Appendix J

Noise Impact Assessment

TransGrid

4 February 2010

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Rookwood Road Substation

Construction and Operational Acoustic Assessment

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Prepared for

TransGrid

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1.0 Introduction

AECOM has been commissioned by TransGrid to undertake a construction and operational noise assessment of the proposed Substation at Rookwood Road, Potts Hill NSW. It is understood that the proposed development is to comprise typical open air High Voltage (HV) equipment such as power transformers, reactors and capacitors. Additional plant is to be housed inside a Gas-Insulated Switchgear (GIS) building located on the site.

This study considers and assesses the following:

- Consultation with Bankstown Council to identify currently approved planning applications for the immediate neighbourhood;
- Identification of critical receiver locations with respect to noise propagation from the proposed substation;
- Measurement of background noise levels and subsequent determination of construction and operational noise criteria using the relevant guidance;
- Prediction of noise impact levels at identified receivers and mitigation recommendations as required.

1.1 Site Location

The site location, noise monitoring locations and key receivers are shown on Figure 1.

Figure 1 Site location, noise monitoring locations and noise sensitive receivers

Image courtesy of Google

2.0 Existing Noise Environment

2.1 Unattended ambient noise logging

Unattended noise monitoring of the existing ambient noise levels at three nearby residential receivers was undertaken for a period of seven days between Monday 30th November 2009 and Sunday 6th December 2009.

A noise logger measures the noise level over the sample period and then determines L_{A1}, L_{A10}, L_{A90}, L_{Amax} and L_{Aeq} levels of the noise environment. The L_{A1}, L_{A10} and L_{A90} levels are the noise levels exceeded for 1%, 10% and 90% of the sample period respectively.

The L_{Amax} is indicative of maximum noise levels due to individual noise events. The L_{A90} is taken as the background noise level.

The Assessment Background Level (ABL) is established by determining the lowest tenth-percentile level of the L_{A90} noise data acquired over each period of interest. The background noise level or Rating Background Level (RBL) representing the day, evening and night-time assessment periods is based on the median of individual ABLs determined over the entire monitoring duration.

Where the evening or night-time RBL exceeds the daytime RBL, the daytime RBL is used as the RBL for such time periods.

Each of the ambient noise logging positions is deemed to be representative of a catchment area of noise sensitive receivers. These are identified in this report as Sensitive Receiver Catchments 1-3.

The locations of the noise logging equipment are shown on Figure 1 and a summary of the results is presented in Table 1:

Table 1 Ambient noise logging results summary

Logger Location	Day		Evening		Night	
Sensitive Receiver Catchment 1 (SRC1)						
9 Boardman Street	L_{A90}	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}	L_{Aeq}
Monday 30 November, 2009			44	50	37	50
Tuesday 01 December, 2009	49	56	42	52	36	49
Wednesday 02 December, 2009	48	53	43	51	33	52
Thursday 03 December, 2009	45	55	45	54	39	51
Friday 04 December, 2009	49	55	44	52	34	49
Saturday 05 December, 2009	43	53	43	51	36	50
Sunday 06 December, 2009	45	54	45	53	37	49
RBL	46		44		36	
Log Average L_{Aeq}		54		52		50
Sensitive Receiver Catchment 2 (SRC2)						
46 Lewis Street	L_{A90}	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}	L_{Aeq}
Monday 30 November, 2009			39	46	31	42
Tuesday 01 December, 2009	43	51	38	48	31	42
Wednesday 02 December, 2009	39	49	36	47	26	40
Thursday 03 December, 2009	33	50	39	51	31	40
Friday 04 December, 2009	42	52	40	52	27	42
Saturday 05 December, 2009	32	59	39	50	31	42
Sunday 06 December, 2009	32	50	38	48	32	44
RBL	36		39		31	
Amended RBL	36		36		31	
Log Average, L_{Aeq}		54		49		42
Sensitive Receiver Catchment 3 (SRC)						
143 Cooper Road	L_{A90}	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}	L_{Aeq}
Monday 30 November, 2009			42	50	34	46
Tuesday 01 December, 2009	46	52	41	50	33	47

Logger Location	Day		Evening		Night	
Wednesday 02 December, 2009	45	52	40	56	28	47
Thursday 03 December, 2009	46	64	43	58	37	47
Friday 04 December, 2009	47	51	40	50	29	45
Saturday 05 December, 2009	42	50	40	51	33	46
Sunday 06 December, 2009	46	50	41	52	33	46
RBL	46		41		33	
Log Average, L_{Aeq}		58		54		46

The background noise levels measured at 9 Boardman Street are considered to be representative of the receivers located on Boardman Street, Graf Avenue and adjacent to Brunker Road. This group of receivers is exposed to higher levels of road traffic noise, from Rookwood Road and Brunker Road, than other affected receivers and is referred to as Sensitive Receiver Catchment 1 (SRC1).

The background noise levels measured at 46 Lewis Street are considered to be representative of the receivers to the north of the Potts Hill Reservoir site. This group of receivers is referred to as Sensitive Receiver Catchment 2 (SRC2).

The background noise levels measured at 143 Cooper Road are considered to be representative of the existing residential receivers on Cooper Street and the proposed Potts Hill residential development, which is to be constructed on the western part of the existing reservoir site. This group of receivers is referred to as Sensitive Receiver Catchment 3 (SRC3).

The demarcation of Sensitive Receiver Catchments is shown on Figure 1.

2.2 Attended Noise Monitoring

Attended monitoring was undertaken at four relevant nearby locations on December 3 2009 between 12.30am and 2am. The attended noise monitoring locations are shown on Figure 1.

Monitoring Location	$L_{Aeq, 15min}$	$L_{A90, 15 min}$
115 Cooper Road	57	30
Brunker Road opposite Lambert Street	54	35
Greyhound Social Club – Boardman Street	56	43
29 Lewis Street	34	30

3.0 Noise Criteria

3.1 Construction noise criteria

In July 2009 the NSW Department of Environment, Climate Change and Water (DECCW) published their *Interim Construction Noise Guidelines (ICNG)* for use in construction noise assessment. This document supersedes their previous publication the *Environmental Noise Control Manual (ENCM)* and is to be used as the basis for establishing construction noise criteria.

Under the existing DECCW policy, a construction noise management plan is required to be compiled by the Contractor, prior to construction commencing. Noise level objectives must be set for the daytime and evening periods, and must be complied with where reasonably practicable. Work that is proposed outside of standard working hours, as defined in the *ICNG*, generally requires strong justification.

The noise management plan should detail the "best practice" construction methods to be used, presenting a reasonable and feasible approach. The plan should identify the extent of the residential areas affected and assess the impact on residents. The plan should detail any community relation programs that are planned e.g. prior notification for particularly noisy activities, letter box drop regarding out of hours construction work to be undertaken and a 24 hour contact phone number for residents to call should they have any complaints or questions.

The *ICNG* defines what is considered to be feasible and reasonable as follows:

Feasible

> *A work practice or abatement measure is feasible if it is capable of being put into practice or of being engineered and is practical to build given project constraints such as safety and maintenance requirements.*

Reasonable

> *Selecting reasonable measures from those that are feasible involves making a judgment to determine whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the measure.*

The *ICNG* recommends that a quantitative assessment is carried out for all *'major construction projects that are typically subject to the EIA process'*. A quantitative assessment, based on a likely 'worst case' construction scenario, has been carried out for the Rookwood Road development.

Predicted noise levels at nearby noise sensitive receivers (residential, commercial and industrial premises) are compared to the levels provided in Section 4 of the *ICNG*. Where an exceedance of the criteria is predicted the *ICNG* advises that the proponent should apply all feasible and reasonable work practises to minimise the noise impact.

Criteria for residential receivers are set using the information in Table 2.

Table 2 – Noise at residences using quantitative assessment

Time of Day	Management Level L_{Aeq} (15min)*	How to Apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	• The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq\ (15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	• The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: o times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences o if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. • For guidance on negotiating agreements see section 7.2.2 (ICNG).

* Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

3.1.1 Construction noise management levels

It is assumed that the construction activities will take place during recommended standard working hours (07.00 am – 6.00 pm Monday to Friday and 8.00 am – 1.00 pm Saturday). No assessment has been made of construction noise impact outside of the standard working hours.

Daytime construction noise management levels for the most affected residential receivers are shown in Table 3.

Table 3 – Construction noise management levels – Residential receivers

Receivers	Background Noise Level, L_{A90} Day dB(A)	Daytime Noise Management Levels L_{Aeq} dB(A)
SRC1	46	56
SRC2	36	46
SRC3	46	56

Criteria for other sensitive land uses, such as schools, hospitals or places of worship are shown in Table 4. The closest sensitive land use other than residential is the Greyhound Social Club race track situated immediately to the south of the substation site. This is considered to be an active recreation area.

Table 4 – Construction noise management levels – Sensitive land uses other than residential

Land Use	Management Level, L_{Aeq} (15 min) (applies when properties are in use)
Classrooms at schools and other educational institutions	Internal noise level 45 dB(A)
Hospital wards and operating theatres	Internal noise level 45 dB(A)
Places of worship	Internal noise level 45 dB(A)
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level 65 dB(A)
Passive recreation areas(characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External noise level 60 dB(A)
Community centres	Depends on the intended use of the centre. Refer to the recommended 'maximum' internal levels in AS 2107 for specific uses.

Criteria for industrial and commercial premises are shown below:

- Industrial premises: external $L_{Aeq\ (15min)}$ 75 dB(A)
- Offices, retail outlets: external $L_{Aeq\ (15min)}$ 70 dB(A)

The closest offices are the Sydney Water Corporation building, which is located immediately to the west of the substation site boundary, and the NSW Police buildings located to the south west of the substation boundary.

3.2 Operational noise criteria

Any noise generated within the Rookwood Road development site boundary, including noise from plant, truck movements, mechanical services or associated with site buildings must be assessed in accordance with the INP. This means

The assessment procedure for industrial noise sources has two components, which are:

- controlling intrusive noise impacts in the short term for residences; and
- maintaining noise level amenity for particular land uses for residences and other land uses.

Intrusive noise impacts

The INP states that the noise from any single source should not intrude greatly above the prevailing background noise level. Industrial noises are generally considered acceptable if the equivalent continuous (energy-average)

A-weighted level of noise from the source (L_{Aeq}), measured over a 15 minute period, does not exceed the background noise level measured in the absence of the source by more than 5 dB(A). This is termed the *Intrusiveness Criterion*. The *Rating Background Level* (RBL) is the background noise level to be used for assessment purposes and is determined by the methods given in Section 3.1 of the INP. Adjustments are to be applied to the level of noise produced if the noise at the receiver contains potentially annoying characteristics such as tonality or impulsiveness.

Protecting noise amenity

To limit continuing increases in noise levels, the maximum ambient noise level resulting from industrial noise sources should not normally exceed the acceptable noise levels specified in *Table 2.1* of the INP. That is, the background noise level should not exceed the level appropriate for the particular locality and land use. This is termed the Amenity criterion.

