



Te Rere Hau Windfarm Annual Noise Monitoring Report

2018—2019

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1.0 Purpose

This annual noise monitoring report has been prepared by TRH Services on behalf of NZ Windfarms to fulfil s128 review Condition 20, with contributions by Marshall Day Acoustics as noted.

As required by Condition 19.4, we provided a copy of this report in draft form to the Community Liaison Group prior to a meeting held on 13 May to discuss the report, and have added a response section to feedback from that meeting.

2.0 Compliance with Conditions 4, 5, and 5A—5C

To demonstrate compliance with these conditions, refer to report “Rp 009 R01 2011095W” prepared by Marshall Day Acoustics with TRH Services, and already submitted to Council on 1 Feb 2019. Taken with the remainder of this report, which indicates no adverse alterations to wind turbines with respect to noise emissions during the preceding year, we submit that we remain in compliance with the conditions.

The Condition 5C noise curtailment regime active on turbines 88, 103, and 104 prevented approximately 449 turbine-hours of running over the period 1 Dec 2018 to 31 Mar 2018.

3.0 Wind turbine alterations

The year to 31 Mar 2019 included the following significant repairs and machinery replacements

- Blade replacements (like-for-like)
- Blade leading edge tape repairs
- Generator replacements (like-for-like, turbines 8, 10, 24)
- Gearbox replacement (like-for-like, turbines 74, 76, 25, 53, 17)
- Gearbox replacement (reduced noise profile, turbine 104),

Marshall Day Acoustics provided the following Acoustic Impact statement:

Blade replacements and gearbox replacements where the replacement parts are the same as those removed will not have a significant effect on noise emissions.

Blade leading edge tape repairs are an ongoing maintenance item which will generally reduce the high-frequency whistle of blade rotation, which would normally accumulate slowly as the leading edge tape wears or becomes damaged. We understand that priority of these repairs is given to turbines which contribute more significantly to residence noise emission. This work is expected to reduce noise levels.

The gearbox replacement at turbine 104 is part of the prescribed noise conditions to reduce noise and tonality to residents. We have measured the output of this turbine following the gearbox change and have confirmed in report Rp 009 R01 2011095W that this has occurred.

None of the repair or maintenance items carried out on the TRH wind farm over the 2018 – 2019 operating year will cause an increase in noise emissions. Replacement of T104 gearbox and leading edge tape repairs will have reduced noise emissions.

4.0 Complaints register

The following 54 complaints were received during 2018.

Name	Address	Date	Time	Complaint Description	Response/Remedy	Wind Speed [m/s]	Wind Direction [deg]
Ellingham	47 Ridgeview Rd	9/01/2018	20:00	Whoosh whoosh, still night. Still noisy 22:00.	Analysed 22/1, see response in row 30/1	8.6	340
Olsson	19 Ridgeview Rd	9/01/2018	10:23	Roaring and winding noise for at least 1 hr.	Analysed 22/1, see response in row 30/1	8.6	340
Ellingham	47 Ridgeview Rd	29/01/2018	7:00	Roaring noise.	Analysed 22/1, see response in row 30/1	9	110
Ellingham	47 Ridgeview Rd	30/01/2018	23:00	Very loud blade noise. Still and hot. Noise from 2? Turbines. Could those 2 be shut down for a trial period to see if alleviates the problem?	Complaints to date analysed by jsw. Further info sought and received from Sue. Marshall Day consulted. Implemented further curtailment of T103, 104 & 088 in NW 2/2/18. Blind test.	6	290
Ellingham	47 Ridgeview Rd	8/02/2018	6:30	Roaring noise.		6	125
Ellingham	47 Ridgeview Rd	8/02/2018	21:40	Roaring noise, sounded like Heathrow airport.		9.8	115
Ellingham	47 Ridgeview Rd	14/02/2018	21:00	Woosh from blades, too noisy to leave window open	Current curtailment to 7 m/s in this sector so T103, T104 & T084 running.	8.1	293
Ellingham	47 Ridgeview Rd	19/02/2018	6:15	Woosh from blades slicing through air	All T084-088 & T103-104 running.	11	310
Ellingham	47 Ridgeview Rd	10/03/2018	22:30	Background noise and GB noise	T103-104 only running	10	100
Ellingham	47 Ridgeview Rd	11/03/2018	11:30	Background noise and GB noise	T103-104, T086, 084, 088 running	8.5	120
Ellingham	47 Ridgeview Rd	17/03/2018	9:00	Roar	Almost all turbines running.	14	140
Olsson	19 Ridgeview Rd	24/03/2018	20:30	Noisey after dark	Comment to Adam when contacted for feedback prior to community meeting - i.e. not an official complaint. 80's turbines running, 103/104 not. Note that SCADA accidentally had 1/3 instead of 31/3 for end of summer hours, so had switched to 21:00-00:00. i.e. under summer hours this operation would have been curtailed.	6	320
Ellingham	47 Ridgeview Rd	27/03/2018	4:00	Woosh woosh blade noise very loud this morning.	All running. This is in sector for voluntary NW curtailment but above current wind speed limit of 7 m/s and outside timeslots.	8.5	300
Ellingham	47 Ridgeview Rd	28/03/2018	6:00	Woosh woosh noise, wind must have picked up around 07:30 as noise got louder	All running. Nothing obviously different around 07:30.	12	300
Ellingham	47 Ridgeview Rd	2/04/2018	22:30	Blade noise slicing through air, loud.	Most running, all near Ridgeview Rd running	10	315
Ellingham	47 Ridgeview Rd	16/04/2018	21:15	Swishing of blades	All but T088 running in met mast area of farm. Typical problem conditions, existing curtailment is up to 7 m/s in this sector.	8	315

