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REPORT ID**: 17095.01.T53.RP2**

Belle River Wind Power Project – Turbine T53
IEC 61400-11 Edition 3.0 Measurement Report

Prepared for:

Belle River Wind LP
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Revision History

Revision Number	Description	Date
1	Issued test report	26 November 2018
2	Revised Tonality Table to include results at 7.5 and 12.5 m/s	21 May 2019

This report in its entirety, including appendices contains 100 pages.

Statement Qualifications and Limitations

This report was prepared by Aercoustics Engineering Limited in accordance with International Standard IEC 61400-11 (Edition 3.0, released 2012-11), "Wind turbine generator systems – Part 11: Acoustic noise measurement techniques". This report is specific only to the Wind Turbine identified in this report.

Aercoustics Engineering Limited shall not be responsible for any events or circumstances that may have occurred since the date on which the Wind Turbine was tested and/or this report was prepared, or for any inaccuracies contained in information that was provided to Aercoustics Engineering Limited. Further, Aercoustics Engineering Limited agrees that this report represents test data analysed as per the above described standard for the specific Wind Turbine described in this report, but Aercoustics Engineering Limited makes no other representations with respect to this report or any part thereof.

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Any use of this report is subject to this Statement of Qualifications and Limitations. Any damages arising from improper use of this report or parts thereof shall be borne by the party making such use.

This Statement of Qualifications and Limitations is attached to and forms part of this report.

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List of Appendices

List of Appendices (cont'd)

1 Introduction

Aercoustics Engineering Limited ("Aercoustics") was retained by Belle River Wind LP to conduct testing per the IEC 61400-11 test standard on one of the wind turbines, designated as T53, located in the Belle River Wind Project. The measurements were carried out in accordance with IEC 61400-11:2012, "*Wind turbine generator systems – Part 11: Acoustic noise measurement techniques*". This report is specific only to turbine T53.

Aercoustics is accredited by the Standards Council of Canada under ISO/IEC 17025 to perform testing according to the IEC 61400-11 test standard.

2 Wind Turbine Information

2.1 Wind Turbine Equipment Details

Equipment information specific to turbine T53 was provided by the manufacturer and is summarized in Tables 1 to 5.

Table 1 – Wind Turbine Details

Wind Turbine Details	
Manufacturer	Siemens Gamesa Renewable Energy
Model Number	SWT 2.772-113
Turbine ID	T53

Table 2 – Operating Details

Operating Details	
Vertical or Horizontal axis wind turbine	Horizontal
Upwind or downwind rotor	Upwind rotor
Hub height	99.5 m
Horizontal distance from rotor centre to tower axis	5.5 m
Diameter of rotor	113 m
Tower type (lattice or tube)	Tubular
Passive stall, active stall, or pitch controlled turbine	Pitch controlled turbine
Constant or variable speed	Variable speed
Power curve	Rev 0
Rotational speed at each integer standardised wind speed	Max speed, 13.2 rpm
Rated power output	2772 kW
Control software version	136.1.0.1

Table 3 – Rotor Details

Rotor Details	
Rotor control devices	Pitch control
Presence of aerodynamic add-ons, such as vortex generators, stall strips, serrated trailing edges, etc.	Vortex generators and DinoTails
Blade type	B55
Serial number	Blade A: 550346101 Blade B: 550259701 Blade C: 550259501
Number of blades	3

Table 4 – Gearbox Details

Gearbox Details	
Manufacturer	N/A Direct drive
Model number	N/A Direct drive
Serial number	N/A Direct drive

Table 5 – Generator Details

Generator Details	
Manufacturer	Siemens
Model number	DD22_02
Serial number	5100219311

2.2 Wind Turbine Location

Turbine T53 is located in the town of Lakeshore, Ontario. Nearby roads are Lakeshore Road 125 and Byrnedale Road, approximately 175 m to the east and 920 m to the south, respectively. The area surrounding T53 is flat and consists primarily of farmland and scattered woodlots. The UTM coordinates of the turbine are 363514 m E and 4679229 m N (Zone 17T).

A general layout of the area in which the turbine is located is provided in the site plan (Figure A.01).

3 Measurement Details

3.1 Measurement Equipment

3.1.1 Acoustic Measurement Equipment

Details regarding the acoustic measurement equipment utilized for the test is summarized in Table 6.

Table 6 – Acoustic Measurement Equipment

Equipment	Manufacturer Name & Model	Serial Number
Acoustic Data acquisition system	LMS SCADA Mobile SCR292	22163146
Microphone	B&K 4189	2622169
Pre-amplifier	B&K 2671	2625417
Acoustic calibrator	B&K 4231	2513182

A field calibration of the measurement chain was performed at the beginning and end of each measurement day.

3.1.2 Non-Acoustic Measurement Equipment

Non-acoustic measurement equipment includes an anemometer installed 10 meters above ground level ("10-m AGL") as well any sensing equipment utilized by the wind turbine to measure and record operational parameters. The 10-m AGL anemometer is provided by Aercoustics while the turbine sensing equipment is a part of the turbine installation.

Details regarding the non-acoustic measurement equipment utilized and controlled by Aercoustics is summarized in Table 7. Equipment used to measure turbine parameters, such as yaw angle and power output, are outside of Aercoustics' control and are not reported here.

Table 7 – Meteorological Measurement Equipment

Equipment	Manufacturer Name & Model	Serial Number
Anemometer	VAISALA WXT520	K4250007
Serial to Analog Converter	NOKEVAL 7470	A165164

3.2 Measurement Setup

3.2.1 Microphone Placement

The measurement microphone was setup 156 meters from the base of the turbine in a downwind position (Position 1, per IEC 61400-11), at an elevation of 0 meters relative to the base of T53. The slant distance (R_1) from microphone location to rotor centre includes

the distance from rotor center to tower axis (R_1 = 189.7 m). The microphone was placed in the centre of a circular, acoustically reflective board.

During the measurement period, data points were used only when the microphone was within 15 degrees of the downwind direction from the turbine. The microphone position relative to downwind is monitored via the turbine yaw angle provided from the turbine SCADA system (discussed further in Section 3.5).

During the test, the land surrounding the turbine was a plowed field. No crops or vegetation were in the nearby area which would influence the results of the measurement. There were no nearby reflecting surfaces (houses, barns etc.); as such the influence from reflecting surfaces is negligible.

Photos of the measurement setup are provided in Figure A.02, Appendix A.

3.2.2 Double Windscreen Setup

A double windscreen setup was not utilized.

3.3 Measurement Periods

Table 8 – Summary of Measurement Periods

Date	Test Type	Start Time	Finish time
October 19, 2018	Background	11:06 am	11:24 am
	Turbine ON	11:29 am	11:43 am
	Turbine ON	11:50 am	12:01 pm
	Background	12:02 pm	12:13 pm
	Turbine ON	1:07 pm	1:12 pm
	Turbine ON	1:23 pm	1:55 pm
	Background	1:56 pm	2:28 pm

3.4 Meteorological Conditions

The normalised hub height wind speed during Turbine ON periods is either derived directly using the turbine power curve and measured power output (Section 8.2.1.1 of [1]) or indirectly using the measured wind speed from the nacelle anemometer and applying a correction factor (Section 8.2.1.2 of [1]). Wind speeds during Background periods are measured using the 10-m AGL anemometer and corrected to hub-height using a correction factor (Section 8.2.2 of [1]). The downwind direction is determined using the turbine yaw angle output, also known as the nacelle position (Section 8.3 of [1]).

Other atmospheric conditions, including ambient temperature and atmospheric pressure, are measured by the 10-m AGL anemometer during the measurement periods.

Detailed meteorological data relevant to the measurement is provided in Appendix E.

3.5 Turbine operational information

Turbine operational parameters – including electrical power, nacelle position (yaw angle), rotational speed, and nacelle wind speed – are acquired from the turbine controller simultaneously with the acoustic and weather measurement data using Aercoustics' data acquisition system.

4 Measurement Results

4.1 Deviations from IEC-61400-11 Edition 3.0

No deviations.

4.2 Special Notes & Considerations

No adjacent turbines were parked during the test.

4.3 Analysis Methodology

The following section outlines any corrections applied to the acoustic or weather measurement data, per IEC 61400-11. Transient events, such as vehicle traffic, wildlife, or air traffic, are excluded from the measurement data set.

4.3.1 Double Windscreen Adjustment

No double wind screen was used in the measurements described in this report and therefore no adjustment for a double windscreen was applied to the measurement data.

4.3.2 Wind Speed Correction

Following the methodology described in Section 8.2 of [1] and summarized in Section 3.4 of this report, two correction factors are derived from the measurement data and used to determine the normalized hub-height wind speed in certain conditions. The first correction factor (k_nac) is used to correct nacelle wind speeds measured for intervals that fall outside of the allowable power curve range. The second correction factor (k_Z) is used to correct 10m-AGL wind speeds measured during Background measurement periods up to hub-height.

The k-factors for this measurement set are provided in Table 9.

Table 9 – Calculated nacelle anemometer (k_nac) and 10m (k_Z) wind speed k-factor

k_nac	k_Z
0.99	1.25

4.4 Type B uncertainties

Type B uncertainties were obtained through interpretation of the information provided in Annex C of [1]. A summary of Type B uncertainties is provided in Table 10, while detailed information, including uncertainties by 1/3 octave band, is provided in Appendix C.

Table 10 – Summary of Type B uncertainties

Component	Typical (dB)	Used (dB)
Calibration	0.2	0.2
Board	0.3	0.3
Distance & direction	0.1	0.1
Air absorption	0	0
Weather conditions	0.5	0.5
Wind speed measured	0.7	0.7
Wind speed derived	0.2	0.2
Wind speed from power curve	0.2	0.2

4.5 Sound Pressure Level Measurements

Average overall sound pressure levels in each wind bin for Turbine ON and Background periods are summarized in Table 11. Average sound levels and uncertainties by 1/3 octave band are provided in Appendix C. A copy of the measurement data used for analysis is provided in Appendix E.

Table 11 – Summary of Sound Pressure Level Measurements

Wind Speed (m/s)	Turbine ON		Background		Turbine ON, Background adjusted L_{eq}, (dBA)
	L_{eq}, (dBA)	# of data pts	L_{eq}, (dBA)	# of data pts	
7.5	52.5	35	44.4	12	51.7
8	53.6	49	44.0	21	53.1
8.5	54.1	61	42.8	23	53.8
9	54.2	93	43.2	26	53.8
9.5	54.1	65	43.1	33	53.7
10	54.0	41	42.4	40	53.7
10.5	53.7	16	43.0	31	53.4
11	53.6	30	42.8	36	53.2
11.5	53.7	30	42.3	26	53.4
12	53.5	26	43.6	19	53.1
12.5	53.6	23	42.9	16	53.2

4.6 Sound Power Level of Turbine

The calculated apparent sound power level at hub height is summarized in Table 12. Corresponding sound power levels for 10-meter height wind speeds are provided in Table 13. Wind speeds at 10 meters are calculated using the wind shear profile described in Section 9.4 of [1].

Sound power levels by 1/3 octave band are provided in Appendix C.

Table 12 – $L_{WA,\,K}$ at each integer wind speed

Wind Speed (m/s)	Apparent L_{WA}, (dBA)	Uncertainty (dB)
7.5	102.3	0.9
8	103.7	0.9
8.5	104.3	0.8
9	104.4	0.8
9.5	104.3	0.8
10	104.2	0.8
10.5	103.9	0.8
11	103.8	0.8
11.5	104.0	0.8
12	103.6	0.8
12.5	103.8	0.8

Table 13 – $L_{WA\ 10m,\,K}$ at each integer wind speed

Wind Speed (m/s)	Apparent L_{WA}, (dBA)	Uncertainty (dB)
5	101.3	0.8
6	104.1	0.8
7	104.2	0.7
8	103.8	0.8
9	103.8	0.8

* denotes a 3 to 6 dB difference between Turbine ON and Background sound level

4.7 Tonality Analysis

The tonality analysis for turbine T53 is summarized in Table 14, while plots of narrow band spectra at each wind speed are provided in Appendix D. All ΔL_{tn} and ΔL_a values reported represent the energy average of all data points with an identified tone that fall within the same frequency of origin (Section 9.5.8 of [1]).

The narrow band spectra provided in the plots represents an energy average of all data points in the given wind speed bin for both Turbine ON and Background.

Table 14 – Tonality Assessment Summary

Wind Speed (m/s)	Frequency (Hz)	Tonality, ΔL_{tn} (dB)	Tonal audibility, ΔL_a (dB)	FFT's with tones	Total # of FFT's	Presence (%)
7.5	-	-	-	-	-	-
8	72	-4.6	-2.6	38	49	78%
8.5	72	-4.7	-2.7	54	61	89%
9	72	-3.7	-1.7	88	93	95%
9.5	71	-3.2	-1.2	61	65	94%
10	71	-4.0	-2.0	36	41	88%
10.5	72	-4.4	-2.4	15	16	94%
11	-	-	-	-	-	-
11.5	73	-4.9	-2.9	21	30	70%
12	73	-4.8	-2.8	21	26	81%
12.5	-	-	-	-	-	-

5 Closure

Measurements and analyses per IEC 61400-11:2012 (Edition 3.0) were performed on turbine T53 of the Belle River Wind Power Project, located in the town of Lakeshore, Ontario. The test turbine was found to have a maximum apparent sound power level of 104.4 dBA and a maximum tonal audibility of -1.2 dB.

Supplementary information to address specific local regulatory requirements are attached separately in Appendix F.

Should you have any questions or comments please contact the authors of this report.

6 References

[1] IEC 61400-11 , *Wind Turbines - Part 11: Acoustic noise measurement techniques,* International Electrotechnical Commission, 2012.

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Appendix A
Site Details

aercoustics	17095.01.T53.RP1	**Project Name**
	Scale: NTS Drawn by: AED Reviewed by: MAD Date: Nov 2018 Revision: 1	Belle River Wind Power Project - IEC 61400-11 Edition 3.0 - Turbine T53
		Figure Title Site Plan
		Figure A.01

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17095.01.T53.RP1

Scale: NTS
Drawn by: AED
Reviewed by: MAD
Date: Nov 2018
Revision: 1

Project Name

Belle River Wind Power Project - IEC 61400-11 Edition 3.0 - Turbine T53

Figure Title

Site Photo

Figure A.02

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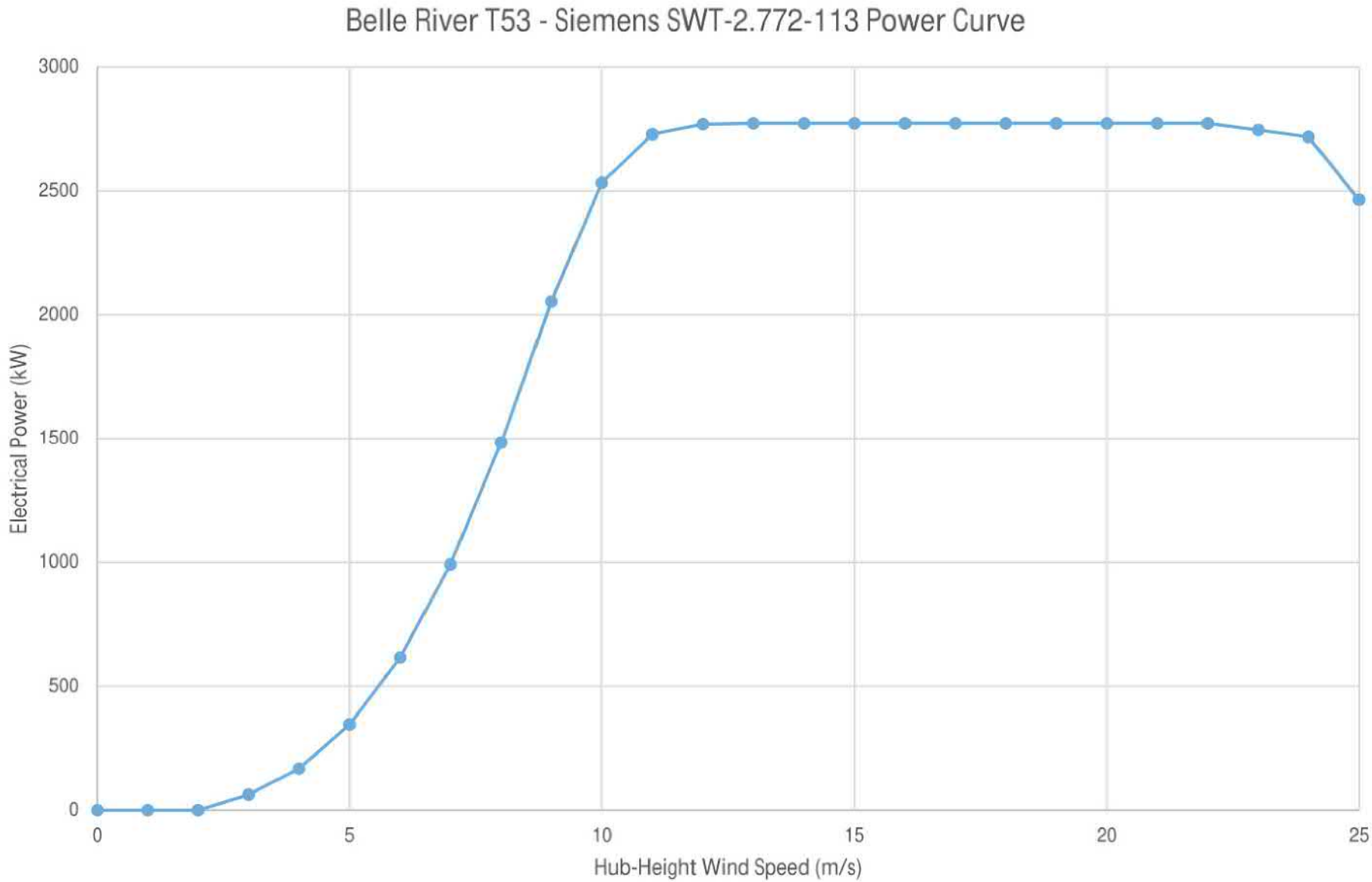
Appendix B
Turbine Information



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	Scale: NTS Drawn by: AED Reviewed by: MAD Date: Nov 2018 Revision: 1	Belle River Wind Power Project - IEC 61400-11 Edition 3.0 - Turbine T53	
		Figure Title Power Curve	**Figure B.01**

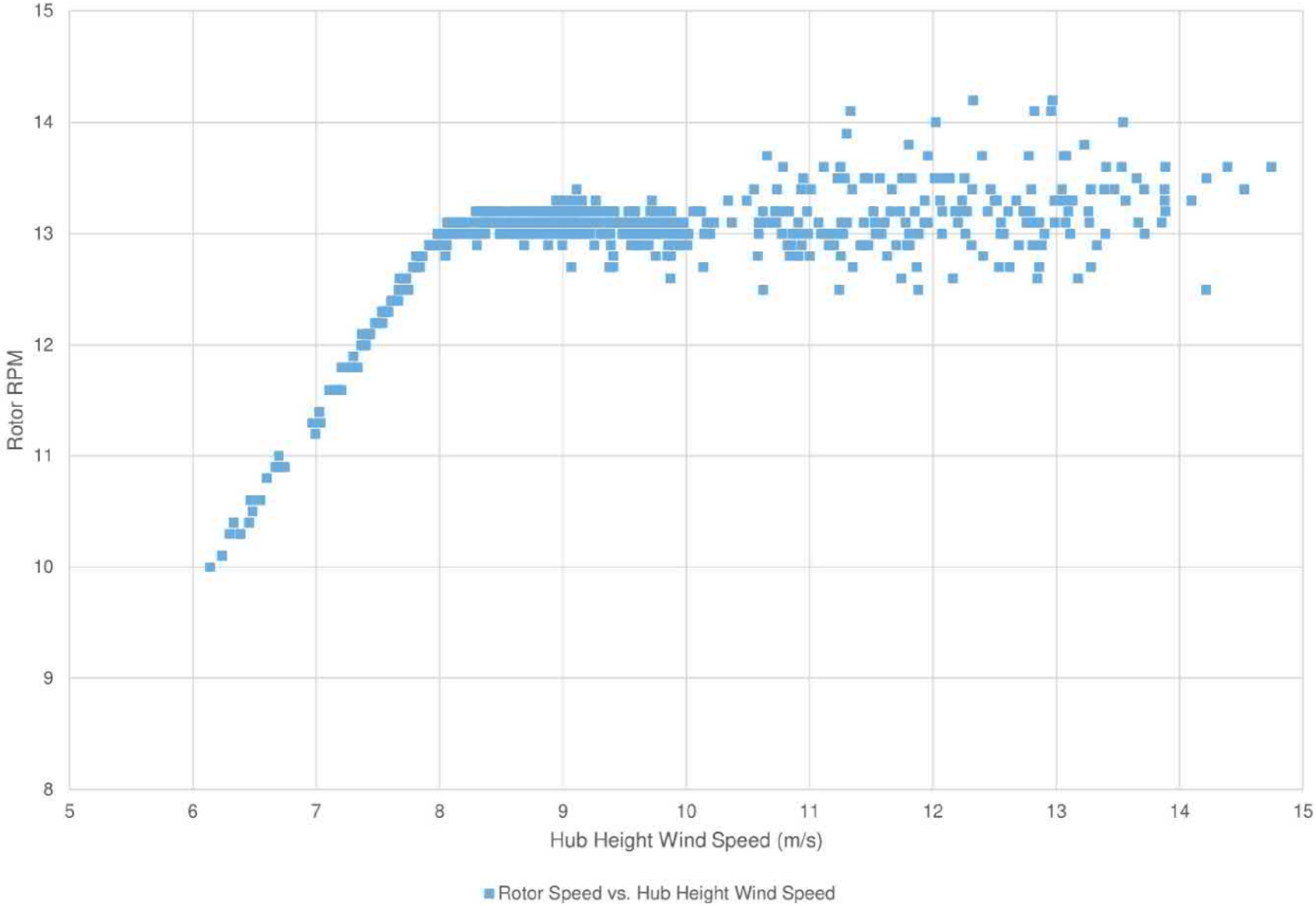

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Table B.01 Allowed range of power curve and required wind speeds

Power Curve & Required Wind Speeds		
Power Curve Tolerance	3%	
Acceptable range min	4	m/s
Acceptable range max	10	m/s
Min allowable range	4	m/s
Max allowable range	10	m/s
Power Output	2772	kW
85% Power	2356	kW
Corresponding wind speed	9.63	m/s
Minimum bin	7.5	m/s
Maximum bin	12.5	m/s

Power Curve (+ value = acceptable)		
Hub Wind Speed (m/s)	Power [kW]	Slope of Power Curve
0	0	-166
1	0	-166
2	0	-103
3	63	-62
4	167	13
5	346	103
6	615	210
7	991	327
8	1484	405
9	2055	312
10	2533	29
11	2728	-126
12	2768	-162
13	2772	-166
14	2772	-166
15	2772	-166
16	2772	-166
17	2772	-166
18	2772	-166
19	2772	-166
20	2772	-166
21	2772	-166
22	2772	-193
23	2745	-194
24	2717	-419
25	2464	

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Appendix C
Apparent Sound Power Level

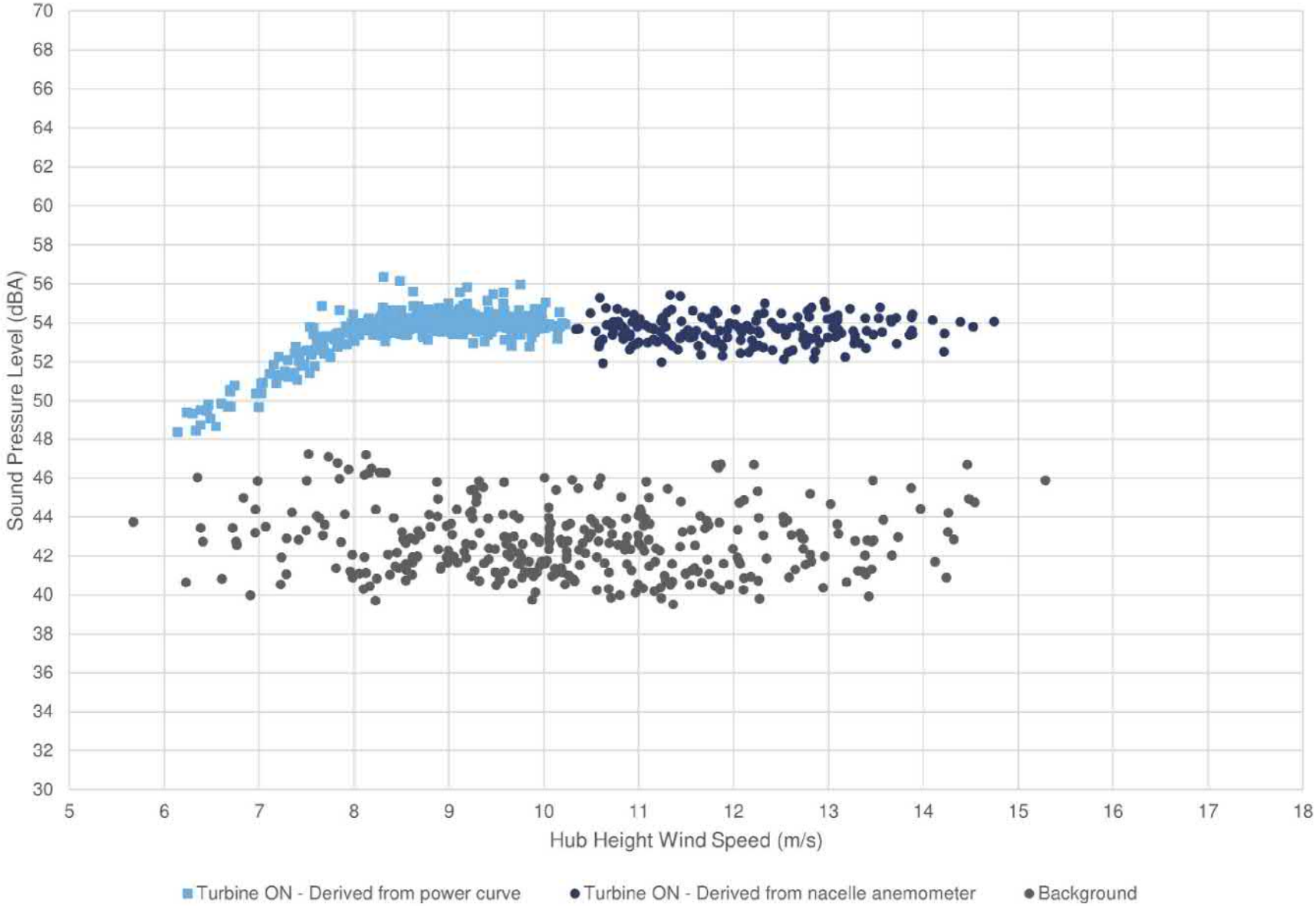

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		Figure Title Plot of overall measurement data pairs at Position 1 (Turbine ON & Background)	**Figure C.01**

