BASSETT

Australasian Resources (Balmoral South) Iron Ore Mine Environmental Noise Assessment

Iron Ore Mine and Processing Plant

Maunsell Pty Ltd

28 November 2006

Environmental Noise Assessment

Prepared for

Maunsell Pty Ltd

Prepared by

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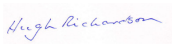
Reviewed by Hugh Richardson

An assessment of the environmental noise emission during construction and the various stages of operation of the proposed Australasian Resources (Balmoral South) iron ore mine

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
0	13/11/2006	Draft issue for comment	Hugh Richardson Acoustic Manager WA	
1	28/11/2006	Amendments for throughput	Hugh Richardson Acoustic Manager WA	

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Executive Summary

Australasian Resources propose to undertake iron ore mining operations in the Cape Preston area, approximately 80km southwest of Karratha, Western Australia. The proposed mine site is approximately 2km south of another proposed iron ore mine, Mineralogy (Preston Iron) mine site.

This report considers the predicted noise levels of the more critical night time operations to the nearest noise sensitive receivers and compares them with the appropriate environmental noise criteria. In particular, noise sensitive receivers are the two miners camps located to the east and south of the proposed mine, and the public camping area at the mouth of the Fortescue River.

Our assessment is based on 3 dimensional topographical data and plant and mine layout data provided to us in electronic form by Maunsell Australia. Sound power data utilised for the mining equipment was the same as that used for the Mineralogy (Preston Iron) mine assessment. There has been no information provided for the bore field, and as such this study excludes noise emission from the bore field.

The operational noise criteria from the WA Environmental Protection (Noise) Regulations 1997 (WAEPNR) will be applicable at the following locations:

- miners camp located to the east of the proposed mine;
- miners camp located to the south of the proposed mine; and
- public camping area located at the mouth of the Fortescue River.

Since the miners camps are associated with the mines, they are considered to be a caretakers premises or the like, attached to or forming part of the mine. Therefore the applicable assigned levels fall under the “Industrial and Utility” category. The public camping area falls under the “noise sensitive” category.

The design target for the miners camps are therefore L_{A10} 60 dB(A), which is 5 dB(A) below the assigned noise level so as not to significantly contribute to the overall noise environment. The design target for the public camping area is most stringent at night, and as the mine will operate for 24 hours per day the applicable criteria is 30 dB(A), also 5 dB(A) below the assigned level.

The WAEPNR provides guidance for construction noise, however there are no specific criteria. The guidelines for construction work specify management practices that should be followed and general adherence to the Regulations.

The WAEPNR specifies allowable airblast levels resulting from blasting when received at any other noise sensitive premises. For blasting carried out between 7am and 6pm on any day, which is not a Sunday or a public holiday, the airblast level received on any other premises must not exceed:

- 125 dB(LIN) L_{peak} for any one blast; and
- 120 dB(LIN) L_{peak} for nine in any 10 consecutive blasts (irrespective of interval between blasts).

For blasting carried out between 7am and 6pm on a Sunday or public holiday, the airblast level received on any other premises must not exceed:

- 120 dB(LIN) L_{peak} for any one blast; and
- 115 dB(LIN) L_{peak} for nine in any 10 consecutive blasts (irrespective of interval between blasts).

The airblast level is limited to 90 dB(LIN) for any period outside these specified times.

The environmental noise emission was predicted using CONCAWE[1] algorithms in the SoundPLAN[2] noise propagation software. Noise levels were predicted for "worst case" night time meteorological conditions as required by the guidelines to the Western Australian Environmental Protection (Noise) Regulations (i.e. Weather Category 6, for wind blowing from source to receiver). The modelled weather conditions are: 3m/s wind speed, 15°C temperature, 50% relative humidity, 1013 mbar atmospheric pressure, Pasquill Stability Category 'F'.

Three operational scenarios were considered for the assessment of the mining noise, these being initial, future and final, with all three scenarios assuming that the processing plant is at 100% operational capacity. Based on the operational noise sources listed in Appendix B, noise emission levels have been predicted at the receivers and are displayed below.

Predicted Environmental Noise Levels

Receiver Location	Predicted Night Time Noise Emission – L_{A10} dB(A)			Criteria – L_{A10} dB(A)
	Initial	Future	Final	
Miners camp (east)	36	36	36	60
Miners camp (south)	26	24	24	60
Public camping area (Fortescue River)	24	24	24	30

The table above indicates that the noise emission criteria are achieved at all sensitive receivers for the proposed Balmoral South mine. Noise contour plots for each operational scenario are included in Appendix C.

