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Vipac Engineers & Scientists

Infigen Energy Developments

Flyers Creek Wind Farm Noise Assessment

R78 Additional Background Noise Measurements

50B-08-0089-TRP-797028-0

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Report Title: R78 Additional Background Noise **Job Title: Flyers Creek Wind Farm Noise Assessment**	
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EXECUTIVE SUMMARY

Vipac has performed an additional background noise survey at Residence 78, within the vicinity of the proposed Flyers Creek Wind Farm (near Orange, NSW) to determine the existing background noise levels at the site and to develop noise amenity criteria in accordance with the SA EPA Guidelines (*Wind Farms: Environmental Noise Guidelines 2009)*.

The background noise levels were measured continuously over a period of at least three weeks at R78 from 11th November 2014 until 2nd December 2014. The sound level meter monitored noise data simultaneously over the period, in conjunction with the collection of wind data from the wind farm site anemometer, as well as a ground level anemometer at the residential receiver location.

The noise data and wind data sampling periods were performed in synchronised 10-minute intervals. A total of over 2,400 synchronised data pairs (after exclusion of unsuitable data) were obtained the site. A small amount of noise data was omitted where there were periods of significant wind speeds at the noise logger microphone or where there were rainfall events.

A regression analysis of the noise-wind speed data scatter plot has been performed on the entire set of wind and noise data pairs (after exclusion of unsuitable data), which is used to determine the noise criteria (from cut-in to rated wind speeds). A recommended noise criterion level at the monitored site has been based on the level not exceeding 35 dB(A) or the regression fitted background noise level curve plus 5 dB(A), in accordance with SA EPA Wind Farm Noise Guidelines 2009.

The overall noise criterion levels in dB(A) for each integer wind speed (at height of 10m AGL), determined from the regression equation (rounded to the nearest 0.5dB), for the measured site is shown in the table below.

Noise Level Criteria (in dB(A)) at Residence 78 at Flyers Creek Wind Farm

Wind Speed (10m AGL), m/s	3	4	5	6	7	8	9
Residence 78	35	35	35	35	36.5	38.5	40.5

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1 INTRODUCTION

Vipac Engineers and Scientists were engaged to undertake additional background noise monitoring at Residence *R78* adjacent the proposed Flyers Creek Wind Farm. This report present the methodology, results and new criteria developed based on these measurements.

2 REFERENCES

[1] *Background Noise Monitoring Report, Flyers Creek Wind Farm*, Vipac Document No. 50B-08-0089-TRP-771535-0, Vipac Engineers & Scientists, 7 June 2010.

[2] *Noise Impact Assessment, Flyers Creek Wind Farm*, Vipac Document No. 50B-08-0089-TRP-773906-2, Vipac Engineers & Scientists, 21 December 2010.

[3] *Wind Farms: Environmental Noise Guidelines*, SA Environment Protection Authority, SA Government, 2009.

[4] Delaire, C., Walsh, D., 'A Comparison of Background Noise Levels Collected at the Portland Wind Energy Project in Victoria, Australia', Proceedings of wind turbine noise 2009, INCE Europe, Aalborg, Denmark, (2009).

3 METHODOLOGY AND EQUIPMENT

An environmental noise logger and microphone weather station were installed for a period of three weeks in November 2014. Monitoring was undertaken at the same position as the 2009 monitoring, and both the monitoring and analysis were undertaken using the same methodology as described in the Background Noise Monitoring report [1].

The following equipment was used for the monitoring campaign:

Location	Logging Period Start Date	Logging Period End Date	Approximate Location UTM (WGS 84) Zone 55H		Wind farmer	Noise Logger (calibrated)		
			Easting	Northing		Type	Serial No.	Noise Floor
R78	11/11/2014	02/12/2014	694018	6285561	No	01dB Duo	10303	17.0 dB(A)

Table 3.1: Details of monitoring at residential sites near the proposed wind farm.