Name	Address	Date	Time	Complaint Description	Response/Remedy	Wind Speed [m/s]	Wind Direction [deg]
Ellingham	47 Ridgeview Rd	25/04/2018	2:15	Blade noise, swishing sound	Half farm running, only T103 in met mast area. Shut down 02:30. No curtailment for this sector, very rare annoyance.	8	10
Banks	48 Ridgeview Rd	1/05/2018	6:30	Loud. No great detail turbines were simply audible, a lot of SE winds during last couple of weeks.		7.5	150
Ellingham	47 Ridgeview Rd	1/05/2018	7:15	Chorus from Windfarm, background roar		10	135
Ellingham	47 Ridgeview Rd	2/05/2018	22:00	Roar noise, no specified time		6	131
Ellingham	47 Ridgeview Rd	3/05/2018	7:00	Extremely load roar noise		7	130
Ellingham	47 Ridgeview Rd	3/05/2018	21:50	Extremely loud roar		10.75	108
Ellingham	47 Ridgeview Rd	4/05/2018	7:30	Extremely load roar, still loud at time of call, she has day off and its too loud so she is having to go out for the day and cant stay home to relax.	Met mast area not running. 54 Turbines running at time of complaint Turbines Running = 1-10, 11-15, 23-38, 46-59	3	275
Tremain	406 Pahiatua Track	4/05/2018	7:30	This morning (4 May 2018) the noise from the windfarm was particularly noticeable. When I left for work at 7.30am I could hear it from inside the garage and on raising the door I could see that T103 and T104 were not operating, so I assume the wind direction was one that is a known problem. (Light easterly at our place). Ashley similarly noticed the noise on leaving the house(about 10.00am)to work on the farm. He noted that there was not much traffic noise at this time. I would describe it as sounding like a plane engine, he called it a rumble. It seemed to be coming from the whole hillside, not individual turbines.	Met mast area not running. 54 Turbines running at time of complaint. Turbines Running = 1-10, 11-15, 23-38, 46-59	3	275
Ellingham	47 Ridgeview Rd	2/06/2018	13:35	Loud roaring noise		8	-238
Ellingham	47 Ridgeview Rd	2/06/2018	23:00	Very noisy		9	123
Ellingham	47 Ridgeview Rd	3/06/2018	9:14	Very noisy		13	121
Ellingham	47 Ridgeview Rd	9/06/2018	23:00	Blade noise		10	-37
Ellingham	47 Ridgeview Rd	11/06/2018	8:00	Roar from Windfarm		10	141