For a residential receiver in an urban area, the amenity criteria are shown in Table 5:

Table 5 Recommended L_{Aeq} noise levels from industrial noise sources

Type of receiver	Indicative Noise Amenity Area	Time of Day	Recommended L_{Aeq} Noise Level dB(A)	
			Acceptable	Recommended Upper Limit
Residence	Urban	Day	60	65
		Evening	50	55
		Night	45	50

All of the noise logging locations were relatively unaffected by existing industrial noise sources.

While conducting attended measurements on Lewis Street and Cooper Street some industrial noise was noted from the nearby Sydney Water Corporation buildings but this was intermittent and did not dominate the noise environment.

On Boardman Street traffic noise from the nearby Rookwood Road was fairly constant even in the early hours of the morning.

The INP application notes state:

Where the ambient noise levels are below the Acceptable Noise Level (ANL), then ideally the measurement of the existing level of noise should include only noise from industrial sources. In these situations, however, it may be acceptable to include noise from other sources (for example, roads, neighbourhood). The reasons for this are that:

- *including noise from other sources typically results in assessing the worst case for impacts on amenity; and*
- *strictly excluding noise from sources other than industry can be difficult and costly and may not be necessary if the development meets the criteria.*

Ambient levels at all noise logging locations include some contribution from existing industry and traffic, but are in some instances below the ANL. In order to provide a conservative assessment and due to the practicalities discussed above, the modification factors in Table 2.2 in the INP have been applied when determining the final environmental noise criteria.

Furthermore, the application notes go on to state:

Where the predicted amenity noise level is lower than the intrusive level for the proposed development, the proponent needs to ensure that both levels will be satisfied. In this situation, noise limits specified in the licence conditions will include both the intrusive and amenity noise levels predicted to be achieved by the proposal to ensure that the community is protected from intrusive noise impacts at all times.

As the noise sources associated with the substation are constant and likely to be operational on a continuous basis it can be determined that satisfying a more stringent Amenity Criterion will also satisfy the Intrusiveness Criterion.

3.2.1 Final environmental noise criteria

A summary of the environmental noise criteria are given in Table 6.

Table 6 Final environmental noise criteria

Receiver	Period	RBL (L_{A90})	Intrusive Criterion RBL + 5	Ambient (L_{Aeq})	Amenity Criterion	Final Environmental Criterion dB(A)
SRC1	Day	46	51	54	59	51
	Evening	44	49	52	42	42
	Night	36	41	50	40	40
SRC2	Day	36	41	54	59	41
	Evening	36	41	49	44	41
	Night	31	36	42	42	36
SRC3	Day	46	51	58	56	51
	Evening	41	46	54	44	44
	Night	33	38	46	37	37

3.3 Tonality

The DECCW Industrial Noise Policy provides additional guidance and criteria for assessing noise emission from sources defined (by procedures contained within the Policy) as 'tonal' in nature. Of significance to substation noise is that penalties of up to 5 dB(A) may be applied where the subject noise emission is tonal or with significant low frequency content at the receiver.

A penalty is applied when the level of a one-third octave band exceeds the level of each adjacent band by:

- 5 dB(A) or more if the frequency band containing the tone is above 400 Hz
- 8 dB(A) or more if the frequency band containing the tone is below 400 Hz and above 160 Hz inclusive
- 15 dB(A) or more if the frequency band containing the tone is below 160 Hz

As part of this assessment, a 'screening test' to determine the potential for tonality has been conducted. The methodology and outcome of this process is presented in Section 5.2.

4.0 Acoustic Assessment

4.1 Meteorological Conditions

Section E3 of the INP provides details of the Pasquill-Gifford methodology for calculating the occurrence of thermal inversions based upon wind speed and cloud cover. This methodology has been applied to data from Bankstown meteorological station for the period June 1 to August 31 2007. During this 'worst case' period a thermal inversion of category F or G (i.e. the most severe) was found to occur for 19% of the time. Section E3.1.1 of the INP states that thermal inversion occurring for less than 30% of the time during the winter months is considered to be insignificant. Thermal inversions have therefore not been included in the modelling.

A source to receiver wind speed of 3 m/s has been included in the SoundPlan model.

4.2 Construction Noise Assessment

The noise impact resulting from construction of the substation has been assessed.

The likely plant associated with the construction is shown in Table 7. If the number of plant, type of plant or 'on time' of plant varies from that shown in Table 7, then the assessment will also change.

Table 7 - Description of expected construction equipment and associated L_{Aeq} Sound Power level

Equipment	Number of Plant Items	Sound Power Level dB(A)	Time On In Any 15 minute period(%)
Excavator	2	97	100%
Bulldozer	2	98	100%
Mobile Crane	1	96	100%
Dump Truck	2	109	100%
Hand Tools	3	98	75%

The likely impact from construction noise at the closest residential receiver is shown in Table 8:

Table 8 - Predicted Construction Noise Level at Closest Receiver

Receiver	Distance from Site Boundary (m)	Daytime Construction Noise Management Level dB(A)	Predicted L_{Aeq} Noise Levels, dB(A)	Compliance with NMLs
SRC1	220	56	54	Yes
SRC2	580	46	40	Yes
SRC3	750	56	43	Yes

The construction noise impact at all receivers is shown to comply with the Noise Management Levels derived from procedures set out in the DECC Interim Construction Noise Guidelines.

The external noise level at the Sydney Water Corporation offices, located immediately to the west of the substation site boundary, is predicted to be 64 dB(A). This complies with the recommended external noise level for commercial premises of 70 dB(A).

The external noise level at the adjacent Greyhound Social Club racing track, located immediately to the south of the substation site boundary, is predicted to be 62 dB(A). This complies with the recommended maximum external noise level for an area of active recreation, as shown in Table 4.

5.0 Operational Noise Assessment

The operation of the proposed transformer substation has been modelled in SoundPLAN Version 7.0.

Industrial noise emission from the site has been modelled using an implementation of the CONCAWE noise propagation algorithm, which is considered appropriate for the source to receiver distances in this study (ranging from 200 m to 800 m).

Operational data supplied by TransGrid on Drawing No. EM_6a.dxf was used to establish the position of plant and buildings to be located on the substation site.

The location and size of these buildings was obtained from drawings submitted to the NSW Department of Planning as part of the planning application reports produced by Landcom consultants on behalf of Sydney Water Corporation and Bates Smart Architects on behalf of NSW Police. The dimensions used in the SoundPlan are summarised in Table 9.

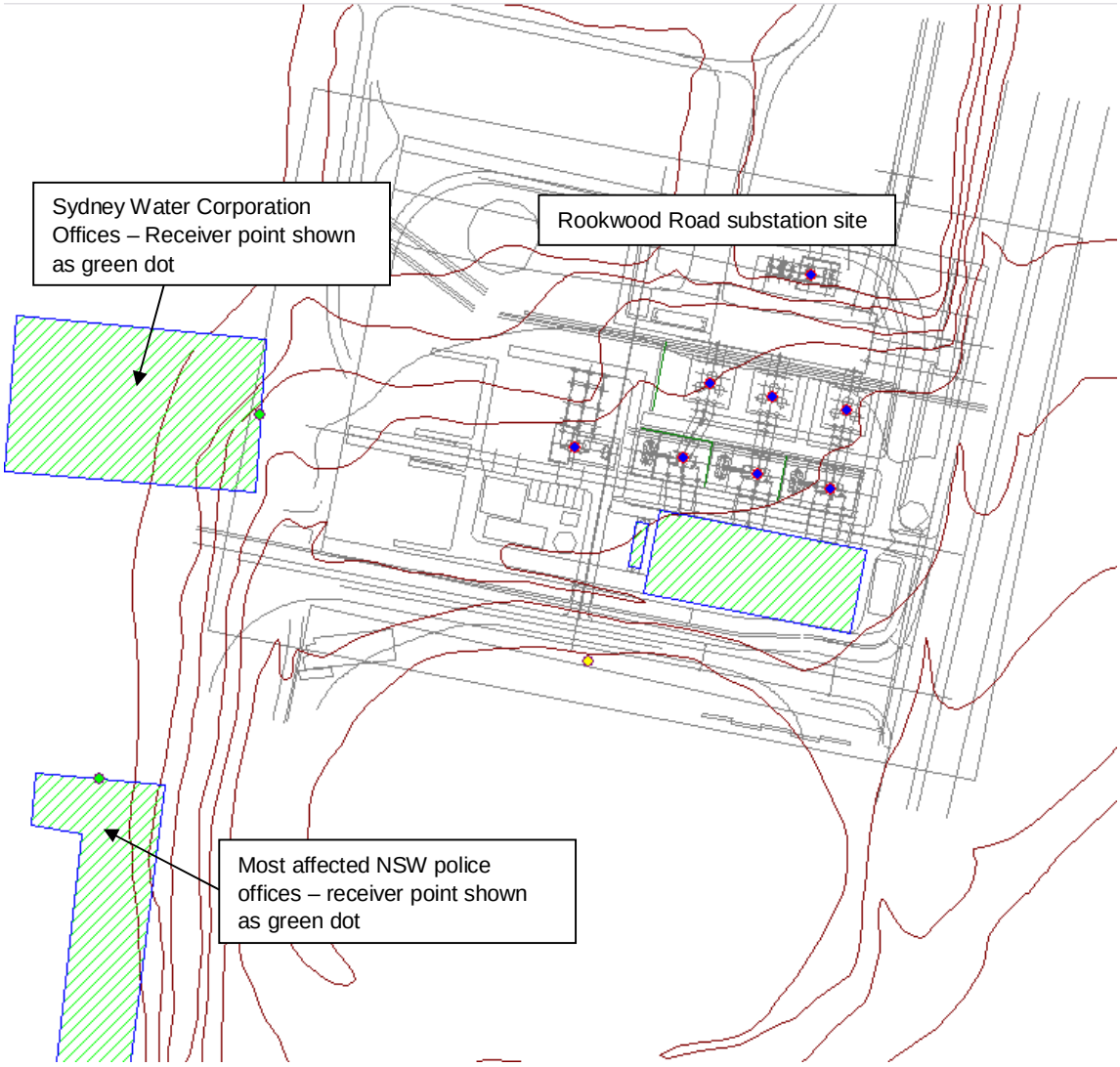
Table 9 Dimensions of commercial receiver buildings used in SoundPlan Model.

Building	Drawing Numbers Consulted	Length	Breadth	Height	Receiver Height above ground level
Sydney Water Corporation Offices	AR DA 1.01, AR DA 4.01, AR DA 5.01, AR DA 5.02, AR DA 5.11	80 m	50 m	8.3 m	3.2m (raised cafe area)
NSW Police Building 1	PA-001 PA-008 PA-016 PA-023	96 m	Varies – 45 m at widest point (affected facade)	14 m (most affected facade)	4.5 m (second floor)

*Drawings can be located on Department of Planning website – www.planning.nsw.gov.au

The relative location of the Sydney Water Corporation Building and most affected NSW Police building to the Rookwood Road substation is shown on Figure 2.

