

**IN THE ENVIRONMENT COURT
WELLINGTON**

ENV-2010-WLG-000114

IN THE MATTER

of the Resource Management Act 1991
(the Act)

AND

IN THE MATTER

of an application under section 311 of the
Act

BETWEEN

Palmerston North City Council

Applicant

AND

New Zealand Wind Farms Limited

Respondent

**THIRD JOINT STATEMENT OF ACOUSTIC EXPERTS FOR NEW ZEALAND
WINDFARMS LIMITED AND PALMERSTON NORTH CITY COUNCIL**

INTRODUCTION

1. This joint statement has been prepared by Miklin Halstead of Marshall Day Acoustics and Nigel Lloyd of Acousafe Limited as acoustic experts engaged by New Zealand Windfarms Limited ("**NZWL**") and Palmerston North City Council ("**Council**") respectively and is filed in accordance with the Court's directions of 7 November 2013.
2. Miklin Halstead is an Associate with Marshall Day Acoustics Limited. He holds a Bachelors degree in Industrial Engineering from The University of Washington, USA; He has 25 years of experience assessing and advising on the environmental sound effects of various projects, including wind farms, gas production plants, electricity substations and roading projects for industrial and public sector clients; his experience with wind farms includes consenting and/or compliance measurements for Te Apiti, Tararua 3, Te Rere Hau, West Wind, Waitahora, and Castle Hill wind farms, and research on propagation of wind turbine noise; and he served as Chair of the NZS6801-6802 (noise measurement and assessment standards) revision committee, and was a member of the NZS6808:2010 (wind farm noise) standard revision committee.
3. Nigel Lloyd has been an acoustic consultant with Acousafe Consulting & Engineering Ltd since 1985. He holds a degree in Mechanical Engineering from the University of Wales received in 1976. His previous work experience includes five years as the noise control engineer with the New Zealand Department of Labour and three years with the Industrial Acoustics Company in the United Kingdom. He assisted various Councils with noise reviews of information for different wind farms including Westwind, Mill Creek, Tararua 3, Turitea, Motorimu, Mahinerangi, Waitahora as well as others. He advised the Council Reporting Officer on noise matters during the consent hearing for the original Te Rere Hau wind farm and Tararua District Council for the eastern extension of Te Rere Hau wind farm.
4. The acoustic experts confirm that they have read the Environment Court's Code of Conduct for Expert Witnesses and agree to comply with their terms. Our qualifications as experts are set out above. We confirm that the issues addressed in this statement are within our areas of expertise. We have not omitted to consider any material facts known to us that might alter or detract from the opinions expressed.

SCOPE

5. This joint statement covers the following matters as directed by the Court in the Minute and Directions dated 7th November 2013:
 - (a) A summary of the information Mr Halstead has provided to Mr Lloyd in order to address the points raised in paragraph 5 of the PNCC Memorandum dated 5 November 2013;
 - (b) Mr Halstead's response to matters raised in Council's memorandum;

- (c) A joint statement between Mr Halstead and Mr Lloyd outlining matters of agreement and disagreement
- (d) Identification of further information required to enable the Court to resolve the outstanding issues before it.

A SUMMARY OF FURTHER INFORMATION PROVIDED BY MR HALSTEAD IN RESPONSE TO THE POINTS RAISED IN PARAGRAPH 5 OF THE PNCC MEMORANDUM DATED 5 NOVEMBER 2013

- 6. The data and results provided in Mr Halstead's affidavit was intended by him to be a demonstration of progress in monitoring as directed by the Court on 17 September 2013, not as a final report on monitoring.
- 7. In response to paragraph 5(a) of the PNCC Memorandum, regarding compliance with paragraph 10 of the Data Collection Specification (regarding special audible characteristics):
 - (a) Mr Halstead has tested three turbines at Te Rere Hau which represent the three production batches of turbines installed. The testing and analysis procedure was carried out in accordance with IEC 61400-11 (2002) and was observed by Mr Lloyd on one occasion. The tones observed at these turbines have been used to inform the assessment of special audible characteristics at the dwellings.
 - (b) However Mr Halstead acknowledges that the input of residents was not sought prior to selecting these turbines. Although Mr Halstead is of the opinion that the tones exhibited by the three turbines tested are consistent with those recorded during measurements at dwellings, he agrees that the opportunity should be given for residents to observe and identify other turbines which may be more representative of the sounds of concern. Subsequently, measurements of these turbines will be made in the same manner as for the three turbines already measured.
 - (c) Mr Halstead notes that residents were provided with logs to record noise experiences during the two-month testing period described in the Data Collection Specification. These logs were collected and analysed, and presented in the Marshall Day Acoustics report of 9 June 2011. However, further analysis of tonality and other special audible characteristics is to be compared with these noise events. Mr Halstead agrees that this information is to be presented in the final report.
 - (d) Recording devices have been installed at the representative dwellings, and have captured audio recordings during the measurement period. These recordings will form the basis of the assessment of special audible characteristics at dwellings. All recordings have been time stamped and can be related to

resident logs, and will be made available to PNCC as part of the report's supporting information.