The construction noise emission was predicted using CONCAWE algorithms in the SoundPLAN noise propagation software. Based on the construction noise sources listed in Appendix B, noise emission levels have been predicted at the receivers and are displayed below.

Predicted Environmental Noise Levels

Receiver Location	Predicted Night Time Construction Noise Emission – L_{A10} dB(A)	Criteria – L_{A10} dB(A)
Miners camp (east)	28	N/A
Miners camp (south)	23	N/A
Public camping area (Fortescue River)	17	N/A

Blasting noise at the receiver locations will vary depending on the stage of the mining operations, blast configuration and site specific conditions. The noise from blasting is likely to be higher during construction and the initial stages of mining, and as such, blast levels should be measured for the initial blasts to determine the typical maximum permissible charge size.

[1] CONCAWE – The oil companies' international study group for conservation of clean air and water – europe (established in 1963) Report 4/81 "The propagation of noise from petroleum and petrochemical complexes to neighbouring communities".

[2] SoundPLAN 6.4 is a suite of noise propagation programs.

1.0 Introduction

Australasian Resources propose to undertake iron ore mining operations in the Cape Preston area, approximately 80km southwest of Karratha, Western Australia. The proposed mine site is approximately 2km south of another proposed iron ore mine, Mineralogy (Preston Iron) mine site.

As a part of the mining operations, it is proposed to establish a power station and processing plant immediately east of the mine, as well as port facilities further north and also accommodation facilities to the south of the mine. Under the proposal, the operations will operate for 24 hours per day, 7 days per week.

Specifically, the report considers the predicted noise levels of the more critical night time operations to the nearest noise sensitive receivers and compares them with the appropriate environmental noise criteria. In particular, noise sensitive receivers are the two miners camps located to the east and south of the proposed mine, and the public camping area at the mouth of the Fortescue River.

The proposed mining operations for the Balmoral South mine will consist of:

- open cut mine, eventually 300m deep, 1.6km long and 1.8km wide;
- extraction of 23.2 million tonnes per annum (Mtpa) of ore on a 24 hour basis, 7 days per week;
- fleet of approximately 8 – 10, 200 tonne haul trucks;
- two drilling rigs;
- 20 Mt of waste in the first year and 18.5 Mtpa of waste thereafter;
- 16.5 Mtpa of tailings;
- 3.2 Mtpa pellets and 2.5 Mtpa DRI;
- 4 high pressure grinding rolls with a force of 2,000 tonnes;
- permanent accommodation for up to 545 people, and possibly as many as 2,500 for the construction period; and
- conveyors to run from the plant to the stockpile then to the jetty offshore from Cape Preston.

Our assessment is based on 3 dimensional topographical data and plant and mine layout data provided to us in electronic form by Maunsell Australia. Sound power data utilised for the mining equipment was the same as that used for the Mineralogy (Preston Iron) mine assessment. There has been no information provided for the bore field, and as such this study excludes noise emission from the bore field.

Two reports prepared by Lloyd Acoustics Pty Ltd for the Mineralogy (Preston Iron) mine were used as a reference for the preparation of this report. These reports are “Noise Impact Assessment, Mineralogy Project, Iron Ore Mine and Processing Plant, Cape Preston, Western Australia” dated January 2005 and April 2005.

Nomenclature relevant to this report has been included in Appendix A.

2.0 Locality Map

Figure 1 Balmoral South and Cape Preston Mines and Receivers Locality Map

3.0 Criteria

3.1 Environmental Noise Criteria

The Western Australian *Environmental Protection (Noise) Regulations* (1997), WAEPNR, made pursuant to the *Environmental Protection Act 1986,* specify allowable noise emissions as shown in Table 1.

