evening	Night	Day	Evening	Night	
Owner	Property	Predicted Noise Level, LAeq,15min						
166	382	27.0	38.8	36.1	28.3	39.9	37.1	37/37/37
168	384	20.4	30.4	29.4	21.8	32.3	31.3	35/35/35
169	385	24.1	33.5	32.8	25.1	35.0	34.4	37/37/37
170	386	24.3	34.3	33.6	25.3	35.4	34.9	35/35/35
171	387	24.2	35.1	33.9	25.2	36.0	35.0	37/37/37
	399	25.5	37.1	36.0	26.4	37.8	36.9	
172	390	28.4	39.9	38.0	29.0	40.6	38.8	37/37/37
173	398	27.3	39.0	37.9	28.1	39.8	38.8	37/37/37
174	400	25.0	36.0	35.6	26.0	36.9	36.7	35/35/35
175	401	25.4	36.0	36.2	26.4	36.9	37.4	35/35/35
176	402	26.8	38.1	37.5	27.7	38.9	38.5	35/35/35
177	403	27.4	38.1	37.7	28.3	38.8	38.7	35/35/35
178	411	30.4	34.1	39.1	31.0	34.9	40.0	37/37/37
179	418	29.6	32.6	38.3	30.1	33.8	39.4	37/37/37
180	419	30.1	32.3	38.5	30.5	33.6	39.4	37/37/37
181	420	29.3	32.0	38.5	29.7	33.5	39.4	37/37/37
182	421	28.0	32.3	38.4	28.5	33.9	39.2	37/37/37
184	423	27.1	32.8	37.5	27.7	34.2	38.5	37/37/37
185	424	25.5	33.3	36.4	26.4	34.7	37.6	37/37/37
186	425	26.0	32.5	36.3	26.7	34.0	37.5	37/37/37
187	427	24.3	33.8	35.2	25.3	35.1	36.5	37/37/37
188	429	23.8	33.7	34.0	24.9	34.9	35.3	37/37/37
189	431	23.2	32.7	32.5	24.5	34.2	34.1	37/37/37
190	432	22.6	32.0	31.9	23.8	33.7	33.6	37/37/37
191	433	21.0	30.5	30.6	22.3	32.5	32.5	37/37/37
192	435	19.1	28.8	28.7	20.5	30.9	30.6	37/37/37
193	438	18.2	27.2	28.4	19.7	29.7	30.6	37/37/37
194	439	19.0	27.1	29.1	20.4	29.3	31.2	37/37/37
195	440	22.4	29.6	32.5	23.4	31.5	34.1	37/37/37
196	441	22.0	27.0	31.7	23.0	28.7	33.0	35/35/35
197	443	23.5	29.5	33.5	24.4	31.3	34.9	37/37/37
198	444	25.2	28.9	34.5	26.0	31.0	35.9	37/37/37
200	446	24.1	27.1	32.4	25.1	28.4	33.9	37/37/37
201	450	19.6	24.6	27.8	21.6	25.9	30.4	35/35/35
202	451	15.2	19.1	25.1	18.0	21.2	27.6	35/35/35
204	453	18.3	21.0	27.7	20.1	23.2	29.5	35/35/35
205	455	19.0	21.8	28.6	20.5	24.2	30.1	35/35/35
206	456	19.0	23.8	28.4	20.4	25.9	30.0	35/35/35
209	460	21.3	29.9	31.1	22.5	32.0	33.1	37/37/37

Table E3: Operational Noise Levels at Drayton South Residences, LAeq,15min

Scenario		Day Neutral							Evening/Night Prevailing							Criteria
Assessed Year		3A	3B	5	10	15	20	27	3A	3B	5	10	15	20	27	Day/
Owner ID	Residence ID	Predicted Noise Level, LAeq,15min														Evening-Night
4	60	40.3	40.4	36.6	35.6	31.0	31.2	27.2	50.7	50.7	47.8	46.3	41.4	42.2	37.8	N/A[1]
21	217N	18.0	19.5	15.4	16.6	16.4	16.2	9.5	30.5	31.5	32.1	31.7	32.6	32.8	29.2	40/38
21	217S	17.4	19.5	15.6	16.6	16.5	16.6	9.2	30.4	31.0	31.3	31.4	32.0	32.8	29.6	40/38
21	219C	17.7	21.8	17.7	19.1	19.3	19.5	11.9	31.4	31.3	33.1	34.6	34.3	33.7	28.5	40/38
21	219E	18.0	21.6	17.3	18.6	18.8	19.0	11.5	31.3	31.3	32.8	34.2	34.2	33.9	28.5	40/38
21	219W	17.9	21.9	18.0	19.4	19.6	19.7	12.2	31.6	31.5	33.3	35.0	34.4	33.6	28.6	40/38
21	227C	18.2	18.7	20.5	22.7	21.2	19.2	13.6	28.2	28.2	27.9	26.5	26.2	25.8	20.6	40/38
21	227E	16.4	17.4	18.6	20.2	19.6	19.0	14.8	31.6	31.6	34.3	30.3	27.8	24.3	20.2	40/38
21	227W	19.1	19.8	21.5	23.4	22.1	20.9	14.5	29.6	29.6	27.3	28.3	27.0	28.1	23.8	40/38
21	228	15.2	18.5	17.2	19.3	18.9	18.4	11.2	28.2	28.4	29.2	29.4	28.4	28.6	22.9	40/38
23	250	16.9	17.0	17.9	18.1	14.8	13.8	9.2	27.7	27.7	29.3	30.0	26.4	25.7	22.8	35/35
24	226N	21.7	22.0	24.6	27.6	25.0	21.5	16.9	29.5	29.5	28.7	32.3	27.7	26.1	22.1	40/38
24	226S	20.0	20.5	22.9	25.8	23.8	20.2	15.5	30.7	30.7	27.5	29.6	26.3	26.2	21.9	40/38
37	209	16.6	17.3	14.3	14.6	14.8	15.2	8.3	27.8	28.0	28.0	28.3	29.2	31.1	28.3	35/35
38	211	14.9	15.8	13.7	14.0	14.2	14.6	7.9	27.0	26.8	26.4	27.1	27.9	30.0	27.3	35/35

1 No noise criteria are proposed for Residence 60 as it is owned by Mt Arthur Coal Mine.

Table E4: Operational Noise Levels over 25% of Drayton South Property Areas, LAeq,15min

Scenario		Day Neutral							Evening/Night Prevailing							Criteria
Assessed Year		3A	3B	5	10	15	20	27	3A	3B	5	10	15	20	27	Day/
Owner ID	Property	Predicted Noise Level, LAeq,15min														Evening-Night
12	7-26,29-30, 33-36,39-41	15.3	15.4	15.9	16.8	13.4	13.5	8.1	26.8	26.8	25.6	27.0	23.4	23.0	21.5	35/35
16	37-38	22.6	22.7	23.1	22.9	17.0	17.3	12.3	31.9	31.9	31.9	33.9	29.5	28.7	27.1	35/35
20	27,28	22.0	22.1	22.8	23.0	17.5	17.1	12.5	30.1	30.1	30.2	32.3	28.6	27.7	25.0	35/35
21	Coolmore	17.3	19.6	18.3	19.8	19.5	18.9	11.8	30.3	30.5	31.4	31.6	31.3	30.4	26.2	40/38
22	Darley	13.5	13.7	14.7	15.8	13.0	12.6	8.1	24.9	24.9	24.5	25.3	22.2	21.9	18.5	35/35
23	249-251,254	16.4	16.5	17.2	17.5	14.2	13.5	8.9	27.7	27.8	28.6	30.0	26.6	25.6	22.8	35/35
24	226	21.0	21.4	24.2	26.8	24.8	21.8	15.9	30.6	30.7	30.5	30.9	28.3	27.6	23.2	40/38
37N	209	16.6	17.4	14.3	14.7	14.9	15.2	8.4	27.9	28.1	28.1	28.5	29.3	31.3	28.4	40/38
37S	216	14.3	16.1	13.8	14.7	14.9	15.4	7.5	26.7	27.0	27.0	27.2	28.3	28.6	25.2	40/38
38	174-177, 208,210,211	15.3	16.0	14.0	14.3	14.5	14.9	8.2	27.1	27.3	26.9	27.5	28.2	30.1	27.4	40/38
47	68	17.5	19.0	19.6	21.0	20.7	21.1	16.3	27.9	27.9	30.4	28.7	26.4	25.6	22.0	40/38
165	42-45,48, 52-55	24.6	24.6	23.6	23.6	20.3	20.2	15.9	33.9	33.9	33.2	33.9	30.2	30.0	27.6	35/35

APPENDIX F – DETAILED NOISE SURVEY RESULTS

Environmental noise level charts on the following pages show 15 minute percentile statistics from noise monitors at four representative receiver 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.

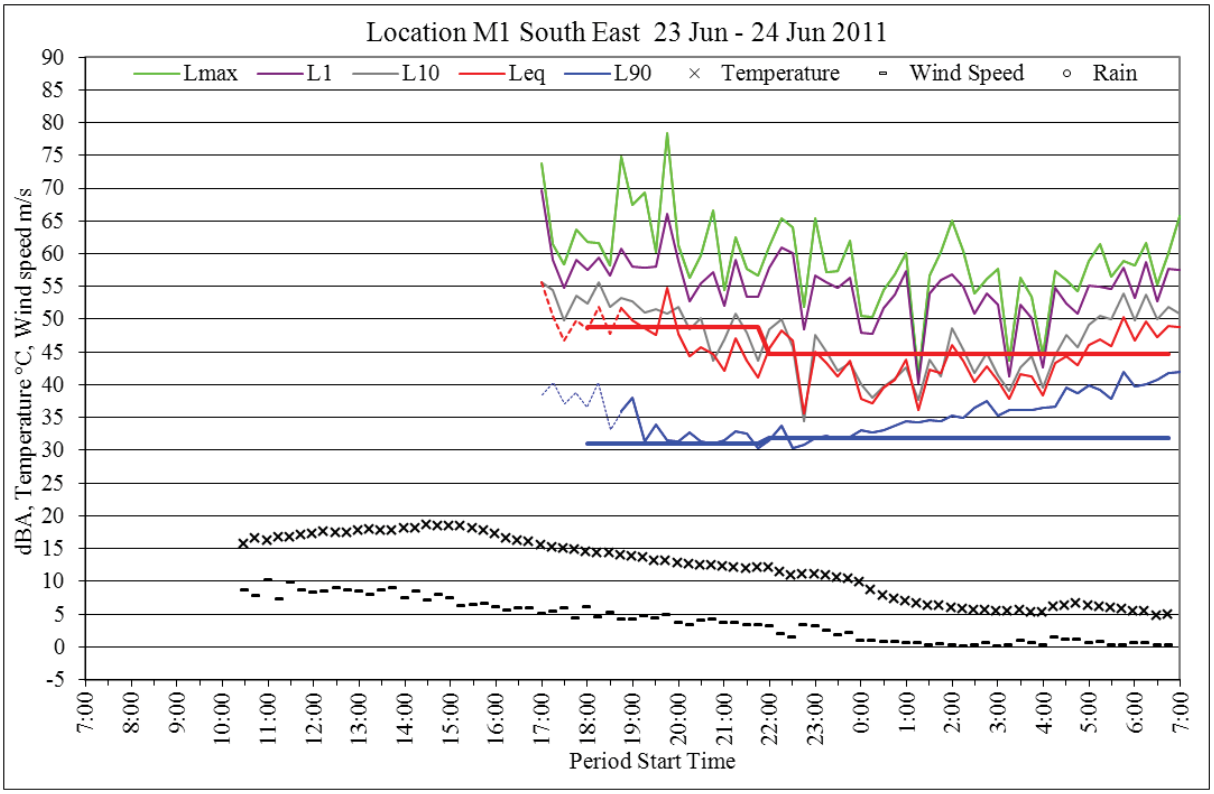
L90 - the lowest dBA line on the chart, shown by a blue line, representing the quietest 10 percent of the time in each 15 minute period and accepted as the background noise level. Sections of line shown dotted indicate periods affected by wind over 5m/s or rain.

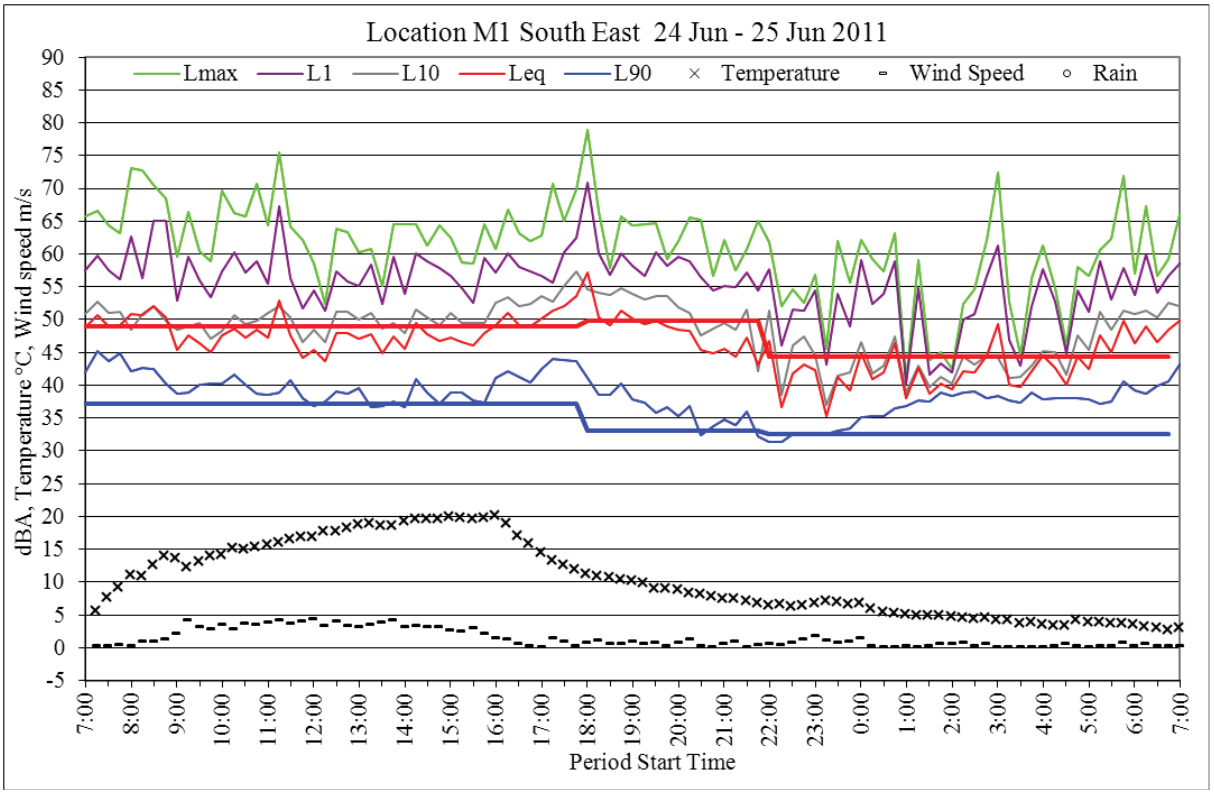
Period L90 - The 'L90 of the 15 minute L90s' for each day, evening and night period, representing the Assessment Background Levels (ABLs) for each period. The Period L90 represents the lowest 10% of all 15 minute L90 values in that time period, excluding those affected by wind or rain, and is shown as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

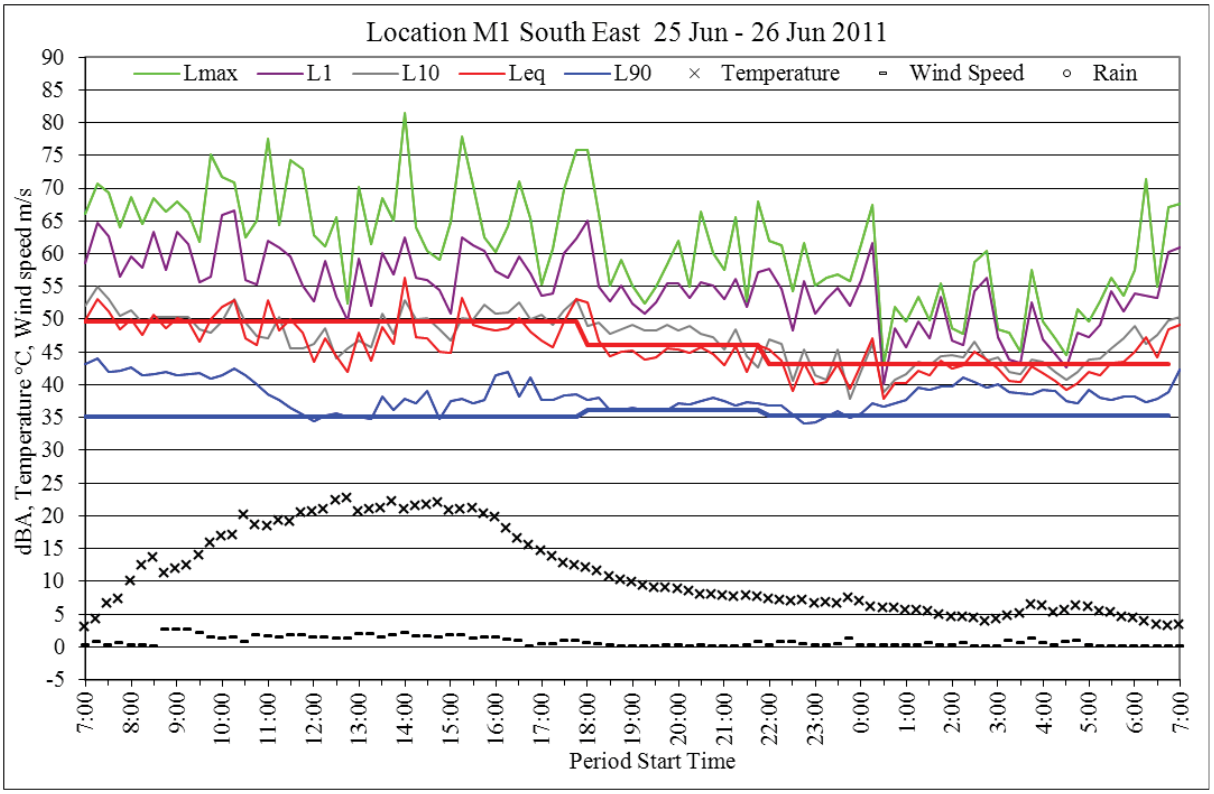
Temperature - Air temperature measured at 10m above the ground in Singleton Heights, which is the closest weather station for which data were available during this time period, indicated by a cross symbol.

