BOWDENS SILVER

Part 1
Noise and Vibration Assessment

State Significant Development No. 5765

Prepared by:

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BOWDENS SILVER

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Noise and Vibration Assessment

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COMMONLY USED ACRONYMS

ANFO	ammonium nitrate emulsion or ammonium nitrate fuel oil
BMP	Blast Management Plan
BoM	Bureau of Meteorology
CNML	Construction Noise Management Level
CNMP	Construction Noise Management Plan
DE&C	Department of Education and Communities
EIS	Environmental Impact Statement
EL	Exploration Licence
EPA	Environment Protection Authority
HNAL	highly noise affected level
ICNG	Interim Construction Noise Guideline
MIC	Maximum Instantaneous Charge
Mtpa	Million tonnes per annum
MWRC	Mid-Western Regional Council
NAF	Non Acid Forming (waste rock)
NPfI	Noise Policy for Industry
ONMP	Operational Noise Management Plan
PAF	Potentially Acid Forming (waste rock)
PANL	Project Amenity Noise Level
PTL	Power Transmission Line
PNTL	Project Noise Trigger Level
PVS	Peak Vector Sum
RANL	Recommended amenity noise level
RBLs	Rating Background Levels
RNP	Road Noise Policy
ROM	Run-of-Mine
SAG	semi-autogenous grinding
SDNL	Sleep Disturbance Noise Level
SEARs	Secretary’s Environmental Assessment Requirements
SLR	SLR Consulting Australia Pty Ltd
TNVMP	Traffic Noise and Vibration Management Plan
tpa	tonnes per annum
TSF	Tailings Storage Facility
VLAMP	Voluntary Land Acquisition Mitigation Policy
WRE	Waste Rock Emplacement

COMMONLY USED TERMS

500kV PTL Re-alignment	A 3.5km section of the 500kV Power Transmission Line (PTL) to be re-aligned around the western boundary of the main open cut pit
Mine Access Road	A 2.2km road from the relocated Maloneys Road to the processing plant.
Mine life	Approximately 16.5 years comprising the site establishment and construction stage (approximately 18 months - including 12 months of mining pre-strip) and mining / processing for approximately 15 years (to the end of concentrate production).
Mine Site	The Mine Site is an area covering approximately 1,000 hectare (ha) in which all mine-related components and disturbance is proposed (see **Annexure 2**). The proposed total area of disturbance (422ha) relates to the key components within the Mine Site comprising the open cut pits, tailings storage facility (TSF), processing plant site, low grade ore stockpile, waste rock emplacement (WRE), oxide ore stockpile, associated infrastructure and mine access road.
Mine Site Boundary	The boundary of the area in which all mine-related components and disturbance are currently planned to be located.
Project life	Approximately 23 years comprising the site establishment and construction stage, mining and processing operations (to the end of concentrate production) and includes the period for final rehabilitation.
Relocated Maloneys Road	A 5.2km section of new road from Lue Road to the retained section of Maloneys Road, approximately 2.5km northwest of the proposed main open cut pit.
ROM pad	The constructed pad on which all run-of-mine ore to be processed is placed.
Site establishment and construction stage	A period of approximately 18 months during which all key components within the Mine Site and relocated Maloneys Road would be constructed.
The Applicant	Bowdens Silver Pty Limited (Bowdens Silver)
The Project	Incorporates the mining and processing of silver, zinc and lead ore, on-site management of waste rock and process tailings and despatch of silver/lead and zinc concentrates.

EXECUTIVE SUMMARY

The Project

Bowdens Silver Pty Limited (Bowdens Silver) proposes to construct and operate an open cut mine to recover mineralised rock (ore) containing silver and small percentages of zinc and lead to depths of approximately 180m. The Mine Site is located approximately 2km northeast of Lue in the Mid-Western Regional Local Government Area. The Project would comprise a main open cut pit and two small satellite pits, processing plant, waste rock emplacement (WRE), tailings storage facility (TSF), as well as ancillary components and associated infrastructure that would extract and process approximately 2 million tonnes of ore per year over a period of approximately 15 years. The Mine Site lies within Exploration Licences (EL) 5920 and EL 6354, both of which are held by Bowdens Silver.

Project Noise Impact Assessment Methodology

Table ES1 presents the Project methodology for assessing the noise levels from the Project at privately-owned residences, other noise sensitive land uses, and privately-owned land, as follows.

- Construction noise levels at privately-owned residences and other noise sensitive land uses during the Site Establishment and Construction Stage Months 1 to 6 and during the construction of the water supply pipeline are assessed in accordance with Interim Construction Noise Guideline (ICNG) against the relevant intrusive construction noise management level (CNMLs) and a highly noise affected level (HNAL).
- Mine operational noise levels at privately-owned residences and other noise sensitive land uses commencing from the Site Establishment and Construction Stage Months 7 to 18 and continuing throughout the mine life are assessed in accordance with the Noise Policy for Industry (NPfI) against the relevant intrusive project noise trigger levels (PNTLs), maximum sleep disturbance noise levels (SDNLs), and recommended amenity noise levels (RANLs) with respect to the cumulative effects from all industrial noise sources.
- Mine operational noise levels at privately-owned residences and other noise sensitive land uses coinciding with the period of re-alignment of the 500kV Power Transmission Line (PTL) during Year 3 of operations are assessed in accordance with the NPfI against the relevant intrusive PNTLs.
- Mine operational noise levels on privately-owned land commencing from the Site Establishment and Construction Stage Months 7 to 18 and continuing throughout the mine life are assessed in accordance with the Voluntary Land Acquisition Mitigation Policy (VLAMP) and the relevant NPfI recommended amenity noise level (i.e. RANL plus 5dB(A)).
- Mine operational noise levels assessed in accordance with a conservative application of the VLAMP when noise impacts are considered appreciable (i.e. marginal, moderate or significant) and warrant noise mitigation measures at privately-owned residences involving: land acquisition rights; and or mitigation measures that should be offered to potentially affected landowners; and or requirements for negotiated agreements between Bowdens Silver and landowners.

Table ES1
Project Noise Impact Assessment Methodology (dB(A) re 20µPa)

Site Establishment and Construction Stage	**Assessment Parameter**	**Assessment Criteria**	**Characterisation of Construction Noise Impacts**		
			Negligible to Marginal	**Moderate**	**Significant**
Affected residences	CNML Intrusive	RBL plus 10dB(A)	1 to 5dB(A) above CNML	> 5dB(A) above CNML	above HNAL 75dB(A)
PTL Re-alignment Works	**Assessment Parameter**	**Assessment Criteria**	**Characterisation of PTL Re-alignment Noise Impacts**		
			Negligible	**Marginal to Moderate**	**Significant**
Affected residences	PNTL Intrusive	RBL plus 5dB(A)	1 to 2dB(A) above PNTL	3 to 5dB(A) above PNTL	> 5dB(A) above PNTL
Mine Operations	**Assessment Parameter**	**Assessment Criteria**	**Characterisation of Operational Noise Impacts**		
			Negligible	**Marginal to Moderate**	**Significant**
Affected residences	SDNL	Intrusive 40dB(A), Maximum 52dB(A)	1 to 2dB(A) above SDNL	3 to 5dB(A) above SDNL	> 5dB(A) above SDNL
	Cumulative Amenity Noise Level	NPfI Table 2.2 RANL	1 to 2dB(A) above RANL	3dB(A) above RANL	> 3dB(A) above RANL
Mine Operations	**Assessment Parameter**	**Assessment Criteria**	**Voluntary Mitigation Rights**		**Voluntary Land Acquisition Rights**
			Negligible	**Marginal to Moderate**	**Significant**
Affected residences	PNTL Intrusive	RBL plus 5dB(A)	1 to 2dB(A) above PNTL[1]	3 to 5dB(A) above PNTL[1]	> 5dB(A) above PNTL[2]
Affected privately-owned land	Project amenity noise level (PANL)	NPfI Table 2.2 RANL	Not applicable	Not applicable	> 5dB(A) above RANL[3]

Note 1: Depending on the range of exceedance of the PNTL assessment parameter, potential noise impacts range from negligible to moderate in accordance with the VLAMP.
Note 2: Noise exceedances greater than 5dB(A) above the PNTL assessment parameter may result in significant noise impacts in accordance with the VLAMP.
Note 3: Noise exceedances greater than 5dB(A) above the NPfI Table 2.2 Recommended Amenity Noise Level (RANL) on more than 25% of any privately-owned land where there is an existing residence or a residence could be built on that land under existing planning controls in accordance with the VLAMP.
Note 4: Noise impacts on the nearest privately-owned rural land to the Mine Site have initially been conservatively assessed on the basis that any land is permitted to have a residence with reference to the Land Ownership Plan (**Annexure 4**) and associated Land Ownership Details (**Annexure 5**) as further described in Section 0. In practice however local zoning restrictions and planning controls would need to be taken into consideration with respect to each parcel of land.

Reasonable and Feasible Noise Mitigation and Management Measures

A detailed evaluation of various combinations of feasible noise control and management measures to assess their relative effectiveness for various modelling scenarios was conducted in accordance with the NPfI and the VLAMP. Bowdens Silver proposes to adopt a range of reasonable noise control and management measures (including the use of low noise mobile equipment and fixed plant, amenity and near-field noise barriers and mine operational controls) to appreciably reduce noise levels from the Project as presented in **Table ES2**.

Table ES2
Bowdens Silver Proposed Range of Reasonable Noise Control and Management Measures

Mitigation	**Bowdens Silver Project**
Noise Source Control - mobile equipment	Use of noise attenuated mobile equipment comprising low noise or extra quiet mobile equipment where practical with nominal design performance sound power levels (SWLs) for specific individual mobile equipment noise source control.
	All dozers restricted to 1st gear operation when operating out of pit.
	Installation of broadband noise "quacker" style reversing alarms.
Noise Source Control - fixed plant	Use of full or partial enclosures to attenuate fixed plant where practical with nominal design performance SWLs for specific individual fixed plant noise source control.
	Use of low noise specifications, low noise idlers, soft-flow chutes and silencers.
	Installation of mid-high frequency noise conveyor alarms.
	Enclosure of pumps for the water supply pipeline within containers or structures.
Noise Propagation Path - mobile equipment	Lower embankment noise barrier and southern barrier.
	Acoustic barriers adjacent to the main open cut pit haul road exit.
	Relocation of the exit ramp from the main open cut pit to maximise topographic shielding at the northern open cut pit exit.
	Optimised evening waste rock haul route to maximise the barrier effect from the existing topography and short-term acoustic bunds within the active WRE areas.
	Optimised night-time ore haul route to maximise the barrier effect from the existing topography and acoustic barriers adjacent to the main pit haul road exit.
Noise Propagation Path - fixed plant	Processing plant relocated further north within the Mine Site with the placement of the primary jaw crusher at a lower elevation to minimize noise propagation in the direction of Lue.
	Nearfield acoustic barriers around the TSF crushing/screening plant.
Operational Management Controls	Scheduling of intrusive activities to less sensitive times of the day, for example TSF lifts, material placement on the southern barrier and soil stockpiles limited to the day-time throughout the mine life.
	Reduced mining operations during the evening within restricted WRE areas.
	Further reduced mining operations during the night-time with only ore delivery to the Run of Mine (ROM) pad.
	Implementation of real-time noise monitoring network at key residential receivers to assist with the on-going monitoring and management of mine noise, and identify partial or full plant and equipment shutdowns (if at all required) during very noise enhancing meteorological conditions. Enhance and maintain continuous meteorological monitoring network for the Project.
Noise Receiver Control	Any residual noise impacts guided by the requirements of the VLAMP (see Section 4.3.1) and Bowdens Silver Project Noise Impact Assessment Methodology (**Table 25**).

Construction Noise Impact Assessment

In accordance with the Project noise impact assessment methodology (**Table ES1**) potential exceedances of the intrusive CNMLs at privately-owned residences and other noise sensitive receivers in the vicinity of the Mine Site, relocated Maloneys Road and water supply pipeline corridor, are as follows.

- Comply with the CNML of 45dB(A) from the on-site earthworks and infrastructure construction activities;
- Marginally (i.e. up to 5dB(A)) exceed the CNML of 45dB(A) during the most intensive period of the off-site road network construction activity at one residence (R82) with an approximate duration of 1 to 2 months;
- Moderately (i.e. >5dB(A)) exceed the CNML of 45dB(A) during the most intensive period of the off-site road network construction activity at four residences (R81; R88; R89; and R90) with a duration of approximately 1 to 2 months, while remaining well below the HNAL of 75dB(A);
- The off-site water supply pipeline construction works are relatively transient, and any noise impact would be short-term, with the HNAL of 75dB(A) being met at an off-set distance of approximately 50m from the construction works; and
- Construction noise from the Project would be managed by Bowdens Silver in accordance with an approved Construction Noise Management Plan (CNMP) based on the general requirements of the ICNG (and any development consent conditional requirements) to ensure that any potential construction noise impacts (particularly from the off-site activities associated with the construction of the related Maloneys Road and water supply pipeline) are minimised in terms of magnitude, duration and character.

Operational Noise Impact Assessment

In accordance with the Project noise impact assessment methodology (**Table ES1**), a summary of potential exceedances of the intrusive PNTLs and maximum SDNLs at privately-owned residences and other noise sensitive receivers in the vicinity of the Mine Site are presented in **Table ES3**, which are further described below.

The predicted day-time, evening and night-time operational noise impacts at privately-owned residences in the vicinity of the Mine Site are summarised below.

Operational Noise Levels at Privately-owned Rural Residences:

- Comply with the day-time intrusive PNTL of 40dB(A) at all rural residences, except at: R21; R27; and R37, resulting in negligible noise exceedances (1dB(A) to 2dB(A)), whereas the noise exceedances at R7; R35; R36A; and R87 are marginal to moderate (3dB(A) to 5dB(A)) in accordance with the Project noise impact assessment methodology (**Table ES1**). The day-time noise exceedance at R4 is predicted to be significant and greater than 5dB(A) intrusive PNTL of 40dB(A);

Table ES3
Privately-owned Residences with Predicted PNTL and SDNL Exceedances

Receiver Area	Exceedance[1]	Day-time	Evening	Night-time	Maximum Exceedance in Any Period
Rural Residences	Negligible 1 to 2dB(A) above PNTL	R21; R27; R37	R21; R27; R35; R36A; R37; R39; R40; R47; R87	R21; R27; R35; R36A; R37; R39; R40; R47; R87	R21; R27; R37; R39; R40; R47
	Marginal to Moderate 3 to 5dB(A) above PNTL	R7; R35; R36A; R87	R7	R7	R7; R35; R36A; R87
	Significant >5dB(A) above PNTL	R4	R4	R4	R4
	Negligible 1 to 2dB(A) above SDNL[2]	-	-	R4	R4
Lue Residences	Negligible 1 to 2dB(A) above PNTL	-	-	-	-
	Marginal to Moderate 3 to 5dB(A) above PNTL	-	-	-	-
	Significant >5dB(A) above PNTL	-	-	-	-
	Negligible 1 to 2dB(A) above SDNL	-	-	-	-
Lue Place of Interest	Negligible 1 to 2dB(A)	-	-	-	-
	Marginal to Moderate 3 to 5dB(A)	-	-	-	-
	Significant >5dB(A)	-	-	-	-

Note 1: In accordance with the Project noise impact assessment methodology presented in **Table ES1**.
Note 2: Exceedance of the intrusive ($L_{Aeq(15minute)}$) SDNL of 40dB(A).

- Comply with the evening and night-time intrusive PNTL of 35dB(A) at all rural residences, except at: R21; R27; R35; R36A; R37; R39; R40; R47; R87, resulting in negligible noise exceedances (1dB(A) to 2dB(A)), whereas the noise exceedances during the evening at R7 is marginal to moderate (3dB(A) to 5dB(A)) in accordance with the Project noise impact assessment methodology (**Table ES1**). The evening and night-time noise exceedances at R4 are predicted to be significant and greater than 5dB(A) above the intrusive PNTL of 35dB(A);
- Comply with the night-time intrusive ($L_{Aeq(15minute)}$) SDNL of 40dB(A) at all rural residences, except at R4, resulting in a negligible noise exceedance (1dB(A) to 2dB(A)) in accordance with the Project noise impact assessment methodology (**Table ES1**); and
- Comply with the night-time maximum SDNL of 52dB(A) at all rural residences.

Operational Noise Levels at Privately-owned Lue Residences:

- Comply with the day-time intrusive PNTL of 40dB(A) at all Lue residences;
- Comply with the evening and night-time intrusive PNTL of 35dB(A) at all Lue residences; and
- Comply with the night-time intrusive SDNL of 40dB(A) and maximum SDNL of 52dB(A) at all rural residences.

Operational Noise Levels at Lue Places of Interest:

- Comply with the intrusive PNTL of 43dB(A) at LPOI3 Lue Public School; and
- Comply with the intrusive PNTL of 48dB(A) at LPOI1 Rural Fire Brigade; LPOI2 Lue Pottery; LPOI4 Lue Hall; LPOI5 Lue Railway Station.

Operational Noise Management Plan (ONMP)

- Operational (inclusive PTL re-alignment works) noise from the Project would be managed by Bowdens Silver in accordance with an approved ONMP based on the general requirements of the NPfI (and any development consent conditional requirements) to ensure that any potential operational noise impacts are minimised in terms of magnitude, duration and character.

Privately-owned Land Impact Assessment

The predicted life of mine (i.e. outer envelope) operational intrusive $L_{Aeq(15minute)}$ noise contours for day-time, evening and night-time under standard meteorological conditions are presented in **Annexure 17**. The predicted life of mine (i.e. outer envelope) operational intrusive $L_{Aeq(15minute)}$ noise contours for day-time, evening and night-time under noise-enhancing meteorological conditions are presented in **Annexure 18**.

In accordance with the Project noise impact assessment methodology presented in **Table ES1** (as guided by the VLAMP), the nearest privately-owned rural land would be impacted if the (mine operational) project amenity noise levels were predicted to exceeded day-time 55dB(A), evening 50dB(A) and night-time 45dB(A). The (mine operational) project amenity noise levels would be at least 3dB(A) lower than the predicted (i.e. outer envelope) operational intrusive $L_{Aeq(15minute)}$ noise contours for day-time, evening and night-time under noise-enhancing meteorological conditions presented in **Annexure 18**.

The predicted operational day-time 55dB(A) intrusive noise contour does not impact more than 25% of the nearest privately-owned rural land throughout the mine life (see **Annexure 18**). Similarly, the predicted operational evening 50dB(A) intrusive noise contour does not impact more than 25% of the nearest privately-owned rural land throughout the mine life (see **Annexure 18**). Likewise, the predicted operational night-time 45dB(A) intrusive noise contour does not impact more than 25% of the nearest privately-owned rural land throughout the mine life (see **Annexure 18**).

Hence, there is no privately-owned rural land is predicted to be impacted by the Project In accordance with the Project noise impact assessment methodology presented in **Table ES1** (as guided by the VLAMP).

PTL Re-alignment Noise Impact Assessment

In accordance with the Project noise impact assessment methodology (**Table ES1**) potential exceedances of the intrusive PNTLs at privately-owned residences and other noise sensitive receivers in the vicinity of the Mine Site are as follows.

PTL Re-alignment Works at Privately-owned Rural Residences:

- Comply with the day-time intrusive PNTL of 40dB(A) of at all rural residences, except at: R21; R25; R27; R37; R40; R45A; R82; R86; and R87, resulting in negligible noise exceedances (1dB(A) to 2dB(A)) in accordance with the Project noise impact assessment methodology (**Table ES1**) during the most intensive period of the PTL re-alignment works with an approximate duration 1 to 2 months;
- The day-time noise exceedances at R35; R36A; R37; R39; and R47, are marginal to moderate (3dB(A) to 5dB(A)) during the most intensive period of the PTL re-alignment works with an approximate duration 1 to 2 months; and
- Day-time noise exceedances at R4 and R7 are predicted to be significant and greater than 5dB(A) above intrusive PNTL of 40dB(A).

Day-time intrusive noise level exceedances arising Year 3 operations (only) are predicted at R7 and R39 in the absence of the PTL works.

The additional intrusive noise exceedances at residences: R4 (significant); R35, R36A, R37 and R47 (marginal to moderate); and R21, R25, R27, R37, R40, R45A, R82, R86, and R87 (negligible) are as a result of PTL works. However, the additional intrusive noise exceedances during the 1 to 2 month period would occur intermittently and not at that level throughout the entire period.

Furthermore, for comparison purposes only, the predicted total Year 3 operations plus PTL works noise levels remain below the CNML of 45dB(A) at all privately-owned rural residences with the exception of nearest potentially noise affected residences of R4 and R7.

PTL Re-alignment Works at Privately-owned Lue Residences:

- Comply with the day-time intrusive PNTL of 40dB(A) of at all Lue residences, except at: L3; L4; and L50, resulting in negligible noise exceedances (1dB(A) to 2dB(A)) in accordance with the Project noise impact assessment methodology (**Table ES1**) during the most intensive period of the PTL re-alignment works with an approximate duration 1 to 2 months.

PTL Re-alignment Works at Lue Places of Interest:

- Comply with the intrusive PNTL of 43dB(A) of at LPOI3 Lue Public School; and
- Comply with the intrusive PNTL of 48dB(A) of at LPOI1 Rural Fire Brigade; LPOI2 Lue Pottery; LPOI4 Lue Hall; LPOI5 Lue Railway Station.

Cumulative Noise Amenity Impact Assessment

There are no major existing and approved industrial developments located in the vicinity of the Mine Site. The existing Ulan Mine Complex, Moolarben Coal Complex and Wilpinjong Extension together with the proposed Bylong Coal Project have been identified and are located between 29km to 38km from the Mine Site. As a result, any cumulative noise impacts are considered negligible.

Blasting Impact Assessment

Ground vibration and airblast overpressure levels which cause human discomfort are lower than recommended structural damage limits. Therefore, compliance with the lowest applicable human comfort criteria generally ensures that the potential to cause structural damage is negligible, as follows:

- The recommended maximum level for airblast overpressure is 115dBLinear;
- The airblast overpressure level of 115dBLinear may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The airblast overpressure level should not exceed 120dBLinear at any time;
- The recommended maximum for ground vibration is 5mm/s, Peak Vector Sum (PVS) vibration velocity. It is recommended however, that 2mm/s PVS be considered the long-term regulatory goal for the control of ground vibration; and
- The ground vibration level of 5mm/s (PVS) may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level should not exceed 10mm/s at any time.

A summary of privately-owned residences and other noise sensitive receivers in the vicinity of the Mine Site with predicted exceedances of the ground vibration and airblast overpressure of human comfort criteria of 5mm/s and 115dBLpk respectively are as follows:

Operational Blast Emission Levels at Privately-owned Rural Residences:

- For typical ore (Maximum Instantaneous Charge (MIC) 117kg) and typical waste rock (MIC 216kg) blast designs, compliance is predicted with the ground vibration and airblast overpressure comfort criteria of 5mm/s and 115dBLpk respectively at all rural residences except at two of the nearest privately-owned residences namely: R4 and R7;
- For typical ore (MIC 117kg) blast design airblast overpressure is predicted to exceed the human comfort criterion of 115dBLpk at one of the privately-owned nearest residence namely: R7, while complying with the ground vibration criterion of 5mm/s;
- For typical waste rock (MIC 216kg) blast design airblast overpressure is predicted to exceed the human comfort criterion of 115dBLpk at two of the privately-owned nearest residences namely: R4 and R7, while complying with the ground vibration criterion of 5mm/s; and
- For typical ore (MIC 117kg) and typical waste rock (MIC 216kg) blast designs, compliance is predicted with the ground vibration and airblast overpressure human comfort criteria of 5mm/s and 115dBLpk respectively at residence R12. However, the maximum airblast overpressure is predicted to exceed the maximum human comfort criteria of 120dBLpk at residence R12.

Blast Management Plan (BMP)

- Ground vibration and airblast overpressure levels would be managed by Bowdens Silver in accordance with an approved Blast Management Plan (BMP) to ensure that ground vibration and potential blast emission impacts are minimised. The BMP should include the implementation of a blast emission monitoring programme and the establishment and maintenance of ground vibration and airblast overpressure site-laws for the Mine Site to enable key blast design parameters to be modified and ensure compliance with the criteria.

Operational Blast Emission Levels Privately-owned Lue Residences:

- For typical ore (MIC 117kg) and typical waste rock (MIC 216kg) blast designs comply with the human comfort criteria of 5mm/s and 115dBLpk at all Lue residences.

Operational Blast Emission Levels at Lue Places of Interest:

- For typical ore (MIC 117kg) and typical waste rock (MIC 216kg) blast designs comply with the human comfort criteria of 5mm/s and 115dBLpk at LPOI3 Lue Public School; LPOI1 Rural Fire Brigade; LPOI2 Lue Pottery; LPOI4 Lue Hall; and LPOI5 Lue Railway Station.

Traffic Noise Impact Assessment

The Project's primary access route to the Mine Site would be via Lue Road from Mudgee and the relocated Maloneys Road. The Road Noise Policy (RNP) adopts a classification scheme for assessing noise impacts on an existing and new road network from additional traffic generated by the Project, and the relevant criteria are presented in **Table ES4**.

Traffic Noise Construction Months 1 to 6

Lue Road

Total traffic noise levels comply with the day-time 60 $L_{Aeq(15hour)}$ and night-time 55 $L_{Aeq(9hour)}$ assessment criteria at all residential locations. The maximum Project-related increase to the total traffic noise level is 1.2dB(A), therefore less than 2dB(A), and well below the relative increase criterion of 12dB(A).

Total traffic noise level at LPOI3 Lue Primary School from the (projected 2021) base traffic is 52 $L_{Aeq(1hour)}$ and marginally 2dB(A) above the equivalent external 50 $L_{Aeq(1hour)}$ assessment criteria. The (projected 2021) total traffic (including the Project related traffic) is 53 $L_{Aeq(1hour)}$ and moderately 3dB(A) above the equivalent external 50 $L_{Aeq(1hour)}$ assessment criteria.

The Project-related increase to the total traffic noise level at LPOI3 Lue Primary School is 1.3dB(A), and therefore less than 2dB(A). In accordance with the RNP, an increase of less than 2dB(A) represents a minor impact that is considered barely perceptible and investigation of noise mitigation measures is not warranted in accordance with the policy.

Table ES4
Road Traffic Noise Criteria for Residential and Non-Residential Land Uses (dB(A) re 20 µPa)

Road	**Project Type and Land Use**	**Total Traffic Noise Criteria**[1,2,5]	**Relative Increase Criterion**[1,2,3,4]
Residential Land Use			
Lue Road is a sub-arterial road in accordance with the RNP Table 2	Land use developments generating additional traffic on existing sub-arterial roads	Day-time 60 $L_{Aeq(15hour)}$	Existing $L_{Aeq(15hour)}$ plus 12dB(A)
		Night-time 55 $L_{Aeq(9hour)}$	Existing $L_{Aeq(9hour)}$ plus 12dB(A)
Relocated Maloneys Road is a principal haulage route in accordance with RNP Section 2.2.2	Existing residences affected by noise from new local road corridors used as a 'principal haulage route'.	Day-time 55 $L_{Aeq(15hour)}$	Existing $L_{Aeq(15hour)}$ plus 12dB(A)
		Night-time 50 $L_{Aeq(9hour)}$	Existing $L_{Aeq(9hour)}$ plus 12dB(A)
Pyangle Road is a local road in accordance with the RNP Table 2	Land use developments generating additional traffic on existing local roads	Day-time 55 $L_{Aeq(1hour)}$	Not Applicable
		Night-time 50 $L_{Aeq(1hour)}$	
Non-Residential Land Use			
Lue Road	School Classrooms	50 $L_{Aeq(1hour)}$ (external) when in use[6]	Not Applicable

Note 1: L_{Aeq} = equivalent continuous noise level.
Note 2: Day-time 7:00am to 10:00pm, Night-time 10:00pm to 7:00am.
Note 3: "Existing" is the projected base (i.e. non-Project-related) traffic noise levels.
Note 4: Relative increase noise level generated by the Project for comparison with the Criteria.
Note 5: Where the total traffic criteria are already exceeded, then limit any increase to 2dB(A) or less.
Note 6: External criteria equivalent to internal 40 $L_{Aeq(1hour)}$ criteria plus 10dB(A).

Pyangle Road

Total traffic noise levels comply with the day-time 55 $L_{Aeq(1hour)}$ and night-time 50 $L_{Aeq(1hour)}$ assessment criteria at the nearest residential location R7.

Corner of Lue Road and Pyangle Road

Total traffic noise levels comply with the day-time 60 $L_{Aeq(15hour)}$ and night-time 55 $L_{Aeq(9hour)}$ assessment criteria at the nearest Location R39. Project related traffic entering and exiting from Lue Road onto Pyangle Road could potentially lead to increased noise from acceleration and braking. However due to the relatively small volume of Project related traffic entering and exiting from Pyangle road (in comparison to existing traffic flows on Lue Road) the increased noise due to intersection operations is unlikely to be appreciable.

Traffic Noise Site Establishment and Construction Stage (Months 7 to 18)

Lue Road

Total traffic noise levels comply with the day-time 60 $L_{Aeq(15hour)}$ and night-time 55 $L_{Aeq(9hour)}$ assessment criteria at all residential locations. The maximum Project related increase to the total traffic noise level is 1.7dB(A), therefore less than 2dB(A), and well below the relative increase criterion of 12dB(A).

Total traffic noise level at LPOI3 Lue Primary School from the (projected 2021) base traffic is 51 $L_{Aeq(1hour)}$ and marginally 1dB(A) above the equivalent external 50 $L_{Aeq(1hour)}$ assessment criteria. The (projected 2021) total traffic (including the Project related traffic) is 52 $L_{Aeq(1hour)}$ and marginally 2dB(A) above the equivalent external 50 $L_{Aeq(1hour)}$ noise assessment criteria.

The Project-related increase to the total traffic noise level at LPOI3 Lue Primary School is 0.7dB(A) (compared with 1.3dB(A) during the first 6 months), and therefore less than 2dB(A). In accordance with the RNP, an increase of less than 2dB(A) represents a minor impact that is considered barely perceptible and investigation of noise mitigation measures is not warranted in accordance with the policy.

Relocated Maloneys Road

Total traffic noise levels comply with the day-time 55 $L_{Aeq(15hour)}$ and night-time 50 $L_{Aeq(9hour)}$ assessment criteria at nearest residential location R88. The Project related increase to the total traffic noise on the relocated Maloneys Road is 2.4dB(A), and well below the relative increase criterion of 12dB(A).

Traffic Noise Operational Scenario 2 (Year 3)

Lue Road

Total traffic noise levels comply with the day-time 60 $L_{Aeq(15hour)}$ and night-time 55 $L_{Aeq(9hour)}$ assessment criteria at all residential locations. The maximum Project related increase to the total traffic noise level is 1.7dB(A), therefore less than 2dB(A), and well below the relative increase criterion of 12dB(A).

Total traffic noise level at LPOI3 Lue Primary School from the (projected 2024) base traffic is 51 $L_{Aeq(1hour)}$ and marginally 1dB(A) above the equivalent external 50 $L_{Aeq(1hour)}$ assessment criteria. The (projected 2024) total traffic (including the Project related traffic) is 52 $L_{Aeq(1hour)}$ and marginally 2dB(A) above the equivalent external 50 $L_{Aeq(1hour)}$ noise assessment criteria.

The Project-related increase to the total traffic noise level at LPOI3 Lue Primary School is 0.8dB(A), and therefore less than 2dB(A). In accordance with the RNP, an increase of less than 2dB(A) represents a minor impact that is considered barely perceptible and investigation of noise mitigation measures is not warranted in accordance with the policy.

Relocated Maloneys Road

Total traffic noise levels comply with the day-time 55 $L_{Aeq(15hour)}$ and night-time 50 $L_{Aeq(9hour)}$ assessment criteria at nearest residential location R88. The Project related increase to the total traffic noise on the relocated Maloneys Road is 2.3dB(A), and well below the relative increase criterion of 12dB(A).

Traffic Vibration Impact Assessment

Residences adjacent to the Project's primary access route (i.e. Lue Road from Mudgee and the relocated Maloneys Road) are located at distances 20 m or greater and therefore Project-related road traffic vibration impacts and annoyance is likely to be negligible.

During the construction and site establishment stage Project-related heavy road traffic would, necessarily, travel through Lue to access the Mine Site. The residential property L10 is approximately 10m from the edge of Lue Road; and property R39 is approximately 15m from the edge of Pyangle Road, and therefore located within the nominal 20m offset distance to comply with vibration annoyance risk criteria.

Given that the Project-related traffic on Pyangle Road would only occur during construction months 1 to 6 (i.e. prior to the opening of the relocated Maloneys Road) traffic vibration levels would be monitored at residential property R39 in accordance with Bowden Silvers Traffic Noise and Vibration Management Plan (TNVMP). Similarly, given the very close proximity of property L10 to Lue Road, it is reasonable to anticipate existing heavy road traffic movements may at times currently exceed the vibration annoyance risk criteria (while remaining below the relevant structural damage criteria). Traffic vibration levels would also be monitored at property L10 in accordance with Bowden Silvers TNVMP to determine whether the criteria are being exceeded.

1. INTRODUCTION

1.1 BACKGROUND

Bowdens Silver Pty Limited (Bowdens Silver) proposes to construct and operate an open cut mine to recover mineralised rock (ore) containing silver and small percentages of zinc and lead to depths of approximately 180m. The Mine Site is located approximately 2km to 3km northeast of Lue in the Mid-Western Region Local Government Area. The Project would comprise a main open cut pit and two small satellite pits, processing plant, waste rock emplacement (WRE), tailings storage facility (TSF), as well as ancillary components and associated infrastructure that would extract and process approximately 2 million tonnes of ore per year over a period of approximately 15 years.

The Mine Site lies within Exploration Licences (EL) 5920 and EL 6354, both of which are held by Bowdens Silver, as shown on the Local Setting Plan (**Annexure 1**).

The Bowdens Silver Mine Site comprises seven principal components, namely:

1. A main open cut pit and two satellite open cut pits, collectively covering approximately 52ha;
2. A processing plant and related infrastructure covering approximately 22ha;
3. A WRE covering approximately 77ha;
4. A low grade ore stockpile covering approximately 14ha (9ha above WRE)[1];
5. An oxide ore stockpile covering approximately 8ha;
6. A TSF covering approximately 117ha; and
7. The southern barrier to provide visual and acoustic protection to properties south of the Mine Site covering approximately 32ha.

The above components would be supported by a range of on-site and off-site infrastructure. The on-site infrastructure comprises haul roads, water management structures, power/water reticulation, workshops, stores, compounds and offices/amenities as well as re-aligning the existing 500kV Power Transmission Line (PTL). The off-site infrastructure comprises a relocated section of Maloneys Road (including a new railway bridge crossing and new crossing of Lawsons Creek), a 132kV power line and a water supply pipeline for the delivery of water from the Ulan Coal Mine and/or Moolarben Coal Mine. Development approval for the 132kV power line will be sought separately through an energy provider under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). **Annexure 2** displays the indicative locations of the principal mine components.

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Bowdens Silver to evaluate and assess the potential noise and blasting impacts associated with the Project and to provide guidance for the most appropriate mitigation measures to achieve compliance with relevant noise and vibration limits.

[1] The low grade ore stockpile would be constructed adjacent to but largely upon the northern sections of the WRE.

1.2 ASSESSMENT REQUIREMENTS

The assessment of noise and blasting impacts for the Project has been guided by the NSW Department of Planning Industry and Environment (DPIE) Secretary's Environmental Assessment Requirements (SEARs), dated 21 June 2019, as presented in **Annexure 3**.

Other government agencies, including the NSW Environment Protection Authority (EPA), Mid-Western Regional Council (MWRC), Department of Education and Communities (DE&C) also provided their requirements for the Environmental Impact Statement (EIS) to accompany the SEARs. A range of other issues and questions arising from the consultation with the Lue and district community has also been assembled. The complete coverage of noise related matters is shown in **Annexure 3**, and reference provided to where each issue is considered in this assessment.

In accordance with the SEARs and associated requirements, the noise and vibration levels associated with the Project have been comprehensively evaluated based on the assessment methodology and procedure guidelines presented in **Table 1**.

Table 1
Assessment Methodology and Procedure Guidelines

Page 1 of 2

Assessment Guideline	Representative Assessment Scenario	Assessment Criteria	Impact Assessment
Project Construction Noise Guided by the requirements of the Interim Construction Noise Guideline (ICNG) in relation to setting construction noise management levels (CNMLs).	Site establishment and construction stage first 6 months.	Section 4.1	Section 6.1
Project Operating Noise Guided by the requirements of the Noise Policy for Industry (NPfI) in relation to setting the project noise trigger levels (PNTLs) and sleep disturbance noise levels (SDNLs) and assessing any impacts.	Scenario 1 Year 0; Scenario 2 Year 3; Scenario 3 Year 8; and Scenario 4 Year 10.	Section 4.2	Section 7
Project Operating Noise Guided by the requirements of the NpfI in relation to setting the project noise trigger levels (PNTLs) and assessing any impacts.	Scenario 2 Year 3 including the 500kV PTL re-alignment.	Section 4.2	Section 8.1
Cumulative Industrial Noise Guided by the requirements of the NpfI in relation to existing and successive industrial developments by setting cumulative $L_{Aeq(period)}$ amenity noise levels for all industrial (i.e. non-transport related) noise in a receiver area.	No major existing and approved industrial developments are located in the vicinity of the Mine Site. Other resource projects in the Mudgee district have been identified and any cumulative noise impacts considered qualitatively.	Section 4.2	Section 9.1

Table 1 (Cont'd)
Assessment Methodology and Procedure Guidelines

Page 2 of 2

Assessment Guideline	**Representative Assessment Scenario**	**Assessment Criteria**	**Impact Assessment**
Off-site Road Traffic Noise Guided by the requirements of the Road Noise Policy (RNP) and associated Application Notes dated 15 February 2013 in relation to setting acceptable $L_{Aeq(period)}$ noise levels for sub-arterial and local roads and assessing any impacts.	Site establishment and construction stage first 6 months; Scenario 1 Year 0; and Scenario 2 Year 3. Mine operating traffic flows are generally unchanged beyond Year 3	Section 11.1	Section 11.2
Project Blasting Noise and Vibration Guided by the requirements of the Australian and New Zealand Environment Council's Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration (ANZEC, 1990) in relation to setting acceptable human comfort blast emission levels.	Throughout mine life.	Section 10.1	Section 10.3

In addition, the SEARs also see the Voluntary Land Acquisition Mitigation Policy (VLAMP): For State Significant Mining, Petroleum and Extractive Industry Developments (NSW Government, 2018) which must also be applied when noise impacts are considered appreciable (i.e. marginal, moderate or significant) and warrant noise mitigation measures at privately-owned residences involving: land acquisition rights; and or mitigation measures that should be offered to affected landowners; and or requirements for negotiated agreements between Bowdens Silver and landowners.

Furthermore, an independent technical Peer Review of this Noise and Vibration Impact Assessment was prepared by EMM Consulting Pty Limited dated 6 December 2019 and attached as **Annexure 19**.

1.3 LAND OWNERSHIP AND SURROUNDING RESIDENCES

The Land Ownership and Surrounding Residences (**Annexure 4**) shows the nearest surrounding residences and receivers in the vicinity of the Mine Site and within Lue, with Land Ownership Details including the property ID number, landowner name and residence co-ordinates presented in **Annexure 5**, together with the Vacant Land Ownership Details.

The Land Zoning Map (MWRC Local Environmental Plan, 2012) (**Annexure 6**) shows the land zones in the vicinity of the Mine Site, namely Primary Production (RU1), Large Lot Residential (R5) and Lue (RU5).

2. PROJECT OVERVIEW

2.1 TIMETABLE AND HOURS OF OPERATION

Bowdens Silver proposes to commence the approximately 18 month site establishment and construction stage for the Project following the receipt of development consent and other requisite approvals required. For the purposes of the noise assessment, the activities undertaken within the first 6 months of the site establishment and construction stage, namely the off-site road network upgrades and the initial on-site earthworks and infrastructure, would be considered construction works. Similarly, the off-site water pipeline and the off-site 132kV power line would also be considered construction works. Whereas, mining would commence within about month 7 of the site establishment and construction stage to provide the waste rock to construct the first stage of the TSF embankment and the initial ore for processing.

The proposed hours of construction and operation for the Project-related activities are presented in **Table 2**, together with a range of qualifying notes provided at the base of **Table 2** with respect to the proposed hours of construction and operation.

Table 2
Proposed Hours of Site Establishment and Construction and Operations

SITE ESTABLISHMENT AND CONSTRUCTION STAGE		
Construction Activity Months 1 to 6[1]	**Monday to Friday**[3]	**Saturday**[3]
Off-site Road Network Upgrades	7:00am – 6:00pm	7:00am – 6:00pm
On-site Initial Earthworks and Infrastructure		
Construction Activity Months 7 to 18[2]	**Monday to Friday**[3]	**Saturday**[3]
Off-site Water Supply Pipeline	7:00am – 6:00pm	7:00am – 6:00pm
Off-site 132kV Power Line		
Mining Activity Months 7 to 18	**Days**	**Hours**
On-site Open Cut Pit Development	7 days per week	7:00am – 6:00pm
On-site Processing Plant and Mining Facility		
On-site Tailings Storage Facility and Pipeline		
OPERATIONS		
Mining and Processing Activity	**Days**	**Hours**
Mining (Year 1 to 2)	7 days per week	7:00am – 6:00pm
Mining (Year 3 onwards)	7 days per week	24hrs
Processing Plant and Maintenance	7 days per week	24hrs
500kV PTL re-alignment (Year ¾)	Monday to Saturday[3]	7:00am – 6:00pm
Concentrate Despatch	Monday to Saturday	7:00am – 6:00pm
Rehabilitation	Monday to Saturday	7:00am – 6:00pm
Blasting	Monday to Saturday[3]	10:00am – 4:00pm

1. Monday to Saturday construction activity within ICNG standard hours, with extended construction hours on Saturday only.
2. Monday to Saturday construction activity within ICNG standard hours, with extended construction hours on Saturday only.
3. Public Holidays excluded.

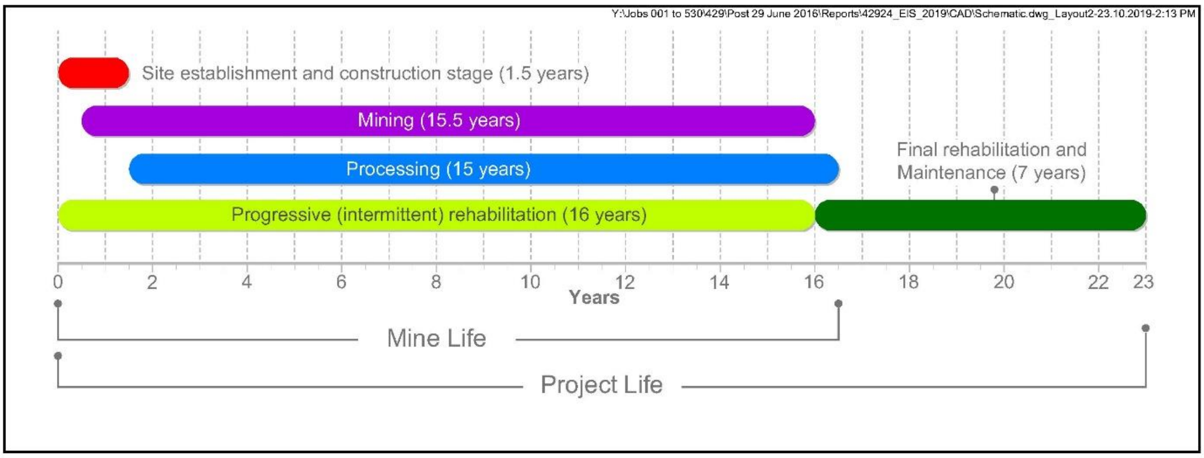
Based on current schedules, mining would continue for approximately 15 years. The subsequent site rehabilitation phase would be completed within approximately 3 to 4 years. However, given the range of circumstances that may cause one or more activities to occur over a longer period, Bowdens Silver has nominated an overall 25 year life for the Project.

2.2 PROJECT OVERVIEW

2.2.1 Development and Operational Schedule

The Project would require a site establishment and construction period of approximately 18 months during which the processing plant and all related infrastructure and the initial embankment of the TSF would be constructed. Once operational, Bowdens Silver anticipates the mine would produce concentrates for approximately 15 years. In total, it is proposed the mine life would be approximately 16.5 years, i.e. from the commencement of the site establishment and construction stage to the completion of concentrate production. It is envisaged rehabilitation activities would be completed over a period of approximately 7 years, i.e. from Year 16 to Year 23. **Figure 1** displays the duration of each of the main components throughout the mine life and Project life.

Figure 1
Schematic Display of Mine Life and Project Life



2.2.2 Indicative Key Project Components

The Project would incorporate a main open cut pit and two small satellite pits where overburden or waste rock is removed from above the silver-zinc-lead ore and placed either in a dedicated out-of-pit WRE for the potentially acid forming (PAF) waste rock and a stockpile referred to as the southern barrier for the storage of non-acid forming (NAF) waste rock. The ore would be mined and transported by haul trucks to the run-of-mine (ROM) pad where it would be stockpiled and fed by a front-end loader into a hopper where it would be crushed, stockpiled in a surge stockpile and then conveyed to the processing plant where it would be ground and processed to liberate the silver, zinc and lead minerals. These minerals would be collected by conventional froth flotation to form concentrates that are dewatered and transported off site by road registered trucks in sealed containers. The residual materials from the processing (tailings) would be pumped in the form of a slurry to the TSF west of the processing plant.

It is noted that the western limit of the open cut pit would be constrained until the 500kV PTL is re-aligned. Bowdens Silver proposes to re-align approximately 3.5km of the 500kV PTL commencing in Year 3 of mining (see **Annexure 2**)[2].

Bowdens Silver plans to undertake construction of the mine components in a manner that would be consistent with the long-term, post-mining landform, wherever possible. The final landform would incorporate a void created by the main open cut pit with the two satellite pits being backfilled.

The make-up water supply for processing and dust suppression would be pumped from the Ulan Coal Mine and/or the Moolarben Coal Mine to the Bowdens Mine Site via a buried 58.5km pipeline (see **Annexure 2**). A pump would be positioned at the source of water with an intermediate pumping station positioned at approximately chainages of 42km to 46km.

The indicative key Project components are presented in **Table 3**.

Table 3
Indicative Key Project Components or Activities

Page 1 of 2

Project Component	Summary of the Project
Mining Method	Open cut mining in a main pit and two satellite pits covering up to approximately 52ha.
Resource	Mineralised rock (ore) containing silver and small percentages of zinc and lead to depths of approximately 180m.
Disturbance Area	Approximately 422ha.
Total Recoverable Ore	Approximately 29.9 million tonnes of ore.
Annual Production	Up to approximately 2 million tonnes per year of ore and up to 4 million tonnes per year of waste rock once processing is underway.
Mine Life	Approximately 16.5 years comprising the site establishment and construction stage (approximately 18 months - including 12 months of mining pre-strip) and mining / processing for approximately 15 years (to the end of concentrate production).
Project Life	Approximately 23 years comprising the site establishment and construction stage, mining and processing operations (to the end of concentrate production) and includes the period for final rehabilitation.
Processing	Crushing, grinding, flotation and filtration to yield two concentrates, a silver/lead concentrate and zinc concentrate.
Management of Waste Rock and Tailings	NAF waste rock would be used to construct the embankment of the TSF (in three stages). All remaining NAF waste rock would be incorporated in a single stockpile referred to as the southern barrier which would also assist in noise attenuation. All PAF waste rock would be placed within a dedicated, engineered WRE east of the main open cut pit. All tailings would be contained in a single TSF.

[2] The noise levels associated with the construction activities for the re-aligned 500kV PTL have been assessed in conjunction with scenario 2 for the Year 3 operations (see Section 8.1).

Table 3 (Cont'd)
Indicative Key Project Components or Activities

Page 2 of 2

Project Component	Summary of the Project
General Infrastructure	A new mine access road would be constructed west of the Mine Site from the relocated Maloneys Road. On-site infrastructure would include electricity supply and distribution, fuel storage, administration, workshop, stores and amenities buildings.
Concentrate Transport	Silver/lead concentrate would be transported by road in sealed containers to Parkes or Kelso and then by rail to Port Pirie (for smelting). Zinc concentrate would be transported by road in sealed containers to either the Port of Newcastle or Port Botany (for export and smelting off-shore).
Water Management and Use	Water for processing and dust suppression would be sourced preferentially from on-site groundwater and surface water in accordance with licence requirements, with make-up water being pumped from the Ulan Coal Mine and/or Moolarben Coal Mine. Considerable emphasis would be placed upon recycling water from the processing plant.
Workforce	Site Establishment and Construction: approximately 320 persons. Operational: approximately 190 to 228 persons.
Hours of Operation	Mining initially day-time, increasing progressively to evening and night-time once sufficiently deep in open cut pit. Processing would be undertaken 24hrs/day, seven days a week although the primary jaw crusher would not operate at night.
Key Environmental Impacts and Mitigation Measures	The key environmental impacts requiring management relate to: acid mine drainage; noise (particularly at evening and night); air quality; surface water; and traffic on local roads.
Capital Investment Value	$146 million.

2.2.3 Indicative Key Ancillary Components

The three key ancillary components for the Project would be:

1. Construction of the relocated Maloneys Road from Lue Road (west of Lue) to the Mine Site, thereby replacing the existing public road (Maloneys Road) that traverses the proposed open cut pit;
2. Construction of a buried water pipeline for make-up water supply; and
3. A new supply 132kV power line to provide the required energy principally for processing the mined ore.

It is proposed that approval for Components 1 and 2 would be sought concurrently with the proposed mining and processing operations whereas the approval for the mine's power supply would be sought via an energy provider under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Hence, the construction of the 132kV power line is not considered in this report.

2.3 SITE ESTABLISHMENT AND CONSTRUCTION STAGE

2.3.1 Schedule of Activities

The site establishment and construction activities for all key components within the Mine Site would be sequenced to achieve the commencement date of concentrate production approximately 18 months after the commencement of the site establishment and construction stage. An indicative construction schedule is presented in **Table 4**.

Table 4
Indicative Site Establishment and Construction Schedule

Page 1 of 2

Construction Activity	Month																	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Approvals, Engineering and Procurement																		
Secondary approvals	■	■	■															
Engineering/detailed design	■	■	■	■	■	■	■	■	■									
Procurement	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
Off-site Road Network																		
Survey and mark out key boundaries			■															
Install erosion and sediment controls, vegetation clearing and soil stripping			■	■	■													
Construct relocated Maloneys Road			■	■	■	■												
Construct relocated Maloneys Road/Lue Road Intersection			■															
Construct new crossing across Lawsons Creek				■	■													
Construct relocated Maloneys Road Rail Bridge				■	■													
Site Earthworks and Infrastructure																		
Survey and mark out key boundaries				■														
Install erosion and sediment controls				■	■													
Vegetation clearing, soil stripping and stockpiling				■	■													
Construct internal roads, culverts, drains and underground services				■	■	■												
Establish low grade ore stockpile area 1 and WRE Cells 1 and 2					■	■												
Construct/install administration offices/amenities, etc.													■	■	■	■		
Processing Plant and Mining Facility																		
Earthworks/footings						■	■	■	■	■	■	■	■					
Plant construction/assembly/installation								■	■	■	■	■	■	■	■	■	■	
Piping/Electricals									■	■	■	■	■	■	■	■	■	■
Instrumentation												■	■	■	■	■	■	■
Commissioning															■	■	■	■
Open Cut Pit Development																		
Vegetation clearing					■													
Soil Stripping						■												
Ore and waste rock extraction							■	■	■	■	■	■	■	■	■	■	■	■
Tailings Storage Facility and Pipeline																		
Vegetation clearing, soil stripping and ripping						■	■	■	■									
Construct interception dams						■	■	■	■									
Tailings impoundment area preparation							■	■	■	■	■	■	■					

Table 4 (Cont'd)
Indicative Site Establishment and Construction Schedule

Page 2 of 2

Construction Activity	Month																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Tailings Storage Facility and Pipeline (Cont'd)																		
Delivery of NAF Waste Rock and Crushing																		
Construct Initial Embankment																		
Lining of decant area																		
Install decant return and monitoring infrastructure																		
Install Tailings and Decant Pipelines																		
Water Pipeline and Power Transmission Lines																		
Construct Water Pump Stations (2)																		
Install Water Pipeline																		
Construct 132kV Power Line																		
Source: Bowdens Silver Pty Limited																		

2.3.2 Equipment List

The indicative locations of the key activities to be undertaken during the site establishment and construction stage months 1 to 6, followed by months 7 to 18 are presented in **Annexure 7**, and the equipment identified in **Table 5** would be utilised, as required. In addition, **Annexure 15** (Figure A) presents the initial operational noise modelling scenario being approximately Month 8 of the establishment and construction stage (i.e. Year 0).

Table 5
Site Establishment and Construction Mobile Equipment

Page 1 of 3

Type	No.	Model[1]	Function
CONSTRUCTION ACTIVITIES MONTHS 1 TO 6			
Off-site Relocated Maloneys Road and Associated Infrastructure			
Bulldozer	1	D9R	Vegetation clearing, soil stripping and earth moving
Excavator	2	30t	Excavation of cuttings
Articulated Haul Truck	2	35t	Transfer of excavated material
Roller Compactor	1	CS533	Road compaction
Grader	1	16M	Road profiling
Water Truck	1	10 000L	Dust suppression/moisture control
On-site Processing Plant Earthworks and Infrastructure			
Bulldozer	1	D11R	Vegetation clearing, soil stripping and earth moving
Excavator	2	70t, 30t	Cut and fill, vegetation clearing
Front-end Loader	3	988F (x2), 950F (x1)	Cut and fill
Articulated Haul Truck	2	40t	Relocating excavated fill
Truck Semi Tipper	2	Road Train (50t)	Relocating excavated fill
Grader	3	16G (x1), 12G (x2)	Shaping/road construction (entire site)
Water Truck	1	10 000L	Dust Suppression
Vibrating Roller	1	CS54XT	Compaction of plant site and TSF embankment/impoundment
Rock Drill	1	Airtrac, Hydraulic	Blast hole drilling
Tool Carrier[#]	1	IT28	Integrated Tool Carrier

Table 5 (Cont'd)
Site Establishment and Construction Mobile Equipment

Page 2 of 3

Type	No.	Model[1]	Function
CONSTRUCTION ACTIVITY MONTHS 7 TO 18			
Off-site Water Pipeline			
Bulldozer	2	D6 (x1), D9 (x1)	Vegetation clearing, shaping corridor
Excavator	1	24t	Vegetation clearing
Mulching Unit	1	Vermeer BC 1800 XL	Mulching vegetation
Excavator	2	30t	Trench excavation and stringing/laying pipe (with hydraulic hammer and caged screen), as required
Trencher	1	Vermeer 1255	Trench excavation
Welder	1	McElroy T500	Welding HDPE pipes
Padfoot Roller	1	8t	Compacting backfill above pipeline
Tipper Truck	1	3t	Relocation of excavated fill
Water Truck	1	10 000L	Dust suppression/revegetation
On-site Processing Plant Installation			
Crane	1	Terex UC15 (Franna)	Crane – 15t Pick and Carry
Crane	1	Terex AC80-2 (Demag)	Crane – 80t All Terrain
Front-end Loader	3	Komatsu WA 900 FEL	Loading of haul trucks and management of ROM material
On-site Processing Plant Installation (Cont'd)			
Tool Carrier[2]	1	924G Integrated Tool Carrier IT924G-Igor	Integrated Tool Carrier
Loader	2	262C Skid Steer Loader	Skid-Steer Loader
Forklift	1	Clark CMP 50sD	Forklift (Reagents) 5t
Forklift	1	Hyster H28-32XM-16CH	Forklift (Concentrate) carry 20ft containers
Pump[2]	1	SE Megapump	Mobile diesel pumps
Scissor Lift[2]	2	Haulotte compact 10DX	Elevated work platform – scissor lift small
On-site Mining Pre-strip and Open Cut Pit Development			
Bulldozer	2	D11R, D9R	Vegetation clearing, soil stripping and earth moving
Excavator	1	Ex 1900 (190t)	Earthmoving loading ore/waste rock
Grader	1	16G	Road maintenance
Front-end Loader	3	950F (x2), 930F (x1)	Loading B-double trucks / shaping oxide ore
Haul Truck	4	777G (90t)	Hauling ore/waste rock
Water Truck	1	10 000L	Dust Suppression
Rock Drill	1	Airtrac, Hydraulic	Blast hole drilling
Mulching Unit	1	Vermeer BC 1800 XL	Mulching vegetation
Chain Saw	1	Husqvarna 455 Rancher	Vegetation removal
On-site Tailings Storage Facility and Tailings Delivery and Decant Water Pipelines			
Bulldozer	2	D11R, D7R	Vegetation clearing, soil stripping and earth moving
Front-end Loader	2	988F, 950F	Cut and fill
Grader	2	16G	Shaping/road construction (entire site)
Excavator	2	70t, 30t	Vegetation clearing

Table 5 (Cont'd)
Site Establishment and Construction Mobile Equipment

Page 3 of 3

Type	No.	Model[1]	Function
CONSTRUCTION ACTIVITY MONTHS 7 TO 18 (Cont'd)			
On-site Tailings Storage Facility and Tailings Delivery and Decant Water Pipelines (Cont'd)			
Crusher/Screen	1	McCloskey J40 & S80	On-site production of road base/ aggregate
Water Truck	1	10 000L	Dust Suppression
Vibrating Roller	1	CS54XT	Compaction of plant site and TSF embankment/impoundment
Haul Truck	2	35t	Transfer crushed rock for TSF
Mulching Unit	1	Vermeer BC 1800 XL	Mulching vegetation
Chain Saw	2	Husqvarna 455 Rancher	Vegetation removal
B-double Truck	6[2]	Freightliner Coronado 114	NAF waste rock to TSF
Note 1. The Model(s) indicated are typically Caterpillar models, however, these are indicative of the class or type of equipment proposed to be used and are not definitive. Note 2. It is envisaged that the 6 trucks would undertake two return trips per hour between the open cut pit NAF waste rock stockpile and the TSF NAF waste rock stockpile area.			
Source: GR Engineering Services Limited / AMC Consultants Pty Ltd			

2.3.3 500kV Power Transmission Line (PTL) Re-alignment

As described in Section 2.2.2, Bowdens Silver proposes to re-align approximately 3.5km of the 500kV PTL commencing in Year 3 (see **Annexure 2**). The re-alignment works and removal of the redundant towers would take up to approximately 6 to 10 months to complete and would involve the use of the equipment listed in **Table 6**, as required.

Table 6
500kV PTL Re-alignment and Equipment Fleet

Type	No.	Model	Function
500kV PTL Re-alignment (Year 3)			
Bulldozer	1	D9R	Vegetation clearing, track construction
Excavator	2	325 FL	Vegetation clearing, preparation of tower footings, loading haul trucks
Mulching Unit	1	272 D2	Mulching vegetation
Articulated Heavy Vehicle	5	Semi-trailer	Delivery (and removal) of tower components
Articulated Haul Truck	2	38t	Transportation of excess excavated material
Crane	2	Up to 250t all terrain	Erection and dismantling towers and stringing power lines
Franna Cranes	2	Up to 25 tonne	Foundations, erection and dismantling towers and stringing power lines
Elevated Work Platform	3	70m 8X8 truck units	Stringing power lines
Soilmac Drill Rigs	2	SR 30-60 size	Foundation works
Pozitrack	2		Access and foundation works
4WD & Light Vehicles	15	Various	Personnel/delivery of tools
Source: Zinfra Pty Ltd			

2.4 MINING OPERATIONS

Mining would be undertaken using conventional open cut drill and blast, load and haul mining methods. This would involve the sequential removal/storage or mulching of vegetation, the stockpiling of topsoil and subsoil (where recoverable), the removal/placement or stockpiling of waste rock and the recovery of ore.

Section 2 of the EIS provides a detailed description of the Project, and this section presents information relating to the mining operations including the open cut pit design, site preparation, mining methods, mining rates and sequencing and mobile equipment to be used with respect to the noise and vibration assessment.

2.4.1 Open Cut Operations Mobile Equipment

The design of the open cut pit and the two satellite pits has been undertaken through a series of pit optimisation realisations carried out for Bowdens Silver. **Annexure 8** presents the conceptual final layout of the open cut pit and the two satellite pits together with sections through the open cut pit and the satellite pits, highlighting the planned years of operation at the nominated locations. The open cut pits have been designed using the following parameters:

- Operational bench height: 5m;
- Maximum face angle: 65º;
- Berm width: 9m;
- Nominal ramp width: between 15m and 25m; and
- Ramp gradient: 1 in 10 (10%).

Dual lane (25m) and single lane (15m) ramp widths would provide for operations with roadside drainage and safety bunds. Horizontal switchbacks would also provide flat turning surfaces to reduce wear and tear to the trucks. All ramps would be positioned to achieve the shortest possible distance from the open cut pit limit to the ROM pad, low grade stockpile, oxide ore stockpile and the WRE. Two entry/exit ramps would be included in the design of the open cut pit, one to the north (mainly for ore) and one to the east (mainly for waste rock and oxide ore). The northern ramp from the open cut pit would not be developed until Year 3 of operations. Access and egress from the two satellite pits would occur via a single ramp for each satellite pit.

The number, types and indicative models of the mobile equipment to be used within the open cut pit to deliver the ore to the ROM pad and the waste rock types to their respective locations is presented in **Table 7**. Distinction is made with respect to the number of items of equipment that would be used during the day-time (7:00am to 6:00pm), evening (6:00pm to 10:00pm) and night-time (10:00pm to 7:00am) periods.

Table 7
Indicative Mobile Equipment List - Open Cut Mining Operations

Type	Model	Function	Number of Mobile Equipment Items		
			Day-time	Evening	Night-time
Hydraulic Drill	PV275	Blast hole drilling	2	1	-
Excavator	190t (EX1900)	Loading ore/waste rock	1	1	1
Haul truck	Cat 777XQ	Hauling ore/waste rock	4	4	4
Grader	16M XQ	Haul road maintenance	2	1	1
Front-end Loader	Cat 988K XQ	Loading NAF waste rock	1	-	-
Bulldozer	D9	Spreading waste rock/land clearing	2	-	-
Articulate Truck	40t	Soil transfer	2	-	-
Fuel Truck	Road Truck (6x6)	Fuel for equipment	1	-	-
Service Truck	Road Truck (6x6)	Mobile vehicle support	1	-	-
Water Cart	Volvo F724 (10,000L)	Dust suppression	1	1	-
Source: AMC Consultants Pty Ltd					

2.4.2 Processing Plant Operations Fixed Plant and Mobile Equipment

The processing plant has been designed to process approximately 2 million tonnes per annum (tpa) of ROM ore to produce silver/lead and zinc concentrates using sequential flotation. The processing plant includes the following principal components:

- A single stage primary jaw crusher;
- A crushed ore stockpile and reclaim;
- A semi-autogenous grinding (SAG) mill, ball mill and pebble crusher;
- Reagent mixing and distribution;
- A silver/lead flotation circuit comprising roughers, rougher concentrate regrind and cleaners;
- Silver/lead concentrate thickening and filtration;
- A zinc flotation circuit comprising roughers, rougher concentrate re-grind and cleaners;
- Zinc concentrate thickening and filtration;
- Concentrate bagging/containerisation facilities and storage; and
- Tailings thickening and pumping.

Annexure 9 presents the conceptual layout of the processing plant, together with a simplified overall process flowsheet for the processing activities. The design maximises the use of gravity flow although some pumping would be required. The number, types and indicative models of the mobile equipment to be used within the processing area are listed in **Table 8**, together with the fixed processing plant in **Table 9.**

Table 8
Indicative Mobile Equipment List - Processing Operations

Type	Model	Function	Number of Mobile Equipment Items		
			Day-time	Evening	Night-time
Bulldozer	D10	Shaping delivered ore and ROM pad	1	-	-
Front-end Loader	988F	Loading hopper above jaw crusher	1	1	-
Rock Breaker	336DL RB	Breaking oversize rock	1	-	-
Tele Handler 3t	Manitou 1135	General operations	1	-	-
Container Lifter	Hyster 28-32	Loading containers onto trucks	1	-	-
Truck 10t [1]	Isuzu FTR 150-260	Transporting consumables			
Truck 3t [1]	Isuzu NNR 65-150	Transporting consumables			
Forklift 3t [1]	Toyota 32-8FG30	Loading / unloading consumables			
Skid Steer Loader [1]	Toyota Huski 30-5SDK8	General operations			
Tool Carrier [1]	Komatsu WA250P	Integrated tool carrier			
Mobile Crane 25t [1]	Terex MAC25	Miscellaneous lifting tasks			
Articulated Work Platform [1]	JLG450	Equipment maintenance			
Note 1. Not included in noise modelling (Section 7) as sound power levels are considerably lower than the key noise sources.					
Source: GR Engineering Pty Ltd					

Table 9
Indicative Fixed Plant List - Processing Operations

Type	Model	Number of Fixed Plant Items		
		Day-time	Evening	Night-time
Primary Jaw Crusher	160 kW Metso C130 (51 x 39)	2	1	-
Conveyors and Drives	273 tph, 1 m/s, 1,000 mm belt, 50/150 kW Drives	4	4	2
Transfer Chutes	-	2	2	1
SAG Mill	250tph, 4.8 MW, 8.5 dia x 3.8 EGL	1	1	1
Ball Mill	750tph, 4.0 MW, 5.0 dia x 10 EGL	1	1	1
Flotation Cells and Thickener	-	1	1	1
Filter Area	500kW Isamill M1000	1	1	1
Plant Workshop	-	1	1	1
Mining/LV Workshop	-	1	1	-
Water pumps	85 kL/hour	1	1	1
Source: GR Engineering Pty Ltd				

2.4.3 Tailings Storage Facility Mobile Equipment

As part of the processing plant operation, a thickened tailings slurry (from which the majority of the silver, zinc and lead minerals would be removed) would be pumped to the TSF situated in the western section of the Mine Site (see **Annexure 10**).

The TSF would comprise the following principal components:

- Embankment (with two raises in Years 3 and 8);
- Tailings pipeline and three discharge points;
- A 103 ha impoundment area;
- Water return system;
- Emergency spillway; and
- Closure spillway.

The number, types and indicative models of the mobile equipment to be used during the second and third TSF embankment raises are listed in **Table 10**.

Table 10
Indicative Mobile Equipment List - Tailings Storage Facility

Type	Model	Function	Number of Mobile Equipment Items		
			Day-time	Evening	Night-time
Mobile Crusher	McCloskey J40 & S80	Crushing NAF Waste Rock	1	-	-
Haul truck	35t	Transfer of crushed rock for TSF embankment	2	-	-
Bulldozer	D9R	Shaping of materials for TSF embankment	2	-	-
Vibrating Roller	C554XT	Compacting materials for TSF embankment	1	-	-
Water truck	Volvo F724 (10,000L)	Dust suppression	1	-	-
Excavator	40t	Feeding crusher and loading haul trucks	1	-	-
B-double Truck	Freightliner Coronado 114	NAF waste rock transfer to TSFs	3	-	-
Source: ATC Williams Pty Ltd					

2.5 BLASTING

The bulk of the ore and waste rock would require blasting following removal of the friable weathered materials, principally to achieve the required level of fragmentation to enable the ore to be processed. Drilling and blasting would be a regular activity within the open cut pit with blasts initiated on most weekdays. Drilling would be undertaken typically 2 to 3 days in advance of each blast to allow the drill cuttings to be analysed for metal grades. Each blast would yield an average of approximately 25,000 tonnes of fragmented rock with maximum yields up to 60,000 tonnes. The emphasis in blasting would be upon fragmentation of the rock in situ rather than heaving it away from a defined face. This approach would ensure the reliability of metal grades identified during the drilling of the blast holes to assist to identify whether the fragmented rock is ore, low grade ore, oxide ore, benign NAF waste rock or PAF waste rock.

Blast hole drilling would be undertaken by up to two production drills. Drill and blast production would be carried out on a bench with a height of approximately 5m (5.5m with sub-drill). The burden and spacing for each blast would be adjusted to reflect the rock type to be blasted and any inherent features present.

The typical maximum instantaneous charge (MIC) would be in the order of 117kg for ore blasting, and 216kg for waste rock blasting, although the MICs would be varied in line with on-site experience and Bowdens Silver's commitment to satisfy all blast limits throughout the mine life at agreed locations. While production blasting would take place in 5m benches, a flitch height of 2.5m would be used in excavating and loading ore and waste rock.

Pre-split blasting would be adopted to achieve the required stability of the final open cut pit walls, particularly in the fresh rock zones.

Bulk ammonium nitrate emulsion or ammonium nitrate fuel oil (ANFO) would be used in production blasting. The selection of the type of explosive used would reflect a range of parameters including the presence or absence of water within each bench to be blasted. All drill and blast operations would be supervised by a suitably qualified and experienced blasting engineer or shot-firer.

Bowdens Silver would establish a protocol to inform interested surrounding landowners and residents about the timetable for blasts. Whenever possible, blasts would be initiated generally at a similar time of day. Further information on the management of blasts and the proposed design and operational safeguards is provided in Section 10.

2.6 ROAD TRAFFIC AND TRANSPORTATION

2.6.1 Mine Access

Access to the Mine Site is currently achieved via Lue Road, Pyangle Road and Maloneys Road (see **Annexure 11**). Lue Road is the main road between Mudgee and Rylstone whilst Maloneys Road and Pyangle Road are local roads.

Access to the Mine Site during the early stages of the site establishment and construction stage (approximately the end of Month 6) would be provided by the existing road network, principally using Pyangle Road (from Lue Road) and Maloneys Road. Access to the Mine Site during the latter stages of the site establishment and construction stage (from about Month 7) and the entire operational stage would be via Lue Road, relocated Maloneys Road and the mine access road.

Whilst it would be necessary for some heavy vehicles accessing the Mine Site during the site establishment and construction stage to transit through Lue, it is envisaged that by establishing access to the Mine Site from Lue Road to the west of Lue early in the development of the Project, very few heavy vehicles delivering components and consumables would pass through Lue in order to gain access to the Mine Site.

2.6.2 Site Establishment and Construction Stage Traffic

The range of light vehicles, buses and heavy vehicles that Bowdens Silver anticipates would travel to and from the Mine Site on a daily basis throughout the site establishment and construction stage is presented in **Table 11**. Distinction is made between the traffic movements prior to and after the construction of the relocated Maloneys Road, i.e. the long-term access to the Mine Site.

Table 11
Daily Traffic Movements[1] during Site Establishment and Construction Stage

Road Description	Light Vehicles	Buses	Heavy Vehicles	Oversize Vehicles
Prior to the establishment of long-term access via relocated Maloneys Road				
Lue Road *(*through Lue)	100 to 120	4	2 to 32 (8[2])	0 to 4
Lue Road (east of Lue)	50 to 70	0 to 4	0 to 10 (2[2])	0 to 4
Existing Maloneys Road	150 to 190	4 to 8	2 to 42 (10[2])	0 to 8
Relocated Maloneys Road (to Mine Entrance)	-	-	-	-
After the establishment of long-term access via relocated Maloneys Road				
Lue Road *(*west of Lue)	100 to 120	4	2 to 32	0 to 4
Lue Road (through Lue)	50 to 70	0 to 4	0 to 10 (2[2])	0 to 4
Existing Maloneys Road[3]	20 to 40	-	-	-
Relocated Maloneys Road/mine access road (to Mine Entrance)	130 to 150	4 to 8	2 to 32 (8[2])	0 to 4
Relocated Maloneys Road/mine access road (to TSF Entrance[4])	12 to 20	-	234	-

Note 1: 1 return trip generates 2 movements.
Note 2: Approximate daily average over 6 months.
Note 3: Vehicles travelling to the Bowdens exploration office and core library.
Note 4: B-doubles travelling on a 1.4km section of relocated Maloneys Road to the TFS embankment.

Source: GR Engineering Services Limited and Bowdens Silver

2.6.3 Operational Traffic

The range of light vehicles, buses and heavy vehicles Bowdens Silver anticipates would travel to and from the Mine Site throughout the mine life is presented in **Table 12**. Each vehicle travelling to the Mine Site would generate two vehicle movements (vehicle in/vehicle out).

Peak light vehicle and bus movements would occur over an approximately 2hr period during shift changes (approximately 30mins prior and 30mins following shift change), with mining and some non-mining shift changes 1 hour apart). It is expected that peak light vehicle movements during these shift changes would be 35 vehicle movements (i.e. a total of 70 light vehicle movements over both shift changes). Additional light vehicle movements would also occur throughout the day including visitors and contractors. It is expected that, on average, this would result in a further 5 light vehicle trips (10 movements) per day. It is anticipated that all bus movements would also occur during the shift change period.

Table 12
Daily Traffic Movements[1] Throughout the Mine Life

Road Description	Light Vehicles	Buses	Heavy Vehicles	Oversize Vehicles
Lue Road (west of Lue - from Mudgee)	90 to 120	0 to 6	2 to 10 (4[2])	0 to 2
Lue Road (through Lue - from Rylstone and Kandos)	80 to 100	0 to 4	0 to 2 (1[2])	-
Existing Maloneys Road[3]	20 to 40	-	-	-
Relocated Maloneys Road/mine access road (to Mine Entrance)	150 to 190	0 to 8	2 to 12 (5[2])	0 to 2
Relocated Maloneys Road/mine access road (to TSF Entrance[4])	12 to 20	-	234	-

Note 1: 1 return trip generates 2 movements.
Note 2: Approximate daily average over 6 months.
Note 3: Vehicles travelling to the Bowdens exploration office and core library.
Note 4: B-doubles travelling on a 1.4km section of relocated Maloneys Road to the TFS embankment.

Based on the annual production of between 20 000t and 30 000t of mineral concentrates, average daily product despatches would be approximately one to three truckloads generating two to six heavy vehicle movements Monday to Saturday. B-double trucks or semi-trailers would be used to transport the concentrates in order to maximise the load carried and minimise the number of truck movements.

In addition to trucks transporting concentrates, it is anticipated that, on average, one or two heavy loads (two or four movements) would occur daily for delivery of fuel, explosives and other consumables.

3. EXISTING METEOROLOGICAL AND NOISE ENVIRONMENT

3.1 METEOROLOGICAL ENVIRONMENT

The Mine Site meteorological environment has been assessed in accordance with the requirements of the NPfI Fact Sheet D, which sets out procedures for establishing noise enhancing weather conditions. There are two options available to consider meteorological effects, as follows.

1. *Adopt the **noise-enhancing meteorological conditions** for all assessment periods for noise impact assessment purposes without an assessment of how often these conditions occur - a conservative approach that considers source-to-receiver wind vectors for all receivers and F class temperature inversions with wind speeds up to 2 m/s at night.*

Or

2. *Determine the **significance** of noise-enhancing conditions. This involves assessing the significance of temperature inversions (F and G class stability categories) for the night-time period and the significance of light winds up to and including 3 m/s for all assessment periods during stability categories other than E, F or G. Significance is based on a threshold of occurrence of 30% determined in accordance with the provisions in this policy. Where noise-enhancing meteorological conditions occur for less than 30% of the time, standard meteorological conditions may be adopted for the assessment.*

NPfI Fact Sheet D also contains several important notes, and in particular states:

> *Noise limits derived for consents and licences will apply under the meteorological conditions used in the environmental assessment process, that is, standard or noise-enhancing meteorological conditions. For 'very noise-enhancing meteorological conditions' (see glossary) a limit is set based on the limit derived under standard or noise-enhancing conditions (whichever is adopted in the assessment) plus 5 dB. In this way a development is subject to noise limits under all meteorological conditions.*
>
> *It should be noted that noise limit conditions will include the wind speed (scalar quantity without direction) under which noise limits will apply.*

In consultation with Bowdens Silver, it was decided that the first option be adopted as a conservative approach and based on NPfI Table D1, the standard and noise enhancing meteorological conditions are presented in **Table 13**.

Table 13
NPfI Table D1 Standard and Noise Enhancing Meteorological Conditions

Meteorological Conditions	Meteorological Parameters
Standard	Day/evening/night: stability categories A-D with wind speed up to 0.5m/s at 10m AGL
Noise-enhancing	Day/evening: stability categories A-D with light winds (up to 3m/s at 10m AGL) Night-time: stability categories A-D with light winds (up to 3m/s at 10m AGL) and/or stability category F with winds up to 2m/s at 10m AGL
Notes: m/s = metres per second; m = metres; AGL = above ground level Where a range of conditions is nominated, the meteorological condition delivering the highest predicted noise level should be adopted for assessment purposes. However, feasible and reasonable noise limits in consents and licences derived from this process would apply under the full range of meteorological conditions nominated under standard or noise-enhancing conditions as relevant. All wind speeds are referenced to 10m AGL. Stability categories are based on the Pasquil-Gifford stability classification scheme.	
Source: NPfI Table D1	

The NPfI standard and noise enhancing meteorological conditions can be further defined for noise modelling purposes as presented in **Table 14**.

Table 14
NPfI Meteorological Conditions for Noise Modelling Purposes

Period	Meteorological Conditions	Air Temperature[1]	Relative Humidity[1]	Wind Speed[2]	Stability Category	Temperature Gradient[3]	Qualitative Description
Day-time	Standard	11ºC	65%	0m/s	D class	-0.5ºC/100m	Neutral
	Noise-enhancing			3m/s			Wind
Evening	Standard	7ºC	83%	0m/s	D class	-0.5ºC/100m	Neutral
	Noise-enhancing			3m/s			Wind
Night-time	Standard	4ºC	90%	0m/s	D class	-0.5ºC/100m	Neutral
	Noise-enhancing			3m/s			Wind
				2m/s	F class	+4.0ºC/100m	Moderation Inversion

Note 1: 2013 to 2016 mean winter air temperature and relative humidity Bowdens Silver's MET01 AWS (see **Annexure 13**).
Note 2: Scalar wind speed without direction.
Note 3: ºC/100m abbreviation for degrees Celsius per 100 metres.

3.2 EXISTING NOISE ENVIRONMENT

3.2.1 Background Noise Monitoring

Background noise monitoring campaigns of unattended noise logging were undertaken in September/October 2011, August 2012, October/November 2013 and February 2017 to quantify background noise levels (i.e. all noise sources) and to estimate industrial noise only (i.e. in the absence of transport, natural and domestic noise) in the two localities of Rural and Lue in relation to the Mine Site. Given there have not been any substantial changes in land use in the vicinity of the Mine Site that would alter the background noise levels since 2011 to 2017, the noise measurement results remain valid and applicable to the Project.

The measurement locations, methodology and analysis procedures are described in **Annexure 12**, where the unattended background noise monitoring results from each location, together with the on-site weather conditions have been analysed and presented on a daily basis.

In order to supplement the unattended logger measurements and to assist in identifying the character and duration of the noise sources, operator-attended surveys were also conducted in the vicinity of the noise measurement locations during the September/October 2011 and February 2017 noise monitoring campaign.

3.2.2 Meteorological Monitoring

Meteorological data for the 2011 and 2012 background noise campaigns was obtained from the Bureau of Meteorology (BoM) Nullo Mountain Automatic Weather Station (AWS) located 35km east of the Mine Site. Meteorological data obtained from the Nullo Mountain AWS was used prior to the installation of Bowdens Silver's AWSs in the vicinity of the Mine Site. Subsequent meteorological data for the 2013 background noise monitoring campaign was obtained from Bowdens Silver's MET01 AWS (**Annexure 13**) and from Bowdens Silver's MET02 AWS for the 2017 traffic noise monitoring campaign.

3.2.3 Unattended Background Noise Monitoring Results

The calculated Rating Background Levels (RBLs) and the measured overall all noise sources ($L_{Aeq(period)}$) determined in accordance with the NPfI are presented in **Table 15**, **Table 16**,

Table 17 and **Table 18** for the 2011, 2012, 2013 and 2017 background noise monitoring campaigns respectively.

Table 15
Unattended Background Noise Results - September/October 2011 (dB(A) re 20µPa)

Locality[8]	Residence ID	Measured RBL[1,2,3] All Noise Sources			Measured $L_{Aeq(period)}$ All Noise Sources		
		Day[4]	Evening[5]	Night[6]	Day[4]	Evening[5]	Night[6]
Rural	R1A	25	25	25	46	36	49
	R1B	27	25	25	66	58	51
	R35	27	25	25	55	57	47
	R22	28	31[7]	25	47	45	52
	R1H	27	25	25	50	41	43
Lue	L21	29	25	25	50	44	44

Note 1: In accordance with NPfI Table 2.1, if the day-time RBL is < 35dB(A), then 35dB(A) shall be the assumed RBL.
Note 2: In accordance with NPfI Table 2.1, if the evening or night RBL is < 30dB(A), then 30dB(A) shall be the assumed RBL.
Note 3: 25dB(A) is the lowest reportable noise level within the specified linearity range of the instrumentation used.
Note 4: Day-time Monday to Saturday 7:00am to 6:00pm, Sunday and Public Holidays 8:00am to 6:00pm.
Note 5: Evening Monday to Sunday 6:00pm to 10:00pm.
Note 6: Night-time Monday to Saturday 10:00pm to 7:00am, Sunday and Public Holidays 10:00pm to 8:00am.
Note 7: Relatively elevated evening background noise level likely due to insect activity in the vicinity of monitoring location.
Note 8: See to **Annexure 4** for land ownership plans and **Annexure 5** for land ownership details.
µPa = micro Pascal

Table 16
Unattended Background Noise Results - August 2012 (dB(A) re 20µPa)

Locality[8]	Residence ID	Measured RBL[1,2,3] All Noise Sources			Measured $L_{Aeq(period)}$ All Noise Sources		
		Day[4]	Evening[5]	Night[6]	Day[4]	Evening[5]	Night[6]
Rural	R1A	28	26	25	46	38	35
	R7	25	25	25	44	38	38
	R35	27	25	25	53	45	39
	R22	27	33[7]	25	49	51	45
	R1H	27	25	25	46	41	39
Lue	L21	31	27	25	48	45	41

Note 1: In accordance with NpfI Table 2.1, if the day-time RBL is < 35dB(A), then 35dB(A) shall be the assumed RBL.
Note 2: In accordance with NpfI Table 2.1, if the evening or night RBL is < 30dB(A), then 30dB(A) shall be the assumed RBL.
Note 3: 25dB(A) is the lowest reportable noise level within the specified linearity range of the instrumentation used.
Note 4: Day-time Monday to Saturday 7:00am to 6:00pm, Sunday and Public Holidays 8:00am to 6:00pm.
Note 5: Evening Monday to Sunday 6:00pm to 10:00pm.
Note 6: Night-time Monday to Saturday 10:00pm to 7:00am, Sunday and Public Holidays 10:00pm to 8:00am.
Note 7: Relatively elevated evening background noise level likely due to insect activity in the vicinity of monitoring location.
Note 8: See **Annexure 4** for land ownership plans and **Annexure 5** for land ownership details.
µPa = micro Pascal

Table 17
Unattended Background Noise Results - October/November 2013 (dB(A) re 20µPa)

Locality[7]	Residence ID	Measured RBL[1,2,3] All Noise Sources			Measured $L_{Aeq(period)}$ All Noise Sources		
		Day[4]	Evening[5]	Night[6]	Day[4]	Evening[5]	Night[6]
Rural	R1I	25	25	25	-	-	-
	R74	27	25	25	-	-	-
	R93A	25	25	25	-	-	-

Note 1: In accordance with NPfI Table 2.1, if the day-time RBL is < 35dB(A), then 35dB(A) shall be the assumed RBL.
Note 2: In accordance with NPfI Table 2.1, if the evening or night RBL is < 30dB(A), then 30dB(A) shall be the assumed RBL.
Note 3: 25dB(A) is the lowest reportable noise level within the specified linearity range of the instrumentation used.
Note 4: Day-time Monday to Saturday 7:00am to 6:00pm, Sunday and Public Holidays 8:00am to 6:00pm.
Note 5: Evening Monday to Sunday 6:00pm to 10:00pm.
Note 6: Night-time Monday to Saturday 10:00pm to 7:00am, Sunday and Public Holidays 10:00pm to 8:00am.
Note 7: See **Annexure 4** for land ownership plans and **Annexure 5** for land ownership details.
µPa = micro Pascal

Table 18
Unattended Background Noise Results - February 2017 (dB(A) re 20µPa)

Locality[7]	Residence ID	Measured RBL[1,2,3] All Noise Sources			Measured $L_{Aeq(period)}$ All Noise Sources		
		Day[4]	Evening[5]	Night[6]	Day[4]	Evening[5]	Night[6]
Rural	R88	29	25	25	48	46	43
Lue	A	28	25	25	47	54	42

Note 1: In accordance with NpfI Table 2.1, if the day-time RBL is < 35dB(A), then 35dB(A) shall be the assumed RBL.
Note 2: In accordance with NpfI Table 2.1, if the evening or night RBL is < 30dB(A), then 30dB(A) shall be the assumed RBL.
Note 3: 25dB(A) is the lowest reportable noise level within the specified linearity range of the instrumentation used.
Note 4: Day-time Monday to Saturday 7:00am to 6:00pm, Sunday and Public Holidays 8:00am to 6:00pm.
Note 5: Evening Monday to Sunday 6:00pm to 10:00pm.
Note 6: Night-time Monday to Saturday 10:00pm to 7:00am, Sunday and Public Holidays 10:00pm to 8:00am.
Note 7: See **Annexure 4** for land ownership plans and **Annexure 5** for land ownership details.
µPa = micro Pascal

Background noise sources in the vicinity of the Mine Site are typical of a relatively undeveloped rural environment, with negligible industrial noise contributions, and a single moderately active road corridor, including:

- Traffic on Lue Road;
- Occasional light aircraft;
- Domestic and rural noise such as lawn mowers, tractors etc;
- Rural fauna noise such as stock, insects and birds;
- Rural natural noise such as wind in the trees; with
- An absence of commercial, industrial or intensive agricultural activities, with no observed or measured industrial noise contributions.

3.2.4 Background Noise and Amenity Levels for Noise Impact Assessment

For the purposes of assessing the potential noise impacts from the Project, the background noise level data has been distilled into two general residential localities namely:

- Rural residences surrounding the Mine Site (prefixed by ‘R’ e.g. R15); and
- Lue residences (prefixed by ‘L’ e.g. L15).

In accordance with NPfI Section 2.3, the minimum day-time RBL of 35dB(A), and the minimum evening and night-time RBL of 30dB(A) has been adopted at both residential localities. The justification for this background noise assessment procedure is described in the Draft Industrial Noise Guideline Technical Background Paper (EPA, May 2015) Attachment 1. Furthermore, $L_{Aeq(period)}$ noise amenity levels (i.e. non-transport related noise) from industrial noise sources is generally negligible at both residential localities.

In view of the foregoing, the adopted RBLs are presented in **Table 19**. These form the basis of establishing the project noise trigger levels (PNTLs) assessment criteria (Section 4) consistent with NSW government policy.

Table 19
Adopted RBLs for Impact Assessment Purposes (dB(A) re 20 µPa)

Locality	Adopted RBLs All Noise Sources[1,2]		
	Day-time[3]	Evening[4]	Night-time[6]
Rural Residences	35	30	30
Lue Residences			

Note 1: In accordance with NPfI Table 2.1, if the day-time RBL is < 35dB(A), then 35dB(A) shall be the assumed RBL.
Note 2: In accordance with NPfI Table 2.1, if the evening or night RBL is < 30dB(A), then 30dB(A) shall be the assumed RBL.
Note 3: Day-time Monday to Saturday 7:00am to 6:00pm, Sunday and Public Holidays 8:00am to 6:00pm.
Note 4: Evening Monday to Sunday 6:00pm to 10:00pm.
Note 5: Night-time Monday to Saturday 10:00pm to 7:00am, Sunday and Public Holidays 10:00pm to 8:00am.

3.2.5 Road Traffic Noise Monitoring

Noise attributed to existing traffic was established through the use of two unattended noise loggers positioned adjacent to Lue Road.

An additional targeted traffic noise monitoring was implemented in February 2017 to quantify the existing traffic noise levels at two locations adjacent to Lue Road, one beyond the western boundary of Lue near Residence R88 (100km/h speed zone) and one within Lue (LMet2) (opposite the Lue Public School) (60km/h speed zone). The two locations are representative of the rural and Lue built-up areas adjacent to Lue Road. The measurement methodology and analysis procedures are described in **Annexure 12**, where the unattended traffic background noise monitoring results from each location, together with the on-site weather conditions have been analysed and presented on a daily basis.

The existing day-time and night-time ($L_{Aeq(period)}$) traffic noise levels were determined in accordance with the RNP, as presented in **Table 20**.

Table 20
Unattended Traffic Noise Results - February 2017 (dB(A) re 20 µPa)

Locality	Residence ID[3]	Offset Distance[1]	Existing $L_{Aeq(period)}$ Traffic Noise Level	
			Day-time[2]	Night-time[2]
Rural	R88	40m	47	43
Lue	A (within Bowdens Silvers compound)	37m	47	42

Note 1: Free field offset distance from centre of Lue Road.
Note 2: In accordance with the RNP Day-time 7:00am to 10:00pm and night-time 10:00pm to 7:00am.
Note 3: See **Annexure 4** for land ownership plans and **Annexure 5** for land ownership details.

4. NOISE ASSESSMENT CRITERIA

4.1 CONSTRUCTION NOISE ASSESSMENT CRITERIA

As described in Section 2.1, Bowdens Silver proposes an approximate 18 month site establishment and construction stage for the Project, and the activities undertaken within the first 6 months, namely the off-site road network upgrades and the initial on-site vegetation clearance, earthworks and infrastructure would be considered construction works and therefore assessed in accordance with the requirements of the ICNG. Similarly, the off-site water pipeline would be considered construction works and therefore assessed in accordance with the requirements of the ICNG. Whereas, mining would commence within about Month 7 of the site establishment and construction stage to provide the waste rock to construct the first stage of the TSF embankment and the initial ore for processing. The application of the ICNG is no longer justified and the site establishment and construction on-site works from Month 7 are assessed in accordance with the requirements of the NPfI.

The ICNG recommends a construction noise management level (CNML) equivalent to the day-time RBL plus 10dB(A) within standard hours (i.e. day-time) and RBL plus 5dB(A) outside standard hours. The ICNG also nominates a “highly noise affected level” (HNAL) day-time intrusive $L_{Aeq(15minute)}$ noise level of 75dB(A). As the site establishment and construction stage (Section 2.3) would be limited to day-time works only, the ICNG CNMLs and HNALs are presented in **Table 21**.

Table 21
Construction Noise Management Levels and Highly Noise Affected Level (dB(A) re 20µPa)

Locality	ICNG Land Use[1]	Intrusive $L_{Aeq(15minute)}$ [2] Day-time CNML	Intrusive $L_{Aeq(15minute)}$ [2] Day-time HNAL
Rural Residences	Residential[3]	45	75
Lue Residences			
Any	Industrial[4]	External 75 when in use	Not applicable
Any	Commercial[4]	External 70 when in use	
Any	Active Recreation[4]	External 65 when in use	
Any	Passive Recreation[4]	External 60 when in use	
Any	Church, Cemetery[4]	External 55 when in use[5]	
Any	Hospital[4]		
Any	School[4]		

Note 1: In accordance with the ICNG Section 4.1.
Note 2: Day-time 7:00am to 6:00pm.
Note 3: At the most-affected point within 30m of the residential premises.
Note 4: At the most-affected point within 50m of the non-residential premises.
Note 5: External criteria equivalent to internal criteria plus 10dB(A).

4.2 OPERATIONAL NOISE ASSESSMENT CRITERIA

4.2.1 Recommended Amenity, Project Amenity and Intrusive, PNTLs

The EPA has regulatory responsibility for the control of noise from “scheduled premises” under the Protection of the Environment Operations Act, 1997. In implementing the NPfI, the EPA has two broad objectives, i.e.:

- Controlling intrusive noise levels in the short-term; and
- Maintaining noise amenity levels for particular land uses over the medium to long term.

The Project comprises on-site industrial operations (as described in Section 2.4) which are dealt with in the accordance the NPfI, whereas transportation on public roads (as described in Section 2.6) is specifically excluded from the NPfI. In general terms, the NPfI sets out procedures for establishing the project intrusive noise level and project amenity noise level, with a view determining the lower (that is, the more stringent) being the PNTL.

Firstly, the NPfI Section 2.4 states:

> *The recommended noise amenity levels represent the objective for **total** industrial noise at a receiver location, whereas the **project amenity noise level** represents the objective for noise from a **single** industrial development at a receiver location.*

As described in Section 1.3, the Land Zoning Map (**Annexure 6**) identifies the planning zones associated with the nearest surrounding residences and receivers in the vicinity of the Mine Site. In accordance with NPfI Table 2.3, the planning zones RU1 (primary production) and R5 (large lot residential) equate with the receiver category of rural residential. While initially planning zone RU5 (Lue) associates with the receiver category suburban residential (see NPfI Table 2.3) it more appropriately equates with the receiver category rural residential. In accordance with NPfI Section 2.4, the proposed recommended amenity noise levels (RANL) for each locality are presented in **Table 22**, together with the project amenity noise levels (PANL) being 5dB(A) less than the recommended amenity noise level from derived from NPfI Table 2.2.

The NPfI Section 2.4 states:

> *The recommended amenity noise levels have been selected on the basis of studies that relate industrial noise to annoyance in communities (Miedema and Voss, 2004). They have been subjectively scaled to reflect the perceived differential expectations and ambient noise environments of rural, suburban and urban communities for residential receivers. They are based on protecting the majority of the community (90%) from being highly annoyed by industrial noise.*

Secondly, the NPfI Section 2.1 states:

> *The project intrusiveness noise level aims to protect against significant changes in noise levels, whilst the project amenity noise level seeks to protect against cumulative noise impacts from industry and maintain amenity for particular land uses. Applying the most stringent requirement as the project noise trigger level ensures that both intrusive noise is limited and amenity is protected and that no single industry can unacceptably change the noise level of an area.*

Table 22
Proposed Recommended Amenity and Project Amenity Noise Levels $L_{Aeq(period)}$ (dB(A) re 20µPa)

Locality	Receiver Land Use[1]	Amenity Area based on Typical LEP Zone[2]		Recommended Amenity Noise Level $L_{Aeq(period)}$[3]			Project Amenity Noise Level $L_{Aeq(period)}$[3]		
				Day-time	Evening	Night-time	Day-time	Evening	Night-time
Rural Residences		Rural Residential[4]	Large Lot Residential (R5); and Primary Production (RU1)	50	45	40	45	40	35
Lue Residences			Lue (RU5)						
Any	School[5,6]	All		External 45 when in use			External 40 when in use		
Any	Hospital[5,6]	All		External 50 when in use			External 45 when in use		
Any	Church, Cemetery[5]	All		External 50 when in use			External 45 when in use		
Any	Passive Recreation	All		External 50 when in use			External 45 when in use		
Any	Active Recreation	All		External 55 when in use			External 50 when in use		
Any	Commercial	All		External 65 when in use			External 60 when in use		
Any	Industrial	All		External 70 when in use			External 65 when in use		

Note 1: In accordance with the NPfI Table 2.2.
Note 2: In accordance with the NPfI Table 2.3.
Note 3: Day-time Monday to Saturday 7:00am to 6:00pm, Sunday and Public Holidays 8:00am to 6:00pm; Evening Monday to Sunday 6:00pm to 10:00pm; Night-time Monday to Saturday 10:00pm to 7:00am, Sunday and Public Holidays 10:00pm to 8:00am.
Note 4: At the most-affected point within 30m of the residential premises.
Note 5: External criteria equivalent to internal criteria plus 10dB(A).
Note 6: Noisiest $L_{Aeq(1hour)}$.

The project intrusive noise level ($L_{Aeq(15minute)}$) should not exceed the RBL once beyond a minimum threshold (see **Table 19**) by more than 5dB(A). The PNTLs are then determined in accordance with NPfI Section 2.1, by identifying the lower of the project amenity noise level or project intrusive noise level [following conversion of the project amenity noise level $L_{Aeq(period)}$ to an equivalent $L_{Aeq(15minute)}$ value for comparison with the project intrusive noise level $L_{Aeq(15minute)}$ using the NPfI Section 2.2 default conversion factor of plus 3dB(A)].

The project amenity noise levels, the project intrusive noise levels and the resulting $L_{Aeq(15minute)}$ PNTLs for the various localities in the vicinity of the Mine Site are presented in **Table 23**. These criteria are nominated for the purposes of assessing the operational noise impacts from the Mine Site.

In qualitative terms, the extent of noise protection provided by the PNTLs is described in A Guide to the Noise Policy for Industry (EPA, 2017).

Table 23
Project Amenity, Intrusive Noise Levels and Resulting $L_{Aeq(15minute)}$ PNTLs (dB(A) re 20µPa)

Locality	Receiver Land Use[1]	Project Amenity Noise Level $L_{Aeq(15minute)}$[1,2]			Project Intrusive Noise Level $L_{Aeq(15minute)}$[1,3]			Resulting PNTL $L_{Aeq(15minute)}$[1,4]		
		Day-time	Evening	Night-time	Day-time	Evening	Night-time	Day-time	Evening	Night-time
Rural Residences	Rural Residential[4]	48	43	38	40	35	35	40	35	35
Lue Residences										
Any	School[5,6]	43			not applicable			43		
Any	Hospital[5,6]	48						48		
Any	Church, Cemetery[5]	48						48		
Any	Passive Recreation	48						48		
Any	Active Recreation	53						53		
Any	Commercial	63						63		
Any	Industrial	68						68		

Note 1: Day-time Monday to Saturday 7:00am to 6:00pm, Sunday and Public Holidays 8:00am to 6:00pm; Evening Monday to Sunday 6:00pm to 10:00pm; Night-time Monday to Saturday 10:00pm to 7:00am, Sunday and Public Holidays 10:00pm to 8:00am.
Note 2: Project amenity noise level $L_{Aeq(15minute)}$ equivalent to the project amenity noise level $L_{Aeq(period)}$ (**Table 22**) plus 3dB(A).
Note 3: Project intrusive noise level $L_{Aeq(15minute)}$ equivalent to the RBL (**Table 19**) plus 5dB(A).
Note 4: Resulting $L_{Aeq(15minute)}$ PNTL is the lower of the project amenity noise level or project intrusive noise level.
Note 5: At the most-affected point within 30m of the residential premises.
Note 5: External criteria equivalent to internal criteria plus 10dB(A).
Note 6: Noisiest $L_{Aeq(1hour)}$.

In those cases where the NPfI noise assessment criteria are not achieved, it does not automatically follow that all people exposed to the noise would find the noise “unacceptable”. In subjective terms, NPfI Table 4.1 and Table 4.2 characterise the noise impacts resulting from residual noise exceedances generally as follows:

- If the residual noise exceedance is 1-2dB(A) above the PNTL, then noise impacts are considered to be negligible (i.e. not discernible by the average listener);
- If the residual noise exceedance is 3-5dB(A) above the PNTL, and the project would contribute less than (or equal to) 1dB to the total industrial noise level, then noise impacts are considered to be marginal;
- If the residual noise exceedance is 3-5dB(A) above the PNTL, and the project would contribute more than 1dB to the total industrial noise level, then noise impacts are considered to be moderate;
- If the residual noise exceedance is >5dB(A) above the PNTL, and the total industrial noise level is less than (or equal to) the relevant amenity level, then noise impacts are considered to be moderate; or
- If the residual noise exceedance is >5dB(A) above the PNTL, and the total industrial noise level is greater than the relevant amenity level, then noise impacts are considered to be significant.

4.2.2 Sleep Disturbance Noise Levels

A sleep disturbance assessment procedure is described in the NPfI Section 2.5, which states:

> *Where the subject development/premises night-time noise levels at a residential location exceed:*
>
> - $L_{Aeq,15min}$ *40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or*
> - L_{AFmax} *52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,*
>
> *a detailed maximum noise level event assessment should be undertaken.*

Based on the foregoing, the applicable night-time sleep disturbance noise levels (SDNLs) for both Rural and Lue residences are: an intrusive ($L_{Aeq(15minute)}$) noise level of 40dB(A); and a maximum noise level ($L_{AF(maximum)}$) 52dB(A) (free field).

4.2.3 NPfI Corrections for Annoying Noise Characteristics

In accordance with the NPfI's Fact Sheet C, where a noise source contains certain characteristics, such as dominant low frequency content, the NPfI states that there is evidence to suggest that it can cause greater annoyance at a receiver than other noise at the same noise level. The modifying factors (if applicable) are to be applied to the measured or predicted noise level at the receiver and then assessed against the PNTLs. In the case of low frequency (10 hertz [Hz] to 160Hz) noise at the receiver, subject to the extent of the exceedance above the thresholds presented in the NPfI's Fact Sheet C (Table C2), requires a 2dB to 5dB correction to be applied to the measured or predicted intrusive noise levels where the difference between the C and A weighted level is 15dB (or more) in accordance with NPfI's Fact Sheet C (Table C1).

4.3 VOLUNTARY LAND ACQUISITION AND MITIGATION POLICY

4.3.1 DPIE's Voluntary Land Acquisition Mitigation Policy (VLAMP)

The VLAMP (see Section 1.2) took effect pursuant to a corresponding amendment to clause 12A of the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 (NSW)* (Mining SEPP) from 21 September 2018. The DPIE's supporting document to the VLAMP, notes that a key change in comparison with the previous VLAMP (DPE, 2014) is that the noise criteria have been adjusted to align with the NPfI, however no changes to cumulative noise levels were made and strong night-time noise protections were maintained.

The VLAMP describes the NSW Government's policy for voluntary mitigation and land acquisition to address noise (and dust) impacts from State Significant Mining, Petroleum and Extractive Industry Developments. The NSW Government has had long-standing processes in place for land acquisition and mitigation associated with mining developments and these procedures are formalised in the VLAMP, including:

- That industry needs to apply all feasible and reasonable measures to minimise noise (and dust) impacts;
- When noise (and dust) impacts are considered appreciable and warrant mitigation measures at the receiver and or land acquisition rights upon request;

- The mitigation measures that need to be offered to affected landowners when impacts are marginal or moderate; and
- Requirements for negotiated agreements between applicants and landowners.

An extract from the VLAMP, attached as **Annexure 14,** details how the policy applies to noise impacts and the key Table 1 is reproduced as **Table 24**.

Table 24
VLAMP Table 1 - Characterisation of Noise Impacts and Potential Treatments[3]

If the predicted noise level minus the project noise trigger level[4] is:	**And the total cumulative industrial noise level is:**	**Characterisation of impacts:**	**Potential treatment:**
All time periods 0-2dB(A)	Not applicable	Impacts are considered to be **negligible**	The exceedances would not be discernible by the average listener and therefore would not warrant receiver based treatments or controls
All time periods *3-5dB(A)*	• < = recommended amenity noise level in Table 2.2 of the NPfI; or • > recommended amenity noise level in Table 2.2 of the NPfI, but the increase in total cumulative industrial noise level resulting from the development is < = 1dB	Impacts are considered to be **marginal**	Provide mechanical ventilation / comfort condition systems to enable windows to be closed without compromising internal air quality / amenity.
All time periods 3-5dB(A)	> recommended amenity noise level in Table 2.2 of the NPfI, and the increase in total cumulative industrial noise level resulting from the development is > 1dB	Impacts are considered to be **moderate**	As for marginal impacts but also upgraded façade elements like windows, doors or roof insulation, to further increase the ability of the building facade to reduce noise levels.
Day and evening >5dB(A)	< = recommended amenity noise levels in Table 2.2 of the NPfI	Impacts are considered to be **moderate**	As for marginal impacts but also upgraded façade elements like windows, doors or roof insulation, to further increase the ability of the building facade to reduce noise levels.
Day and evening >5dB(A)	> recommended amenity noise levels in Table 2.2 of the NPfI	Impacts are considered to be **significant**	Provide mitigation as for moderate impacts and see voluntary land acquisition provisions above.
Night >5dB(A)	Not applicable	Impacts are considered to be **significant**	Provide mitigation as for moderate impacts and see voluntary land acquisition provisions above.

[3] Adapted from the Noise Policy for Industry (NPfI) (EPA 2017).
[4] See section 2.1 of the NPfI for an explanation of project noise trigger levels.

4.3.2 Project Noise Impact Assessment Methodology

In view of the foregoing, **Table 25** presents the Project (and conservative) methodology for assessing the construction noise levels against the relevant intrusive CNMLs and HNALs (**Table 21**), mine operational noise levels against the relevant maximum SDNLs (Section 4.2.2), intrusive PNTLs (**Table 23**) and amenity noise levels (**Table 22**) for assessing noise impacts on privately-owned land and at residences from cumulative effects from all industrial noise sources. It is noted that; the Project noise impact assessment methodology adopts a conservative and simplified approach in regard to the assessment of residual noise exceedances by comparison with that nominated in NPfI Table 4.1 and Table 4.2 (see Section 4.2.1) and the VLAMP (see Section 4.3.1). The Project noise impact assessment methodology adopts lower residual exceedance thresholds by discarding the additional 'industrial noise level' component (employed by the NPfI and VLAMP) and its associated secondary exceedance requirements, and rather solely focuses on exceedance of the PNTLs.

Table 25
Project Noise Impact Assessment Methodology (dB(A) re 20µPa)

Site Establishment and Construction Stage	**Assessment Parameter**	**Assessment Criteria**	**Characterisation of Construction Noise Impacts**		
			Negligible to Marginal	**Moderate**	**Significant**
Affected residences	CNML Intrusive	RBL plus 10dB(A)	1 to 5dB(A) above CNML	> 5dB(A) above CNML	above HNAL 75dB(A)
PTL Re-alignment Works	**Assessment Parameter**	**Assessment Criteria**	**Characterisation of PTL Re-alignment Noise Impacts**		
			Negligible	**Marginal to Moderate**	**Significant**
Affected residences	PNTL Intrusive	RBL plus 5dB(A)	1 to 2dB(A) above PNTL	3 to 5dB(A) above PNTL	> 5dB(A) above PNTL
Mine Operations	**Assessment Parameter**	**Assessment Criteria**	**Characterisation of Operational Noise Impacts**		
			Negligible	**Marginal to Moderate**	**Significant**
Affected residences	SDNL	Intrusive 40dB(A), Maximum 52dB(A)	1 to 2dB(A) above SDNL	3 to 5dB(A) above SDNL	> 5dB(A) above SDNL
	Cumulative Amenity Noise Level	NPfI Table 2.2 RANL see **Table 22**	1 to 2dB(A) above RANL	3dB(A) above RANL	> 3dB(A) above RANL
Mine Operations	**Assessment Parameter**	**Assessment Criteria**	**Voluntary Mitigation Rights**		**Voluntary Land Acquisition Rights**
			Negligible	**Marginal to Moderate**	**Significant**
Affected residences	PNTL Intrusive	RBL plus 5dB(A)	1 to 2dB(A) above PNTL[1]	3 to 5dB(A) above PNTL[1]	> 5dB(A) above PNTL[2]
Affected privately-owned land	PANL amenity	NPfI Table 2.2 RANL see **Table 22**	Not applicable	Not applicable	> 5dB(A) above RANL[3,4]

Note 1: Depending on the range of exceedance of the PNTL assessment parameter, potential noise impacts range from negligible to moderate in accordance with the VLAMP.

Note 2: Noise exceedances greater than 5dB(A) above the PNTL assessment parameter may result in significant noise impacts in accordance with the VLAMP.

Note 3: Noise exceedances greater than 5dB(A) above the NPfI Table 2.2 Recommended Amenity Noise Level (RANL) (**Table 22**) on more than 25% of any privately-owned rural land where there is an existing residence or a residence could be built on that land under existing planning controls in accordance with the VLAMP.

Note 4: Noise impacts on the nearest privately-owned rural land to the Mine Site have initially been conservatively assessed on the basis that any land is permitted to have a residence with reference to the Land Ownership Plan (**Annexure 4)** and associated Land Ownership Details (**Annexure 5)** as further described in Section 0. In practice however local zoning restrictions and planning controls would need to be taken into consideration with respect to each parcel of land.

5. NOISE MODELLING METHODOLOGY

5.1 NOISE MODEL VALIDATION

The noise model for the Project was prepared using RTA Software's Environmental Noise Model (ENM for Windows, Version 3.06), a commercial software system developed in conjunction with the NSW EPA. The acoustical algorithms utilised by this software have been endorsed by the Australian and New Zealand Environment Council (ANZEC) and all State Environmental Agencies throughout Australia as representing one of the most appropriate predictive methodologies available.

ENM has been used for several of the major coal mine noise assessments in the Mid-Western Regional Local Government Area including the Wilpinjong Extension Project Noise and Blasting Assessment (SLR, 2015) and Moolarben Coal Complex Open Cut Optimisation Modification Noise Assessment (SLR, 2017). As a greenfield project, it was not possible to quantify any existing (or as-built) noise levels from the Project. In the absence of field validation noise measurements from the Project, a conservative approach has been adopted and any fixed plant and mobile equipment associated with the construction and/or operation of the Project does not attract any site specific noise model adjustment factor.

5.2 NOISE MODELLING SCENARIOS

In accordance with NPfI requirements, the Project description was reviewed to determine representative scenarios to assess potential construction and operational noise impacts. As presented in Section 2.3, the site establishment and construction activities for all key components within the Mine Site would be sequenced to achieve the commencement date of concentrate production approximately 18 months after the commencement of the site establishment and construction stage (see **Table 4**).

The first 6 months of the site establishment and construction stage involves the off-site road network upgrades and initial on-site earthworks and infrastructure works as presented in **Annexure 7** which has been modelled for the purposes of construction noise impact. The construction fleet used for the off-site relocated Maloneys Road construction works (see **Table 5**) were modelled in typical locations representative of the construction fleet progressing along the road corridor throughout the construction period. The construction fleet for on-site earthworks and infrastructure works (see **Table 5**) modelled in typical locations representative of the construction of the internal Mine Access Road, vegetation clearing, soil stripping and stockpiling.

The construction fleet used for the off-site water pipeline construction (see **Table 5**) was predicted representative of the various stages of the pipeline construction including vegetation clearing and corridor preparation followed by trenching and back filling the pipeline.

Mining pre-strip activities would commence within about Month 7 of the site establishment and construction stage with the most intensive activities, albeit widely geographically distributed, anticipated midway in the schedule around Month 8 to provide the waste rock to construct the first stage of the TSF embankment and the initial ore for processing. Based on current schedules, mining would continue for approximately 15 years after the commencement of processing, and the significant mine operational scenarios identified to represent the Project are Year 0, Year 3, Year 8 and Year 10. The mine operational noise modelling scenarios are further described below and the associated layout of the Mine Site presented in **Annexure 15**:

- Scenario 1 (Year 0) (**Annexure 15**); day-time operations involving open cut pit development and construction of processing plant, tailings storage facility (initial embankment) and water supply pipeline;
- Scenario 2 (Year 3) (**Annexure 15**); day-time ore processing plus open cut pit operations, southern barrier development (590m AHD), waste rock haulage; and TSF raise (595m AHD). Evening ore processing plus open cut pit operations and waste rock placement. Night-time ore processing plus open cut pit operations and ore stockpiling;
- Scenario 3 (Year 8) (**Annexure 15**); day-time, ore processing plus open cut pit operations, southern barrier development (615m AHD), waste rock haulage; and TSF raise (604m AHD). Evening ore processing plus open cut pit operations and waste rock placement (650m AHD). Night-time ore processing plus open cut pit operations and ore stockpiling; and
- Scenario 4 (Year 10) (**Annexure 15**); ore processing plus western side open cut pit operations, southern barrier development (620m AHD) and waste rock placement (650m AHD). Evening ore processing plus western side open cut pit operations and waste rock placement (650m AHD). Night-time ore processing plus open cut pit operations and ore stockpiling.

A site rehabilitation phase would be completed within approximately 3 to 4 years from the completion of mining. Mine closure and rehabilitation activities would be comparable to Year 8. Similarly, mine closure and rehabilitation activities involving the removal of the southern barrier would be comparable to Year 10.

The operational noise modelling scenarios (described above) include all major proposed fixed plant and mobile equipment operating concurrently to simulate the overall operating maximum energy equivalent (i.e. $L_{Aeq(15minute)}$) intrusive noise level. A large proportion of the mobile equipment would be operated in repeatable routines and to achieve the Project production rates the overall average utilisation rates of the mining mobile equipment is approximately: 75% for day-time operations; 83% for evening operations; and 87% for night-time operations. A relatively smaller proportion of the noise emanates from continuous fixed plant items.

Noise levels from construction activities are more variable than noise levels from mining operations. Typically, the overall average utilisation rate of construction mobile equipment is less by comparison with the overall average utilisation rate of mining mobile equipment, due to shorter work routines, longer down cycles and in some cases, shared operators.

5.3 MOBILE EQUIPMENT AND FIXED PLANT SOUND POWER LEVELS

The potential for machinery to emit noise is quantified as the sound power level (SWL) measured on the A-weighted scale in decibels re 1 picowatt (dB(A) re 1ρW). At each receiver, the received noise is quantified as the sound pressure level (SPL) measured on the A-weighted scale in decibels re 20 micropascals (dB(A) re 20µPa). In general terms, any variation in the on-site plant and equipment SWLs would produce a similar variation in the off-site SPL at the receiver (e.g. an increase of 5dB(A) in the SWL of equipment operating at a site may result in a corresponding 5dB(A) increase in SPL of intrusive noise at the receiver, when averaged over the same 15 minute period).

The day-time Scenario 1 mobile equipment list, indicative type and source noise control for the Project are presented in **Table 26** together with the design individual and total SWLs.

Table 26
Daytime Scenario 1 Mobile Equipment List and Design SWLs (dB(A) re 1ρW)

Item	Indicative Type	Source Noise Control	SWL[1] per Item	Scenario 1	
				Total Fleet	Total SWL
Drill	PV-275	Low noise	115	2	118
Excavator	EX-1900	Low noise	114	1	114
	CAT 390 (70t)	Low noise	109	2	112
	CAT 336 (30t)	Low noise	105	2	108
Haul Trucks	CAT 777XQ	Low noise extra quiet	112	4	118
	Volvo A45G/35G	Low noise	110	4	116
Grader	CAT 16MXQ	Low noise extra quiet	108	4	114
	CAT 12M	Low noise	107	2	110
Frontend-loader	CAT 988K XQ	Low noise extra quiet	110	3	115
	CAT 950M	Low noise	107	4	113
	CAT 930F	Low noise	101	1	101
Dozer	CAT D11T XQ	Low noise extra quiet, 1st gear[2]	113	3	118
	CAT D9	Low noise, 1st gear[2]	109	1	109
	CAT D7	Low noise, 1st gear[2]	109	1	109
Water Truck	Volvo F724 (10,000L)	Low noise	106	3	111
B-double Truck	B-double Truck	-	108	6	116
Truck Semi Tipper	Truck Semi Tipper	-	108	2	111
Vibrating Roller	CAT CS54XT	Low noise	109	2	112
Crusher/Screen	McCloskey J40 & S80	Nearfield barrier[3]	118	1	118
Mulching Unit	Petersen 2710	-	115	2	118
Chain Saw	Husqvarna 455 R	-	114	3	119
Total Mobile Equipment List				53	128

Note 1: SWL inclusive of noise reduction due to source noise control based on either: manufacture's acoustical specifications; or field noise measurements of the equipment type operating; or similar equipment operating and then adjusted.
Note 2: SWL inclusive of noise reduction due to 1st gear only when operating out of pit.
Note 3: SWL exclusive of nearfield barrier mitigation.

The day-time Scenario 2, Scenario 3 and Scenario 4 mobile equipment and fixed plant lists, indicative type and source noise control for the Project are presented in **Table 27** together with the design individual and total SWLs. During the day-time, the total SWL is 128dB(A) for Scenario 1, 2 and 3, before reducing to 126dB(A) in Scenario 4 (i.e. no TSF embankment construction).

Table 27

Day-time Scenarios 2, 3 & 4 Mobile Equipment & Fixed Plant List & Design SWLs (dB(A) re 1ρW)

Page 1 of 2

Item	Indicative Type	Source Noise Control	SWL[1] per Item	Scenario 2		Scenario 3		Scenario 4	
				Total Fleet	**Total SWL**	**Total Fleet**	**Total SWL**	**Total Fleet**	**Total SWL**
Drill	PV-275	Low noise	115	2	118	2	118	2	118
Excavator	EX-1900	Low noise	114	1	114	1	114	1	114
	CAT 390 (70t)	Low noise	109	1	109	1	109		-
	CAT 336 (30t) with Rock-breaker	-	122	1	122	1	122	1	122
Haul Trucks	CAT 777XQ	Low noise extra quiet	112	4	118	4	118	4	118
	Volvo A45G/35G	Low noise	110	4	116	4	116		-
Grader	CAT 16M XQ	Low noise extra quiet	108	2	111	2	111	2	111
Frontend loader	CAT 988K XQ	Low noise extra quiet	110	2	113	2	113	1	110
Dozer	CAT D10T XQ	Low noise extra quiet, 1st gear[2]	111	1	111	1	111	1	111
	CAT D9	Low noise, 1st gear[2]	109	4	115	4	115	2	112
Water Truck	Volvo F724 (10,000L)	-	106	2	109	2	109	1	106
Fuel Truck	Road Truck	-	106	1	106	1	106	1	106
Service Truck	Road Truck	-	106	1	106	1	106	1	106
B-double Truck	B-double Truck	-	108	4	114	4	114	1	108
Vibrating Roller	CAT CS54XT	Low noise	109	1	109	1	109		-
Crusher/Screen	McCloskey J40 & S80	Nearfield barrier[3]	118	1	118	1	118		-
Container Lifter	-	-	99	1	99	1	99	1	99
Telehandler	-	-	92	1	92	1	92	1	92
			Total Mobile Equipment	**34**	**127**	**34**	**127**	**20**	**126**
Primary Jaw Crusher	160kW Metso C130 (51 x 39)	Full enclosure[4]	108	1	108	1	108	1	108
Jaw Crusher Dust Extraction Unit	-	Silenced	93	1	93	1	93	1	93
50kW Conveyor Drive	-	Low noise	90	1	90	1	90	1	90
150kW Conveyor Drive	-	Low noise	92	3	96	3	96	3	96
Conveyor	27tph, 1m/s, 1,000mm belt	Low noise idlers	92dB(A) / 100m	4	99	4	99	4	99
Transfer Chute	-	Soft-flow chute	93	2	96	2	96	2	96
Stockpile Discharge	-	-	100	1	100	1	100	1	100
SAG Mill	25 tph, 4.8 MW, 8.5 dia x 3.8 EGL	Full enclosure[5]	106	1	106	1	106	1	106
Ball Mill	75 tph, 4.0 MW, 5.0 dia x 10 EGL								
Flotation Area (combined)	-	Full enclosure[5]	103	1	103	1	103	1	103
Thickener Area (combined)	-								

Table 27 (Cont'd)

Day-time Scenarios 2, 3 & 4 Mobile Equipment & Fixed Plant List & Design SWLs (dB(A) re 1ρW)

Page 2 of 2

Item	Indicative Type	Source Noise Control	SWL[1] per Item	Scenario 2		Scenario 3		Scenario 4	
				Total Fleet	Total SWL	Total Fleet	Total SWL	Total Fleet	Total SWL
Filter Area	500kW Isamill M1000	Full enclosure[5]	105	1	105	1	105	1	105
Filter Air Compressors	-	Silenced	90	1	90	1	90	1	90
Plant Workshop	Metal work (hand tools)	Partial enclosure[6]	94	1	94	1	94	1	94
Mining/LV Workshop	Rattle Gun/Welding etc	-	99	1	99	1	99	1	99
Water Pumps	85kL/hour	Enclosure / silenced	93	1	93	1	93	1	93
Total Fixed Plant				**20**	**113**	**20**	**113**	**20**	**113**
Total Mobile Equipment and Fixed Plant				**54**	**128**	**54**	**128**	**40**	**126**

Note 1: SWL inclusive of noise reduction due to source noise control based on either: manufactures acoustical specifications; or field noise measurements of the equipment type operating; or similar equipment operating and then adjusted.

Note 2: SWL inclusive of noise reduction due to 1st gear only when operating out of pit.

Note 3: SWL exclusive of nearfield barrier mitigation.

Note 4: Full enclosure (lower double clad) minimum penetrations 60% absorptive lining (or equivalent) - 10dB(A) reduction.

Note 5: Full enclosure with minimum penetrations and 60% absorptive lining - 10dB(A) reduction.

Note 6: Partial enclosure and 60% absorptive lining - 6dB(A) reduction.

The evening Scenario 2, Scenario 3 and Scenario 4 mobile equipment list, indicative type and source noise control for the Project are presented in **Table 28** together with the design individual and total SWLs. During the evening, the total SWL of 122dB(A) for Scenario 2, 3 and 4, is appreciably lower by comparison with the day-time total SWL of 128dB(A).

The night-time Scenario 2, Scenario 3 and Scenario 4 mobile equipment list, indicative type and noise control for the source noise control are presented in **Table 29** together with the design individual and total SWLs. During the night-time, the total SWL of 120dB(A) for Scenario 2, 3 and 4, is marginally lower by comparison with the evening total SWL of 122dB(A).

Table 28
Evening Scenarios 2, 3 & 4 Mobile Equipment & Fixed Plant List & Design SWLs (dB(A) re 1ρW)

Page 1 of 2

Item	Indicative Type	Source Noise Control	SWL[1] per Item	Scenario 2		Scenario 3		Scenario 4	
				Total Fleet	**Total SWL**	**Total Fleet**	**Total SWL**	**Total Fleet**	**Total SWL**
Drill	PV-275	Low noise	115	1	115	1	115	1	115
Excavator	EX-1900	Low noise	114	1	114	1	114	1	114
	CAT 390 (70t)	Low noise	109		-		-		-
	CAT 336 (30t) with Rock-breaker	-	122		-		-		-
Haul Trucks	CAT 777XQ	Low noise extra quiet	112	4	118	4	118	4	118
	Volvo A45G/35G	Low noise	110		-		-		-
Grader	CAT 16M XQ	Low noise extra quiet	108	1	108	1	108	2	111
Frond-end-loader	CAT 988K XQ	Low noise extra quiet	110	1	110	1	110	1	110
Dozer	CAT D10T XQ	Low noise extra quiet, 1st gear [2]	111		-		-		-
	CAT D9	Low noise, 1st gear[2]	109		-		-		-
Water Truck	Volvo F724 (10,000L)	Low noise	106	1	106	1	106	1	106
Fuel Truck	Road Truck	-	106		-		-		-
Service Truck	Road Truck	-	106		-		-		-
B-double Truck	B-double Truck	-	108		-		-		-
Vibrating Roller	CAT CS54XT	Low noise	109		-		-		-
Crusher/ Screen	McCloskey J40 & S80	Nearfield barrier[3]	118		-		-		-
Container Lifter	-	-	99		-		-		-
Telehandler	-	-	92		-		-		-
Total Mobile Equipment				9	121	9	121	10	122
Primary Jaw Crusher	160kW Metso C130 (51 x 39)	Full enclosure[4]	108	1	108	1	108	1	108
Jaw Crusher Dust Extraction Unit	-	Silenced	93	1	93	1	93	1	93
50kW Conveyor Drive	-	Low noise	90	1	90	1	90	1	90
150kW Conveyor Drive	-	Low noise	92	3	96	3	96	3	96
Conveyor	273tph, 1m/s, 1,000mm belt	Low noise idlers	92dB(A) /100m	4	99	4	99	4	99
Transfer Chute	-	Soft-flow chute	93	2	96	2	96	2	96
Stockpile Discharge	-	-	100	1	100	1	100	1	100
SAG Mill	250tph, 4.8 MW, 8.5 dia x 3.8 EGL	Full enclosure[5]	106	1	106	1	106	1	106
Ball Mill	250tph, 4.0 MW, 5.0 dia x 10 EGL								

Table 28 (Cont'd)
Evening Scenarios 2, 3 & 4 Mobile Equipment & Fixed Plant List & Design SWLs (dB(A) re 1ρW)

Page 2 of 2

Item	Indicative Type	Source Noise Control	SWL[1] per Item	Scenario 2		Scenario 3		Scenario 4	
				Total Fleet	Total SWL	Total Fleet	Total SWL	Total Fleet	Total SWL
Flotation Area (combined)	-	Full enclosure[5]	103	1	103	1	103	1	103
Thickener Area (combined)	-								
Filter Area	500kW Isamill M1000	Full enclosure[5]	105	1	105	1	105	1	105
Filter Air Compressors	-	Silenced	90	1	90	1	90	1	90
Plant Workshop	Metal work (hand tools)	Partial enclosure[6]	94	1	94	1	94	1	94
Mining/LV Workshop	Rattle Gun / Welding etc	-	99	1	99	1	99	1	99
Water Pumps	85kL/hour	Enclosure/silenced	93	1	93	1	93	1	93
Total Fixed Plant				**20**	**113**	**20**	**113**	**20**	**113**
Total Mobile Equipment and Fixed Plant				**29**	**122**	**29**	**122**	**30**	**122**

Note 1: SWL inclusive of noise reduction due to source noise control based on either: manufactures acoustical specifications; or field noise measurements of the equipment type operating; or similar equipment operating and then adjusted.
Note 2: SWL inclusive of noise reduction due to 1st gear only when operating out of pit.
Note 3: SWL exclusive of nearfield barrier mitigation.
Note 4: Full enclosure (lower double clad) minimum penetrations 60% absorptive lining (or equivalent) - 10dB(A) reduction.
Note 5: Full enclosure with minimum penetrations and 60% absorptive lining - 10dB(A) reduction.
Note 6: Partial enclosure and 60% absorptive lining - 6dB(A) reduction.

Table 29
Night-time Scenarios 2, 3 & 4 Mobile Equipment & Fixed Plant List & Design SWLs (dB(A) re 1ρW)

Page 1 of 2

Item	Indicative Type	Source Noise Control	SWL[1] per Item	Scenario 2		Scenario 3		Scenario 4	
				Total Fleet	Total SWL	Total Fleet	Total SWL	Total Fleet	Total SWL
Drill	PV-275	Low noise	115		-		-		-
Excavator	EX-1900	Low noise	114[7]	1	114	1	114	1	114
	CAT 390 (70t)	Low noise	109		-		-		-
	CAT 336 (30t) with Rock-breaker	-	122		-		-		-
Haul Trucks	CAT 777XQ	Low noise extra quiet	112[8]	4	118	4	118	4	118
	Volvo A45G/35G	Low noise	110		-		-		-
Grader	CAT 16M XQ	Low noise extra quiet	108	1	108	1	108	1	108
Frond-end-loader	CAT 988K XQ	Low noise extra quiet	110		-		-		-
Dozer	D10T XQ	Low noise extra quiet, 1st gear[2]	111		-		-		-
	CAT D9	Low noise, 1st gear[2]	109		-		-		-

Table 29 (Cont'd)
Night-time Scenarios 2, 3 & 4 Mobile Equipment & Fixed Plant List & Design SWLs (dB(A) re 1ρW)

Page 2 of 2

Item	Indicative Type	Source Noise Control	SWL[1] per Item	Scenario 2		Scenario 3		Scenario 4	
				Total Fleet	Total SWL	Total Fleet	Total SWL	Total Fleet	Total SWL
Water Truck	Volvo F724 (10,000L)	Low noise	106	1	106	1	106	1	106
Fuel Truck	Road Truck	-	106		-		-		-
Service Truck	Road Truck	-	106		-		-		-
B-double Truck	B-double Truck	-	108		-		-		-
Vibrating Roller	CAT CS54XT	Low noise	109		-		-		-
Crusher/Screen	McCloskey J40 & S80	Nearfield barrier[3]	118		-		-		-
Container Lifter	-	-	99		-		-		-
Telehandler	-	-	92		-		-		-
Total Mobile Equipment				**7**	**120**	**7**	**120**	**7**	**120**
Primary Jaw Crusher	160kW Metso C130 (51 x 39)	Full enclosure[4]	108		-		-		-
Jaw Crusher Dust Extraction Unit	-	Silenced	93		-		-		-
50kW Conveyor Drive	-	Low noise specification	90		-		-		-
150kW Conveyor Drive	-	Low noise specification	92	2	95	2	95	2	95
Conveyor	273tph, 1m/s, 1,000mm belt	Low noise idlers	92dB(A)/ 100m	2	96	2	96	2	96
Transfer Chute	-	Soft-flow chute	93	1	93	1	93	1	93
Stockpile Discharge	-	-	100		-		-		-
SAG Mill	250tph, 4.8 MW, 8.5 dia x 3.8 EGL	Full enclosure[4]	106	1	106	1	106	1	106
Ball Mill	750tph, 4.0 MW, 5.0 dia x 10 EGL								
Flotation Area (combined)	-	Full enclosure[4]	103	1	103	1	103	1	103
Thickener Area (combined)	-								
Filter Area	500kW Isamill M1000	Full enclosure[4]	105	1	105	1	105	1	105
Filter Air Compressors	-	Silenced	90	1	90	1	90	1	90
Plant Workshop	Metal work (hand tools)	Partial enclosure[6]	94	1	94	1	94	1	94
Mining/LV Workshop	Rattle Gun/Welding etc	-	99		-		-		-
Water Pumps	85kL/hour	Enclosure/silenced	93	1	93	1	93	1	93
Total Fixed Plant				**11**	**110**	**11**	**110**	**11**	**110**
Total Mobile Equipment and Fixed Plant				**18**	**120**	**18**	**120**	**18**	**120**

Note 1: SWL inclusive of noise reduction due to source noise control based on either: manufactures acoustical specifications; or field noise measurements of the equipment type operating; or similar equipment operating and then adjusted.

Note 2: SWL inclusive of noise reduction due to 1st gear only when operating out of pit.

Note 3: SWL exclusive of nearfield barrier mitigation.

Note 4: Full enclosure (lower double clad) minimum penetrations 60% absorptive lining (or equivalent) - 10dB(A) reduction.

Note 5: Full enclosure with minimum penetrations and 60% absorptive lining - 10dB(A) reduction.

Note 6: Partial enclosure and 60% absorptive lining - 6dB(A) reduction.

Note 7: Excavator loading SWL L_{Amax} 123dB(A) adopted for predicting night-time maximum sleep disturbance noise levels.

Note 8: Haul truck dumping SWL L_{Amax} 122dB(A) adopted for predicting night-time maximum sleep disturbance noise levels.

5.4 NOISE MITIGATION AND MANAGEMENT MEASURES

As discussed in Section 1.2, the SEARs nominate several environmental planning instruments, policies, guidelines and plans relevant to the noise assessment of the Project. Guidelines for determining feasible and reasonable noise mitigation are presented in the NPfI Fact Sheet F (**Annexure 16**). In particular, NPfI Section 3.1, states the following:

> *Where the project noise trigger level is exceeded, assess the feasible and reasonable mitigation measures that could be implemented to reduce noise down towards the relevant project noise trigger level. If it is reasonable to achieve these levels, the proponents should do so. If not, then achievable noise levels should be identified. It is not mandatory to achieve the trigger levels but the assessment should provide justification if they cannot be met. An assessment of the acceptability of residual impacts should also be provided. …*
>
> *… For new developments and redevelopments, mitigation strategies should be considered in a hierarchical approach:*
>
> – *controlling noise at the source*
> – *once the controls at the source are exhausted, controlling the transmission of noise*
> – *once source and transmission controls are exhausted, considering mitigation measures at the noise-sensitive receivers.*

The NPfI focuses on achieving the desired environmental noise outcomes by considering potential mitigation or management strategies to achieve PNTLs via the above hierarchical approach. Bowdens Silver has adopted this approach when designing and implementing a program of noise control and management applicable to its mining operations. Furthermore, in the event of residual noise impacts the VLAMP (see Section 4.3.1) provides guidance on the implementation of the NSW Government's voluntary land acquisition and mitigation policy.

The development of the Project would result in the operation of an open cut mine located in proximity to surrounding Lue district rural residences with minimal topographic shielding between the Mine Site and some of the nearest rural residences. Similarly, the Project is proximal to Lue residences with substantial topographic shielding between the Mine Site and Lue. Bingman Ridge (**Annexure 1**) at 678m AHD is approximately 118m higher than the elevation of Lue Public School.

In view of the foregoing, investigation of feasible and reasonable noise mitigation measures for the Project were guided by the requirements of the NPfI Section 3.4 in close consultation with Bowdens Silver, particularly in relation to evening and night-time mining operations. Several noise mitigation and management measures were developed for the Project, along with extensive preliminary noise modelling of scenarios representative of the predicted typical maximum Project noise levels at the nearest rural and Lue residences.

In particular, the preliminary noise modelling focused on a selection of the nearest rural and Lue residences during periods of day-time, evening and night-time mine operations under standard and noise enhancing meteorological conditions (see **Table 14**) to identify and reduce potential noise exceedances at the nearest rural residences when assessed against the relevant PNTLs.

Further iterative steps were then undertaken including:

- Ranking the highest noise source contributors and progressively evaluating alternative noise mitigation measures of each contributor to reduce noise associated with the Project at representative residences;
- Evaluating various combinations of noise source and propagation path controls to assess their relative effectiveness for various modelling scenarios; and
- Identifying operational management controls by scheduling intrusive mining activities to less sensitive times of the day:
  - TSF lifts, waste rock placement on the southern barrier and soil stockpiles limited to the day-time throughout the mine life;
  - Reduced mining operations during the evening within restricted waste rock emplacement areas; and
  - Further reduced mining operations during the night-time with only ore delivery to the ROM pad.

Bowdens Silver proposes to adopt a range of reasonable noise control and management measures (including the use of low noise mobile equipment and fixed plant, amenity and noise barriers, mine operational controls) to appreciably reduce noise levels from the Project as presented in **Table 30** which is a clear demonstration of the Bowdens Sliver's commitment to the design and implementation of best practice in noise control and management for the Project. Based on the proposed range of reasonable noise control and management measures (**Table 30**), the mine operational intrusive noise levels have been assessed in the Section 7.