Table 1 Assigned levels by the Western Australian Environmental Protection (Noise) Regulations 1997

Type of premise receiving noise	Time of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises at locations within 15m of a building directly associated with a noise sensitive use	7:00 to 19:00 Monday to Saturday	45 + influencing factor	55 + influencing factor	65 + influencing factor
	9:00 to 19:00 Sundays and public holidays	40 + influencing factor	50 + influencing factor	65 + influencing factor
	19:00 to 22:00 any day	40 + influencing factor	50 + influencing factor	55 + influencing factor
	22:00 on any day to 7:00 Monday to Saturday and 9:00 Sunday and public holidays	35 + influencing factor	45 + influencing factor	55 + influencing factor
Noise sensitive premises at locations further than 15m of a building directly associated with a noise sensitive use	All hours	60	75	80
Commercial premises	All hours	60	75	80
Industrial and Utility premises	All hours	65	80	90

The influencing factor is applied to account for higher noise areas as a result of nearby industrial and commercial areas and major roads. The influencing factor is determined by considering the land use within two circles having a radius of 100m and 450m from the noise sensitive premises of concern.

According to the policy the noise emissions must not significantly contribute to a level of noise which exceeds the assigned level (as shown in Table 1). The Environmental Protection (Noise) Regulations 1997 suggest that a noise emission is taken to “significantly contribute to” a level of noise if the noise emission is greater than a level which is 5 dB below the assigned level at the point of reception. Therefore, the design target shall be 5 dB less than the assigned noise level as set out by the Environmental Protection (Noise) Regulations 1997 in order to not significantly contribute to the overall noise environment.

Penalties for the character of the noise may be applicable according to the policy. A 5 dB(A) penalty is to be applied for each of the characteristics of tone and modulation, and a 10 dB(A) penalty is applied impulsiveness. The noise emission is expected to be broadband in nature and hence no penalty is warranted. However, “track slap” can be produced by the tracked dozers which would attract a penalty for modulation, but this can be minimised by restricting the dozers to 2nd gear in reverse, and therefore no penalty has been applied.

The noise criteria will be applicable at the following locations:

- miners camp located to the east of the proposed mine;
- miners camp located to the south of the proposed mine; and
- public camping area located at the mouth of the Fortescue River.

Since the miners camps are associated with the mines, they are considered to be a caretakers premises or the like, attached to or forming part of the mine. Therefore the applicable assigned levels fall under the “Industrial and Utility” category. The public camping area falls under the “noise sensitive” category.

The design target for the miners camps are therefore L_{A10} 60 dB(A), which is 5 dB(A) below the assigned noise level so as not to significantly contribute to the overall noise environment. The design target for the public camping area is most stringent at night, and as the mine will operate for 24 hours per day the applicable criteria is 30 dB(A), since no influencing factor is applied.

3.2 Construction Noise Criteria

The WAEPNR provides guidance for construction noise, however there are no specific criteria. The guidelines for construction work carried out between 7am and 7pm on any day which is not a Sunday or public holiday are:

- the construction work must be carried out in accordance with control of noise practices set out in section six of Australian Standard 2436-1981 “Guide to Noise Control on Construction, Maintenance and Demolition Sites”;
- the equipment used for the construction work must be the quietest reasonably available; and
- the chief executive officer may request that a noise management plan be submitted for the construction work at any time.

For construction work done outside the hours shown above:

- the work must be carried out in accordance with section six of AS 2436-1981;
- the equipment used must be the quietest reasonably available;
- the builder must advise all nearby occupants of the work to be done at least 24 hours before it commences;
- the builder must show that it was reasonably necessary for the work to be done out of hours; and
- the builder must submit to the chief executive officer (CEO) a noise management plan at least seven days before the work starts, and the plan must be approved by the CEO.

3.3 Blasting Noise Criteria

The WAEPNR specifies allowable airblast levels resulting from blasting when received at any other noise sensitive premises.
For blasting carried out between 7am and 6pm on any day, which is not a Sunday or a public holiday, the airblast level received on any other premises must not exceed:

- 125 dB(LIN) L_{peak} for any one blast; and
- 120 dB(LIN) L_{peak} for nine in any 10 consecutive blasts (irrespective of interval between blasts).

For blasting carried out between 7am and 6pm on a Sunday or public holiday, the airblast level received on any other premises must not exceed:

- 120 dB(LIN) L_{peak} for any one blast; and
- 115 dB(LIN) L_{peak} for nine in any 10 consecutive blasts (irrespective of interval between blasts).

The airblast level is limited to 90 dB(LIN) for any period outside these specified times.

4.0 Assessment

4.1 Environmental Noise

The environmental noise emission was predicted using CONCAWE[3] algorithms in the SoundPLAN[4] noise propagation software. Noise levels were predicted for "worst case" night time meteorological conditions as required by the Western Australian Environmental Protection (Noise) Regulations (i.e. Weather Category 6, for wind blowing from source to receiver). The modelled weather conditions are: 3m/s wind speed, 15°C temperature, 50% relative humidity, 1013mbar atmospheric pressure, Pasquill Stability Category 'F'.