Figure 2 Relative location of Sydney Water and NSW Police Office Buildings



5.1 Transformer and reactor one-third octave band sound power levels

The noise emission of transformers and reactors often has a characteristic 'tone' at 100 Hz. TransGrid has directed AECOM to use one third octave band sound power data for the transformers and reactors in order to examine the potential for tonal noise emission from the site. The sound power data has been based on two sources as follows:

- Transformers – based upon measurements undertaken by Bassett Consulting Engineers (AECOM) as part of the Sydney North Substation project for Transgrid (Refer BCE report 60023379.SK01.00 dated July 2007); and
- Reactors – based upon measurements undertaken by Day Design (acoustic engineers) as part of the Sydney East Substation project. Refer to Day Design report 3700-r1 dated 27 February 2008 (relevant excerpt provided to AECOM by Transgrid for the Holroyd Substation study).

The linear one-third octave band sound power levels for the transformers (T) and reactors (R) used as the basis for this assessment are presented in Table 10:

Table 10 - Linear one-third octave band sound power levels for the transformers and reactors

Equipment	Sound Power Level (dB) at one-third octave band centre frequency (Hz)																											Lw Overall, dBA
	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k	
T	77	76	70	74	58	80	102	83	79	94	88	96	95	89	82	74	71	69	64	60	54	50	47	42	35	34	33	96
R	-	-	-	96	79	82	112	94	91	112	96	101	94	96	85	81	76	73	70	68	67	57	53	48	-	-	-	103

5.2 Tonality screening test

As noted in Section 5.1 and evidenced in the one-third octave band sound power spectrum presented in Table 10, the equipment used in substations often has a characteristic 'tone' or 'hum' at 100 Hz and first order harmonic frequency at 200 Hz.

In order to assess the need to apply a 'tonality penalty' to account for the potential greater annoyance caused by tonal noise sources, a screening test has been conducted by examining the one-third octave band results at each receiver location under a 'no treatment' scenario.

The methodology of this screening test is as follows:

- Run a calculation in SoundPLAN under a 'no treatment' scenario to generate one-third octave band predicted noise levels at all single point receiver locations;
- Logarithmically add the predicted noise levels at frequencies of interest (being 80 Hz, 100 Hz and 125 Hz for this assessment) to the measured ambient noise spectra at each receiver at the same frequencies; and
- Examine the logarithmically summed noise level and apply the INP tonality rules (Refer to Section 3.3) and determine whether a tonality penalty is appropriate to apply.

The 'ambient' L_{Aeq} noise levels used for this process have been determined based upon attended noise measurements taken at various receiver locations (shown on Figure 1). In accordance with the INP, tonality is assessed based on the Linear, (not A-weighted spectrum) at the receiver location.

The results of this process are presented in Table 11:

Table 11 – Tonality screening test results

Receiver Location	L_{Aeq} Predicted/Measured Ambient/Summed Noise Level	L_{eq} noise level, dB, at one-third octave band centre frequency, Hz		
		80	100	125
SRC1	Predicted	30	53	35
	Measured Ambient	57	55	52
	Summed	**57**	**57**	**52**
SRC2	Predicted	15	37	18
	Measured Ambient	37	36	33
	Summed	**37**	**39**	**33**
SRC3	Predicted	21	43	25
	Measured Ambient	68	51	48
	Summed	**68**	**52**	**48**
Sydney Water Corporation Offices	Predicted	37	63	45
	Measured Ambient	57	55	52
	Summed	**57**	**63**	**53**
NSW Police	Predicted	33	58	41
	Measured Ambient	57	47	51

Receiver Location	L_{Aeq} Predicted/Measured Ambient/Summed Noise Level	L_{eq} noise level, dB, at one-third octave band centre frequency, Hz		
		80	100	125
	Summed	**57**	**58**	**51**
Greyhound Social Club	Predicted	33	57	40
	Measured Ambient	57	55	52
	Summed	**57**	**59**	**52**

The results of this screening test show that whilst the noise emission of the summed sources is theoretically-tonal, when considered in the context of the ambient noise environmental each receiver location, the noise emission from the operation of the proposed Substation will not be perceived as tonal, according to the definitions of tonality provided by the INP. Therefore no tonality penalty has been applied to the noise emission from the proposed Substation for any one source (or collectively) and the intent of the treatments presented hereafter is to control the broadband noise emission from the site to the established dB(A) criteria presented in Table 6.

5.3 Modelling Results

Results are presented to the nearest 0.1 dB(A) only to identify any marginal differences between treatment scenarios. The determination of a compliant or non-compliant outcome is based on each value rounded to the nearest 1 dB(A).

Compliant outcomes are identified by green text. Non-compliant outcomes are identified by red text.

Table 12 – Modelling results

Receiver Location	Worst impacted receiver	Noise criterion, dB(A)	No treatment	5 m barrier on southern edge of reactor 3	Reactor L_w Reduced by 5 dB
3.0 m/s source to receiver wind conditions					
SRC1	16 Boardman Street	40 at night	42.3	38.6	38.9
	14 Boardman Street		41.9	37.8	39.8
SRC2	34 Lewis Street	36 at night	23.4	23.4	21.5
SRC3	Closest point of planned Potts Hill residential development	37 at night	32.0	32.0	31.6
Sydney Water Corporation Offices		65 When In Use	51.3	51.3	50.7
NSW Police		65 When In Use	49.2	49.2	45.9
Greyhound Social Club		55 When In Use	45.8	43.1	36.9

5.4 Analysis of results

With no treatment of the proposed plant on site the relevant criteria is predicted to be met at all receivers with the exception of the worst impacted receiver in SRC1.

The worst affected receivers in SRC1 are number 16 Boardman Street and number 14 Boardman Street. The night time noise impact criteria are predicted to be exceeded by up to 2.3 dB(A) under adverse source to receiver wind conditions of 3 m/s.

Analysis of the modelling results shows that the dominant source of noise at 16 and 14 Boardman Street is Reactor number three. This reactor is the only one not screened from the receivers by the 12 m high 330kv GIS building.

Inclusion of a 5 m high noise barrier between Reactor number three and Transformer number three reduces the predicted noise impact at 16 Boardman Street to 39 dB(A), which complies with the night time noise criteria under adverse 3 m/s source to receiver wind speeds.

As an alternative mitigation option the sound power of Reactor number three was reduced by 5 dB. This results in compliance at number 16 Boardman Street but not number 14 Boardman Street. This is due to the increased influence of Reactor number two. When the sound power of both reactor number three and reactor number two was reduced by 5 dB the predicted noise level at all receivers complies with the night time noise criteria.

5.5 Assessment

The acoustic impact of operations at the proposed Rookwood Road substation is predicted to exceed the night time noise impact criterion at the worst affected noise sensitive receivers, located on Boardman Street, under adverse meteorological conditions.

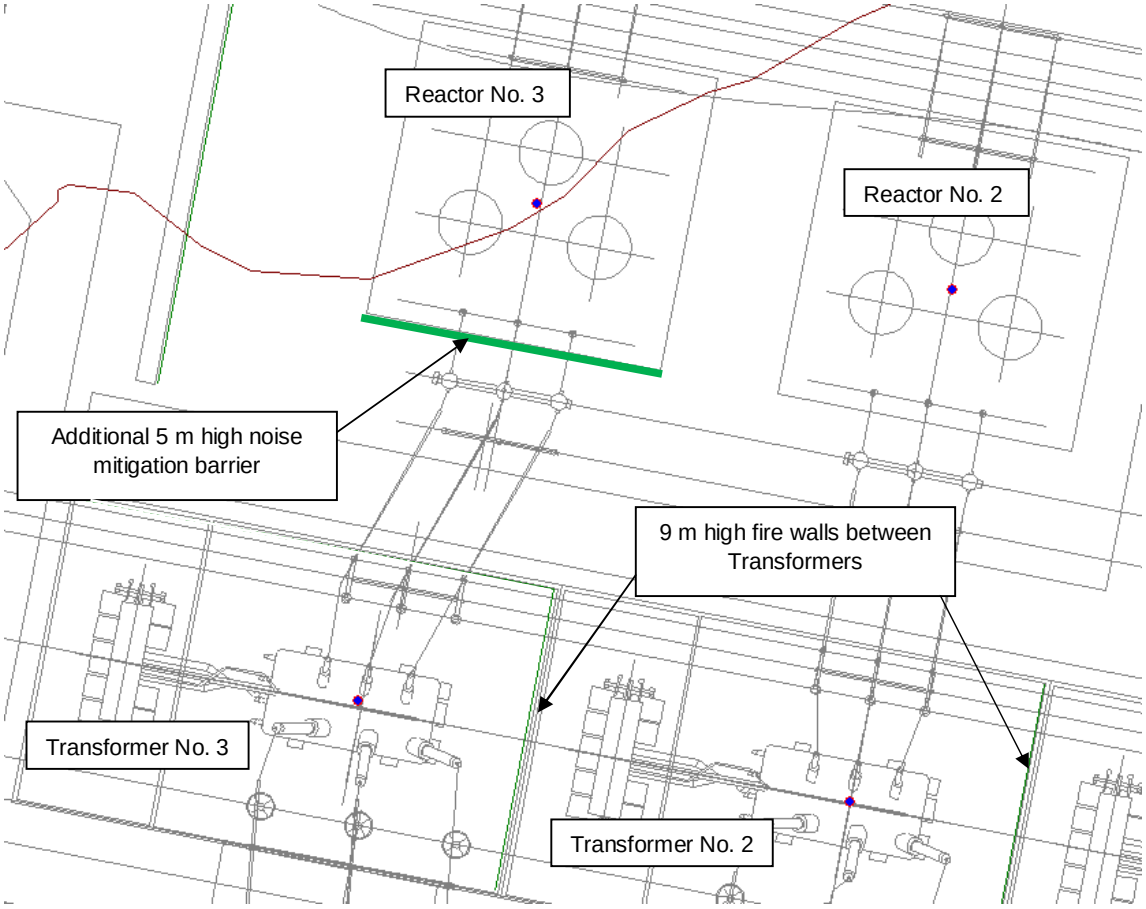
At all other critical noise sensitive receivers the relevant criteria is predicted to be met under adverse meteorological conditions.

Reactor number three is indicated as the dominant noise source at affected receivers on Boardman Street. Construction of a 5 m high noise barrier between Reactor number three and Transformer number three is predicted to result in compliance with the night time noise criteria at all receivers on Boardman Street.

As an alternative mitigation option the sound power of Reactors number two and three was reduced by 5 dB. This results in compliance at all receivers on Boardman Street without the need for the 5m high noise barrier.

The proposed location of the barrier mitigation option is shown on Figure 3.

Figure 3 Proposed Mitigation



6.0 Conclusion

The noise impact at nearby noise sensitive receivers, resulting from construction and operation of the proposed Rookwood Road electrical substation, has been assessed.

The noise impact has been assessed at existing residential and commercial premises and also at planned residential and commercial development at Potts Hill reservoir.

Noise criteria have been established in accordance with the DECCW's *Interim Construction Noise Guideline* (ICNG) and the *NSW Industrial Noise Policy* (INP). Unattended ambient noise monitoring was carried out on site for a period of one week and attended 15 minute measurements were carried out at night to establish the spectral content of the existing noise environment.

The potentially most affected residential receivers were split into sensitive catchment areas designated SRC1, SRC 2 and SRC 3. Assessment of the impact at the worst affected receivers in each catchment area was carried out.

The impact of construction noise at the most affected receiver locations has been found to comply with the ICNG at all nearby noise sensitive receivers. Recommendations to minimise the impact of construction noise have been included in this report.