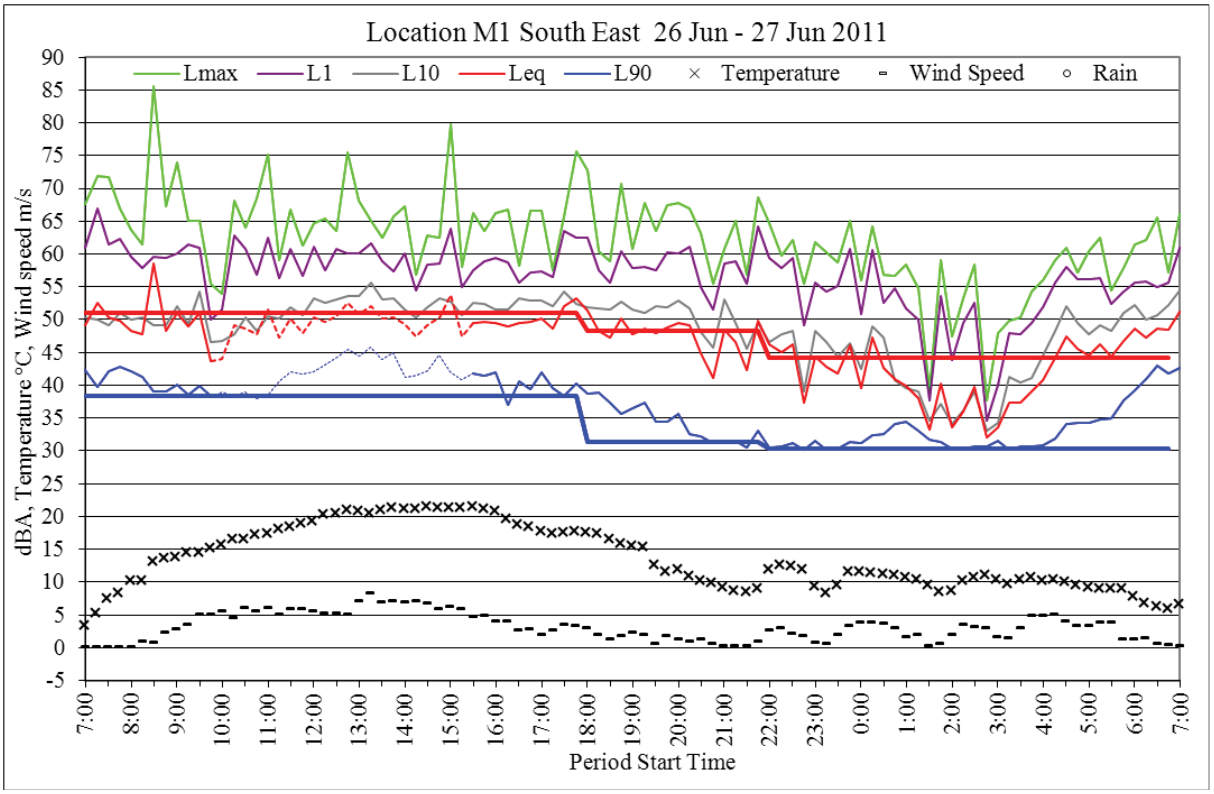
Wind Speed - Wind speed measured at 10m above the ground in singleton Heights and indicated by small horizontal lines.

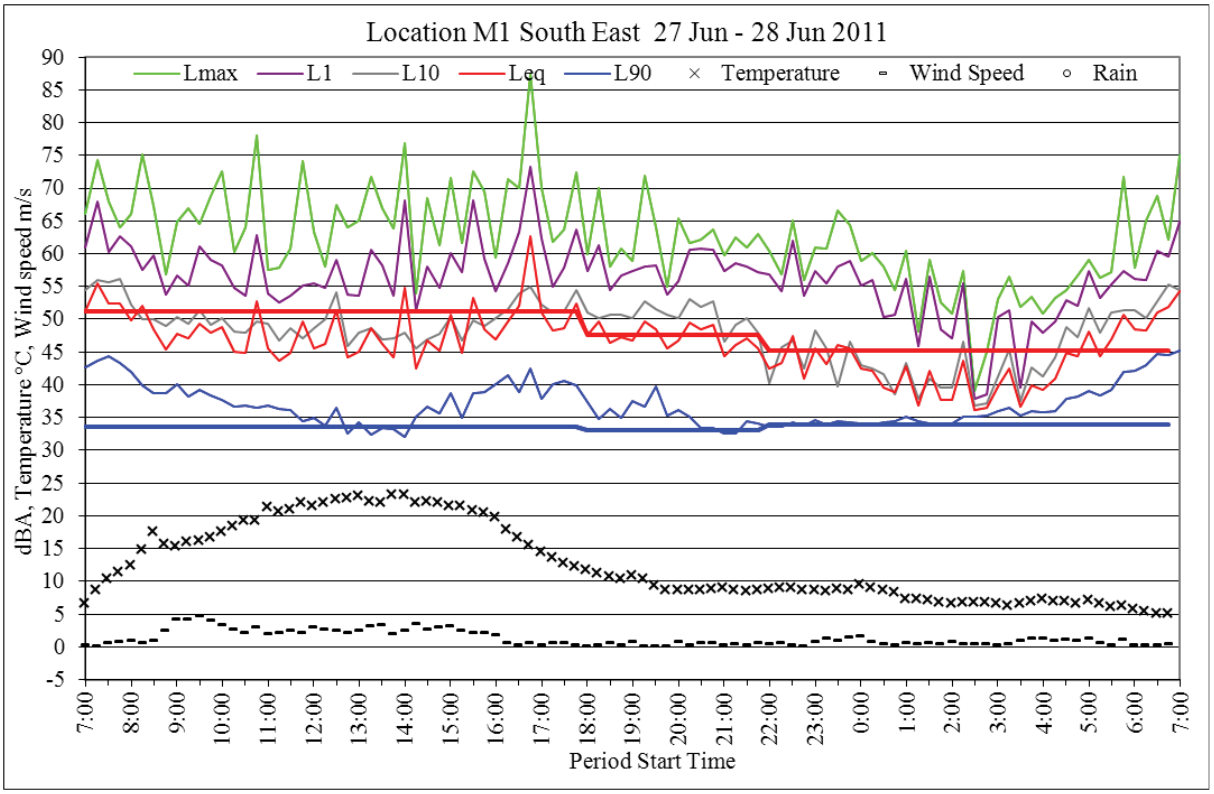
Rain - The occurrence of rain in a 15 minute period, indicated by a small circle at the bottom of each chart.

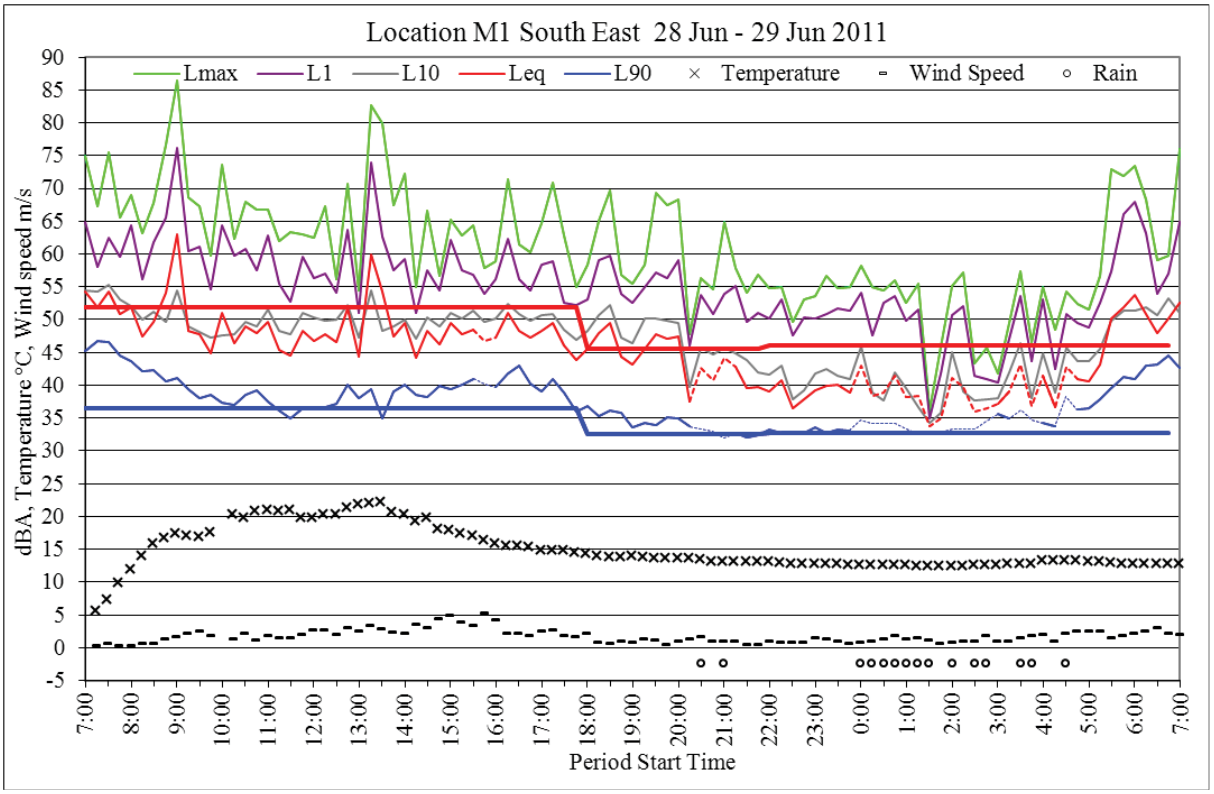

Location M1 South East 23 Jun - 24 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

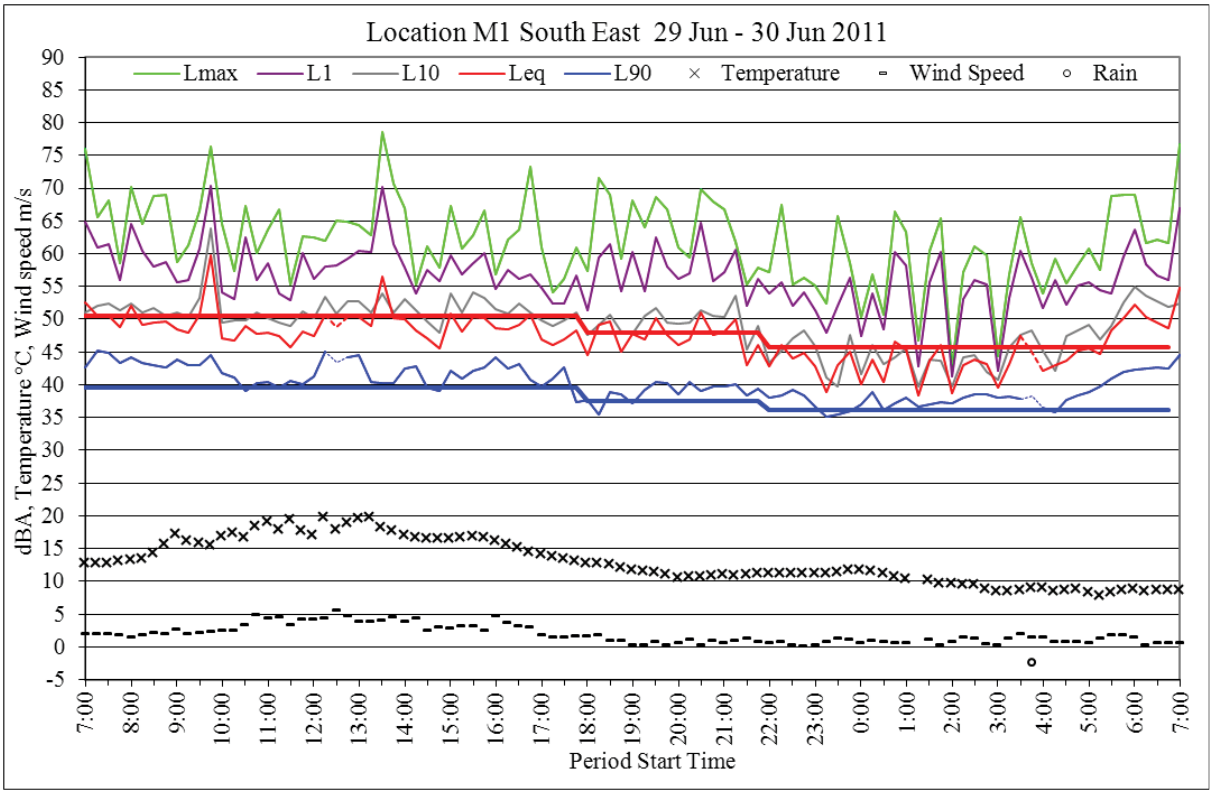

Location M1 South East 24 Jun - 25 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

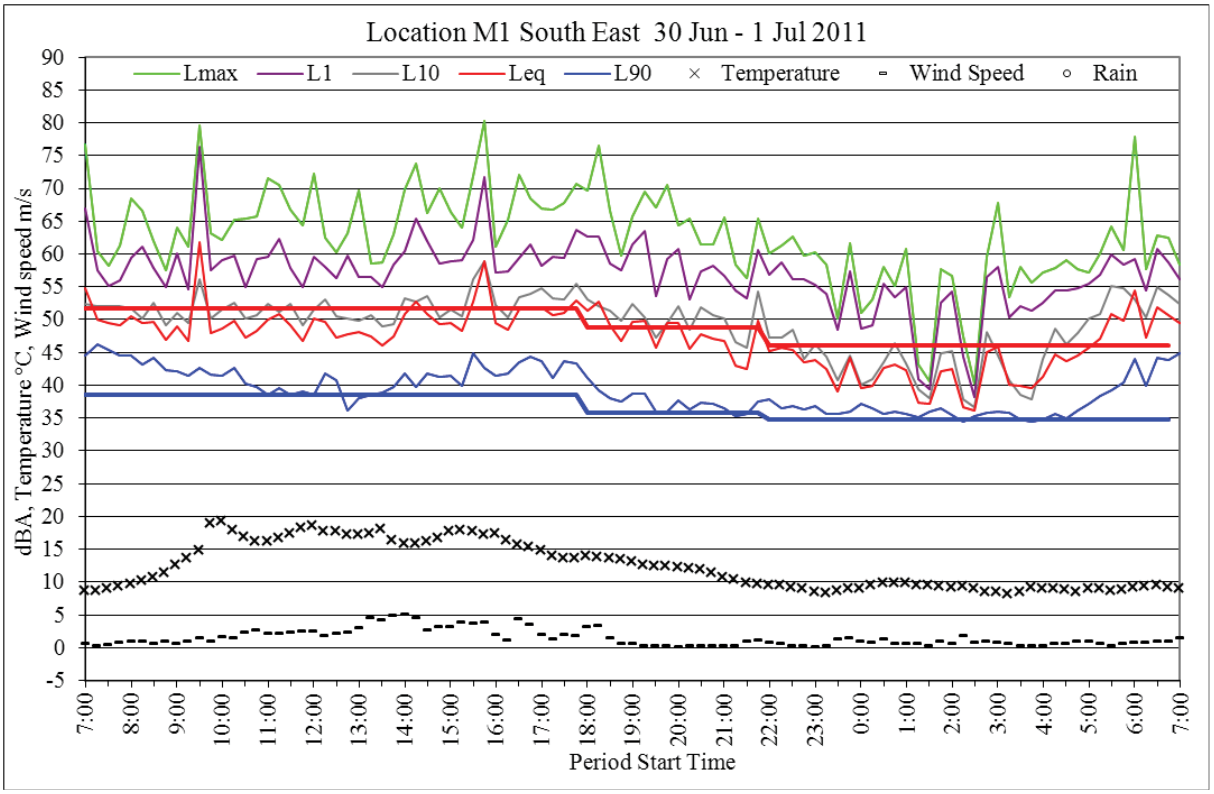

Location M1 South East 25 Jun - 26 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

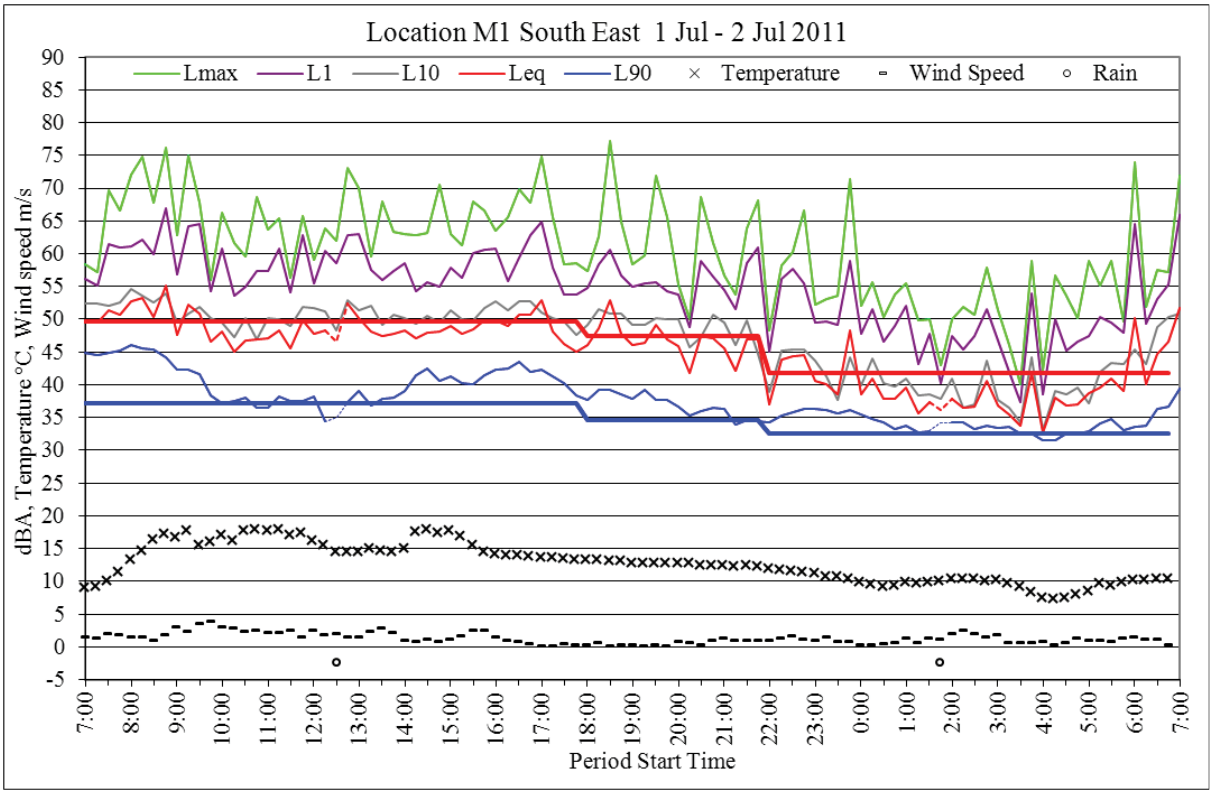

Location M1 South East 26 Jun - 27 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