Three operational scenarios were considered for the assessment of the mining noise, these being initial, future and final. The scenarios are described below, with all three scenarios assuming that the processing plant is at 100% operational capacity:

- **Initial**

  One tracked dozer and three haul trucks operating in the waste area (approximately 20m above natural surface level), one haul truck located between the mine and waste area (at natural surface level), one haul truck and two wheeled front end loaders at the primary crusher (at natural surface level), and all other equipment located in the mine (approximately 40m below natural surface level).
- **Future**

  One tracked dozer and two haul trucks operating in the waste area (approximately 40m above natural surface level), one haul truck located between the mine and waste area (at natural surface level), one haul truck and two wheeled front end loaders at the primary crusher (at natural surface level), and all other equipment located in the mine (approximately 150m below natural surface level).
- **Final**

  One tracked dozer and one haul truck operating in the waste area (approximately 60m above natural surface level), one haul truck located between the mine and waste area (at natural surface level), one haul truck and two wheeled front end loaders at the primary crusher (at natural surface level), and all other equipment located in the mine (approximately 300m below natural surface level).

Based on the operational noise sources listed in Appendix B, noise emission levels have been predicted at the receivers and are displayed in Table 2.

Table 2 Predicted Environmental Noise Levels

Receiver Location	Predicted Night Time Noise Emission – L_{A10} dB(A)			Criteria – L_{A10} dB(A)
	Initial	Future	Final	
Miners camp (east)	36	36	36	60
Miners camp (south)	26	24	24	60
Public camping area (Fortescue River)	24	24	24	30

[3] CONCAWE – The oil companies' international study group for conservation of clean air and water – europe (established in 1963) Report 4/81 "The propagation of noise from petroleum and petrochemical complexes to neighbouring communities".

[4] SoundPLAN 6.4 is a suite of noise propagation programs.

Table 2 indicates that the noise emission criteria are achieved at all sensitive receivers for the proposed Balmoral South mine. Noise contour plots for each operational scenario are included in Appendix C.

4.2 Construction Noise

The construction noise emission was predicted using CONCAWE algorithms in the SoundPLAN noise propagation software. Noise levels were predicted for "worst case" night time meteorological conditions as required by the Western Australian Environmental Protection (Noise) Regulations (i.e. Weather Category 6, for wind blowing from source to receiver). The modelled weather conditions are: 3m/s wind speed, 15°C temperature, 50% relative humidity, 1013mbar atmospheric pressure, Pasquill Stability Category 'F'.

The construction noise is the removal of overburden and the construction of the tailings dams, roads and hardstand plant areas. The construction noise scenario is described below:

- **Construction**

  One tracked dozer and two haul trucks operating in the waste area, one haul truck and one wheeled front end loader at the plant hardstand, one haul truck, watercart and grader constructing the section of road between the Balmoral South and Preston Iron mines, two haul trucks and one tracked dozer operating in the tailings dam, and all other equipment located in the mine. All equipment for the construction model was located at natural surface level.

Based on the construction noise sources listed in Appendix B, noise emission levels have been predicted at the receivers and are displayed in Table 2.

Table 2 Predicted Environmental Noise Levels

Receiver Location	Predicted Night Time Construction Noise Emission – L_{A10} dB(A)	Criteria
Miners camp (east)	28	N/A
Miners camp (south)	23	N/A
Public camping area (Fortescue River)	17	N/A

There are no applicable criteria for the construction noise, however we note that the predicted noise levels are below the assigned noise levels set out in the WAEPNR.

4.3 Blasting Noise

Blasting noise at the receiver locations will vary depending on the stage of the mining operations, blast configuration and site specific conditions. The noise from blasting is likely to be higher during construction and the initial stages of mining, and as such, blast levels should be measured for the initial blasts to determine the typical maximum permissible charge size.

5.0 Conclusion

An environmental noise assessment for the proposed development of the Australasian Resources (Balmoral South) Iron Ore mine has been undertaken. This assessment has considered the applicable criteria based on the Western Australian Environmental Protection (Noise) Regulations (1997) (WAEPNR).