The impact of substation operations have been predicted to comply with the INP criteria at all but one of the most affected noise sensitive receivers under adverse meteorological conditions (source to receiver wind speed of 3 m/s). An unmitigated operational scenario at the site is predicted to result in a 2 dB(A) exceedance of the night-time noise management criteria at 16 and 14 Boardman Street. This exceedance is controlled by noise emission from Reactor number three. Further modelling indicates that construction of a 5 m high noise barrier between Reactor number three and Transformer number three reduces the predicted impact at 16 Boardman Street to 39 dB(A) and at 14 Boardman Street to 38 dB(A). This complies with the night-time noise management criterion for receivers in SRC1.

As an alternative to the noise barrier the sound power level of Reactors number two and three were reduced by 5 dB. This results in compliance with the night time noise criteria at the worst affected receivers without the need for the noise barrier.

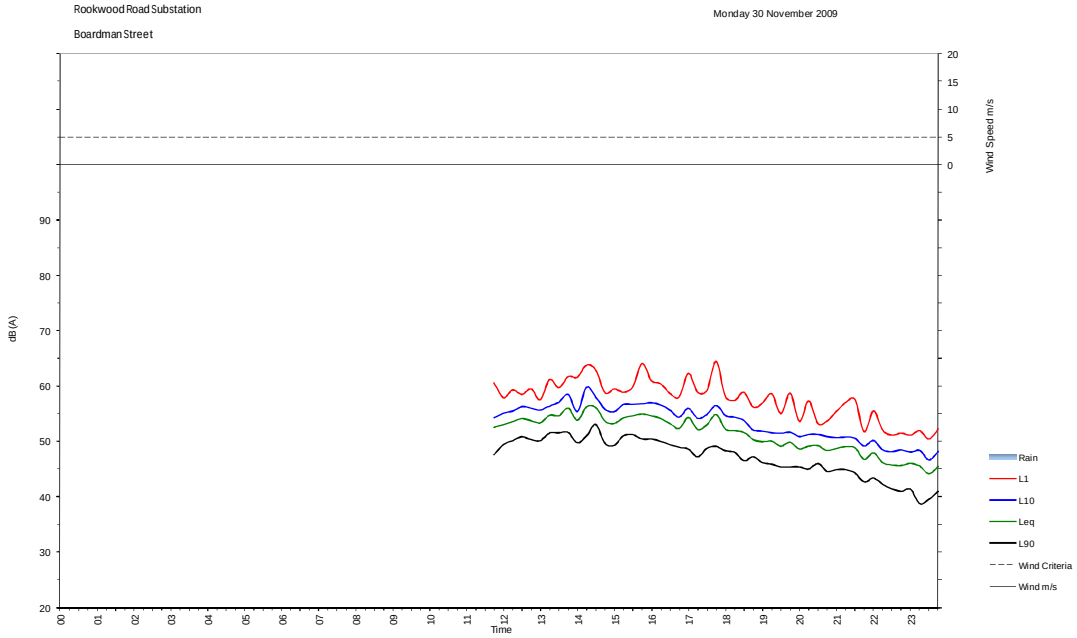
The results of this assessment indicate that the acoustic impact of the proposed Rookwood Road substation is acceptable at all nearby noise sensitive receivers, assuming that the recommended mitigation is applied.