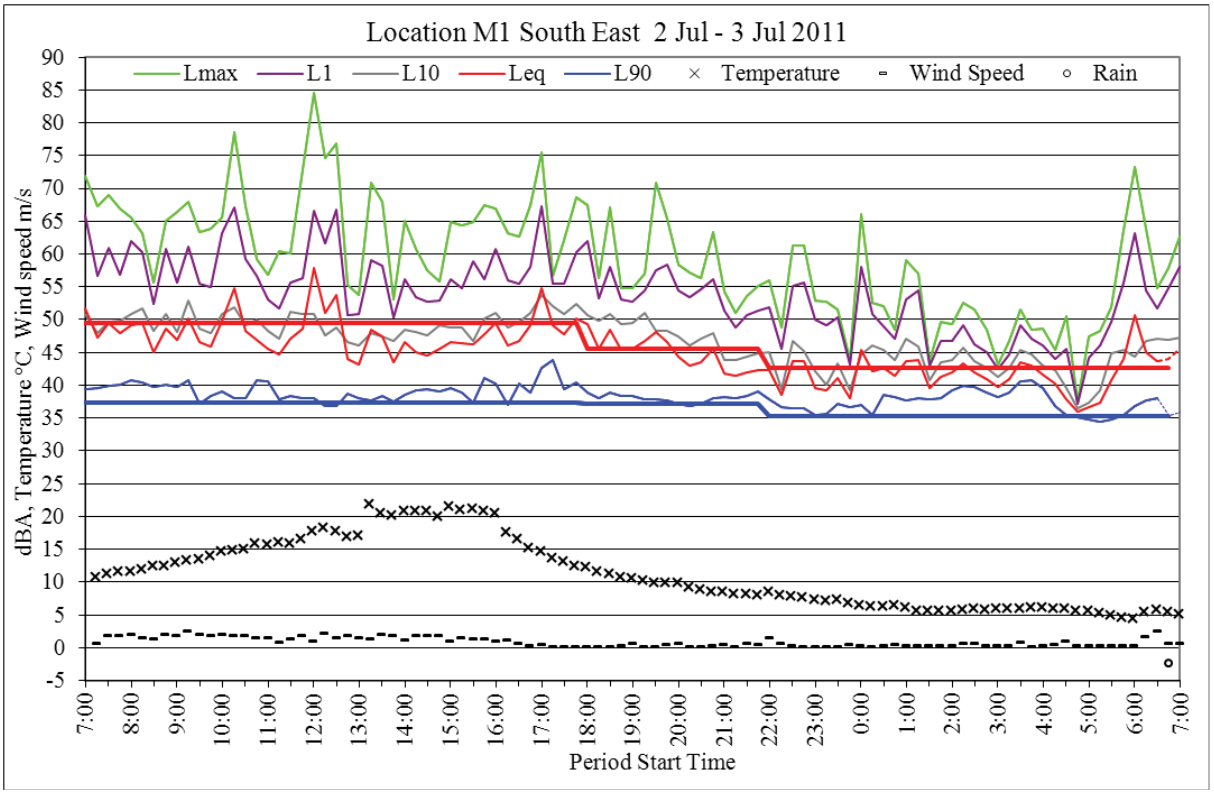

Location M1 South East 27 Jun - 28 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

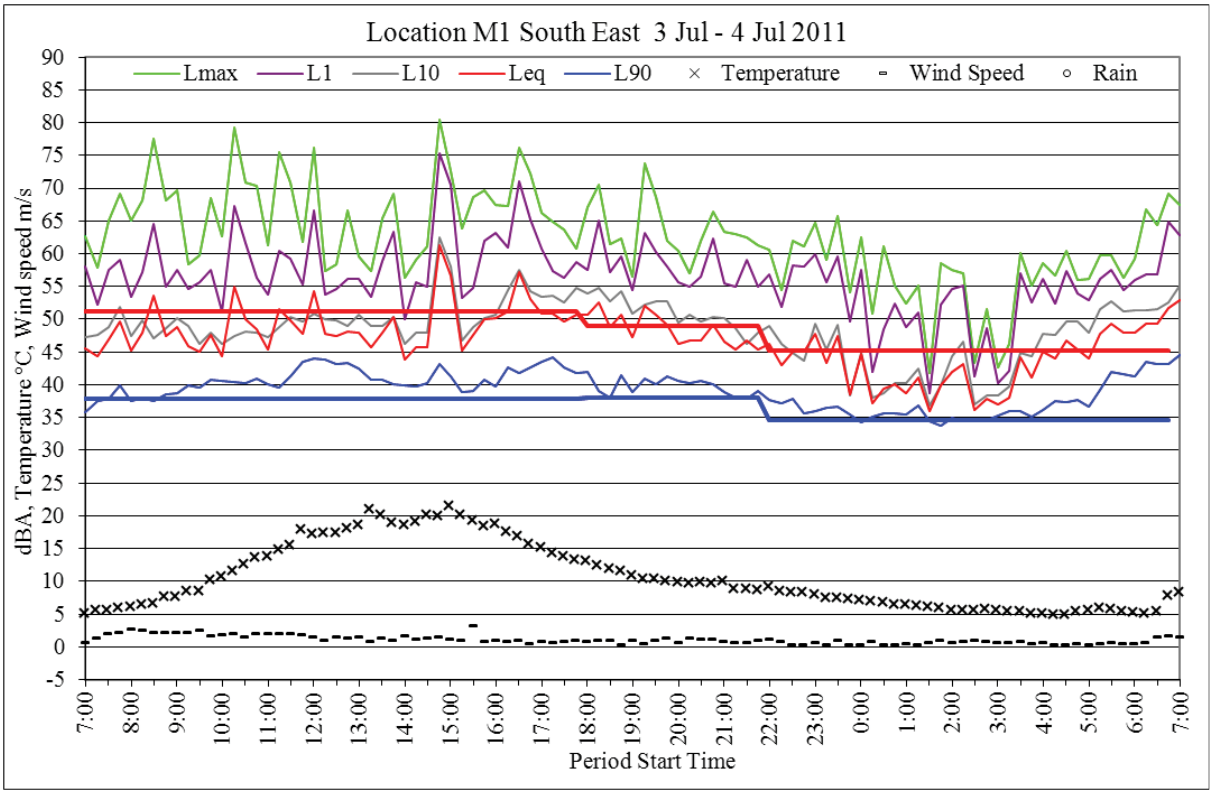

Location M1 South East 28 Jun - 29 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

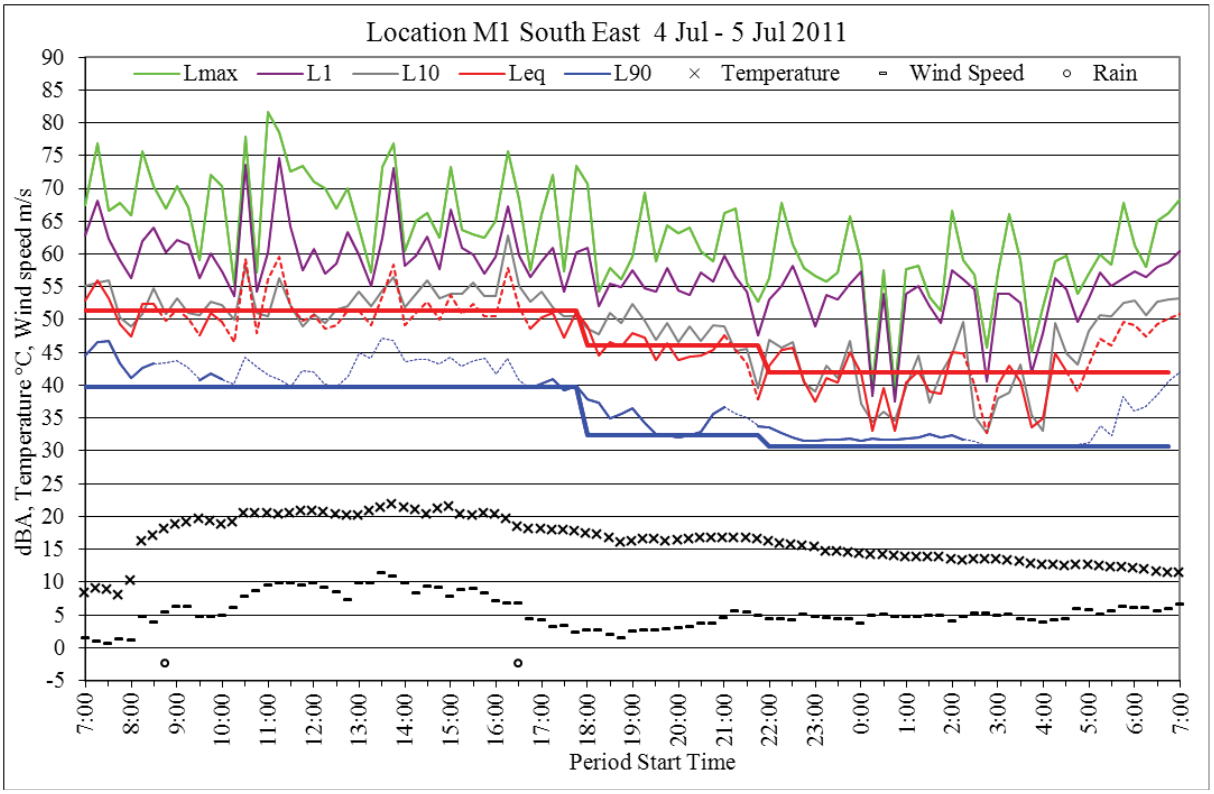

Location M1 South East 29 Jun - 30 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

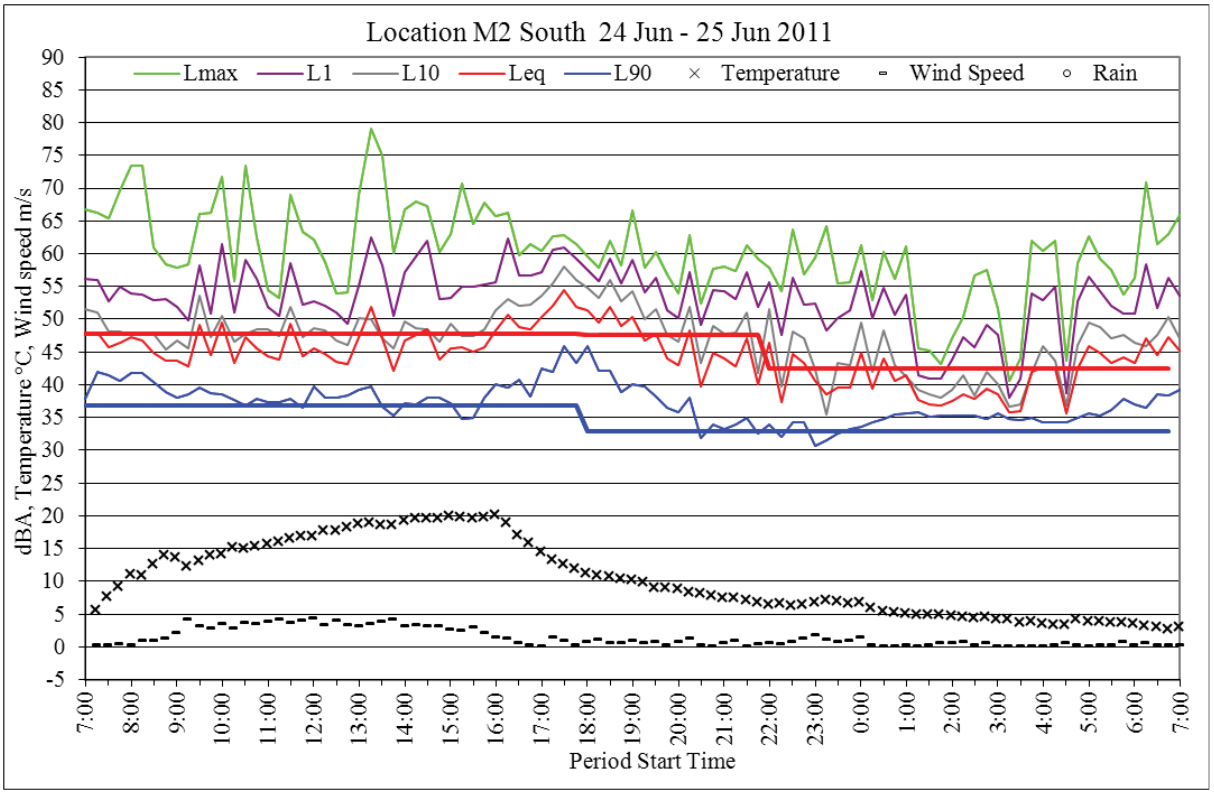

Location M1 South East 30 Jun - 1 Jul 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time