The operational noise of the Balmoral South mine is expected to comply with the relevant criteria at the miners camps and the public camping area at the Fortescue River. If penalties are applied (particularly for modulation from the tracked dozer “track slap”), then the 30 dB(A) design criterion at the Fortescue River may be exceeded, however the noise level will still be within the 35 dB(A) overall environmental noise criterion. This is not desirable since there will also be noise emission from the Mineralogy (Cape Preston) Iron Ore mine contributing to the overall noise level at the Fortescue River location. Therefore, tracked dozer operations on the waste mound should be limited at night or care should be taken to prevent “track slap”, alternatively, wheeled dozers could be considered for the waste mound.

The construction noise does not need to comply with the assigned noise levels, rather, best practices should be used to minimise noise emission during the period. However, given the construction noise levels, it is anticipated that these are likely to be acceptable as they do comply with the operational assigned noise level criteria.

Blasting noise will vary and as such should be monitored during the construction and initial operational stages to determine the typical maximum charges sizes for compliance.

6.0 Appendix A: Nomenclature

A-Weighting	The “A” weighting scale is designed to adjust the absolute sound pressure levels to correspond to the subjective response of the human ear.
dB(A)	A-Weighted sound pressure level measured in decibels.
dB(LIN)	Unweighted sound pressure level measured in decibels.
L_{A1}	The A-weighted sound level exceeded for 1% of a time period.
L_{A10}	The A-weighted sound level exceeded for 10% of a time period.
L_{Amax}	The maximum A-weighted sound level in dB(A).
L_{peak}	Peak sound pressure level measured in decibels. When followed by dB(LIN) it represents the linear (un-weighted) peak sound pressure level.
Influencing factor	The influencing factor is calculated for each noise-sensitive premises receiving noise. It takes into account the amount of industrial and commercial land and the presence of major roads within a 450m radius around the noise receiver.

7.0 Appendix B: Noise Sources

7.1 Operational Noise Sources

Operational noise sources that were included in the model are listed in the table below. The numbers of items of plant included in the model are indicated in brackets after the source name. The numbers remained the same for all three models, initial, future and final, assuming 100% operational capacity.

Source	Source Height (m)	Sound Power Level (dB re 10^{-12}W) at Octave Band Centre Frequency (Hz)								Overall Noise Level dB(A)
		31.5	63	125	250	500	1k	2k	4k	
Mine Area										
Excavator (2)	4	121	118	117	114	112	110	106	102	115
Haul Truck (10)	4	110	112	121	118	115	109	106	101	116
Drill (2)	4	90	109	111	118	116	112	108	103	117
Wheeled FEL (2)	3	107	106	112	109	110	107	106	98	112
Tracked Dozer (2)	3	107	111	120	122	110	110	104	102	116
Watercart (1)	3	110	111	116	106	102	104	105	99	110
Grader (1)	3	106	104	105	103	106	106	104	98	110
Crusher (1)	5	100	120	117	113	114	113	111	107	118
Conveyors (/m)	1		84	89	82	86	83	79	74	88
Concentrator Plant										
Grinding Mills (4)	5	118	122	123	119	121	113	111	103	121
Fans/Pumps (4)	5	84	90	93	102	109	99	92	98	108
Pellet Plant										
Fans/Pumps (3)	5	81	87	90	99	106	96	89	95	105
DRI Plant										
Compressors (2)	2	88	97	100	109	116	106	99	115	121
Fans/Pumps (2)	5	81	87	90	99	106	96	89	95	105
Power Station										
Power Station (1)	10	86	98	103	106	108	111	105	102	114
Port										
Shiploader (1)	15*	114	111	108	108	109	110	104	100	113
Wheeled FEL (1)	3	107	106	112	109	110	107	106	98	112
Conveyors (/m)	1		84	89	82	86	83	79	74	88