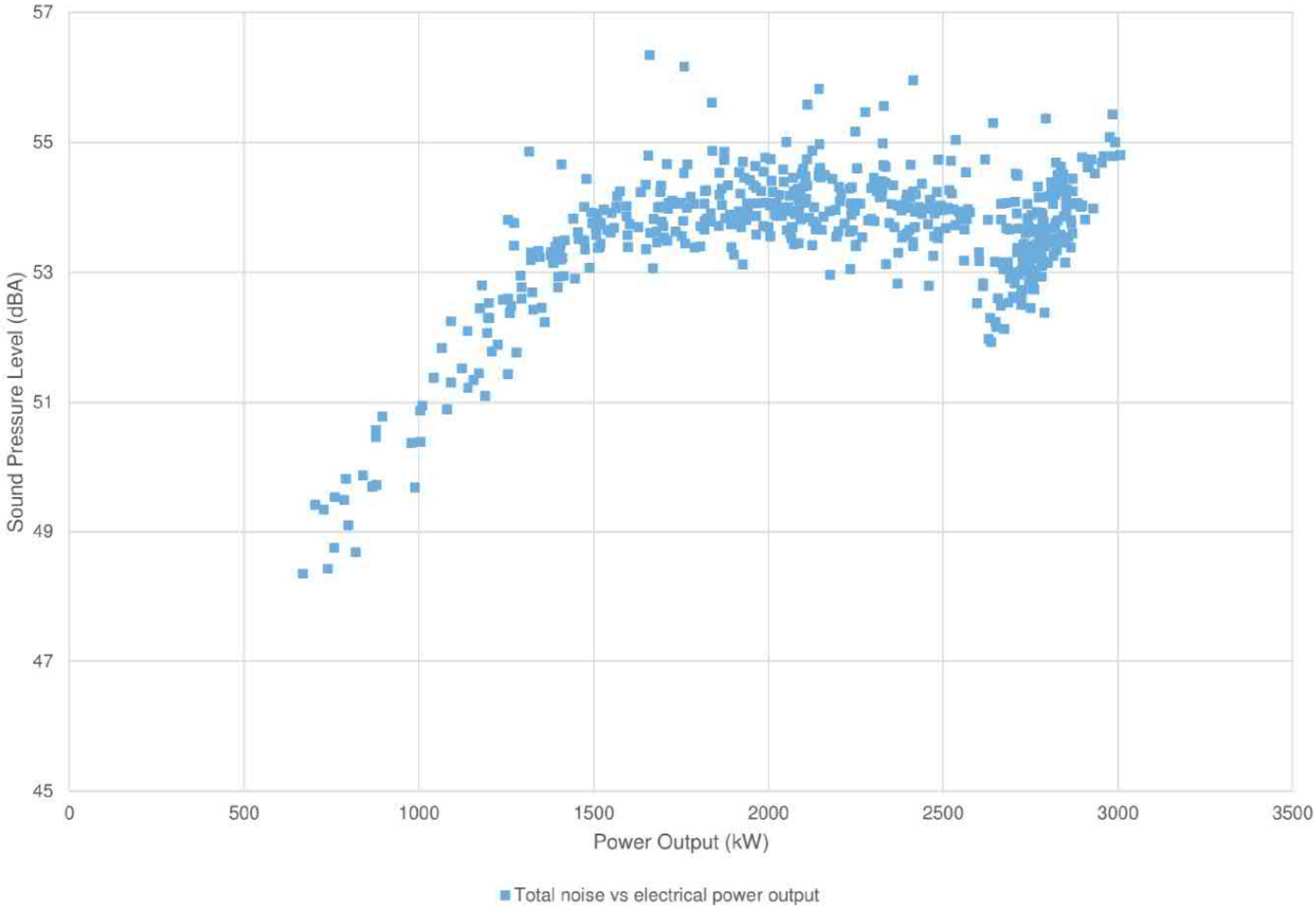

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		Figure Title Plot of measured total noise vs. electrical power output	**Figure C.02**

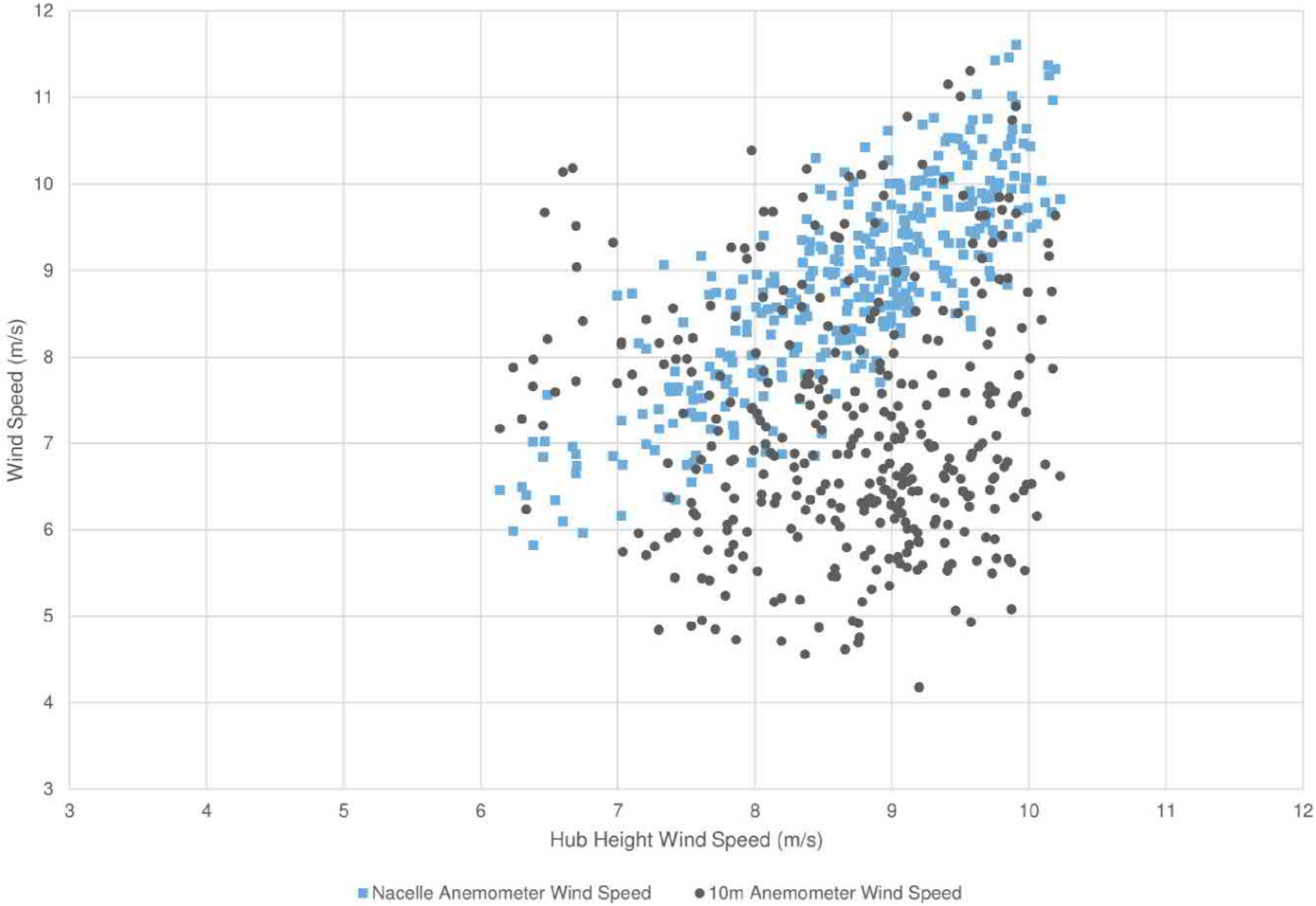

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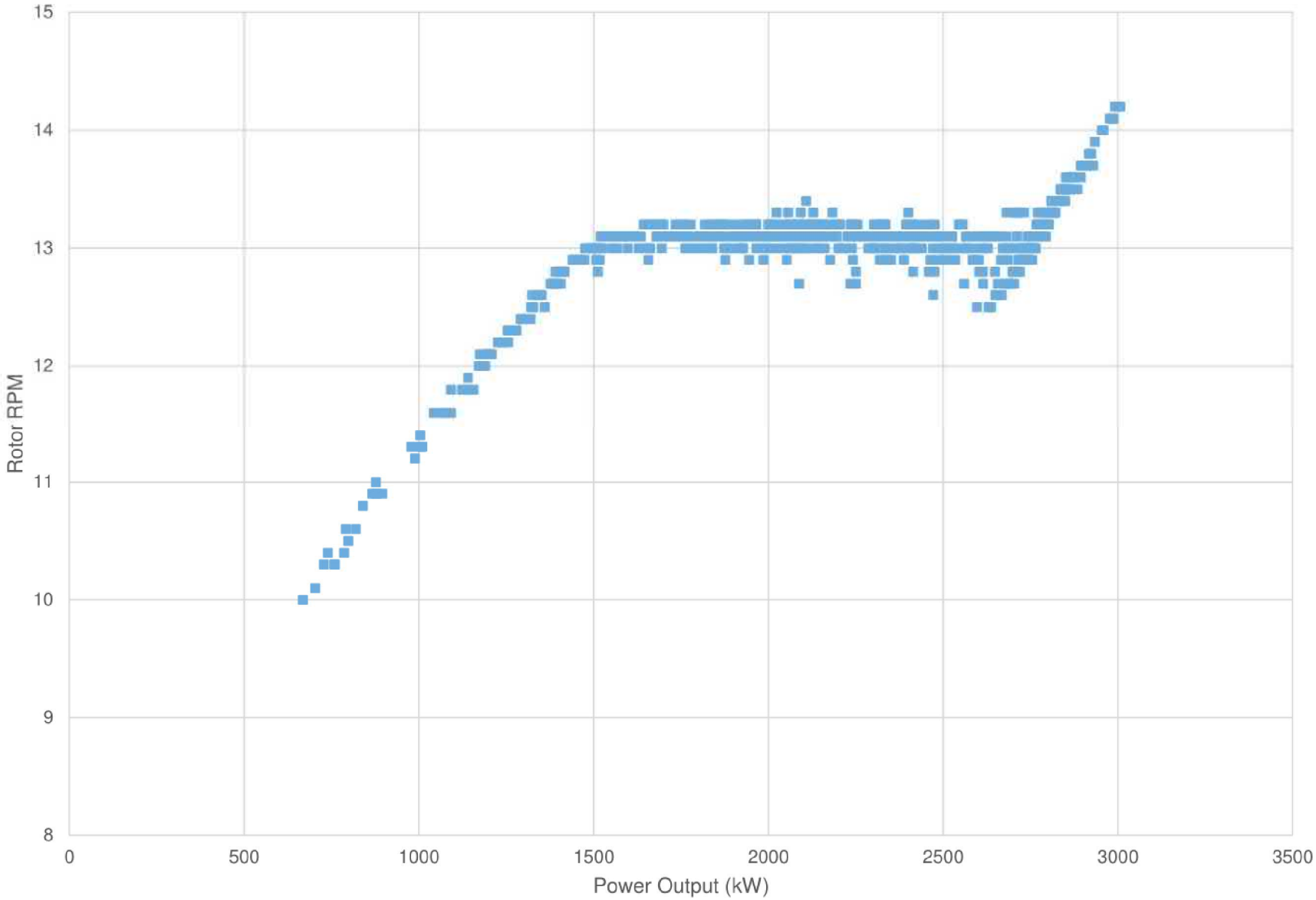
		Figure Title Plot of power curve relative to nacelle anemometer and 10 m anemometer	**Figure C.03**



aercoustics	17095.01.T53.RP1 Scale: NTS Drawn by: AED Reviewed by: MAD Date: Nov 2018 Revision: 1	**Project Name** Belle River Wind Power Project - IEC 61400-11 Edition 3.0 - Turbine T53 **Figure Title** Plot of rotor RPM vs. electrical power output **Figure C.04**

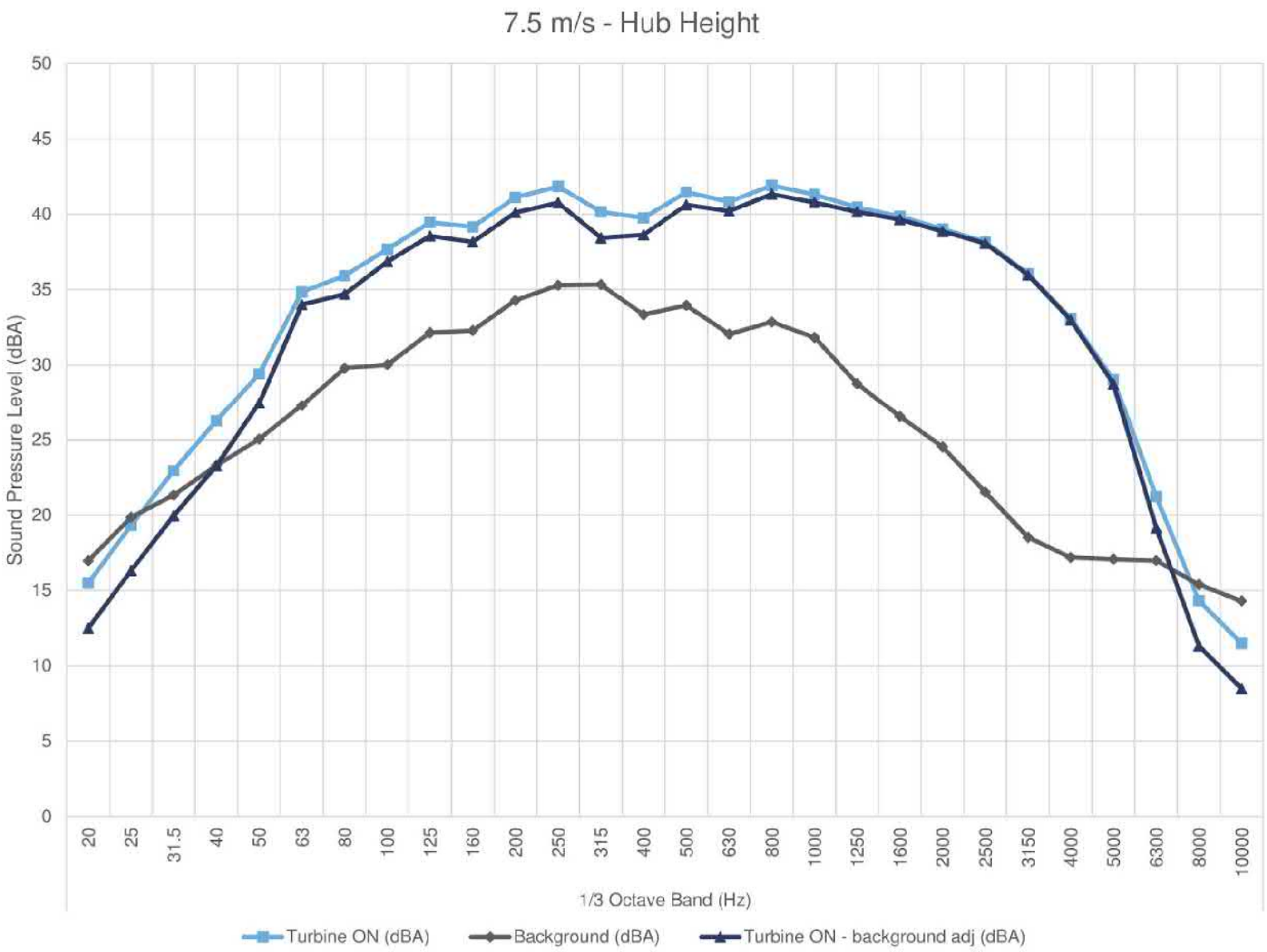


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		Figure Title Plot of sound pressure spectrum in 1/3 Octave at 7.5 m/s
		Figure C.05

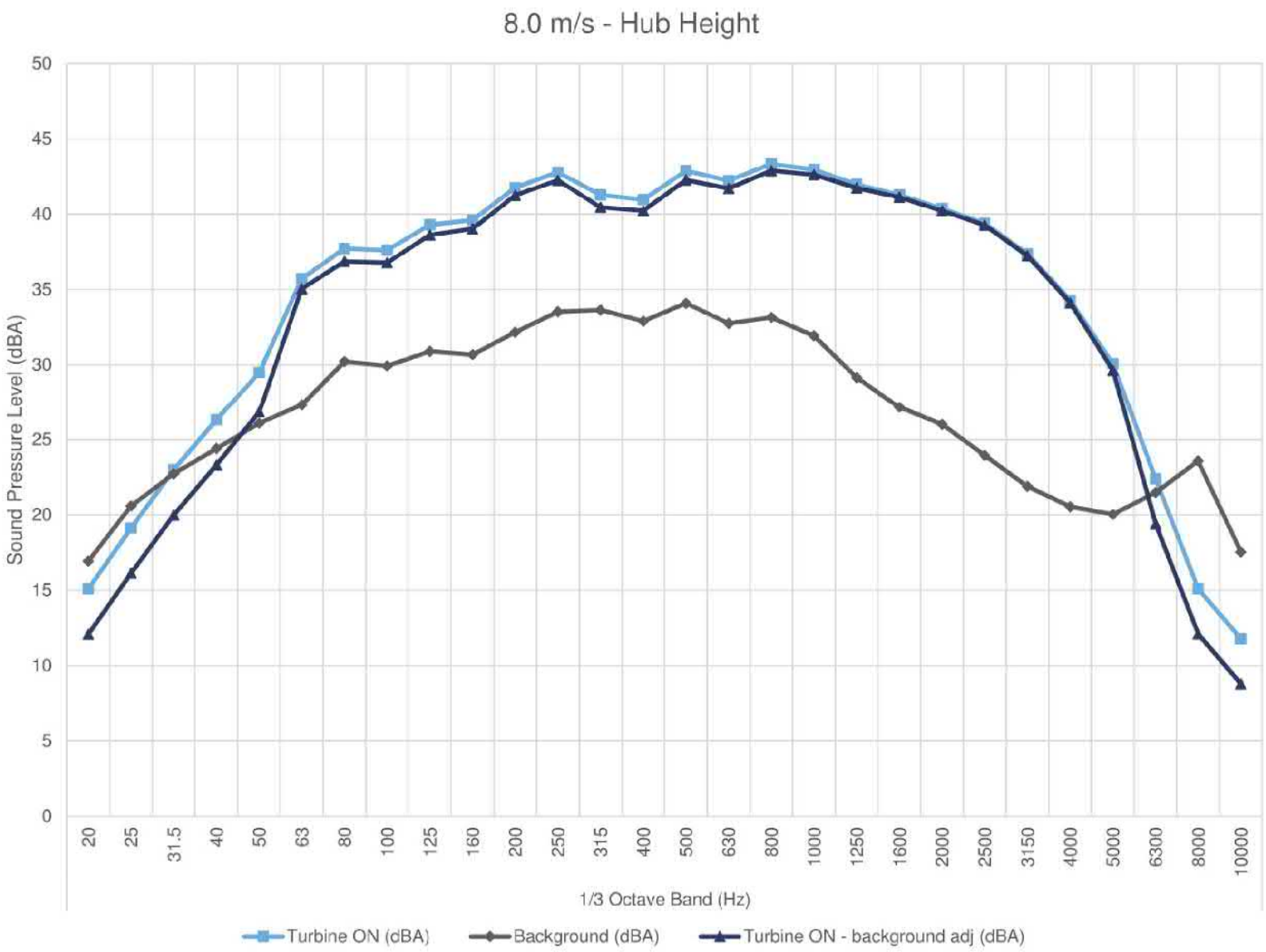

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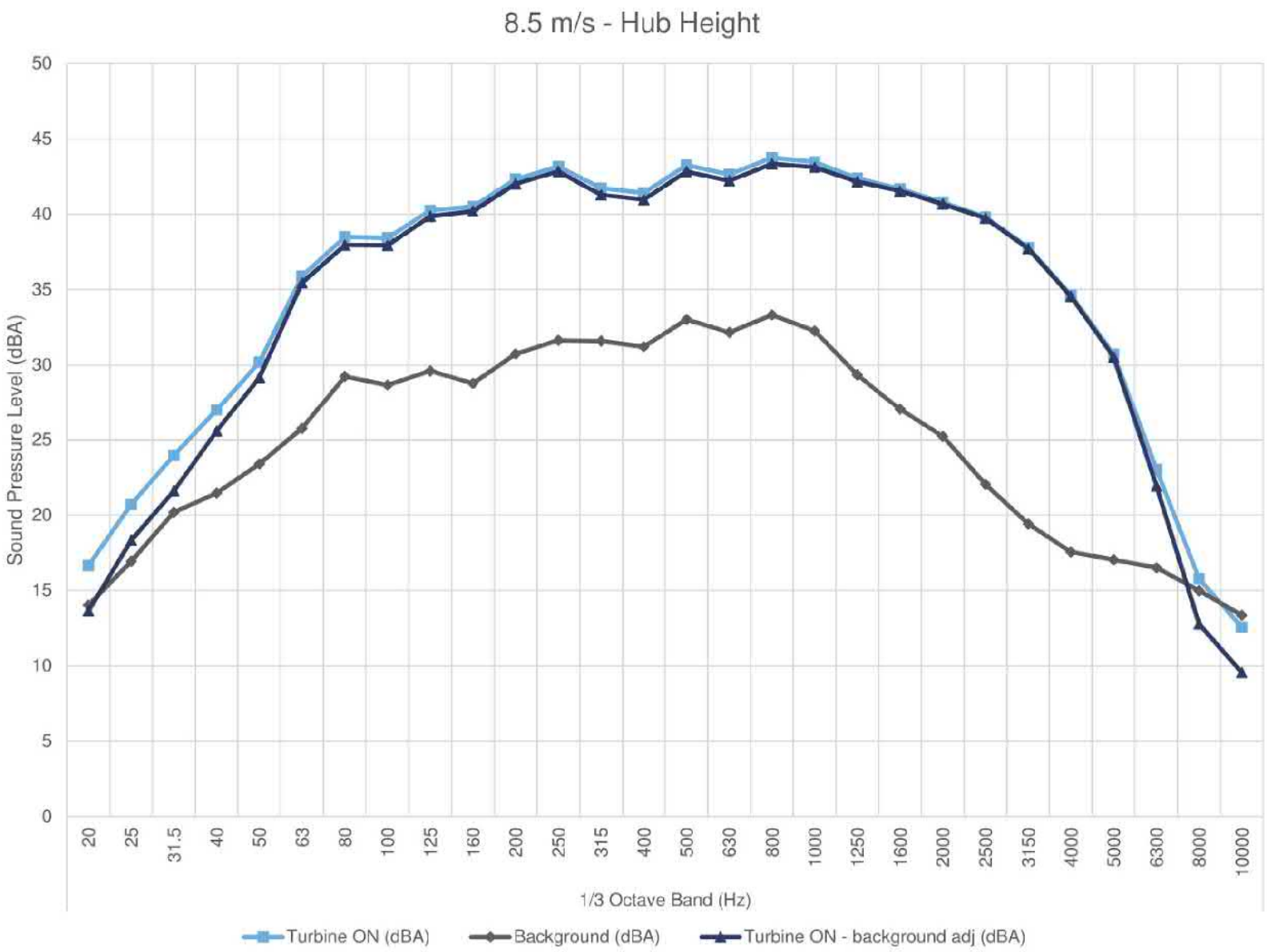
		Figure Title Plot of sound pressure spectrum in 1/3 Octave at 8 m/s
		Figure C.06



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	Scale: NTS Drawn by: AED Reviewed by: MAD Date: Nov 2018 Revision: 1	Belle River Wind Power Project - IEC 61400-11 Edition 3.0 - Turbine T53	
		Figure Title Plot of sound pressure spectrum in 1/3 Octave at 8.5 m/s	**Figure C.07**

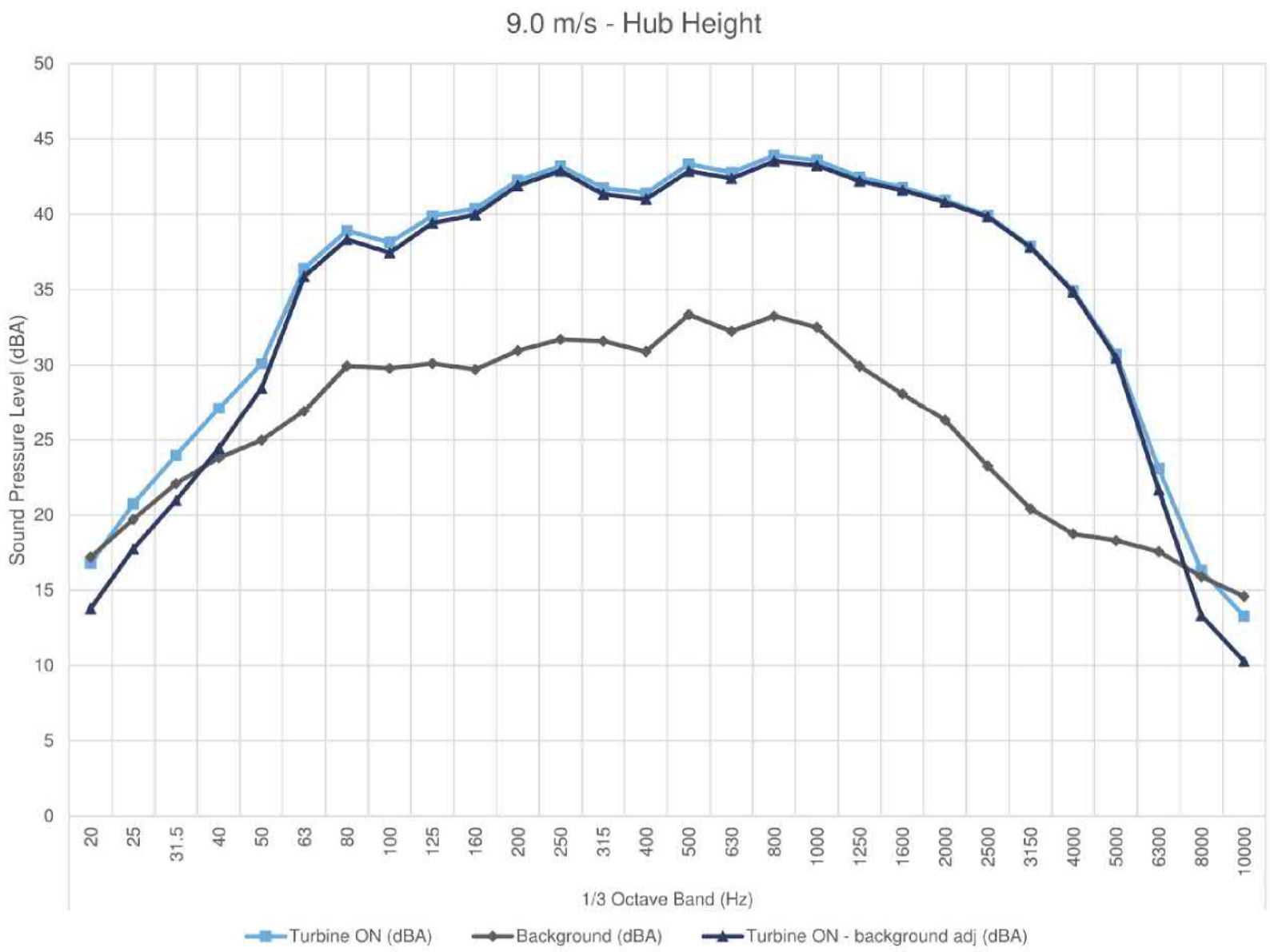

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		Figure Title Plot of sound pressure spectrum in 1/3 Octave at 9 m/s	**Figure C.08**