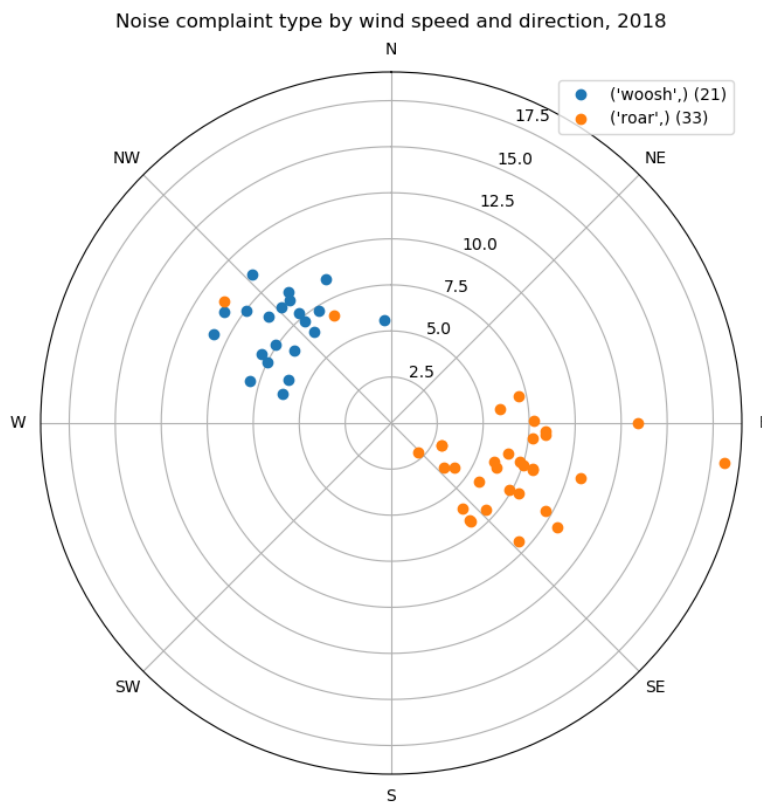
Name	Address	Date	Time	Complaint Description	Response/Remedy	Wind Speed [m/s]	Wind Direction [deg]
Ellingham	47 Ridgeview Rd	12/06/2018	22:30	Extremely loud wind farm roaring noise		9	119
Ellingham	47 Ridgeview Rd	30/06/2018	22:30	Whoosh whoosh blade noise		8	-22
Ellingham	47 Ridgeview Rd	1/07/2018	8:50	Whoosh whoosh blade noise		11	-30
Ellingham	47 Ridgeview Rd	5/07/2018	7:00	Roaring noise		9	121
Ellingham	47 Ridgeview Rd	6/07/2018	23:00	Whoosh whoosh blade noise		13	-42
Ellingham	47 Ridgeview Rd	15/07/2018	13:00	continual droning noise. Very unpleasant background noise. Spent the afternoon gardening, not a very relaxing afternoon having the background noise.		11	100
Ellingham	47 Ridgeview Rd	21/07/2018	22:00	whooshing noise		13	-39
Ellingham	47 Ridgeview Rd	22/07/2018	22:00	whooshing noise		12	-43
Ellingham	47 Ridgeview Rd	5/08/2018	9:00	all day. Extremely loud, horrendous wind farm roar. I would class this day the worst it has ever been as far as the roar noise goes. On a scale of 1 - 10 this would be a 10.		8	108
Ellingham	47 Ridgeview Rd	13/08/2018	21:00	Roaring noise		8	87
Ellingham	47 Ridgeview Rd	16/08/2018	2:00	whoosh whoosh of blades		9	-25
Ellingham	47 Ridgeview Rd	8/10/2018	8:00	Roaring noise		5	105
Ellingham	47 Ridgeview Rd	9/10/2018	18:45	Blade whooshing noise		9	-65
Ellingham	47 Ridgeview Rd	18/10/2018	6:30	Blade noise slicing through air today		7	320
Ellingham	47 Ridgeview Rd	18/10/2018	21:14	Roaring noise		2	138
Ellingham	47 Ridgeview Rd	20/10/2018	23:00	Whooshing blade noise		8	296
Ellingham	47 Ridgeview Rd	21/10/2018	8:10	Whooshing blade noise		9	311
Ellingham	47 Ridgeview Rd	8/11/2018	7:00	Whoosh whoosh blade noise		7	307
Banks	48 Ridgeview Rd	2/06/2018	22:37	Loud roaring noise coming from Te Rere Hau Wind farm. She also advised it is calm at her house but a Easterly up at the farm.		12	116
Banks	48 Ridgeview Rd	5/08/2018	10:36	Caller reporting lot of noise from the windfarm. Caller says it sounds like the interislander background rumbling.		9	98
Ellingham	47 Ridgeview Rd	24/11/2018	13:15	Roaring noise		6	83
Ellingham	47 Ridgeview Rd	25/11/2018	11:00	Roaring noise		8	108

Name	Address	Date	Time	Complaint Description	Response/Remedy	Wind Speed [m/s]	Wind Direction [deg]
Ellingham	47 Ridgeview Rd	1/12/2018	7:17	Roaring noise		13	90
Ellingham	47 Ridgeview Rd	2/12/2018	10:00	Roaring noise		8	94
Ellingham	47 Ridgeview Rd	15/12/2018	23:00	Roaring noise		6	124

During 2018, complaints came in at an average rate of one every 7 days. Since 1 Jan 2019, this has slowed to once every 9 days.