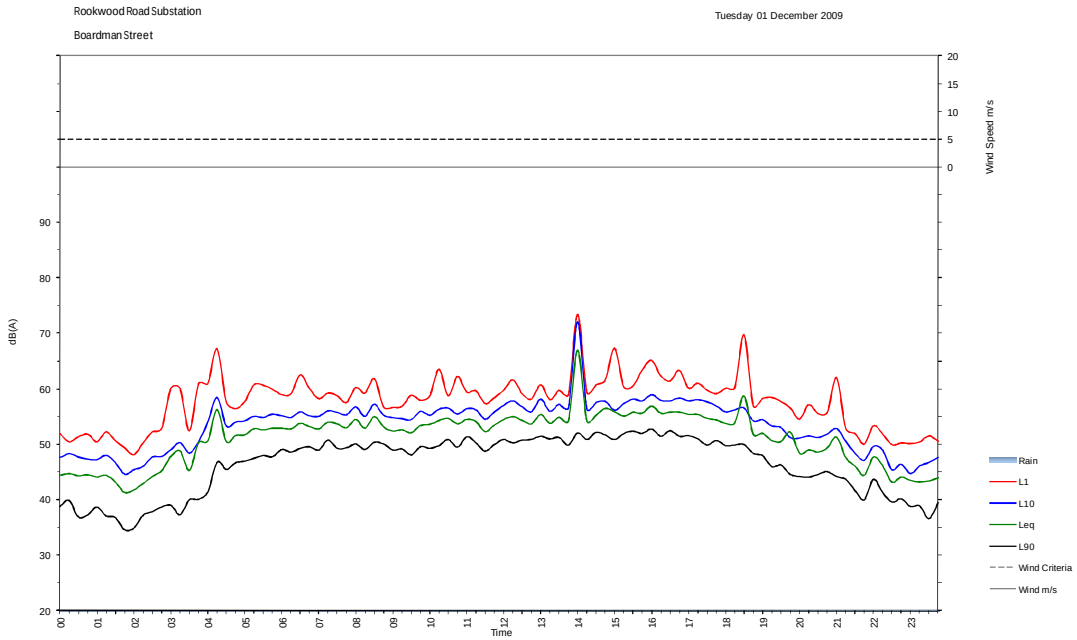
Appendix A

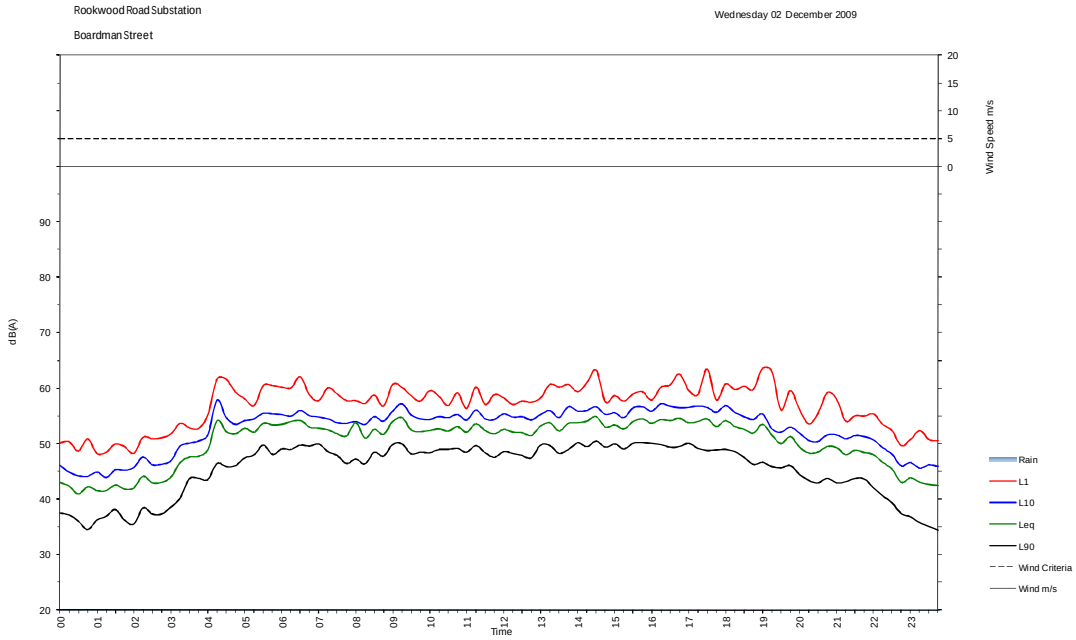
Noise Logging Graphs

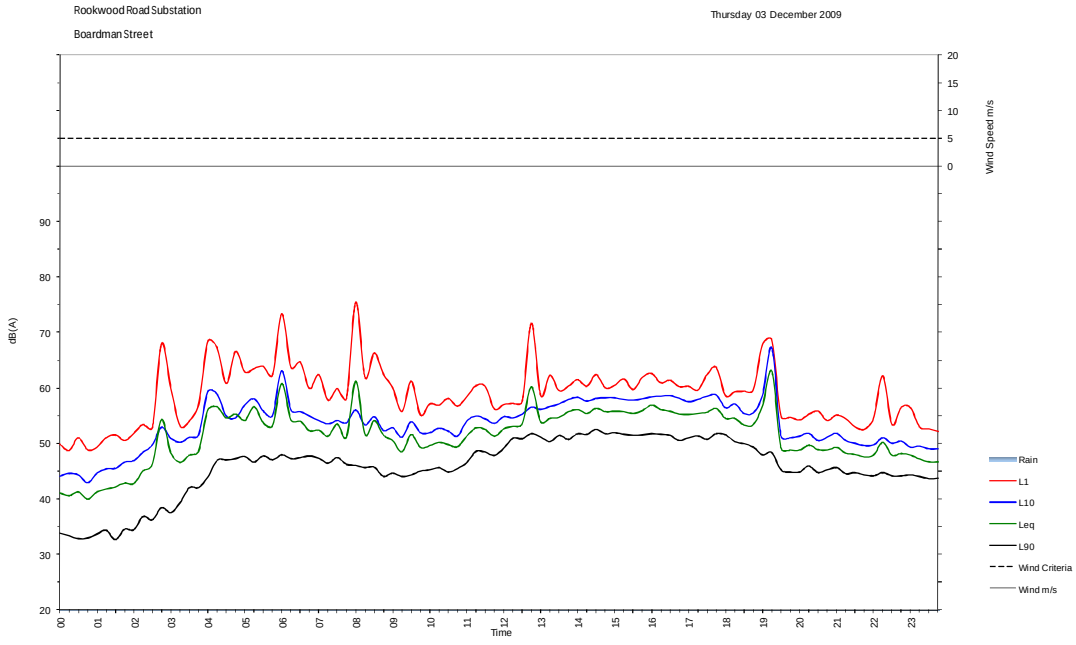
Appendix A Noise Logging Graphs

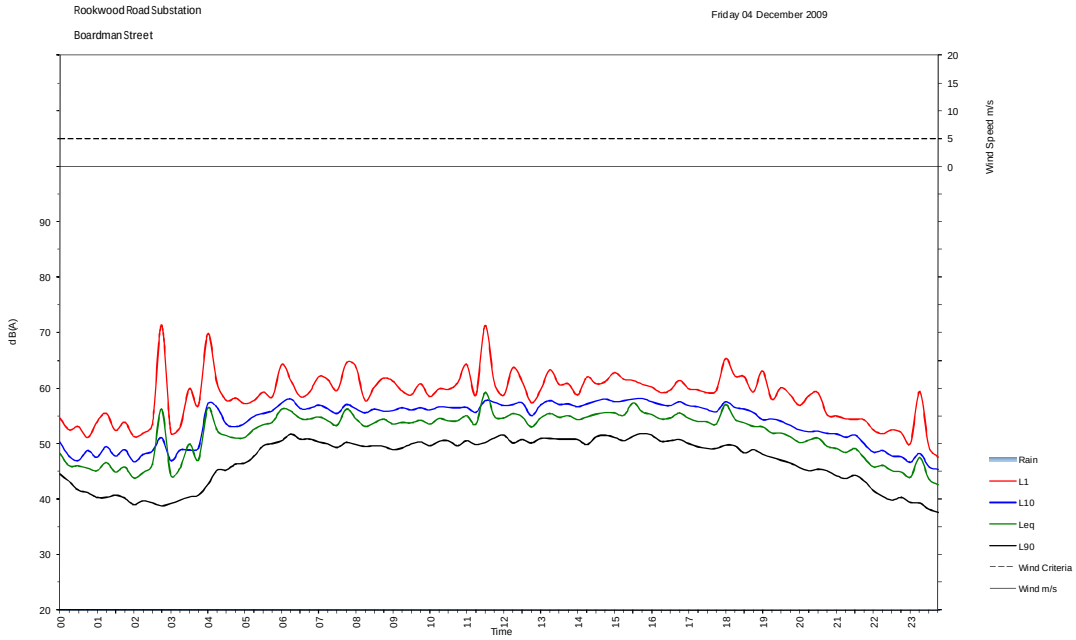
Boardman Street

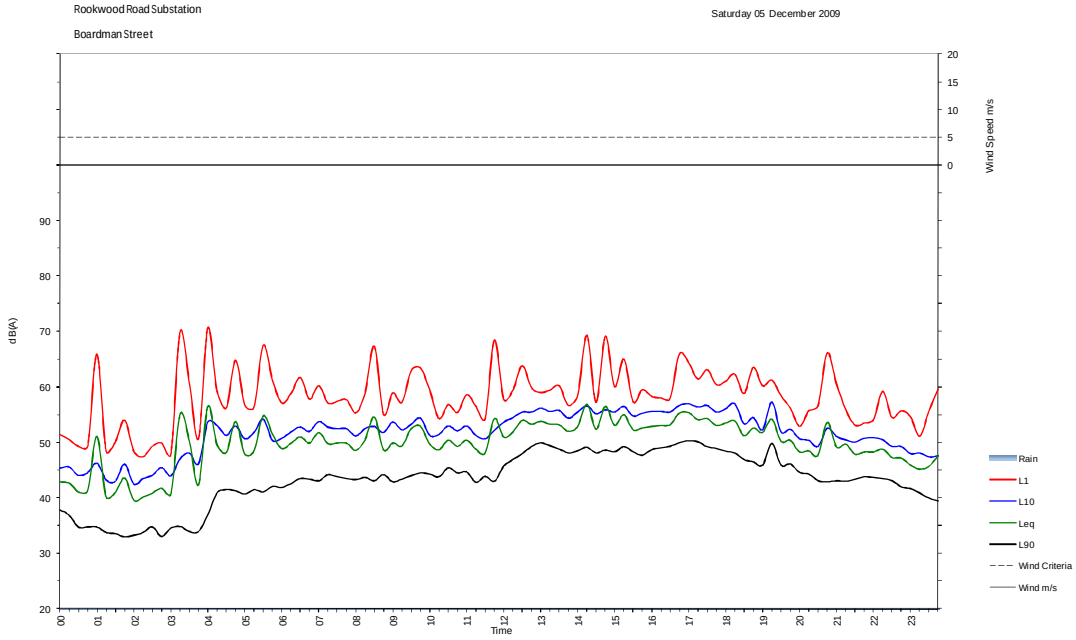


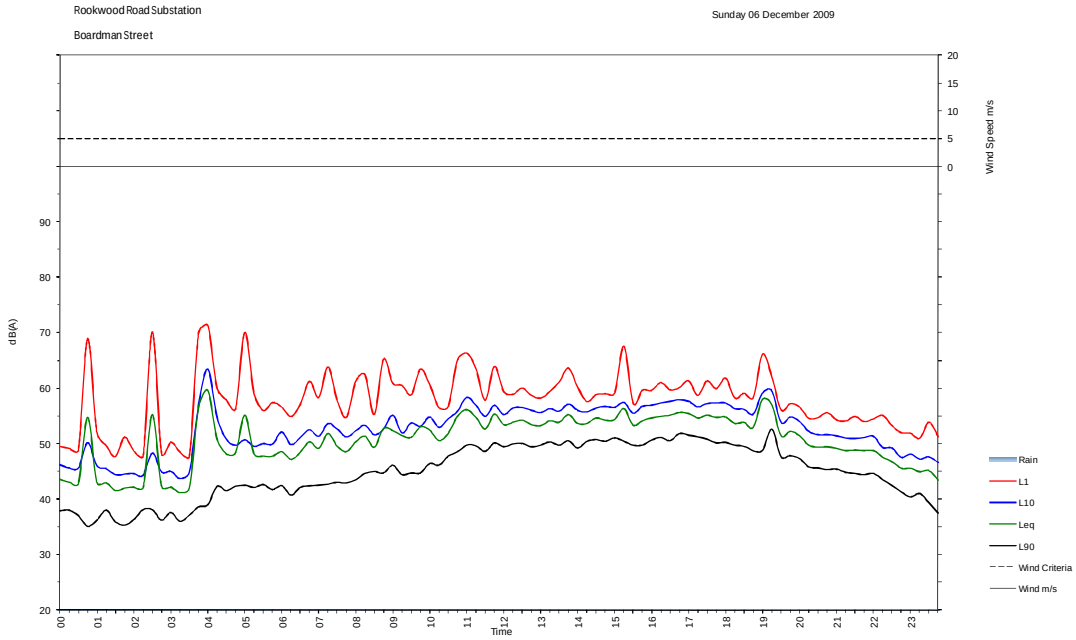


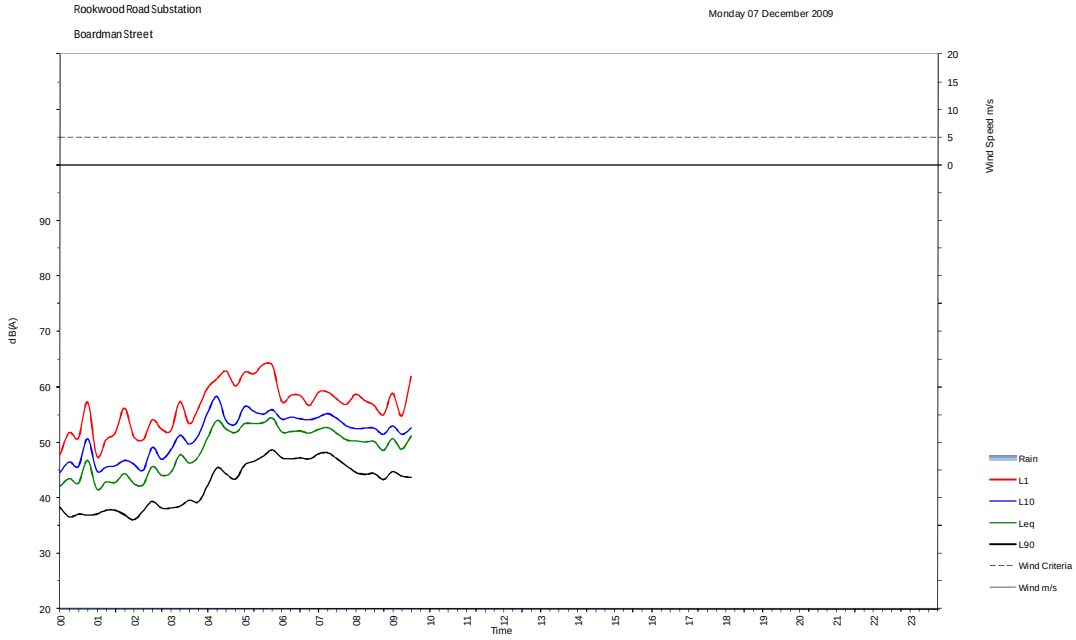

Rookwood Road Substation
Boardman Street
Wednesday 02 December 2009
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


Rookwood Road Substation
Boardman Street
Thursday 03 December 2009
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

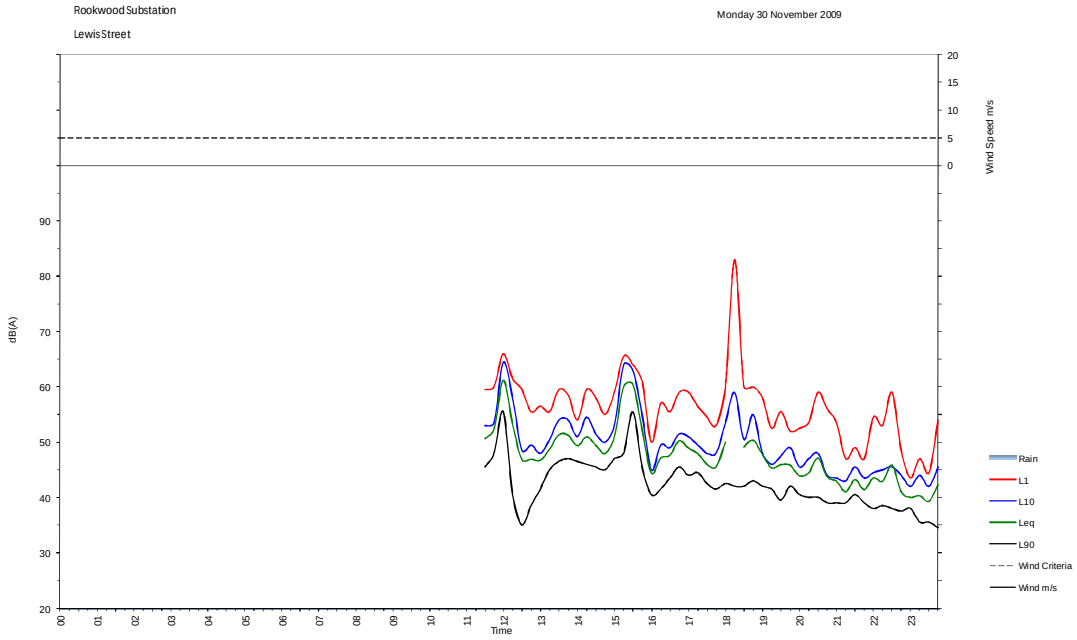

Rookwood Road Substation
Boardman Street
Friday 04 December 2009
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