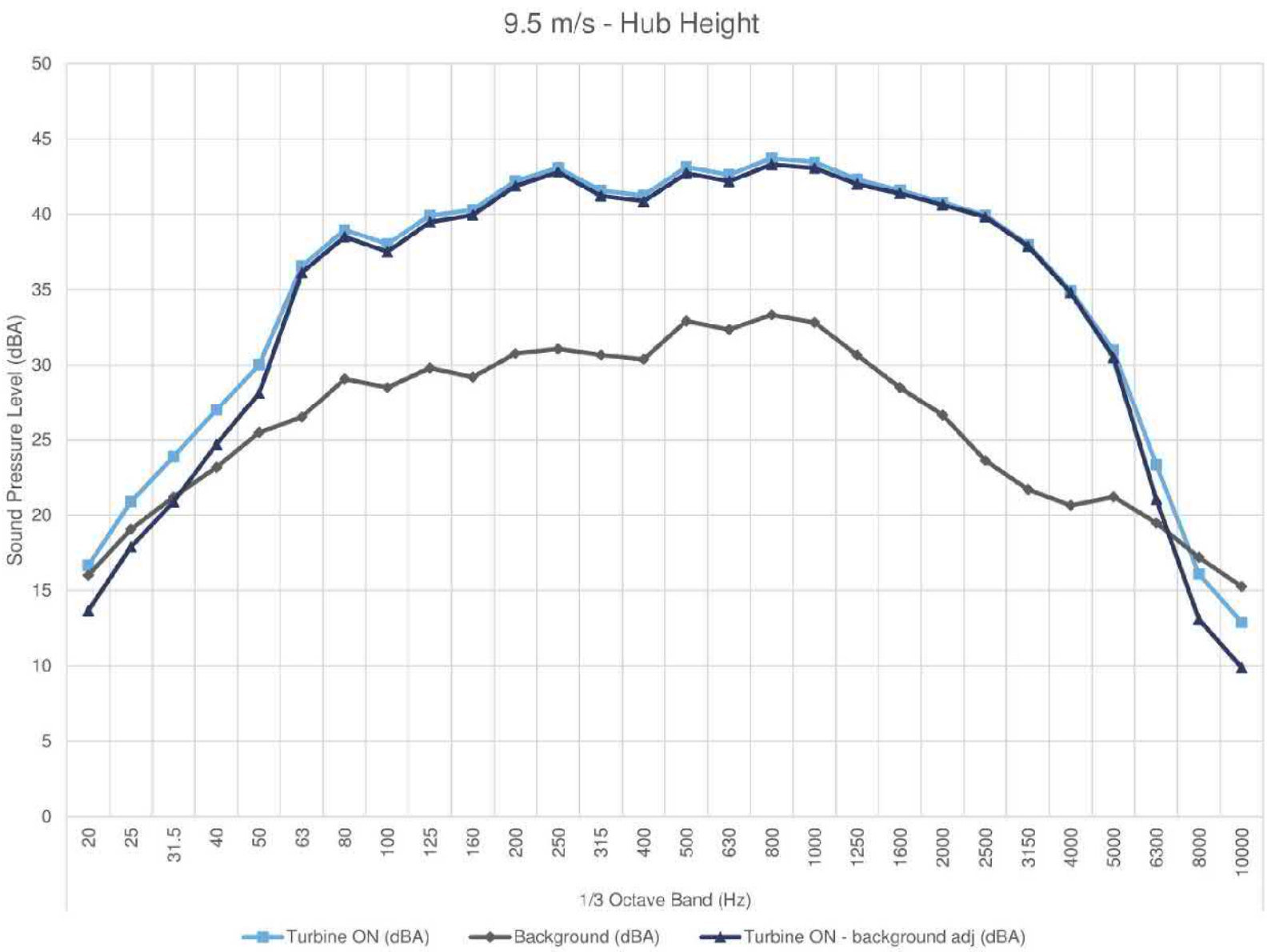

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		Figure Title Plot of sound pressure spectrum in 1/3 Octave at 9.5 m/s	**Figure C.09**

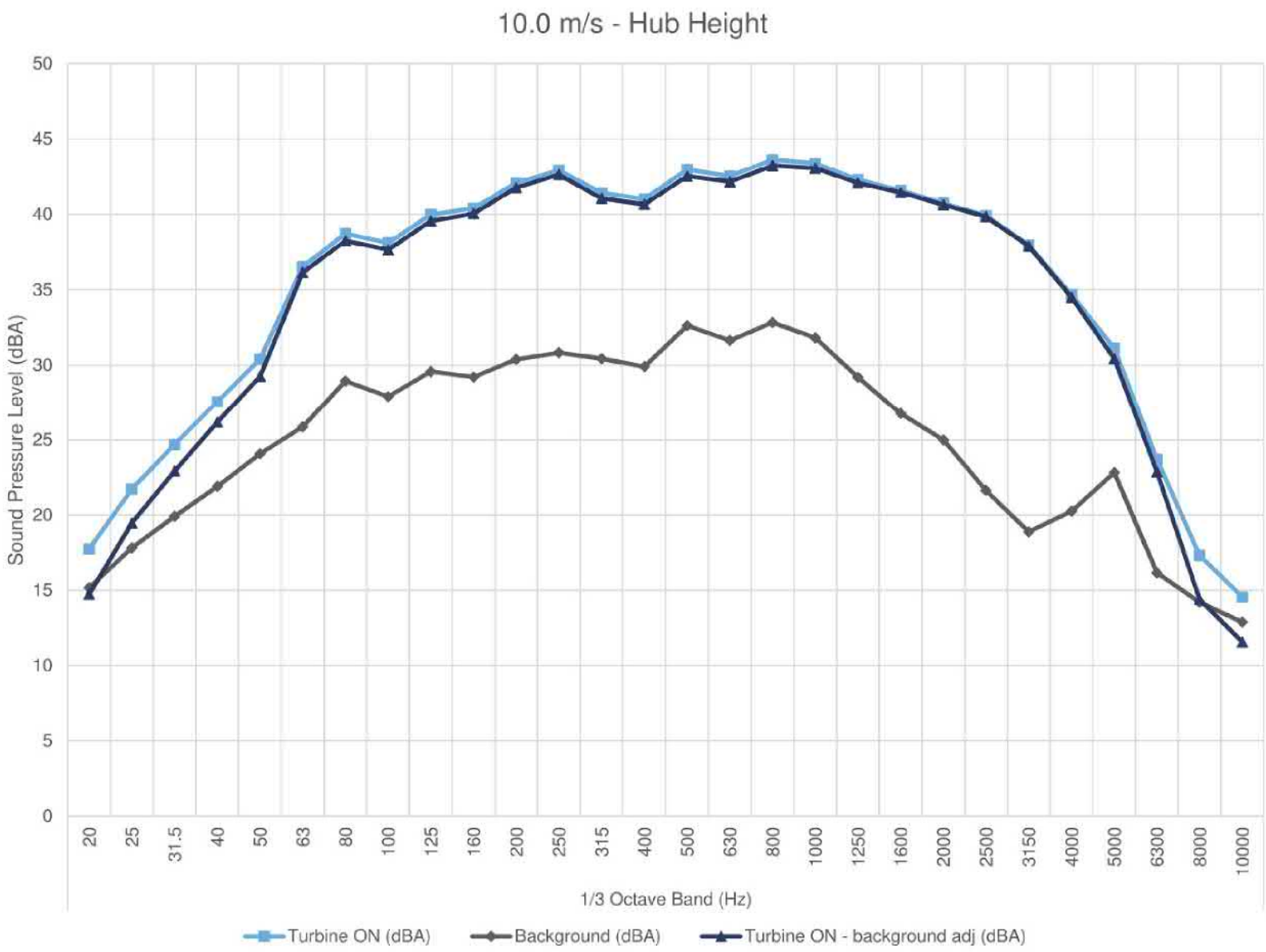

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		Figure Title Plot of sound pressure spectrum in 1/3 Octave at 10 m/s	**Figure C.10**

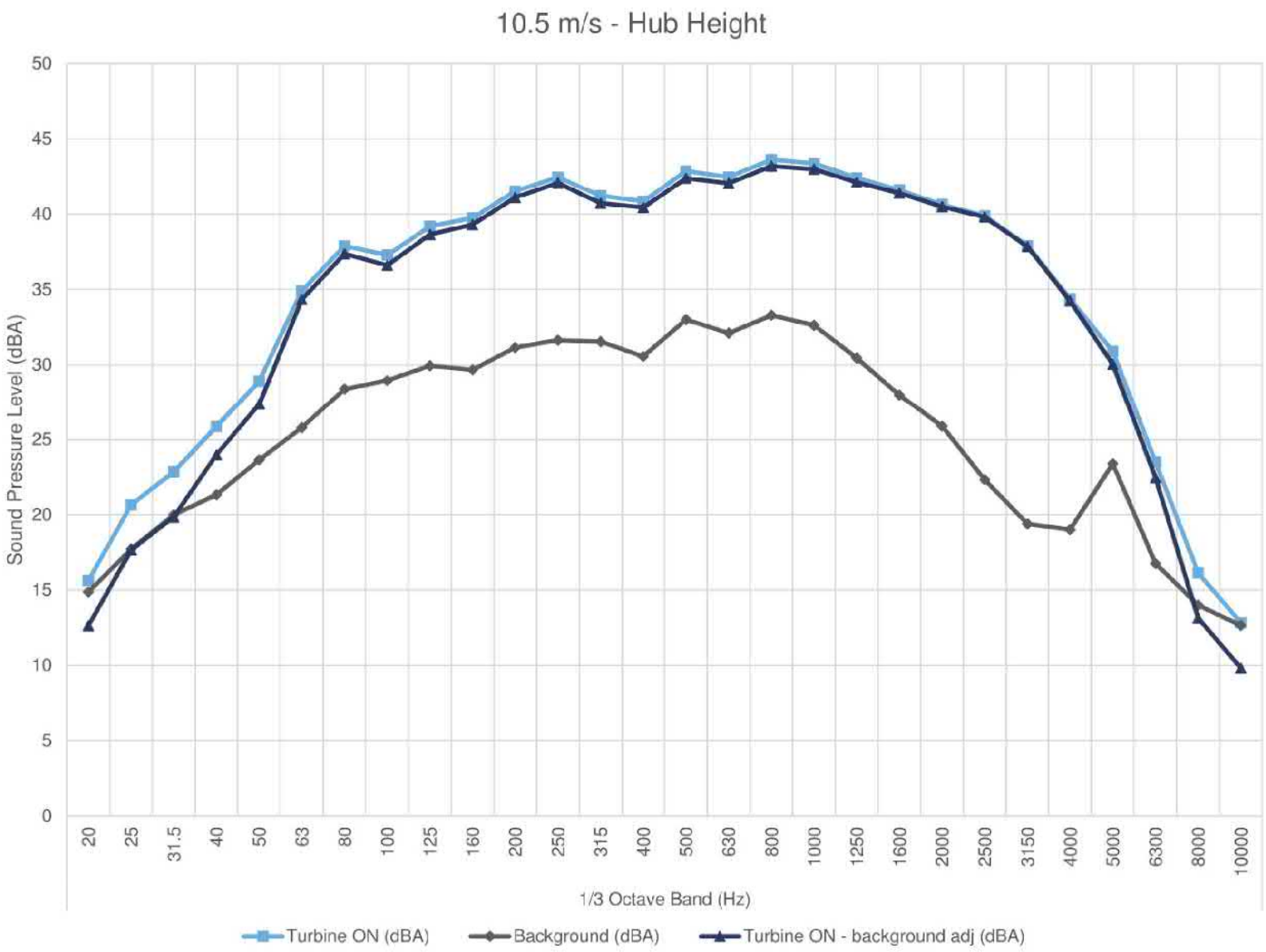

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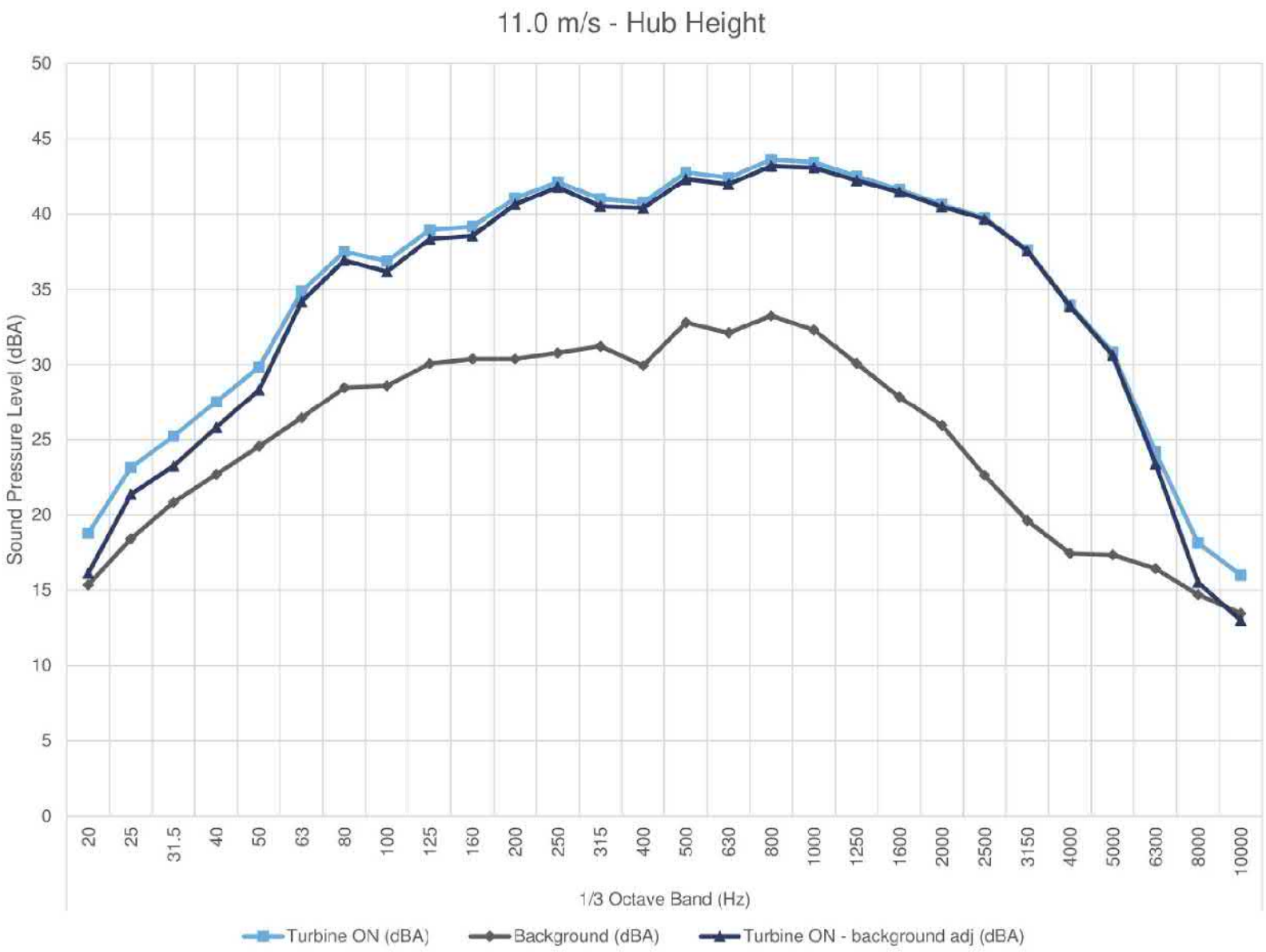
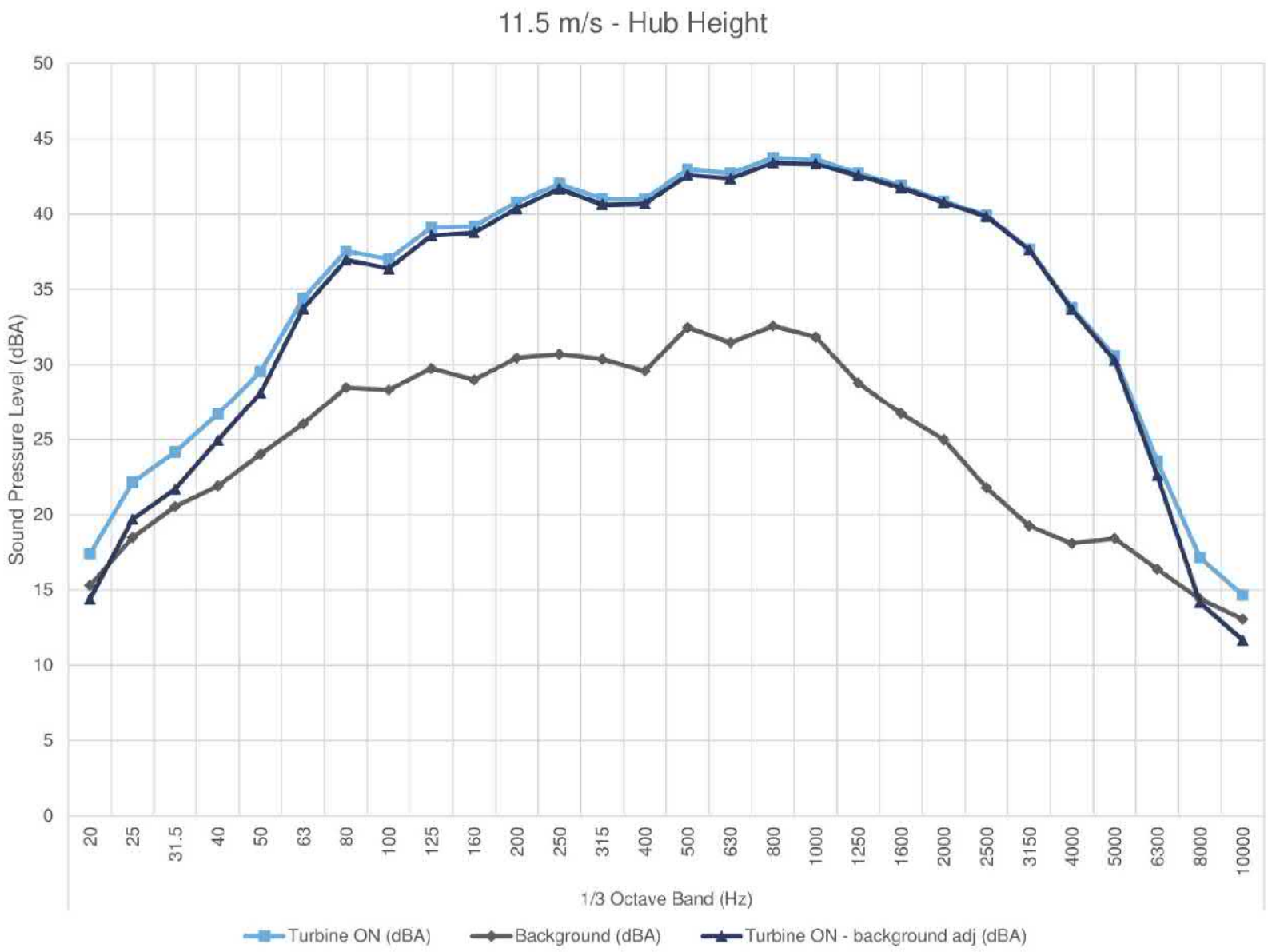
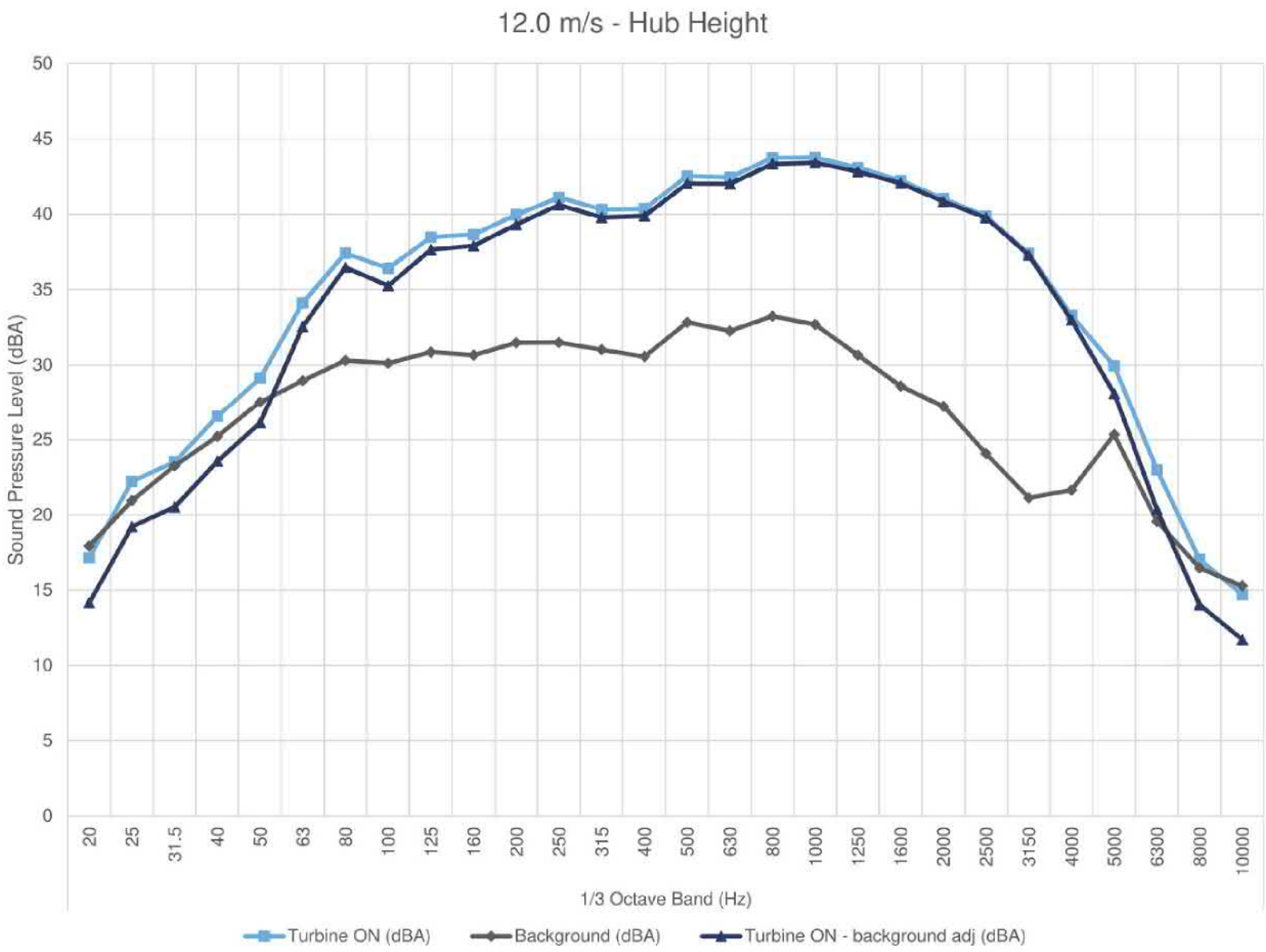
		Figure Title Plot of sound pressure spectrum in 1/3 Octave at 10.5 m/s	**Figure C.11**



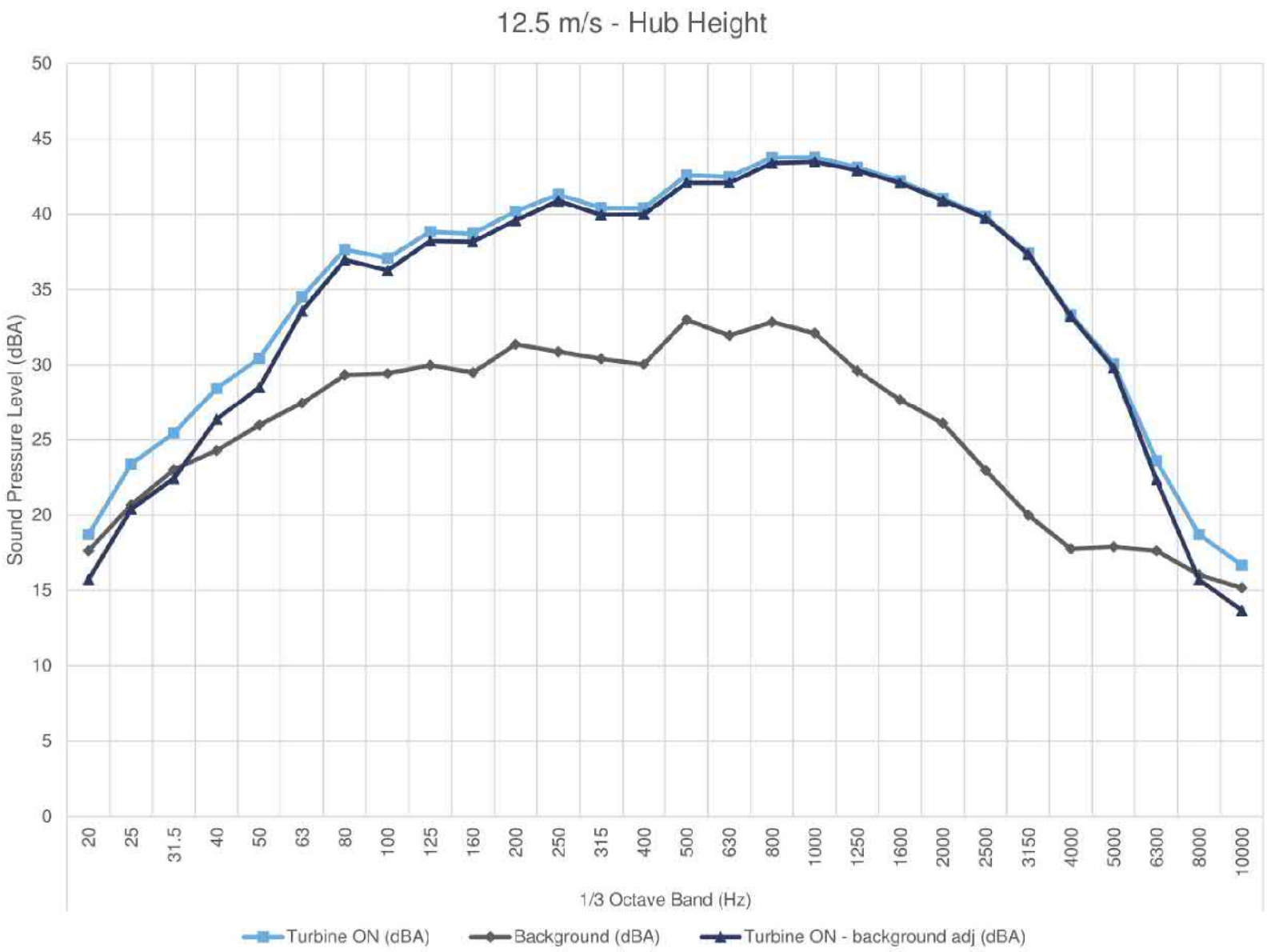
aercoustics	17095.01.T53.RP1	**Project Name**	
	Scale: NTS Drawn by: AED Reviewed by: MAD Date: Nov 2018 Revision: 1	Belle River Wind Power Project - IEC 61400-11 Edition 3.0 - Turbine T53	
		Figure Title Plot of sound pressure spectrum in 1/3 Octave at 11 m/s	**Figure C.12**



aercoustics	17095.01.T53.RP1	**Project Name**
	Scale: NTS Drawn by: AED Reviewed by: MAD Date: Nov 2018 Revision: 1	Belle River Wind Power Project - IEC 61400-11 Edition 3.0 - Turbine T53
		Figure Title Plot of sound pressure spectrum in 1/3 Octave at 11.5 m/s
		Figure C.13



aercoustics	17095.01.T53.RP1	**Project Name**	
	Scale: NTS Drawn by: AED Reviewed by: MAD Date: Nov 2018 Revision: 1	Belle River Wind Power Project - IEC 61400-11 Edition 3.0 - Turbine T53	
		Figure Title Plot of sound pressure spectrum in 1/3 Octave at 12 m/s	**Figure C.14**



aercoustics	17095.01.T53.RP1	**Project Name**	
	Scale: NTS Drawn by: AED Reviewed by: MAD Date: Nov 2018 Revision: 1	Belle River Wind Power Project - IEC 61400-11 Edition 3.0 - Turbine T53	
		Figure Title Plot of sound pressure spectrum in 1/3 Octave at 12.5 m/s	**Figure C.15**