Of the 54 complaints, 53 were received from Ridgeview Road and one was received from Pahiatua Track.

The figure below shows all 54 complaints categorized as either “roar” or “woosh” based on keywords in the complaint and plotted according to the wind speed and direction at the time of the complaint.



Generally, for the affected residents, “roar” noise occurs in easterly winds and “woosh” noise in westerly winds.

5.0 Community Liaison Group meeting minutes

5.1 Meeting held 5 Apr 2018

Opening

The meeting of the NZ Windfarms Ltd Community Liaison Group was opened at 6.10pm, on Thursday 5th April 2018 at the Aokautere School hall by John Worth, Adam Radich and Jamie Wallace.

Present

Mark & Kelly Dawson, Murray Olsen, Terry & Kay Armstrong, Sam Ellingham, Charles & Barbara Little, Ashley Kells & Lorraine Tremaine, Clel Wallace & Nicky Banks, Craig Auckram (PNCC).

Apologies

Joe Poff

Discussion

-S128 decision outcome- Overview given of S128 outcome and insight given to residents about changes NWF would need to make to meet the conditions of the consent.

- Reinforced to residents the robust nature of this decision and that it would be enforced whether current staff were employed by NWF or not

-G/box change in T104 and T103 have been completed to M7 type

-Installation of noise monitoring station at Irvins property, Irvins thanked for their co-operation

-Details given of official complaints management process and the importance of this to help NWF to identify conditions of concern.

-Specific details of mandated curtailment regime and how NWF were achieving this

-Compliance reporting as required by PNCC 21 December 2018 as part of S128 decision

-On-site additional noise testing to be undertaken to confirm compliance with consent conditions

-Voluntary Curtailment regime – Feedback/ complaints are extremely important to enable us to specifically identify areas of concern and further refine and develop our curtailment regime.

Contact details and process was specifically outlined in detail

Closed

Meeting was closed at 7pm by John Worth (CEO NZ Windfarms Ltd).

5.2 Meeting held 13 May 2019

Opening

The meeting of the NZ Windfarms Ltd Community Liaison Group was opened at 7.00pm, on 13 May 2019 at the Aokautere School hall by Adam Radich and Adam Fuller. Also present from NWF Peter Darke and Alison Angove

Present

Joe Poff, Lee Huffman & Graham Denvey, Ashley Kells & Lorraine Tremaine, Craig Auckram (PNCC).

Apologies

Nil

Discussion

-S128 decision requires NWF to submit draft Annual report to community for feedback prior to submitting final to PNCC

- Overview of voluntary vs mandated curtailment
 - Discussion of wind roses to show wind conditions represent previous years wind conditions
 - Time line of events which outlined actions taken and to be taken in the future
 - Spoke about reduction in complaints from 499 in 2012 to 54 in 2018-19
 - Discussed noise monitoring terminal and its effectiveness in evaluating noise issues
 - Discussed noise measurements taken and how they demonstrated compliance with our current consent, as well as provide a baseline for comparison with next year's, and subsequent years', data.
 - Lee Huffman asked for an addition to report that explained the M7 gear modification impact at T103, 104
-
- Voluntary Curtailment regime – Feedback/ complaints are extremely important to enable us to specifically identify areas of concern and further refine and develop our curtailment regime.
 - Presented recent months' daily hours noise curtailed, with year-on-year comparison.
 - Discussed that NMT data allows more quantitative and objective corroboration of complaints and refined location of time and wind conditions which may help understand noisy conditions and improve curtailment.
 - Contact details and process was specifically outlined in detail

Closed

Meeting was closed at 7.45pm

6.0 Community Group meeting feedback

A question was raised at the 13 May meeting on the effect of the gearbox upgrade on turbine noise emissions:

The gearbox employed by the W500 turbines at Te Rere Hau has 4 'stages' or gear sets. The third stage gear set design has been iterated to moderate a tone and to reduce the overall sound power level.