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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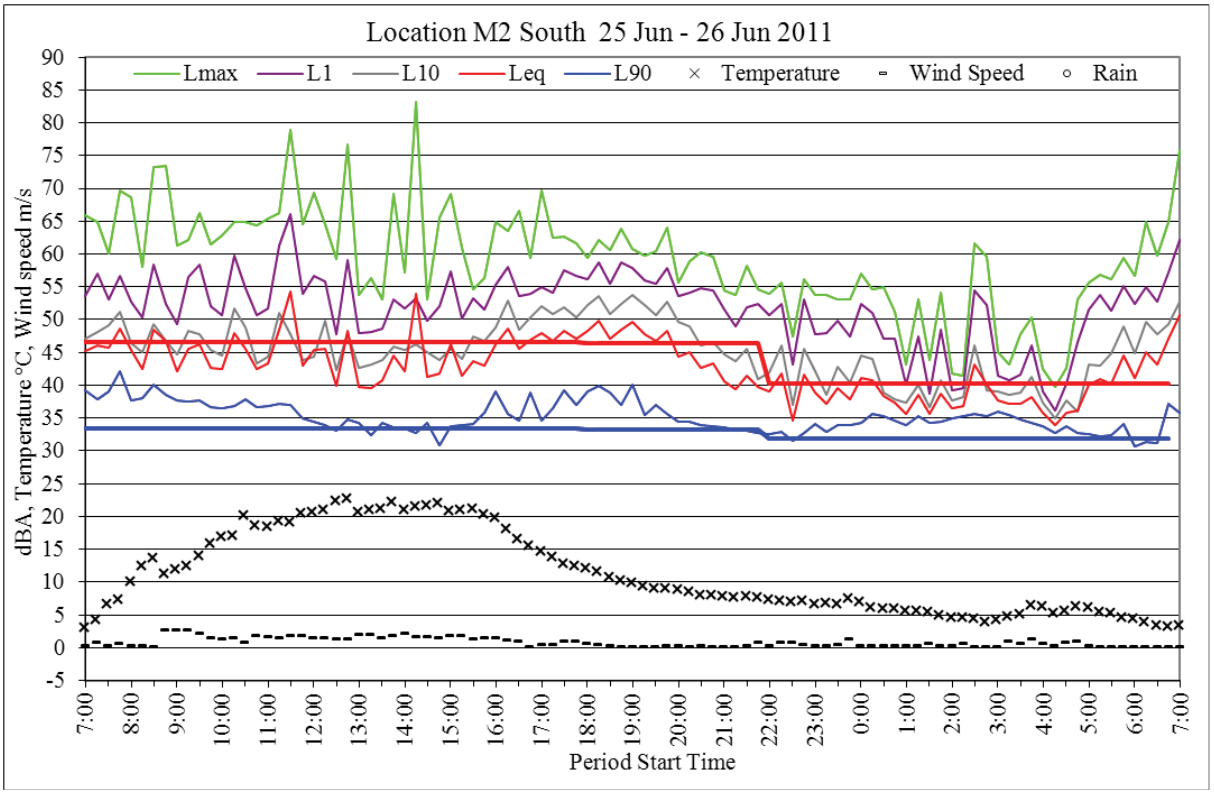
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time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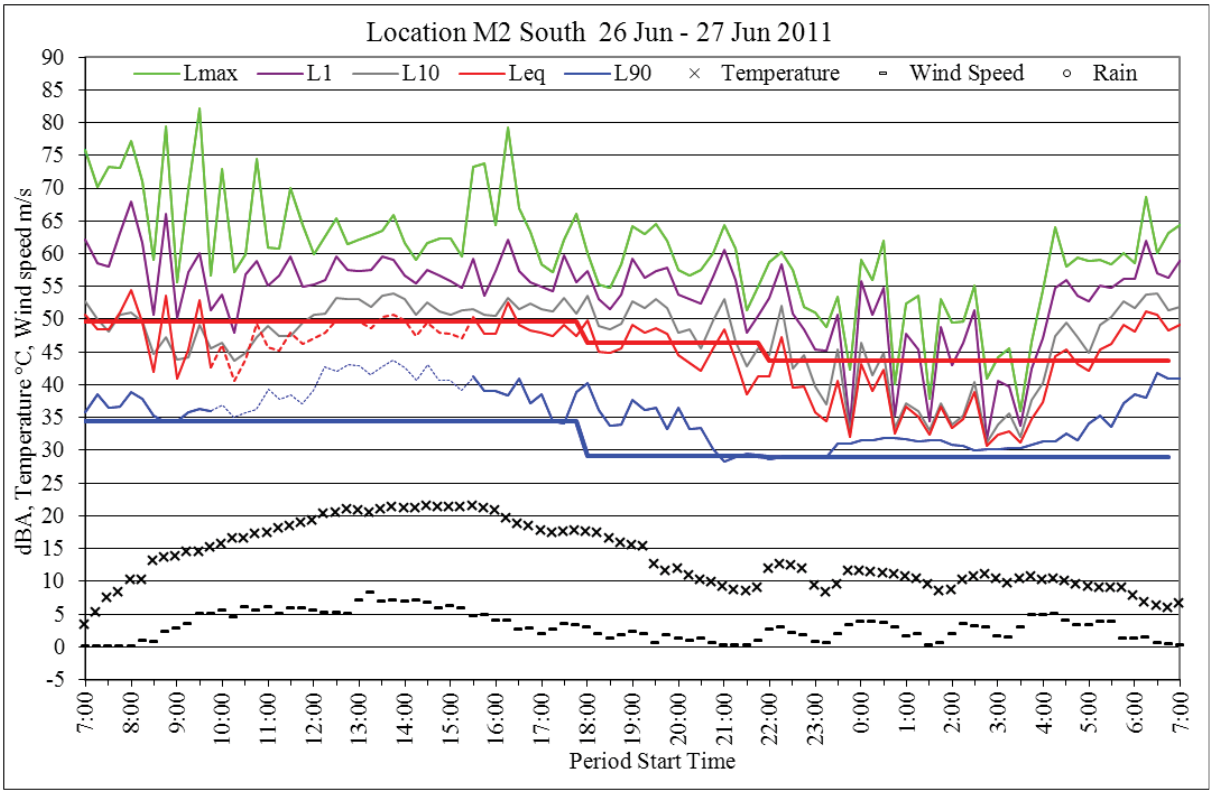
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time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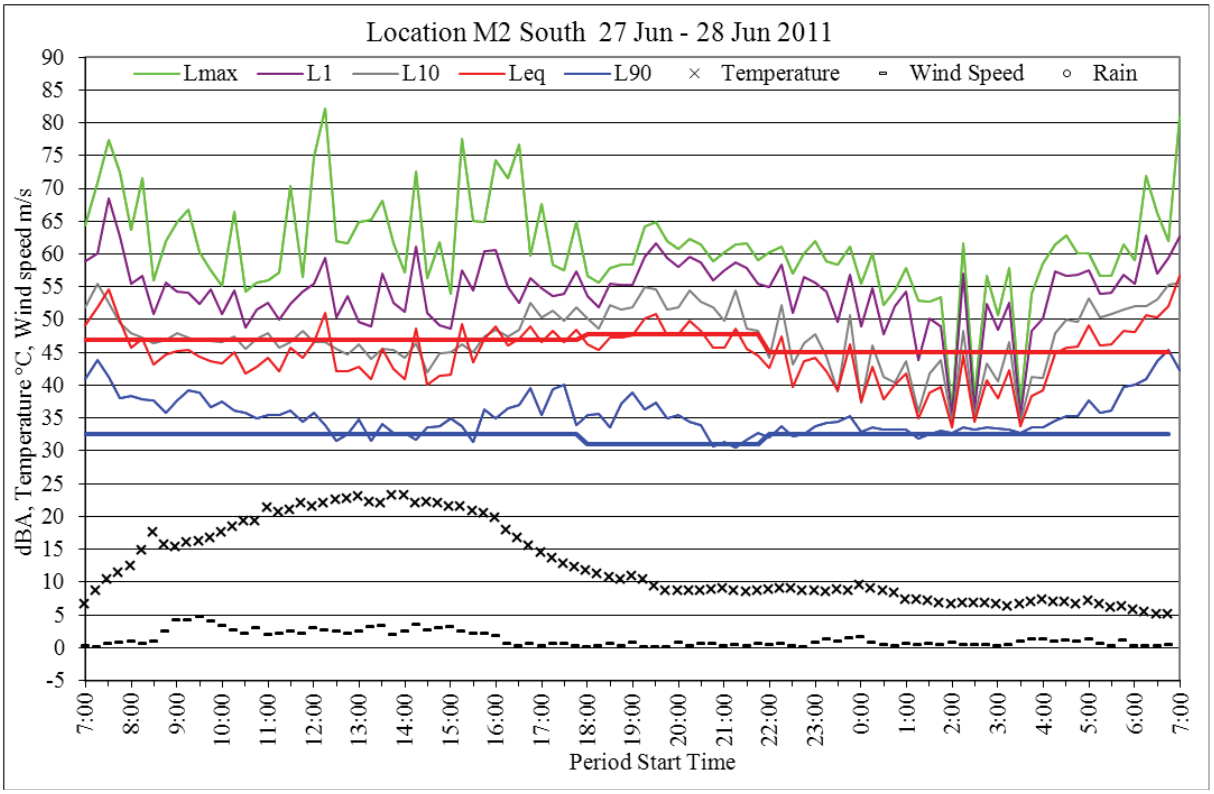
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time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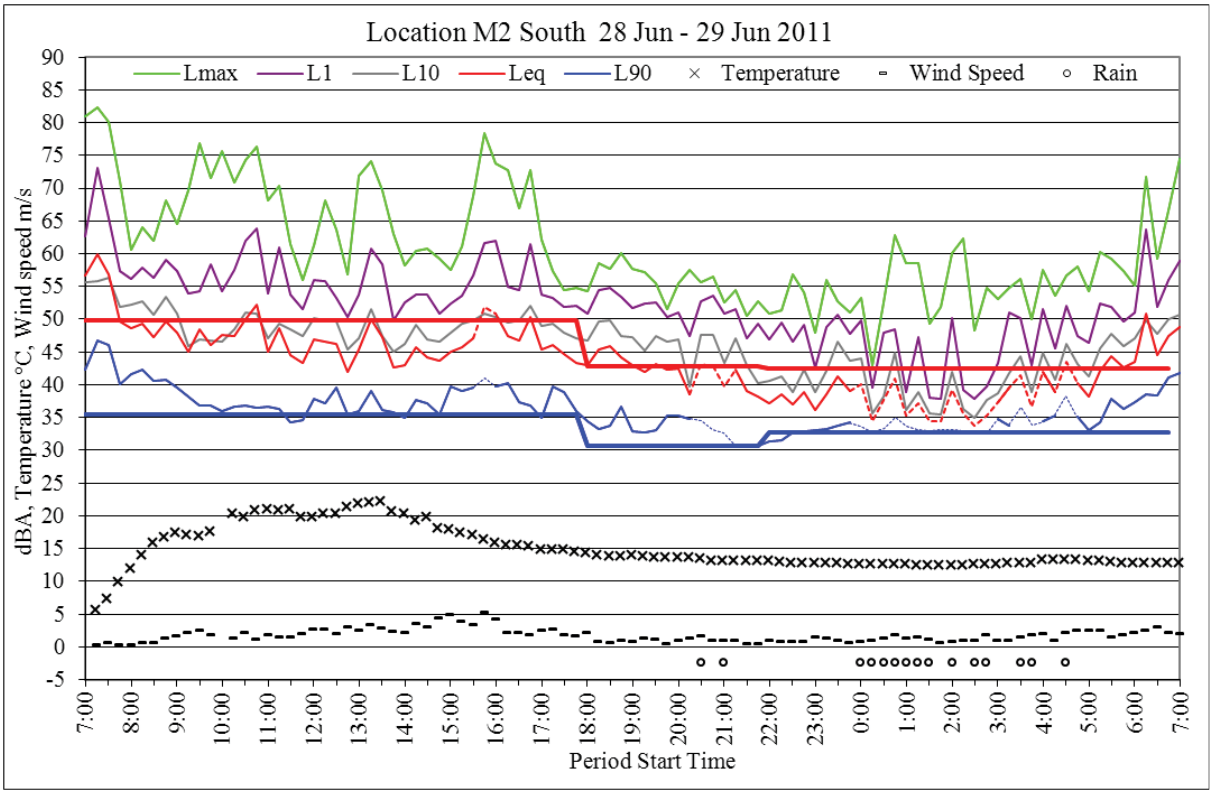
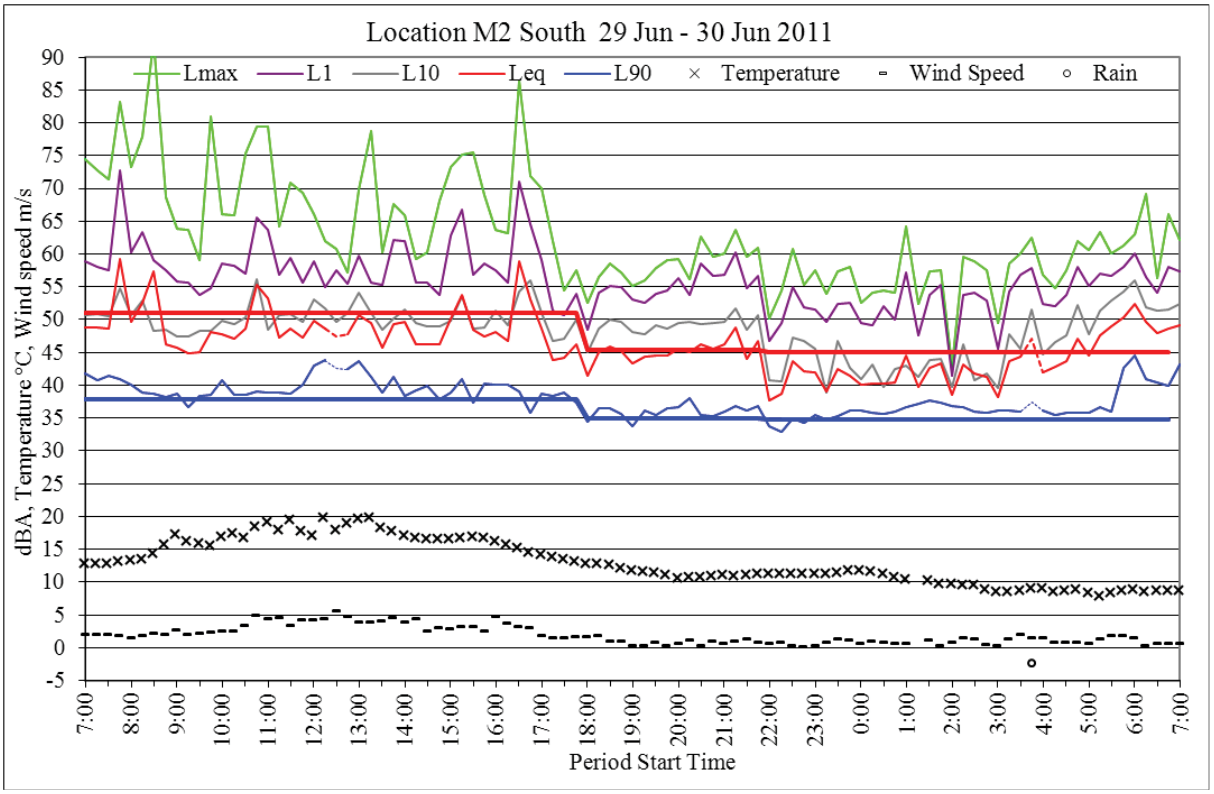
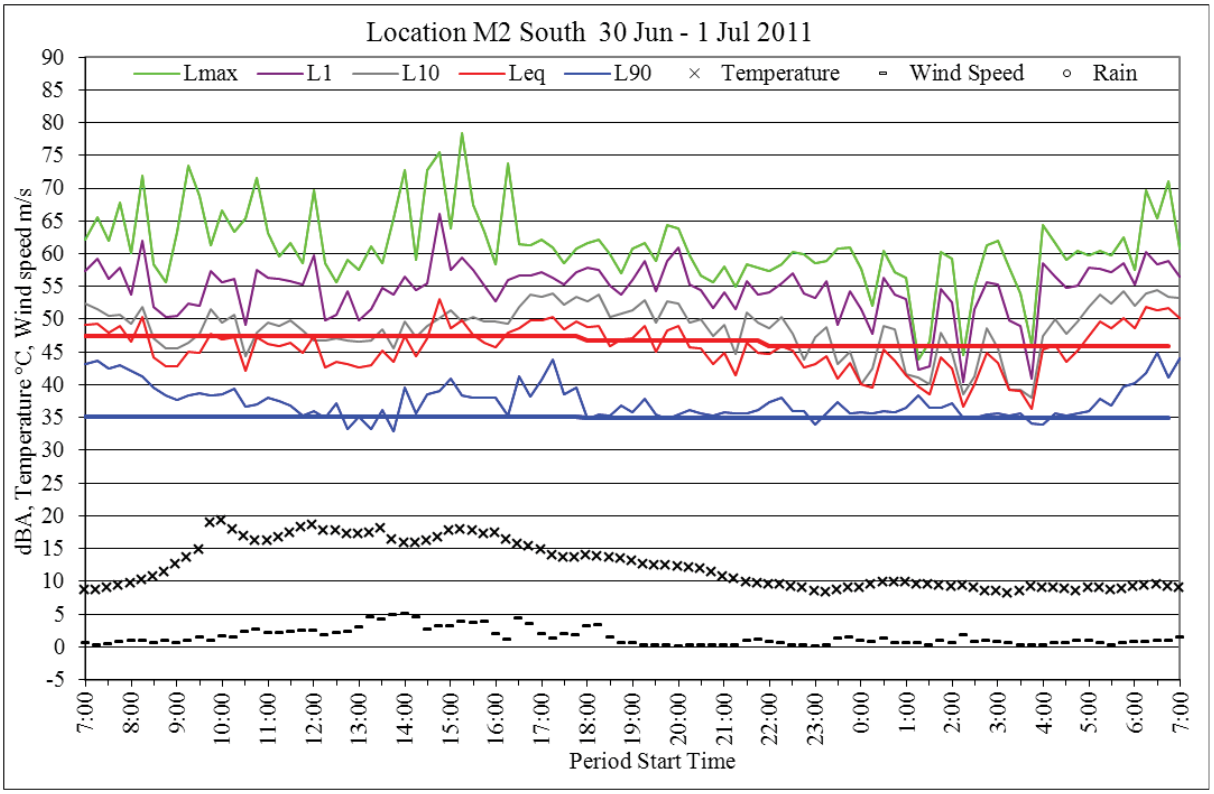
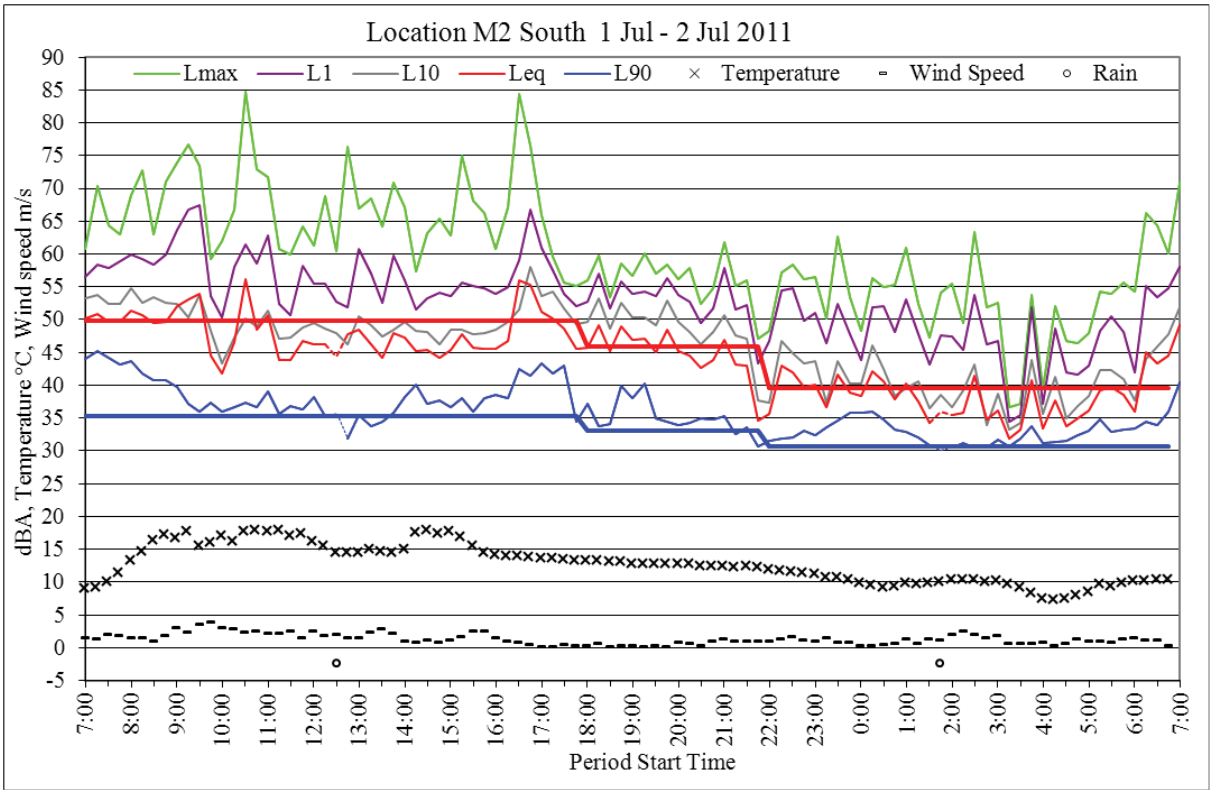
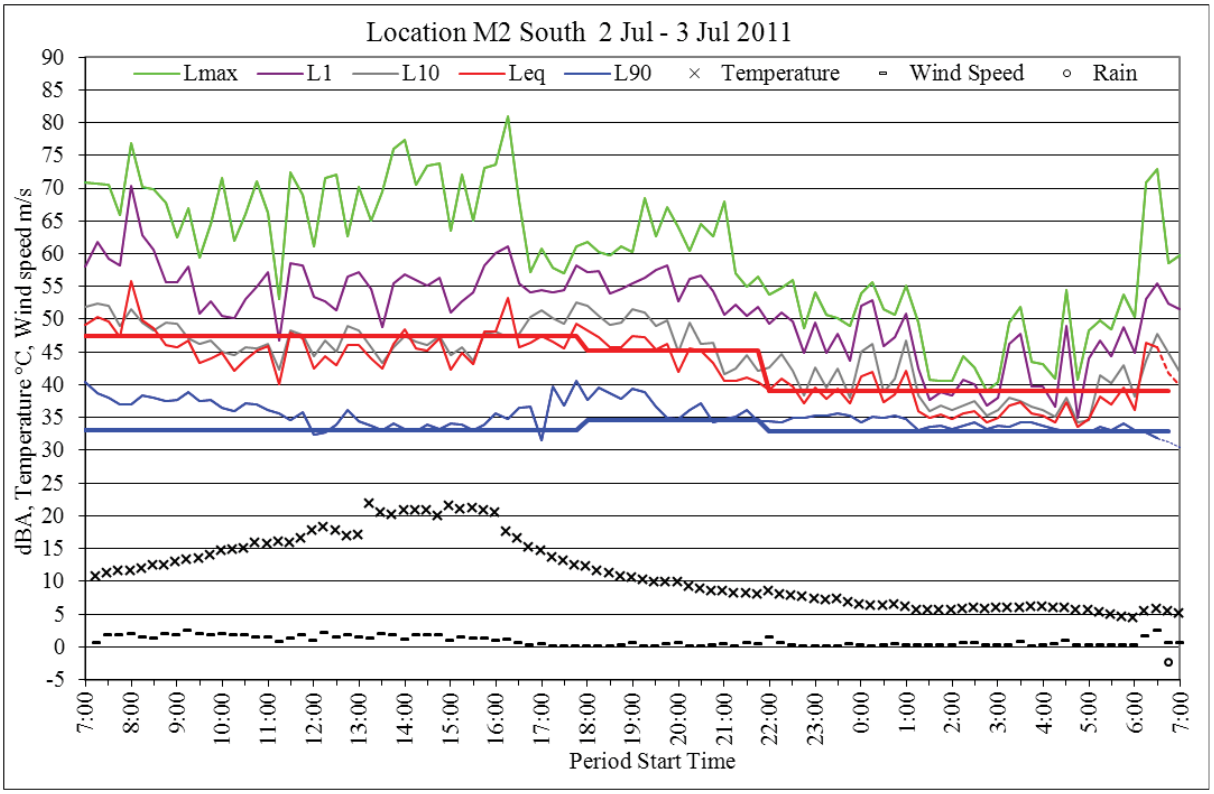
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