Table C.01 Detailed apparent sound power level data at hub height

Project: Belle River Wind Power Project - Turbine T53 - IEC 61400-11 Measurement

Report ID: 17095.01.T53.RP1

Created on: 2018-11-23

1/3 Octave values marked with brackets [ ] denote less than 3 dB difference between Turbine ON and Background

Overall levels marked with an asterisk * denote 3 to 6 dB difference between Turbine ON and Background, while Overall values with less than 3 dB difference between Turbine ON and Background are not reported

Wind Bin (m/s)	Parameter	1/3 Octave Band (Hz)																												Overall
		20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	
7.5	Turbine ON (dBA)	15.5	19.3	23.0	26.3	29.4	34.8	35.9	37.7	39.5	39.2	41.1	41.8	40.2	39.8	41.5	40.8	41.9	41.3	40.5	39.9	39.0	38.2	36.0	33.1	29.0	21.2	14.3	11.5	52.5
	Background (dBA)	17.0	19.8	21.3	23.3	25.0	27.3	29.8	30.0	32.2	32.3	34.3	35.3	35.3	33.3	34.0	32.1	32.9	31.8	28.8	26.6	24.5	21.5	18.5	17.2	17.1	17.0	15.4	14.3	44.4
	Turbine ON - background adj (dBA)	[12.5]	[16.3]	[20]	[23.3]	27.5	34.0	34.7	36.9	38.6	38.2	40.1	40.8	38.4	38.6	40.6	40.2	41.3	40.8	40.2	39.6	38.9	38.1	36.0	33.0	28.7	19.2	[11.3]	[8.5]	51.7
	Signal to noise (dB)	-1.5	-0.5	1.6	3.0	4.4	7.5	6.1	7.7	7.3	6.9	6.8	6.6	4.8	6.4	7.5	8.8	9.0	9.5	11.7	13.3	14.5	16.6	17.5	15.9	12.0	4.2	-1.1	-2.8	8.0
	Uncertainty (dB)	4.6	3.9	2.7	3.5	1.8	1.1	1.2	1.0	1.1	1.1	0.9	1.0	1.2	1.0	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.8	1.0	1.0	1.0	1.8	3.1	3.8	0.9
	PWL (dBA)	[63]	[66.9]	[70.5]	[73.8]	78.0	84.6	85.3	87.4	89.1	88.7	90.7	91.3	89.0	89.2	91.2	90.8	91.9	91.3	90.7	90.2	89.4	88.6	86.5	83.5	79.3	69.7	[61.9]	[59]	102.3
8.0	Turbine ON (dBA)	15.1	19.1	23.0	26.3	29.5	35.7	37.7	37.6	39.3	39.6	41.8	42.8	41.3	41.0	42.9	42.2	43.3	43.0	42.0	41.3	40.4	39.4	37.4	34.3	30.1	22.4	15.1	11.8	53.6
	Background (dBA)	16.9	20.6	22.7	24.4	26.1	27.3	30.2	29.9	30.9	30.7	32.2	33.5	33.6	32.9	34.1	32.8	33.2	31.9	29.2	27.2	26.0	24.0	21.9	20.6	20.0	21.5	23.6	17.5	44.0
	Turbine ON - background adj (dBA)	[12.1]	[16.1]	[20]	[23.3]	26.9	35.1	36.9	36.8	38.6	39.0	41.2	42.2	40.5	40.2	42.3	41.7	42.9	42.6	41.7	41.1	40.2	39.3	37.2	34.1	29.6	[19.4]	[12.1]	[8.8]	53.1
	Signal to noise (dB)	-1.8	-1.5	0.3	1.9	3.4	8.4	7.5	7.7	8.4	8.9	9.6	9.3	7.6	8.1	8.8	9.5	10.2	11.0	12.8	14.1	14.4	15.4	15.5	13.8	10.0	0.9	-8.5	-5.8	9.6
	Uncertainty (dB)	4.7	4.0	2.8	3.6	2.3	1.1	1.0	1.0	1.0	1.0	0.8	0.8	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.1	2.9	3.9	4.1	0.9
	PWL (dBA)	[62.6]	[66.7]	[70.6]	[73.9]	77.4	85.6	87.4	87.3	89.2	89.6	91.8	92.8	91.0	90.8	92.8	92.3	93.4	93.2	92.3	91.7	90.8	89.8	87.8	84.7	80.2	[70]	[62.7]	[59.3]	103.7
8.5	Turbine ON (dBA)	16.7	20.7	24.0	27.0	30.2	35.9	38.5	38.4	40.3	40.5	42.3	43.2	41.7	41.4	43.3	42.6	43.8	43.5	42.4	41.7	40.8	39.8	37.8	34.6	30.7	23.0	15.8	12.6	54.1
	Background (dBA)	14.0	16.9	20.2	21.5	23.4	25.8	29.2	28.7	29.6	28.8	30.7	31.7	31.6	31.2	33.0	32.2	33.3	32.3	29.4	27.0	25.2	22.0	19.4	17.5	17.0	16.5	15.0	13.4	42.8
	Turbine ON - background adj (dBA)	[13.7]	18.3	21.6	25.6	29.2	35.5	38.0	37.9	39.9	40.2	42.0	42.8	41.3	41.0	42.8	42.2	43.3	43.1	42.2	41.5	40.7	39.7	37.7	34.6	30.5	21.9	[12.8]	[9.6]	53.8
	Signal to noise (dB)	2.6	3.8	3.8	5.5	6.8	10.1	9.3	9.8	10.6	11.7	11.6	11.5	10.1	10.2	10.2	10.5	10.4	11.2	13.0	14.6	15.6	17.8	18.4	17.1	13.7	6.5	0.8	-0.8	11.3
	Uncertainty (dB)	4.6	3.2	2.2	2.2	1.4	1.1	1.0	1.0	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.4	3.2	3.9	0.8
	PWL (dBA)	[64.2]	68.9	72.2	76.1	79.7	86.0	88.5	88.5	90.4	90.8	92.6	93.4	91.8	91.5	93.4	92.8	93.9	93.7	92.7	92.1	91.2	90.3	88.3	85.1	81.1	72.5	[63.3]	[60.1]	104.3
9.0	Turbine ON (dBA)	16.8	20.7	24.0	27.1	30.1	36.4	38.9	38.1	39.9	40.4	42.2	43.2	41.8	41.4	43.3	42.8	43.9	43.6	42.5	41.8	40.9	39.9	37.9	34.9	30.7	23.1	16.3	13.3	54.2
	Background (dBA)	17.2	19.7	22.1	23.8	25.0	26.9	29.9	29.8	30.1	29.7	31.0	31.7	31.6	30.9	33.3	32.2	33.2	32.5	29.9	28.1	26.3	23.2	20.4	18.7	18.3	17.6	15.9	14.6	43.2
	Turbine ON - background adj (dBA)	[13.8]	[17.7]	[21]	24.4	28.5	35.9	38.3	37.5	39.4	40.0	41.9	42.9	41.3	41.0	42.9	42.4	43.5	43.2	42.2	41.6	40.8	39.8	37.8	34.8	30.5	21.7	[13.3]	[10.3]	53.8
	Signal to noise (dB)	-0.4	1.0	1.9	3.3	5.1	9.5	9.0	8.4	9.8	10.7	11.3	11.5	10.2	10.5	10.0	10.5	10.7	11.1	12.5	13.7	14.6	16.7	17.5	16.2	12.4	5.5	0.4	-1.3	10.9
	Uncertainty (dB)	4.5	3.8	2.5	3.2	1.6	1.1	1.0	1.0	0.9	0.9	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.1	1.6	3.1	3.9	0.8
	PWL (dBA)	[64.3]	[68.3]	[71.5]	75.0	79.0	86.4	88.9	88.0	90.0	90.5	92.5	93.4	91.9	91.6	93.4	92.9	94.1	93.8	92.8	92.2	91.3	90.4	88.4	85.4	81.0	72.2	[63.9]	[60.8]	104.4
9.5	Turbine ON (dBA)	16.7	20.9	23.9	27.0	30.0	36.6	39.0	38.0	39.9	40.3	42.2	43.1	41.6	41.3	43.1	42.6	43.7	43.5	42.3	41.6	40.8	39.9	38.0	35.0	31.0	23.4	16.1	12.9	54.1
	Background (dBA)	16.0	19.1	21.2	23.2	25.5	26.5	29.1	28.5	29.8	29.2	30.8	31.1	30.7	30.4	32.9	32.4	33.3	32.8	30.7	28.5	26.6	23.6	21.7	20.7	21.2	19.5	17.2	15.3	43.1
	Turbine ON - background adj (dBA)	[13.7]	[17.9]	[20.9]	24.7	28.1	36.1	38.5	37.5	39.5	39.9	41.9	42.8	41.2	40.9	42.7	42.2	43.3	43.1	42.0	41.4	40.6	39.8	37.9	34.8	30.5	21.1	[13.1]	[9.9]	53.7
	Signal to noise (dB)	0.7	1.8	2.7	3.8	4.5	10.1	9.9	9.5	10.1	11.1	11.5	12.0	10.9	10.9	10.2	10.3	10.4	10.6	11.6	13.1	14.1	16.3	16.3	14.3	9.8	3.9	-1.1	-2.4	11.0
	Uncertainty (dB)	4.5	3.8	2.5	2.8	1.8	1.0	0.9	0.9	0.9	0.9	0.7	0.8	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.1	2.0	3.1	3.9	0.8
	PWL (dBA)	[64.2]	[68.5]	[71.4]	75.3	78.7	86.7	89.1	88.1	90.0	90.5	92.5	93.4	91.8	91.4	93.3	92.7	93.9	93.6	92.6	91.9	91.2	90.4	88.4	85.3	81.1	71.6	[63.6]	[60.4]	104.3
10.0	Turbine ON (dBA)	17.7	21.7	24.7	27.6	30.4	36.5	38.7	38.1	40.0	40.4	42.1	42.9	41.4	41.0	43.0	42.5	43.6	43.4	42.3	41.6	40.7	39.9	37.9	34.7	31.1	23.7	17.3	14.6	54.0
	Background (dBA)	15.2	17.8	19.9	21.9	24.1	25.9	28.9	27.9	29.6	29.2	30.4	30.8	30.4	29.9	32.6	31.6	32.8	31.8	29.2	26.8	25.0	21.6	18.9	20.3	22.8	16.2	14.2	12.9	42.4
	Turbine ON - background adj (dBA)	[14.7]	19.5	22.9	26.2	29.3	36.1	38.2	37.7	39.6	40.1	41.8	42.6	41.1	40.7	42.5	42.2	43.2	43.1	42.1	41.4	40.6	39.8	37.9	34.5	30.4	22.9	14.4	[11.6]	53.7
	Signal to noise (dB)	2.6	3.9	4.8	5.7	6.3	10.7	9.8	10.2	10.4	11.2	11.7	12.1	11.0	11.1	10.3	10.9	10.8	11.6	13.1	14.8	15.8	18.3	19.1	14.4	8.3	7.5	3.1	1.7	11.6
	Uncertainty (dB)	4.3	2.9	1.6	2.0	1.3	0.9	0.9	0.9	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.7	0.7	0.8	1.0	1.0	1.1	1.2	2.8	3.7	0.8
	PWL (dBA)	[65.3]	70.0	73.5	76.7	79.8	86.7	88.8	88.2	90.1	90.6	92.3	93.2	91.6	91.2	93.1	92.7	93.8	93.6	92.6	92.0	91.2	90.4	88.4	85.1	81.0	73.4	65.0	[62.1]	104.2

Table C.01 Detailed apparent sound power level data at hub height

Project: Belle River Wind Power Project - Turbine T53 - IEC 61400-11 Measurement

Report ID: 17095.01.T53.RP1

Created on: 2018-11-23

1/3 Octave values marked with brackets [ ] denote less than 3 dB difference between Turbine ON and Background

Overall levels marked with an asterisk * denote 3 to 6 dB difference between Turbine ON and Background, while Overall values with less than 3 dB difference between Turbine ON and Background are not reported

Wind Bin (m/s)	Parameter	1/3 Octave Band (Hz)																												Overall
		20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	
10.5	Turbine ON (dBA)	15.6	20.7	22.8	25.9	28.9	34.9	37.9	37.3	39.2	39.7	41.5	42.4	41.2	40.9	42.9	42.5	43.6	43.4	42.4	41.6	40.6	39.9	37.9	34.4	30.9	23.5	16.1	12.8	53.7
	Background (dBA)	14.9	17.7	20.0	21.3	23.6	25.8	28.4	29.0	29.9	29.7	31.2	31.6	31.5	30.6	33.0	32.1	33.3	32.6	30.5	28.0	25.9	22.3	19.4	19.0	23.4	16.8	14.0	12.7	43.0
	Turbine ON - background adj (dBA)	[12.6]	[17.7]	[19.8]	24.0	27.4	34.3	37.4	36.6	38.6	39.3	41.1	42.1	40.7	40.4	42.4	42.0	43.2	43.0	42.1	41.4	40.5	39.8	37.8	34.3	30.0	22.5	[13.1]	[9.8]	53.4
	Signal to noise (dB)	0.8	2.9	2.9	4.5	5.3	9.1	9.5	8.3	9.3	10.1	10.4	10.8	9.7	10.3	9.9	10.3	10.3	10.7	11.9	13.6	14.8	17.6	18.5	15.4	7.5	6.7	2.1	0.2	10.7
	Uncertainty (dB)	4.2	3.5	2.5	2.3	1.5	1.0	0.9	1.0	0.9	0.9	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.7	0.7	0.7	0.9	1.0	1.1	1.2	2.9	3.6	0.8
	PWL (dBA)	[63.2]	[68.2]	[70.4]	74.5	77.9	84.9	87.9	87.2	89.2	89.9	91.7	92.6	91.3	91.0	92.9	92.6	93.7	93.5	92.7	92.0	91.0	90.4	88.4	84.8	80.6	73.0	[63.7]	[60.4]	103.9
11.0	Turbine ON (dBA)	18.8	23.1	25.2	27.5	29.9	34.9	37.5	36.9	39.0	39.2	41.0	42.1	41.0	40.8	42.8	42.4	43.6	43.4	42.5	41.6	40.6	39.8	37.6	34.0	30.8	24.2	18.1	16.0	53.6
	Background (dBA)	15.4	18.4	20.8	22.7	24.6	26.4	28.5	28.6	30.1	30.4	30.4	30.8	31.2	30.0	32.8	32.1	33.3	32.3	30.1	27.9	25.9	22.6	19.6	17.4	17.3	16.4	14.7	13.5	42.8
	Turbine ON - background adj (dBA)	16.1	21.4	23.2	25.8	28.3	34.2	36.9	36.2	38.3	38.6	40.7	41.8	40.5	40.4	42.3	42.0	43.2	43.1	42.2	41.5	40.5	39.7	37.6	33.9	30.6	23.4	15.5	[13]	53.2
	Signal to noise (dB)	3.4	4.7	4.4	4.8	5.3	8.4	9.0	8.3	8.9	8.8	10.6	11.3	9.8	10.8	10.0	10.3	10.4	11.1	12.4	13.8	14.7	17.1	18.0	16.5	13.5	7.7	3.4	2.5	10.8
	Uncertainty (dB)	4.1	2.7	1.9	2.4	1.6	1.1	1.0	1.0	1.0	1.0	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.8	0.8	0.8	1.1	1.1	1.1	1.3	2.8	4.0	0.8
	PWL (dBA)	66.7	71.9	73.8	76.4	78.9	84.7	87.5	86.7	88.9	89.1	91.2	92.3	91.1	91.0	92.9	92.5	93.7	93.6	92.8	92.0	91.0	90.2	88.1	84.4	81.2	73.9	66.1	[63.6]	103.8
11.5	Turbine ON (dBA)	17.4	22.2	24.2	26.7	29.5	34.4	37.5	37.0	39.1	39.2	40.8	42.0	41.0	41.0	43.0	42.7	43.7	43.6	42.7	41.9	40.9	39.9	37.7	33.8	30.6	23.6	17.2	14.7	53.7
	Background (dBA)	15.3	18.5	20.5	21.9	24.0	26.0	28.5	28.3	29.8	29.0	30.5	30.7	30.4	29.6	32.5	31.5	32.6	31.9	28.8	26.7	25.0	21.8	19.3	18.1	18.4	16.4	14.4	13.1	42.3
	Turbine ON - background adj (dBA)	[14.4]	19.7	21.7	24.9	28.1	33.7	37.0	36.4	38.6	38.8	40.4	41.7	40.6	40.7	42.6	42.4	43.4	43.3	42.5	41.8	40.8	39.8	37.6	33.7	30.3	22.6	[14.2]	[11.7]	53.4
	Signal to noise (dB)	2.1	3.7	3.6	4.8	5.5	8.4	9.1	8.7	9.4	10.2	10.3	11.3	10.6	11.4	10.5	11.2	11.2	11.8	13.9	15.2	15.9	18.1	18.4	15.7	12.1	7.2	2.8	1.6	11.4
	Uncertainty (dB)	4.5	3.2	2.2	2.4	1.6	1.1	1.0	1.0	1.0	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.1	1.3	3.1	3.9	0.8
	PWL (dBA)	[64.9]	70.3	72.2	75.5	78.7	84.3	87.5	86.9	89.1	89.3	90.9	92.2	91.2	91.2	93.1	92.9	93.9	93.9	93.1	92.3	91.3	90.4	88.2	84.2	80.9	73.2	[64.7]	[62.2]	104.0
12.0	Turbine ON (dBA)	17.2	22.2	23.5	26.6	29.1	34.1	37.4	36.4	38.5	38.7	40.0	41.1	40.3	40.4	42.5	42.4	43.7	43.8	43.1	42.2	41.0	39.9	37.4	33.3	29.9	23.0	17.0	14.7	53.5
	Background (dBA)	17.9	21.0	23.3	25.2	27.5	29.0	30.3	30.1	30.9	30.7	31.5	31.5	31.0	30.6	32.8	32.3	33.2	32.7	30.7	28.6	27.2	24.1	21.1	21.7	25.3	19.6	16.5	15.3	43.6
	Turbine ON - background adj (dBA)	[14.2]	[19.2]	[20.5]	[23.6]	[26.1]	32.5	36.5	35.3	37.6	37.9	39.3	40.6	39.8	39.9	42.0	42.0	43.3	43.4	42.8	42.1	40.8	39.8	37.3	33.0	28.1	20.4	[14]	[11.7]	53.1
	Signal to noise (dB)	-0.8	1.3	0.3	1.3	1.6	5.2	7.1	6.3	7.6	8.0	8.5	9.6	9.3	9.8	9.7	10.2	10.5	11.1	12.4	13.6	13.8	15.8	16.3	11.6	4.6	3.4	0.6	-0.6	9.9
	Uncertainty (dB)	4.7	4.0	2.8	3.6	2.6	1.5	1.1	1.2	1.0	1.0	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.9	2.3	3.2	4.0	0.8
	PWL (dBA)	[64.7]	[69.8]	[71.1]	[74.1]	[76.7]	83.1	87.0	85.8	88.2	88.5	89.9	91.2	90.3	90.4	92.6	92.6	93.9	94.0	93.4	92.6	91.4	90.3	87.9	83.5	78.7	70.9	[64.6]	[62.3]	103.6
12.5	Turbine ON (dBA)	18.7	23.4	25.4	28.5	30.4	34.5	37.7	37.1	38.8	38.7	40.2	41.3	40.4	40.4	42.6	42.5	43.8	43.8	43.1	42.2	41.0	39.8	37.4	33.3	30.1	23.6	18.7	16.7	53.6
	Background (dBA)	17.6	20.7	23.0	24.3	26.0	27.5	29.3	29.4	30.0	29.5	31.4	30.9	30.4	30.0	33.0	32.0	32.9	32.1	29.6	27.7	26.1	23.0	20.0	17.8	17.9	17.6	16.0	15.2	42.9
	Turbine ON - background adj (dBA)	[15.7]	[20.4]	[22.4]	26.4	28.5	33.6	37.0	36.3	38.2	38.2	39.6	40.9	40.0	40.0	42.1	42.1	43.4	43.5	42.9	42.1	40.9	39.7	37.3	33.2	29.8	22.3	[15.7]	[13.7]	53.2
	Signal to noise (dB)	1.1	2.7	2.4	4.2	4.5	7.1	8.3	7.6	8.8	9.2	8.8	10.4	10.0	10.4	9.6	10.5	10.9	11.7	13.5	14.5	15.0	16.9	17.4	15.6	12.2	6.0	2.7	1.5	10.7
	Uncertainty (dB)	4.5	3.8	2.6	2.7	1.8	1.2	1.0	1.0	1.0	1.0	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.8	0.8	0.8	0.7	0.8	1.0	1.1	1.0	1.5	3.2	4.0	0.8
	PWL (dBA)	[66.3]	[70.9]	[73]	76.9	79.1	84.1	87.5	86.8	88.8	88.7	90.1	91.4	90.5	90.5	92.6	92.6	93.9	94.0	93.5	92.6	91.5	90.3	87.9	83.8	80.4	72.9	[66.3]	[64.2]	103.8

Table C.02 Detailed apparent sound power level data at 10m height

Project: Belle River Wind Power Project - Turbine T53 - IEC 61400-11 Measurement

Report ID: 17095.01.T53.RP1

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1/3 Octave values marked with brackets [ ] denote less than 3 dB difference between Turbine ON and Background
Overall levels marked with an asterisk * denote 3 to 6 dB difference between Turbine ON and Background, while Overall values with less than 3 dB difference between Turbine ON and Background are not reported
‡ marks values derived from a data set with less than 10 points

Wind Bin (m/s)	Parameter	1/3 Octave Band (Hz)																												Overall
		20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	
5.0	Turbine ON (dBA)	14.4	18.4	22.0	25.4	29.0	34.1	35.3	37.0	38.5	38.4	40.3	41.0	39.2	38.7	40.5	39.8	40.9	40.3	39.5	39.0	38.2	37.3	35.2	32.4	28.9	21.9	13.9	11.2	51.6
	Background (dBA)	15.9	18.6	20.7	22.9	24.4	26.8	29.7	29.8	31.6	31.7	33.4	34.5	34.5	32.9	33.6	32.0	32.9	31.9	28.9	26.6	24.6	21.6	18.9	17.3	17.0	16.5	14.8	13.5	44.0
	Turbine ON - background adj (dBA)	[11.4]	[15.4]	[19]	[22.4]	27.1	33.2	34.0	36.0	37.5	37.4	39.3	39.8	37.3	37.4	39.6	39.0	40.1	39.6	39.1	38.7	38.0	37.2	35.1	32.3	28.6	20.4	[10.9]	[8.2]	50.7
	Signal to noise (dB)	-1.5	-0.3	1.3	2.4	4.5	7.3	5.7	7.1	6.8	6.7	6.9	6.4	4.6	5.8	6.9	7.8	7.9	8.4	10.6	12.3	13.6	15.7	16.4	15.1	11.9	5.4	-0.9	-2.3	7.6
	Uncertainty (dB)	3.9	3.3	2.2	3.0	1.5	1.0	1.0	0.9	0.9	0.9	0.8	0.8	1.0	0.9	0.8	0.7	0.7	0.8	0.7	0.7	0.6	0.7	0.9	0.9	1.0	1.6	2.7	3.3	0.8
	PWL (dBA)	[62]	[65.9]	[69.6]	[72.9]	77.6	83.8	84.5	86.6	88.0	88.0	89.9	90.4	87.9	87.9	90.1	89.5	90.7	90.1	89.7	89.3	88.6	87.8	85.7	82.8	79.2	70.9	[61.5]	[58.7]	101.3
6.0	Turbine ON (dBA)	16.3	20.3	23.7	26.9	30.0	36.1	38.5	38.1	39.8	40.2	42.1	43.0	41.6	41.2	43.1	42.5	43.6	43.3	42.2	41.6	40.7	39.7	37.7	34.6	30.5	22.9	15.9	12.8	53.9
	Background (dBA)	16.5	19.5	21.8	23.4	25.4	26.8	29.8	29.4	30.1	29.5	31.1	31.9	32.0	31.6	33.5	32.5	33.4	32.5	30.0	27.9	26.2	23.3	20.8	19.3	19.5	19.3	20.2	15.7	43.4
	Turbine ON - background adj (dBA)	[13.3]	[17.3]	[20.7]	24.2	28.1	35.5	37.8	37.4	39.3	39.8	41.7	42.7	41.0	40.7	42.6	42.1	43.2	42.9	42.0	41.4	40.5	39.6	37.6	34.5	30.2	20.4	[12.9]	[9.8]	53.5
	Signal to noise (dB)	-0.1	0.9	1.8	3.5	4.5	9.3	8.6	8.6	9.7	10.7	11.0	11.1	9.6	9.7	9.6	10.0	10.2	10.8	12.2	13.6	14.4	16.4	16.9	15.3	11.1	3.6	-4.3	-2.9	10.6
	Uncertainty (dB)	4.3	3.6	2.3	2.9	1.6	1.0	0.9	0.9	0.9	0.9	0.7	0.7	0.7	0.8	0.7	0.8	0.7	0.8	0.8	0.7	0.7	0.8	1.0	1.0	1.0	1.9	3.0	3.7	0.8
	PWL (dBA)	[63.9]	[67.9]	[71.2]	74.8	78.6	86.1	88.4	88.0	89.9	90.3	92.3	93.2	91.6	91.3	93.2	92.6	93.8	93.5	92.5	91.9	91.1	90.1	88.1	85.0	80.7	71.0	[63.4]	[60.3]	104.1
7.0	Turbine ON (dBA)	17.2	21.5	24.2	27.2	30.1	36.2	38.6	37.9	39.8	40.2	41.9	42.8	41.4	41.1	43.0	42.6	43.7	43.4	42.4	41.6	40.8	39.9	37.9	34.7	31.0	23.5	16.8	13.9	54.0
	Background (dBA)	15.1	18.0	20.1	21.9	23.9	25.9	28.8	28.4	29.7	29.3	30.7	31.1	30.8	30.1	32.7	31.9	33.0	32.2	29.8	27.4	25.6	22.3	19.9	20.0	22.5	17.4	15.2	13.5	42.7
	Turbine ON - background adj (dBA)	[14.2]	18.9	22.1	25.7	28.9	35.8	38.2	37.4	39.3	39.8	41.6	42.5	41.0	40.7	42.6	42.2	43.3	43.1	42.1	41.5	40.6	39.8	37.8	34.5	30.3	22.3	[13.8]	[10.9]	53.6
	Signal to noise (dB)	2.1	3.5	4.1	5.3	6.1	10.3	9.9	9.5	10.1	10.8	11.2	11.7	10.6	11.0	10.3	10.7	10.7	11.2	12.6	14.2	15.2	17.6	18.0	14.7	8.5	6.1	1.6	0.4	11.3
	Uncertainty (dB)	4.1	3.0	1.7	2.0	1.3	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.7	0.7	0.7	1.0	1.0	1.1	1.3	2.8	3.5	0.7
	PWL (dBA)	[64.8]	69.4	72.7	76.2	79.4	86.3	88.7	87.9	89.9	90.3	92.2	93.1	91.6	91.3	93.1	92.7	93.8	93.7	92.7	92.0	91.2	90.4	88.4	85.1	80.9	72.9	[64.3]	[61.4]	104.2
8.0	Turbine ON (dBA)	17.9	22.6	24.4	27.0	29.6	34.5	37.5	36.8	38.9	39.1	40.7	41.8	40.8	40.8	42.8	42.5	43.7	43.6	42.8	41.9	40.9	39.9	37.6	33.7	30.5	23.6	17.5	15.2	53.6
	Background (dBA)	15.9	19.0	21.2	23.0	25.2	26.9	28.9	28.8	30.1	30.0	30.6	30.9	30.9	29.9	32.6	31.9	33.0	32.2	29.8	27.6	25.9	22.6	19.8	19.0	21.1	17.3	15.0	13.8	42.8
	Turbine ON - background adj (dBA)	[14.9]	20.1	21.6	24.8	27.6	33.7	36.9	36.1	38.3	38.5	40.2	41.4	40.4	40.4	42.3	42.1	43.3	43.3	42.5	41.8	40.7	39.8	37.5	33.6	30.0	22.5	[14.5]	[12.2]	53.3
	Signal to noise (dB)	2.1	3.6	3.2	4.1	4.4	7.6	8.6	8.0	8.8	9.1	10.0	10.9	10.0	10.9	10.1	10.7	10.7	11.4	13.0	14.3	14.9	17.2	17.8	14.8	9.4	6.3	2.5	1.5	10.9
	Uncertainty (dB)	4.4	3.2	2.3	2.7	1.8	1.1	1.0	1.0	1.0	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.1	1.4	3.0	3.8	0.8
	PWL (dBA)	[65.5]	70.6	72.2	75.4	78.2	84.2	87.4	86.6	88.8	89.0	90.8	92.0	90.9	90.9	92.9	92.7	93.9	93.8	93.1	92.3	91.3	90.3	88.1	84.1	80.5	73.1	[65.1]	[62.8]	103.8
9.0	Turbine ON (dBA)	18.7	23.5	25.3	28.1	30.6	34.7	38.0	37.1	38.9	38.9	40.0	41.1	40.3	40.2	42.5	42.4	43.7	43.9	43.4	42.5	41.4	40.1	37.5	33.4	30.2	23.5	18.4	16.3	53.7
	Background (dBA) ‡	16.9	19.7	21.9	23.6	25.3	27.0	29.2	29.1	29.8	30.9	31.5	30.7	30.6	30.1	33.1	32.0	32.9	32.2	29.6	27.6	26.1	22.9	20.1	18.3	18.8	17.5	15.8	14.7	42.9
	Turbine ON - background adj (dBA) ‡	[15.7]	21.2	22.6	26.1	29.1	33.9	37.4	36.3	38.3	38.1	39.4	40.7	39.9	39.8	41.9	42.0	43.4	43.5	43.2	42.4	41.2	40.0	37.5	33.3	29.9	22.2	[15.4]	[13.3]	53.3
	Signal to noise (dB)	1.8	3.8	3.4	4.4	5.3	7.7	8.8	8.0	9.1	8.0	8.6	10.4	9.8	10.1	9.4	10.4	10.8	11.7	13.8	14.9	15.3	17.2	17.4	15.1	11.4	6.0	2.6	1.6	10.7
	Uncertainty (dB)	4.4	3.0	2.2	2.5	1.5	1.1	0.9	1.0	0.9	1.0	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.8	0.8	0.7	0.7	0.8	1.0	1.0	1.0	1.4	3.0	3.8	0.8
	PWL (dBA) ‡	[66.3]	71.8	73.2	76.7	79.6	84.4	87.9	86.9	88.9	88.7	89.9	91.2	90.4	90.3	92.5	92.5	93.9	94.1	93.8	92.9	91.8	90.6	88.0	83.8	80.4	72.8	[66]	[63.9]	103.8