Location	Weather Station Type	Weather Station Serial Number	Period Start	Period End	Easting	Northing	% of excluded data – Wind at microphone	% of excluded data - Rain
R78	Vaisala WXT520-1	F2040003	11/11/2014	02/12/2014	694018	6285561	9%	4%

Table 3.2: Details of the weather station installed adjacent noise monitoring equipment.

4 RESULTS

Measurement data was recorded for the following noise descriptors:

- L_{Aeq}
- L_{A10}
- L_{Amax}
- L_{A90}

A plot of the measured noise level over time is attached in Appendix A. The number of valid paired wind and background noise points collected for each site (after exclusion of unsuitable data) is given in Table 4.1. This achieves the minimum requirement for 2000 paired noise and wind data points (listed in [3]). A total of 1075 paired noise and wind data points were collected in the worst case wind direction (meeting the minimum requirement of 500). Note that attended measurements were performed at site and agree with logged data.

Location	Total Number of Data Points	Number of Data Points Excluded	Number of Data Points Used
R78	3049	640	2409

Table 4.1: Number of noise data points measured (after excluding wind and rain affected data).

The scatter plot of noise level against wind speed measured at the wind farm site central/middle Met Mast is attached in Appendix A. The background noise level and resultant criteria (rounded to nearest 0.5dBA) from cut-in wind speed to rated power wind speed (at hub height) is shown in Table 4.2.

Location	Wind Speed (ms^{-1} at 78.6m AGL)									
	3	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
R78 – Background Noise Level	27.5	27	27	27.5	28.5	29.5	30.5	32	33.5	35
R78 – Resultant Noise Criteria	35	35	35	35	35	35	35.5	37	38.5	40

Table 4.2: Background noise levels and criteria, in dB(A), at various wind speeds (at 78.6mAGL).

For the purposes of the noise impact assessment, where sound power data is referenced to 10m AGL wind speeds, the resultant noise criteria referenced to 10m AGL wind speed is provided in Table 4.3.

Location	Wind speed ms^{-1} (at 10m AGL)						
	3	**4**	**5**	**6**	**7**	**8**	**9**
R78	35	35	35	35	36.5	38.5	40.5

Table 4.3: Resultant noise criteria, in dB(A), for each site at 10m AGL reference