The gear set has been modified from a module 5 tooth profile to module 7. In simple terms the module communicates the number of teeth (relative to gear diameter); for the same diameter gear, as is the case here, a larger module indicates fewer teeth. This has the effect of altering the sound characteristic of the gear set, changing the mesh frequency and intensity of the sound. The change to module 7 shifts a 1000 Hz SAC to approximately 700 and 1400 Hz, each with vastly reduced tonal audibility. Module 7 third stage gear sets were installed in T103 on 1 October 2014 and T104 on 8 December 2017, being the earliest possible weather window since conclusion of S128 proceedings. The sound power level was also reduced compared to non-upgraded turbines, and is no more than 103 dB at wind speeds of 6 to 10 m/s.

This summarizes the results presented in Marshall Day report Rp 006 2011095W which was submitted to PNCC in Jan 2018 to meet condition 5B of the s128 review.

7.0 Noise Monitoring Terminal

Noise monitoring at a permanent noise monitoring terminal (NMT) at the Irvin Property (Site 4, 38 Ridgeview Road) is required in Condition 13. This was completed in May 2018, with calibration completed by 10 June. The NMT gathers A-weighted noise statistics including L_{A90} as required by NZS6808:2010, and stores audio data to a hard disk, which is regularly exchanged and archived by NZWL.

The NMT is a Norsonic NOR140 sound level meter connected to a class-1 measurement microphone with outdoor windscreen and protection kit, located at approximately the same location as used during the 2011 – 2013 monitoring exercise. This location complies with the requirements of clause 7.1.6 in NZS6808:2010.

The measurement system is calibrated periodically by NZWL staff using a class-1 compliant field calibrator. Both the meter/microphone system and the field calibrator are subject to periodic laboratory calibration, which is undertaken at the prescribed intervals by NZWL. The latest calibration certificate for the field calibrator is included at the end of this report. L_{A90} statistics are collected continuously in 10-minute intervals as required by NZS6808:2010 and stored on a web server.

The logger was installed and went live on 7 Jun 2018 at 13:30 and has operated continuously since then (for a total of 7138.5 hours in the year to 31 Mar 2019) except for the following periods of lost data due in all three cases to cellular communications outages:

- 3 hours on 8 Jun 2018
- 1 hour on 21 Jan 2019
- 24 hours on 22 Feb 2019.

Audio recording is independent of the logging and there are no gaps.

Improvements to the logging software reliability are continuous, and the logger is updated with the latest firmware from time to time.

8.0 Analysis of operational data

This section has been provided by Marshall Day Acoustics.

We have compared the collected L_{A90} (10-min) sound level measurements with the wind speed measurements taken at the reference met mast, and applied the operational filters described in Condition 7 (ensuring most turbines are operating, including nearest turbines and T103-T104, excluding curtailed periods, assessing only night-time data, and restricting assessments to the operating wind speeds).

Tables are provided to summarise the compliance status of these measurements in the four critical wind sectors (WNW, NNW, SSE, ESE).

The data collected during the 2011-2013 period excluded high background noise periods where possible to reflect the most exposed periods of turbine noise – during both “shutdown” and “operational” measurements. By contrast the current year measurements have not been so selected (aside from removing rainfall periods) and so include increased traffic periods and seasonal effects.

Therefore this data should be considered as a valuable baseline for year-round monitoring rather than as a direct equivalent of the 2011 – 2013 compliance measurements, when evaluating trends.

8.1 WNW

Site 4, WNW

Wind Speed (m/s):	6	7	8	9	10	11	12	13	14	15
Background Noise Level (dB L_{A90}):	24	26	28	30	32	34	36	38	40	42
Operational Noise Level (dB L_{A90}):	28	29	31	32	34	36	38	40	42	44
Noise Limit (dB L_{A90}):	35	40	40	40	40	40	41	43	45	47
Turbine Noise Level (dB L_{A90}):	25	26	27	28	30	31	33	36	38	41
Exceedance (dB):	0	0	0	0	0	0	0	0	0	0

8.2 NNW

Site 4, NNW

Wind Speed (m/s):	6	7	8	9	10	11	12	13	14	15
Background Noise Level (dB L_{A90}):	25	26	28	30	32	34	36	38	40	42
Operational Noise Level (dB L_{A90}):	28	29	31	33	35	38	40	43	46	50
Noise Limit (dB L_{A90}):	35	40	40	40	40	40	41	43	45	47
Turbine Noise Level (dB L_{A90}):	25	27	28	30	33	36	39	42	45	49
Exceedance (dB):	0	0	0	0	0	0	0	0	1	2