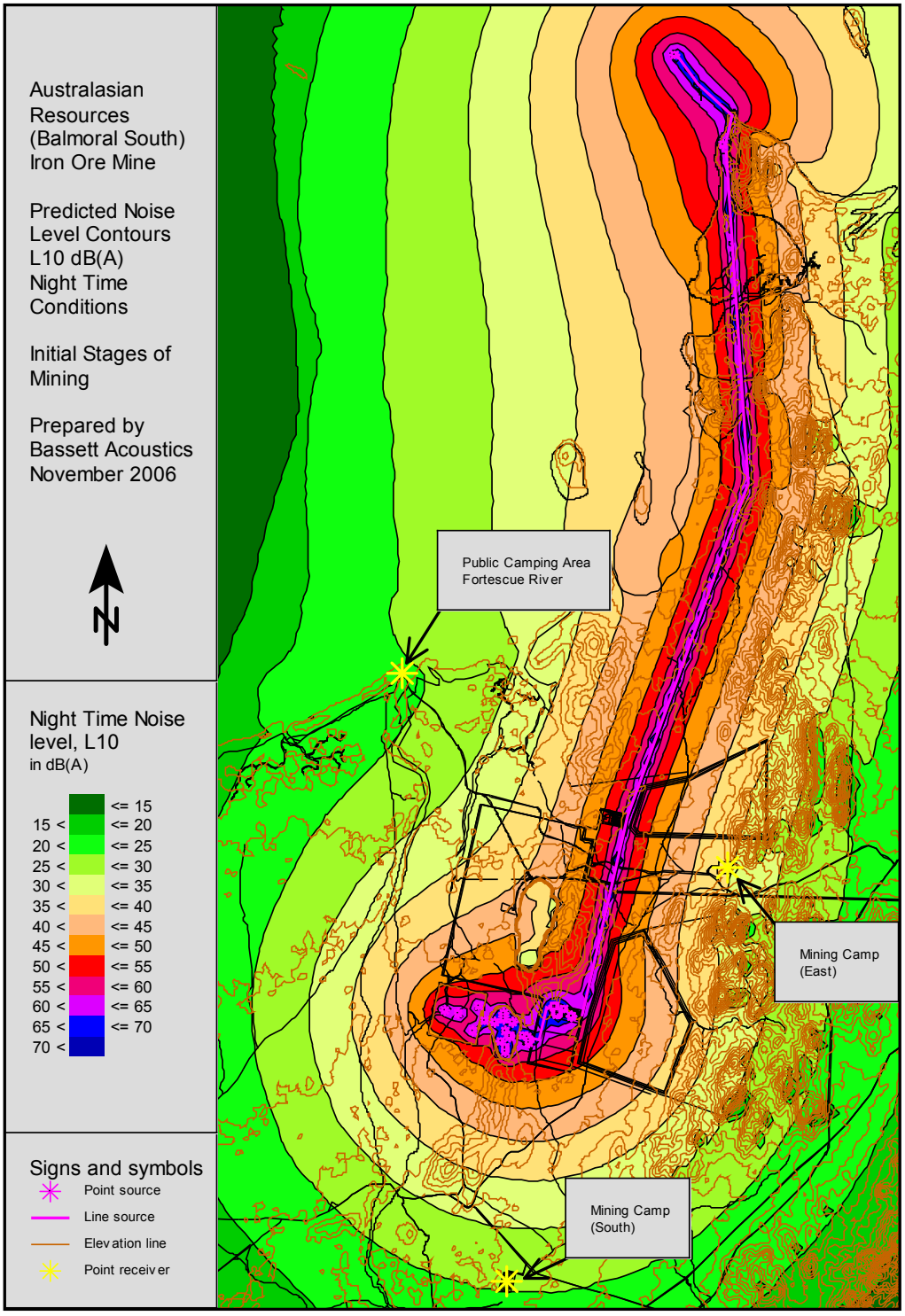
* Height above sea level

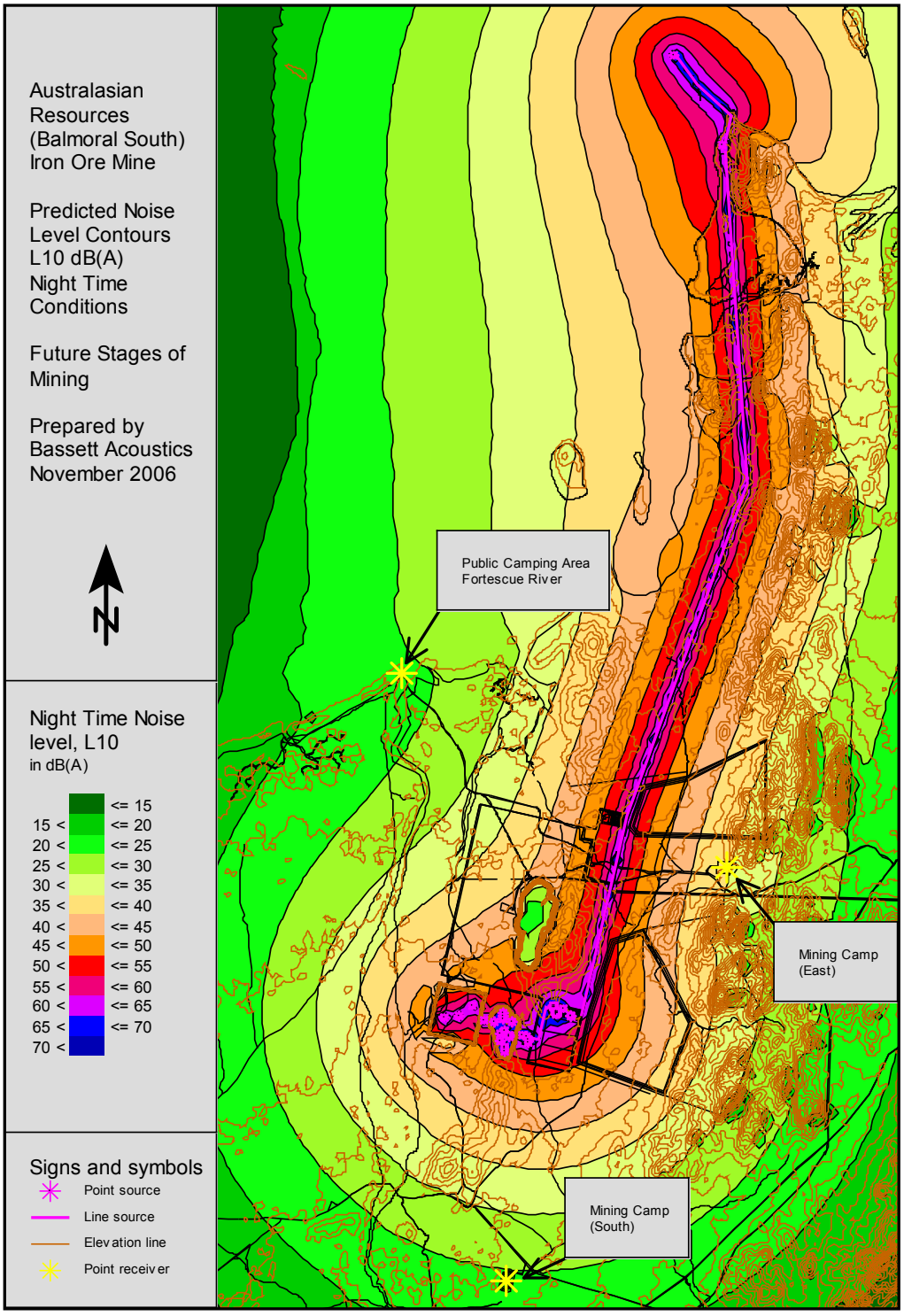
7.2 Construction Noise Sources

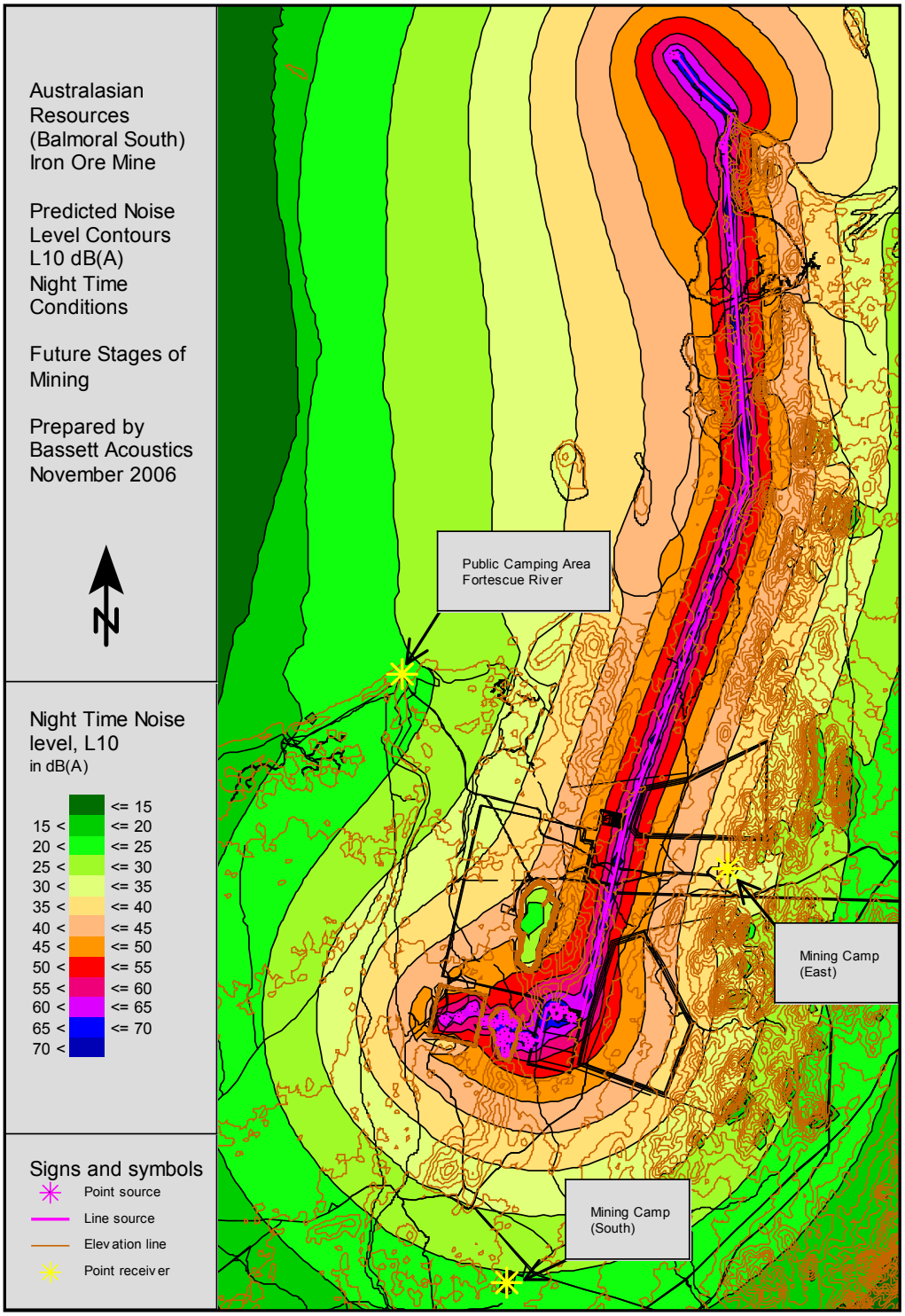
Construction noise sources that were included in the model are listed in the table below.

Source	Source Height (m)	Sound Power Level (dB re 10^{-12}W) at Octave Band Centre Frequency (Hz)								Overall Noise Level dB(A)
		31.5	63	125	250	500	1k	2k	4k	
Excavator (2)	4	121	118	117	114	112	110	106	102	115
Haul Truck (8)	4	110	112	121	118	115	109	106	101	116
Drill (2)	4	90	109	111	118	116	112	108	103	117
Wheeled FEL (1)	3	107	106	112	109	110	107	106	98	112