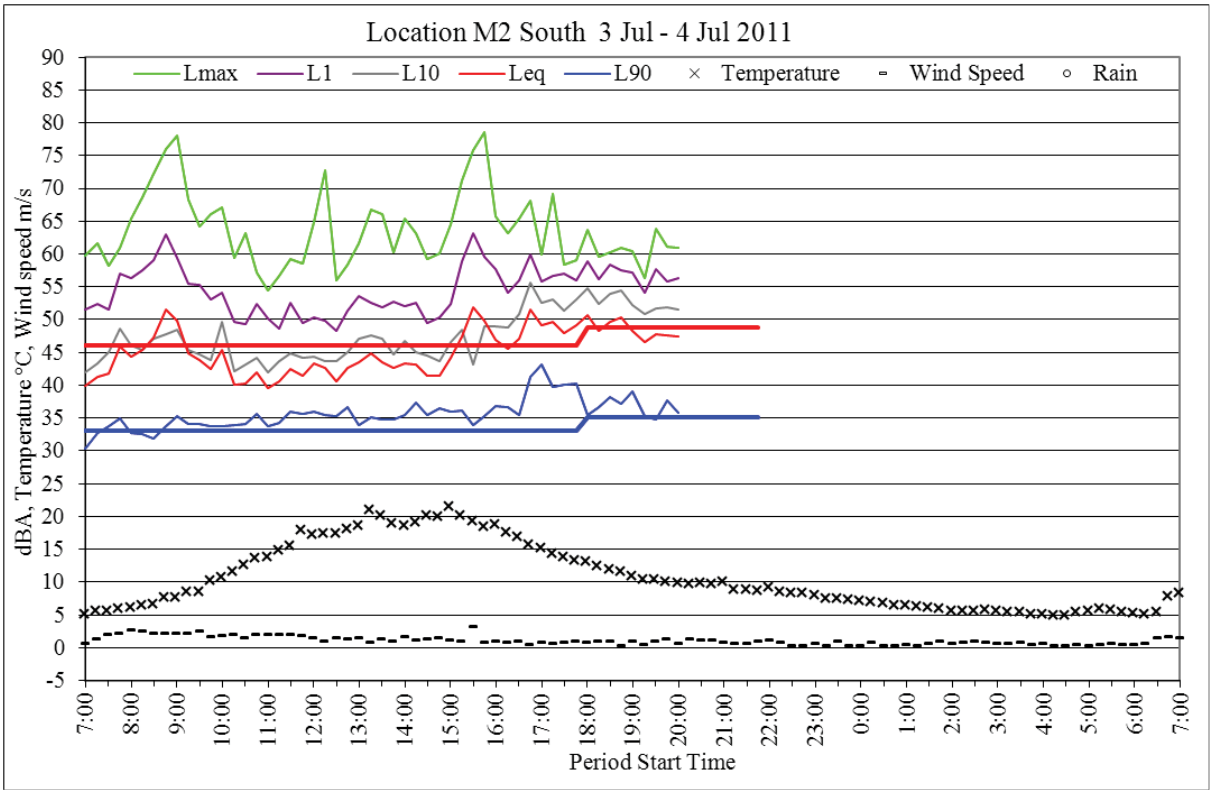

Location M2 South 28 Jun - 29 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

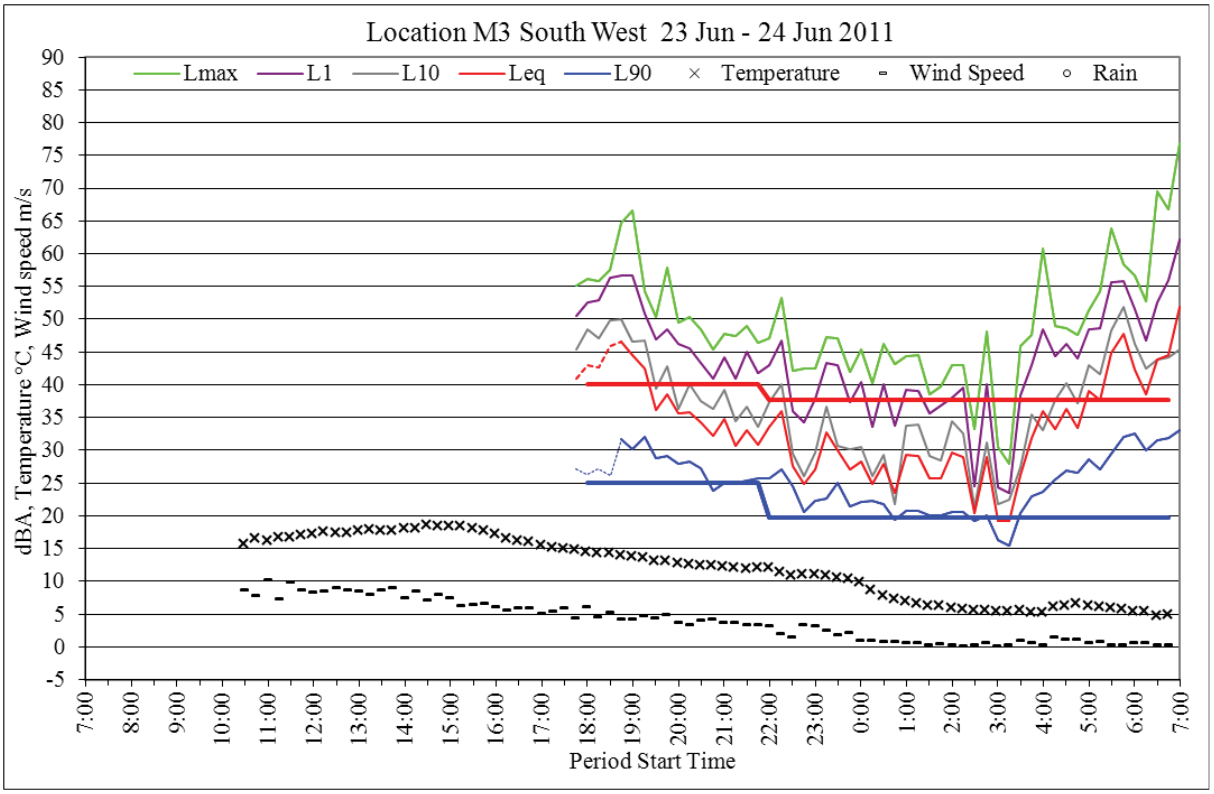

Location M2 South 29 Jun - 30 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

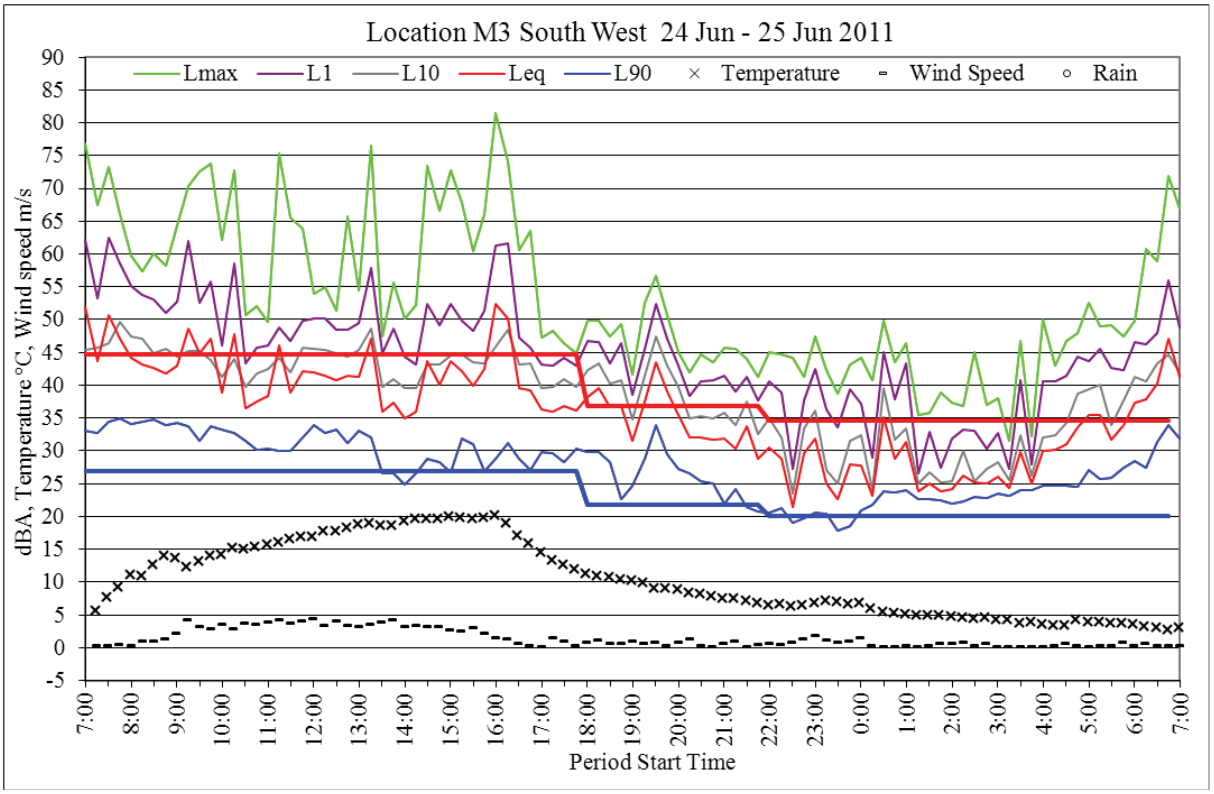

Location M2 South 30 Jun - 1 Jul 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

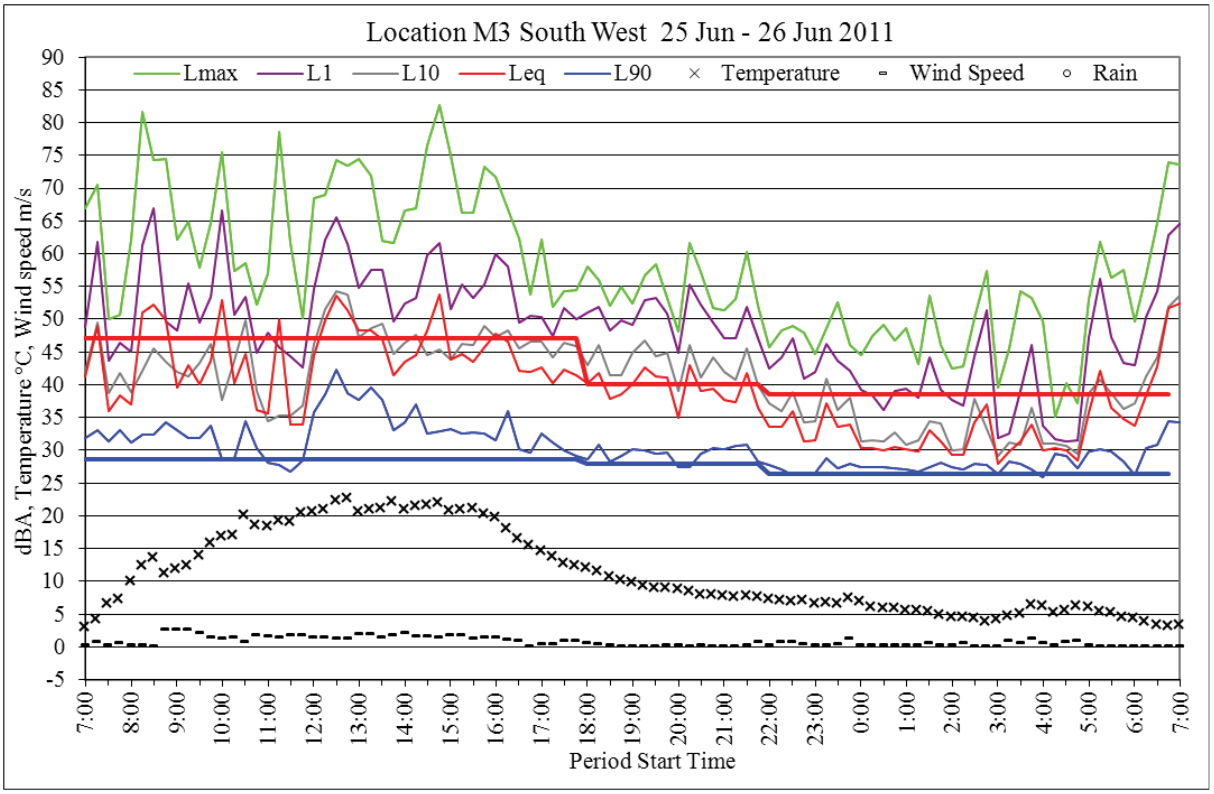

Location M2 South 1 Jul - 2 Jul 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

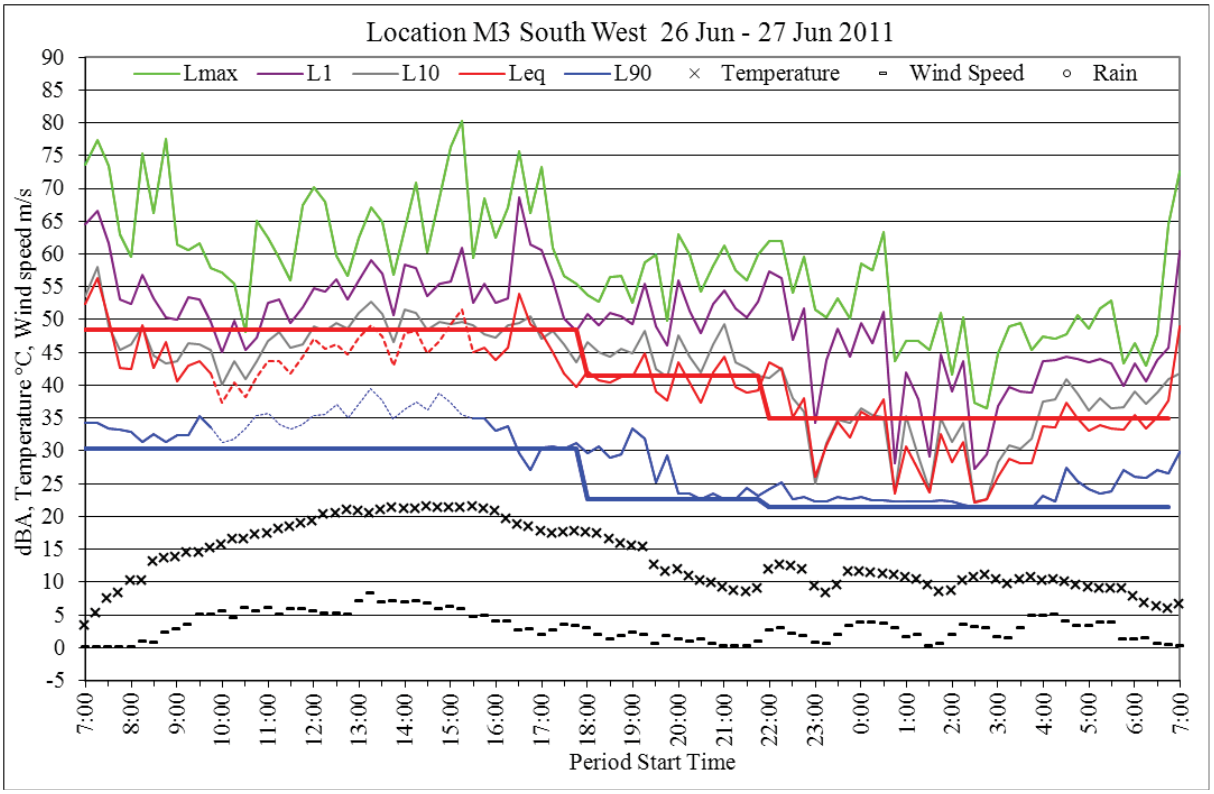

Location M2 South 2 Jul - 3 Jul 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