Table 30
Bowdens Silver Proposed Range of Reasonable Noise Control and Management Measures

Page 1 of 2

Mitigation	Bowdens Silver Project
Noise Source Control - mobile equipment	Use of noise attenuated mobile equipment comprising low noise or extra quiet mobile equipment where practical. See **Table 26**, **Table 27**, **Table 28**, and **Table 29** for specific individual mobile equipment noise source controls including design performance SWLs.
	All dozers restricted to 1st gear operation when operating out of pit.
	Installation of broadband noise "quacker" style reversing alarms.
Noise Source Control - fixed plant	Use of full or partial enclosures to attenuate fixed plant where practical. See **Table 26**, **Table 27**, **Table 28**, and **Table 29** for specific individual fixed plant noise source controls including design performance SWLs.
	Use of low noise specifications, low noise idlers, soft-flow chutes and silencers.
	Installation of mid-high frequency noise conveyor alarms.
Noise Propagation Path - mobile equipment	Lower embankment noise barrier and southern barrier (see **Annexure 15**).
	Acoustic barriers adjacent to the main pit haul road exit (see **Annexure 15**).
	Relocation of the exit ramp from the main open cut pit to maximise topographic shielding at the northern open cut pit exit.
	Optimised evening waste rock haul route to maximise the barrier effect from the existing topography and short-term acoustic bunds within the active waste rock emplacement areas.
	Optimised night-time ore haul route to maximise the barrier effect from the existing topography and acoustic barriers adjacent to the main pit haul road exit.

Table 30 (Cont')
Bowdens Silver Proposed Range of Reasonable Noise Control and Management Measures

Page 2 of 2

Noise Propagation Path - fixed plant	Processing plant relocated further north within the Mine Site and with the placement of the primary jaw crusher at a lower elevation to minimize noise propagation in the direction of Lue (see **Annexure 15**).
	Nearfield acoustic barriers around TSF crushing/screening plant.
Operational Management Controls	Scheduling of intrusive activities to less sensitive times of the day, for example TSF lifts, material emplacement on southern barrier and soil stockpiles limited to the day-time throughout the mine life.
	Reduced mining operations during the evening within restricted WRE areas.
	Further reduced mining operations during the night-time with only ore delivery to the ROM pad.
	Implementation of real-time noise monitoring network at key residential receivers to assist with the on-going monitoring and management of mine noise, and to identify partial or full plant and equipment shutdowns (if at all required) during very noise enhancing meteorological conditions. Enhance and maintain continuous meteorological monitoring network for the Project.
Noise Receiver Control	Any residual noise impacts guided by the requirements of the VLAMP (see Section 4.3.1) and Bowdens Silver Project Noise Impact Assessment Methodology (**Table 25**).

5.5 LOW FREQUENCY NOISE MODIFYING FACTOR ASSESSMENT

As described in Section 4.2.3, where a noise source contains certain characteristics, such as dominant low frequency content, the NPfI states that there is evidence to suggest that it can cause greater annoyance at a receiver than other noise at the same noise level. The modifying factors (if applicable) are to be applied to the measured or predicted noise level at the receiver and then assessed against the PNTLs. In the case of low frequency (10 hertz [Hz] to 160Hz) noise at the receiver, subject to the extent of the exceedance above the thresholds presented in the NPfI's Fact Sheet C (Table C2), requires a 2dB to 5dB correction to be applied to the measured or predicted intrusive noise levels where the difference between the C and A weighted level is 15dB (or more) in accordance with NPfI's Fact Sheet C (Table C1).

Four geographically representative residences, namely R21, R47, L20 and R87, were selected for low frequency analysis and associated calculation of the intrusive $L_{Ceq(15minute)}$ noise level for the comparison with the corresponding intrusive $L_{Aeq(15minute)}$ noise level. The resulting C and A weighted day-time, evening and night-time predicted intrusive noise levels differences under noise enhancing meteorological conditions (**Table 14**) are presented in **Table 31** for mine operating Scenario 1, Scenario 2, Scenario 3 and Scenario 4.

Table 31
C and A Weighted Predicted Noise Enhancing Intrusive Noise Level Differences (dB re 20µPa)

Scenario 1	**Day-time**				**Evening**				**Night-time**			
Residence	**R21**	**R47**	**L20**	**R87**	**R21**	**R47**	**L20**	**R87**	**R21**	**R47**	**L20**	**R87**
C Weighted	52.5	51.2	52.0	53.9	-	-	-	-	-	-	-	-
A Weighted	42.5	40.1	38.6	42.9	-	-	-	-	-	-	-	-
Difference	10.0	11.1	13.4	11.0	-	-	-	-	-	-	-	-
Scenario 2	**Day-time**				**Evening**				**Night-time**			
Residence	**R21**	**R47**	**L20**	**R87**	**R21**	**R47**	**L20**	**R87**	**R21**	**R47**	**L20**	**R87**
C Weighted	47.3	48.3	47.7	51.3	43.5	44.7	43.1	45.1	39.2	42.5	41.4	42.7
A Weighted	38.7	38.8	36.4	40.8	36.5	35.7	33.1	**36.4**	33.7	35.1	34.1	**35.8**
Difference	8.5	9.5	11.3	10.5	7.1	9.0	10.1	8.8	5.5	7.4	7.4	6.9
Scenario 3	**Day-time**				**Evening**				**Night-time**			
Residence	**R21**	**R47**	**L20**	**R87**	**R21**	**R47**	**L20**	**R87**	**R21**	**R47**	**L20**	**R87**
C Weighted	46.1	47.3	48.1	50.8	41.9	42.5	41.3	42.9	38.1	40.9	38.5	40.5
A Weighted	36.1	36.3	36.3	40.2	34.4	32.7	31.1	33.2	33.3	32.9	30.6	33.4
Difference	10.0	11.1	11.8	10.6	7.5	9.8	10.2	9.7	4.9	8.0	7.8	7.1
Scenario 4	**Day-time**				**Evening**				**Night-time**			
Residence	**R21**	**R47**	**L20**	**R87**	**R21**	**R47**	**L20**	**R87**	**R21**	**R47**	**L20**	**R87**
C Weighted	45.5	47.0	43.1	44.4	44.1	44.8	41.4	43.6	42.5	42.9	39.1	40.3
A Weighted	36.6	38.7	33.4	35.0	36.5	36.2	31.2	33.8	36.1	36.1	30.8	33.3
Difference	8.0	8.3	9.6	9.4	7.6	8.6	10.2	9.7	6.4	6.8	8.3	7.0

Note 1: See Land Ownership and Surrounding Residences (**Annexure 4**) and Land Ownership Details (**Annexure 5**).
Note 2: Predicted $L_{Aeq(15minute)}$ intrusive noise level complies with the PNTL (**Table 23**).
Note 3: Predicted negligible noise exceedance 1-2dB(A) above the PNTL (**Table 23**).
Note 4: Predicted marginal to moderate noise exceedance 3-5dB(A) above the PNTL (**Table 23**).

As shown in **Table 31**, the resulting C and A weighted predicted (noise enhancing) intrusive noise levels differences ranges from 5dB to 13dB, i.e. less than 15dB. Hence compliance with the requirements of NPfI's Fact Sheet C (Table C1) would be achieved and no further assessment in accordance with NPfI's Fact Sheet C (Table C2) is warranted.

6. CONSTRUCTION NOISE IMPACT ASSESSMENT

6.1 CONSTRUCTION STAGE MONTHS 1 TO 6 INTRUSIVE NOISE LEVELS

6.1.1 Privately-owned Residences in the vicinity of the Mine Site

As described in Section 2, the activities undertaken during the first 6 months of the site establishment and construction stage are activities assessable under the Interim Constructions Noise Guideline (ICNG). The predicted day-time construction intrusive noise levels at privately-owned residences in the vicinity of the Mine Site are presented in

Table 32 under standard and noise-enhancing meteorological conditions (**Table 14**), together with the CNMLs and HNALs drawn from **Table 21**.

Table 32
Day-time Intrusive $L_{Aeq(15minute)}$ Construction Noise Levels (dB(A) re 20μPa)

Page 1 of 4

Residence ID/ Place of Interest[1]	Off-site Road Network		On-site Earthworks and Infrastructure		Total Off-site plus On-site Construction Noise		Intrusive CNML[2]	Intrusive HNAL[2]
	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind		
Rural Residences								
R4	7	24	25	38	25	38	45	75
R6	4	15	14	24	15	25	45	75
R7	8	26	24	32	24	33	45	75
R9	1	11	13	20	13	21	45	75
R12	28	36	21	33	29	38	45	75
R13	1	12	13	20	13	20	45	75
R15	3	14	13	22	14	23	45	75
R16	2	11	12	19	13	20	45	75
R17	15	29	19	25	20	31	45	75
R19	-3	16	16	26	16	26	45	75
R21	2	22	19	31	19	32	45	75
R22	1	19	18	31	18	31	45	75
R24	6	19	19	30	19	31	45	75
R25	26	39	18	34	27	41	45	75
R27	8	23	23	34	23	34	45	75
R28B	4	18	17	28	18	28	45	75
R28C	5	15	18	25	18	26	45	75
R28D	5	16	17	26	17	26	45	75
R31	1	19	19	29	19	30	45	75
R33	4	19	19	29	19	29	45	75
R34	0	18	16	30	16	30	45	75
R35	30	40	18	36	30	42	45	75
R36A	31	43	17	35	31	44	45	75
R36B	32	44	16	20	32	44	45	75
R37	24	38	18	36	25	40	45	75
R39	13	26	19	33	20	34	45	75
R40	13	25	19	33	20	33	45	75
R42	23	37	17	34	24	39	45	75

Table 32 (Cont'd)
Day-time Intrusive $L_{Aeq(15minute)}$ Construction Noise Levels (dB(A) re 20µPa)

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Residence ID/ Place of Interest[1]	Off-site Road Network		On-site Earthworks and Infrastructure		Total Off-site plus On-site Construction Noise		Intrusive CNML[2]	Intrusive HNAL[2]
	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind		
Rural Residences (Cont'd)								
R43	0	15	16	23	16	23	45	75
R44	16	25	13	32	18	33	45	75
R45A	17	29	15	31	19	33	45	75
R45B	15	24	14	31	17	32	45	75
R46	16	26	20	33	21	34	45	75
R47	13	25	20	33	21	34	45	75
R48	12	22	18	29	19	30	45	75
R50	5	20	11	21	12	23	45	75
R58	25	36	15	25	26	36	45	75
R60	27	37	16	28	27	38	45	75
R63	7	22	10	20	12	24	45	75
R68	17	31	17	31	20	34	45	75
R70	15	32	17	21	19	32	45	75
R73	38	44	17	35	38	45	45	75
R74	28	39	17	33	29	40	45	75
R75	33	39	23	36	33	41	45	75
R76	22	41	17	32	23	41	45	75
R80	1	14	13	22	13	23	45	75
R81	45	51	20	33	45	51	45	75
R82	36	47	19	34	36	47	45	75
R83	22	36	18	33	23	38	45	75
R84A	25	36	18	33	25	38	45	75
R84B	25	36	18	32	26	37	45	75
R85	25	39	17	33	25	40	45	75
R86	30	40	18	35	30	41	45	75
R87	30	43	17	35	30	43	45	75
R88	54	57	19	31	54	57	45	75
R89	52	56	19	32	52	56	45	75
R90	50	54	20	32	50	54	45	75
R91	7	30	15	29	15	32	45	75
R92B	30	41	18	29	31	41	45	75
R92E	19	28	15	31	21	33	45	75
R92F	19	28	16	31	21	33	45	75
R92G	19	27	15	31	20	32	45	75
R93A	19	31	15	32	21	34	45	75
R93B	18	30	15	31	20	34	45	75
R93C	18	30	15	31	20	34	45	75
R94A	19	31	15	32	20	35	45	75
R94B	18	28	15	32	20	33	45	75
R95	13	21	17	24	18	26	45	75

Table 32 (Cont'd)
Day-time Intrusive $L_{Aeq(15minute)}$ Construction Noise Levels (dB(A) re 20µPa)

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Residence ID/ Place of Interest[1]	Off-site Road Network		On-site Earthworks and Infrastructure		Total Off-site plus On-site Construction Noise		Intrusive CNML[2]	Intrusive HNAL[2]
	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind		
Lue Residences								
L1	23	37	17	35	24	39	45	75
L2	22	34	17	34	23	37	45	75
L3	26	39	17	35	26	41	45	75
L4	25	40	17	34	26	41	45	75
L5	24	38	17	34	25	40	45	75
L7	23	37	18	35	24	39	45	75
L8	24	37	18	35	24	39	45	75
L9	21	35	17	34	22	38	45	75
L10	21	34	16	33	22	37	45	75
L12	21	34	16	33	22	37	45	75
L13	22	35	16	34	23	37	45	75
L15	22	35	16	34	23	37	45	75
L16	22	34	16	33	23	37	45	75
L17	22	34	16	33	23	37	45	75
L18	23	35	16	34	24	38	45	75
L19	23	36	17	34	24	38	45	75
L20	23	36	17	34	24	38	45	75
L21	23	36	17	34	24	38	45	75
L22	23	36	17	34	24	38	45	75
L23	23	36	17	34	24	38	45	75
L24	23	36	17	34	24	38	45	75
L25	23	36	17	33	24	38	45	75
L26	23	35	17	33	24	38	45	75
L27	23	36	18	34	24	38	45	75
L28A	23	37	18	34	24	39	45	75
L28B	23	37	17	34	24	39	45	75
L29	22	34	16	33	23	37	45	75
L30	22	32	17	33	23	35	45	75
L31	22	35	17	33	23	37	45	75
L32	23	35	17	33	24	37	45	75
L33	23	36	17	33	24	38	45	75
L34	23	37	17	34	24	38	45	75
L35	23	36	17	34	24	38	45	75
L37	24	36	17	34	24	38	45	75
L38	24	37	17	33	24	39	45	75
L39	23	37	17	33	24	39	45	75
L40	23	37	17	33	24	39	45	75
L41	23	37	17	33	24	38	45	75
L42	24	37	17	33	24	38	45	75
L43	23	34	17	33	24	36	45	75
L44	24	37	17	33	25	39	45	75

Table 32 (Cont'd)
Day-time Intrusive $L_{Aeq(15minute)}$ Construction Noise Levels (dB(A) re 20µPa)

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Residence ID/ Place of Interest[1]	Off-site Road Network		On-site Earthworks and Infrastructure		Total Off-site plus On-site Construction Noise		Intrusive CNML[2]	Intrusive HNAL[2]
	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind		
Lue Residences (Cont'd)								
L45	27	38	17	33	27	39	45	75
L46	24	37	17	34	25	38	45	75
L47	26	38	17	33	26	39	45	75
L49	21	34	16	33	22	36	45	75
L50	25	39	18	35	26	41	45	75
Lue Places of Interest								
LPOI1 Rural Fire Brigade	23	37	18	34	24	39	70	-
LPOI2 Lue Pottery	23	36	17	33	24	38	70	-
LPOI3 Lue Public School	21	35	16	33	22	37	55	-
LPOI4 Lue Hall	21	35	17	34	22	38	60	-
LPOI5 Lue Railway Station Buildings	21	34	16	34	23	37	60	-

Note 1: See Land Ownership and Surrounding Residences (**Annexure 4**) and Land Ownership Details (**Annexure 5**).
Note 2: Construction Noise Management Level (CNML), Highly Noise Affected Level (HNAL of 75dB(A)).
Note 3: Predicted LAeq(15minute) noise level complies with the intrusive CNML.
Note 4: Predicted negligible to marginal noise exceedance 1 to 5dB(A) above intrusive CNML.
Note 5: Predicted moderate noise exceedance >5dB(A) above intrusive CNML.
Note 6: Predicted significant noise exceedance above intrusive HNAL of 75dB(A).

A summary of the day-time construction intrusive noise impacts at privately-owned residences in the vicinity of the Mine Site is presented in Section 6.1.3.

6.1.2 Project-related Receivers

The predicted day-time construction intrusive noise levels at project-related receivers are presented in **Table 33** under standard and noise-enhancing meteorological conditions (**Table 14**), together with the CNMLs and HNALs drawn from **Table 21**.

A summary of the day-time construction intrusive noise impacts at project-related receivers is presented in Section 6.1.3.

Table 33
Day-time Calm Intrusive LAeq(15minute) Construction Noise Levels (dB(A) re 20µPa)

Residence ID[1,7]	Off-site Road Network		On-site Earthworks and Infrastructure		Total Off-site plus On-site Construction Noise		Intrusive CNML[2]	Intrusive HNAL[2]
	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind		
Project-related Receivers								
R1A	9	25	24	37	24	37	45	75
R1B	8	26	22	31	22	32	45	75
R1G	7	18	22	30	22	30	45	75
R1H	8	24	27	36	27	36	45	75
R1I	7	23	23	34	23	35	45	75
R1J	9	25	29	37	29	37	45	75
R1K	6	20	37	43	37	43	45	75
R1L	46	52	20	27	46	52	45	75
R1M	44	50	20	25	44	50	45	75
R1N	38	48	19	34	38	48	45	75
R1O	70	70	20	33	70	70	45	75
R1P	8	25	26	40	26	40	45	75
R1Q	11	25	29	37	29	37	45	75
L1R	21	34	16	33	22	37	45	75
R10	8	27	26	39	26	39	45	75

Note 1: See Land Ownership and Surrounding Residences (**Annexure 4**) and Land Ownership Details (**Annexure 5**).
Note 2: Construction Noise Management Level (CNML), Highly Noise Affected Level (HNAL of 75dB(A)).
Note 3: Predicted LAeq(15minute) noise level complies with the intrusive CNML.
Note 4: Predicted negligible to marginal noise exceedance 1 to 5dB(A) above intrusive CNML.
Note 5: Predicted moderate noise exceedance >5dB(A) above intrusive CNML.
Note 6: Predicted significant noise exceedance above intrusive HNAL of 75dB(A)
Note 7: Residences R1C, R1D, R1E and R1F have been excluded as these residences would be demolished.

6.1.3 Construction Noise Impact Summary

Table 34 presents a summary of both privately-owned residences and project-related receivers with potential exceedances of the intrusive CNML of 45dB(A), which are further described below.

Table 34
Privately-owned Residences and Project-related Receivers with CNML Exceedances

Construction Activity	Negligible to Marginal 1 to 5dB(A) CNML[1]	Moderate > 5dB(A) CNML[1]	Significant > above HNAL[1]
Privately-owned Residences			
Off-site Road Network	R82	R81; R88; R89; R90	-
On-site Earthworks and Infrastructure	-	-	-
Project-related Receivers			
Off-site Road Network	R1M; R1N	R1L; R1O	-
On-site Earthworks and Infrastructure	-	-	-

Note 1: Construction Noise Management Level (CNML), Highly Noise Affected Level (HNAL of 75dB(A)).

The predicted day-time construction noise impacts at both privately-owned residences and project-related receivers in the vicinity of the Mine Site and relocated Maloneys Road, are summarised below.

Construction Noise Levels at Privately-owned Residences:

- Comply with the CNML of 45dB(A) from the on-site earthworks and infrastructure construction activities;
- Marginally (i.e. up to 5dB(A)) exceed the CNML of 45dB(A) during the most intensive period of the off-site road network construction activity at one residence (R82) with an approximate duration of 1 to 2 months; and
- Moderately (i.e. >5dB(A)) exceed the CNML of 45dB(A) during the most intensive period of the off-site road network construction activity at four residences (R81; R88; R89; and R90) with a duration of approximately 1 to 2 months, while remaining well below the HNAL of 75dB(A).

Construction Noise Levels at Project-related receivers:

- Are likely to exceed the relevant CNML at multiple residences as the majority of these are located in close proximity to the Mine Site. Impacts upon occupants of residences (if any) would be managed in accordance with the requirements of the CNMP.

6.2 CONSTRUCTION STAGE MONTHS 7 TO 18 INTRUSIVE NOISE LEVELS

As described in Section 2.2, the make-up water supply for processing and dust suppression would be pumped from the Ulan Coal Mine and/or the Moolarben Coal Mine to the Bowdens Mine Site via a buried 58.5km pipeline (see **Annexure 2**).

It is estimated that the water supply pipeline would be constructed in a period of approximately 10 months. The contractor mobile equipment list to construct the water supply pipeline is presented in **Table 5**, and it is anticipated that that the contractor would achieve the excavation, placement and backfilling of between approximately 200m and 500m of the pipeline each working day.

The water supply pipeline construction works are therefore relatively transient and any noise impact would be very short-term. It is estimated that the ICNG's HNAL day-time intrusive $L_{Aeq(15minute)}$ noise level of 75dB(A) would be met at an off-set distance of approximately 50m from the construction works. The ICNG's CNML day-time intrusive $L_{Aeq(15minute)}$ noise level of 45dB(A) is estimated to be met at an off-set distance of approximately 1,050m during initial vegetation clearing and trenching operations and 750m when backfilling.

The nearest residences in proximity to the water supply pipeline corridor are shown in **Annexure 4**, where it is conservatively estimated that a total of five residences are located within 50m of the water supply pipeline corridor centre line and 126 residences between 50m and 1050m. However, the predicted offset distances are based on an assumed direct line of sight between the residence and the pipeline construction operations which provides a conservative assessment of noise impacts. Consequently, any noise impacts would often be reduced given intervening topography would act to ameliorate noise levels.

6.3 CONSTRUCTION NOISE MANAGEMENT PLAN (CNMP)

Construction noise from the Project would be managed by Bowdens Silver in accordance with an approved CNMP based on the general requirements of the ICNG (and any development consent requirements) to ensure that any potential construction noise impacts (particularly from the off-site activities associated with the construction of the related Maloneys Road and water supply pipeline) are minimised in terms of magnitude, duration and character.

7. OPERATIONAL NOISE IMPACT ASSESSMENT

7.1 DAY-TIME OPERATIONAL INTRUSIVE NOISE LEVELS

7.1.1 Privately-owned Residences in the vicinity of the Mine Site

Based on the noise modelling scenarios described in Section 5.2 and adopted noise control and management measures in Section 5.4, the predicted day-time operating intrusive noise levels for privately-owned residences in the vicinity of the Mine Site are presented in **Table 35** under standard and noise-enhancing meteorological conditions (**Table 14**), together with the intrusive PNTLs drawn from **Table 23**.

Table 35

Day-time Standard and Noise-enhancing Intrusive $L_{Aeq(15minute)}$ Noise Levels (dB(A) re 20μPa)

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Residence ID/Places of Interest[1]	Year 0 Scenario 1		Year 3 Scenario 2		Year 8 Scenario 3		Year 10 Scenario 4		% Frequency of Occurrence		Intrusive PNTL
	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard[6]	Enhancing Wind[7]	
Rural Residences											
R4	43	50	37	46	35	42	33	44	3	16	40
R6	19	30	15	27	14	25	13	25	3	16	40
R7	38	44	30	42	28	39	28	41	3	11	40
R9	18	26	14	23	12	20	11	20	3	16	40
R12	24	36	22	30	22	30	16	24	3	19	40
R13	17	26	13	23	11	19	10	18	3	15	40
R15	19	28	15	25	13	24	11	24	3	15	40
R16	17	25	12	22	11	20	10	17	3	15	40
R17	20	33	17	28	17	27	13	26	3	9	40
R19	21	33	17	30	15	29	15	29	3	15	40
R21	27	42	23	39	22	36	22	37	3	14	40
R22	24	38	21	35	20	33	20	35	3	15	40
R24	24	40	22	37	20	33	20	34	3	16	40
R25	27	40	23	39	24	38	11	34	3	19	40
R27	32	42	29	40	26	37	26	38	3	16	40
R28A	21	35	18	33	17	31	14	31	3	15	40
R28B	21	34	18	32	17	30	15	31	3	15	40
R28C	22	32	18	30	17	26	16	25	3	15	40
R28D	22	33	18	30	16	27	15	26	3	15	40
R31	25	36	21	34	19	32	17	33	3	16	40
R33	24	34	22	32	20	28	20	29	3	15	40
R34	23	36	19	33	18	32	17	33	3	14	40
R35	29	43	24	40	24	39	14	36	3	20	40
R36A	29	44	28	42	28	42	13	37	3	21	40
R36B	33	39	32	38	32	38	14	20	3	21	40
R37	24	42	21	39	21	38	14	34	3	19	40
R39	30	39	25	38	22	36	22	38	3	12	40
R40	27	39	25	38	23	36	23	38	3	12	40
R42	23	40	20	36	20	36	13	31	3	18	40
R43	21	31	17	29	15	26	15	25	3	16	40

Table 35 (Cont'd)
Day-time Standard and Noise-enhancing Intrusive $L_{Aeq(15minute)}$ Noise Levels (dB(A) re 20μPa)

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Residence ID/Places of Interest[1]	Year 0 Scenario 1		Year 3 Scenario 2		Year 8 Scenario 3		Year 10 Scenario 4		% Frequency of Occurrence		Intrusive PNTL
	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard[6]	Enhancing Wind[7]	
Rural Residences (Cont'd)											
R44	21	37	18	35	18	34	17	33	3	15	40
R45A	21	36	19	36	18	34	17	33	3	14	40
R45B	22	36	19	35	18	33	17	31	3	15	40
R46	27	38	25	37	22	36	23	38	3	12	40
R47	32	40	28	39	24	36	24	39	3	11	40
R48	26	36	23	34	21	32	21	33	3	11	40
R50	17	28	14	26	12	24	12	23	3	12	40
R58	21	33	19	30	19	29	5	24	3	21	40
R60	20	34	18	32	18	32	5	19	3	19	40
R63	11	20	7	16	7	16	1	10	3	14	40
R68	18	32	16	29	16	29	11	24	3	11	40
R70	17	29	14	26	14	26	6	14	3	9	40
R73	23	38	20	36	20	35	8	27	3	14	40
R74	23	35	20	32	20	32	8	17	3	8	40
R75	28	40	25	37	25	36	7	32	3	9	40
R76	22	34	21	30	21	29	7	17	3	16	40
R80	19	30	14	27	13	25	13	25	3	16	40
R81	29	40	28	38	28	37	13	32	3	20	40
R82	28	40	27	38	28	38	12	33	3	20	40
R83	26	39	25	37	25	35	11	32	3	20	40
R84A	26	39	26	37	26	37	11	32	3	20	40
R84B	26	39	25	37	25	35	11	33	3	19	40
R85	23	38	23	37	24	36	11	32	3	19	40
R86	26	40	27	39	27	39	11	34	3	20	40
R87	29	43	27	41	28	40	12	35	3	21	40
R88	26	37	25	33	25	33	12	22	3	20	40
R89	29	40	28	38	28	37	13	31	3	20	40
R90	29	40	28	38	29	38	11	31	3	21	40
R91	18	34	16	32	15	30	13	28	3	16	40
R92B	23	35	21	31	21	31	6	26	3	21	40
R92E	19	36	17	35	17	33	12	31	3	17	40
R92F	19	36	17	34	17	33	13	31	3	17	40
R92G	19	36	17	34	17	33	13	31	3	17	40
R93A	19	36	18	35	17	34	15	32	3	16	40
R93B	19	36	18	35	17	33	15	32	3	15	40
R93C	19	36	18	35	17	33	15	31	3	16	40
R94A	19	37	18	35	17	34	15	33	3	16	40
R94B	19	37	17	35	17	34	14	33	3	16	40
R95	21	31	18	27	17	26	16	25	3	15	40

Table 35 (Cont'd)
Day-time Standard and Noise-enhancing Intrusive $L_{Aeq(15minute)}$ Noise Levels (dB(A) re 20µPa)

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Residence ID/Places of Interest[1]	Year 0 Scenario 1		Year 3 Scenario 2		Year 8 Scenario 3		Year 10 Scenario 4		% Frequency of Occurrence		Intrusive PNTL
	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard[6]	Enhancing Wind[7]	
Lue Residences											
L1	21	38	19	36	19	36	13	32	3	18	40
L2	20	38	19	36	19	36	13	31	3	18	40
L3	23	39	22	39	22	38	12	34	3	19	40
L4	23	40	22	39	22	38	11	35	3	19	40
L5	22	39	21	38	21	37	12	34	3	19	40
L7	21	38	20	37	20	36	13	33	3	18	40
L8	21	38	20	36	20	37	12	34	3	18	40
L9	20	38	18	36	18	35	12	32	3	18	40
L10	19	37	18	35	17	34	11	32	3	18	40
L12	20	37	18	36	18	34	11	32	3	18	40
L13	20	37	18	36	18	35	11	32	3	18	40
L15	20	38	19	36	18	35	12	32	3	18	40
L16	20	37	18	36	18	35	11	32	3	18	40
L17	20	37	18	35	18	34	11	32	3	18	40
L18	20	38	19	36	19	35	12	32	3	18	40
L19	21	38	19	36	19	35	12	33	3	18	40
L20	24	39	19	36	19	36	12	33	3	18	40
L21	21	38	19	36	19	36	12	34	3	18	40
L22	21	38	20	37	20	37	12	34	3	18	40
L23	21	38	19	36	19	36	12	34	3	18	40
L24	21	38	19	36	19	36	12	33	3	18	40
L25	21	38	19	36	19	36	12	32	3	18	40
L26	20	38	19	36	19	35	12	32	3	18	40
L27	22	38	20	37	20	37	12	34	3	18	40
L28A	22	39	20	38	21	37	11	34	3	18	40
L28B	22	39	21	37	21	36	11	33	3	18	40
L29	20	37	18	35	18	34	12	31	3	18	40
L30	20	37	19	35	19	34	12	31	3	18	40
L31	20	37	19	36	19	34	12	31	3	18	40
L32	21	37	19	36	19	35	12	32	3	18	40
L33	23	38	20	36	20	36	11	34	3	18	40
L34	21	38	20	37	20	36	11	34	3	18	40
L35	22	38	20	37	20	36	11	34	3	18	40
L37	22	38	21	37	21	36	11	34	3	18	40
L38	22	38	20	37	21	36	12	33	3	18	40
L39	22	38	20	37	21	36	11	34	3	18	40
L40	22	38	20	37	20	36	11	33	3	18	40
L41	22	37	20	36	20	36	11	33	3	18	40
L42	22	38	21	37	21	36	11	33	3	18	40
L43	22	38	21	36	21	36	11	33	3	18	40
L44	21	37	20	36	20	35	11	33	3	18	40
L45	23	38	22	37	22	36	11	33	3	19	40

Table 35 (Cont'd)

Day-time Standard and Noise-enhancing Intrusive $L_{Aeq(15minute)}$ Noise Levels (dB(A) re 20µPa)

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Residence ID/Places of Interest[1]	Year 0 Scenario 1		Year 3 Scenario 2		Year 8 Scenario 3		Year 10 Scenario 4		% Frequency of Occurrence		Intrusive PNTL
	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard[6]	Enhancing Wind[7]	
Lue Residences (Cont'd)											
L46	22	38	21	37	21	36	11	34	3	19	40
L47	22	38	21	37	22	36	11	34	3	19	40
L49	19	37	17	36	17	35	11	32	3	17	40
L50	23	40	21	39	21	38	12	34	3	19	40
Lue Place of Interest											
LPOI1 Rural Fire Brigade	22	39	20	37	20	37	12	34	3	18	48
LPOI2 Lue Pottery	21	37	20	36	20	35	11	34	3	18	48
LPOI3 Lue Public School	20	38	18	36	18	35	12	32	3	18	43
LPOI4 Lue Hall	20	38	18	36	18	35	12	32	3	18	48
LPOI5 Lue Railway Station Buildings	20	38	18	36	18	35	11	32	3	18	48

Note 1: See Land Ownership and Surrounding Residences (**Annexure 4**) and Land Ownership Details (**Annexure 5**).
Note 2: Predicted $L_{Aeq(15minute)}$ intrusive noise level complies with the PNTL.
Note 3: Predicted negligible noise exceedance 1-2dB(A) above the PNTL.
Note 4: Predicted marginal to moderate noise exceedance 3-5dB(A) above the PNTL.
Note 5: Predicted significant noise exceedance >5dB(A) above the PNTL.
Note 6: Standard meteorological condition - wind speed up to 0.5m/s.
Note 7: Noise-enhancing wind - wind speed up to 3m/s; plus/minus 45 degrees with respect to the receiver.

A summary of the day-time operating intrusive noise impacts at privately-owned residences in the vicinity of the Mine Site is presented in Section 7.5.1.

7.1.2 Project-related Receivers

The predicted day-time operating intrusive noise levels for project-related receivers are presented in **Table 36** under standard and noise-enhancing meteorological conditions (**Table 14**), together with the intrusive PNTLs drawn from **Table 23**.

A summary of the day-time operating intrusive noise impacts at project-related receivers is presented in Section 7.5.2.

Table 36
Day-time Standard and Noise-enhancing Intrusive $L_{Aeq(15minute)}$ Noise Levels (dB(A) re 20µPa)

Residence ID[1,6]	Year 0 Scenario 1		Year 3 Scenario 2		Year 8 Scenario 3		Year 10 Scenario 4		% Frequency of Occurrence		Intrusive PNTL
	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard[7]	Enhancing Wind[8]	
Project-related Receivers											
R1A	45	52	40	49	35	44	35	42	3	13	40
R1B	29	39	29	41	27	37	27	38	3	12	40
R1G	29	37	26	36	26	32	25	32	3	16	40
R1H	37	45	34	43	31	40	31	41	3	16	40
R1I	29	41	26	39	24	36	23	37	3	16	40
R1J	37	47	37	45	31	41	32	43	3	14	40
R1K	30	42	27	40	28	40	27	40	3	8	40
R1L	32	40	32	40	32	42	12	26	3	21	40
R1M	30	36	29	36	30	36	13	23	3	21	40
R1N	29	41	30	40	29	40	11	33	3	20	40
R1O	29	40	29	38	29	38	9	31	3	20	40
R1P	45	52	40	47	42	46	27	37	3	15	40
R1Q	39	48	35	45	32	42	32	43	3	15	40
L1R	21	39	18	36	18	35	11	32	3	18	40
R10	41	48	37	46	32	44	31	43	3	12	40

Note 1: See Land Ownership and Surrounding Residences (**Annexure 4**) and Land Ownership Details (**Annexure 5**).
Note 2: Predicted $L_{Aeq(15minute)}$ intrusive noise level complies with the PNTL.
Note 3: Predicted negligible noise exceedance 1-2dB(A) above the PNTL.
Note 4: Predicted marginal to moderate noise exceedance 3-5dB(A) above the PNTL.
Note 5: Predicted significant noise exceedance >5dB(A) above the PNTL.
Note 6: Residences R1C, R1D, R1E and R1F have been excluded as these residences would be demolished.
Note 7: Standard meteorological condition - wind speed up to 0.5m/s.
Note 8: Noise-enhancing wind - wind speed up to 3m/s; plus/minus 45 degrees with respect to the receiver.

7.2 EVENING OPERATIONAL INTRUSIVE NOISE LEVELS

7.2.1 Privately-owned Residences in the vicinity of the Mine Site

Based on the noise modelling scenarios described in Section 5.2 and adopted noise control and management measures in Section 5.4, the predicted evening operating intrusive noise levels for privately-owned residences are presented in **Table 37** under standard and noise-enhancing meteorological conditions (**Table 14**), together with the intrusive PNTLs drawn from **Table 23**.

Table 37

Evening Standard and Noise-enhancing Intrusive $L_{Aeq(15minute)}$ Noise Levels (dB(A) re 20µPa)

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Residence ID/Place of Interest[1]	Year 0 Scenario 1		Year 3 Scenario 2		Year 8 Scenario 3		Year 10 Scenario 4		% Frequency of Occurrence		Intrusive PNTL
	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard[6]	Enhancing Wind[7]	
Rural Residences											
R4	-	-	26	41	22	38	23	40	2	7	35
R6	-	-	13	24	11	22	12	24	2	7	35
R7	-	-	25	38	22	35	23	39	2	25	35
R9	-	-	12	20	10	15	11	18	2	7	35
R12	-	-	15	26	15	25	16	24	2	45	35
R13	-	-	11	20	8	15	9	15	2	8	35
R15	-	-	13	23	9	22	9	23	2	9	35
R16	-	-	10	20	8	14	8	15	2	8	35
R17	-	-	13	23	13	22	13	23	2	1	35
R19	-	-	15	28	13	27	15	28	2	5	35
R21	-	-	22	36	20	34	22	36	2	4	35
R22	-	-	19	33	17	31	19	34	2	4	35
R24	-	-	18	33	17	27	18	31	2	6	35
R25	-	-	11	35	10	32	11	32	2	45	35
R27	-	-	26	37	21	35	23	37	2	7	35
R28A	-	-	15	30	13	27	13	29	2	8	35
R28B	-	-	15	30	13	27	13	30	2	8	35
R28C	-	-	16	28	14	21	14	20	2	10	35
R28D	-	-	15	28	13	24	13	24	2	10	35
R31	-	-	19	31	16	30	16	31	2	6	35
R33	-	-	21	28	18	27	19	30	2	5	35
R34	-	-	17	31	15	30	18	32	2	4	35
R35	-	-	12	37	13	34	13	35	2	42	35
R36A	-	-	11	36	11	34	12	35	2	36	35
R36B	-	-	11	17	11	17	11	18	2	29	35
R37	-	-	11	36	12	34	12	33	2	46	35
R39	-	-	20	35	18	32	19	36	2	33	35
R40	-	-	21	35	19	32	20	36	2	30	35
R42	-	-	12	31	12	30	13	29	2	46	35
R43	-	-	15	26	13	20	14	24	2	6	35
R44	-	-	13	32	12	31	14	31	2	43	35
R45A	-	-	15	35	13	31	15	31	2	42	35
R45B	-	-	14	34	13	30	14	30	2	43	35
R46	-	-	21	35	19	32	19	35	2	33	35
R47	-	-	23	36	20	33	20	36	2	29	35
R48	-	-	21	31	18	30	18	31	2	25	35
R50	-	-	11	24	9	21	10	21	2	23	35
R58	-	-	4	24	4	22	4	23	2	39	35

Table 37 (Cont'd)

Evening Standard and Noise-enhancing Intrusive $L_{Aeq(15minute)}$ Noise Levels (dB(A) re 20µPa)

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Residence ID/Place of Interest[1]	Year 0 Scenario 1		Year 3 Scenario 2		Year 8 Scenario 3		Year 10 Scenario 4		% Frequency of Occurrence		Intrusive PNTL
	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard[6]	Enhancing Wind[7]	
Rural Residences (Cont'd)											
R60	-	-	5	20	5	19	5	20	2	14	35
R63	-	-	1	13	0	12	1	12	2	5	35
R68	-	-	11	25	10	24	11	25	2	3	35
R70	-	-	6	12	5	12	6	13	2	1	35
R73	-	-	7	29	7	27	7	28	2	5	35
R74	-	-	7	15	7	15	8	17	2	1	35
R75	-	-	6	32	6	31	6	32	2	1	35
R76	-	-	7	18	6	17	6	18	2	7	35
R80	-	-	13	25	11	20	12	23	2	7	35
R81	-	-	12	33	11	30	12	30	2	41	35
R82	-	-	11	33	11	31	11	31	2	42	35
R83	-	-	11	32	10	29	11	31	2	44	35
R84A	-	-	10	33	10	30	10	31	2	44	35
R84B	-	-	10	32	10	29	10	31	2	44	35
R85	-	-	10	33	10	30	11	30	2	46	35
R86	-	-	11	35	10	32	11	32	2	43	35
R87	-	-	10	36	10	33	11	34	2	39	35
R88	-	-	11	22	9	22	12	23	2	39	35
R89	-	-	11	32	9	30	13	30	2	39	35
R90	-	-	10	32	9	30	10	30	2	39	35
R91	-	-	9	30	9	26	10	27	2	46	35
R92B	-	-	5	27	4	25	5	25	2	35	35
R92E	-	-	9	32	9	29	10	29	2	47	35
R92F	-	-	9	32	9	29	10	29	2	46	35
R92G	-	-	9	32	9	28	10	29	2	46	35
R93A	-	-	10	33	10	30	12	30	2	46	35
R93B	-	-	11	33	11	30	12	30	2	45	35
R93C	-	-	11	33	11	29	12	29	2	45	35
R94A	-	-	10	33	10	30	11	30	2	46	35
R94B	-	-	10	33	10	30	11	30	2	46	35
R95	-	-	13	25	12	22	14	22	2	44	35
Lue Residences											
L1	-	-	12	31	12	30	13	30	2	46	35
L2	-	-	11	31	11	29	12	28	2	46	35
L3	-	-	11	35	10	32	11	33	2	45	35
L4	-	-	11	35	10	32	11	33	2	45	35
L5	-	-	11	35	11	32	11	33	2	46	35
L7	-	-	12	33	12	32	12	32	2	46	35
L8	-	-	12	33	113	32	12	32	2	46	35

Table 37 (Cont'd)

Evening Standard and Noise-enhancing Intrusive $L_{Aeq(15minute)}$ Noise Levels (dB(A) re 20µPa)

Page 3 of 4

Residence ID/Place of Interest[1]	Year 0 Scenario 1		Year 3 Scenario 2		Year 8 Scenario 3		Year 10 Scenario 4		% Frequency of Occurrence		Intrusive PNTL
	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard[6]	Enhancing Wind[7]	
Lue Residences (Cont'd)											
L9	-	-	10	32	10	29	10	30	2	46	35
L10	-	-	9	32	9	29	10	30	2	46	35
L12	-	-	9	32	10	30	10	30	2	46	35
L13	-	-	9	32	10	30	10	30	2	46	35
L15	-	-	10	32	10	30	11	30	2	46	35
L16	-	-	10	33	10	29	10	30	2	46	35
L17	-	-	9	32	9	29	10	30	2	46	35
L18	-	-	11	33	11	31	11	31	2	46	35
L19	-	-	11	33	11	31	11	31	2	46	35
L20	-	-	11	33	11	31	11	31	2	46	35
L21	-	-	11	33	11	31	11	32	2	46	35
L22	-	-	11	33	10	31	11	32	2	46	35
L23	-	-	11	33	11	31	11	32	2	46	35
L24	-	-	11	33	11	31	11	31	2	46	35
L25	-	-	11	33	10	31	11	31	2	46	35
L26	-	-	11	33	11	31	11	31	2	46	35
L27	-	-	11	34	10	32	11	32	2	46	35
L28A	-	-	10	35	10	31	11	32	2	46	35
L28B	-	-	10	34	10	31	10	32	2	46	35
L29	-	-	10	32	10	29	10	30	2	46	35
L30	-	-	10	33	10	29	10	29	2	46	35
L31	-	-	10	32	10	29	11	30	2	46	35
L32	-	-	11	33	10	30	11	31	2	46	35
L33	-	-	11	33	10	30	11	32	2	46	35
L34	-	-	11	34	10	31	11	33	2	46	35
L35	-	-	11	34	10	31	10	33	2	46	35
L37	-	-	10	34	10	31	10	33	2	46	35
L38	-	-	10	34	10	31	10	32	2	46	35
L39	-	-	10	34	10	31	10	32	2	46	35
L40	-	-	11	34	10	31	10	33	2	46	35
L41	-	-	11	34	10	30	10	32	2	46	35
L42	-	-	10	33	10	30	10	32	2	46	35
L43	-	-	10	33	10	30	10	32	2	46	35
L44	-	-	10	33	10	30	10	32	2	46	35
L45	-	-	11	33	10	31	11	32	2	46	35
L46	-	-	10	34	10	31	11	33	2	46	35
L47	-	-	11	34	10	31	10	33	2	46	35
L49	-	-	9	32	10	30	10	30	2	46	35
L50	-	-	11	35	11	33	11	33	2	46	35

Table 37 (Cont'd)
Evening Standard and Noise-enhancing Intrusive $L_{Aeq(15minute)}$ Noise Levels (dB(A) re 20µPa)

Page 4 of 4

Residence ID/Place of Interest[1]	Year 0 Scenario 1		Year 3 Scenario 2		Year 8 Scenario 3		Year 10 Scenario 4		% Frequency of Occurrence		Intrusive PNTL
	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard[6]	Enhancing Wind[7]	
Lue Place of Interest											
LPOI1 Rural Fire Brigade	-	-	11	33	11	32	11	33	2	46	48
LPOI2 Lue Pottery	-	-	11	33	10	30	11	32	2	46	48
LPOI3 Lue Public School	-	-	10	32	10	29	10	30	2	46	43
LPOI4 Lue Hall	-	-	10	32	10	29	10	30	2	46	48
LPOI5 Lue Railway Station Buildings	-	-	9	32	10	30	10	30	2	46	48

Note 1: See Land Ownership and Surrounding Residences (**Annexure 4**) and Land Ownership Details (**Annexure 5**).
Note 2: Predicted $L_{Aeq(15minute)}$ intrusive noise level complies with the PNTL.
Note 3: Predicted negligible noise exceedance 1-2dB(A) above the PNTL.
Note 4: Predicted marginal to moderate noise exceedance 3-5dB(A) above the PNTL.
Note 5: Predicted significant noise exceedance >5dB(A) above the PNTL.
Note 6: Standard meteorological condition - wind speed up to 0.5m/s.
Note 7: Noise-enhancing wind - wind speed up to 3m/s; plus/minus 45 degrees with respect to the receiver.

A summary of the evening operating intrusive noise impacts at privately-owned residences in the vicinity of the Mine Site is presented in Section 7.5.1.

7.2.2 Project-related Receivers

The predicted evening operating intrusive noise levels for project-related receivers are presented in **Table 38** under standard and noise-enhancing meteorological conditions (**Table 14**), together with the intrusive PNTLs drawn from **Table 23**.

A summary of the evening operating intrusive noise impacts at project-related receivers is presented in Section 7.5.2.

Table 38

Evening Standard and Noise-enhancing Intrusive $L_{Aeq(15minute)}$ Noise Levels (dB(A) re 20µPa)

Residence ID[1,6]	Year 0 Scenario 1		Year 3 Scenario 2		Year 8 Scenario 3		Year 10 Scenario 4		% Frequency of Occurrence		Intrusive PNTL
	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard[7]	Enhancing Wind[8]	
Project-related Receivers											
R1A	-	-	32	44	28	40	28	37	2	14	35
R1B	-	-	24	36	22	34	23	34	2	28	35
R1G	-	-	25	31	24	30	25	32	2	6	35
R1H	-	-	29	40	23	37	26	39	2	6	35
R1I	-	-	24	35	22	34	22	35	2	6	35
R1J	-	-	32	41	25	37	24	40	2	10	35
R1K	-	-	26	40	26	39	26	39	2	2	35
R1L	-	-	9	24	9	25	9	26	2	26	35
R1M	-	-	11	23	11	22	12	23	2	31	35
R1N	-	-	10	34	10	32	10	32	2	40	35
R1O	-	-	9	32	8	30	9	30	2	37	35
R1P	-	-	28	39	34	41	39	44	2	5	35
R1Q	-	-	32	41	25	38	26	40	2	8	35
L1R	-	-	9	32	10	30	10	30	2	46	35
R10	-	-	29	43	24	37	25	41	2	32	35

Note 1: See Land Ownership and Surrounding Residences (**Annexure 4**) and Land Ownership Details (**Annexure 5**).
Note 2: Predicted $L_{Aeq(15minute)}$ intrusive noise level complies with the PNTL.
Note 3: Predicted negligible noise exceedance 1-2dB(A) above the PNTL.
Note 4: Predicted marginal to moderate noise exceedance 3-5dB(A) above the PNTL.
Note 5: Predicted significant noise exceedance >5dB(A) above the PNTL.
Note 6: Residences R1C, R1D, R1E and R1F have been excluded as these residences would be demolished
Note 7: Standard meteorological condition - wind speed up to 0.5m/s.
Note 8: Noise-enhancing wind - wind speed up to 3m/s; plus/minus 45 degrees with respect to the receiver.

7.3 NIGHT-TIME OPERATIONAL INTRUSIVE NOISE LEVELS

7.3.1 Privately-owned Residences in the vicinity of the Mine Site

Based on the noise modelling scenarios described in Section 5.2 and adopted noise control and management measures in Section 5.4, the predicted night-time operating intrusive noise levels for privately-owned residences are presented in **Table 39** under standard and noise-enhancing meteorological conditions (**Table 14**), together with the intrusive PNTLs drawn from **Table 23**.

A summary of the day-time operating intrusive noise impacts at privately-owned residences in the vicinity of the Mine Site is presented in Section 7.5.1.

Table 39
Night-time Standard and Noise-enhancing Intrusive $L_{Aeq(15minute)}$ Noise Levels (dB(A) re 20µPa)

Page 1 of 4

Residence ID/Place of Interest[1]	Year 3 Scenario 2			Year 8 Scenario 3			Year 10 Scenario 4			% Frequency of Occurrence			PNTL
	Standard	Enhancing Wind	Enhancing Inversion	Standard	Enhancing Wind	Enhancing Inversion	Standard	Enhancing Wind	Enhancing Inversion	Standard[6]	Enhancing Wind[7]	Enhancing Inversion[8]	
Rural Residences													
R4	19	37	41	17	36	38	20	37	40	4	1	4	35
R6	8	22	24	6	18	20	7	22	24	4	1	5	35
R7	19	37	39	16	32	35	19	34	36	4	3	21	35
R9	7	17	19	5	14	16	6	15	17	4	1	5	35
R12	12	22	28	12	21	28	13	22	28	4	6	52	35
R13	7	17	20	4	14	16	5	14	16	4	1	6	35
R15	10	20	22	6	20	22	7	21	22	4	1	7	35
R16	7	18	20	4	14	16	5	14	17	4	1	7	35
R17	10	18	23	10	18	23	10	19	26	4	0	1	35
R19	9	26	28	7	24	25	7	26	28	4	1	2	35
R21	15	32	34	14	30	33	14	33	36	4	0	2	35
R22	12	29	31	11	28	30	11	32	34	4	0	2	35
R24	14	28	31	12	26	29	13	28	30	4	1	4	35
R25	7	32	34	7	29	32	8	29	31	4	6	52	35
R27	20	35	37	17	32	34	18	34	36	4	1	5	35
R28A	11	28	30	8	25	29	9	27	30	4	1	6	35
R28B	11	27	29	8	25	29	9	28	30	4	1	7	35
R28C	13	26	28	10	20	22	10	20	23	4	1	8	35
R28D	11	26	28	9	23	25	9	22	25	4	1	7	35
R31	14	30	31	10	27	28	11	29	31	4	1	4	35
R33	16	23	26	12	20	22	12	26	29	4	1	2	35
R34	10	27	30	8	26	29	9	30	32	4	0	2	35
R35	9	35	37	10	32	34	10	33	35	4	6	50	35
R36A	9	32	37	8	31	33	9	32	35	4	6	45	35
R36B	8	14	16	9	14	16	10	15	17	4	6	40	35
R37	8	34	36	9	31	34	9	31	33	4	6	52	35
R39	16	31	35	13	30	32	14	34	36	4	3	29	35
R40	17	33	35	13	30	33	14	34	36	4	3	25	35
R42	9	29	32	9	27	31	10	28	32	4	6	52	35
R43	11	20	23	8	18	22	9	20	23	4	1	4	35
R44	10	28	34	9	26	30	10	26	30	4	5	46	35
R45A	12	32	34	10	28	30	11	27	30	4	4	44	35
R45B	11	31	33	8	27	29	9	27	29	4	5	45	35
R46	17	32	34	14	30	32	14	33	35	4	3	29	35
R47	17	33	35	14	30	33	15	34	36	4	3	23	35
R48	16	28	30	14	27	29	14	29	31	4	2	20	35
R50	7	22	24	5	18	20	7	19	21	4	2	18	35
R58	1	22	24	-1	21	22	0	20	21	4	7	48	35

Table 39 (Cont'd)

Night-time Standard and Noise-enhancing Intrusive $L_{Aeq(15minute)}$ Noise Levels (dB(A) re 20µPa)

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Residence ID/Place of Interest[1]	Year 3 Scenario 2			Year 8 Scenario 3			Year 10 Scenario 4			% Frequency of Occurrence			PNTL
	Standard	Enhancing Wind	Enhancing Inversion	Standard	Enhancing Wind	Enhancing Inversion	Standard	Enhancing Wind	Enhancing Inversion	Standard[6]	Enhancing Wind[7]	Enhancing Inversion[8]	
Rural Residences (Cont'd)													
R60	2	18	22	1	18	22	2	18	22	4	4	21	35
R63	-2	9	12	-3	8	11	-2	9	12	4	2	5	35
R68	7	23	25	5	23	25	7	23	25	4	1	3	35
R70	4	10	12	3	9	11	3	11	14	4	0	1	35
R73	4	27	29	4	25	28	4	27	30	4	3	5	35
R74	5	11	14	5	11	14	5	15	20	4	0	1	35
R75	3	29	31	3	28	30	3	30	32	4	0	1	35
R76	4	14	18	4	13	18	4	14	19	4	3	8	35
R80	8	21	23	6	19	21	7	20	22	4	1	5	35
R81	8	30	32	7	29	31	8	27	29	4	7	50	35
R82	8	31	33	7	29	31	8	28	30	4	6	51	35
R83	8	30	32	6	28	30	7	27	29	4	6	51	35
R84A	7	31	33	6	28	30	7	28	30	4	6	51	35
R84B	7	30	32	6	27	29	7	27	29	4	6	52	35
R85	7	31	33	7	28	30	7	28	30	4	6	52	35
R86	8	32	34	7	30	32	8	30	32	4	6	51	35
R87	7	34	36	7	30	33	8	31	33	4	7	48	35
R88	9	20	24	7	19	23	7	20	24	4	7	49	35
R89	9	30	32	8	28	30	8	27	29	4	7	49	35
R90	6	30	32	6	28	30	6	28	30	4	7	49	35
R91	6	27	29	4	24	26	5	24	28	4	5	52	35
R92B	2	25	27	1	23	25	1	22	24	4	6	45	35
R92E	6	30	32	5	27	29	6	25	28	4	5	52	35
R92F	6	30	32	5	26	29	6	26	29	4	5	52	35
R92G	6	29	31	5	26	28	6	25	28	4	5	52	35
R93A	7	31	33	6	27	29	7	26	29	4	5	51	35
R93B	7	31	33	6	27	29	7	26	28	4	5	50	35
R93C	7	30	32	6	27	29	7	26	28	4	5	51	35
R94A	7	31	33	6	27	30	7	27	29	4	5	52	35
R94B	7	31	33	6	27	30	7	27	29	4	5	52	35
R95	9	22	26	9	20	23	10	20	24	4	5	49	35
Lue Residences													
L1	9	29	34	9	28	30	10	28	31	4	6	52	35
L2	8	28	34	8	27	30	9	28	32	4	6	52	35
L3	8	32	34	7	30	32	8	29	31	4	6	52	35
L4	8	32	34	7	29	31	8	29	31	4	6	52	35
L5	8	32	34	7	29	32	8	29	32	4	6	52	35
L7	9	29	34	9	28	30	10	29	31	4	6	52	35
L8	9	29	34	8	29	31	9	29	31	4	6	52	35
L9	7	30	34	7	27	30	8	29	30	4	6	53	35

Table 39 (Cont'd)
Night-time Standard and Noise-enhancing Intrusive $L_{Aeq(15minute)}$ Noise Levels (dB(A) re 20µPa)

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Residence ID/Place of Interest[1]	Year 3 Scenario 2			Year 8 Scenario 3			Year 10 Scenario 4			% Frequency of Occurrence			PNTL
	Standard	Enhancing Wind	Enhancing Inversion	Standard	Enhancing Wind	Enhancing Inversion	Standard	Enhancing Wind	Enhancing Inversion	Standard[6]	Enhancing Wind[7]	Enhancing Inversion[8]	
Lue Residences (Cont'd)													
L10	6	31	33	6	27	30	7	28	30	4	5	53	35
L12	6	31	33	6	27	30	7	28	30	4	6	53	35
L13	6	31	33	7	27	30	7	28	30	4	6	53	35
L15	7	31	34	7	27	30	8	28	30	4	6	52	35
L16	6	31	33	7	27	30	7	28	30	4	6	53	35
L17	6	31	33	6	27	30	7	27	29	4	6	53	35
L18	8	31	34	8	27	30	9	28	30	4	6	52	35
L19	8	31	33	7	27	30	8	28	30	4	6	52	35
L20	8	31	34	7	28	31	8	28	31	4	6	52	35
L21	8	31	34	7	28	31	8	28	31	4	6	52	35
L22	7	31	34	7	28	30	8	28	31	4	6	52	35
L23	8	31	34	7	28	30	8	28	31	4	6	52	35
L24	8	31	34	7	28	30	8	28	31	4	6	52	35
L25	8	31	34	7	27	30	8	28	30	4	6	53	35
L26	8	31	33	8	27	30	9	28	30	4	6	52	35
L27	7	31	34	7	29	31	8	28	30	4	6	52	35
L28A	7	32	34	7	29	31	8	28	30	4	6	52	35
L28B	7	32	34	7	29	31	8	28	30	4	6	52	35
L29	7	30	33	6	27	30	7	28	29	4	6	53	35
L30	7	30	32	6	27	30	7	27	29	4	6	53	35
L31	7	31	33	7	26	29	8	28	29	4	6	53	35
L32	8	31	33	7	27	30	8	28	30	4	6	52	35
L33	7	31	34	6	28	30	7	28	30	4	6	52	35
L34	7	31	34	7	29	31	7	28	30	4	6	53	35
L35	7	32	34	7	29	31	7	28	30	4	6	52	35
L37	7	31	33	7	29	31	7	28	30	4	6	52	35
L38	7	31	33	7	29	31	7	28	30	4	6	52	35
L39	7	31	33	7	28	30	7	28	30	4	6	52	35
L40	7	31	33	6	29	30	7	28	30	4	6	53	35
L41	7	31	33	6	28	30	7	28	30	4	6	52	35
L42	7	31	33	6	28	30	7	27	30	4	6	52	35
L43	7	31	33	6	29	31	7	27	30	4	6	52	35
L44	7	31	33	6	28	30	7	28	30	4	6	52	35
L45	7	31	33	7	29	31	8	28	30	4	6	52	35
L46	7	31	33	7	29	31	8	28	30	4	6	52	35
L47	7	31	33	7	29	31	7	28	30	4	6	52	35
L49	6	30	34	6	27	30	7	28	30	4	5	53	35
L50	8	33	35	8	30	33	8	30	32	4	6	52	35

Table 39 (Cont'd)
Night-time Standard and Noise-enhancing Intrusive $L_{Aeq(15minute)}$ Noise Levels (dB(A) re 20µPa)

Page 4 of 4

Residence ID/Place of Interest[1]	Year 3 Scenario 2			Year 8 Scenario 3			Year 10 Scenario 4			% Frequency of Occurrence			PNTL
	Standard	Enhancing Wind	Enhancing Inversion	Standard	Enhancing Wind	Enhancing Inversion	Standard	Enhancing Wind	Enhancing Inversion	Standard[6]	Enhancing Wind[7]	Enhancing Inversion[8]	
Lue Place of Interest													
LPOI1 Rural Fire Brigade	8	31	35	7	29	31	8	29	31	4	6	52	48
LPOI2 Lue Pottery	7	32	34	7	28	30	7	28	30	4	6	52	48
LPOI3 Lue Public School	7	31	34	7	27	30	8	28	30	4	6	53	43
LPOI4 Lue Hall	7	30	34	7	27	30	8	29	30	4	6	53	48
LPOI5 Lue Railway Station Buildings	6	30	34	6	27	30	7	28	30	4	5	53	48

Note 1: See Land Ownership and Surrounding Residences (**Annexure 4**) and Land Ownership Details (**Annexure 5**).
Note 2: Predicted $L_{Aeq(15minute)}$ intrusive noise level complies with the PNTL.
Note 3: Predicted negligible noise exceedance 1-2dB(A) above the PNTL.
Note 4: Predicted marginal to moderate noise exceedance 3-5dB(A) above the PNTL.
Note 5: Predicted significant noise exceedance >5dB(A) above the PNTL.
Note 6: Standard meteorological condition - wind speed up to 0.5m/s.
Note 7: Noise-enhancing wind - stability categories A to E wind speed up to 3m/s; plus/minus 45 degrees with respect to the receiver.
Note 8: Noise-enhancing temperature inversion - stability categories F to G wind speed up to 2m/s; plus/minus 45 degrees with respect to the receiver.

7.3.2 Project-related Receivers

The predicted night-time operating intrusive noise levels for project-related receivers are presented in **Table 40** under standard and noise-enhancing meteorological conditions (**Table 14**), together with the intrusive PNTLs drawn from **Table 23**.

A summary of the night-time operating intrusive noise impacts on project-related receivers is presented in Section 7.5.2.

Table 40
Night-time Standard and Noise-enhancing Intrusive $L_{Aeq(15minute)}$ Noise Levels (dB(A) re 20µPa)

Residence ID[1,6]	Year 3 Scenario 2			Year 8 Scenario 3			Year 10 Scenario 4			% Frequency of Occurrence			Intrusive PNTL
	Standard	Enhancing Wind	Enhancing Inversion	Standard	Enhancing Wind	Enhancing Inversion	Standard	Enhancing Wind	Enhancing Inversion	Standard[7]	Enhancing Wind[8]	Enhancing Inversion[9]	
Project-related residential receivers													
R1A	26	43	46	24	36	39	24	31	34	4	1	10	35
R1B	20	31	34	18	30	33	20	31	33	4	3	23	35
R1G	20	27	29	18	25	27	18	24	26	4	1	3	35
R1H	23	37	39	18	34	36	22	36	38	4	1	4	35
R1I	18	31	33	15	29	32	16	31	33	4	1	3	35
R1J	31	38	40	24	35	38	23	38	40	4	1	8	35
R1K	25	38	40	25	38	40	25	38	40	4	0	1	35
R1L	6	21	29	6	19	28	7	20	30	4	6	38	35
R1M	9	21	28	9	21	28	10	21	28	4	6	42	35
R1N	7	32	34	6	29	32	7	29	31	4	7	49	35
R1O	5	30	32	4	28	30	5	27	29	4	6	47	35
R1P	22	33	37	20	29	33	19	28	32	4	1	3	35
R1Q	28	39	40	23	36	40	25	38	40	4	1	6	35
L1R	6	29	33	6	28	30	7	29	31	4	5	53	35
R10	25	40	42	20	35	37	21	37	39	4	3	28	35

Note 1: See Land Ownership and Surrounding Residences (**Annexure 4**) and Land Ownership Details (**Annexure 5**).
Note 2: Predicted $L_{Aeq(15minute)}$ intrusive noise level complies with the PNTL.
Note 3: Predicted negligible noise exceedance 1-2dB(A) above the PNTL.
Note 4: Predicted marginal to moderate noise exceedance 3-5dB(A) above the PNTL.
Note 5: Predicted significant noise exceedance >5dB(A) above the PNTL.
Note 6: Residences R1C, R1D, R1E and R1F have been excluded as these residences would be demolished.
Note 7: Standard meteorological condition - wind speed up to 0.5m/s.
Note 8: Noise-enhancing wind - stability categories A to E wind speed up to 3m/s; plus/minus 45 degrees with respect to the receiver.
Note 9: Noise-enhancing temperature inversion - stability categories F to G wind speed up to 2m/s; plus/minus 45 degrees with respect to the receiver.

7.4 NIGHT-TIME SLEEP DISTURBANCE NOISE LEVELS

7.4.1 Privately-owned Residences in the vicinity of the Mine Site

Based on the noise modelling scenarios described in Section 5.2 and adopted noise control and management measures Section 5.4, the predicted night-time operating intrusive and maximum noise levels for privately-owned residences are presented in **Table 41** under noise-enhancing temperature inversion meteorological conditions (**Table 14**), together with the SDNLs (Section 4.2.2).

Table 41
Night-time Noise-enhancing Intrusive and Maximum Sleep Disturbance Noise Levels (dB(A) re 20µPa)

Page 1 of 3

Residence ID[1]	Year 0 Scenario 1		Year 3 Scenario 2		Year 8 Scenario 3		Year 10 Scenario 4		Percentage Occurrence	SDNLs	
	LAeq (15min)	LAmax	LAeq (15min)	LAmax	LAeq (15min)	LAmax	LAeq (15min)	LAmax	Enhancing Inversion[6]	LAeq (15min)	LAmax
Rural Residences											
R4	-	-	41	49	38	39	40	45	4	40	52
R6	-	-	24	32	20	23	24	31	5	40	52
R7	-	-	39	47	35	43	36	44	21	40	52
R9	-	-	19	22	16	19	17	19	5	40	52
R12	-	-	28	36	28	36	28	36	52	40	52
R13	-	-	20	25	16	19	16	19	6	40	52
R15	-	-	22	29	22	29	22	29	7	40	52
R16	-	-	20	28	16	19	17	20	7	40	52
R17	-	-	23	26	23	26	26	34	1	40	52
R19	-	-	28	35	25	33	28	34	2	40	52
R21	-	-	34	37	33	36	36	41	2	40	52
R22	-	-	31	37	30	38	34	41	2	40	52
R24	-	-	31	33	29	31	30	31	4	40	52
R25	-	-	34	41	32	41	31	40	52	40	52
R27	-	-	37	44	34	43	36	42	5	40	52
R28A	-	-	30	37	29	37	30	38	6	40	52
R28B	-	-	29	37	29	37	30	37	7	40	52
R28C	-	-	28	36	22	27	23	26	8	40	52
R28D	-	-	28	36	25	34	25	34	7	40	52
R31	-	-	31	39	28	37	31	38	4	40	52
R33	-	-	26	28	22	25	29	30	2	40	52
R34	-	-	30	39	29	38	32	39	2	40	52
R35	-	-	37	45	34	44	35	45	50	40	52
R36A	-	-	37	45	33	44	35	44	45	40	52
R36B	-	-	16	23	16	23	17	23	40	40	52
R37	-	-	36	44	34	43	33	43	52	40	52
R39	-	-	35	42	32	41	36	44	29	40	52
R40	-	-	35	42	33	41	36	44	25	40	52
R42	-	-	32	43	31	42	32	42	52	40	52
R43	-	-	23	25	22	23	23	24	4	40	52
R44	-	-	34	41	30	40	30	41	46	40	52
R45A	-	-	34	41	30	40	30	40	44	40	52
R45B	-	-	33	40	29	39	29	39	45	40	52
R46	-	-	34	41	32	41	35	43	29	40	52
R47	-	-	35	42	33	41	36	44	23	40	52
R48	-	-	30	37	29	37	31	38	20	40	52
R50	-	-	24	33	20	32	21	32	18	40	52
R58	-	-	24	31	22	30	21	30	48	40	52
R60	-	-	22	32	22	33	22	33	21	40	52
R63	-	-	12	17	11	17	12	17	5	40	52

Table 41 (Cont'd)
Night-time Noise-enhancing Intrusive and Maximum Sleep Disturbance Noise Levels (dB(A) re 20µPa)

Page 2 of 3

Residence ID[1]	Year 0 Scenario 1		Year 3 Scenario 2		Year 8 Scenario 3		Year 10 Scenario 4		Percentage Occurrence	SDNLs	
	LAeq (15min)	LAmax	LAeq (15min)	LAmax	LAeq (15min)	LAmax	LAeq (15min)	LAmax	Enhancing Inversion[6]	LAeq (15min)	LAmax
Rural Residences (Cont'd)											
R68	-	-	25	36	25	36	25	36	3	40	52
R70	-	-	12	19	11	18	14	21	1	40	52
R73	-	-	29	39	28	38	30	39	5	40	52
R74	-	-	14	20	14	20	20	28	1	40	52
R75	-	-	31	39	30	40	32	40	1	40	52
R76	-	-	18	27	18	27	19	27	8	40	52
R80	-	-	23	26	21	23	22	23	5	40	52
R81	-	-	32	39	31	38	29	38	50	40	52
R82	-	-	33	40	31	40	30	39	51	40	52
R83	-	-	32	39	30	38	29	29	51	40	52
R84A	-	-	33	40	30	39	30	39	51	40	52
R84B	-	-	32	39	29	38	29	38	52	40	52
R85	-	-	33	40	30	39	30	39	52	40	52
R86	-	-	34	41	32	41	32	40	51	40	52
R87	-	-	36	43	33	43	33	43	48	40	52
R88	-	-	24	33	23	33	24	33	49	40	52
R89	-	-	32	38	30	38	29	38	49	40	52
R90	-	-	32	39	30	38	30	38	49	40	52
R91	-	-	29	36	26	35	28	36	52	40	52
R92B	-	-	27	33	25	33	24	32	45	40	52
R92E	-	-	32	39	29	38	28	37	52	40	52
R92F	-	-	32	39	29	38	29	38	52	40	52
R92G	-	-	31	38	28	37	28	38	52	40	52
R93A	-	-	33	40	29	39	29	39	51	40	52
R93B	-	-	33	40	29	39	28	39	50	40	52
R93C	-	-	32	39	29	38	28	38	51	40	52
R94A	-	-	33	40	30	39	29	40	52	40	52
R94B	-	-	33	40	30	40	29	40	52	40	52
R95	-	-	26	34	23	33	24	34	49	40	52
Lue Residences											
L1	-	-	34	42	30	42	31	42	52	40	52
L2	-	-	34	42	30	42	32	42	52	40	52
L3	-	-	34	42	32	41	31	40	52	40	52
L4	-	-	34	41	31	41	31	41	52	40	52
L5	-	-	34	41	32	41	32	40	52	40	52
L7	-	-	34	42	30	41	31	41	52	40	52
L8	-	-	34	42	31	41	31	41	52	40	52
L9	-	-	34	42	30	41	30	41	53	40	52
L10	-	-	33	41	30	41	30	40	53	40	52
L12	-	-	33	40	30	40	30	40	53	40	52
L13	-	-	33	40	30	40	30	39	53	40	52

Table 41 (Cont'd)
Night-time Noise-enhancing Intrusive and Maximum Sleep Disturbance Noise Levels (dB(A) re 20µPa)

Page 3 of 3

Residence ID[1]	Year 0 Scenario 1		Year 3 Scenario 2		Year 8 Scenario 3		Year 10 Scenario 4		Percentage Occurrence	SDNLs	
	LAeq (15min)	LAmax	LAeq (15min)	LAmax	LAeq (15min)	LAmax	LAeq (15min)	LAmax	Enhancing Inversion[6]	LAeq (15min)	LAmax
Lue Residences (Cont'd)											
L15	-	-	34	42	30	40	30	40	52	40	52
L16	-	-	33	41	30	40	30	40	53	40	52
L17	-	-	33	40	30	40	29	39	53	40	52
L18	-	-	34	41	30	40	30	40	52	40	52
L19	-	-	33	41	30	40	30	40	52	40	52
L20	-	-	34	41	31	40	31	40	52	40	52
L21	-	-	34	41	31	40	31	40	52	40	52
L22	-	-	34	41	30	40	31	40	52	40	52
L23	-	-	34	41	30	40	31	40	52	40	52
L24	-	-	34	41	30	40	31	40	52	40	52
L25	-	-	34	40	30	40	30	40	53	40	52
L26	-	-	33	41	30	40	30	40	52	40	52
L27	-	-	34	41	31	40	30	40	52	40	52
L28A	-	-	34	41	31	40	30	40	52	40	52
L28B	-	-	34	41	31	40	30	40	52	40	52
L29	-	-	33	40	30	39	29	40	53	40	52
L30	-	-	32	40	30	38	29	39	53	40	52
L31	-	-	33	41	29	39	29	40	53	40	52
L32	-	-	33	41	30	39	30	40	52	40	52
L33	-	-	34	40	30	39	30	39	52	40	52
L34	-	-	34	40	31	40	30	40	53	40	52
L35	-	-	34	40	31	40	30	40	52	40	52
L37	-	-	33	40	31	40	30	40	52	40	52
L38	-	-	33	40	31	39	30	39	52	40	52
L39	-	-	33	40	30	40	30	40	52	40	52
L40	-	-	33	40	30	40	30	40	53	40	52
L41	-	-	33	40	30	39	30	39	52	40	52
L42	-	-	33	40	30	39	30	39	52	40	52
L44	-	-	33	40	30	39	30	39	52	40	52
L45	-	-	33	40	31	39	30	39	52	40	52
L46	-	-	33	40	31	39	30	39	52	40	52
L47	-	-	33	40	31	40	30	40	52	40	52
L49	-	-	34	42	30	41	30	40	53	40	52
L50	-	-	35	42	33	42	32	41	52	40	52

Note 1: See Land Ownership and Surrounding Residences (**Annexure 4**) and Land Ownership Details (**Annexure 5**).
Note 2: Predicted LAeq(15minute) intrusive noise level complies with the SDNL.
Note 3: Predicted negligible noise exceedance 1-2dB(A) above the SDNL.
Note 4: Predicted marginal to moderate noise exceedance 3-5dB(A) above the SDNL.
Note 5: Predicted significant noise exceedance >5dB(A) above the SDNL.
Note 6: Noise-enhancing temperature inversion - stability categories F to G wind speed up to 2m/s; plus/minus 45 degrees with respect to the receiver.

A summary of the night-time operating intrusive and maximum noise levels on sleep disturbance at privately-owned residences in the vicinity of the Mine Site is presented in Section 7.5.1.

7.4.2 Project-related Receivers

The predicted night-time operating intrusive and maximum noise levels for project-related receivers are presented in **Table 42** under noise-enhancing temperature inversion meteorological conditions (**Table 14**), together with the SDNLs (Section 4.2.2).

A summary of the night-time operating intrusive and maximum noise levels on sleep disturbance at project-related receivers in the vicinity of the Mine Site is presented in Section 7.5.2.

Table 42
Night-time Noise-enhancing Intrusive and Maximum Sleep Disturbance Noise Levels (dB(A) re 20µPa)

Residence ID[1,6]	Year 0 Scenario 1		Year 3 Scenario 2		Year 8 Scenario 3		Year 10 Scenario 4		Percentage Occurrence	SDNLs	
	LAeq (15min)	LAmax	LAeq (15min)	LAmax	LAeq (15min)	LAmax	LAeq (15min)	LAmax	Enhancing Inversion[7]	LAeq (15min)	LAmax
Project-related Receivers											
R1A	-	-	46	55	39	46	34	41	10	40	52
R1B	-	-	34	40	33	35	33	35	23	40	52
R1G	-	-	29	35	27	33	26	33	3	40	52
R1H	-	-	39	46	36	45	38	45	4	40	52
R1I	-	-	33	43	32	43	33	41	3	40	52
R1J	-	-	40	49	38	46	40	47	8	40	52
R1K	-	-	40	41	40	41	40	42	1	40	52
R1L	-	-	29	38	28	38	30	38	38	40	52
R1M	-	-	28	30	28	30	28	31	42	40	52
R1N	-	-	34	41	32	41	31	40	49	40	52
R1O	-	-	32	38	30	38	29	38	47	40	52
R1P	-	-	37	40	33	37	32	37	3	40	52
R1Q	-	-	40	48	40	47	40	47	6	40	52
L1R	-	-	33	41	30	41	31	41	53	40	52
R10	-	-	42	49	37	47	39	46	28	40	52

Note 1: See Land Ownership and Surrounding Residences (**Annexure 4**) and Land Ownership Details (**Annexure 5**).
Note 2: Predicted $L_{Aeq(15minute)}$ intrusive noise level complies with the SDNL.
Note 3: Predicted negligible noise exceedance 1-2dB(A) above the SDNL.
Note 4: Predicted marginal to moderate noise exceedance 3-5dB(A) above the SDNL.
Note 5: Predicted significant noise exceedance >5dB(A) above the SDNL.
Note 6: Residences R1C, R1D, R1E and R1F have been excluded as these residences would be demolished.
Note 7: Noise-enhancing temperature inversion - stability categories F to G wind speed up to 2m/s; plus/minus 45 degrees with respect to the receiver.

7.5 OPERATIONAL NOISE IMPACT SUMMARY

7.5.1 Privately-owned Residences in the vicinity of the Mine Site

The predicted day-time, evening and night-time operational noise impacts at both privately-owned residences and project-related receivers in the vicinity of the Mine Site are summarised below.

Table 43 presents a summary of privately-owned residences with predicted exceedances of the relevant day-time, evening and night-time intrusive PNTLs and SDNLs, which are further described below.

Table 43
Privately-owned Residences with predicted PNTL and SDNL Exceedances

Page 1 of 2

Receiver Area	Exceedance[1]	Day-time	Evening	Night-time	Maximum Exceedance in Any Period
Rural Residences **Year 0 Scenario 1**	Negligible 1 to 2dB(A) above PNTL	R21; R27; R37	Not Operating	Not Operating	R21; R27; R37
	Marginal to Moderate 3 to 5dB(A) above PNTL	R7; R35; R36A; R87			R7; R35; R36A; R87
	Significant > 5dB(A) above PNTL	R4			R4
	Negligible 1 to 2dB(A) above SDNL[2]	n/a			-
Rural Residences **Year 3 Scenario 2**	Negligible 1 to 2dB(A) above PNTL	R7; R36A; R87	R21; R27; R35; R36A; R37; R47; R87	R27; R35; R36A, R37; R87	R21; R27; R35; R36A; R37; R47; R87
	Marginal to Moderate 3 to 5dB(A) above PNTL	-	- R7	R7	R7
	Significant > 5dB(A) above PNTL	R4	R4	R4	R4
	Negligible 1 to 2dB(A) above SDNL[2]	n/a	n/a	R4	R4
Rural Residences **Year 8 Scenario 3**	Negligible 1 to 2dB(A) above PNTL	R4; R36A	-	-	R36A
	Marginal to Moderate 3 to 5dB(A) above PNTL	-	R4	R4	R4
	Significant > 5dB(A) above PNTL	-	-	-	-
	Negligible 1 to 2dB(A) above SDNL[2]	n/a	n/a	-	-
Rural Residences **Year 10 Scenario 4**	Negligible 1 to 2dB(A) above PNTL	R7	R21; R27; R39; R40; R47	R7; R21; R27; R39; R40; R47	R21; R27; R39: R40; R47
	Marginal to Moderate 3 to 5dB(A) above PNTL	R4	R4; R7	R4	R4; R7
	Significant > 5dB(A) above PNTL	-	-	-	-
	Negligible 1 to 2dB(A) above SDNL[2]	n/a	n/a	-	-

Table 43 (Cont'd)
Privately-owned Residences with predicted PNTL and SDNL Exceedances

Page 2 of 2

Receiver Area	Exceedance[1]	Day-time	Evening	Night-time	Maximum Exceedance in Any Period
Rural Residences **Throughout Mine Life**	Negligible 1 to 2dB(A) above PNTL	R21; R27; R37	R21; R27; R35; R36A; R37; R39; R40; R47; R87	R21; R27; R35; R36A; R37; R39; R40; R47; R87	R21; R27; R37; R39; R40; R47
	Marginal to Moderate 3 to 5dB(A) above PNTL	R7; R35; R36A; R87	R7	R7	R7; R35; R36A; R87
	Significant > 5dB(A) above PNTL	R4	R4	R4	R4
	Negligible 1 to 2dB(A) above SDNL[2]	-	-	R4	R4
Lue Residences	Negligible 1 to 2dB(A) above PNTL	-	-	-	-
	Marginal to Moderate 3 to 5dB(A) above PNTL	-	-	-	-
	Significant > 5dB(A) above PNTL	-	-	-	-
	Negligible 1 to 2dB(A) above SDNL	n/a	n/a	-	-
Lue Place of Interest	Negligible 1 to 2dB(A)	-	-	-	-
	Marginal to Moderate 3 to 5dB(A)	-	-	-	-
	Significant > 5dB(A)	-	-	-	-
Note 1: In accordance with the Project noise impact assessment methodology presented in **Table 25**.					
Note 2: Exceedance of the intrusive ($L_{Aeq(15minute)}$) SDNL of 40dB(A).					

The predicted day-time, evening and night-time operational noise impacts at both privately-owned residences and project-related receivers in the vicinity of the Mine Site are summarised below.

Operational Noise Levels at Privately-owned Rural Residences:

- Comply with the day-time intrusive PNTL of 40dB(A) at all rural residences, except at: R21; R27; and R37, resulting in negligible noise exceedances (1dB(A) to 2dB(A)), whereas the noise exceedances at R7; R35; R36A; and R87 are marginal to moderate (3dB(A) to 5dB(A)) in accordance with the Project noise impact assessment methodology presented in **Table 25**. The day-time noise exceedance at R4 is predicted to be significant and greater than the 5dB(A) intrusive PNTL of 40dB(A);
- Comply with the evening and night-time intrusive PNTL of 35dB(A) at all rural residences, except at: R21; R27; R35; R36A; R37; R39; R40; R47; R87, resulting in negligible noise exceedances (1dB(A) to 2dB(A)), whereas the noise exceedance at R7 is marginal to moderate (3dB(A) to 5dB(A)) in accordance with the Project noise impact assessment methodology presented in **Table 25**. The evening and night-time noise exceedances at R4 are predicted to be significant and greater than the 5dB(A) intrusive PNTL of 35dB(A);

- Comply with the night-time intrusive ($L_{Aeq(15minute)}$) SDNL of 40dB(A) (over a 15 minute period) at all rural residences, except at R4, resulting in a negligible noise exceedance (1dB(A) to 2dB(A)) in accordance with the Project noise impact assessment methodology presented in **Table 25**; and
- Comply with the night-time maximum SDNL of 52dB(A) at all rural residences (for the maximum level).

Operational Noise Levels at Privately-owned Lue Residences:

- Comply with the day-time intrusive PNTL of 40dB(A) at all Lue residences;
- Comply with the evening and night-time intrusive PNTL of 35dB(A) at all Lue residences; and
- Comply with the night-time intrusive SDNL of 40dB(A) and maximum SDNL of 52dB(A) at all Lue residences.

Operational Noise Levels at Lue Places of Interest:

- Comply with the intrusive PNTL of 43dB(A) of at LPOI3 Lue Public School; and
- Comply with the intrusive PNTL of 48dB(A) of at LPOI1 Rural Fire Brigade; LPOI2 Lue Pottery; LPOI4 Lue Hall; LPOI5 Lue Railway Station.

7.5.2 Project-related Receivers

Table 44 presents a summary of project-related receivers with predicted exceedances of the intrusive PNTLs and SDNLs, which are further described below.

Table 44
Project-related Receivers with predicted PNTL and SDNL Exceedances

Receiver Area	Exceedance[1]	Day-time	Evening	Night-time	Maximum Exceedance in Any Period
Rural	Negligible 1 to 2dB(A) above PNTL	R1B; R1I; R1K; R1L; R1N	R1B	-	R1B; R1I; R1L; R1N
	Marginal to Moderate 3 to 5dB(A) above PNTL	R1H	R1H; R1K	R1H; R1J; R1K; R1P; R1Q	R1H; R1J; R1K; R1P; R1Q
	Significant > 5dB(A) above PNTL	R1A; R1J; R1P; R1Q	R1A; R1J; R1P; R1Q	R1A	R1A; R1J; R1P; R1Q
	Negligible 1 to 2dB(A) above SDNL	-	-	-	-
	Marginal to Moderate 3 to 5dB(A) above SDN[2]L	-	-	-	-
	Significant > 5dB(A) above SDNL[2]	-	-	R1A	R1A

Note 1: In accordance with the Project noise impact assessment methodology presented in **Table 25**.
Note 2: Exceedance of the intrusive ($L_{Aeq(15minute)}$) SDNL of 40dB(A).

Operational Noise Levels at Project-related Receivers:

- Are likely to exceed the relevant PNTLs and SDNLs at multiple receivers as the majority of these are located in close proximity to the Mine Site. Impacts upon occupants of dwellings (if any) would be managed in accordance with the requirements of the ONMP. Residences R1C, R1D, R1E and R1F have been excluded as these residences would be demolished.

7.5.3 Privately-owned Land Impact Assessment

The predicted (i.e. outer envelope) operational intrusive $L_{Aeq(15minute)}$ noise contours for day-time, evening and night-time under standard meteorological conditions throughout the mine life are presented in **Annexure 17**. The predicted (i.e. outer envelope) operational intrusive $L_{Aeq(15minute)}$ noise contours for day-time, evening and night-time under noise-enhancing meteorological conditions throughout the mine life are presented in **Annexure 18**. The calculation of the noise contours involves numerical interpolation of a noise level array with a graphical accuracy of up to approximately ±2dB(A). This means that in some cases the noise contours would differ slightly from the values in Section 7, which are calculated at the individual residential and receiver locations and are therefore more accurate predictions.

Noise impacts on the nearest privately-owned rural land to the Mine Site have initially been conservatively assessed on the basis that any land is permitted to have a residence with reference to the Land Ownership Plan (**Annexure 4)** and associated Land Ownership Details (**Annexure 5)**. In practice however local zoning restrictions and planning controls would need to be taken into consideration with respect to each parcel of land.

In accordance with the Project noise impact assessment methodology presented in **Table 25** (as guided by the VLAMP), the nearest privately-owned rural land would be impacted if the (mine operational) project amenity noise levels were predicted to exceeded day-time 55dB(A), evening 50dB(A) and night-time 45dB(A). The (mine operational) project amenity noise levels would be at least 3dB(A) lower than the predicted (i.e. outer envelope) operational intrusive $L_{Aeq(15minute)}$ noise contours for day-time, evening and night-time under noise-enhancing meteorological conditions presented in **Annexure 18**.

The predicted operational day-time 55dB(A) intrusive noise contour does not impact more than 25% of the nearest privately-owned rural land throughout the mine life (see **Annexure 18**). Similarly, the predicted operational evening 50dB(A) intrusive noise contour does not impact more than 25% of the nearest privately-owned rural land throughout the mine life (see **Annexure 18**). Likewise, the predicted operational night-time 45dB(A) intrusive noise contour does not impact more than 25% of the nearest privately-owned rural land throughout the mine life (see **Annexure 18**).

Hence, there is no privately-owned rural land predicted to be impacted by the Project in accordance with the Project noise impact assessment methodology presented in **Table 25** (as guided by the VLAMP).

7.6 OPERATIONAL NOISE MANAGEMENT PLAN (ONMP)

Operational noise from the Project would be managed by Bowdens Silver in accordance with an approved ONMP based on the general requirements of the NPfI (and any requirements arising from the development consent for the Project) to ensure that any potential operational noise impacts are minimised in terms of magnitude, duration and character. The ONMP for the Project would include detailed methodologies and procedures in relation to the following:

- A permanent, continuous real-time noise monitoring system (minimum of two locations) being representative of rural residences and residences in Lue and capable of identifying noise from the Project (as distinct from extraneous noise) and provide real-time information to mine management;
- The real time noise monitors would be capable of recording continuous real-time audio, sampling A-weighted and C-weighted noise levels and statistical 1/3 octave noise data to establish the extent of any low frequency noise content;
- The system would involve the use of upcoming meteorological forecasts to predict potential noise enhancing meteorological conditions as well as noise investigation trigger levels (i.e. alerts) to assist in the implementation of pre-emptive management actions;
- It is envisaged that the system would automatically alert mine management via SMS or other site specific communications protocol as required. Depending on the alert received management responses would include:
  - Scheduling of mining operations;
  - Modification to fleet composition;
  - Make preparations for moving plant and equipment into protected operational areas; and
  - Temporarily shutting down equipment.
- In addition to the real-time noise monitoring operator-attended monitoring using precision sound level meters would be conducted to inform the continual calibration and validation of the real-time noise monitoring system in order to improve the effectiveness of the system as a trigger for ongoing operational management, and to indicate compliance;
- Operator attended noise monitoring would also be conducted on a regular basis during the day-time, evening and night-time periods, the results of which would be assessed against the relevant noise criteria detailed in the development consent for the Project. The compliance assessment protocol would be developed as part of the ONMP and would include relevant reporting requirements to the EPA and DPIE as well as any follow up noise monitoring and investigation into operational procedures; and
- An evaluation of the effectiveness of the noise management system would be conducted annually and reported as part of the Annual Review. Bowdens Silver would review and update, if necessary, the monitoring component of the ONMP on an annual basis to reflect the experience and results of the monitoring undertaken during the preceding 12 months.

8. POWER TRANSMISSION LINE RE-ALIGNMENT NOISE IMPACT ASSESSMENT

8.1 PTL RE-ALIGNMENT WORKS INTRUSIVE NOISE LEVELS

8.1.1 Privately-owned Residences in the vicinity of the Mine Site

As discussed in Section 2.3.3, Bowdens Silver proposes to re-align approximately 3.5km of the 500kV PTL (see **Annexure 2**). The PTL re-alignment works and would involve the use of the equipment listed in **Table 6** for a duration of up to approximately 6 to 10 months anticipated to coincide with day-time Year 3 mine operations. The predicted day-time $L_{Aeq(15minute)}$ intrusive noise levels for Year 3 operations and the re-alignment works for privately-owned residences in the vicinity of the Mine Site are presented in **Table 45** under standard and noise-enhancing meteorological conditions (**Table 14**), together with the intrusive PNTLs drawn from **Table 23**.

Table 45

Day-time Intrusive $L_{Aeq(15minute)}$ Operational and PTL Re-alignment Noise Levels (dB(A) re 20µPa)

Page 1 of 4

Residence ID/Place of Interest[1]	Year 3 Scenario 2 Operational		Year 3 PTL Re-alignment Works		Total Year 3 Operational plus Re-alignment Works		% Frequency of Occurrence		Intrusive PNTL[2]
	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard[6]	Enhancing Wind[7]	
Rural Residences									
R4	30	39	37	46	38	46	3	16	40
R6	16	24	15	27	19	29	3	16	40
R7	30	46	30	42	33	47	3	11	40
R9	13	22	14	23	16	25	3	16	40
R12	28	39	22	30	29	39	3	19	40
R13	12	21	13	23	15	25	3	15	40
R15	15	23	15	25	18	27	3	15	40
R16	13	21	12	22	16	25	3	15	40
R17	16	22	17	28	19	29	3	9	40
R19	17	25	17	30	20	31	3	15	40
R21	20	36	23	39	25	41	3	14	40
R22	19	31	21	35	23	36	3	15	40
R24	21	33	22	37	24	38	3	16	40
R25	27	38	23	39	28	41	3	19	40
R27	24	35	29	40	30	41	3	16	40
R28A	21	30	18	33	22	35	3	15	40
R28B	20	29	18	32	22	34	3	15	40
R28C	17	28	18	30	21	32	3	15	40
R28D	17	28	18	30	20	32	3	15	40
R31	20	29	21	34	23	35	3	16	40
R33	19	30	22	32	24	34	3	15	40
R34	20	29	19	33	22	35	3	14	40
R35	32	39	24	40	32	43	3	20	40
R36A	28	38	28	42	31	43	3	21	40
R36B	25	35	32	38	33	39	3	21	40
R37	27	38	21	39	28	42	3	19	40

Table 45 (Cont'd)

Day-time Intrusive LAeq(15minute) Operational and PTL Re-alignment Noise Levels (dB(A) re 20µPa)

Page 2 of 4

Residence ID/Place of Interest[1]	Year 3 Scenario 2 Operational		Year 3 PTL Re-alignment Works		Total Year 3 Operational plus Re-alignment Works		% Frequency of Occurrence		Intrusive PNTL[2]
	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard[6]	Enhancing Wind[7]	
Rural Residences (Cont'd)									
R39	30	41	25	38	31	43	3	12	40
R40	30	40	25	38	31	42	3	12	40
R42	26	37	20	36	27	40	3	18	40
R43	15	26	17	29	19	31	3	16	40
R44	22	35	18	35	24	38	3	15	40
R45A	25	39	19	36	26	41	3	14	40
R45B	23	38	19	35	24	40	3	15	40
R46	29	40	25	37	30	42	3	12	40
R47	31	40	28	39	33	43	3	11	40
R48	26	33	23	34	28	36	3	11	40
R50	14	27	14	26	17	29	3	12	40
R58	14	25	19	30	20	31	3	21	40
R60	10	24	18	32	19	33	3	19	40
R63	4	13	7	16	9	18	3	14	40
R68	14	26	16	29	18	31	3	11	40
R70	13	25	14	26	16	29	3	9	40
R73	13	29	20	36	21	37	3	14	40
R74	15	32	20	32	21	35	3	8	40
R75	21	35	25	37	26	39	3	9	40
R76	13	27	21	30	21	32	3	16	40
R80	12	25	14	27	16	29	3	16	40
R81	22	35	28	38	29	40	3	20	40
R82	25	36	27	38	29	41	3	20	40
R83	23	36	25	37	27	39	3	20	40
R84A	25	36	26	37	28	40	3	20	40
R84B	23	35	25	37	27	39	3	19	40
R85	24	36	23	37	27	40	3	19	40
R86	26	37	27	39	30	41	3	20	40
R87	28	37	27	41	31	42	3	21	40
R88	18	29	25	33	25	35	3	20	40
R89	21	34	28	38	29	39	3	20	40
R90	23	35	28	38	29	40	3	21	40
R91	19	33	16	32	21	36	3	16	40
R92B	15	28	21	31	22	33	3	21	40
R92E	21	36	17	35	22	39	3	17	40
R92F	19	35	17	34	21	38	3	17	40
R92G	20	36	17	34	21	38	3	17	40
R93A	20	37	18	35	22	39	3	16	40
R93B	20	37	18	35	22	39	3	15	40
R93C	19	37	18	35	22	39	3	16	40
R94A	19	35	18	35	22	38	3	16	40
R94B	19	35	17	35	21	38	3	16	40
R95	21	27	18	27	23	30	3	15	40

Table 45 (Cont'd)

Day-time Intrusive $L_{Aeq(15minute)}$ Operational and PTL Re-alignment Noise Levels (dB(A) re 20µPa)

Page 3 of 4

Residence ID/Place of Interest[1]	Year 3 Scenario 2 Operational		Year 3 PTL Re-alignment Works		Total Year 3 Operational plus Re-alignment Works		% Frequency of Occurrence		Intrusive PNTL[2]
	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard[6]	Enhancing Wind[7]	
Lue Residences									
L1	26	37	19	36	27	40	3	18	40
L2	24	37	19	36	25	40	3	18	40
L3	27	37	22	39	28	41	3	19	40
L4	27	37	22	39	28	41	3	19	40
L5	26	37	21	38	27	40	3	19	40
L7	26	37	20	37	27	40	3	18	40
L8	25	37	20	36	26	40	3	18	40
L9	24	36	18	36	25	39	3	18	40
L10	22	36	18	35	23	39	3	18	40
L12	23	36	18	36	24	39	3	18	40
L13	24	36	18	36	25	39	3	18	40
L15	24	36	19	36	25	39	3	18	40
L16	24	36	18	36	25	39	3	18	40
L17	23	36	18	35	24	39	3	18	40
L18	24	35	19	36	25	39	3	18	40
L19	24	35	19	36	26	39	3	18	40
L20	24	36	19	36	26	39	3	18	40
L21	24	36	19	36	26	39	3	18	40
L22	25	36	20	37	26	39	3	18	40
L23	24	36	19	36	26	39	3	18	40
L24	24	36	19	36	25	39	3	18	40
L25	24	36	19	36	25	39	3	18	40
L26	24	36	19	36	25	39	3	18	40
L27	24	36	20	37	26	40	3	18	40
L28A	25	36	20	38	26	40	3	18	40
L28B	25	36	21	37	26	40	3	18	40
L29	23	35	18	35	24	38	3	18	40
L30	23	35	19	35	24	38	3	18	40
L31	24	36	19	36	25	39	3	18	40
L32	24	35	19	36	25	39	3	18	40
L33	24	35	20	36	25	39	3	18	40
L34	24	35	20	37	25	39	3	18	40
L35	24	36	20	37	26	39	3	18	40
L37	24	36	21	37	26	40	3	18	40
L38	24	35	20	37	26	39	3	18	40
L39	24	35	20	37	25	39	3	18	40
L40	24	35	20	37	25	39	3	18	40
L41	24	35	20	36	25	39	3	18	40
L42	24	35	21	37	26	39	3	18	40
L43	24	35	21	36	26	39	3	18	40
L44	23	35	20	36	25	39	3	18	40
L45	25	35	22	37	26	39	3	19	40
L46	25	36	21	37	26	40	3	19	40

Table 45 (Cont'd)

Day-time Intrusive LAeq(15minute) Operational and PTL Re-alignment Noise Levels (dB(A) re 20µPa)

Page 4 of 4

Residence ID/Place of Interest[1]	Year 3 Scenario 2 Operational		Year 3 PTL Re-alignment Works		Total Year 3 Operational plus Re-alignment Works		% Frequency of Occurrence		Intrusive PNTL[2]
	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard[6]	Enhancing Wind[7]	
Lue Residences (Cont'd)									
L47	25	35	21	37	26	39	3	19	40
L49	21	34	17	36	22	38	3	17	40
L50	28	37	21	39	29	41	3	19	40
Lue Places of Interest									
LPOI1 Rural Fire Brigade	25	37	20	37	26	40	3	18	48
LPOI2 Lue Pottery	24	35	20	36	25	39	3	18	48
LPOI3 Lue Public School	24	36	18	36	25	39	3	18	43
LPOI4 Lue Hall	24	36	18	36	25	39	3	18	48
LPOI5 Lue Railway Station Buildings	22	35	18	36	24	38	3	18	48

Note 1: See Land Ownership and Surrounding Residences (**Annexure 4**) and Land Ownership Details (**Annexure 5**).
Note 2: Predicted LAeq(15minute) intrusive noise level complies with the PNTL.
Note 3: Predicted negligible noise exceedance 1-2dB(A) above the PNTL.
Note 4: Predicted marginal to moderate noise exceedance 3-5dB(A) above the PNTL.
Note 5: Predicted significant noise exceedance >5dB(A) above the PNTL.
Note 6: Standard meteorological condition - wind speed up to 0.5m/s.
Note 7: Noise-enhancing wind - wind speed up to3m/s; plus/minus 45 degrees with respect to the receiver.

A summary of predicted PTL re-alignment works noise impacts at privately-owned residences in the vicinity of the Mine Site is presented in Section 8.1.3.

8.1.2 Project-related Receivers

The predicted day-time LAeq(15minute) intrusive noise levels for Year 3 operations and the re-alignment works for Project-related receivers in the vicinity of the Mine Site are presented in **Table 46** under standard and noise-enhancing meteorological conditions (**Table 14**), together with the intrusive PNTLs drawn from **Table 23**.

A summary of predicted PTL re-alignment works noise impacts at project-related receivers in the vicinity of the Mine Site is presented in Section 8.1.3.

Table 46
Day-time Calm Intrusive $L_{Aeq(15minute)}$ Construction Noise Levels (dB(A) re 20µPa)

Residence ID[1,6]	Year 3 Scenario 2 Operational		Year 3 PTL Re-alignment Works		Total Year 3 Operational plus Re-alignment Works		% Frequency of Occurrence[2]		Intrusive PNTL
	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard	Enhancing Wind	Standard[6]	Enhancing Wind[7]	
Project-related Receivers									
R1A	36	42	40	49	41	50	3	13	40
R1B	30	43	29	41	33	45	3	12	40
R1G	19	33	26	36	27	37	3	16	40
R1H	28	37	34	43	35	44	3	16	40
R1I	23	34	26	39	28	40	3	16	40
R1J	33	40	37	45	38	46	3	14	40
R1K	24	39	27	40	29	43	3	8	40
R1L	22	32	32	40	32	41	3	21	40
R1M	21	31	29	36	30	37	3	21	40
R1N	26	37	30	40	31	42	3	20	40
R1O	22	34	29	38	30	40	3	20	40
R1P	22	42	40	47	41	48	3	15	40
R1Q	30	39	35	45	36	46	3	15	40
L1R	22	34	18	36	23	38	3	18	40
R10	46	52	37	46	47	53	3	12	40

Note 1: See Land Ownership and Surrounding Residences (**Annexure 4**) and Land Ownership Details (**Annexure 5**).
Note 2: Predicted $L_{Aeq(15minute)}$ intrusive noise level complies with the PNTL.
Note 3: Predicted negligible noise exceedance 1-2dB(A) above the PNTL.
Note 4: Predicted marginal to moderate noise exceedance 3-5dB(A) above the PNTL.
Note 5: Predicted significant noise exceedance >5dB(A) above the PNTL.
Note 6: Residences R1C, R1D, R1E and R1F have been excluded as these residences would be demolished.
Note 7: Standard meteorological condition - wind speed up to 0.5m/s.
Note 8: Noise-enhancing wind - wind speed up to 3m/s; plus/minus 45 degrees with respect to the receiver.

8.1.3 Construction Noise Impact Summary

Table 47 presents a summary of both privately-owned residences and project-related receivers with predicted exceedances of the day-time intrusive PNTL of 40dB(A), which are further described below.

The predicted day-time PTL re-alignment noise impacts at both privately-owned residences and project-related receivers in the vicinity of the Mine Site are summarised below.

Table 47
Privately-owned Residences and Project-related Receivers with PNTL Exceedances

Total Year 3 Operational plus PTL Re-alignment Works	Characterisation of PTL Re-alignment Noise Impacts		
	Negligible[2]	**Marginal to Moderate[3]**	**Significant[4]**
Privately-owned Residences[1]			
Rural Residences	R21; R25; R27; R37; R40; R45A; R82; R86; R87	R35; R36A; R37; R39; R47	R4; R7
Lue Residences	L3; L4; L50	-	-
Lue Places of Interest	-	-	-
Project-related Receivers[1]			
Rural	R1L; R1N	R1B; R1H; R1K	R1A; R1J; R1P; R1Q

Note 1: See Land Ownership and Surrounding Residences (**Annexure 4**) and Land Ownership Details (**Annexure 5**).
Note 2: Predicted negligible noise exceedance 1-2dB(A) above the day-time intrusive PNTL of 40dB(A).
Note 3: Predicted marginal to moderate noise exceedance 3-5dB(A) above the day-time intrusive PNTL of 40dB(A).
Note 4: Predicted significant noise exceedance >5dB(A) above the day-time intrusive PNTL of 40dB(A).

PTL Re-alignment Works at Privately-owned Rural Residences:

- Comply with the day-time intrusive PNTL of 40dB(A) at all rural residences, except at: R21; R25; R27; R37; R40; R45A; R82; R86; and R87, resulting in negligible noise exceedances (1dB(A) to 2dB(A)) in accordance with the Project noise impact assessment methodology presented in **Table 25** during the most intensive period of the PTL re-alignment works with an approximate duration of 1 to 2 months;
- The day-time noise exceedances at R35; R36A; R37; R39; and R47, are marginal to moderate (3dB(A) to 5dB(A)) during the most intensive period of the PTL re-alignment works with an approximate duration of 1 to 2 months; and
- Day-time noise exceedances at R4 and R7 are predicted to be significant and greater than 5dB(A) above intrusive PNTL of 40dB(A).

As shown in **Table 45**, day-time intrusive noise level exceedances arising during Year 3 operations (only) are predicted at R7 and R39 in the absence of the PTL works.

The additional intrusive noise exceedances at residences: R4 (significant); R35, R36A, R37 and R47 (marginal to moderate); and R21, R25, R27, R37, R40, R45A, R82, R86, and R87 (negligible) are as a result of PTL works. However, the additional intrusive noise exceedances during the 1 to 2 month period would occur intermittently and not at that level throughout the entire period.

Furthermore, for comparison purposes only, the predicted total Year 3 operations plus PTL works noise levels remain below the CNML of 45dB(A) at all privately-owned rural residences with the exception of nearest potentially noise affected residences of R4 and R7.

PTL Re-alignment Works at Privately-owned Lue Residences:

- Comply with the day-time intrusive PNTL of 40dB(A) at all Lue residences, except at: L3; L4; and L50, resulting in negligible noise exceedances (1dB(A) to 2dB(A)) in accordance with the Project noise impact assessment methodology presented in **Table 25** during the most intensive period of the PTL re-alignment works with an approximate duration 1 to 2 months.

PTL Re-alignment Works at Lue Places of Interest:

- Comply with the intrusive PNTL of 43dB(A) of at LPOI3 Lue Public School; and
- Comply with the intrusive PNTL of 48dB(A) of at LPOI1 Rural Fire Brigade; LPOI2 Lue Pottery; LPOI4 Lue Hall; LPOI5 Lue Railway Station.

Operational (inclusive PTL Re-alignment Works) Noise Management Plan (ONMP)

- Operational (inclusive PTL re-alignment works) noise from the Project would be managed by Bowdens Silver accordance with an approved ONMP based on the general requirements of the NPfI (and any Project approval requirements) to ensure that any potential operational noise impacts are minimised in terms of magnitude, duration and character.

Operational (inclusive PTL Re-alignment Works) Noise Levels at Project-related Receivers

- Are likely to exceed the relevant PNTLs at multiple receivers as the majority of these are located in close proximity to the Mine Site. Impacts upon occupants of dwellings (if any) would be managed in accordance with the requirements of the ONMP.

9. CUMULATIVE NOISE AMENITY IMPACT ASSESSMENT

9.1 OTHER APPROVED OR PROPOSED RESOURCE DEVELOPMENTS

There are no major existing or approved industrial developments are located in the vicinity of the Mine Site. Other existing, approved and proposed resource developments in the Mudgee district are listed in **Table 48**.

The existing Ulan Mine Complex, Moolarben Coal Complex and Wilpinjong Extension together with the proposed Bylong Coal Project have been identified and are located between 29km to 38km from the Mine Site. As a result, any cumulative noise impacts are considered negligible.

Table 48
Other Approved or Proposed Resource Developments

Proponent	Project	Closest Distance from Bowdens Mine Site	Status
Moolarben Coal Mines Pty Ltd (MCMPL)	Moolarben Coal Project Stage 1 (as modified) Moolarben Coal Project Stage 2 (as modified)	33km	Stage 1 Project Approval (05_0117) dated 6 September 2007 (as modified), with MOD 14 approved 19 June 2019. Stage 2 Project Approval (08_0135) dated 30 January 2015 (as modified), with MOD 3 approved 19 June 2019. The Moolarben Coal Complex (i.e. Stage 1 & Stage 2) is approved to extract a maximum of 20Mtpa of ROM coal.
Ulan Coal Mines Ltd (UCML)	Ulan (Mine Complex) Continued Operations Project (as modified)	38km	Project Approval (MP 08_0184) dated 15 November 2010 (as modified), with MOD 4 approved 17 July 2019. The Ulan Mine Complex is approved to operate up to a maximum coal export capacity (from the site) of 20Mtpa.
Wilpinjong Coal Pty Ltd (WCPL)	Wilpinjong Extension Project (WEP)	29km	Project Approval (SSD-6764) dated 24 April 2017. The WEP is approved to operate up to a maximum coal export capacity (from the site) of 16Mtpa.
KEPCO Bylong Australia Pty Ltd	Bylong Coal Project (BCP)	30km	The BCP development application was refused consent as determined by the NSW Independent Planning Commission (IPC) on the 18 September 2019.
Note 1: Million tonnes per annum (Mtpa).			

10. BLASTING IMPACT ASSESSMENT

10.1 BLASTING ASSESSMENT CRITERIA

10.1.1 Australian Standard Criteria

Australian Standard (AS) 2187: Part 2-2006 Explosives - Storage and Use - Part 2: Use of Explosives, provides guidance in assessing blast-induced ground (and structural) vibration and airblast overpressure effects on buildings and their occupants, with details are presented in Appendix J of AS 2187.

Recommended vibration limits are based on international standards (or studies) as presented in Appendix J, Tables J4.5(A) and J4.5(B) of AS 2187, for human comfort and structural building damage respectively. Similarly, recommended human comfort and structural damage airblast overpressure limits are presented in Appendix J, Tables J5.4(A) and J5.4(B) AS 2187, respectively.

10.1.2 Human Comfort Ground Vibration and Airblast Overpressure Criteria

Ground vibration and airblast overpressure levels which cause human discomfort are lower than recommended structural damage limits. Therefore, compliance with the lowest applicable human comfort criteria generally ensures that the potential to cause structural damage is negligible. The EPA currently adopts the ANZEC Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration dated September 1990 for assessing potential annoyance from blasting during day-time hours, as follows:

- The recommended maximum level for airblast overpressure is 115dB Linear Peak.
- The airblast overpressure level of 115dBLinear Peak may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The airblast overpressure level should not exceed 120dBLinear Peak at any time.
- The recommended maximum for ground vibration is 5mm/s, Peak Vector Sum (PVS) vibration velocity. It is recommended however, that 2mm/s PVS be considered the long-term regulatory goal for the control of ground vibration.
- The ground vibration level of 5mm/s (PVS) may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level should not exceed 10mm/s (PVS) at any time.

The ANZEC criteria are generally consistent with AS 2187: Part 2-2006 Appendix J, Tables J4.5(A) and J5.4(A) with respect to vibration ground and airblast overpressure human comfort respectively.

10.1.3 Livestock Comfort Ground Vibration and Airblast Overpressure Criteria

In a study by Casaday and Lehmann (1967) (Responses of Farm Animals to Sonic Booms), animal installations were selected for observations on animal behaviour under sonic boom conditions. The number of animals observed in this study included approximately 10,000 commercial feedlot beef cattle, 100 horses, 150 sheep and 320 lactating dairy cattle. Booms during the test period were scheduled at varying intervals during the morning hours Monday to Friday of each week.

Results of the study showed that the reactions of the sheep and horses to sonic booms were slight. Dairy cattle were little affected by sonic booms (125dB to 136dB). Only 19 of 104 booms produced even a mild reaction, as evidenced by a temporary cessation of eating, raising of heads, or slight startle effects in a few of those being milked. Milk production was not affected during the test period, as evidenced by total and individual milk yield. The researchers developed a summary by species and farms indicating that the few abnormal behavioural changes observed were well within the range of activity variation within a group of animals. They defined these changes as horses jumping up and galloping around the paddock, bellowing of dairy cattle, and increased activity by beef cattle (Casaday and Lehmann, 1967). In order to provide for a conservative assessment, the lowest airblast overpressure exposure studied (125dB) was adopted as a criterion for the purposes of assessment of livestock impacts.

Similarly, an investigation (Heggies Pty Ltd, 2006) was conducted to determine the vibration levels experienced by cattle during typical short term road transportation together with any vibration-induced health effects as observed by a registered veterinary surgeon. The study concluded that cattle are commonly exposed to vibration levels in excess of 200mm/s during road transportation with no adverse effects on the cattle's health including levels of stress and contentment. It was consequently presumed that there would only be an effect on the cattle's health at vibration levels well in excess of 200mm/s.

10.1.4 Building Damage Airblast Overpressure Criteria

In relation to building damage airblast overpressure criteria, AS 2187: Part 2-2006, Appendix J, Table J5.4(B) recommends a maximum airblast overpressure of 133dBLinear Peak.

10.1.5 Building Damage Vibration Criteria

The applicable building damage vibration criteria AS 2187: Part 2-2006 Appendix J, Table J4.5(B) is derived from British Standard 7385: Part 2-1993 Evaluation and Measurement for Vibration in Buildings Part 2 - Guideline to damage levels from ground-borne vibration. The standard sets guideline values for building vibration based on the lowest vibration levels above which damage has been credibly demonstrated. These levels have been established to give a minimum risk of vibration induced damage, where "minimum risk" for a named effect is usually taken as equating to a 95% probability of no effect.

Sources of vibration which are considered in the standard include blasting (carried out during mineral extraction or construction excavation), demolition, piling, ground treatments (e.g. compaction), construction equipment, tunnelling, road and rail traffic and industrial machinery.

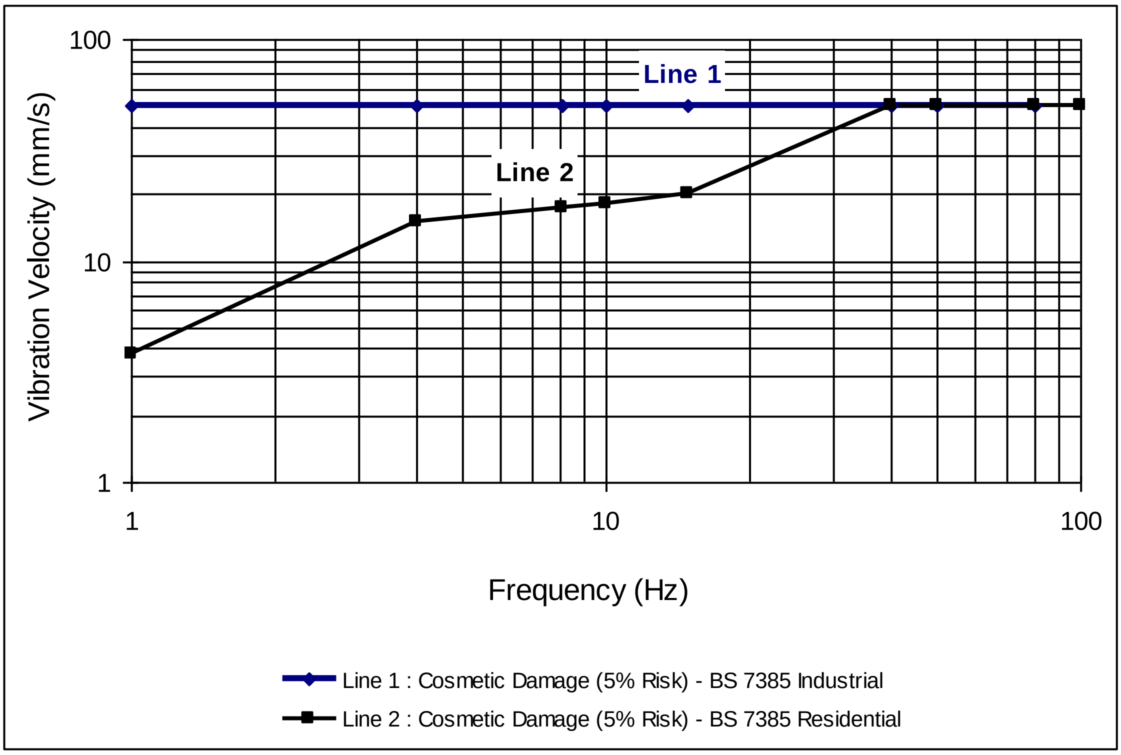
The recommended limits (guide values) for transient vibration to ensure minimal risk of cosmetic damage to residential and industrial buildings are presented numerically in **Table 49** and graphically in **Figure 2**.

Table 49
Transient Vibration Guide Values - Minimal Risk of Cosmetic Damage

Line	Type of Building	Vibration PCPV in Frequency Range of Predominant Pulse[1]	
		4 to 15Hz	**15Hz and Above**
1	Reinforced or framed structures Industrial and heavy commercial buildings	50mm/s at 4 Hz and above	-
2	Unreinforced or light framed structures Residential or light commercial type buildings	15mm/s at 4Hz increasing to 20mm/s at 15Hz	20mm/s at 15Hz increasing to 50mm/s at 40Hz and above
Note 1: Vibration Peak Component Particle Velocity - PCPV (mm/s).			

The standard states that the guide values in **Table 49** relate predominantly to transient vibration which does not give rise to resonant responses in structures, and to low-rise buildings.

Figure 2
Graph of Transient Vibration Guide Values for Cosmetic Damage



The standard goes on to state that minor damage is possible at vibration magnitudes which are greater than twice those given in **Table 49** and major damage to a building structure may occur at vibration magnitudes greater than four times the tabulated values. It is noteworthy that additional to the guide values nominated in **Table 49**, the standard states that:

> *Some data suggests that the probability of damage tends towards zero at 12.5 mm/s peak component particle velocity. This is not inconsistent with an extensive review of the case history information available in the UK.*

Also that:

> *A building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive.*

Based on the foregoing discussion a conservative vibration (PCPV) damage assessment criterion of 12.5mm/s would be applicable to all privately-owned residences in the vicinity of the Mine Site.

10.1.6 Railway, Roadway, and PTL Infrastructure Vibration Damage Criteria

Infrastructure located outside or within of the Mine Site (**Annexure 2**) includes the closed railway line, roadway infrastructure (i.e. culverts and abutments) and existing 500kV PTL and proposed re-aligned 500kV PTL. Accordingly, consideration has been given to potential vibration effects on such infrastructure.

The German Standard DIN 4150-3:2016 Vibrations in Buildings Part 3: Effects on Structures (Section 5.2) provides guideline values for evaluating the effect of short term vibration on massive structural components and underground structures. The values are based on the assumption that the structures have been manufactured and applied using current technology. Based on the guideline values, the recommended short term vibration assessment criteria to ensure minimal risk of damage are presented in **Table 50**.

Table 50
Guideline Values for Vibration - Effects of Short Term Vibration on Buried Structures

Structure Type	Short Term Vibration PCPV[1] Criteria
Steel, welded	100mm/s
Vitrified clay, concrete, reinforced concrete, pre-stressed concrete, metal (with or without flange)	80mm/s
Masonry, plastic	50mm/s
Note 1: Vibration Peak Component Particle Velocity - PCPV (mm/s).	

While now closed, the railway infrastructure comprises mainly steel and similar materials and a vibration (PCPV) damage assessment criterion of 100mm/s would be applicable. Similarly, roadway infrastructure (i.e. culverts and abutments) comprises mainly reinforced concrete and similar materials and a vibration (PCPV) damage assessment criterion of 80mm/s would be applicable. Based on similar projects, a vibration (PCPV) damage criterion of 50mm/s has been adopted for the assessment of 500kV PTL.

10.1.7 Archaeological/Geological Vibration Damage Criteria

There are no regulatory criteria nominated in Australia for the assessment of damage to archaeological/geological structures from vibration. Research, however, has been undertaken by the United States (US) Army Corps of Engineers into the effects of large surface blasts on the dynamic stability of nearby unlined tunnels of various diameters in sandstone and granite (Blast Vibration Monitoring and Control [Dowding, 1985]). The results of the research indicated that intermittent rock fall or observable damage was not observed until vibration levels exceeded 460mm/s.

This assessment therefore adopts a conservative safe blast design vibration criterion of 250mm/s (5% exceedance) as being applicable to archaeological/geological structures and Aboriginal heritage sites (i.e. rock shelters or the like), if present.

10.2 PROPOSED BLASTING PRACTICES

Assessment of the potential ground vibration and airblast overpressure levels arising from ore and waste rock blasting has been based on the indicative Project blast design parameters described presented in Section 2.5 and summarised in **Table 51** and the shortest distance between the open cut pits and the nominated residence(s) or infrastructure. Potential blast emission impacts from blasting within the proposed open cut pit boundary (**Annexure 8**) have been assessed assuming the typical waste rock and ore blast designs in **Table 51**.

Table 51
Indicative Waste Rock and Ore Blast Design Parameters

Parameter	Typical Waste rock Blast Design	Typical Ore Blast Design
Bench Height	5m (5.5m with sub-drill)	5m (5.5m with sub-drill)
Burden and Spacing	4.6m x 4.9m	3.3m x 3.6m
Stemming	1.9m (aggregate)	2.0m (aggregate)
Hole Diameter	152mm	127mm
Number of Holes	Typically 220 holes	Typically 220 holes
Holes per Delay	Typically 4 holes	Typically 3 holes
Explosive Type	Wet (bulk emulsion), Dry (ANFO)[1]	Wet (bulk emulsion), Dry (ANFO)[1]
Effective Powder Factor	Typically 0.48kg per bcm^2	Typically 0.65kg per bcm^2
Maximum Instantaneous Charge (MIC)	Typically 216kg	Typically 117kg
Note 1: ammonium nitrate fuel oil (ANFO). Note 2: bank cubic metre (bcm).		

As discussed in Section 2.5, the nominated MIC values to be used within the open cut pits are typical values. It remains the intention of Bowdens Silver to modify the MIC values for all blasts to ensure that the blast criteria set out in Section 10.1 are satisfied at all times at those privately-owned residences that Bowdens Silver does not hold an agreement regarding the Project's impacts upon their residence. Bowdens Silver proposes to commence blasting in the north-eastern section of the main open cut pit, i.e. at distances of between 1.2km and 1.7km from the closest three assessed privately-owned residences or infrastructure that has been relied upon for the impact assessment in Section 10.3. The commencement of blasting in this location would enable Bowdens Silver to develop a specific site law for blasts in both ore and waste rock that can be relied upon when blasting is undertaken later in the mine life when blasting would occur at the closest point to the privately-owned residences.

10.3 BLASTING IMPACT ASSESSMENT

10.3.1 Ground Vibration and Airblast Overpressure Prediction Methodology

To determine the blast emission impacts from ore and waste rock production blasting at the nearest privately-owned rural residences, Lue residences and project-related receivers, ground vibration and airblast overpressure levels were calculated based on the conservative 50%, 5% and 0.1% exceedance ground vibration and airblast overpressure site laws established in accordance with AS 2187: Part 2-2006 Appendix J, Section J7.2 with respect airblast overpressure and Section J7.3 and with respect ground vibration, as follows:

PVS (50% exceedance) = 1,140*(R/Q1/2)-1.6

PVS (5% exceedance) = 3,272*(R/Q1/2)-1.6

PVS (0.1% exceedance)= 8,263*(R/Q1/2)-1.6

SPL (50% exceedance) = 164.3 – 24.0*(log(R) - ⅓ log(Q))

SPL (5% exceedance) = 173.5 – 24.0*(log(R) - ⅓ log(Q))

SPL (0.1% exceedance)= 181.6 – 24.0*(log(R) - ⅓ log(Q))

where,

PVS = Vibration velocity Peak Vector Sum (PVS) (mm/s)

SPL = Airblast overpressure Level Linear Peak (dBLpk re 20µPa).

R = Distance between charge and receiver (m)

Q = MIC (kg) being the charge mass detonated within 8 milliseconds

10.3.2 Privately-owned Residences in the vicinity of the Mine Site

Using the ground vibration and airblast overpressure site laws described above, blast emission levels were predicted at the nearest privately-owned residences and places of interest in the vicinity of the Mine Site assuming the blast was initiated at the closest point to each residence. The predicted (50%, 5% and 0.1% exceedance) ground vibration and airblast overpressure levels are presented in **Table 52** for a typical ore blast (MIC 117kg) and typical waste rock blast (MIC 216kg).

Table 52
Predicted 50%, 5% and 0.1% Exceedance Ground Vibration and Airblast Overpressure Levels - Privately-owned Residences

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Residence ID/Place of Interest[1]	Typical Ore Blast (MIC 117kg)[4,5,6,7]						Typical Waste Rock Blast (MIC 216kg)[4,5,6,7]					
	Vibration (mm/s)[2]			Airblast (dBLpk)[3]			Vibration (mm/s)[2]			Airblast (dBLpk)[3]		
	50%	5%	0.1%	50%	5%	0.1%	50%	5%	0.1%	50%	5%	0.1%
Rural Residences												
R4	0.5	1.4	3.6	106	115	123	0.8	2.3	5.9	108	117	125
R6	0.0	0.1	0.3	90	99	108	0.1	0.2	0.6	92	102	110
R7	0.6	1.8	4.5	107	116	124	1.0	2.9	7.3	109	118	126
R9	0.0	0.1	0.3	89	98	106	0.1	0.2	0.4	91	100	108
R12	0.4	1.0	2.6	104	113	121	0.6	1.7	4.3	106	115	123
R13	0.0	0.1	0.3	89	98	106	0.1	0.2	0.4	91	100	108
R15	0.0	0.1	0.3	89	98	106	0.1	0.2	0.5	91	100	108
R16	0.0	0.1	0.2	88	97	105	0.1	0.2	0.4	90	99	107
R17	0.2	0.7	1.7	101	110	118	0.4	1.1	2.7	103	112	120
R19	0.1	0.2	0.4	91	101	109	0.1	0.3	0.7	94	103	111
R21	0.2	0.7	1.7	101	110	118	0.4	1.1	2.7	103	112	120
R22	0.1	0.4	0.9	97	106	114	0.2	0.6	1.5	99	108	116
R24	0.2	0.5	1.3	99	108	116	0.3	0.8	2.1	101	110	118
R25	0.2	0.5	1.2	98	108	116	0.3	0.8	1.9	100	110	118
R27	0.2	0.6	1.5	100	109	117	0.3	1.0	2.5	102	111	119
R28A	0.1	0.3	0.7	95	104	112	0.2	0.4	1.1	97	106	114
R28B	0.1	0.3	0.6	94	104	112	0.1	0.4	1.1	97	106	114
R28C	0.1	0.2	0.6	94	103	111	0.1	0.4	1.0	96	105	113
R28D	0.1	0.2	0.6	94	103	111	0.1	0.4	0.9	96	105	113
R31	0.1	0.3	0.7	95	104	112	0.2	0.4	1.1	97	106	114
R33	0.1	0.4	1.0	97	106	115	0.2	0.6	1.6	99	109	117
R34	0.1	0.3	0.7	95	104	112	0.1	0.4	1.1	97	106	114
R35	0.2	0.7	1.8	101	110	118	0.4	1.2	2.9	103	112	120
R36A	0.2	0.6	1.5	100	109	117	0.3	1.0	2.5	102	111	120
R36B	0.2	0.7	1.8	101	110	118	0.4	1.1	2.9	103	112	120
R37	0.2	0.7	1.7	101	110	118	0.4	1.1	2.8	103	112	120
R39	0.2	0.6	1.6	100	110	118	0.4	1.0	2.6	103	112	120
R40	0.2	0.6	1.6	100	110	118	0.4	1.0	2.6	102	112	120
R42	0.2	0.7	1.7	101	110	118	0.4	1.1	2.8	103	112	120
R43	0.1	0.2	0.5	93	102	111	0.1	0.3	0.9	95	105	113
R44	0.2	0.6	1.5	100	109	117	0.3	1.0	2.5	102	111	119
R45A	0.2	0.6	1.4	100	109	117	0.3	0.9	2.3	102	111	119
R45B	0.2	0.5	1.2	98	107	116	0.3	0.8	1.9	100	110	118
R46	0.2	0.6	1.4	100	109	117	0.3	0.9	2.3	102	111	119
R47	0.2	0.6	1.6	101	110	118	0.4	1.1	2.7	103	112	120
R48	0.1	0.3	0.8	96	105	113	0.2	0.5	1.2	98	107	115
R50	0.1	0.2	0.5	93	102	110	0.1	0.3	0.8	95	104	112
R58	0.0	0.1	0.3	90	99	107	0.1	0.2	0.5	92	101	109

Table 52 (Cont'd)
Predicted 50%, 5% and 0.1% Exceedance Ground Vibration and Airblast Overpressure Levels - Privately-owned Residences

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Residence ID/Place of Interest[1]	Typical Ore Blast (MIC 117kg)[4,5,6,7]						Typical Waste Rock Blast (MIC 216kg)[4,5,6,7]					
	Vibration (mm/s)[2]			Airblast (dBLpk)[3]			Vibration (mm/s)[2]			Airblast (dBLpk)[3]		
	50%	5%	0.1%	50%	5%	0.1%	50%	5%	0.1%	50%	5%	0.1%
Rural Residences (Cont'd)												
R60	0.1	0.2	0.4	91	101	109	0.1	0.3	0.7	94	103	111
R63	0.0	0.1	0.2	87	96	104	0.0	0.1	0.3	89	98	106
R68	0.1	0.2	0.4	92	101	109	0.1	0.3	0.7	94	103	111
R70	0.1	0.2	0.5	93	102	110	0.1	0.3	0.8	95	104	112
R73	0.1	0.3	0.7	95	104	112	0.1	0.4	1.1	97	106	114
R74	0.1	0.3	0.8	96	105	113	0.2	0.5	1.3	98	107	115
R75	0.1	0.3	0.7	95	104	112	0.1	0.4	1.1	97	106	114
R76	0.1	0.2	0.6	94	103	111	0.1	0.4	1.0	96	105	113
R80	0.1	0.2	0.4	92	101	109	0.1	0.3	0.7	94	103	111
R81	0.1	0.3	0.8	96	105	113	0.2	0.5	1.3	98	107	115
R82	0.1	0.4	0.9	97	106	114	0.2	0.6	1.5	99	108	116
R83	0.1	0.3	0.8	96	105	113	0.2	0.5	1.4	98	107	116
R84A	0.1	0.4	0.9	97	106	114	0.2	0.6	1.5	99	108	116
R84B	0.1	0.3	0.8	96	105	113	0.2	0.5	1.4	98	108	116
R85	0.1	0.4	1.0	97	106	114	0.2	0.6	1.6	99	108	116
R86	0.2	0.4	1.1	98	107	115	0.3	0.7	1.8	100	109	117
R87	0.2	0.5	1.3	99	108	116	0.3	0.8	2.1	101	110	118
R88	0.1	0.3	0.7	95	104	112	0.1	0.4	1.1	97	106	114
R89	0.1	0.3	0.7	95	104	112	0.2	0.5	1.2	97	106	115
R90	0.1	0.3	0.8	95	105	113	0.2	0.5	1.2	98	107	115
R91	0.1	0.3	0.6	94	104	112	0.1	0.4	1.1	97	106	114
R92B	0.1	0.2	0.4	91	100	108	0.1	0.3	0.6	93	102	110
R92E	0.1	0.4	1.0	97	106	114	0.2	0.6	1.6	99	109	117
R92F	0.1	0.4	0.9	97	106	114	0.2	0.6	1.5	99	108	116
R92G	0.1	0.4	0.9	97	106	114	0.2	0.6	1.5	99	108	116
R93A	0.2	0.4	1.1	98	107	115	0.2	0.7	1.8	100	109	117
R93B	0.2	0.4	1.1	98	107	115	0.3	0.7	1.8	100	109	117
R93C	0.1	0.4	1.0	97	106	114	0.2	0.6	1.6	99	109	117
R94A	0.2	0.5	1.2	99	108	116	0.3	0.8	2.0	101	110	118
R94B	0.2	0.5	1.2	99	108	116	0.3	0.8	2.0	101	110	118
R95	0.1	0.4	1.1	98	107	115	0.2	0.7	1.7	100	109	117
Lue Residences												
L1	0.2	0.6	1.6	100	109	118	0.4	1.0	1.0	102	112	120
L2	0.2	0.7	1.7	101	110	118	0.4	1.1	1.1	103	112	120
L3	0.2	0.5	1.2	99	108	116	0.3	0.8	0.8	101	110	118
L4	0.2	0.5	1.2	99	108	116	0.3	0.8	0.8	101	110	118
L5	0.2	0.5	1.3	99	108	116	0.3	0.8	0.8	101	110	118
L7	0.2	0.6	1.4	100	109	117	0.3	0.9	0.9	102	111	119
L8	0.2	0.6	1.4	99	109	117	0.3	0.9	0.9	102	111	119

Table 52 (Cont'd)

Predicted 50%, 5% and 0.1% Exceedance Ground Vibration and Airblast Overpressure Levels - Privately-owned Residences

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Residence ID/Place of Interest[1]	Typical Ore Blast (MIC 117kg)[4,5,6,7]						Typical Waste Rock Blast (MIC 216kg)[4,5,6,7]					
	Vibration (mm/s)[2]			Airblast (dBLpk)[3]			Vibration (mm/s)[2]			Airblast (dBLpk)[3]		
	50%	5%	0.1%	50%	5%	0.1%	50%	5%	0.1%	50%	5%	0.1%
Lue Residences (Cont'd)												
L9	0.2	0.6	1.4	100	109	117	0.3	0.9	0.9	102	111	119
L10	0.2	0.5	1.3	99	108	116	0.3	0.9	0.9	101	111	119
L12	0.2	0.5	1.3	99	108	116	0.3	0.8	0.8	101	110	118
L13	0.2	0.5	1.3	99	108	116	0.3	0.8	0.8	101	110	118
L15	0.2	0.5	1.3	99	108	116	0.3	0.8	0.8	101	110	118
L16	0.2	0.5	1.2	99	108	116	0.3	0.8	0.8	101	110	118
L17	0.2	0.5	1.2	99	108	116	0.3	0.8	0.8	101	110	118
L18	0.2	0.5	1.3	99	108	116	0.3	0.8	0.8	101	110	118
L19	0.2	0.5	1.2	99	108	116	0.3	0.8	0.8	101	110	118
L20	0.2	0.5	1.2	99	108	116	0.3	0.8	0.8	101	110	118
L21	0.2	0.5	1.2	99	108	116	0.3	0.8	0.8	101	110	118
L22	0.2	0.5	1.2	99	108	116	0.3	0.8	0.8	101	110	118
L23	0.2	0.5	1.2	99	108	116	0.3	0.8	0.8	101	110	118
L24	0.2	0.5	1.2	98	108	116	0.3	0.8	0.8	101	110	118
L25	0.2	0.5	1.2	99	108	116	0.3	0.8	0.8	101	110	118
L26	0.2	0.5	1.2	99	108	116	0.3	0.8	0.8	101	110	118
L27	0.2	0.5	1.2	99	108	116	0.3	0.8	0.8	101	110	118
L28A	0.2	0.5	1.2	98	108	116	0.3	0.8	0.8	101	110	118
L28B	0.2	0.5	1.1	98	107	115	0.3	0.7	0.7	100	109	118
L29	0.2	0.4	1.1	98	107	115	0.3	0.7	0.7	100	109	117
L30	0.1	0.4	1.1	98	107	115	0.2	0.7	0.7	100	109	117
L31	0.2	0.5	1.2	98	108	116	0.3	0.8	0.8	100	110	118
L32	0.2	0.5	1.2	98	107	115	0.3	0.7	0.7	100	110	118
L33	0.1	0.4	1.1	98	107	115	0.2	0.7	0.7	100	109	117
L34	0.2	0.4	1.1	98	107	115	0.3	0.7	0.7	100	109	117
L35	0.2	0.4	1.1	98	107	115	0.2	0.7	1.8	100	109	117
L37	0.2	0.4	1.1	98	107	115	0.2	0.7	1.8	100	109	117
L38	0.1	0.4	1.1	98	107	115	0.2	0.7	1.7	100	109	117
L39	0.1	0.4	1.1	98	107	115	0.2	0.7	1.7	100	109	117
L40	0.1	0.4	1.1	98	107	115	0.2	0.7	1.8	100	109	117
L41	0.1	0.4	1.1	98	107	115	0.2	0.7	1.7	100	109	117
L42	0.1	0.4	1.0	97	107	115	0.2	0.7	1.7	100	109	117
L43	0.1	0.4	1.0	97	106	114	0.2	0.6	1.6	99	108	117
L44	0.1	0.4	1.0	97	107	115	0.2	0.7	1.7	100	109	117
L45	0.1	0.4	1.0	97	106	115	0.2	0.6	1.6	99	109	117
L46	0.2	0.4	1.1	98	107	115	0.2	0.7	1.8	100	109	117
L47	0.1	0.4	1.0	98	107	115	0.2	0.7	1.7	100	109	117
L49	0.2	0.6	1.4	100	109	117	0.3	0.9	2.4	102	111	119
L50	0.2	0.6	1.4	100	109	117	0.3	0.9	2.3	102	111	119

Table 52 (Cont'd)
Predicted 50%, 5% and 0.1% Exceedance Ground Vibration and Airblast Overpressure Levels - Privately-owned Residences

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Residence ID/Place of Interest[1]	Typical Ore Blast (MIC 117kg)[4,5,6,7]						Typical Waste Rock Blast (MIC 216kg)[4,5,6,7]					
	Vibration (mm/s)[2]			Airblast (dBLpk)[3]			Vibration (mm/s)[2]			Airblast (dBLpk)[3]		
	50%	5%	0.1%	50%	5%	0.1%	50%	5%	0.1%	50%	5%	0.1%
Lue Place of Interest												
LPOI1 Rural Fire Brigade	0.2	0.5	1.4	99	109	117	0.3	0.9	2.2	101	111	119
LPOI2 Lue Pottery	0.1	0.4	1.1	98	107	115	0.2	0.7	1.8	100	109	117
LPOI3 Lue Public School	0.2	0.5	1.3	99	108	116	0.3	0.8	2.1	101	110	118
LPOI4 Lue Hall	0.2	0.6	1.4	100	109	117	0.3	0.9	2.3	102	111	119
LPOI5 Lue Railway Station Buildings	0.2	0.5	1.4	99	109	117	0.3	0.9	2.2	101	111	119

Note 1: See Land Ownership and Surrounding Residences (**Annexure 4**) and Land Ownership Details (**Annexure 5**).
Note 2: Vibration Velocity Peak Vector Sum (PVS) - (mm/s).
Note 3: Airblast overpressure Level Linear Peak - (dBLpk re 20µPa).
Note 4: Blast emission level complies with human comfort criteria (5% exceedance) of 5mm/s and 115dBLpk and maximum of 10mm/s and 120dBLpk.
Note 5: Blast emission level exceedance of 1 to 2mm/s or 1 to 2dB above the human comfort criteria (5% exceedance) of 5mm/s and 115dBLpk.
Note 6: Blast emission level exceedance of 3 to 5mm/s or 3 to 5dB above the human comfort criteria (5% exceedance) of 5mm/s and 115dBLpk.
Note 7: Blast emission level exceedance of > 5mm/s or > 5dB above the human comfort criteria (5% exceedance) of 5mm/s and 115dBLpk.
Note 8: Blast emission level exceedance of the human comfort criteria (maximum) of 10mm/s and 120dBLpk.