Tracked Dozer (2)	3	107	111	120	122	110	110	104	102	116
Watercart (1)	3	110	111	116	106	102	104	105	99	110
Grader (1)	3	106	104	105	103	106	106	104	98	110

8.0 Appendix C: Noise Contour Plots




Australasian Resources (Balmoral South) Iron Ore Mine
Predicted Noise Level Contours L10 dB(A) Night Time Conditions
Future Stages of Mining
Prepared by Bassett Acoustics November 2006
N
Night Time Noise level, L10
in dB(A)
<= 15
15 < <= 20
20 < <= 25
25 < <= 30
30 < <= 35
35 < <= 40
40 < <= 45
45 < <= 50
50 < <= 55
55 < <= 60
60 < <= 65
65 < <= 70
70 <
Signs and symbols
Point source
Line source
Elevation line
Point receiver
Public Camping Area Fortescue River
Mining Camp (East)
Mining Camp (South)


Australasian Resources (Balmoral South) Iron Ore Mine
Predicted Noise Level Contours L10 dB(A) Night Time Conditions
Future Stages of Mining
Prepared by Bassett Acoustics November 2006
N
Night Time Noise level, L10
in dB(A)
<= 15
15 < <= 20
20 < <= 25
25 < <= 30
30 < <= 35
35 < <= 40
40 < <= 45
45 < <= 50
50 < <= 55
55 < <= 60
60 < <= 65
65 < <= 70
70 <
Signs and symbols
Point source
Line source
Elevation line
Point receiver
Public Camping Area Fortescue River
Mining Camp (East)
Mining Camp (South)