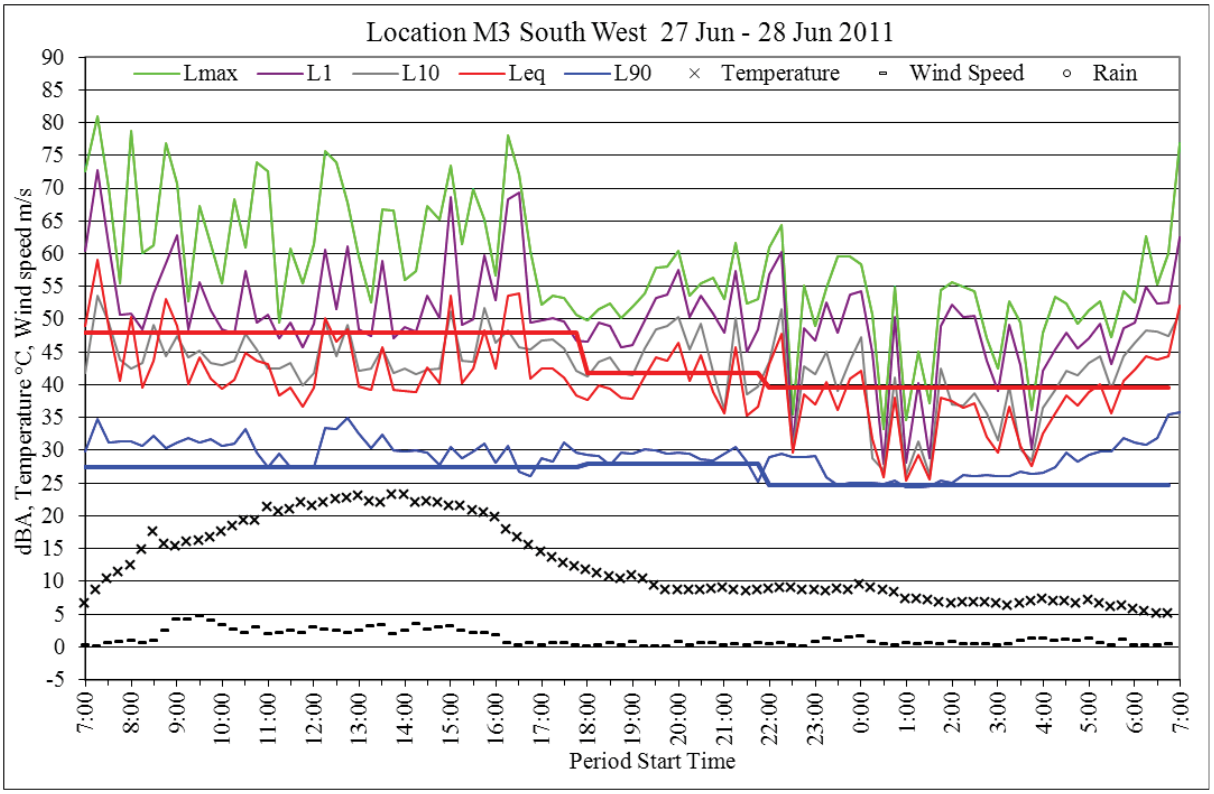

Location M2 South 3 Jul - 4 Jul 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

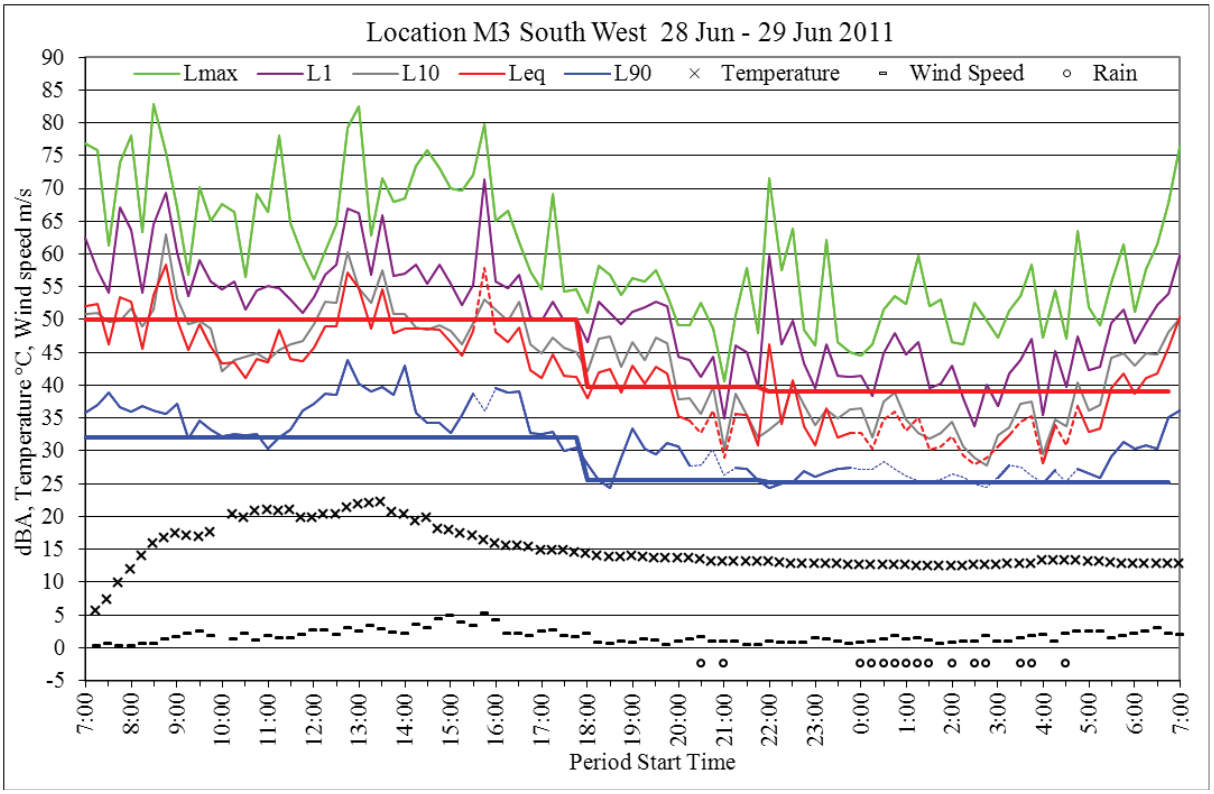

Location M3 South West 23 Jun - 24 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

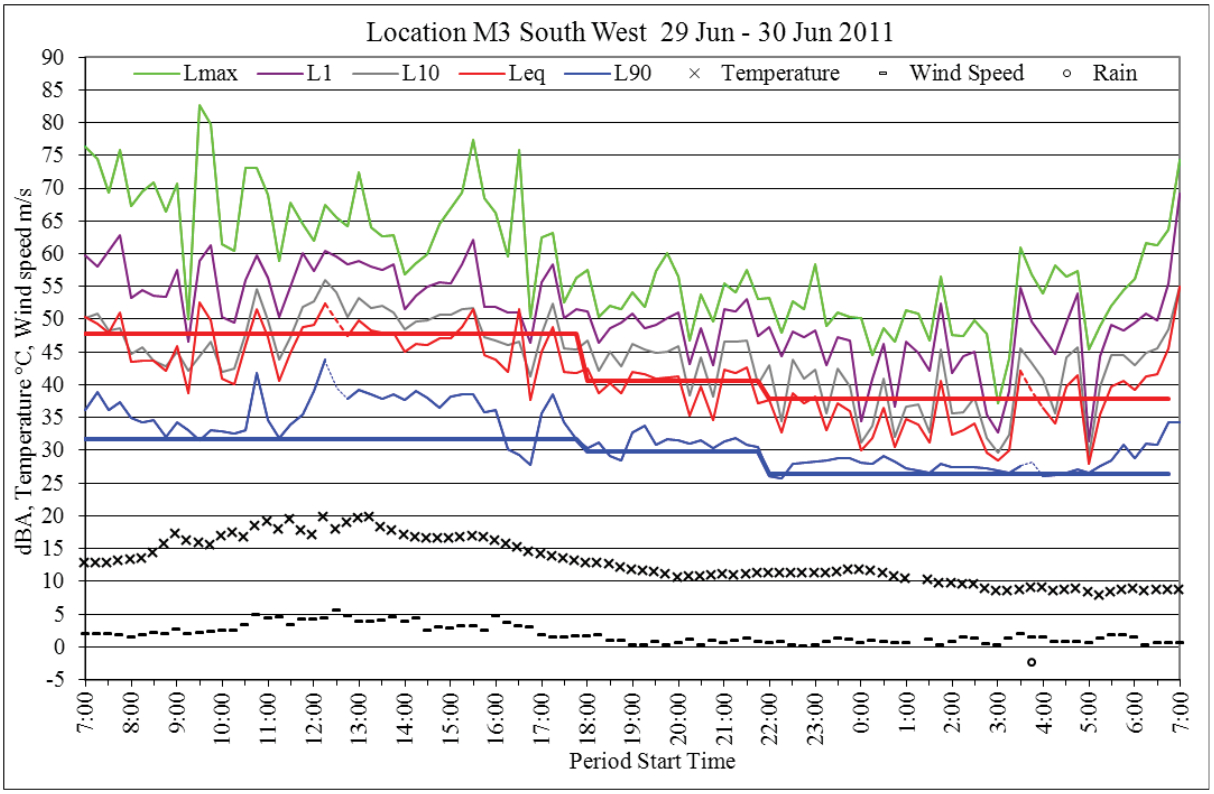

Location M3 South West 24 Jun - 25 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

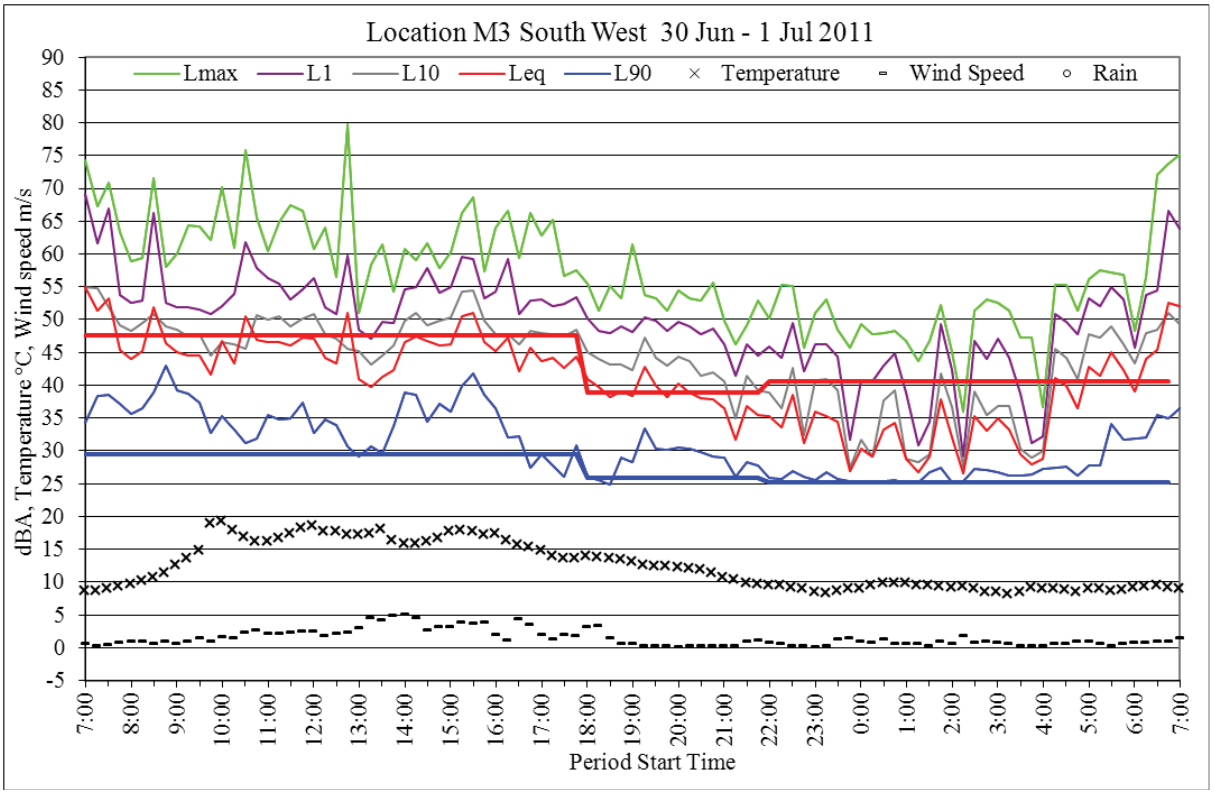

Location M3 South West 25 Jun - 26 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

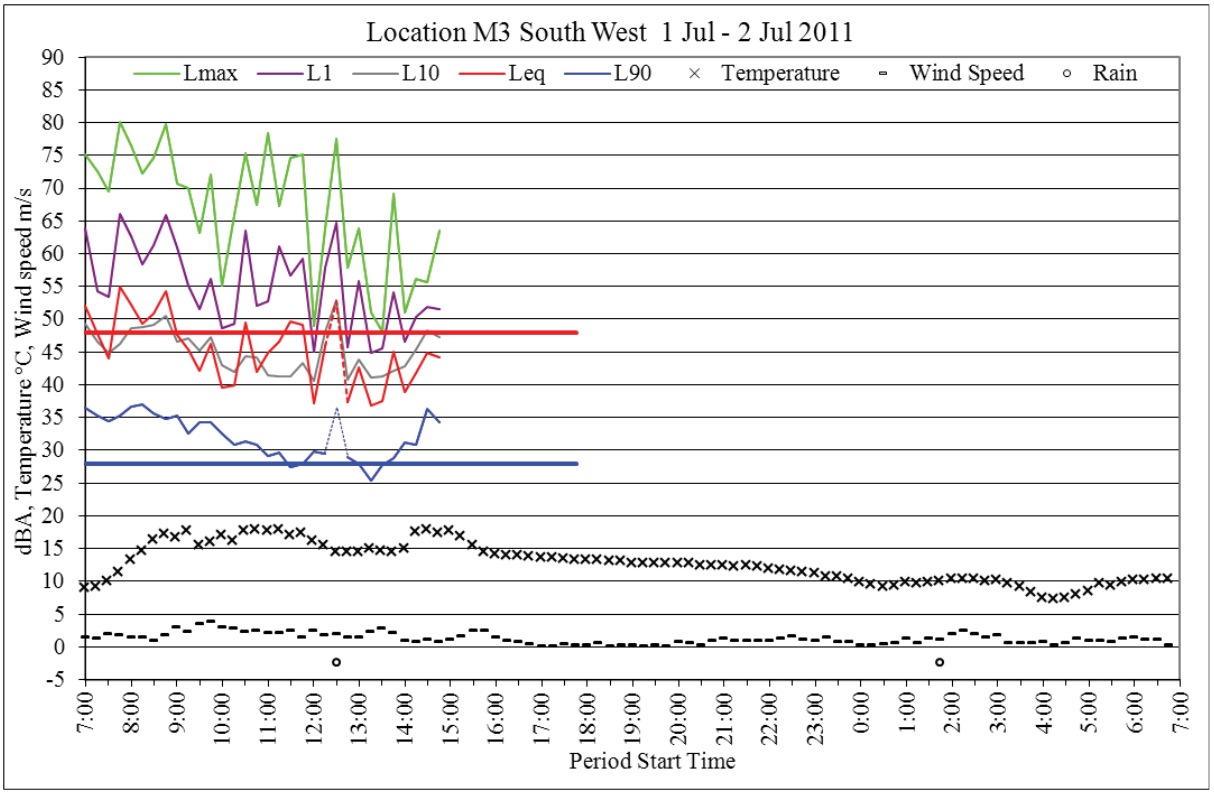

Location M3 South West 26 Jun - 27 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

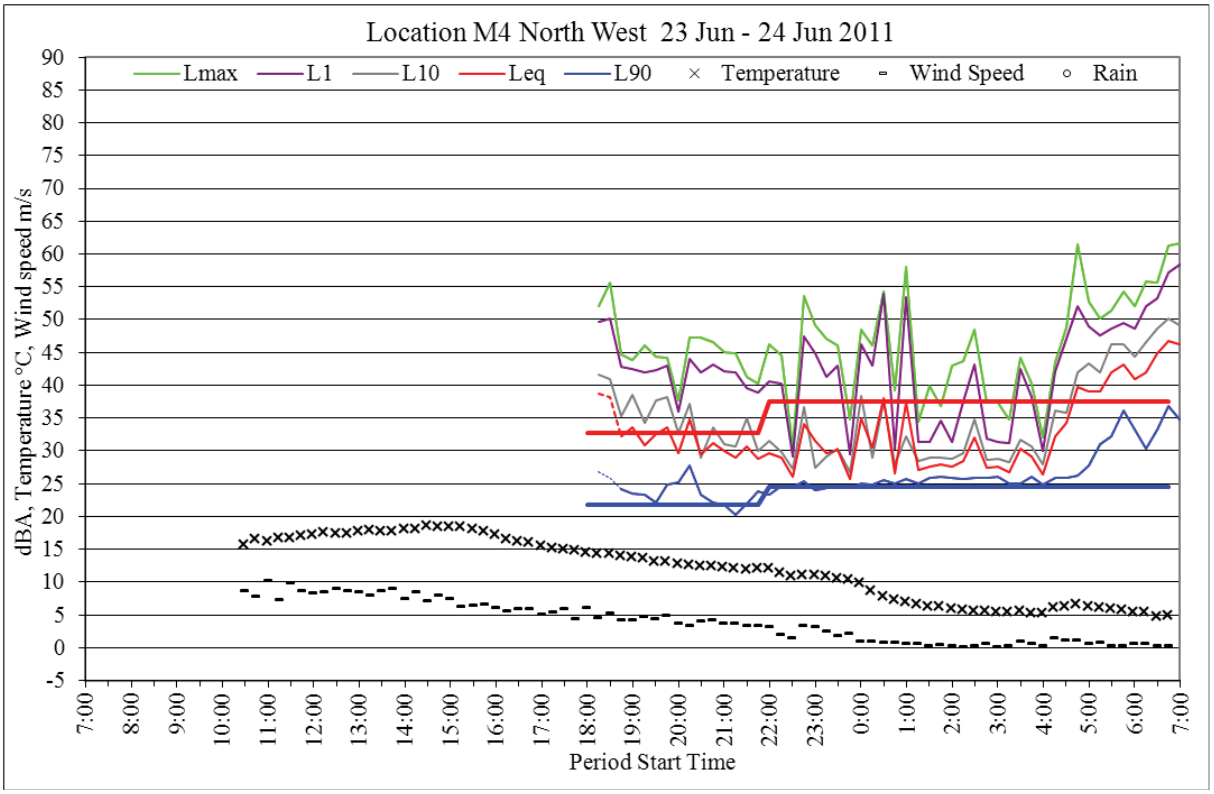

Location M3 South West 27 Jun - 28 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