A summary of ground vibration and airblast overpressure level impacts at privately-owned residences in the vicinity of the Mine Site is presented in Section 10.6.

10.3.3 Project-related Receivers

Using the ground vibration and airblast overpressure site laws described above, blast emission levels were predicted at the nearest privately-owned residences and places of interest in the vicinity of the Mine Site assuming the blast was initiated at the closest point to each residence. The predicted (50%, 5% and 0.1% exceedance) ground vibration and airblast overpressure levels are presented in **Table 52** for a typical ore blast (MIC 117kg) and typical waste rock blast (MIC 216kg).

Using the ground vibration and airblast overpressure site laws described above, blast emission levels were predicted at the nearest project-related receivers in the vicinity of the Mine Site assuming the blast was initiated at the closest point to each receiver. The predicted (50%, 5% and 0.1% exceedance) ground vibration and airblast overpressure levels are presented in **Table 53** for a typical ore blast (MIC 117kg) and typical waste rock blast (MIC 216kg).

Table 53
Predicted 50%, 5% and 0.1% Exceedance Ground Vibration and Airblast Overpressure Levels - Project-related Receivers

Residence ID[1,9]	Typical Ore Blast (MIC 117kg)[4,5,6,7,8]						Typical Waste Rock Blast (MIC 216kg)[4,5,6,7,8]					
	Vibration (mm/s)[2]			Airblast (dBLpk)[3]			Vibration (mm/s)[2]			Airblast (dBLpk)[3]		
	50%	5%	0.1%	50%	5%	0.1%	50%	5%	0.1%	50%	5%	0.1%
Project-related Receivers												
R1A	3.8	11.0	27.8	119	128	136	6.3	18.0	45.4	121	130	138
R1B	0.7	2.0	4.9	108	117	125	1.1	3.2	8.1	110	119	127
R1G	0.7	1.9	4.7	107	117	125	1.1	3.1	7.7	110	119	127
R1H	0.3	0.9	2.2	102	112	120	0.5	1.4	3.6	105	114	122
R1I	0.2	0.6	1.5	100	109	117	0.3	1.0	2.5	102	111	119
R1J	0.4	1.2	3.0	105	114	122	0.7	2.0	4.9	107	116	124
R1K	0.3	1.0	2.4	103	112	120	0.5	1.6	4.0	105	114	122
R1L	0.2	0.5	1.2	98	107	115	0.3	0.7	1.9	100	110	118
R1M	0.2	0.4	1.1	98	107	115	0.3	0.7	1.8	100	109	117
R1N	0.1	0.4	1.0	97	106	114	0.2	0.6	1.6	99	109	117
R1O	0.1	0.3	0.7	95	104	112	0.2	0.5	1.1	97	106	114
R1P	1.2	3.3	8.4	111	120	128	1.9	5.5	13.8	113	123	131
R1Q	0.4	1.2	3.1	105	114	122	0.7	2.0	5.0	107	116	124
L1R	0.2	0.6	1.4	100	109	117	0.3	0.9	2.3	102	111	119
R10	0.9	2.7	6.9	110	119	127	1.5	4.4	11.2	112	121	129

Note 1: See Land Ownership and Surrounding Residences (**Annexure 4**) and Land Ownership Details (**Annexure 5**).
Note 2: Vibration Velocity Peak Vector Sum (PVS) - (mm/s).
Note 3: Airblast overpressure Level Linear Peak - (dBLpk re 20µPa).
Note 4: Blast emission level complies with human comfort criteria (5% exceedance) of 5 mm/s and 115dBLpk and maximum of 10mm/s and 120dBLpk.
Note 5: Blast emission level exceedance of 1 to 2mm/s or 1 to 2dB above the human comfort criteria (5% exceedance) of 5mm/s and 115dBLpk.
Note 6: Blast emission level exceedance of 3 to 5mm/s or 3 to 5dB above the human comfort criteria (5% exceedance) of 5mm/s and 115dBLpk.
Note 7: Blast emission level exceedance of > 5mm/s or > 5dB above the human comfort criteria (5% exceedance) of 5mm/s and 115dBLpk.
Note 8: Blast emission level exceedance of the human comfort criteria (maximum) of 10mm/s and 120dBLpk.
Note 9: Residences R1C, R1D, R1E and R1F have been excluded as these residences would be demolished.

A summary of ground vibration and airblast overpressure level impacts at project-related receivers is presented in Section 10.6.

10.4 GENERALISED SAFE WORKING DISTANCES

The generalised predicted ground vibration level (5% likelihood of exceedance) safe working distances from typical ore (MIC 117kg) and typical waste rock (MIC 216kg) blast designs for heritage, infrastructure and geological structures (if any) are presented in **Table 54**.

Table 54
Heritage, Infrastructure and Geological Structures Ground Vibration Safe Working Distances

Blast MIC	Buildings including Sensitive/ Heritage Vibration[1] 12.5mm/s	500kV Power Transmission Line Vibration[1] 50mm/s	Roadway (Culvert) Vibration[1] 80mm/s	Railway (Line) Vibration[1] 100mm/s	Archaeological/ Geological Structure Vibration[1] 250mm/s
Typical Ore Blast					
117kg	351m (5%)	148m (5%)	110m (5%)	96m (5%)	54m (5%)
Typical Waste Rock Blast					
216kg	477m (5%)	201m (5%)	150m (5%)	130m (5%)	73m (5%)
Note 1: The distance from blast site to where the ground vibration level is predicted to meet the relevant damage criteria.					

The generalised predicted ground vibration and airblast overpressure level (5% likelihood of exceedance) safe working distances from typical ore (MIC 117kg) and typical waste rock (MIC 216kg) blast designs for residential (human comfort) and livestock disturbance are presented in **Table 55**.

Table 55
Human Comfort and Livestock Ground Vibration and Airblast Overpressure Level Safe Working Distances

Blast MIC	Residential Vibration[1] 5mm/s	Residential Airblast[1] 115 dBLpk	Stockyard Livestock Vibration[2] 200mm/s	Stockyard Livestock Airblast[2] 125dBLpk
Typical Ore Blast				
117kg	622m (5%)	1340m (5%)	62m (5%)	514m (5%)
Typical Waste Rock Blast				
216kg	846m (5%)	1645m (5%)	84m (5%)	630m (5%)
Note 1: The distance from blast to where the ground vibration or airblast overpressure is predicted to meet the relevant human comfort criteria.				
Note 2: The distance from blast to where the ground vibration or airblast overpressure is predicted to meet the relevant livestock disturbance criteria.				

10.5 FLYROCK IMPACT ASSESSMENT

Flyrock is any solid material ejected from beyond the designed blast envelope at a blast site by the force of the blast.

There are generally two areas within the blast from which flyrock has the potential to be produced. These are at the blasthole collar (where the stemming length has not been optimised and the explosive column is too close to the upper surface of the rock mass creating crater effects - rifling) and at the face of the blast (where there could be less than optimum burden on a blasthole in the front row of a blast whereby the explosives gases are able to vent to atmosphere - blowouts, producing flyrock). Flyrock would be managed through appropriate blast design in order to avoid flyrock risk to the public using Pyangle Road or at nearby (project-related) residences. Pyangle Road is located to the south of the Mine Site and approximately 1,150m from the nearest point in any open cut pit.

In terms of collar ejection, the proposed stemming length of 1.9m to 2.0m (**Table 51**) is considered acceptable for the proposed blasthole lengths and has been selected in order to safely contain the explosives and separate them from the collar of the blasthole. Aggregate would be used as the stemming material to contain the explosives within the blasthole. The closest privately-owned land used for grazing is approximately 1km from the closest edge of the satellite pit east.

Burden on the front-row of blastholes would be checked in order to identify any areas of less than optimum burden and, if required, inert material (rather than explosives) would be placed at this location in the blasthole. In general, blasting should result in either no flyrock or limited flyrock within approximately 100m from the blast site. This is particularly appropriate for the blasts undertaken within the open cut pits within the Mine Site as the emphasis of the blast design would be upon in situ fragmentation of the rock rather than heaving the rock away from the point of blasting, i.e. a common practice in coal mines and quarries.

The NSW Resources Regulator and the Roads and Maritime Services (RMS) has previously permitted open cut blasting to be carried-out at distances of 500m (or greater) without the need for road closure, and hence it is not expected that any management measures for Pyangle Road would be required for blasting within the nominated open cut pits.

Notwithstanding, potential flyrock impacts would be managed in accordance with the Bowdens Silver Blast Management Plan (BMP) at project-related receivers to address the management of any resident or livestock safety in proximity to Mine Site boundary.

10.6 BLASTING IMPACT SUMMARY

Table 56 presents a summary of privately-owned residences with predicted exceedances of the ground vibration and airblast overpressure human comfort criteria (i.e. 5mm/s and 115dBLpk respectively) and maximum human comfort criteria (i.e. 10mm/s and 120dBLpk respectively), which are further described below.

Table 56
Privately-owned Residences with Human Comfort Criteria 5% and 0.1% Exceedances

Page 1 of 2

Receiver Area[1]	Ground Vibration or Airblast Exceedance[2,3,4]	5% Exceedance		0.1% Exceedance		Maximum Exceedance in Any Blast
		Typical Ore Blast (MIC 117kg)	Typical Waste Rock Blast (MIC 216kg)	Typical Ore Blast (MIC 117kg)	Typical Waste Rock Blast (MIC 216kg)	
Privately-owned Residences[1]						
Rural Residences	1 to 2mm/s; or 1 to 2dB	R7	R4	R12	-	-
	3 to 5mm/s; or 3 to 5dB	-	R7	R4, R7	R4, R12	R4, R12
	> 5mm/s; or > 5dB	-	-	-	R7-	R7-

Table 56 (Cont'd)
Privately-owned Residences with Human Comfort Criteria 5% and 0.1% Exceedances

Page 2 of 2

Receiver Area[1]	Ground Vibration or Airblast Exceedance[2,3,4]	5% Exceedance Typical Ore Blast (MIC 117kg)	5% Exceedance Typical Waste Rock Blast (MIC 216kg)	0.1% Exceedance Typical Ore Blast (MIC 117kg)	0.1% Exceedance Typical Waste Rock Blast (MIC 216kg)	Maximum Exceedance in Any Blast
Privately-owned Residences[1] (Cont'd)						
Lue Residences	1 to 2mm/s; or 1 to 2dB	-	-	-	-	-
	3 to 5mm/s; or 3 to 5dB	-	-	-	-	-
	> 5mm/s; or > 5dB	-	-	-	-	-
Lue Place of Interest	1 to 2mm/s; or 1 to 2dB	-	-	-	-	-
	3 to 5mm/s; or 3 to 5dB	-	-	-	-	-
	> 5mm/s; or > 5dB	-	-	-	-	-

Note 1: See Land Ownership and Surrounding Residences (**Annexure 4**) and Land Ownership Details (**Annexure 5**).
Note 2: Vibration Velocity Peak Vector Sum (PVS) - (mm/s).
Note 3: Airblast overpressure Level Linear Peak - (dBLpk re 20µPa).
Note 4: Predicted human comfort criteria exceedances of ground vibration 5mm/s or airblast overpressure 115dBLpk.

The predicted blast emission impacts at both privately-owned residences and project-related receivers in the vicinity of the Mine Site are summarised below.

Operational Blast Emission Levels at Privately-owned Rural Residences:

- For typical ore (MIC 117kg) and typical waste rock (MIC 216kg) blast designs, compliance is predicted with the ground vibration human and airblast overpressure comfort criteria of 5mm/s and 115dBLpk respectively at all rural residences except at two of the nearest privately-owned residences namely: R4 and R7;
- For typical ore (MIC 117kg) blast design airblast overpressure is predicted to exceed the human comfort criterion of 115dBLpk at one of the nearest privately-owned residence namely: R7, while complying with the ground vibration criterion of 5mm/s;
- For typical waste rock (MIC 216kg) blast design airblast overpressure is predicted to exceed the human comfort criterion of 115dBLpk at two of the privately-owned nearest residences namely: R4 and R7 while complying with the ground vibration criterion of 5mm/s; and
- For typical ore (MIC 117kg) and typical waste rock (MIC 216kg) blast designs, compliance is predicted with the ground vibration and airblast overpressure human comfort criteria of 5mm/s and 115dBLpk respectively at residence R12. However, the maximum airblast overpressure is predicted to exceed the maximum human comfort criteria of 120dBLpk at residence R12.

Operational Blast Emission Levels Privately-owned Lue Residences:

- For typical ore (MIC 117kg) and typical waste rock (MIC 216kg) blast designs comply with the human comfort criteria of 5mm/s and 115dBLpk at all Lue residences.

Operational Blast Emission Levels at Lue Places of Interest:

- For typical ore (MIC 117kg) and typical waste rock (MIC 216kg) blast designs comply with the human comfort criteria of 5mm/s and 115dBLpk at LPOI3 Lue Public School; LPOI1 Rural Fire Brigade; LPOI2 Lue Pottery; LPOI4 Lue Hall; and LPOI5 Lue Railway Station.

Operational Blast Emission Levels at Project-related Receivers

- Are likely to exceed the relevant human comfort criteria of 5mm/s and 115dBLpk at multiple receivers as the majority of these are located in close proximity to the Mine Site. Impacts upon occupants of dwellings (if any) would be managed in accordance with the requirements of the BMP.

Livestock Airblast Overpressure Level Safe Working Distances

- The predicted airblast overpressure levels from typical blast designs indicate that livestock disturbance is most unlikely to occur at distances greater than 514m for ore blasts (MIC 117kg), and 630m for waste rock blasts (MIC 216kg).

Archaeological/Geological Structure Ground Vibration Level Safe Working Distances

- The predicted ground vibration levels from typical blast designs indicate that archaeological/geological structures are unlikely to be damaged at distances greater than 54m for ore blasts (MIC 117kg), and 73m for waste rock blasts (MIC 216kg).

10.7 BLASTING NOISE AND VIBRATION MITIGATION AND MANAGEMENT

Ground vibration and airblast overpressure levels would be managed by Bowdens Silver in accordance with an approved Blast Management Plan (BMP) to ensure that ground vibration and potential blast emission impacts are minimised. The BMP for the Project would include detailed methodologies and procedures in relation to the following:

- Planning and commissioning of an appropriately qualified engineer to undertake an inspection of the structural integrity of the residences and other relevant structures within 2km of the proposed open cut pits;
- Consultation and liaison with the surrounding landowners to establish the most appropriate manner in which they can notify each landowner regarding the dates and times of blasts within the Mine Site;

- A permanent blast monitoring system (minimum of two locations) being representative of rural residences and residences in Lue and capable of identifying noise and vibration from the Project (as distinct from extraneous noise and vibration) and provide real-time information to mine management; and
- A programme of blast emissions analysis and the establishment and maintenance of ground vibration and airblast overpressure site-laws for the Mine Site to enable key blast design parameters to be modified and ensure compliance with the criteria. Bowdens Silver would review and update, if necessary, the ground vibration and airblast overpressure site-law components of the BMP on an annual basis to reflect the experience and results of the monitoring undertaken during the preceding 12 months.

11. TRAFFIC NOISE AND VIBRATION IMPACT ASSESSMENT

11.1 TRAFFIC NOISE ASSESSMENT CRITERIA

The NSW Road Noise Policy (DECCW, 2011) and associated Application Notes dated 12 June 2013 is the relevant policy for the assessment of road traffic noise in NSW. The RNP classification scheme for assessing noise impacts on an existing and new road network from additional traffic generated by the Project as presented in **Table 57**.

Table 57
Road Traffic Noise Criteria for Residential and Non-Residential Land Uses (dB(A) re 20 µPa)

Road	Project Type and Land Use	Total Traffic Noise Criteria[1,2,5]	Relative Increase Criterion[1,2,3,4]
Residential Land Use			
Lue Road is a sub-arterial road in accordance with the RNP Table 2	Land use developments generating additional traffic on existing sub-arterial roads	Day-time 60 $L_{Aeq(15hour)}$	Existing $L_{Aeq(15hour)}$ plus 12dB(A)
		Night-time 55 $L_{Aeq(9hour)}$	Existing $L_{Aeq(9hour)}$ plus 12dB(A)
Relocated Maloneys Road is a principal haulage route in accordance with RNP Section 2.2.2	Existing residences affected by noise from new local road corridors used as a 'principal haulage route'.	Day-time 55 $L_{Aeq(15hour)}$	Existing $L_{Aeq(15hour)}$ plus 12dB(A)
		Night-time 50 $L_{Aeq(9hour)}$	Existing $L_{Aeq(9hour)}$ plus 12dB(A)
Pyangle Road is a local road in accordance with the RNP Table 2	Land use developments generating additional traffic on existing local roads	Day-time 55 $L_{Aeq(1hour)}$	Not Applicable
		Night-time 50 $L_{Aeq(1hour)}$	
Non-Residential Land Use			
Lue Road	School Classrooms	50 $L_{Aeq(1hour)}$ (external) when in use[6]	Not Applicable

Note 1: L_{Aeq} = equivalent continuous noise level.
Note 2: Day-time 7:00am to 10:00pm, Night-time 10:00pm to 7:00am.
Note 3: "Existing" is the projected base (i.e. non-Project-related) traffic noise levels
Note 4: Relative increase noise level generated by the Project for comparison with the Criteria.
Note 5: Where the total traffic criteria are already exceeded, then limit any increase to 2dB(A) or less.
Note 6: External criteria equivalent to internal 40 $L_{Aeq(1hour)}$ criteria plus 10dB(A).

The Total Traffic Noise Criteria sets out assessment criteria to be applied to a particular type of road category and land use. Where the Total Traffic Noise Criteria is already exceeded due to projected base traffic, any increase in noise levels due to the Project should be limited to 2dB above the existing projected base traffic level.

The Relative Increase Criterion of the existing $L_{Aeq(N)}$ plus 12dB(A) is primarily intended to protect quiet areas from excessive changes in amenity due to additional traffic generated by the Project on the existing and/or new road network. The 'existing' level refers to existing projected base road traffic noise levels, and where this is found to be less than 30dB(A), it is set to 30dB(A) for the purposes of assessing the level of relative increase due to the Project.

In relation to situations where exceedances of the road traffic noise assessment criteria are predicted, the RNP Section 3.4 relevantly provides:

> *Where existing traffic noise levels are above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet the assessment criteria. A secondary objective is to protect against excessive decreases in amenity as the result of a project by applying the relative increase criteria.*
>
> *In assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.*
>
> *… For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'.*

11.2 TRAFFIC NOISE ASSESSMENT PROCEDURE

The RNP describes a number of process steps for applying the criteria. In general accordance with these steps, this assessment has:

- Identified a Study Area to include approximately a 7km section of Lue Road in the vicinity of Lue between the relocated Maloneys Road and Pyangle Road, the relocated Maloneys Road south of the mine access road and Pyangle Road. The nearest residences and, where applicable, other noise sensitive receivers within the Study Area have been identified in **Table 58**;

Table 58
Nearest Privately-owned Residences and Sensitive Receivers to Study Area Road Network

Residence ID/ Place of Interest[1]	Approximate Distance to Road Centre (m)	Residence ID/ Place of Interest[1]	Approximate Distance to Road Centre (m)
Lue Road - Lue		**Pyangle Road**	
L10	13	R7	39
LPOI3 - Lue Public School	34		
Lue Road - East of Relocated Maloneys Road and West of Lue		**Lue Road - East of Lue and West of Pyangle Road**	
R90	50	R94	39
Lue Road - West of Relocated Maloneys Road		**Relocated Maloneys Road**	
R92B	30	R88	180
Lue Road East of Pyangle Road			
R40	24		
R39	18		
Note 1: See Land Ownership and Surrounding Residences (**Annexure 4**) and Land Ownership Details (**Annexure 5**).			

- Tabulated road traffic flows within the Study Area, due to the projected baseline traffic and including the additional traffic from the Project during construction prior to the opening of the relocated Maloneys Road, Project traffic during the latter stages of the site establishment and construction stage Scenario 1 (Year 0) and Project operational traffic Scenario 2 (Year 3);
- Calculated traffic noise levels (based on measured existing traffic noise levels) due to the projected base traffic and the additional traffic from the Project during construction prior to the opening of the relocated Maloneys Road, Project traffic during the latter stages of the site establishment and construction stage Scenario 1 (Year 0) and Project operational traffic Scenario 2 (Year 3) for comparison with the relevant criteria; and
- The calculated traffic noise levels are based on the methodology endorsed by the US Environmental Protection Agency Report 550/9-74-004 dated March 1974, but including modifications based on equations in Appendix A-13 and certain amendments recommended in the UK Calculation of Road Traffic Noise (CORTN). The prediction methodology is generally conservative and takes into account vehicle volume, speed, type, pass-by duration and facade reflection and assumes no intervening barriers or topography with all receivers having a full angle of view to the road.

The RNP recommends that noise from vehicles travelling on private roads associated with the Project should be assessed as an industrial noise source under the NPfI (rather than road traffic). Conservatively, road traffic between the TSF embankment access road and the mine access road has been included as part of the operation noise impact assessment (**Sections 7** and **8**).

The existing and Project-related traffic flows on the road network within the Study Area are provided in **Table 59**.

Table 59
Projected Base, Project-related and Total Road Traffic Flows

Road and Representative Receiver Locations	Time Period[1]	Base Traffic Flows		Project Traffic Flows		Total Traffic Flows	
		Light Vehicles	Heavy Vehicles	Light Vehicles	Heavy Vehicles	Light Vehicles	Heavy Vehicles
Construction Months 1 to 6[4]							
Lue Road - West of Pyangle Road, East of Relocated Maloneys Road Receivers: L10, LPOI3, R90, R94	Daytime	739	37	56	11	795	48
	Night-time	76	5	30	1	106	6
	Daytime - Peak Hour (10:00am-11:00am)[1]	52	3	0	2	52	5
Lue Road - East of Pyangle Road Receivers: R40, R39	Daytime	607	35	30	5	637	40
	Night-time	58	4	16	1	74	5
Lue Road - West of Relocated Maloneys Road Receivers: R92B	Daytime	653	83	56	11	709	94
	Night-time	67	10	30	1	97	11
Pyangle Road Receivers: R7	Daytime - Peak Hour (6:00pm-7:00pm)[2]	1	0	46	2	47	2
	Night - Peak Hour (6:00am-7:00am)[2]	1	0	46	2	47	2

Table 59 (Cont'd)
Projected Base, Project-related and Total Road Traffic Flows

Page 2 of 2

Road and Representative Receiver Locations	Time Period[1]	Base Traffic Flows		Project Traffic Flows		Total Traffic Flows	
		Light Vehicles	Heavy Vehicles	Light Vehicles	Heavy Vehicles	Light Vehicles	Heavy Vehicles
Site Establishment and Construction Phase (Months 7-18) [4]							
Lue Road - West of Pyangle Road, East of relocated Maloneys Road Receivers: L10, LPOI3, R90, R94	Daytime	739	37	54	5	793	42
	Night-time	76	5	28	1	104	6
	Daytime - Peak Hour (12:00pm-1:00pm)[1]	49	3	0	1	49	4
Lue Road - East of Pyangle Road Receivers: R40, R39	Daytime	607	35	30	5	637	40
	Night-time	58	4	16	1	74	5
Lue Road - West of relocated Maloneys Road Receivers: R92B	Daytime	653	83	78	14	731	97
	Night-time	67	10	52	2	119	12
Relocated Maloneys Road Receivers: R88	Daytime	15	1	80	19	95	20
	Night-time	1	0	80	3	81	3
Scenario 2 (Year 3)[5]							
Lue Road - West of Pyangle Road, East of relocated Maloneys Road Receivers: L10, LPOI3, R90, R94	Daytime	784	40	55	10	839	50
	Night-time	80	5	13	4	93	9
	Daytime - Peak Hour (1:00pm-2:00pm)[1]	52	2	1	1	53	3
Lue Road - East of Pyangle Road Receivers: R40, R39	Daytime	644	37	43	10	687	47
	Night-time	61	5	13	4	74	9
Lue Road West of relocated Maloneys Road Receivers: R92B	Daytime	693	88	73	18	766	106
	Night-time	71	10	17	4	88	14
Relocated Maloneys Road Receivers: R88	Daytime	16	1	76	28	92	29
	Night-time	1	0	30	8	31	8

Note 1: Day-time 7:00am to 10:00pm, Night-time 10:00pm to 7:00am.
Note 1: Base traffic flow coinciding with peak hourly project-related traffic movements during school hours.
Note 2: Base traffic flow coinciding with peak hourly project-related traffic movements.
Note 4: Assumes projected baseline traffic growth at 2021.
Note 5: Assumes projected baseline traffic growth at 2024.

11.3 TRAFFIC NOISE ASSESSMENT CONSTRUCTION MONTHS 1 TO 6

The traffic noise assessment for construction months 1 to 6 at the nearest residential locations and sensitive receivers within the Study Area is presented in **Table 60**.

Table 60
Traffic Noise Levels Construction Months 1 to 6 (dB(A) re 20 µPa)

Residence ID/ Place of Interest[1]	Period and Descriptor	Base Traffic Noise Level	Total Traffic Noise Level	Project-related Traffic Noise Level Increase	Assessment Criteria
Lue Road					
L10	Day - $L_{Aeq(15hour)}$	56	57	0.7	60
	Night - $L_{Aeq(9hour)}$	49	50	1.1	55
R90	Day - $L_{Aeq(15hour)}$	50	51	0.6	60
	Night - $L_{Aeq(9hour)}$	43	44	1.2	55
R92B	Day - $L_{Aeq(15hour)}$	55	55	0.5	60
	Night - $L_{Aeq(9hour)}$	47	48	1.0	55
R94	Day - $L_{Aeq(15hour)}$	52	53	0.6	60
	Night - $L_{Aeq(9hour)}$	45	46	1.2	55
R40	Day - $L_{Aeq(15hour)}$	54	55	0.3	60
	Night - $L_{Aeq(9hour)}$	47	48	1.0	55
LPOI3 Lue Public School	Day - $L_{Aeq(1hour)}$ (when in use)	52	53	1.3	50
Pyangle Road					
R7	Day - $L_{Aeq(1hour)}$	31	50	-	55
	Night - $L_{Aeq(1hour)}$	31	50	-	50
Corner of Lue Road and Pyangle Road[2]					
R39	Day - $L_{Aeq(15hour)}$	54	56	1.4	60
	Night - $L_{Aeq(9hour)}$	47	50	2.6	55

Note 1: See Land Ownership and Surrounding Residences (**Annexure 4**) and Land Ownership Details (**Annexure 5**).
Note 2: Inclusive of Lue Road and Pyangle Road..
Note 3: Traffic noise level complies with relevant day-time and night-time assessment criteria (**Table 57**).
Note 4: Traffic noise level marginal exceedance of 1 to 2dB(A) above the relevant day-time and night-time assessment criteria (**Table 57**).
Note 5: Traffic noise level moderate exceedance of 3 to 5dB(A) above the relevant day-time and night-time assessment criteria (**Table 57**).

11.3.1 Lue Road

Total traffic noise levels comply with the day-time 60 $L_{Aeq(15hour)}$ and night-time 55 $L_{Aeq(9hour)}$ assessment criteria at all residential locations. The maximum Project-related increase to the total traffic noise level is 1.2dB(A), therefore less than 2dB(A), and well below the relative increase criterion of 12dB(A).

Total traffic noise level at LPOI3 Lue Primary School from the (projected 2021) base traffic is 52 $L_{Aeq(1hour)}$ and marginally 2dB(A) above the equivalent external 50 $L_{Aeq(1hour)}$ assessment criteria. The (projected 2021) total traffic (including the Project related traffic) is 53 $L_{Aeq(1hour)}$ and moderately 3dB(A) above the equivalent external 50 $L_{Aeq(1hour)}$ assessment criteria.

The Project-related increase to the total traffic noise level at LPOI3 Lue Primary School is 1.3dB(A), and therefore less than 2dB(A). In accordance with the RNP, an increase of less than 2dB(A) represents a minor impact that is considered barely perceptible and investigation of noise mitigation measures is not warranted in accordance with the policy.

11.3.2 Pyangle Road

Total traffic noise levels comply with the day-time 55 $L_{Aeq(1hour)}$ and night-time 50 $L_{Aeq(1hour)}$ assessment criteria at the nearest residential location R7.

11.3.3 Corner of Lue Road and Pyangle Road

Total traffic noise levels comply with the day-time 60 $L_{Aeq(15hour)}$ and night-time 55 $L_{Aeq(9hour)}$ assessment criteria at the nearest Location R39. Project related traffic entering and exiting from Lue Road onto Pyangle Road could potentially lead to increased noise from acceleration and braking. However due to the relatively small volume of Project related traffic entering and exiting from Pyangle road (in comparison to existing traffic flows on Lue Road) the increased noise due to intersection operations is unlikely to be appreciable.

11.4 TRAFFIC NOISE ASSESSMENT SITE ESTABLISHMENT AND CONSTRUCTION STAGE (MONTHS 7 TO 18)

The traffic noise assessment for the site establishment and construction stage months 7 to 18 following the opening of the relocated Maloneys Road at the nearest residential locations and sensitive receivers within the Study Area is presented in **Table 61**.

Table 61
Traffic Noise Levels Site Establishment & Construction Stage (Months 7 to 18) (dB(A) re 20 µPa)

Residence ID/Place of Interest[1]	Period and Descriptor	Base Traffic Noise Level	Total Traffic Noise Level	Project-related Traffic Noise Level Increase	Assessment Criteria
Lue Road					
L10	Day - $L_{Aeq(15hour)}$	56	57	0.4	60
	Night - $L_{Aeq(9hour)}$	49	50	1.7	55
R90	Day - $L_{Aeq(15hour)}$	50	51	0.4	60
	Night - $L_{Aeq(9hour)}$	43	44	1.2	55
R92B	Day - $L_{Aeq(15hour)}$	55	55	0.6	60
	Night - $L_{Aeq(9hour)}$	47	49	1.6	55
R94	Day - $L_{Aeq(15hour)}$	52	52	0.4	60
	Night - $L_{Aeq(9hour)}$	45	46	1.2	55
R40	Day - $L_{Aeq(15hour)}$	54	55	0.3	60
	Night - $L_{Aeq(9hour)}$	47	48	1.0	55
LPOI3 Lue Public School	Day - $L_{Aeq(1hour)}$ (when in use)	51	52	0.7	50
Relocated Maloneys Road					
R88	Day - $L_{Aeq(15hour)}$	43[2]	44	0.9	55
	Night - $L_{Aeq(9hour)}$	35[2]	38	2.4	50

See Land Ownership and Surrounding Residences (**Annexure 4**) and Land Ownership Details (**Annexure 5**).
Existing road traffic noise prior to opening of Relocated Maloneys Road.
Traffic noise level complies with relevant day-time and night-time assessment criteria (**Table 57**).
Traffic noise level marginal exceedance of 1 to 2dB(A) above the relevant day-time and night-time assessment criteria (**Table 57**).

11.4.1 Lue Road

Total traffic noise levels comply with the day-time 60 $L_{Aeq(15hour)}$ and night-time 55 $L_{Aeq(9hour)}$ assessment criteria at all residential locations. The maximum Project related increase to the total traffic noise level is 1.7dB(A), therefore less than 2dB(A), and well below the relative increase criterion of 12dB(A).

Total traffic noise level at LPOI3 Lue Primary School from the (projected 2021) base traffic is 51 $L_{Aeq(1hour)}$ and marginally 1dB(A) above the equivalent external 50 $L_{Aeq(1hour)}$ assessment criteria. The (projected 2021) total traffic (including the Project related traffic) is 52 $L_{Aeq(1hour)}$ and marginally 2dB(A) above the equivalent external 50 $L_{Aeq(1hour)}$ noise assessment criteria.

The Project-related increase to the total traffic noise level at LPOI3 Lue Primary School is 0.7dB(A) (compared with 1.3dB(A) during the first 6 months), and therefore less than 2dB(A). In accordance with the RNP, an increase of less than 2dB(A) represents a minor impact that is considered barely perceptible and investigation of noise mitigation measures is not warranted in accordance with the policy.

11.4.2 Relocated Maloneys Road

Total traffic noise levels comply with the day-time 55 $L_{Aeq(15hour)}$ and night-time 50 $L_{Aeq(9hour)}$ assessment criteria at nearest residential location R88. The Project related increase to the total traffic noise on the relocated Maloneys Road is 2.4dB(A), and well below the relative increase criterion of 12dB(A).

11.5 TRAFFIC NOISE ASSESSMENT OPERATIONAL SCENARIO 2 (YEAR 3)

The traffic noise assessment for the operational Scenario 2 (Year 3) at the nearest residential locations and sensitive receivers within the Study Area is presented in **Table 62**.

11.5.1 Lue Road

Total traffic noise levels comply with the day-time 60 $L_{Aeq(15hour)}$ and night-time 55 $L_{Aeq(9hour)}$ assessment criteria at all residential locations. The maximum Project related increase to the total traffic noise level is 1.7dB(A), therefore less than 2dB(A), and well below the relative increase criterion of 12dB(A).

Total traffic noise level at LPOI3 Lue Primary School from the (projected 2024) base traffic is 51 $L_{Aeq(1hour)}$ and marginally 1dB(A) above the equivalent external 50 $L_{Aeq(1hour)}$ assessment criteria. The (projected 2024) total traffic (including the Project related traffic) is 52 $L_{Aeq(1hour)}$ and marginally 2dB(A) above the equivalent external 50 $L_{Aeq(1hour)}$ noise assessment criteria.

The Project-related increase to the total traffic noise level at LPOI3 Lue Primary School is 0.8dB(A), and therefore less than 2dB(A). In accordance with the RNP, an increase of less than 2dB(A) represents a minor impact that is considered barely perceptible and investigation of noise mitigation measures is not warranted in accordance with the policy.

Table 62
Traffic Noise Levels Operational Scenario 2 (Year 3) (dB(A) re 20 µPa)

Residence ID/Place of Interest[1]	Period and Descriptor	Base Traffic Noise Level	Total Traffic Noise Level	Project-related Traffic Noise Level Increase	Assessment Criteria
Lue Road					
L10	Day - LAeq(15hour)	57	57	0.6	60
	Night - LAeq(9hour)	49	51	1.7	55
R90	Day - LAeq(15hour)	51	51	0.5	60
	Night - LAeq(9hour)	43	45	1.4	55
R92B	Day - LAeq(15hour)	55	56	0.6	60
	Night - LAeq(9hour)	48	49	1.2	55
R94	Day - LAeq(15hour)	52	53	0.5	60
	Night - LAeq(9hour)	45	46	1.4	55
R40	Day - LAeq(15hour)	55	55	0.6	60
	Night - LAeq(9hour)	47	49	1.6	55
LPOI3 Lue Public School	Day - LAeq(1hour) (when in use)	51	52	0.8	50
Relocated Maloneys Road					
R88	Day - LAeq(15hour)	43[2]	44	1.0	55
	Night - LAeq(9hour)	36[2]	38	2.3	50

Note 1: See Land Ownership and Surrounding Residences (**Annexure 4**) and Land Ownership Details (**Annexure 5**).
Note 2: Existing road traffic noise prior to opening of Relocated Maloneys Road.
Note 3: Traffic noise level complies with relevant day-time and night-time assessment criteria (**Table 57**).
Note 4: Traffic noise level marginal exceedance of 1 to 2dB(A) above the relevant day-time and night-time assessment criteria (**Table 57**).
Note 5: Traffic noise level moderate exceedance of 3 to 5dB(A) above the relevant day-time and night-time assessment criteria (**Table 57**).

11.5.2 Relocated Maloneys Road

Total traffic noise levels comply with the day-time 55 LAeq(15hour) and night-time 50 LAeq(9hour) assessment criteria at nearest residential location R88. The Project related increase to the total traffic noise on the relocated Maloneys Road is 2.3dB(A), and well below the relative increase criterion of 12dB(A).

11.6 TRAFFIC VIBRATION IMPACT ASSESSMENT

11.6.1 Traffic Vibration Assessment Criteria

The DEC's guideline interim guideline *Assessing Vibration: A Technical Guideline* dated February 2006 is based on the information set out in British Standard 6472-1992 "Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz)". This standard defines building vibration velocity levels associated with a "low probability of adverse comment" from occupants. The applicable vibration velocity levels for continuous day-time and night-time activities are shown in **Table 63**.

Table 63
Continuous Vibration Velocity Levels Annoyance Risk Criteria

Receiver Area	Day-time Annoyance Risk[1] (mm/s)		Night-time Annoyance Risk[1] (mm/s)	
	Horizontal	Vertical	Horizontal	Vertical
Residences	1.2	0.45	0.6	0.2
Commercial/Offices	1.6	0.6	1.6	0.6
Industrial/Workshops	3.2	1.2	3.2	1.2
Note 1: BS6472-1992 "Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz)".				

11.6.2 Traffic Vibration Impact Assessment Summary

The nominal offset distances to residences to comply with the annoyance risk criteria on public roads from 60t capacity heavy vehicle movements are presented in **Table 64** based on heavy vehicle vibration level contained in the Transportation Noise Reference Book (Nelson, 1987). As the vertical criterion is equal or lower than the horizontal criterion in all cases, then the vertical criterion is the controlling criterion.

Table 64
Nominal Offset Distances to Residences to Comply with Vibration Annoyance Risk Criteria

Traffic Area	Day-time Residential Annoyance Risk		Night-time Residential Annoyance Risk	
	Horizontal	Vertical	Horizontal	Vertical
Public Road (60t capacity heavy vehicles)[1]	7m	12m	10m	20m
Note 1: Assumes 60t capacity heavy vehicle travelling at 60kph.				

This is consistent with the description of the potential impacts from ground-borne traffic vibration detailed in the RNP, which states:

> *"Vehicles operating on a roadway are unlikely to cause a perceptible level of vibration unless there are significant road irregularities, particularly if the affected receiver is more than 20 metres from the roadway."*

Semi-trailers and rigid trucks have an existing and unrestricted use of Lue Road during both the day-time and night-time whereas B-doubles are not permitted to travel on Lue Road during the periods of school bus use.

Residences adjacent to the Project's primary access route (i.e. Lue Road from Mudgee and the relocated Maloneys Road) are located at distances 20m or greater (**Table 58**) and therefore Project-related road traffic vibration impacts and annoyance are likely to be negligible.

During the construction and site establishment stage Project-related heavy road traffic would, necessarily, travel through Lue to access the Mine Site. The residential property L10 is approximately 10m from the edge of Lue Road; and property R39 is approximately 15m from the edge of Pyangle Road, and therefore located within the nominal 20m offset distance to comply with vibration annoyance risk criteria.

11.7 TRAFFIC NOISE AND VIBRATION MITIGATION AND MANAGEMENT

11.7.1 Traffic Vibration Mitigation and Management

Given that the Project-related traffic on Pyangle Road would only occur during construction months 1 to 6 (i.e. prior to the opening of the relocated Maloneys Road) traffic vibration levels would be monitored at residential property R39 in accordance with Bowden Silvers Traffic Noise and Vibration Management Plan (TNVMP). Similarly, given the very close proximity of property L10 to Lue Road, it is reasonable to anticipate existing heavy road traffic movements may at times currently exceed the vibration annoyance risk criteria (while remaining below the relevant structural damage criteria). Traffic vibration levels would also be monitored at property L10 in accordance with Bowden Silvers TNVMP to determine whether the criteria are being exceeded.

11.7.2 Traffic Noise Mitigation and Management

The Bowdens Silver TNVMP would also include a Driver's Code of Conduct. Bowdens Silver proposes to require the transport contractor transporting concentrates from the Mine Site to their final destinations to induct all drivers to adopt all safety and operating procedures specified in a Driver's Code of Conduct. The code would address a range of practices including those relating to hours of travel on Lue Road, minimal use or avoidance of exhaust brakes and adherence to nominated speed limits.

12. SUMMARY OF FINDINGS

12.1 CONSTRUCTION NOISE IMPACT ASSESSMENT

12.1.1 Construction Noise Assessment Criteria

The ICNG recommends a construction noise management level (CNML) equivalent to the day-time rating background level (RBL) plus 10dB(A) within standard hours (i.e. day-time) and RBL plus 5dB(A) outside standard hours. The ICNG also nominates a "highly noise affected level" (HNAL) day-time intrusive $L_{Aeq(15minute)}$ noise level of 75dB(A). As the site establishment and construction stage (Section 2.3) would be limited to day-time works only, the ICNG CNMLs and HNALs are presented in **Table 65**.

Table 65
Construction Noise Management Levels and Highly Noise Affected Level (dB(A) re 20µPa)

		Intrusive $L_{Aeq(15minute)}$[2]	**Intrusive $L_{Aeq(15minute)}$[2]**
Locality	**ICNG Land Use[1]**	**Day-time CNML**	**Day-time HNAL**
Rural Residences	Residential[3]	45	75
Lue Residences			
Any	Industrial[4]	External 75 when in use	Not applicable
Any	Commercial[4]	External 70 when in use	
Any	Active Recreation[4]	External 65 when in use	
Any	Passive Recreation[4]	External 60 when in use	
Any	Church, Cemetery[4]	External 55 when in use[5]	
Any	Hospital[4]		
Any	School[4]		

Note 1: In accordance with the ICNG Section 4.1.
Note 2: Day-time 7:00am to 6:00pm.
Note 3: At the most-affected point within 30m of the residential premises.
Note 4: At the most-affected point within 50m of the non-residential premises.
Note 5: External criteria equivalent to internal criteria plus 10dB(A).

12.1.2 Construction Noise Impact Summary

12.1.2.1 Privately-owned Residences in the vicinity of the Mine Site

A summary of privately-owned residences with potential exceedances of the intrusive CNML of 45dB(A) is presented in **Table 66,** which are further described below.

Table 66
Privately-owned Residences Receivers with CNML Exceedances

Construction Activity	**Negligible to Marginal 1 to 5dB(A) CNML[1]**	**Moderate >5dB(A) CNML[1]**	**Significant >above HNAL[1]**
Privately-owned Residences			
Off-site Road Network	R82	R81; R88; R89; R90	-
On-site Earthworks and Infrastructure	-	-	-

Note 1: Construction Noise Management Level (CNML), Highly Noise Affected Level (HNAL of 75dB(A)).

The predicted day-time construction noise impacts at both privately-owned residences in the vicinity of the Mine Site, relocated Maloneys Road and the supply pipeline corridor, are summarised below.

Construction Noise Levels at Privately-owned Residences:

- Comply with the CNML of 45dB(A) from the on-site earthworks and infrastructure construction activities;
- Marginally (i.e. up to 5dB(A)) exceed the CNML of 45dB(A) during the most intensive period of the off-site road network construction activity at one residence (R82) with an approximate duration of 1 to 2 months;
- Moderately (i.e. >5dB(A)) exceed the CNML of 45dB(A) during the most intensive period of the off-site road network construction activity at four residences (R81; R88; R89; and R90) with a duration of approximately 1 to 2 months, while remaining well below the HNAL of 75dB(A); and
- The off-site water supply pipeline construction works are relatively transient, and any noise impact would be short-term, with the HNAL of 75dB(A) being met at an off-set distance of approximately 50m from the construction works.

Construction Noise Management Plan (CNMP)

- Construction noise from the Project would be managed by Bowdens Silver in accordance with an approved CNMP based on the general requirements of the ICNG (and any Project approval requirements) to ensure that any potential construction noise impacts (particularly from the off-site activities associated with the construction of the related Maloneys Road and water supply pipeline) are minimised in terms of magnitude, duration and character.

12.1.2.2 Project-related receivers in the vicinity of the Mine Site

Construction noise levels are likely to exceed the relevant CNML at multiple receivers. The majority of these are located in close proximity to the Mine Area. Impacts upon occupants of residences (if any) would be managed in accordance with the requirements of the CNMP.

12.2 OPERATIONAL NOISE IMPACT ASSESSMENT

12.2.1 Operational Noise Assessment Criteria

The project intrusive noise level ($L_{Aeq(15minute)}$) should not exceed the rating background level (RBL) beyond a minimum threshold (see **Table 19**) by more than 5dB(A). The project noise trigger levels (PNTLs) are then determined in accordance with Noise Policy for Industry (NPfI Section 2.1), by identifying the lower of the project amenity noise level or project intrusive noise level.

The project amenity noise levels, the project intrusive noise levels and the resulting $L_{Aeq(15minute)}$ PNTLs for the various localities in the vicinity of the Mine Site are presented in **Table 67**. These criteria are nominated for the purposes of assessing the operational noise impacts from the Mine Site.

Table 67
Project Amenity, Intrusive Noise Levels and Resulting $L_{Aeq(15minute)}$ PNTLs (dB(A) re 20µPa)

Locality	Receiver Land Use[1]	Project Amenity Noise Level $L_{Aeq(15minute)}$[1,2]			Project Intrusive Noise Level $L_{Aeq(15minute)}$[1,3]			Resulting PNTL $L_{Aeq(15minute)}$[1,4]		
		Day-time	Evening	Night-time	Day-time	Evening	Night-time	Day-time	Evening	Night-time
Rural Residences	Rural Residential[4]	48	43	38	40	35	35	40	35	35
Lue Residences										
Any	School[5,6]	43			not applicable			43		
Any	Hospital[5,6]	48						48		
Any	Church, Cemetery[5]	48						48		
Any	Passive Recreation	48						48		
Any	Active Recreation	53						53		
Any	Commercial	63						63		
Any	Industrial	68						68		

Note 1: Day-time Monday to Saturday 7:00am to 6:00pm, Sunday and Public Holidays 8:00am to 6:00pm; Evening Monday to Sunday 6:00pm to 10:00pm; Night-time Monday to Saturday 10:00pm to 7:00am, Sunday and Public Holidays 10:00pm to 8:00am.

Note 2: Project amenity noise level $L_{Aeq(15minute)}$ equivalent to the project amenity noise level $L_{Aeq(period)}$ (**Table 22**) plus 3dB(A).

Note 3: Project intrusive noise level $L_{Aeq(15minute)}$ equivalent to the RBL (**Table 19**) plus 5dB(A).

Note 4: Resulting $L_{Aeq(15minute)}$ PNTL is the lower of the project amenity noise level or project intrusive noise level.

Note 5: At the most-affected point within 30m of the residential premises.

Note 5: External criteria equivalent to internal criteria plus 10dB(A).

Note 6: Noisiest $L_{Aeq(1hour)}$.

12.2.2 Project Noise Impact Assessment Methodology

Table 68 presents the Project (and conservative) methodology for assessing the construction noise levels against the relevant intrusive CNMLs and HNALs (**Table 21**), mine operational noise levels against the relevant maximum SDNLs (Section 4.2.2), intrusive PNTLs (**Table 23**) and amenity noise levels (**Table 22**) for assessing noise impacts on privately-owned land and at residences from cumulative effects from all industrial noise sources. It is noted that; the Project noise impact assessment methodology adopts a conservative and simplified approach in regard to the assessment of residual noise exceedances by comparison with that nominated in NPfI Table 4.1 and Table 4.2 (see Section 4.2.1) and the VLAMP (see Section 4.3.1). The Project noise impact assessment methodology adopts lower residual exceedance thresholds by discarding the additional 'industrial noise level' component (employed by the NPfI and VLAMP) and its associated secondary exceedance requirement, and rather solely focuses on exceedance of the PNTLs.

Table 68
Project Noise Impact Assessment Methodology (dB(A) re 20µPa)

Site Establishment and Construction Stage	Assessment Parameter	Assessment Criteria	Characterisation of Construction Noise Impacts		
			Negligible to Marginal	**Moderate**	**Significant**
Affected residences	CNML Intrusive	RBL plus 10dB(A)	1 to 5dB(A) above CNML	> 5dB(A) above CNML	above HNAL 75dB(A)
PTL Re-alignment Works	**Assessment Parameter**	**Assessment Criteria**	**Characterisation of PTL Re-alignment Noise Impacts**		
			Negligible	**Marginal to Moderate**	**Significant**
Affected residences	PNTL Intrusive	RBL plus 5dB(A)	1 to 2dB(A) above PNTL	3 to 5dB(A) above PNTL	> 5dB(A) above PNTL
Mine Operations	**Assessment Parameter**	**Assessment Criteria**	**Characterisation of Operational Noise Impacts**		
			Negligible	**Marginal to Moderate**	**Significant**
Affected residences	SDNL	Intrusive 40dB(A), Maximum 52dB(A)	1 to 2dB(A) above SDNL	3 to 5dB(A) above SDNL	> 5dB(A) above SDNL
	Cumulative Amenity Noise Level	NPfI Table 2.2 RANL see **Table 22**	1 to 2dB(A) above RANL	3dB(A) above RANL	> 3dB(A) above RANL
Mine Operations	**Assessment Parameter**	**Assessment Criteria**	**Voluntary Mitigation Rights**		**Voluntary Land Acquisition Rights**
			Negligible	**Marginal to Moderate**	**Significant**
Affected residences	PNTL Intrusive	RBL plus 5dB(A)	1 to 2dB(A) above PNTL[1]	3 to 5dB(A) above PNTL[1]	> 5dB(A) above PNTL[2]
Affected privately-owned land	PANL amenity	NPfI Table 2.2 RANL see **Table 22**	Not applicable	Not applicable	> 5dB(A) above RANL[3]

Note 1: Depending on the range of exceedance of the PNTL assessment parameter, potential noise impacts range from negligible to moderate in accordance with the VLAMP.

Note 2: Noise exceedances greater than 5dB(A) above the PNTL assessment parameter may result in significant noise impacts in accordance with the VLAMP.

Note 3: Noise exceedances greater than 5dB(A) above the NPfI Table 2.2 Recommended Amenity Noise Level (RANL) (**Table 22**) on more than 25% of any privately-owned land where there is an existing residence or a residence could be built on that land under existing planning controls in accordance with the VLAMP.

Note 4: Noise impacts on the nearest privately-owned rural land to the Mine Site have initially been conservatively assessed on the basis that any land is permitted to have a residence with reference to the Land Ownership Plan (**Annexure 4**) and associated Land Ownership Details (**Annexure 5**) as further described in Section 0. In practice however local zoning restrictions and planning controls would need to be taken into consideration with respect to each parcel of land.

12.2.3 Noise Mitigation and Management Measures

Following the evaluation of various combinations of feasible noise control and management measures to assess their relative effectiveness for various modelling scenarios, Bowdens Silver proposes to adopt a range of reasonable noise control and management measures (including the use of low noise mobile equipment and fixed plant, amenity and noise barriers, mine operational controls) to appreciably reduce noise levels from the Project as presented in **Table 69**.

Table 69
Bowdens Silver Proposed Range of Reasonable Noise Control and Management Measures

Mitigation	Bowdens Silver Project
Noise Source Control - mobile equipment	Use of noise attenuated mobile equipment comprising low noise or extra quiet mobile equipment where practical. See **Table 26**, **Table 27**, **Table 28**, and **Table 29** for specific individual mobile equipment noise source controls including design performance SWLs.
	All dozers restricted to 1st gear operation when operating out of pit.
	Installation of broadband noise "quacker" style reversing alarms.
Noise Source Control - fixed plant	Use of full or partial enclosures to attenuate fixed plant where practical. See **Table 26**, **Table 27**, **Table 28**, and **Table 29** for specific individual fixed plant noise source controls including design performance SWLs.
	Use of low noise specifications, low noise idlers, soft-flow chutes and silencers.
	Installation of mid-high frequency noise conveyor alarms.
	Enclosure of pumps for the water supply pipeline within containers or structures.
Noise Propagation Path - mobile equipment	Lower embankment noise barrier and southern barrier (see **Annexure 15**).
	Acoustic barriers adjacent to the main open cut pit haul road exit (see **Annexure 15**).
	Relocation of the exit ramp from the main open cut pit to maximise topographic shielding at the northern open cut pit exit.
	Optimised evening waste rock haul route to maximise the barrier effect from the existing topography and short-term acoustic bunds within the active waste rock emplacement areas.
	Optimised night-time ore haul route to maximise the barrier effect from the existing topography and acoustic barriers adjacent to the main pit haul road exit.
Noise Propagation Path - fixed plant	Processing plant relocated further north within the Mine Site and with the placement of the primary jaw crusher at a lower elevation to minimize noise propagation in the direction of Lue (see **Annexure 15**).
	Nearfield acoustic barriers around TSF crushing/screening plant.
Operational Management Controls	Scheduling of intrusive activities to less sensitive times of the day, for example TSF lifts, material emplacement on southern barrier and soil stockpiles limited to the day-time throughout the mine life.
	Reduced mining operations during the evening within restricted WRE areas.
	Further reduced mining operations during the night-time with only ore delivery to the ROM pad.
	Implementation of real-time noise monitoring network at key residential receivers to assist with the on-going monitoring and management of mine noise, and identify partial or full plant and equipment shutdowns (if at all required) during very noise enhancing meteorological conditions. Enhance and maintain continuous meteorological monitoring network for the Project.
Noise Receiver Control	Any residual noise impacts guided by the requirements of the VLAMP (see Section 4.3.1) and Bowdens Silver Project Noise Impact Assessment Methodology (**Table 25**).

12.2.4 Operational Noise Impact Summary

A summary of privately-owned residences with predicted exceedances of the relevant day-time, evening and night-time intrusive PNTLs and SDNLs is presented in **Table 70**, which are further described below.

Table 70
Privately-owned Residences with predicted PNTL and SDNL Exceedances

Receiver Area	Exceedance[1]	Day-time	Evening	Night-time	Maximum Exceedance in Any Period
Rural Residences	Negligible 1 to 2dB(A) above PNTL	R21; R27; R37	R21; R27; R35; R36A; R37; R39; R40; R47; R87	R21; R27; R35; R36A; R37; R39; R40; R47; R87	R21; R27; R37; R39; R40; R47
	Marginal to Moderate 3 to 5dB(A) above PNTL	R7; R35; R36A; R87	R7	R7	R7; R35; R36A; R87
	Significant > 5dB(A) above PNTL	R4	R4	R4	R4
	Negligible 1 to 2dB(A) above SDNL[2]	-	-	R4	R4
Lue Residences	Negligible 1 to 2dB(A) above PNTL	-	-	-	-
	Marginal to Moderate 3 to 5dB(A) above PNTL	-	-	-	-
	Significant > 5dB(A) above PNTL	-	-	-	-
	Negligible 1 to 2dB(A) above SDNL	-	-	-	-
Lue Place of Interest	Negligible 1 to 2dB(A)	-	-	-	-
	Marginal to Moderate 3 to 5dB(A)	-	-	-	-
	Significant > 5dB(A)	-	-	-	-

Note 1: In accordance with the Project noise impact assessment methodology presented in **Table 25**.
Note 2: Exceedance of the intrusive ($L_{Aeq(15minute)}$) SDNL of 40 dB(A).

12.2.4.1 Privately-owned Residences in the vicinity of the Mine Site

The predicted day-time, evening and night-time operational noise impacts at privately-owned residences in the vicinity of the Mine Site are summarised below.

Operational Noise Levels at Privately-owned Rural Residences:

- Comply with the day-time intrusive PNTL of 40dB(A) at all rural residences, except at: R21; R27; and R37, resulting in negligible noise exceedances (1dB(A) to 2dB(A)), whereas the noise exceedances at R7; R35; R36A; and R87 are marginal to moderate (3dB(A) to 5dB(A)) in accordance with the Project noise impact assessment methodology presented in **Table 68**. The day-time noise exceedances at R4 are predicted to be significant and greater than the 5dB(A) intrusive PNTL of 40dB(A);

- Comply with the evening and night-time intrusive PNTL of 35dB(A) at all rural residences, except at: R21; R27; R35; R36A; R37; R39; R40; R47; R87, resulting in negligible noise exceedances (1dB(A) to 2dB(A)), whereas the noise exceedance at R7 is marginal to moderate (3dB(A) to 5dB(A)) in accordance with the Project noise impact assessment methodology presented in **Table 68**. The evening and night-time noise exceedances at R4 are predicted to be significant and greater than the 5dB(A) intrusive PNTL of 35dB(A);
- Comply with the night-time intrusive ($L_{Aeq(15minute)}$) SDNL of 40dB(A) (over a 15 minute period) at all rural residences, except at R4, resulting in a negligible noise exceedance (1dB(A) to 2dB(A)) in accordance with the Project noise impact assessment methodology presented in **Table 68**; and
- Comply with the night-time maximum SDNL of 52dB(A) at all rural residences (for the maximum level).

Operational Noise Levels at Privately-owned Lue Residences:

- Comply with the day-time intrusive PNTL of 40dB(A) at all Lue residences;
- Comply with the evening and night-time intrusive PNTL of 35dB(A) at all Lue residences; and
- Comply with the night-time intrusive SDNL of 40dB(A) and maximum SDNL of 52dB(A) at all Lue residences.

Operational Noise Levels at Lue Places of Interest:

- Comply with the intrusive PNTL of 43dB(A) of at LPOI3 Lue Public School; and
- Comply with the intrusive PNTL of 48dB(A) of at LPOI1 Rural Fire Brigade; LPOI2 Lue Pottery; LPOI4 Lue Hall; LPOI5 Lue Railway Station.

Operational Noise Management Plan (ONMP)

- Operational noise from the Project would be managed by Bowdens Silver accordance with an approved ONMP based on the general requirements of the NPfI (and any requirements arising from the development consent for the Project) to ensure that any potential operational noise impacts are minimised in terms of magnitude, duration and character.

12.2.4.2 Operational Noise Levels at Project-related Receivers

Operational noise levels are likely to exceed the relevant PNTLs and SDNLs at multiple receivers as the majority of these are located in close proximity to the Mine Site. Impacts upon occupants of dwellings (if any) would be managed in accordance with the requirements of the ONMP. Residences R1C, R1D, R1E and R1F have been excluded as these residences would be demolished.

12.2.5 Privately-owned Land Impact Assessment

The predicted (i.e. outer envelope) operational intrusive $L_{Aeq(15minute)}$ noise contours for day-time, evening and night-time under standard meteorological conditions throughout the mine life are presented in **Annexure 17**. The predicted (i.e. outer envelope) operational intrusive $L_{Aeq(15minute)}$ noise contours for day-time, evening and night-time under noise-enhancing meteorological conditions throughout the mine life are presented in **Annexure 18**.

In accordance with the Project noise impact assessment methodology presented in **Table 68** (as guided by the VLAMP), the nearest privately-owned rural land would be impacted if the (mine operational) project amenity noise levels were predicted to exceeded day-time 55dB(A), evening 50dB(A) and night-time 45dB(A). The (mine operational) project amenity noise levels would be at least 3dB(A) lower than the predicted (i.e. outer envelope) operational intrusive $L_{Aeq(15minute)}$ noise contours for day-time, evening and night-time under noise-enhancing meteorological conditions presented in **Annexure 18**.

The predicted operational day-time 55dB(A) intrusive noise contour does not impact more than 25% of the nearest privately-owned rural land throughout the mine life (see **Annexure 18**). Similarly, the predicted operational evening 50dB(A) intrusive noise contour does not impact more than 25% of the nearest privately-owned rural land throughout the mine life (see **Annexure 18**). Likewise, the predicted operational night-time 45dB(A) intrusive noise contour does not impact more than 25% of the nearest privately-owned rural land throughout the mine life (see **Annexure 18**).

Hence, there is no privately-owned rural land is predicted to be impacted by the Project In accordance with the Project noise impact assessment methodology presented in **Table 68** (as guided by the VLAMP).

12.2.6 PTL Re-alignment Noise Impact Summary

A summary of privately-owned residences with predicted exceedances of the day-time intrusive PNTL of 40dB(A) is presented in **Table 71**, which are further described below.

Table 71
Privately-owned Residences with PNTL Exceedances

Total Year 3 Operational plus PTL Re-alignment Works	Characterisation of PTL Re-alignment Noise Impacts		
	Negligible[2]	**Marginal to Moderate[3]**	**Significant[4]**
Privately-owned Residences[1]			
Rural Residences	R21; R25; R27; R37; R40; R45A; R82; R86; R87	R35; R36A; R37; R39; R47	R4; R7
Lue Residences	L3; L4; L50	-	-
Lue Places of Interest	-	-	-

Note 1: See Land Ownership and Surrounding Residences (**Annexure 4**) and Land Ownership Details (**Annexure 5**).
Note 2: Predicted negligible noise exceedance 1-2dB(A) above the day-time intrusive PNTL of 40dB(A).
Note 3: Predicted marginal to moderate noise exceedance 3-5dB(A) above the day-time intrusive PNTL of 40dB(A).
Note 4: Predicted significant noise exceedance >5dB(A) above the day-time intrusive PNTL of 40dB(A).

12.2.6.1 Operational (inclusive PTL Re-alignment Works) Noise Levels at Privately-owned Residences

The predicted day-time PTL re-alignment noise impacts at privately-owned residences in the vicinity of the Mine Site are summarised below.

PTL Re-alignment Works at Privately-owned Rural Residences:

- Comply with the day-time intrusive PNTL of 40dB(A) at all rural residences, except at: R21; R25; R27; R37; R40; R45A; R82; R86; and R87, resulting in negligible noise exceedances (1dB(A) to 2dB(A)) in accordance with the Project noise impact assessment methodology presented in **Table 25** during the most intensive period of the PTL re-alignment works with an approximate duration of 1 to 2 months;
- The day-time noise exceedances at R35; R36A; R37; R39; and R47, are marginal to moderate (3dB(A) to 5dB(A)) during the most intensive period of the PTL re-alignment works with an approximate duration of 1 to 2 months; and
- Day-time noise exceedances at R4 and R7 are predicted to be significant and greater than 5dB(A) above intrusive PNTL of 40dB(A).

As shown in **Table 45**, day-time intrusive noise level exceedances arising Year 3 operations (only) are predicted at R7 and R39 in the absence of the PTL works.

The additional intrusive noise exceedances at residences: R4 (significant); R35, R36A, R37 and R47 (marginal to moderate); and R21, R25, R27, R37, R40, R45A, R82, R86, and R87 (negligible) are as a result of PTL works. However, the additional intrusive noise exceedances during the 1 to 2 month period would occur intermittently and not at that level throughout the entire period.

Furthermore, for comparison purposes only, the predicted total Year 3 operations plus PTL works noise levels remain below the CNML of 45dB(A) at all privately-owned rural residences with the exception of nearest potentially noise affected residences of R4 and R7.

PTL Re-alignment Works at Privately-owned Lue Residences:

- Comply with the day-time intrusive PNTL of 40dB(A) at all Lue residences, except at: L3; L4; and L50, resulting in negligible noise exceedances (1dB(A) to 2dB(A)) in accordance with the Project noise impact assessment methodology presented in **Table 25** during the most intensive period of the PTL re-alignment works with an approximate duration 1 to 2 months.

PTL Re-alignment Works at Lue Places of Interest:

- Comply with the intrusive PNTL of 43dB(A) of at LPOI3 Lue Public School; and
- Comply with the intrusive PNTL of 48dB(A) of at LPOI1 Rural Fire Brigade; LPOI2 Lue Pottery; LPOI4 Lue Hall; LPOI5 Lue Railway Station.

Operational (inclusive PTL Re-alignment Works) Noise Management Plan (ONMP)

- Operational (inclusive PTL re-alignment works) noise from the Project would be managed by Bowdens Silver accordance with an approved ONMP based on the general requirements of the NPfI (and any Project approval requirements) to ensure that any potential operational noise impacts are minimised in terms of magnitude, duration and character.

12.2.6.2 Operational (inclusive PTL Re-alignment Works) Noise Levels at Project-related Receivers

Are likely to exceed the relevant PNTLs at multiple receivers as the majority of these are located in close proximity to the Mine Site. Impacts upon occupants of dwellings (if any) would be managed in accordance with the requirements of the ONMP.

12.3 CUMULATIVE NOISE AMENITY IMPACT ASSESSMENT

12.3.1 Cumulative Noise Amenity Impact Summary

There are no major existing and approved industrial developments are located in the vicinity of the Mine Site. Other existing, approved or proposed resource developments in the Mudgee district are listed in **Table 48**.

The existing Ulan Mine Complex, Moolarben Coal Complex and Wilpinjong Extension together with the proposed Bylong Coal Project have been identified and are located between 29km to 38km from the Mine Site. As a result, any cumulative noise impacts are considered negligible.

12.4 BLASTING IMPACT ASSESSMENT

12.4.1 Blasting Assessment Criteria

Ground vibration and airblast overpressure levels which cause human discomfort are lower than recommended structural damage limits. Therefore, compliance with the lowest applicable human comfort criteria generally ensures that the potential to cause structural damage is negligible. The EPA currently adopts the ANZEC *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* dated September 1990 for assessing potential annoyance from blasting during day-time hours, as follows:

- The recommended maximum level for airblast overpressure is 115dBLinear.
- The airblast overpressure level of 115dBLinear may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The airblast overpressure level should not exceed 120dBLinear at any time.
- The recommended maximum for ground vibration is 5mm/s, Peak Vector Sum (PVS) vibration velocity. It is recommended however, that 2mm/s PVS be considered the long-term regulatory goal for the control of ground vibration.

- The ground vibration level of 5mm/s (PVS) may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level should not exceed 10mm/s at any time.

12.4.2 Blasting Impact Summary

12.4.2.1 Privately-owned Residences in the vicinity of the Mine Site

A summary of privately-owned residences with predicted exceedances of the ground vibration and airblast overpressure human comfort criteria (i.e. 5mm/s and 115dBLpk respectively) and maximum human comfort criteria (i.e. 10mm/s and 120dBLpk respectively) are presented in **Table 72**, which are further described below.

Table 72
Privately-owned Residences with Human Comfort Criteria 5% and 0.1%Exceedances

Receiver Area[1]	Ground Vibration or Airblast Exceedance[2,3,4]	5% Exceedance		0.1% Exceedance		Maximum Exceedance in Any Blast
		Typical Ore Blast (MIC 117kg)	Typical Waste Rock Blast (MIC 216kg)	Typical Ore Blast (MIC 117kg)	Typical Waste Rock Blast (MIC 216kg)	
Privately-owned Residences[1]						
Rural Residences	1 to 2mm/s; or 1 to 2dB	R7	R4	R12	-	-
	3 to 5mm/s; or 3 to 5dB	-	R7	R4, R7	R4, R12	R4, R12
	>5mm/s; or >5dB		-	-	R7	R7
Lue Residences	1 to 2mm/s; or 1 to 2dB	-	-	-	-	-
	3 to 5mm/s; or 3 to 5dB	-	-	-	-	-
	>5mm/s; or >5dB	-	-	-	-	-
Lue Place of Interest	1 to 2mm/s; or 1 to 2dB	-	-	-	-	-
	3 to 5mm/s; or 3 to 5dB	-	-	-	-	-
	>5mm/s; or >5dB	-	-	-	-	-

Note 1: See Land Ownership and Surrounding Residences (**Annexure 4**) and Land Ownership Details (**Annexure 5**).
Note 2: Vibration Velocity Peak Vector Sum (PVS) - (mm/s).
Note 3: Airblast overpressure Level Linear Peak - (dBLpk re 20µPa).
Note 4: Predicted human comfort criteria exceedances of ground vibration 5mm/s or airblast overpressure 115dBLpk.

The predicted blast emission impacts at privately-owned residences in the vicinity of the Mine Site are summarised below.

Operational Blast Emission Levels at Privately-owned Rural Residences:

- For typical ore (MIC 117kg) and typical waste rock (MIC 216kg) blast designs, compliance is predicted with the ground vibration human and airblast overpressure comfort criteria of 5mm/s and 115dBLpk respectively at all rural residences except at two of the nearest privately-owned residences namely: R4 and R7;

- For typical ore (MIC 117kg) blast design airblast overpressure is predicted to exceed the human comfort criterion of 115dBLpk at one of the nearest privately-owned residence namely: R7, while complying with the ground vibration criterion of 5mm/s;
- For typical waste rock (MIC 216kg) blast design airblast overpressure is predicted to exceed the human comfort criterion of 115dBLpk at two of the nearest privately-owned residences namely: R4 and R7 while complying with the ground vibration criterion of 5mm/s; and
- For typical ore (MIC 117kg) and typical waste rock (MIC 216kg) blast designs, compliance is predicted with the ground vibration and airblast overpressure human comfort criteria of 5mm/s and 115dBLpk respectively at residence R12. However, the maximum airblast overpressure is predicted to exceed the maximum human comfort criteria of 120dBLpk at residence R12.

Blast Management Plan (BMP)

- Ground vibration and airblast overpressure levels would be managed by Bowdens Silver in accordance with an approved Blast Management Plan (BMP) to ensure that ground vibration and potential blast emission impacts are minimised. The BMP should include the implementation of a blast emission monitoring programme and the establishment and maintenance of ground vibration and airblast overpressure site-laws for the Mine Site to enable key blast design parameters to be modified and ensure compliance with the criteria.

Operational Blast Emission Levels Privately-owned Lue Residences:

- For typical ore (MIC 117kg) and typical waste rock (MIC 216kg) blast designs comply with the human comfort criteria of 5mm/s and 115dBLpk at all Lue residences.

Operational Blast Emission Levels at Lue Places of Interest:

- For typical ore (MIC 117kg) and typical waste rock (MIC 216kg) blast designs comply with the human comfort criteria of 5mm/s and 115dBLpk at LPOI3 Lue Public School; LPOI1 Rural Fire Brigade; LPOI2 Lue Pottery; LPOI4 Lue Hall; and LPOI5 Lue Railway Station.

12.4.2.2 Blast Emission Levels at Project-related Receivers

Are likely to exceed the relevant human comfort criteria of 5mm/s and 115dBLpk at multiple receivers as the majority of these are located in close proximity to the Mine Site. Impacts upon occupants of dwellings (if any) would be managed in accordance with the requirements of the BMP.

12.5 TRAFFIC NOISE IMPACT ASSESSMENT

12.5.1 Traffic Noise Assessment Criteria

The NSW Road Noise Policy (DECCW, 2011) and associated Application Notes dated 12 June 2013 is the relevant policy for the assessment of road traffic noise in NSW. The RNP classification scheme for assessing noise impacts on an existing and new road network from additional traffic generated by the Project as presented in **Table 73**.

Table 73
Road Traffic Noise Criteria for Residential and Non-Residential Land Uses (dB(A) re 20 µPa)

Road	Project Type and Land Use	Total Traffic Noise Criteria[1,2,5]	Relative Increase Criterion[1,2,3,4]
Residential Land Use			
Lue Road is a sub-arterial road in accordance with the RNP Table 2	Land use developments generating additional traffic on existing sub-arterial roads	Daytime 60 $L_{Aeq(15hour)}$	Existing $L_{Aeq(15hour)}$ plus 12dB(A)
		Night-time 55 $L_{Aeq(9hour)}$	Existing $L_{Aeq(9hour)}$ plus 12dB(A)
Relocated Maloneys Road is a principal haulage route in accordance with RNP Section 2.2.2	Existing residences affected by noise from new local road corridors used as a 'principal haulage route'.	Daytime 55 $L_{Aeq(15hour)}$	Existing $L_{Aeq(15hour)}$ plus 12dB(A)
		Night-time 50 $L_{Aeq(9hour)}$	Existing $L_{Aeq(9hour)}$ plus 12dB(A)
Pyangle Road is a local road in accordance with the RNP Table 2	Land use developments generating additional traffic on existing local roads	Daytime 55 $L_{Aeq(1hour)}$	Not Applicable
		Night-time 50 $L_{Aeq(1hour)}$	
Non-Residential Land Use			
Lue Road	School Classrooms	50 $L_{Aeq(1hour)}$ (external) when in use[6]	Not Applicable

Note 1: L_{Aeq} = equivalent continuous noise level.
Note 2: Day-time 7:00am to 10:00pm, Night-time 10:00pm to 7:00am.
Note 3: "Existing" is the projected base (i.e. non-Project-related) traffic noise levels
Note 4: Relative increase noise level generated by the Project for comparison with the Criteria.
Note 5: Where the total traffic criteria are already exceeded, then limit any increase to 2dB(A) or less.
Note 6: External criteria equivalent to internal 40 $L_{Aeq(1hour)}$ criteria plus 10dB(A).

12.5.2 Traffic Noise Assessment Summary Construction Months 1 to 6

12.5.2.1 Lue Road

Total traffic noise levels comply with the day-time 60 $L_{Aeq(15hour)}$ and night-time 55 $L_{Aeq(9hour)}$ assessment criteria at all residential locations. The maximum Project-related increase to the total traffic noise level is 1.2dB(A), therefore less than 2dB(A), and well below the relative increase criterion of 12dB(A).

Total traffic noise level at LPOI3 Lue Primary School from the (projected 2021) base traffic is 52 $L_{Aeq(1hour)}$ and marginally 2dB(A) above the equivalent external 50 $L_{Aeq(1hour)}$ assessment criteria. The (projected 2021) total traffic (including the Project related traffic) is 53 $L_{Aeq(1hour)}$ and moderately 3dB(A) above the equivalent external 50 $L_{Aeq(1hour)}$ assessment criteria.

The Project-related increase to the total traffic noise level at LPOI3 Lue Primary School is 1.3dB(A), and therefore less than 2dB(A). In accordance with the RNP, an increase of less than 2dB(A) represents a minor impact that is considered barely perceptible and investigation of noise mitigation measures is not warranted in accordance with the policy.

12.5.2.2 Pyangle Road

Total traffic noise levels comply with the day-time 55 $L_{Aeq(1hour)}$ and night-time 50 $L_{Aeq(1hour)}$ assessment criteria at the nearest residential location R7.

12.5.2.3 Corner of Lue Road and Pyangle Road

Total traffic noise levels comply with the day-time 60 $L_{Aeq(15hour)}$ and night-time 55 $L_{Aeq(9hour)}$ assessment criteria at the nearest Location R39. Project related traffic entering and exiting from Lue Road onto Pyangle Road could potentially lead to increased noise from acceleration and braking. However due to the relatively small volume of Project related traffic entering and exiting from Pyangle road (in comparison to existing traffic flows on Lue Road) the increased noise due to intersection operations is unlikely to be appreciable.

12.5.3 Traffic Noise Assessment Summary Site Establishment and Construction Stage (Months 7 to 18)

12.5.3.1 Lue Road

Total traffic noise levels comply with the day-time 60 $L_{Aeq(15hour)}$ and night-time 55 $L_{Aeq(9hour)}$ assessment criteria at all residential locations. The maximum Project related increase to the total traffic noise level is 1.7dB(A), therefore less than 2dB(A), and well below the relative increase criterion of 12dB(A).

Total traffic noise level at LPOI3 Lue Primary School from the (projected 2021) base traffic is 51 $L_{Aeq(1hour)}$ and marginally 1dB(A) above the equivalent external 50 $L_{Aeq(1hour)}$ assessment criteria. The (projected 2021) total traffic (including the Project related traffic) is 52 $L_{Aeq(1hour)}$ and marginally 2dB(A) above the equivalent external 50 $L_{Aeq(1hour)}$ noise assessment criteria.

The Project-related increase to the total traffic noise level at LPOI3 Lue Primary School is 0.7dB(A) (compared with 1.3dB(A) during the first 6 months), and therefore less than 2dB(A). In accordance with the RNP, an increase of less than 2dB(A) represents a minor impact that is considered barely perceptible and investigation of noise mitigation measures is not warranted in accordance with the policy.

12.5.3.2 Relocated Maloneys Road

Total traffic noise levels comply with the day-time 55 $L_{Aeq(15hour)}$ and night-time 50 $L_{Aeq(9hour)}$ assessment criteria at nearest residential location R88. The Project related increase to the total traffic noise on the relocated Maloneys Road is 2.4dB(A), and well below the relative increase criterion of 12dB(A).

12.5.4 Traffic Noise Assessment Operational Scenario 2 (Year 3)

12.5.4.1 Lue Road

Total traffic noise levels comply with the day-time 60 $L_{Aeq(15hour)}$ and night-time 55 $L_{Aeq(9hour)}$ assessment criteria at all residential locations. The maximum Project related increase to the total traffic noise level is 1.7dB(A), therefore less than 2dB(A), and well below the relative increase criterion of 12dB(A).

Total traffic noise level at LPOI3 Lue Primary School from the (projected 2024) base traffic is 51 $L_{Aeq(1hour)}$ and marginally 1dB(A) above the equivalent external 50 $L_{Aeq(1hour)}$ assessment criteria. The (projected 2024) total traffic (including the Project related traffic) is 52 $L_{Aeq(1hour)}$ and marginally 2dB(A) above the equivalent external 50 $L_{Aeq(1hour)}$ noise assessment criteria.

The Project-related increase to the total traffic noise level at LPOI3 Lue Primary School is 0.8dB(A), and therefore less than 2dB(A). In accordance with the RNP, an increase of less than 2dB(A) represents a minor impact that is considered barely perceptible and investigation of noise mitigation measures is not warranted in accordance with the policy.

12.5.4.2 Relocated Maloneys Road

Total traffic noise levels comply with the day-time 55 $L_{Aeq(15hour)}$ and night-time 50 $L_{Aeq(9hour)}$ assessment criteria at nearest residential location R88. The Project related increase to the total traffic noise on the relocated Maloneys Road is 2.3dB(A), and well below the relative increase criterion of 12dB(A).

12.6 TRAFFIC VIBRATION IMPACT ASSESSMENT

12.6.1 Traffic Vibration Assessment Criteria

The DEC's guideline interim guideline *Assessing Vibration: A Technical Guideline* dated February 2006 is based on the information set out in British Standard 6472-1992 "Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz)". This standard defines building vibration velocity levels associated with a "low probability of adverse comment" from occupants. The applicable vibration velocity levels for continuous day-time and night-time activities are shown in **Table 74**.

Table 74
Continuous Vibration Velocity Levels Annoyance Risk Criteria

Receiver Area	Day-time Annoyance Risk[1] (mm/s)		Night-time Annoyance Risk[1] (mm/s)	
	Horizontal	Vertical	Horizontal	Vertical
Residences	1.2	0.45	0.6	0.2
Commercial/Offices	1.6	0.6	1.6	0.6
Industrial/Workshops	3.2	1.2	3.2	1.2
Note 1: BS6472-1992 "Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz)".				

12.6.2 Traffic Vibration Impact Assessment Summary

Residences adjacent to the Project's primary access route (i.e. Lue Road from Mudgee and the relocated Maloneys Road) are located at distances 20m or greater (**Table 58**) and therefore Project-related road traffic vibration impacts and annoyance is likely to be negligible.

During the construction and site establishment stage Project-related heavy road traffic would, necessarily, travel through Lue to access the Mine Site. The residential property L10 is approximately 10m from the edge of Lue Road; and property R39 is approximately 15m from the edge of Pyangle Road, and therefore located within the nominal 20m offset distance to comply with vibration annoyance risk criteria.

Given that the Project-related traffic on Pyangle Road would only occur during construction months 1 to 6 (i.e. prior to the opening of the relocated Maloneys Road) traffic vibration levels would be monitored at residential property R39 in accordance with Bowden Silvers Traffic Noise and Vibration Management Plan (TNVMP). Similarly, given the very close proximity of property L10 to Lue Road, it is reasonable to anticipate existing heavy road traffic movements may at times currently exceed the vibration annoyance risk criteria (while remaining below the relevant structural damage criteria). Traffic vibration levels would also be monitored at property L10 in accordance with Bowden Silvers TNVMP to determine whether the criteria are being exceeded.

13. GLOSSARY AND ABBREVIATIONS

Ambient Noise	The all-encompassing noise associated with a given environment. It is the composite of sounds from many sources, both near and far, and is often (but need not necessarily be) assigned the L_{Aeq} descriptor.
A-weighting	The adjustment made to measured noise spectra, via use of an electronic filter, to approximate the response of the human ear.
Background Noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. Background noise is described using the L_{A90} descriptor. (See also RBL.)
Day or Day-time	The duration of the assessment period - which may change according to the particular Standard or Guideline. For NPfI purposes, day-time is Monday to Saturday 7:00am to 6:00pm, Sunday and Public Holidays 8:00am to 6:00pm. For RNP purposes, day-time is 7:00am to 10:00pm.
dB	Abbreviation for decibel - a unit of (amongst other things) sound measurement. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure.
dBA or dB(A)	A-weighted decibel. A single number measurement of the sound pressure based on the decibel but weighted to approximate the response of the human ear with respect to frequencies. A change of 1dB(A) or 2dB(A) in the level of a sound is difficult for most people to detect, whilst a 3dB(A) to 5dB(A) change corresponds to a small but noticeable change in loudness. A 10dB(A) change corresponds to an approximate doubling or halving in loudness. A noise level of 56dB(A) may also be written as 56dB(A) LA 56, or 56 LA.
EPA	NSW Environment Protection Authority
Evening	The duration of the assessment period - which may change according to the particular Standard or Guideline. For NPfI purposes, evening is Monday to Sunday 6:00pm to 10:00pm.
NPfI	Noise Policy for Industry. Administered by the NSW Government's EPA. The NPfI provides a framework and process for deriving noise limit conditions for consents and licenses that would enable the EPA to regulate premises.
L_{Amax}	Maximum noise level measured at a given location over a specified time.

L_{AN}	L_{AN} is the A-weighted sound pressure level exceeded for N% of a given measurement period. (See also L_{A1} etc.)
L_{A1}	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L_{A10}	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured. During a 15 minute survey, it would represent the loudest 90 seconds.
L_{A90}	The A-weighted sound pressure level that is exceeded for annoyed of the time over which a given sound is measured. This is considered to represent the background noise. During a 15 minute survey, it would represent the quietest 90 seconds.
L_{Aeq}	Equivalent sound pressure level - the steady sound level that, over a specified period of time, would produce the same energy as the fluctuating sound level actually occurring.
$L_{Aeq(15minute)}$	The L_{Aeq} noise level for the 15 minute period.
$L_{Aeq(1hour)}$	The L_{Aeq} noise level for the 1 hour period.
$L_{Aeq(period)}$	The L_{Aeq} noise level for the assessment period. For the NPfI: day-time is Monday to Saturday 7:00am to 6:00pm, Sunday and Public Holidays 8:00am to 6:00pm; evening is Monday to Sunday 6:00pm to 10:00pm; and night-time is Monday to Saturday 10:00pm to 7:00am, Sunday and Public Holidays 10:00pm to 8:00am.
Median	The middle value in a series of values e.g. for the values 11, 9, 2, the median is 9. Where there is an even number of values in the series, the median is the average of the middle two values.
Night or Night-time	The duration of the assessment period - which may change according to the particular Standard or Guideline. For INP purposes, night-time is Monday to Saturday 10:00pm to 7:00am, Sunday and Public Holidays 10:00pm to 8:00am. For RNP purposes, night-time is 10:00pm to 7:00am.
Noise Level	See Sound Pressure Level.
RBL	The Rating Background Level (from the NPfI) is obtained by calculating the median values of the day /evening /night ABLs. For example, for a week's worth of monitoring, the night RBL is the median of the seven ABLs. (See also ABL and Background Noise)
Sound Level	See Sound Pressure Level.

Sound Pressure Level SPL or Lp	The level of noise, usually expressed in dB(A), as measured by a sound level meter with a microphone. The sound pressure level due to a noise source (e.g. a vacuum cleaner, or an item of mechanical plant) would depend upon the distance from the source and /or the acoustic conditions (“reverberant” or not) of the space in which it is located, as well as the “directionality” of the noise source and the location of any reflecting surfaces near to the source and /or the measurement location. (See also Sound Power Level)
Sound Power Level SWL or Lw	The Sound Power Level of a noise source is an inherent quality of that source does not depend upon its location or the distance from it. On the other hand, however, the sound pressure level, of say a vacuum cleaner, would depend upon the distance from it and /or the acoustic conditions (“reverberant” or not) of the room in which it is located. (See also Sound Pressure Level)

14. REFERENCES

ANZEC, 1990. Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration

Australian Standard 2187: Part 2-2006. Explosives - Storage and Use - Part 2: Use of Explosives

British Standard 6472-1992. Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz)

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Nelson, 1987. Transportation Noise Reference Book

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Annexures

(Total No. of pages including blank pages = 198)

* This Annexure is only available on the digital version of this document

** A colour version of this Appendix is available on the digital version of this document

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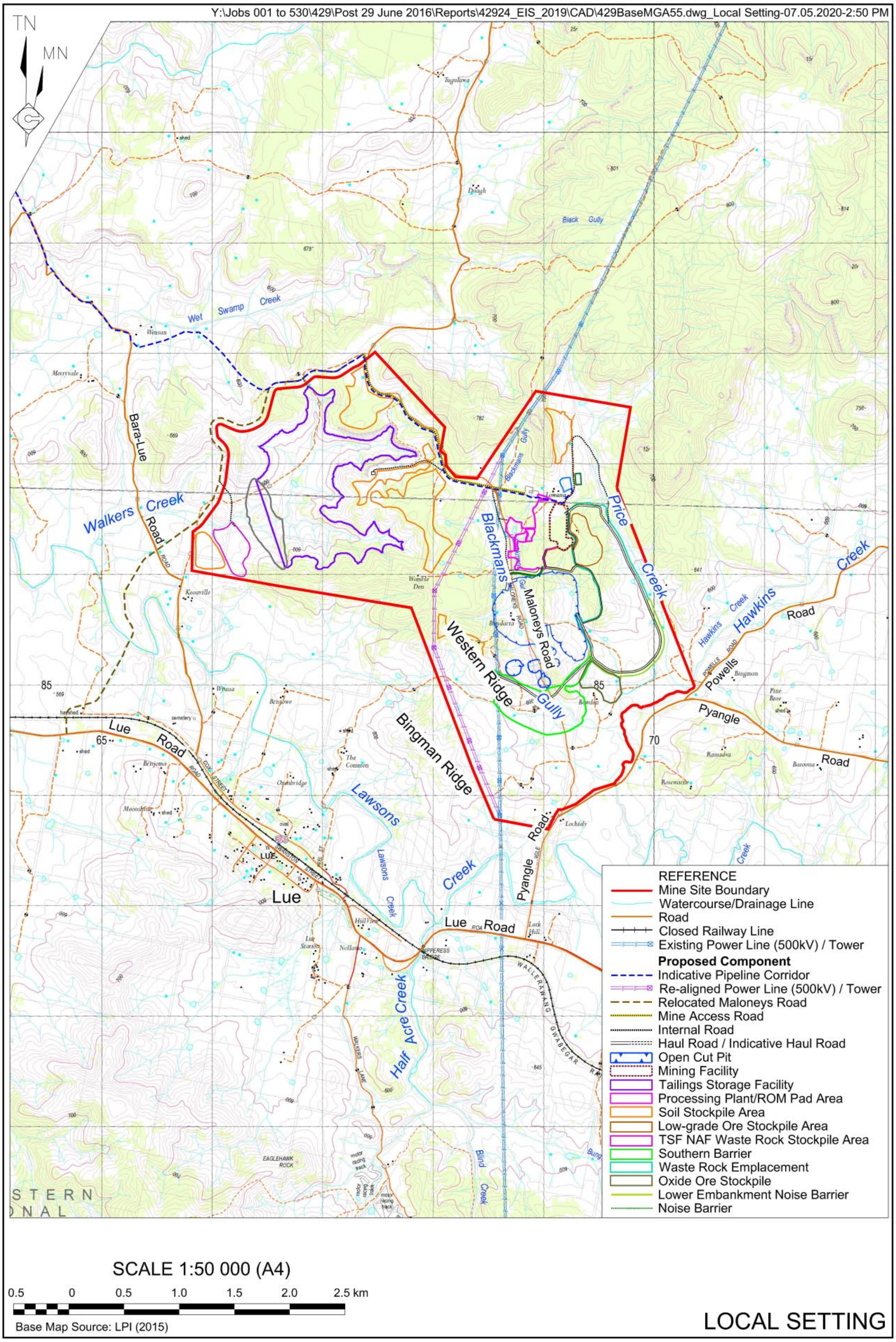
Annexure 1

Local Setting Plan

(Total No. of pages including blank pages = 2)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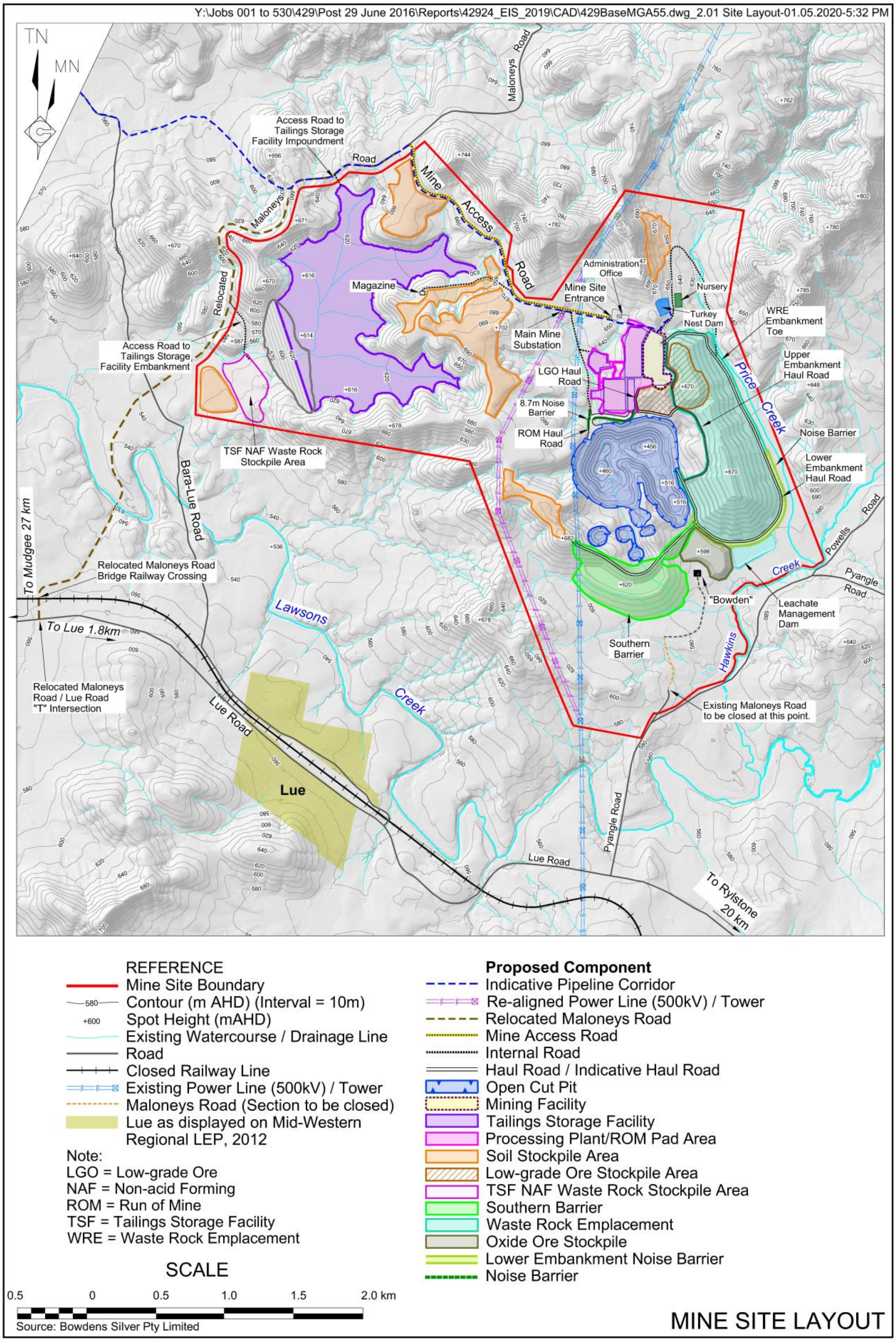
TN
MN
Wet Swamp Creek
Black Gully
Walkers Creek
Bara-Lue Road
Blackmans Gully
Maloneys Road
Price Creek
Western Ridge
Bingman Ridge
Hawkins Creek
Hawkins Road
Powells Road
Pyangle Road
Lawsons Creek
Lue Road
Lue
Half Acre Creek
Blind Creek
REFERENCE
Mine Site Boundary
Watercourse/Drainage Line
Road
Closed Railway Line
Existing Power Line (500kV) / Tower
Proposed Component
Indicative Pipeline Corridor
Re-aligned Power Line (500kV) / Tower
Relocated Maloneys Road
Mine Access Road
Internal Road
Haul Road / Indicative Haul Road
Open Cut Pit
Mining Facility
Tailings Storage Facility
Processing Plant/ROM Pad Area
Soil Stockpile Area
Low-grade Ore Stockpile Area
TSF NAF Waste Rock Stockpile Area
Southern Barrier
Waste Rock Emplacement
Oxide Ore Stockpile
Lower Embankment Noise Barrier
Noise Barrier
SCALE 1:50 000 (A4)
0.5 0 0.5 1.0 1.5 2.0 2.5 km
Base Map Source: LPI (2015)
LOCAL SETTING

Annexure 2

Mine Site Layout
and
Water Supply Pipeline Corridor

(Total No. of pages including blank pages = 4)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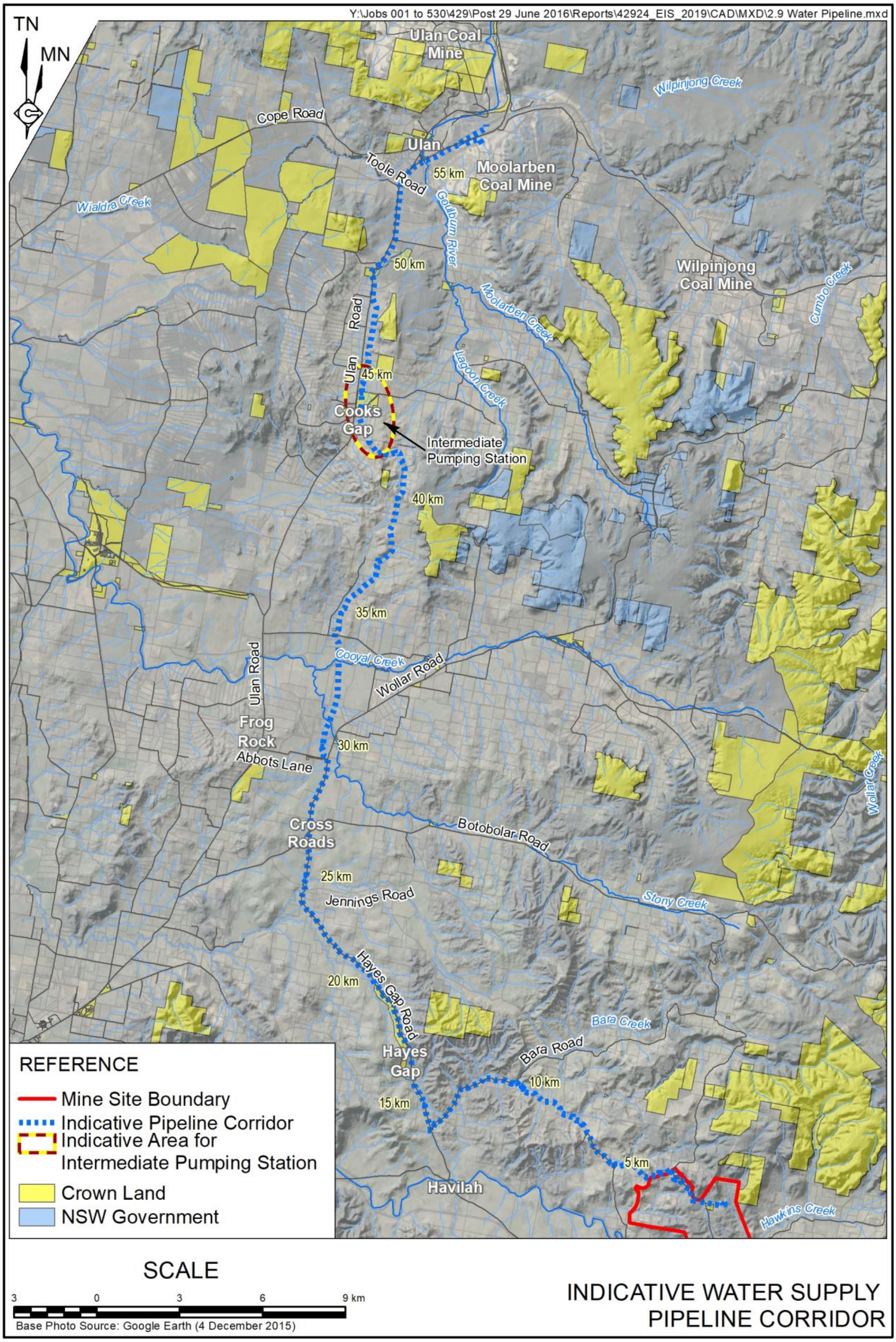
TN
MN
Access Road to Tailings Storage Facility Impoundment
Maloneys Road
Mine Access Road
Magazine
Administration Office
Mine Site Entrance
Nursery
Turkey Nest Dam
WRE Embankment Toe
Upper Embankment Haul Road
Main Mine Substation
LGO Haul Road
8.7m Noise Barrier
ROM Haul Road
Noise Barrier
Lower Embankment Haul Road
Price Creek
Powells Road
Pyangle Road
Leachate Management Dam
"Bowden"
Southern Barrier
Hawkins Creek
Existing Maloneys Road to be closed at this point.
Access Road to Tailings Storage Facility Embankment
Relocated Maloneys Road
TSF NAF Waste Rock Stockpile Area
Bara-Lue Road
To Mudgee 27 km
Relocated Maloneys Road Bridge Railway Crossing
To Lue 1.8km
Relocated Maloneys Road / Lue Road "T" Intersection
Lawsons Creek
Lue Road
Lue
Pyangle Road
To Rylstone 20 km
REFERENCE
Mine Site Boundary
Contour (m AHD) (Interval = 10m)
Spot Height (mAHD)
Existing Watercourse / Drainage Line
Road
Closed Railway Line
Existing Power Line (500kV) / Tower
Maloneys Road (Section to be closed)
Lue as displayed on Mid-Western Regional LEP, 2012
Note:
LGO = Low-grade Ore
NAF = Non-acid Forming
ROM = Run of Mine
TSF = Tailings Storage Facility
WRE = Waste Rock Emplacement
Proposed Component
Indicative Pipeline Corridor
Re-aligned Power Line (500kV) / Tower
Relocated Maloneys Road
Mine Access Road
Internal Road
Haul Road / Indicative Haul Road
Open Cut Pit
Mining Facility
Tailings Storage Facility
Processing Plant/ROM Pad Area
Soil Stockpile Area
Low-grade Ore Stockpile Area
TSF NAF Waste Rock Stockpile Area
Southern Barrier
Waste Rock Emplacement
Oxide Ore Stockpile
Lower Embankment Noise Barrier
Noise Barrier
SCALE
0.5 0 0.5 1.0 1.5 2.0 km
Source: Bowdens Silver Pty Limited
MINE SITE LAYOUT



INDICATIVE WATER SUPPLY PIPELINE CORRIDOR

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Annexure 3

Coverage of Noise-related Matters

(Total No. of pages including blank pages = 6)

Table A3.1

Coverage of SEARs and Other Government Agency Requirements

Page 1 of 5

Relevant Requirement(s)		Coverage in Report Section
Secretary's Environmental Assessment Requirements		
The EIS must address the following specific issues: • an assessment of the likely operational noise impacts of the development (including construction noise) under the *Noise Policy for Industry (EPA)*, and the *Voluntary Land Acquisition and Mitigation Policy,* and having regard to the EPA's requirements (Attachment 2);		4.3, 6,7
• if a claim is made for specific construction noise criteria for certain activities, then this claim must be justified and accompanied by an assessment of the likely construction noise impacts of these activities under the *Interim Construction Noise Guideline*;		4.1
• an assessment of the likely road noise impacts of the development under the *NSW Road Noise Policy*; and		11
• an assessment of the likely blasting impacts of the development on people, animals, buildings and infrastructure, and significant natural features, having regard to the relevant ANZECC guidelines.		10
While not exhaustive, Attachment 1 Extract (below) contains a list of some of the environmental planning instruments, guidelines, policies, and plans that may be relevant to the environmental assessment of this development.		-
• NSW Noise Policy for Industry (EPA)		4
• Interim Construction Noise Guideline (DECC)		4
• NSW Road Noise Policy (DECC&W)		11
• Assessing Vibration: a Technical Guideline (DE&C)		10
• Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration (ANZECC)		10.1
• Voluntary Land Acquisition and Mitigation Policy		4.3
Requirements Nominated by Other Government Agencies		
Environment Protection Authority 14/05/19	Potential impacts on the noise amenity of the surrounding area should be assessed in accordance with the NSW Noise Policy or Industry 2017 (NPI) and other relevant guidelines mentioned below, accounting for all noise sources associated with the Project.	9
	In particular, seasonality assessments are to be undertaken to assess the impact of temperature inversions and wind conditions.	3, 7
	A noise and vibration impact assessment for both construction and operational scenarios should be undertaken as part of the EIS.	6, 7
	The assessment should consider the issues outlined below and identify noise mitigation measures to be implemented to meet project specific noise levels developed for the Project.	5.4
	The EIS will need to assess all feasible and reasonable mitigation measures including an assessment of any residual impacts in accordance with section 3.2 of the NPI.	4.2.1, 5.4
	The noise assessment must include (but not be limited to) an assessment of the C-weighted noise (low frequency) as well as A-weighted noise.	4.2.3, 5.5

Table A3.1 (Cont'd)
Coverage of SEARs and Other Government Agency Requirements

Relevant Requirement(s)		**Coverage in Report Section**
Requirements Nominated by Other Government Agencies (Cont'd)		
Environment Protection Authority 14/05/19 (Cont'd)	In relation to noise, the following matters should be addressed (where relevant) as part of the Environmental Assessment: • Construction noise associated with the proposed development should be assessed using the Interim Construction Noise Guideline (DECC, 2009).	4.1, 6
	• Operational noise from all industrial activities (including private haul roads and private railway lines) to be undertaken on the premises must be assessed in accordance with the guidelines contained in the *NSW Noise Policy for Industry* (EPA, 2017).	4.2, 7, 8
	• Vibration from all activities (including construction and operation) to be undertaken on the premises should be assessed using the guidelines contained in the *Assessing Vibration:* a *technical guideline* (DEC, 2006).	10, 11
	• If blasting is required for any reasons during the construction or operational stage of the proposed development, blast impacts should be demonstrated to be capable of complying with the guidelines contained in *Australian and New Zealand Environment Council* - *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration* (ANZEC, 1990).	10.1.2
	• Noise on public roads from increased road traffic generated by land use developments should be assessed using the *NSW Road Noise Policy* (DECCW, 2011).	11.1
	• Noise from new or upgraded public roads should be assessed using the *NSW Road Noise Policy* (DECCW, 2011).	11
	Describe the noise monitoring system in detail, including the development and implementation of a monitoring program that: • uses a combination of predictive meteorological forecasting and real-time noise monitoring, supplemented with attended monitoring measures to evaluate the performance of the mine complex; • adequately supports the proactive and reactive noise management system on site; • includes a protocol for determining exceedances of the conditions imposed on the project; • evaluates and reports on the effectiveness of the noise management system on site; • provides for the annual validation of the noise model for the mine complex.	7.6
	The EIS must describe the system that will be implemented to enable the community to access up-to-date information regarding any proposed blasting schedule.	10.7
Department of Education 3/08/17	Assess the potential of noise and vibration from blasting, and vehicles passing the school site, to adversely impact the structure of school buildings and internal classroom noise levels.	10, 11
TransGrid 25/03/13	Any blasting occurring near the transmission line easement shall consider vibration impacts on the stability of transmission line structures. Blasting shall have a maximum charge of 2kg/delay, with a maximum peak particle velocity of 50mm/second. Furthermore, the impacts on the transmission line from potential flyrock associated with blasting operations also need to be considered.	10.4

Table A3.2
Issues raised by Lue and District Community

Page 3 of 5

Relevant Requirement(s)	Coverage in Report Section
Relevant Requirements Nominated by Lue and District Community	
Hours of operation.	2.1 – Table 2
Noise levels should comply with applicable noise criteria.	Agreed, and when they don't, Bowdens Silver is obligated to address any exceedances
Noise impact conditions based on existing noise levels rather than nominal minimum noise levels set in current Industrial Noise Policy.	Not Agreed, Section 4.2.1 establishes noise criteria (PNTLs) in accordance with the NPfI
Avoidance of the use of the term 'to the extent practicable' when assessing noise impacts.	Section 5.4 describes feasible and reasonable noise mitigation in accordance with NPfI
Traffic noise impacts on the proposed new deviation of Maloneys (Bara) Road.	11
Accurate assessment of noise impacts to residences rather than use of 'approximate distances' from the mine site.	Accurate three dimensional topography has been used in the noise model
Will the operation be running 24/7?	2.1 – Table 2
How much noise will we hear and vibration will we feel (and when)?	Subject to your location, mine noise may audible at times, and vibration is less likely to be detected
We are concerned about how much noise mining operations will generate. How loud will it be and what is Bowdens Silver going to do about it?	4, 5, 6, 7, 8
What is the area of impact for noise?	See **Annexure 18** for the daytime, evening and night-time outer envelope intrusive noise contours
How much noise will be generated at night?	
How much noise will be generated on weekends?	2.1 – Table 2 and Section 7
How will operational noise compare to current noise generated from drilling and the rock breaker?	Daytime operational noise will be generally lower by comparison with exploration activity noise
I live in an elevated location – how will noise impact me?	The noise model takes into account your elevated location
Will the proposed noise mitigation strategies be adequate?	Section 5.4 describes feasible and reasonable noise mitigation in accordance with NPfI
Will earth noise bunds be constructed across the front of the property?	See **Annexure 2** Mine Site Layout depicting the Southern Barrier.
Will double glazing be provided, if required?	Yes – at relevant VLAMP agreement properties.
Will Bowdens Silver ensure that machinery isn't operating unnecessarily to reduce noise?	Yes, will be included in the Noise Management Plans
Can the product be sent via conveyer off site to reduce noise?	Conveyors are used on-site and the product transported off site by truck

Table A3.2
Issues raised by Lue and District Community

Page 4 of 5

Relevant Requirement(s)	Coverage in Report Section
Relevant Requirements Nominated by Lue and District Community (Cont'd)	
Why has the location of the Plant moved south? Could the processing plant be moved further to the north? Would this make a difference to noise impacts in Lue village?	See **Annexure 9** Site Infrastructure Plan, where the site is located north of its original location.
I am concerned about noise from traffic - how bad will it be and what will be done about it?	See Section 11
Will speed limits be changed to ensure truck-related noise from exhaust brakes is minimised?	Section 11.7.2 provides SLR's recommendation regarding a management of transport noise.
What noise monitoring will be undertaken?	Section 7.6
Is the noise logger microphone omnidirectional?	Yes, see **Annexure 12**
The existing background noise level is "zero", so 35 dB(A) from the mine is unacceptable. What will Bowdens Silver do to keep reduce noise?	Background noise levels are low, however Section 4.2.1 establishes noise criteria as per the NPfI
We have lived here for 40 years and enjoy the peace and quiet - how are you going to ensure there are no impacts to our lifestyle?	See Section 4, where noise criteria have been established in accordance with relevant policy
What will you do if people find noise generated from the mine is unacceptable?	Once operating, noise levels will be monitored to ensure compliance
I live about 7km south of the mine and am concerned about mine noise impacting my beef cattle operation - will operations be audible at my location and what impacts will it have on my livestock?	See **Annexure 18** for outer envelope noise contours, indicating noise levels will be less than 30dBA, and livestock will be unaffected
We would like to understand how noisy 35dB(A) and 40dB(A) would be.	Noise levels in the range 35dBA to 40dBA are low, in fact a quiet spaces such libraries are designed to maintain noise levels in this range
What if the noise predictions are wrong, like they were at Wollar? Have any comparisons made between noise predictions and actual noise levels?	Noise predictions are most unlikely to be wrong, if anything more likely to be relatively conservative
Our residence is located well to east of the Mine Site, stated that their *'silence was very precious to us!'* Motor bikes can be heard at times on the weekends.	See **Annexure 18** for outer envelope noise contours, indicating noise levels will be less than 30dBA
What would be the noise criteria and noise levels from the mine in Lue village during the day and night-time?	See Sections 4, 5, 6, 7, 8
Will the mine be audible beyond 25dB(A) noise contour shown on your map?	Mine noise levels below 25dBA are unlikely to be discernible to a person going about their daily activities
My home is of a solar passive design and therefore not suitable for acoustic treatments. Noise from the mine would remain 'deafening'.	Mine noise will not be 'deafening' at any residential location either with or without acoustic treatments
I am not unduly concerned being within the 1-2dBA noise impact zone from the Mine Site.	Noted

Table A3.2
Issues raised by Lue and District Community

Page 5 of 5

Relevant Requirement(s)	Coverage in Report Section
Relevant Requirements Nominated by Lue and District Community (Cont'd)	
We are concerned about potential mine related traffic (and noise) through Lue village, but somewhat relieved by the proposed relocated Maloneys Road.	See Section 11
Won't the noise escape 1.5km? (location of their residence)	The extent to which noise travels is a function of distance, intervening topography, built barriers, prevailing weather conditions and the nature of the ground surface between the noise source and the receiver. Tables 35 to 42 list the predicted noise levels at all the residences surrounding the Mine Site.
Blasting and Vibration	
How much vibration will be caused by blasting and will this cause any damage?	See Section 10
Will blasting notices be sent out?	Section 10.7 provides SLR's recommendation regarding notification to landowners of blasts.
What will be the difference between the mine operating noise criteria and that for blasting?	See Section 4.2 for mine operating noise criteria, and Section 10.1 for Airblast Overpressure criteria
How will blast scheduling occur to avoid adverse weather conditions?	Bowdens Silver will review the weather forecast prior to the scheduled blast, and defer blasting if adverse weather persists
What will be the effect of the blasts on our home, outbuildings and concrete tanks.	See Section 10
What are the requirements for land acquisition and mitigation?	Section 10.6 summaries the blast impacts at privately-owned residences
Catalogue of photographs (internal and external) of all residences and masonry structures located within 3km of the proposed pit.	Section 10.7 describes the recommended inspection procedures prior to any blasting.
Blasting and vibration impacts to existing livestock, wildlife and recreational activities.	Section 10.4 considers blast impacts on livestock; SCSC Part 9a Section 7.4.9; There are no recreational uses surrounding the Mine Site.

Annexure 4

Land Ownership and Surrounding Residences

(Total No. of pages including blank pages = 8)

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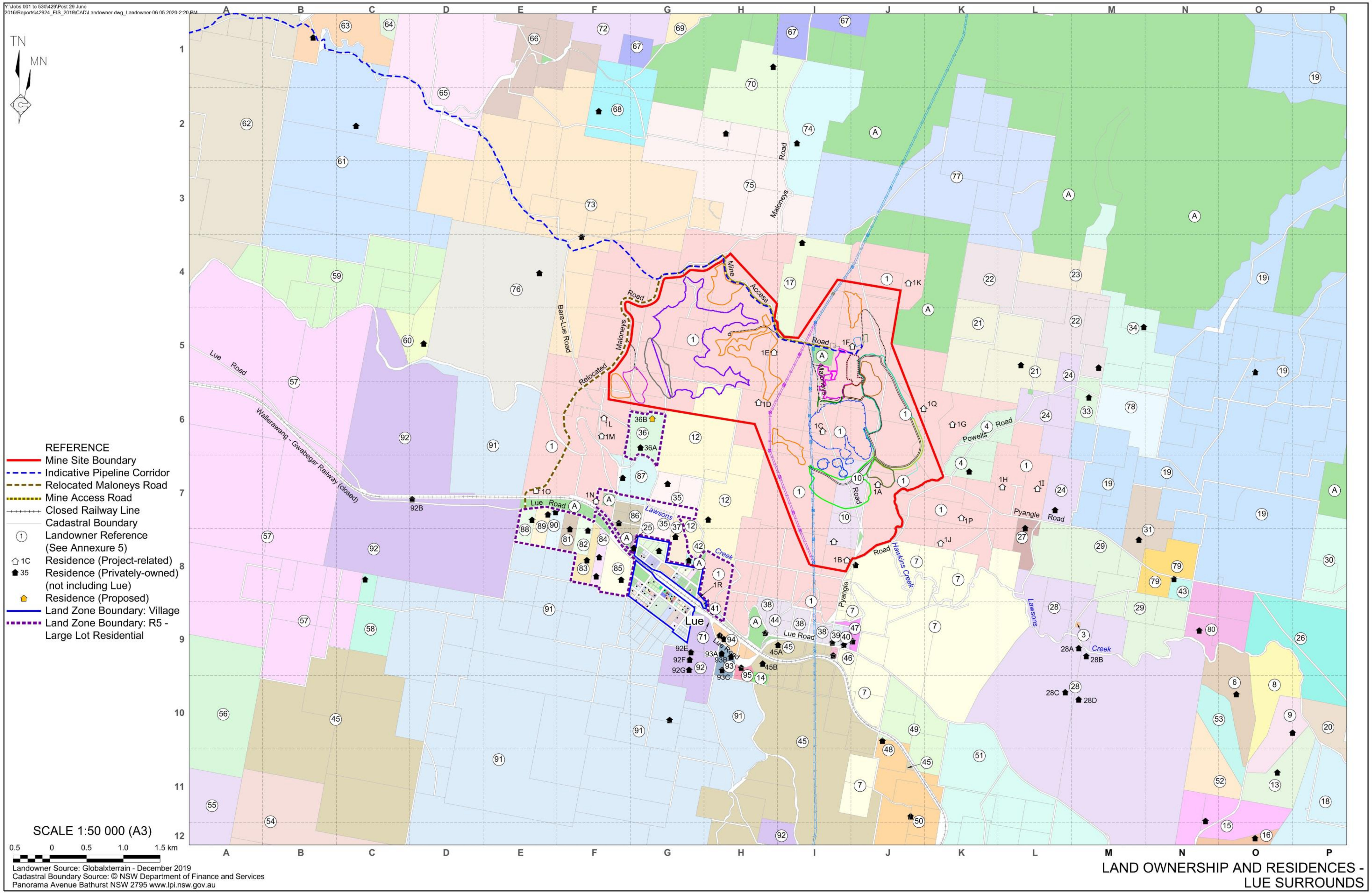

LAND OWNERSHIP AND RESIDENCES - LUE SURROUNDS

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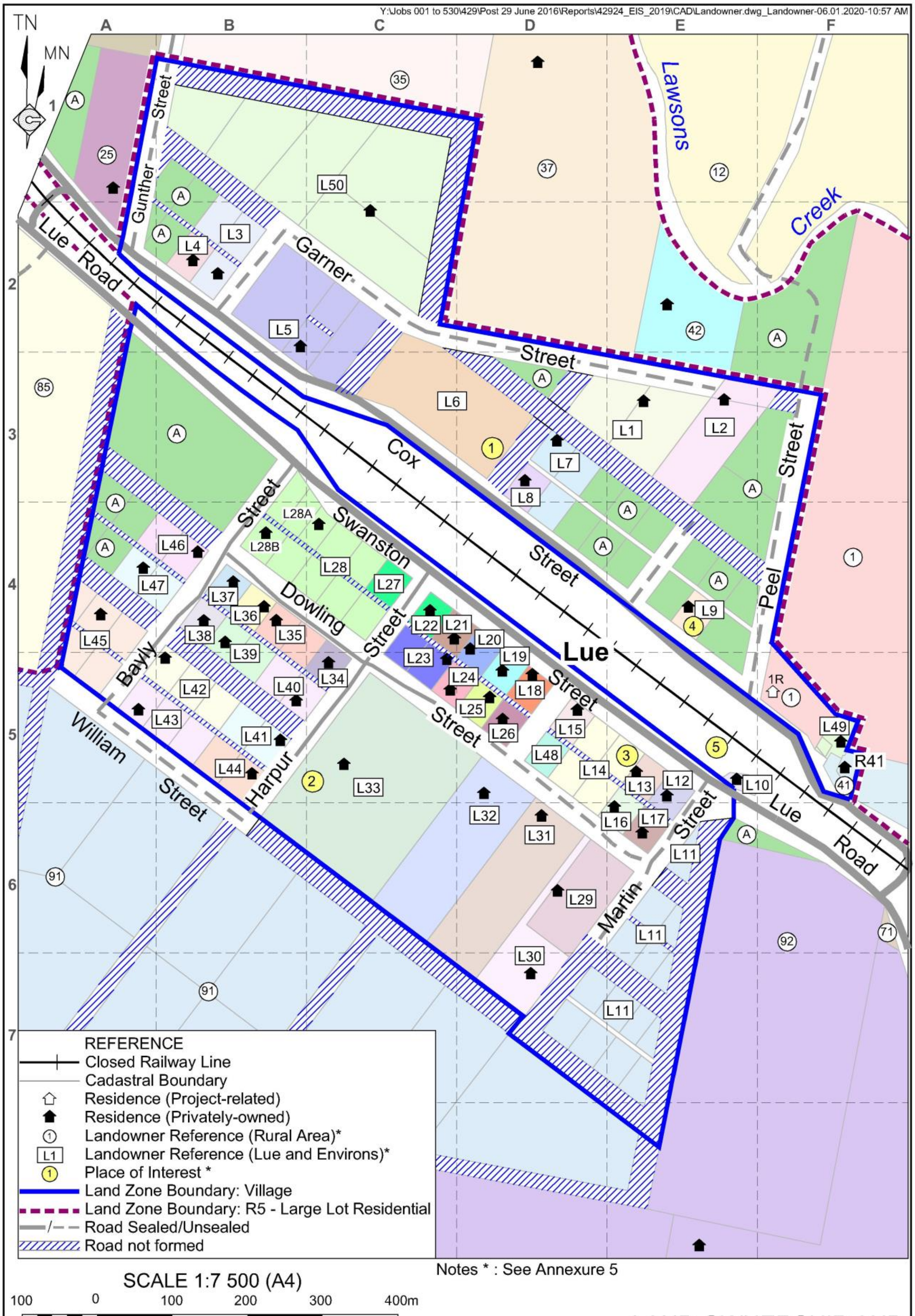

LAND OWNERSHIP AND RESIDENCES - LUE

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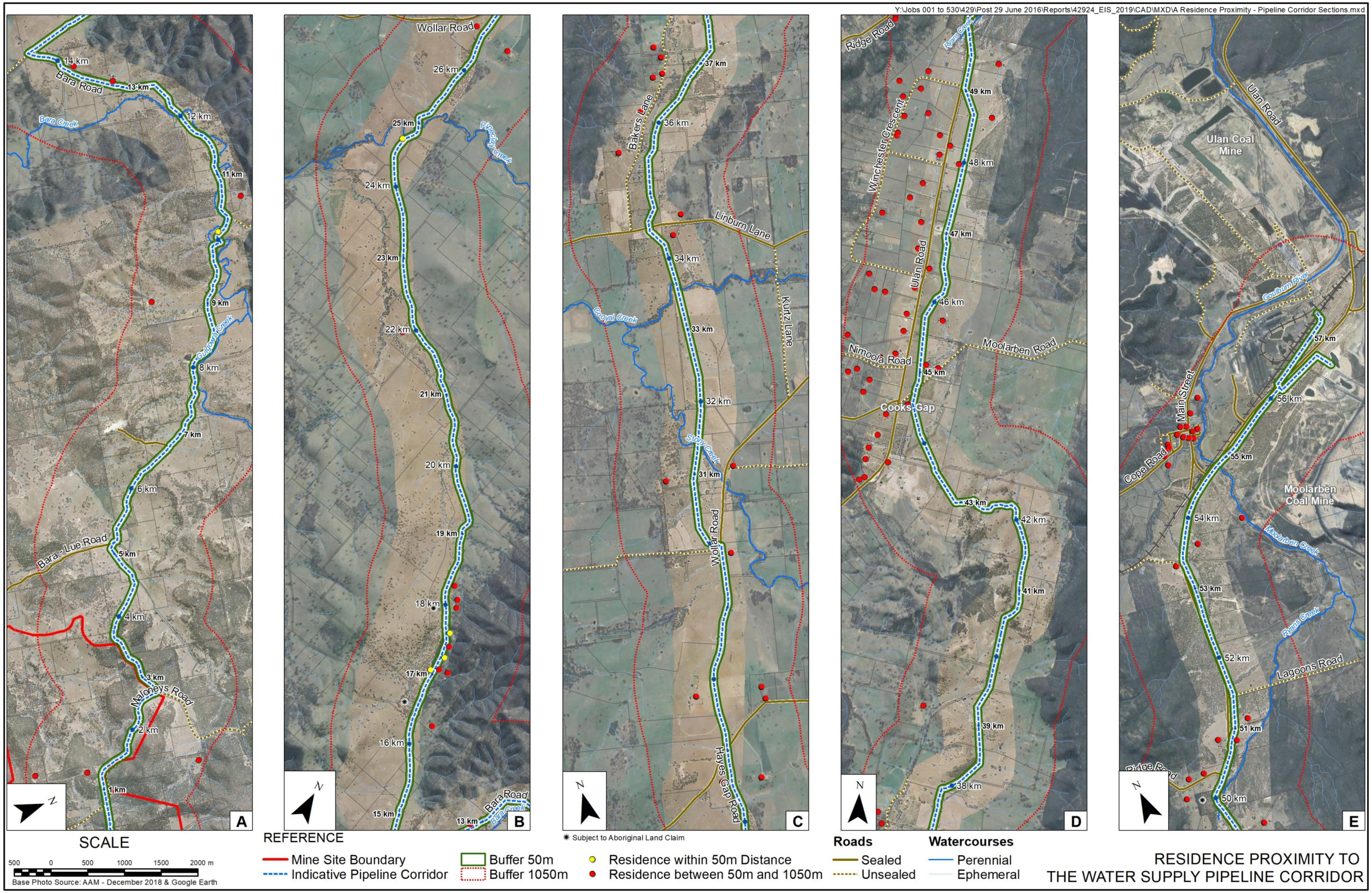

RESIDENCE PROXIMITY TO THE WATER SUPPLY PIPELINE CORRIDOR

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Annexure 5

Residence and Other Receiver Ownership Details

(Total No. of pages including blank pages = 6)

Table A5.1
Schedule of Land Ownership - Lue Surrounds (3 December 2019)

Page 1 of 2

Ref	Landowner Abbreviated Name	Landowner Name	Grid Ref	Easting (m)	Northing (m)	Elevation (m AHD)	MWRC Land Zone[1]	Noise Amenity Area[2]
R1D	Bowden	Bowdens Silver Pty Limited	H6	767860	6385992	685.1	RU1	Rural
R1E	Bowden	Bowdens Silver Pty Limited	H5	768070	6386673	691.5	RU1	Rural
R1F	Bowden	Bowdens Silver Pty Limited	J5	769135	6386755	673.7	RU1	Rural
R1G	Bowden	Bowdens Silver Pty Limited	K6	770496	6385692	599.3	RU1	Rural
R1H	Bowden	Bowdens Silver Pty Limited	L7	771174	6384841	642.5	RU1	Rural
R1I	Bowden	Bowdens Silver Pty Limited	L7	771653	6384819	630.2	RU1	Rural
R1J	Bowden	Bowdens Silver Pty Limited	K8	770336	6384078	615.1	RU1	Rural
R1K	Bowden	Bowdens Silver Pty Limited	J4	769896	6387614	655.7	RU1	Rural
R1L	Bowden	Bowdens Silver Pty Limited	F6	765759	6385779	546.1	RU1	Rural
R1M	Bowden	Bowdens Silver Pty Limited	F6	765726	6385535	536.9	RU1	Rural
R1N	Bowden	Bowdens Silver Pty Limited	F7	765648	6384651	561.6	RU1	Rural
R1O	Bowden	Bowdens Silver Pty Limited	E7	764834	6384795	564.4	RU1	Rural
R1P	Bowden	Bowdens Silver Pty Limited	K7	770105	6385907	602.2	RU1	Rural
R1Q	Bowden	Bowdens Silver Pty Limited	J6	770619	6384421	633.2	RU1	Rural
R4	Robinson	Geoffrey Vincent Robinson	K7	770723	6385051	589.5	RU1	Rural
R6	Patterson	N.G. & J.Patterson	O10	774356	6382023	616.5	RU1	Rural
R7	Locheily	Lochiely Pty. Limited	J8	769179	6383781	582.3	RU1	Rural
R9	Backhouse	A.M. & E.R. Backhouse	P10	775120	6381500	612.0	RU1	Rural
R10[3]	Winter	Bernard Winter	I8	768884	6384070	614.0	RU1	Rural
R12	Lydiard	J.C. Lydiard	H7	767174	6384398	567.1	RU1	Rural
R13	O'Neill	J.M. O'Neill	O11	774913	6380959	619.1	RU1	Rural
R15	Bentivoglio	P.J.S. Bentivoglio	N11	773936	6380299	660.1	RU1	Rural
R16	Van Oosterum	L.A. & G.P.J. Van Oosterum	O12	774611	6380065	653.4	RU1	Rural
R17	Dryden	C.A. Dryden	I4	768452	6388161	659.7	RU1	Rural
R19	Mills	R.G. & G.R. Mills	O5	774613	6386402	634.5	RU1	Rural
R21	Hornery	K.R. & J. Hornery	L5	771427	6386498	612.0	RU1	Rural
R22	Boller	M.F. Boller	M5	772483	6386464	601.6	RU1	Rural
R24	Price	G.R. Price	L7	771891	6384526	615.2	RU1	Rural
R25	Skinner	A.A. Skinner	G8	766160	6384002	558.7	R5	Rural
R27	Friend	M.C. & L.R. Friend	L7	771485	6384281	627.0	RU1	Rural
R28A	Attunga 2850	Attunga 2850 Pty Ltd	M9	772213	6382649	572.2	RU1	Rural
R28B	Attunga 2850	Attunga 2850 Pty Ltd	M9	772315	6382541	574.2	RU1	Rural
R28C	Attunga 2850	Attunga 2850 Pty Ltd	L10	772030	6382049	587.3	RU1	Rural
R28D	Attunga 2850	Attunga 2850 Pty Ltd	M10	772212	6381951	583.6	RU1	Rural
R31	Carkegis	P.J. Carkagis	M8	773031	6384124	625.2	RU1	Rural
R33	Anderson & Downie	D.S. Anderson & C.L. Downie	M6	772351	6386059	601.5	RU1	Rural
R34	Beckingham	F.F. Beckingham	M5	773098	6387016	629.6	RU1	Rural
R35	Clydesdale	M.R. Clydesdale	G7	766623	6384884	553.7	RU1	Rural
R36A	Patsky	L.M. Patsky	G6	766253	6385377	543.7	R5	Rural
R36B	Patsky	L.M. Patsky	G6	766411	6385764	560.5	R5	Rural
R37	Coombe	L.A. Coombe	G8	766725	6384169	545.0	R5	Rural
R39	Gordon & Tubnor	C. Gordon & I. Tubnor	I9	768861	6382726	575.0	RU1	Rural
R40	Mitchell	M. Mitchell	I9	769019	6382694	576.4	RU1	Rural
R42	Bray	R.A. Bray	G9	766897	6383846	547.2	R5	Rural

Table A5.1 (Cont'd)
Schedule of Land Ownership - Lue Surrounds (3 December 2019)

Page 2 of 2

Ref	Landowner Abbreviated Name	Landowner Name	Grid Ref	Easting (m)	Northing (m)	Elevation (m AHD)	MWRC Land Zone[1]	Noise Amenity Area[2]
R43	Burnett	S. Burnett	N8	773508	6383591	595.4	RU1	Rural
R44	Statham	L.J. & E.R. Statham	H9	767951	6382857	549.3	RU1	Rural
R45A	Combes	T.D.P. & S.E. Combes	I9	768124	6382692	557.6	RU1	Rural
R45B	Combes	T.D.P. & S.E. Combes	H9	767915	6382439	557.1	RU1	Rural
R46	Brown	T.A & A.O Brown	I9	768873	6382551	586.0	RU1	Rural
R47	Walsh	G.T. Walsh	J9	769139	6382743	585.0	RU1	Rural
R48	ACN 059 643 533	ACN 059 643 533 Pty Limited	J10	769543	6381390	625.2	RU1	Rural
R50	ACN 059 643 533	ACN 059 643 533 Pty Limited	J11	769927	6380363	619.7	RU1	Rural
R58	Curro	A.M. Curro	C8	762508	6383584	571.0	RU1	Rural
R60	Barnes	R.J. & D.M Barnes	K7	763305	6386791	559.3	RU1	Rural
R63	Kavanagh	T.W. & D.L. Kavanagh	B1	761802	6390952	543.5	RU1	Rural
R68	Hinton	I.C. & H.A. Hinton	F2	765686	6389950	662.8	RU1	Rural
R70	Tugulawa Homestead	Tugulawa Homestead Pty Ltd	H1	768058	6390555	704.7	RU1	Rural
R73	Murdoch & Co	W.J. Murdoch & Co Pty Ltd	F4	765454	6388243	563.5	RU1	Rural
R74	Brown	M.N. & E. Brown	I2	768381	6389515	661.3	RU1	Rural
R75	Van Oosterum	P.F. Van Oosterum	H2	767415	6389649	673.1	RU1	Rural
R76	Merryvale Farm	Merryvale Farm Pty Limited	E4	764878	6387750	573.2	RU1	Rural
R80	Clear	B.R. & D. Clear	N9	773851	6382889	597.3	RU1	Rural
R81	Jones	L.J Jones	F8	765294	6384267	613.1	R5	Rural
R82	Short	D.G. & R.M. Short	F8	765539	6384249	598.4	R5	Rural
R83	Rumney	K.R. Rumney	F8	765524	6383845	591.3	R5	Rural
R84A	Francis & Krull	P. Francis & N.J. Krull	F8	765692	6383886	578.9	R5	Rural
R84B	Francis& Krull	P. Francis & N.J. Krull	F8	765652	6383626	589.8	R5	Rural
R85	Turner	S.L & K.A. Turner	F8	765991	6383581	574.3	R5	Rural
R86	Eno	A.J. Eno	F7	765960	6384351	558.9	R5	Rural
R87	Cameron	P.B. & M.M. Cameron	F7	766011	6384965	537.6	RU1	Rural
R88	Jameson	A. & C.M Jameson	E7	764779	6384393	567.8	R5	Rural
R89	Andrew & Paterson	G.A. & S.J Paterson	E7	764995	6384467	578.5	R5	Rural
R90	Stearman	D.R. Stearman	E7	765098	6384499	579.0	R5	Rural
R91	Lue Station	Lue Station Pty Limited	G10	766649	6381672	584.5	RU1	Rural
R92B	Combes	T.D. Combes	D7	763148	6384675	544.0	RU1	Rural
R92E	Combes	T.D. Combes	G9	766940	6382593	563.4	RU1	Rural
R92F	Combes	T.D. Combes	G9	766923	6382494	566.1	RU1	Rural
R92G	Combes	T.D. Combes	G9	766914	6382354	568.9	RU1	Rural
R93A	Hawkins	R.E. & C.A. Hawkins	H9	767357	6382576	571.5	RU1	Rural
R93B	Hawkins	R.E. & C.A. Hawkins	H9	767485	6382534	568.7	RU1	Rural
R93C	Hawkins	R.E. & C.A. Hawkins	H9	767363	6382351	571.8	RU1	Rural
R94A	Knott	D.M. & C.L. Knott	H9	767333	6382822	566.4	RU1	Rural
R94B	Knott	D.M. & C.L. Knott	H9	767388	6382772	561.7	RU1	Rural
R95	Adams & Grisedale	L.D. Adams & D.L. Grisedale	H9	767622	6382383	557.0	RU1	Rural

Note 1: See **Annexure 6** for Mid-Western Regional Council (MWRC) Land Zoning Maps.
Note 2: In accordance with the NPfI Table 2.3.
Note 3: Bowden Silver has a negotiated agreement wih the Landowner.
RU1 = Primary Production R5= Large Lot Residential

Table A5.2
Schedule of Land Ownership - Lue Village (3 December 2019)

Ref	Landowner Abbreviated Name	Landowner Full Name	Grid Ref	Easting (m)	Northing (m)	Elevation (m AHD)	MWRC Land Zone[1]	Noise Amenity Area[2]
L1R	Bowden	Bowdens Silver Pty Limited	F5	767038	6383331	550.0	RU1	Rural
L1	Jackson	K.C. Jackson	E3	766866	6383718	552.6	RU5	Rural
L2	Millsom	S. & R.A. Millsom	E3	766973	6383720	546.2	RU5	Rural
L3	Caldwell	M.K. Caldwell	B2	766299	6383888	557.6	RU5	Rural
L4	Statham & Hulme	A. Statham & K.A. Hulme	B2	766266	6383905	557.9	RU5	Rural
L5	Raymond & Squires	S. Raymond & L.M. Squires	B2	766409	6383791	554.2	RU5	Rural
L7	Garner	M.F. Garner	D3	766750	6383665	551.7	RU5	Rural
L8	Tattersall	L.R Tattersall & P.A Tattersall	D3	766708	6383612	552.5	RU5	Rural
L9	Thompson, Underwood & Fisher	J. Thompson & H.W Underwood & J.W Fisher	E4	766925	6383444	549.1	RU5	Rural
L10	Hogben	S.R. Hogben	E5	766990	6383214	553.6	RU5	Rural
L12	Farrow	B.H. Farrow & C.A. Farrow	E5	766897	6383192	556.4	RU5	Rural
L13	Mackenzie	S.R. Mackenzie	E5	766856	6383224	556.5	RU5	Rural
L15	Altimira	L.A. Altimira	D5	766778	6383306	556.7	RU5	Rural
L16	Maher	J.M. Maher	E6	766827	6383177	558.8	RU5	Rural
L17	Elphick	C.M Elphick & L.B Elphick	E6	766864	6383143	558.1	RU5	Rural
L18	Codrington	B.S. & L.M. Codrington	D5	766718	6383354	556.1	RU5	Rural
L19	Dawson	K.A. Dawson	D5	766678	6383359	557.8	RU5	Rural
L20	Everest	N.K Everest	D4	766635	6383388	557.9	RU5	Rural
L21	Nevell	D.J.C Nevell	C4	766614	6383401	558.3	RU5	Rural
L22	Madden	J.L. Madden	C4	766581	6383439	558.3	RU5	Rural
L23	Beckingham	F.F. Beckingham	C5	766604	6383374	559.1	RU5	Rural
L24	Rothe	L.A. Rothe	C5	766608	6383333	560.0	RU5	Rural
L25	Robinson	R. Robinson & D.M Robinson	D5	766661	6383323	559.5	RU5	Rural
L26	Butler	Y.A. Butler	D5	766678	6383294	560.0	RU5	Rural
L27*	Madden	J.L. Madden	C4	766526	6383492	558.4	RU5	Rural
L28A	Kurtz	P.A & C.R Kurtz	C4	766434	6383554	558.6	RU5	Rural
L28B	Kurtz	P.A & C.R Kurtz	B4	766363	6383542	560.6	RU5	Rural
L29	Wells	E.G Wells	D6	766751	6383066	566.5	RU5	Rural
L30	Wells & Walsh	P.A Wells & T.M Walsh	D7	766715	6382955	574.8	RU5	Rural
L31	Rawson	T.C. & S.F. Rawson	D6	766730	6383165	563.7	RU5	Rural
L32	Palmer	I. Palmer	D6	766653	6383196	566.5	RU5	Rural
L33	Howard	D.V Howard & J.M Howard	C5	766467	6383234	569.2	RU5	Rural
L34	Collins	K.M. & J.S. Collins	C5	766446	6383369	562.4	RU5	Rural
L35	Dixon & Hyland	N.A. Dixon & J.A. Hyland	B4	766377	6383426	563.1	RU5	Rural
L37	Veitch	J. Veitch	B4	766320	6383477	564.2	RU5	Rural
L38	Harrington	M.A.J. & M.E. Harringtom	B4	766281	6383425	566.8	RU5	Rural
L39	Unicomb & McKeoewn	D.G Unicomb & K.E McKeown	B4	766309	6383397	566.1	RU5	Rural
L40	Battye	S.J & H. Battye	B5	766403	6383319	565.6	RU5	Rural
L41	Lue Hospitality	Lue Hospitality Pty Ltd	F5	766382	6383266	568.7	RU5	Rural
L42	Kidson	H.M. & T.A. Kidson	B5	766229	6383376	570.6	RU5	Rural
L43	Bisson	B.T. Bisson	A5	766194	6383307	573.9	RU5	Rural
L44	Munro	M.J & D. Munro	B5	766345	6383221	571.1	RU5	Rural
L45	Docherty	W.W. & M.H. Docherty	A4	766143	6383434	577.5	RU5	Rural
L46	Hulme	D.L Hulme	B4	766273	6383517	565.0	RU5	Rural
L47	Warner	D. Warner	A4	766200	6383495	569.8	RU5	Rural
L49	Scifleet	R.C Scifleet	F5	767128	6383264	551.1	RU5	Rural
L50	Tot	P.J. & P. Tot	C2	766502	6383971	556.0	RU5	Rural

* Formerly St Lukes Anglican Church
Note 1: See **Annexure 6** for Mid-Western Regional Council (MWRC) Land Zoning Maps;
Note 2: In accordance with the NPfI Table 2.3.