8.3 SSE

Site 4, SSE

Wind Speed (m/s):	6	7	8	9	10	11	12	13	14	15
Background Noise Level (dB L _{A90}):	24	27	29	32	35	38	41	44	47	50
Operational Noise Level (dB L _{A90}):	33	35	37	39	41	43	44	45	47	47
Noise Limit (dB L _{A90}):	35	40	40	40	40	43	46	49	52	55
Turbine Noise Level (dB L _{A90}):	32	35	37	39	40	41	42	40	--	--
Exceedance (dB):	0	0	0	0	0	0	0	0	--	--

8.4 ESE

Site 4, ESE

Wind Speed (m/s):	6	7	8	9	10	11	12	13	14	15
Background Noise Level (dB L _{A90}):	25	31	35	38	41	43	44	45	46	48
Operational Noise Level (dB L _{A90}):	34	37	40	42	44	45	47	48	48	48
Noise Limit (dB L _{A90}):	35	40	40	43	46	48	49	50	51	53
Turbine Noise Level (dB L _{A90}):	33	36	38	40	41	42	43	44	43	38
Exceedance (dB):	0	0	0	0	0	0	0	0	0	0

9.0 Comments

This section has been provided by Marshall Day Acoustics.

The regression lines plotted through the 2018-2019 data all show compliance with the high-amenity noise limit except during WNW winds of 14 – 15 m/s. It should be noted that the regression line does not accurately reflect the average noise level at these wind speeds, and that bin analysis would demonstrate compliance in these two wind speed bins. It should also be noted that the background noise level in these wind conditions was not significantly present during those measurements.

The sound level under ESE, 6 m/s winds was the one case where during the 2011 – 2013 compliance assessment the limit would have been exceeded if the high amenity limit were applied at this property. The sound level has decreased to below this limit, presumably as a result of the decrease in sound output from turbines 103 and 104 following the gearbox replacement.

No other curtailments are reflected in this data – periods where turbines have been shut down or have not started due to curtailment requirements have been excluded from this data. If these data were included this would further reduce the average sound levels during the relevant wind conditions.

In two conditions (WNW and ESE at higher wind speeds) the noise level appears to have significantly increased. However in both cases, the operational sound level was similar to or less than the background sound level, which makes calculation of residual turbine noise unreliable. In such situations the turbine noise level is well below the noise limit.

10.0 Complaints Assessment

This section has been provided by Marshall Day Acoustics.

NZWL has provided a register of complaint covering the period from Dec 2017 to Mar 2019. The register shows 68 complaints over this period, of which all but one were received from Ridgeview Road residents. 62 complaints were received from the property at 47 Ridgeview Road, with the others at 19 and 48 Ridgeview road and 406 Pahiatua Track. 47 Ridgeview road is directly opposite Ridgeview Road from the permanent monitoring location, and so the noise level recorded by this device provides a relevant point of reference for these complaints.

Complaints received prior to 10 June 2018 when the permanent monitor was established include various periods of experimentation with mandatory and voluntary curtailment methods. For complaints received after 10 June we have summarised the noise conditions present. All of these complaints were received from the properties directly adjacent to the noise monitoring terminal.

The following complaints have been divided between general NW and SE wind directions, and in each case sorted by ascending wind speed. The time and text of the complaint are included, and the noise level and wind farm state are described.

We note that the time of the complaint may not correspond directly to the time that the problem noise occurred. In two instances the complaint refers to previous parts of the day being an issue, and so the wind and noise conditions may not correspond to the conditions of complaint.

The “Full Operation” column describes whether enough turbines were enabled to comply with the requirements of Condition 7.4 for valid sound level reporting. The “Curtailed” column describes whether any turbines were shut down in response to either mandatory or voluntary curtailment programming.