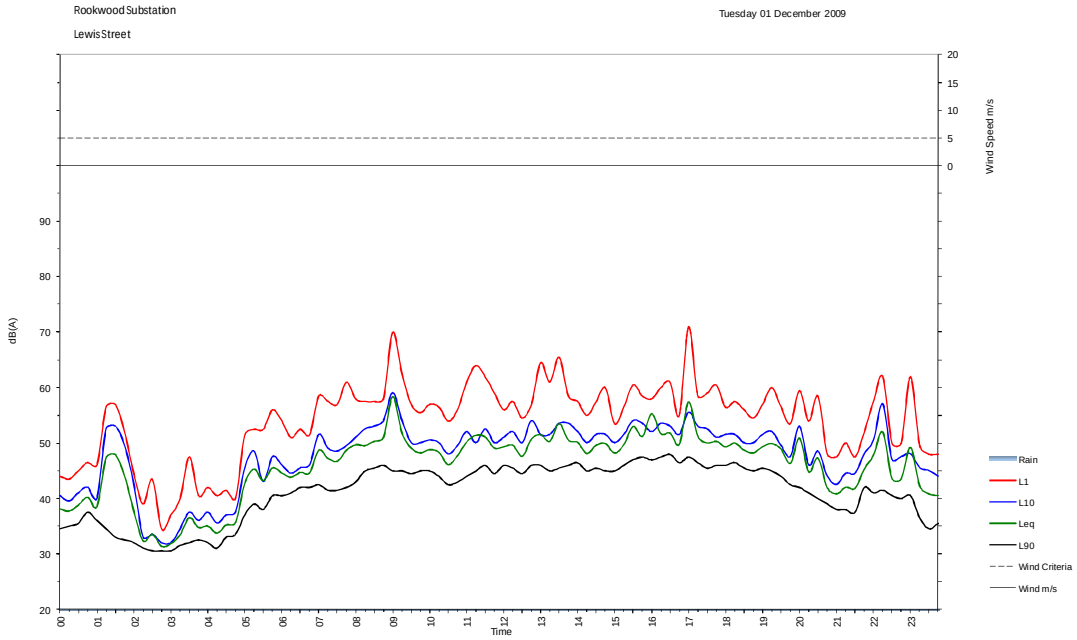

Rookwood Road Substation
Boardman Street
Saturday 05 December 2009
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

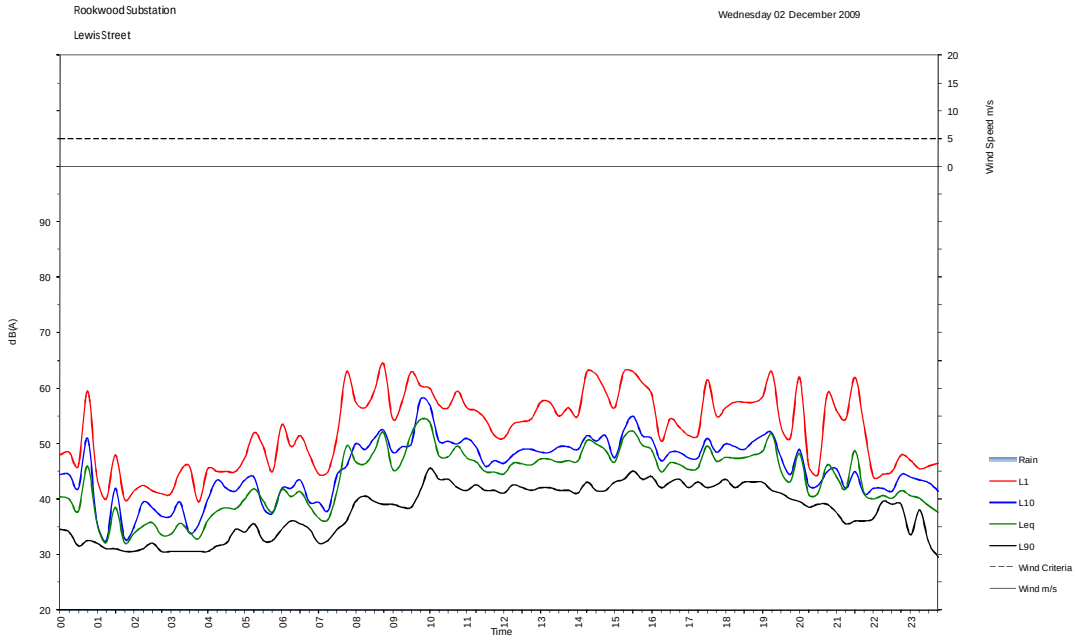

Rookwood Road Substation
Boardman Street
Sunday 06 December 2009
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

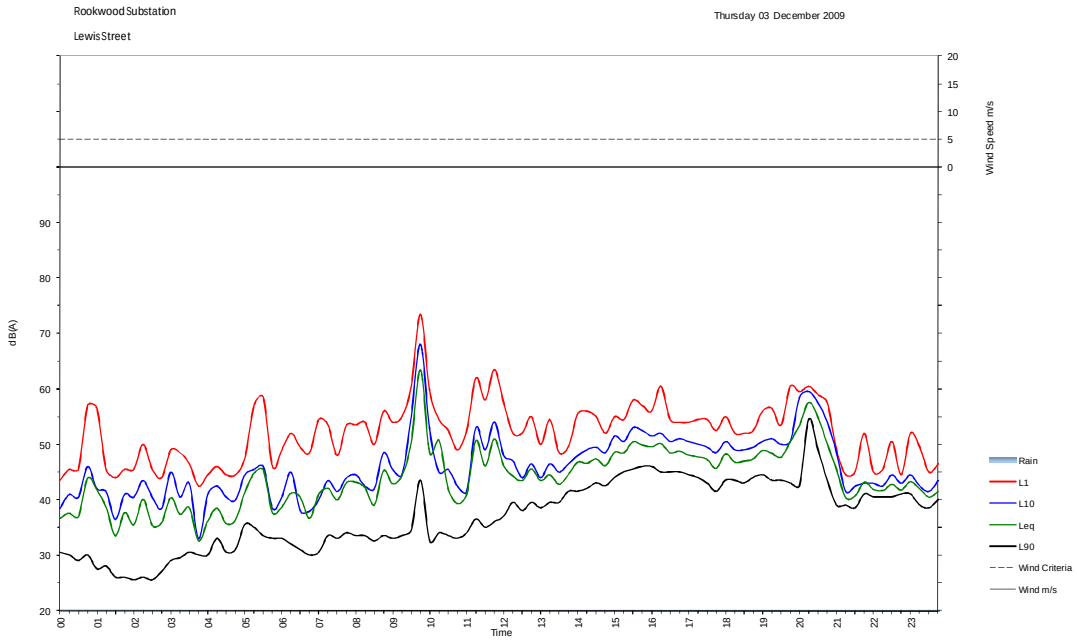

Rookwood Road Substation
Boardman Street
Monday 07 December 2009
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