Table A5.3
Lue Village Places of Interest (3 December 2019)

Ref	Places of Interest Abbreviated Name	Places of Interest Full Name	Easting (m)	Northing (m)	Elevation (m AHD)	MWRC Land Zone[1]	Noise Amenity Area[2]
LPOI1	Rural Fire Brigade	Lue / Havilah Rural Fire Brigade	766653	6383632	553.1	RU5	Rural
LPOI2	Lue Pottery	D.V Howard & J.M Howard	766472	6383242	569.1	RU5	Rural
LPOI3	Lue Public School	Lue Public School	766819	6383253	557.0	RU5	Rural
LPOI4	Lue Hall	J. Thompson & H.W Underwood & J.W Fisher	766921	6383441	549.1	RU5	Rural
LPOI5	Lue Railway Station	Lue Railway Station buildings	766987	6383263	552.8	SP2	Infrastructure
Note 1: See Annexure 6 for Mid-Western Regional Council (MWRC) Land Zoning Maps;							
Note 2: In accordance with the NPfI Table 2.3							

Table A5.4
Vacant Land Ownership Details (3 December 2019)

Ref	Landowner Abbreviated Name	Landowner Name	MWRC Land Zone	Noise Amenity Area
Vacant Land (see Annexure 4, Land Ownership Plan Surrounding Land)				
08	Sam Lynch Electrical	Sam Lynch Electrical Pty Limited	RU1	Rural
14	Erskine	A.E. Erskine	RU1	Rural
20	Brown	W.A. Brown	RU1	Rural
23	Nevell	D.J.C. Nevell	RU1	Rural
26	Stanford	T.J. Stanford	RU1	Rural
29	Price	S.G. & K.D. Price	RU1	Rural
30	Bleach & Smink	R.J. Bleach & L. Smink	RU1	Rural
38	McDonald	T.F. McDonald	RU1	Rural
41	Lue Hotel	Lue Hospitality Pty Ltd	RU5	Rural
49	Scifleet	R.C. Scifleet	RU1	Rural
51	Kerr	J.W. & J.M. Kerr	RU1	Rural
52	Hood	A.J. & A. Hood	RU1	Rural
53	Wood	C.M. Wood	RU1	Rural
54	Mudgee LALC	Mudgee Local Aboriginal Land Council	RU1	Rural
55	Nelson	D.A. & S.M. Nelson	RU1	Rural
56	Ward	J.M. & S.G. Ward	RU1	Rural
57	Havilah South	Havilah South Pty Limited	RU1	Rural
59	Inglis	S.J. Inglis	RU1	Rural
61	McNiven	J.R. & A.M. McNiven	RU1	Rural
62	White	N.D. White	RU1	Rural
69	Muller	A. & V. Muller	RU1	Rural
71	State Rail	State Rail	RU1	Rural
72	Orr	P.R. Orr	RU1	Rural
77	Walker	J. Walker	RU1	Rural
78	Price	S.J. Price	RU1	Rural
79	Stanford (Botobolar)	Stanford (Botobolar) Pty Limited	RU1	Rural
L11	Lue Station	Lue Station Pty Limited	RU5	Rural
Note 1: Relates solely to coverage of **Figure A6.1**				
Note 2: See Annexure 6 for Mid-Western Regional Council (MWRC) Land Zoning Maps;				
Note 3: In accordance with the NPfI Table 2.3				

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Annexure 6

Land Zoning Maps
(Mid-Western Regional, LEP 2012)

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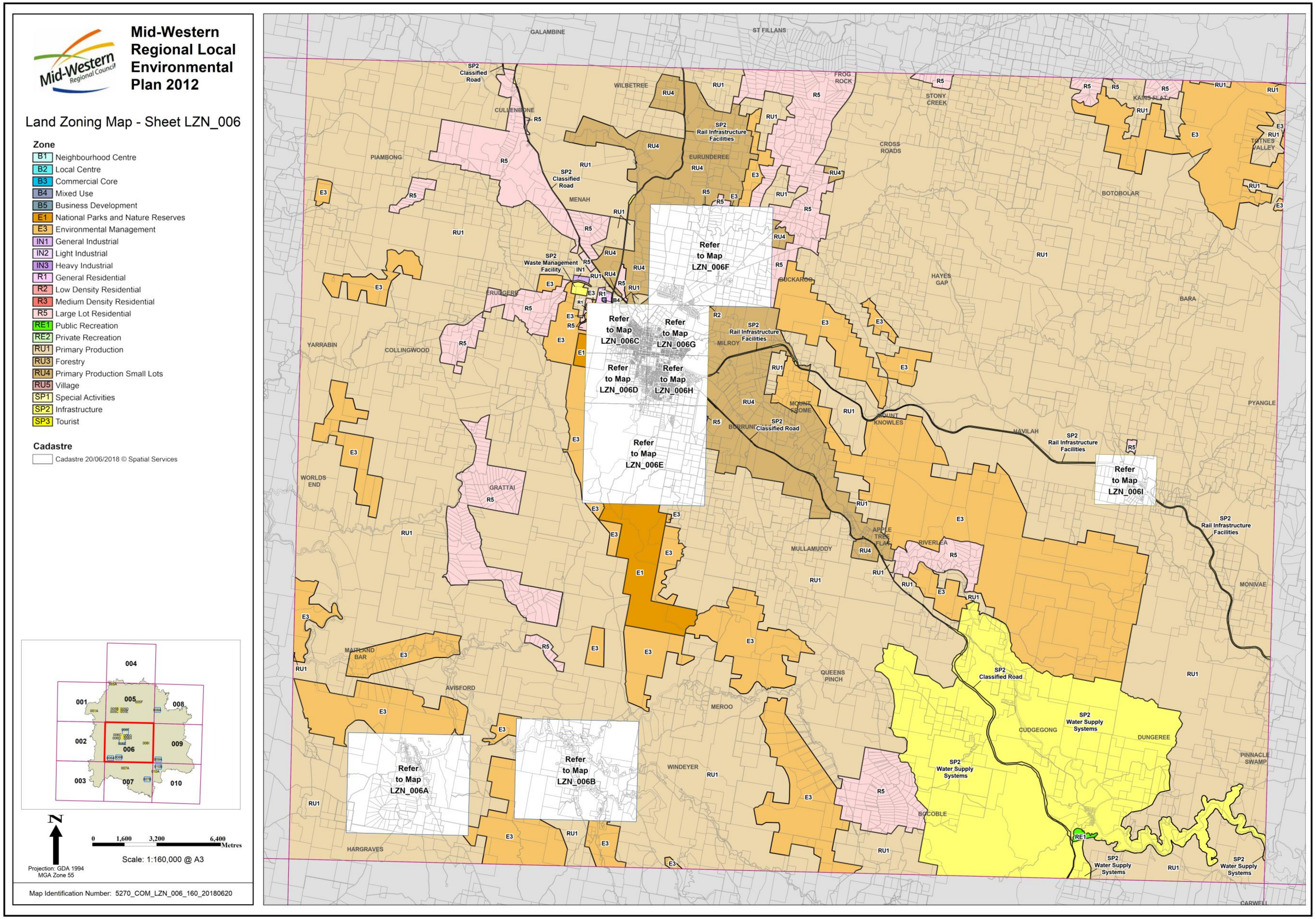
Mid-Western Regional Council
Mid-Western Regional Local Environmental Plan 2012
Land Zoning Map - Sheet LZN_006
Zone
B1 Neighbourhood Centre
B2 Local Centre
B3 Commercial Core
B4 Mixed Use
B5 Business Development
E1 National Parks and Nature Reserves
E3 Environmental Management
IN1 General Industrial
IN2 Light Industrial
IN3 Heavy Industrial
R1 General Residential
R2 Low Density Residential
R3 Medium Density Residential
R5 Large Lot Residential
RE1 Public Recreation
RE2 Private Recreation
RU1 Primary Production
RU3 Forestry
RU4 Primary Production Small Lots
RU5 Village
SP1 Special Activities
SP2 Infrastructure
SP3 Tourist
Cadastre
Cadastre 20/06/2018 © Spatial Services
004
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Projection: GDA 1994 MGA Zone 55
Map Identification Number: 5270_COM_LZN_006_160_20180620
Refer to Map LZN_006F
Refer to Map LZN_006C
Refer to Map LZN_006G
Refer to Map LZN_006D
Refer to Map LZN_006H
Refer to Map LZN_006E
Refer to Map LZN_006I
Refer to Map LZN_006A
Refer to Map LZN_006B
GALAMBINE
ST FILLANS
WILBETREE
FROG ROCK
STONY CREEK
CULLENBONE
EURUNDEREE
CROSS ROADS
PIAMBONG
MENAH
BOTOBOLAR
TOTNES VALLEY
HAYES GAP
BARA
YARRABIN
COLLINGWOOD
MILROY
PYANGLE
MOUNT FROME
MOUNT KNOWLES
HAVILAH
BURRUNDULLA
WORLDS END
GRATTAI
MULLAMUDDY
APPLE TREE FLAT
RIVERLEA
MONIVAE
MAITLAND BAR
AVISFORD
QUEENS PINCH
MEROO
CUDGEGONG
DUNGEREE
WINDEYER
PINNACLE SWAMP
BOCOBLE
HARGRAVES
CARWELL
SP2 Classified Road
SP2 Rail Infrastructure Facilities
SP2 Waste Management Facility
SP2 Water Supply Systems

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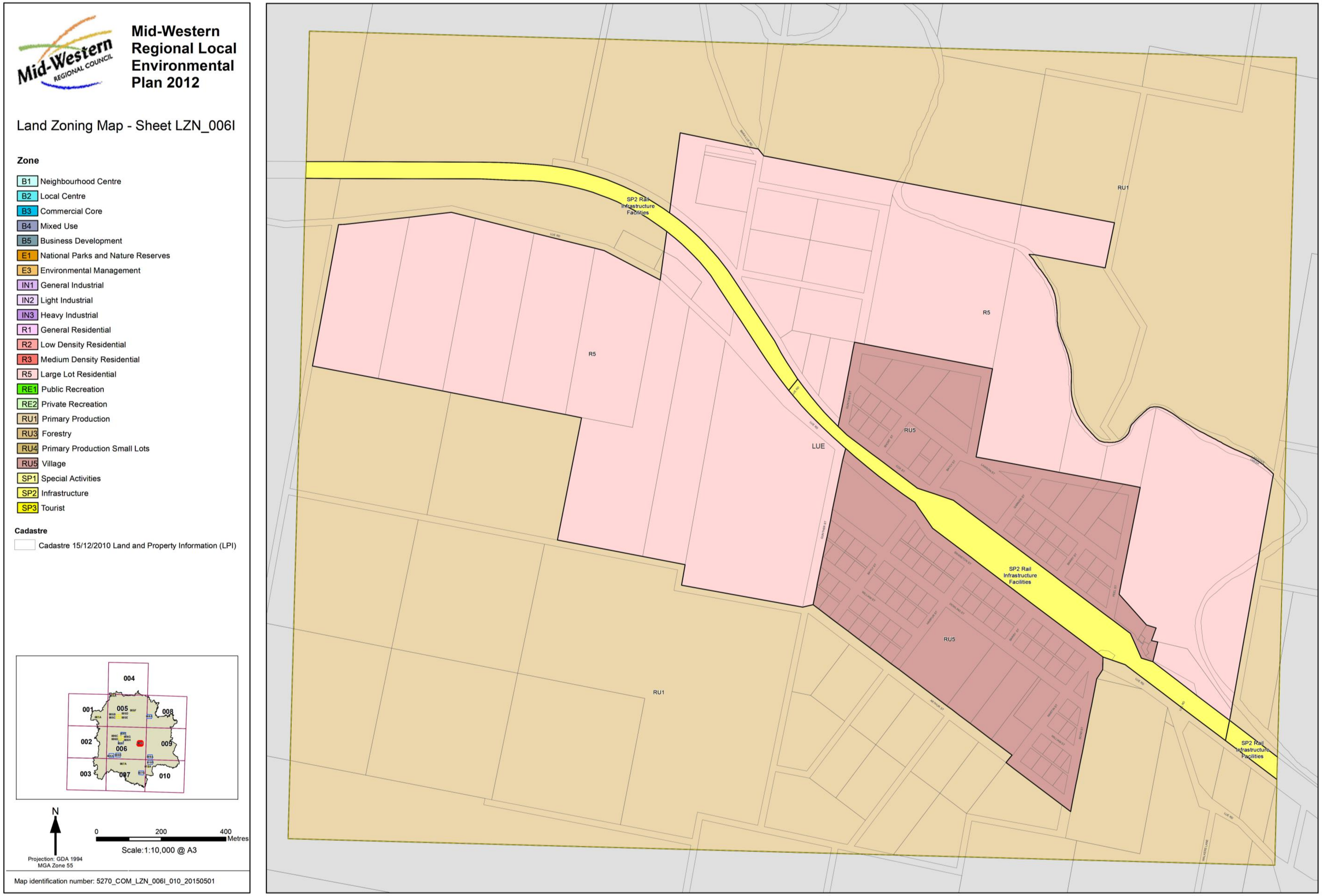
Mid-Western Regional Council
Mid-Western Regional Local Environmental Plan 2012
Land Zoning Map - Sheet LZN_006I
Zone
B1 Neighbourhood Centre
B2 Local Centre
B3 Commercial Core
B4 Mixed Use
B5 Business Development
E1 National Parks and Nature Reserves
E3 Environmental Management
IN1 General Industrial
IN2 Light Industrial
IN3 Heavy Industrial
R1 General Residential
R2 Low Density Residential
R3 Medium Density Residential
R5 Large Lot Residential
RE1 Public Recreation
RE2 Private Recreation
RU1 Primary Production
RU3 Forestry
RU4 Primary Production Small Lots
RU5 Village
SP1 Special Activities
SP2 Infrastructure
SP3 Tourist
Cadastre
Cadastre 15/12/2010 Land and Property Information (LPI)
004
001
005
008
002
006
009
003
007
010
N
0
200
400
Metres
Scale:1:10,000 @ A3
Projection: GDA 1994
MGA Zone 55
Map identification number: 5270_COM_LZN_006I_010_20150501
SP2 Rail Infrastructure Facilities
RU1
R5
R5
LUE
RU5
RU5
SP2 Rail Infrastructure Facilities
RU1
SP2 Rail Infrastructure Facilities

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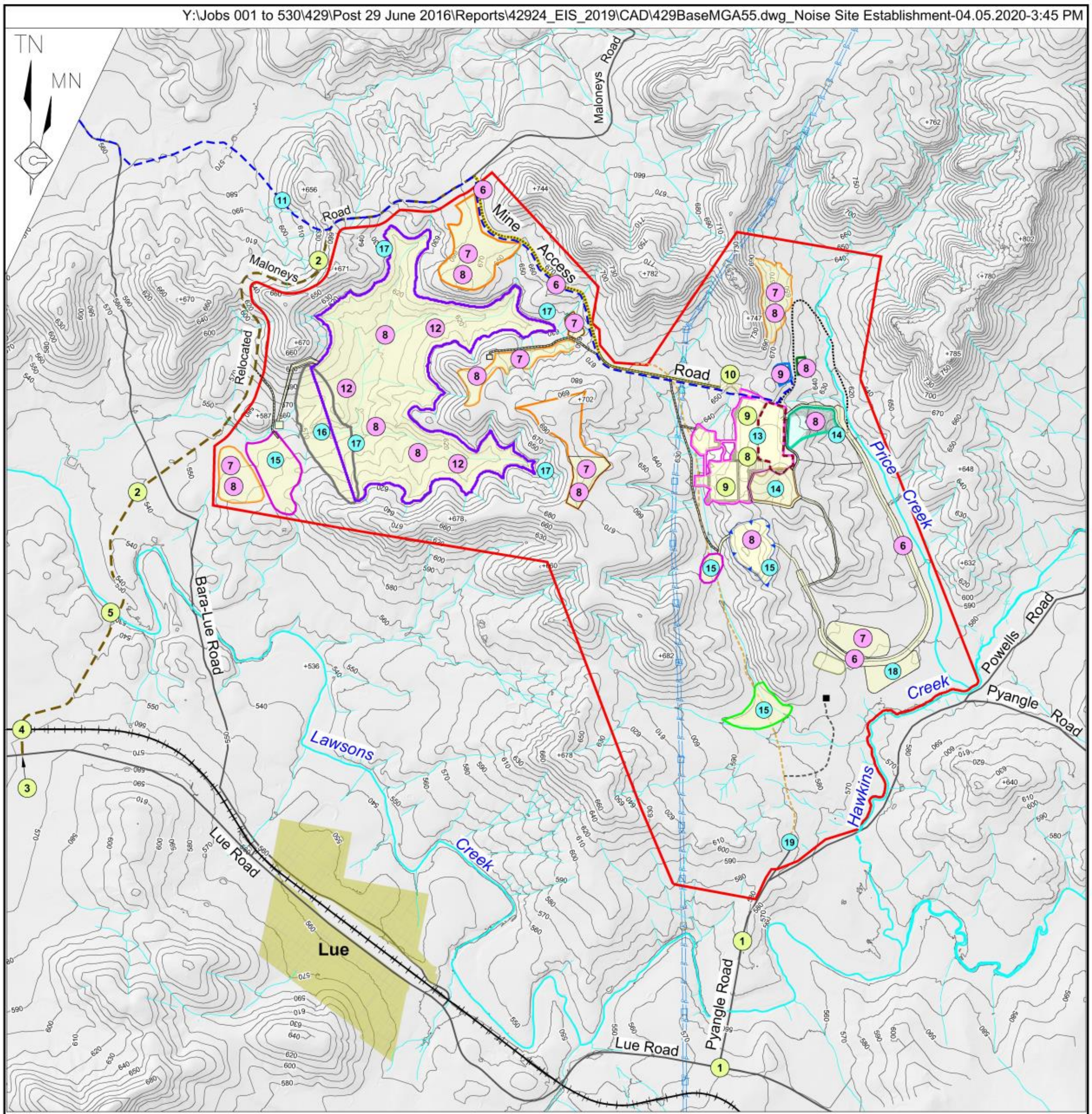
Annexure 7

Site Establishment and Construction Activities

(Total No. of pages including blank pages = 2)



REFERENCE
- Mine Site Boundary
- Road
- Closed Railway Line
- Existing Power Line (500kV) / Tower

Proposed Component
- Indicative Pipeline Corridor
- Relocated Maloneys Road
- Mine Access Road
- Internal Road
- Haul Road
- Open Cut Pit
- Tailings Storage Facility Boundary
- Waste Rock Emplacement Boundary
- Processing Plant/ROM Pad Area
- Mining Facility
- Soil Stockpile Boundary
- NAF Waste Rock Stockpile
- Southern Barrier
- Low-grade Ore Stockpile Boundary
- Disturbance During Site Establishment and Construction Stage

	Construction Activities
1	Upgrade Pyangle Road (to the Mine Site)
2	Construct Relocated Maloneys Road
3	Construct Relocated Maloneys Road/Lue Road Intersection
4	Construct Relocated Maloneys Road Bridge Railway Crossing
5	Construction of Lawsons Creek Crossing
6	Construct Internal Access Roads & Install Services
7	Establish Soil Stockpile Areas
8	Vegetation Clearing & Soil Stripping
9	Excavation / Earthworks for Processing Plant Site
10	Install Administration Offices and Amenities
11	Construct Water Supply Pipeline
12	Preparation of TSF Impoundment Area
13	Processing Plant, Mining Facility Construction and Assembly
14	Establish Stage 1 Low Grade Ore Stockpile & Initial Cell of Waste Rock Emplacement
15	Initial Development of Main Open Cut Pit, Ore & Waste Rock Extraction and Stockpiling / Placement
16	Construct Initial TSF Embankment
17	Construct Decant Pond Area & Tailings Pipeline
18	Construct Leachate Management Dam
19	Close Maloneys Road Following Opening of Relocated Maloneys Road

- Months 1 to 6
- Months 1 to 18
- Months 7 to 18

SCALE
0.5 0 0.5 1.0 1.5 2.0 km

Base Map Source: Bowdens Silver Pty Limited

SITE ESTABLISHMENT AND CONSTRUCTION ACTIVITIES

Annexure 8

Open Cut Pit Design

(Total No. of pages including blank pages = 4)

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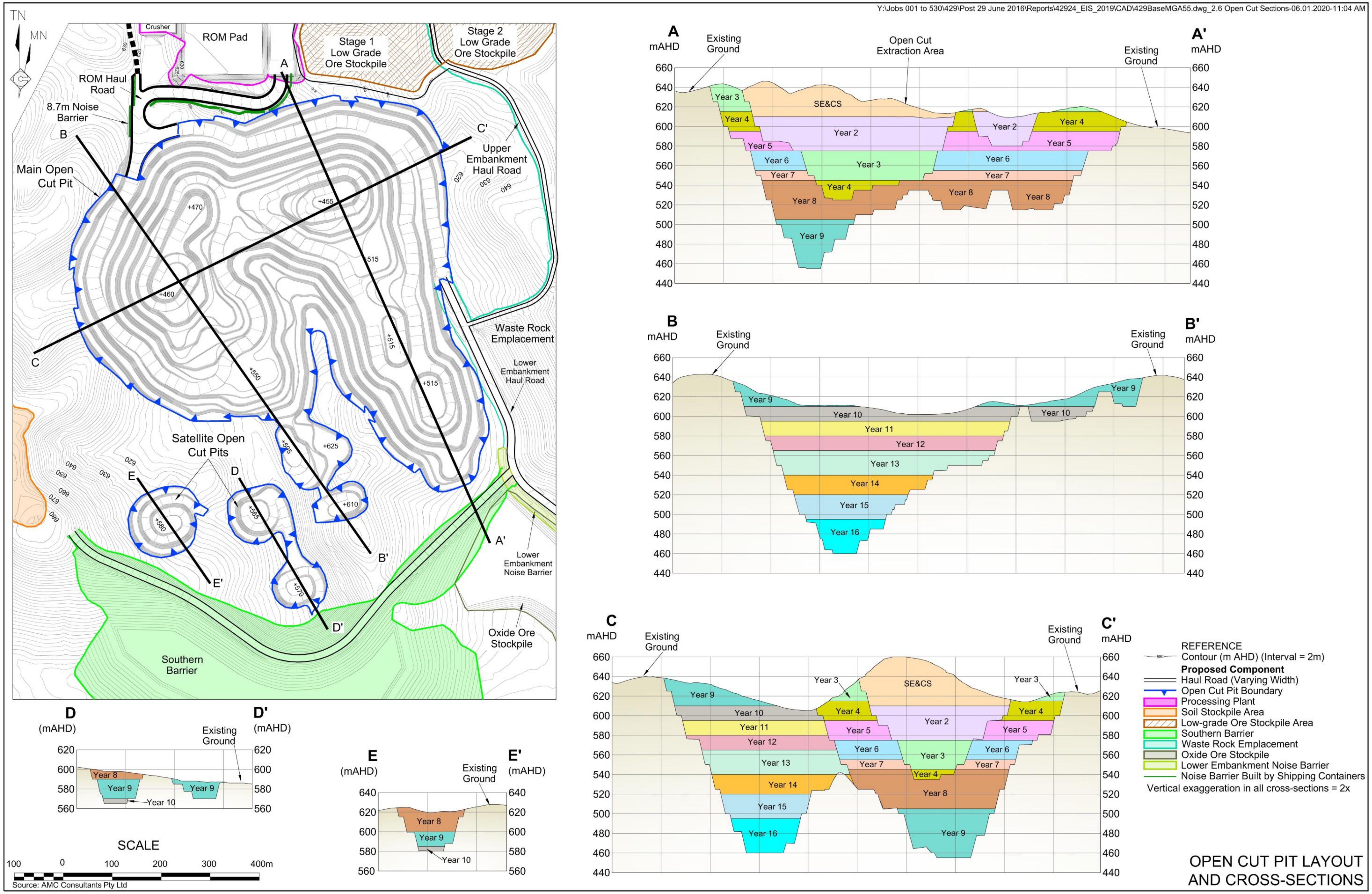
Y:\Jobs 001 to 530\429\Post 29 June 2016\Reports\42924_EIS_2019\CAD\429BaseMGA55.dwg_2.6 Open Cut Sections-06.01.2020-11:04 AM
TN
MN
Crusher
ROM Pad
Stage 1 Low Grade Ore Stockpile
Stage 2 Low Grade Ore Stockpile
ROM Haul Road
8.7m Noise Barrier
Main Open Cut Pit
Upper Embankment Haul Road
Waste Rock Emplacement
Lower Embankment Haul Road
Satellite Open Cut Pits
Lower Embankment Noise Barrier
Oxide Ore Stockpile
Southern Barrier
A
A'
B
B'
C
C'
D
D'
E
E'
mAHD
Existing Ground
Open Cut Extraction Area
SE&CS
Year 2
Year 3
Year 4
Year 5
Year 6
Year 7
Year 8
Year 9
Year 10
Year 11
Year 12
Year 13
Year 14
Year 15
Year 16
(mAHD)
SCALE
100 0 100 200 300 400m
Source: AMC Consultants Pty Ltd
REFERENCE
Contour (m AHD) (Interval = 2m)
Proposed Component
Haul Road (Varying Width)
Open Cut Pit Boundary
Processing Plant
Soil Stockpile Area
Low-grade Ore Stockpile Area
Southern Barrier
Waste Rock Emplacement
Oxide Ore Stockpile
Lower Embankment Noise Barrier
Noise Barrier Built by Shipping Containers
Vertical exaggeration in all cross-sections = 2x
OPEN CUT PIT LAYOUT AND CROSS-SECTIONS

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Annexure 9

Site Infrastructure Plan

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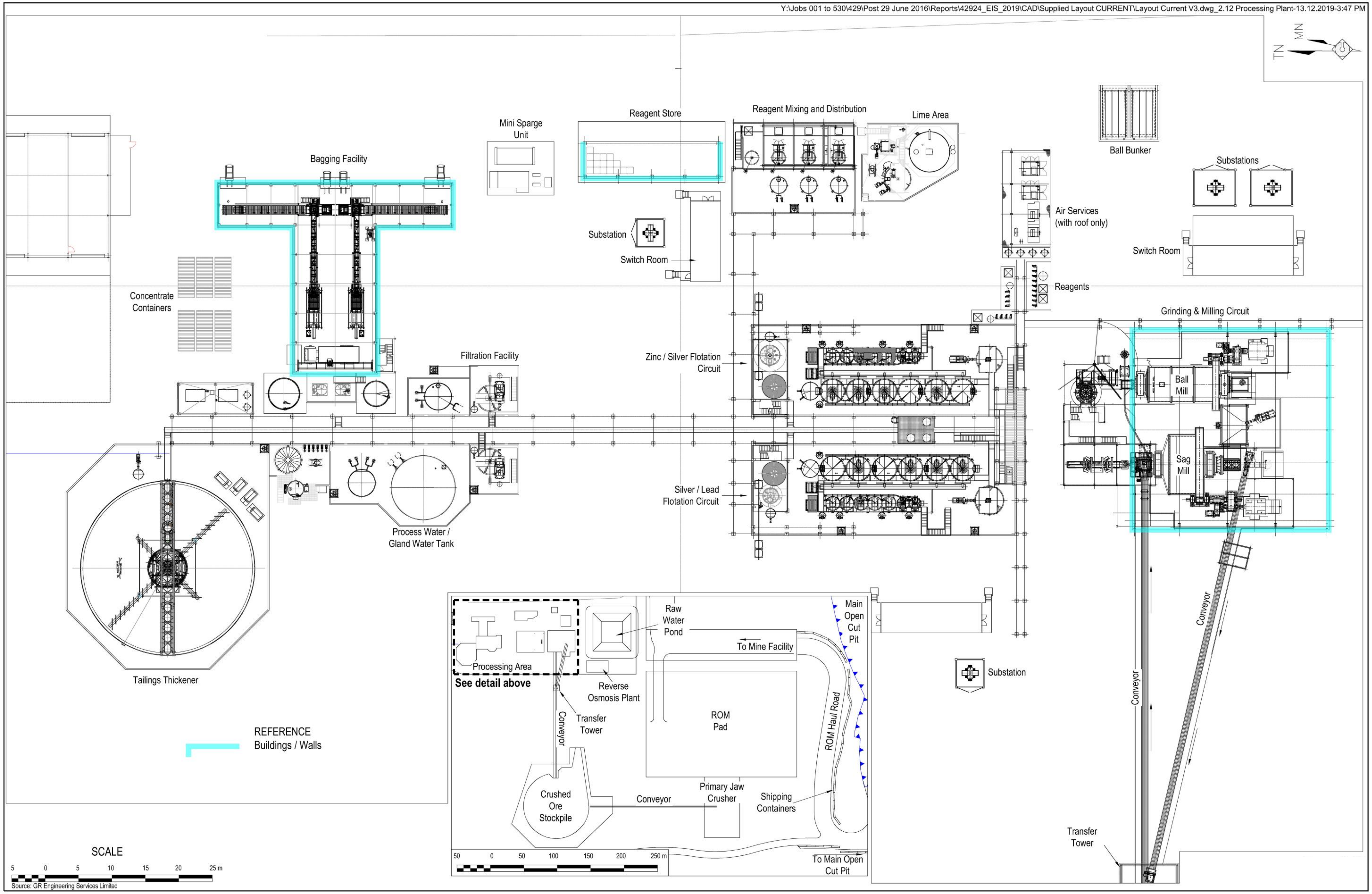
Y:\Jobs 001 to 530\429\Post 29 June 2016\Reports\42924_EIS_2019\CAD\Supplied Layout CURRENT\Layout Current V3.dwg_2.12 Processing Plant-13.12.2019-3:47 PM
TN
MN
Mini Sparge Unit
Reagent Store
Reagent Mixing and Distribution
Lime Area
Ball Bunker
Substations
Bagging Facility
Substation
Switch Room
Air Services (with roof only)
Switch Room
Concentrate Containers
Reagents
Grinding & Milling Circuit
Filtration Facility
Zinc / Silver Flotation Circuit
Ball Mill
Sag Mill
Silver / Lead Flotation Circuit
Process Water / Gland Water Tank
Conveyor
Raw Water Pond
Main Open Cut Pit
To Mine Facility
Processing Area
See detail above
Reverse Osmosis Plant
Substation
Tailings Thickener
Transfer Tower
Conveyor
ROM Pad
ROM Haul Road
REFERENCE
Buildings / Walls
Crushed Ore Stockpile
Conveyor
Primary Jaw Crusher
Shipping Containers
Conveyor
Transfer Tower
SCALE
5 0 5 10 15 20 25 m
Source: GR Engineering Services Limited
50 0 50 100 150 200 250 m
To Main Open Cut Pit

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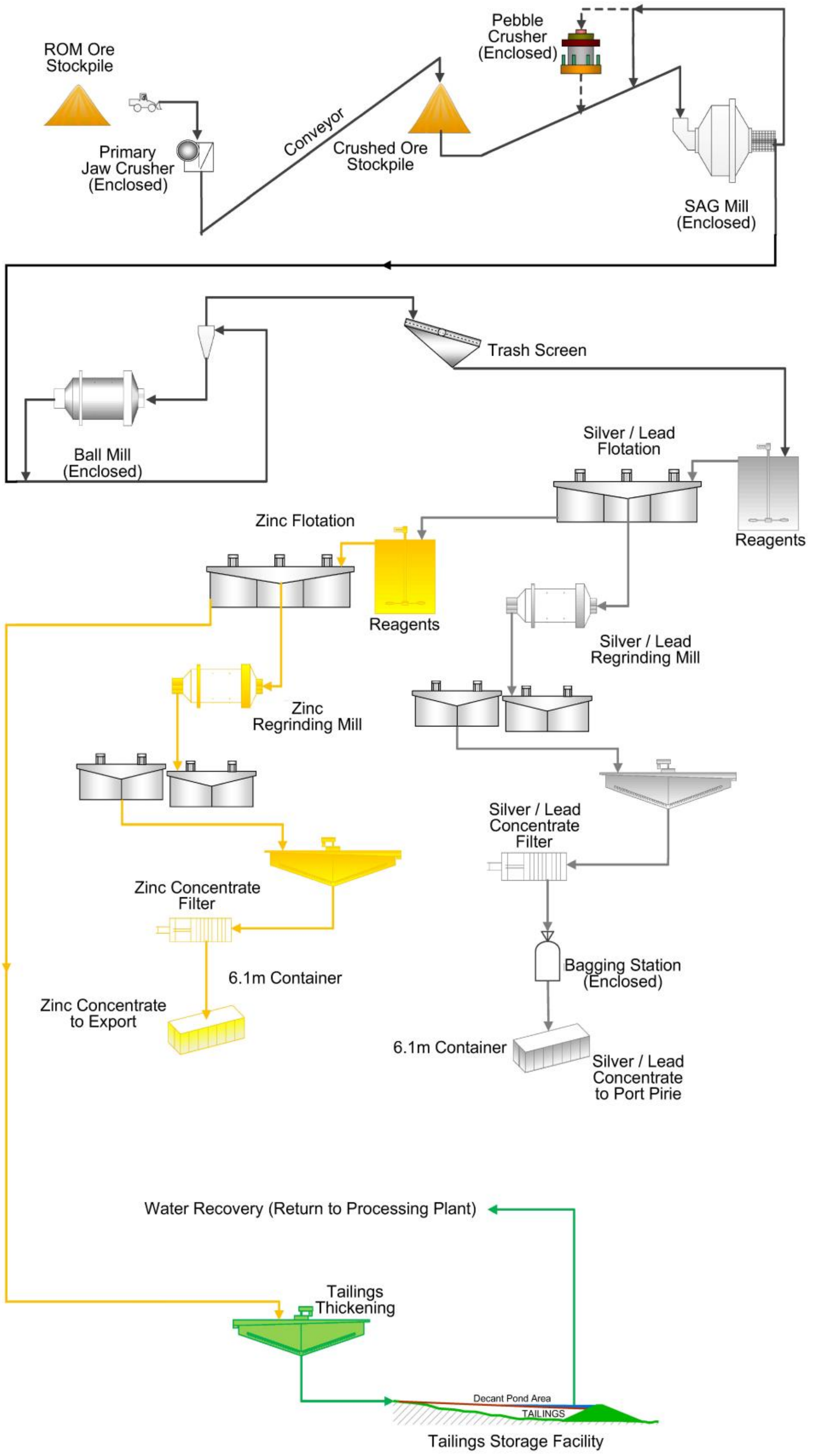

Source: GR Engineering Services Limited

PROCESSING PLANT FLOWSHEET

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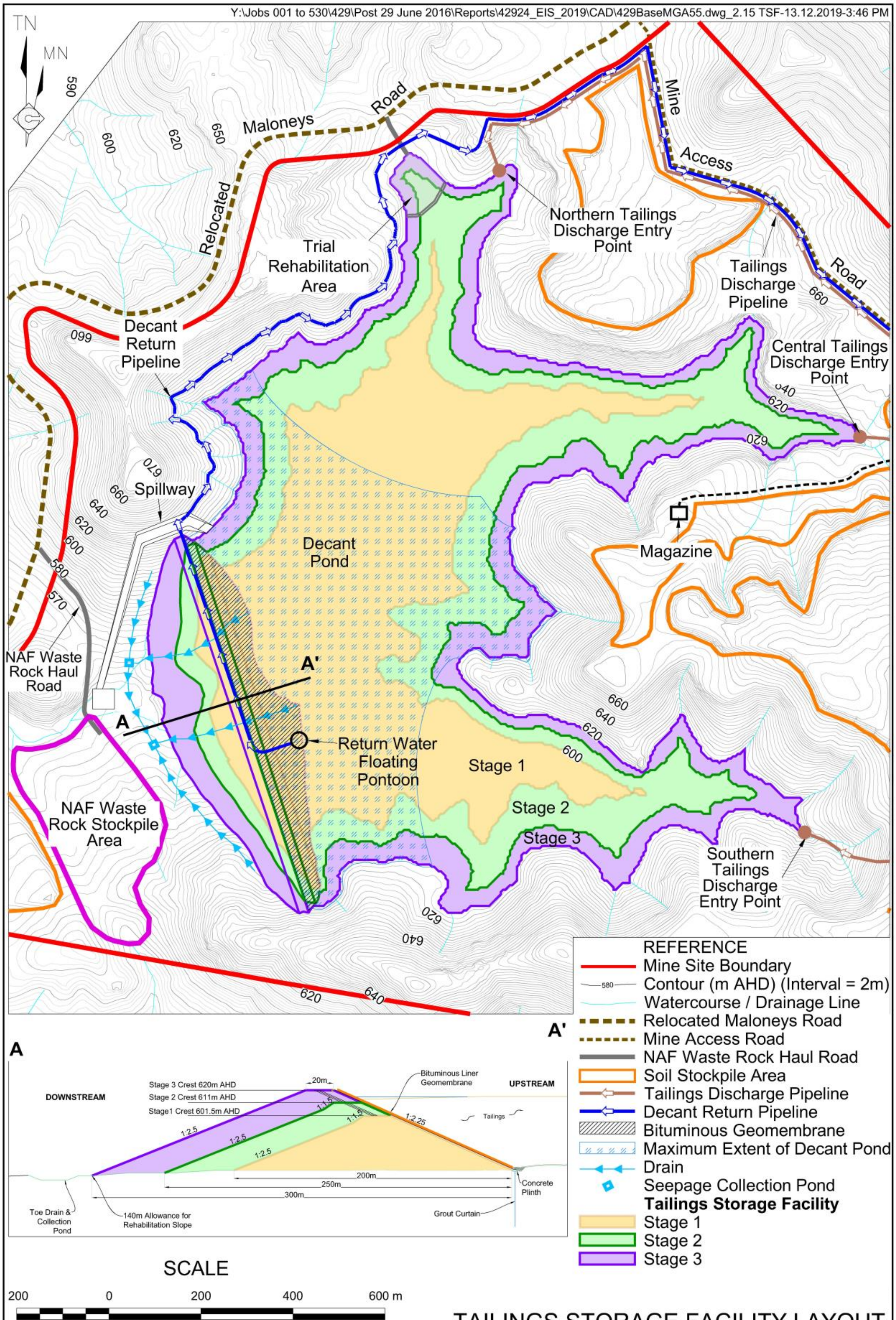
Annexure 10

Tailings Storage Facility Layout

(Total No. of pages including blank pages = 2)



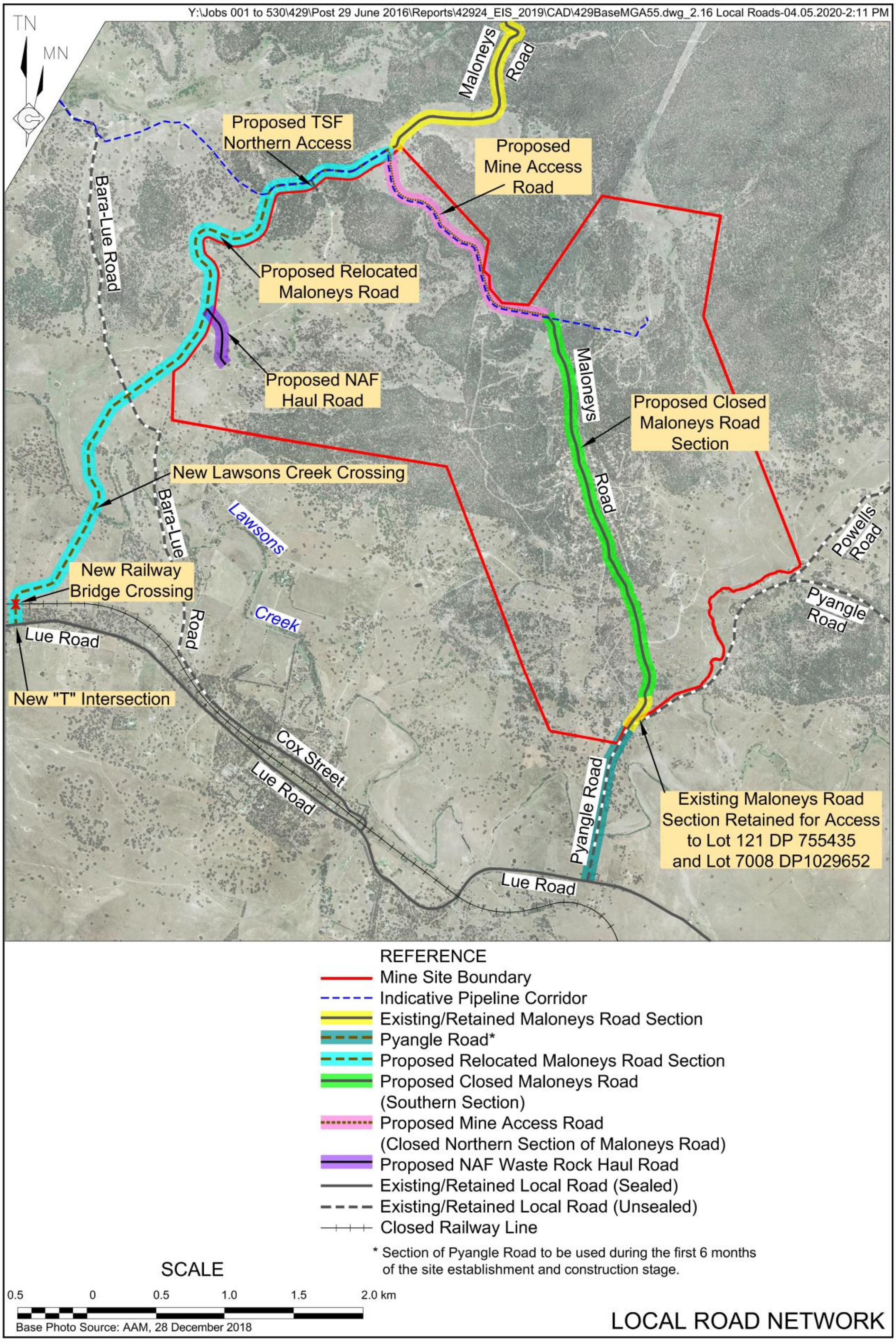
Source: ATC Williams Pty Ltd

TAILINGS STORAGE FACILITY LAYOUT

Annexure 11

Local Roads

(Total No. of pages including blank pages = 2)



LOCAL ROAD NETWORK

Annexure 12

Background and Traffic Noise Monitoring Campaigns

(Total No. of pages including blank pages = 90)

Note: This Appendix is only available on the digital version of this document

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Background and Traffic Noise Monitoring Campaign

Background noise monitoring campaigns of unattended noise logging were undertaken in September/October 2011, August 2012, October/November 2013 and February 2017 to quantify background noise levels (i.e. all noise sources) and to estimate industrial noise only (i.e. in the absence of transport, natural and domestic noise) in the two localities of Lue rural and Lue village in relation to the Project. **Figure A12.1** displays the location of all background noise monitoring sites. More than 45 days of unattended noise measurements were taken.

Additional targeted traffic noise monitoring was implemented in February 2017 to quantify the existing traffic noise levels at two locations adjacent to Lue Road. In order to supplement the unattended logger measurements and to assist in identifying the character and duration of the noise sources, operator-attended surveys were also conducted in the vicinity of the logging locations.

Instrumentation and Measurement Parameters

The ambient noise monitoring programme was implemented in accordance with AS 1055 1997 Acoustics Description and Measurement of Environmental Noise. All acoustic instrumentation employed throughout the noise monitoring programme has been designed to comply with the requirements of Australian Standard (AS) 1259.2 1990 Sound Level Meters and carries current National Association of Testing Authorities (NATA) or manufacturer calibration certificates.

All instrumentation was programmed to record continuously the noise exceedance levels in 15 minute intervals including the L_{Amax}, L_{A1}, L_{A10}, L_{A50}, L_{A90}, L_{A99}, L_{Amin} and the L_{Aeq}. Instrument calibration was conducted before and after each measurement survey, with the variation in calibrated levels not exceeding ±0.5 dB(A).

The locality, ID, landowner and monitoring locations for the 2011, 2012 and 2013 background noise monitoring campaigns are presented in **Table A12-1, Table A12.2** and **Table A12.3** respectively, together with the survey period, instrumentation and associated serial numbers.

Table A12.1
Background Noise Monitoring Campaign - September 2011

Locality	ID	Landowner	Location	Survey Period	Instrumentation
Lue Rural	1A	Bowdens Silver	Bara Road, Lue	8 to 19 September 2011	SVAN 21866
	1B	Bowdens Silver	1584 Pyangle Road, Lue	8 to 18 September 2011	SVAN 20667
	R35	Clydesdale	24 Gunther Street, Lue	10 to 25 October 2011	SVAN 20665
	R22	Boller	261 Powells Road, Lue	10 to 25 October 2011	SVAN 21866
	1H	Bowdens Silver	1312 Pyangle Road, Lue	8 to 18 September 2011	SVAN 20678
Lue Village	L21	Nevell	2782 Lue Road, Lue	8 to 16 September 2011	SVAN 20670

Table A12.2
Background Noise Monitoring Campaign - August 2012

Locality	ID	Landowner	Location	Survey Period	Instrumentation
Lue Rural	1A	Bowdens Silver	Bara Road, Lue	3 to 12 August 2012	ARL-316 16-207-045
	R7	Lochiely	1585 Pyangle Road, Lue	9 to 13 August 2012	ARL-316 16-207-047
	R35	Clydesdale	24 Gunther Street, Lue	3 to 10 August 2012	SVAN 23244
	R22	Boller	261 Powells Road, Lue	9 to 19 August 2012	ARL-316 16-203-506
	1H	Bowdens Silver	1312 Pyangle Road, Lue	3 to 14 August 2012	ARL-316 16-207-042
Lue Village	L21	Nevell	2782 Lue Road, Lue	3 to 15 August 2012	ARL-316 16-207-020

Table A12.3
Background Noise Monitoring Campaign - October/November 2013

Locality	ID	Landowner	Location	Survey Period	Instrumentation
Lue Rural	1I	Bowdens Silver	1306 Pyangle Road, Lue	3 to 6 October 2013 11 to 14 November 2013 18 to 21 November 2013	SVAN-957 21886
	R74	Brown	844 Maloneys Road, Lue	21 to 24 October 2013	SVAN-957 27598
				11 to 14 November 2013 21 to 25 November 2013 26 to 30 November 2013	SVAN-957 21886
Lue Village	R93A	Hawkins	2890 Lue Road, Lue	1 to 2 September 2013 20 September to 1 October 2013 4 to 10 October 2013	SVAN-957 27599
				1 to 12 January 2012 14 to 18 January 2012 21 to 30 December 2012	SVAN-957 27599
				1 to 3 December 2013	SVAN-957 27598
				19 April to 4 May 2013 9 to 24 May 2013 28 to 31 May 2013	SVAN-957 27598
				1 June to 15 July 2013 20 to 23 July 2013 26 to 27 July 2013	SVAN-957 27599
				30 July to 20 August 2013 28 to 31 August 2013	SVAN-957 27598

The locality, ID, landowner and monitoring locations for the 2017 background and traffic noise monitoring campaign are presented in **Table A12.4**, together with the survey period, instrumentation and associated serial numbers. Traffic flow data was also collected during the unattended traffic noise monitoring period.

Table A12.4
Traffic Noise Monitoring Campaign - February 2017

Locality	ID[2]	Landowner	Offset Distance[1]	Location	Survey Period	Instrumentation
Lue Rural	R88	Jameson	40 m	2558 Lue Road, Lue	15 to 23 February 2017	SVAN-957 20644
Lue Village	A	The State of NSW	37 m	Lue Village	15 to 23 February 2017	SVAN-957 23244
Note 1: Free field offset distance from centre of Lue Road						
Note 2: See **Annexure 4** for land ownership plans and **Annexure 5** for land ownership details.						

Meteorological Monitoring

Meteorological data for the 2011 and 2012 background noise campaigns was obtained from the Bureau of Meteorology (BoM) Nullo Mountain Automatic Weather Station (AWS) located approximately 35km southwest of the Mine Site. Subsequent meteorological data for the 2013 background noise monitoring campaign was obtained from Bowdens Silver's MET01 AWS (**Annexure 13**) and MET02 AWS for the 2017 background and traffic noise monitoring campaign, as presented in **Table A12.5**.

Table A12.5
Bowdens Silver's Automatic Weather Stations Locations

Code ID	Station Name	Ground AHD	Instrument AHD	Easting	Northing
BoM NM	Nullo Mountain AWS	1130.0 m	+ 10 m	240,381.0 m	6,376,558.0 m
MET 01	Bowdens AWS	576.7 m	+2 m, + 10 m	770,080.5 m	6,385,069.6 m
MET 02	Lue AWS	550.0 m	+2 m, + 10 m	766,884.7 m	6,383,628.8 m
Note 1: Automatic Weather Stations (AWS).					

Unattended Background Noise Monitoring Results

The unattended background noise monitoring results from each location, together with the on-site weather conditions were analysed on a daily basis.

The statistical noise exceedance levels (L_{AN}) are the levels exceeded for N% of the interval period. The L_{A90} represents the level exceeded for 90% of the interval period and is referred to as the average minimum or ambient noise level. The L_{A10} is the level exceeded for 10% of the time and is usually referred to as the average maximum noise level. The LAeq is the equivalent continuous sound pressure level and represents the steady sound level which is equal in energy to the fluctuating level over the interval period.

Prior to further analysis, the background noise levels from each location which correlated with periods of unstable weather (e.g. rainfall greater than 0.5 millimetres [mm] or wind speed greater than 5 metres per second [m/s]) were discarded. The acceptable background noise levels were then processed in accordance with the NPfI Fact Sheet A to derive the Monday to Sunday background noise levels.

The calculated Rating Background Levels (RBLs) and the measured overall all noise sources ($L_{Aeq(period)}$) were determined in accordance with the NPfI are presented in **Table A12.6, Table A12.7**, **Table A12.8**, and **Table A12.9** for the 2011, 2012, 2013 and 2017 background noise monitoring campaigns respectively.

Table A12.6
Unattended Background Noise Results – September/October 2011 (dB(A) re 20µPa)

Locality[8]	ID	Landholder	Measured RBL[1,2,3] All Noise Sources			Measured $L_{Aeq(period)}$ All Noise Sources		
			Day[4]	Evening[5]	Night[6]	Day[4]	Evening[5]	Night[6]
Lue Rural	1A	Bowdens Silver	25	25	25	46	36	49
	1B	Bowdens Silver	27	25	25	66	58	51
	R35	Clydesdale	27	25	25	55	57	47
	R22	Boller	28	31[7]	25	47	45	52
	1H	Bowdens Silver	27	25	25	50	41	43
Lue Village	L21	Nevell	29	25	25	50	44	44

Note 1: In accordance with NPfI Table 2.1, if the daytime RBL is < 35dB(A), then 35dB(A) shall be the assumed RBL.
Note 2: In accordance with NPfI Table 2.1, if the evening or night RBL is < 30dB(A), then 30dB(A) shall be the assumed RBL.
Note 3: 25dB(A) is the lowest reportable noise level within the specified linearity range of the instrumentation.
Note 4: Daytime Monday to Saturday 7:00am to 6:00pm, Sunday and Public Holidays 8:00am to 6:00pm.
Note 5: Evening Monday to Sunday 6:00pm to 10:00pm.
Note 6: Night-time Monday to Saturday 10:00pm to 7:00am, Sunday and Public Holidays 10:00pm to 8:00am.
Note 7: Relatively elevated evening background noise level likely due to insect activity in the vicinity of monitoring location.
Note 8: See **Annexure 4** for land ownership plans and **Annexure 5** for land ownership details.
µPa = micro Pascal.

Table A12.7
Unattended Background Noise Results – August 2012 (dB(A) re 20µPa)

Locality[8]	ID	Landholder	Measured RBL[1,2] All Noise Sources			Measured $L_{Aeq(period)}$ All Noise Sources		
			Day[4]	Evening[5]	Night[6]	Day[4]	Evening[5]	Night[6]
Lue Rural	1A	Bowdens Silver	28	26	23	46	38	35
	R7	Locheily	24	23	21	44	38	38
	R35	Clydesdale	27	25[3]	25[3]	53	45	39
	R22	Boller	27	33[7]	24	49	51	45
	1H	Bowdens Silver	27	24	23	46	41	39
Lue Village	L21	Nevell	31	27	22	48	45	41

Note 1: In accordance with NPfI Table 2.1, if the daytime RBL is < 35dB(A), then 35dB(A) shall be the assumed RBL.
Note 2: In accordance with NPfI Table 2.1, if the evening or night RBL is < 30dB(A), then 30dB(A) shall be the assumed RBL.
Note 3: 25dB(A) is the lowest reportable noise level within the specified linearity range of the instrumentation.
Note 4: Daytime Monday to Saturday 7:00am to 6:00pm, Sunday and Public Holidays 8:00am to 6:00pm.
Note 5: Evening Monday to Sunday 6:00pm to 10:00pm.
Note 6: Night-time Monday to Saturday 10:00pm to 7:00am, Sunday and Public Holidays 10:00pm to 8:00am.
Note 7: Relatively elevated evening background noise level likely due to insect activity in the vicinity of monitoring location.
Note 8: See **Annexure 4** for land ownership plans and **Annexure 5** for land ownership details.
Pa = micro Pascal.

Table A12.8
Unattended Background Noise Results – October/November 2013 (dB(A) re 20μPa)

Locality[7]	ID	Landholder	Measured RBL[1,2,3] All Noise Sources			Measured $L_{Aeq(period)}$ All Noise Sources		
			Day[4]	Evening[5]	Night[6]	Day[4]	Evening[5]	Night[6]
Lue Rural	1I	Bowdens Silver	25	25	25	-	-	-
	R74	Brown	27	25	25	-	-	-
Lue Village	R93A	Hawkins	25	25	25	-	-	-

Note 1: In accordance with NPfI Table 2.1, if the daytime RBL is < 35dB(A), then 35dB(A) shall be the assumed RBL.
Note 2: In accordance with NPfI Table 2.1, if the evening or night RBL is < 30dB(A), then 30dB(A) shall be the assumed RBL.
Note 3: 25dB(A) is the lowest reportable noise level within the specified linearity range of the instrumentation.
Note 4: Daytime Monday to Saturday 7:00am to 6:00pm, Sunday and Public Holidays 8:00am to 6:00pm.
Note 5: Evening Monday to Sunday 6:00pm to 10:00pm.
Note 6: Night-time Monday to Saturday 10:00pm to 7:00am, Sunday and Public Holidays 10:00pm to 8:00am.
Note 7: See **Annexure 4** for land ownership plans and **Annexure 5** for land ownership details.
μPa = micro Pascal.

Table A12.9
Unattended Background Noise Results – February 2017 (dB(A) re 20μPa)

Locality[7]	ID	Landholder	Measured RBL[1,2,3] All Noise Sources			Measured $L_{Aeq(period)}$ All Noise Sources		
			Day[4]	Evening[5]	Night[6]	Day[4]	Evening[5]	Night[6]
Lue Rural	R88	Jameson	29	25	25	48	46	43
Lue Village	A	The State of NSW	28	25	25	47	54	42

Note 1: In accordance with NPfI Table 2.1, if the daytime RBL is < 35dB(A), then 35dB(A) shall be the assumed RBL.
Note 2: In accordance with NPfI Table 2.1, if the evening or night RBL is < 30dB(A), then 30dB(A) shall be the assumed RBL.
Note 3: 25dB(A) is the lowest reportable noise level within the specified linearity range of the instrumentation.
Note 4: Daytime Monday to Saturday 7:00am to 6:00pm, Sunday and Public Holidays 8:00am to 6:00pm.
Note 5: Evening Monday to Sunday 6:00pm to 10:00pm.
Note 6: Night-time Monday to Saturday 10:00pm to 7:00am, Sunday and Public Holidays 10:00pm to 8:00am.
Note 7: See **Annexure 4** for land ownership plans and **Annexure 5** for land ownership details.
μPa = micro Pascal.

The measured overall all noise sources ($L_{Aeq(period)}$) and the estimated traffic noise levels ($L_{Aeq(period)}$) determined in accordance with the RNP are presented in **Table A12.10** for the 2017 traffic noise monitoring campaign.

Table A12.10
Unattended Traffic Noise Results – February 2017 (dB(A) re 20µPa)

Locality	ID[4]	Landholder	Offset Distance[1]	Measured $L_{Aeq(period)}$ All Noise Sources[2]		Estimated $L_{Aeq(period)}$ Traffic Noise Sources[2]	
				Daytime	Night-time	Daytime	Night-time
Lue Rural	R88	Jameson	40 m	47	43	47	43
Lue Village	A	The State of NSW	37 m	50	42	47[3]	42

Note 1: Free field offset distance from centre of Lue Road.
Note 2: In accordance with the RNP Daytime 7:00am to 10:00pm and night-time 10:00pm to 07:00am.
Note 3: Adjusted to remove non-traffic related extraneous noise.
Note 4: See **Annexure 4** for land ownership plans and **Annexure 5** for land ownership details.

Operator-Attended Ambient Noise Survey Results

Operator-attended noise surveys of 15 minutes duration were conducted with a precision integrating sound level meter in order to qualify the results obtained with the unattended noise loggers. During the operator-attended noise surveys, the operator identified the character and duration of acoustically significant ambient noise sources, and wherever applicable, made a quantitative assessment of the prevailing local weather conditions at the survey location.

The SLR operator-attended background and traffic noise monitoring results are presented in **Table A12.11** and **Table A12.12** respectively.

Table A12.11
Operator-attended Background Noise Results - September 2011 (dB(A) re 20µPa)

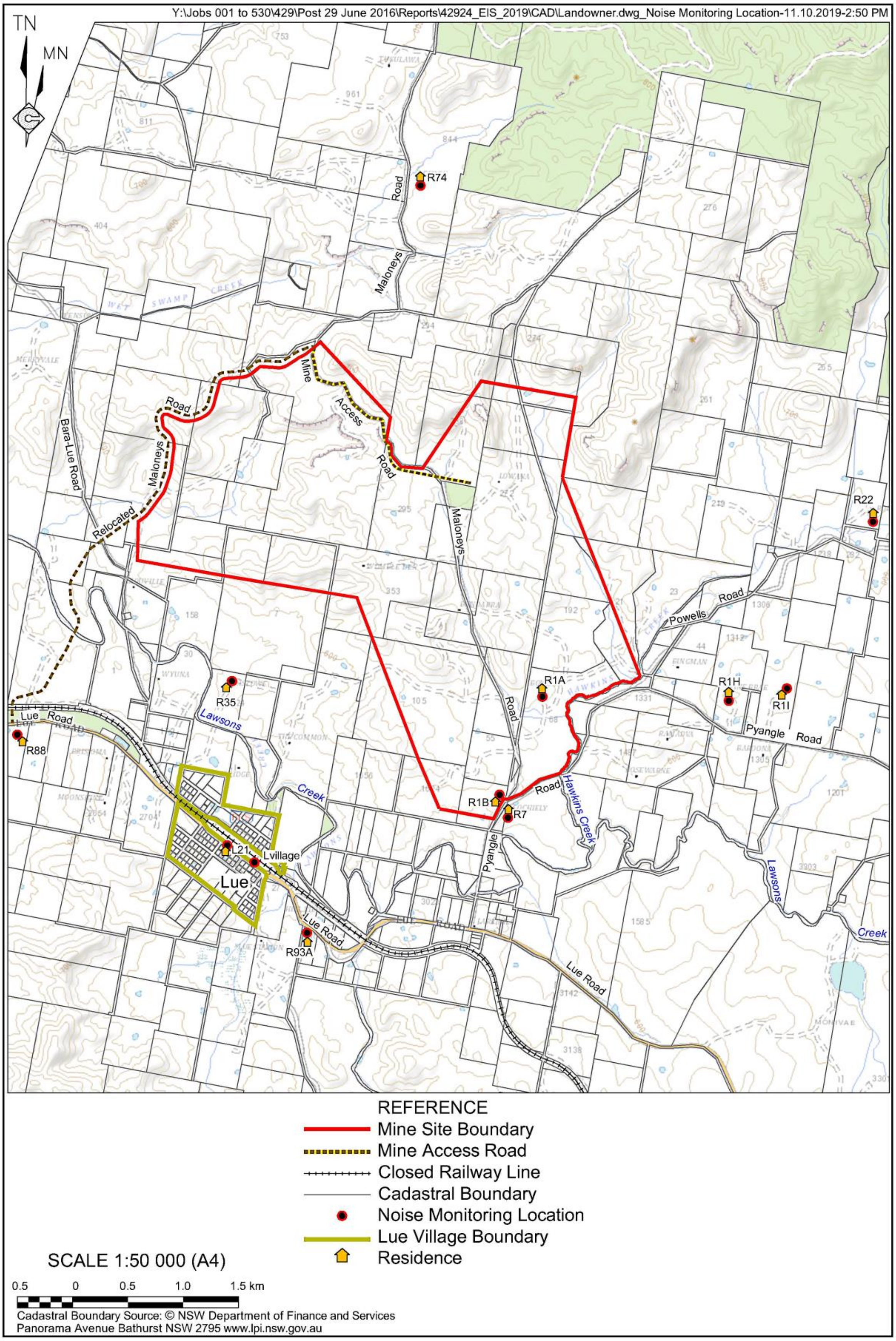
Locality	ID[1]	Landowner	Address	Date/Start Time Weather	Primary Noise Descriptor (dB(A) re 20uPa)				Typical maximum Levels LAmax - dB(A)
					Leq	Lmax	L10	L90	
Lue Rural	1A	Bowdens Silver	Bara Road, Lue	8 September 2011 1045 hour 8 okta; 1-2 m/s ESE; 18°C; 70% humidity	34	55	36	27	Birds 30-42 Wind/wind in trees 26-31
	1B	Bowdens Silver	1584 Pyangle Road, Lue	8 September 2011 1110 hour 8 okta; 1-2 m/s NE; 18°C; 70% humidity	42	62	46	28	Birds 30-62 Wind/Wind in trees 27-30 Domestic Activities 45-52 Plane 40-55 Passing vehicles 51 Rooster 50
	R35	Clydesdale	24 Gunther Street, Lue	8 September 2011 1454 hour 8 okta; calm; 18°C; 70% humidity	33	55	34	26	Birds 30-53 Cow 43-51 Timber 44-48 Plane 25-30 Distant Traffic 30-35 Talking 32-37 Domestic Activities 27-48
	R22	Boller	261 Powells Road, Lue	8 September 2011 1424 hour 8 okta; calm; 18°C; 70% humidity	36	54	38	28	Birds 29-50
	1H	Bowdens Silver	1312 Pyangle Road, Lue	8 September 2011 1139 hour 8 okta; 2-3 m/s NNE; 18°C; 70% humidity	42	62	46	28	Birds 33-53 Wind/Wind in trees 27-43

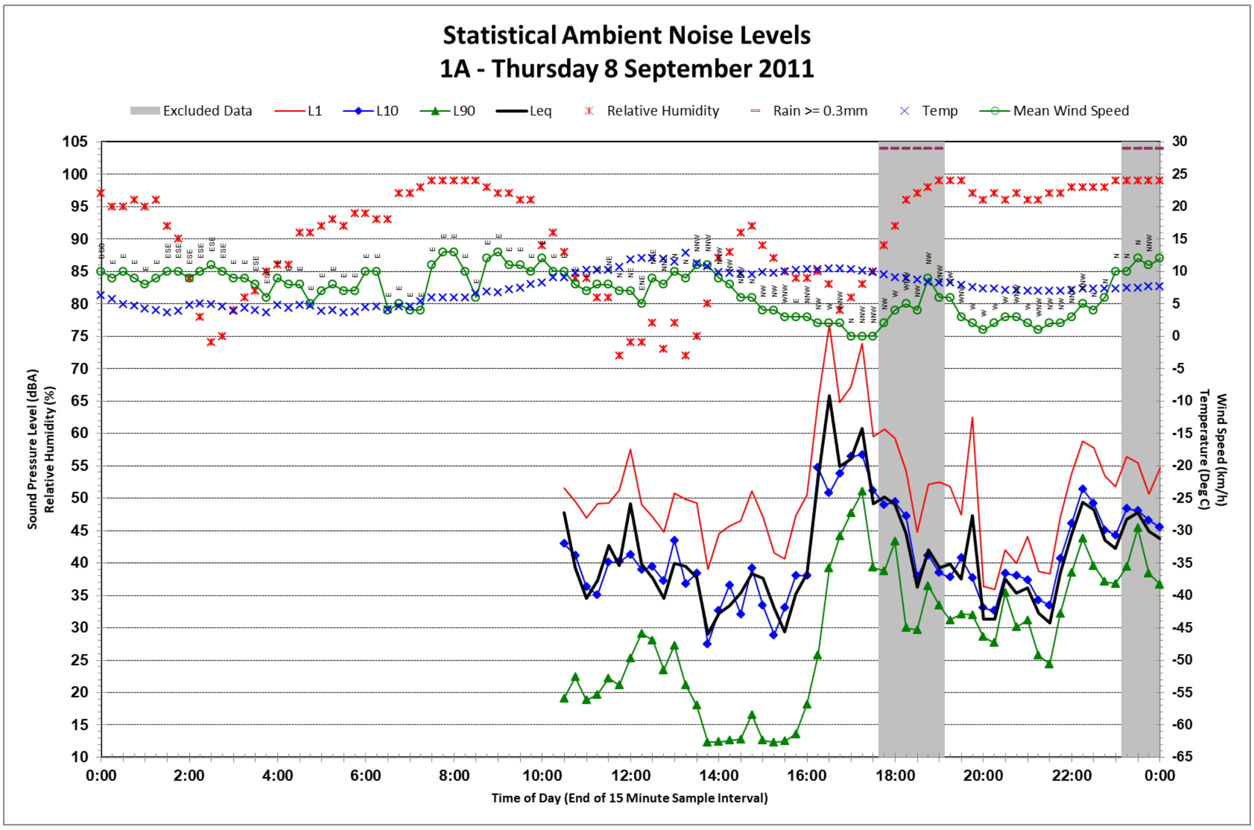
Note 1: See **Annexure 4** for land ownership plans and **Annexure 5** for land ownership details.

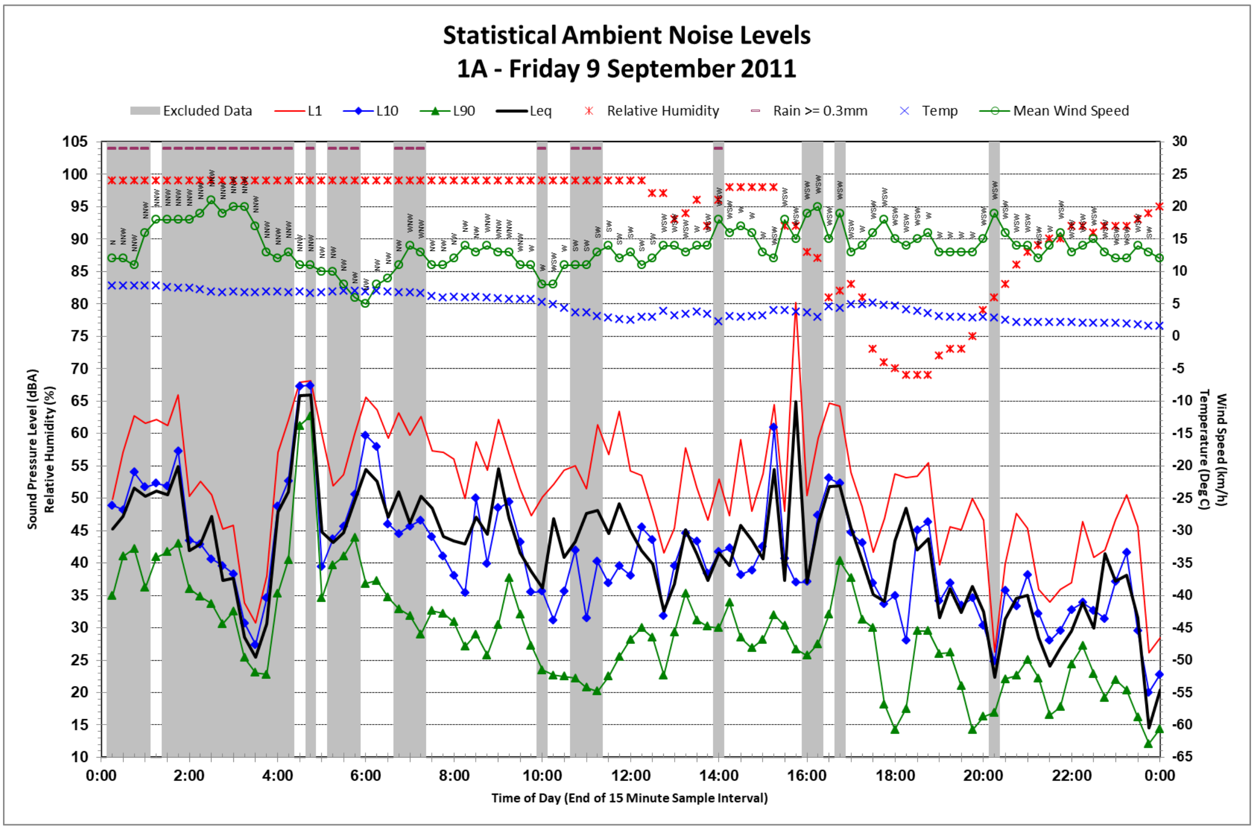
Table A12.12
Operator-attended Traffic Noise Results – February 2017 (dB(A) re 20µPa)

Locality	ID[1]	Landowner	Address	Date/Start Time Weather	Primary Noise Descriptor (dB(A) re 20µPa)				Typical maximum Levels LAmax - dB(A)
					Leq	Lmax	L10	L90	
Lue Rural	R88	Jameson	2558 Lue Road, Lue	15 February 2017 1208 hour 7 okta; 1-2 m/s N; 23^{o}C; 54% humidity	45	62	47	26	Birds:31-49 Wind/wind in trees: 28-29 Dog barking: 33-45 Mowing machine: 33-39 Traffic: 57-62
				15 February 2017 1225 hour 7 okta; 1 m/s N; 24^{o}C; 51% humidity	47	62	51	29	Birds:32-42 Plane: 44-52 Insects: 35-36 Dog barking: 31-43 Mowing machine: 33-49 Traffic: 53-62
Lue Village	A	The State of NSW	Lue Village	15 February 2017 1113 hour 7 okta; 1-2 m/s N; 22^{o}C; 56% humidity	42	67	46	32	Birds: 36-67 Wind/Wind in trees: 35-36 Children playing and talking: 28-51 Traffic: 45-56
				15 February 2017 1128 hour 7 okta; 1-2 m/s N; 22^{o}C; 54% humidity	42	58	45	33	Birds: 41-58 Wind/Wind in trees: 38-39 Children playing and talking: 34-54 Traffic: 43-57
Note 1: See **Annexure 4** for land ownership plans and **Annexure 5** for land ownership details.									