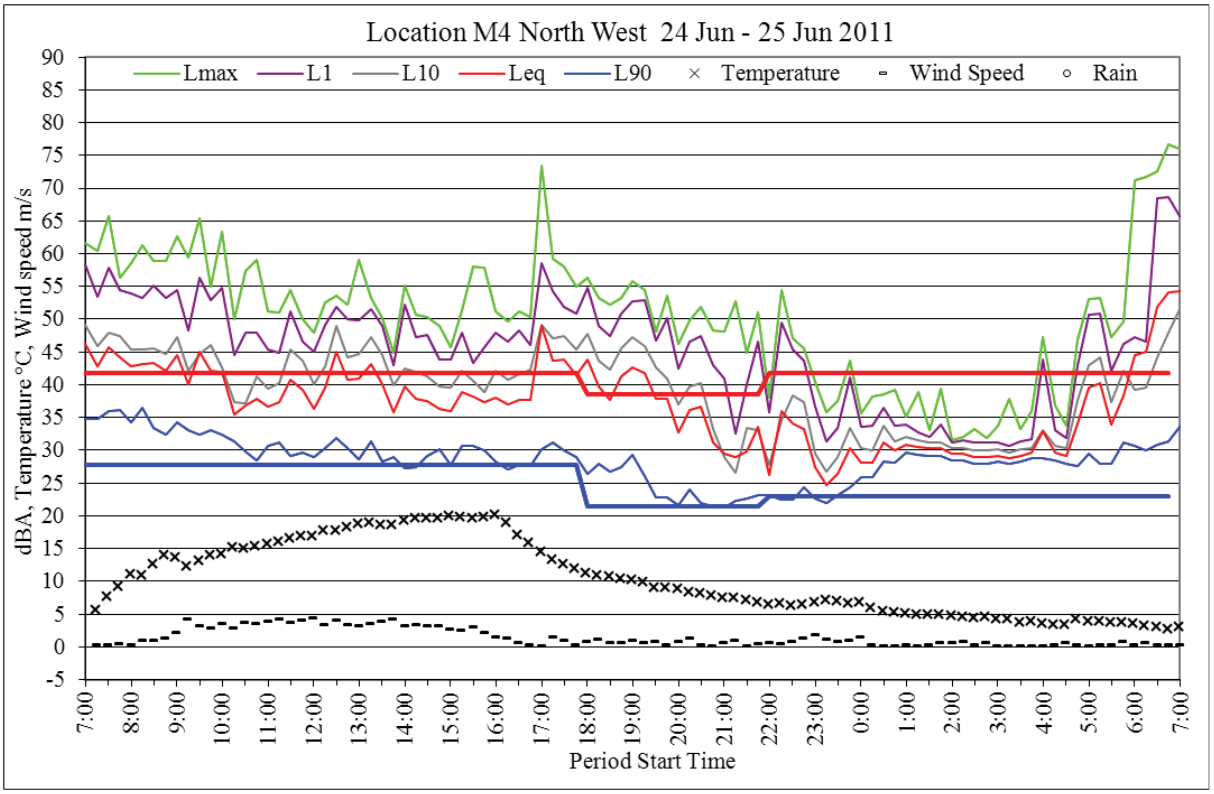

Location M3 South West 28 Jun - 29 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

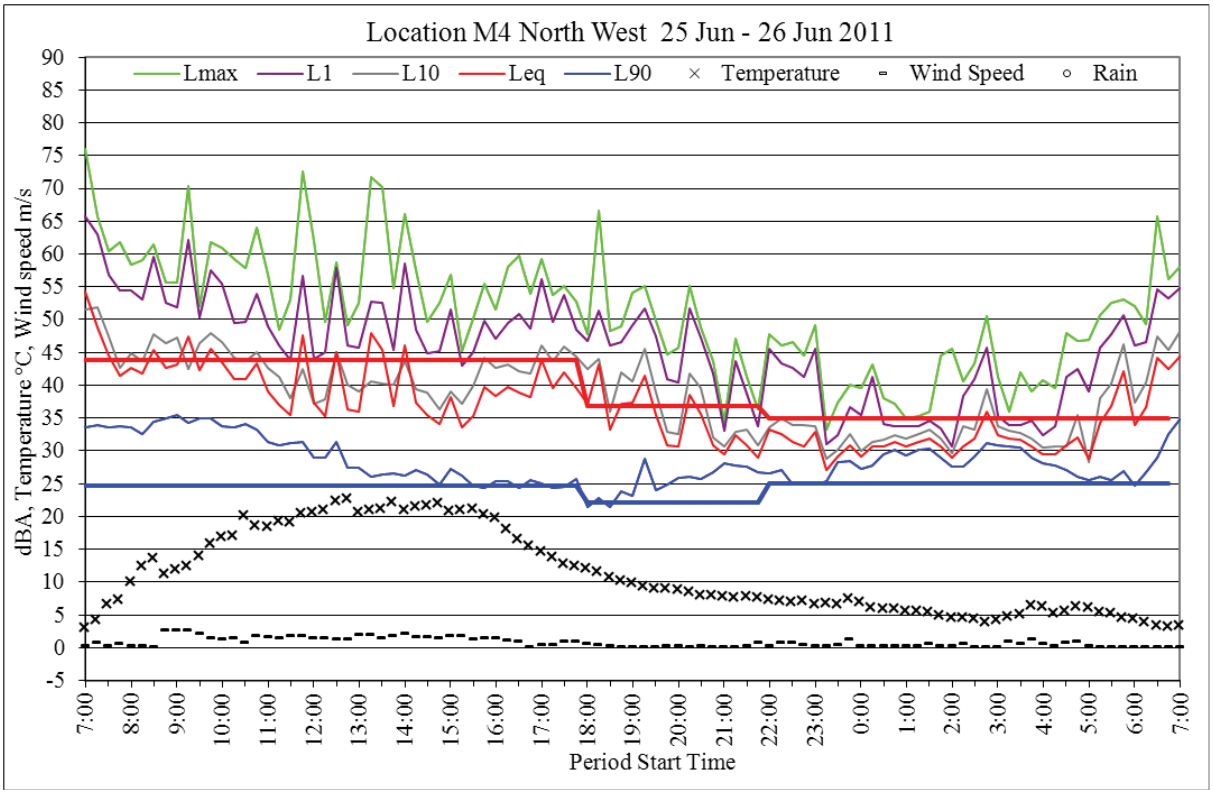

Location M3 South West 29 Jun - 30 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

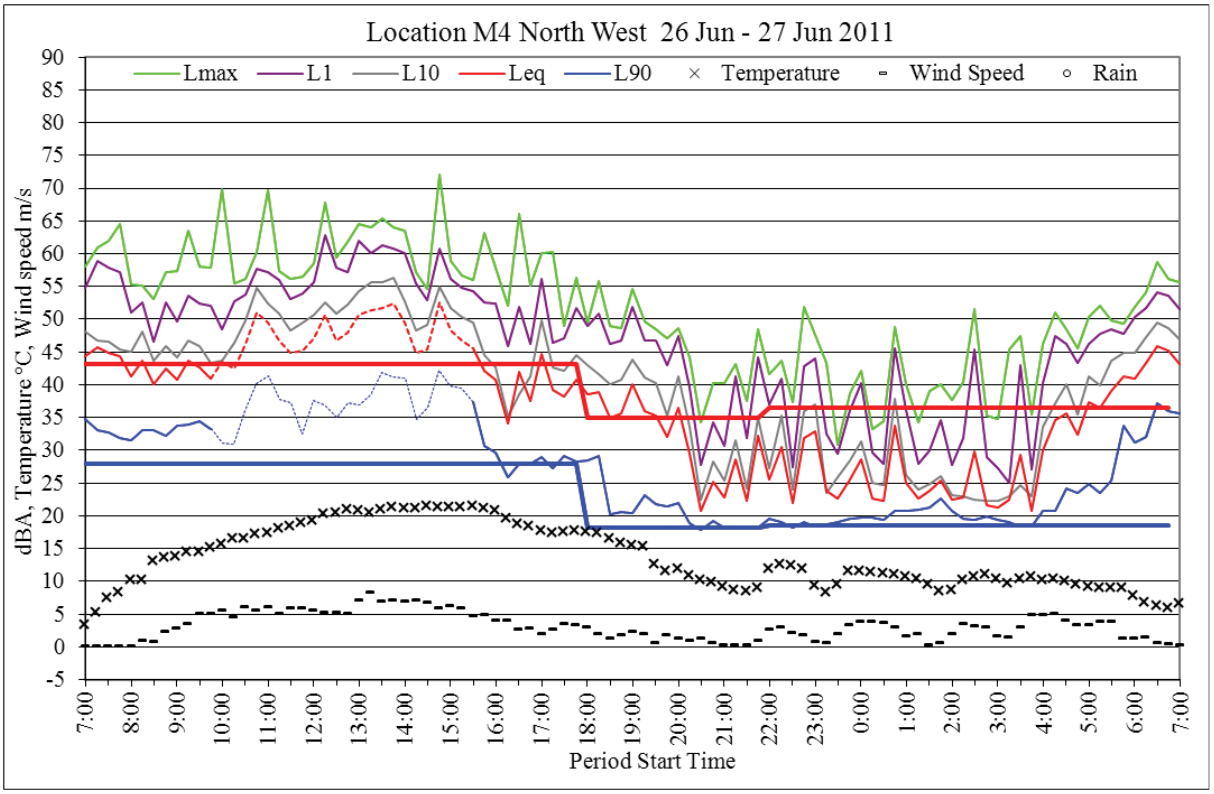

Location M3 South West 30 Jun - 1 Jul 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

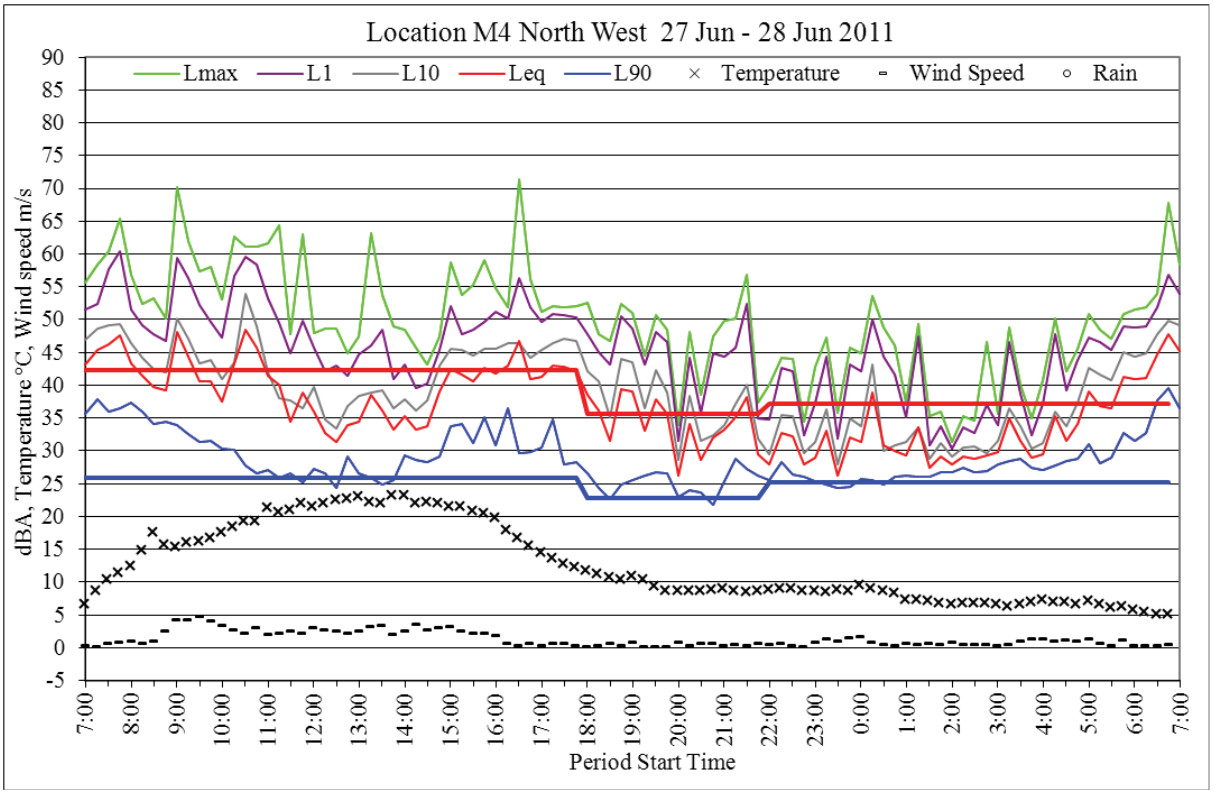

Location M3 South West 1 Jul - 2 Jul 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

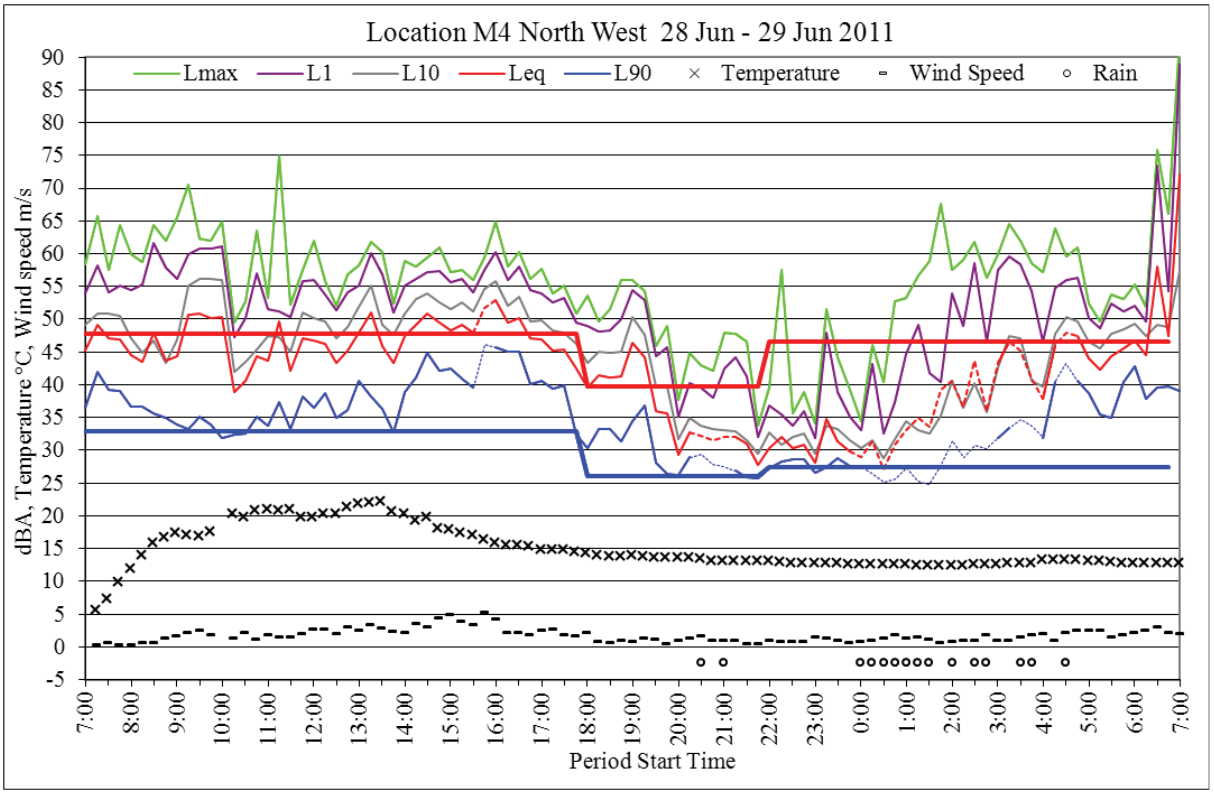

Location M4 North West 23 Jun - 24 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