- (e) In addition to the recordings and logs taken over the two-month measurement period in 2011, recordings were made during the 2012 – 2013 measurement periods. These recordings have been exhaustively analysed for tonality, and spot checks made for amplitude modulation. Resident logs were not collected during this period, as exhaustive testing allows any periods to have been analysed which would have elicited comments or complaints. This approach was agreed in paragraph 22(b) of the First Joint Statement.
 - (f) Mr Halstead acknowledges that if the measurements described in (b) above reveal different tones to those previously attributed to the turbines, then the scope of tonality analysis from these recordings should be broadened to include them.
 - (g) It has previously been agreed that Amplitude Modulation may be reasonably assessed using the "interim test method" in NZS6808:2010. Mr Halstead agrees that the results of such an assessment on recordings taken during times indicated by residents logs or complaints should be presented in the final report.
8. In response to paragraph 5(b) of the PNCC Memorandum, regarding reporting matters:
- (a) Mr Halstead agrees that scatter plots and regression lines are to be provided for both the "operational" and "fully operating" cases in the final report.
 - (b) Mr Halstead maintains his position that the "fully operating" case is a subset of the "operational" case, and that it is the "operational" case that is required to be tested in the Consent Conditions and in relation to testing in accordance with NZS6808:1998.
 - (c) It was agreed in the First Joint Statement that the Willis and Burnett sites would be deleted from further consideration, and that the remaining measurements would only involve six sites.
 - (d) It is agreed that an assessment shall be made in the final report whereby regression lines are not influenced by data points below cut-in wind speed or above 14 m/s wind speed. Mr Halstead is of the opinion that this is not necessarily the correct interpretation of NZS6808:1998, but agrees that there is merit in understanding the influence of this difference.
 - (e) Mr Halstead is of the opinion that the R^2 value of the regression lines is a function of the natural relationship between wind and noise, and is not an indication of the correctness of the

measurements. However it is agreed that the R² value should be supplied for all regression lines.

(f) Mr Halstead agrees that the fitted function should be supplied in all regression lines.

(g) Mr Halstead agrees that separate scatter plots and regression lines should be supplied for the 2011 and the 2012-2013 measurement period, as well as for the aggregate data set; but considers that there is little value in including the incorrect data set presented in the 2011 Report.

9. In response to paragraph 5(c) of the PNCC Memorandum, Mr Halstead agrees that tabulated results shall be provided for all cases reported. Mr Halstead notes that the final set of tabulated results cannot be provided until the background noise testing which is currently underway (and expected to be completed by mid-December) is analysed, as this provides the baseline noise level against which the noise limit is tested.

10. In response to paragraph 5(d) of the PNCC Memorandum, Mr Halstead explains that the incorrect wind mast data had been used in the 2011 Report – wind speed and direction data was taken from the Eastern Extension mast rather than the original TRH mast. As both masts' data had been simultaneously collected, the method of correcting this analysis was to delete the incorrect mast data and insert the correct mast data. No adjustments to any measurements were required, and the present analysis is the same as if the error had not been committed in 2011.

11. In response to paragraph 5(e) of the PNCC Memorandum, Mr Halstead notes that these local wind measurements have not been taken in 2012 due to unavailability of suitable equipment, but that newly acquired equipment will allow this to be done during the December 2013 period.

JOINT STATEMENT OF MR LLOYD AND MR HALSTEAD

Matters of Agreement in respect of paragraph 5 of the Council's memorandum of 5 November 2013:

5(a)		That the information provided in Mr Halstead's affidavit of 30 September 2013 is not sufficient for the court to resolve the outstanding issues before it, and that further information to meet the requirements of the Data Collection Specification.
5(b)		That it was agreed in the Joint Statement dated 9 th September 2011 that, for reasons of efficiency and effectiveness, monitoring shall be undertaken at six