Figure A12.1
Noise Monitoring Locations




Statistical Ambient Noise Levels
1A - Thursday 8 September 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
1A - Friday 9 September 2011
Excluded Data
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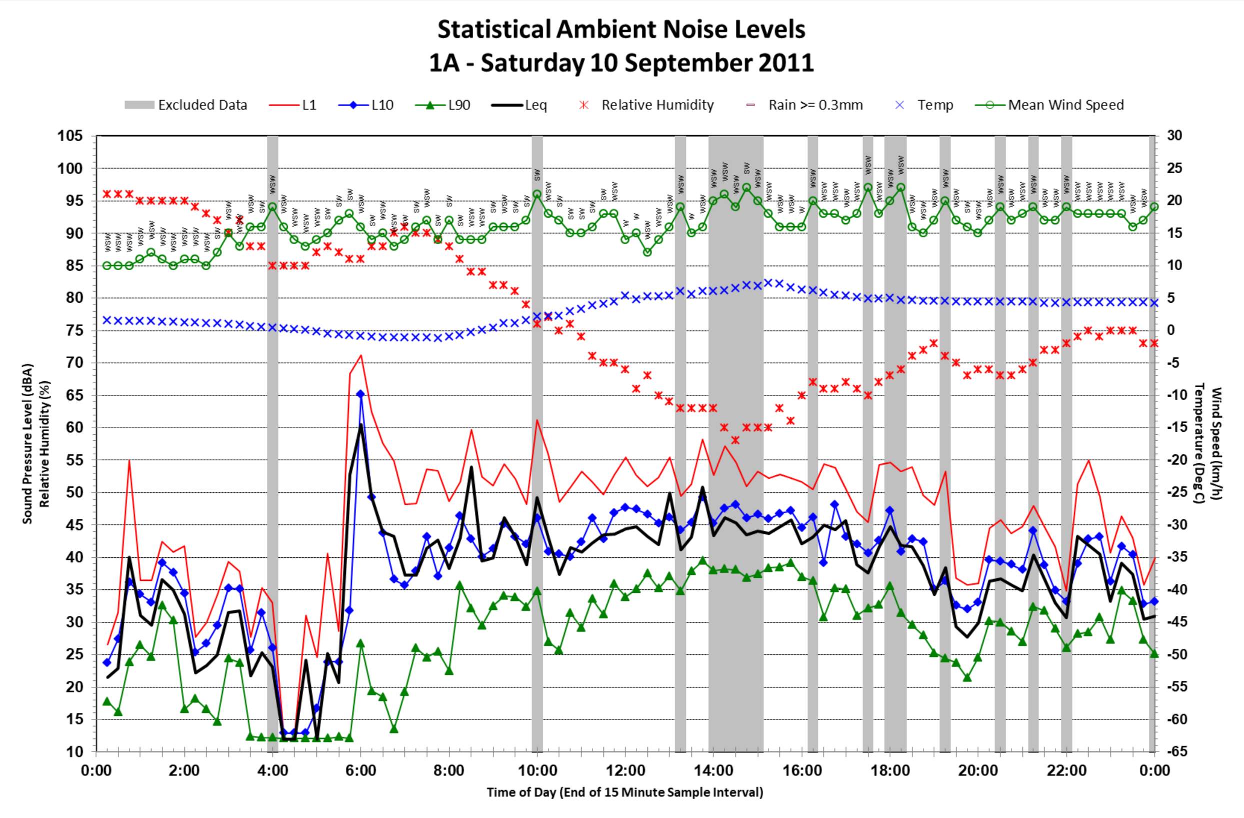
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
1A - Saturday 10 September 2011
Excluded Data
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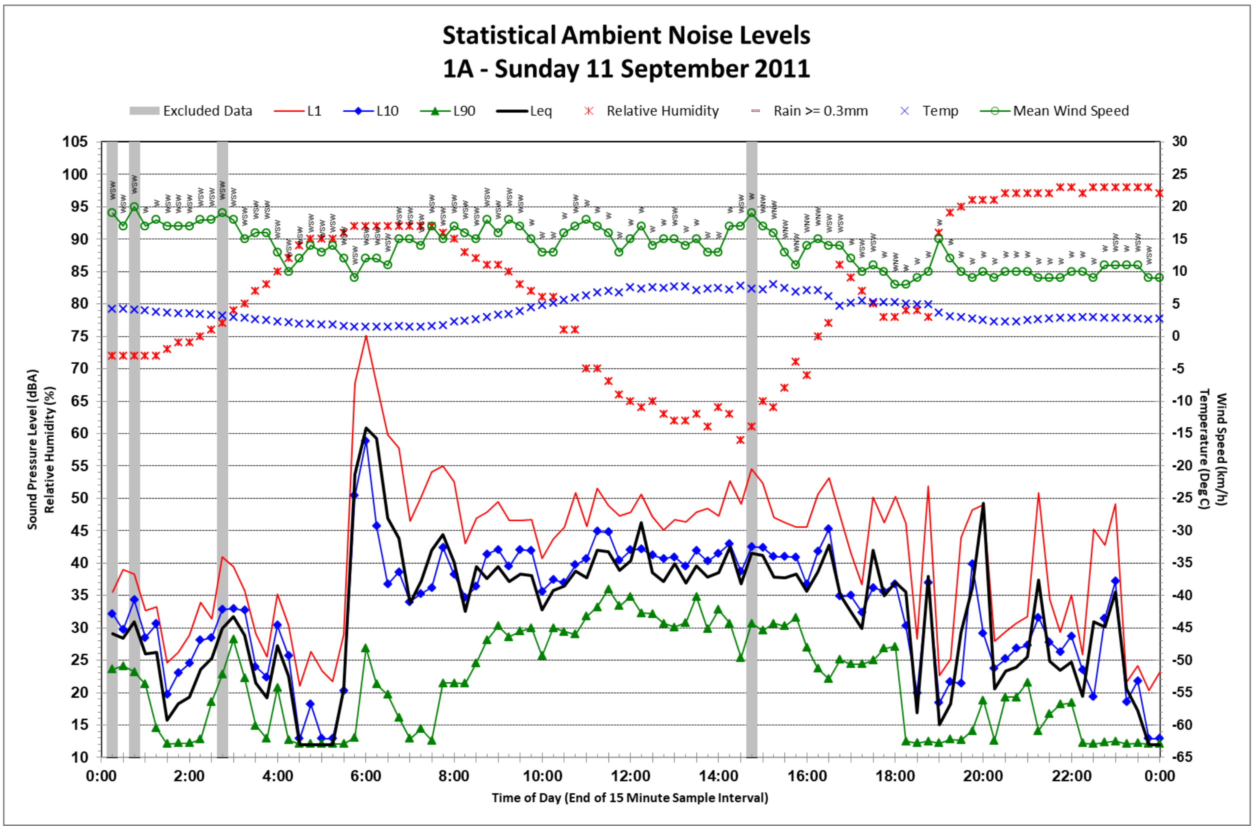
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)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Excluded Data
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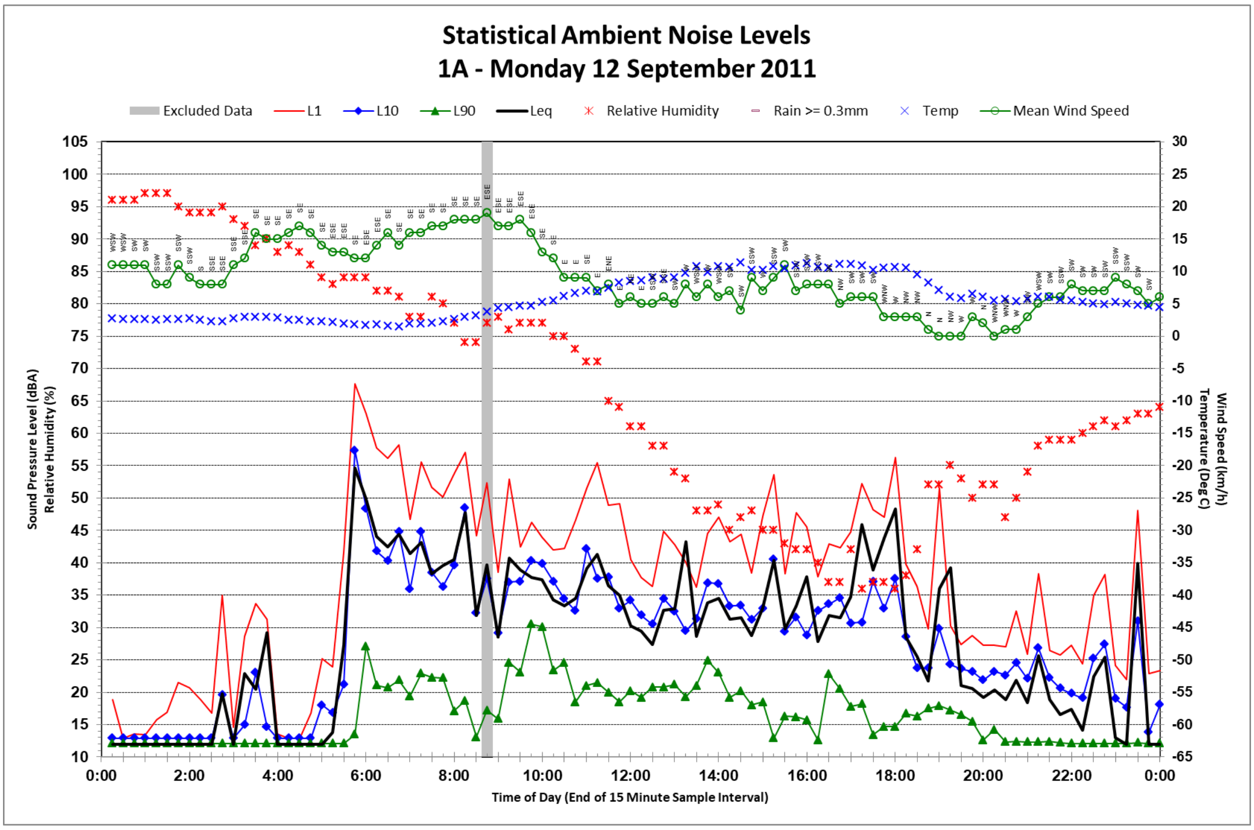
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)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L90
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Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
105
100
95
90
85
80
75
70
65
60
55
50
45
40
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-55
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-65
0:00
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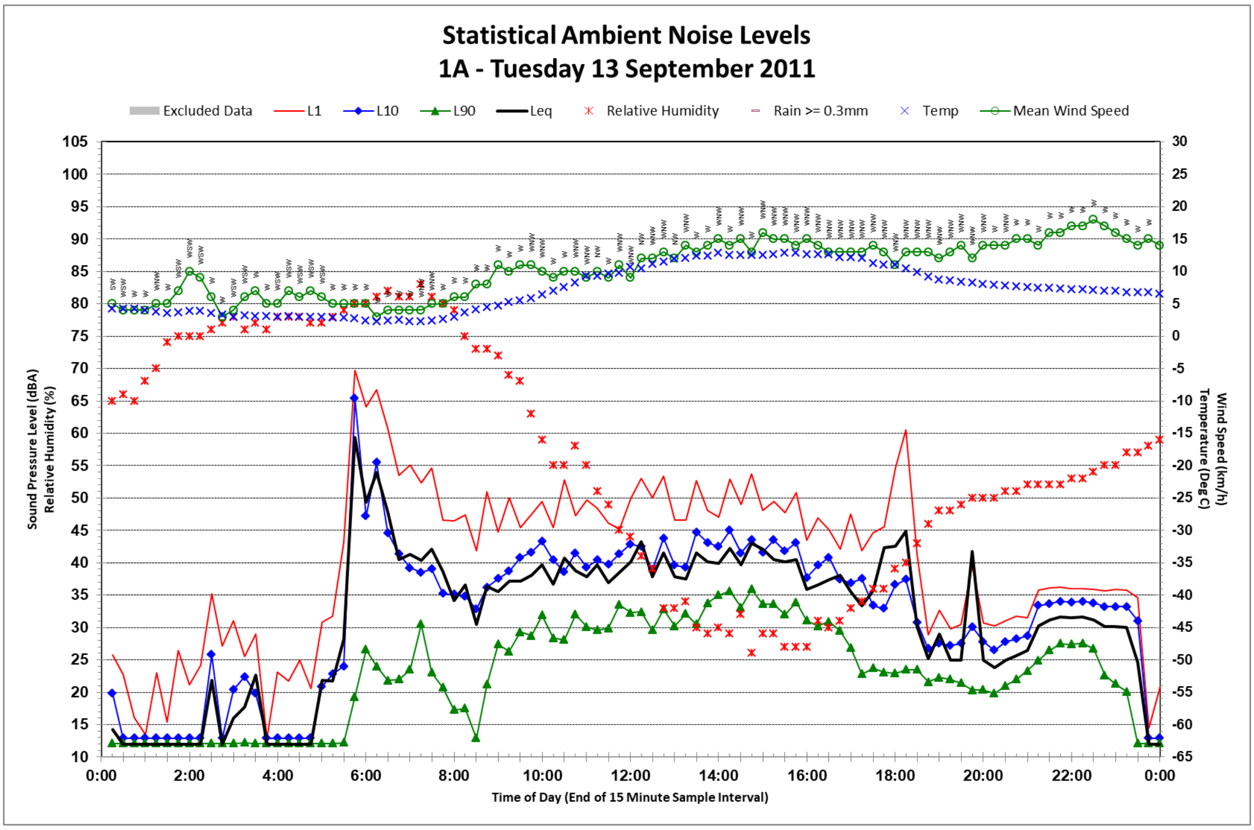
Statistical Ambient Noise Levels
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L90
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Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)
105
100
95
90
85
80
75
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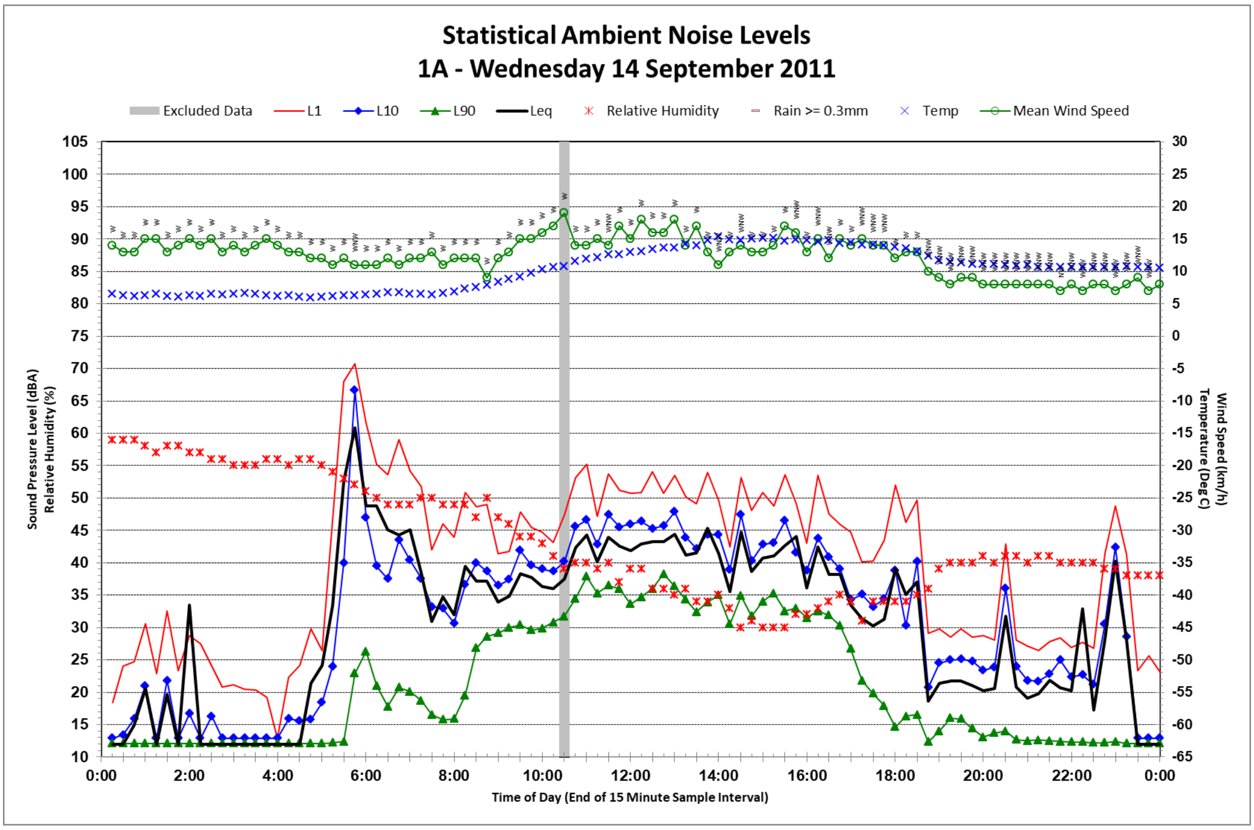
Statistical Ambient Noise Levels
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Relative Humidity
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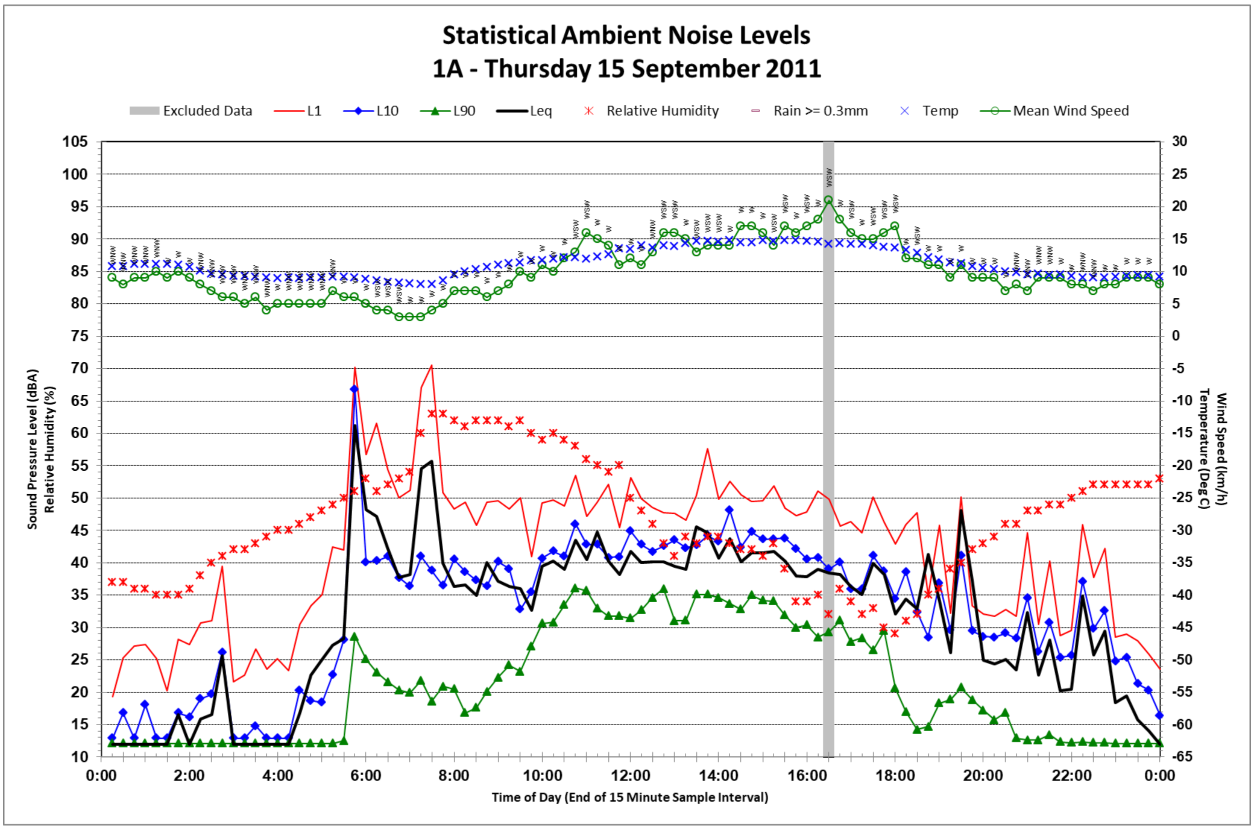
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)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1A - Thursday 15 September 2011
Excluded Data
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L90
Leq
Relative Humidity
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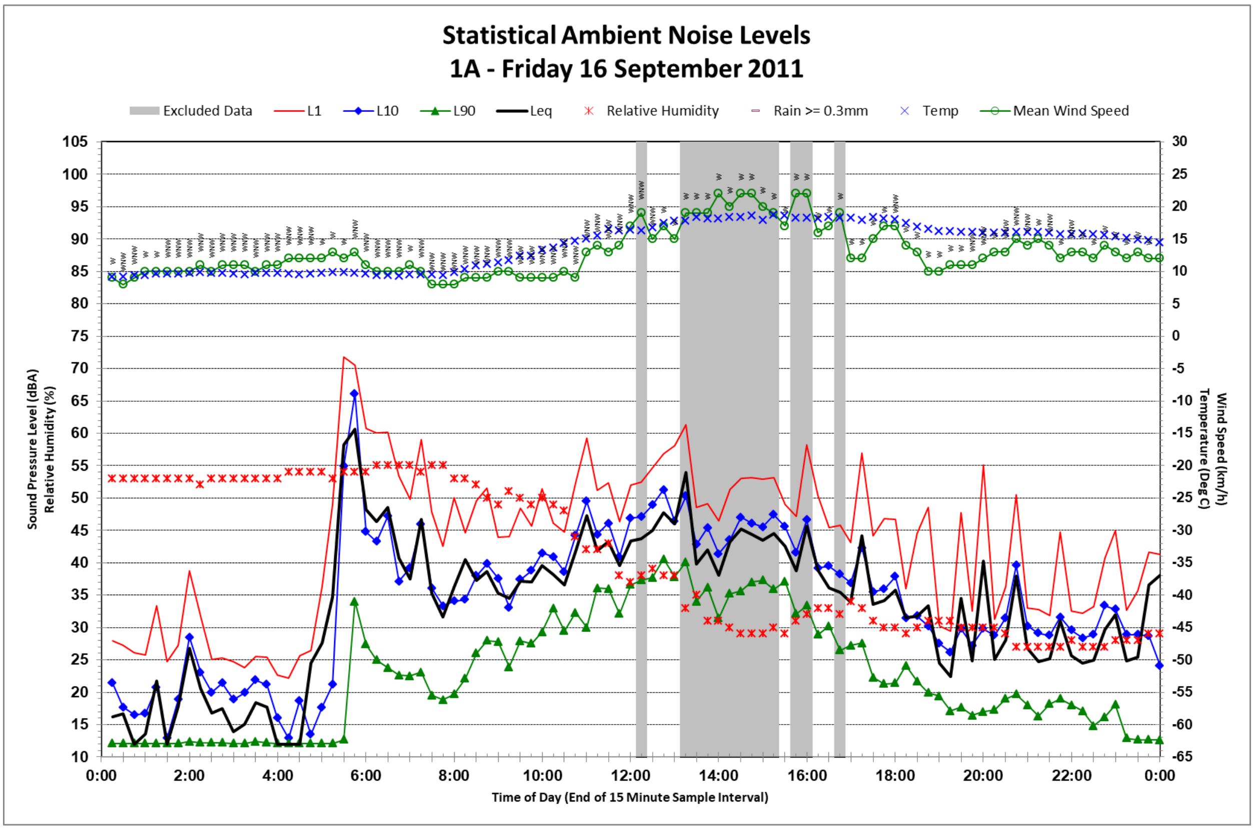
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
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Excluded Data
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L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
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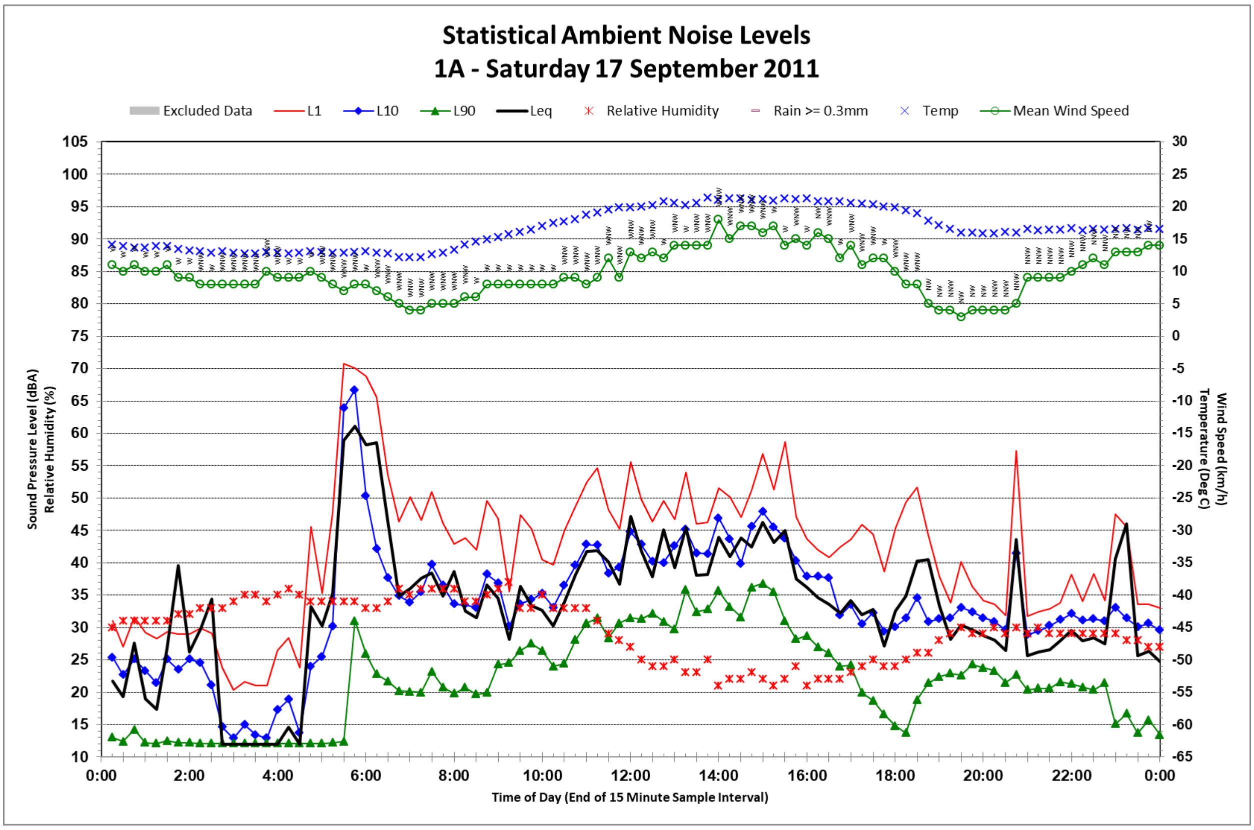
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
1A - Saturday 17 September 2011
Excluded Data
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L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
105
100
95
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85
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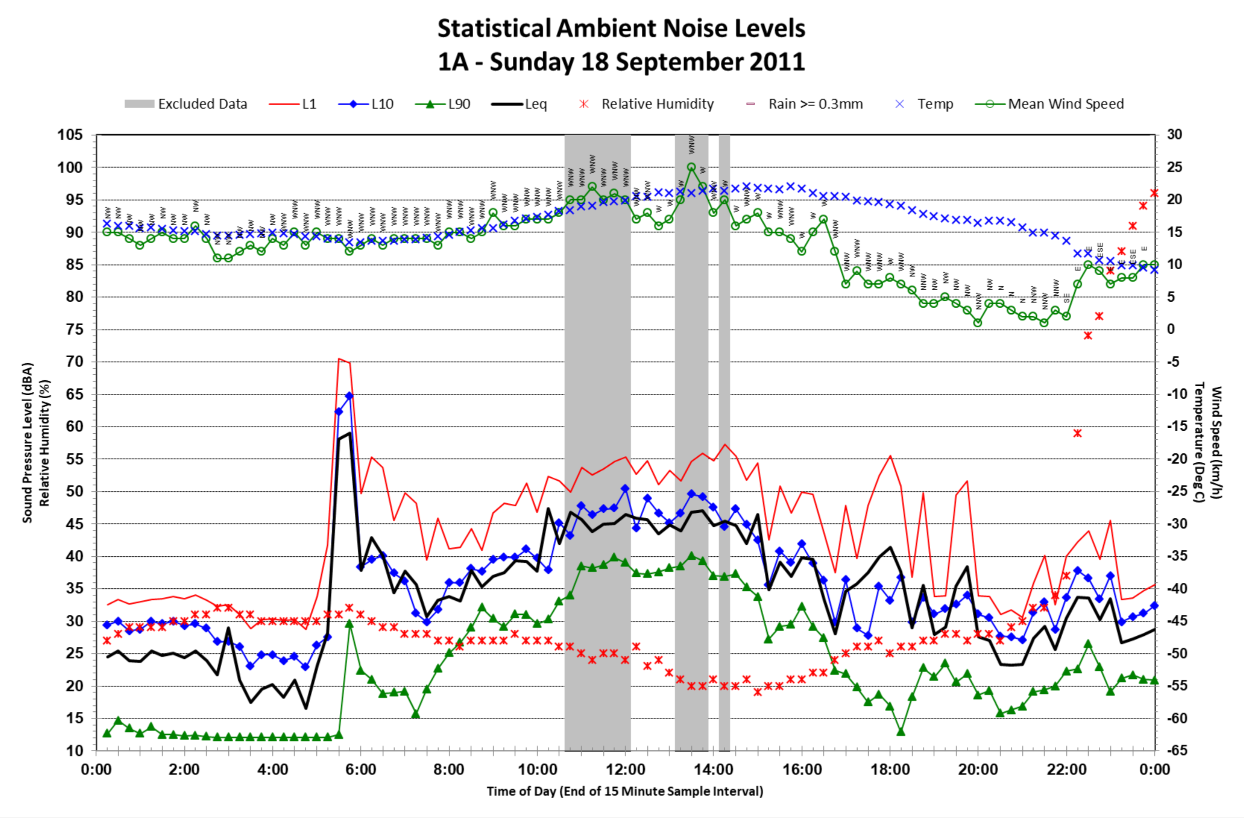
22:00
0:00
Time of Day (End of 15 Minute Sample Interval)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1A - Sunday 18 September 2011
Excluded Data
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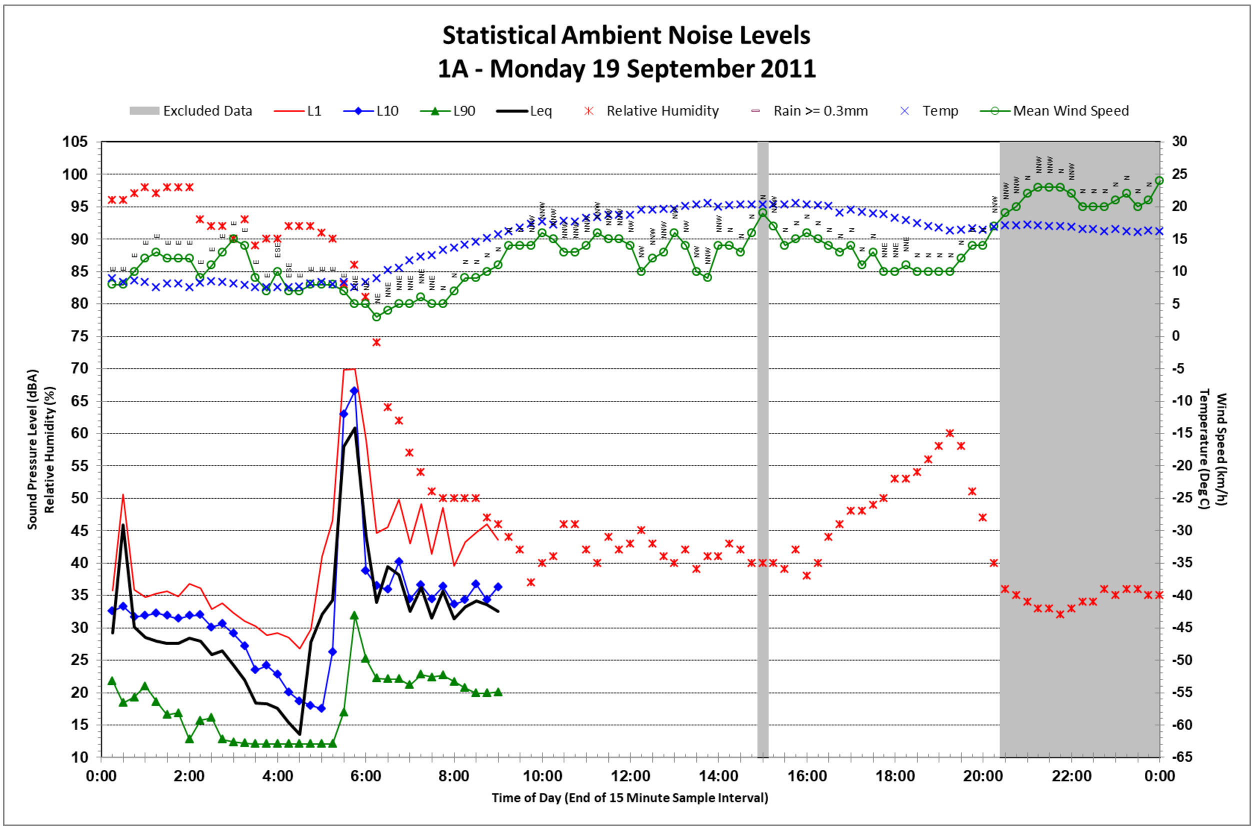
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)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1A - Monday 19 September 2011
Excluded Data
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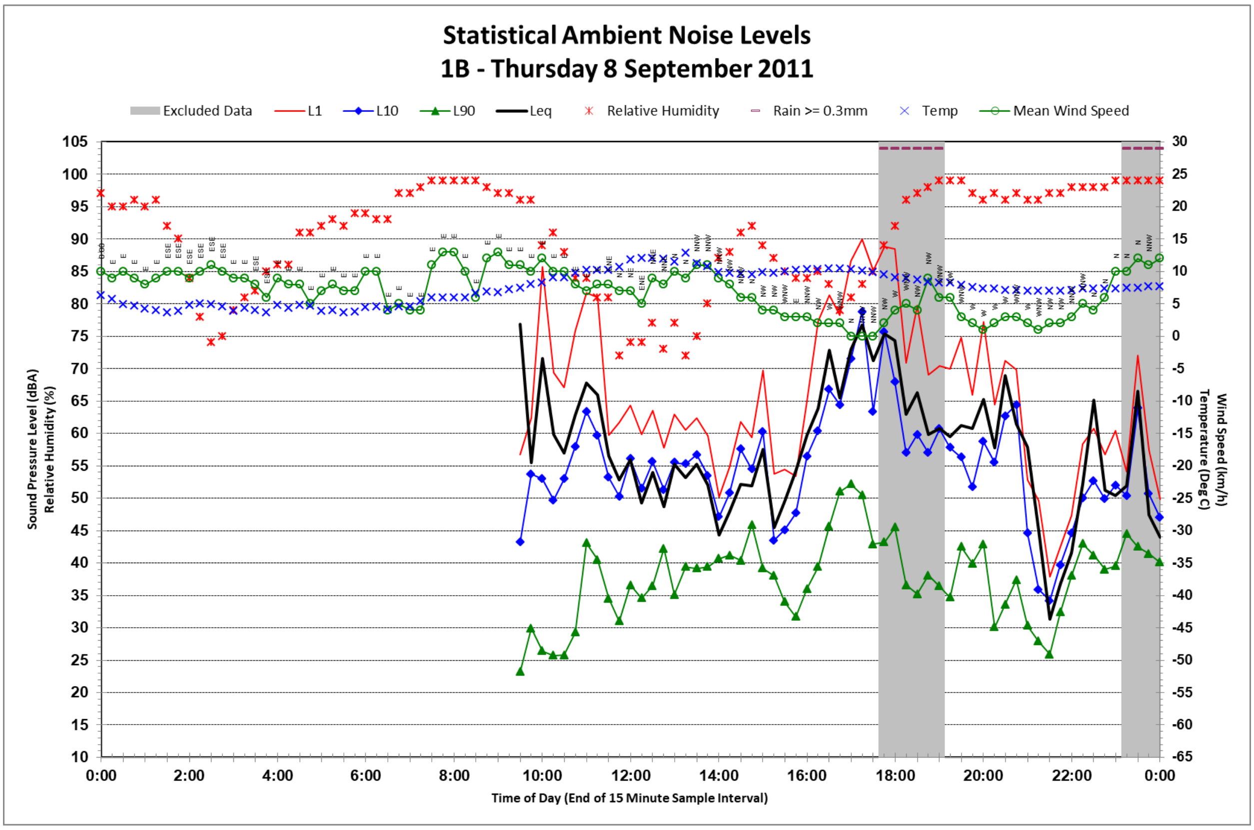
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
1B - Thursday 8 September 2011
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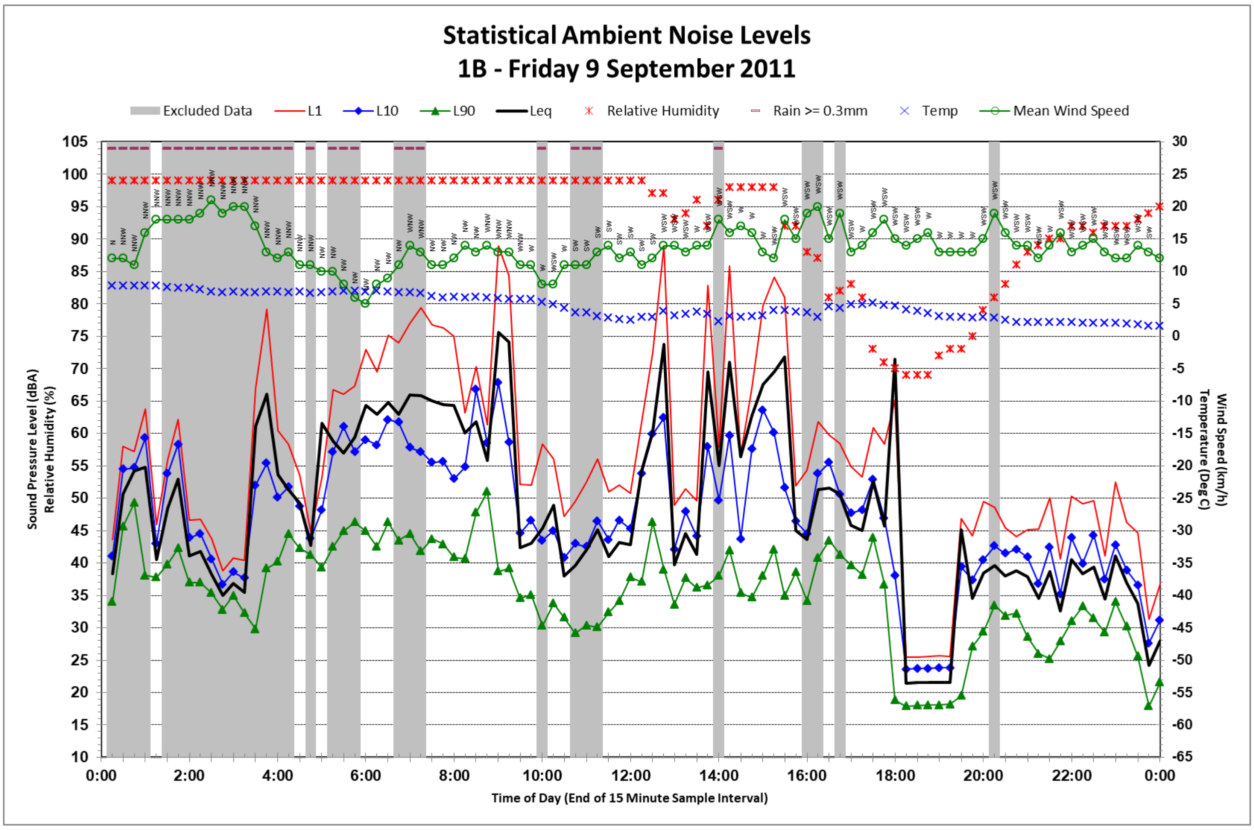
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)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L90
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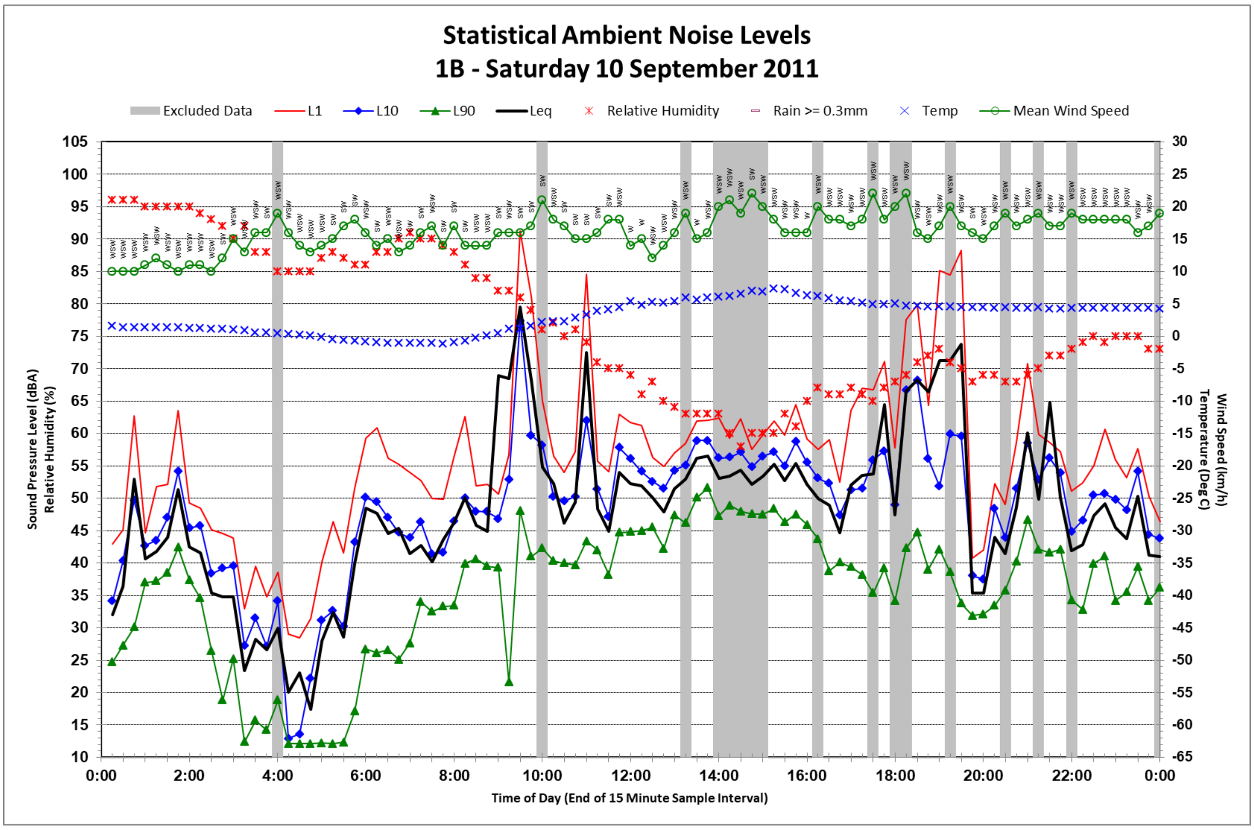
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)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Relative Humidity
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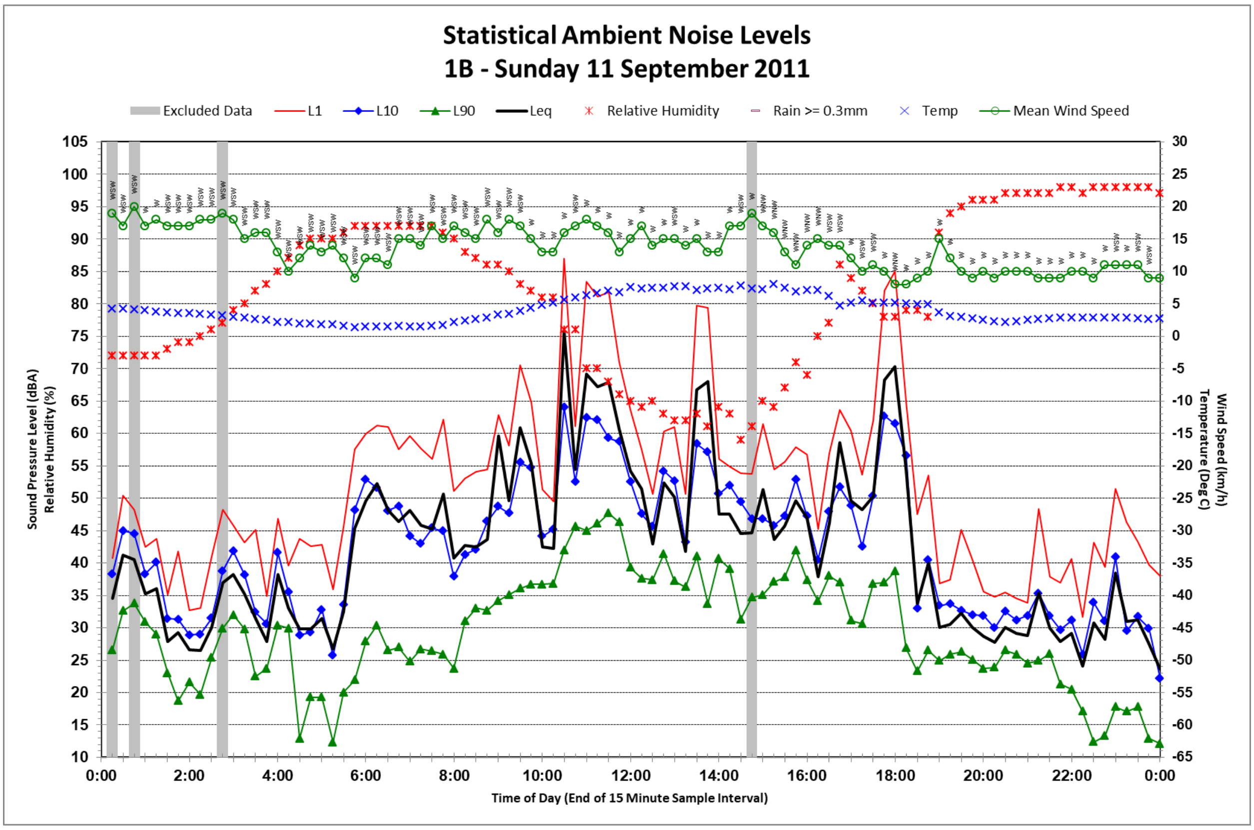
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)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1B - Sunday 11 September 2011
Excluded Data
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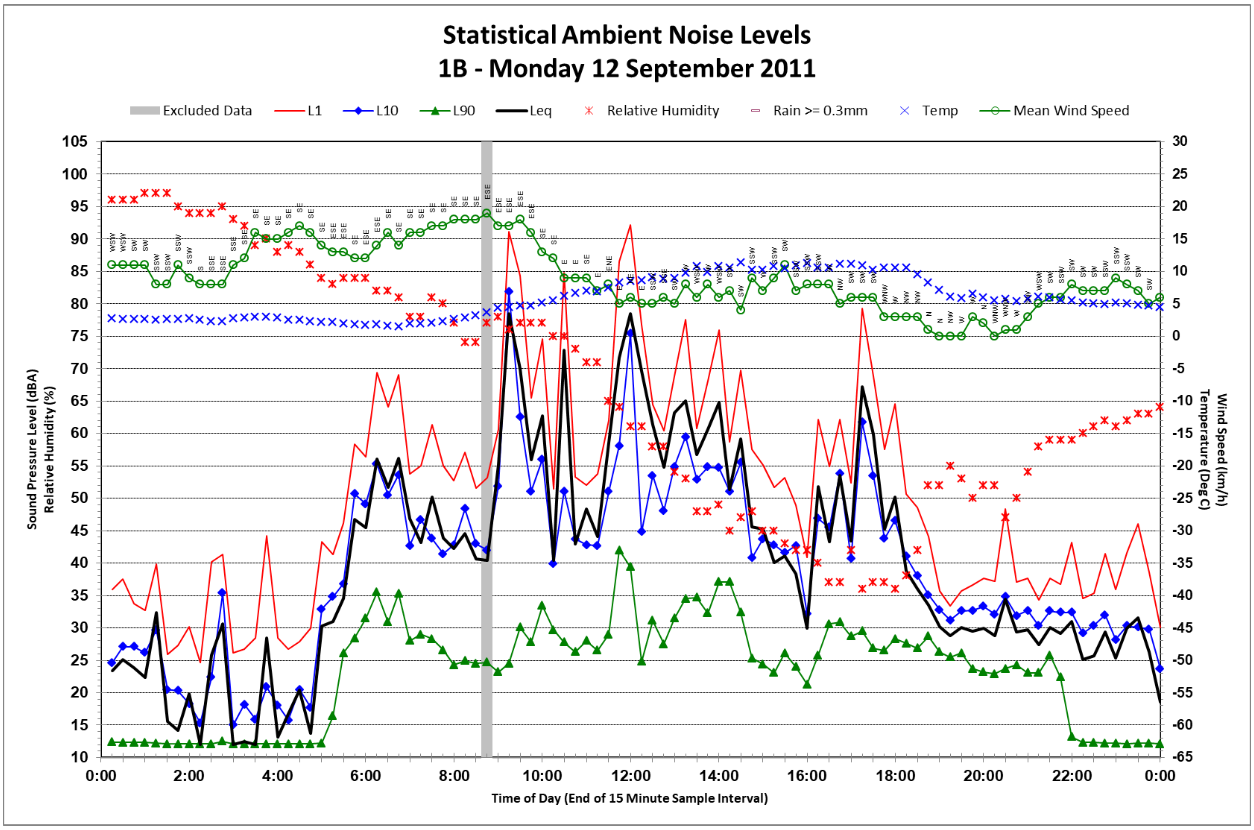
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
1B - Monday 12 September 2011
Excluded Data
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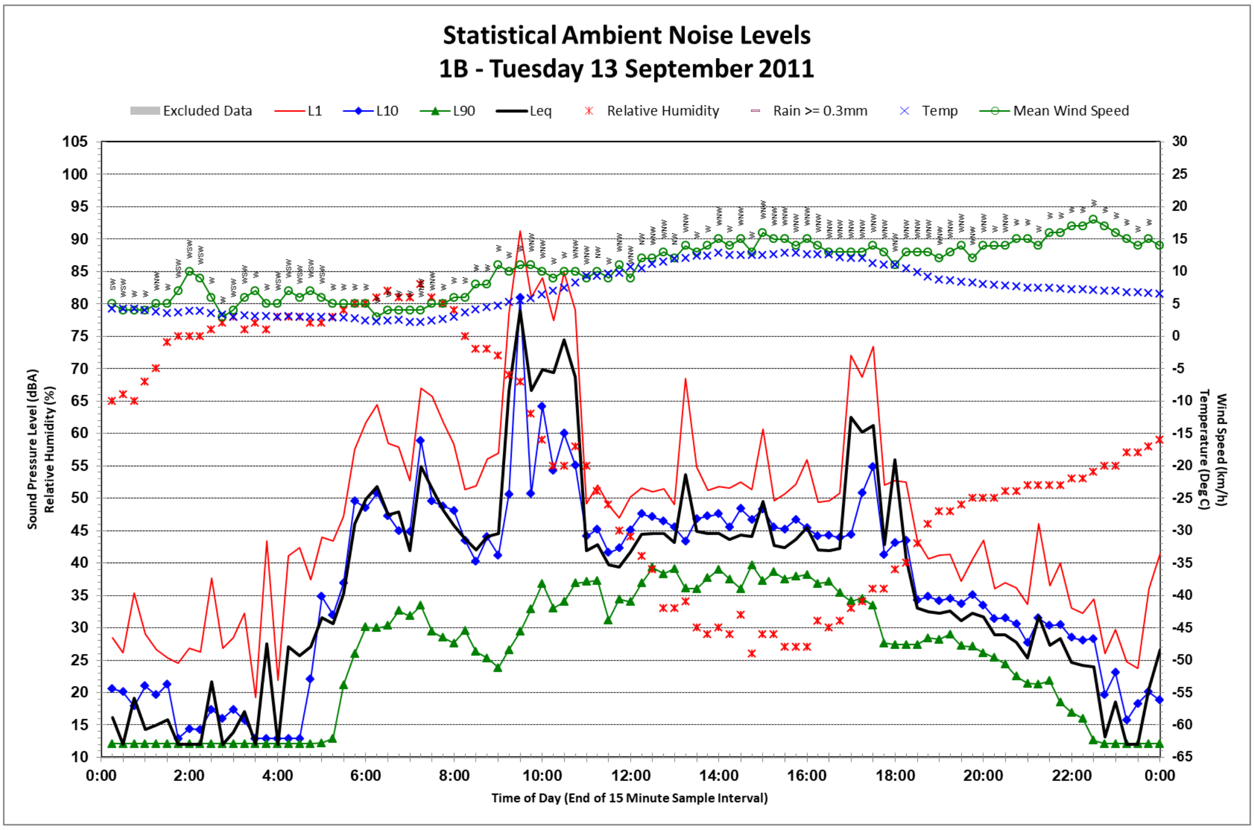
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
1B - Tuesday 13 September 2011
Excluded Data
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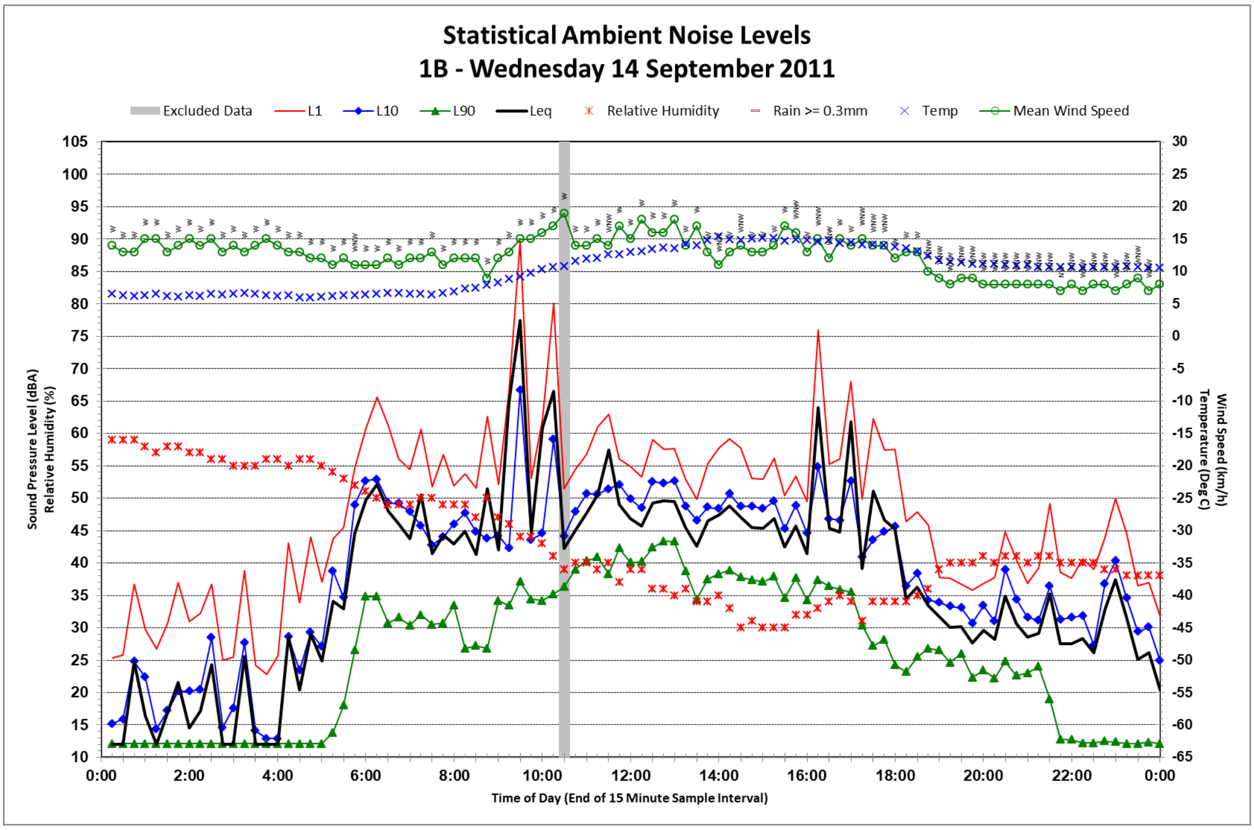
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
1B - Wednesday 14 September 2011
Excluded Data
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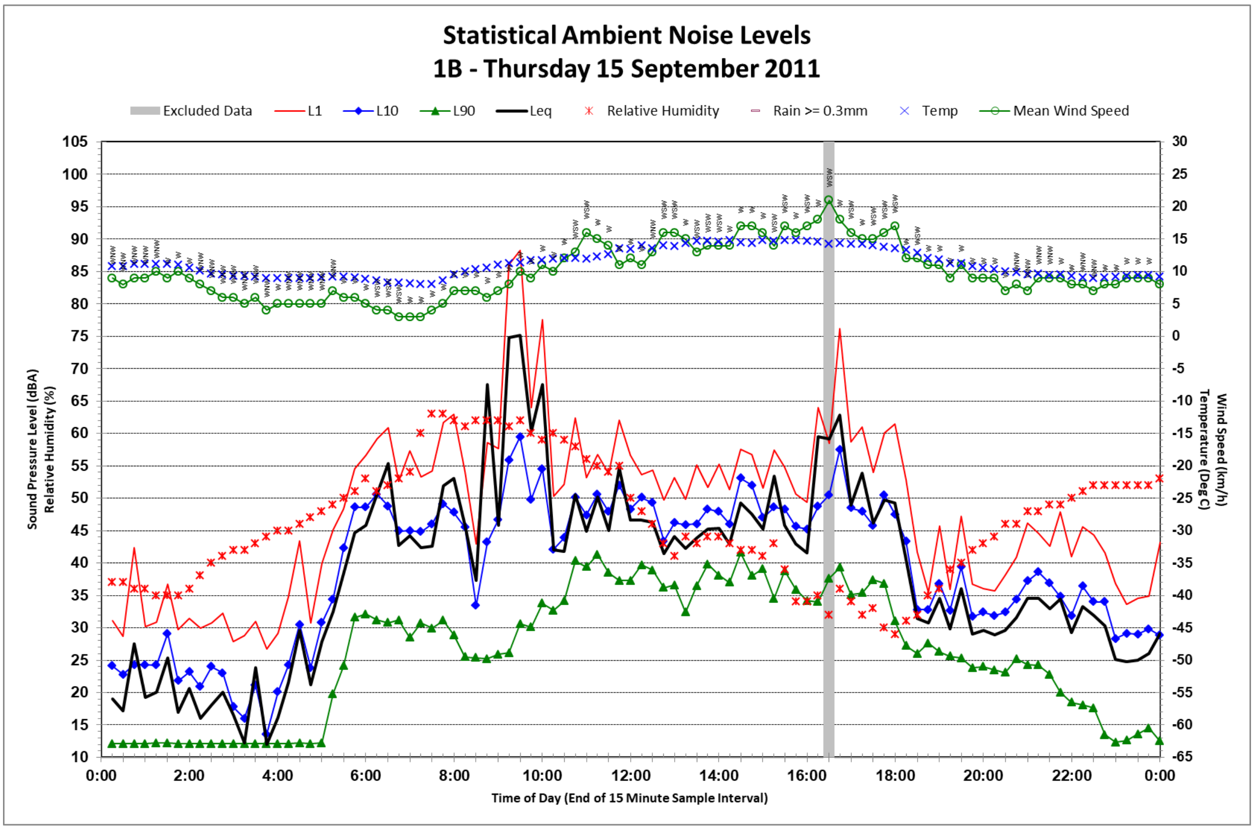
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
1B - Thursday 15 September 2011
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Relative Humidity
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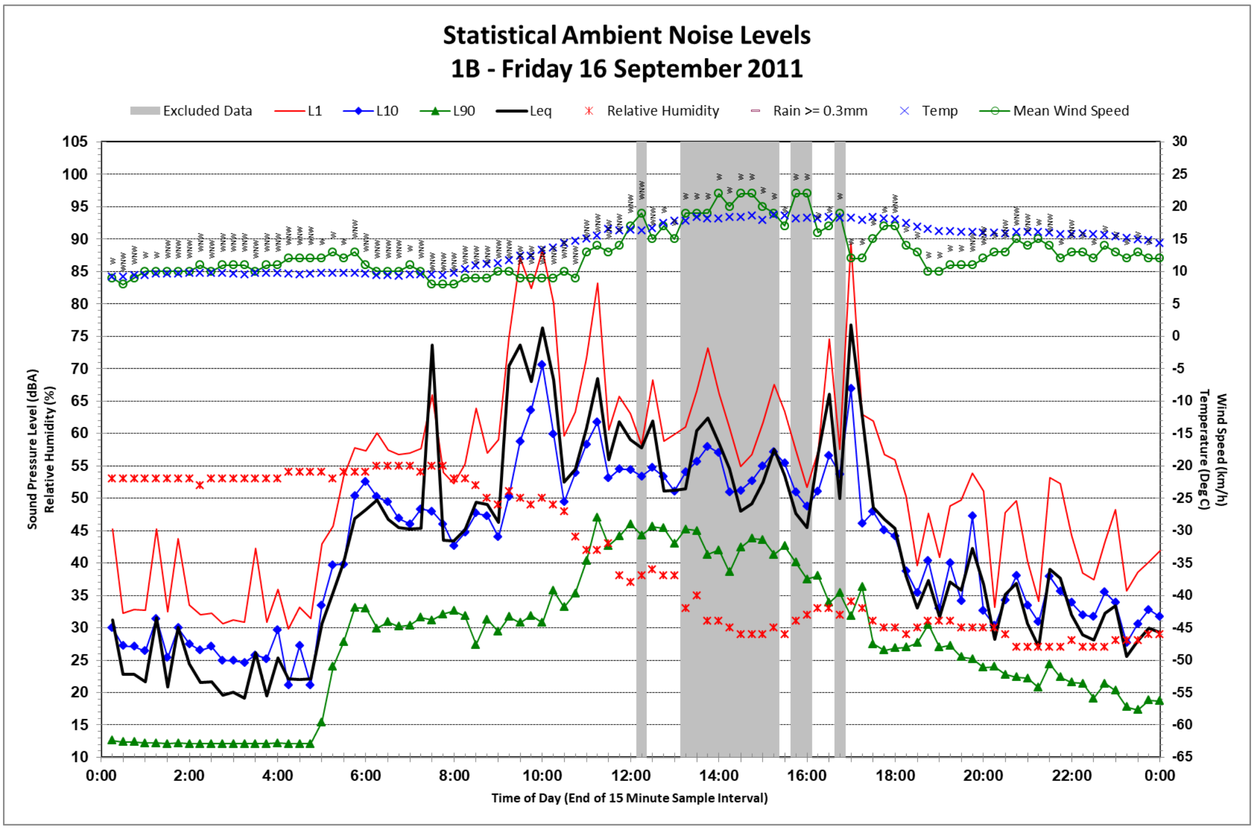
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
1B - Friday 16 September 2011
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L90
Leq
Relative Humidity
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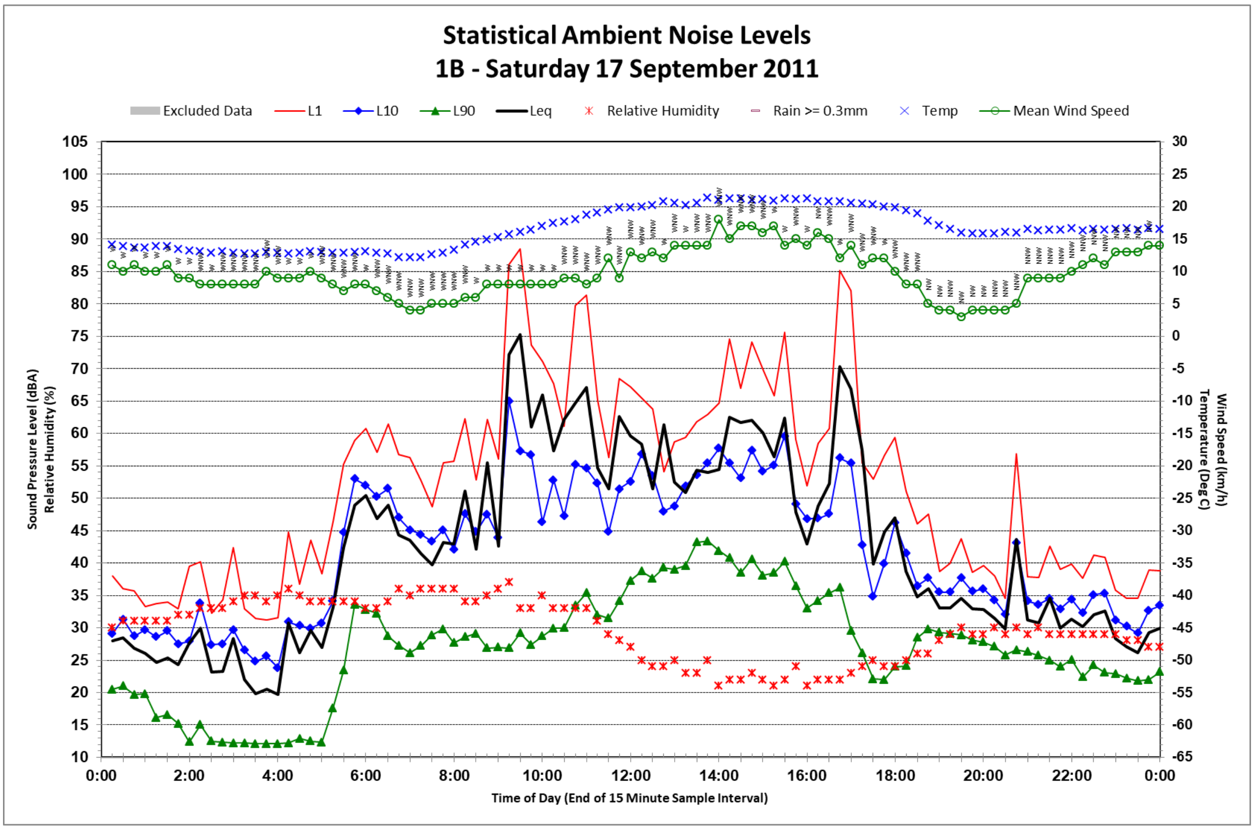
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)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Excluded Data
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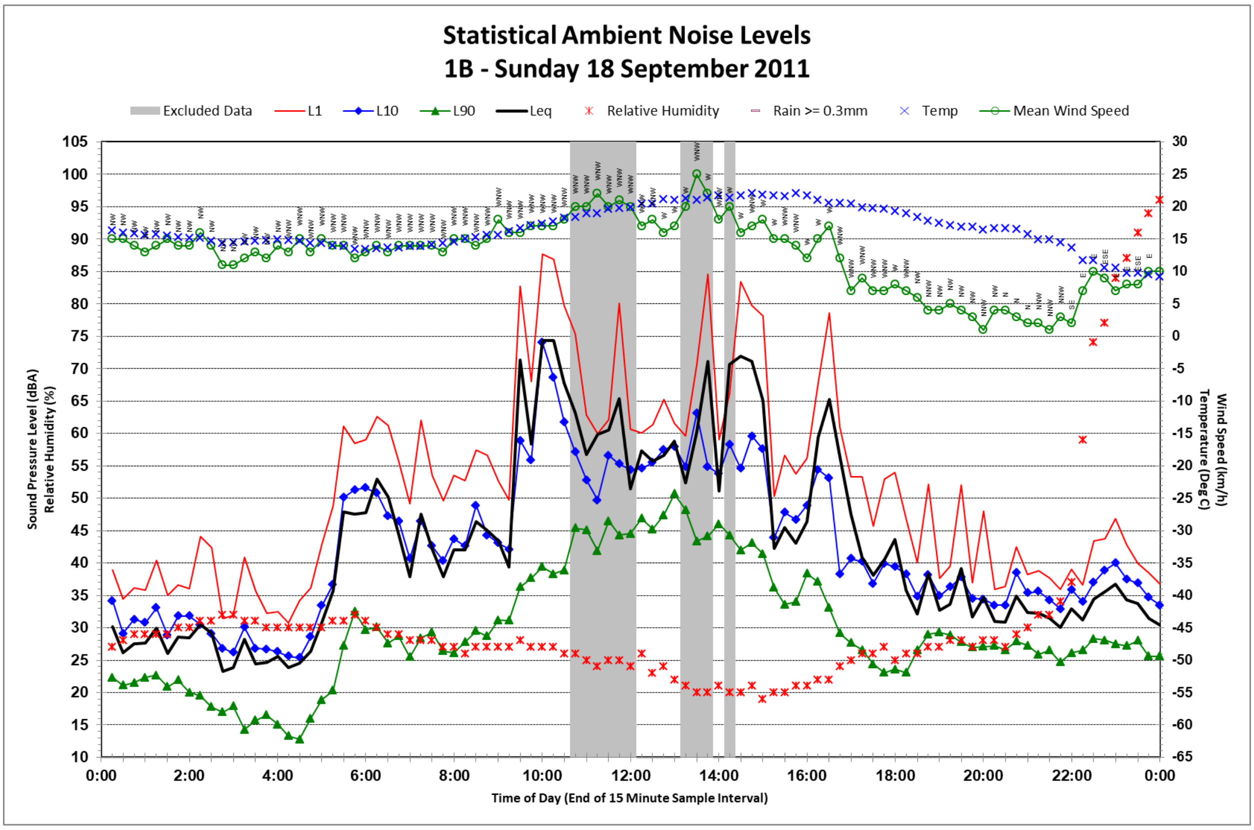
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
1B - Sunday 18 September 2011
Excluded Data
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Relative Humidity
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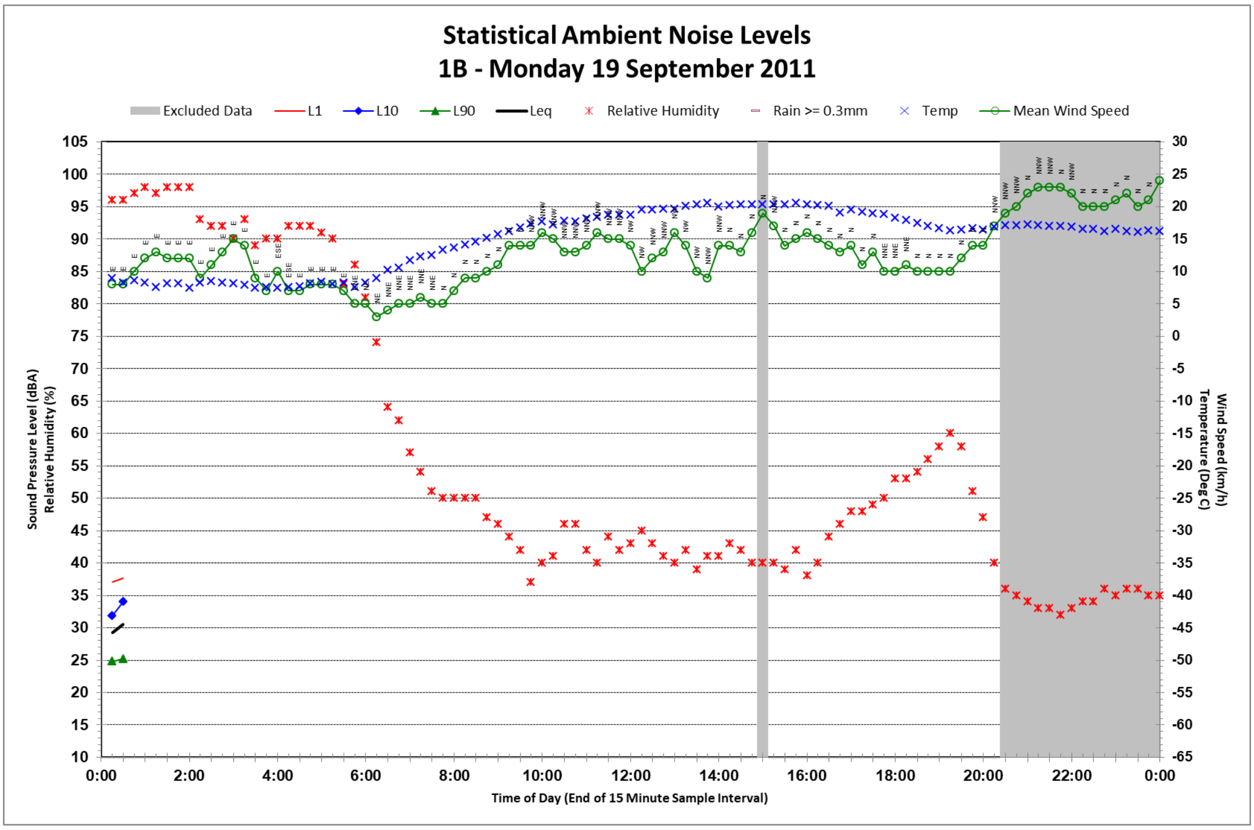
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
1B - Monday 19 September 2011
Excluded Data
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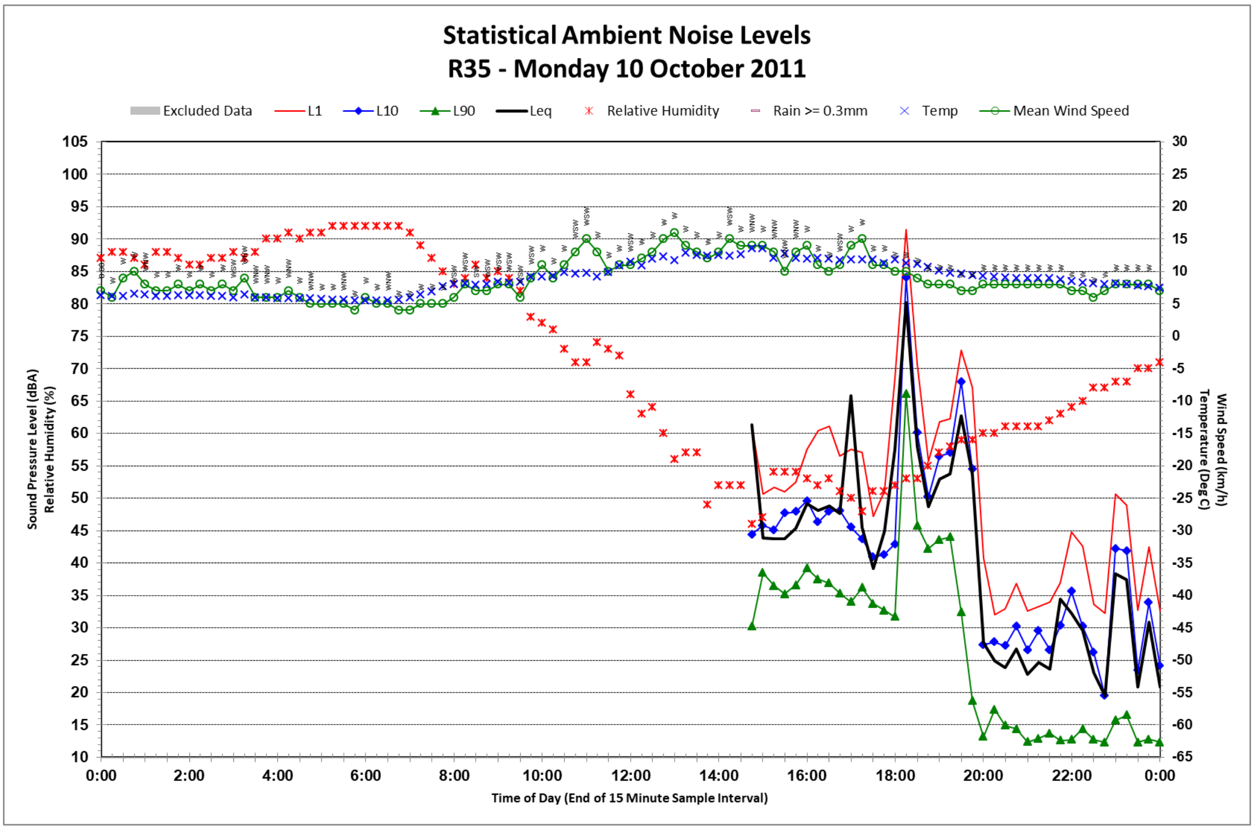
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
R35 - Monday 10 October 2011
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L90
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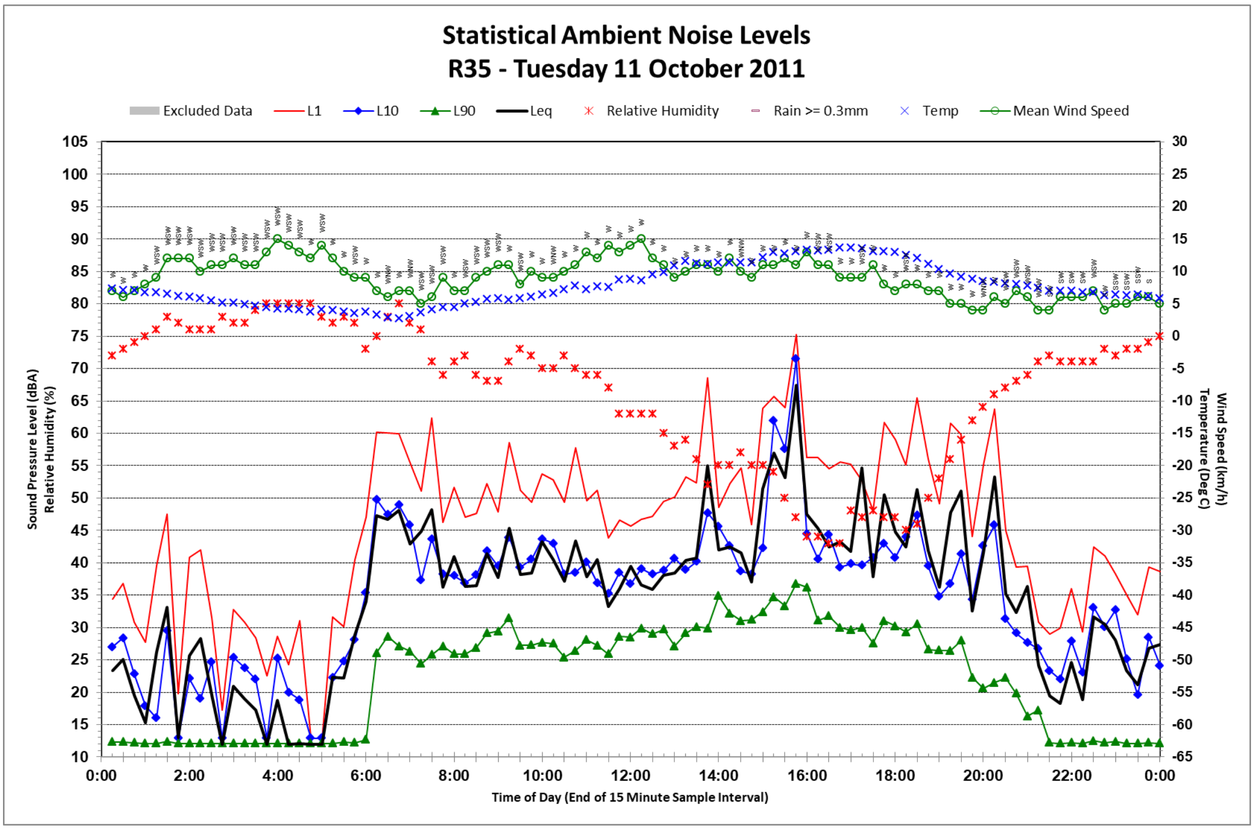
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
R35 - Tuesday 11 October 2011
Excluded Data
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L90
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Temp
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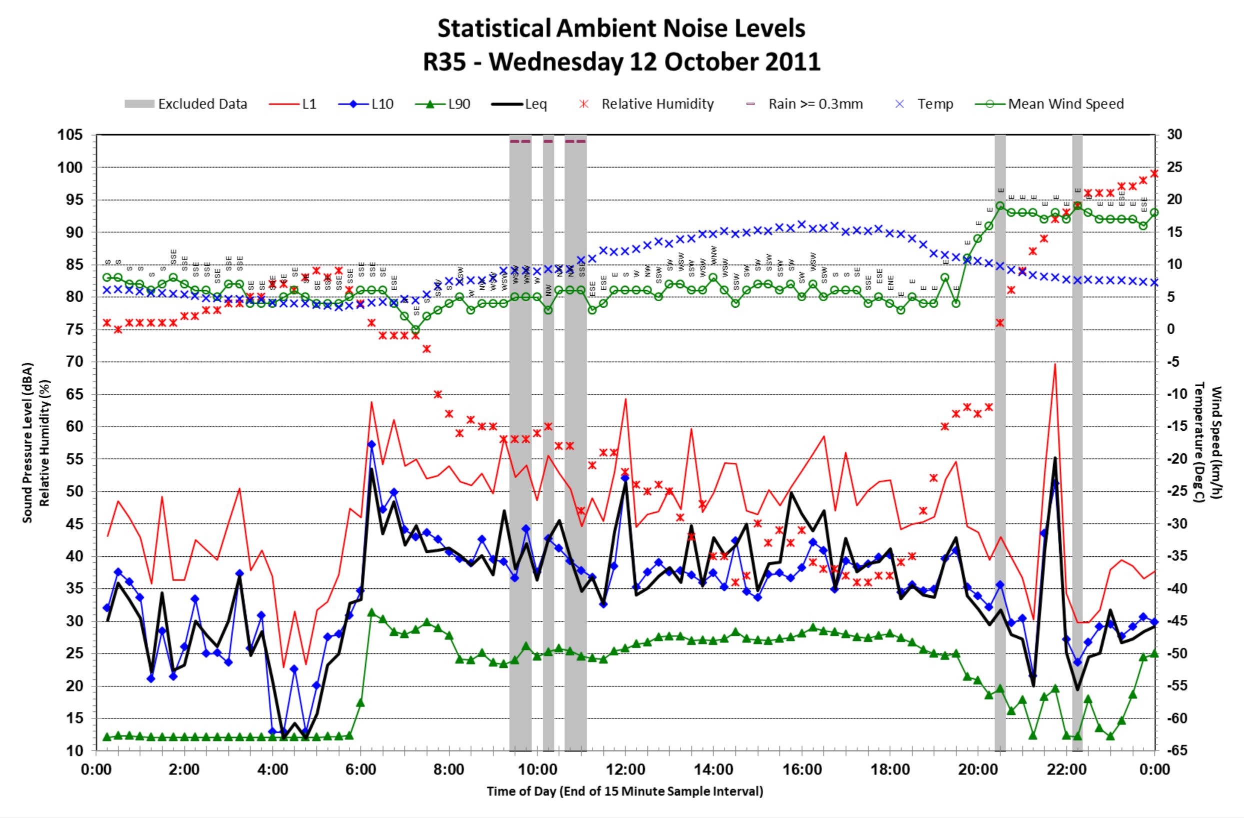
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
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Temp
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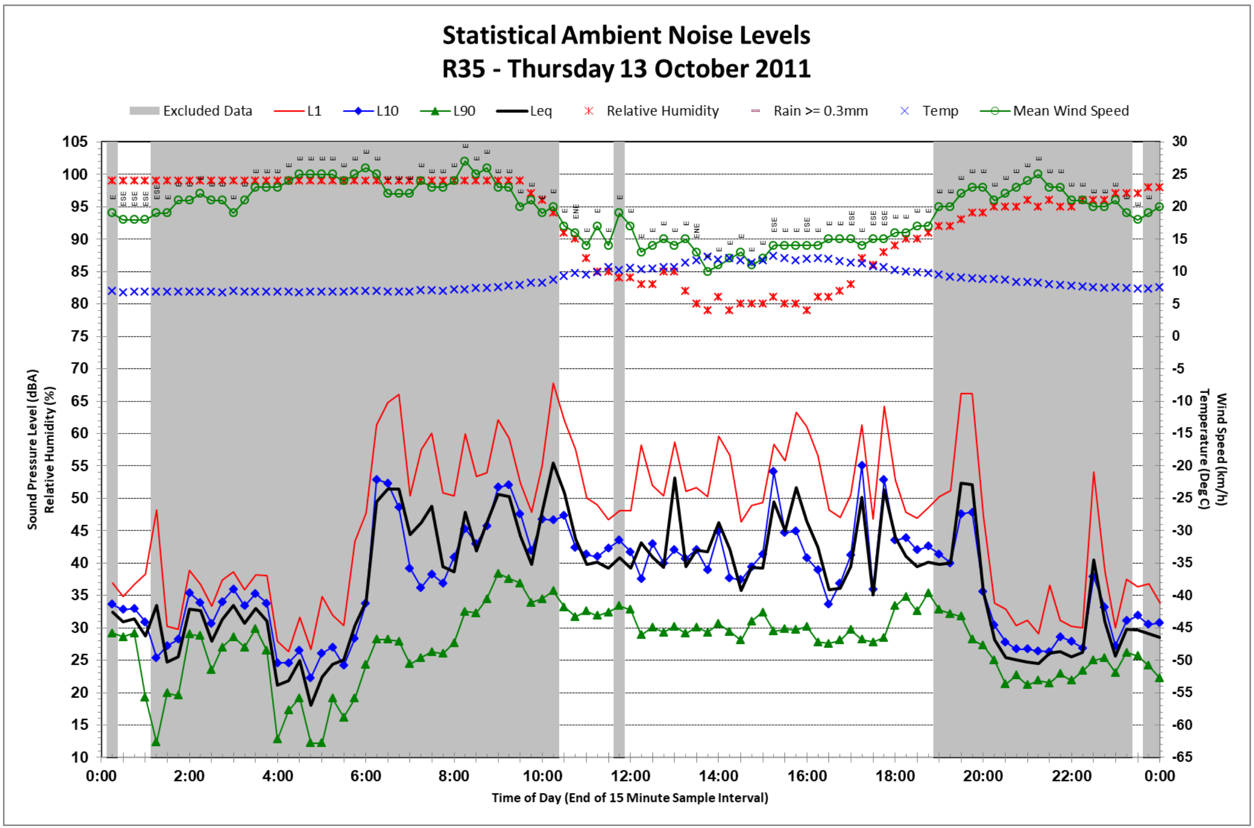
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)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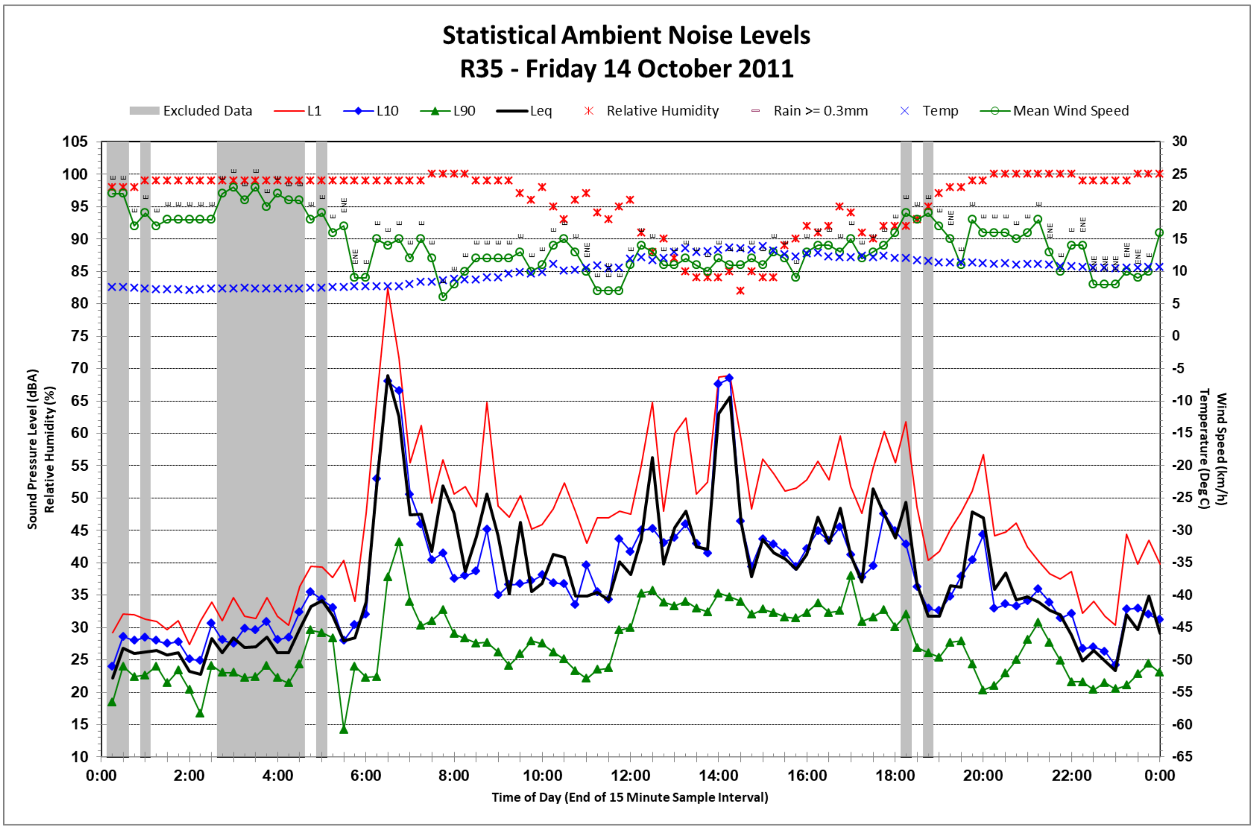
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)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R35 - Friday 14 October 2011
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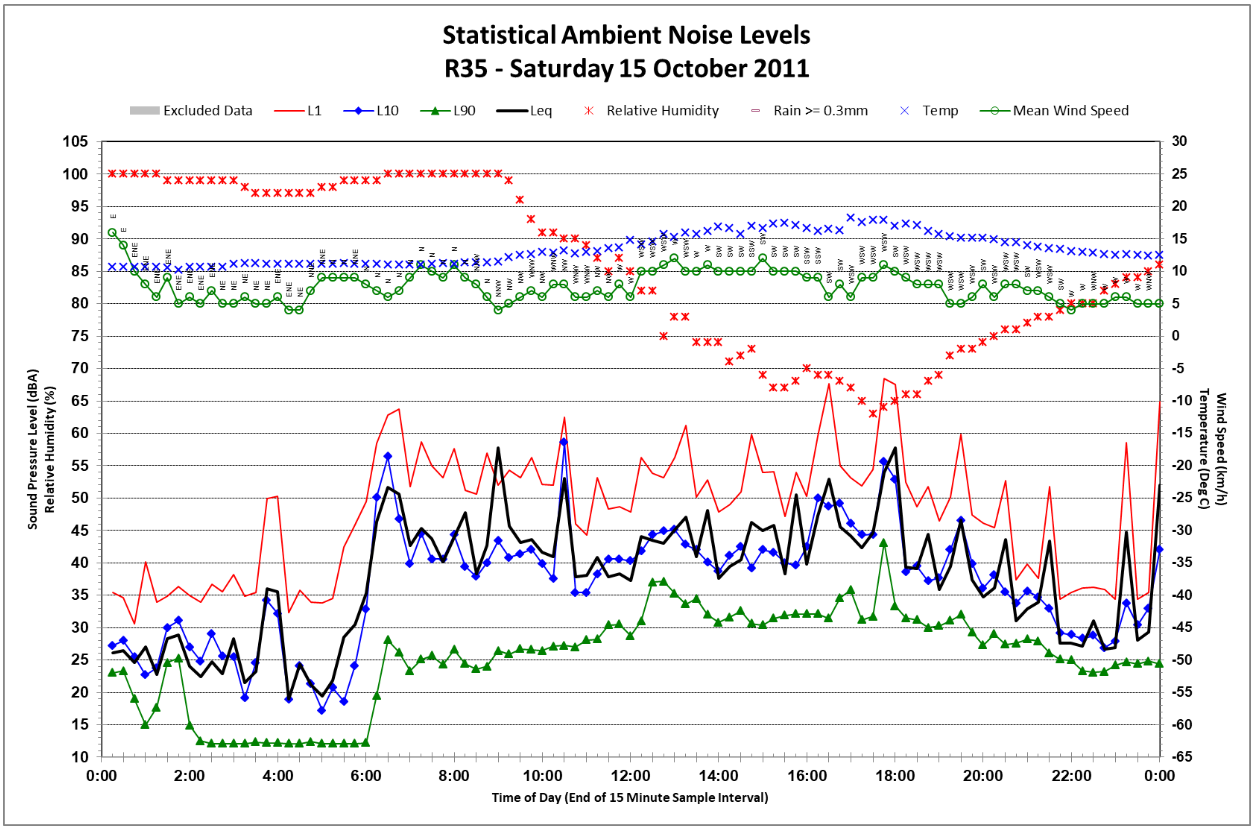
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)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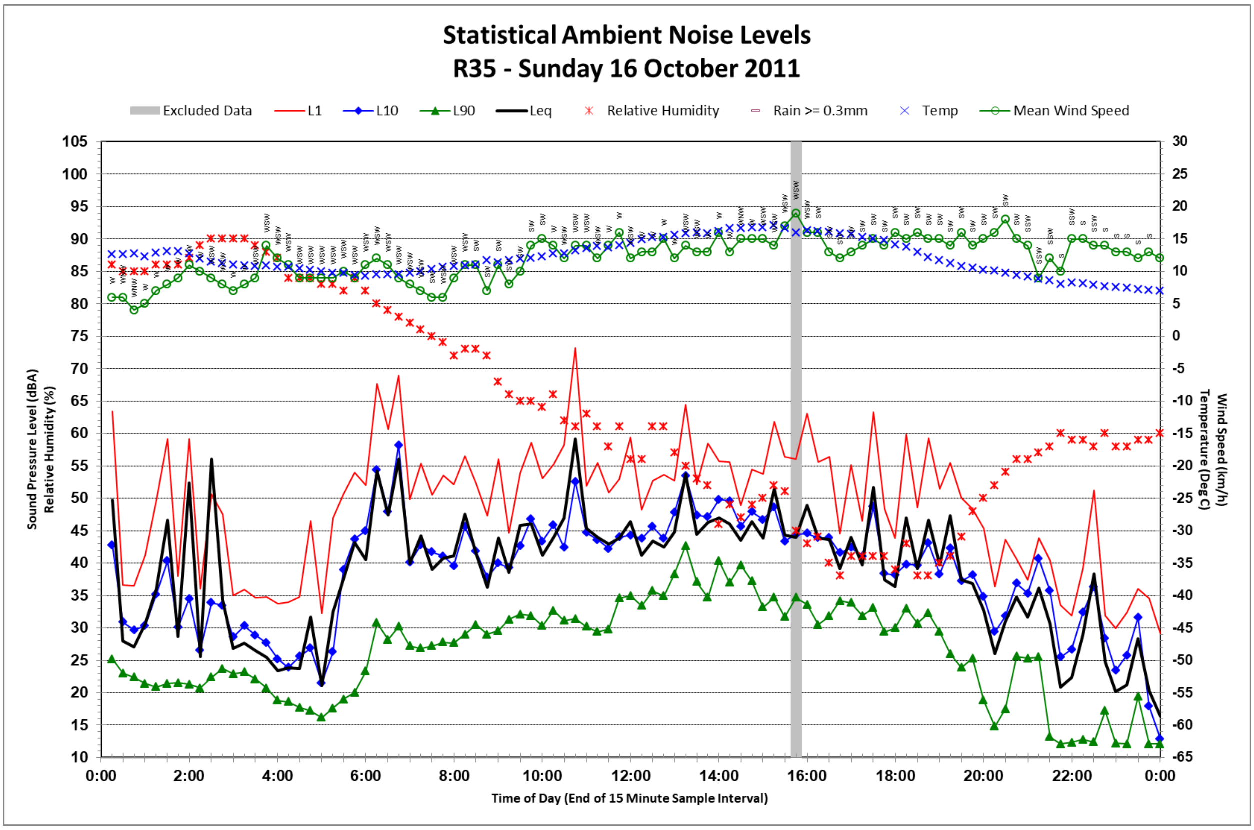
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
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Excluded Data
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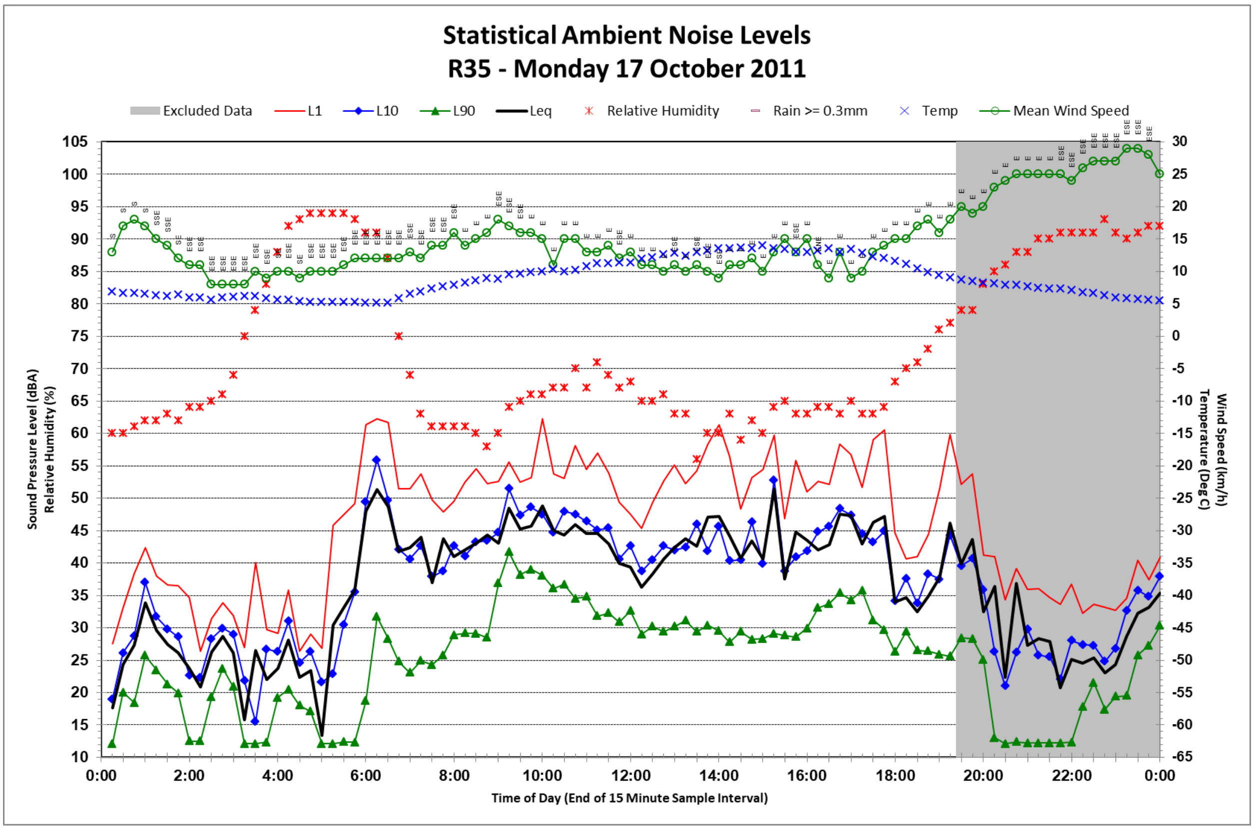
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)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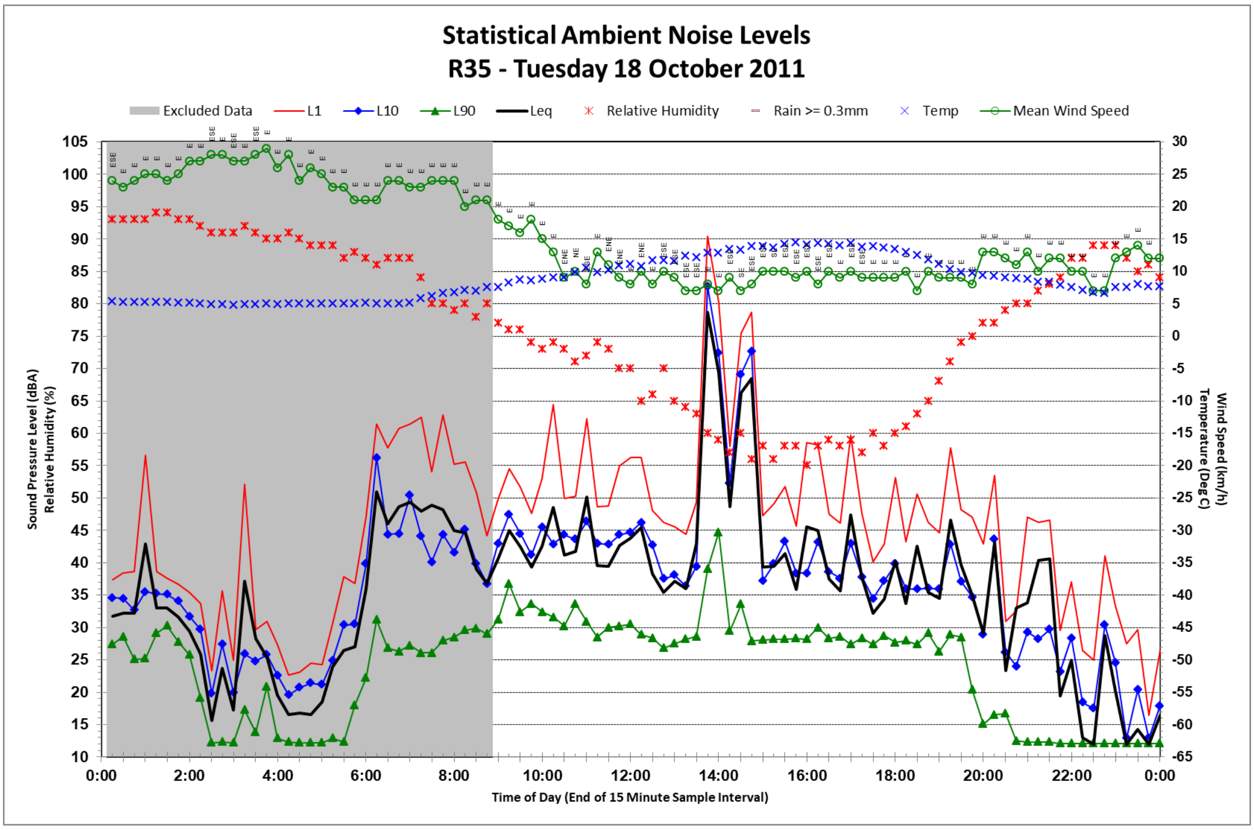
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)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L90
Leq
Relative Humidity
Rain >= 0.3mm
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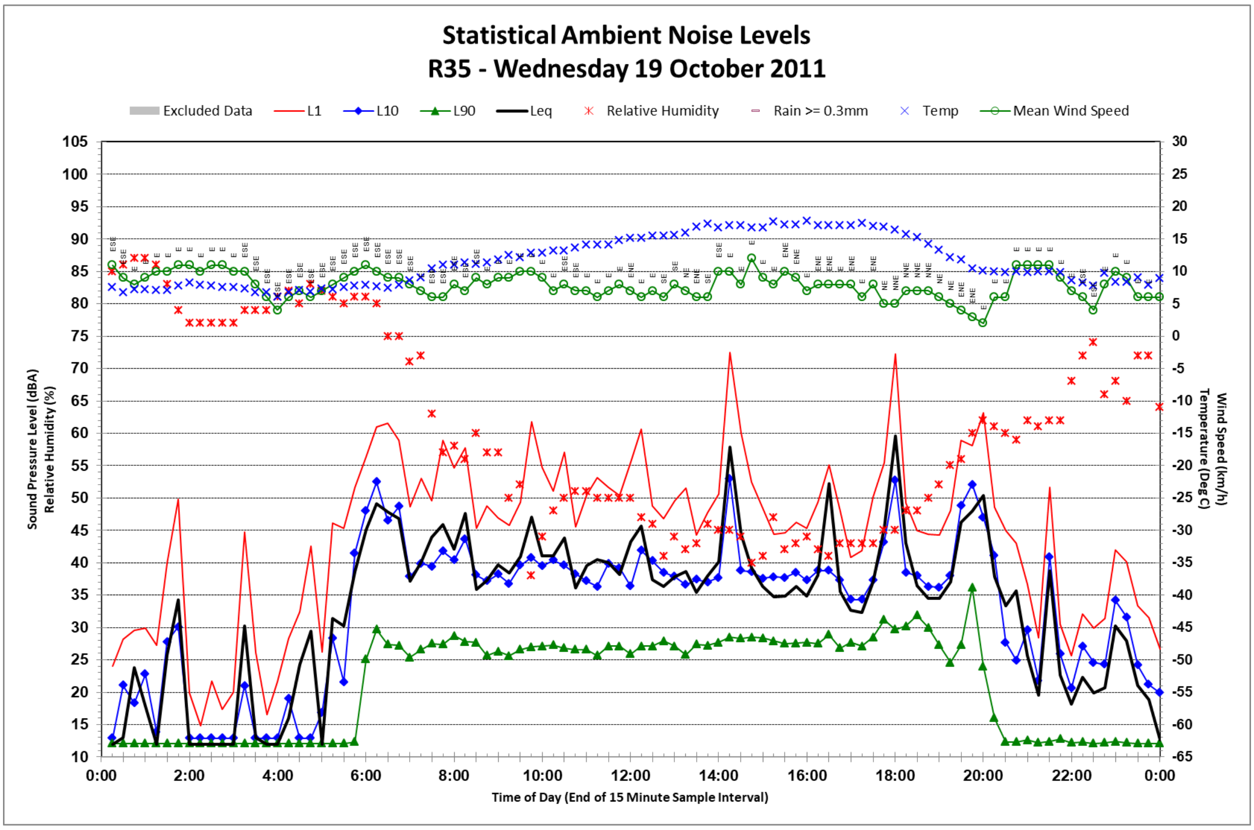
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)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R35 - Wednesday 19 October 2011
Excluded Data
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Leq
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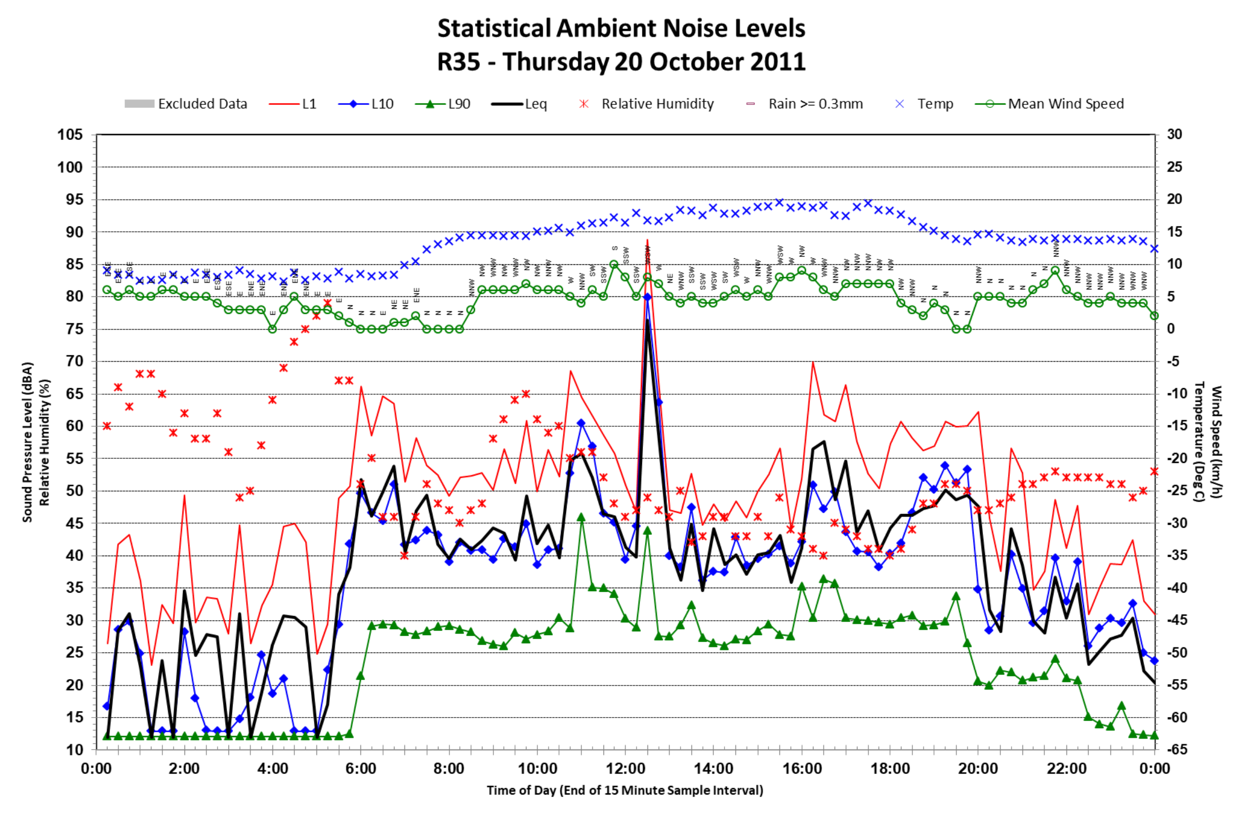
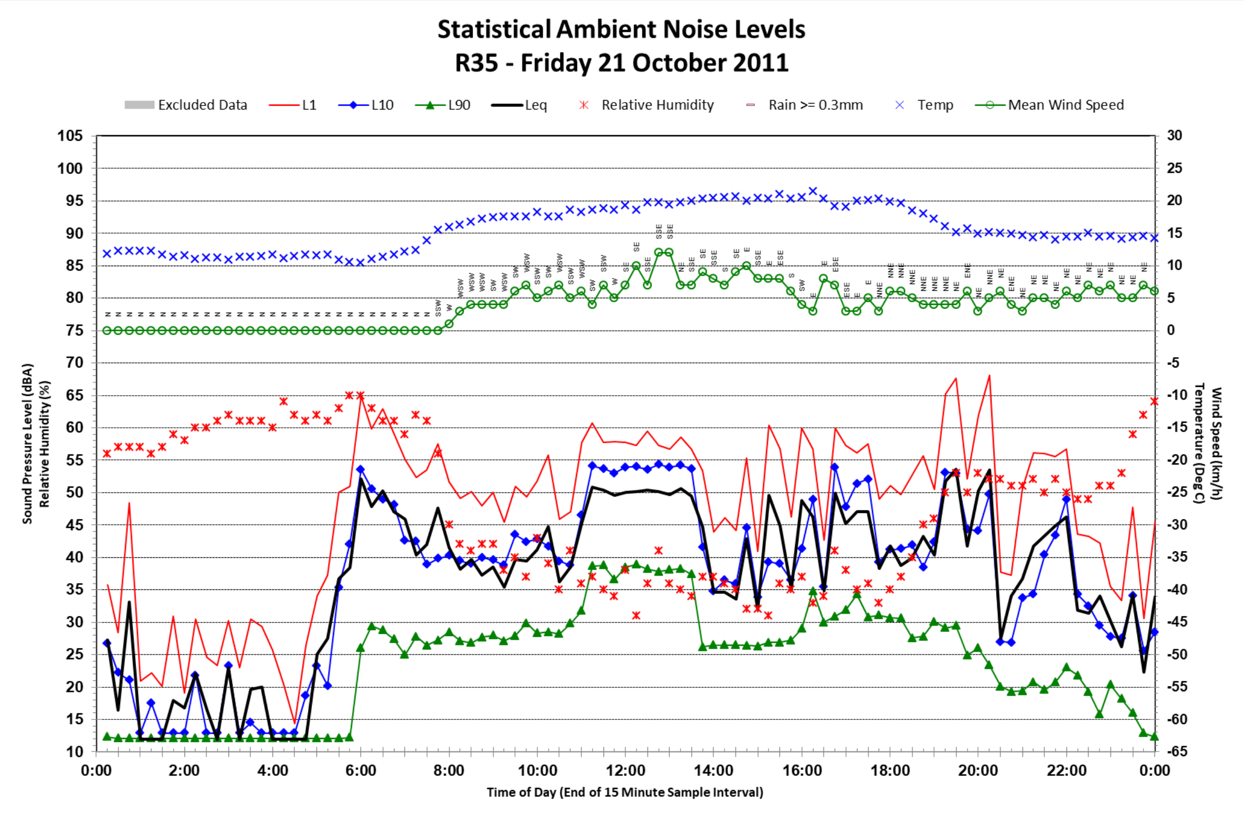
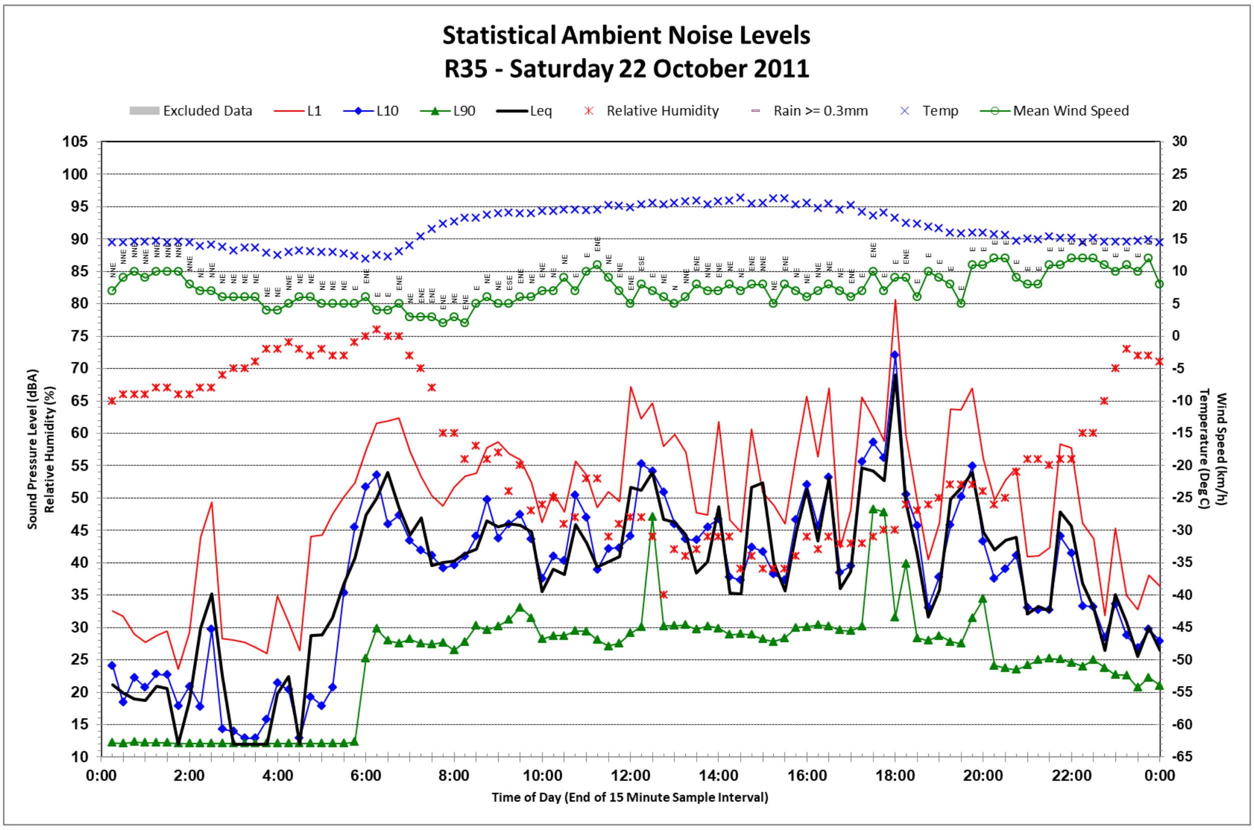
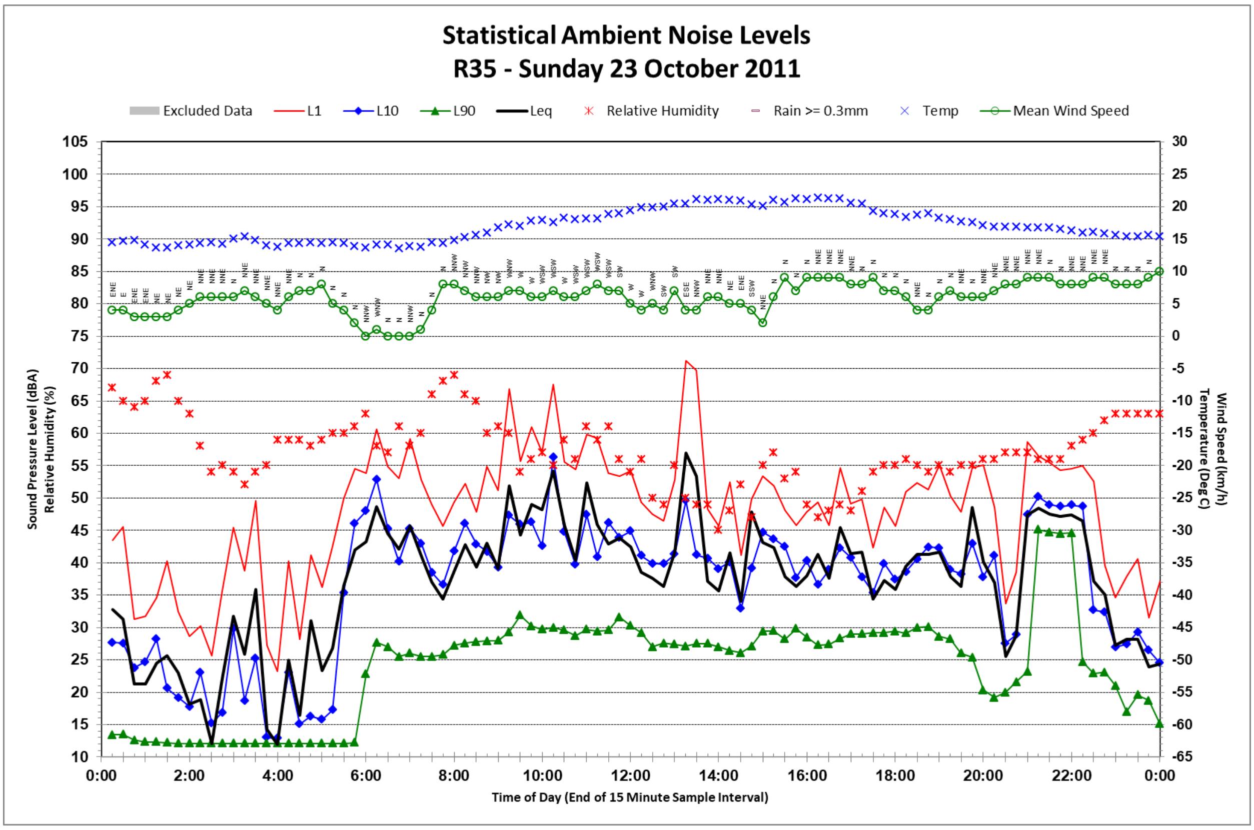
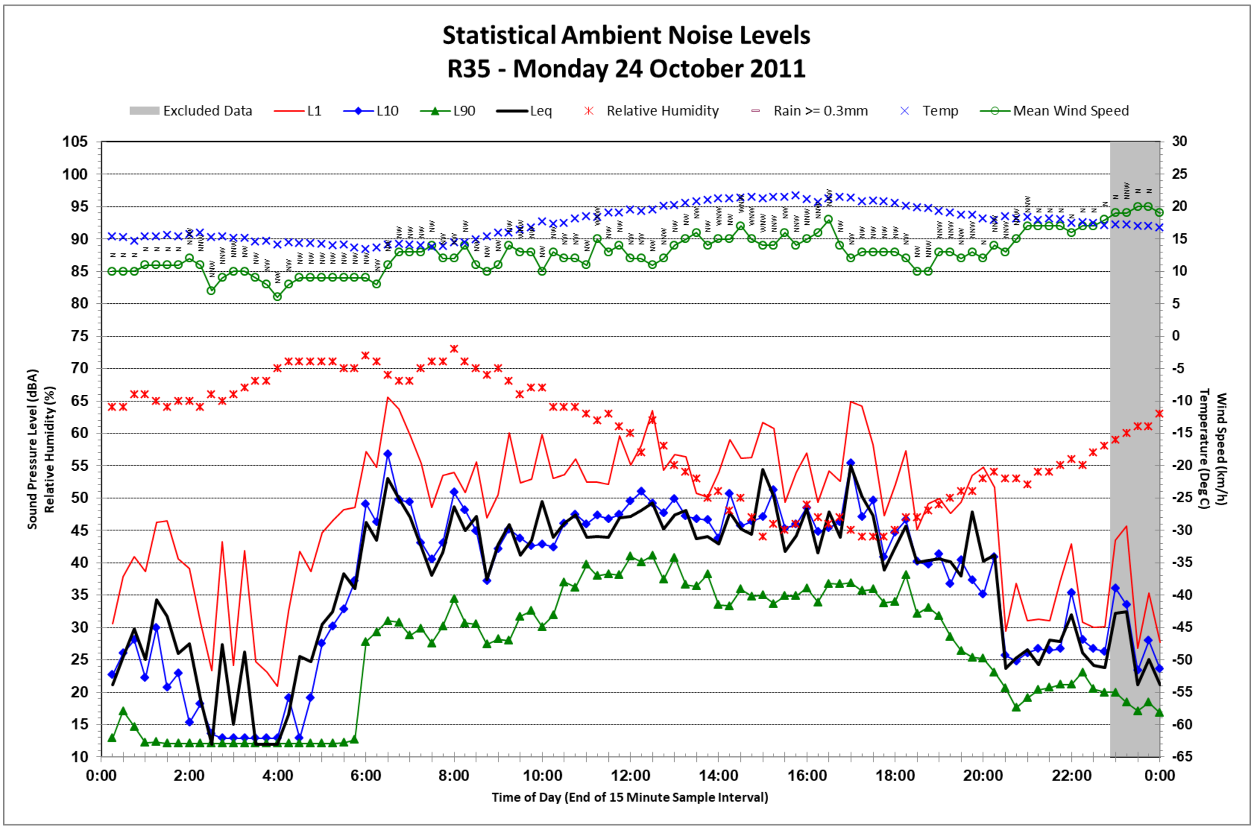
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

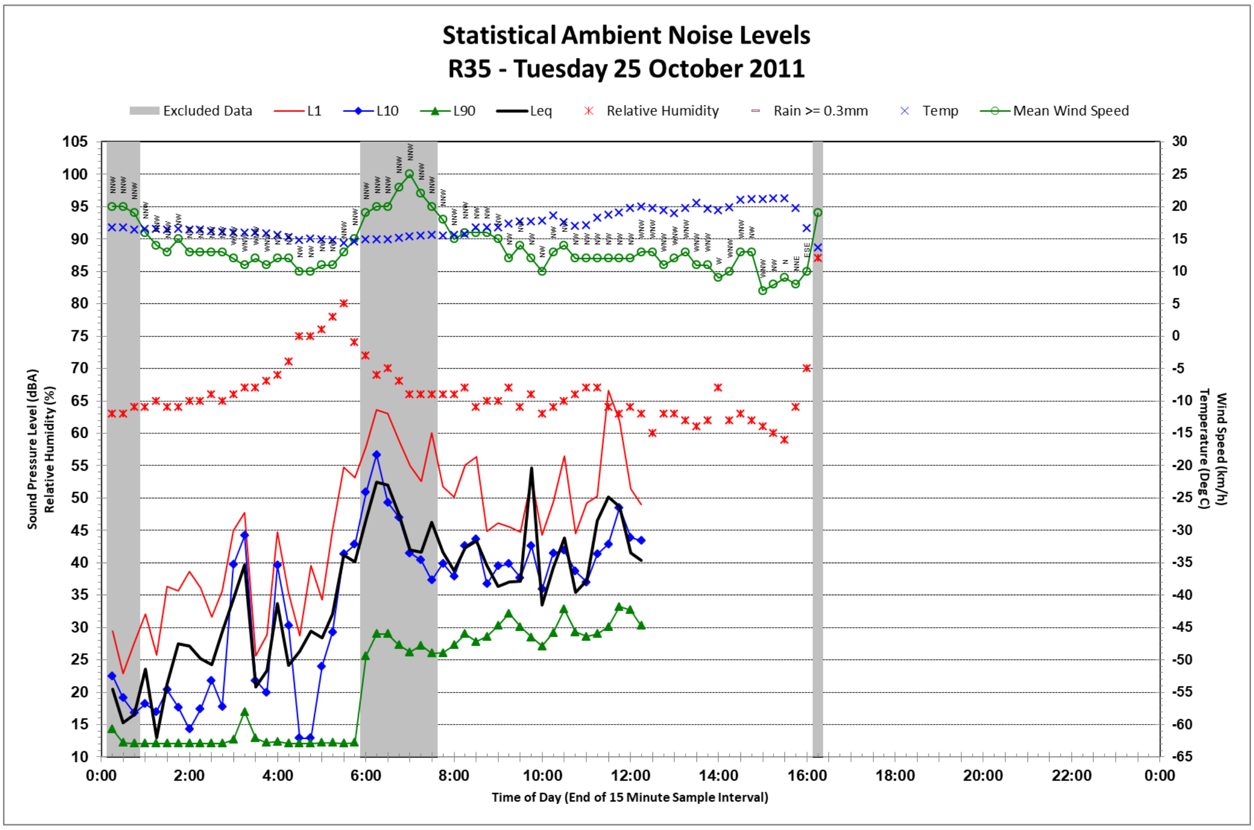

Statistical Ambient Noise Levels
R35 - Thursday 20 October 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

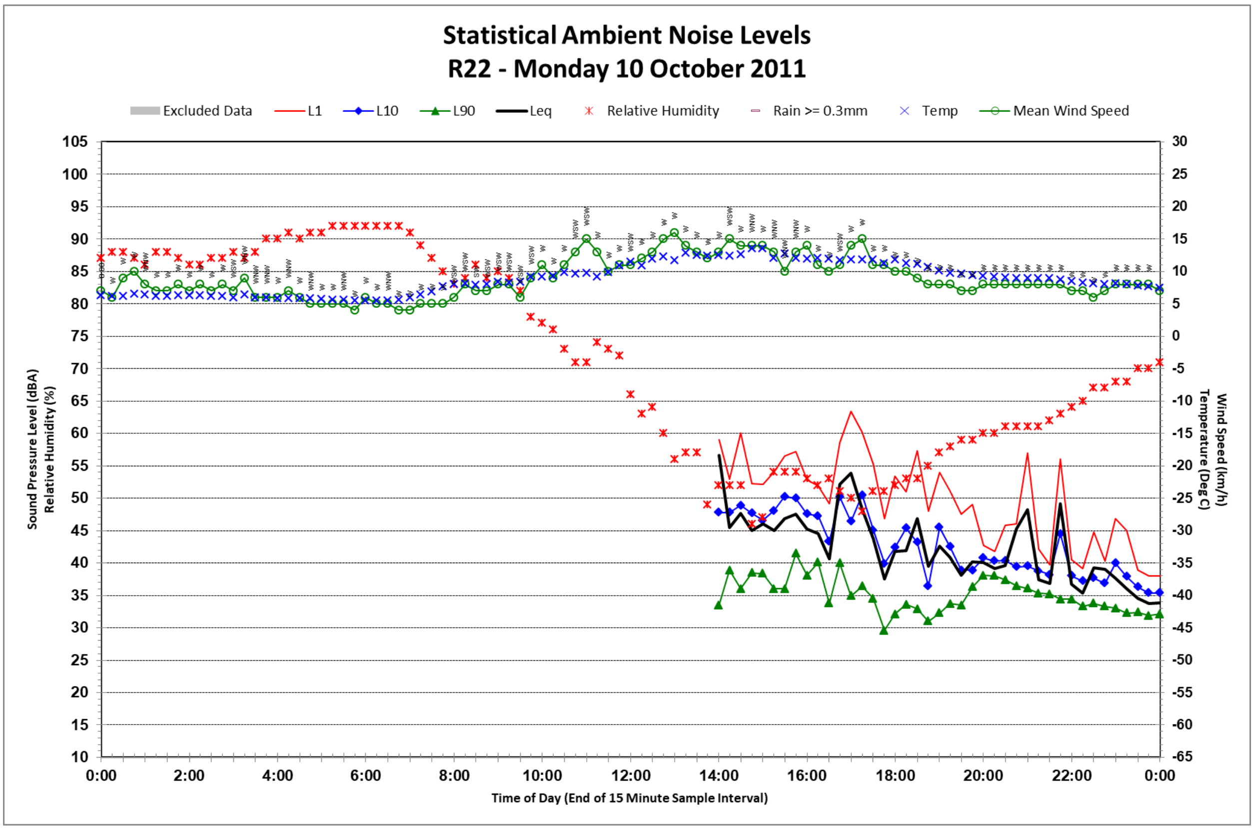

Statistical Ambient Noise Levels
R35 - Friday 21 October 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

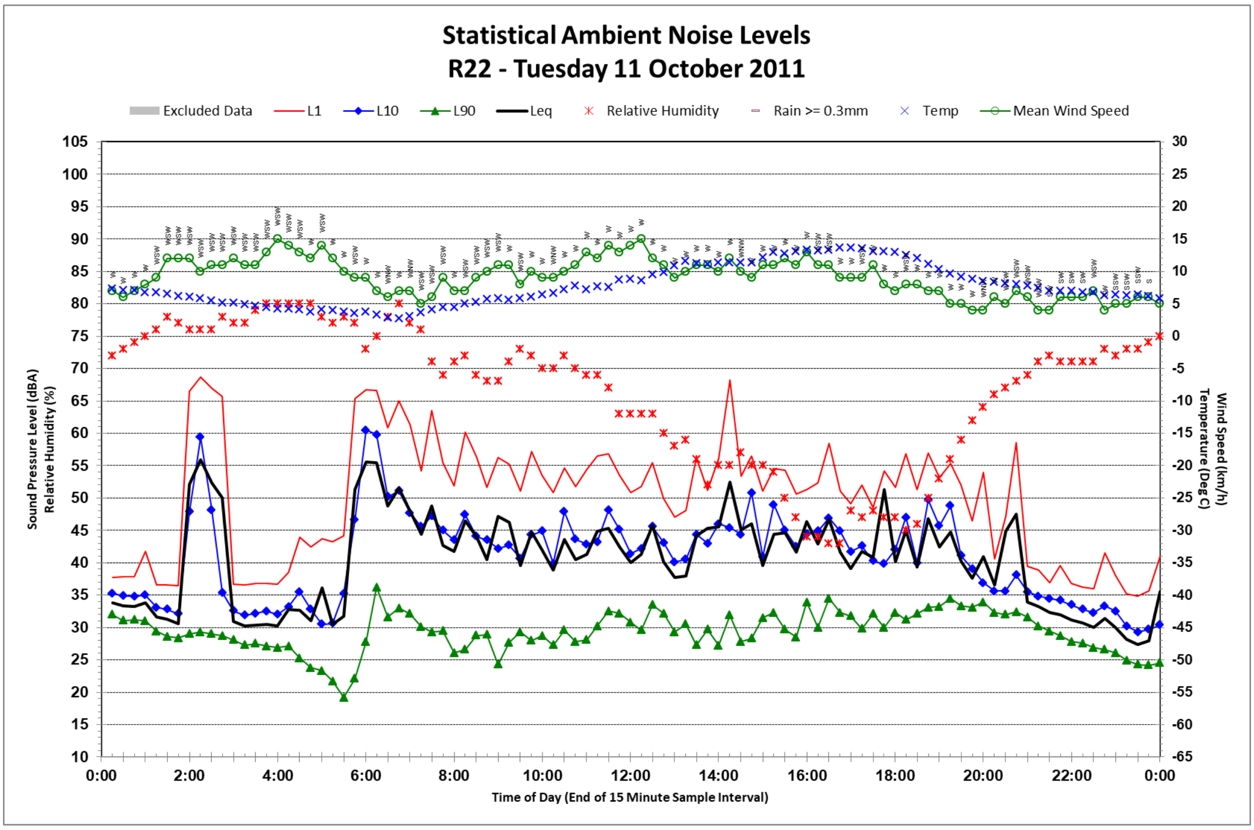

Statistical Ambient Noise Levels
R35 - Saturday 22 October 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

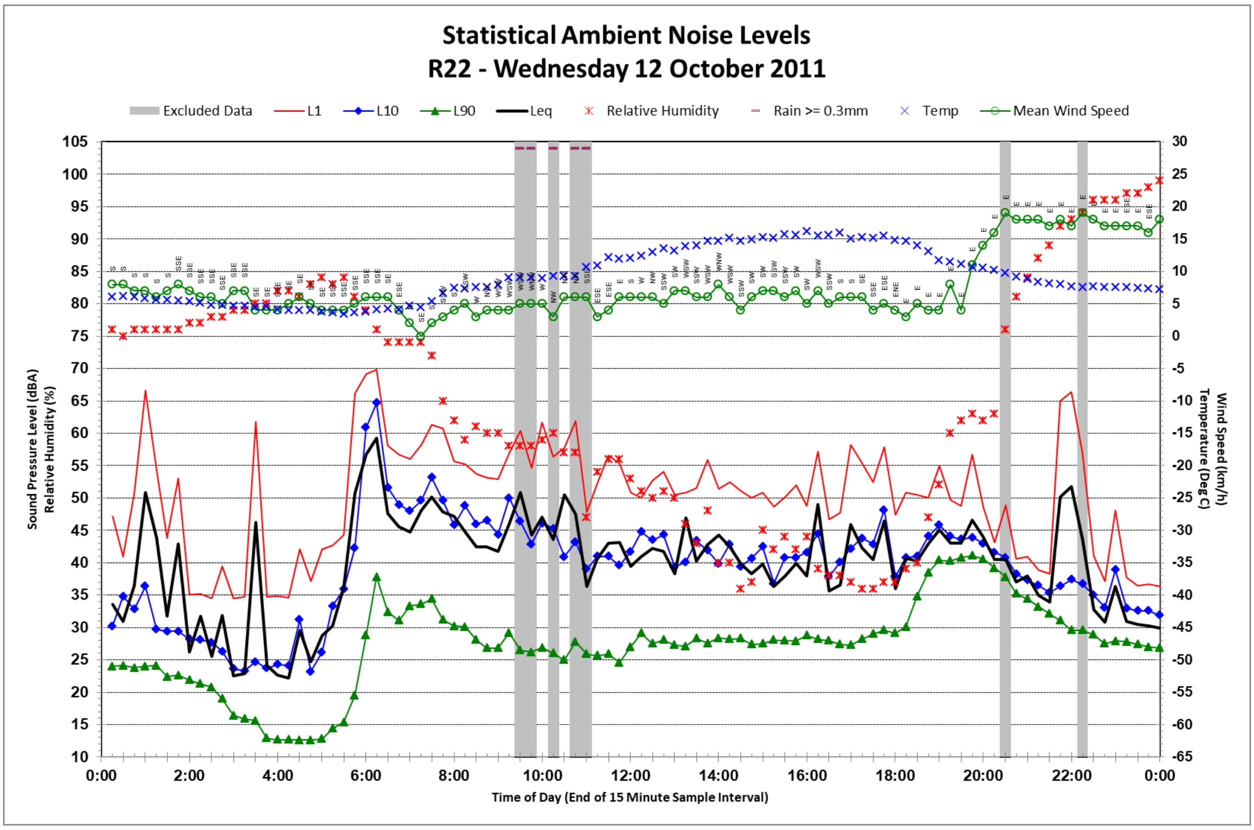

Statistical Ambient Noise Levels
R35 - Sunday 23 October 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

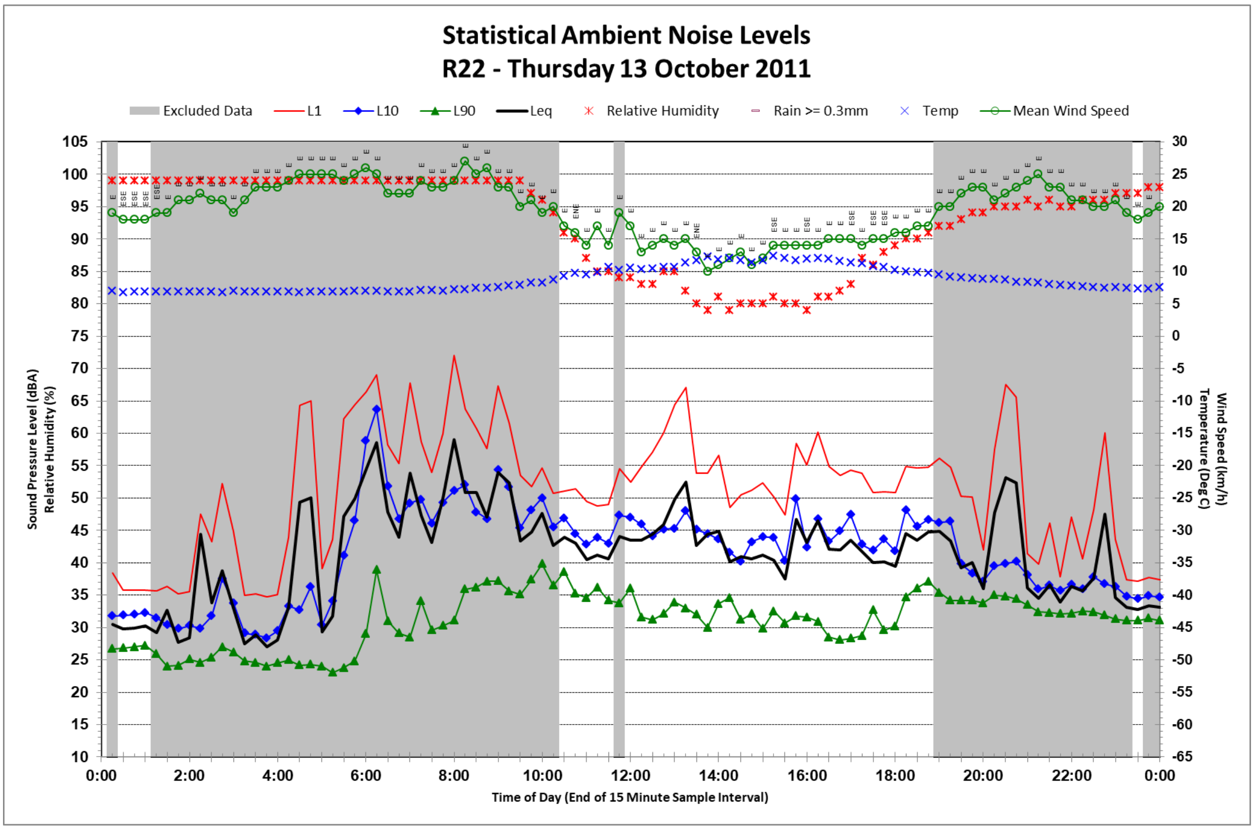

Statistical Ambient Noise Levels
R35 - Monday 24 October 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

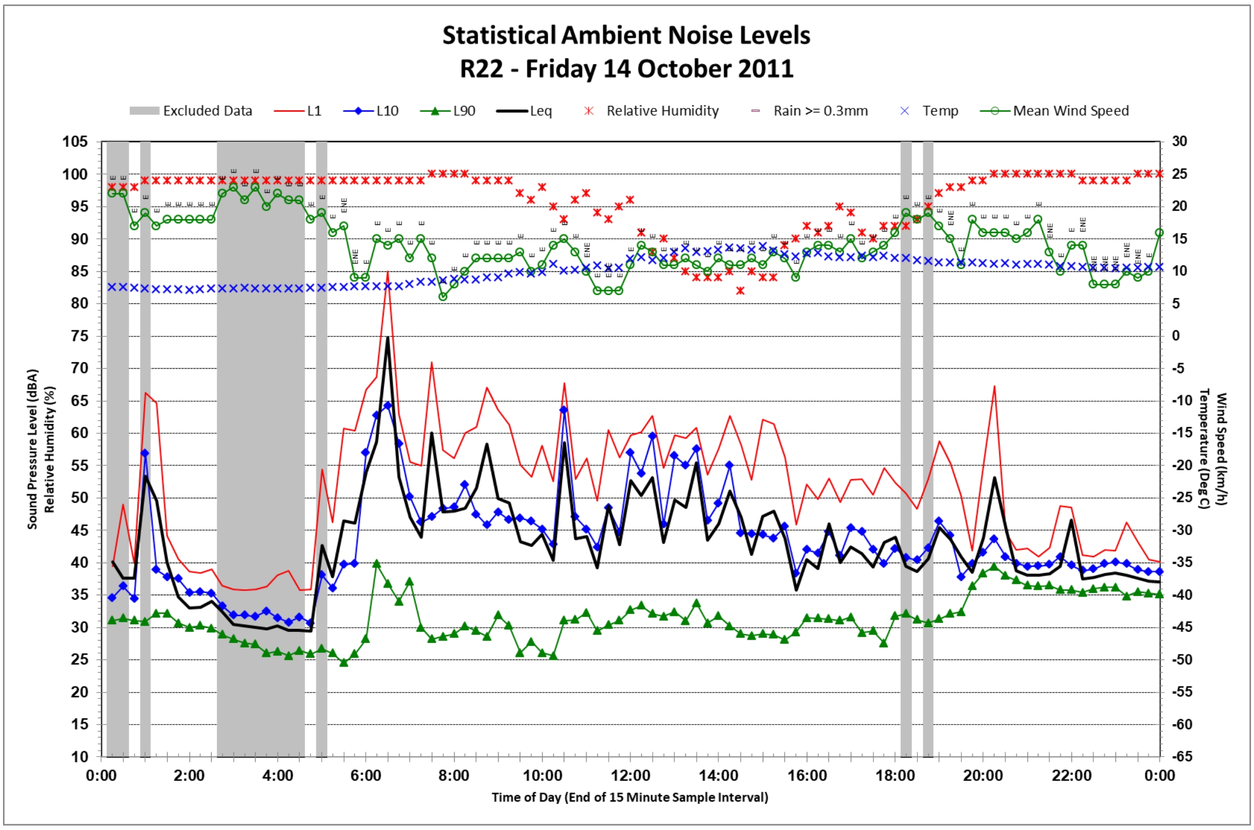

Statistical Ambient Noise Levels
R35 - Tuesday 25 October 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

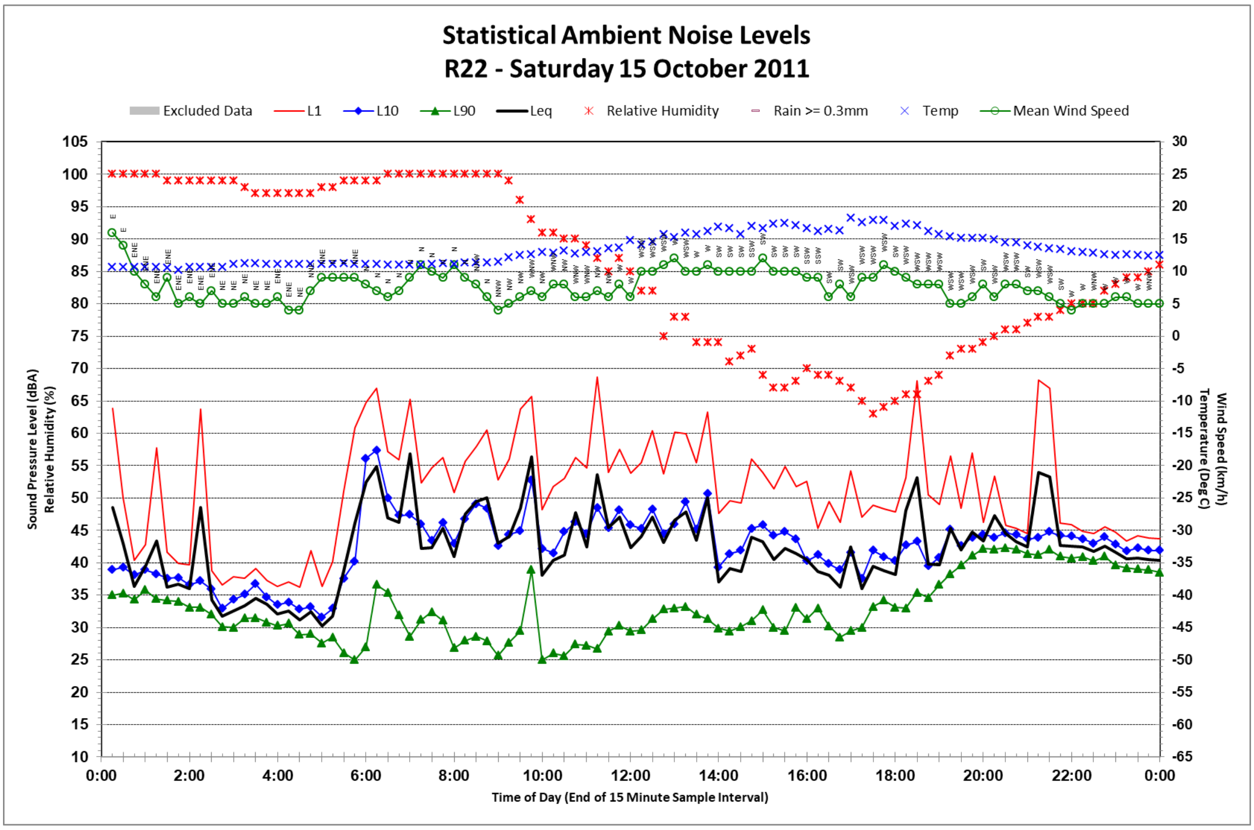

Statistical Ambient Noise Levels
R22 - Monday 10 October 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

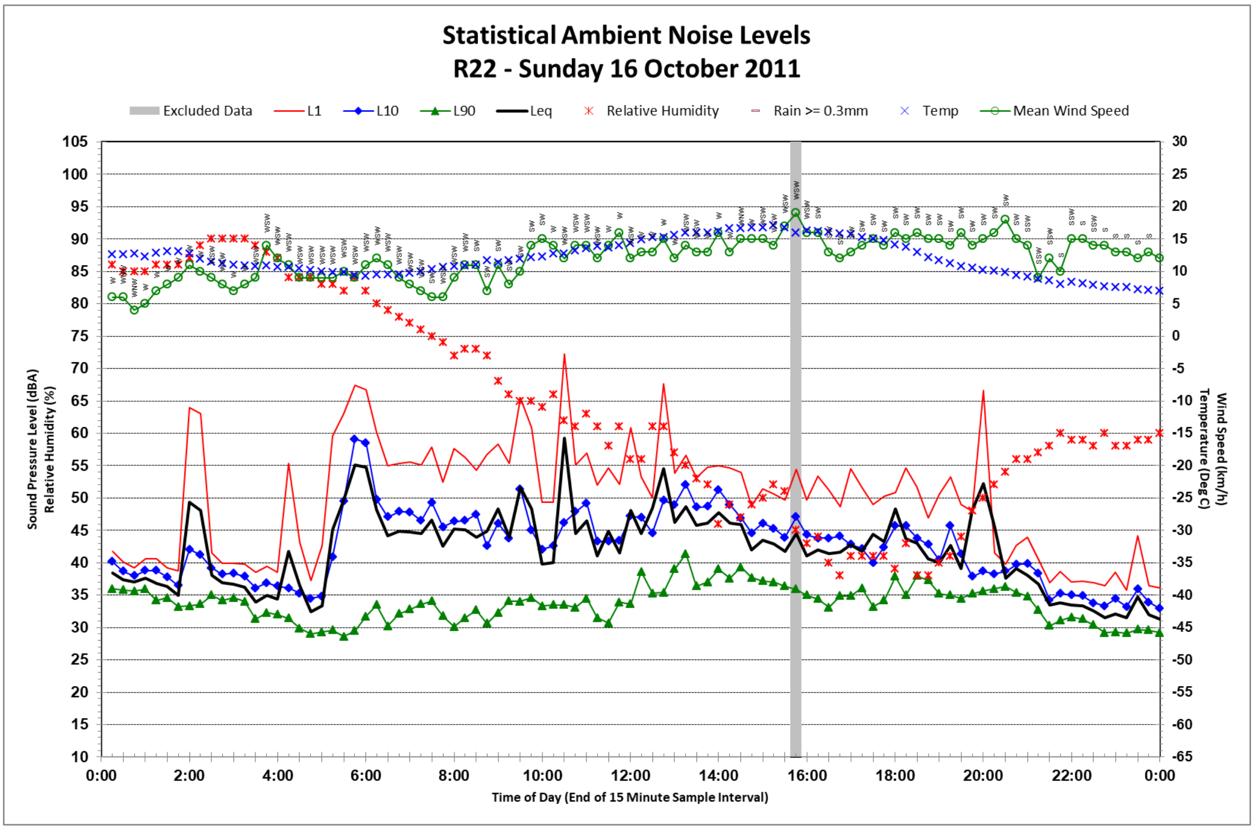

Statistical Ambient Noise Levels
R22 - Tuesday 11 October 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

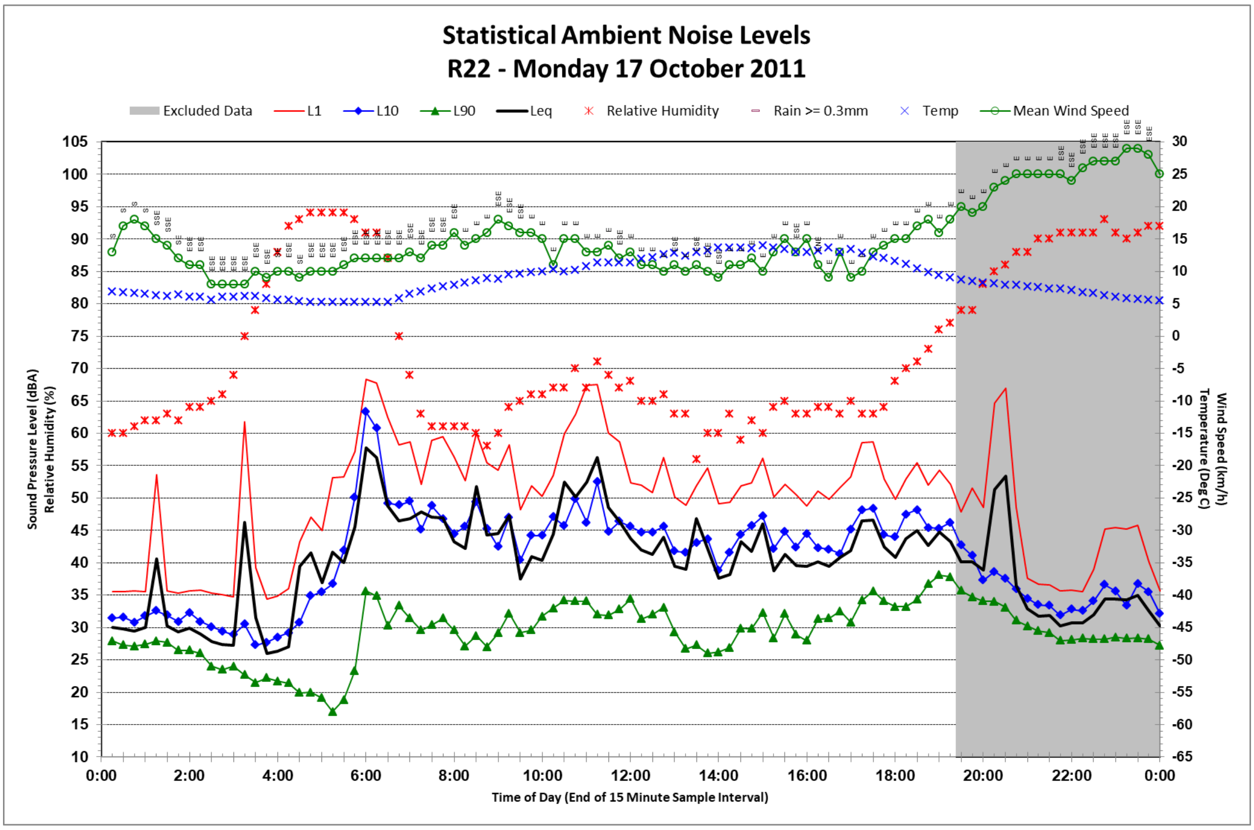

Statistical Ambient Noise Levels
R22 - Wednesday 12 October 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

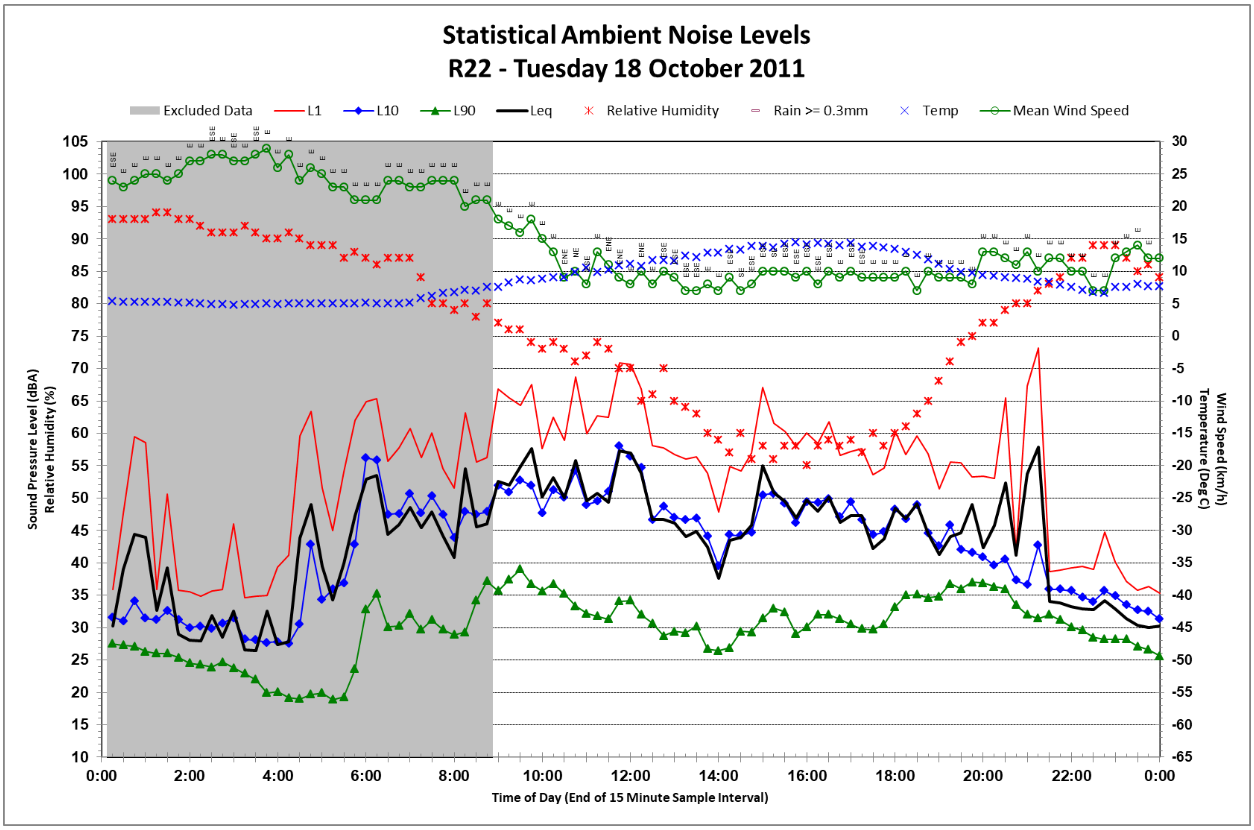

Statistical Ambient Noise Levels
R22 - Thursday 13 October 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

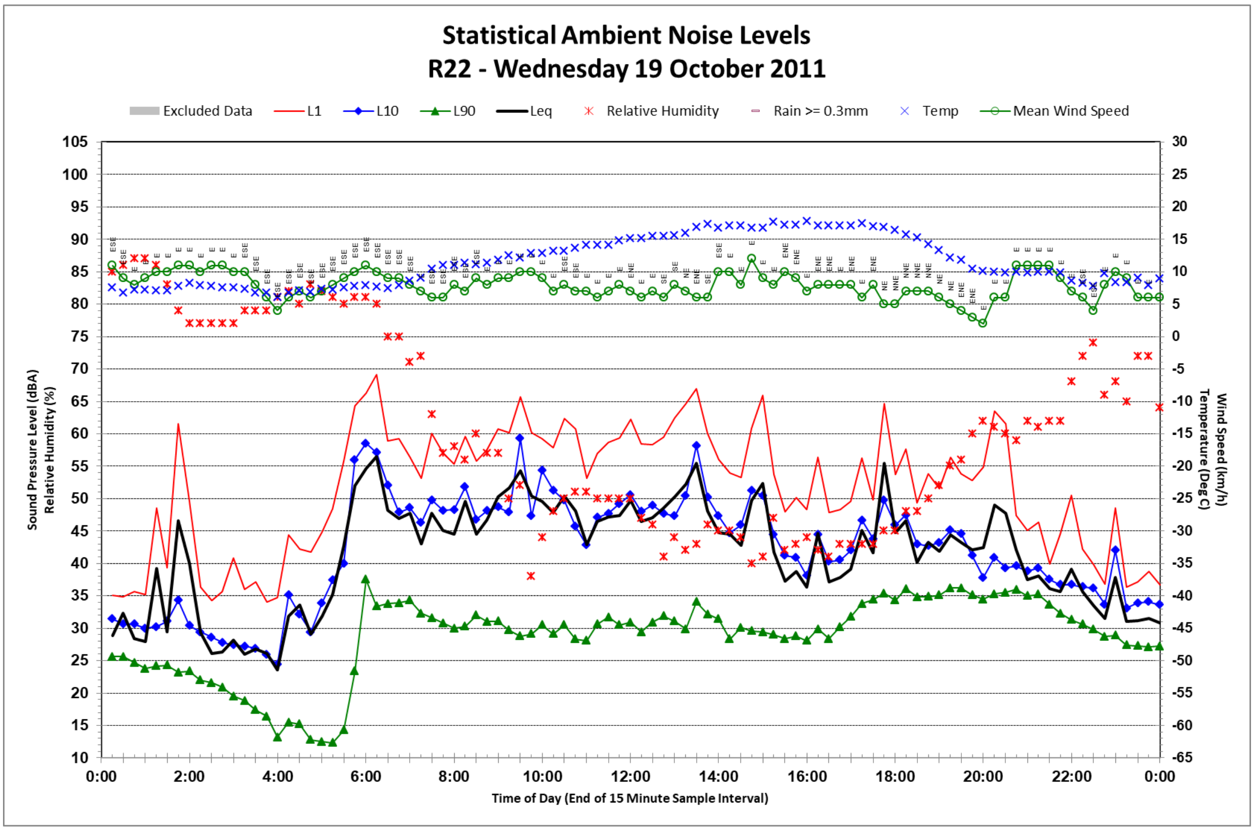

Statistical Ambient Noise Levels
R22 - Friday 14 October 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

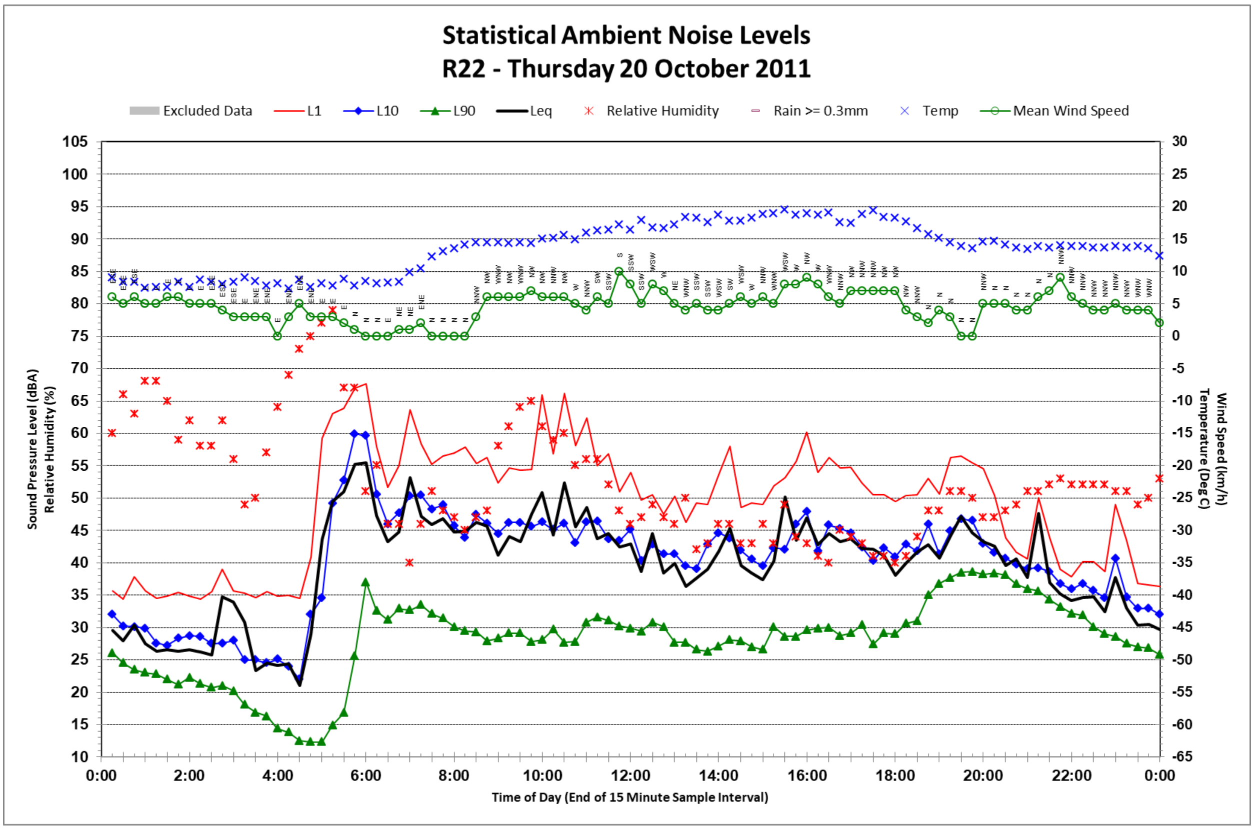

Statistical Ambient Noise Levels
R22 - Saturday 15 October 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

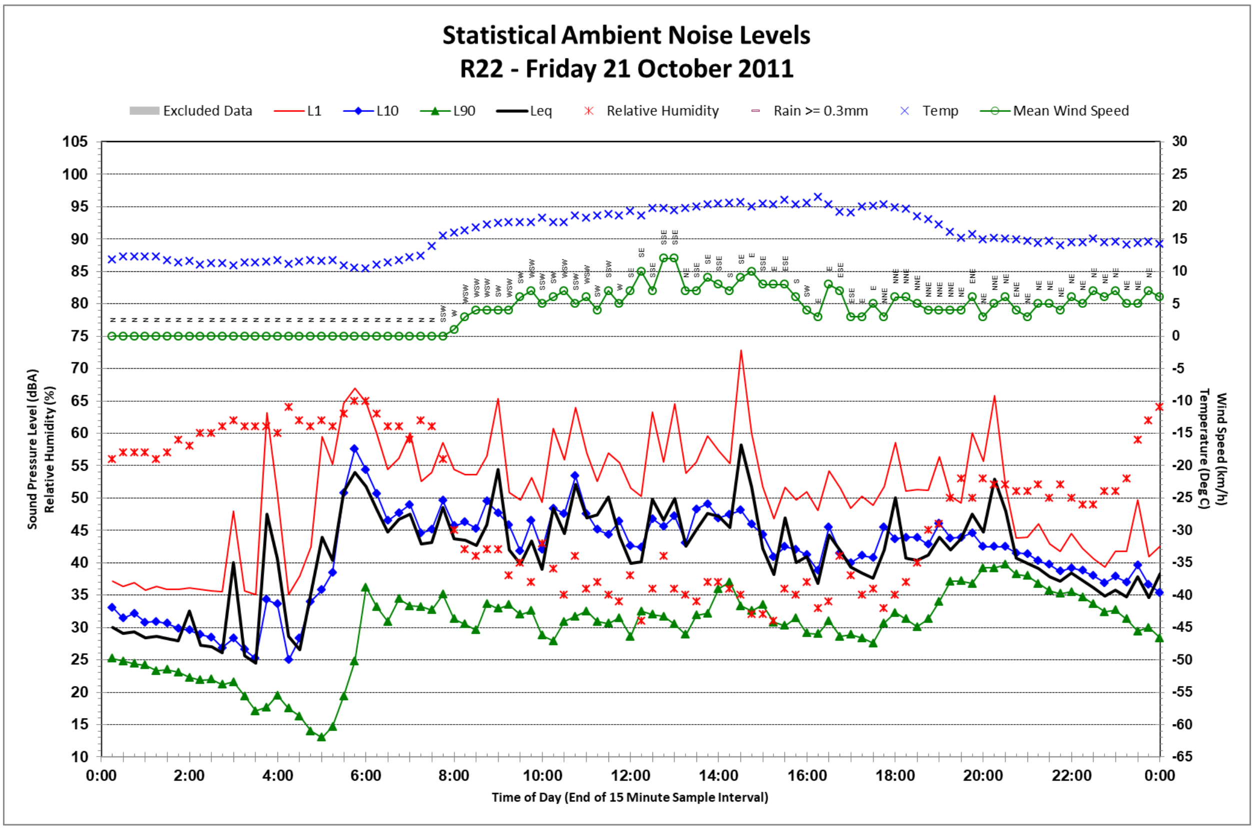

Statistical Ambient Noise Levels
R22 - Sunday 16 October 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

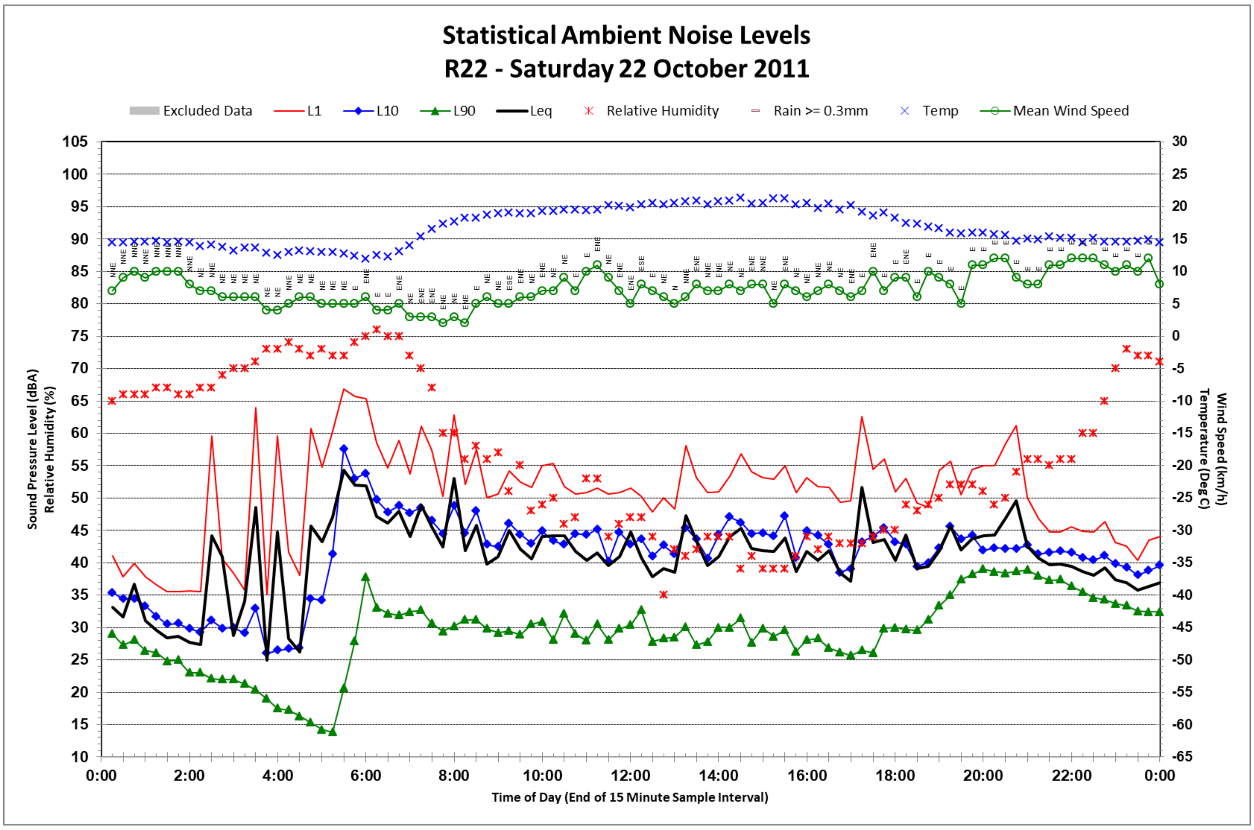

Statistical Ambient Noise Levels
R22 - Monday 17 October 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

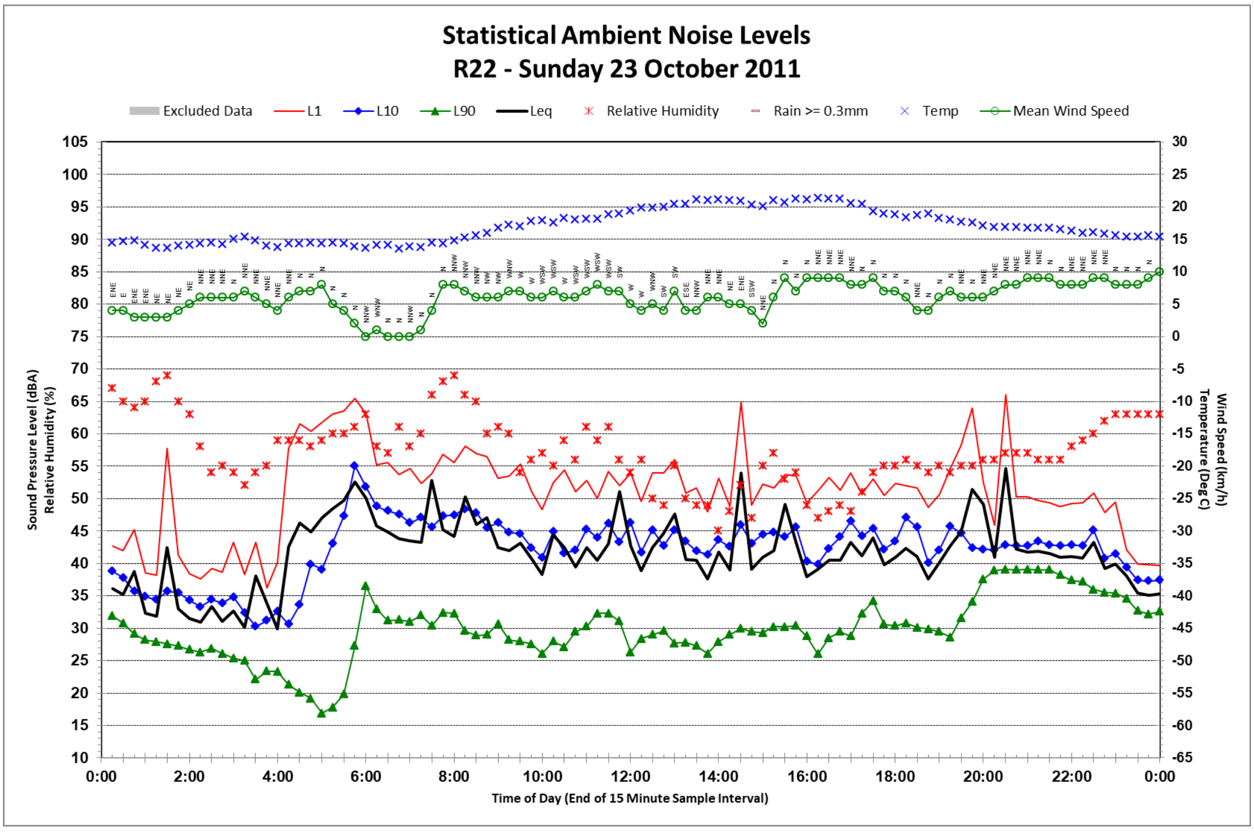

Statistical Ambient Noise Levels
R22 - Tuesday 18 October 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

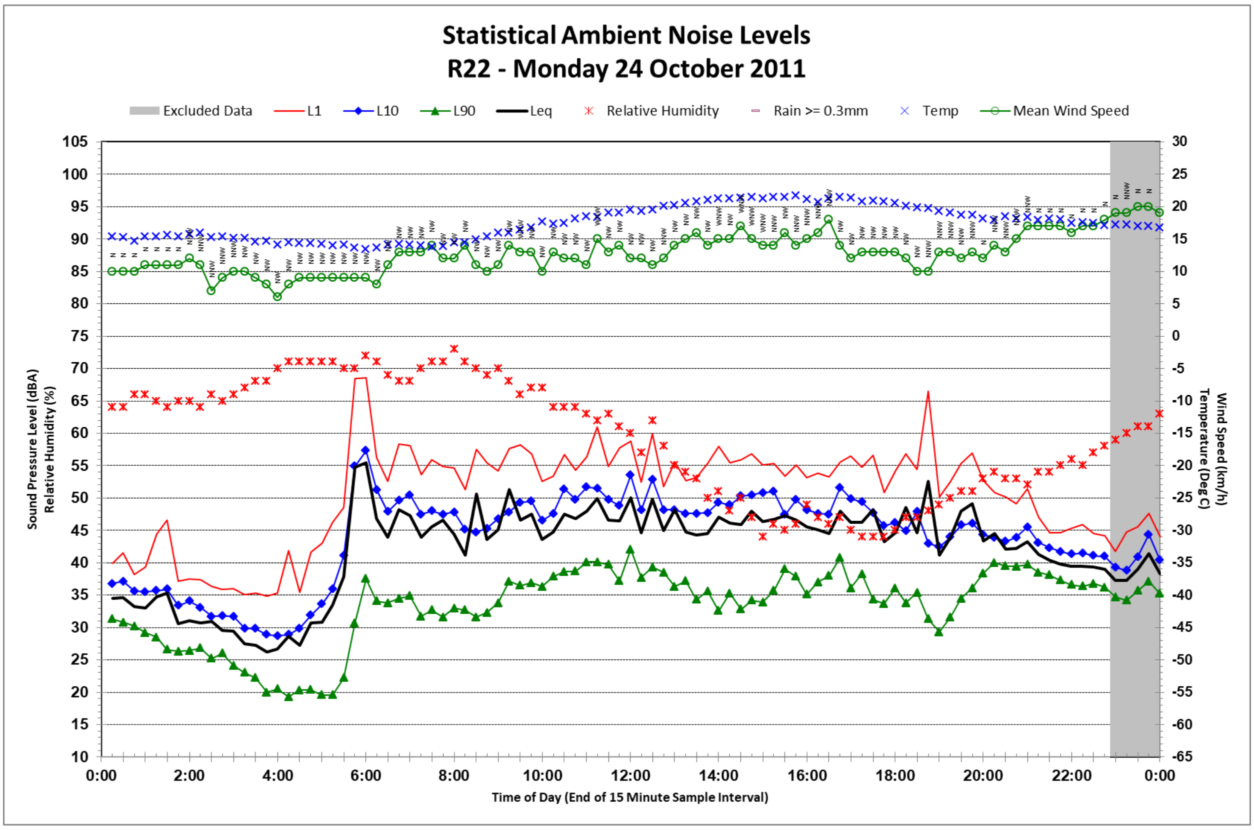

Statistical Ambient Noise Levels
R22 - Wednesday 19 October 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

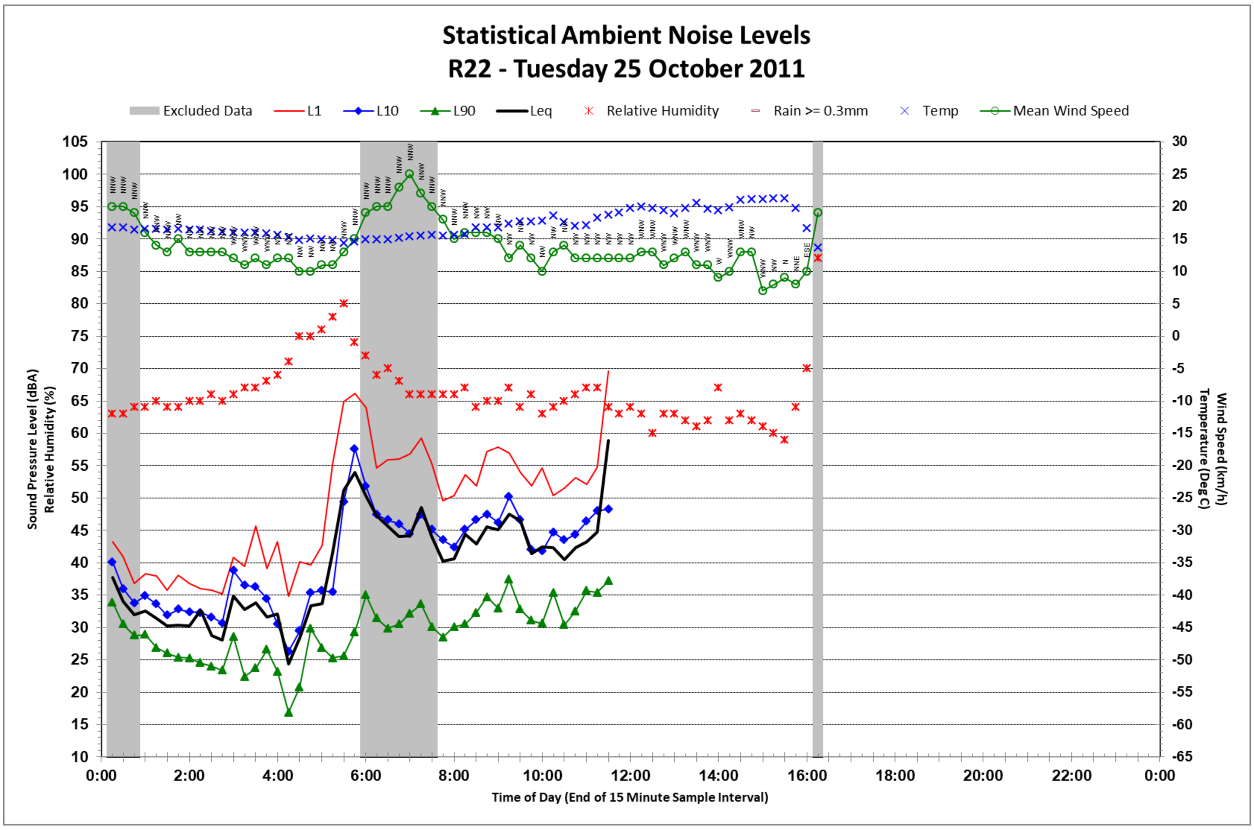

Statistical Ambient Noise Levels
R22 - Thursday 20 October 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

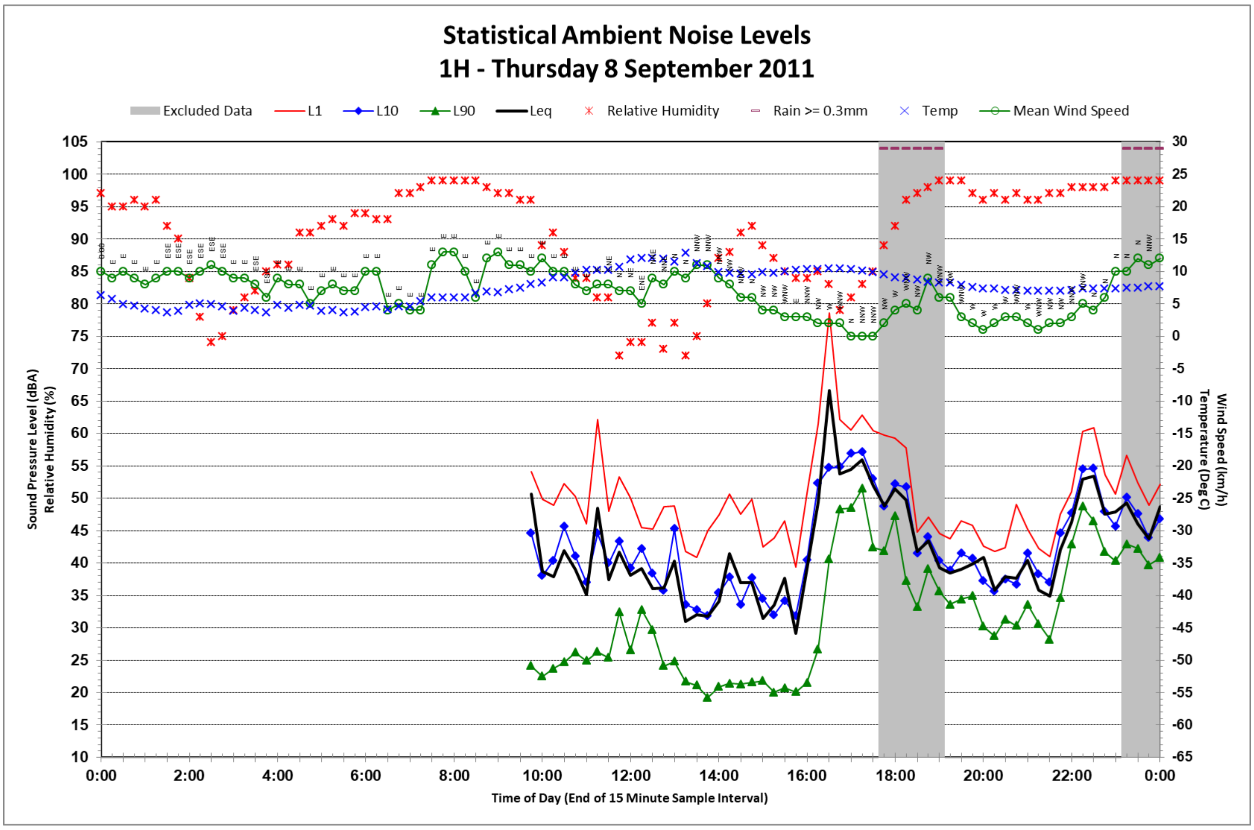

Statistical Ambient Noise Levels
R22 - Friday 21 October 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

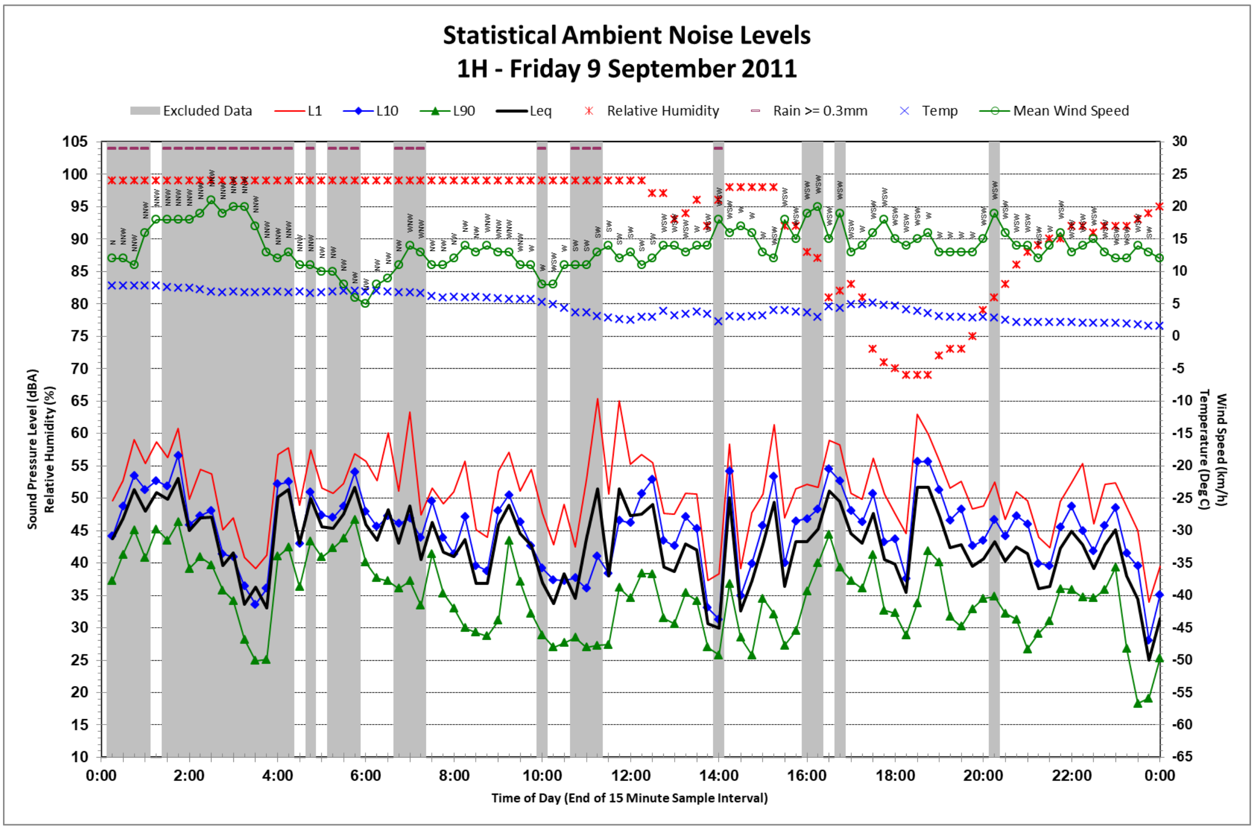

Statistical Ambient Noise Levels
R22 - Saturday 22 October 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

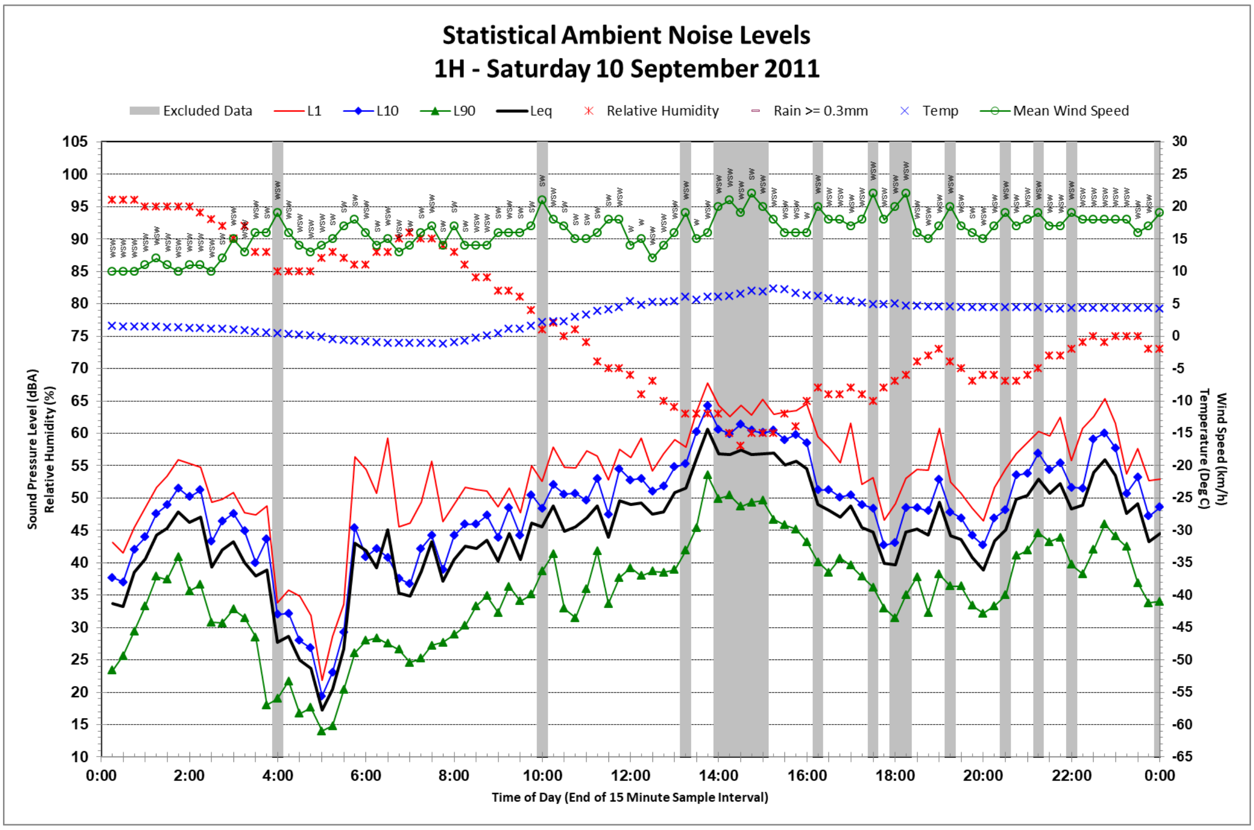

Statistical Ambient Noise Levels
R22 - Sunday 23 October 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

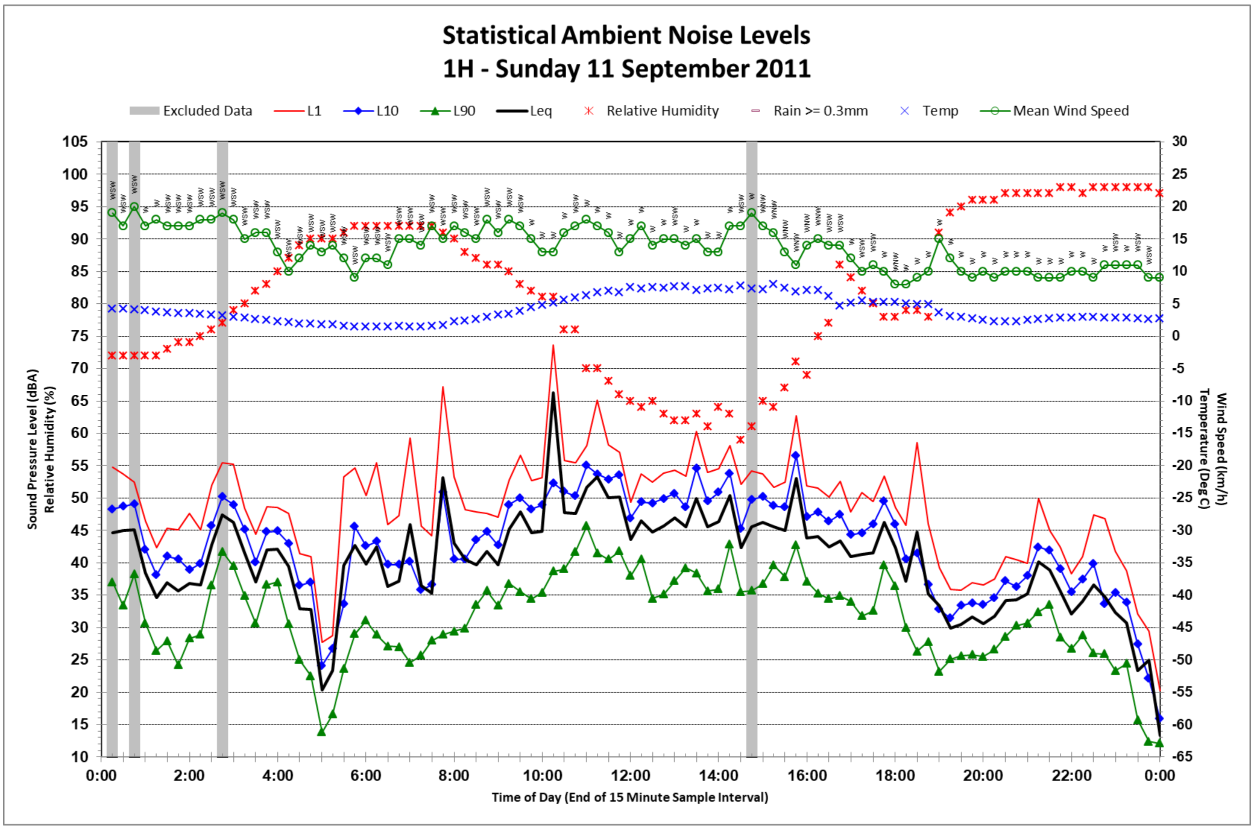

Statistical Ambient Noise Levels
R22 - Monday 24 October 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

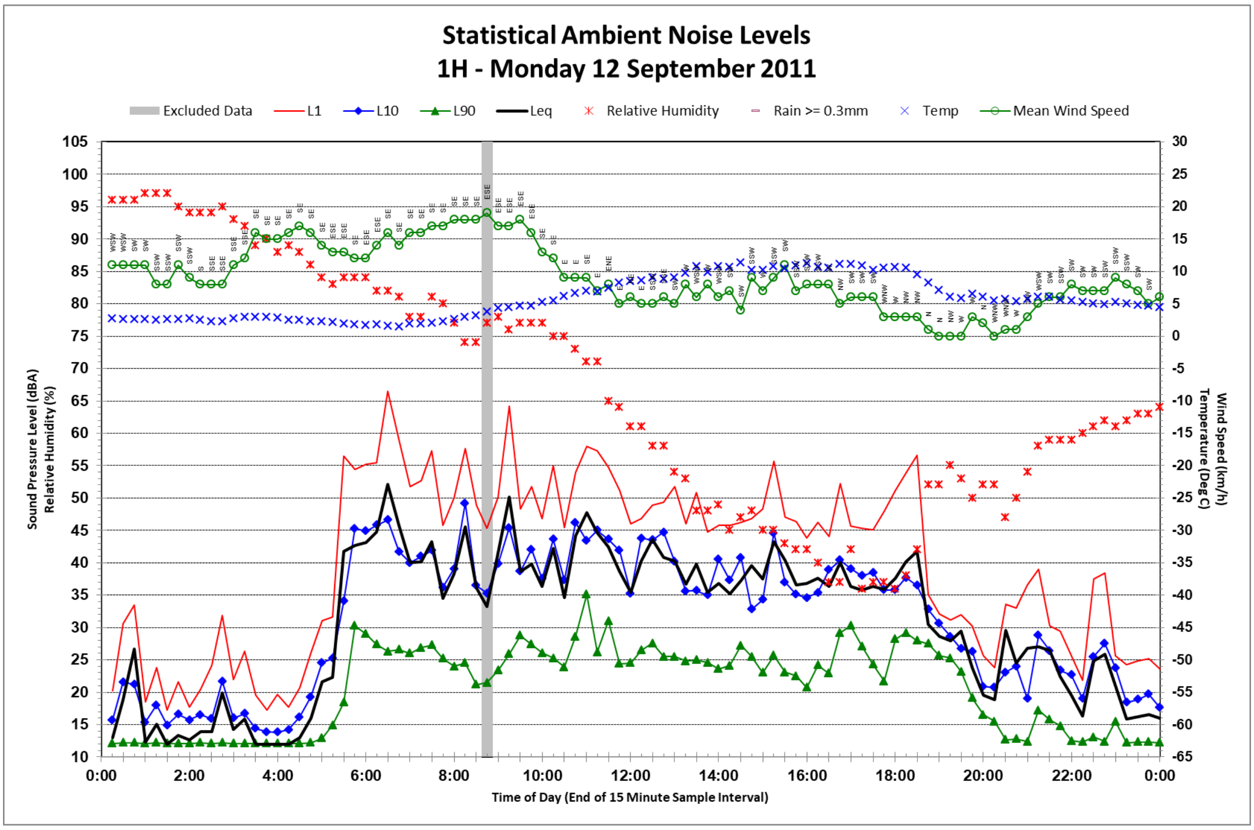

Statistical Ambient Noise Levels
R22 - Tuesday 25 October 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