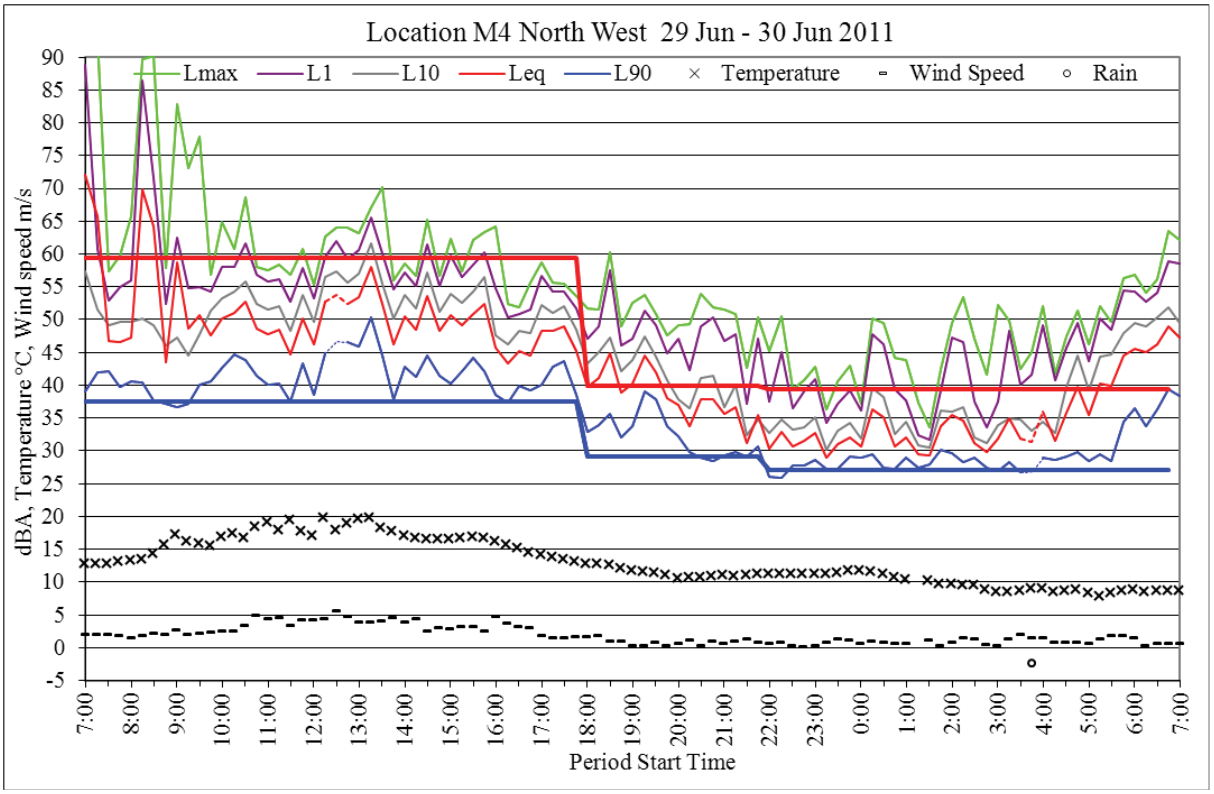

Location M4 North West 24 Jun - 25 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

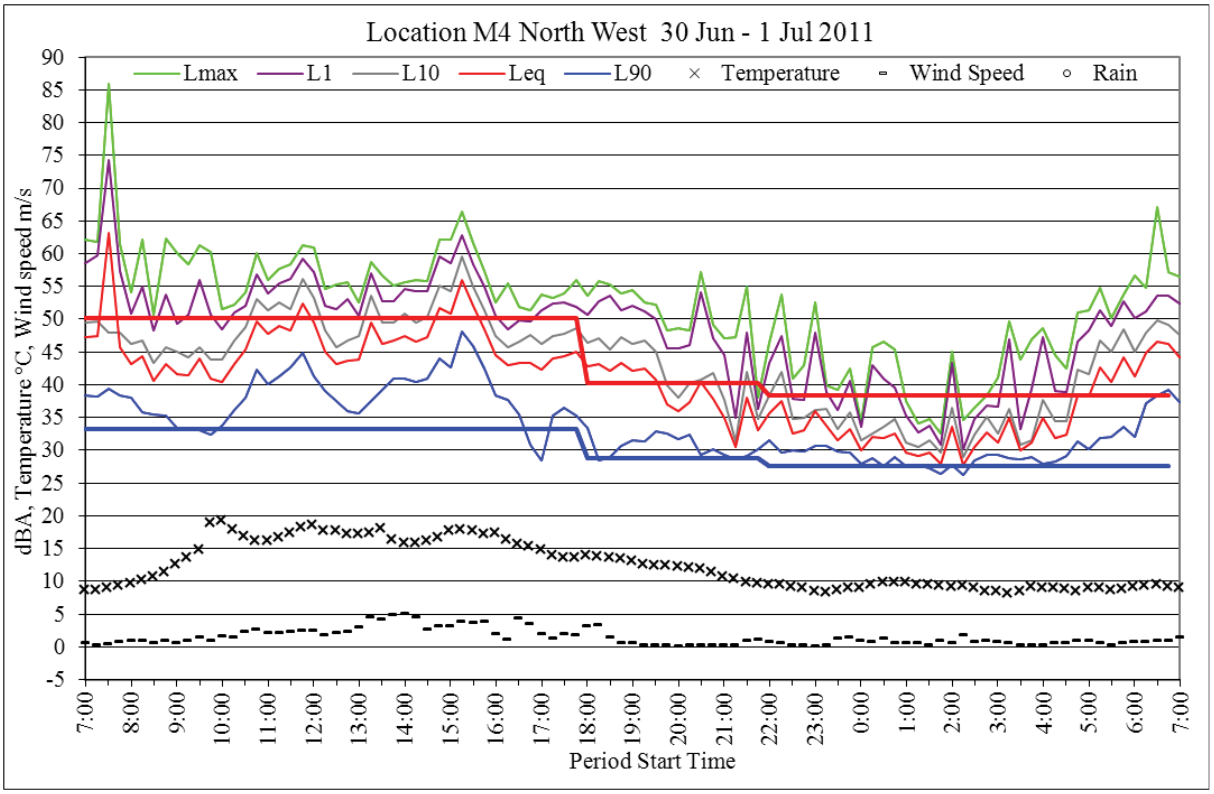

Location M4 North West 25 Jun - 26 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

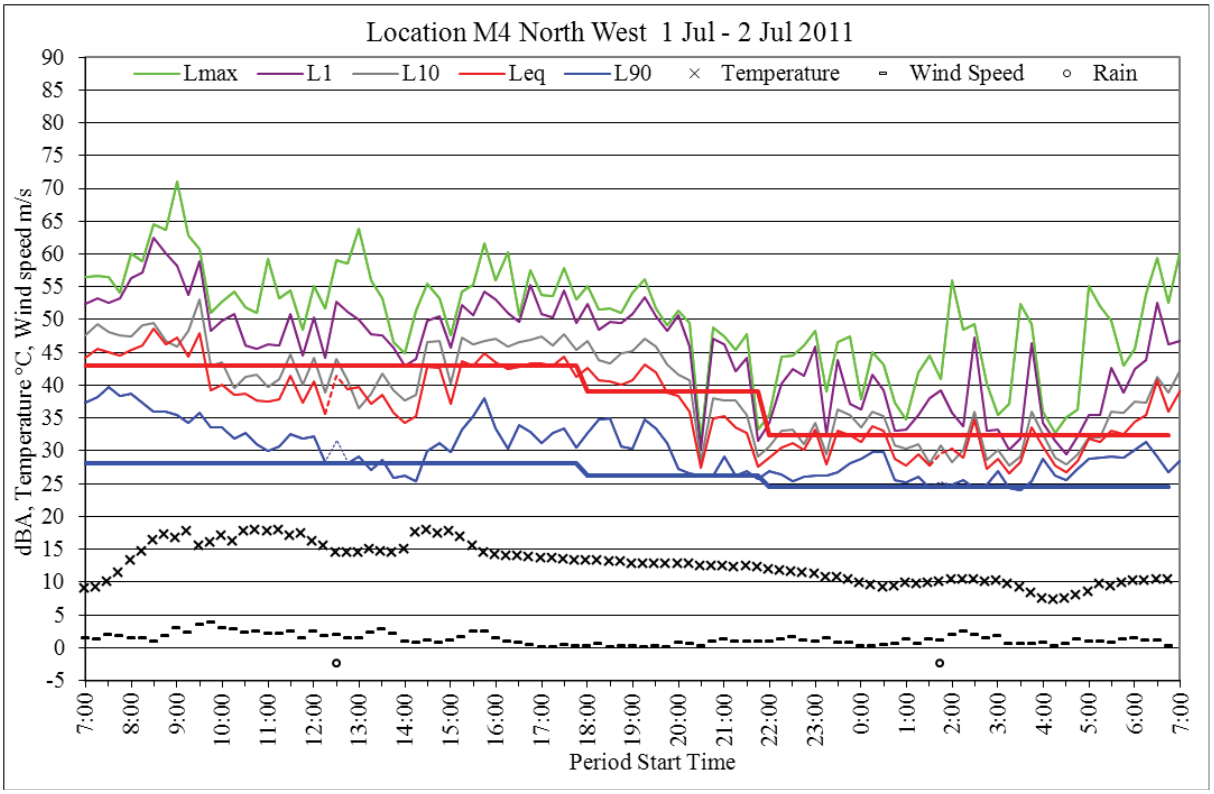

Location M4 North West 26 Jun - 27 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

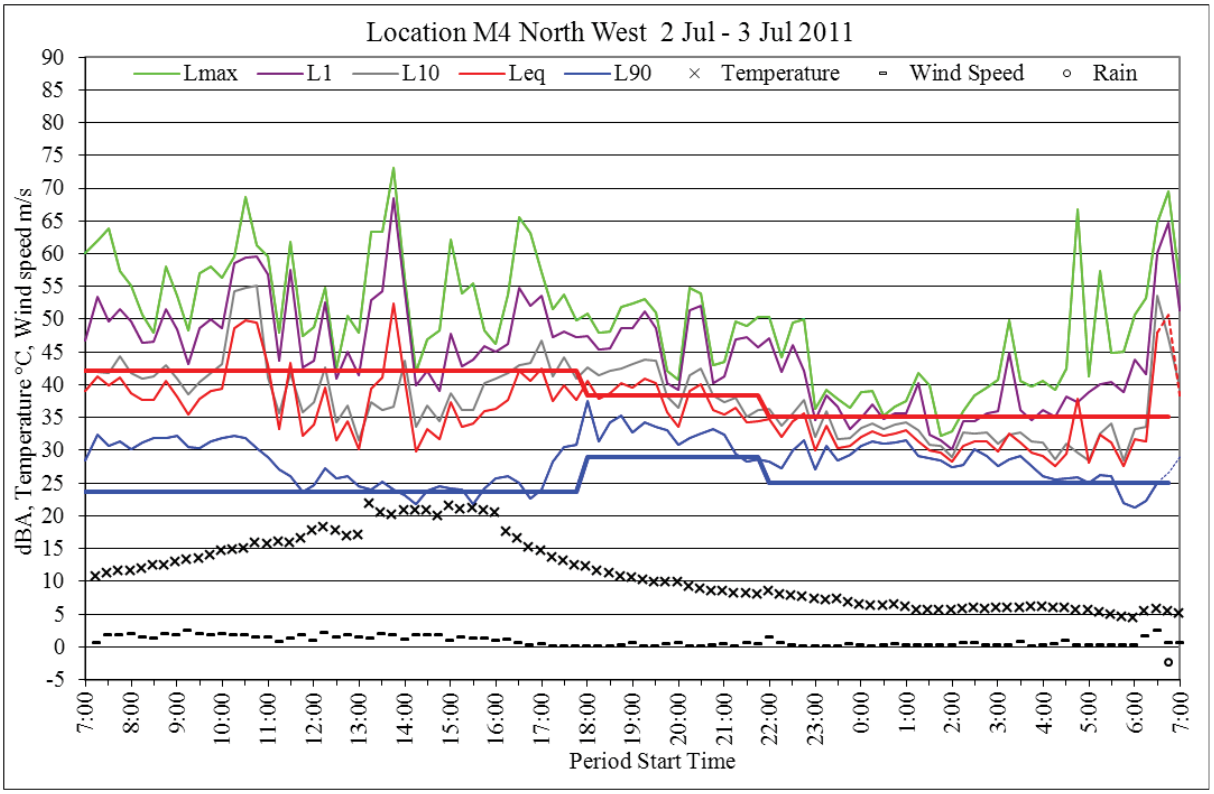

Location M4 North West 27 Jun - 28 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

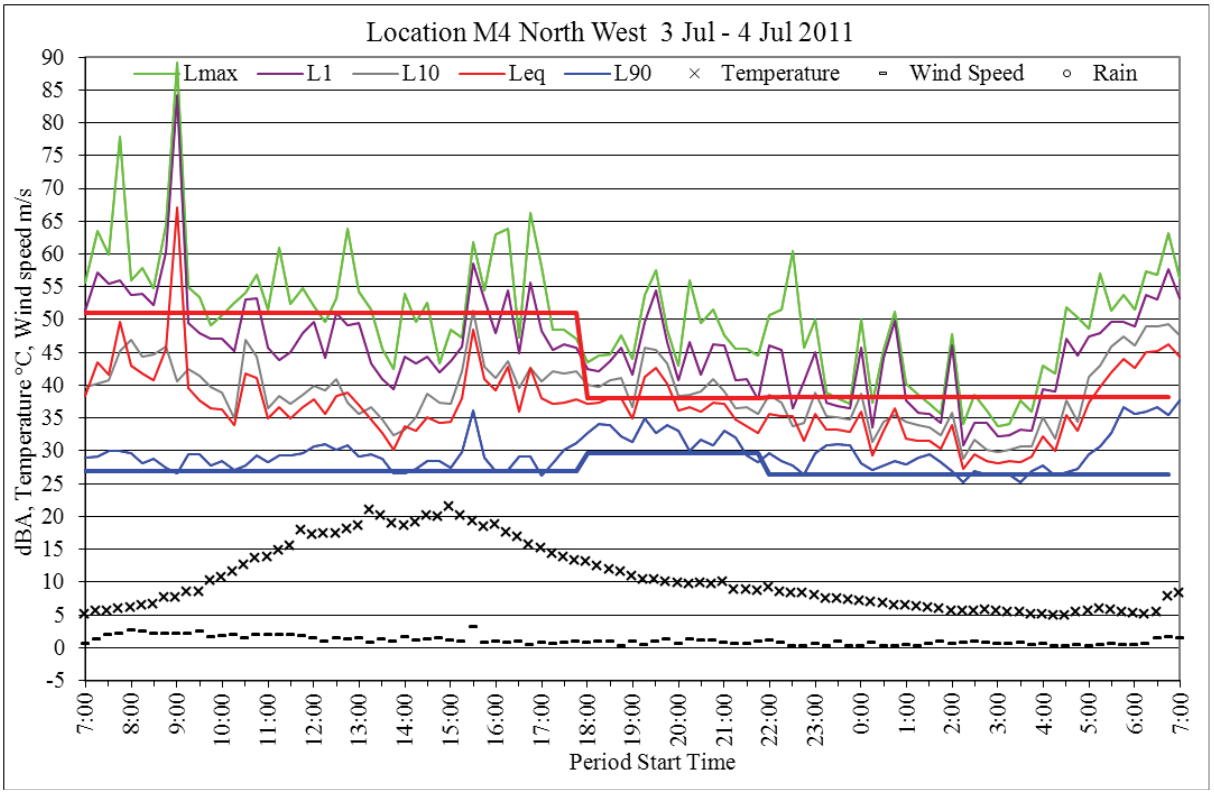

Location M4 North West 28 Jun - 29 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time

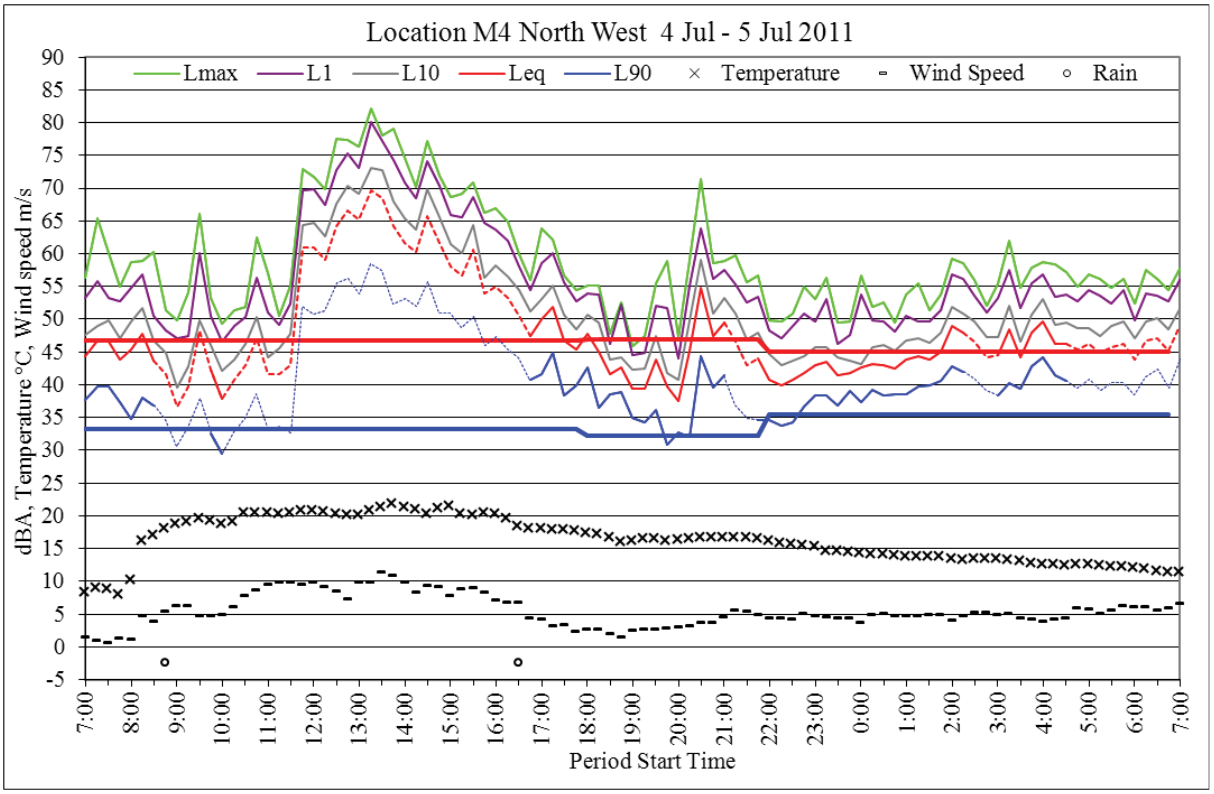

Location M4 North West 29 Jun - 30 Jun 2011
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature °C, Wind speed m/s
Period Start Time


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