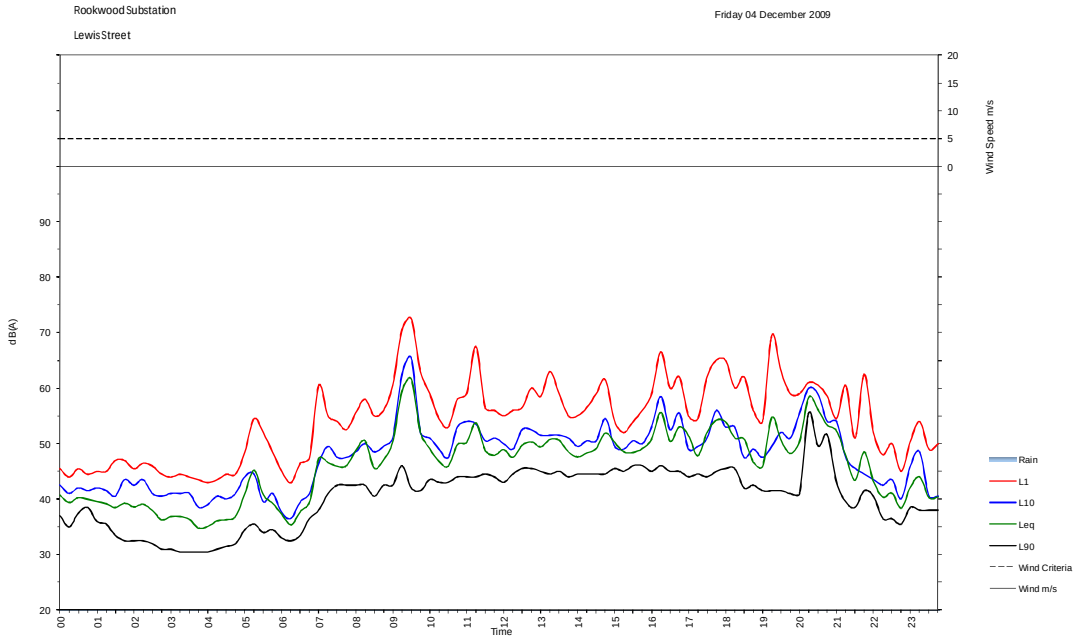
Lewis Street

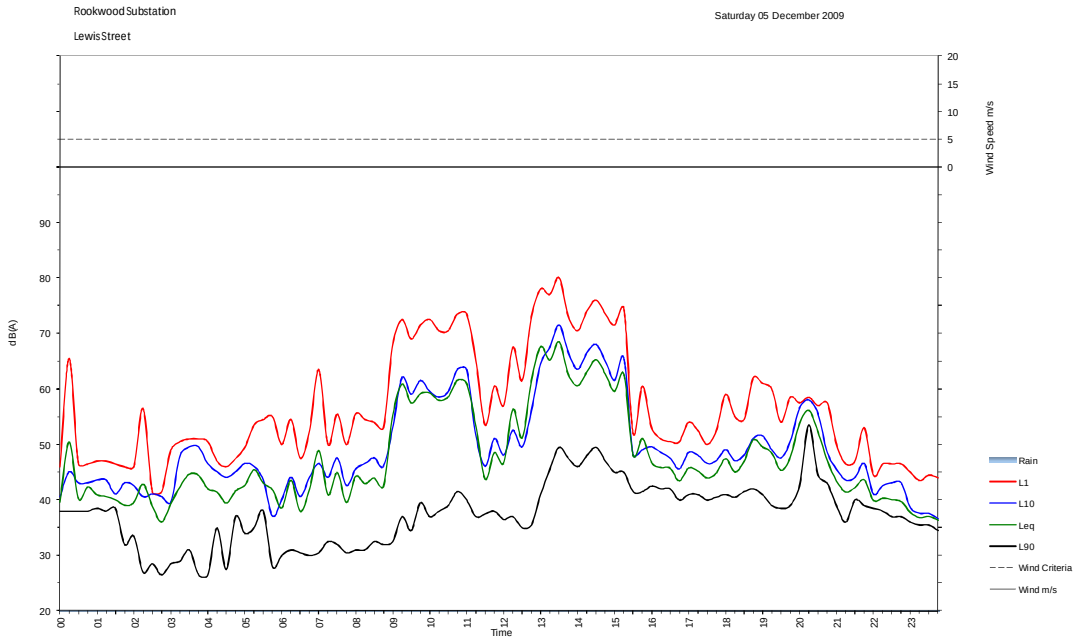


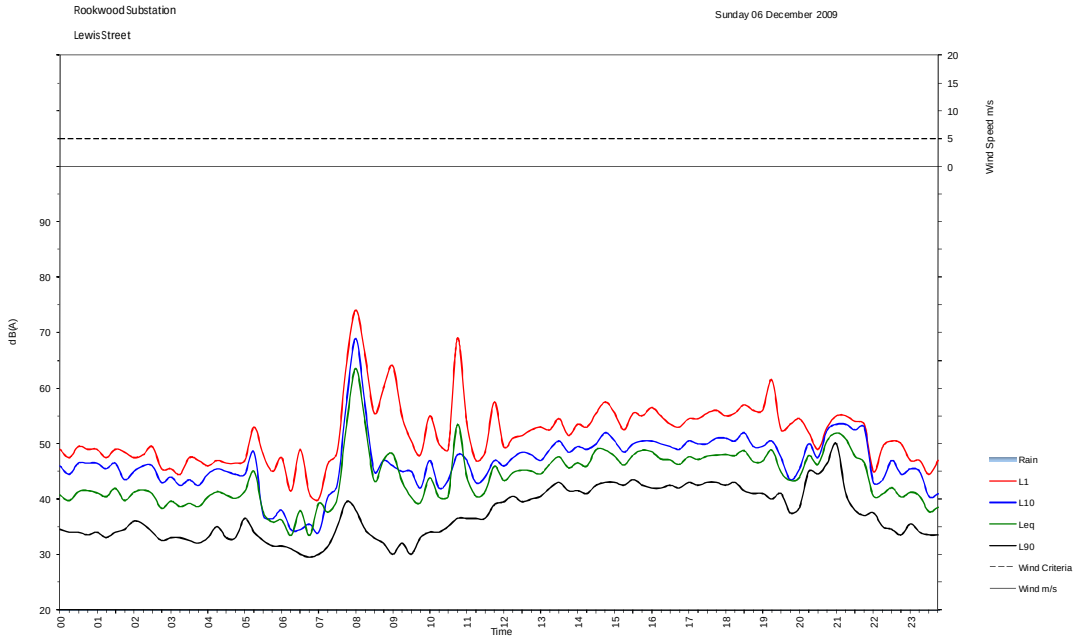


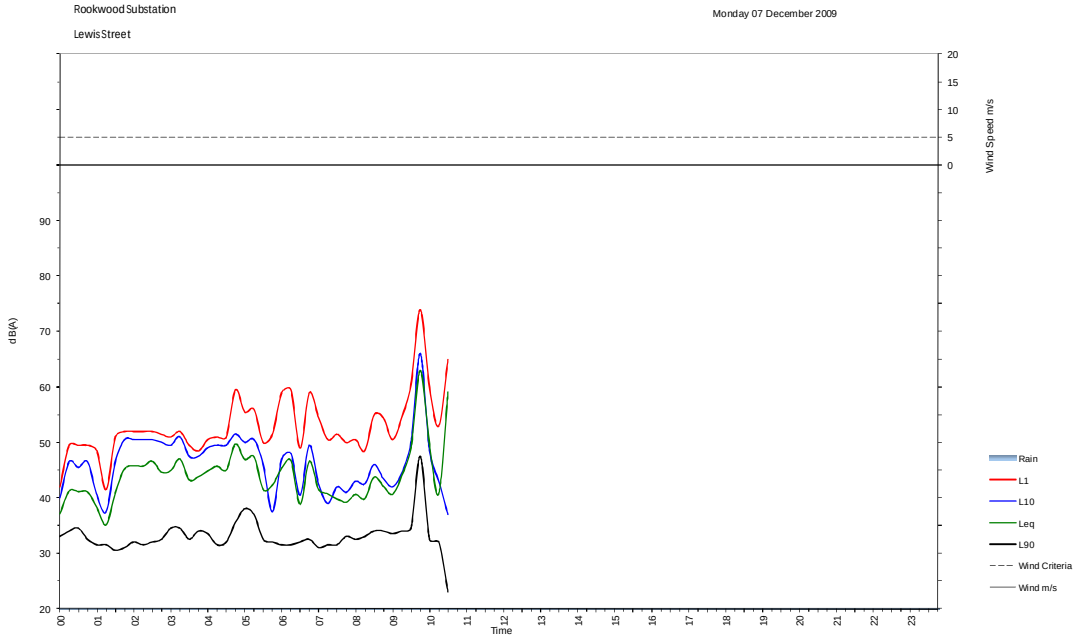

Rookwood Substation
Lewis Street
Wednesday 02 December 2009
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


Rookwood Substation
Lewis Street
Thursday 03 December 2009
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

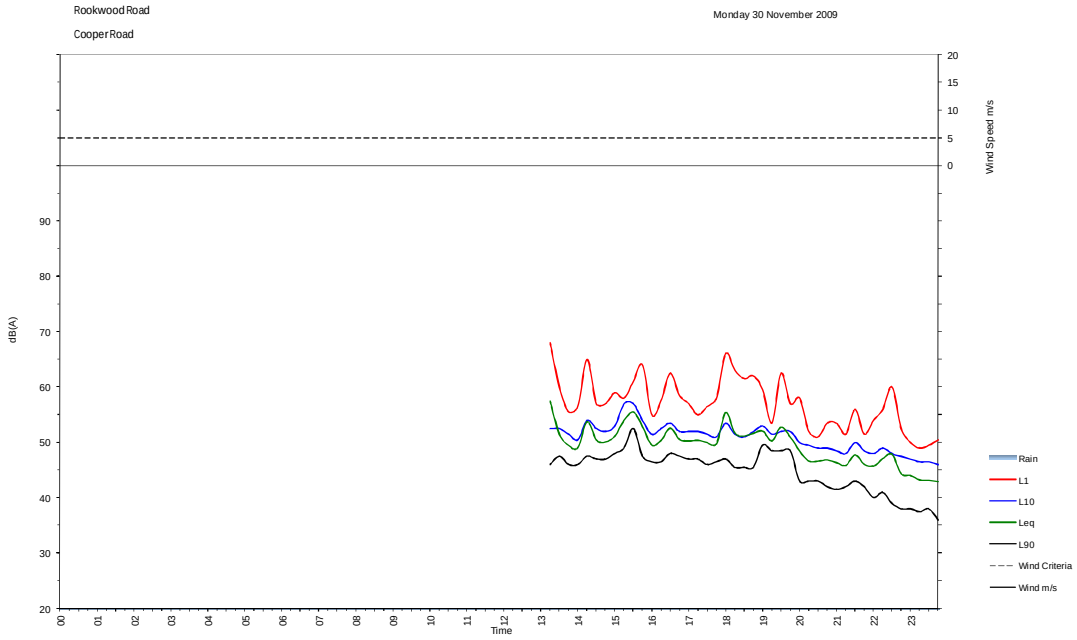

Rookwood Substation
Lewis Street
Friday 04 December 2009
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

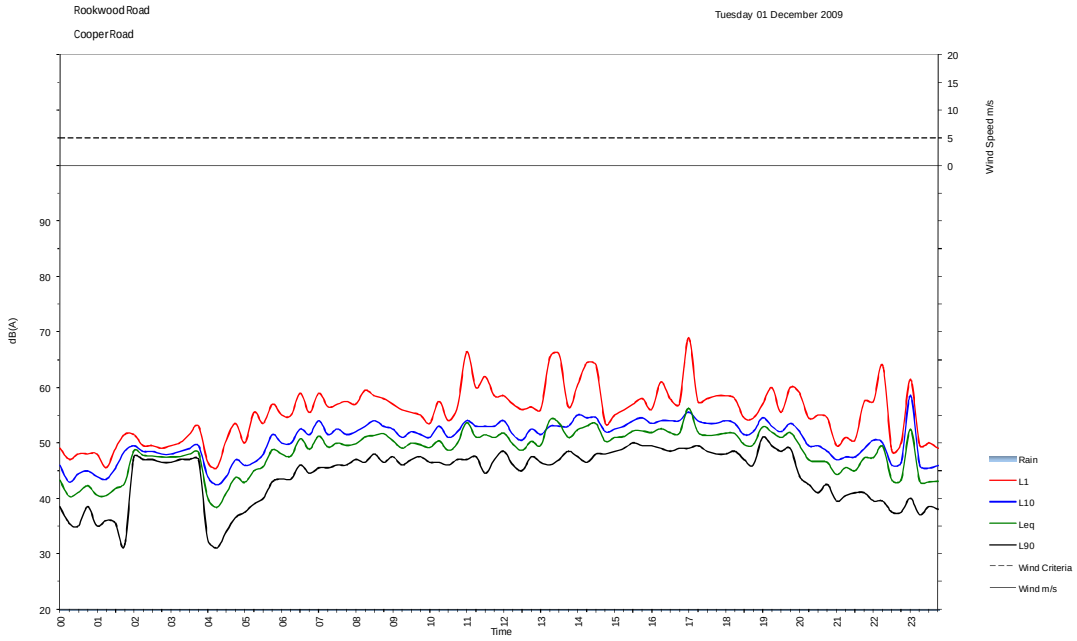

Rookwood Substation
Lewis Street
Saturday 05 December 2009
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

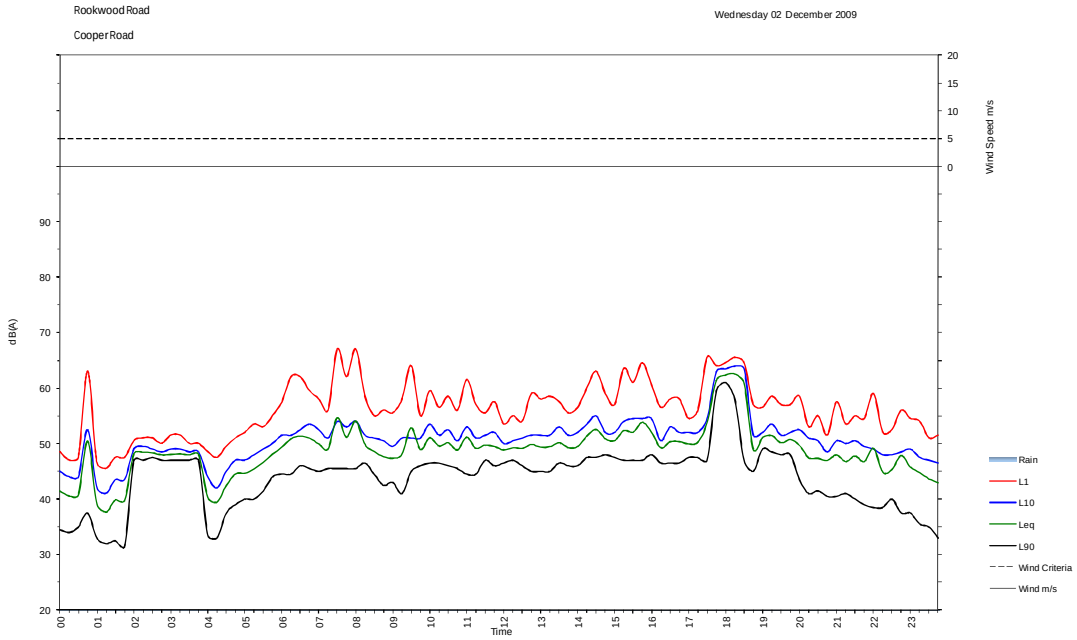

Rookwood Substation
Lewis Street
Sunday 06 December 2009
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