10.1 South-easterly Complaints

Date	Time	Complaint Description	Wind Dir (deg)	Wind Spd (m/s)	Noise Level (dB LA90)	Full Operation?	Curtailed?
18/10/2018	21:14	Roaring noise	136	1.7	30	Yes	No
5/07/2018	7:00	Roaring noise	113	6.2	36	Yes	No
8/02/2019	8:40	Roaring noise	76	6.4	51	Yes	No
8/10/2018	8:00	Roaring noise	104	6.5	37	Yes	No
2/06/2018	13:35	Loud roaring noise	110	6.6	--	Yes	No
11/06/2018	8:00	Roar from Windfarm	141	6.8	30	Yes	No
13/08/2018	21:00	Roaring noise	78	7.1	36	Yes	No
12/06/2018	22:30	Extremely loud wind farm roaring noise	119	7.4	26	No	Yes
24/11/2018	13:15	Roaring noise	88	7.6	37	Yes	No
15/12/2018	23:00	Roaring noise	123	7.7	33	No	Yes
5/08/2018	9:00	all day. Extremely loud, horrendous wind farm roar. I would class this day the worst it has ever been as far as the roar noise goes. On a scale of 1 -10 this would be a 10.	89	7.8	35	Yes	No
2/06/2018	23:00	Very noisy Caller reporting lot of noise from the windfarm. Caller says it sounds like the interislander background rumbling.	119	7.9	--	No	Yes
5/08/2018	10:36	Roaring noise	94	8.0	38	Yes	No
2/12/2018	10:00	Loud roaring noise coming from Te Rere Hau Wind farm. She also advised it is calm at her house but a Easterly up at the farm.	92	9.4	43	Yes	Yes
2/06/2018	22:37	Roaring noise	121	9.6	--	No	Yes
25/11/2018	11:00	Roaring noise	108	9.7	40	Yes	No
3/06/2018	9:14	Very noisy	123	10.2	--	Yes	No
1/12/2018	7:17	Roaring noise	94	11.0	41	No	Yes
29/01/2019	7:15	Roaring noise	133	11.4	47	Yes	No
15/07/2018	13:00	continual droning noise. Very unpleasant background noise. Spent the afternoon gardening, not a very relaxing afternoon having the background noise.	97	18.0	48	No	No

10.2 North-westerly Complaints

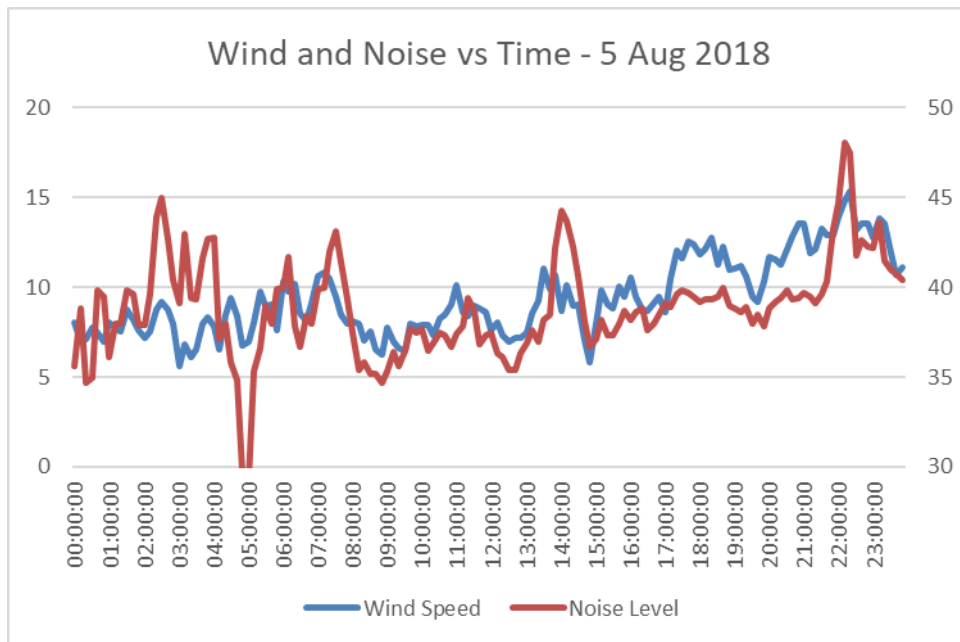
Date	Time	Complaint Description	Wind Dir (deg)	Wind Spd (m/s)	Noise Level (dB LA90)	Full Operation?	Curtailed?
9/01/2019	22:12	Blade noise slicing through air	284	5.7	27	Yes	No
17/02/2019	21:45	Slicing through air noise	307	5.9	26	Yes	No
8/11/2018	7:00	Whoosh whoosh blade noise	308	6.9	36	Yes	No
16/08/2018	2:00	whoosh whoosh of blades	327	7.2	30	Yes	No
18/10/2018	6:30	Blade noise slicing through air today	324	7.3	35	Yes	No
21/07/2018	22:00	whooshing noise	320	7.7	38	Yes	No
20/10/2018	23:00	Whooshing blade noise	296	7.8	29	Yes	No
26/03/2019	9:00	Blade noise slicing through air	322	8.3	39	Yes	No
9/10/2018	18:45	Blade whooshing noise	290	8.5	36	Yes	No
21/10/2018	8:10	Whooshing blade noise	309	8.6	37	Yes	No
30/06/2018	22:30	Whoosh whoosh blade noise	335	8.6	31	Yes	No
1/07/2018	8:50	Whoosh whoosh blade noise	320	8.7	36	Yes	No
14/02/2019	21:50	Whoosh whoosh noise	306	8.9	33	Yes	No
9/06/2018	23:00	Blade noise	322	9.1	--	Yes	No
10/01/2019	21:40	Blade noise slicing through air,	298	9.4	31	Yes	No