Table C.03 Type B measurement uncertainty summary

Overall Equipment Uncertainties		
	Typical values	Used values
Calibration	0.2 dB	0.2 dB
Board	0.3 dB	0.3 dB
Distance	0.1 dB	0.1 dB
Air absorption	0 dB	0 dB
Weather	0.5 dB	0.5 dB

1/3 Octave Band Uncertainties		
Frequency (Hz)	Microphone Uncertainty	Overall (including overall equipment Uncertainties)
20	0.8 dB	2 dB
25	0.8 dB	1.6 dB
31.5	0.5 dB	1.1 dB
40	0.5 dB	1.5 dB
50	0.5 dB	1.1 dB
63	0.5 dB	0.9 dB
80	0.5 dB	0.8 dB
100	0.5 dB	0.8 dB
125	0.5 dB	0.8 dB
160	0.5 dB	0.8 dB
200	0.3 dB	0.7 dB
250	0.3 dB	0.7 dB
315	0.3 dB	0.7 dB
400	0.3 dB	0.7 dB
500	0.3 dB	0.7 dB
630	0.3 dB	0.7 dB
800	0.3 dB	0.7 dB
1000	0.3 dB	0.8 dB
1250	0.3 dB	0.8 dB
1600	0.3 dB	0.8 dB
2000	0.3 dB	0.7 dB
2500	0.5 dB	0.8 dB
3150	0.5 dB	1.1 dB
4000	0.5 dB	1.1 dB
5000	0.5 dB	1 dB
6300	0.5 dB	1.1 dB
8000	0.5 dB	1.4 dB
10000	1.3 dB	1.7 dB

Table C.04 Detailed measurement uncertainty at hub height

Project: Belle River Wind Power Project - Turbine T53 - IEC 61400-11 Measurement

Report ID: 17095.01.T53.RP1

Created on: 2018-11-23

Wind Bin (m/s)	Parameter	Average Wind Speed (m/s)	# of data points	Parameter	1/3 Octave Band (Hz) 20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	Overall
7.5	Turbine ON	7.52	35	Average (dBA)	15.5	19.4	23.0	26.3	29.5	34.8	36.0	37.8	39.5	39.2	41.2	41.9	40.3	39.9	41.6	40.9	42.0	41.4	40.5	39.9	39.1	38.2	36.1	33.2	29.1	21.2	14.3	11.4	52.6
				Uncertainty A (dB)	0.4	0.4	0.4	0.3	0.3	0.2	0.4	0.4	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.4	
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
				Combined Uncertainty (dB)	2.0	1.7	1.1	1.6	1.1	1.0	0.9	0.9	0.9	0.9	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
	Background	7.52	12	Average (dBA)	17.1	20.0	21.4	23.4	25.1	27.3	29.8	30.0	32.2	32.3	34.3	35.3	35.4	33.4	34.0	32.1	32.9	31.8	28.8	26.6	24.5	21.6	18.6	17.2	17.1	17.1	15.5	14.4	44.5
				Uncertainty A (dB)	1.6	1.6	1.2	1.0	0.7	0.5	0.5	0.4	0.6	0.9	1.0	1.1	1.3	1.0	0.5	0.3	0.3	0.2	0.3	0.4	0.4	0.5	0.6	0.6	0.7	0.8	0.8	0.9	
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
				Combined Uncertainty (dB)	2.6	2.3	1.6	1.8	1.3	1.1	1.0	0.9	1.0	1.2	1.2	1.3	1.5	1.2	0.8	0.8	0.7	0.8	0.8	0.8	0.8	1.0	1.2	1.2	1.2	1.3	1.6	1.9	
8.0	Turbine ON	7.99	49	Average (dBA)	15.1	19.1	23.0	26.3	29.5	35.7	37.7	37.6	39.3	39.6	41.7	42.8	41.3	41.0	42.9	42.2	43.3	43.0	42.0	41.3	40.4	39.4	37.4	34.3	30.1	22.4	15.1	11.8	53.6
				Uncertainty A (dB)	0.3	0.3	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.4	
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
				Combined Uncertainty (dB)	2.0	1.7	1.1	1.5	1.1	1.0	0.9	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
	Background	8.04	21	Average (dBA)	16.9	20.6	22.9	24.5	26.2	27.3	30.3	29.9	30.8	30.5	32.0	33.4	33.5	32.9	34.1	32.8	33.2	31.9	29.2	27.2	26.1	24.2	22.2	20.9	20.3	21.9	24.3	17.8	44.0
				Uncertainty A (dB)	1.7	1.7	1.6	1.3	1.1	0.7	0.7	0.7	0.5	0.7	0.6	0.8	1.0	0.9	0.6	0.5	0.3	0.3	0.5	0.6	0.8	1.1	1.4	1.5	1.4	1.9	2.7	1.8	
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
				Combined Uncertainty (dB)	2.6	2.4	1.9	2.0	1.5	1.2	1.1	1.1	1.0	1.1	0.9	1.1	1.2	1.2	1.0	0.9	0.8	0.8	0.9	1.0	1.1	1.4	1.8	1.8	1.7	2.2	3.0	2.5	
8.5	Turbine ON	8.50	61	Average (dBA)	16.7	20.7	24.0	27.0	30.2	35.9	38.5	38.4	40.3	40.5	42.3	43.2	41.7	41.4	43.3	42.6	43.8	43.5	42.4	41.7	40.8	39.8	37.8	34.6	30.7	23.0	15.8	12.6	54.1
				Uncertainty A (dB)	0.4	0.4	0.3	0.3	0.2	0.1	0.2	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.2	0.3	0.4	
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
				Combined Uncertainty (dB)	2.0	1.7	1.1	1.5	1.1	1.0	0.8	0.9	0.9	0.9	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
	Background	8.53	23	Average (dBA)	13.9	16.7	20.0	21.3	23.2	25.7	29.2	28.6	29.5	28.7	30.7	31.6	31.5	31.1	33.0	32.1	33.3	32.3	29.4	27.0	25.2	21.9	19.2	17.4	16.8	16.2	14.5	13.1	42.8
				Uncertainty A (dB)	1.3	1.1	1.1	0.7	0.5	0.4	0.5	0.4	0.3	0.3	0.4	0.5	0.6	0.5	0.3	0.2	0.2	0.2	0.3	0.4	0.6	0.6	0.8	0.9	0.9	0.8	0.9	0.9	
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
				Combined Uncertainty (dB)	2.4	2.0	1.5	1.7	1.2	1.0	1.0	0.9	0.9	0.9	0.8	0.9	0.9	0.9	0.8	0.8	0.7	0.8	0.9	0.9	0.9	1.0	1.3	1.4	1.3	1.3	1.6	1.9	
9.0	Turbine ON	9.00	93	Average (dBA)	16.8	20.7	24.0	27.1	30.1	36.4	38.9	38.1	39.9	40.4	42.2	43.2	41.8	41.4	43.3	42.8	43.9	43.6	42.5	41.8	40.9	39.9	37.9	34.9	30.7	23.1	16.3	13.3	54.2
				Uncertainty A (dB)	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.3	0.3	
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
				Combined Uncertainty (dB)	2.0	1.7	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
	Background	9.04	26	Average (dBA)	17.5	20.0	22.3	24.0	25.1	27.0	30.0	29.9	30.2	29.8	31.0	31.7	31.6	30.9	33.4	32.3	33.2	32.5	30.0	28.2	26.4	23.4	20.5	18.9	18.4	17.7	16.0	14.7	43.3
				Uncertainty A (dB)	1.1	1.1	1.0	0.8	0.6	0.5	0.5	0.5	0.3	0.4	0.3	0.4	0.4	0.4	0.3	0.2	0.2	0.2	0.4	0.4	0.5	0.6	0.7	0.7	0.7	0.8	0.8	0.8	
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
				Combined Uncertainty (dB)	2.3	2.0	1.4	1.7	1.2	1.0	1.0	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.7	0.8	0.7	0.8	0.9	0.9	0.9	1.0	1.3	1.3	1.2	1.3	1.6	1.9	
9.5	Turbine ON	9.51	65	Average (dBA)	16.7	20.9	23.9	27.0	30.0	36.6	39.0	38.0	39.9	40.3	42.2	43.1	41.6	41.2	43.1	42.6	43.7	43.5	42.3	41.6	40.8	39.9	38.0	35.0	31.0	23.4	16.1	12.9	54.1
				Uncertainty A (dB)	0.4	0.3	0.3	0.2	0.2	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.4	
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
				Combined Uncertainty (dB)	2.0	1.7	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
	Background	9.52	33	Average (dBA)	16.0	19.1	21.2	23.1	25.5	26.5	29.1	28.5	29.8	29.2	30.8	31.1	30.6	30.4	32.9	32.4	33.3	32.8	30.7	28.5	26.7	23.6	21.7	20.7	21.3	19.5	17.2	15.3	43.1
				Uncertainty A (dB)	1.0	1.0	0.9	0.8	0.7	0.5	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.5	0.5	0.6	0.6	0.8	1.0	1.1	1.0	0.9	0.9	
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
				Combined Uncertainty (dB)	2.2	1.9	1.4	1.7	1.3	1.0	0.9	0.9	0.9	0.9	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.3	1.5	1.5	1.4	1.6	1.9	
10.0	Turbine ON	9.93	41	Average (dBA)	18.0	21.9	24.9	27.8	30.6	36.7	38.8	38.2	40.1	40.5	42.2	43.0	41.5	41.0	43.0	42.5	43.6	43.4	42.3	41.6	40.8	39.9	38.0	34.7	31.2	23.7	17.5	14.8	54.0
				Uncertainty A (dB)	0.5	0.4	0.4	0.3	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.4	0.5	
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
				Combined Uncertainty (dB)	2.0	1.7	1.1	1.6	1.1	1.0	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.8	
	Background	10.02	40	Average (dBA)	15.1	17.8	19.9	21.8	24.0	25.8	28.9	27.9	29.6	29.2	30.4	30.8	30.4	29.9	32.6	31.6	32.8	31.8	29.1	26.7	24.9	21.6	18.8	20.2	22.9	16.0	14.1	12.8	42.4
				Uncertainty A (dB)	0.9	0.8	0.7	0.5	0.5	0.3	0.3	0.3	0.3	0.4	0.2	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.3	0.3	0.4	0.5	0.5	0.9	1.3	0.5	0.5	0.6	
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
				Combined Uncertainty (dB)	2.2	1.8	1.2	1.6	1.2	1.0	0.9	0.9	0.9	0.9	0.7	0.8	0.8	0.8	0.7	0.8	0.7	0.8	0.9	0.8	0.8	0.9	1.2	1.4	1.6	1.2	1.5	1.8	

Table C.04 Detailed measurement uncertainty at hub height

Project: Belle River Wind Power Project - Turbine T53 - IEC 61400-11 Measurement

Report ID: 17095.01.T53.RP1

Created on: 2018-11-23

Wind Bin (m/s)	Parameter	Average Wind Speed (m/s)	# of data points	Parameter	1/3 Octave Band (Hz) 20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	Overall
10.5	Turbine ON	10.60	16	Average (dBA)	15.2	20.5	22.5	25.5	28.6	34.6	37.7	37.1	39.0	39.6	41.4	42.4	41.2	40.8	42.8	42.5	43.6	43.4	42.4	41.6	40.6	39.9	37.9	34.3	30.8	23.4	15.9	12.5	53.7
				Uncertainty A (dB)	0.7	0.5	0.6	0.5	0.6	0.4	0.5	0.6	0.4	0.4	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.3	0.4	0.6	
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
				Combined Uncertainty (dB)	2.1	1.7	1.2	1.6	1.2	1.0	1.0	1.0	0.9	0.9	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.8	
	Background	10.50	31	Average (dBA)	14.9	17.7	20.0	21.3	23.6	25.8	28.4	29.0	29.9	29.7	31.2	31.7	31.5	30.6	33.0	32.1	33.3	32.6	30.5	28.0	25.9	22.3	19.4	19.0	23.4	16.8	14.0	12.6	43.0
				Uncertainty A (dB)	0.9	0.9	0.7	0.5	0.5	0.4	0.3	0.4	0.4	0.5	0.4	0.4	0.5	0.4	0.3	0.3	0.3	0.4	0.5	0.5	0.5	0.5	0.5	0.7	1.5	0.7	0.6	0.6	
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
				Combined Uncertainty (dB)	2.2	1.9	1.3	1.6	1.2	1.0	0.9	0.9	0.9	0.9	0.8	0.8	0.9	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.2	1.3	1.8	1.3	1.5	1.8	
11.0	Turbine ON	11.00	30	Average (dBA)	18.8	23.2	25.2	27.5	29.9	34.9	37.5	36.9	39.0	39.2	41.0	42.1	41.0	40.8	42.8	42.4	43.6	43.4	42.5	41.6	40.6	39.8	37.6	34.0	30.8	24.2	18.2	16.0	53.6
				Uncertainty A (dB)	0.6	0.5	0.5	0.3	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.4	0.6	
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
				Combined Uncertainty (dB)	2.1	1.7	1.2	1.6	1.1	1.0	0.9	0.9	0.9	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.8	
	Background	11.01	36	Average (dBA)	15.4	18.4	20.9	22.7	24.6	26.5	28.5	28.6	30.1	30.4	30.4	30.8	31.2	29.9	32.8	32.1	33.3	32.3	30.1	27.9	25.9	22.6	19.6	17.4	17.2	16.4	14.7	13.5	42.8
				Uncertainty A (dB)	0.8	0.7	0.6	0.5	0.4	0.4	0.3	0.3	0.3	0.5	0.3	0.3	0.4	0.3	0.3	0.2	0.3	0.3	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
				Combined Uncertainty (dB)	2.1	1.8	1.2	1.6	1.1	1.0	0.9	0.9	0.9	1.0	0.7	0.8	0.8	0.8	0.8	0.8	0.7	0.8	0.9	0.9	0.8	0.9	1.2	1.2	1.1	1.2	1.5	1.8	
11.5	Turbine ON	11.49	30	Average (dBA)	17.4	22.2	24.2	26.7	29.6	34.4	37.5	37.0	39.1	39.2	40.8	42.0	41.0	41.0	43.0	42.7	43.7	43.6	42.7	41.9	40.9	39.9	37.7	33.8	30.6	23.6	17.2	14.7	53.7
				Uncertainty A (dB)	0.5	0.5	0.4	0.4	0.3	0.2	0.2	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.5	
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
				Combined Uncertainty (dB)	2.0	1.7	1.1	1.6	1.1	1.0	0.9	0.9	0.9	0.9	0.7	0.7	0.7	0.8	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.8	
	Background	11.52	26	Average (dBA)	15.3	18.5	20.5	21.9	24.0	26.0	28.5	28.3	29.7	28.9	30.5	30.7	30.3	29.6	32.5	31.4	32.5	31.8	28.7	26.7	24.9	21.8	19.2	18.1	18.5	16.4	14.4	13.1	42.3
				Uncertainty A (dB)	1.0	0.9	0.8	0.7	0.5	0.4	0.4	0.3	0.4	0.3	0.3	0.3	0.4	0.3	0.4	0.3	0.3	0.3	0.3	0.4	0.5	0.5	0.6	0.8	0.8	0.7	0.6	0.7	
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
				Combined Uncertainty (dB)	2.2	1.9	1.3	1.7	1.2	1.0	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.2	1.3	1.3	1.3	1.5	1.8	
12.0	Turbine ON	11.98	26	Average (dBA)	17.1	22.2	23.4	26.5	29.1	34.1	37.4	36.4	38.5	38.7	40.0	41.1	40.3	40.4	42.5	42.4	43.7	43.8	43.1	42.2	41.0	39.9	37.4	33.3	29.9	23.0	17.0	14.6	53.5
				Uncertainty A (dB)	0.5	0.4	0.4	0.3	0.3	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.3	0.5	
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
				Combined Uncertainty (dB)	2.0	1.7	1.1	1.6	1.1	1.0	0.9	0.9	0.9	0.9	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.8	
	Background	11.99	19	Average (dBA)	17.9	21.0	23.3	25.2	27.6	29.0	30.3	30.1	30.9	30.7	31.5	31.5	31.0	30.6	32.8	32.3	33.2	32.7	30.7	28.6	27.3	24.1	21.2	21.7	25.5	19.6	16.5	15.3	43.6
				Uncertainty A (dB)	1.6	1.6	1.4	1.3	1.1	1.0	0.8	0.8	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.4	0.5	0.6	0.7	0.7	0.8	0.9	1.4	2.0	1.3	1.0	1.0	
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
				Combined Uncertainty (dB)	2.6	2.3	1.8	2.0	1.6	1.4	1.2	1.1	1.0	1.0	0.9	0.9	0.9	1.0	0.9	0.9	0.8	0.9	1.0	1.0	1.0	1.2	1.4	1.8	2.3	1.7	1.7	2.0	
12.5	Turbine ON	12.48	23	Average (dBA)	18.7	23.4	25.4	28.5	30.4	34.5	37.6	37.1	38.8	38.7	40.2	41.3	40.4	40.4	42.6	42.5	43.8	43.8	43.1	42.2	41.0	39.8	37.4	33.3	30.1	23.6	18.7	16.7	53.6
				Uncertainty A (dB)	0.6	0.4	0.5	0.4	0.3	0.2	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.5	0.7	
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
				Combined Uncertainty (dB)	2.1	1.7	1.2	1.6	1.1	1.0	0.9	0.9	0.9	0.9	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.5	1.8	
	Background	12.50	16	Average (dBA)	17.6	20.7	23.0	24.3	26.0	27.5	29.3	29.4	30.0	29.5	31.4	30.9	30.4	30.0	33.0	32.0	32.8	32.1	29.6	27.7	26.1	23.0	20.0	17.7	17.8	17.6	16.0	15.2	42.9
				Uncertainty A (dB)	1.0	0.9	0.8	0.8	0.6	0.6	0.6	0.6	0.5	0.5	0.6	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.6	0.6	0.5	0.6	0.6	0.6	0.7	
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7	
				Combined Uncertainty (dB)	2.2	1.9	1.3	1.7	1.2	1.1	1.0	1.0	1.0	1.0	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.2	1.2	1.2	1.2	1.5	1.8	

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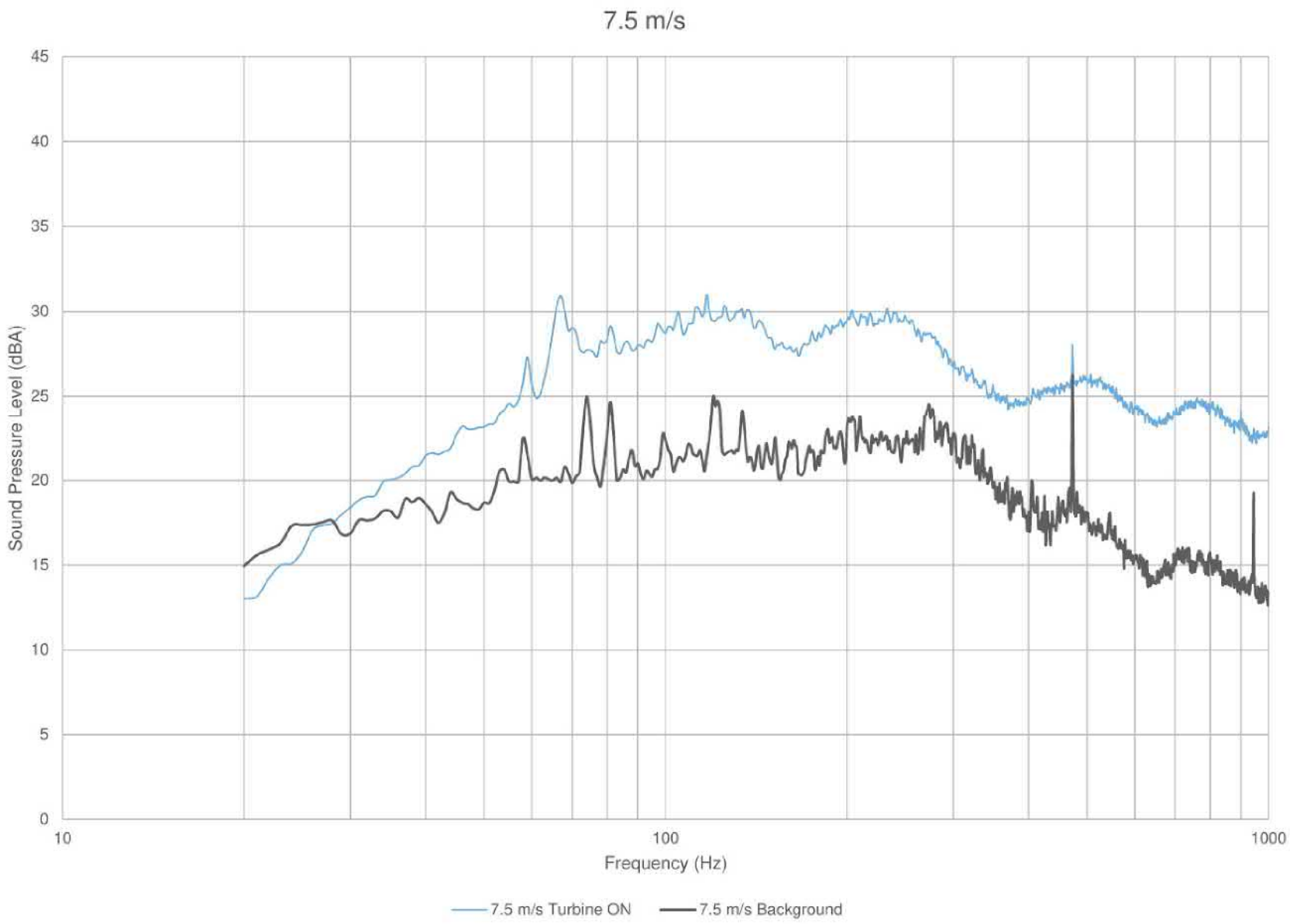
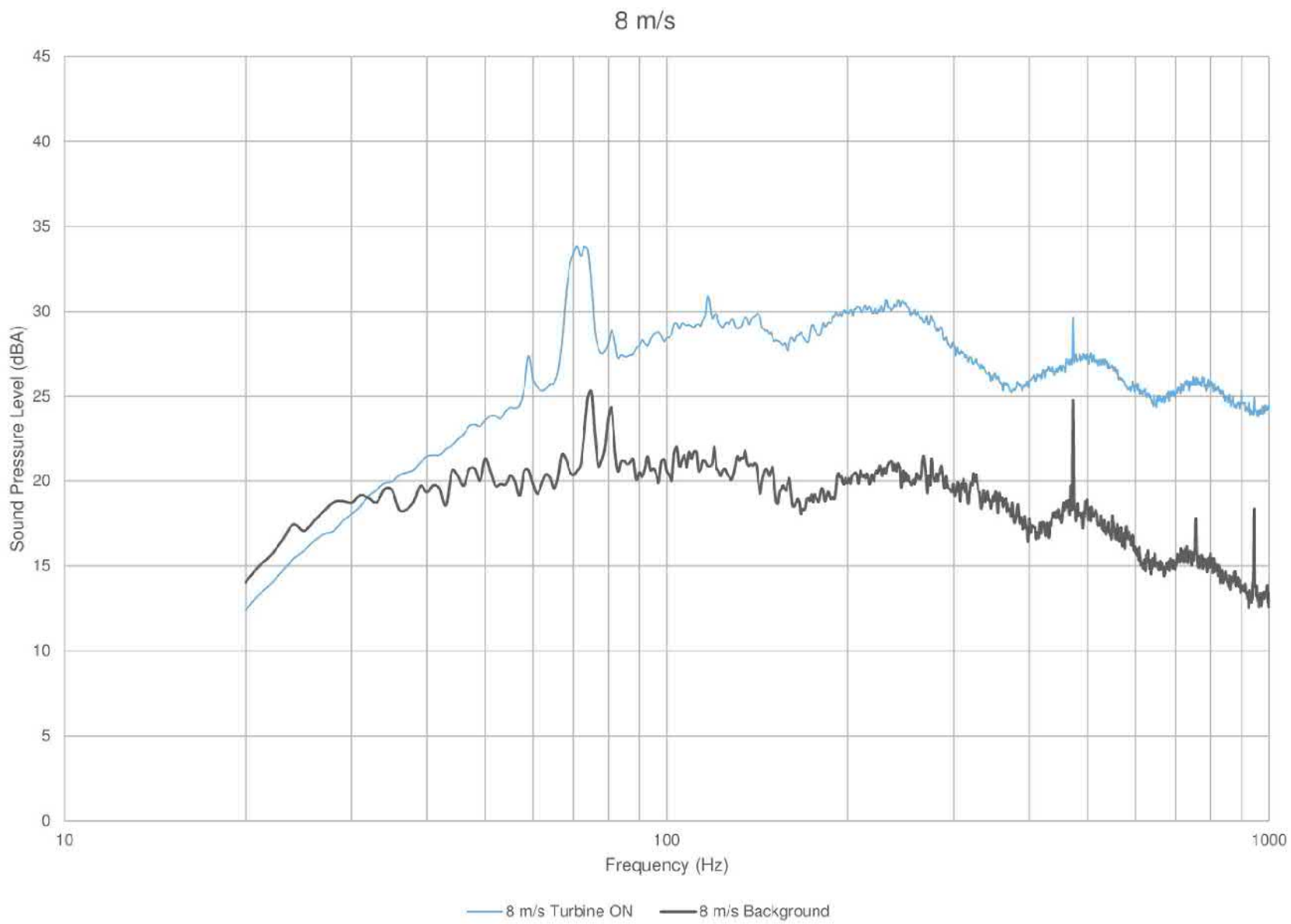
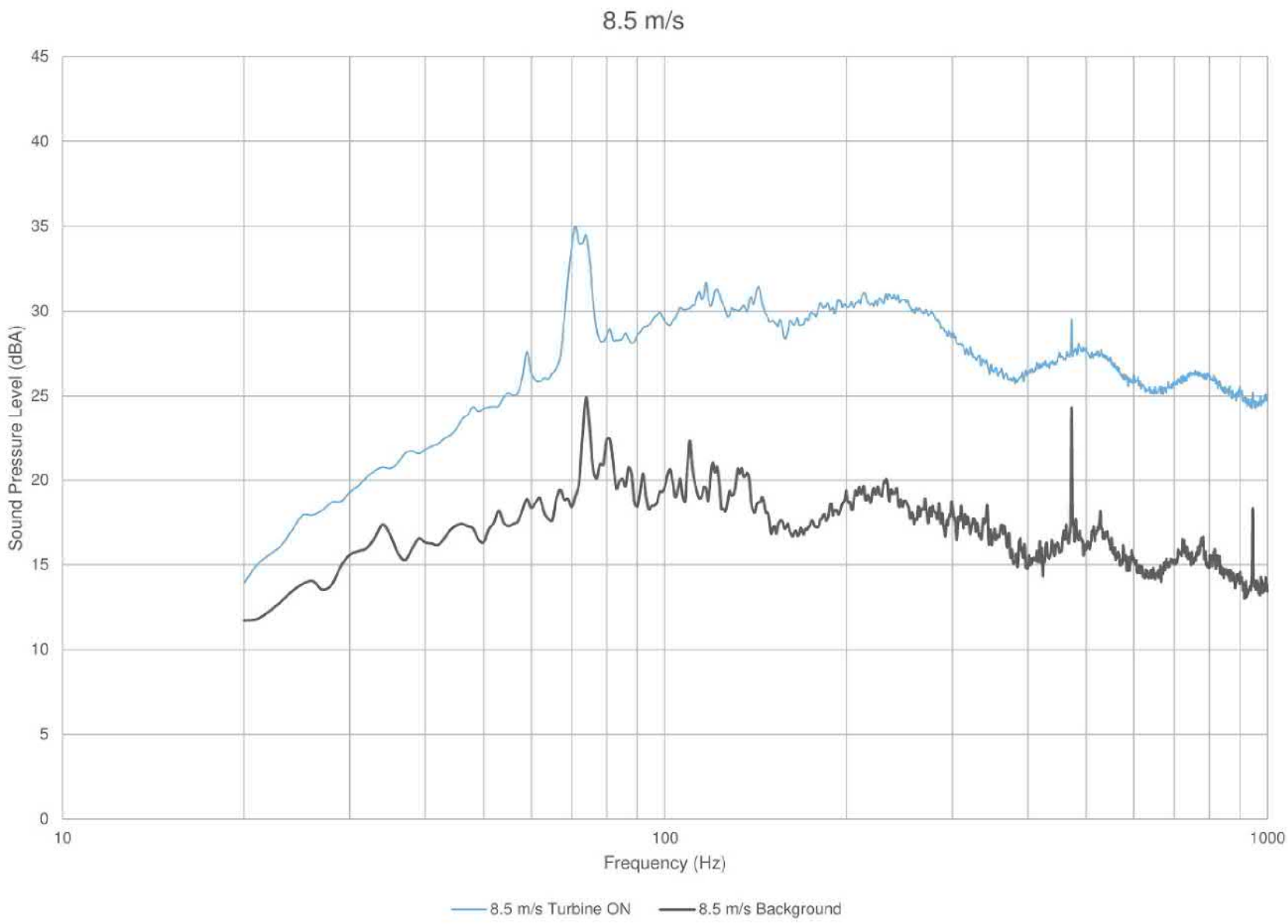
Appendix D
Tonality Assessment