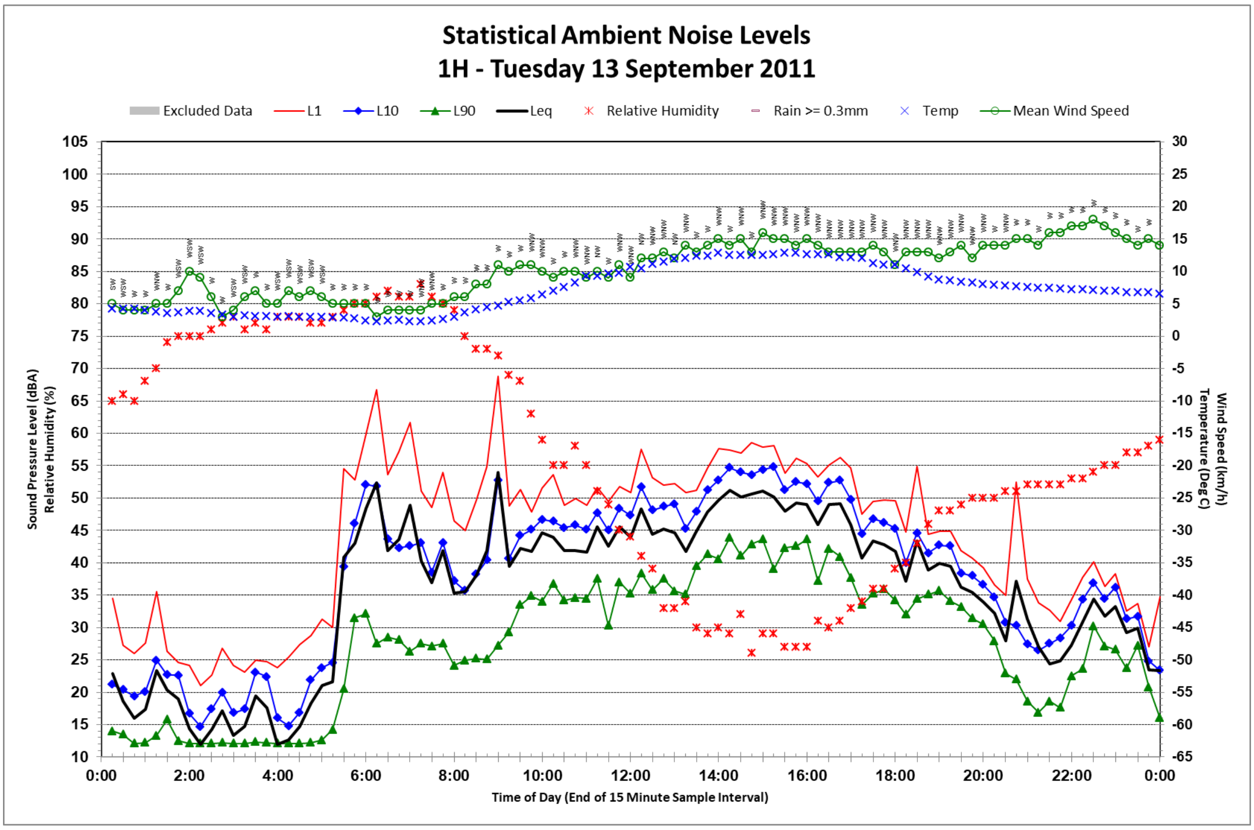

Statistical Ambient Noise Levels
1H - Thursday 8 September 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

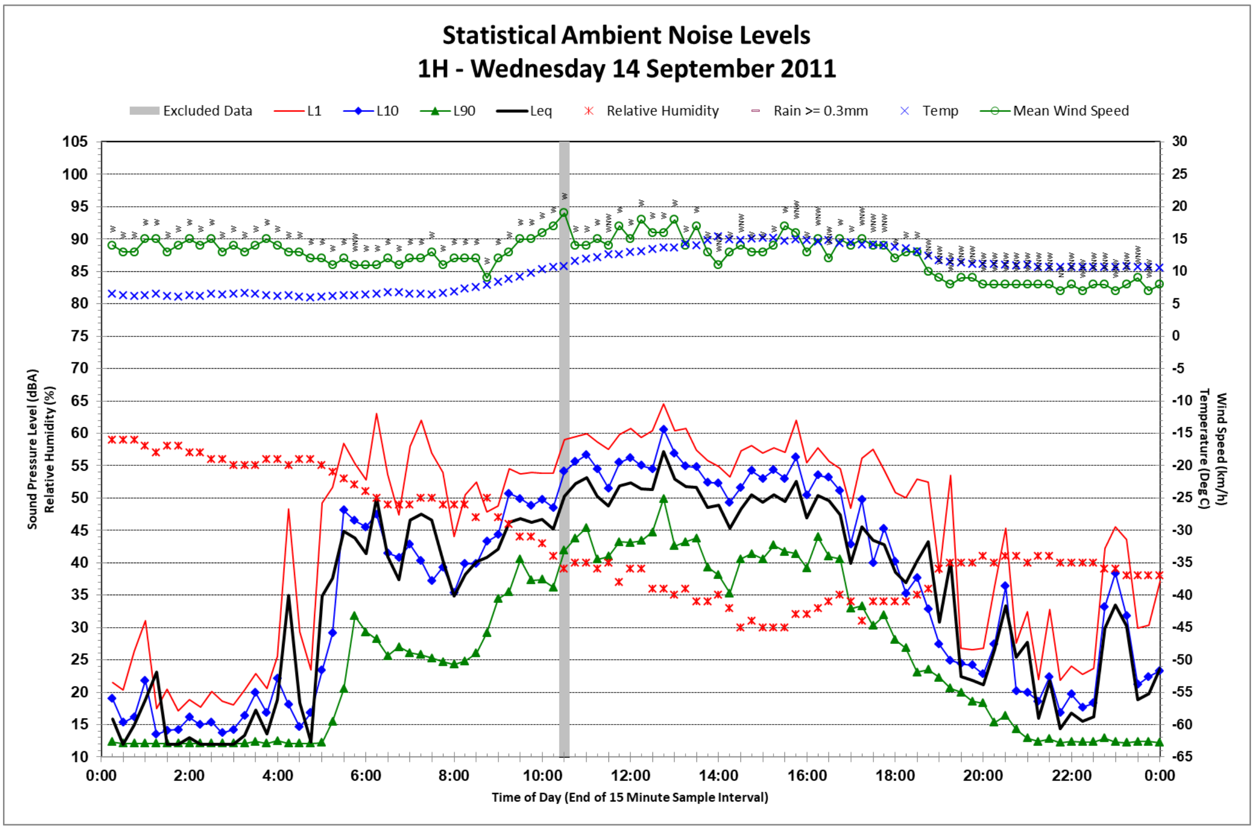

Statistical Ambient Noise Levels
1H - Friday 9 September 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

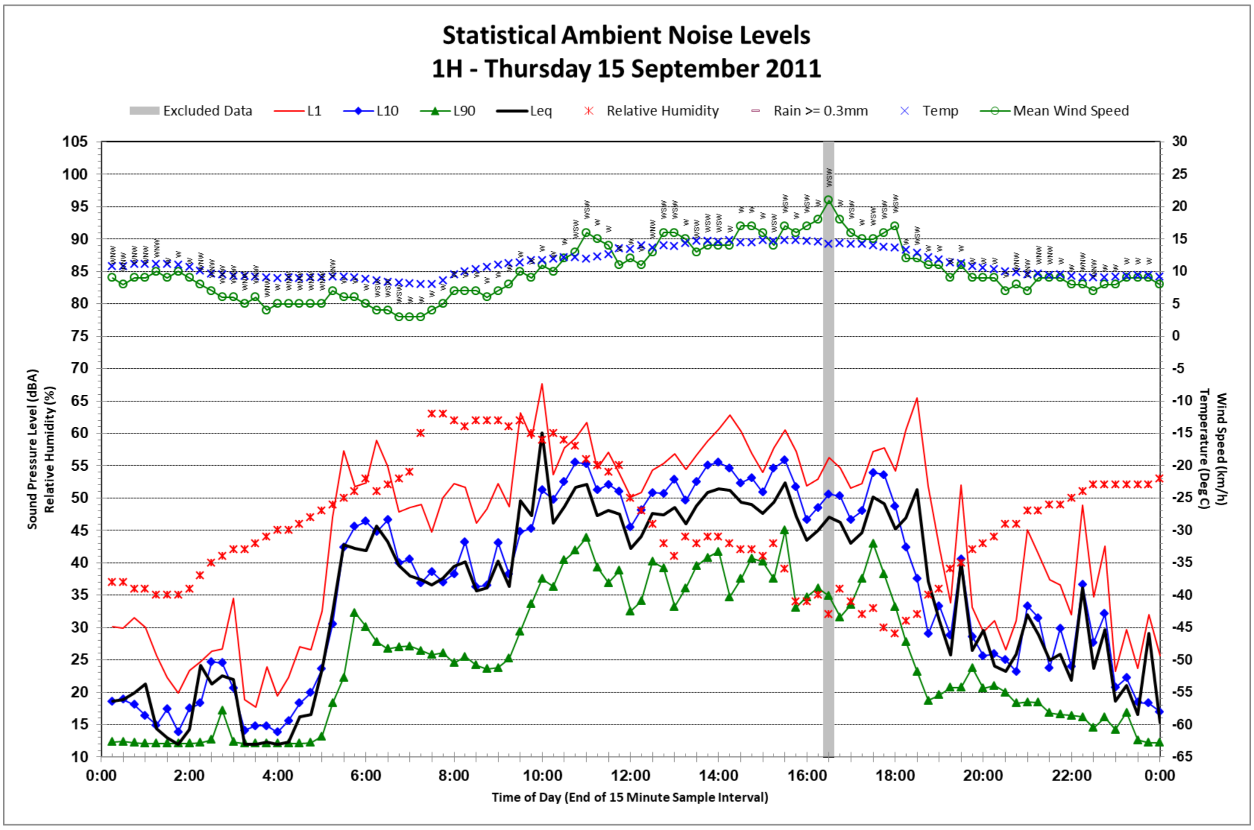

Statistical Ambient Noise Levels
1H - Saturday 10 September 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

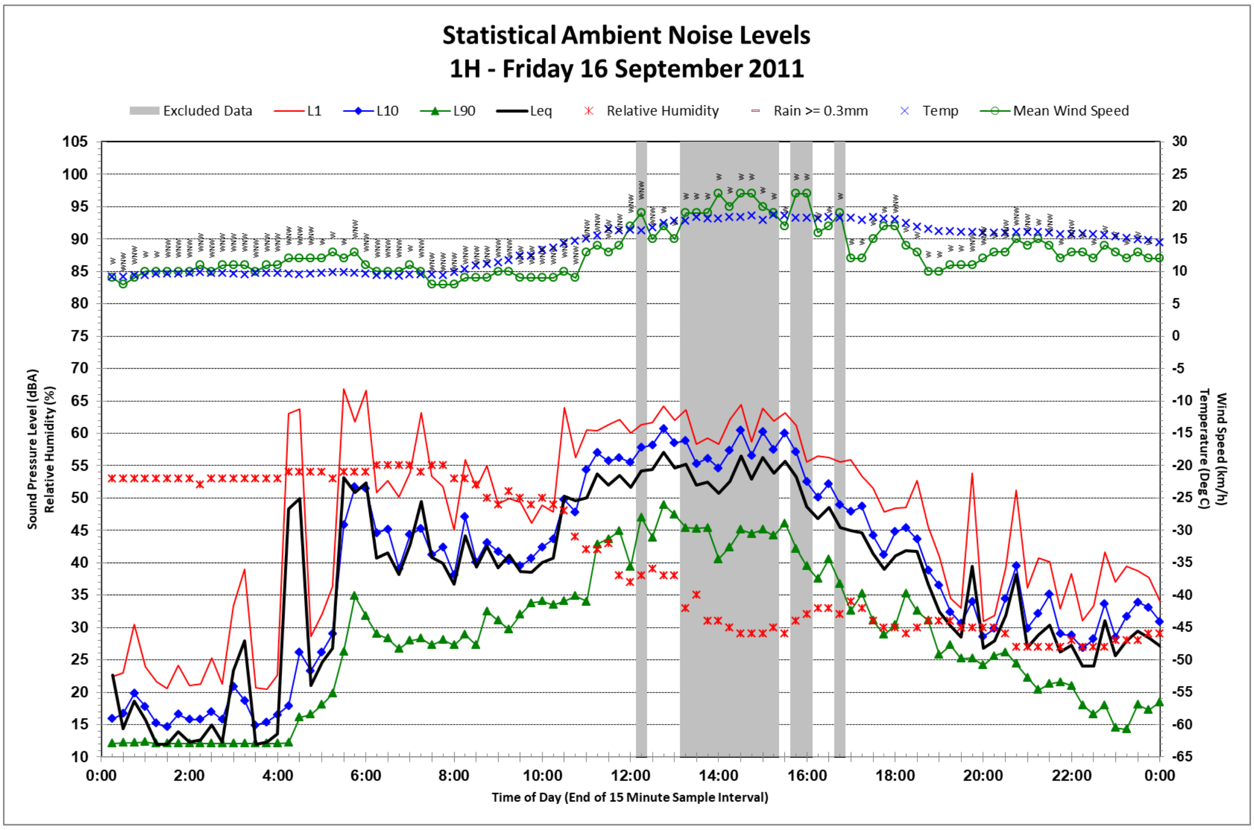

Statistical Ambient Noise Levels
1H - Sunday 11 September 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

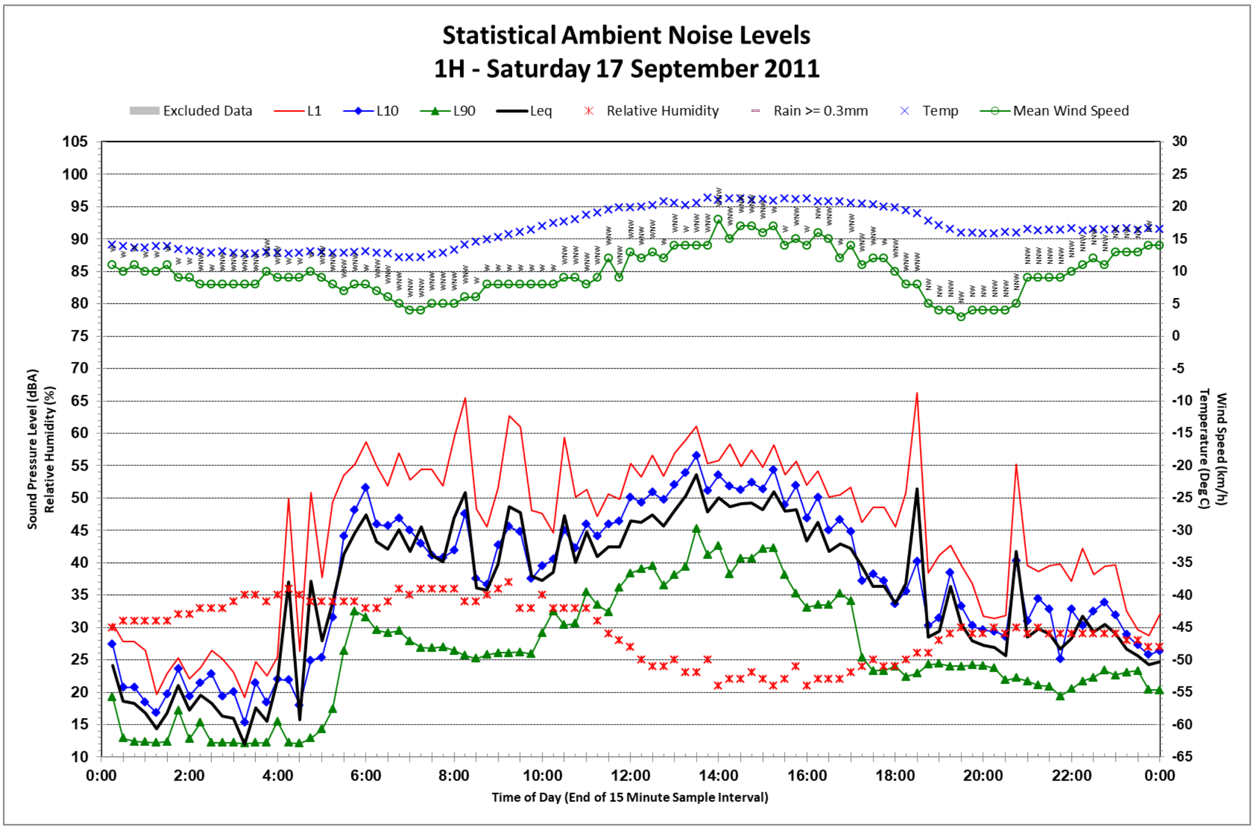

Statistical Ambient Noise Levels
1H - Monday 12 September 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

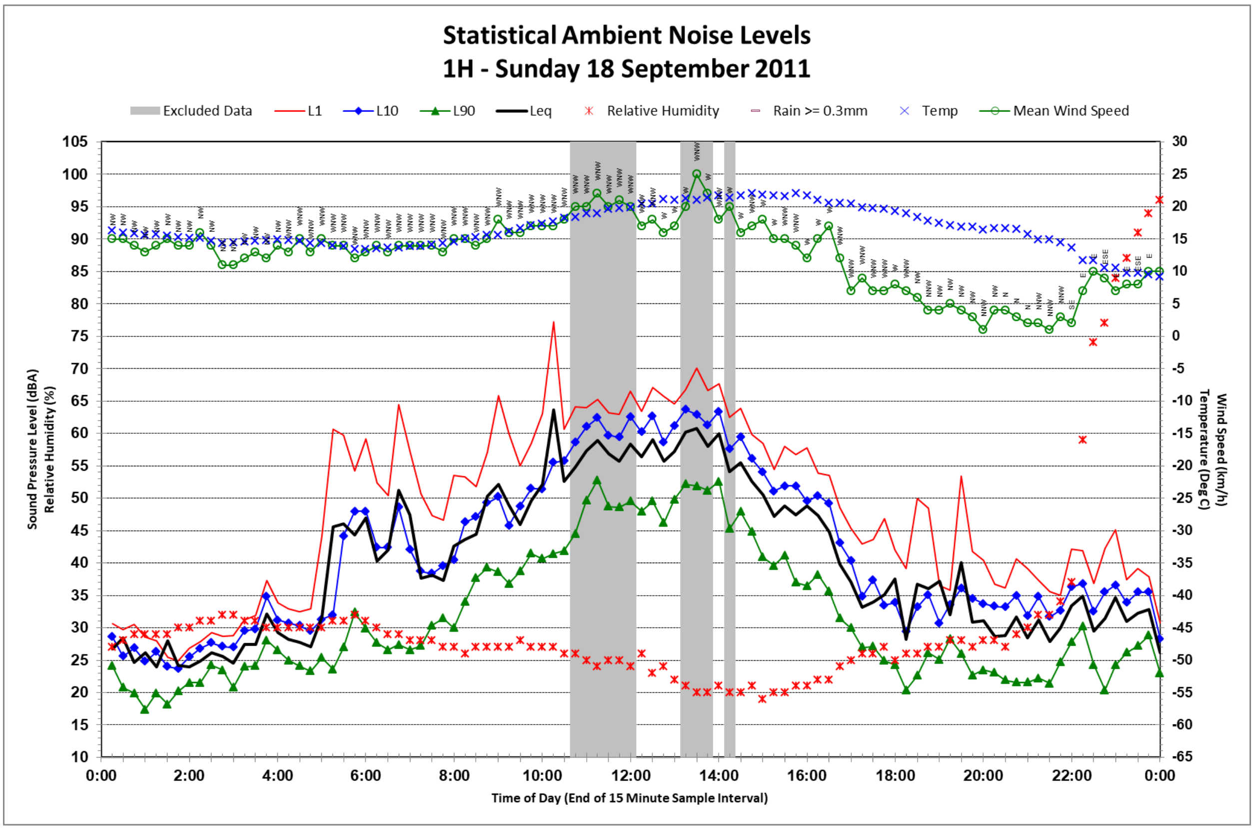

Statistical Ambient Noise Levels
1H - Tuesday 13 September 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

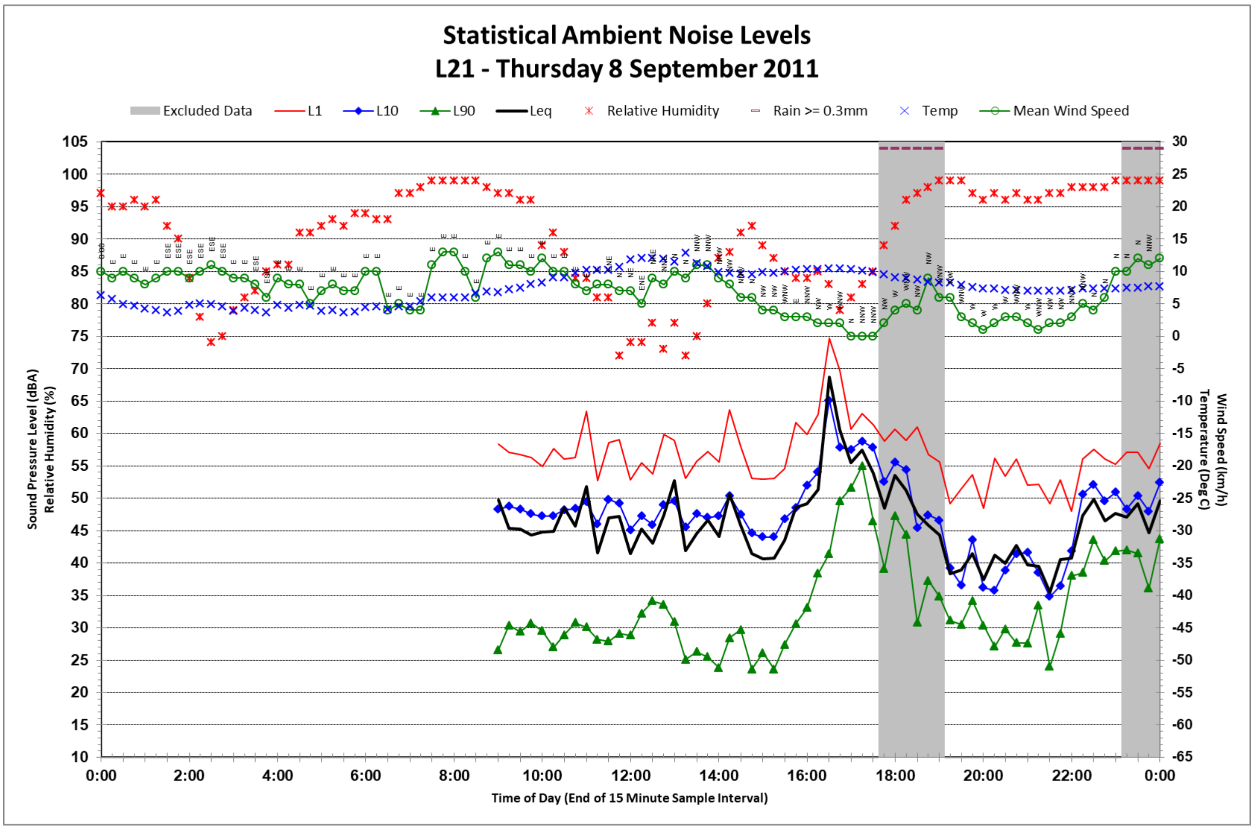

Statistical Ambient Noise Levels
1H - Wednesday 14 September 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

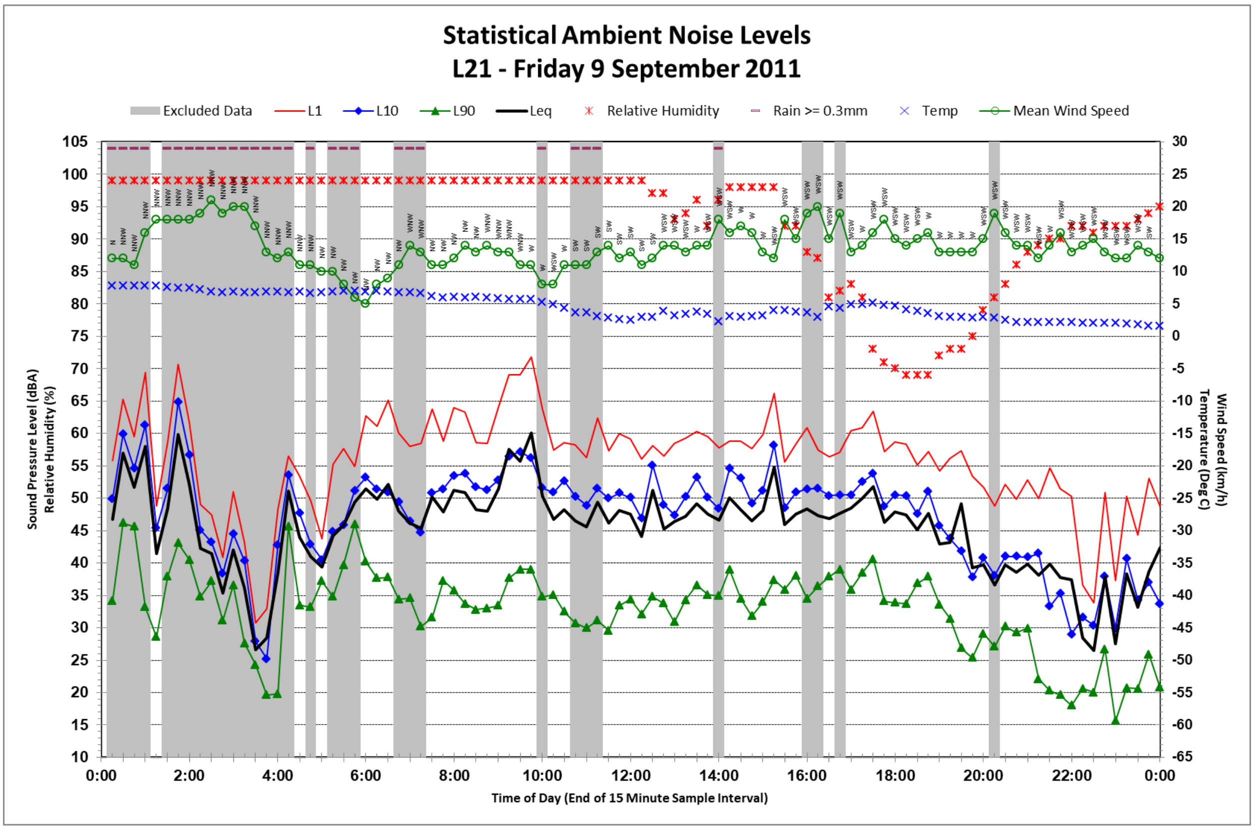

Statistical Ambient Noise Levels
1H - Thursday 15 September 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

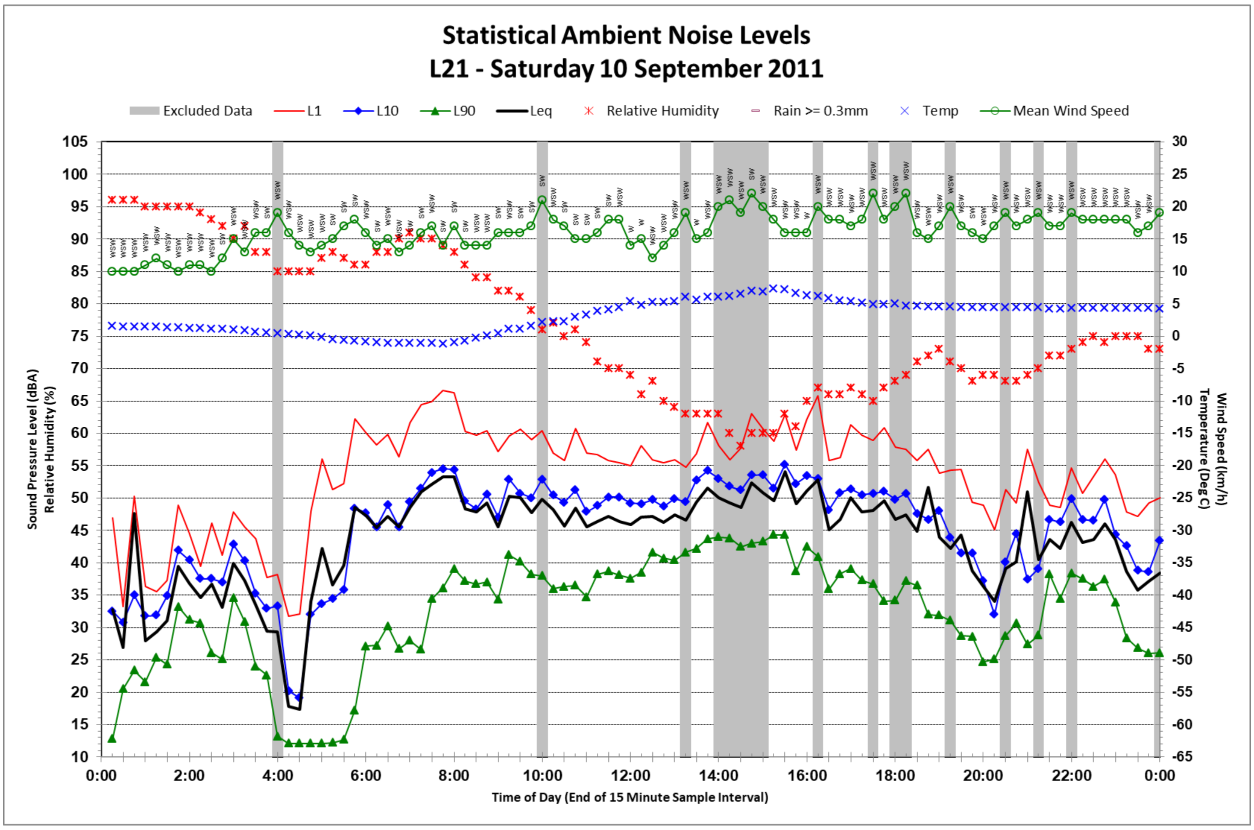

Statistical Ambient Noise Levels
1H - Friday 16 September 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

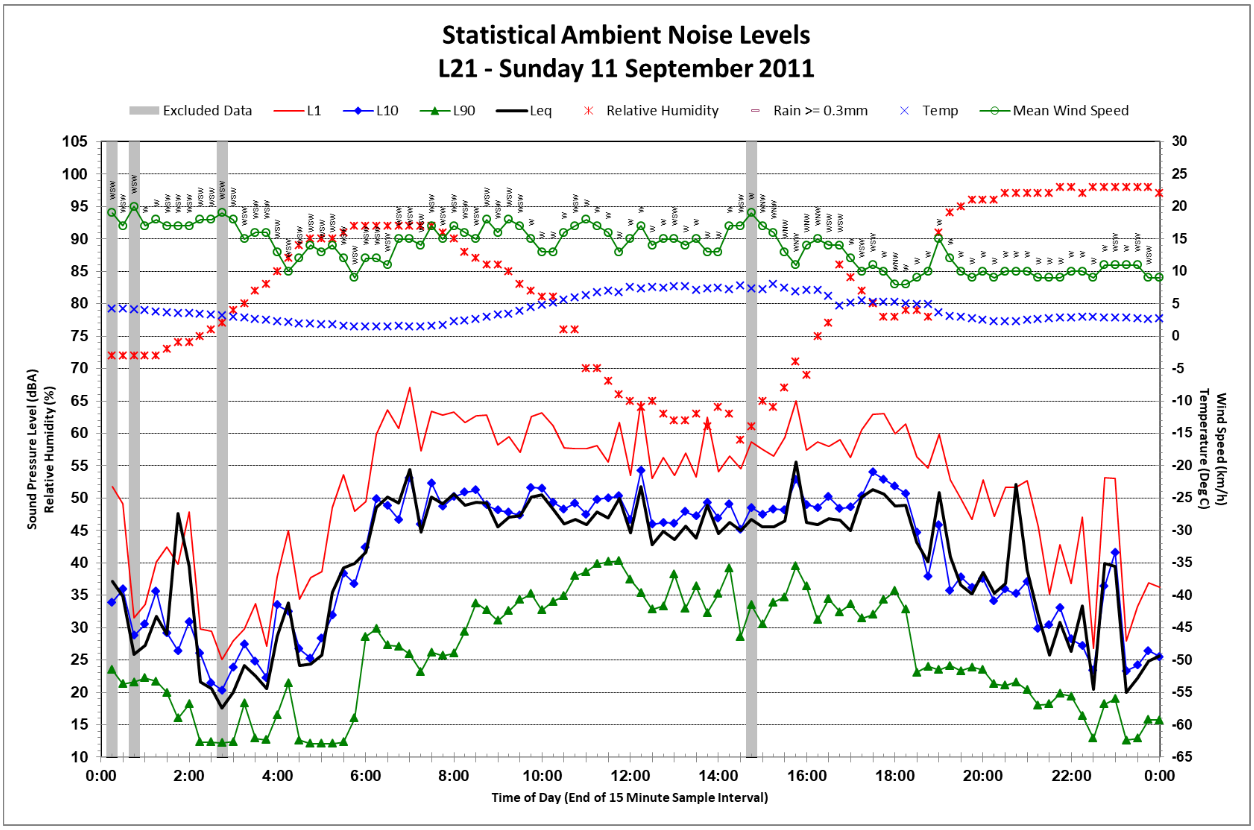

Statistical Ambient Noise Levels
1H - Saturday 17 September 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

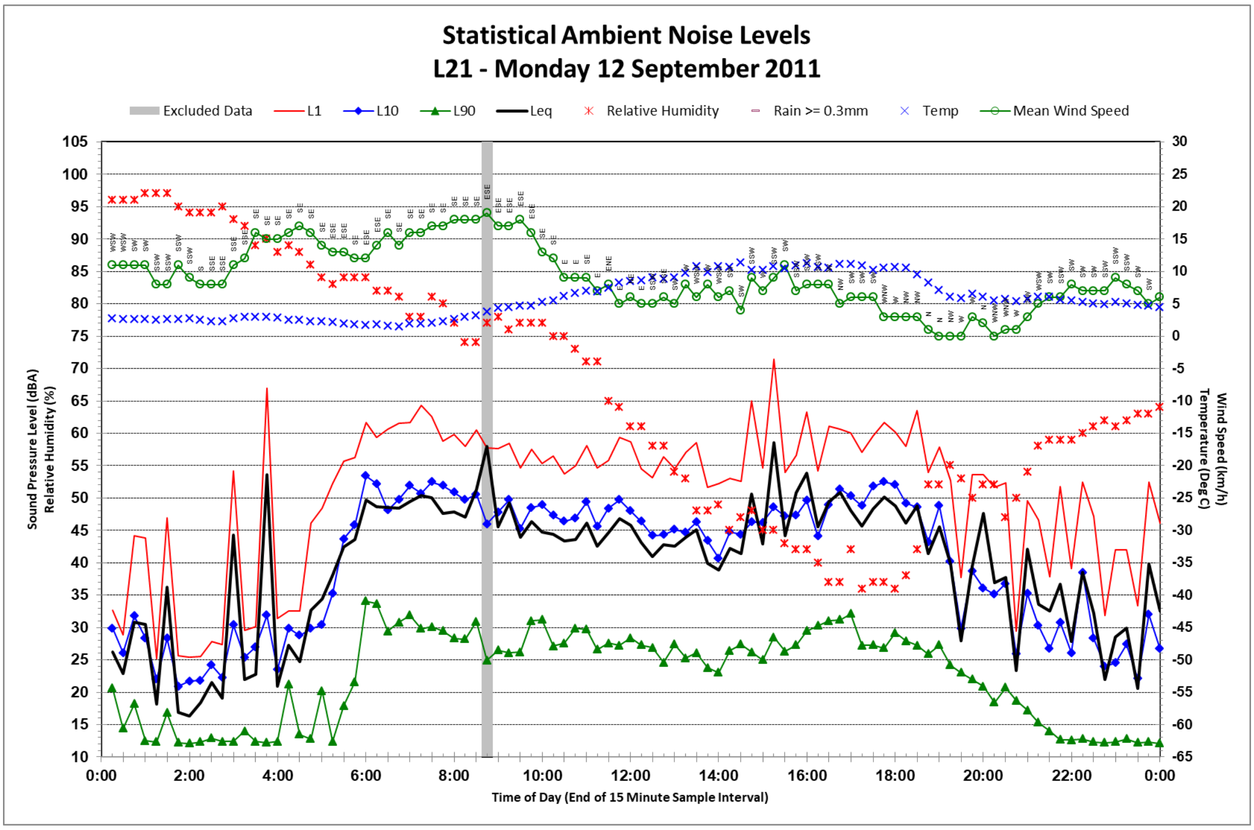

Statistical Ambient Noise Levels
1H - Sunday 18 September 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

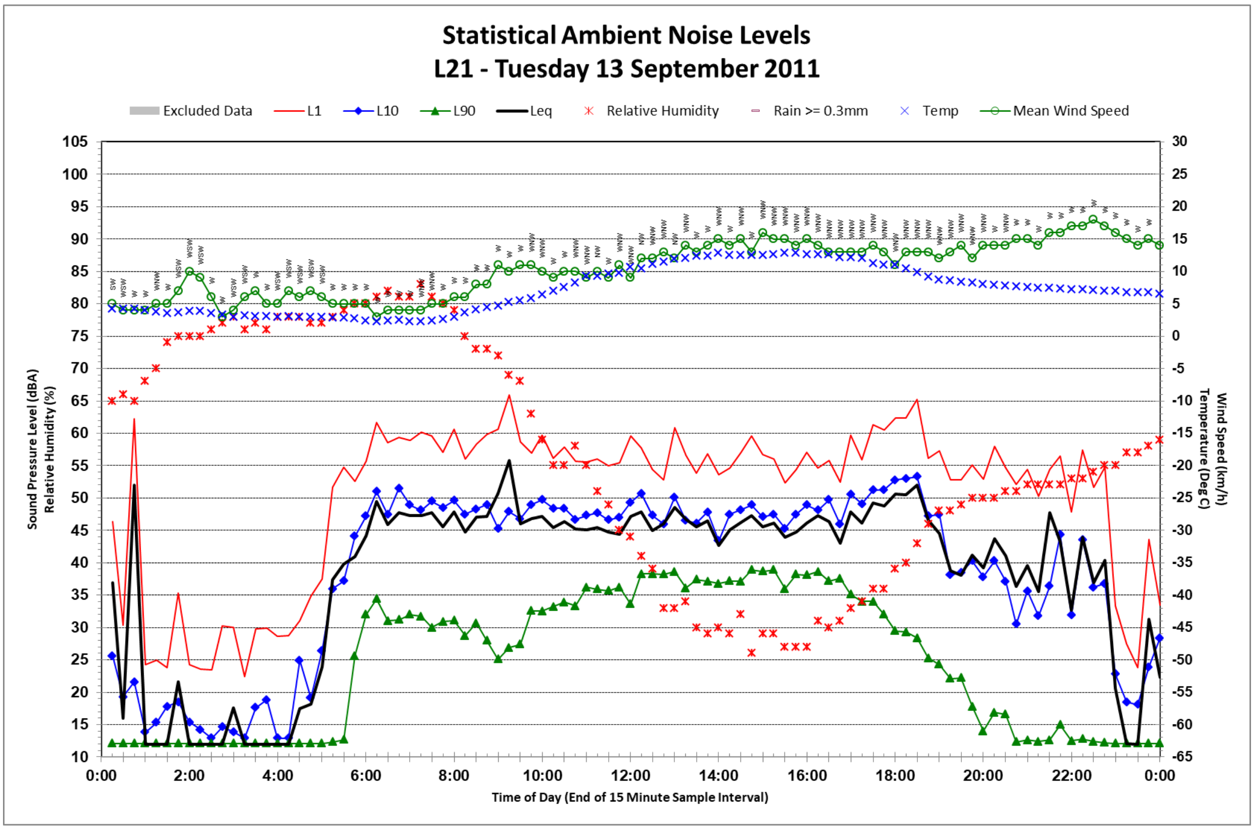

Statistical Ambient Noise Levels
L21 - Thursday 8 September 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

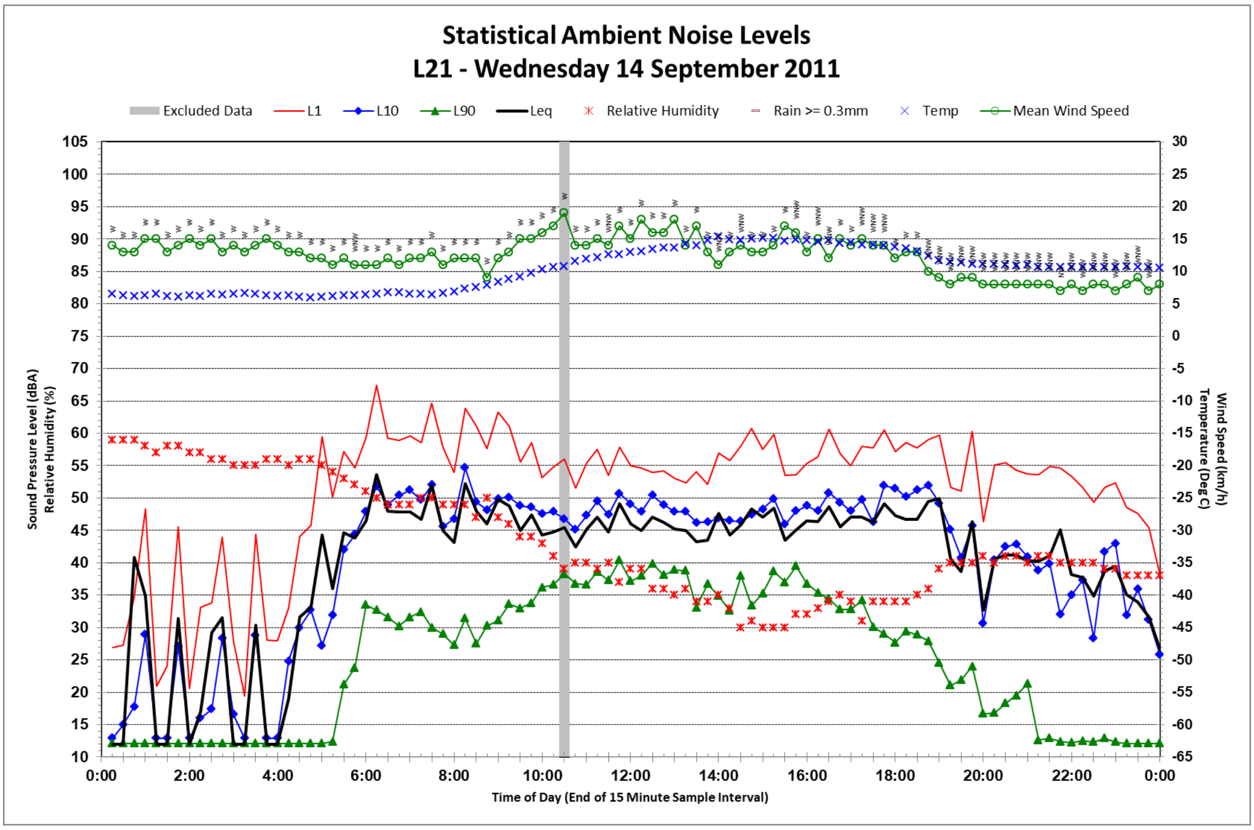

Statistical Ambient Noise Levels
L21 - Friday 9 September 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

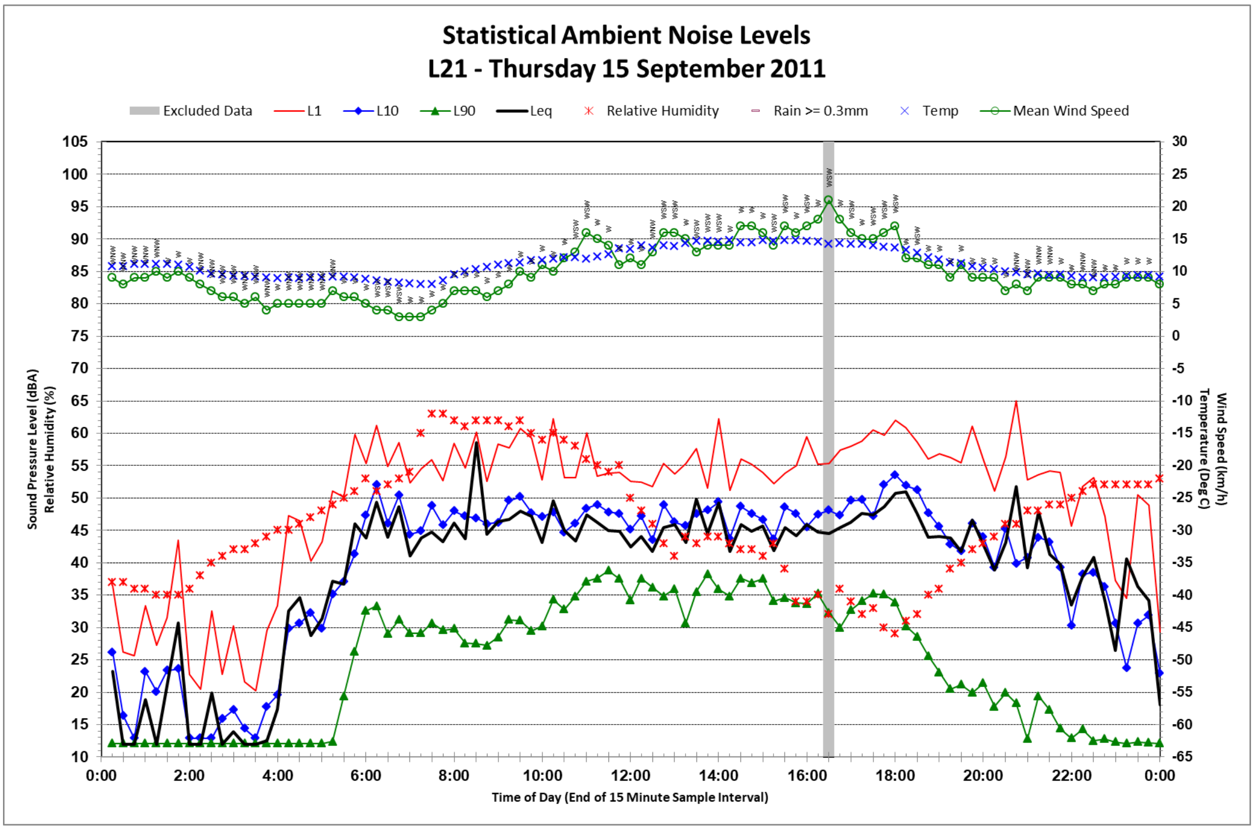

Statistical Ambient Noise Levels
L21 - Saturday 10 September 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

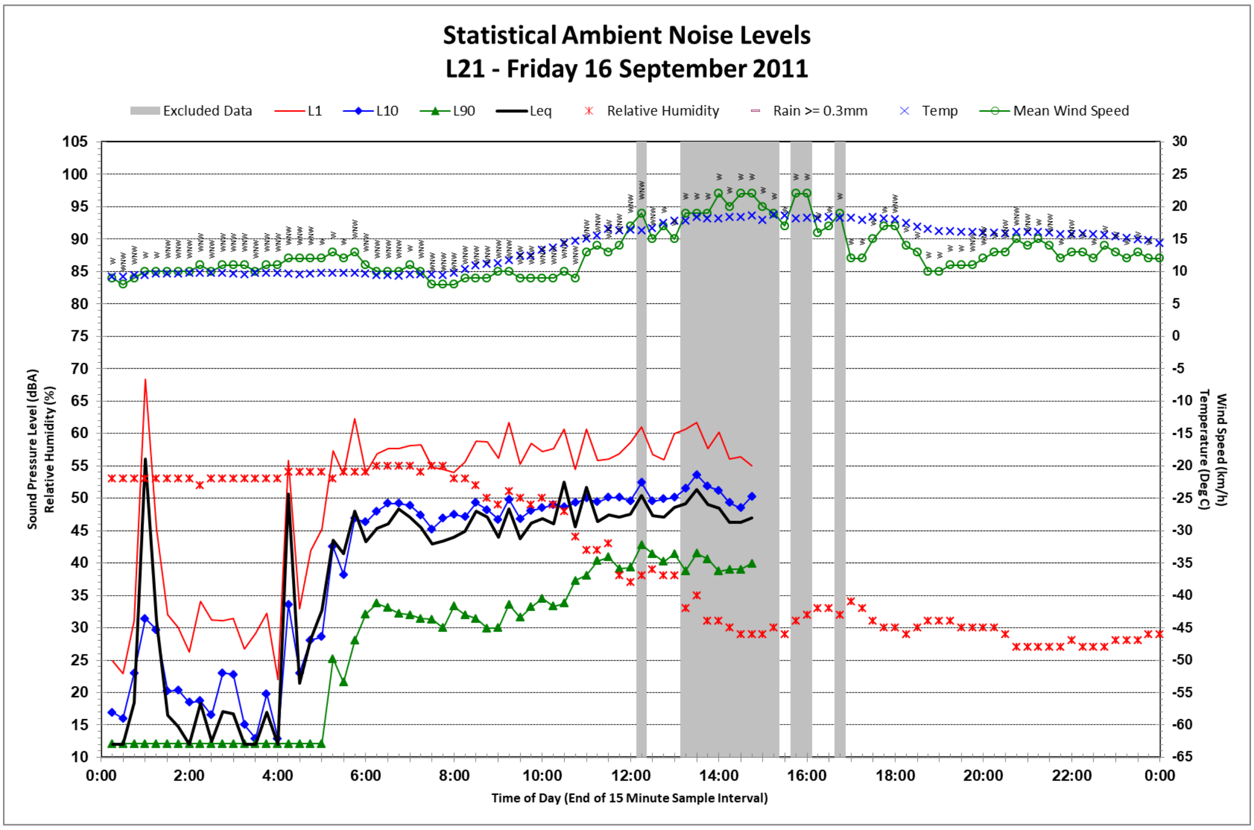

Statistical Ambient Noise Levels
L21 - Sunday 11 September 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

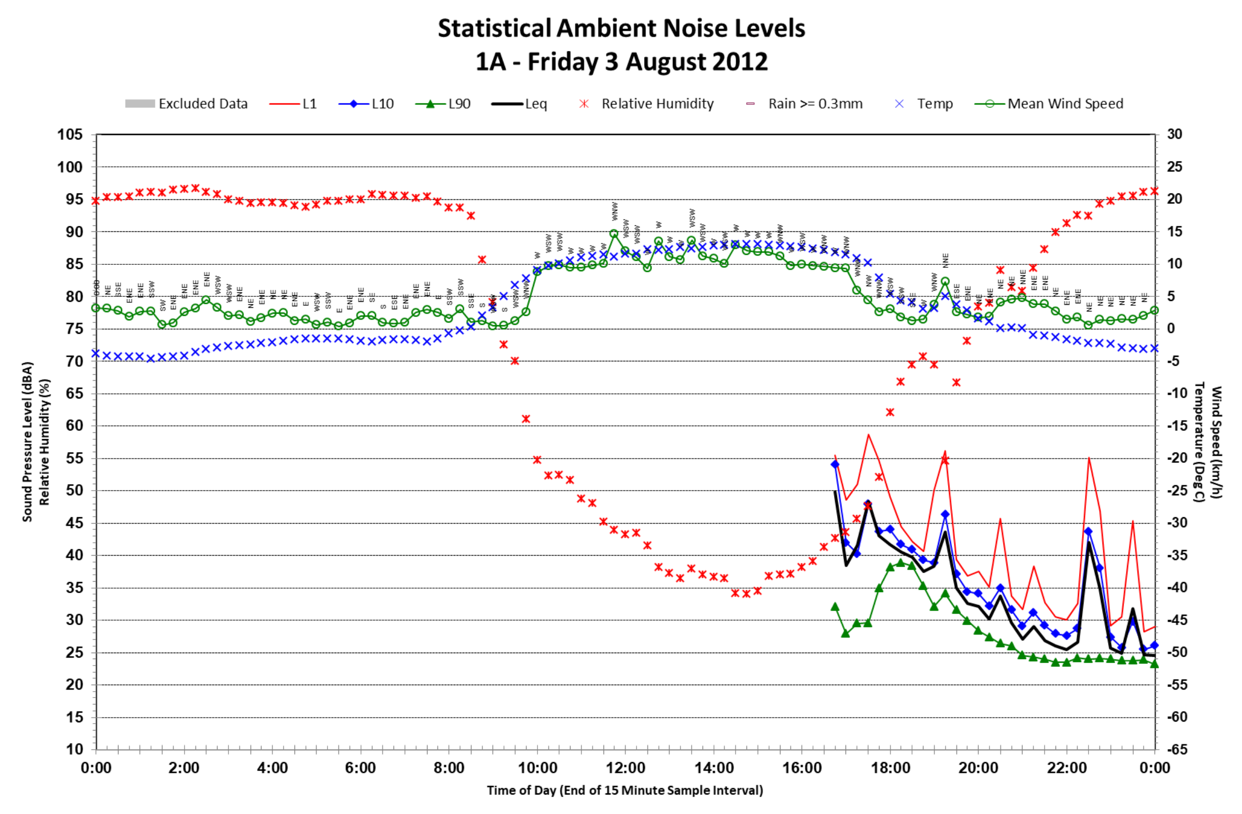

Statistical Ambient Noise Levels
L21 - Monday 12 September 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

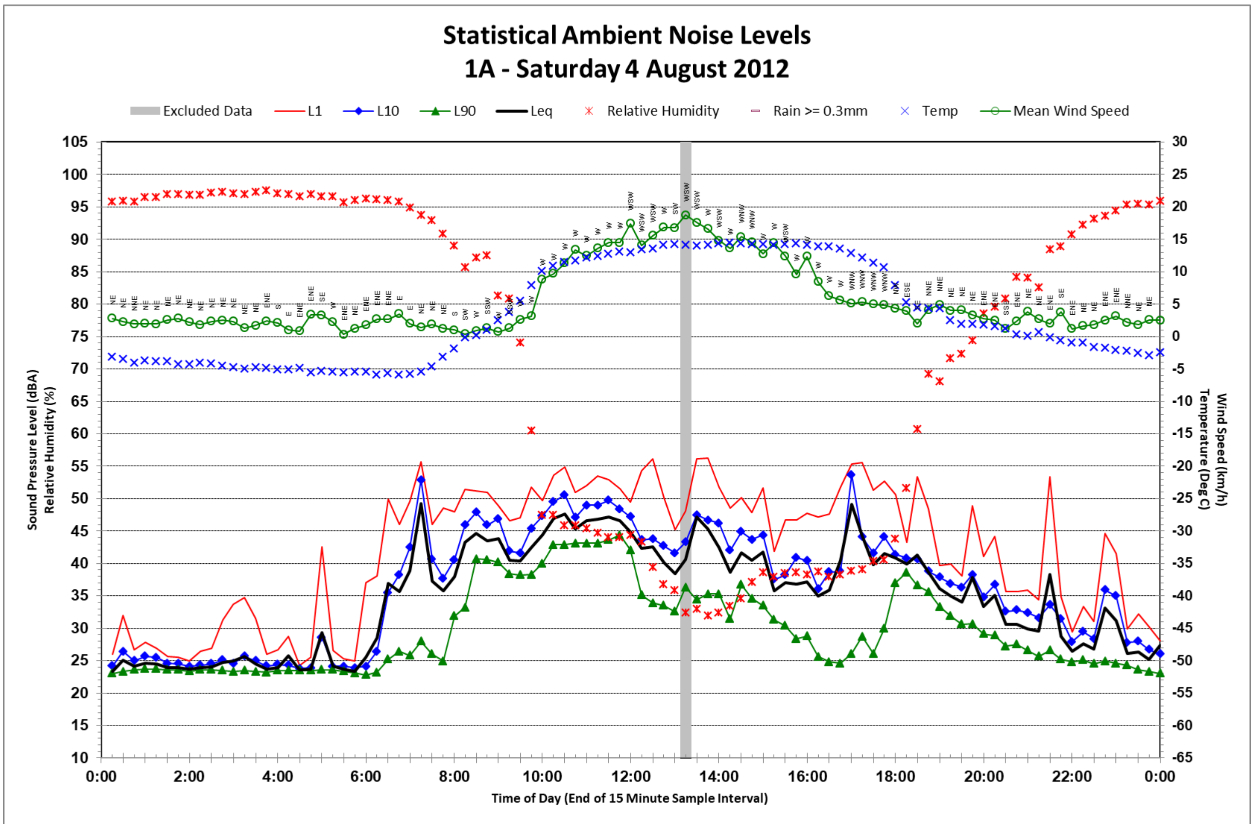

Statistical Ambient Noise Levels
L21 - Tuesday 13 September 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

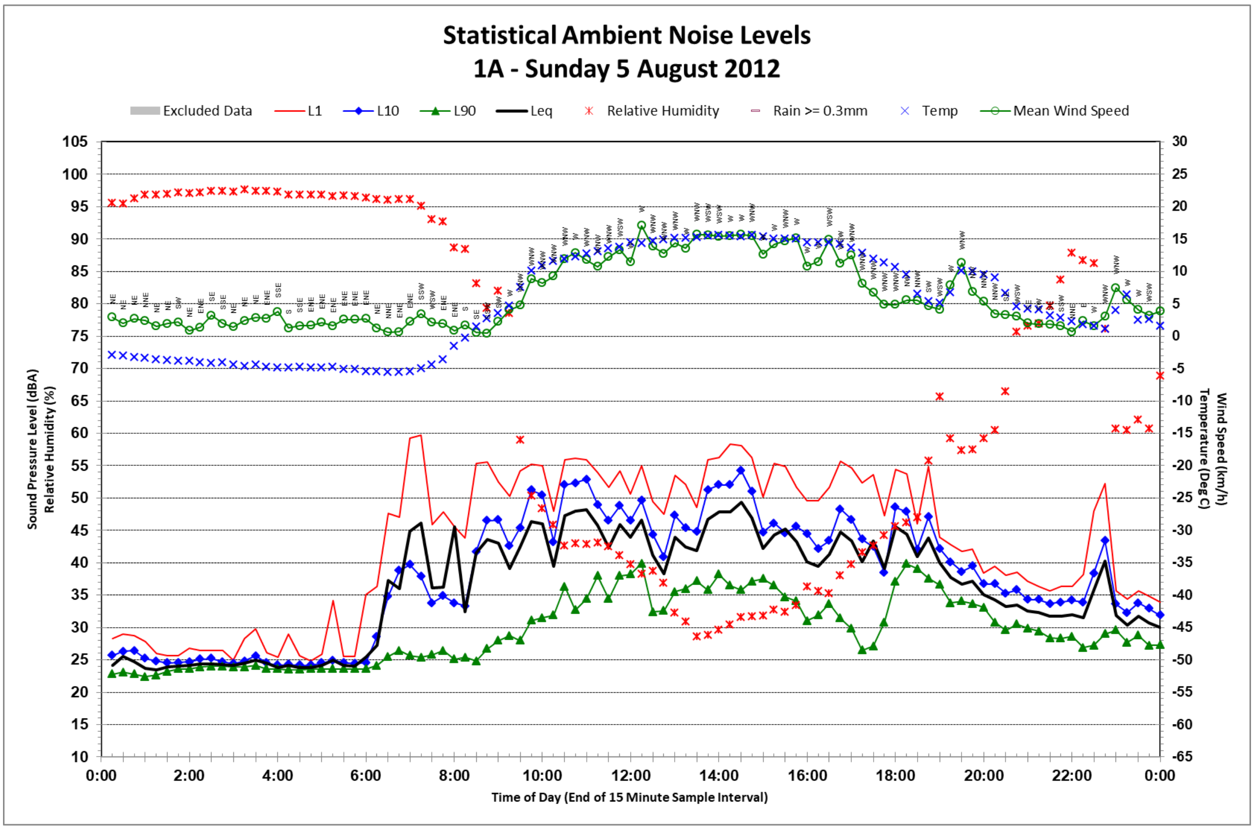

Statistical Ambient Noise Levels
L21 - Wednesday 14 September 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

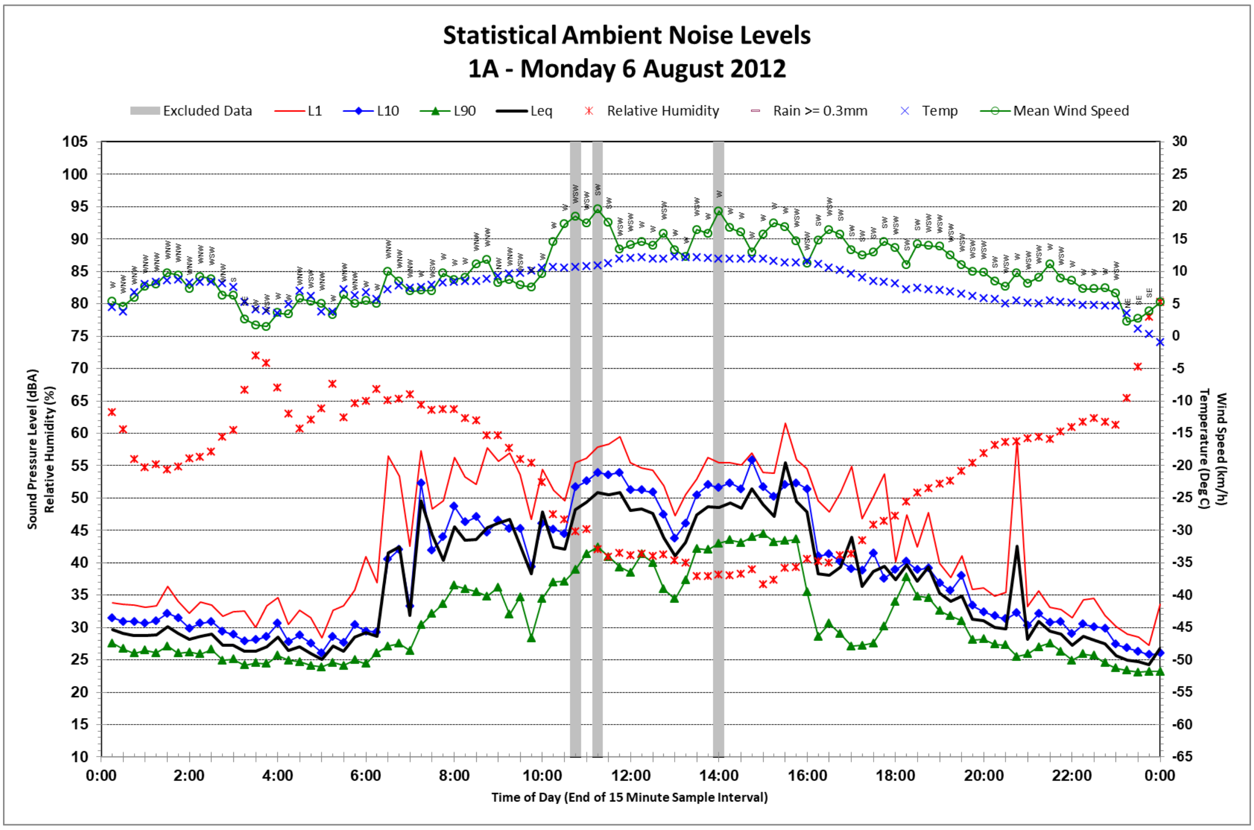

Statistical Ambient Noise Levels
L21 - Thursday 15 September 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

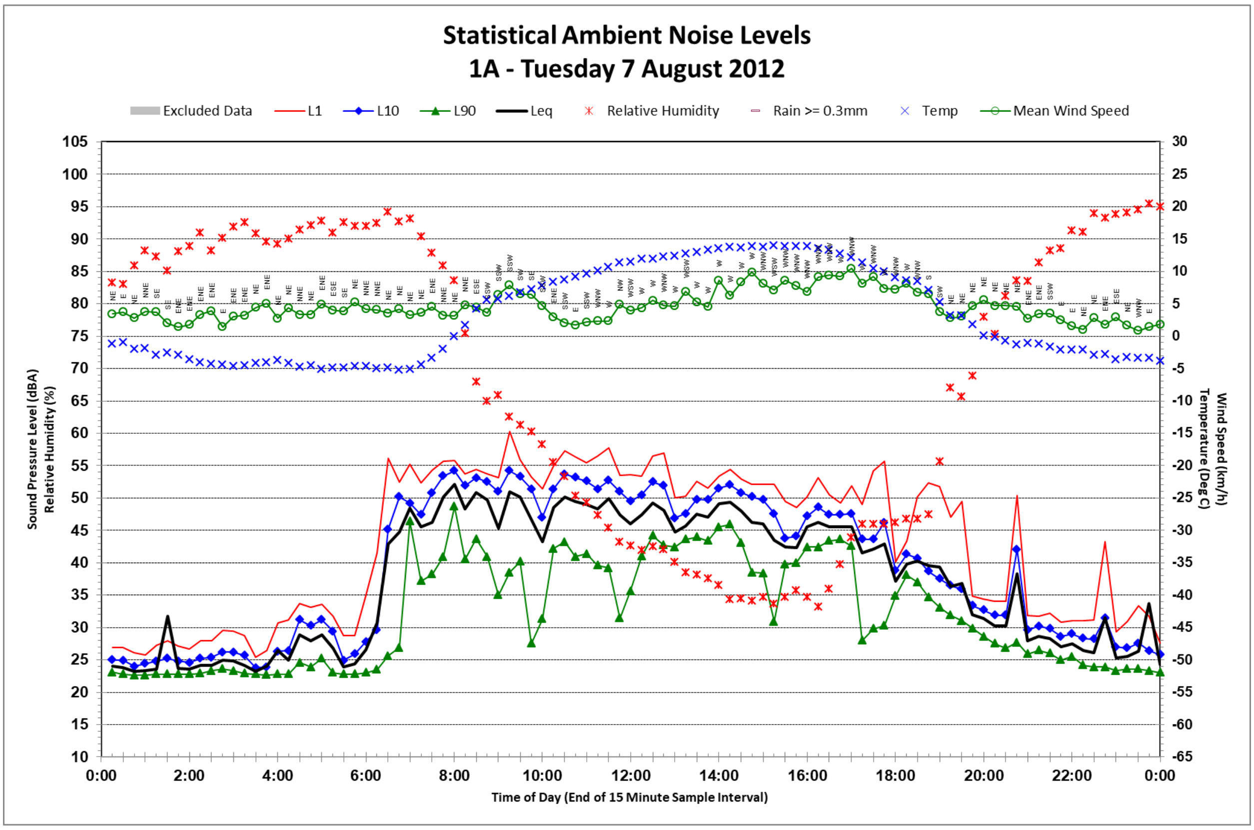

Statistical Ambient Noise Levels
L21 - Friday 16 September 2011
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

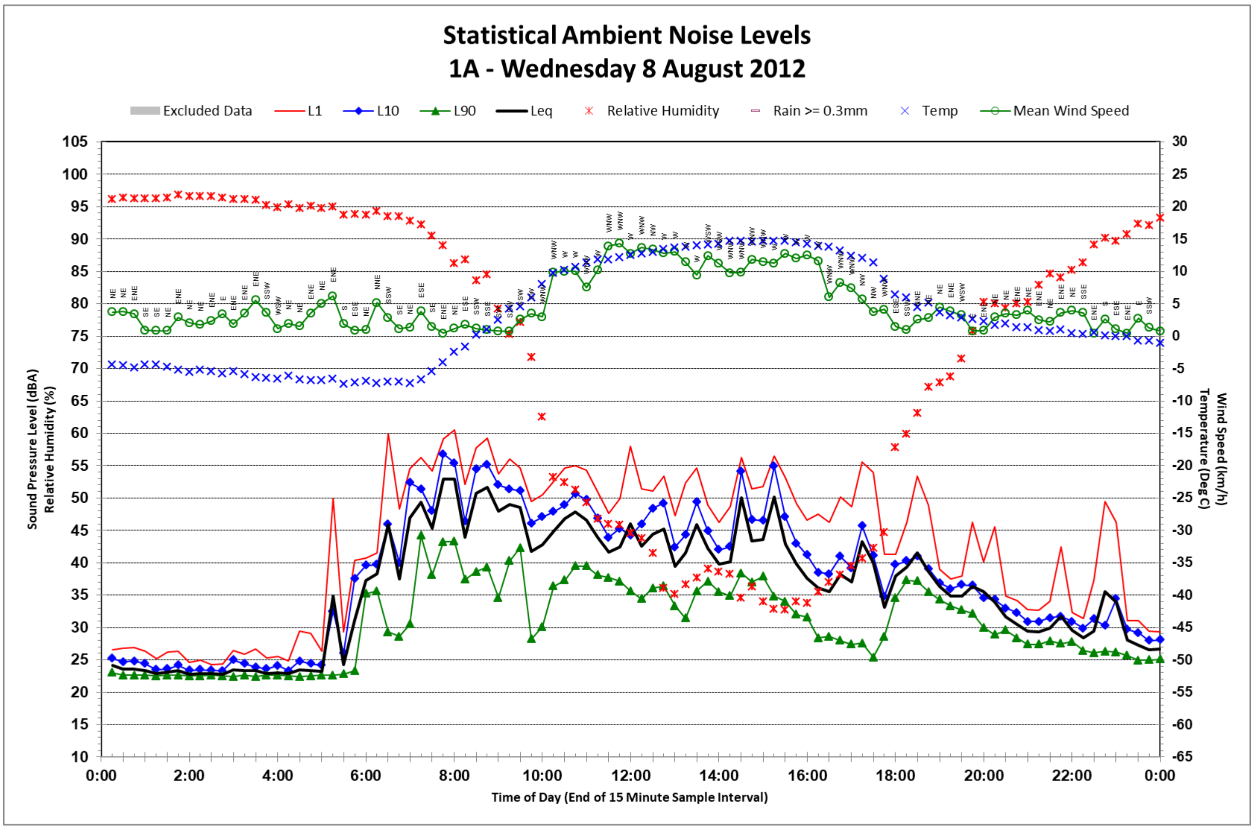

Statistical Ambient Noise Levels
1A - Friday 3 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

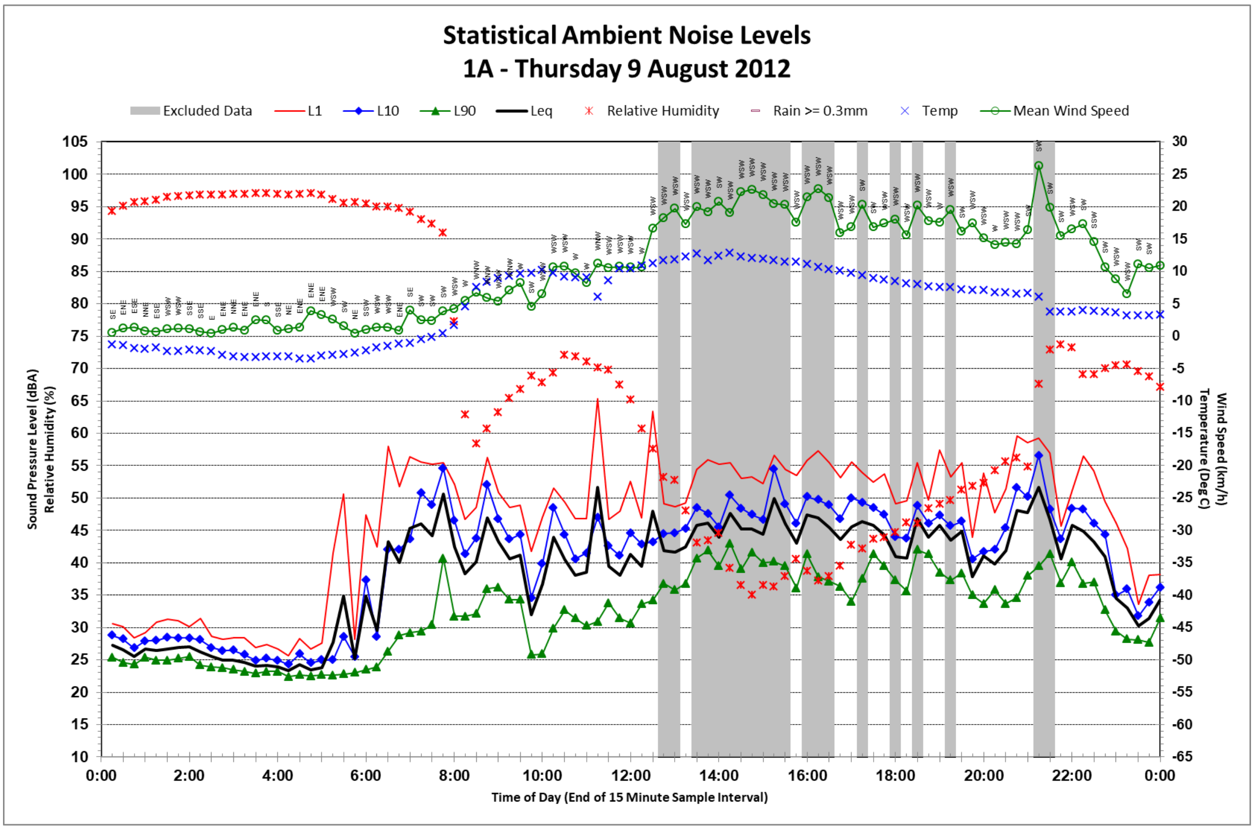

Statistical Ambient Noise Levels
1A - Saturday 4 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

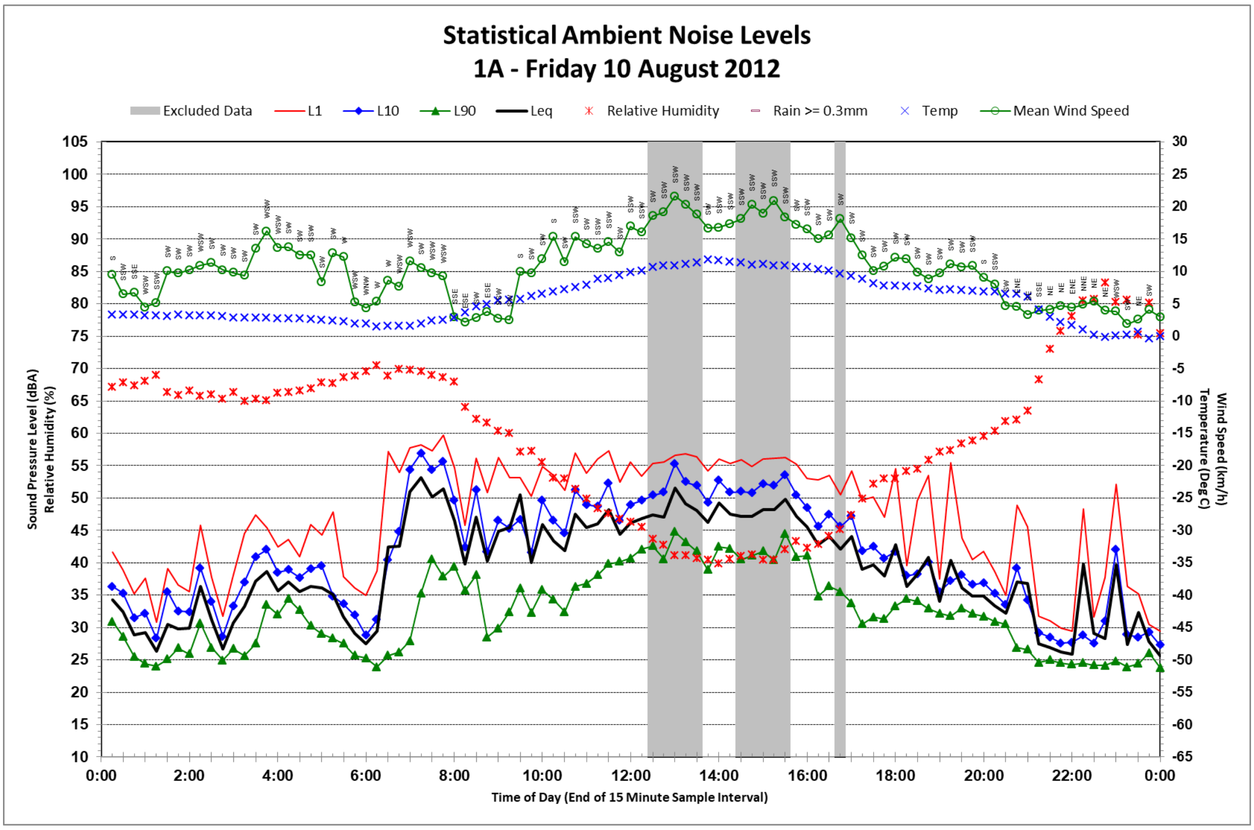

Statistical Ambient Noise Levels
1A - Sunday 5 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

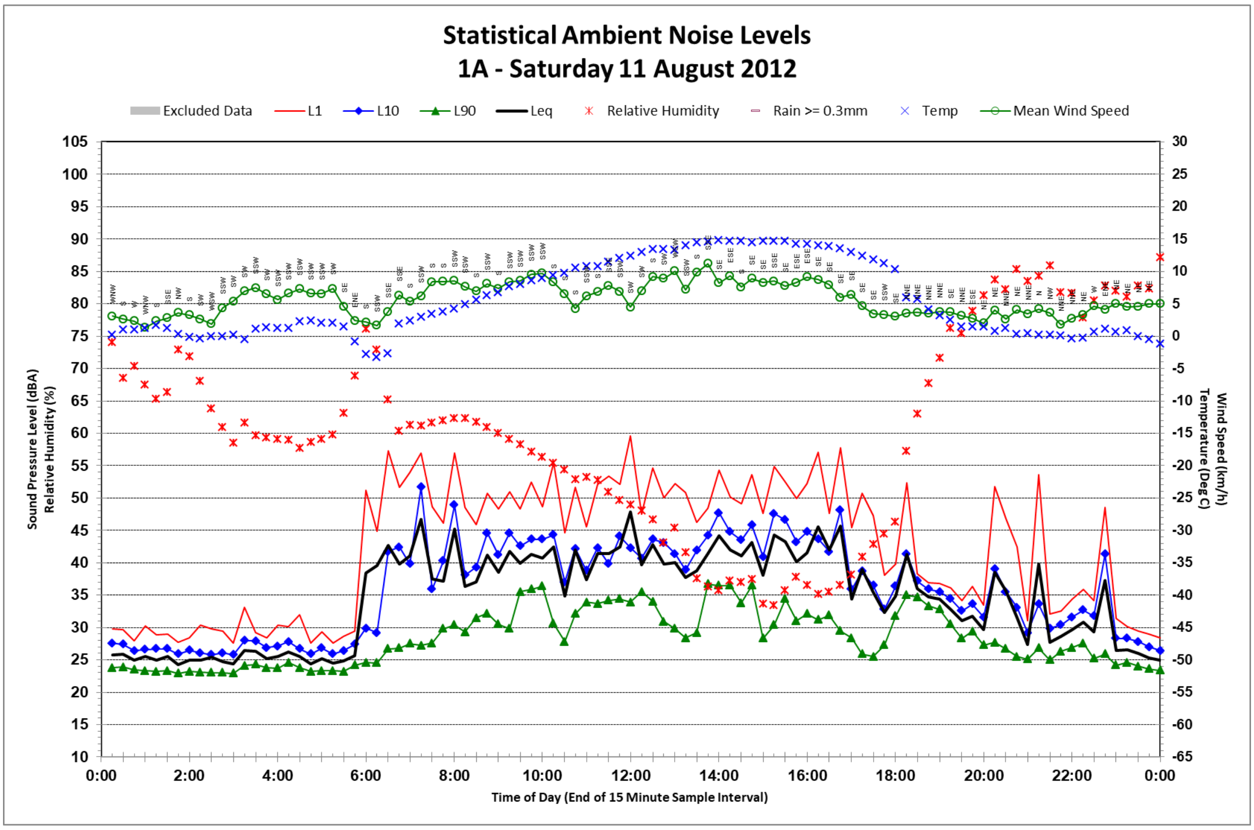

Statistical Ambient Noise Levels
1A - Monday 6 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

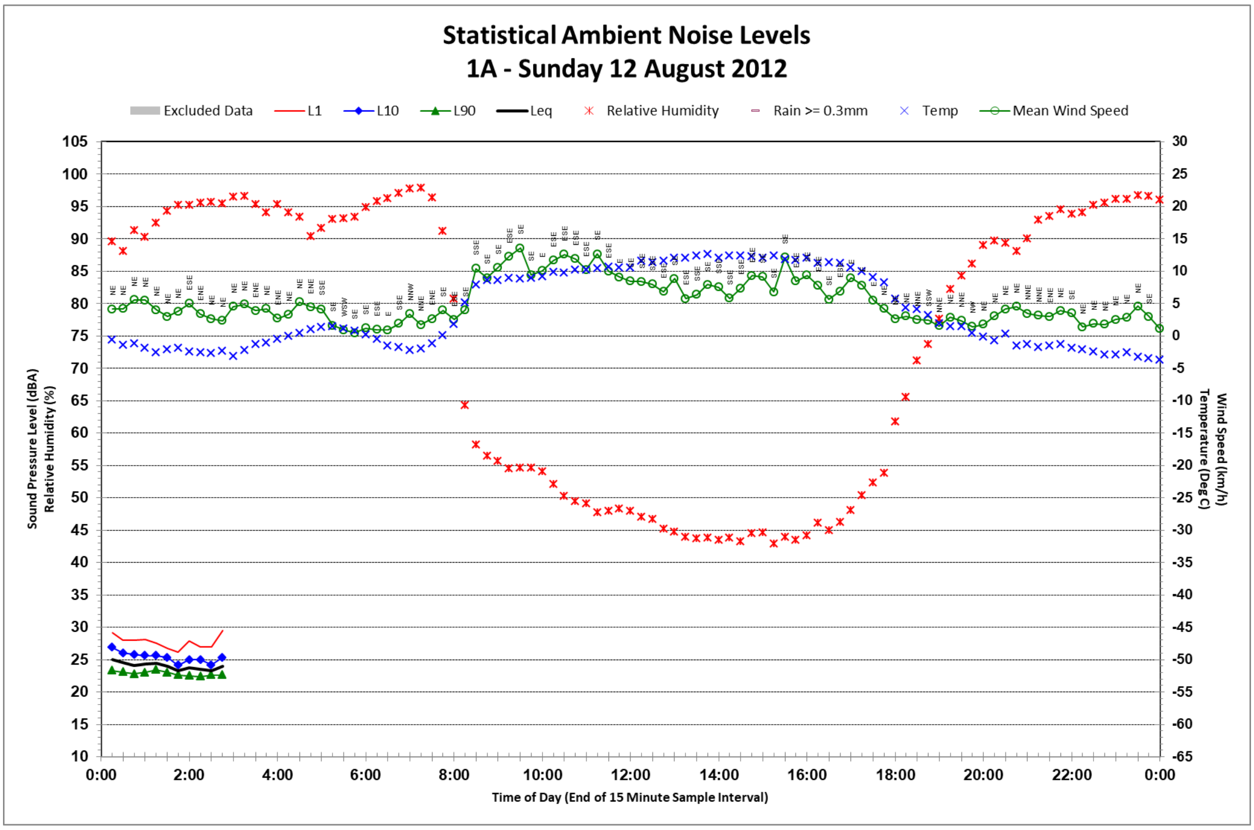

Statistical Ambient Noise Levels
1A - Tuesday 7 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

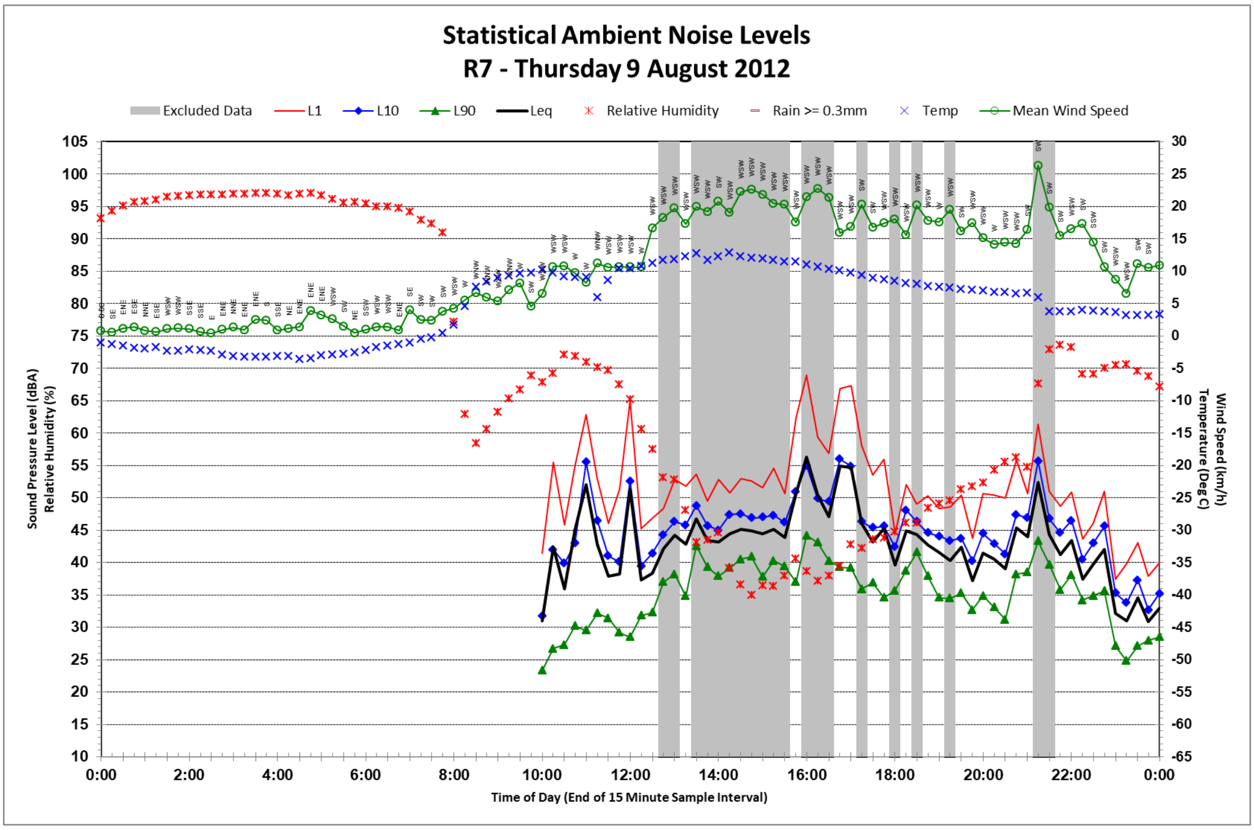

Statistical Ambient Noise Levels
1A - Wednesday 8 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

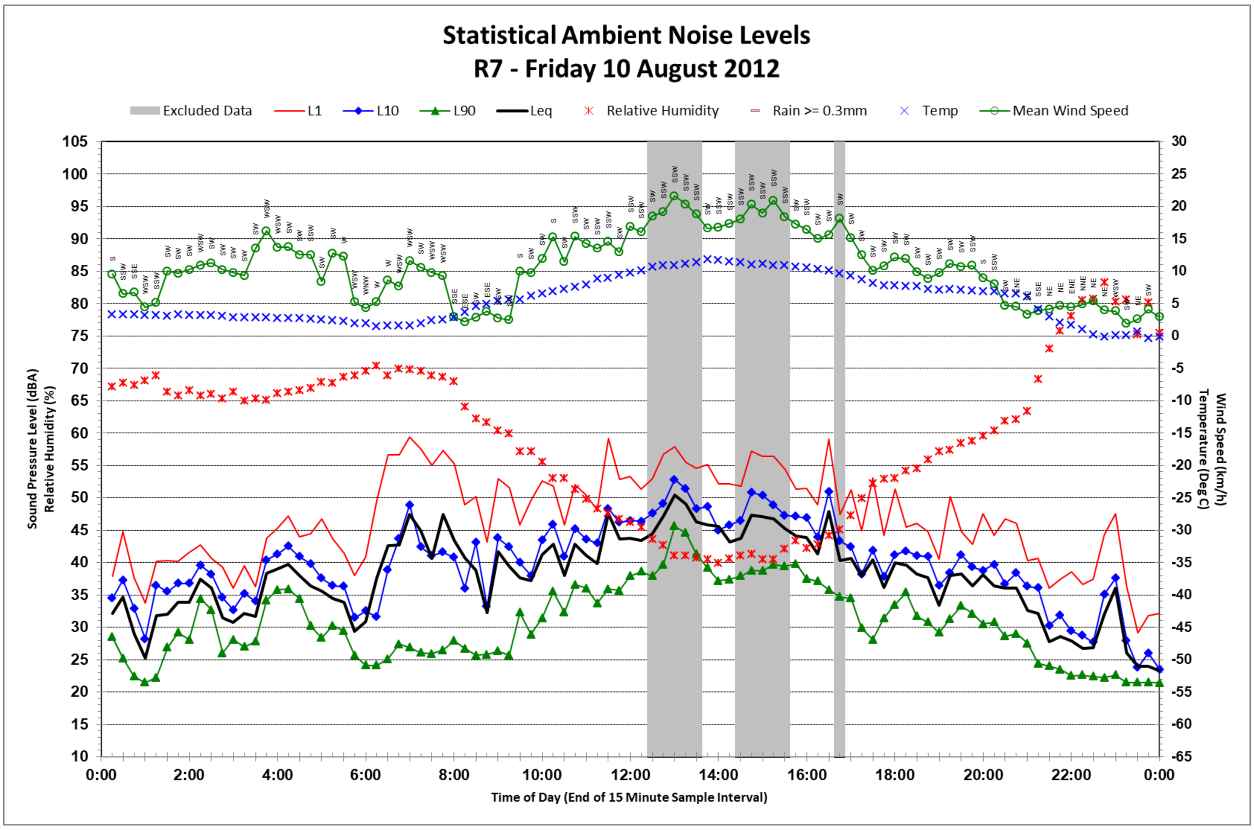

Statistical Ambient Noise Levels
1A - Thursday 9 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

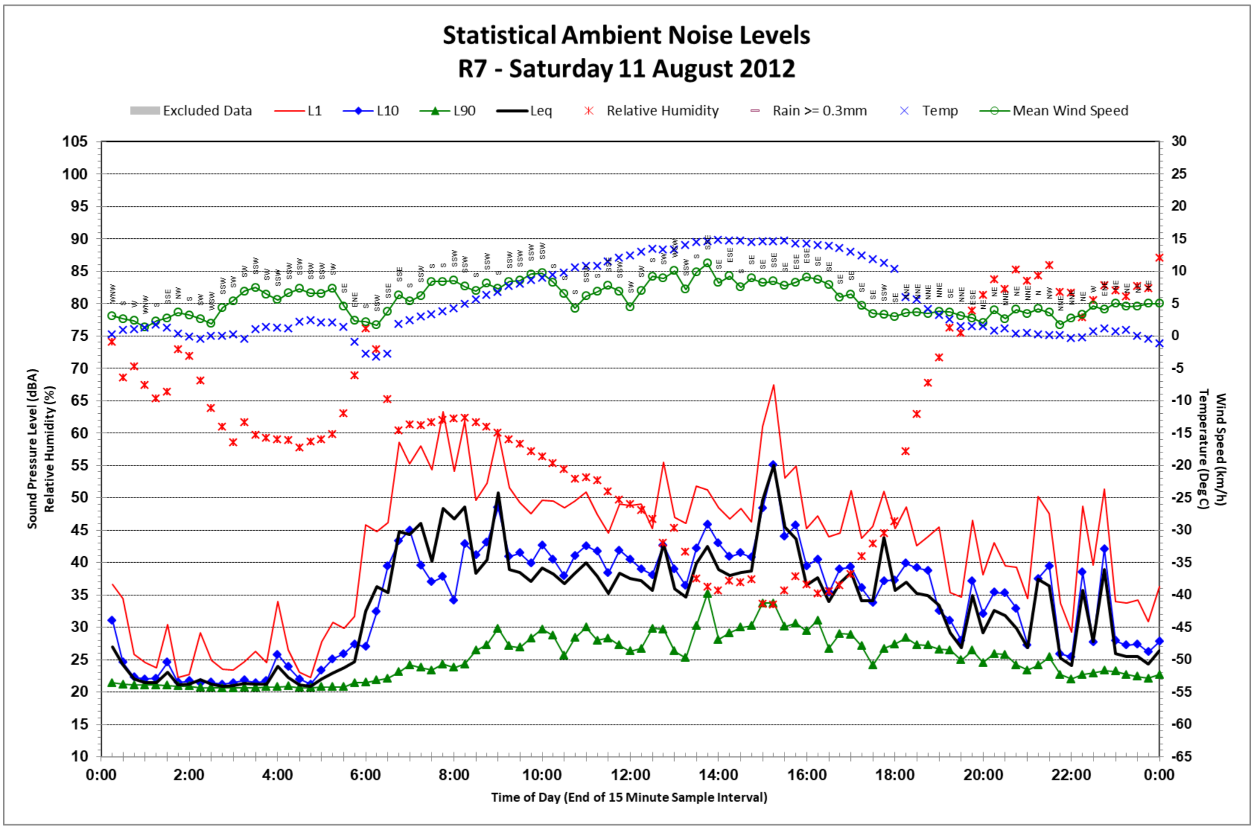

Statistical Ambient Noise Levels
1A - Friday 10 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

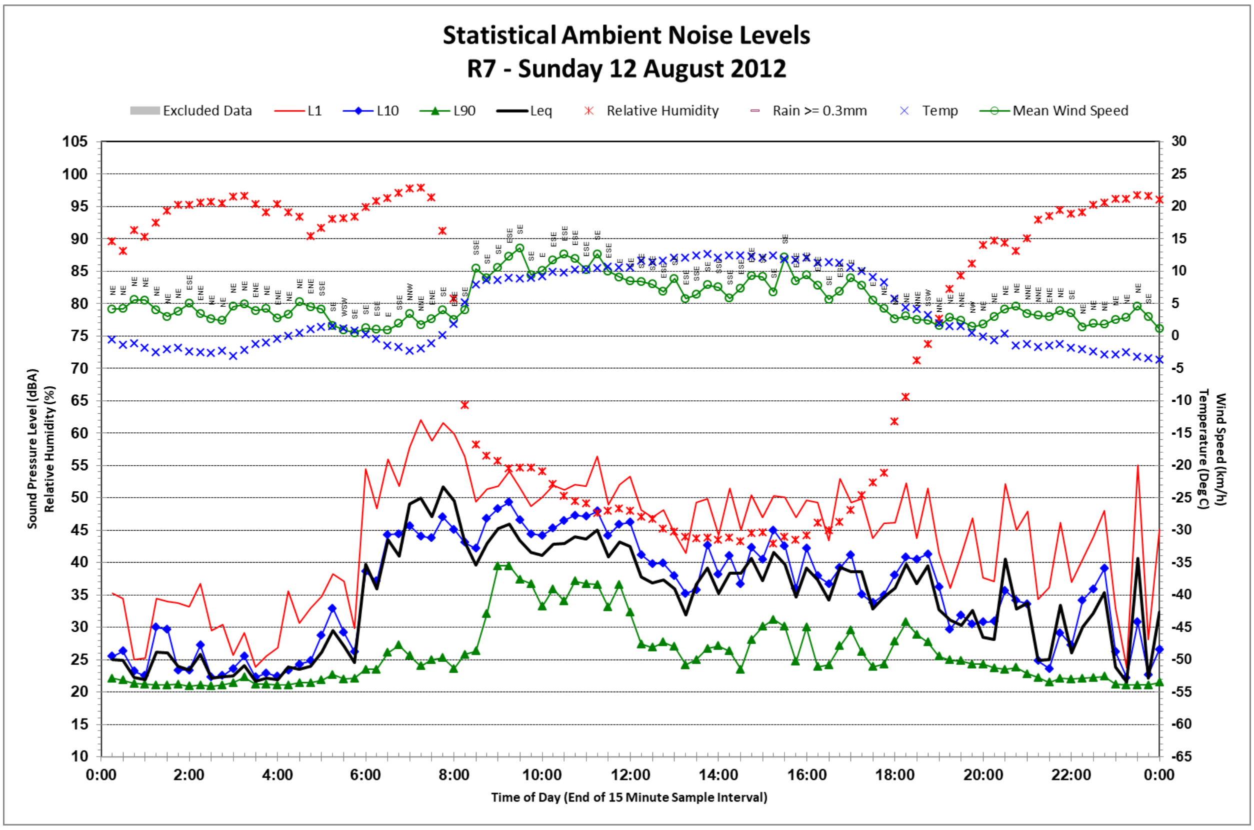

Statistical Ambient Noise Levels
1A - Saturday 11 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

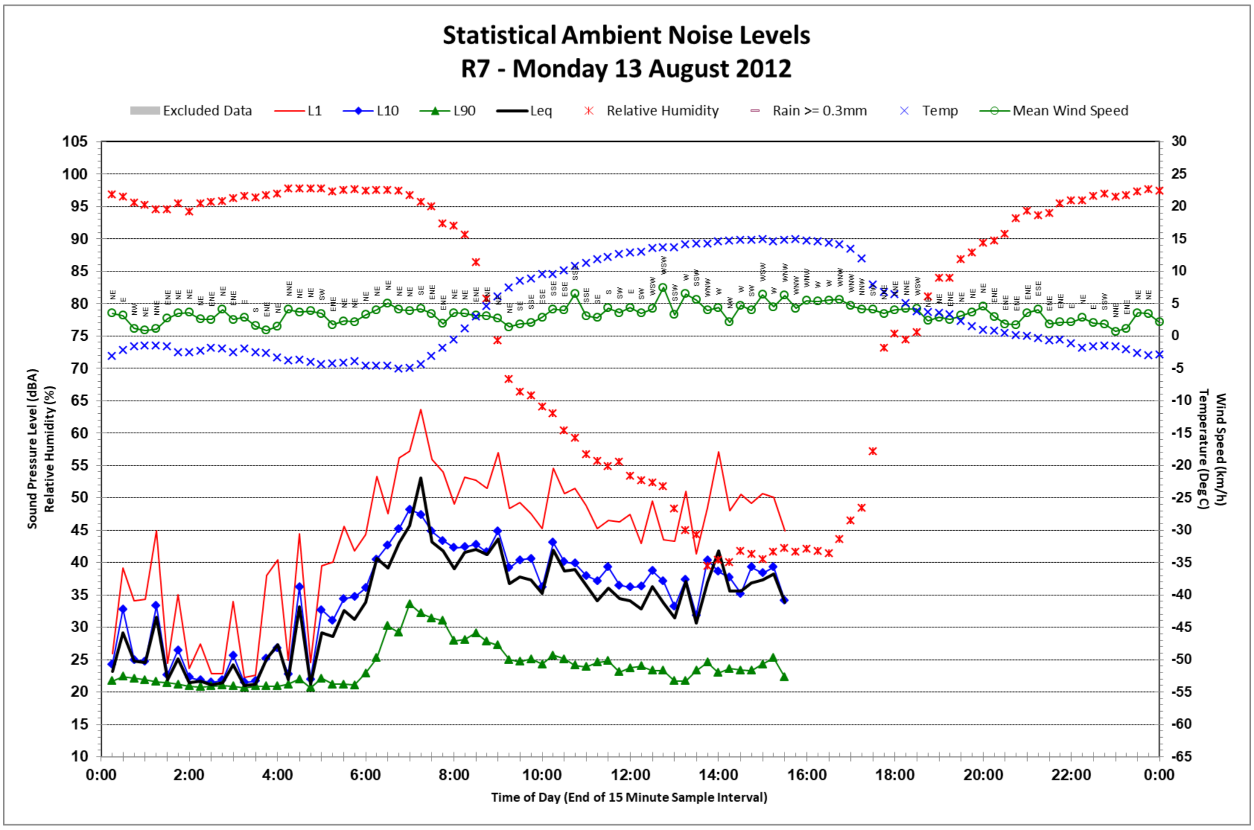

Statistical Ambient Noise Levels
1A - Sunday 12 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

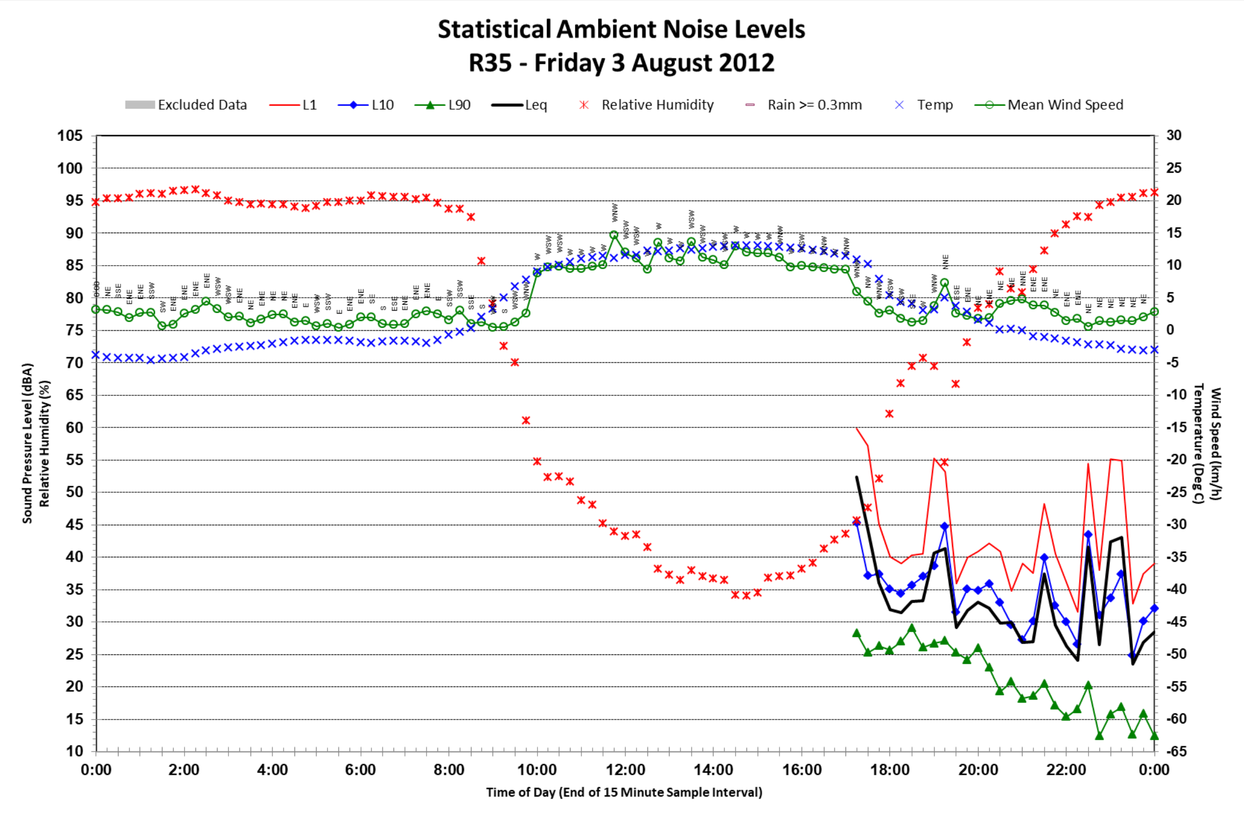

Statistical Ambient Noise Levels
R7 - Thursday 9 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

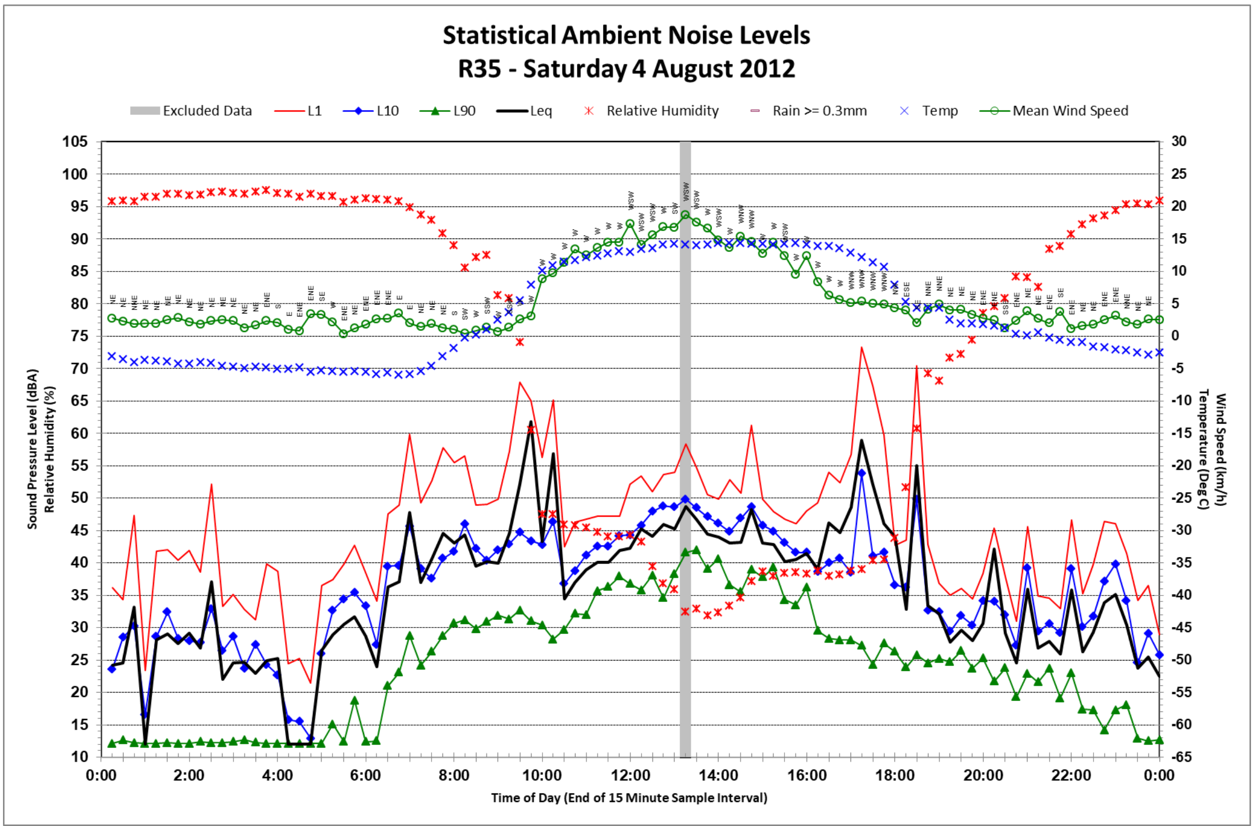

Statistical Ambient Noise Levels
R7 - Friday 10 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

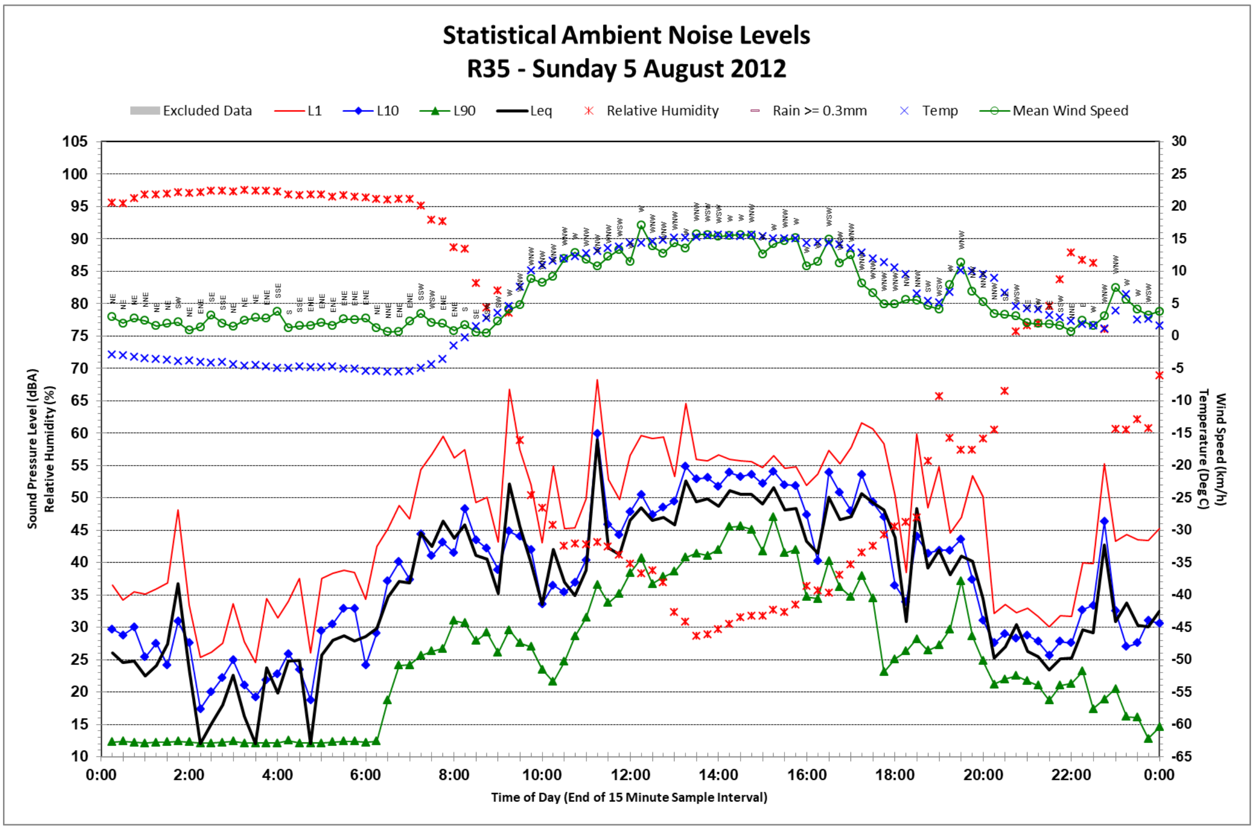

Statistical Ambient Noise Levels
R7 - Saturday 11 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

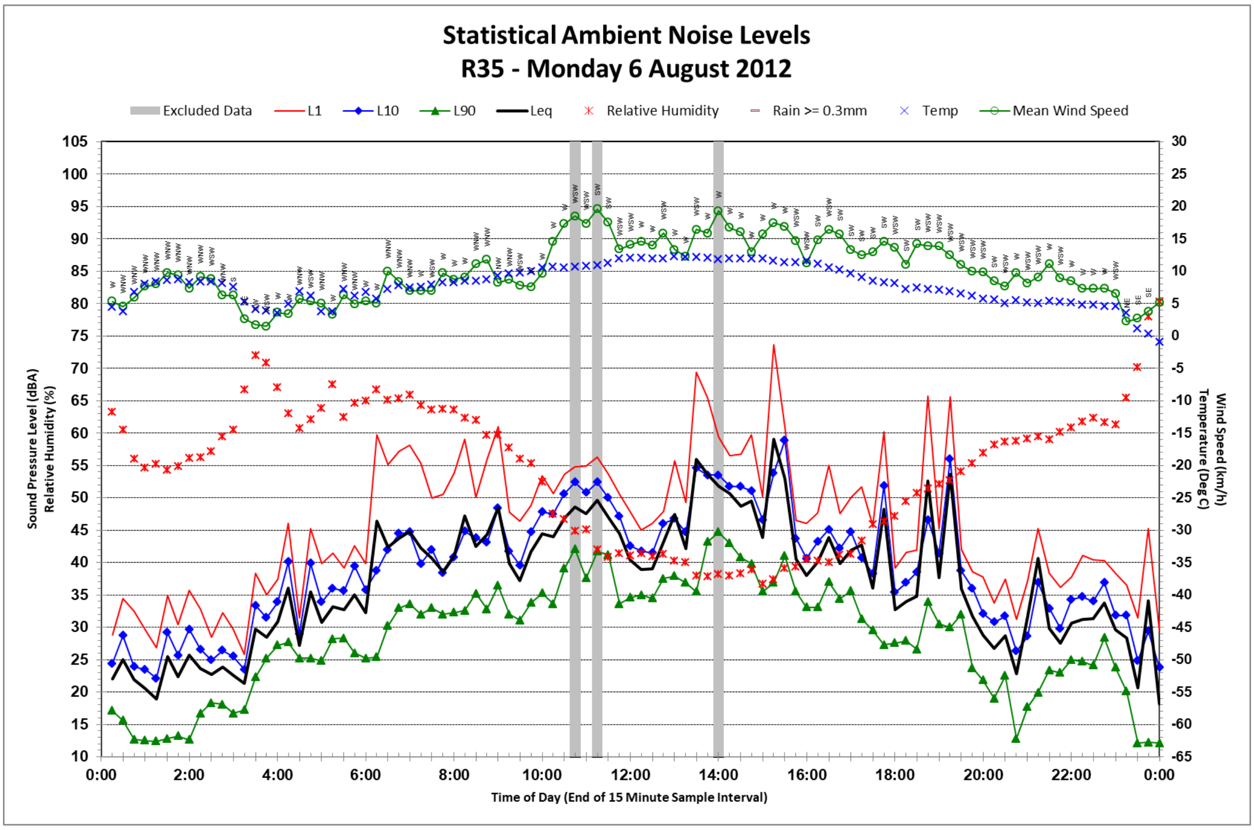

Statistical Ambient Noise Levels
R7 - Sunday 12 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

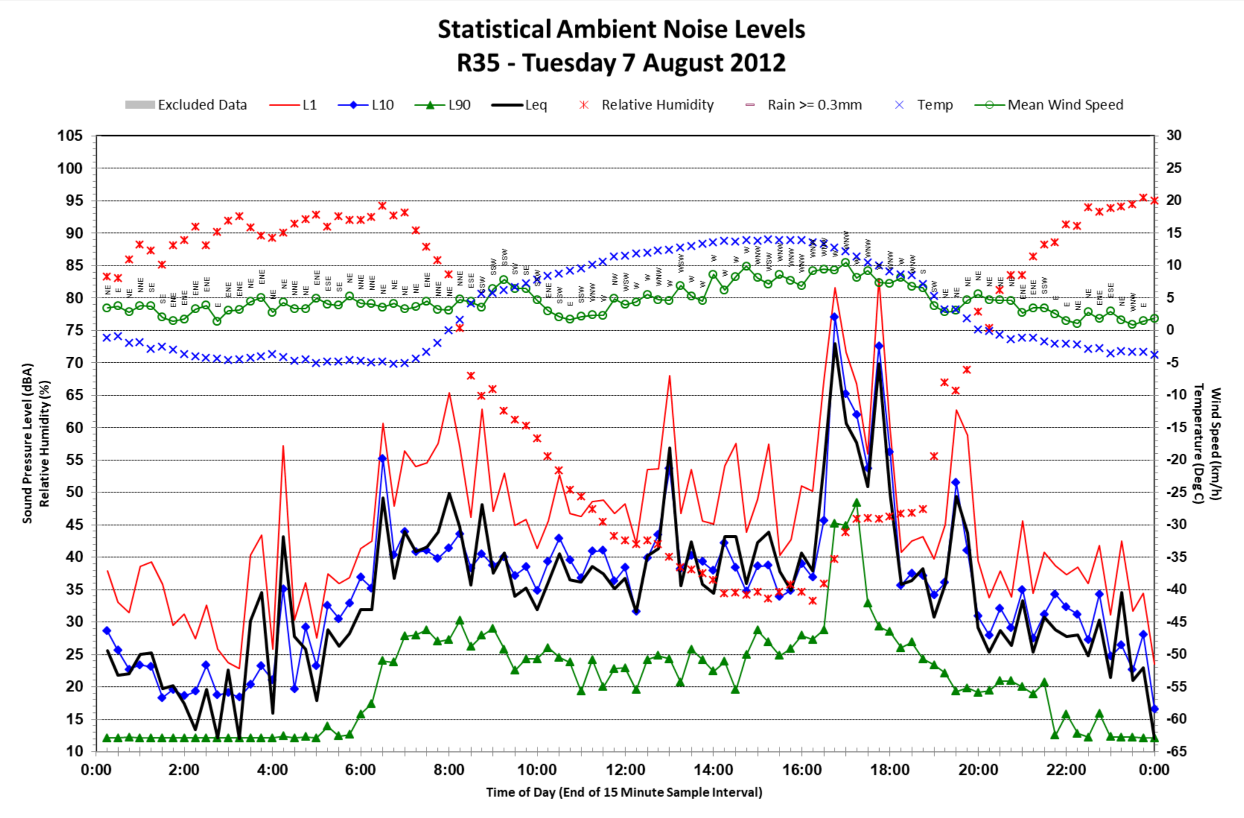

Statistical Ambient Noise Levels
R7 - Monday 13 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

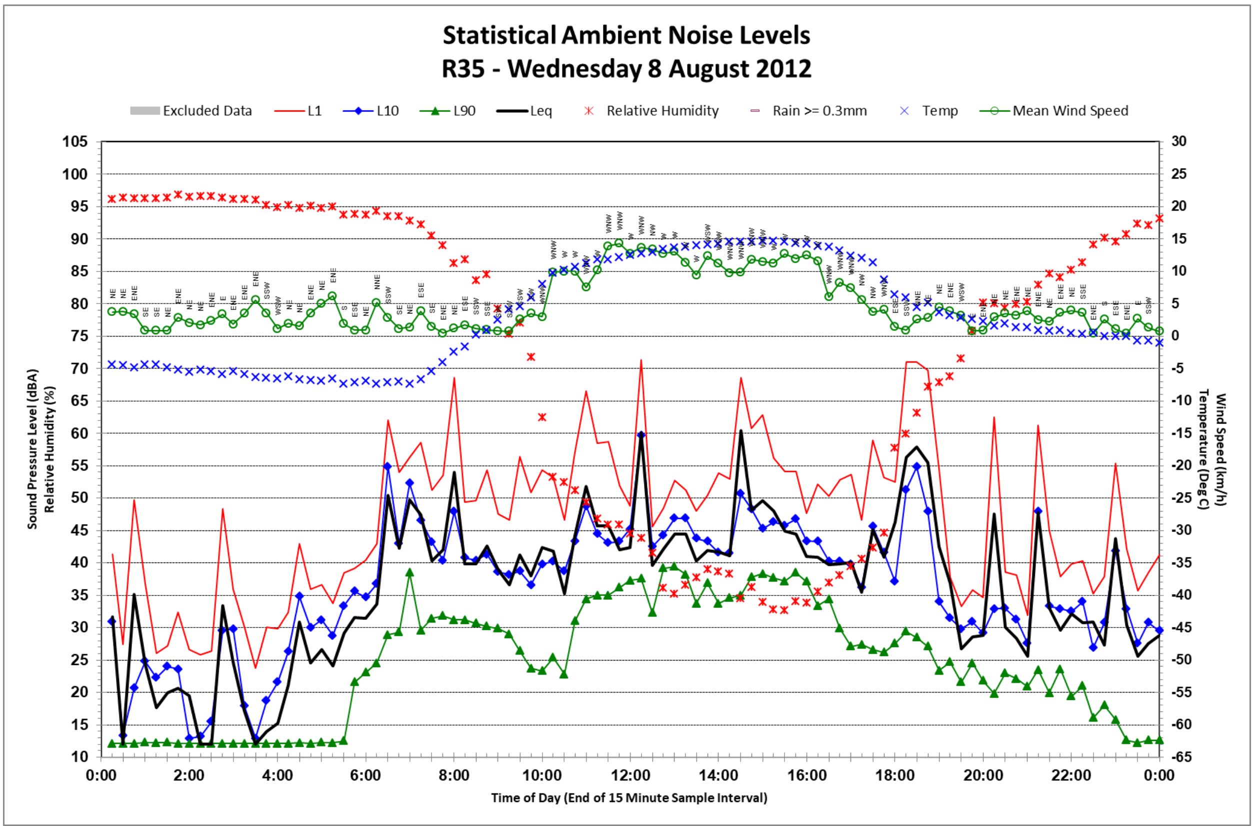

Statistical Ambient Noise Levels
R35 - Friday 3 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

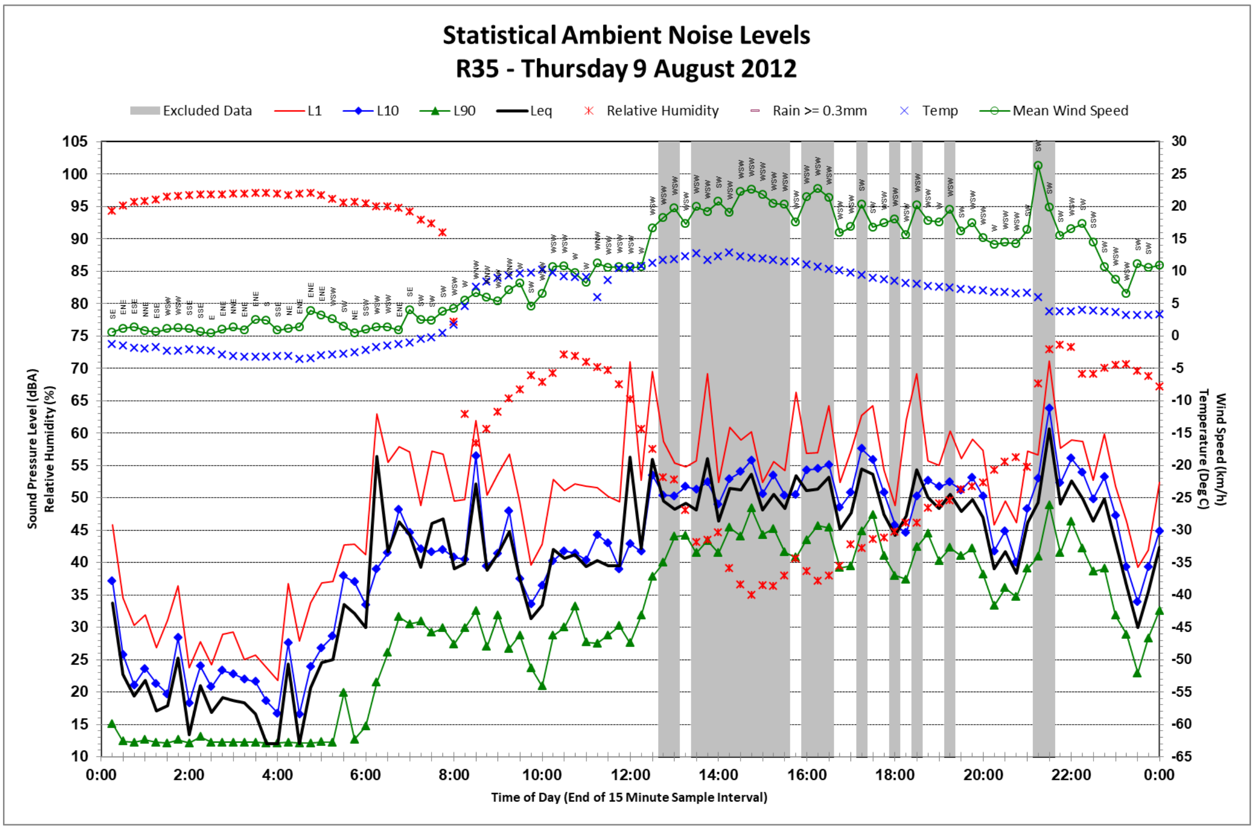

Statistical Ambient Noise Levels
R35 - Saturday 4 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

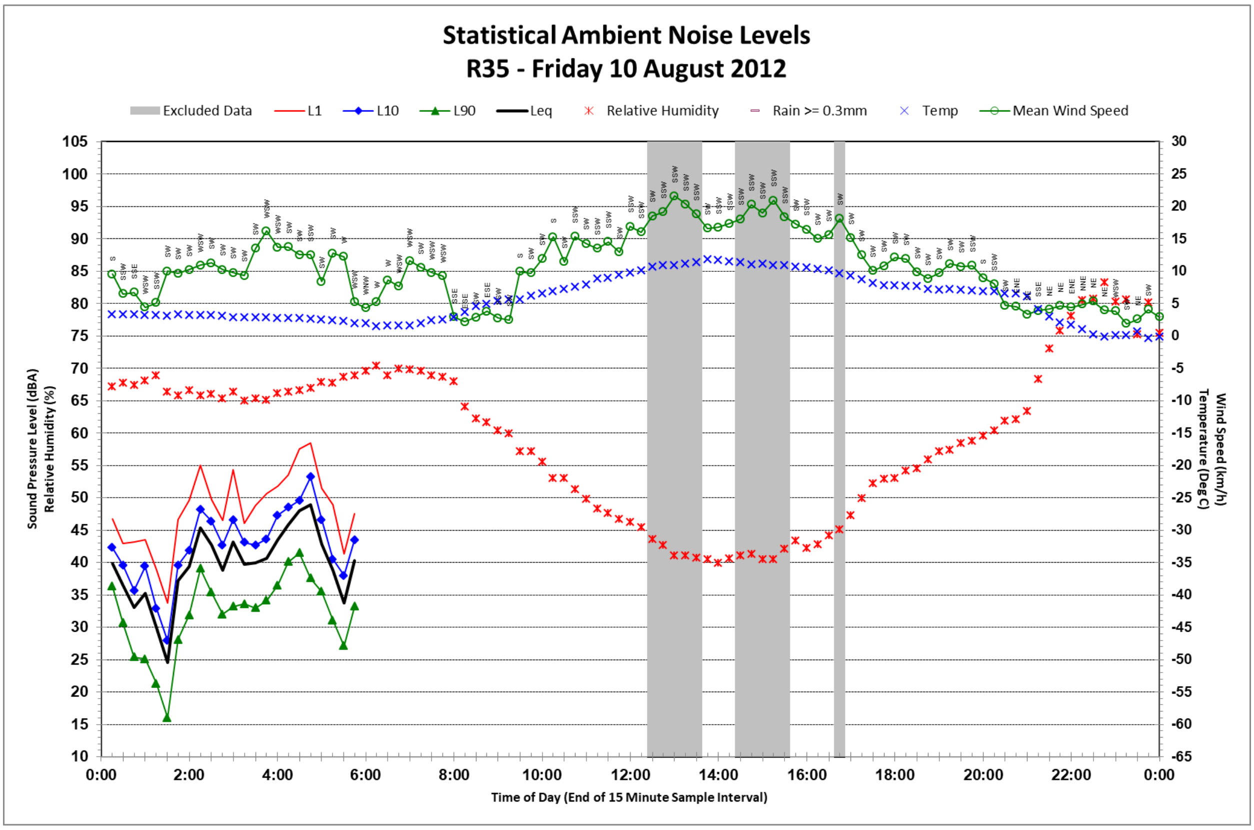

Statistical Ambient Noise Levels
R35 - Sunday 5 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

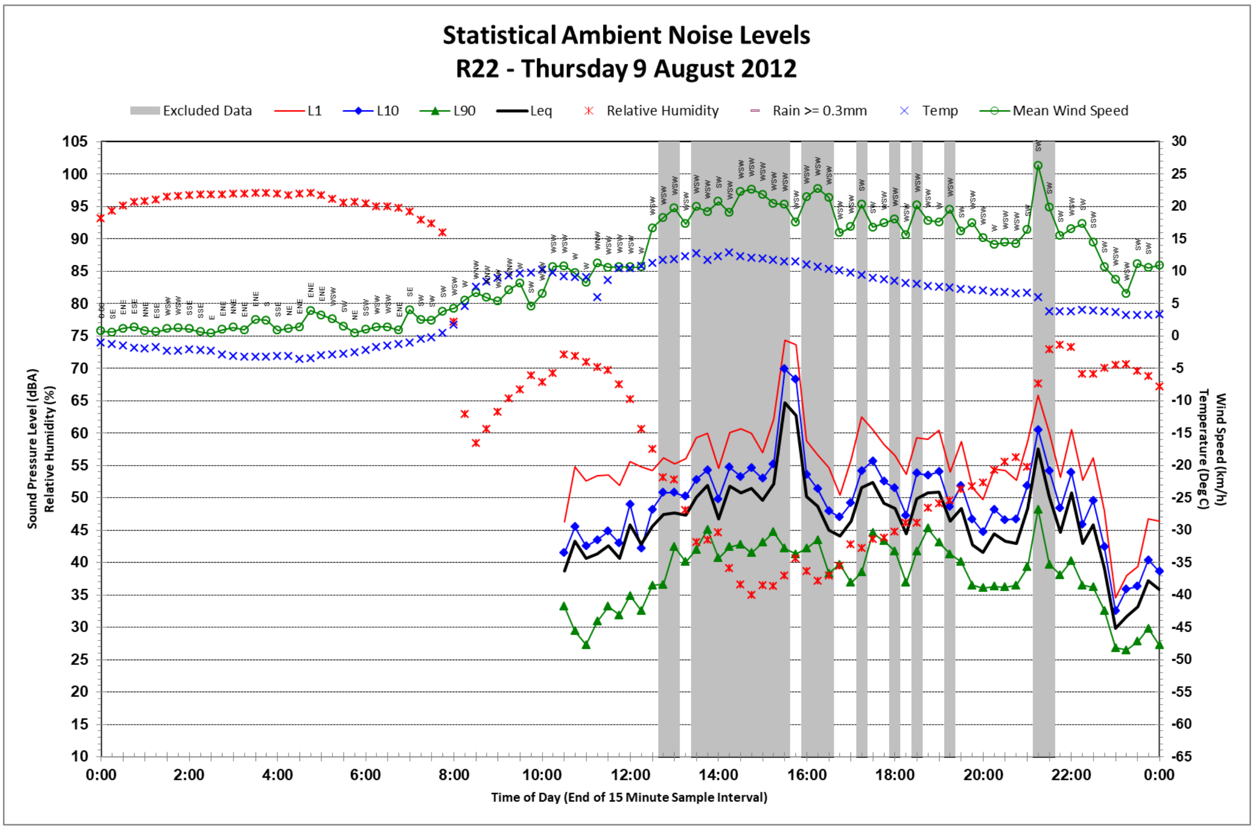

Statistical Ambient Noise Levels
R35 - Monday 6 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

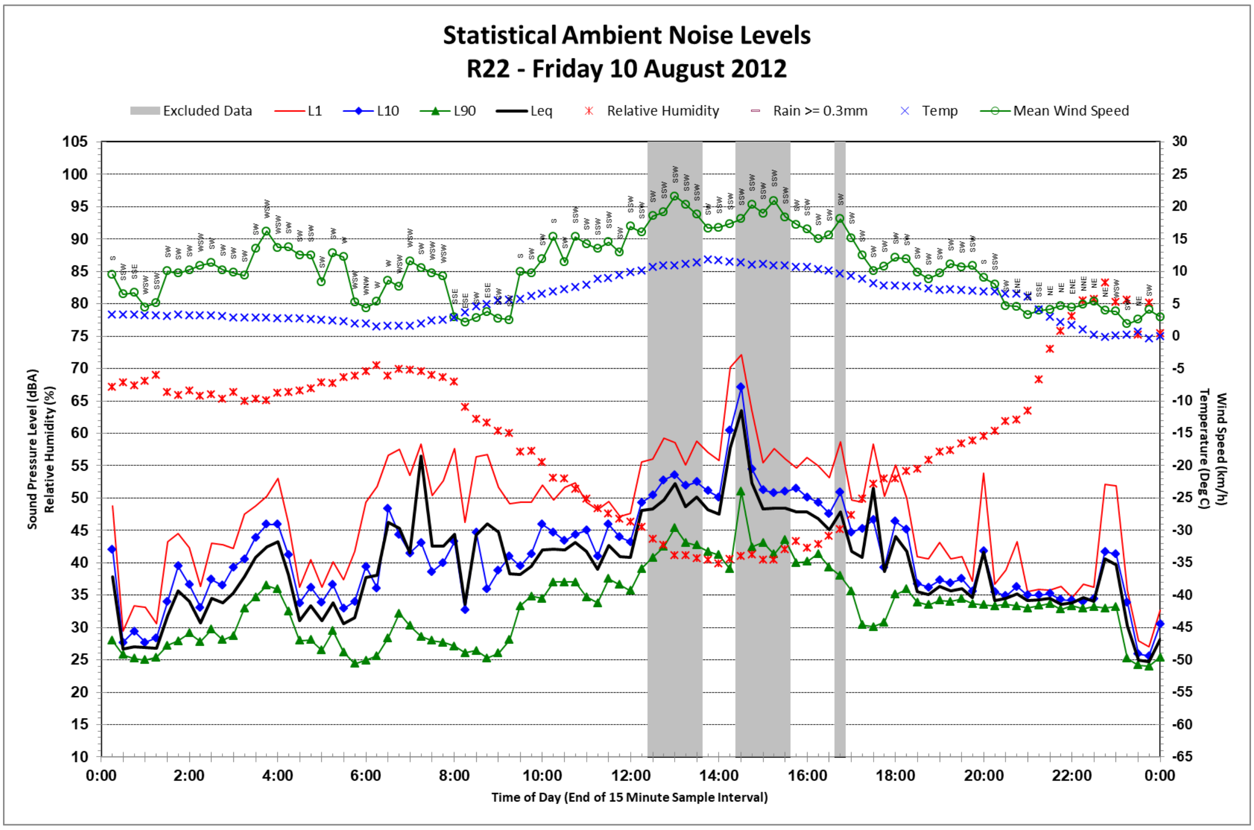

Statistical Ambient Noise Levels
R35 - Tuesday 7 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