		<p> dwellings and that 21 Ridgeview Road (Willis) and 140 Harrison Hill Road (Burnett) would be fairly represented by monitoring at nearby sites.</p>
	(i)	<p>That scatter plots and regression lines are to be provided for both the "operational" and "fully operating" cases in the final report.</p>
	(ii)	<p>That best fit regression curve for post installation compliance testing shall be provided for the times WTGs are operating above cut-in and wind speeds up to 14m/s at 10m height in accordance with condition 5(j) of the consent.</p> <p>That the measured wind speeds during IEC 61400 testing should include only the range between cut-in and 14 m/s.</p> <p>That all of the scatter plots and regression lines for each of the graphs shall be re-analysed on that basis.</p>
	(iii)	<p>That the R² value is function of the natural relationship between wind and noise, and is not an indication of the correctness of the measurements. However it is agreed that the R² value should be supplied for all regression lines. This will allow monitoring results with a poor correlation to be identified and discussed.</p>
	(iv)	<p>That the fitted function should be supplied in all regression lines.</p>
	(v)	<p>That the wind data used in the 2011 report was originally taken, in error, from the wrong wind mast. The wrong (uncorrected) data should not therefore be used in the final results. Otherwise the data will be presented for the 2011, 2012-2013 data set combined and the October 2012 – February 2013 data set alone.</p>
5(c)		<p>That tabulated results shall be provided for all cases reported (recognising Mr Halstead's note that the final set of tabulated results cannot be provided until the background sound testing which is currently underway is analysed).</p>
5(d)		<p>Further consideration and explanation will be given to those results where R² values show a poor</p>

		correlation for the regression lines including the validity of these results, what actual wind farm and background noise levels are being received by residents, and whether further monitoring is required to improve the confidence in the results.
5(e)		That data collection has not been carried out with concurrent wind speed data from the Wallace and Huffman properties (see Mr Halstead's explanation in 11 above).
5(f)		In response to paragraph 5(f) of the PNCC Memorandum, it is agreed that the tonality method agreed in the First Joint Statement is the correct method for tonality assessment, and that the 1/3-octave band method referred to in 5(f) of the memorandum is not relevant.

Matters of Disagreement

12. There are no matters of disagreement.

IDENTIFICATION OF FURTHER INFORMATION REQUIRED TO ENABLE THE COURT TO RESOLVE THE OUTSTANDING ISSUES BEFORE IT.

13. In summary it was agreed that the following further information shall be supplied before the court can resolve the issues:

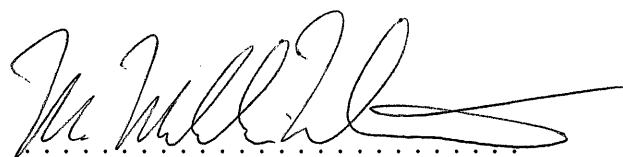
- (a) Weather stations are to be installed one each at 48 Ridgeview Road (Wallace) and 428 Pahiataua-Aokautere Road (Huffman Devy) to allow commensurate local wind speed data to be collected with wind farm wind speeds and wind farm noise data;
- (b) Residents shall be given the opportunity to visit the wind farm to attempt to identify which turbines are causing issues with respect to annoyance (the details of the visit(s) need to be worked through with the residents and with NZ Windfarms);
- (c) If a small number of turbines are identified as being the possible source of annoyance then further testing shall be undertaken as required by 10(a) of the Data Collection Specification;
- (d) Further analysis of wind farm noise shall be undertaken at times when residents' logs identify that the noise is particularly annoying. If there is insufficient information to fulfil this task from logs thus far collected (noting that residents' logs were not collected after the two-month measurement period in 2011) then further logs will be provided to residents to gain sufficient information to satisfy 10 (d) and (e)) of the Data Collection Specification;

- (e) The further analysis will include testing for tonality and special audible characteristics.
- (f) All existing data is to be re-analysed in the form agreed above as will all future analyses relating to this Measurement Specification. This includes:
 - i. The provision of separate scatter plots and regression curves for the 2011 and the 2012-2014 measurement period as well as the aggregate data set.
 - ii. With the limitations on wind speed to between cut-in and 14m/s.
 - iii. With the provision of R² values and fitted function for all regression lines, and
 - iv. With all results separately tabulated.

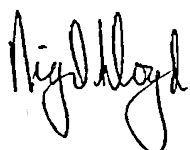
14. It was agreed that collaboration between Mr Halstead and Mr Lloyd would be beneficial particularly in the following areas:

- (a) Listening to representative tonality and amplitude modulation recordings;
- (b) Visiting residents and the wind farm to assist with turbine observation and selection for near-field measurement;
- (c) Attendance for targeted on-off monitoring in terms of para 11 of the data Collection Specification;
- (d) Design and review of the report structure.

Date: 2 December 2013



Miklin Halstead
Marshall Day Acoustics Ltd



Nigel Lloyd
Acousafe Limited