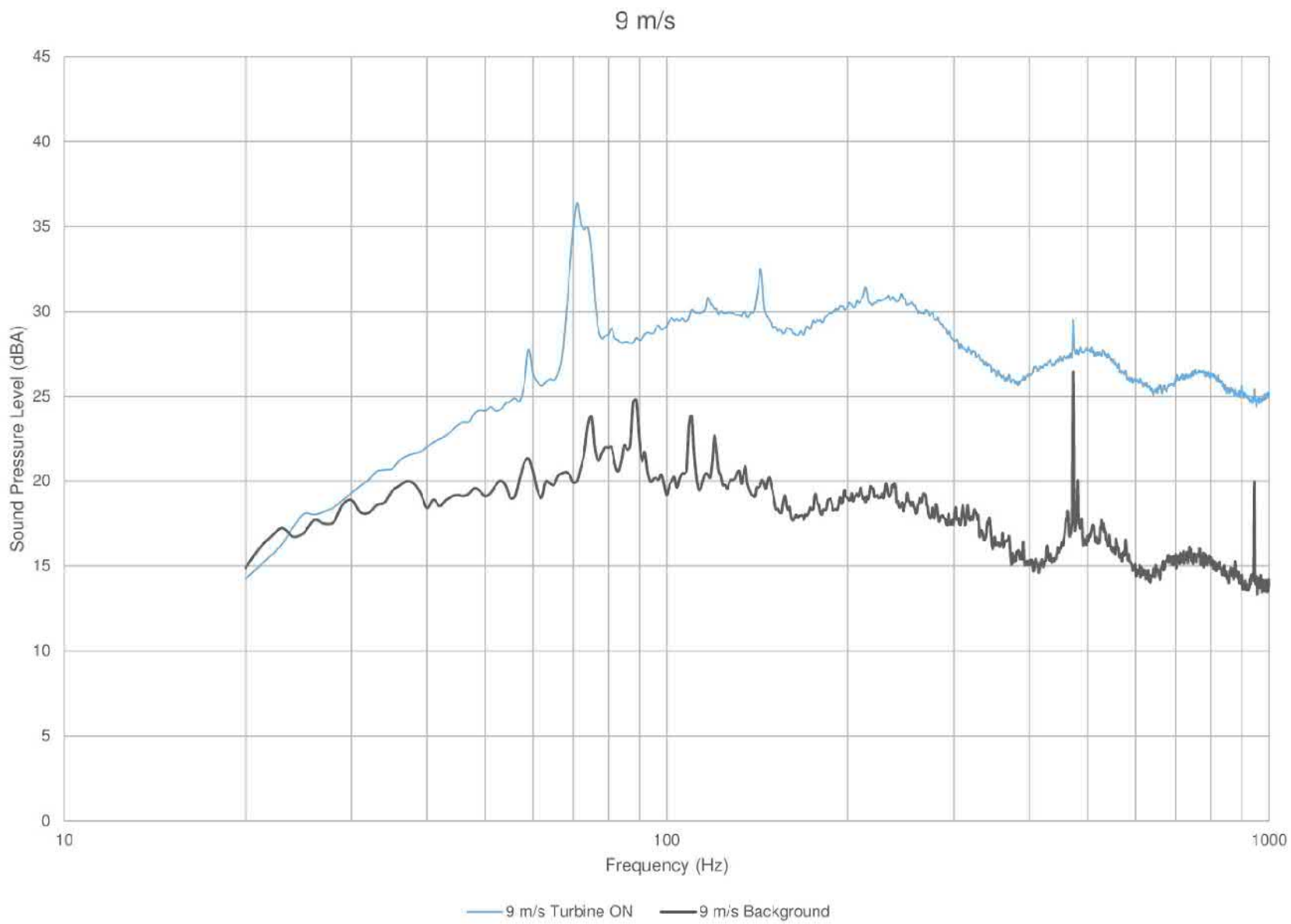
aercoustics	17095.01.T53.RP1	**Project Name**
	Scale: NTS Drawn by: AED Reviewed by: MAD Date: Nov 2018 Revision: 1	Belle River Wind Power Project - IEC 61400-11 Edition 3.0 - Turbine T53
		Figure Title Plot of narrow band spectra - Turbine ON vs. Background at 7.5 m/s
		Figure D.01



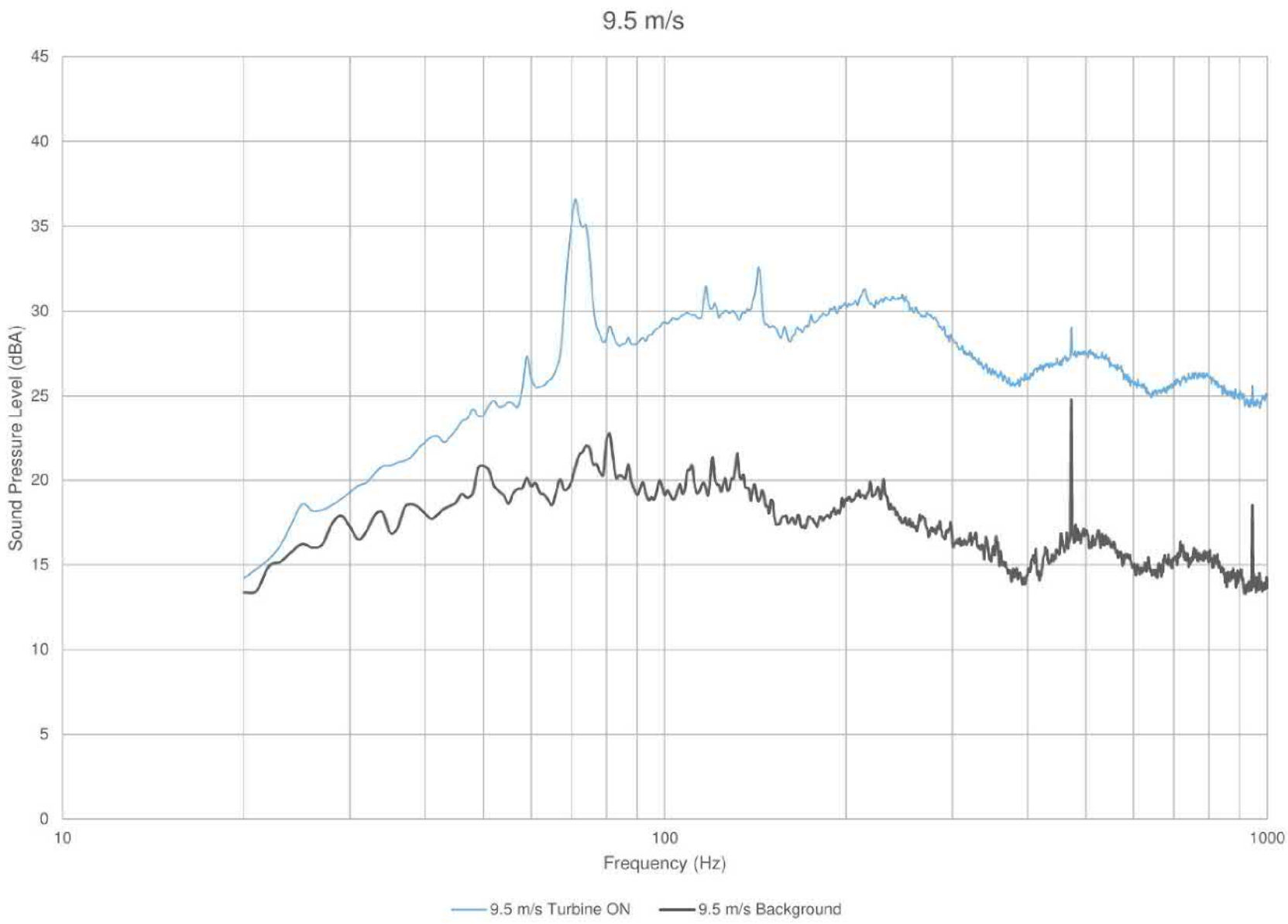
aercoustics	17095.01.T53.RP1	**Project Name**	
	Scale: NTS Drawn by: AED Reviewed by: MAD Date: Nov 2018 Revision: 1	Belle River Wind Power Project - IEC 61400-11 Edition 3.0 - Turbine T53	
		Figure Title Plot of narrow band spectra - Turbine ON vs. Background at 8 m/s	**Figure D.02**



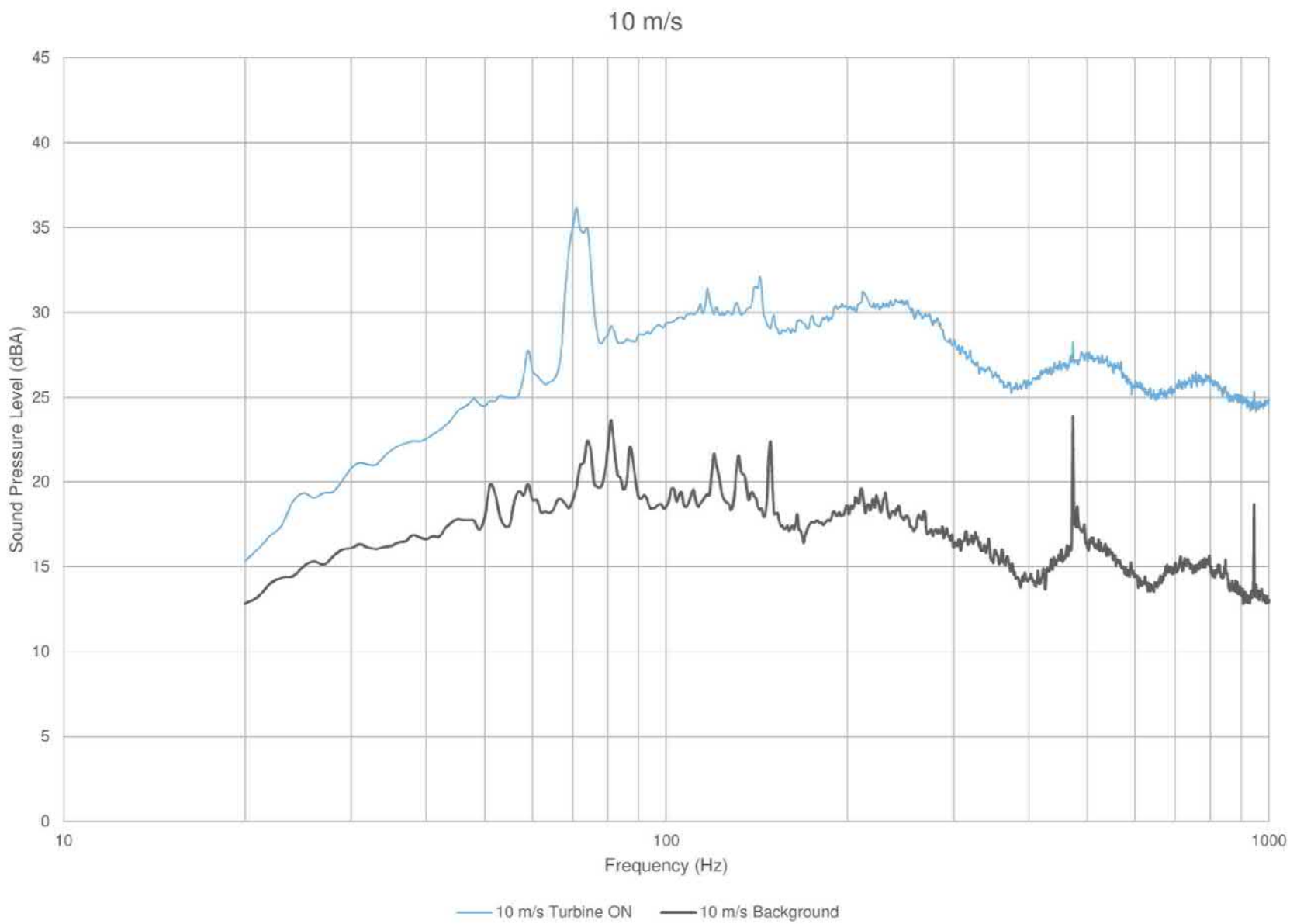
aercoustics	17095.01.T53.RP1	**Project Name**	
	Scale: NTS Drawn by: AED Reviewed by: MAD Date: Nov 2018 Revision: 1	Belle River Wind Power Project - IEC 61400-11 Edition 3.0 - Turbine T53	
		Figure Title Plot of narrow band spectra - Turbine ON vs. Background at 8.5 m/s	**Figure D.03**



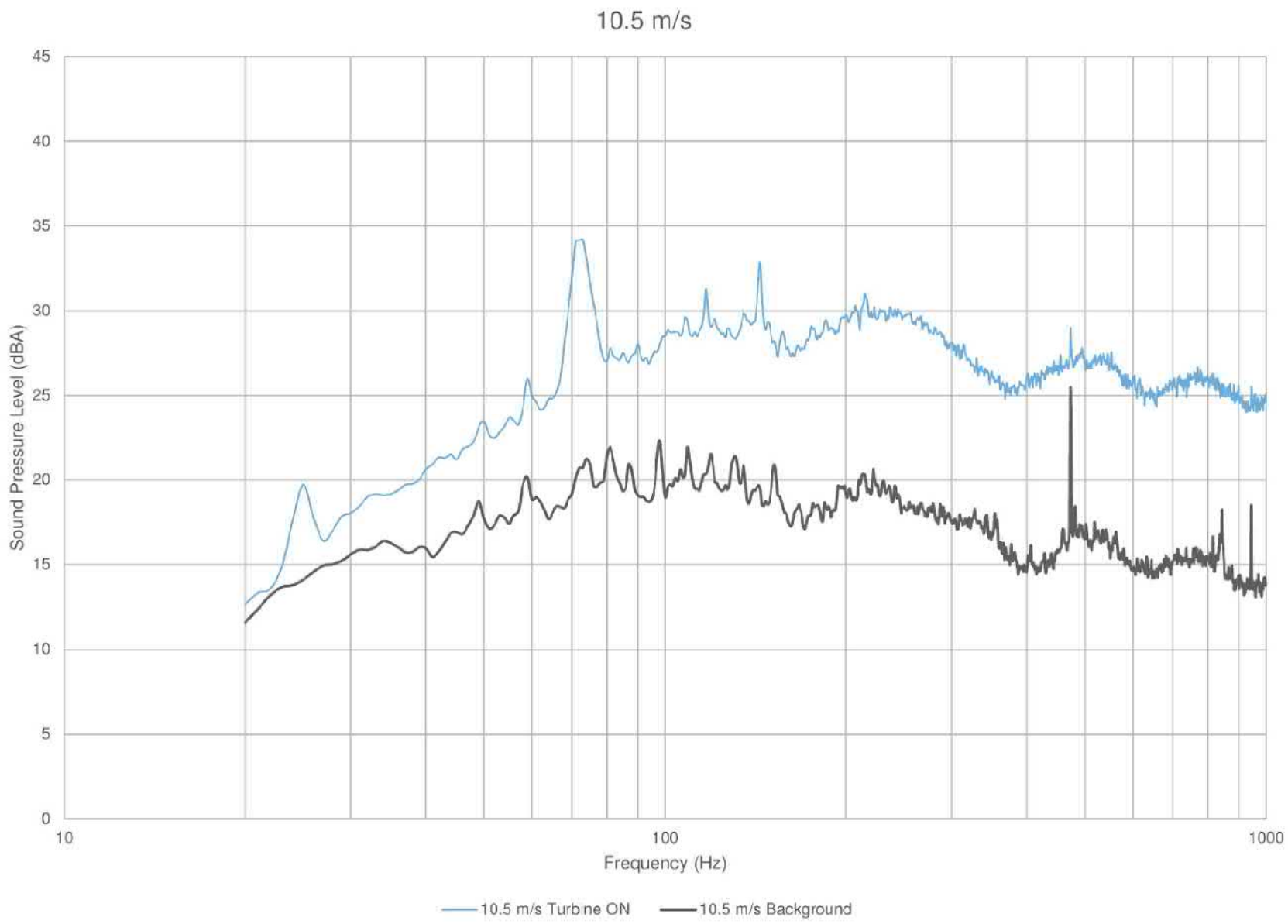
aercoustics	17095.01.T53.RP1	**Project Name**	
	Scale: NTS Drawn by: AED Reviewed by: MAD Date: Nov 2018 Revision: 1	Belle River Wind Power Project - IEC 61400-11 Edition 3.0 - Turbine T53	
		Figure Title Plot of narrow band spectra - Turbine ON vs. Background at 9 m/s	**Figure D.04**



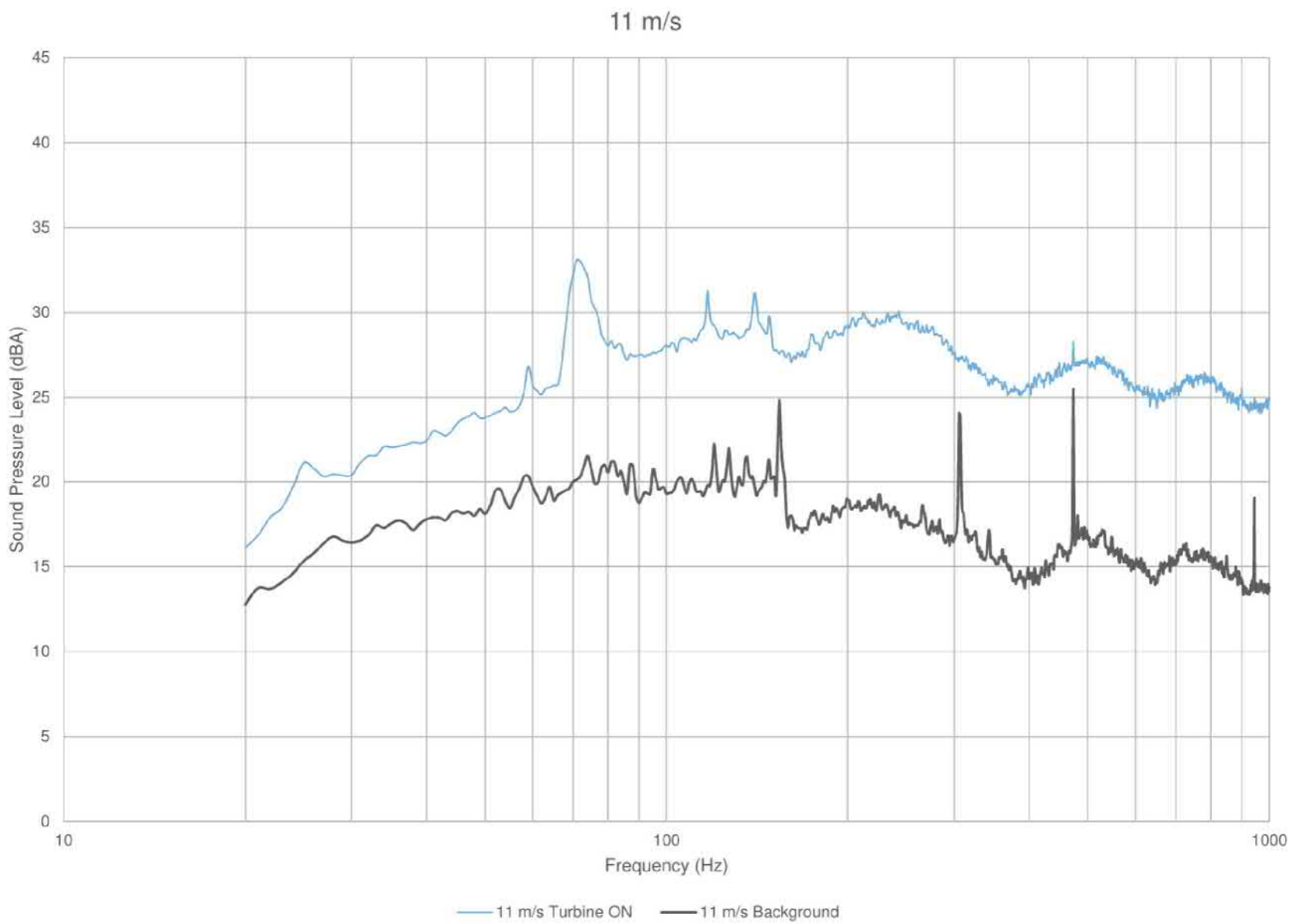
aercoustics	17095.01.T53.RP1	**Project Name**
	Scale: NTS Drawn by: AED Reviewed by: MAD Date: Nov 2018 Revision: 1	Belle River Wind Power Project - IEC 61400-11 Edition 3.0 - Turbine T53
		Figure Title Plot of narrow band spectra - Turbine ON vs. Background at 9.5 m/s
		Figure D.05



aercoustics	17095.01.T53.RP1	**Project Name**	
	Scale: NTS Drawn by: AED Reviewed by: MAD Date: Nov 2018 Revision: 1	Belle River Wind Power Project - IEC 61400-11 Edition 3.0 - Turbine T53	
		Figure Title Plot of narrow band spectra - Turbine ON vs. Background at 10 m/s	**Figure D.06**



aercoustics	17095.01.T53.RP1	**Project Name**	
	Scale: NTS Drawn by: AED Reviewed by: MAD Date: Nov 2018 Revision: 1	Belle River Wind Power Project - IEC 61400-11 Edition 3.0 - Turbine T53	
		Figure Title Plot of narrow band spectra - Turbine ON vs. Background at 10.5 m/s	**Figure D.07**



aercoustics	17095.01.T53.RP1	**Project Name**	
	Scale: NTS Drawn by: AED Reviewed by: MAD Date: Nov 2018 Revision: 1	Belle River Wind Power Project - IEC 61400-11 Edition 3.0 - Turbine T53	
		Figure Title Plot of narrow band spectra - Turbine ON vs. Background at 11 m/s	**Figure D.08**