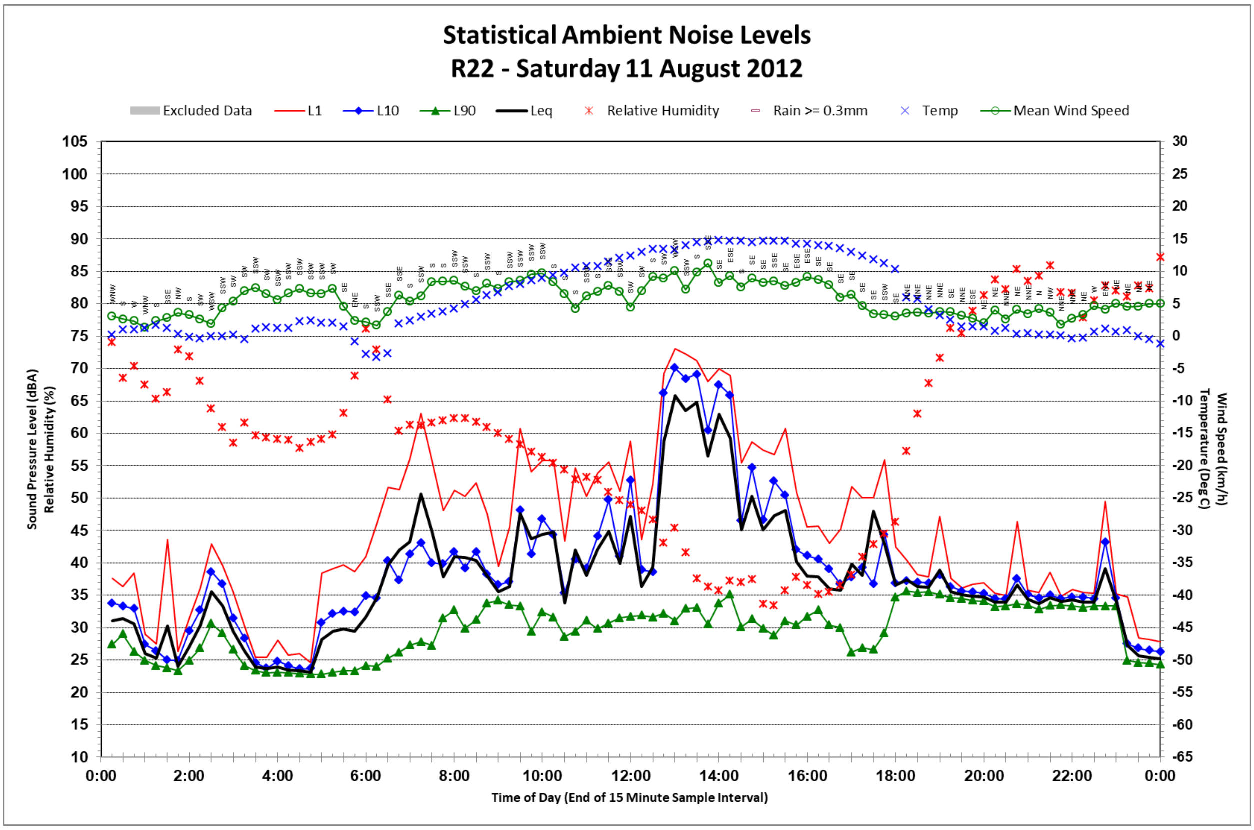

Statistical Ambient Noise Levels
R35 - Wednesday 8 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

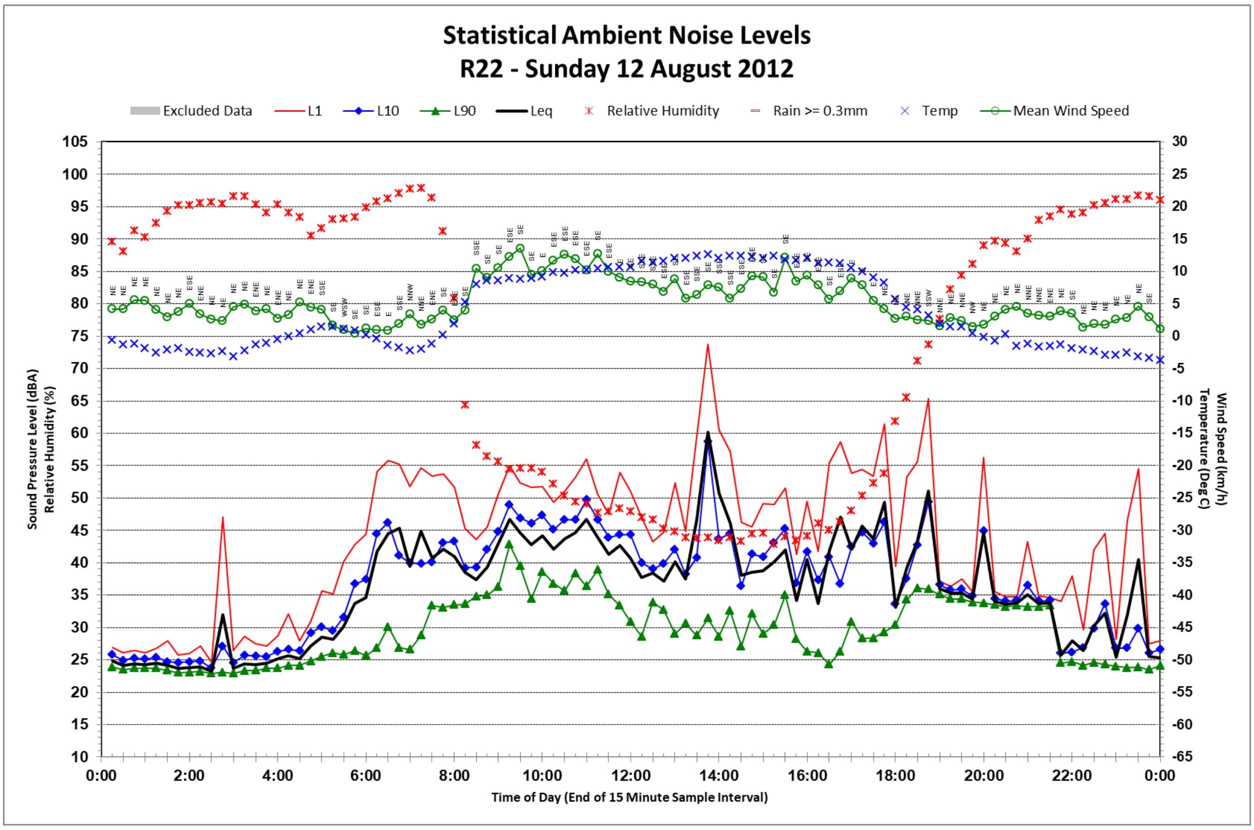

Statistical Ambient Noise Levels
R35 - Thursday 9 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

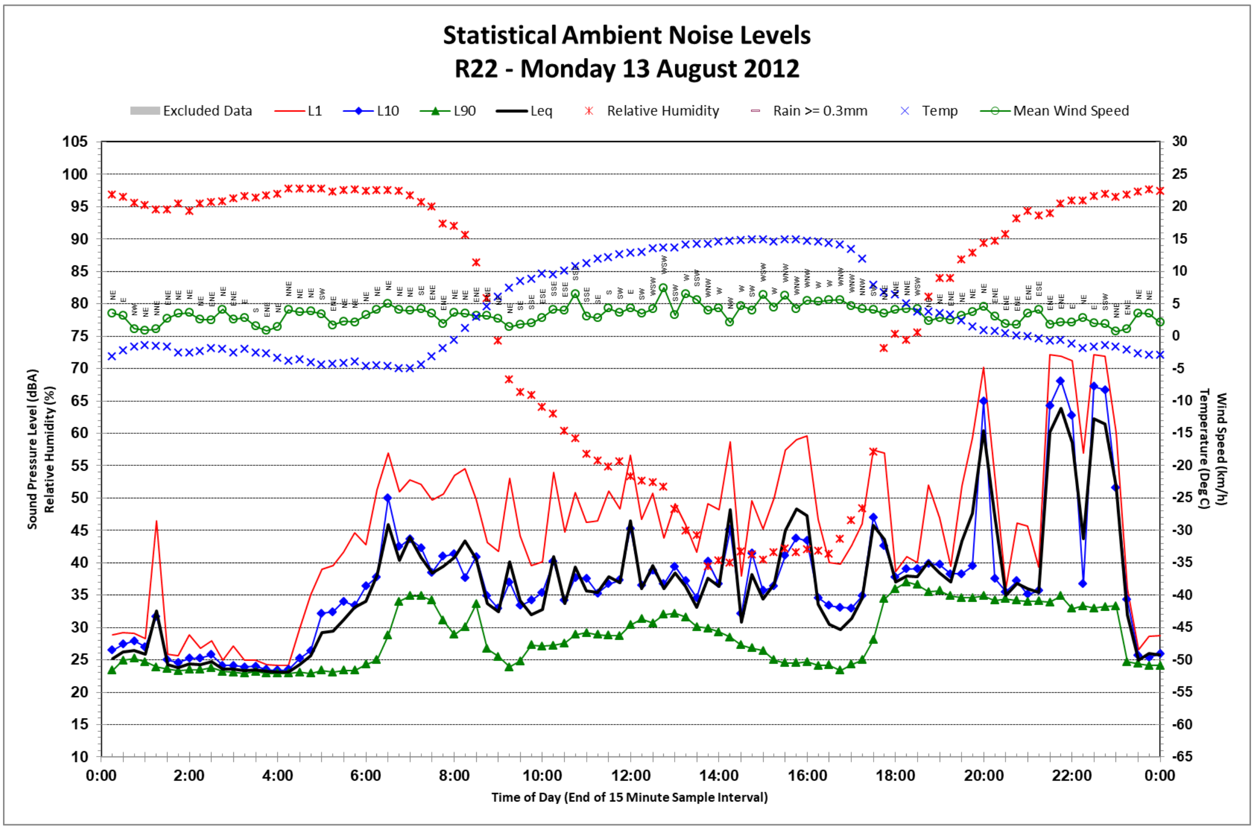

Statistical Ambient Noise Levels
R35 - Friday 10 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

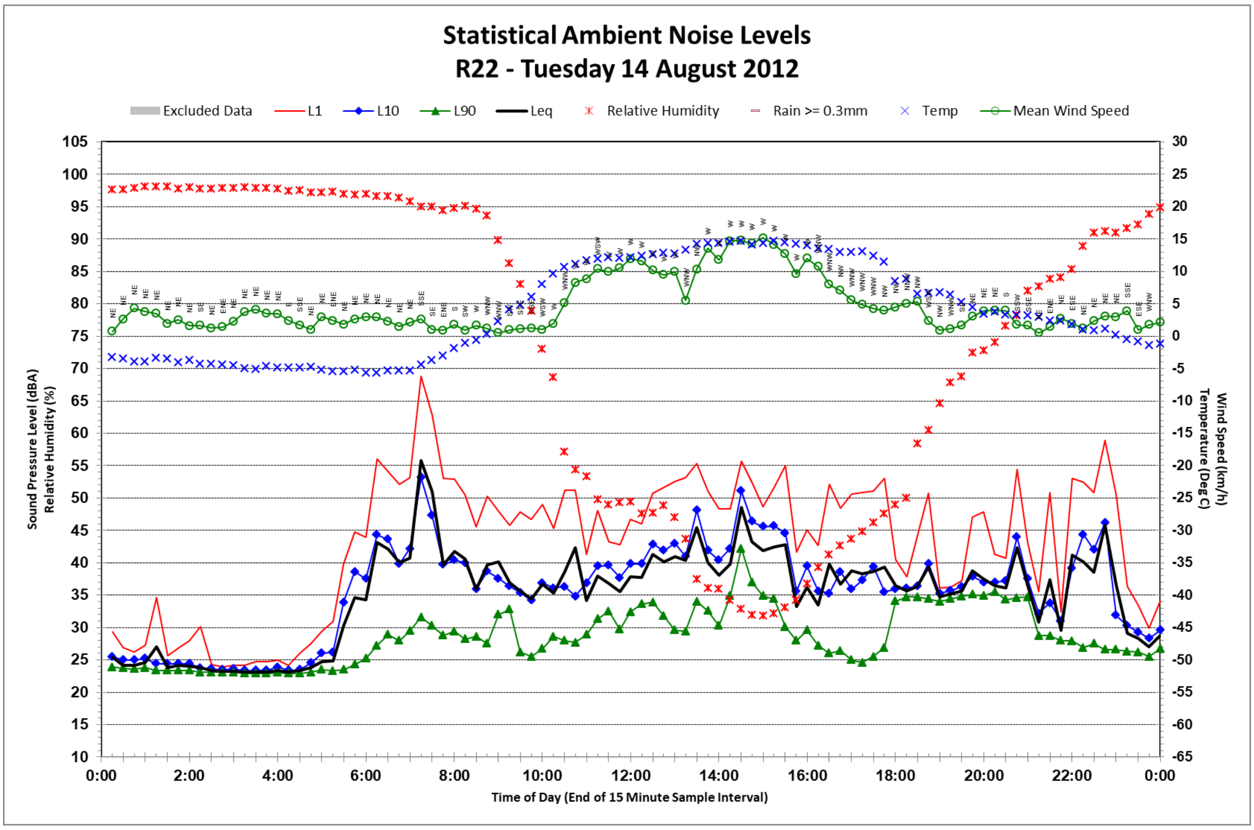

Statistical Ambient Noise Levels
R22 - Thursday 9 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

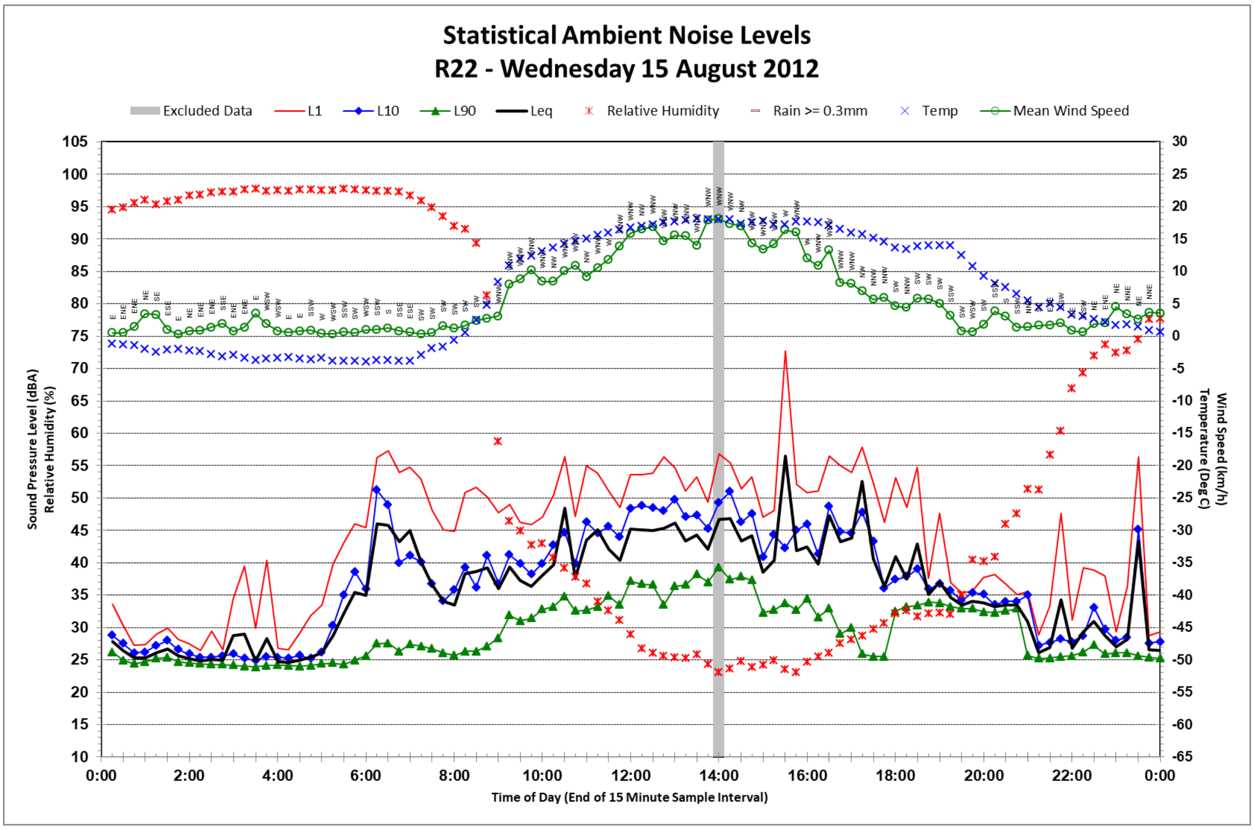

Statistical Ambient Noise Levels
R22 - Friday 10 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

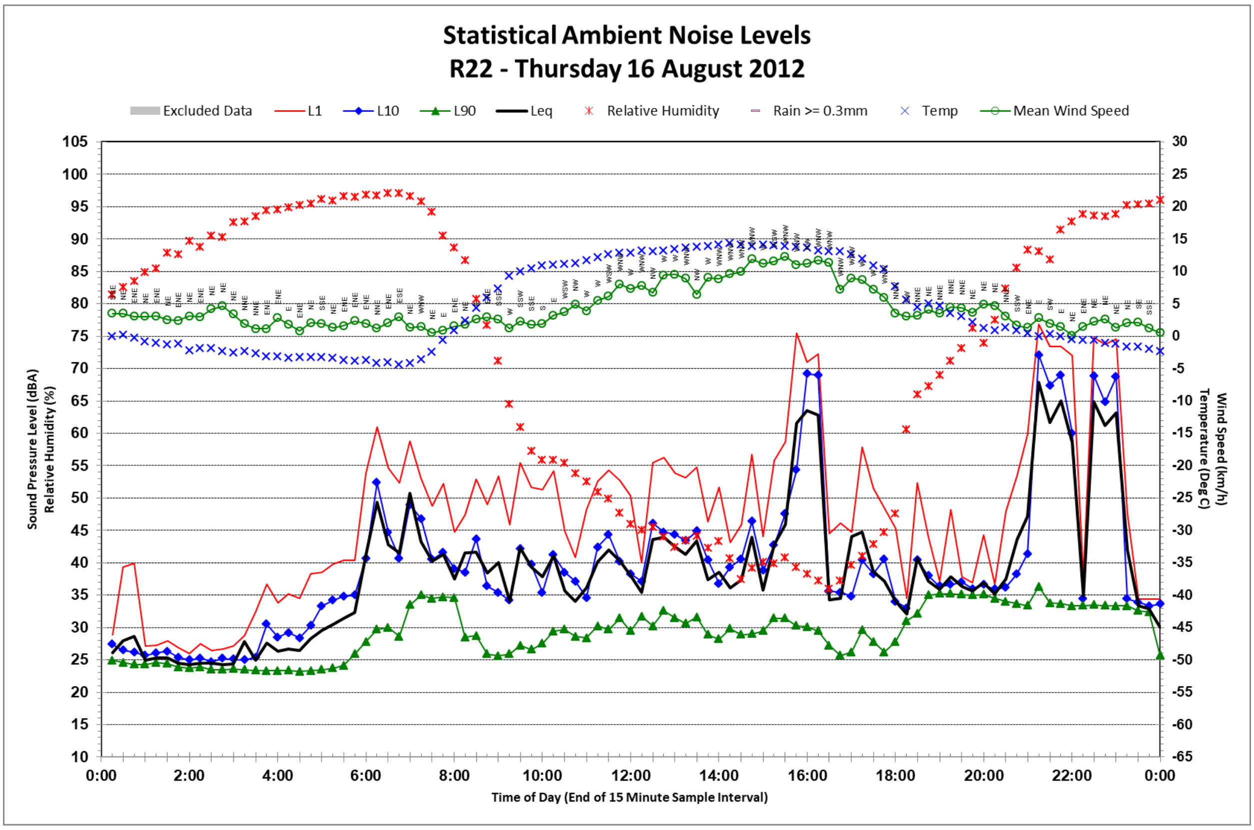

Statistical Ambient Noise Levels
R22 - Saturday 11 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

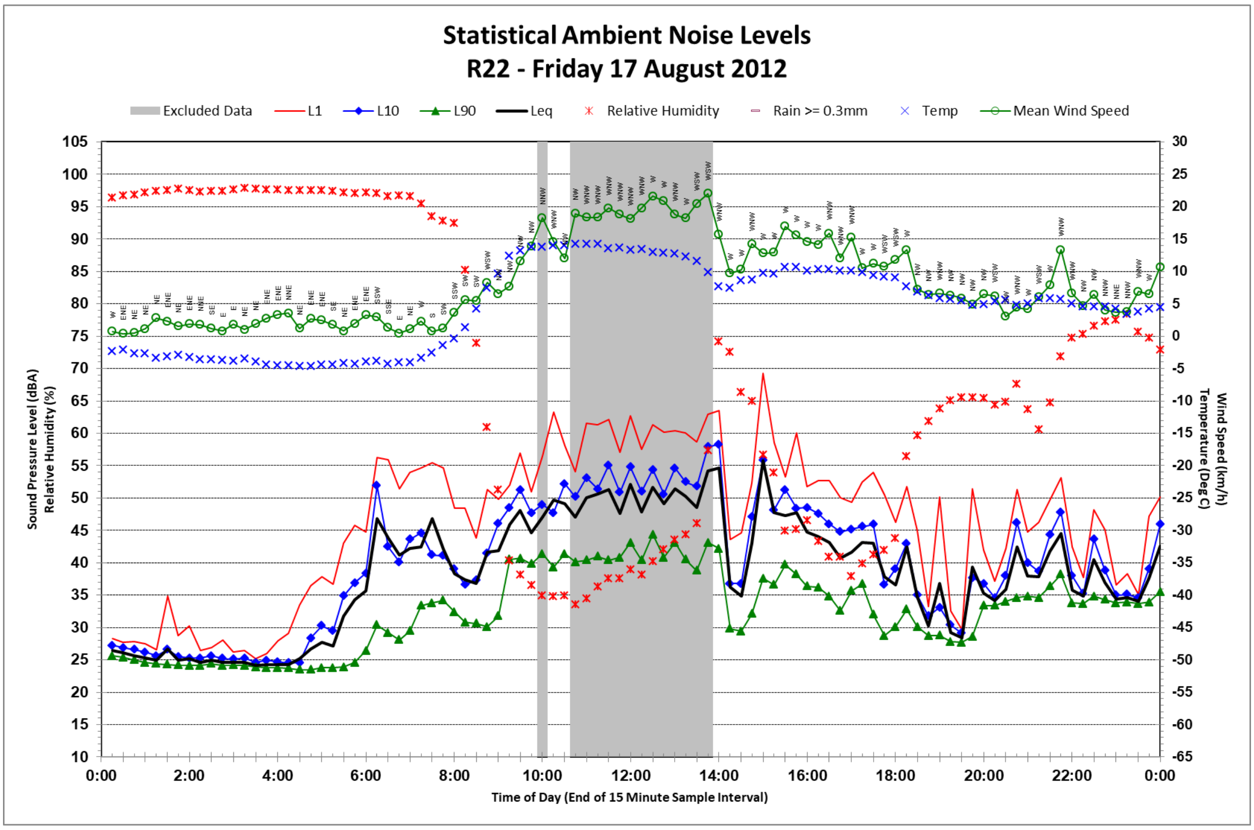

Statistical Ambient Noise Levels
R22 - Sunday 12 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

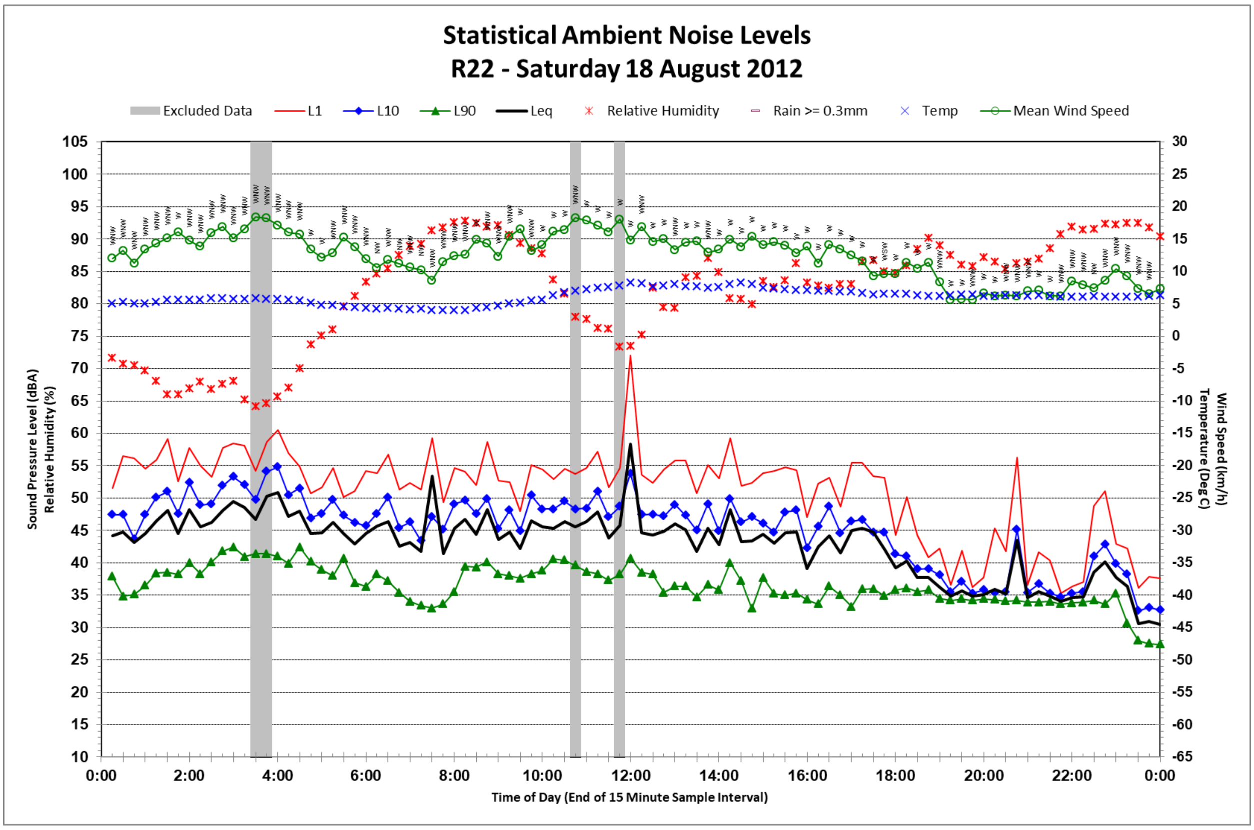

Statistical Ambient Noise Levels
R22 - Monday 13 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

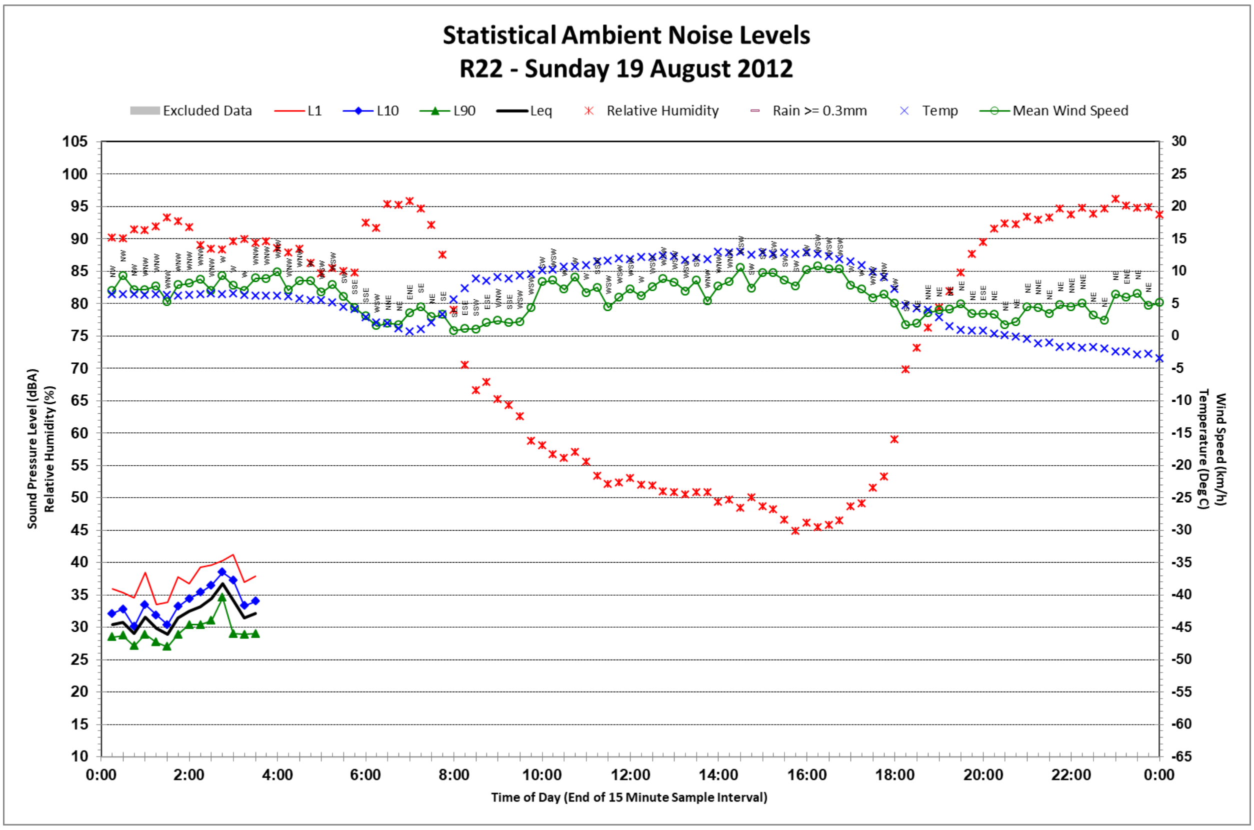

Statistical Ambient Noise Levels
R22 - Tuesday 14 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

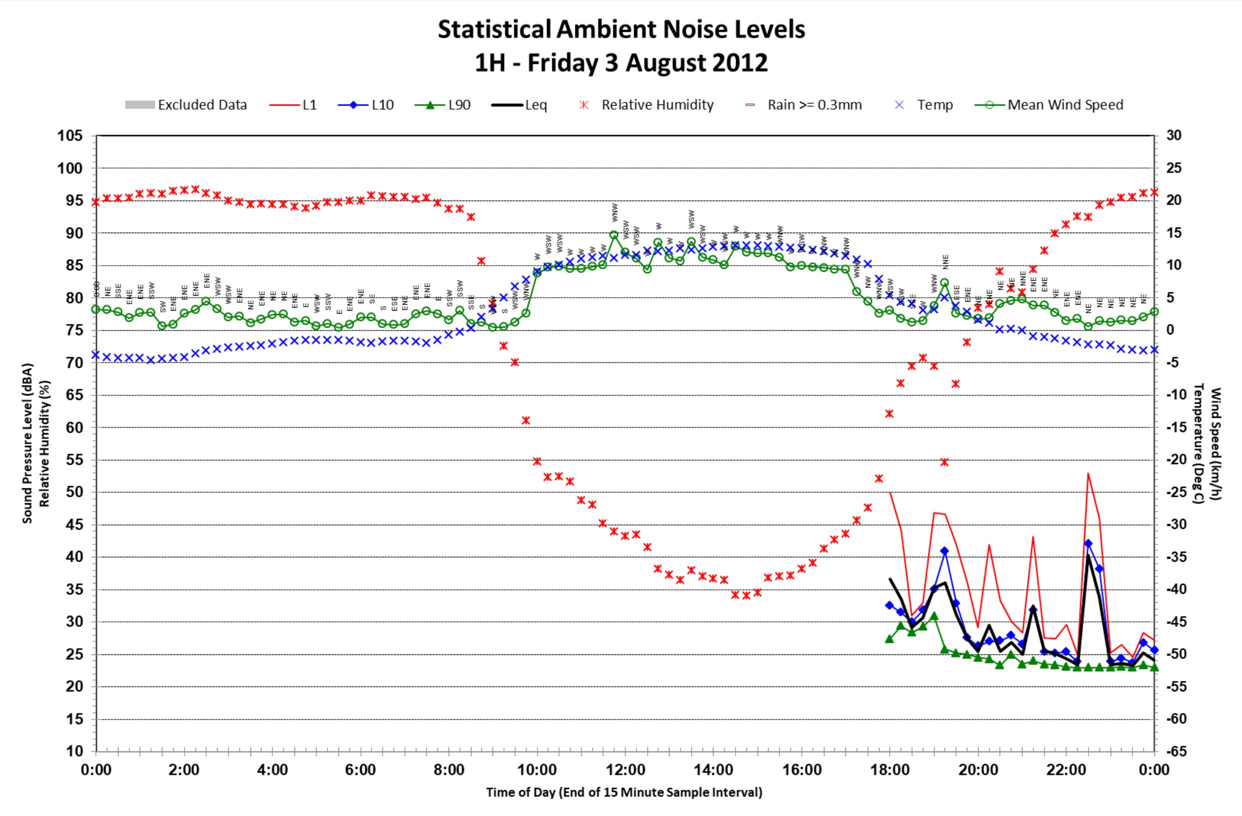

Statistical Ambient Noise Levels
R22 - Wednesday 15 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

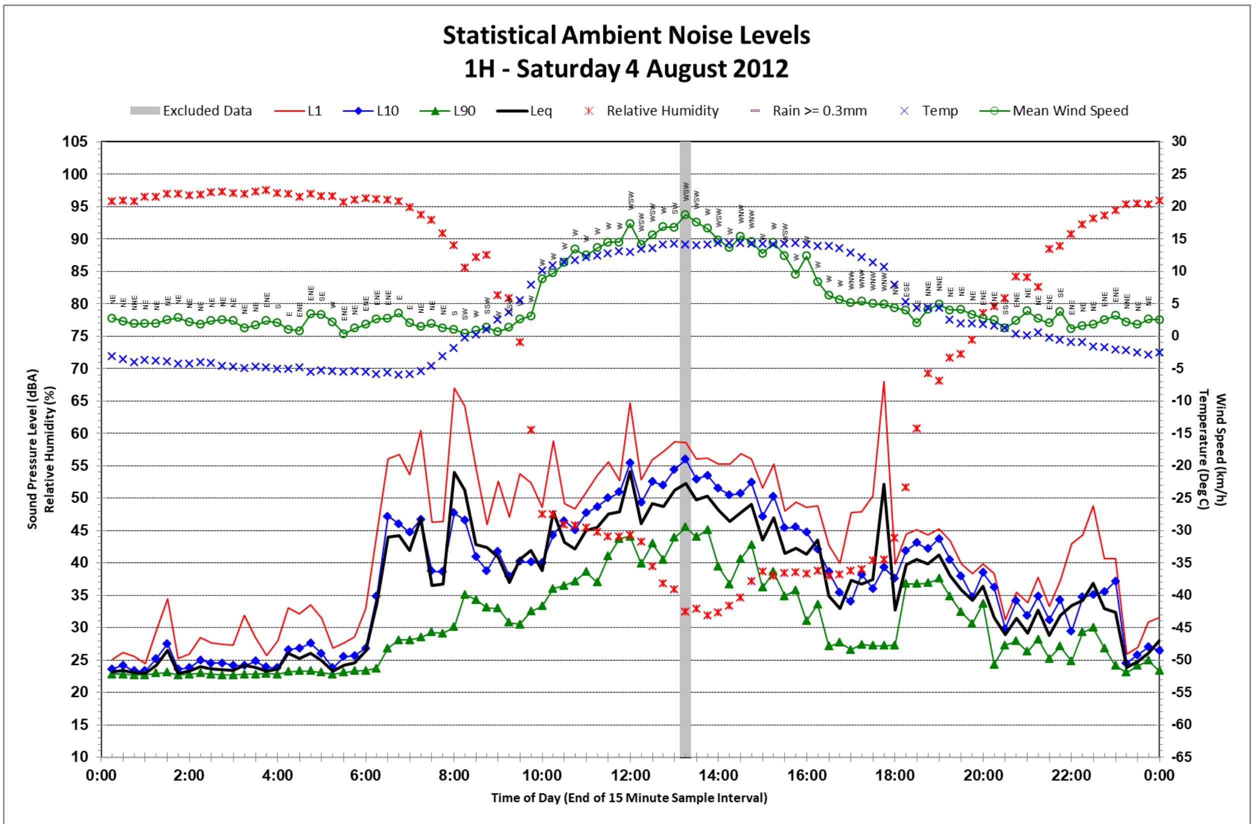

Statistical Ambient Noise Levels
R22 - Thursday 16 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

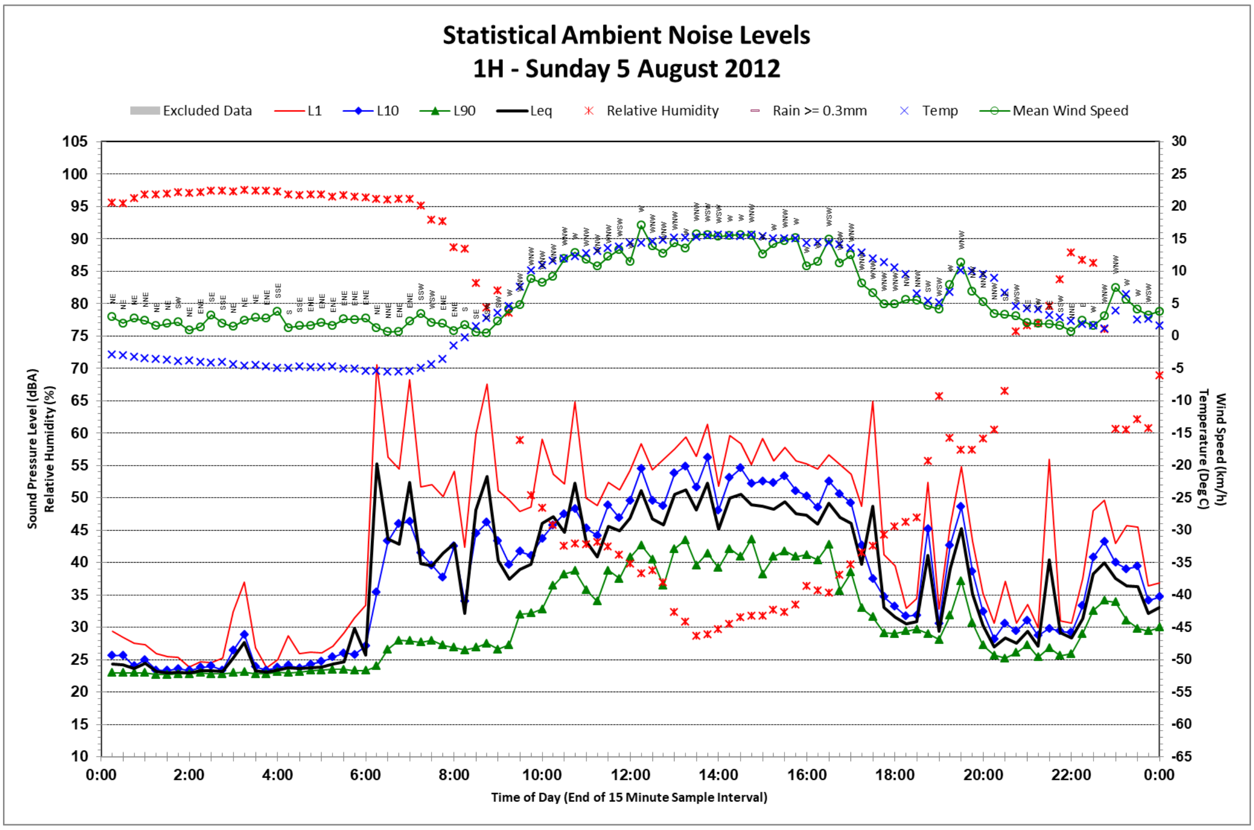

Statistical Ambient Noise Levels
R22 - Friday 17 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

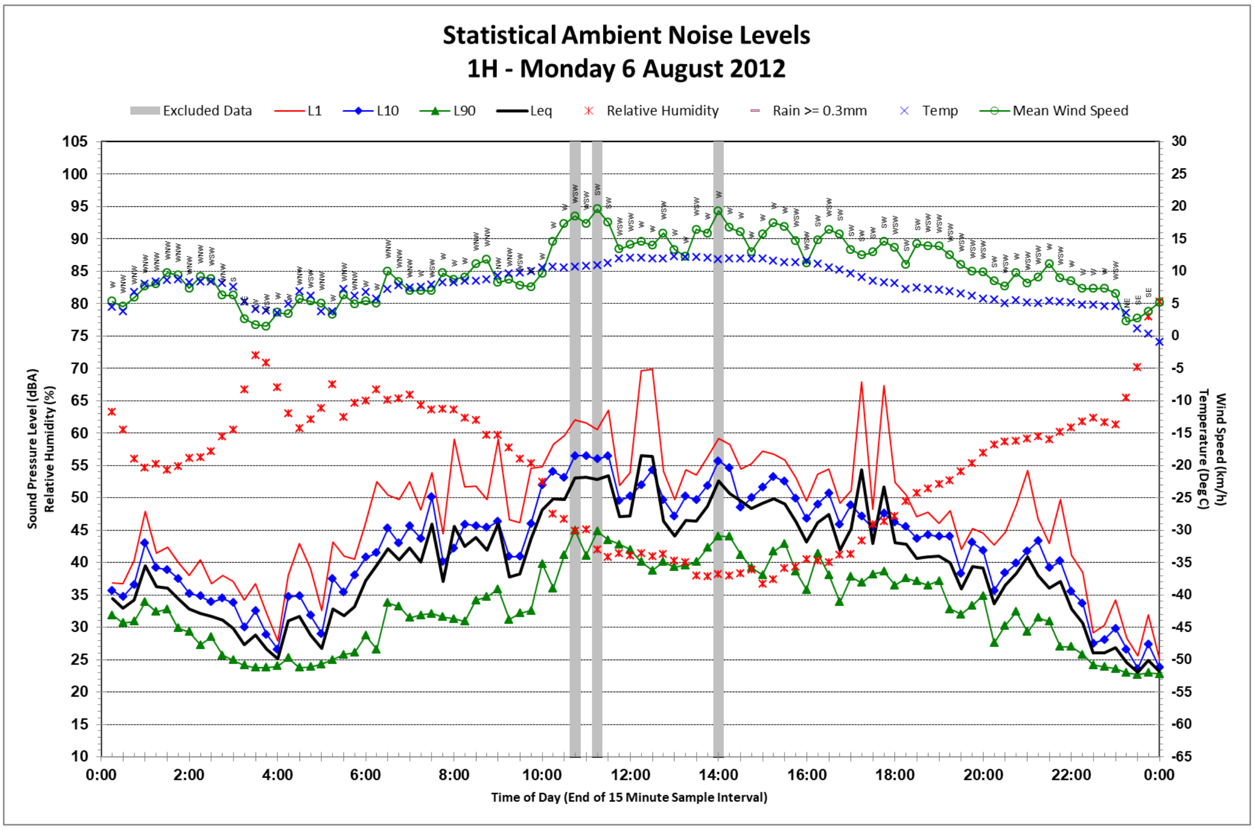

Statistical Ambient Noise Levels
R22 - Saturday 18 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

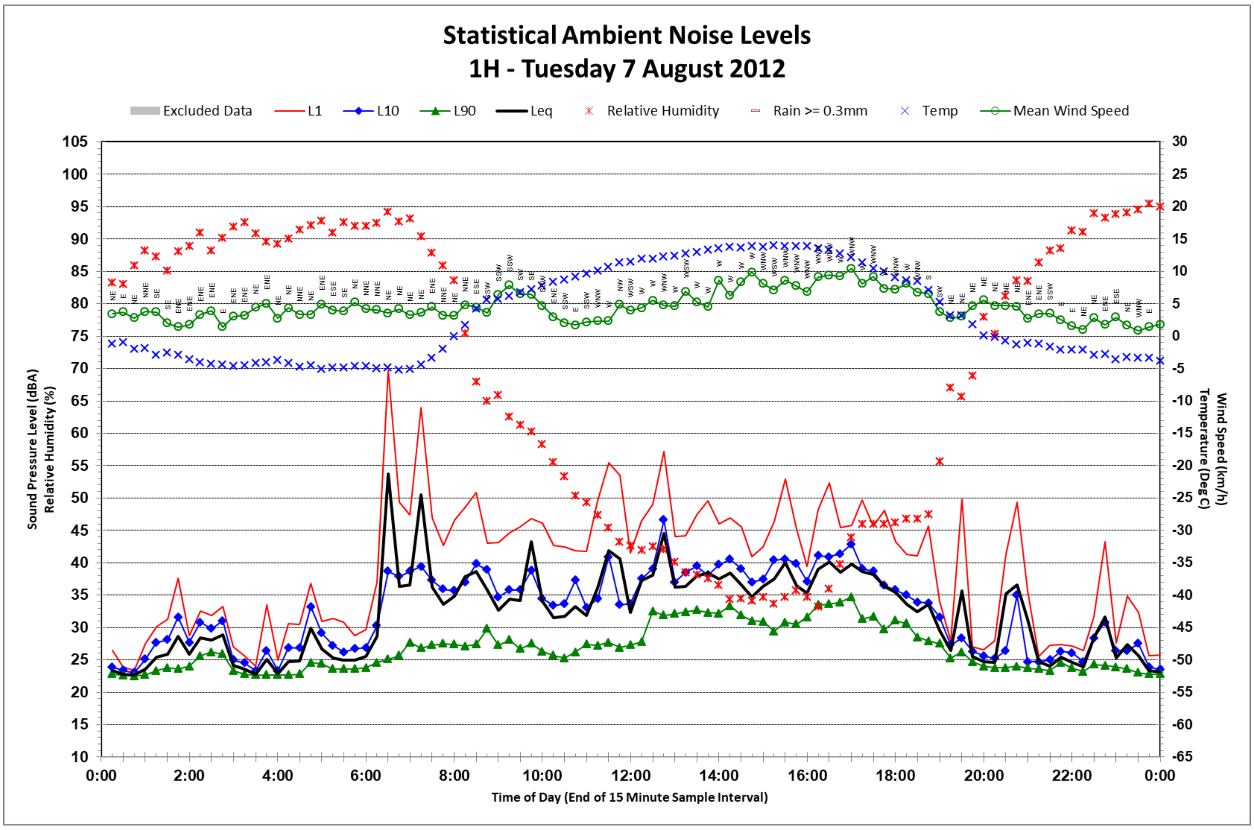

Statistical Ambient Noise Levels
R22 - Sunday 19 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

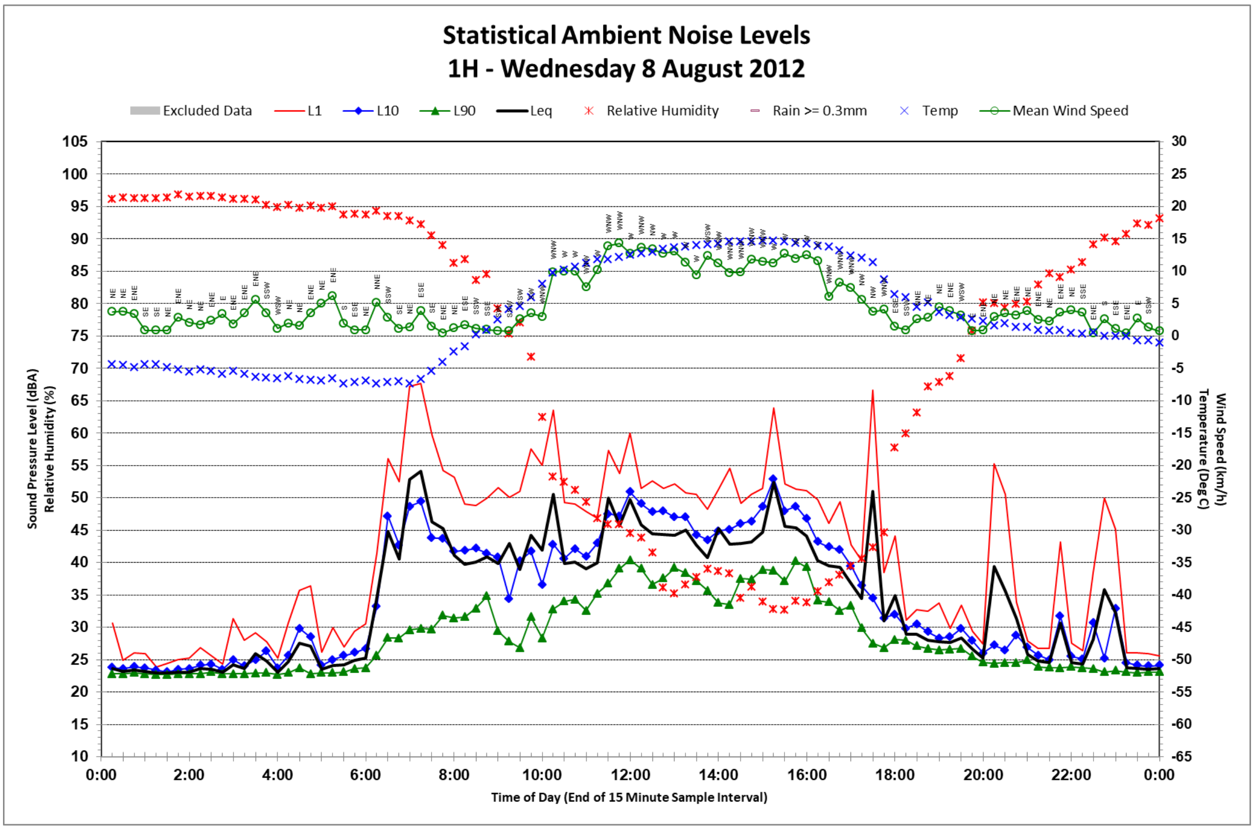

Statistical Ambient Noise Levels
1H - Friday 3 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

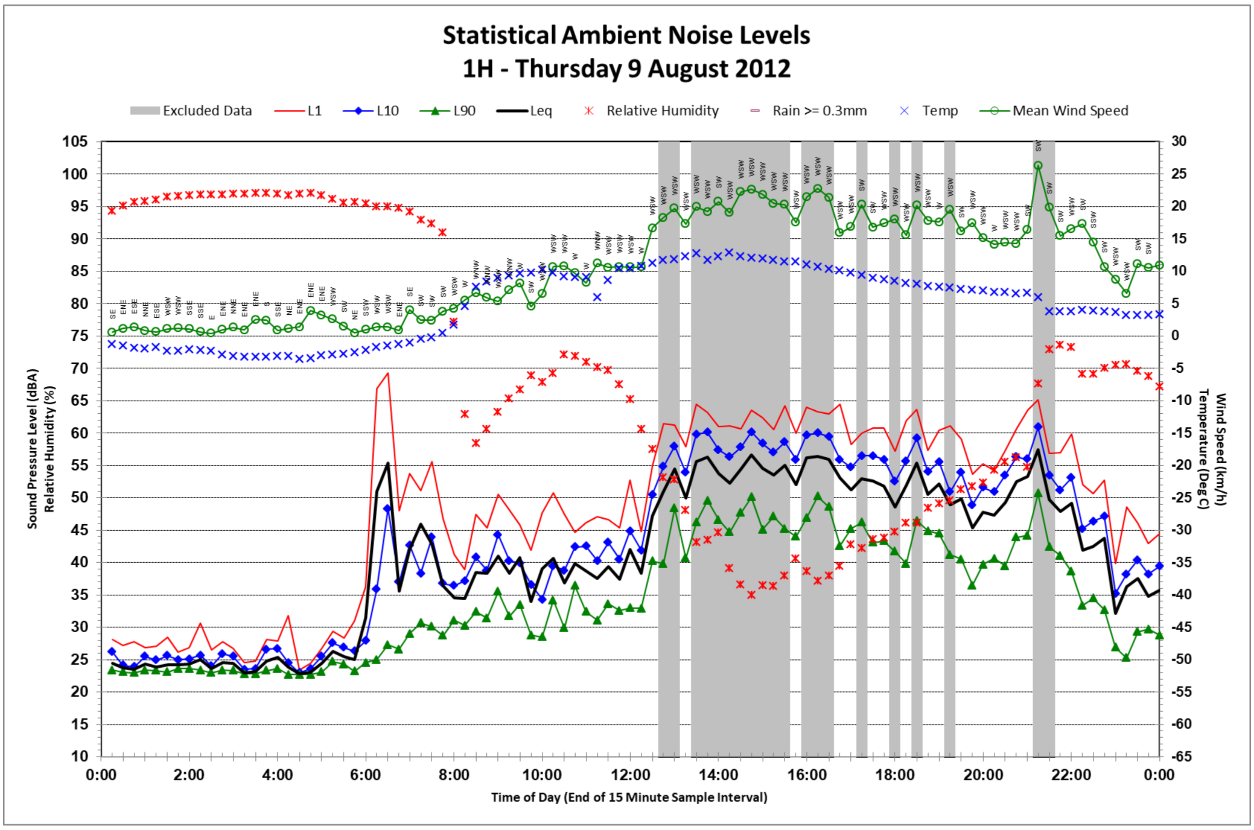

Statistical Ambient Noise Levels
1H - Saturday 4 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

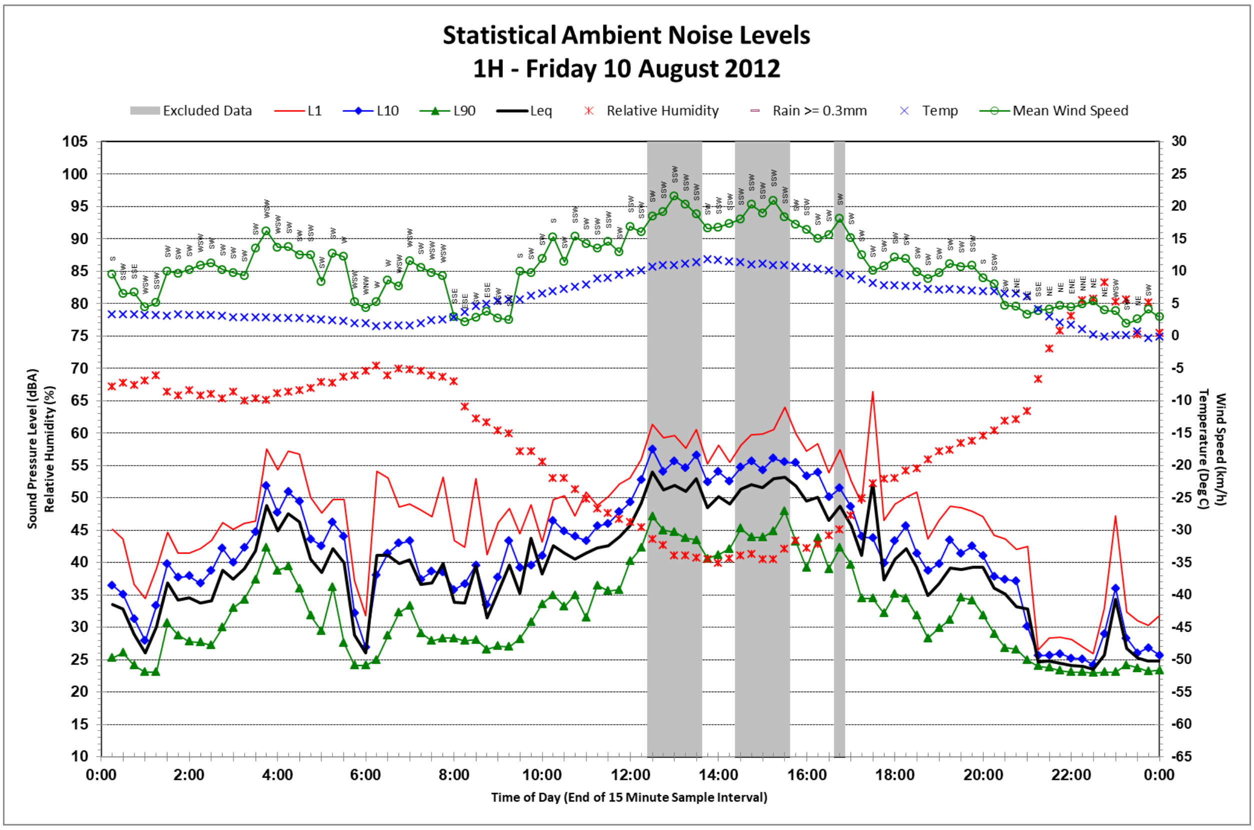

Statistical Ambient Noise Levels
1H - Sunday 5 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

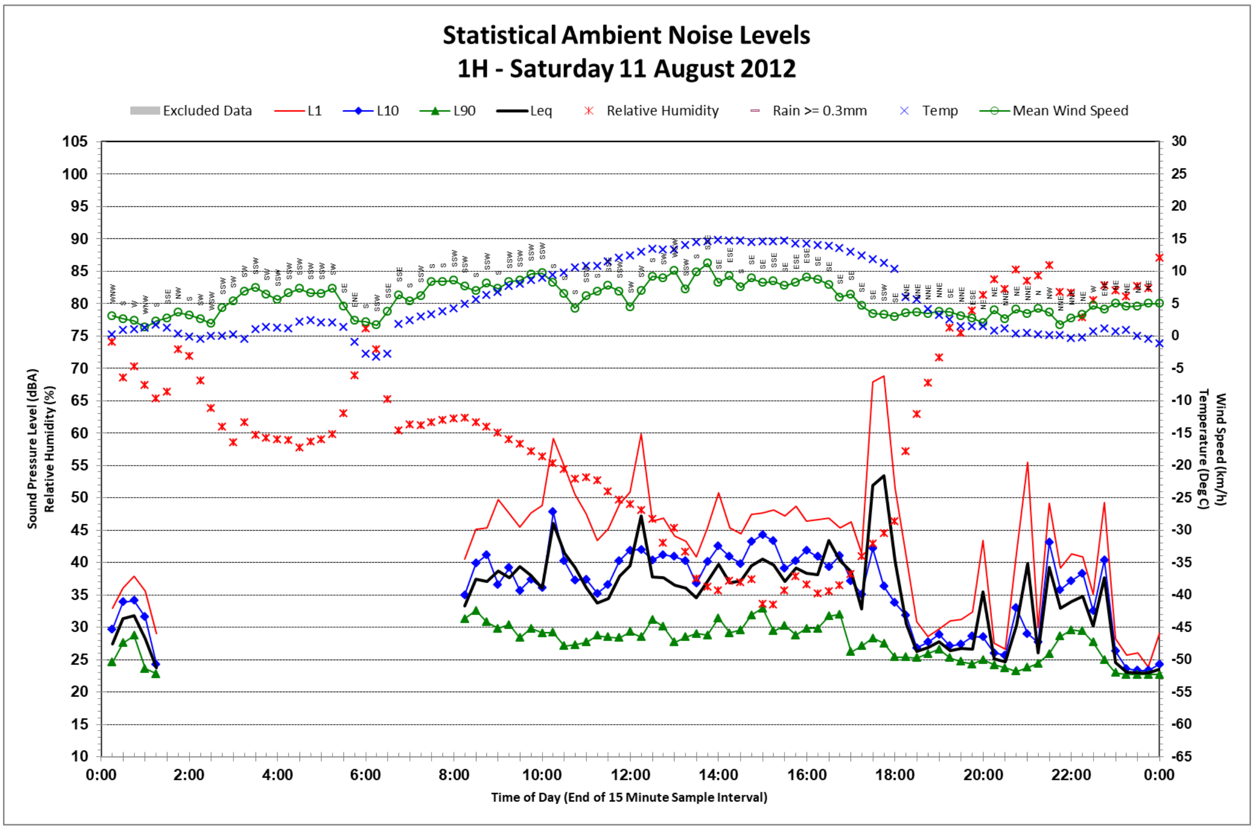

Statistical Ambient Noise Levels
1H - Monday 6 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

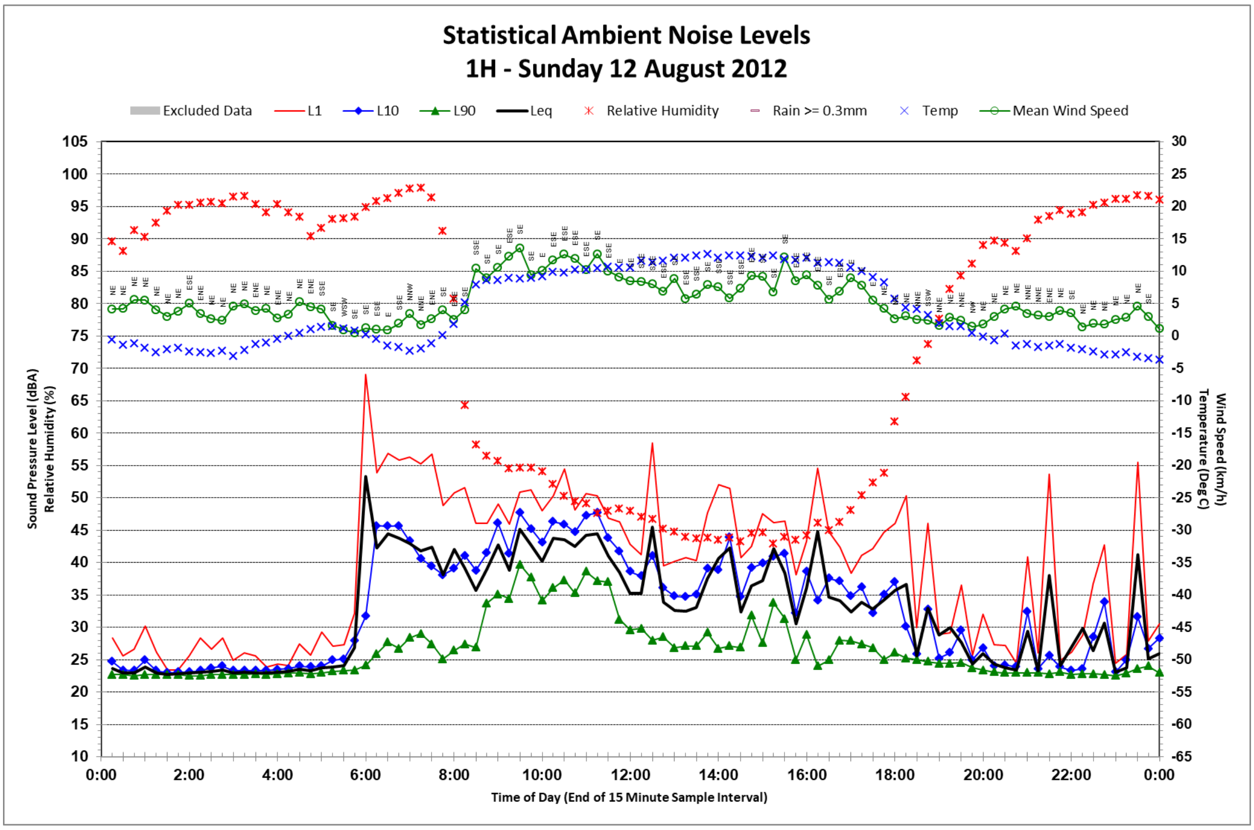

Statistical Ambient Noise Levels
1H - Tuesday 7 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

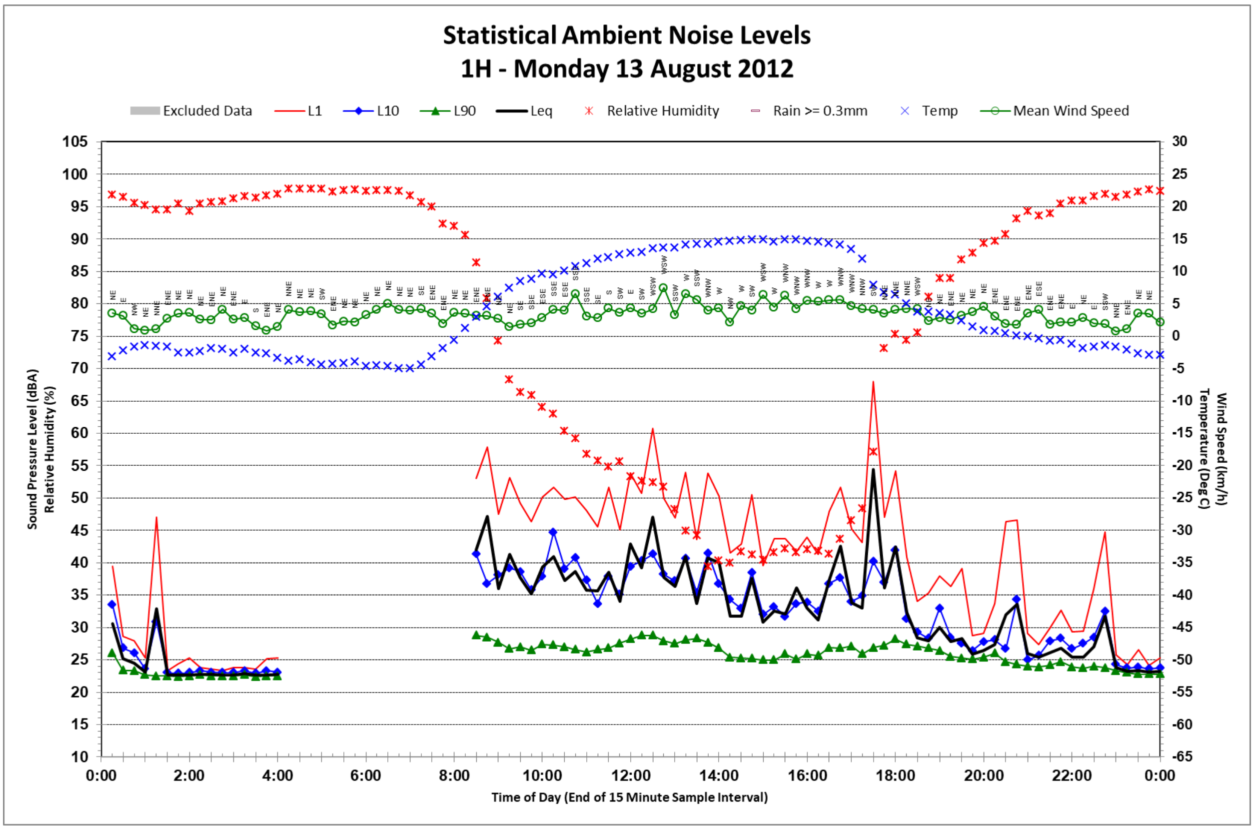

Statistical Ambient Noise Levels
1H - Wednesday 8 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

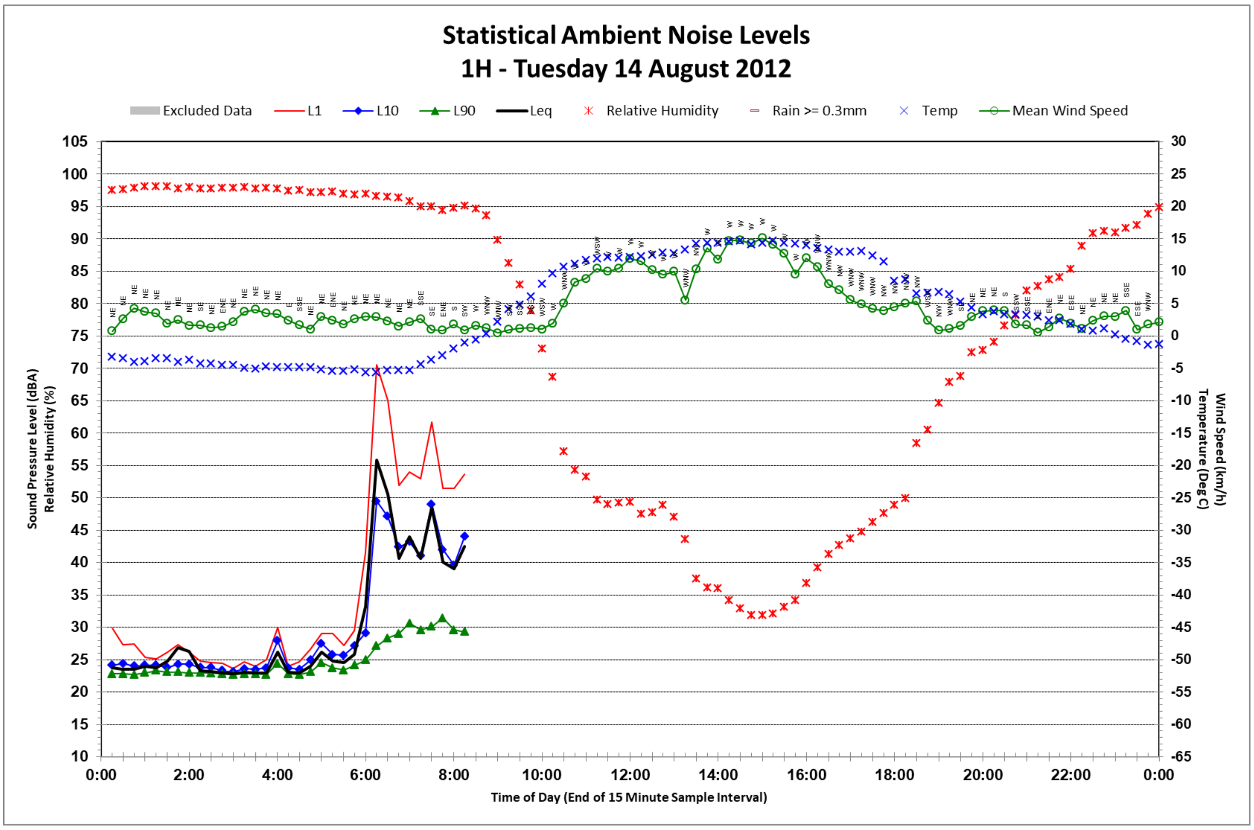

Statistical Ambient Noise Levels
1H - Thursday 9 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

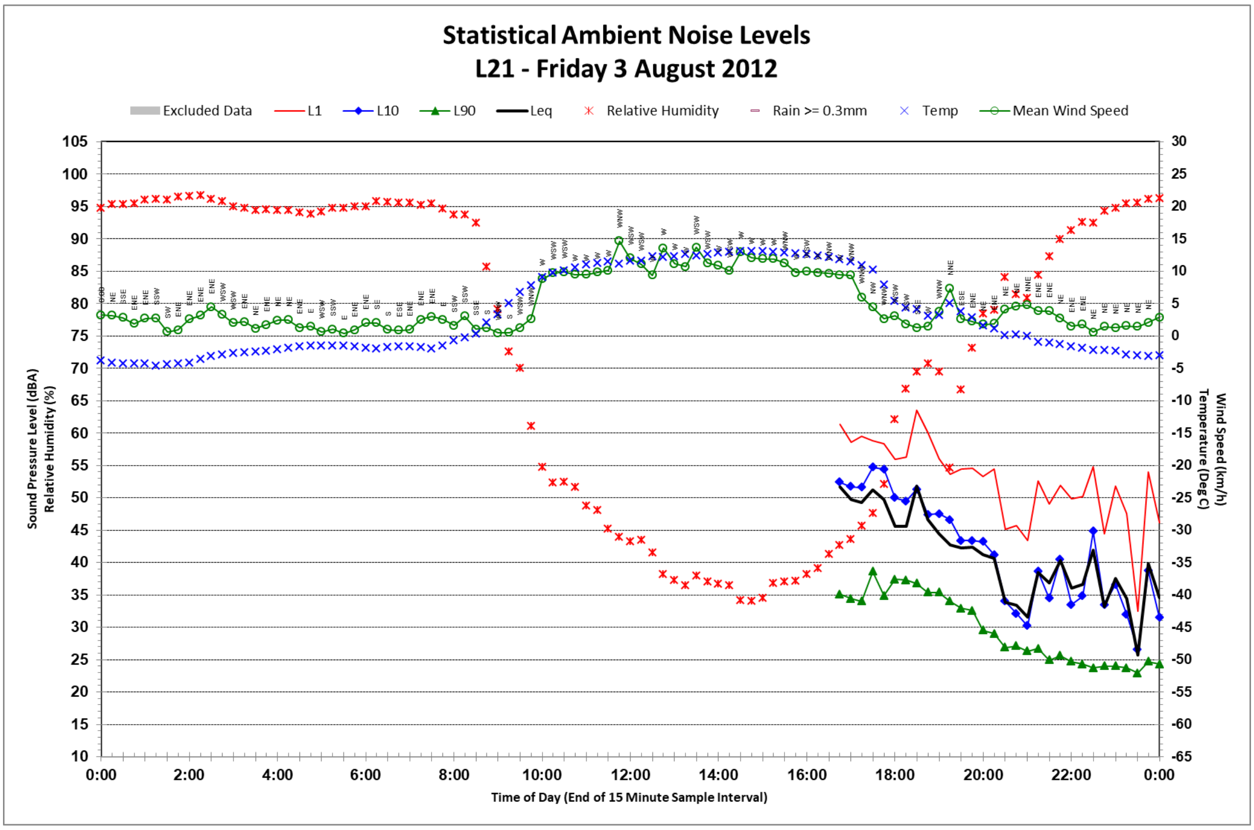

Statistical Ambient Noise Levels
1H - Friday 10 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

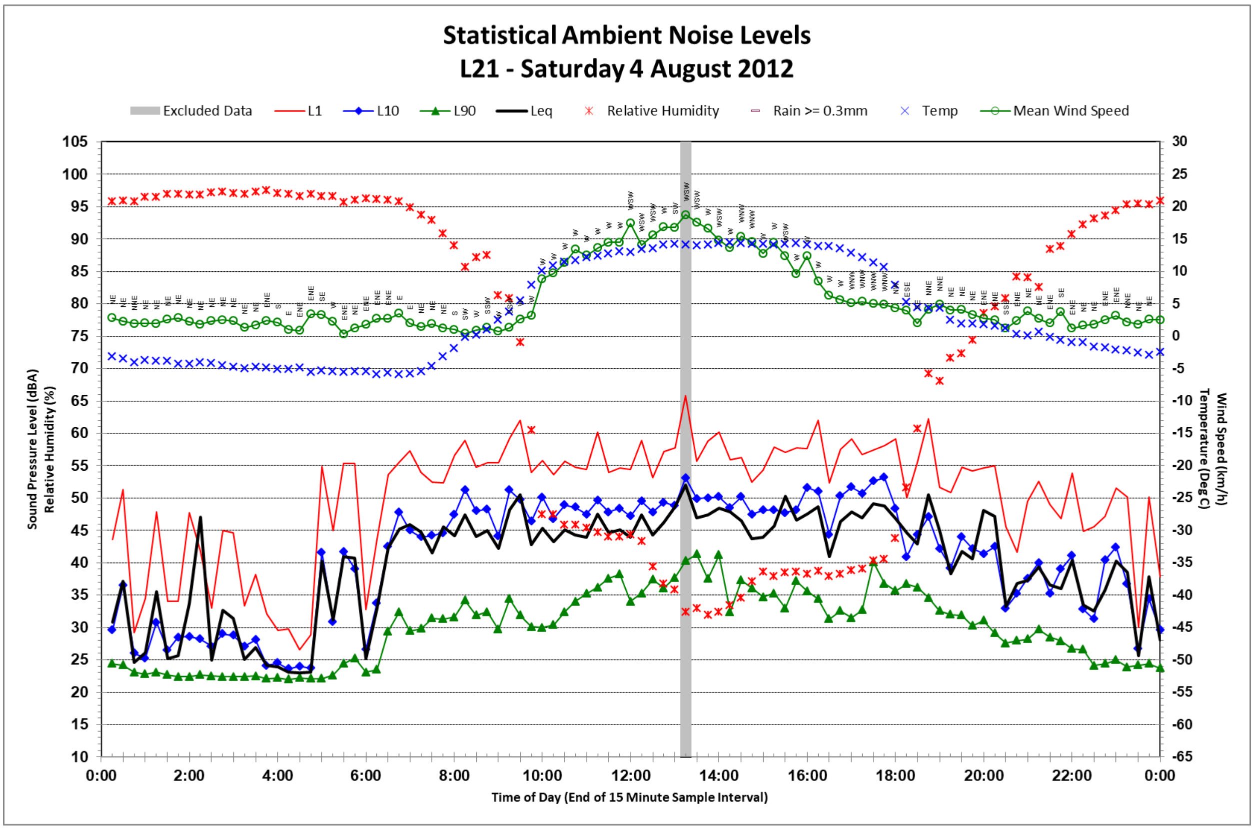

Statistical Ambient Noise Levels
1H - Saturday 11 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

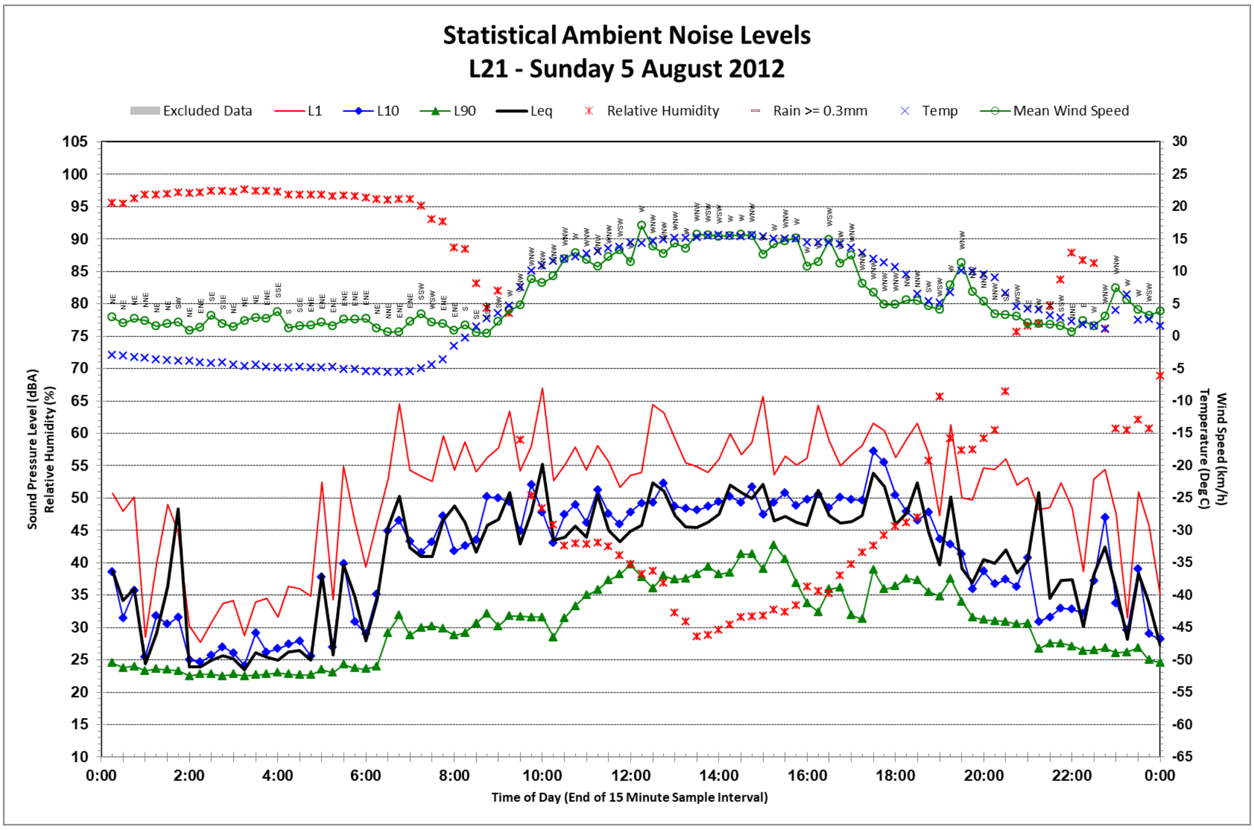

Statistical Ambient Noise Levels
1H - Sunday 12 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

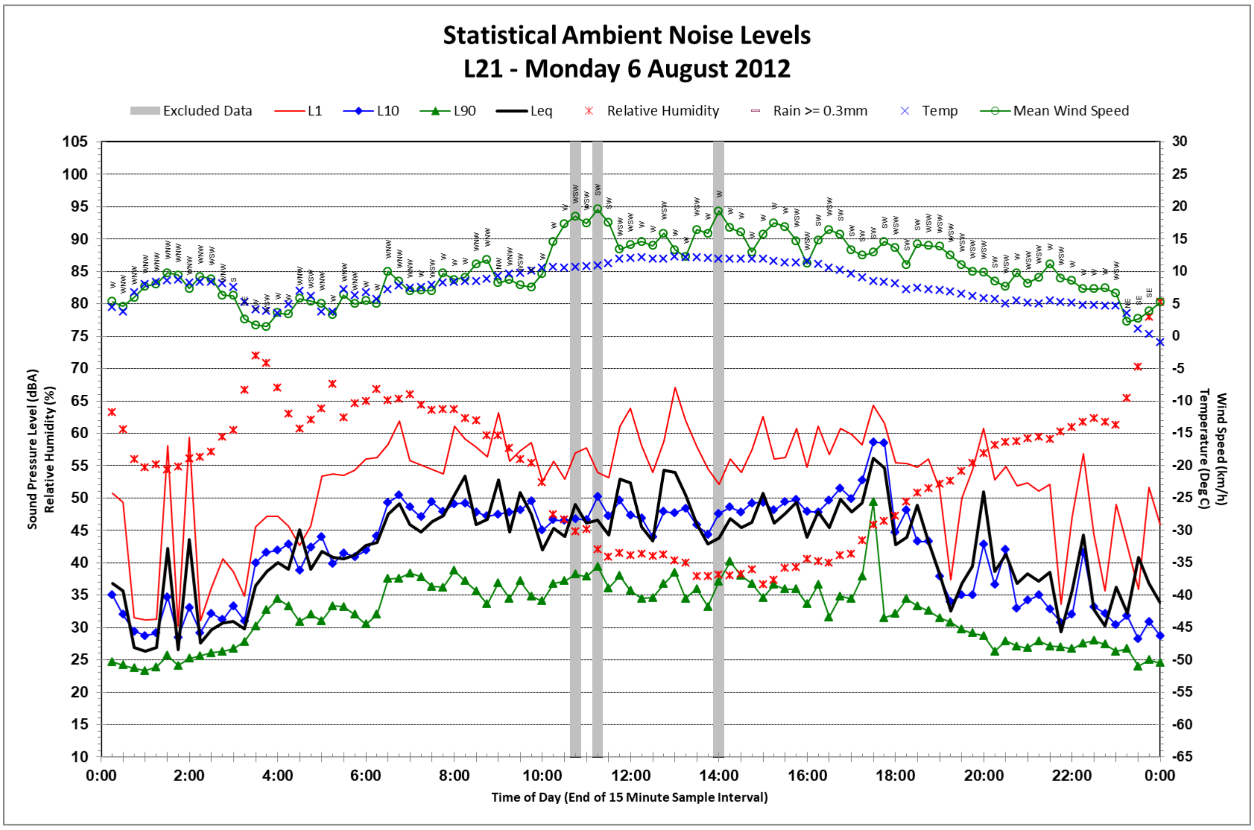

Statistical Ambient Noise Levels
1H - Monday 13 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

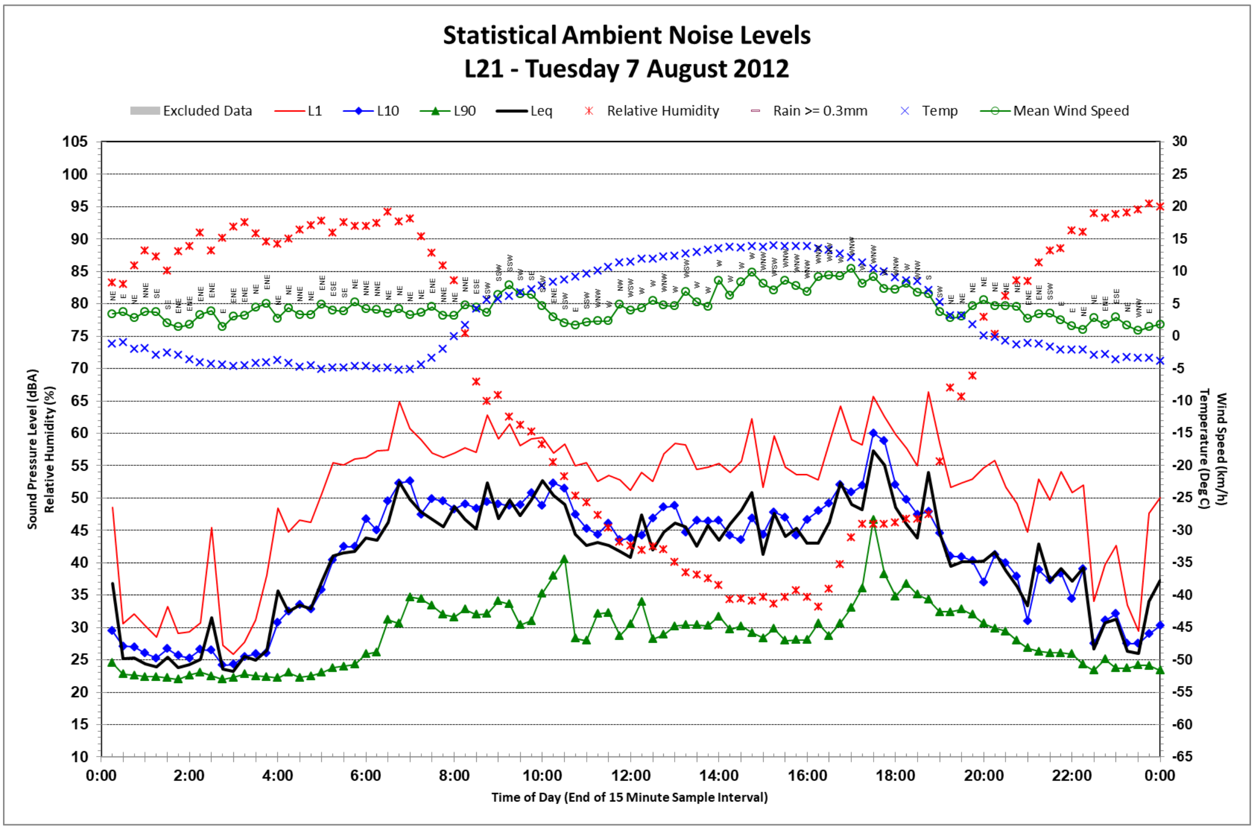

Statistical Ambient Noise Levels
1H - Tuesday 14 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

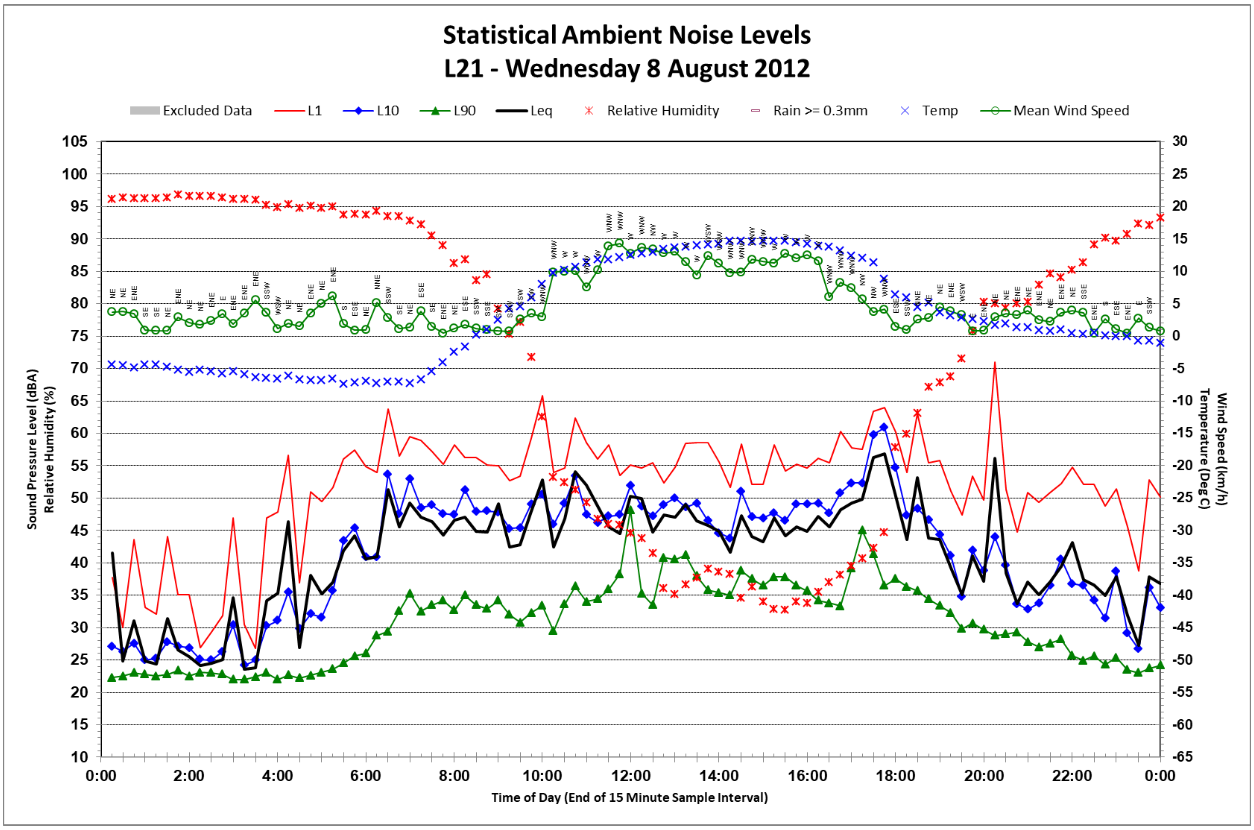

Statistical Ambient Noise Levels
L21 - Friday 3 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

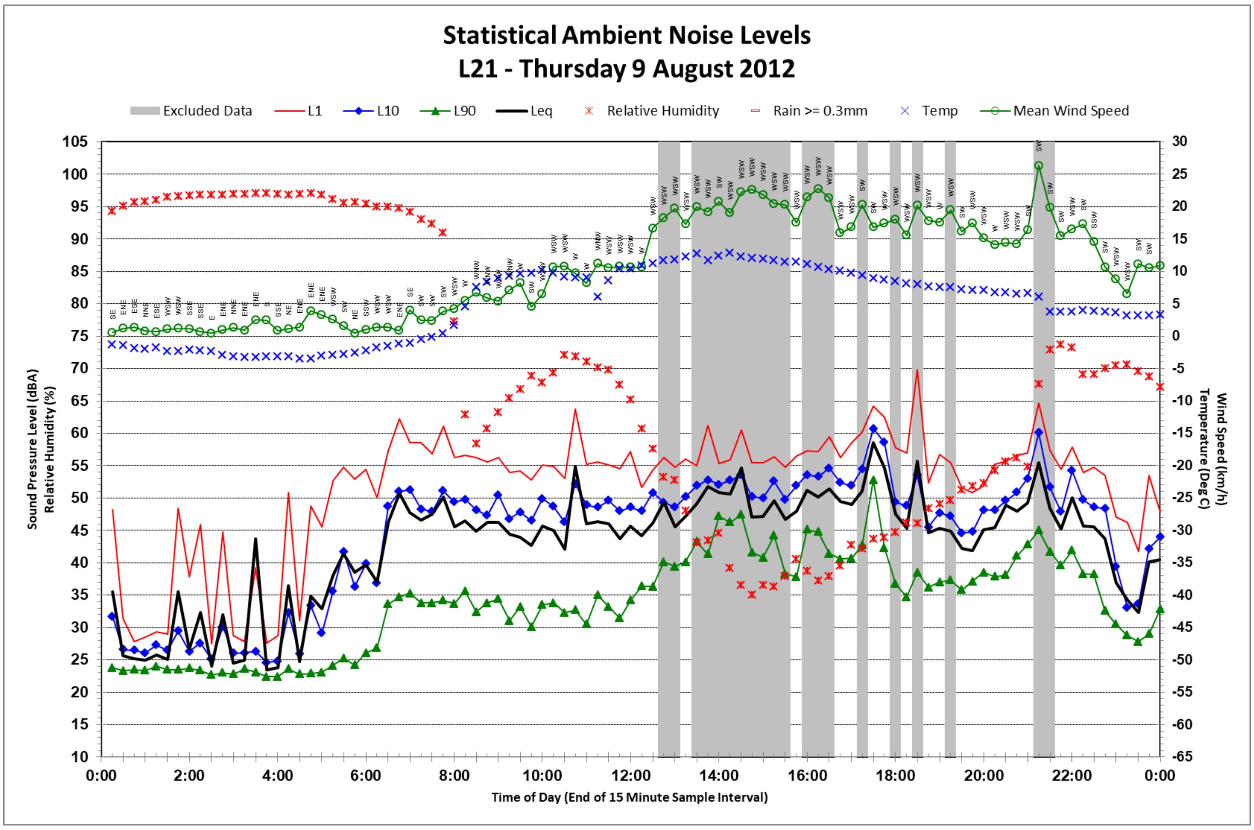

Statistical Ambient Noise Levels
L21 - Saturday 4 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

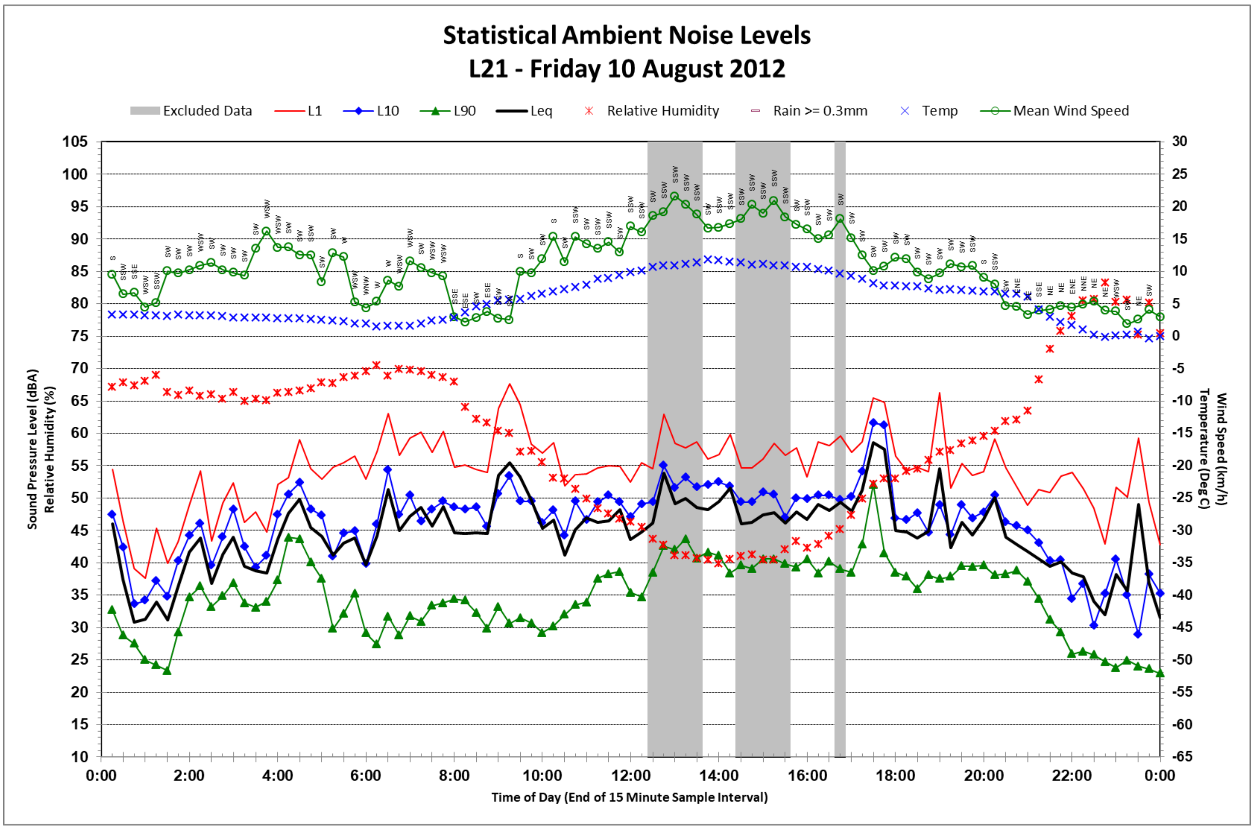

Statistical Ambient Noise Levels
L21 - Sunday 5 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

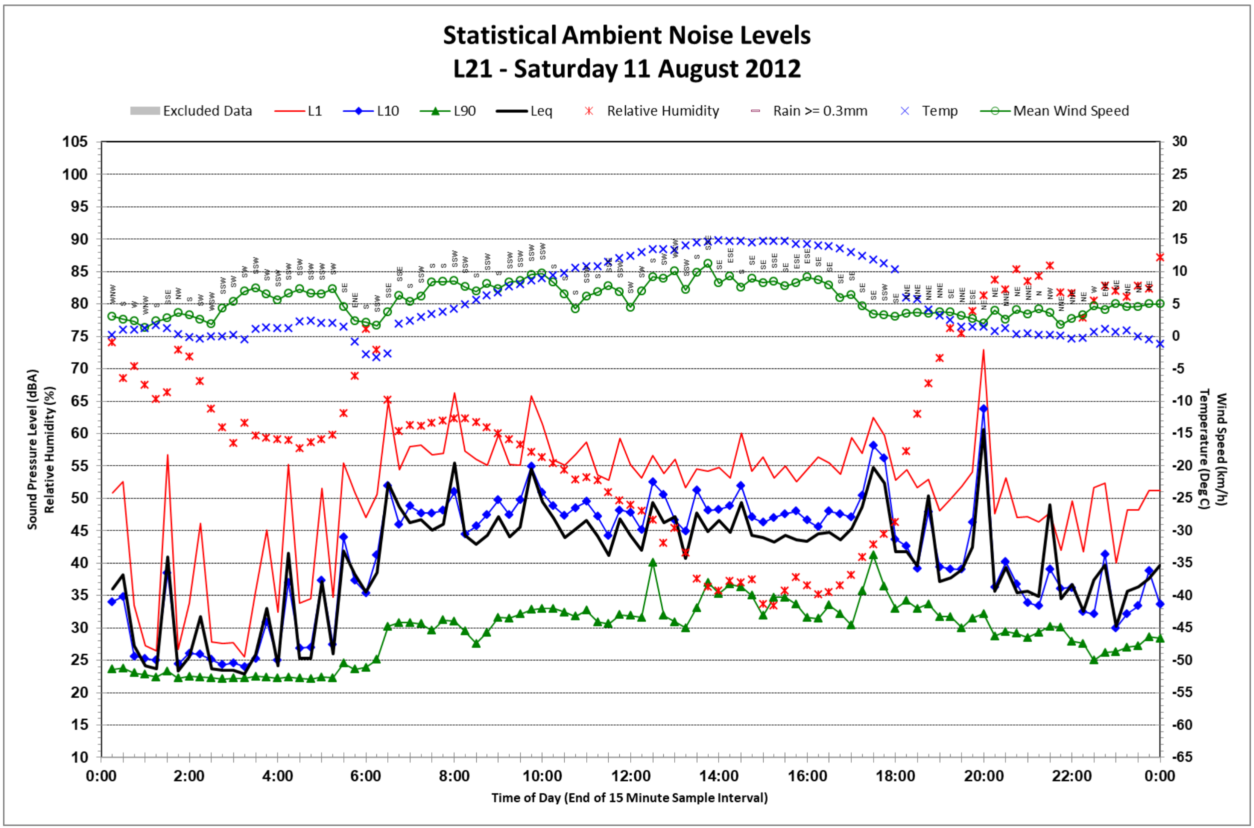

Statistical Ambient Noise Levels
L21 - Monday 6 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

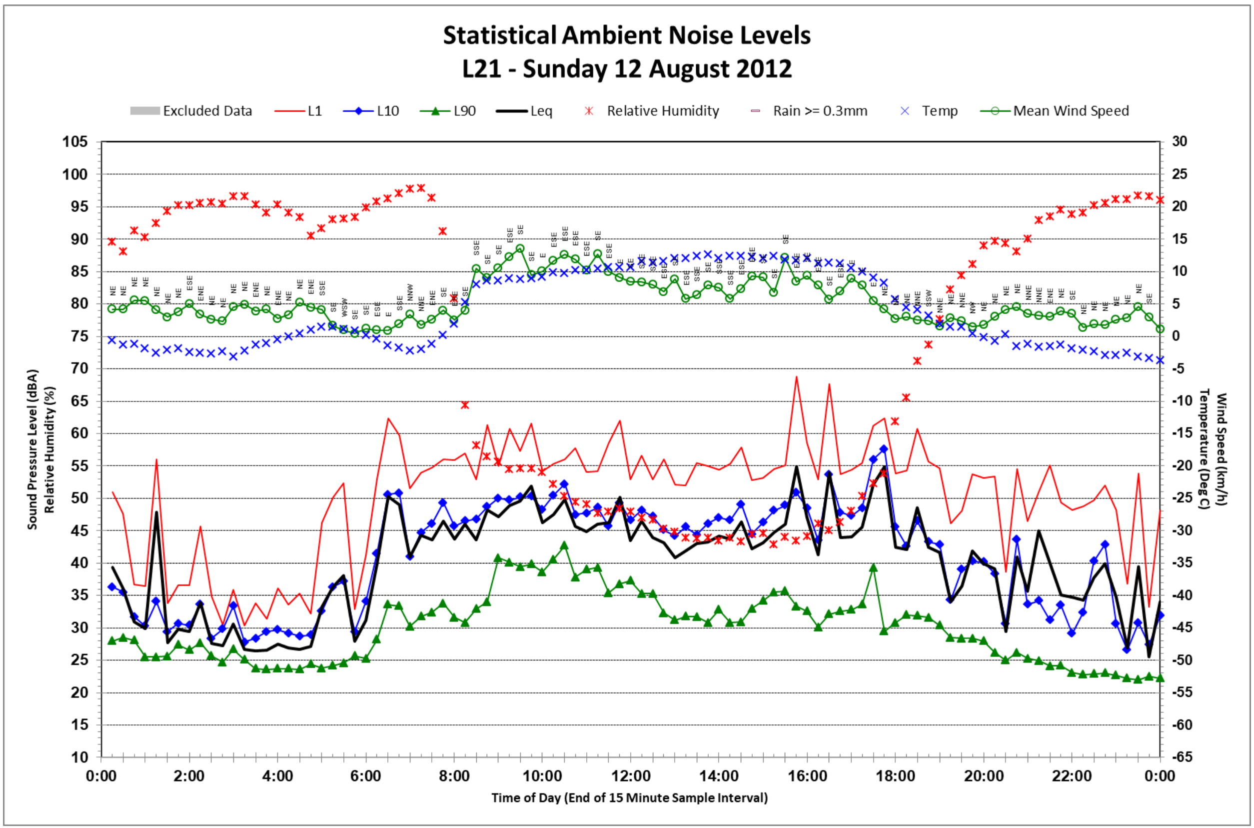

Statistical Ambient Noise Levels
L21 - Tuesday 7 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

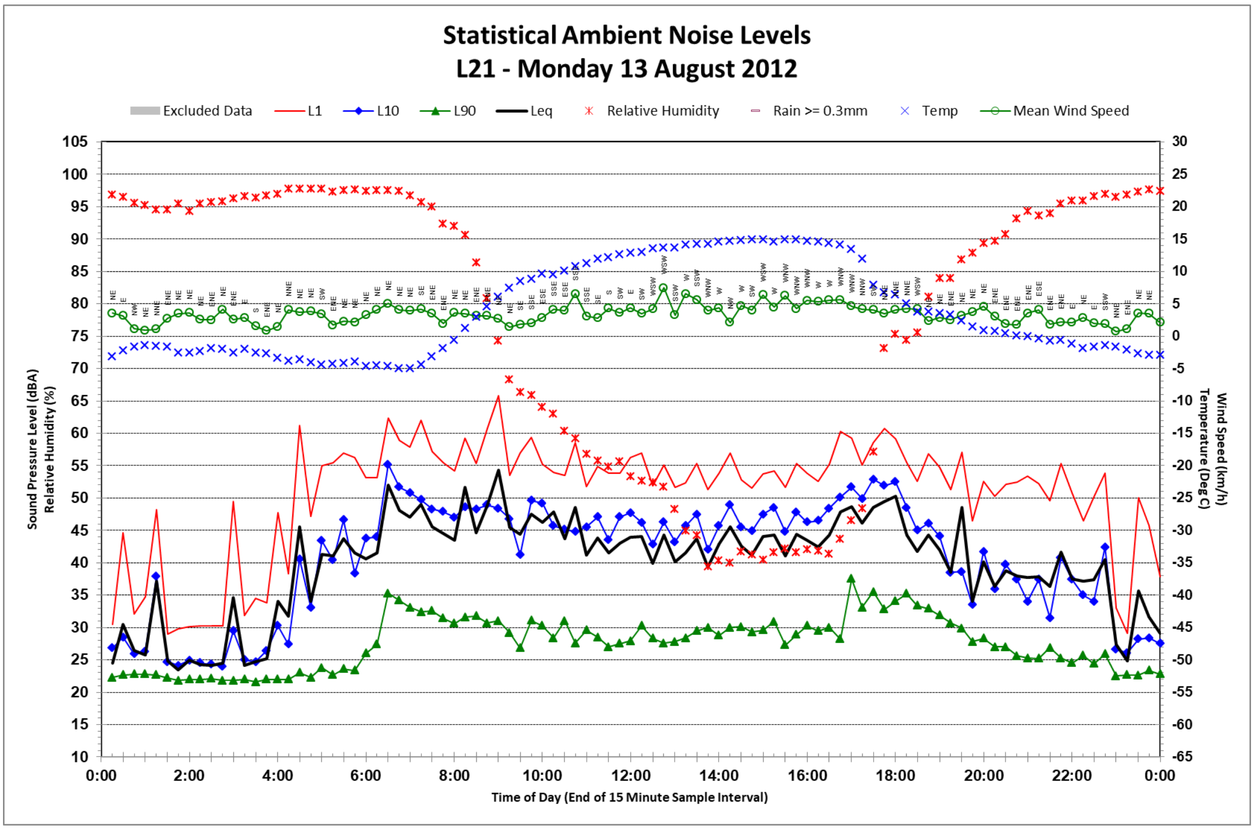

Statistical Ambient Noise Levels
L21 - Wednesday 8 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

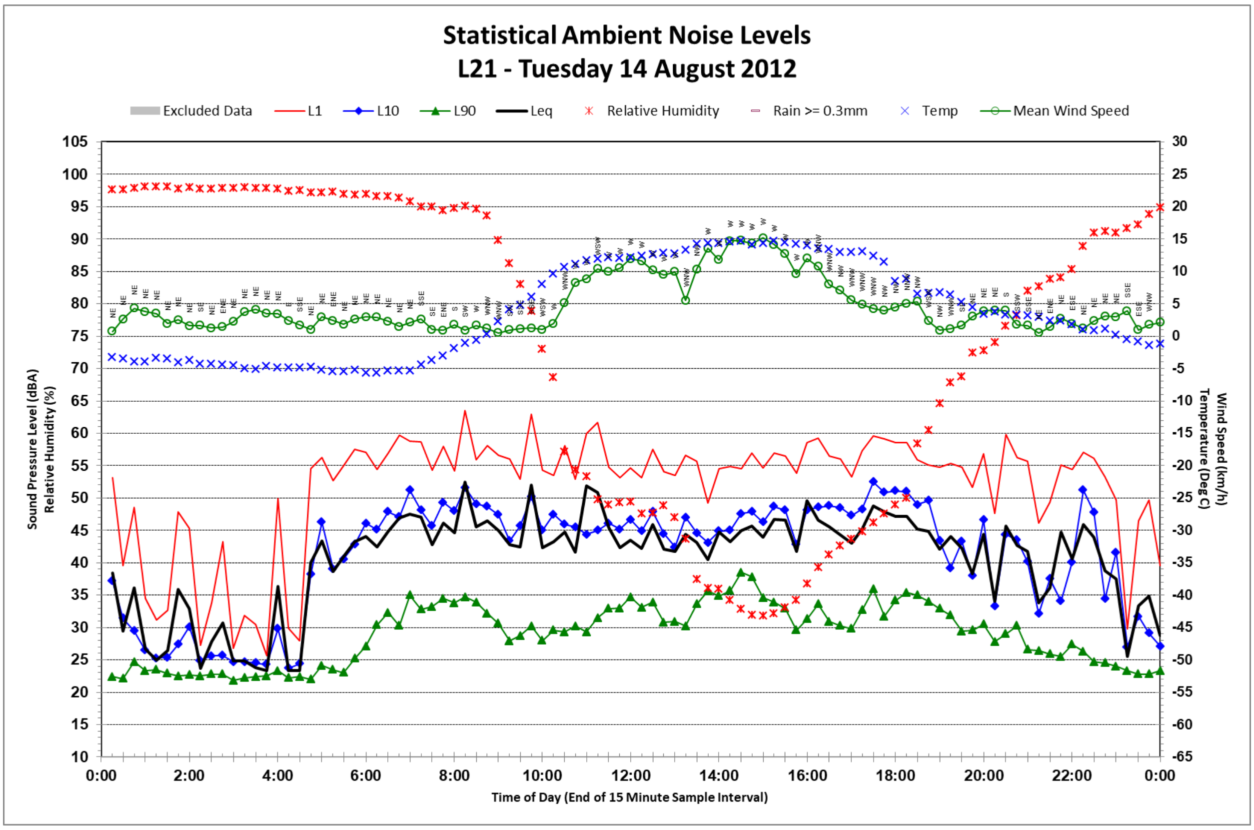

Statistical Ambient Noise Levels
L21 - Thursday 9 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

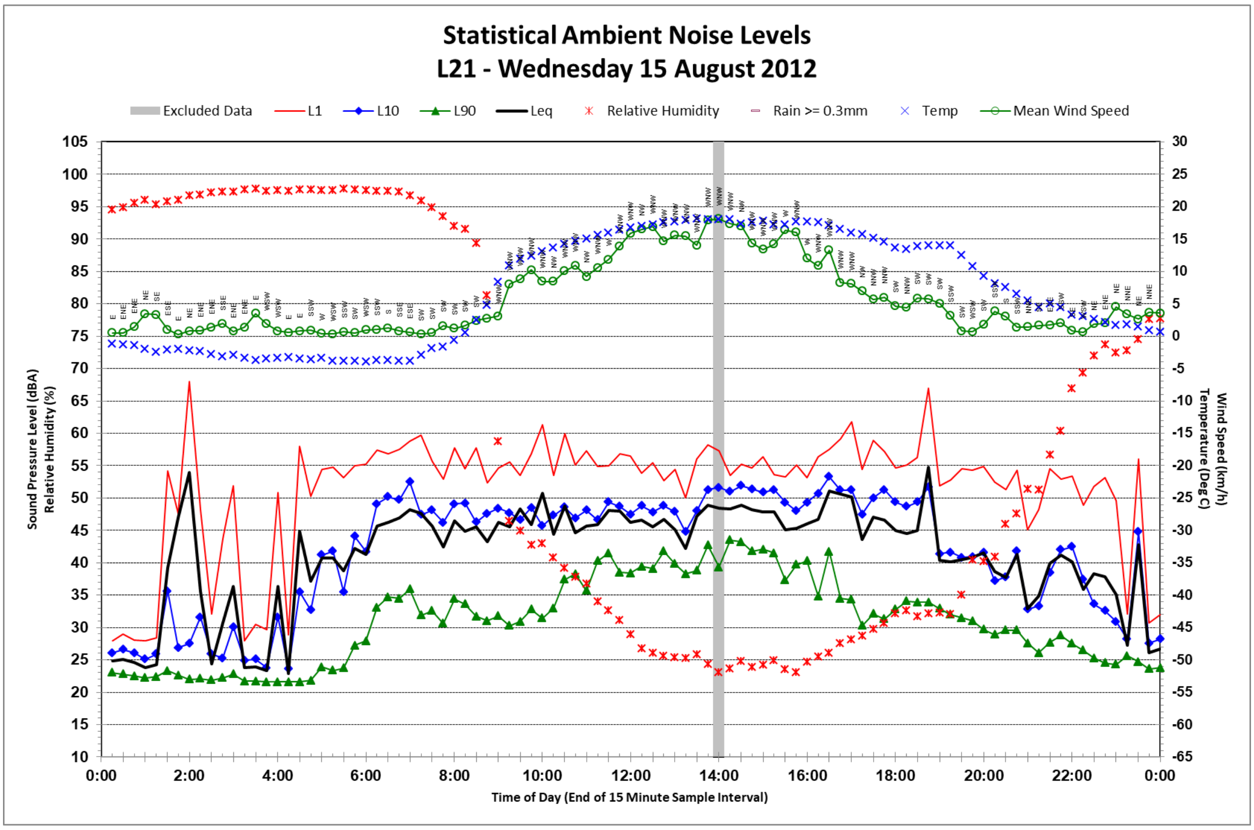

Statistical Ambient Noise Levels
L21 - Friday 10 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

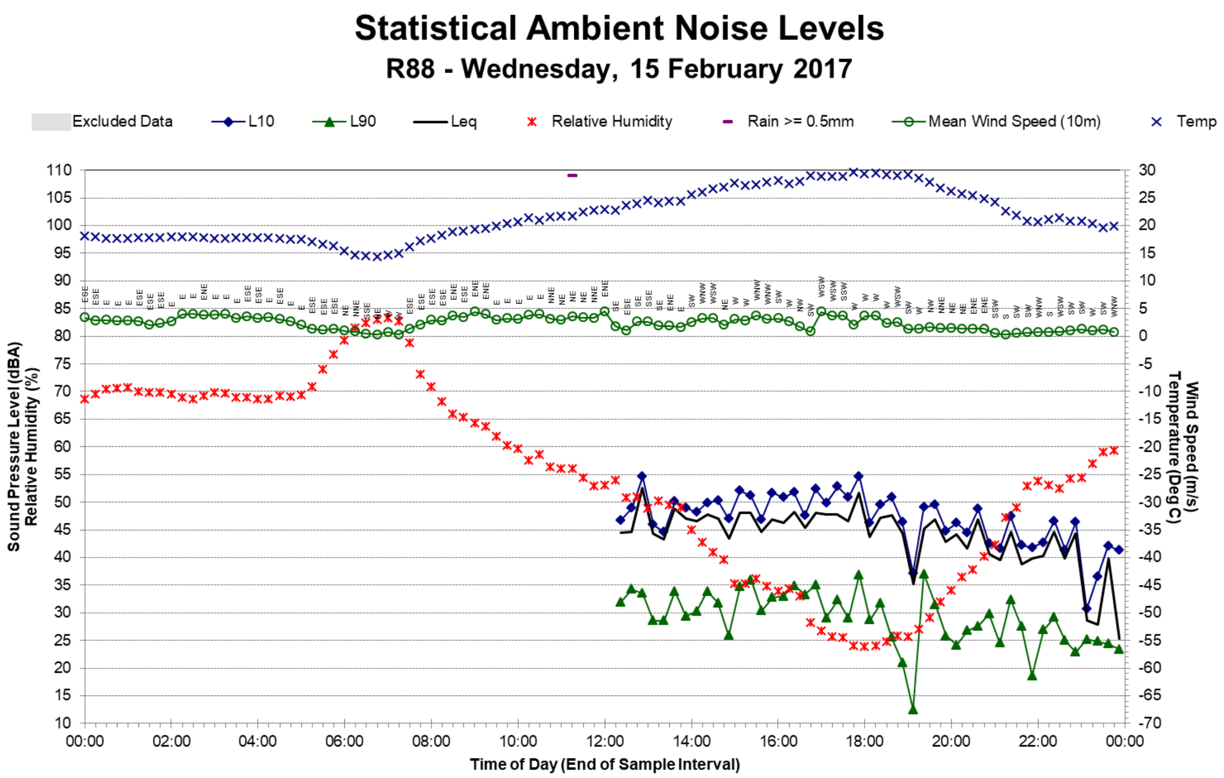

Statistical Ambient Noise Levels
L21 - Saturday 11 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

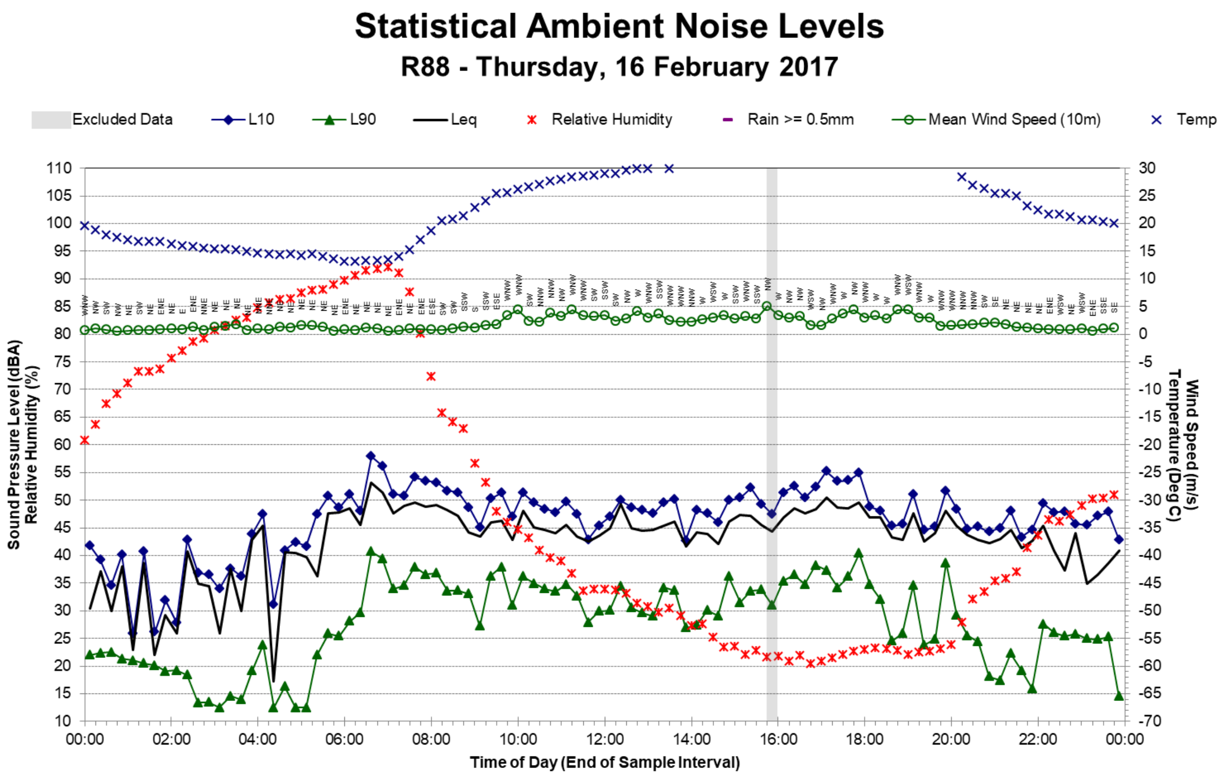

Statistical Ambient Noise Levels
L21 - Sunday 12 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
L21 - Monday 13 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

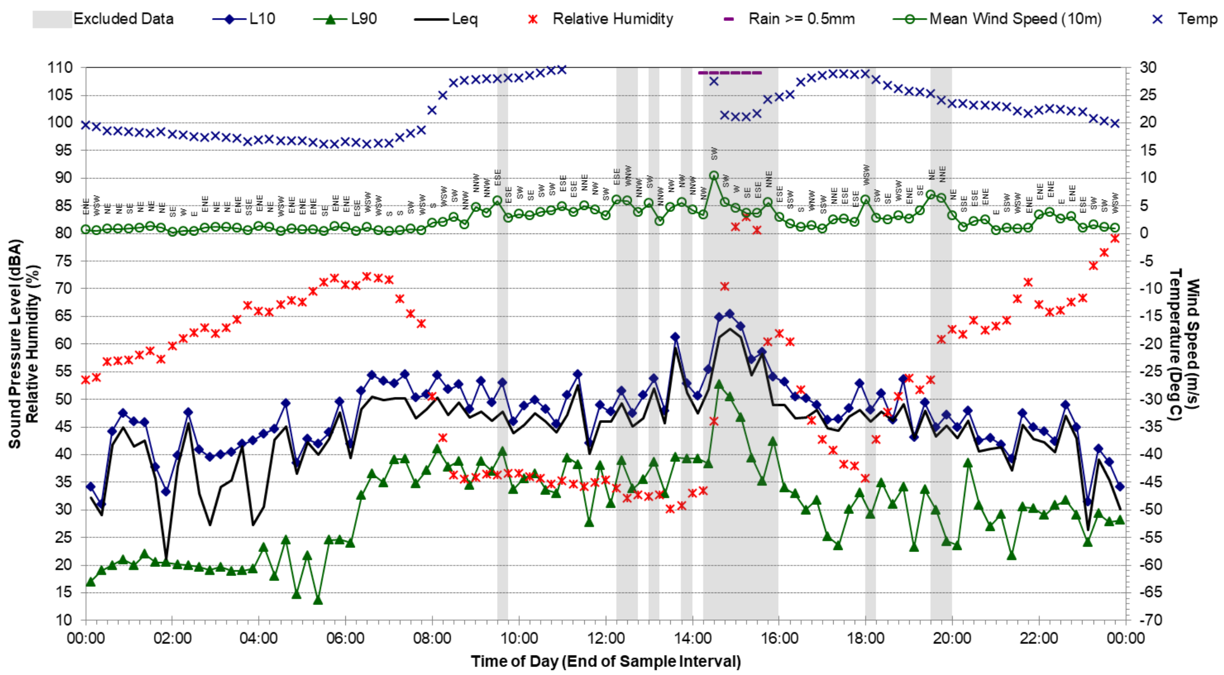

Statistical Ambient Noise Levels
L21 - Tuesday 14 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
L21 - Wednesday 15 August 2012
Excluded Data
L1
L10
L90
Leq
Relative Humidity
Rain >= 0.3mm
Temp
Mean Wind Speed
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (km/h)
Temperature (Deg C)
Time of Day (End of 15 Minute Sample Interval)

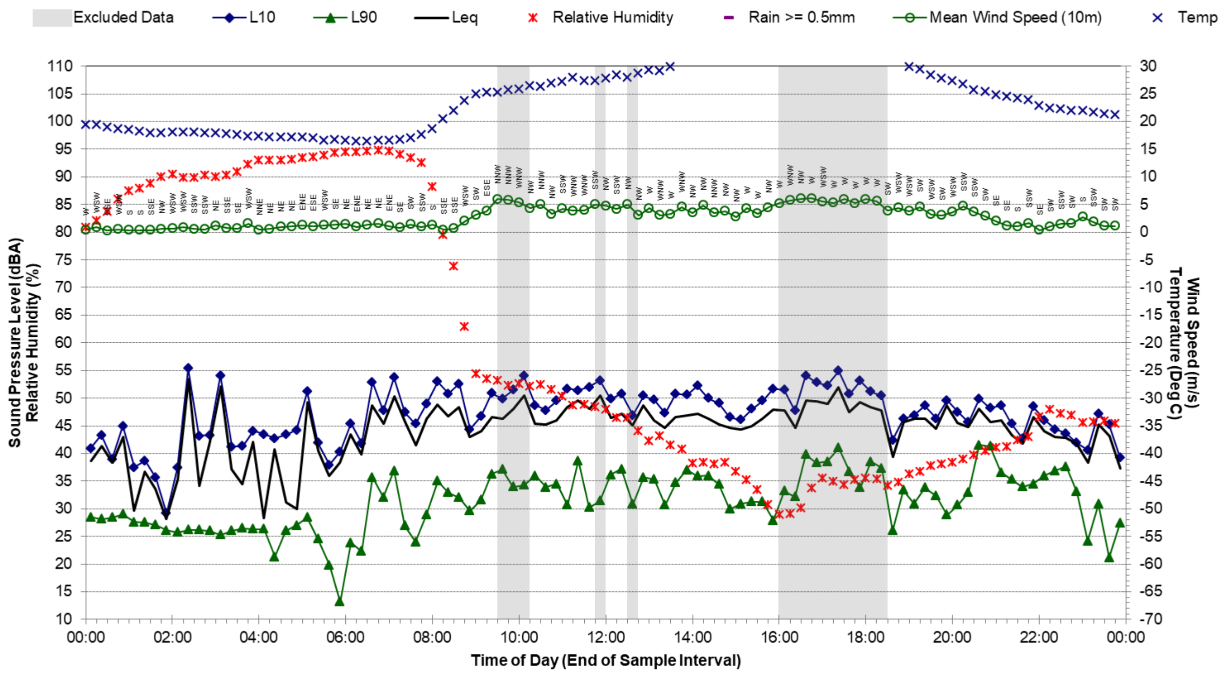

Statistical Ambient Noise Levels
R88 - Wednesday, 15 February 2017
Excluded Data
L10
L90
Leq
Relative Humidity
Rain >= 0.5mm
Mean Wind Speed (10m)
Temp
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (m/s)
Temperature (Deg C)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
R88 - Thursday, 16 February 2017
Excluded Data
L10
L90
Leq
Relative Humidity
Rain >= 0.5mm
Mean Wind Speed (10m)
Temp
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (m/s)
Temperature (Deg C)
Time of Day (End of Sample Interval)

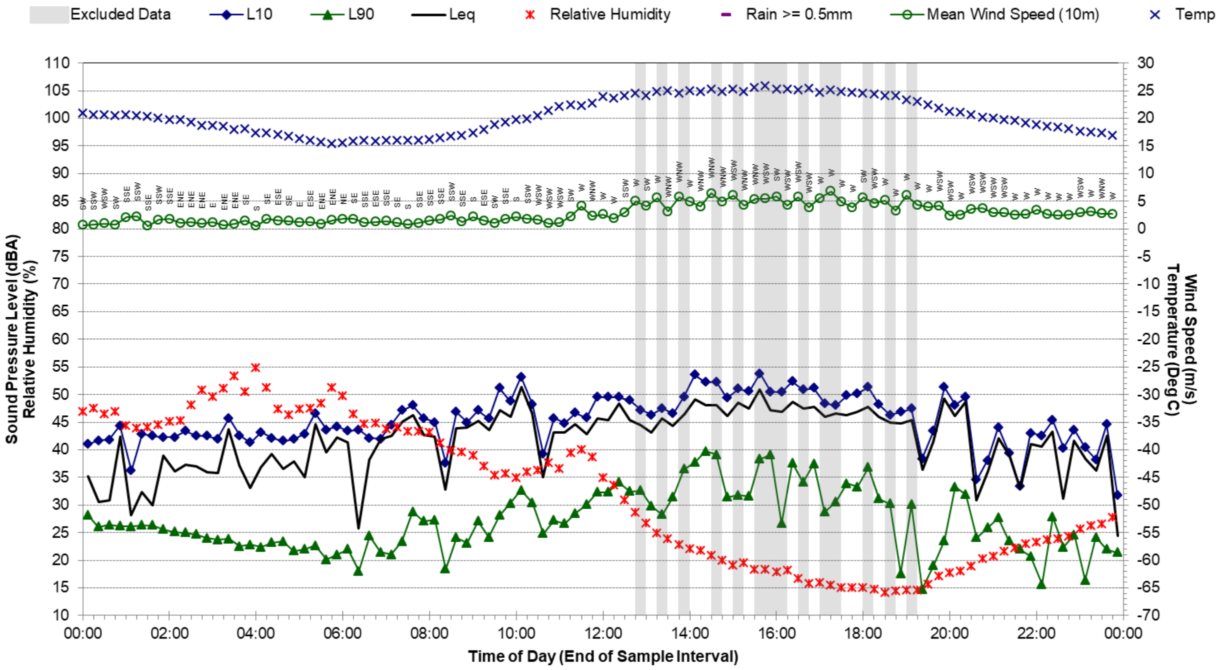
Statistical Ambient Noise Levels
R88 - Friday, 17 February 2017



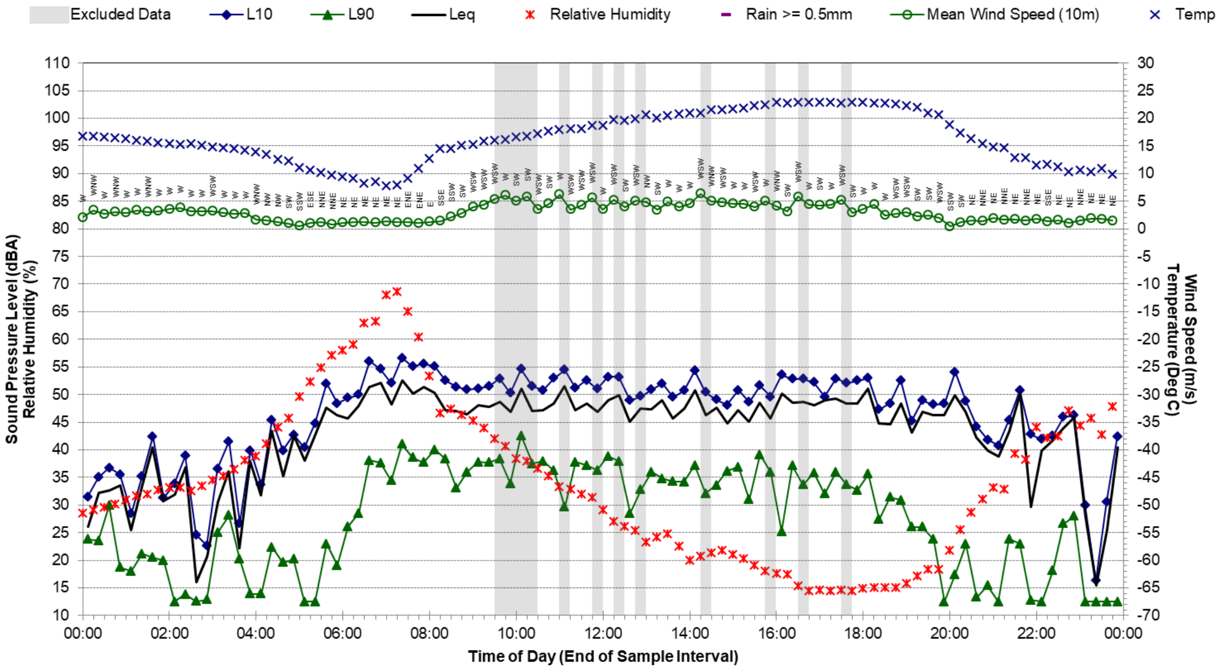
Statistical Ambient Noise Levels
R88 - Saturday, 18 February 2017

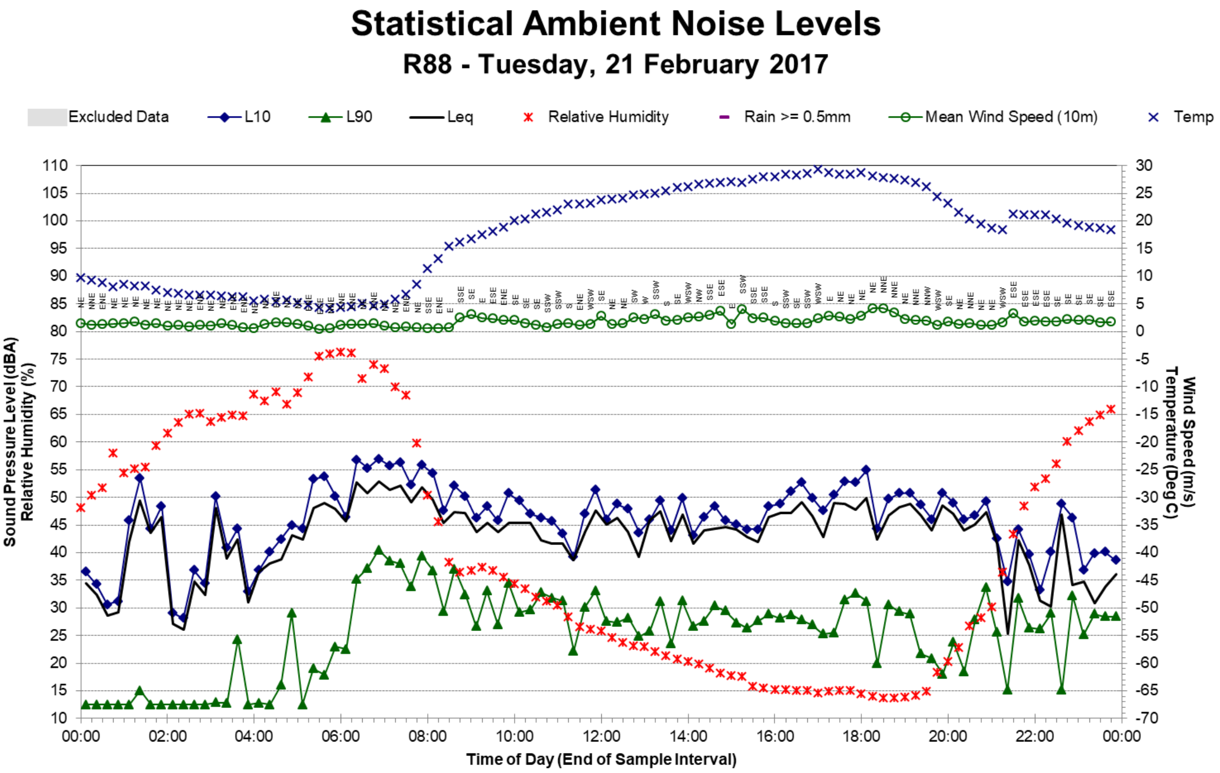


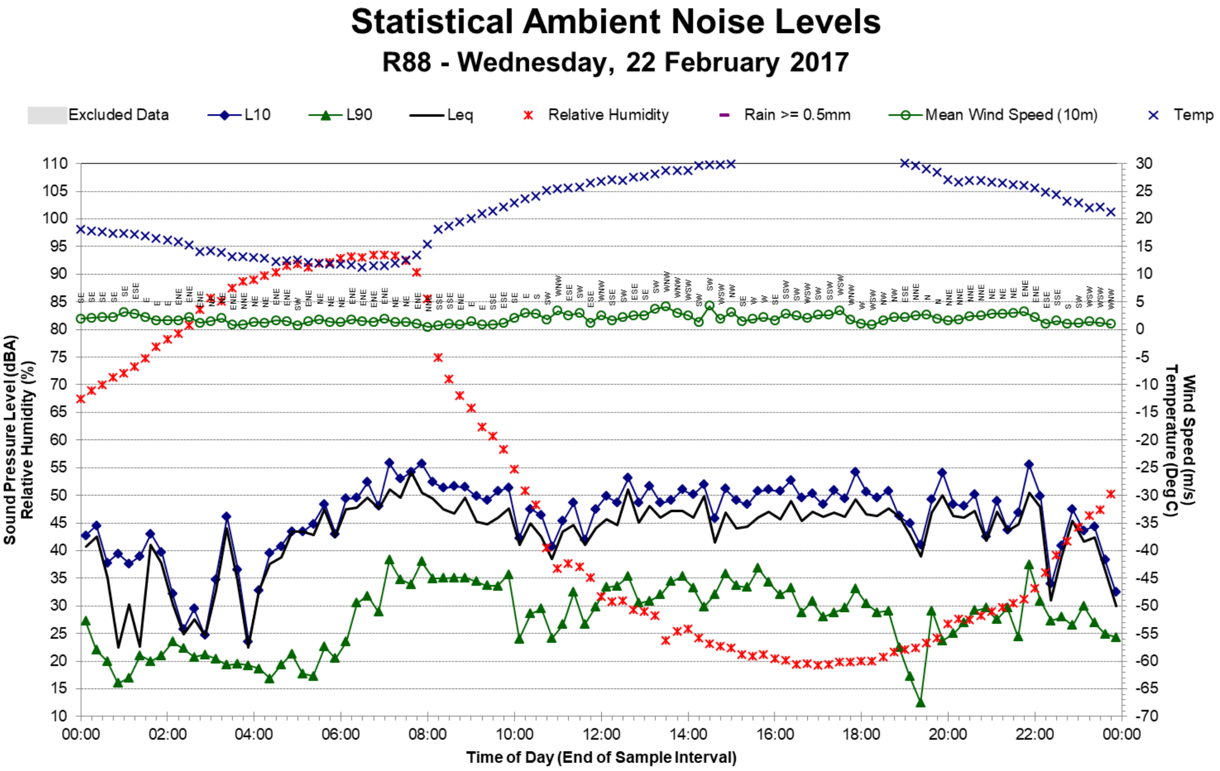
Statistical Ambient Noise Levels
R88 - Sunday, 19 February 2017