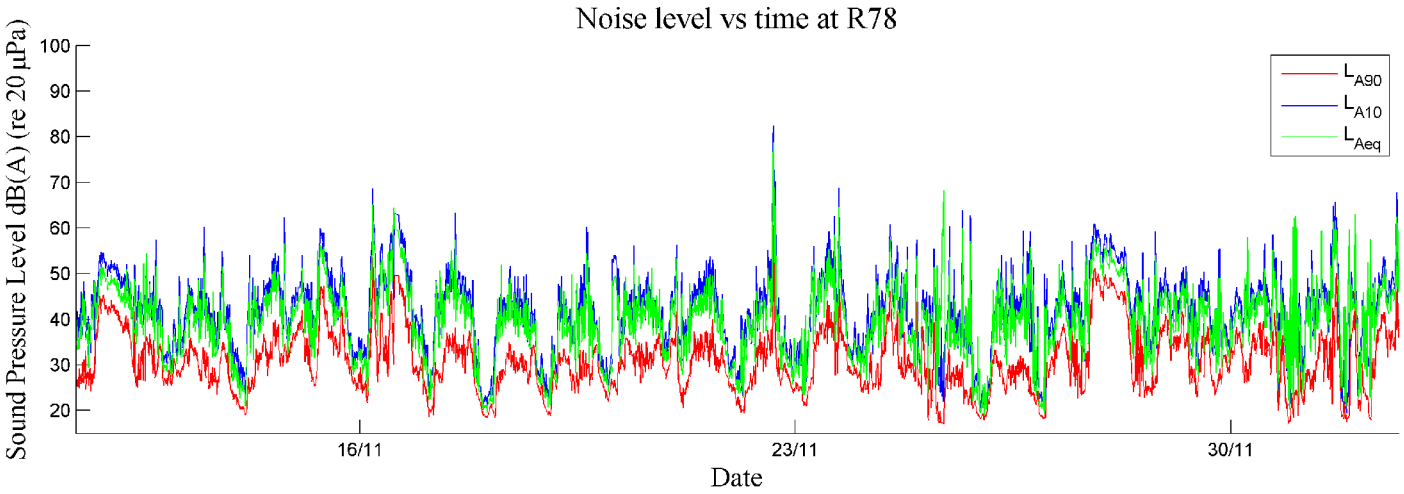
5 DISCUSSION

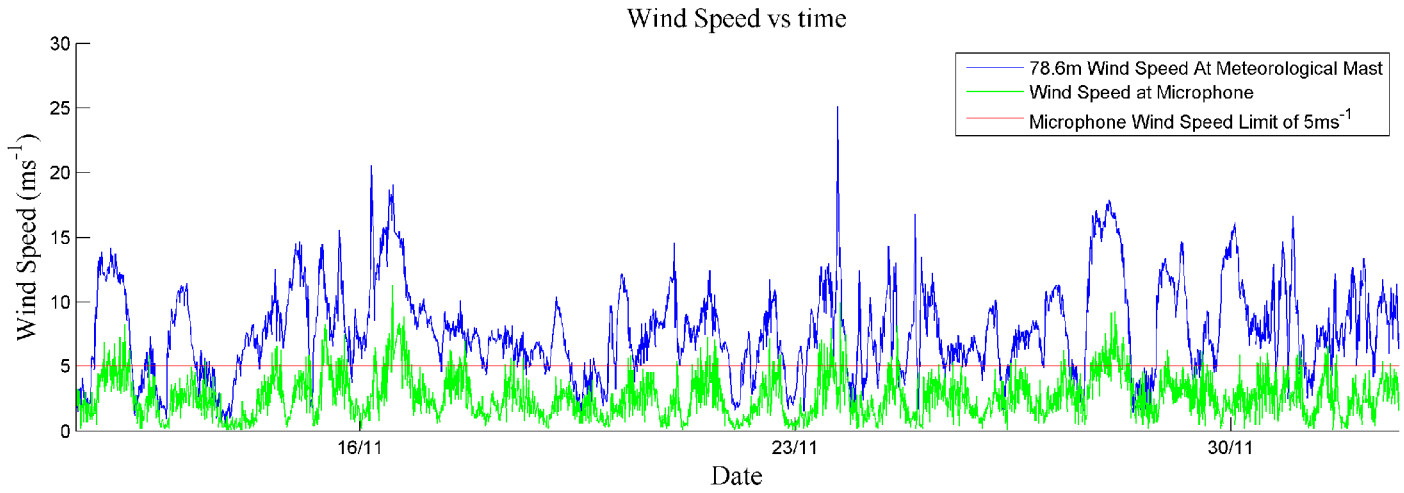
The noise levels measured during this monitoring campaign (Nov 2014) at lower wind speeds (3m/s – 4m/s at hub height) are slightly higher than the results of noise monitoring undertaken previously (Dec 2009) at this site. However the noise levels measured during this monitoring campaign (Nov 2014) at higher wind speeds (5m/s – 12m/s at hub height) are slightly lower than the results of previous noise monitoring campaign (Dec 2009) at this site, by 0.5 to 3dB.

Previous case studies [4] have shown that noise levels measured at the same location at different periods in time can vary by several decibels, and are largely attributed to variations in wind speed and direction distribution across measurement periods. It could also be due to seasonal variation of insect noise (cicadas, crickets), which can be more prevalent at different stages of the season.

The possible causes for this change include a reduction in noise from vegetation (e.g. trees rustling), pumps or air conditioners and insects in the vicinity of the noise logger. The methodology and equipment used in both cases is compliant with the SA Wind Farm Noise Guidelines.