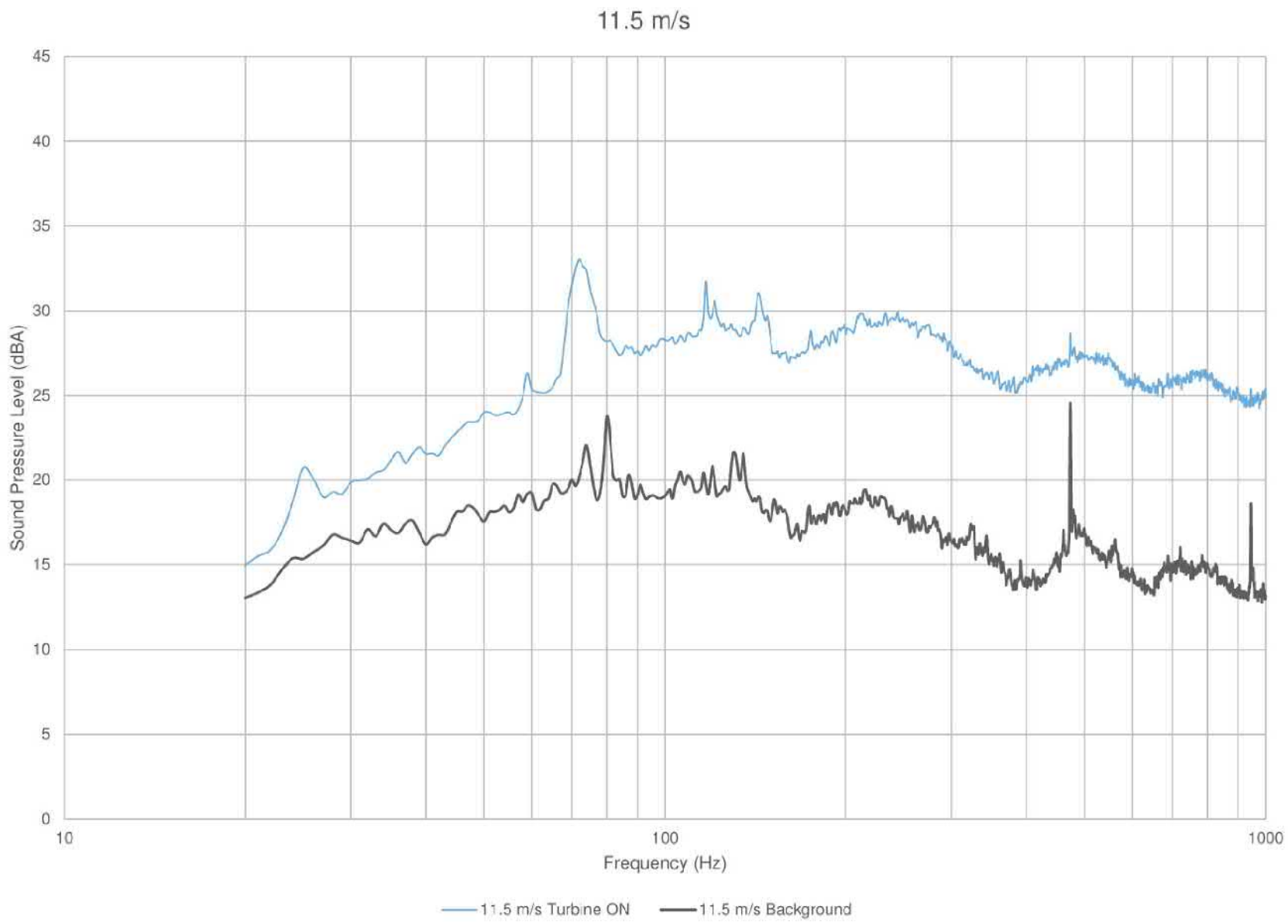


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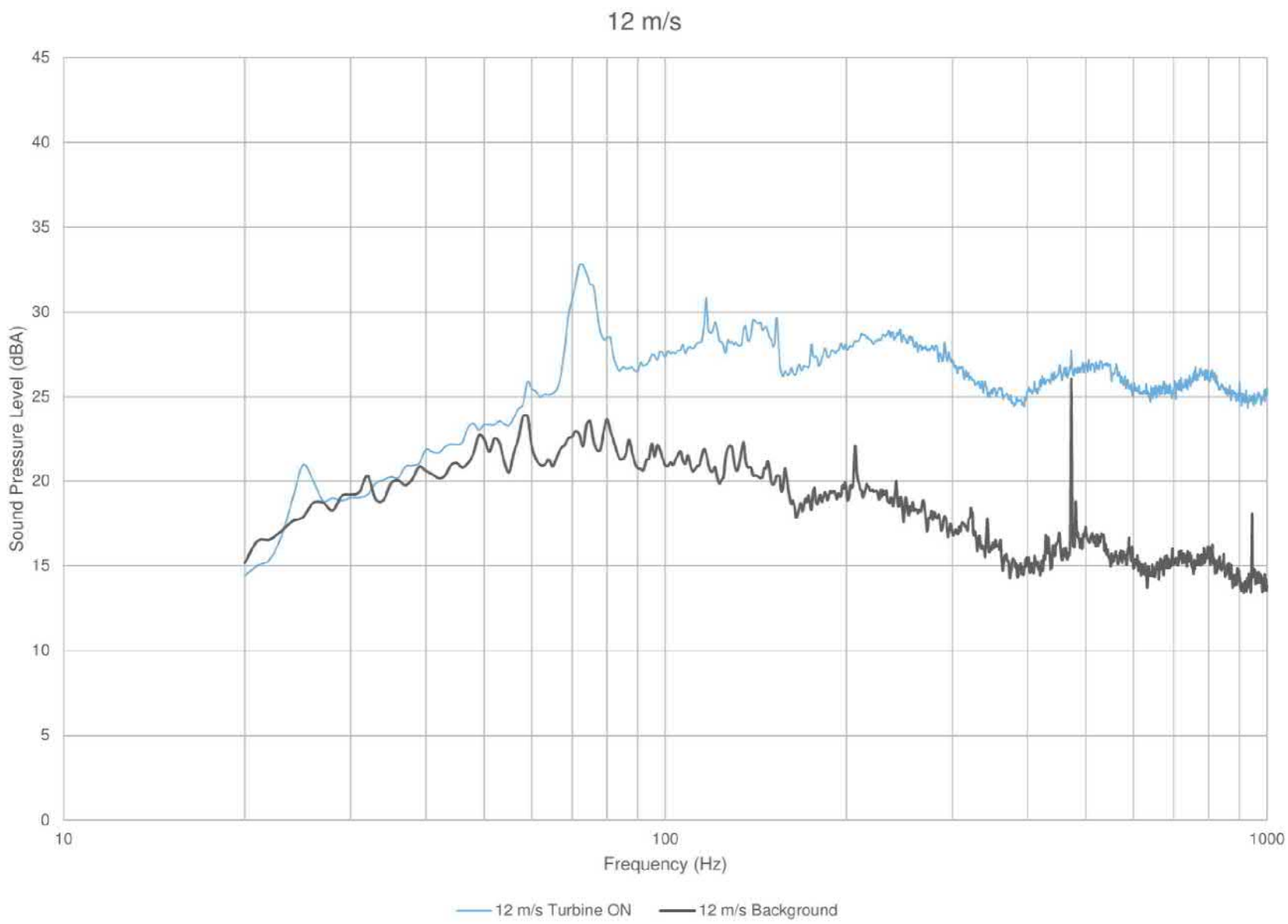
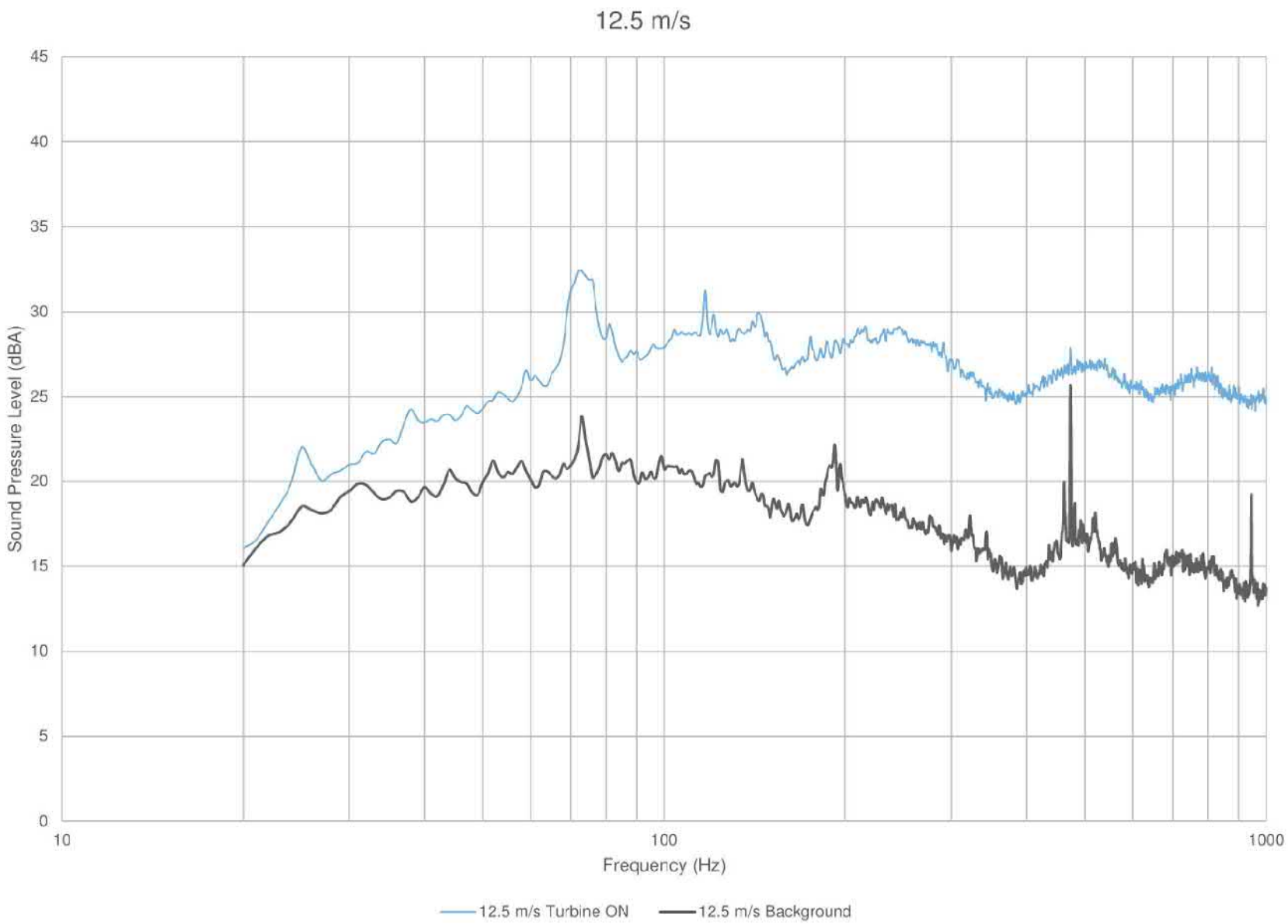
		Figure Title Plot of narrow band spectra - Turbine ON vs. Background at 11.5 m/s	**Figure D.09**



aercoustics	17095.01.T53.RP1	**Project Name**	
	Scale: NTS Drawn by: AED Reviewed by: MAD Date: Nov 2018 Revision: 1	Belle River Wind Power Project - IEC 61400-11 Edition 3.0 - Turbine T53	
		Figure Title Plot of narrow band spectra - Turbine ON vs. Background at 12 m/s	**Figure D.10**



aercoustics	17095.01.T53.RP1	**Project Name**	
	Scale: NTS Drawn by: AED Reviewed by: MAD Date: Nov 2018 Revision: 1	Belle River Wind Power Project - IEC 61400-11 Edition 3.0 - Turbine T53	
		Figure Title Plot of narrow band spectra - Turbine ON vs. Background at 12.5 m/s	**Figure D.11**

Table D.01 Tonality Assessment Table - 7.5 m/s

Project: Belle River Wind Power Project - Turbine T53 - IEC 61400-11 Measurement

Report ID: 17095.01.T53.RP2

Created on: 2019-05-21

Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
No Reportable Tones							

Table D.02 Tonality Assessment Table - 8 m/s

Project: Belle River Wind Power Project - Turbine T53 - IEC 61400-11 Measurement

Report ID: 17095.01.T53.RP2

Created on: 2019-05-21

Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
145	68	24.7	42.9	35.4	-7.6	-2.0	-5.6
420	69	26.2	44.4	40.3	-4.1	-2.0	-2.1
267	69	24.2	42.5	39.0	-3.4	-2.0	-1.4
386	69	25.4	43.7	37.7	-6.0	-2.0	-4.0
215	69	26.9	45.2	36.7	-8.5	-2.0	-6.5
387	69	24.6	42.9	39.4	-3.4	-2.0	-1.4
305	70	25.1	43.4	39.2	-4.1	-2.0	-2.1
271	71	24.0	42.3	40.5	-1.8	-2.0	0.2
273	71	25.9	44.1	42.2	-1.9	-2.0	0.1
272	71	25.5	43.8	42.3	-1.5	-2.0	0.5
159	71	26.6	44.9	40.8	-4.1	-2.0	-2.1
266	71	26.8	45.0	41.4	-3.6	-2.0	-1.6
160	71	26.1	44.4	40.7	-3.7	-2.0	-1.7
216	71	25.8	44.0	41.4	-2.7	-2.0	-0.6
147	71	26.3	44.6	40.6	-4.0	-2.0	-1.9
214	71	27.7	45.9	42.1	-3.9	-2.0	-1.9
150	71	26.7	44.9	41.6	-3.3	-2.0	-1.3
312	71	26.4	44.6	40.5	-4.1	-2.0	-2.1
383	71	25.4	43.6	41.0	-2.7	-2.0	-0.7
419	71	27.3	45.5	41.6	-4.0	-2.0	-2.0
385	72	25.5	43.8	41.0	-2.7	-2.0	-0.7
217	72	27.2	45.4	39.3	-6.1	-2.0	-4.1
285	73	26.4	44.7	40.9	-3.8	-2.0	-1.8
187	73	27.9	46.2	33.9	-12.2	-2.0	-10.2
178	73	26.4	44.6	35.8	-8.8	-2.0	-6.8
309	73	26.7	45.0	39.9	-5.0	-2.0	-3.0
108	73	27.2	45.5	37.6	-7.9	-2.0	-5.9
143	73	28.4	46.7	36.6	-10.0	-2.0	-8.0
307	73	27.9	46.2	35.7	-10.4	-2.0	-8.4
94	73	27.4	45.6	38.9	-6.7	-2.0	-4.7
155	73	27.9	46.2	41.4	-4.7	-2.0	-2.7
158	73	24.9	43.1	36.2	-7.0	-2.0	-4.9
162	74	28.3	46.5	38.7	-7.8	-2.0	-5.8
161	74	25.3	43.6	37.9	-5.7	-2.0	-3.7
149	74	27.9	46.2	41.7	-4.5	-2.0	-2.5
213	74	27.6	45.9	36.2	-9.6	-2.0	-7.6
142	74	26.1	44.4	37.6	-6.7	-2.0	-4.7
388	74	25.0	43.2	40.6	-2.6	-2.0	-0.6
Average	72				-4.6	-2.0	-2.6

Table D.03 Tonality Assessment Table - 8.5 m/s

Project: Belle River Wind Power Project - Turbine T53 - IEC 61400-11 Measurement

Report ID: 17095.01.T53.RP2

Created on: 2019-05-21

Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
375	70	26.0	44.2	38.8	-5.4	-2.0	-3.4
438	70	27.9	46.1	37.5	-8.7	-2.0	-6.7
304	70	26.2	44.5	39.8	-4.6	-2.0	-2.6
382	70	25.6	43.9	39.8	-4.1	-2.0	-2.1
370	71	27.0	45.3	39.8	-5.4	-2.0	-3.4
417	71	26.9	45.1	40.5	-4.6	-2.0	-2.6
299	71	25.1	43.3	38.8	-4.6	-2.0	-2.5
96	71	25.0	43.2	41.2	-2.0	-2.0	0.0
126	71	26.0	44.3	40.7	-3.6	-2.0	-1.6
70	71	26.1	44.3	39.5	-4.8	-2.0	-2.8
376	71	25.4	43.6	40.2	-3.4	-2.0	-1.4
151	71	27.0	45.3	40.6	-4.6	-2.0	-2.6
125	71	27.4	45.7	35.8	-9.9	-2.0	-7.9
41	71	26.1	44.3	40.7	-3.7	-2.0	-1.7
290	71	28.0	46.3	36.7	-9.6	-2.0	-7.6
97	71	27.9	46.2	39.9	-6.2	-2.0	-4.2
454	71	29.1	47.4	40.2	-7.1	-2.0	-5.1
99	71	25.3	43.6	40.2	-3.4	-2.0	-1.4
274	71	26.2	44.5	38.3	-6.2	-2.0	-4.2
308	71	27.4	45.6	40.2	-5.4	-2.0	-3.4
381	71	24.7	43.0	40.7	-2.3	-2.0	-0.3
284	71	25.8	44.1	41.3	-2.8	-2.0	-0.8
418	71	24.5	42.8	41.6	-1.2	-2.0	0.9
289	71	27.5	45.7	33.9	-11.8	-2.0	-9.8
455	71	28.7	46.9	36.4	-10.5	-2.0	-8.5
384	71	25.3	43.6	39.2	-4.4	-2.0	-2.4
283	71	24.9	43.1	40.4	-2.7	-2.0	-0.7
68	71	26.8	45.0	37.0	-8.1	-2.0	-6.1
148	71	26.2	44.5	41.3	-3.2	-2.0	-1.2
95	71	26.1	44.3	41.1	-3.3	-2.0	-1.3
264	71	25.0	43.2	41.5	-1.7	-2.0	0.3
191	71	24.1	42.4	40.2	-2.2	-2.0	-0.2
364	72	27.7	45.9	38.7	-7.2	-2.0	-5.2
416	72	26.7	45.0	40.8	-4.2	-2.0	-2.2
310	72	26.9	45.1	39.5	-5.7	-2.0	-3.7
363	72	27.4	45.6	37.0	-8.6	-2.0	-6.6
265	72	24.5	42.7	40.4	-2.4	-2.0	-0.4
392	73	25.0	43.2	39.5	-3.7	-2.0	-1.7
311	73	28.3	46.6	41.1	-5.5	-2.0	-3.5
40	74	26.5	44.7	39.7	-5.1	-2.0	-3.1
186	74	30.1	48.4	37.8	-10.6	-2.0	-8.6
203	74	26.8	45.0	40.8	-4.2	-2.0	-2.2
282	74	25.1	43.4	39.2	-4.2	-2.0	-2.2
117	74	26.9	45.1	38.1	-7.1	-2.0	-5.1
154	74	26.1	44.4	40.7	-3.7	-2.0	-1.7
69	74	26.0	44.2	39.5	-4.7	-2.0	-2.7
101	74	26.9	45.2	40.7	-4.5	-2.0	-2.5
153	74	25.1	43.4	40.6	-2.8	-2.0	-0.8
50	74	27.0	45.3	39.8	-5.5	-2.0	-3.5
139	74	25.7	43.9	40.3	-3.7	-2.0	-1.7
185	74	25.9	44.1	38.7	-5.5	-2.0	-3.5
107	74	28.1	46.4	36.9	-9.5	-2.0	-7.5
100	74	28.3	46.6	39.2	-7.3	-2.0	-5.3

Table D.03 Tonality Assessment Table - 8.5 m/s

184	75	28.5	46.8	39.5	-7.3	-2.0	-5.3
Average	72				-4.7	-2.0	-2.7

Table D.04 Tonality Assessment Table - 9 m/s

Project: Belle River Wind Power Project - Turbine T53 - IEC 61400-11 Measurement

Report ID: 17095.01.T53.RP2

Created on: 2019-05-21

Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
281	69	25.1	43.3	36.9	-6.4	-2.0	-4.4
115	70	26.6	44.8	41.8	-3.0	-2.0	-1.0
545	70	26.3	44.6	41.9	-2.7	-2.0	-0.7
12	70	24.9	43.2	39.6	-3.5	-2.0	-1.5
135	70	27.8	46.1	41.9	-4.2	-2.0	-2.1
298	70	24.3	42.5	42.0	-0.5	-2.0	1.5
352	71	25.8	44.0	41.9	-2.1	-2.0	-0.1
103	71	26.0	44.3	41.1	-3.1	-2.0	-1.1
30	71	25.1	43.3	41.7	-1.6	-2.0	0.4
72	71	27.0	45.2	41.8	-3.4	-2.0	-1.4
301	71	24.6	42.8	40.5	-2.3	-2.0	-0.3
201	71	27.7	46.0	42.7	-3.3	-2.0	-1.3
414	71	26.6	44.8	42.0	-2.8	-2.0	-0.8
36	71	27.8	46.0	41.7	-4.3	-2.0	-2.3
205	71	25.5	43.8	41.1	-2.7	-2.0	-0.7
192	71	26.1	44.4	40.7	-3.7	-2.0	-1.7
37	71	23.9	42.1	42.2	0.1	-2.0	2.1
116	71	26.5	44.8	41.5	-3.2	-2.0	-1.2
35	71	30.7	48.9	36.8	-12.1	-2.0	-10.1
14	71	28.0	46.3	40.2	-6.1	-2.0	-4.1
76	71	27.9	46.2	42.1	-4.0	-2.0	-2.0
71	71	25.8	44.1	41.5	-2.5	-2.0	-0.5
65	71	27.5	45.7	42.5	-3.2	-2.0	-1.2
85	71	27.5	45.8	42.0	-3.7	-2.0	-1.7
60	71	29.7	47.9	41.0	-6.9	-2.0	-4.9
47	71	25.1	43.3	41.3	-2.0	-2.0	0.0
39	71	28.6	46.9	43.1	-3.8	-2.0	-1.8
53	71	25.2	43.4	42.2	-1.3	-2.0	0.7
43	71	29.3	47.5	44.1	-3.4	-2.0	-1.4
63	71	27.1	45.4	42.3	-3.1	-2.0	-1.1
64	71	26.9	45.2	42.4	-2.7	-2.0	-0.7
58	71	26.3	44.6	41.8	-2.8	-2.0	-0.8
52	71	24.5	42.7	41.3	-1.4	-2.0	0.6
48	71	26.3	44.6	42.4	-2.2	-2.0	-0.2
13	71	27.9	46.1	42.2	-3.9	-2.0	-1.9
15	71	27.8	46.0	42.5	-3.6	-2.0	-1.6
204	71	25.8	44.0	40.8	-3.3	-2.0	-1.3
45	71	25.8	44.1	41.3	-2.8	-2.0	-0.8
137	71	29.0	47.3	42.5	-4.8	-2.0	-2.8
31	71	26.4	44.6	42.8	-1.8	-2.0	0.2
294	71	27.6	45.8	40.8	-5.0	-2.0	-3.0
46	71	25.6	43.9	40.5	-3.3	-2.0	-1.3
51	71	25.5	43.7	40.9	-2.8	-2.0	-0.8
38	71	27.4	45.6	41.2	-4.4	-2.0	-2.4
73	71	27.0	45.2	41.4	-3.8	-2.0	-1.8
84	71	27.5	45.7	40.7	-5.0	-2.0	-3.0
295	71	26.2	44.4	41.1	-3.4	-2.0	-1.4
102	71	25.8	44.0	39.7	-4.3	-2.0	-2.3
77	71	28.2	46.4	35.2	-11.2	-2.0	-9.2
380	71	25.9	44.2	41.0	-3.2	-2.0	-1.2
300	71	25.1	43.4	39.4	-4.0	-2.0	-2.0
127	71	25.0	43.3	40.2	-3.0	-2.0	-1.0
42	71	26.4	44.7	41.8	-2.8	-2.0	-0.8

Table D.04 Tonality Assessment Table - 9 m/s

293	71	27.0	45.3	41.1	-4.2	-2.0	-2.2
439	71	26.9	45.1	39.7	-5.4	-2.0	-3.4
415	71	25.7	44.0	39.4	-4.6	-2.0	-2.6
61	71	26.2	44.5	41.5	-3.0	-2.0	-1.0
362	71	26.9	45.2	40.4	-4.8	-2.0	-2.8
369	71	26.2	44.4	39.9	-4.5	-2.0	-2.5
83	71	28.2	46.5	40.4	-6.1	-2.0	-4.1
62	71	25.9	44.2	42.0	-2.1	-2.0	-0.1
371	71	25.9	44.2	39.9	-4.3	-2.0	-2.3
377	72	25.2	43.5	42.3	-1.2	-2.0	0.8
59	72	28.7	47.0	40.6	-6.4	-2.0	-4.4
313	72	28.0	46.2	38.3	-7.9	-2.0	-5.9
396	72	26.7	45.0	42.0	-3.0	-2.0	-1.0
365	72	26.4	44.7	40.2	-4.5	-2.0	-2.5
303	72	26.1	44.3	41.1	-3.2	-2.0	-1.2
78	72	29.4	47.6	37.8	-9.8	-2.0	-7.8
292	72	25.7	43.9	40.6	-3.3	-2.0	-1.3
26	73	29.1	47.4	42.8	-4.6	-2.0	-2.6
544	73	27.2	45.4	41.4	-4.0	-2.0	-2.0
395	73	25.6	43.9	41.3	-2.6	-2.0	-0.6
114	73	25.7	44.0	41.2	-2.8	-2.0	-0.8
67	74	26.3	44.6	37.8	-6.8	-2.0	-4.8
152	74	26.5	44.7	39.8	-4.9	-2.0	-2.9
136	74	28.8	47.0	39.5	-7.5	-2.0	-5.5
138	74	28.4	46.6	37.6	-9.0	-2.0	-7.0
57	74	25.2	43.5	41.9	-1.5	-2.0	0.5
89	74	27.8	46.1	37.3	-8.8	-2.0	-6.8
49	74	26.5	44.7	40.2	-4.6	-2.0	-2.6
105	74	28.3	46.6	42.7	-3.9	-2.0	-1.9
140	74	28.4	46.6	41.5	-5.1	-2.0	-3.1
141	74	26.4	44.7	40.7	-4.0	-2.0	-2.0
81	74	29.4	47.7	41.6	-6.1	-2.0	-4.1
106	74	26.8	45.0	41.6	-3.4	-2.0	-1.4
456	74	28.0	46.2	39.2	-7.0	-2.0	-5.0
113	75	25.5	43.7	39.8	-3.9	-2.0	-1.9
Average	72				-3.7	-2.0	-1.7

Table D.05 Tonality Assessment Table - 9.5 m/s

Project: Belle River Wind Power Project - Turbine T53 - IEC 61400-11 Measurement

Report ID: 17095.01.T53.RP2

Created on: 2019-05-21

Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
502	68	27.7	45.9	34.1	-11.8	-2.0	-9.8
394	69	25.6	43.8	39.6	-4.3	-2.0	-2.3
579	69	26.3	44.6	37.6	-6.9	-2.0	-4.9
350	70	25.9	44.1	39.8	-4.3	-2.0	-2.3
409	70	26.5	44.7	38.1	-6.6	-2.0	-4.6
339	70	27.6	45.8	36.6	-9.2	-2.0	-7.2
374	70	26.2	44.4	39.3	-5.1	-2.0	-3.1
11	70	26.5	44.7	39.5	-5.2	-2.0	-3.2
19	70	26.8	45.0	41.8	-3.2	-2.0	-1.2
27	71	26.3	44.5	41.8	-2.7	-2.0	-0.7
29	71	27.1	45.4	42.2	-3.2	-2.0	-1.2
337	71	27.1	45.3	42.5	-2.9	-2.0	-0.9
32	71	25.8	44.0	42.3	-1.7	-2.0	0.3
194	71	28.2	46.4	42.8	-3.6	-2.0	-1.6
86	71	27.6	45.9	45.5	-0.4	-2.0	1.6
16	71	24.5	42.8	42.3	-0.5	-2.0	1.5
361	71	26.2	44.4	41.3	-3.1	-2.0	-1.1
367	71	26.9	45.1	42.1	-3.0	-2.0	-1.0
28	71	26.4	44.6	43.3	-1.3	-2.0	0.7
549	71	27.1	45.3	40.9	-4.4	-2.0	-2.4
1	71	25.8	44.0	42.2	-1.8	-2.0	0.2
17	71	25.0	43.2	42.5	-0.7	-2.0	1.3
87	71	26.6	44.8	42.2	-2.6	-2.0	-0.6
220	71	26.0	44.3	41.0	-3.2	-2.0	-1.2
336	71	26.2	44.5	41.5	-3.0	-2.0	-1.0
3	71	28.5	46.8	44.0	-2.7	-2.0	-0.7
21	71	25.9	44.2	41.9	-2.3	-2.0	-0.3
351	71	26.2	44.5	41.9	-2.6	-2.0	-0.6
335	71	26.1	44.3	40.4	-4.0	-2.0	-2.0
297	71	25.1	43.3	42.9	-0.5	-2.0	1.5
275	71	27.1	45.4	40.2	-5.2	-2.0	-3.2
379	71	26.2	44.5	40.9	-3.6	-2.0	-1.6
128	71	25.3	43.6	41.5	-2.1	-2.0	-0.1
368	71	26.5	44.7	42.2	-2.5	-2.0	-0.5
79	71	30.8	49.1	43.9	-5.2	-2.0	-3.2
193	71	25.7	43.9	41.6	-2.4	-2.0	-0.4
302	71	26.1	44.4	40.3	-4.0	-2.0	-2.0
120	71	25.3	43.6	41.2	-2.4	-2.0	-0.4
340	71	27.9	46.1	41.8	-4.3	-2.0	-2.3
20	71	25.8	44.1	41.9	-2.2	-2.0	-0.2
44	71	28.6	46.9	40.2	-6.7	-2.0	-4.7
33	71	28.6	46.8	41.1	-5.7	-2.0	-3.7
296	71	25.9	44.2	41.8	-2.3	-2.0	-0.3
54	72	26.9	45.1	41.9	-3.2	-2.0	-1.2
546	72	28.3	46.6	41.4	-5.1	-2.0	-3.1
372	72	25.4	43.7	41.3	-2.4	-2.0	-0.4
366	72	25.9	44.2	41.4	-2.7	-2.0	-0.7
104	72	26.9	45.2	41.8	-3.4	-2.0	-1.4
393	72	24.9	43.1	40.3	-2.8	-2.0	-0.8
80	73	27.0	45.3	42.2	-3.1	-2.0	-1.1
582	74	27.3	45.5	42.8	-2.7	-2.0	-0.7
397	74	26.8	45.1	40.2	-4.9	-2.0	-2.9
134	74	26.6	44.9	40.4	-4.4	-2.0	-2.4