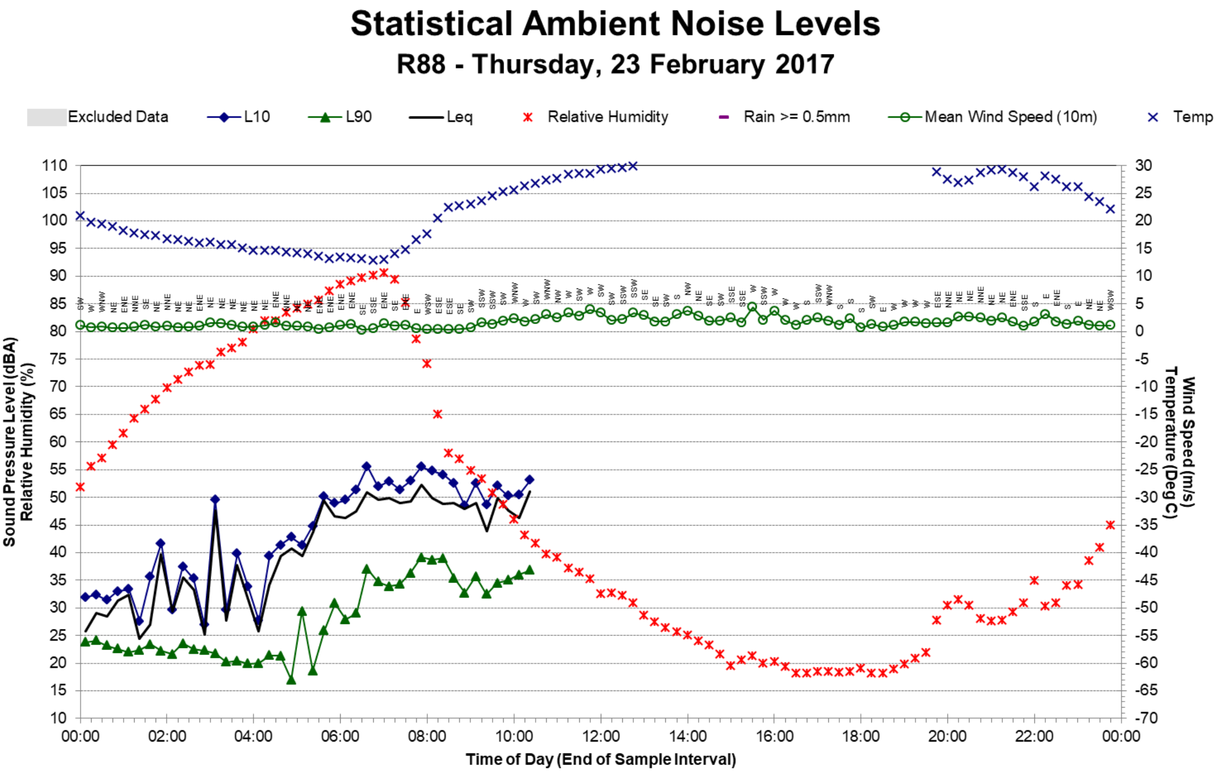


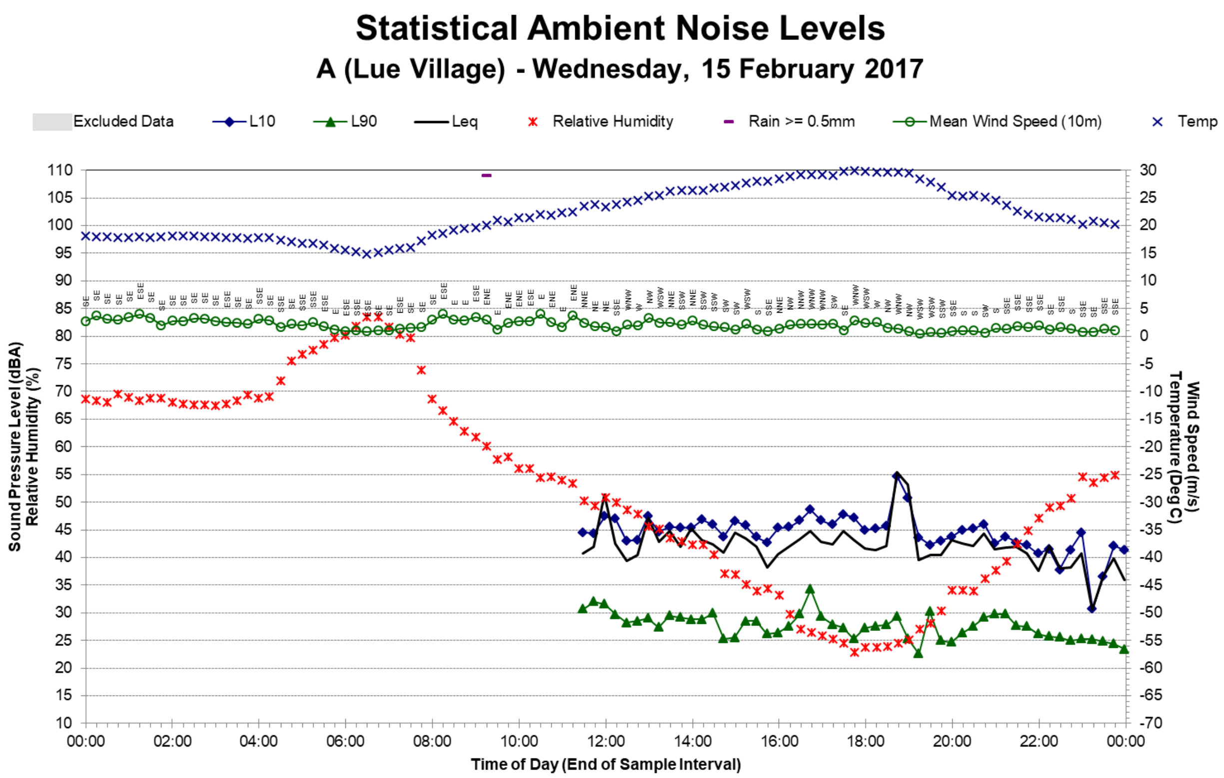
Statistical Ambient Noise Levels
R88 - Monday, 20 February 2017

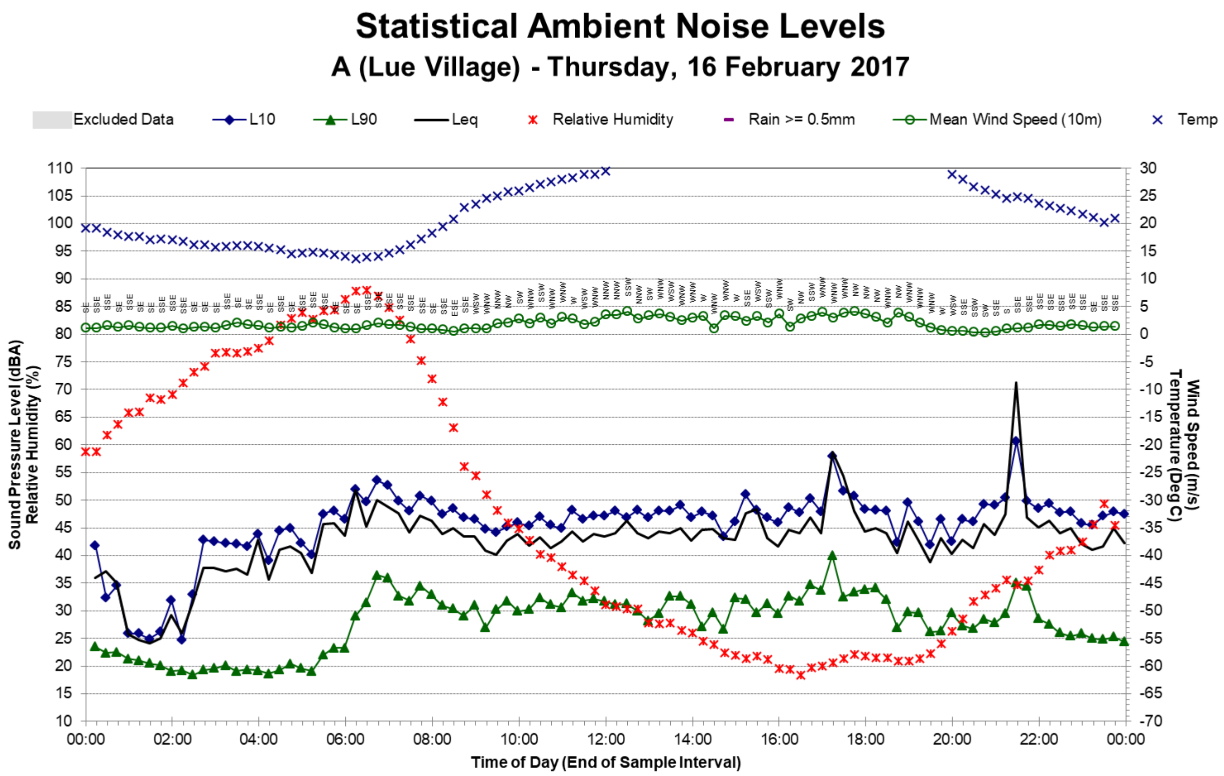


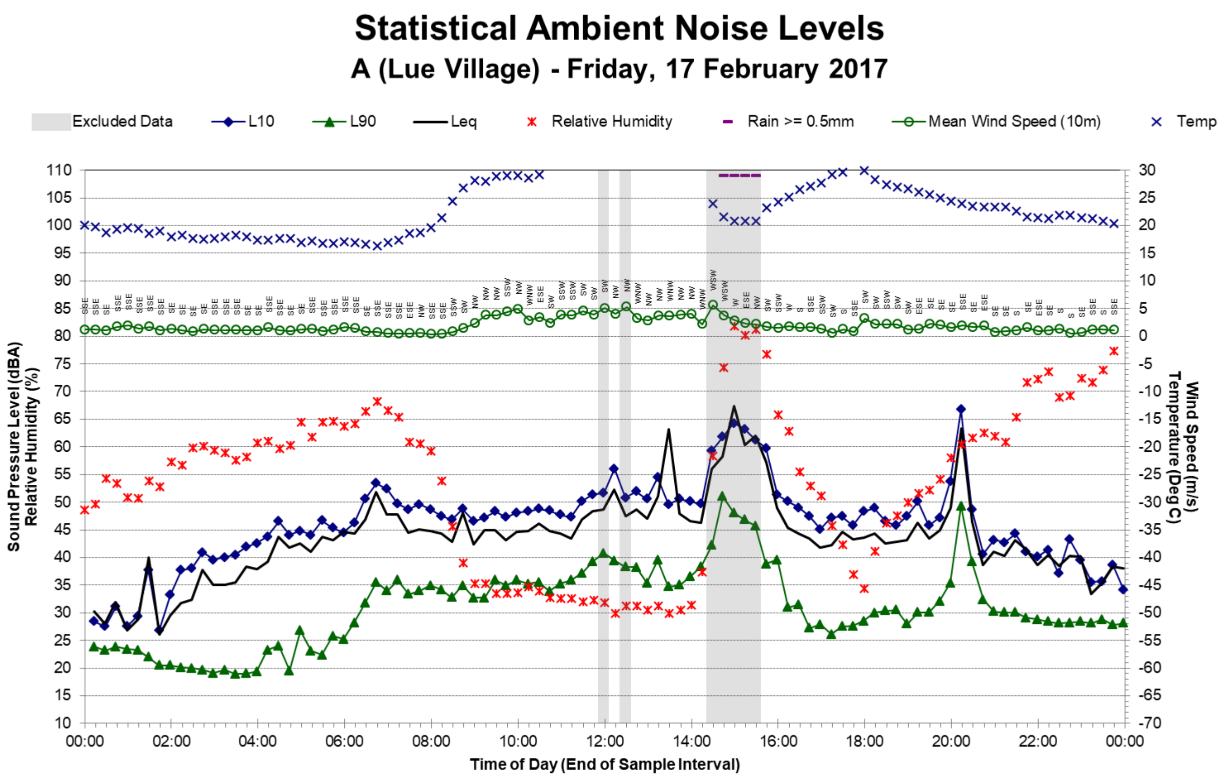

Statistical Ambient Noise Levels
R88 - Tuesday, 21 February 2017
Excluded Data
L10
L90
Leq
Relative Humidity
Rain >= 0.5mm
Mean Wind Speed (10m)
Temp
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (m/s)
Temperature (Deg C)
Time of Day (End of Sample Interval)

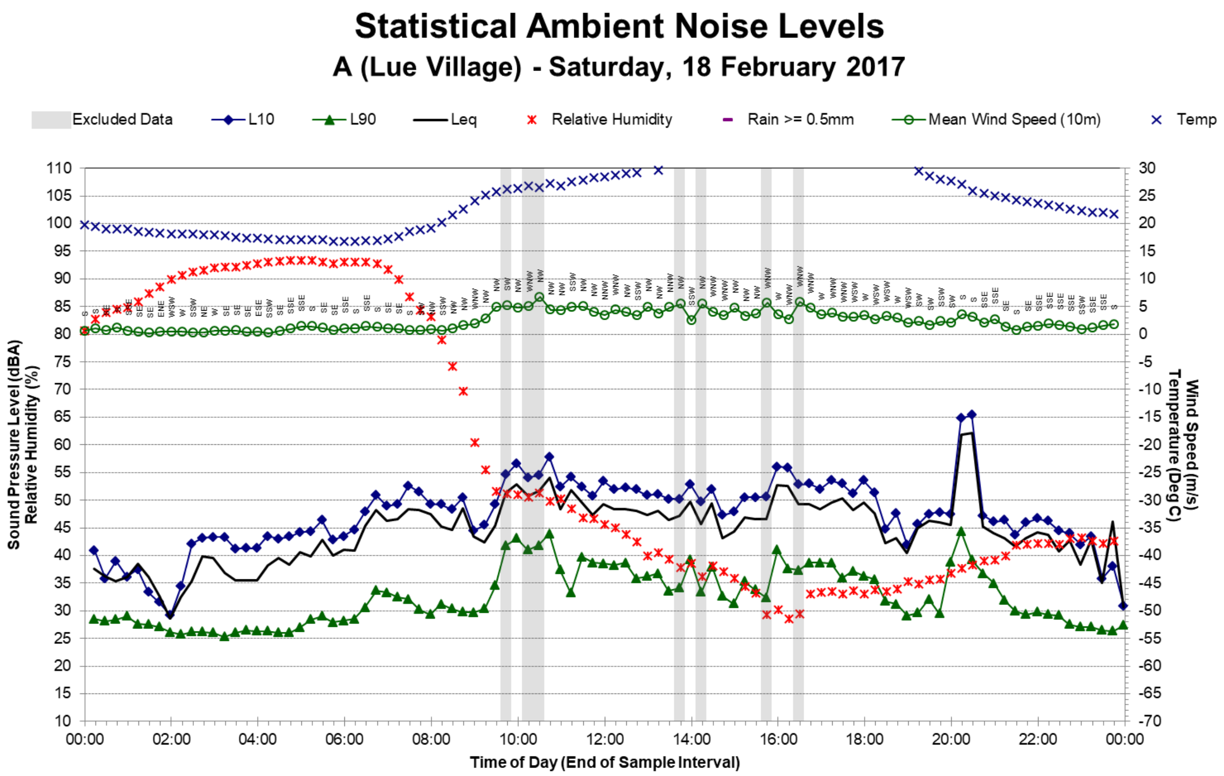

Statistical Ambient Noise Levels
R88 - Wednesday, 22 February 2017
Excluded Data
L10
L90
Leq
Relative Humidity
Rain >= 0.5mm
Mean Wind Speed (10m)
Temp
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (m/s)
Temperature (Deg C)
Time of Day (End of Sample Interval)

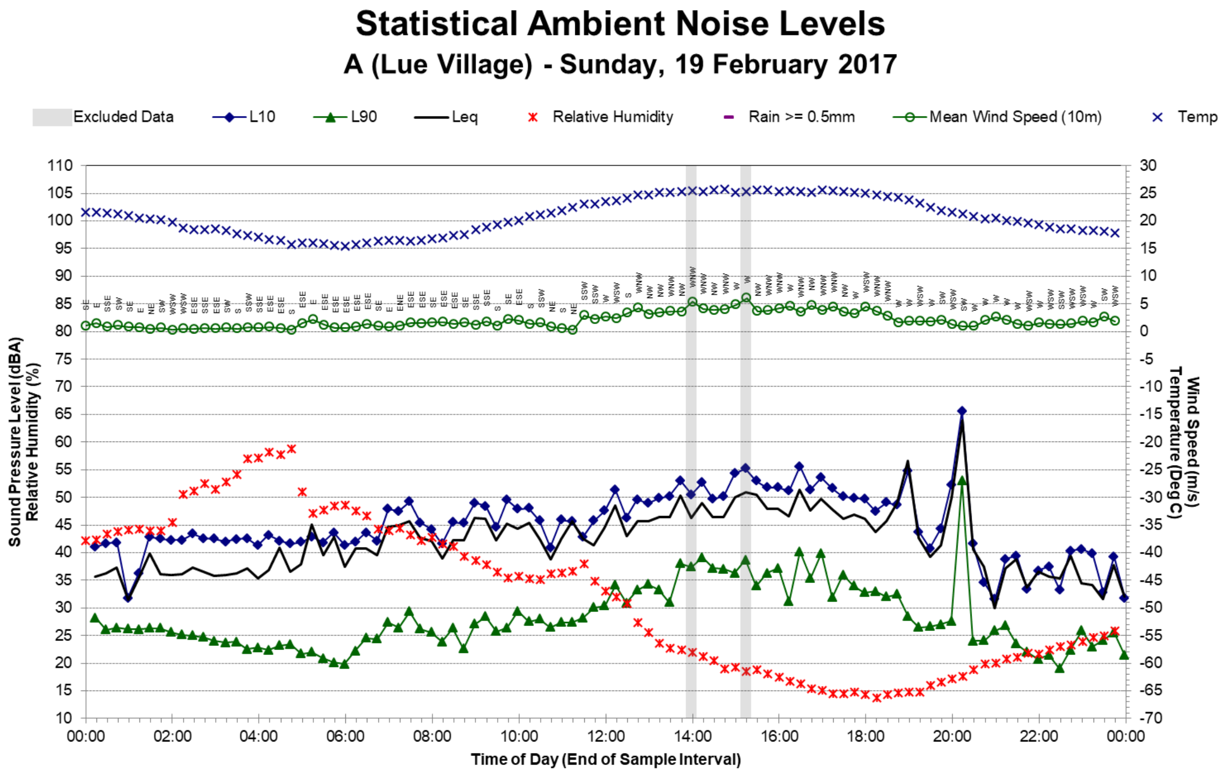

Statistical Ambient Noise Levels
R88 - Thursday, 23 February 2017
Excluded Data
L10
L90
Leq
Relative Humidity
Rain >= 0.5mm
Mean Wind Speed (10m)
Temp
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (m/s)
Temperature (Deg C)
Time of Day (End of Sample Interval)

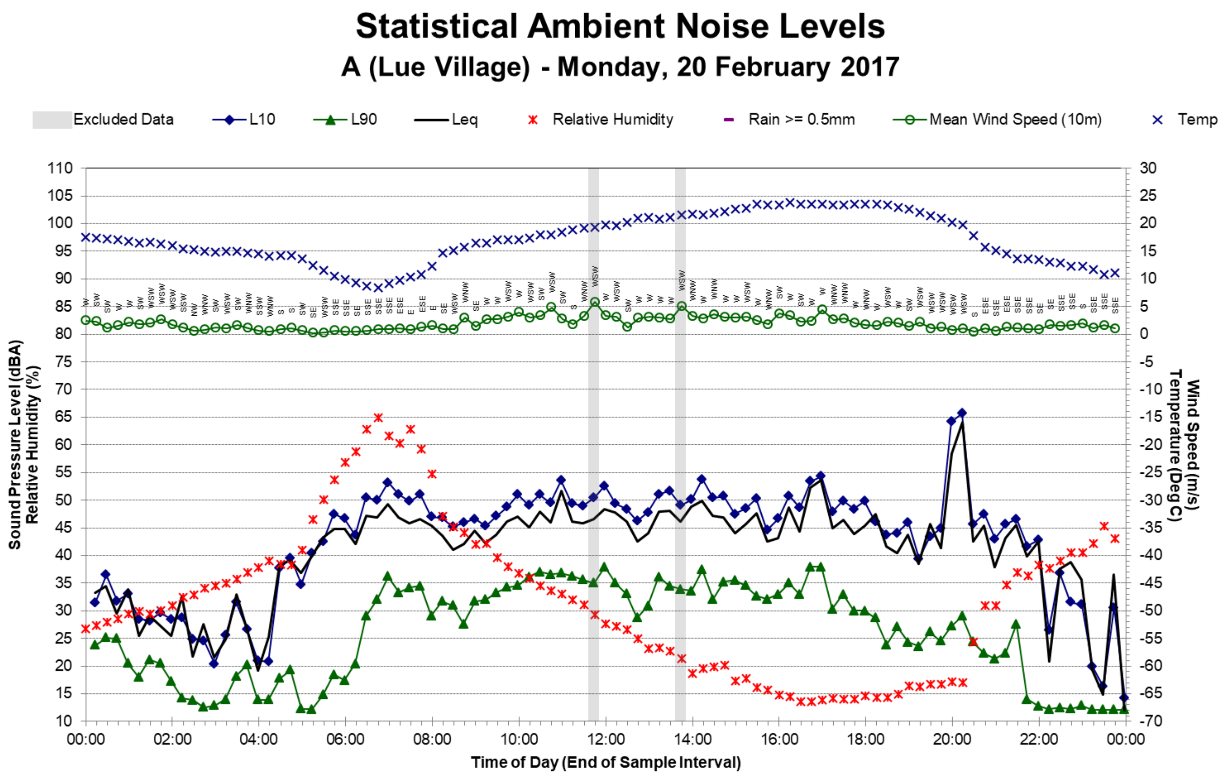

Statistical Ambient Noise Levels
A (Lue Village) - Wednesday, 15 February 2017
Excluded Data
L10
L90
Leq
Relative Humidity
Rain >= 0.5mm
Mean Wind Speed (10m)
Temp
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (m/s)
Temperature (Deg C)
Time of Day (End of Sample Interval)

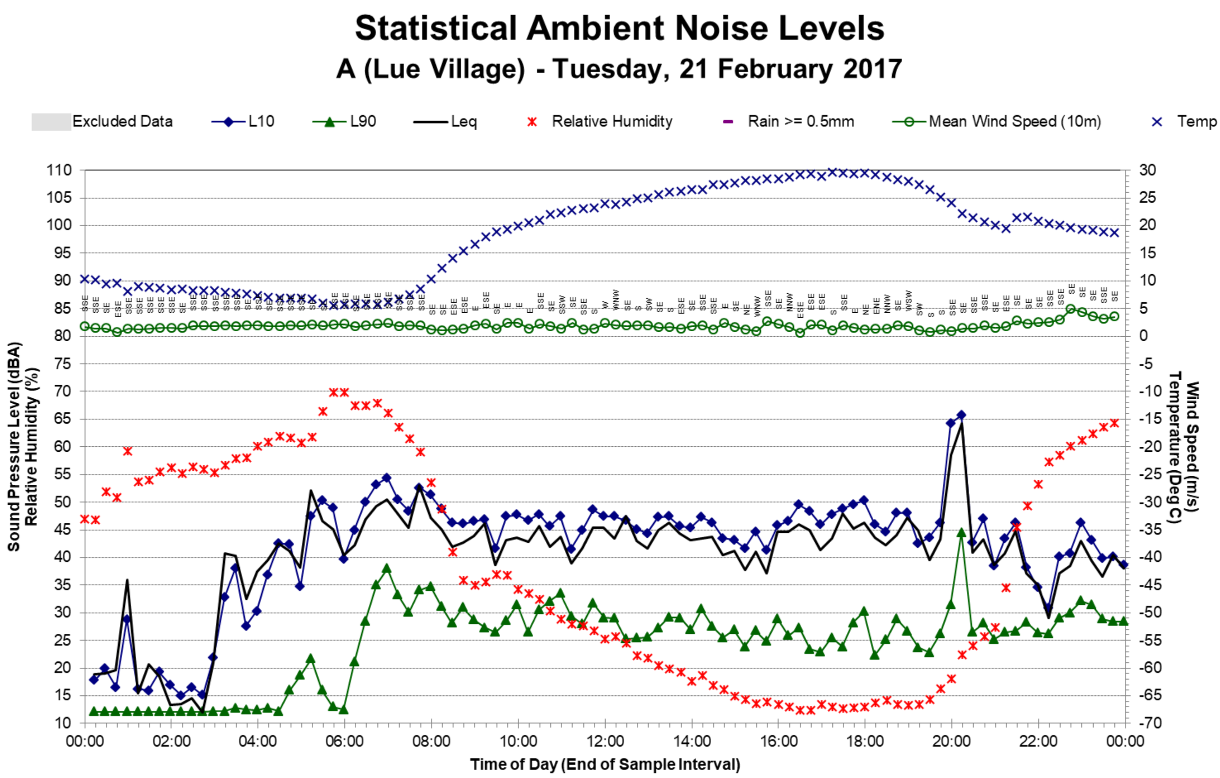

Statistical Ambient Noise Levels
A (Lue Village) - Thursday, 16 February 2017
Excluded Data
L10
L90
Leq
Relative Humidity
Rain >= 0.5mm
Mean Wind Speed (10m)
Temp
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (m/s)
Temperature (Deg C)
Time of Day (End of Sample Interval)

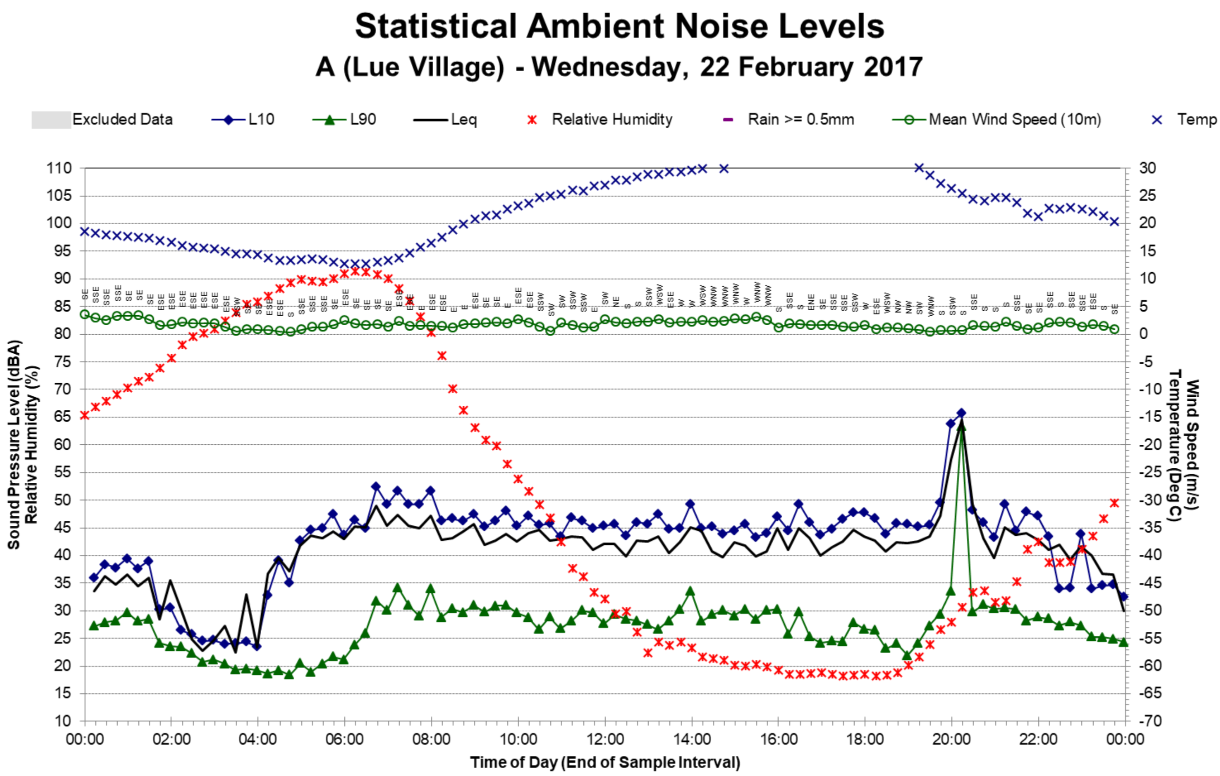

Statistical Ambient Noise Levels
A (Lue Village) - Friday, 17 February 2017
Excluded Data
L10
L90
Leq
Relative Humidity
Rain >= 0.5mm
Mean Wind Speed (10m)
Temp
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (m/s)
Temperature (Deg C)
Time of Day (End of Sample Interval)

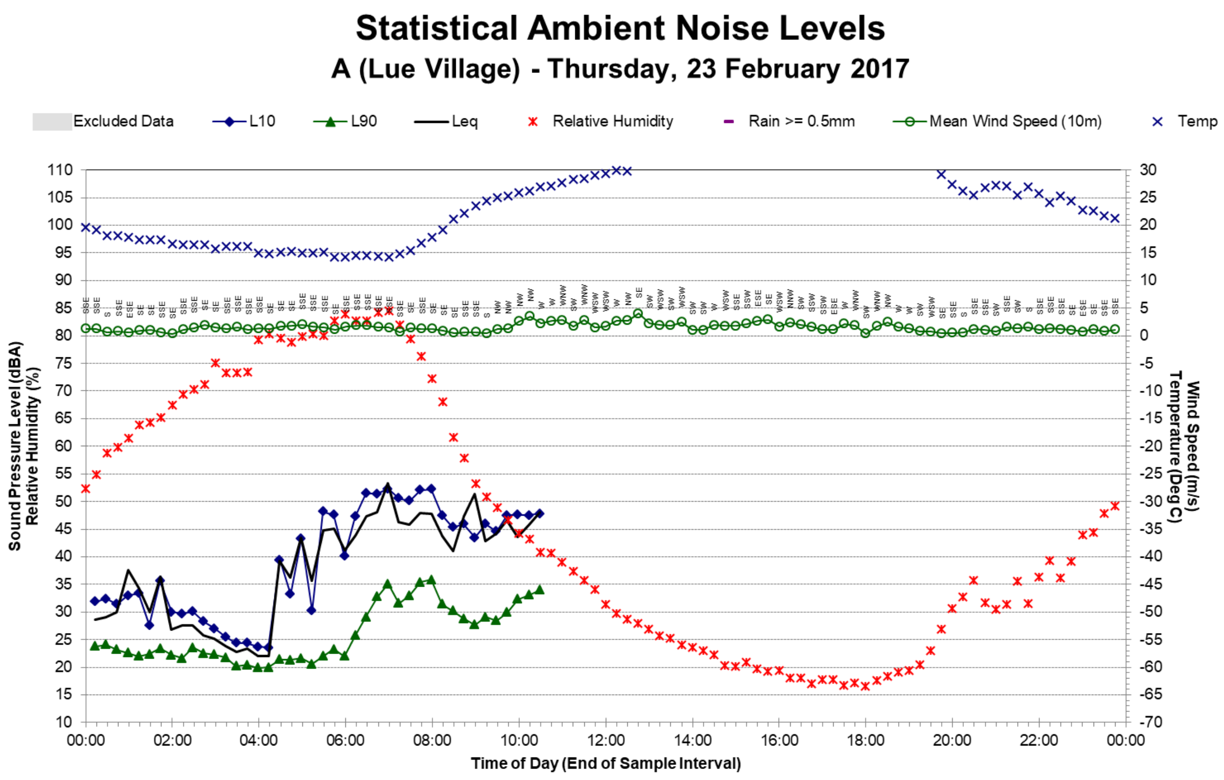

Statistical Ambient Noise Levels
A (Lue Village) - Saturday, 18 February 2017
Excluded Data
L10
L90
Leq
Relative Humidity
Rain >= 0.5mm
Mean Wind Speed (10m)
Temp
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (m/s)
Temperature (Deg C)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
A (Lue Village) - Sunday, 19 February 2017
Excluded Data
L10
L90
Leq
Relative Humidity
Rain >= 0.5mm
Mean Wind Speed (10m)
Temp
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (m/s)
Temperature (Deg C)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
A (Lue Village) - Monday, 20 February 2017
Excluded Data
L10
L90
Leq
Relative Humidity
Rain >= 0.5mm
Mean Wind Speed (10m)
Temp
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (m/s)
Temperature (Deg C)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
A (Lue Village) - Tuesday, 21 February 2017
Excluded Data
L10
L90
Leq
Relative Humidity
Rain >= 0.5mm
Mean Wind Speed (10m)
Temp
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (m/s)
Temperature (Deg C)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
A (Lue Village) - Wednesday, 22 February 2017
Excluded Data
L10
L90
Leq
Relative Humidity
Rain >= 0.5mm
Mean Wind Speed (10m)
Temp
Sound Pressure Level (dBA)
Relative Humidity (%)
Wind Speed (m/s)
Temperature (Deg C)
Time of Day (End of Sample Interval)



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Annexure 13

Meteorological Monitoring Sites

(Total No. of pages including blank pages = 2)

Automatic Weather Station (AWS) Locations

Figure 1 Automatic Weather Station (AWS) Locations

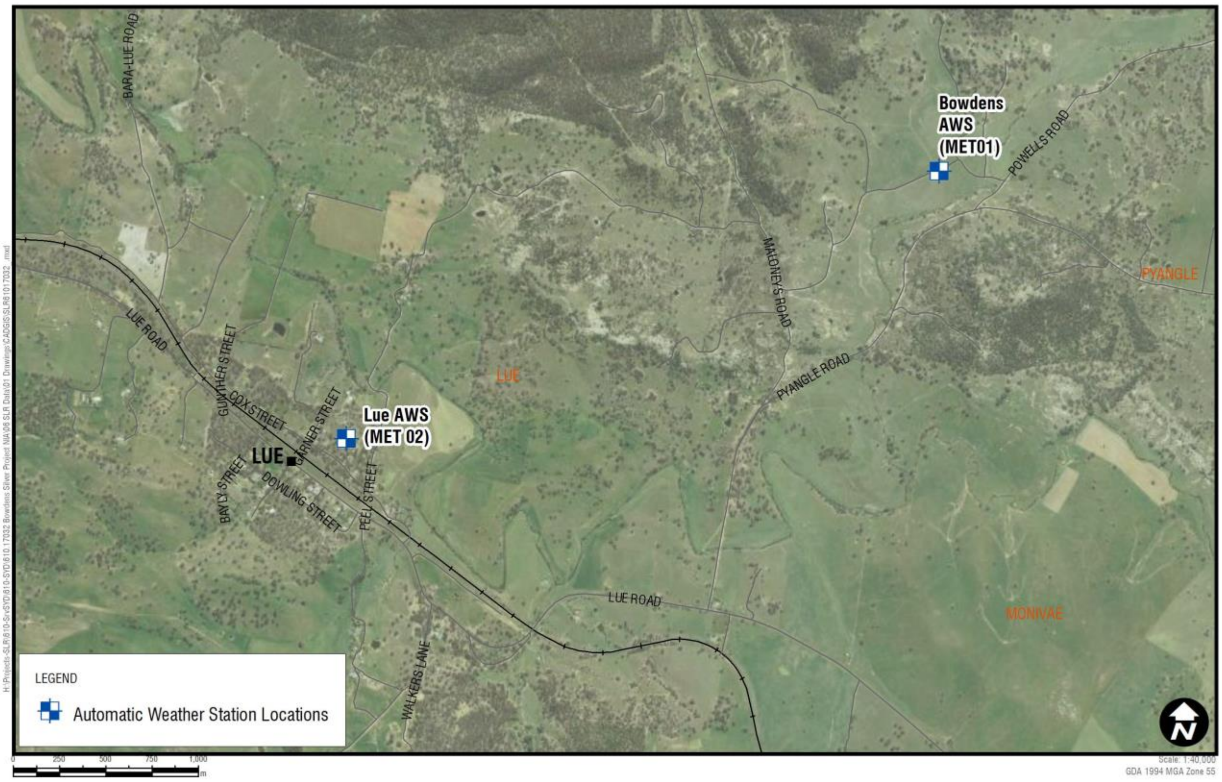

Table A13.1
Automatic Weather Station (AWS) Locations

Code ID	Station Name	Ground AHD	Instrument AHD	Easting	Northing
MET 01	Bowdens AWS	576.7 m	+2 m, + 10 m	770,080.5 m	6,385,069.6 m
MET 02	Lue AWS	550.0 m	+2 m, + 10 m	766,884.7 m	6,383,628.8 m

Annexure 14

Extract:
Voluntary Land Acquisition and Mitigation Policy (VLAMP)

(Total No. of pages including blank pages = 6)

EXTRACT: POLICY – NOISE

This section explains how this policy applies to noise impacts.

Assessment Criteria

Applicants are required to assess the impacts of the development in accordance with the:

- Noise Policy for Industry (EPA 2017) (NPfl);
- Rail Infrastructure Noise Guideline (EPA 2013) (RING);
- Road Noise Policy(DECCW 2011) (RNP) ; and
- Interim Construction Noise Guideline (DECC 2009) (ICNG).

These policies and guidelines seek to strike an appropriate balance between supporting the economic development of NSW and protecting the amenity and wellbeing of the community. They recommend standards for regulating the construction, operational, road and rail noise impacts of a development, and require applicants to implement all reasonable and feasible avoidance and mitigation measures.

These standards are generally conservative, and it does not automatically follow that exceedances of the relevant criteria will result in unacceptable impacts.

Mitigation and Acquisition Criteria

A consent authority can apply voluntary mitigation and voluntary land acquisition rights to reduce:

- operational noise impacts of a development on privately owned land; and
- rail noise impacts of a development on privately owned land near a non-network rail line (private rail line), that is on, or exclusively servicing an industrial site (see Appendix 3 of the RING);

But not:

- construction noise impacts, as these impacts are shorter term and can be controlled;
- noise impacts on the public road or rail network; or
- modifications of existing developments with legacy noise issues, where the modification would have beneficial or negligible noise impacts[1].

Process for Decision-making on Noise Impacts

The decision-making process which should be applied by a consent authority under this policy is summarised in Figure 4 below.

[1] Noise issues for existing premises may be addressed through site-specific pollution reduction programs under the Protection of the Environment Operations Act 7997.

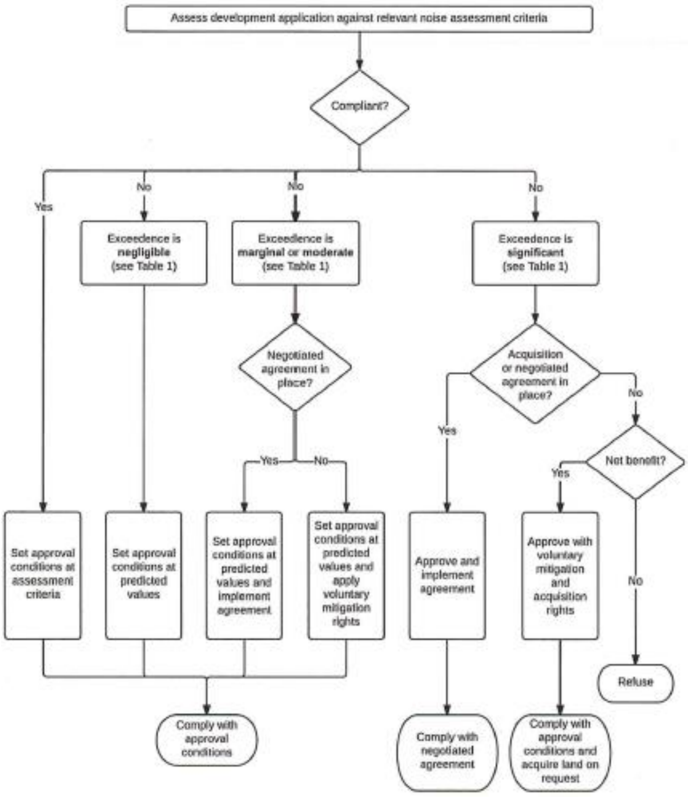

Figure 4 - Decision making Process for Noise Impacts[2]

Table 1 (see following page) summarises the NSW Government's interpretation of the significance of any potential exceedances of the relevant noise assessment criteria, and identifies potential treatments for those exceedances.

Voluntary Mitigation Rights

A consent authority should only apply voluntary mitigation rights where, even with the implementation of best practice management at the mine site:

- the noise generated by the development would meet the requirements in Table 1 (see following page), such that the impacts would be characterised as marginal, moderate or significant, at any residence on privately owned land; or
- the development would increase the total industrial noise level at any residence on privately owned land by more than 1dB(A) and noise levels at the residence are already above the recommended amenity noise levels in Table 2.2 of the Noise Policy for Industry; or
- the development includes a private rail line and the use of that private rail line would cause exceedances of the recommended acceptable levels in Table 6 of Appendix 3 of the RING by greater than or equal to 3dB(A) at any residence on privately owned land.

2 The reference in Figure 4 to 'net benefit', means that if, after weighing up the positive and negative impacts of the project as a whole, the consent authority is of the opinion that on balance there is a net benefit to the project proceeding, voluntary acquisition and mitigation rights should be considered for any land that is predicted to experience significant impacts (as defined by Table 1). Where the consent authority determines that, on balance, there is not a net benefit to the project, the development application would be refused.

All noise levels must be calculated in accordance with the NPfI or RING (as applicable).

The selection of mitigation measures should be guided by the potential treatments identified in **Table 1** (see following page).

Voluntary Land Acquisition Rights

A consent authority should only apply voluntary land acquisition rights where, even with the implementation of best practice management:

- the noise generated by the development would be characterised as significant, according to Table 1 (see following page), at any residence on privately owned land; or
- the noise generated by the development would contribute to exceedances of the acceptable noise levels plus 5dB in Table 2.2 of the NPfI on more than 25% of any privately-owned land where there is an existing dwelling or where a dwelling could be built under existing planning controls[3]; or
- the development includes a private rail line and the use of that private rail line would cause exceedances of the recommended maximum criteria in Table 6 of Appendix 3 of the RING at any residence on privately owned land.

All noise levels must be calculated in accordance with the NPfI or RING (as applicable).

Table 1 - Characterisation of Noise Impacts and Potential Treatments[4]

Page 1 of 2

If the predicted noise level minus the project noise trigger level[5] is:	And the total cumulative industrial noise level is:	Characterisation of impacts:	Potential treatment:
All time periods 0-2dB(A)	Not applicable	Impacts are considered to be **negligible**	The exceedances would not be discernible by the average listener and therefore would not warrant receiver based treatments or controls
All time periods 3-5dB(A)	• < = recommended amenity noise level in Table 2.2 of the NPfI; or • > recommended amenity noise level in Table 2.2 of the NPfI, but the increase in total cumulative industrial noise level resulting from the development is < = 1dB	Impacts are considered to be **marginal**	Provide mechanical ventilation / comfort condition systems to enable windows to be closed without compromising internal air quality / amenity.
All time periods 3-5dB(A)	> recommended amenity noise level in Table 2.2 of the NPfI, and the increase in total cumulative industrial noise level resulting from the development is > 1dB	Impacts are considered to be **moderate**	As for marginal impacts but also upgraded façade elements like windows, doors or roof insulation, to further increase the ability of the building facade to reduce noise levels.

3 Voluntary land acqui5ition rights should not be applied to address noise levels on vacant land other than to vacant land specifically meeting these criteria.
4 Adapted from the Noise Policy for Industry (NPfI) (EPA 2017).
5 See section 2.1 of the NPfI for an explanation of project noise trigger levels.

Table 1 - Characterisation of Noise Impacts and Potential Treatments[4] (Cont'd)

Page 2 of 2

If the predicted noise level minus the project noise trigger level[6] is:	And the total cumulative industrial noise level is:	Characterisation of impacts:	Potential treatment:
Day and evening >5dB(A)	< = recommended amenity noise levels in Table 2.2 of the NPfI	Impacts are considered to be **moderate**	As for marginal impacts but also upgraded façade elements like windows, doors or roof insulation, to further increase the ability of the building facade to reduce noise levels.
Day and evening >5dB(A)	> recommended amenity noise levels in Table 2.2 of the NPfI	Impacts are considered to be **significant**	Provide mitigation as for moderate impacts and see voluntary land acquisition provisions above.
Night >5dB(A)	Not applicable	Impacts are considered to be **significant**	Provide mitigation as for moderate impacts and see voluntary land acquisition provisions above.

6 See section 2.1 of the NPfI for an explanation of project noise trigger levels.

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Annexure 15

Operational Scenarios

(Total No. of pages including blank pages = 12)

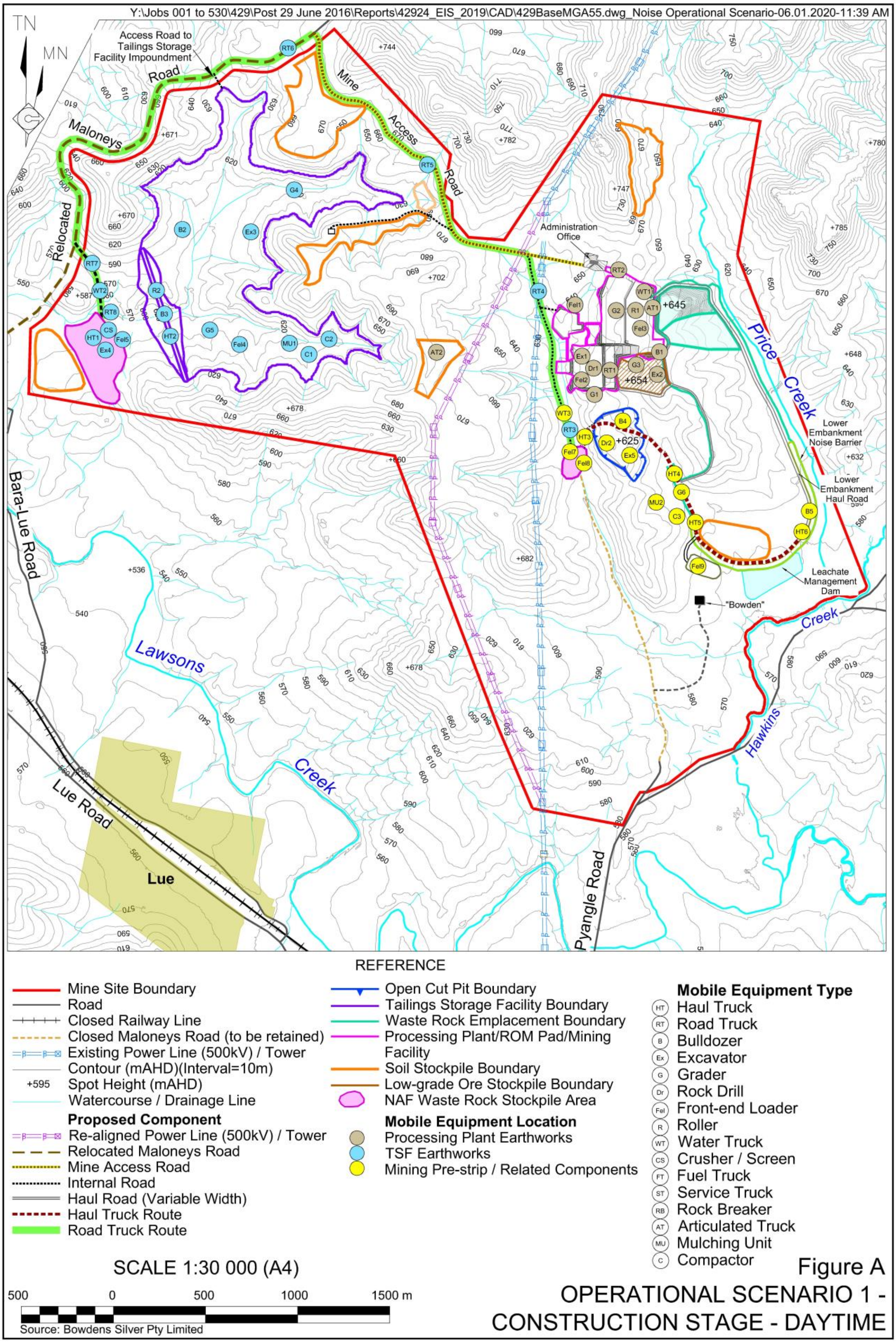


Figure A
OPERATIONAL SCENARIO 1 - CONSTRUCTION STAGE - DAYTIME

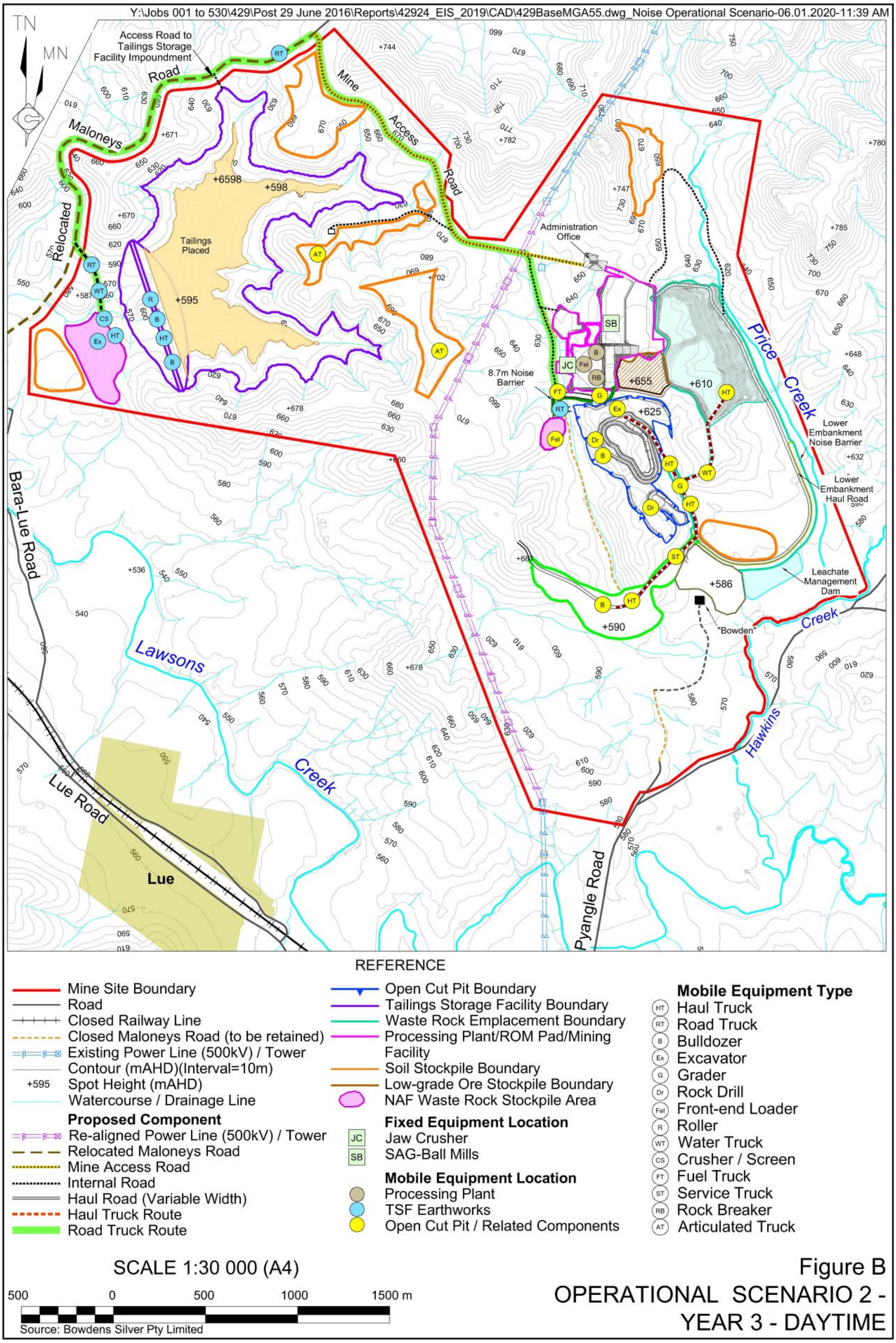


Figure B
OPERATIONAL SCENARIO 2 - YEAR 3 - DAYTIME

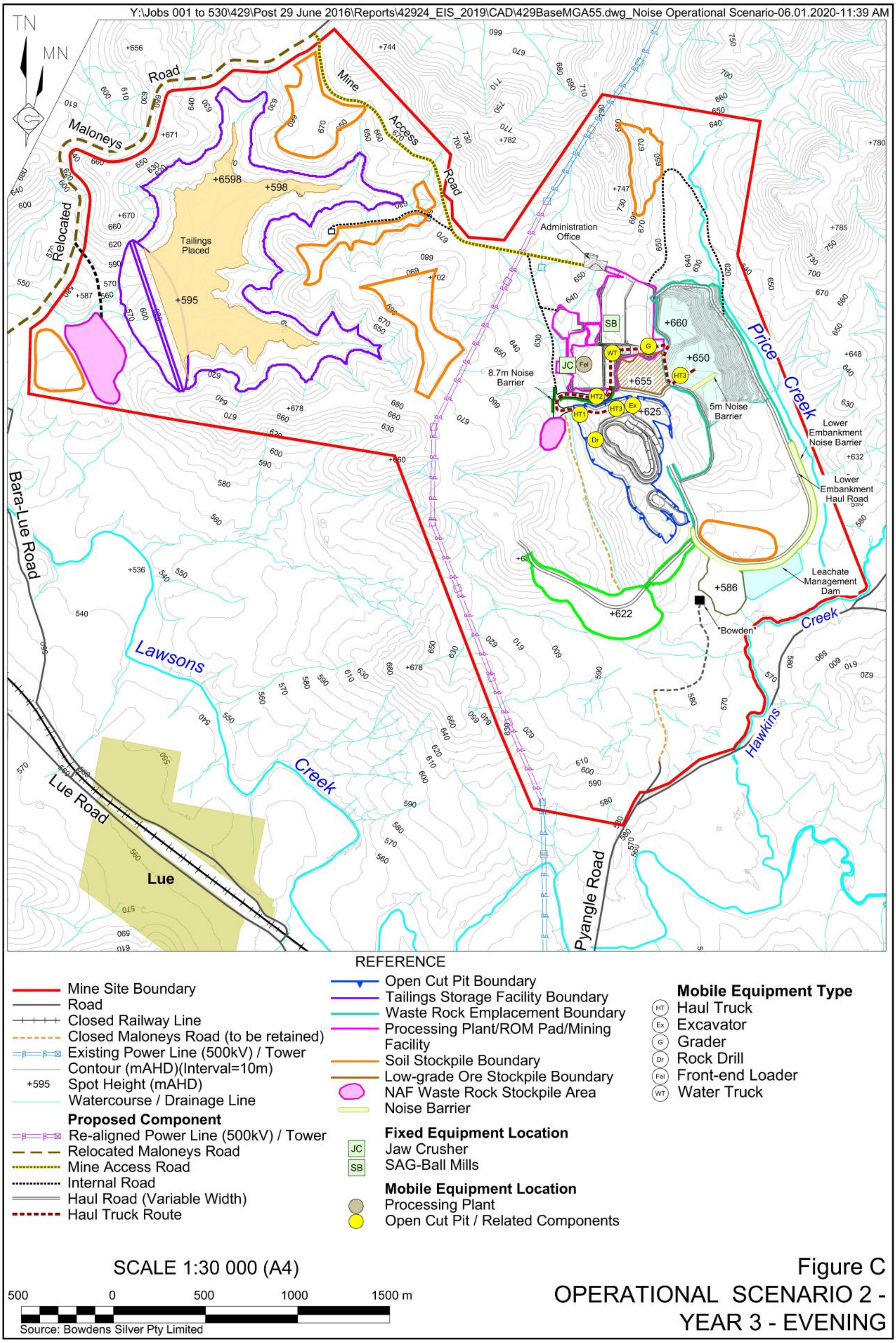


Figure C
OPERATIONAL SCENARIO 2 - YEAR 3 - EVENING

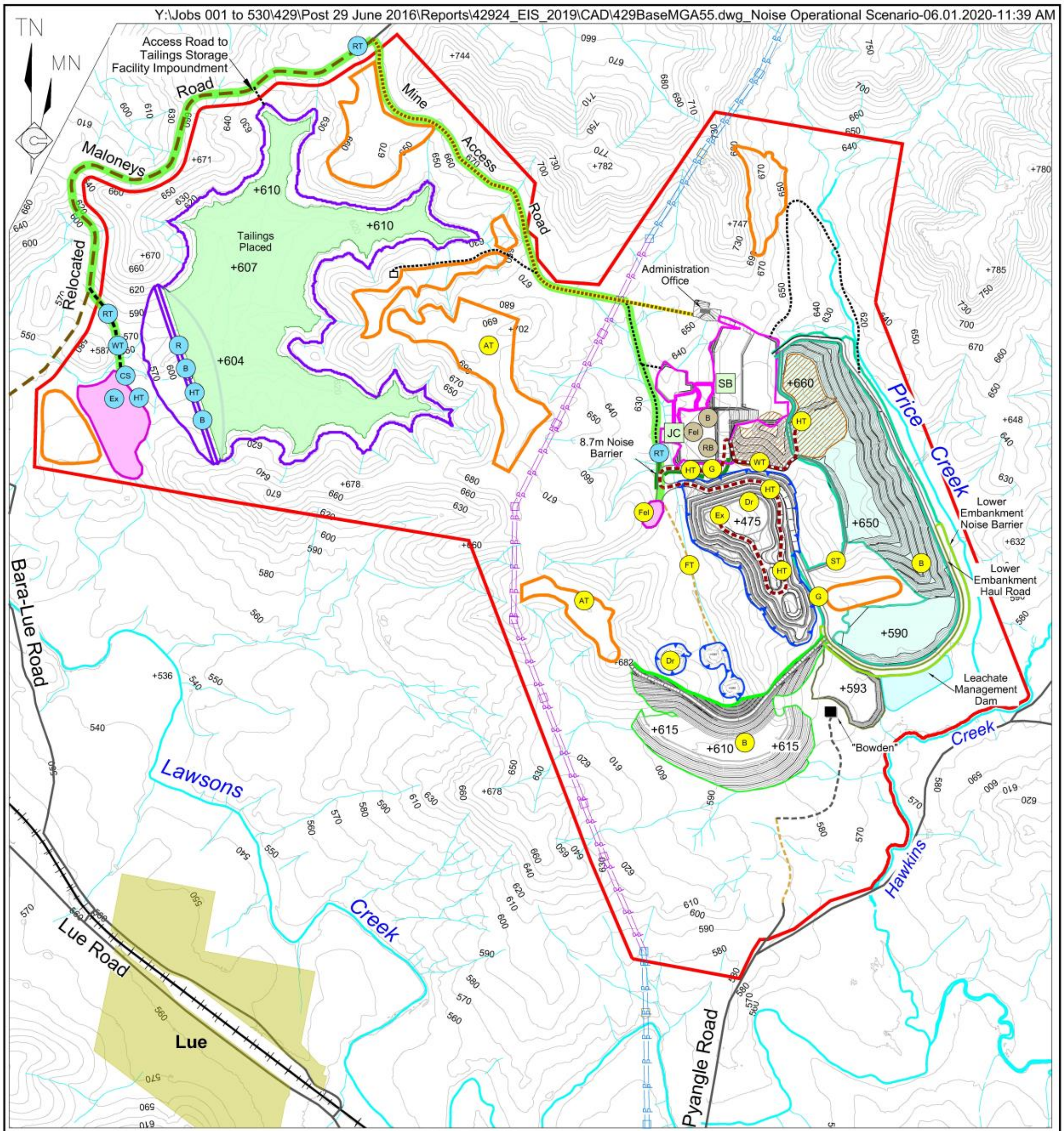


Figure D
OPERATIONAL SCENARIO 3 - YEAR 8 - DAYTIME

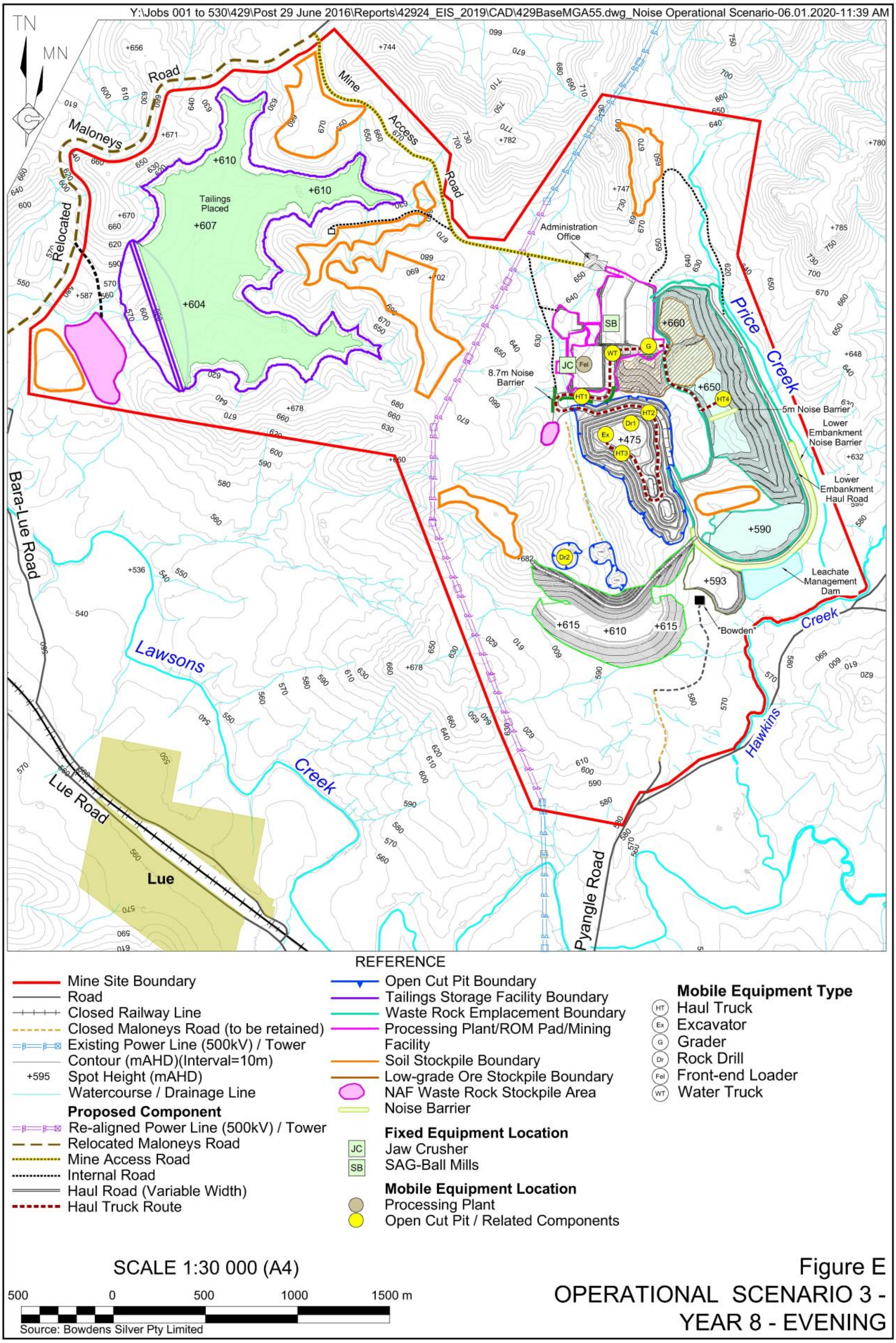


Figure E
OPERATIONAL SCENARIO 3 - YEAR 8 - EVENING

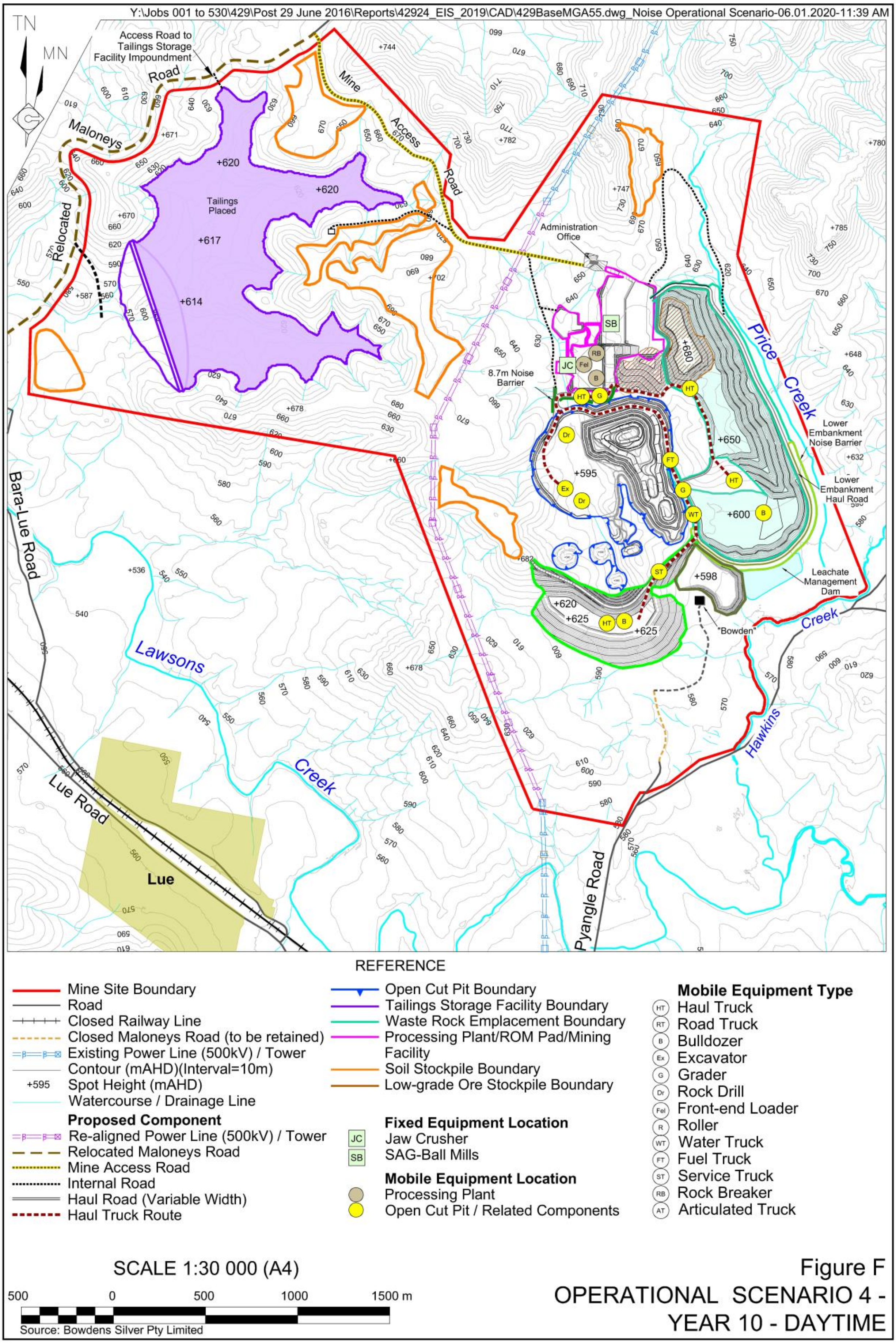
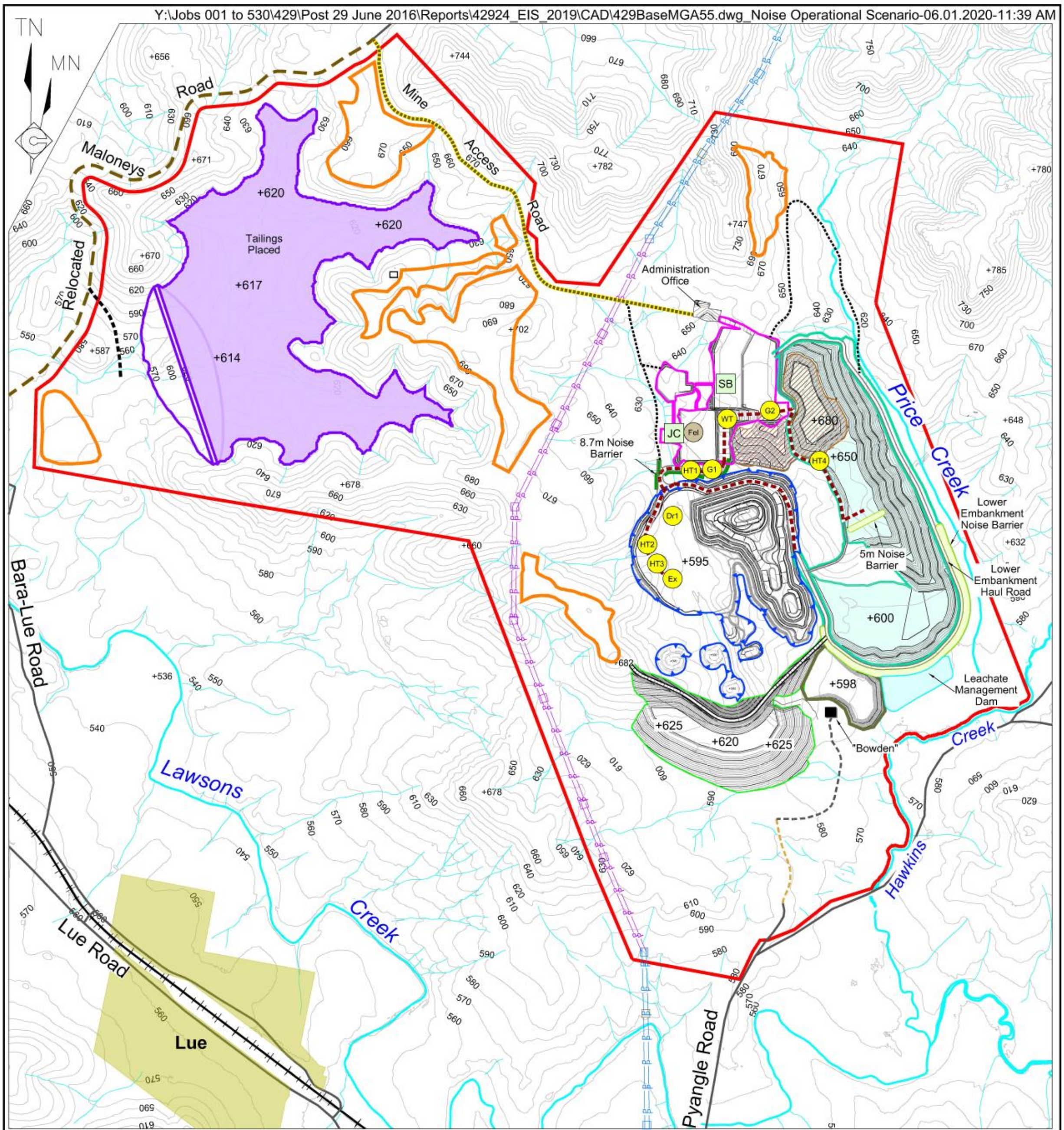


Figure F
OPERATIONAL SCENARIO 4 - YEAR 10 - DAYTIME



Mine Site Boundary	
Road	
Closed Railway Line	
Closed Maloneys Road (to be retained)	
Existing Power Line (500kV) / Tower	
Contour (mAHD)(Interval=10m)	
+595	Spot Height (mAHD)
Watercourse / Drainage Line	
Proposed Component	
Re-aligned Power Line (500kV) / Tower	
Relocated Maloneys Road	
Mine Access Road	
Internal Road	
Haul Road (Variable Width)	
Haul Truck Route	

REFERENCE

Open Cut Pit Boundary	
Tailings Storage Facility Boundary	
Waste Rock Emplacement Boundary	
Processing Plant/ROM Pad/Mining Facility	
Soil Stockpile Boundary	
Low-grade Ore Stockpile Boundary	
NAF Waste Rock Stockpile Area	
Noise Barrier	
Fixed Equipment Location	
JC	Jaw Crusher
SB	SAG-Ball Mills
Mobile Equipment Location	
Processing Plant	
Open Cut Pit / Related Components	

Mobile Equipment Type

HT	Haul Truck
Ex	Excavator
G	Grader
Dr	Rock Drill
Fel	Front-end Loader
WT	Water Truck

SCALE 1:30 000 (A4)

500 0 500 1000 1500 m

Source: Bowdens Silver Pty Limited

Figure G
OPERATIONAL SCENARIO 4 - YEAR 10 - EVENING

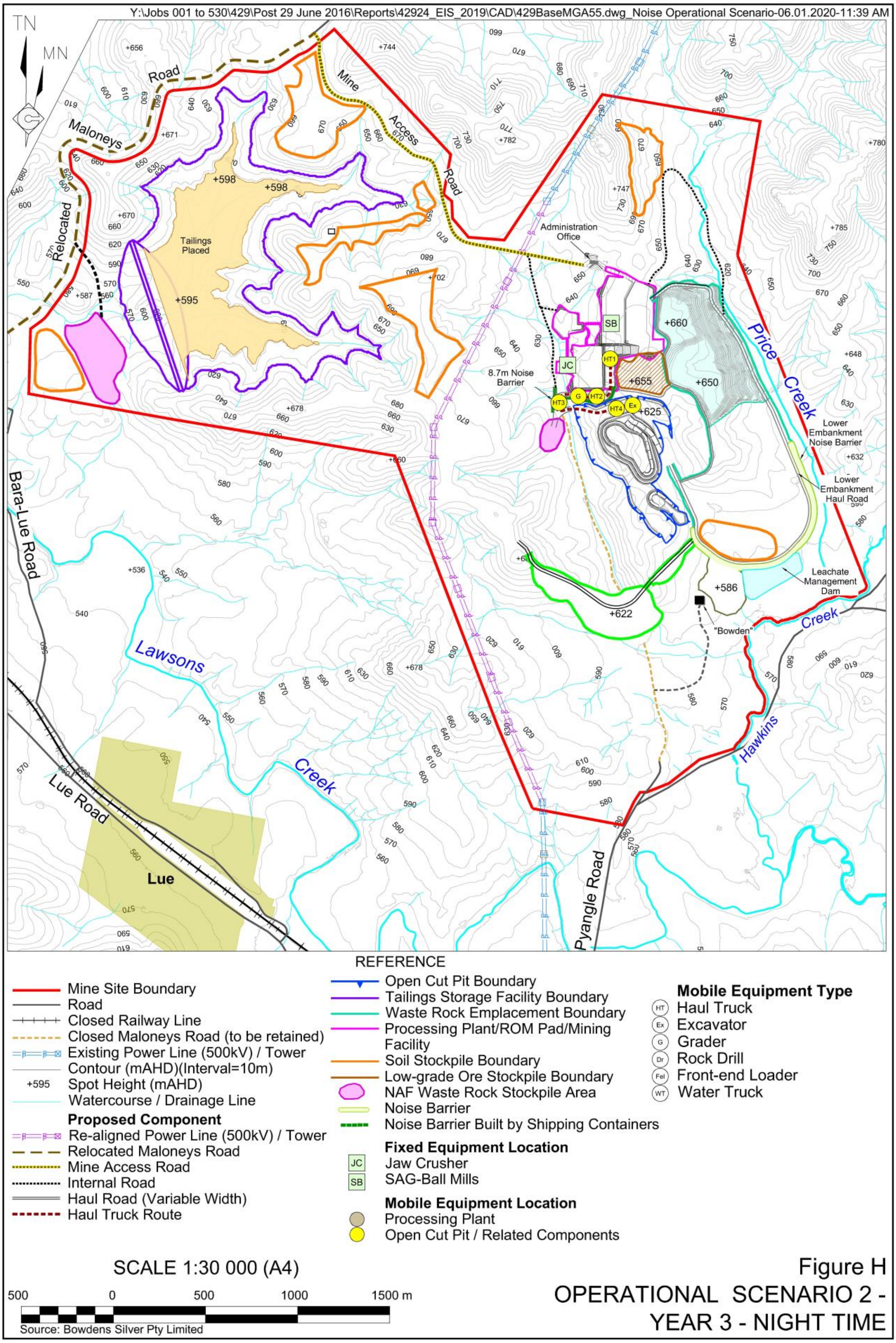
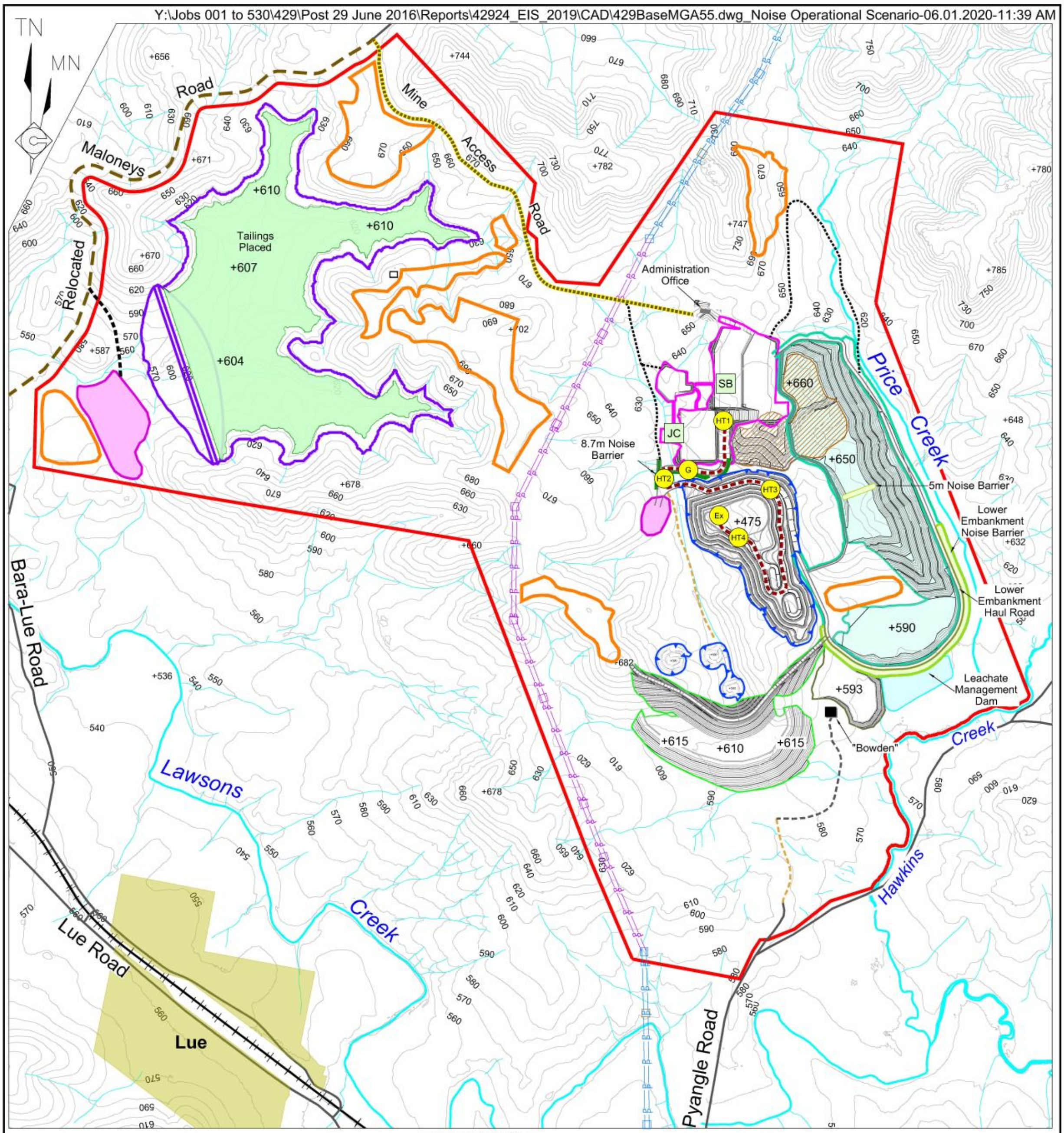


Figure H
OPERATIONAL SCENARIO 2 - YEAR 3 - NIGHT TIME



REFERENCE

- Mine Site Boundary
- Road
- Closed Railway Line
- Closed Maloneys Road (to be retained)
- Existing Power Line (500kV) / Tower
- Contour (mAHD)(Interval=10m)
- +595 Spot Height (mAHD)
- Watercourse / Drainage Line

Proposed Component

- Re-aligned Power Line (500kV) / Tower
- Relocated Maloneys Road
- Mine Access Road
- Internal Road
- Haul Road (Variable Width)
- Haul Truck Route
- Open Cut Pit Boundary
- Tailings Storage Facility Boundary
- Waste Rock Emplacement Boundary
- Processing Plant/ROM Pad/Mining Facility
- Soil Stockpile Boundary
- Low-grade Ore Stockpile Boundary
- NAF Waste Rock Stockpile Area
- Noise Barrier
- Noise Barrier Built by Shipping Containers

Fixed Equipment Location

- JC Jaw Crusher
- SB SAG-Ball Mills

Mobile Equipment Location

- Processing Plant
- Open Cut Pit / Related Components

Mobile Equipment Type

- HT Haul Truck
- Ex Excavator
- G Grader
- Dr Rock Drill
- Fel Front-end Loader
- WT Water Truck

SCALE 1:30 000 (A4)

500 0 500 1000 1500 m

Source: Bowdens Silver Pty Limited

Figure I
OPERATIONAL SCENARIO 3 - YEAR 8 - NIGHT TIME

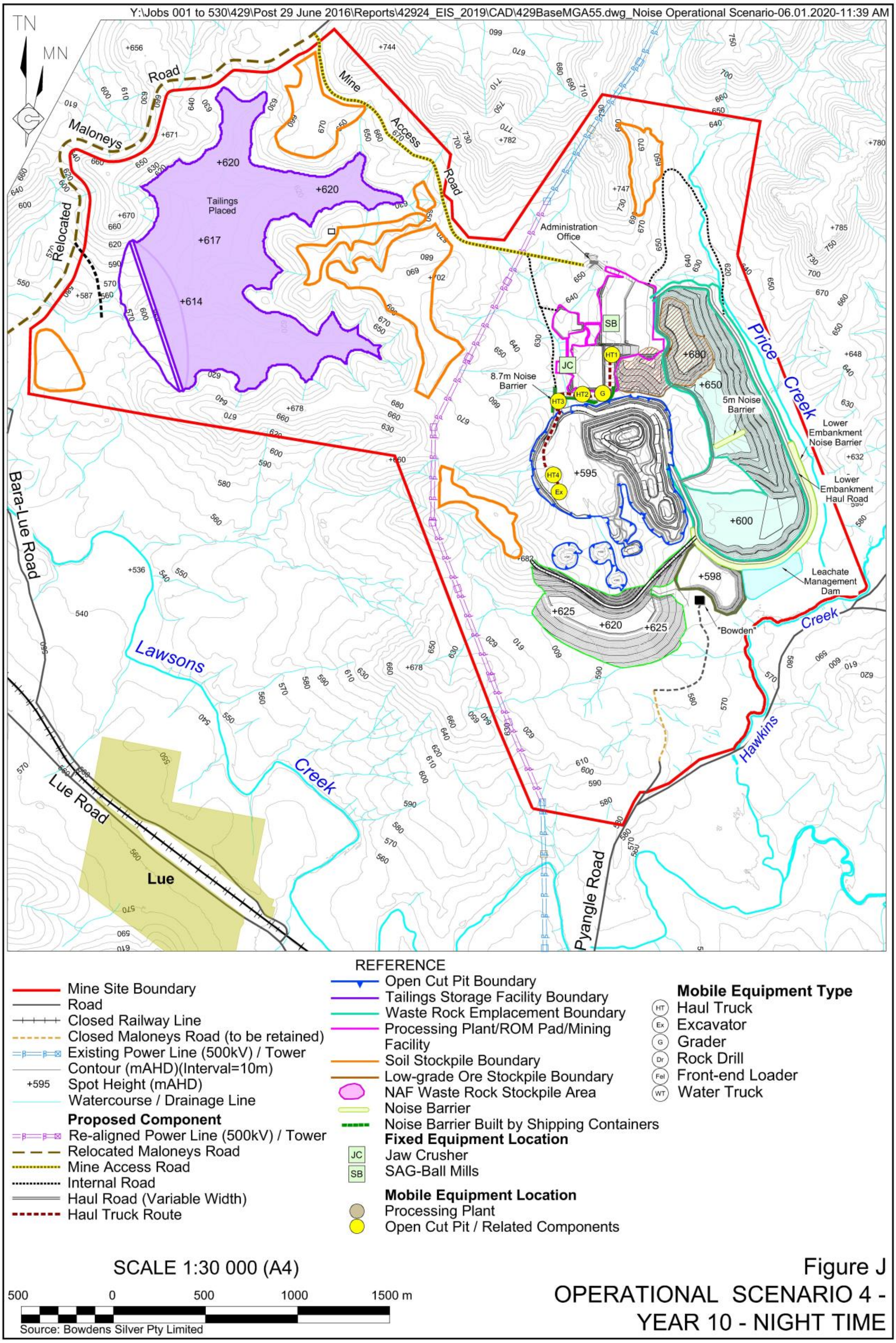


Figure J
OPERATIONAL SCENARIO 4 - YEAR 10 - NIGHT TIME

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Annexure 16

Definition of Feasible and Reasonable Mitigation

(Total No. of pages including blank pages = 2)

NPfI Fact Sheet F: Feasible and Reasonable Mitigation

'Feasible' and 'reasonable' mitigation is defined as follows.

A feasible mitigation measure is a noise mitigation measure that can be engineered and is practical to build and/or implement, given project constraints such as safety, maintenance and reliability requirements. It may also include options such as amending operational practices (for example, changing a noisy operation to a less-sensitive period or location) to achieve noise reduction.

Selecting reasonable measures from those that are feasible involves judging whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the mitigation measure. To make such a judgement, consider the following:

- *Noise impacts:*
  - *existing and future levels, and projected changes in noise levels*
  - *level of amenity before the development, for example, the number of people affected or annoyed*
  - *the amount by which the triggers are exceeded.*
- *Noise mitigation benefits:*
  - *the amount of noise reduction expected, including the cumulative effectiveness of proposed mitigation measures, for example, a noise wall/mound should be able to reduce noise levels by at least 5 decibels*
  - *the number of people protected.*
- *Cost effectiveness of noise mitigation:*
  - *the total cost of mitigation measures*
  - *noise mitigation costs compared with total project costs, taking into account capital and maintenance costs*
  - *ongoing operational and maintenance cost borne by the community, for example, running air conditioners or mechanical ventilation.*
- *Community views:*
  - *engage with affected land users when deciding about aesthetic and other impacts of noise mitigation measures*
  - *determine the views of all affected land users, not just those making representations, through early community consultation*
  - *consider noise mitigation measures that have majority support from the affected community.*

Take into account the above considerations when determining the mitigation measures proposed to be incorporated into the development. In practice, the detail of the mitigation measures applied will largely depend on project-specific factors. These are the measures that minimise, as far as practicable, the local impacts of the project. Project approval conditions that flow from this process should be achievable. They need to provide clarity and confidence for the proponent, local community, regulators and the ultimate operator that the proposed mitigation measures can achieve the predicted level of environmental protection.

Annexure 17

Operational Intrusive Noise Contours Standard Meteorological Conditions

(Total No. of pages including blank pages = 8)

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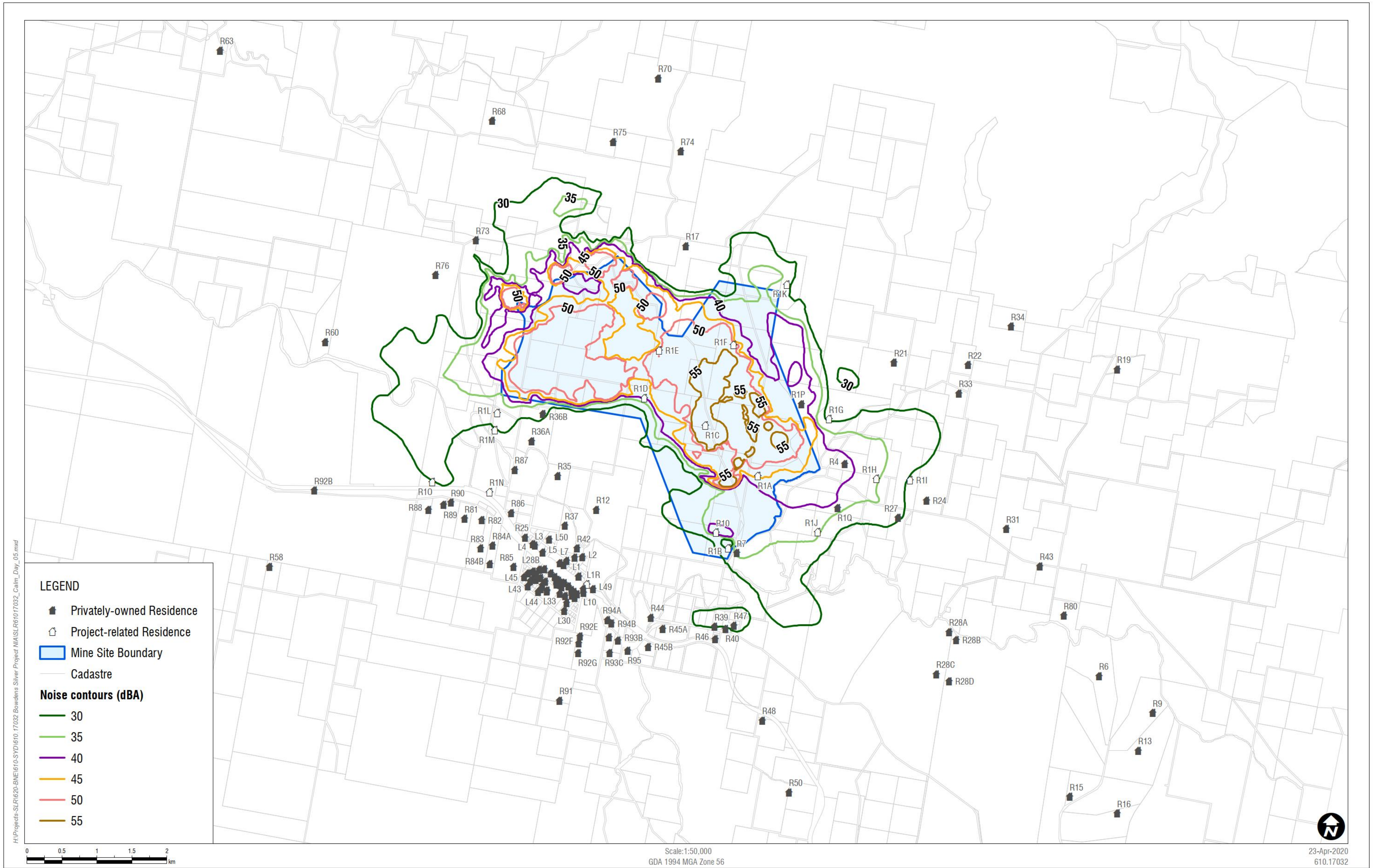

Sheet Size : A3

SLR

www.slrconsulting.com PH: 02 4037 3200

Predicted life of mine (outer envelope) operational intrusive $L_{Aeq(15minute)}$ noise contours
Daytime standard meteorological conditions

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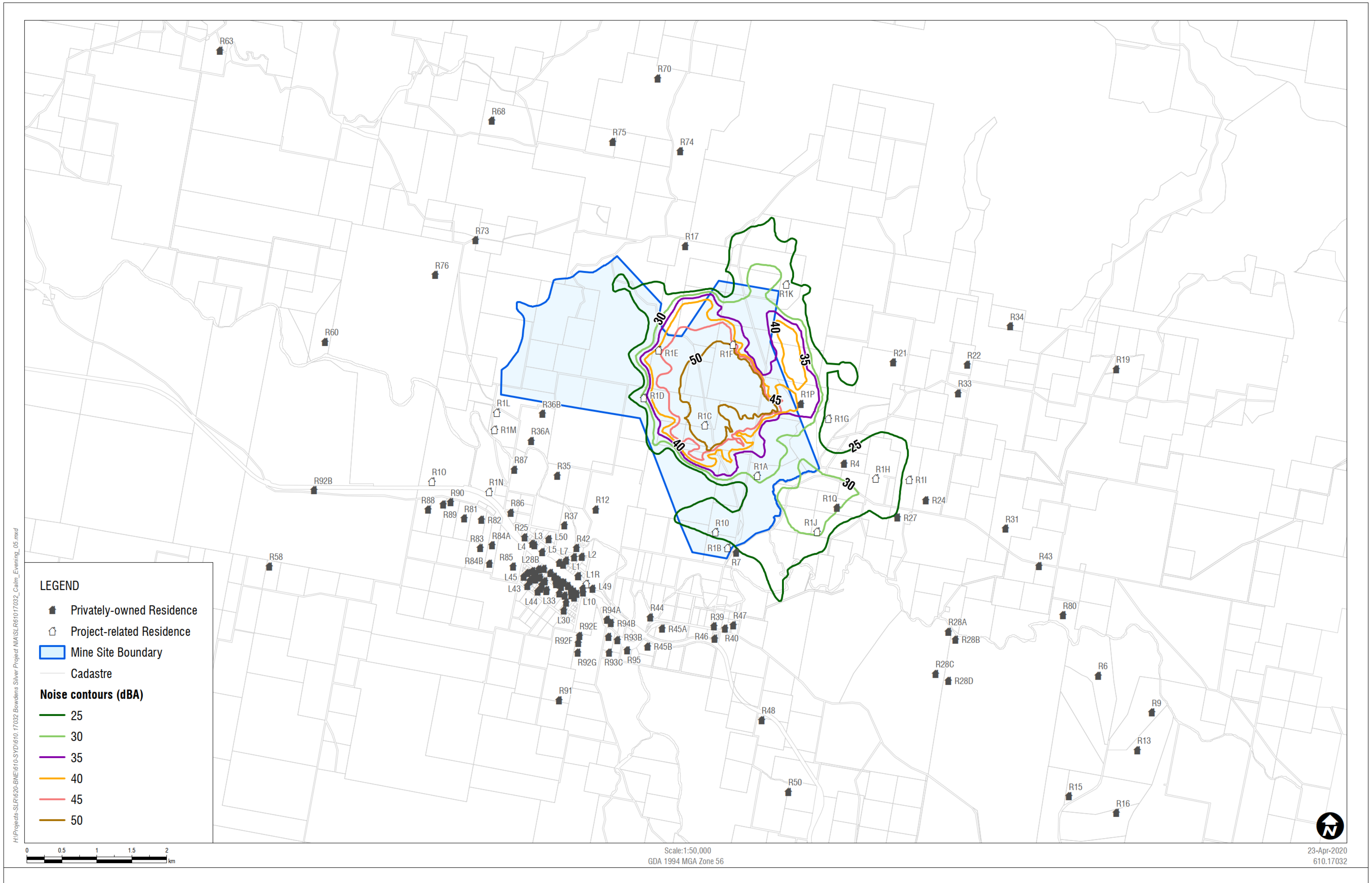

Predicted life of mine (outer envelope) operational intrusive $L_{Aeq(15minute)}$ noise contours Evening standard meteorological conditions

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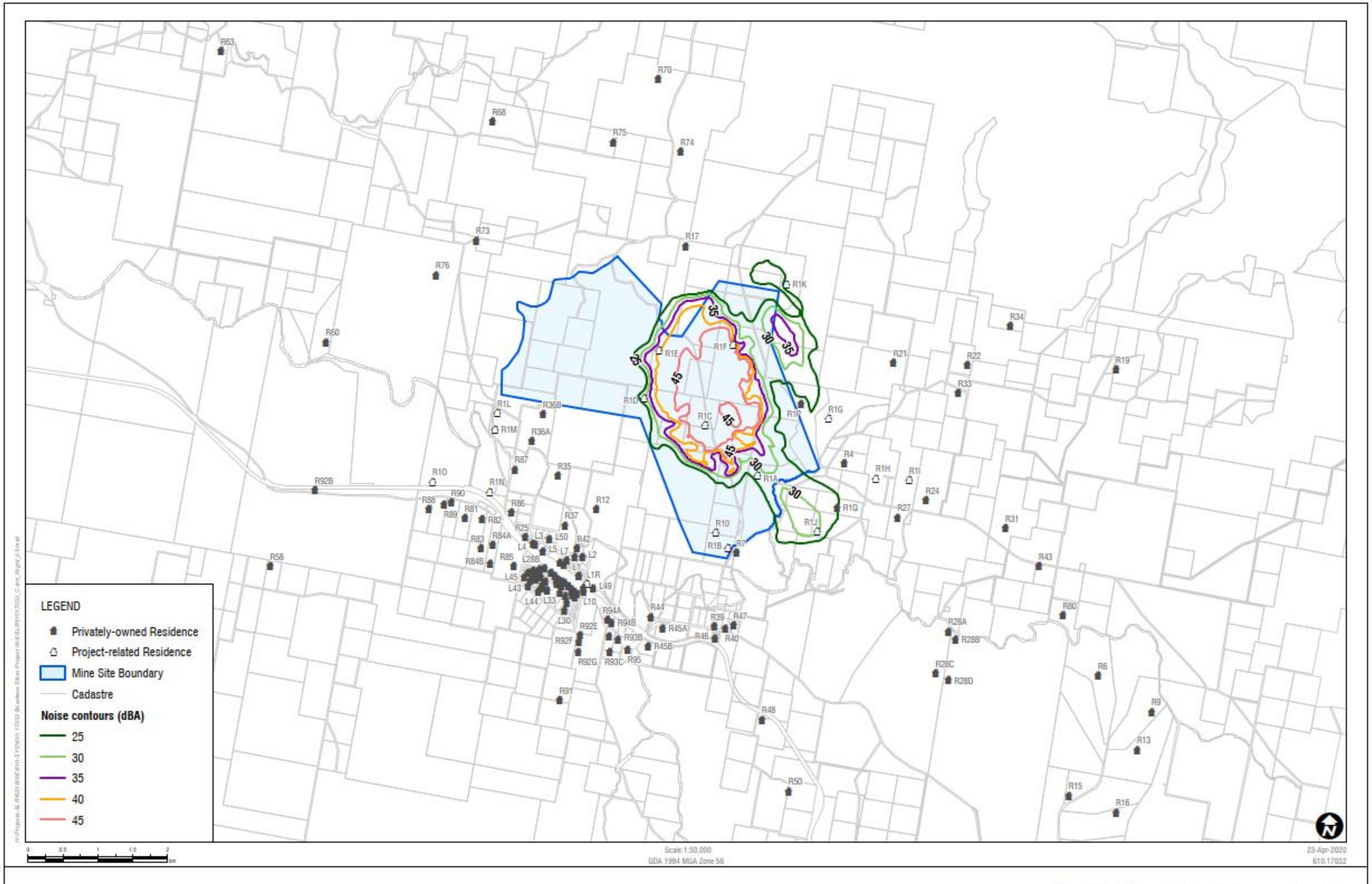

Predicted life of mine (outer envelope) operational intrusive $L_{Aeq(15minute)}$ noise contours
Night-time standard meteorological conditions

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Annexure 18

Operational Intrusive Noise Contours Noise-enhancing Meteorological Conditions

(Total No. of pages including blank pages = 8)

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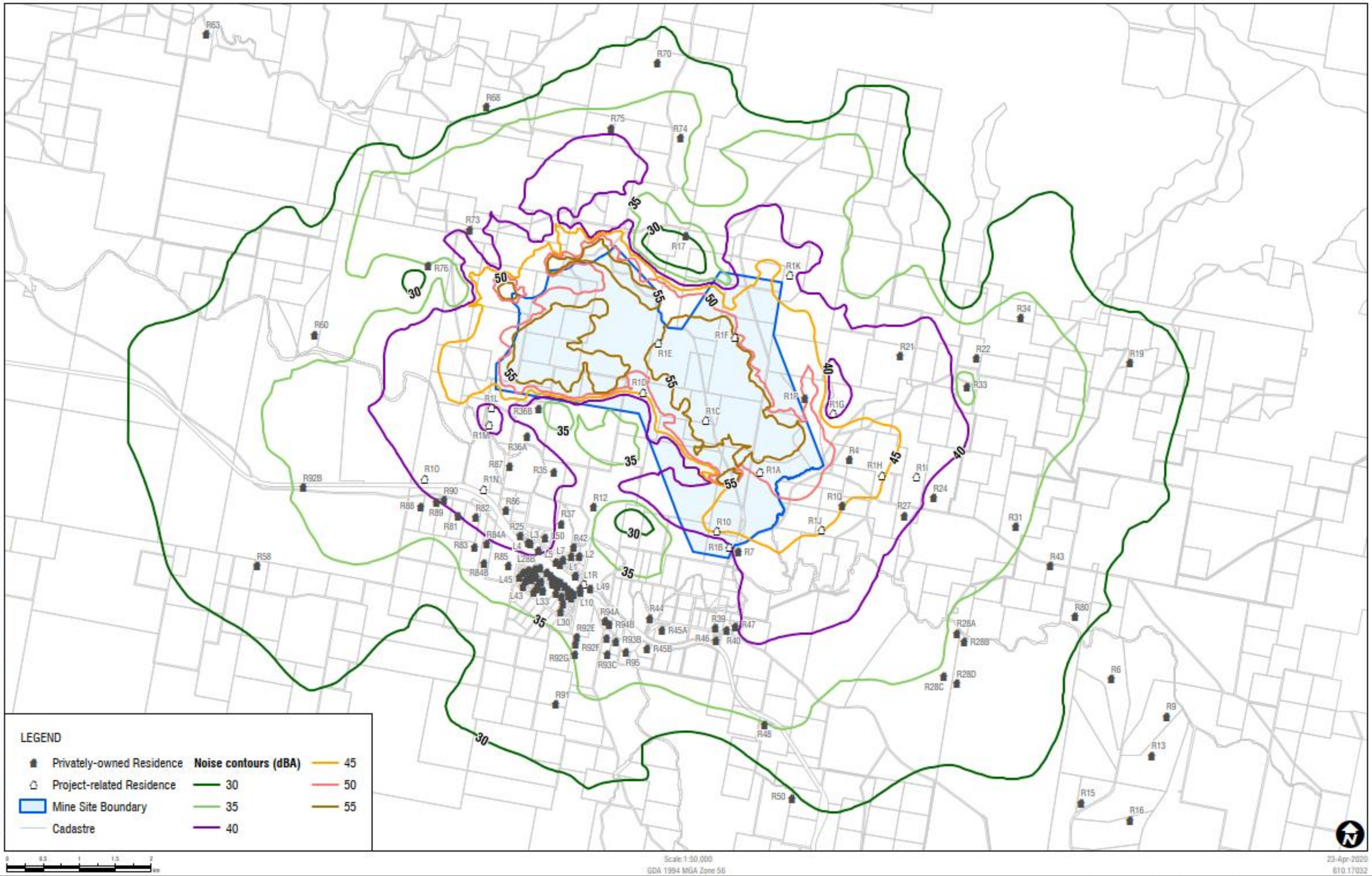

Predicted life of mine (outer envelope) operational intrusive $L_{Aeq(15minute)}$ noise contours

Daytime noise-enhancing 3m/s wind speed from source to receiver

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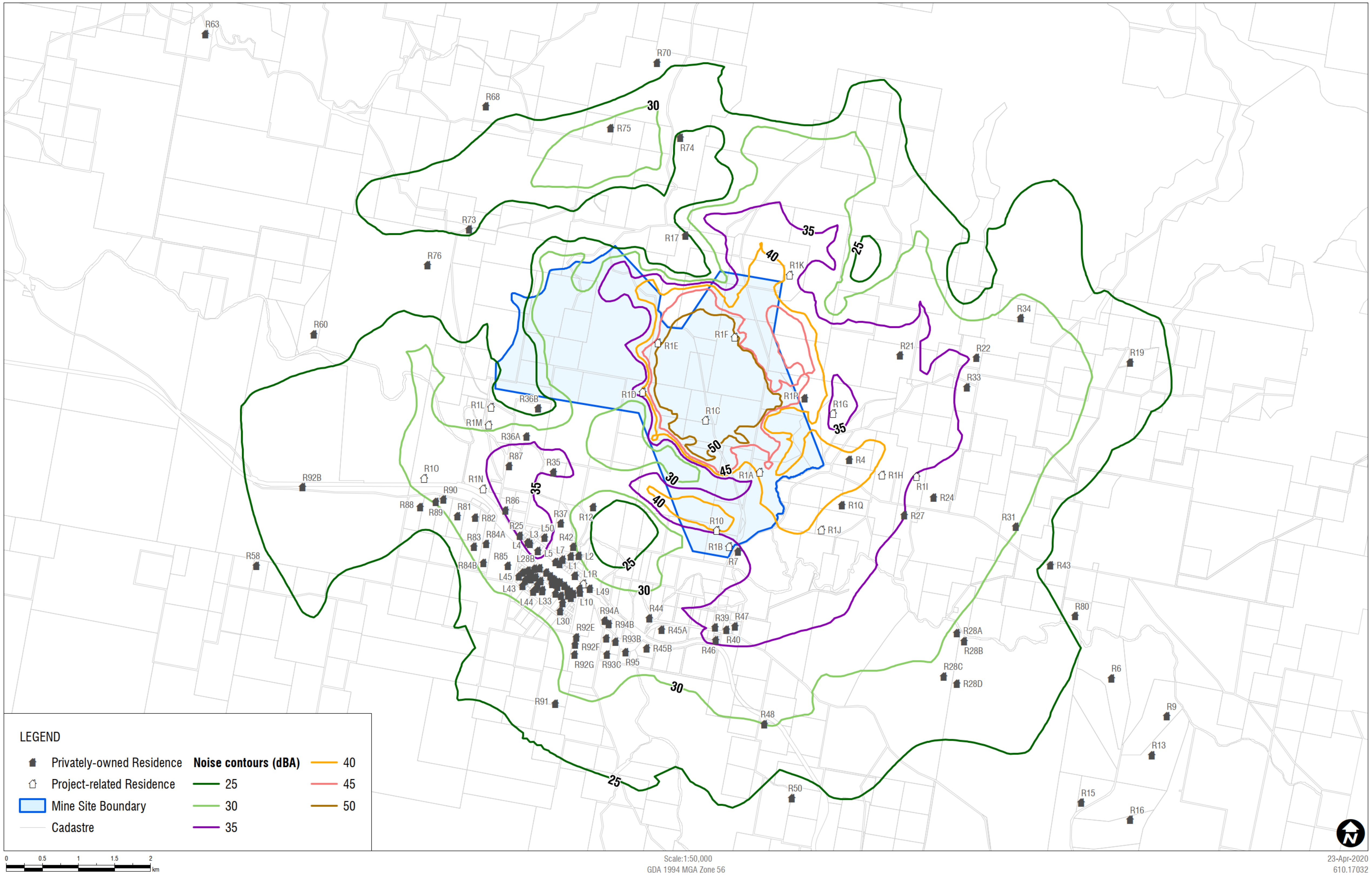

Sheet Size : A3

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Predicted life of mine (outer envelope) operational intrusive $L_{Aeq(15minute)}$ noise contours

Evening noise-enhancing 3m/s wind speed from source to receiver

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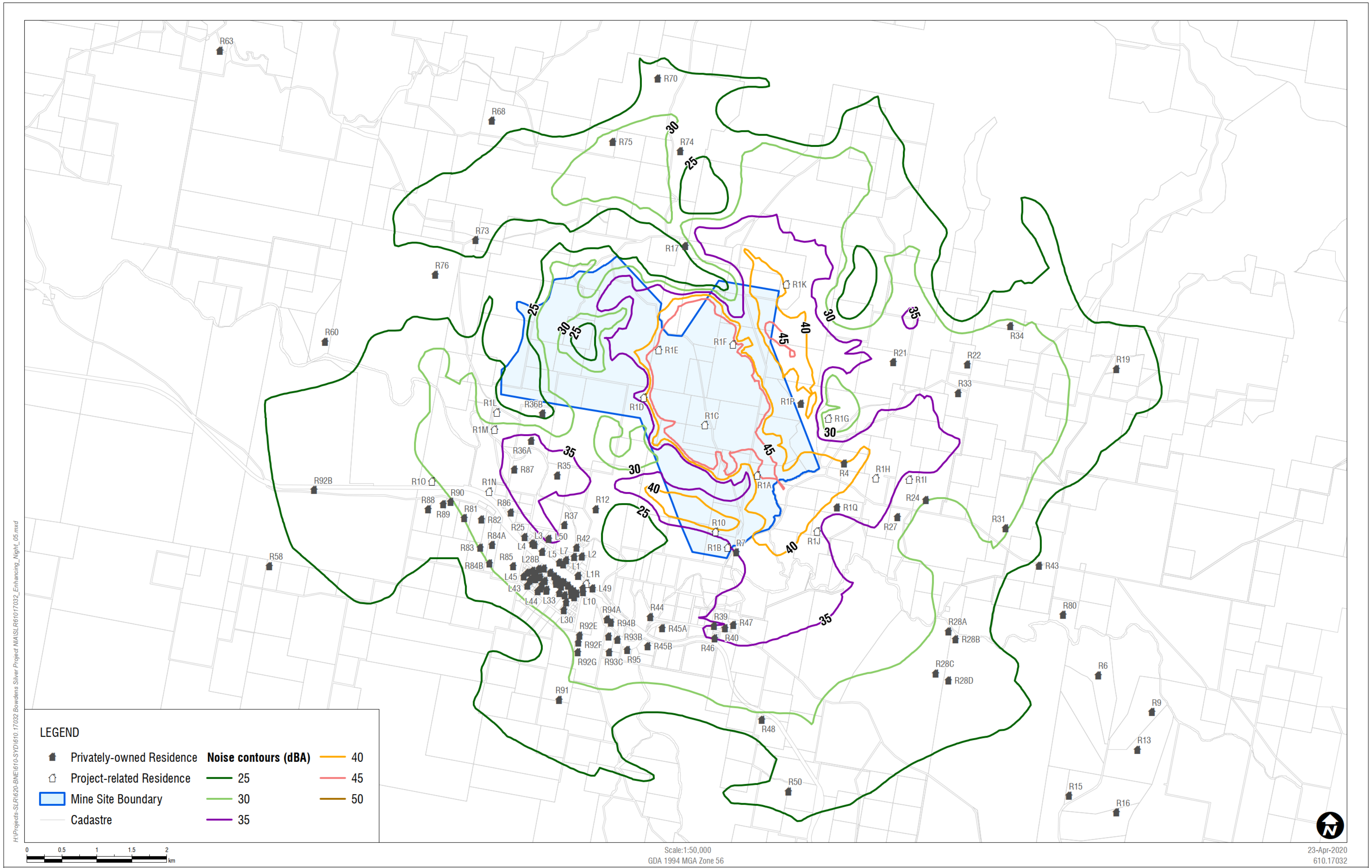

Predicted life of mine (outer envelope) operational intrusive $L_{Aeq(15minute)}$ noise contours

Night-time noise-enhancing 4°C/100m temperature inversion plus 2m/s wind speed from source to receiver

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Annexure 19

Peer Review

(Total No. of pages including blank pages = 20)

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Bowdens Silver Project

Acoustic Peer Review

Prepared for RW Corkery & Co. Pty Ltd
December 2019

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Bowdens Silver Project

Acoustics Peer Review

Report Number

J17359 RP1

Client

RW Corkery & Co. Pty Ltd

Date

6 December 2019

Version

v2 Final

Prepared by

Najah Ishac
Director
6 December 2019

This report has been prepared in accordance with the brief provided by the client and has relied upon the information collected at the time and under the conditions specified in the report. All findings, conclusions or recommendations contained in the report are based on the aforementioned circumstances. The report is for the use of the client and no responsibility will be taken for its use by other parties. The client may, at its discretion, use the report to inform regulators and the public.

Table of Contents

Appendices

1 Introduction

1.1 Overview

EMM Consulting Pty Limited (EMM) has been engaged to undertake an independent technical peer review of the Noise and Vibration Impact Assessment (NVIA) for the Bowdens Silver project.

EMM's involvement has been generally limited to a desktop review of information, as well as a number of meetings with SLR Consulting (SLR) noise specialists. EMM has not completed independent modelling of impacts to verify outcomes.

The scope of the impact assessment review was to:

- review the EIS methodology, including its technical adequacy and completeness of the NVIA, taking into account relevant noise and vibration impact assessment guidelines, requirements and legislation (including the Secretary's Environmental Assessment Requirements (SEARs)) and impact assessment best practice;
- analyse the NVIA results, with reference to applicable legislation, guidelines and comparable projects; and
- review the mitigation and management recommended in the EIS , including the appropriateness and effectiveness of management and mitigation measures.

The following documents formed a key part of the review:

- Preliminary Environmental Assessment State Significant Development No. 5765, dated November 2016 (RW Corkery & Co. Pty Ltd);
- Environmental Impact Statement Section 2 – Description of the Project, Draft Report No. 429/24 dated 19 December 2018 (RW Corkery & Co. Pty Ltd);
- Bowdens Silver Project Noise and Vibration Assessment, Part 1 version 2, dated 23 January 2019 (SLR Consulting Australia Pty Ltd);
- Bowdens Silver Project Noise and Vibration Assessment, version 5 dated 9 August 2019;
- Bowdens Silver Project Noise and Vibration Assessment, version 6 dated 30 September 2019;
- Bowdens Silver Project Noise and Vibration Assessment, version 10 dated 15 November 2019; and
- Bowdens Silver Project Noise and Vibration Assessment, version 11 dated 27 November 2019.

Several reviews of the draft NVIA were completed. Each time, updates or comments were provided by the authors responding to review notes, culminating in the final NVIA. The review process was therefore iterative over a period of many months to ensure any major points were captured early and changes made were necessary along the way.

1.2 Peer review approach

The Association of Australasian Acoustical Consultants (AAAC) provides a code of professional conduct available on their website (aaac.org.au). The AAAC Consultants Guideline for Report Writing version 2.0 (July 2017) at Chapter 8 (Peer Reviews) provides objectives and report structure recommendations as follows:

> "…all Peer Review reports should, based on the information contained within the document being reviewed, identify opinions on:
>
> - Advice, which they believe is incorrect or inappropriate;
> - Advice which requires clarification or additional information;
> - Minor points which, in the peer reviewer's opinion, may not be the approach they would have taken, however, do not alter the outcome/ conclusion of the report.
>
> Use of a similar structure in Peer Review reports (to the three categories above) is recommended.
>
> Any Peer Review should take into account the nature of the commission which should be stated in the original consultant's report.
>
> The Peer Reviewer should attempt to contact the author of the report, where permitted by the client and where clarification would address questions the peer reviewer has."

The above approach has been followed as relevant. A number of iterations of the NVIA by SLR have been reviewed and each time we have provided comments to which responses have been provided.

Appendix A provides a glossary of acoustic terms used in this report.

2 The proposed project

Bowdens Silver Pty Limited (Bowdens Silver) proposes to construct and operate an open cut mine to recover mineralised rock (ore) containing silver and small percentages of zinc and lead to depths of approximately 180m. The Mine Site is located approximately 3km northeast of Lue in the Mid-Western Region Local Government Area. The Project would comprise a main open cut pit and two small satellite pits, processing plant, waste rock emplacement (WRE), tailings storage facility (TSF), as well as ancillary components and associated infrastructure that would extract and process approximately two million tonnes of ore per year over an anticipated period of 15 years.

The Bowdens Silver Project comprises seven principal components, namely:

1. A main open cut pit and two satellite open cut pits, collectively covering approximately 52ha;
2. A processing plant and related infrastructure covering approximately 22ha;
3. A waste rock emplacement (WRE) covering approximately 77ha;
4. A low grade ore stockpile covering approximately 14ha (9ha above WRE)[1];
5. An oxide ore stockpile covering approximately 8ha;
6. A tailings storage facility (TSF) covering approximately 114ha; and
7. The southern barrier to provide visual and acoustic protection to properties south of the Mine Site covering approximately 32ha.

The above components would be supported by a range of on-site and off-site infrastructure. The on-site infrastructure comprises haul roads, water management structures, power/water reticulation, workshops, stores, compounds and offices/amenities as well as realigning the existing 500kV Power Transmission Line (PTL). The off-site infrastructure comprises a relocated section of Maloneys Road (including a new railway bridge crossing and new crossing of Lawsons Creek), and a water supply pipeline for the delivery of water from the Ulan Coal Mine.

[1] The low grade ore stockpile would be constructed adjacent to but largely upon the northern sections of the WRE

3 SEARs and EPA requirements

The Secretary's Environmental Assessment Requirements (SEARs) were issued 21 June 2019. The requirements for noise and blasting were:

- an assessment of the likely operational noise impacts of the development (including construction noise) under the Noise Policy for Industry (EPA), and the Voluntary Land Acquisition and Mitigation Policy, and having regard to the EPA's requirements (see Attachment 2A and 2B);
- if a claim is made for specific construction noise criteria for certain activities, then this claim must be justified and accompanied by an assessment of the likely construction noise impacts of these activities under the Interim Construction Noise Guideline;
- an assessment of the likely road noise impacts of the development under the NSW Road Noise Policy; and
- an assessment of the likely blasting impacts of the development on people, animals, buildings and infrastructure, and significant natural features, having regard to the relevant ANZECC guidelines.

The noise and blasting policies and guidelines listed at Attachment 1 of the SEARs are:

- NSW Noise Policy for Industry (EPA);
- Interim Construction Noise Guideline (EPA);
- NSW Road Noise Policy (EPA);
- Assessing Vibration: a Technical Guideline (EPA);
- Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration (ANZECC); and
- Voluntary Land Acquisition and Mitigation Policy (DP&E).

The EPA's requirements (as referenced in the SEARs) dated 13 December 2016 mirror the SEARs in the most part. One additional requirement of the EPA is for noise monitoring as described below.

> Describe the noise monitoring system in detail, including the development and implementation of a monitoring program that:
>
> - uses a combination of predictive meteorological forecasting and real-time noise monitoring, supplemented with attended monitoring measures to evaluate the performance of the mine complex;
> - adequately supports the proactive and reactive noise management system on site;
> - includes a protocol for determining exceedances of the conditions imposed on the project;
> - evaluates and reports on the effectiveness of the noise management system on site; and
> - provides for the annual validation of the noise model for the mine complex.

4 Methodology review

4.1 Existing noise environment and assessment locations

The land uses in the vicinity of the Mine Site are rural in nature, with rural residential being the most sensitive to potential noise from site. Hence, existing ambient background noise levels are relatively low as shown by baseline monitoring data presented.

There are no major existing industrial sites in the area and this is acknowledged in the report, supported by attended noise sampling and observations.

Approximately 150 assessment locations were adopted for noise impact assessment purposes, the majority of which being privately-owned residential locations. This is considered to provide a fair representation of the potentially exposed community to future site noise.

4.2 Ambient and background noise monitoring

The majority of the baseline data adopted is relatively dated (2011, 2012 and 2013) although more recent data is also included from 2017. This is inconsequential as the assessment adopts the lowest possible background noise levels in accordance with the NPfI, and hence assesses potential emissions against the strictest derivable noise targets. It is evident from the data presented that the surrounding area is afforded a relatively quiet environment with background noise levels often well below the NPfI minimum threshold of 35 dB(A) day and 30dB(A) evening and night.

4.3 Noise modelling methods

The noise modelling of proposed construction and operational activity was completed using the Renzo Tonin and Associates' Environmental Noise Model (ENM) software Version 3.06. This software is no longer available for purchase nor supported by the developer. However, in our experience is still suitable for large scale industrial noise modelling such as mine sites and is particularly reliable for estimations at large distances (greater than 1km) for various meteorological conditions and is known to provide conservative predictions for such situations.

The input parameters for plant and equipment were scrutinised including a review of the noise model itself during a meeting with SLR. This is discussed further in subsequent sections of this report.

4.4 Weather data

A number of Automatic Weather Stations (AWS) were used to provide data and to understand the meteorological conditions for the Mine Site and surrounds. The data from the Bureau of Meteorology AWS (35km east of Mine Site) was used to analyse the baseline noise monitoring data captured in 2011 and 2012, while Bowdens Silver's local AWS were used for analysing baseline noise data captured in 2013 and 2017. Information on prevailing winds or prevalence of temperature inversions (both relevant to noise propagation) was not provided. However, the assessment adopted the NPfI default standard and noise-enhancing meteorological conditions for noise modelling purposes, which covers all assessable weather and hence is considered an acceptable approach.

5 Assessment and findings review

5.1 Adopted criteria

5.1.1 Construction noise

It is common for DPIE to require mining projects to assess construction noise as per operational noise given the similarities in both activities. This is reflected in the SEARs as follows:

> an assessment of the likely operational noise impacts of the development (including construction noise) under the *Noise Policy for Industry* (EPA), and the *Voluntary Land Acquisition and Mitigation Policy,* and having regard to the EPA's requirements

The SEARs also states:

> if a claim is made for specific construction noise criteria for certain activities, then this claim must be justified and accompanied by an assessment of the likely construction noise impacts of these activities under the *Interim Construction Noise Guideline*

The assessment has demonstrated that the construction phase is separate from operations from a timing perspective and/or includes activities unlike operational phases of the project or that activities are well removed from proposed operational areas. The assessment has appropriately adopted the ICNG for the first six months of construction activities for the relocated Maloneys Road (and associated infrastructure) and for on-site processing plant earthworks and infrastructure. From month seven onwards, construction activities overlap with ore and waste rock extraction (delineating the commencement of "mining") and hence is assessed as per operational noise where works are proposed on site. However, off-site water pipeline construction is proposed for months 7 to 18 and has been assessed under the ICNG given noise impacts will be transient in nature and activities will be well removed from Mine Site.

This approach is considered reasonable.

5.1.2 Operational noise

The assessment has appropriately adopted the NSW EPA's Noise Policy for Industry (NPfI, 2017) as well as the Department of Planning's Voluntary Land Acquisition and Mitigation Policy (VLAMP, 2018) to the project.

5.2 Noise modelling

The noise model input parameters for Scenario 1 (Year 0), representing the construction phase (daytime only), include a list of expected plant, their corresponding sound power levels, quantity of each item and where they are expected to operate on the site (displayed on maps in Annexures to the report). A total combined sound power level for all modelled plant of 128dB(A) is shown for the 53 items listed.

Similarly, noise model parameters for Scenarios 2, 3 and 4 are provided representing project years 3, 8 and 10 respectively.

The total sound power level and quantity of plant is similar between Scenarios 1 to 3, before reducing for Scenario 4 when tailings storage facility (TSF) embankment construction has ceased.

The evening and night operations (Scenarios 2 to 4) are materially reduced by way of quantity of plant and therefore corresponding total sound power level. This is considered to be a management measure that mitigates impacts to the community during the more sensitive periods.

The assessment confirms that modelled scenarios include all major proposed fixed and mobile plant operating concurrently and simulates the overall operating maximum noise energy. For mobile plant, utilisation rates of 75% for daytime, 83% for evening and 87% for night time were adopted for operational scenarios.

The sound power levels adopted are considered representative of the plant types listed, and utilisation rates are also typical for the mining industry in our experience.

The NPfI noise characteristics penalties (e.g. low frequency noise) were also appropriately considered.

5.3 Noise mitigation and management

It is a requirement of government noise policy and guidelines to consider all feasible and reasonable noise mitigation and management when residual noise levels are found (e.g. where the NPfI project noise trigger levels are exceeded).

Noise source control is the first measure that should be adopted, and for the project this includes a commitment to using noise attenuated mobile plant, restricting dozer operations to 1st gear when out of pit, and broad band noise “quacker” style reversing alarms. Operational management controls are also proposed and will include reducing the operating plant quantities for the evening and night periods, as well as real-time noise monitoring, scheduling of intrusive activities to less sensitive times of the day and continuous meteorological monitoring. For fixed plant, full or partial enclosures are adopted, as well as low noise specifications.

Controlling the transmission path is the next measure that should be considered once noise source control measures have been exhausted. A number of measures have been described to mitigate noise in the transmission path for mobile and fixed plant.

Once noise control at the source and in the transmission path has been exhausted, measures at the receiver can be considered. This has appropriately taken the form of the VLAMP where voluntary mitigation of the dwelling or acquisition of the property has been afforded to landowners where they can opt for it if the Project is approved.

5.4 Construction and operational noise results

The results of noise model show the following:

- Construction of the off-site road network and on-site earthworks and infrastructure (ie month 1 to 6) – one privately-owned residence is identified where predicted noise levels are 1 to 5dB(A) above criteria. Four privately owned residences would experience construction noise greater than 5dB(A) above NML. Such exceedances are not considered significant when assessed as daytime only construction noise. No residences are predicted to experience noise levels above the ICNG Highly Noise Affected level of 75dB(A) applicable during ICNG standard hours.

- Construction noise from the proposed make-up water supply pipeline aspect of the project (months 7 to 18) has not be detailed. The expected noise levels are predicted to satisfy the ICNG daytime highly noise affected level (HNAL) of 75dB(A) at 50m from proposed construction. These works will be relatively transient (eg approximately 200m to 500m per day) and any impacts would be short-term and restricted to daytime only.

- A construction noise management plan (CNMP) will be developed by the proponent in accordance with any project approval requirements should an approval be granted.

- Operational noise:

- Residences and places of interest in Lue are not expected to be impacted by the Project in accordance with government policy.
- A number of properties have been identified as potentially impacted by residual noise levels above government targets.
- A total of 11 rural residences are predicted to exceed the government's noise levels (ie Project Noise Trigger Levels or PNTLs). These include:
  - six residences where predicted mine noise is 1 to 2 dB above targets;
  - four residences where predicted mine noise is 3 to 5 dB above targets and hence afforded dwelling treatment upon request; and
  - one residence where predicted mine noise is more than 5dB above targets and hence afforded dwelling treatment and land acquisition upon request.
- The NPfI sleep disturbance L_{Amax} level is predicted to be exceeded at one residence. This residence is afforded dwelling treatment and land acquisition upon request based on exceedances of average noise level triggers (ie PNTL).
- An operational noise management plan will be developed by Bowden Silver as per any consent conditions should the Project be approved.
- An assessment of privately owned land as per the VLAMP was completed and shows that there are no properties with more than 25% of their area impacted.

• Power transmission line re-alignment noise and Year 3 operations:
  - Daytime only construction works together with Year 3 operational noise shows the following for a period of 1 to 2 months:
    - nine rural and three Lue town residences where predicted mine noise is 1 to 2 dB above PNTL targets;
    - five rural residences where predicted mine noise is 3 to 5 dB above PNTL targets ; and
    - two rural residences where predicted mine noise is more than 5dB above PNTL targets.
  - The assessment notes that the ICNG daytime target of 45dB $L_{Aeq,15minute}$ is predicted to be met at all but two rural residences.
  - The operational noise management plan (ONMP) will include management measures for realignment works.

• Cumulative noise.
  - There are no major existing or approved industrial developments located in the vicinity of the Mine Site.

- The existing Ulan Mine Complex, Moolarben Coal Complex and Wilpinjong Extension have been identified and are located between 29km to 38km from the Mine Site. As a result, any cumulative noise impacts are considered negligible.

The operational noise and construction noise and vibration impact assessments are considered to have been completed in accordance with industry practice.

5.5 Blasting impact assessment

The blast noise overpressure and ground vibration assessment adopt target levels based on accepted standards and guidelines. The predictions adopt industry accepted methods from Australian Standard AS 2187.

The results provide safe working distances for residential, livestock and structures needed to achieve established targets for typical blasts proposed. The results show, based on the selected blast designs and maximum instantaneous charges,

- three rural residences where the maximum not-to-be exceeded air blast overpressure target of 120dBL is predicted to be exceeded;
- at two of the three rural residences, the predicted air blast overpressure exceeds the 5% exceedance noise level criterion of 115dBL;
- impact on livestock is unlikely; and
- archaeological or geological structures are unlikely to be damaged.

A blast management plan will be developed if the Project is granted approval. The plan will include establishment of site-laws for the mine to enable key design parameters to be modified to achieve compliance with criteria.

The blast noise and vibration assessment are considered to have been completed adequately.

5.6 Offsite traffic noise

The road traffic noise assessment adopts the relevant government policy (NSW Road Noise Policy, RNP) for construction and operational phases of the project. The assessment classifies the relevant roads appropriately in accordance with the RNP. The results show:

- Construction months 1 to 6:
    - Lue Road – applicable criteria are predicted to be satisfied at all residential locations, albeit with marginal road traffic noise level increases. Project-related traffic is shown to increase the 52dB $L_{Aeq,1hour}$ base noise level by 1.3dB at the Lue Public School (for the coinciding 10am to 11am peak hour), as compared to the derived external 50dB target. This marginal traffic noise level increase that the project is predicted to contribute to does not warrant mitigation measures according to the RNP.
    - Pyangle Road - applicable criteria are predicted to be satisfied. It is important to note that the Project traffic will materially increase existing traffic noise at location R7 (from 31dB to 50dB for the day and night periods). The predicted night time traffic noise level is equal to the target of 50dB $L_{Aeq,1hour}$, and hence leaves little margin for any discrepancy. Given the calculations are understood to be desktop based, things like offset distances, which are critical to the calculations, should be verified through field ground truthing rather than rely on aerial imagery. Notwithstanding any possible discrepancies, any impacts as a result would be marginal and limited to the initial six month construction period.

- Corner Lue and Pyangle Roads – the combined traffic noise from these roads are predicted to satisfy the criteria for the dominant source of noise, Lue Road.

- Construction months 7 to 18:

  - Lue Road – applicable criteria are predicted to be satisfied at all residential locations, albeit with marginal road traffic noise level increases. Project-related traffic is shown to increase the 51dB $L_{Aeq,1hour}$ base noise level by 0.7dB(A) at the Lue Public School (for the coinciding 12pm to 1pm peak hour), as compared to the derived external 50dB target. This marginal increase the project is predicted to contribute does not warrant further measures according to the RNP.

  - Maloneys Road (relocated) - applicable criteria are predicted to be satisfied at all residential locations, albeit with marginal road traffic noise level increases. Final noise levels are predicted to be well below criteria.

- Operational Scenario 2:

  - Lue Road – applicable criteria are predicted to be satisfied at all residential locations, albeit with marginal road traffic noise level increases. Project related traffic is shown to increase the 51dB $L_{Aeq,1hour}$ base noise level by 0.8dB at the Lue Public School (for the coinciding 1pm to 2pm peak hour), as compared to the derived external 50dB target. The marginal increase the project is predicted to contribute does not warrant further measures according to the RNP.

  - Maloneys Road (relocated) - applicable criteria are predicted to be satisfied at all residential locations, albeit with marginal road traffic noise level increases. Final noise levels are predicted to be well below criteria.

The mitigation and management of traffic noise will be addressed through a Driver Code of Conduct should the project be approved.

5.7 Traffic vibration

The road traffic vibration assessment adopts the relevant government approach (Assessing vibration: A technical guideline) for project traffic. The results show impacts of road traffic related vibration is largely unlikely. However, two residential locations have been identified as within the EPA's RNP perceptible vibration offset distance of 20m from Lue Road or Pyangle Road.

Traffic vibration monitoring has been recommended for these two properties through a Traffic Noise and Vibration Management Plan (TNVMP) should the project proceed. Although it is unclear what measures would be afforded to such properties in the unlikely case that exceedances are found. Such measures should be detailed in the TNVMP.

Appendix A

Glossary of Acoustic Terms

A.1 Glossary of acoustic terms

Technical terms typically utilised in a noise assessment report are explained in the table below.

Glossary of acoustic terms and abbreviations

Abbreviation or term	Definition
ABL	The assessment background level (ABL) is defined in the INP as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L_{A90} statistical noise levels.
Amenity noise level	The amenity noise levels relate to the overall level of industrial noise subject to land zoning or use
A-weighting	There are several different weightings utilised for describing noise, the most common being the 'A-weighting'. This attempts to closely approximate the frequency response of the human ear.
Day period	Monday–Saturday: 7.00 am to 6.00 pm, on Sundays and public holidays: 8.00 am to 6.00 pm.
dB	Noise is measured in units called decibels (dB).
DPIE	NSW Department of Planning, Industry and Environment
EA	Environmental assessment
EMM	EMM Consulting Pty Limited
EP&A Act	NSW *Environmental and Planning Assessment Act 1979* (NSW)
EPA	NSW Environment Protection Authority (formerly the Department of Environment, Climate Change and Water).
Evening period	Monday–Saturday: 6.00 pm to 10.00 pm, on Sundays and public holidays
ICNG	Interim Construction Noise Guideline
Intrusive noise level	The intrusive noise level refers to noise that intrudes above the background level by more than 5 dB.
L_{A1}	The A-weighted noise level exceeded for 1% of the time.
L_{A10}	The A-weighted noise level which is exceeded 10% of the time. It is roughly equivalent to the average of maximum noise level.
L_{A90}	The A-weighted noise level that is exceeded 90% of the time. Commonly referred to as the background noise level.
L_{Aeq}	The A-weighted energy average noise level. This is the equivalent continuous sound pressure level over a given period. The $L_{Aeq(15\text{-minute})}$ descriptor refers to an L_{Aeq} noise level measured over a 15 minute period.
L_{Amax}	The maximum A-weighted sound pressure level received during a measurement interval.
Night period	Monday–Saturday: 10.00 pm to 7.00 am, on Sundays and public holidays: 10.00 pm to 8.00 am.
NMP	Noise management plan
PNTL	The project noise trigger levels (PNTLs) are targets for a particular industrial noise source or industry. The PNTLs are the lower of either the project intrusive noise level or project amenity noise level.
POEO Act	NSW *Protection of the Environment Operations Act 1997* (NSW)
RBL	The rating background level (RBL) is an overall single value background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the average background levels.
RNP	Road Noise Policy
Sound power level (L_w)	A measure of the total power radiated by a source. The sound power of a source is a fundamental property of the source and is independent of the surrounding environment.
Temperature inversion	A meteorological condition where the atmospheric temperature increases with altitude.

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