Appendix A MONITORED NOISE LEVEL PLOTS





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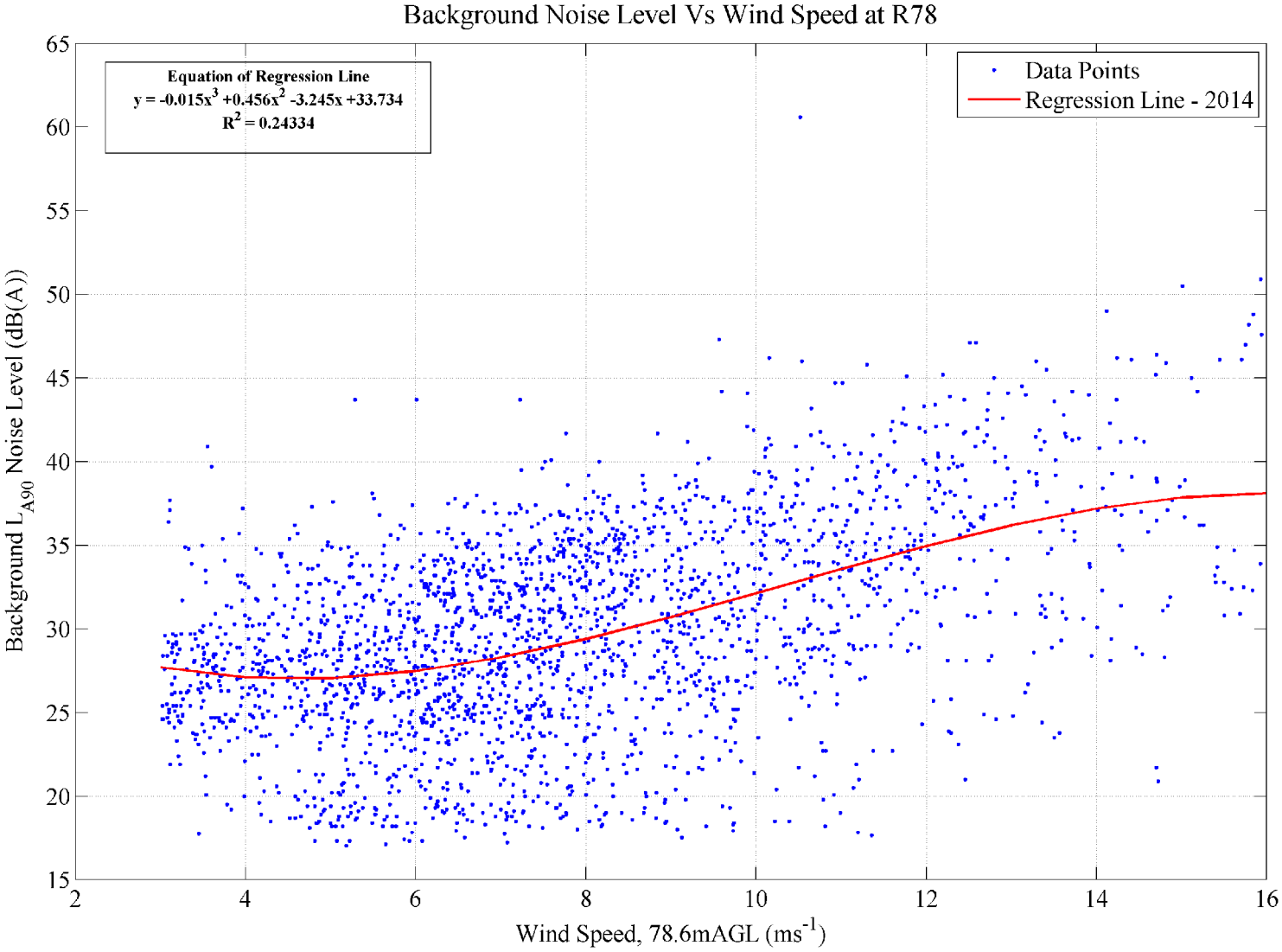

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Appendix B PHOTO OF LOGGER INSTALLATION

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