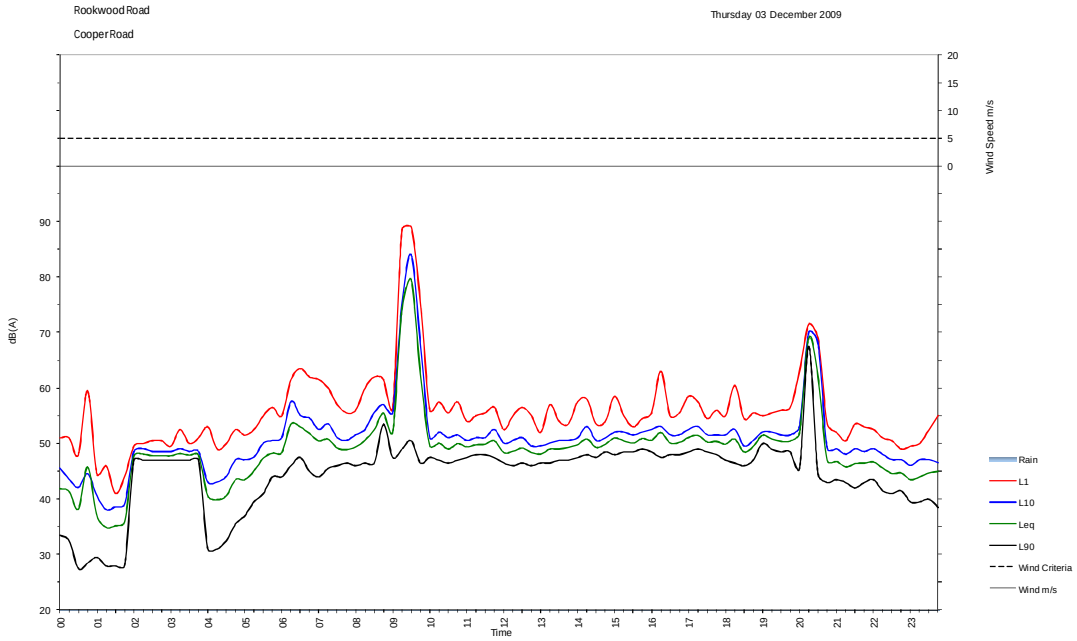

Rookwood Substation
Lewis Street
Monday 07 December 2009
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

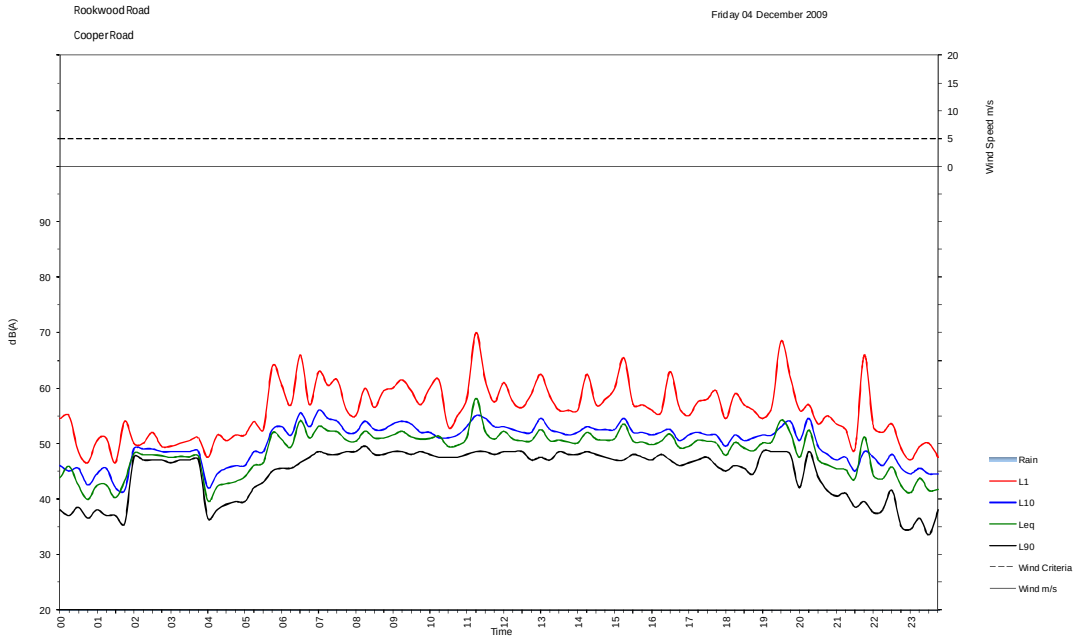
Cooper Road

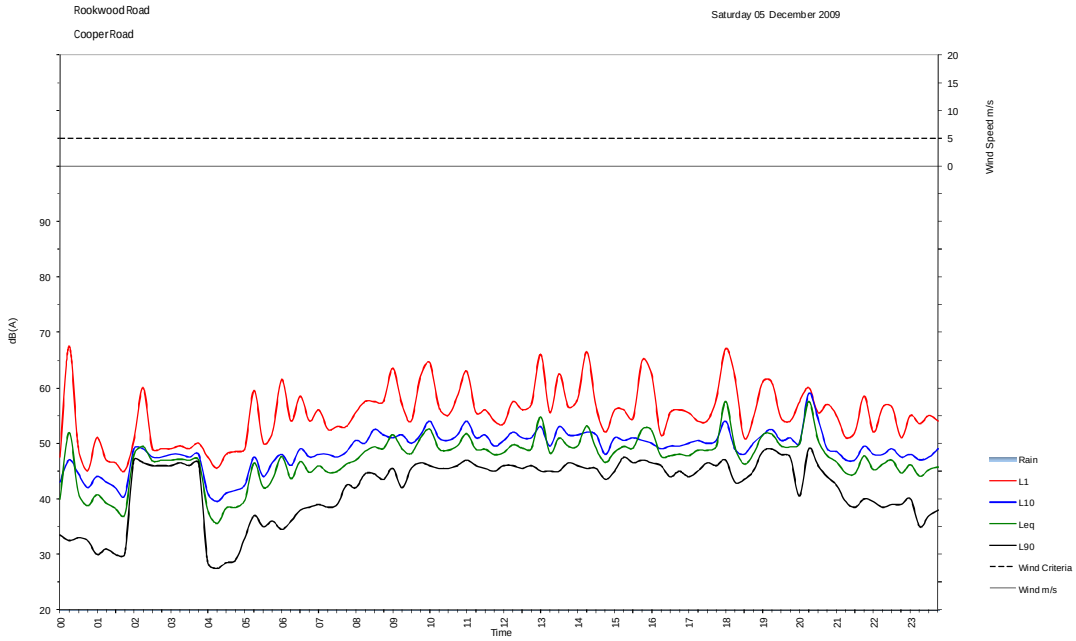

Rookwood Road
Cooper Road
Monday 30 November 2009
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

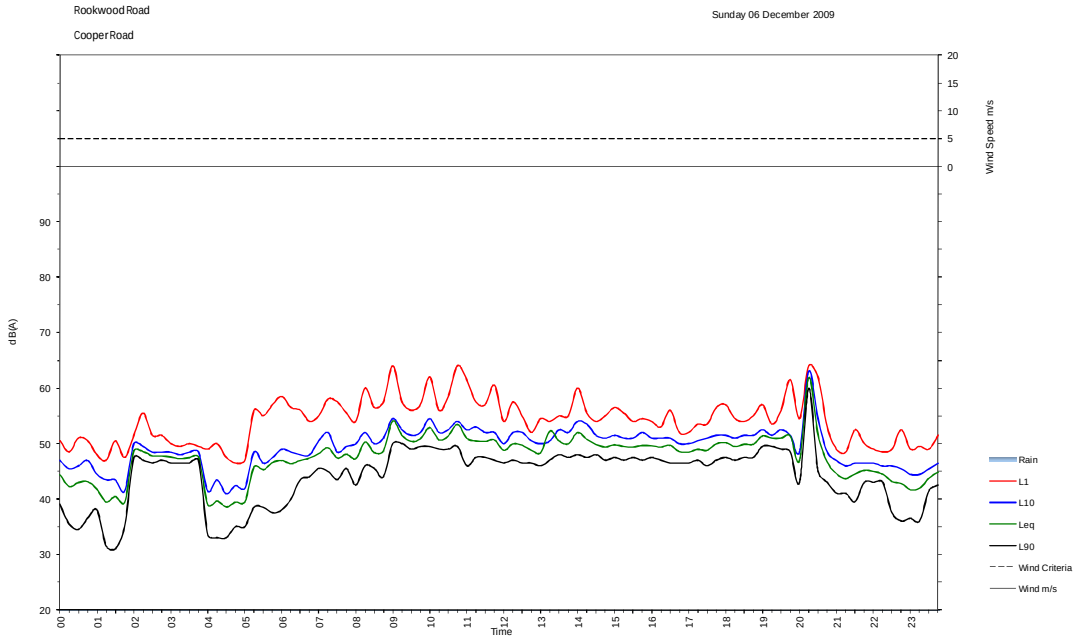

Rookwood Road
Cooper Road
Tuesday 01 December 2009
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

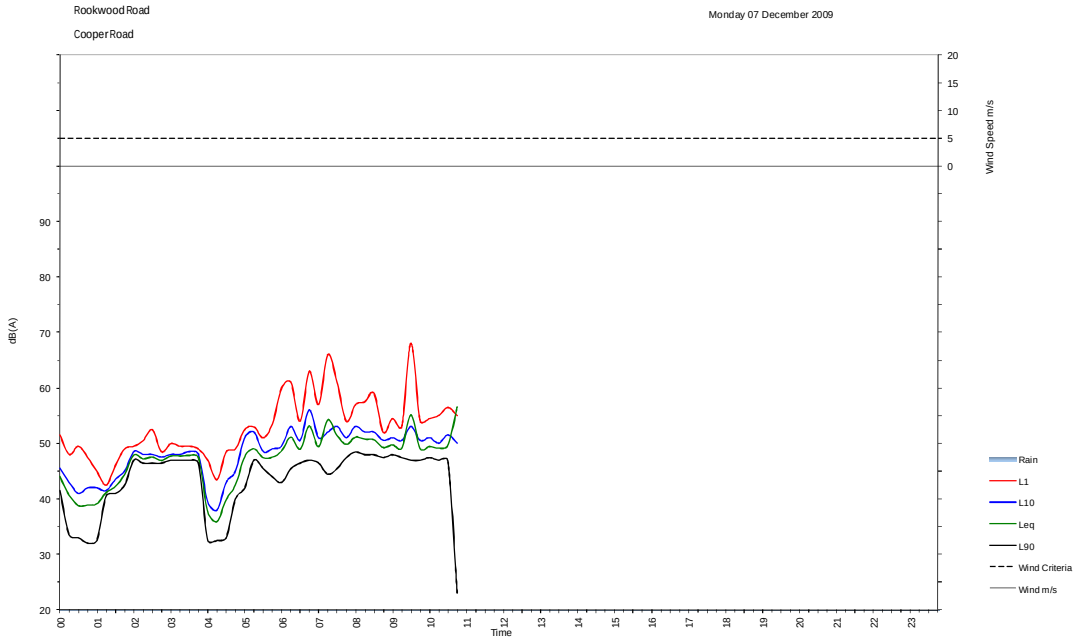

Rookwood Road
Cooper Road
Wednesday 02 December 2009
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


Rookwood Road
Cooper Road
Thursday 03 December 2009
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


Rookwood Road
Cooper Road
Friday 04 December 2009
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


Rookwood Road
Cooper Road
Saturday 05 December 2009
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


Rookwood Road
Cooper Road
Sunday 06 December 2009
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


Rookwood Road
Cooper Road
Monday 07 December 2009
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s