		whoosh whoosh noise					
27/03/2019	7:30	Blade noise slicing through air	317	10.6	39	Yes	No
22/07/2018	22:00	whooshing noise	304	10.9	36	Yes	Yes
6/07/2018	23:00	Whoosh whoosh blade noise	317	11.0	39	Yes	No

10.3 Comments

The earlier comments about complaint times perhaps not corresponding to noise event times notwithstanding, many of the complaints arise at times of relatively low noise levels - ones which are below the compliance noise limit individually. This is the case for all the South-easterly complaints periods and all but five of the complaints in NW conditions.

Of note is the 5 August 2018 complaint, referring to this being “the worst it has ever been”, and mentioning ongoing noise from that day. The logged sound levels for that day are shown in the following figure. The complaint was logged at 9 am and may be in response to the peaks in noise level which occurred early in the morning, and then again at around 7:30 am. These peaks were approximately 43 – 45 dB L_{A90} , and related to wind speeds of around 10 m/s.



In general, the complaints from the point of “settling in” of the curtailment and monitoring systems are received on average once per week. The curtailment appears to have significantly reduced complaints relative to occurrences prior to receiving the latest conditions of consent.

Calibration certificate for field calibrator

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EQUIPMENT | SERVICE | SUPPLIES

(IANZ Accredited laboratory)

Calibration, Sales & Service of Audiological and Acoustical Equipment

ACOUSTIC CALIBRATOR CALIBRATION CERTIFICATE

29 April 2019

TRH Services
C/O Masakill Contracting
138 Benmore Avenue
Cloverlea
Palmerston North 4412

IANZ Accredited Laboratory 537

Make: Norsonic	Type: Nor1256	Serial No: 125626090
Date Tested: 29 April 2019	By: RJ	Job No: SO010800-125626090

A measurement of the output sound pressure level of the calibrator was made by the insert voltage method, using a microphone of known sensitivity. Testing has been conducted in accordance with IEC60942 (2017) Annex B - Periodic Verification Tests. Tested using ECS procedure; Proc_Sound_Calibrators.

Results

Measurement results reported are traceable to SI units via recognised National Standards.

Reference Microphone: Bruel & Kjaer 4134 **Serial No:** 1094890 fitted with protection grid.

Ambient Temperature: 24.0°C ± 1°C **Ambient Pressure:** 1001.3 hPa


Calibrator frequency was **1000.0** Hz on the 1 kHz setting
Calibrator frequency was **251.2** Hz on the 250 Hz setting
Distortion was **0.20** % THD+N on the 1 kHz @ 114dB setting
Distortion was **0.28** % THD+N on the 250 Hz @ 114dB setting


The sound pressure level measured 94.12 dB SPL re 20 µPa on the 1 kHz @ 94dB setting.
The sound pressure level measured 114.11 dB SPL re 20 µPa on the 1 kHz @ 114dB setting.
The sound pressure level measured 94.06 dB SPL re 20 µPa on the 250 Hz @ 94dB setting.
The sound pressure level measured 114.04 dB SPL re 20 µPa on the 250 Hz @ 114dB setting.

The expanded uncertainty was calculated using a coverage factor of 2.04 and is estimated to be ±0.06 dB with a confidence level of 95%. The sound calibrator was tested with the ½ inch aperture.

The sound calibrator was tested against Class 1 tolerance limits of the standard and has been shown to meet periodic verification criteria described in IEC60942:2017 for the sound pressure level(s), distortion and frequency(ies) stated, for the environmental conditions under which tests were performed.

Note: The manufacturer of this model of calibrator does not claim type approval conformance to IEC60942 (2017 edition) as it was manufactured before this standard was written.


(Robert Jaques)
Authorised IANZ signatory


(Angelo DeGuzman)
Report Checked

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Street Address: Millennium Centre, Level 2 Building A, 600 Great South Road, Ellerslie, Auckland 1051.

Postal address: PO Box 74103, Greenlane, Auckland 1546, New Zealand.

Phone: +64 9 279 8833 Fax: +64 9 279 8883 Email: info@ecs-ltd.co.nz Web: www.ecs-ltd.co.nz