Table D.05 Tonality Assessment Table - 9.5 m/s

Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
122	74	28.0	46.2	39.9	-6.3	-2.0	-4.3
410	74	26.5	44.7	41.8	-2.9	-2.0	-0.9
581	74	26.4	44.7	42.7	-2.0	-2.0	0.0
436	74	26.3	44.5	41.5	-3.0	-2.0	-1.0
121	74	27.6	45.8	40.8	-5.0	-2.0	-3.0
88	74	27.1	45.4	42.2	-3.2	-2.0	-1.2
580	74	28.2	46.4	42.7	-3.7	-2.0	-1.7
437	74	27.3	45.6	42.5	-3.1	-2.0	-1.1
Average	71				-3.2	-2.0	-1.2

Table D.06 Tonality Assessment Table - 10 m/s

Project: Belle River Wind Power Project - Turbine T53 - IEC 61400-11 Measurement

Report ID: 17095.01.T53.RP2

Created on: 2019-05-21

Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
559	68	26.4	44.6	35.8	-8.8	-2.0	-6.8
543	69	26.5	44.7	36.6	-8.2	-2.0	-6.2
452	69	29.1	47.4	38.7	-8.7	-2.0	-6.7
447	69	28.2	46.4	39.4	-7.0	-2.0	-5.0
565	69	25.9	44.1	38.0	-6.1	-2.0	-4.1
278	69	26.8	45.0	41.7	-3.3	-2.0	-1.3
567	70	26.6	44.9	36.7	-8.2	-2.0	-6.2
484	70	27.5	45.8	38.6	-7.2	-2.0	-5.2
22	71	26.7	45.0	43.2	-1.8	-2.0	0.2
18	71	28.7	46.9	41.8	-5.2	-2.0	-3.2
195	71	27.6	45.9	41.7	-4.2	-2.0	-2.2
338	71	26.6	44.9	42.8	-2.0	-2.0	0.0
23	71	29.2	47.4	40.5	-7.0	-2.0	-5.0
129	71	24.8	43.0	42.4	-0.7	-2.0	1.3
353	71	24.5	42.7	42.5	-0.3	-2.0	1.7
276	71	26.2	44.5	41.9	-2.5	-2.0	-0.5
550	71	28.0	46.2	42.3	-3.9	-2.0	-1.9
24	71	25.7	44.0	41.8	-2.2	-2.0	-0.2
359	71	26.8	45.1	41.0	-4.1	-2.0	-2.1
133	71	27.4	45.7	42.9	-2.7	-2.0	-0.7
55	71	26.3	44.6	42.4	-2.1	-2.0	-0.1
378	71	25.3	43.6	41.9	-1.7	-2.0	0.3
449	71	28.3	46.6	40.3	-6.2	-2.0	-4.2
360	71	25.8	44.0	40.7	-3.3	-2.0	-1.3
411	71	26.9	45.1	42.8	-2.3	-2.0	-0.3
398	71	27.0	45.3	41.8	-3.5	-2.0	-1.5
412	71	28.1	46.4	42.6	-3.8	-2.0	-1.8
2	71	27.3	45.6	40.6	-4.9	-2.0	-2.9
277	73	27.2	45.4	42.0	-3.4	-2.0	-1.4
199	74	26.5	44.8	40.0	-4.8	-2.0	-2.8
435	74	27.5	45.8	40.0	-5.8	-2.0	-3.8
56	74	26.6	44.8	40.9	-3.9	-2.0	-1.9
556	74	28.4	46.7	40.6	-6.1	-2.0	-4.1
221	74	27.1	45.4	41.9	-3.5	-2.0	-1.5
25	74	31.0	49.3	37.9	-11.4	-2.0	-9.4
440	75	27.6	45.9	41.1	-4.7	-2.0	-2.7
Average	71				-4.0	-2.0	-2.0

Table D.07 Tonality Assessment Table - 10.5 m/s

Project: Belle River Wind Power Project - Turbine T53 - IEC 61400-11 Measurement

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Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
510	68	22.6	40.8	34.6	-6.2	-2.0	-4.2
516	69	25.4	43.7	32.2	-11.5	-2.0	-9.5
130	71	26.1	44.3	40.9	-3.4	-2.0	-1.4
432	71	24.8	43.1	40.4	-2.6	-2.0	-0.6
279	71	26.5	44.7	41.1	-3.7	-2.0	-1.7
373	72	25.0	43.3	40.0	-3.2	-2.0	-1.2
399	72	24.7	43.0	37.5	-5.5	-2.0	-3.5
346	72	24.7	42.9	39.1	-3.8	-2.0	-1.8
349	72	25.7	44.0	38.9	-5.0	-2.0	-3.0
355	73	24.7	43.0	38.6	-4.4	-2.0	-2.4
564	73	24.8	43.1	37.4	-5.7	-2.0	-3.7
561	73	24.7	43.0	40.1	-2.9	-2.0	-0.9
560	73	27.9	46.1	41.3	-4.8	-2.0	-2.8
562	73	23.5	41.7	39.1	-2.6	-2.0	-0.6
584	74	27.4	45.7	38.3	-7.4	-2.0	-5.4
Average	72				-4.4	-2.0	-2.4

Table D.10 Tonality Assessment Table - 11 m/s

Project: Belle River Wind Power Project - Turbine T53 - IEC 61400-11 Measurement

Report ID: 17095.01.T53.RP2

Created on: 2019-05-21

Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
No Reportable Tones							

Table D.09 Tonality Assessment Table - 11.5 m/s

Project: Belle River Wind Power Project - Turbine T53 - IEC 61400-11 Measurement

Report ID: 17095.01.T53.RP2

Created on: 2019-05-21

Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
474	69	26.9	45.1	33.3	-11.8	-2.0	-9.8
599	70	23.8	42.0	35.7	-6.3	-2.0	-4.3
407	70	26.5	44.7	33.9	-10.8	-2.0	-8.8
538	71	25.6	43.9	39.3	-4.6	-2.0	-2.6
443	71	25.3	43.6	37.8	-5.8	-2.0	-3.8
500	71	25.5	43.7	37.3	-6.5	-2.0	-4.5
357	71	26.2	44.4	37.8	-6.6	-2.0	-4.6
356	72	24.0	42.3	39.7	-2.6	-2.0	-0.6
344	72	27.2	45.4	39.0	-6.5	-2.0	-4.5
322	72	24.4	42.6	39.7	-2.9	-2.0	-0.9
490	73	29.3	47.6	36.0	-11.5	-2.0	-9.5
314	73	28.1	46.4	38.2	-8.1	-2.0	-6.1
539	73	24.1	42.3	38.4	-3.9	-2.0	-1.9
431	74	24.8	43.1	39.9	-3.1	-2.0	-1.1
573	74	25.0	43.2	40.5	-2.8	-2.0	-0.7
430	74	24.6	42.8	39.6	-3.2	-2.0	-1.2
442	74	26.7	44.9	39.1	-5.8	-2.0	-3.8
609	74	27.1	45.4	36.7	-8.7	-2.0	-6.7
433	74	27.1	45.3	36.6	-8.7	-2.0	-6.7
572	75	23.5	41.7	39.1	-2.7	-2.0	-0.7
319	86	24.9	43.2	42.7	-0.5	-2.0	1.5
Average	73				-4.9	-2.0	-2.9

Table D.10 Tonality Assessment Table - 12 m/s

Project: Belle River Wind Power Project - Turbine T53 - IEC 61400-11 Measurement

Report ID: 17095.01.T53.RP2

Created on: 2019-05-21

Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
603	69	24.3	42.6	35.9	-6.7	-2.0	-4.7
558	70	25.7	44.0	35.4	-8.6	-2.0	-6.6
503	72	26.5	44.7	41.8	-2.9	-2.0	-0.9
511	72	25.3	43.5	37.6	-5.9	-2.0	-3.9
534	72	22.8	41.0	39.7	-1.3	-2.0	0.7
498	72	23.9	42.1	37.6	-4.6	-2.0	-2.6
445	72	27.0	45.3	36.8	-8.5	-2.0	-6.5
608	72	25.3	43.6	38.0	-5.6	-2.0	-3.6
571	72	22.2	40.4	39.5	-1.0	-2.0	1.0
587	73	24.3	42.5	40.6	-1.9	-2.0	0.1
506	73	24.7	43.0	41.4	-1.6	-2.0	0.4
497	73	25.7	43.9	39.7	-4.2	-2.0	-2.2
585	73	26.5	44.8	34.2	-10.6	-2.0	-8.6
600	73	24.6	42.8	40.1	-2.7	-2.0	-0.7
586	73	28.3	46.5	38.3	-8.3	-2.0	-6.3
316	73	26.8	45.0	33.2	-11.8	-2.0	-9.8
574	74	24.5	42.7	37.7	-5.0	-2.0	-3.0
406	74	25.4	43.6	39.3	-4.3	-2.0	-2.3
597	75	26.5	44.8	35.0	-9.8	-2.0	-7.8
458	76	27.2	45.5	38.2	-7.2	-2.0	-5.2
496	79	28.8	47.0	35.5	-11.5	-2.0	-9.5
Average	73				-4.8	-2.0	-2.8

Table D.11 Tonality Assessment Table - 12.5 m/s

Project: Belle River Wind Power Project - Turbine T53 - IEC 61400-11 Measurement

Report ID: 17095.01.T53.RP2

Created on: 2019-05-21

Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
No Reportable Tones							

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Appendix E
Measurement Data

Table E.01 Measurement data - Turbine ON

***Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (-C)	Pressure (kPa)	Relative Humidity (%)
1	7.7	52.2	1360	217.0	231.7	-1.8	12.5	8.1	7.8	11.2	99787.9	49
2	7.4	51.1	1189	217.0	231.7	-1.8	12.0	7.2	8.6	11.3	99775.7	49
3	7.3	51.3	1157	217.0	231.6	-1.8	11.8	9.1	7.9	11.3	99776.2	49
4	7.0	49.7	989	217.0	231.6	-1.8	11.2	8.7	7.7	11.3	99777.3	49
5	6.5	48.7	819	217.0	231.6	-2.1	10.6	6.3	7.6	11.3	99776.6	49
6	6.5	49.5	786	217.0	231.6	-2.1	10.4	6.8	7.2	11.3	99776.7	49
7	6.4	49.5	760	217.0	231.7	-2.1	10.3	5.8	8.0	11.3	99776.3	49
8	6.4	48.8	758	217.0	231.7	-2.1	10.3	7.0	7.7	11.4	99774.9	48
9	6.7	49.7	878	217.0	231.7	-2.1	10.9	6.7	9.0	11.4	99775.1	48
10	7.0	50.4	1004	217.0	231.7	-2.1	11.3	7.3	8.2	11.4	99774.4	48
11	7.5	52.4	1260	217.0	231.6	-0.9	12.3	6.8	8.2	11.4	99774.8	48
12	8.3	53.4	1650	217.0	231.4	1.2	13.2	8.1	6.9	11.4	99774.1	48
13	8.3	53.1	1669	217.0	229.1	-0.7	13.2	8.4	7.5	11.4	99773.9	48
14	8.1	53.6	1548	217.0	229.0	-1.3	13.1	8.9	6.9	11.4	99773.7	49
15	7.8	52.8	1398	217.0	228.2	-1.5	12.7	8.0	6.8	11.4	99774.4	49
16	7.6	51.8	1280	217.0	226.4	-1.5	12.3	7.7	6.0	11.4	99774.8	49
17	7.5	51.4	1255	217.0	226.4	-1.8	12.3	7.4	6.3	11.4	99775.6	49
18	7.7	52.5	1351	217.0	226.4	-1.8	12.6	7.8	7.1	11.4	99766.5	49
19	8.1	53.4	1519	217.0	226.4	-1.6	13.1	7.8	6.6	11.3	99759.9	49
20	8.1	54.0	1530	217.0	224.4	-1.6	13.1	7.0	7.2	11.3	99759.4	49
21	8.1	54.0	1528	217.0	223.5	-1.6	13.1	6.9	7.0	11.3	99759.9	49
22	8.6	53.9	1834	217.0	223.5	-1.3	13.2	9.1	6.5	11.3	99759.2	49
23	9.3	54.4	2183	217.0	223.2	-0.6	13.3	10.1	7.0	11.3	99759.9	49
24	10.1	53.8	2556	217.0	221.2	0.4	13.2	9.8	6.8	11.3	99759.0	49
25	9.9	54.0	2493	217.0	221.2	-0.3	13.1	9.4	7.6	11.3	99759.0	49
26	9.9	54.0	2498	217.0	221.3	-0.7	13.0	9.7	7.8	11.3	99747.4	49
27	10.7	54.1	2666	217.0	221.3	-0.3	13.1	10.9	7.7	11.3	99746.4	49
28			2690	217.0	221.3	-0.7	13.0	10.1	7.3	11.3	99747.0	49
29	9.0	53.7	2052	217.0	221.3	-1.1	12.9	9.8	7.3	11.3	99746.7	49
30	8.6	53.8	1836	217.0	221.3	-1.2	13.0	9.2	9.4	11.3	99746.6	49
31	8.4	53.5	1702	217.0	221.3	-1.3	13.1	8.5	7.8	11.3	99748.6	49
32	8.4	54.0	1713	217.0	221.2	-1.4	13.1	8.9	7.4	11.2	99759.9	48
33	8.0	53.6	1508	217.0	221.2	-1.7	12.9	7.8	9.3	11.2	99758.9	48
34	7.5	52.6	1255	217.0	221.3	-1.8	12.2	6.6	7.8	11.2	99759.4	48
35	7.2	52.3	1092	217.0	221.3	-1.8	11.6	7.0	8.4	11.2	99758.8	48
36	7.4	52.5	1200	217.0	221.3	-1.8	12.1	7.6	8.0	11.2	99759.1	48
37	8.4	53.5	1711	217.0	221.3	-0.4	13.1	8.8	7.7	11.2	99759.6	48
38	8.7	54.0	1868	217.0	221.3	-0.9	13.1	8.0	7.4	11.1	99759.7	49
39	8.1	53.7	1519	217.0	221.3	-1.6	13.0	7.6	7.8	11.1	99759.7	49
40	8.9	53.9	2023	217.0	221.3	0.0	13.3	8.9	7.4	11.1	99759.9	49
41	8.9	54.2	2012	217.0	221.3	-1.1	13.1	9.5	7.6	11.1	99759.6	49
42	9.0	54.0	2038	217.0	221.2	-1.1	13.1	10.6	7.8	11.1	99762.3	49
43	8.9	54.1	1992	217.0	221.2	-1.1	13.1	9.7	6.3	11.0	99772.8	50
44	9.4	54.1	2255	217.0	221.2	-0.1	13.2	10.1	6.8	11.0	99773.1	50
45	9.4	53.5	2268	217.0	221.3	-0.4	13.1	10.5	6.7	11.0	99773.1	50
46	9.1	53.5	2086	217.0	221.3	-1.0	13.0	9.9	7.2	11.0	99773.2	50
47	8.5	53.4	1762	217.0	221.3	-1.3	13.0	7.1	7.2	11.0	99773.1	50
48	8.8	53.6	1965	217.0	221.3	-0.9	13.2	8.9	6.4	11.0	99772.8	50
49	9.0	53.4	2073	217.0	221.3	-1.1	13.2	8.6	6.2	11.0	99772.3	50
50	9.4	53.9	2237	217.0	221.9	-0.9	13.2	10.1	6.3	11.0	99772.5	50
51	9.0	53.9	2039	217.0	223.5	-1.1	13.1	10.3	7.0	11.0	99772.6	50
52	8.7	53.4	1894	217.0	223.5	-1.2	13.1	10.0	7.3	11.0	99772.7	50
53	8.1	53.4	1517	217.0	224.5	-1.6	12.9	8.8	8.7	11.0	99772.8	50
54	7.8	52.9	1399	217.0	226.4	-1.8	12.7	8.7	9.3	11.0	99768.8	50
55	8.1	53.8	1520	217.0	229.6	-1.4	13.0	9.4	9.7	11.0	99746.9	49
56	8.4	53.6	1734	217.0	229.9	-1.3	13.2	6.9	9.5	11.0	99747.4	49
57	8.0	53.5	1473	217.0	229.9	-1.7	12.9	8.0	10.4	11.0	99747.7	49
58	8.4	53.7	1699	217.0	229.9	-1.2	13.2	9.6	10.2	11.0	99747.6	49
59	8.4	54.0	1685	217.0	229.9	-1.4	13.1	9.1	9.8	11.0	99752.2	49
60	8.1	53.7	1559	217.0	229.9	-1.6	13.1	7.1	9.7	11.1	99763.5	49
61	9.1	54.1	2108	217.0	229.9	0.0	13.4	8.7	10.8	11.1	99774.7	49
62	11.3	54.7	2823	217.0	229.9	1.6	13.4	11.5	10.1	11.1	99774.2	49
63	11.4	54.1	2884	217.0	229.9	3.6	13.5	11.6	9.4	11.1	99774.3	49
64	12.0	54.0	2929	217.0	229.9	5.9	13.7	12.1	9.4	11.1	99774.4	49
65	12.8	54.6	2913	217.0	229.9	7.4	13.7	12.9	10.1	11.1	99774.3	49
66	11.4	55.4	2795	217.0	229.9	6.8	13.1	11.6	9.4	11.0	99774.3	49
67	11.7	53.3	2736	217.0	229.9	5.7	12.9	11.8	8.1	11.0	99775.7	48
68	10.9	52.8	2746	217.0	229.9	4.8	12.9	11.1	9.1	11.0	99776.7	48
69	11.2	53.0	2754	217.0	229.9	4.2	12.9	11.3	8.1	11.0	99775.7	48
70	11.5	53.6	2789	217.0	231.6	4.6	13.2	11.6	9.6	11.0	99775.5	48
71			2841	217.0	232.5	5.8	13.4	11.6	10.9	11.0	99776.0	48
72			2869	217.0	232.5	7.1	13.6	12.5	10.3	11.0	99773.4	48
73			2796	217.0	232.5	7.1	13.2	11.4	10.3	11.0	99762.5	49
74			2720	217.0	232.5	5.3	12.8	11.3	10.2	11.0	99762.3	49
75			2704	217.0	232.5	3.7	12.7	11.3	9.3	11.0	99762.0	49
76			2740	217.0	232.5	2.9	12.9	11.2	9.5	11.0	99761.8	49
77			2766	217.0	232.5	2.6	13.0	12.1	8.9	11.0	99762.7	49
78			2797	217.0	232.6	3.2	13.2	11.4	8.7	11.0	99765.3	49
79			2816	217.0	232.6	3.6	13.3	11.1	8.4	11.0	99775.8	49
80			2894	217.0	232.6	5.9	13.6	11.7	6.5	11.0	99775.9	49
81			2761	217.0	232.4	6.8	13.0	11.9	9.2	11.0	99775.0	49
82			2584	217.0	226.4	1.5	12.9	10.1	6.6	10.8	99774.5	52
83	9.7	53.5	2413	217.0	226.4	0.7	13.0	9.9	5.9	10.8	99774.6	52
84	9.7	53.7	2404	217.0	226.3	0.2	13.0	9.9	5.5	10.8	99774.7	52
85	9.5	54.3	2305	217.0	226.4	-0.6	13.0	9.2	6.4	10.8	99774.9	52
86	10.0	54.2	2525	217.0	226.3	-0.3	13.1	10.6	6.5	10.8	99775.0	52
87	9.6	54.2	2319	217.0	226.4	-0.8	12.9	10.2	6.4	10.8	99777.5	52
88	9.4	54.0	2248	217.0	226.4	-0.4	13.1	9.0	5.5	10.8	99775.4	52

***Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (-C)	Pressure (kPa)	Relative Humidity (%)
89			2681	217.0	226.4	0.6	13.3	10.2	6.4	10.8	99774.8	52
90	10.9	54.0	2814	217.0	226.4	2.1	13.4	11.1	7.3	10.8	99774.2	52
91	11.0	53.8	2628	217.0	226.4	0.6	13.0	11.1	6.8	10.8	99774.1	52
92	11.7	54.2	2774	217.0	226.4	1.1	13.2	11.9	8.3	10.8	99774.1	52
93	11.1	53.9	2752	217.0	226.4	0.8	13.1	11.2	8.3	10.8	99773.9	51
94	10.7	53.4	2774	217.0	226.4	1.4	13.2	10.8	7.1	10.8	99774.2	50
95	10.8	53.9	2784	217.0	226.4	1.8	13.2	10.9	8.0	10.8	99773.9	50
96	10.8	54.1	2851	217.0	226.4	3.9	13.6	10.9	7.6	10.8	99773.7	50
97	10.6	53.1	2672	217.0	226.4	2.5	13.0	10.7	8.8	10.8	99773.6	50
98	9.6	53.1	2337	217.0	226.4	1.0	12.9	10.7	9.3	10.8	99773.8	50
99	9.5	53.8	2286	217.0	226.4	0.5	13.0	10.5	8.5	10.8	99774.0	50
100	9.2	53.7	2137	217.0	226.4	-0.6	13.1	10.0	8.5	10.8	99773.8	50
101	10.1	53.8	2551	217.0	226.4	0.3	13.2	10.0	8.4	10.8	99774.1	50
102	11.2	54.3	2854	217.0	226.4	2.7	13.6	11.4	7.8	10.8	99774.1	50
103	10.7	53.5	2825	217.0	226.4	3.8	13.4	10.9	7.0	10.8	99774.1	50
104	11.3	53.1	2748	217.0	226.4	3.0	13.1	11.4	7.4	10.8	99774.1	50
105	11.4	53.3	2602	217.0	226.4	1.6	12.9	11.6	6.6	10.8	99772.9	50
106	11.2	54.1	2680	217.0	228.4	1.5	13.0	11.4	8.4	10.8	99762.7	51
107	10.2	54.0	2571	217.0	229.2	0.7	13.0	11.3	9.6	10.8	99762.8	51
108	9.8	53.9	2439	217.0	229.2	-0.1	13.0	10.2	9.7	10.8	99762.9	51
109	9.5	53.8	2294	217.0	229.1	-0.8	13.0	9.7	11.0	10.8	99762.9	51
110	8.9	53.9	2021	217.0	229.1	-1.1	13.0	9.5	9.9	10.8	99762.5	51
111	8.6	53.7	1817	217.0	229.1	-1.2	13.0	9.1	9.4	10.8	99760.4	51
112	8.3	53.7	1627	217.0	229.1	-1.4	13.0	8.6	8.1	10.8	99747.9	50
113	9.2	53.8	2129	217.0	229.2	0.4	13.3	8.5	7.7	10.8	99748.4	50
114	9.4	53.6	2233	217.0	229.2	0.3	13.1	9.0	8.5	10.8	99747.9	50
115	9.6	53.8	2346	217.0	228.2	0.1	13.1	9.4	8.9	10.8	99748.7	50
116	9.3	53.8	2217	217.0	226.9	-0.8	13.0	10.3	8.2	10.8	99748.5	50
117	8.8	53.7	1922	217.0	226.9	-1.1	13.0	9.2	8.1	10.8	99748.0	50
118	8.5	54.0	1767	217.0	226.9	-1.3	13.1	9.2	7.3	10.8	99748.0	50
119	8.8	54.3	1964	217.0	227.0	-1.1	13.2	9.3	8.4	10.8	99747.1	50
120	9.7	54.0	2400	217.0	227.0	0.1	13.3	8.9	8.3	10.8	99747.5	50
121	10.3	53.7	2770	217.0	227.0	1.4	13.3	10.5	8.4	10.8	99748.3	50
122	9.4	53.6	2241	217.0	227.0	-0.8	12.9	10.5	7.6	10.8	99746.8	50
123	8.7	53.7	1894	217.0	226.9	-1.1	13.0	8.9	7.0	10.8	99747.4	50
124	8.6	53.8	1825	217.0	226.9	-1.2	13.1	8.3	6.9	10.8	99747.1	50
125	9.1	53.4	2126	217.0	226.9	0.0	13.2	9.6	6.6	10.8	99747.8	50
126	9.8	53.7	2457	217.0	226.7	0.7	13.2	8.8	6.8	10.8	99747.1	50
127	9.3	53.6	2201	217.0	224.5	-0.6	13.0	10.8	7.0	10.8	99746.7	50
128	8.9	53.6	2006	217.0	224.4	-1.1	13.1	9.2	7.9	10.8	99746.7	50
129	8.7	53.3	1901	217.0	224.5	-1.2	13.1	7.9	7.6	10.9	99747.5	51
130	8.5	53.6	1752	217.0	224.4	-1.3	13.1	7.8	7.6	10.9	99747.0	51
131	8.2	53.4	1598	217.0	224.4	-1.5	13.1	6.9	8.5	10.9	99747.3	51
132	8.3	53.6	1679	217.0	224.4	-1.4	13.1	8.4	8.6	10.9	99747.0	51
133	8.0	53.1	1488	217.0	224.4	-1.7	13.0	8.6	8.0	10.9	99747.0	51
134	7.9	52.9	1414	217.0	224.4	-1.8	12.8	8.3	8.5	10.9	99747.7	51
135	7.9	52.9	1447	217.0	224.4	-1.7	12.9	7.5	9.3	11.0	99747.4	50
136	8.0	53.4	1475	217.0	224.4	-1.7	13.0	7.8	7.4	11.0	99747.5	50
137	7.7	52.4	1327	217.0	224.4	-1.8	12.5	8.9	7.0	11.0	99747.3	50
138	7.2	50.9	1080	217.0	224.4	-1.8	11.6	7.3	7.6	11.0	99746.6	50
139	7.0	50.9	1003	217.0	224.4	-1.8	11.4	6.2	8.2	11.0	99746.9	50
140	8.5	53.4	1789	217.0	224.5	1.3	13.0	9.0	8.4	11.0	99746.5	50
141	9.7	52.8	2369	217.0	224.5	2.7	13.0	9.7	8.7	11.1	99746.1	50
142	9.3	53.0	2177	217.0	224.4	1.3	12.9	9.2	8.2	11.1	99746.1	50
143	9.0	53.6	2062	217.0	224.5	0.7	13.0	9.2	8.3	11.1	99745.9	50
144	9.2	53.7	2153	217.0	224.5	0.5	13.1	9.3	7.2	11.1	99746.4	50
145	9.3	53.6	2194	217.0	224.4	0.0	13.1	10.0	7.8	11.1	99746.7	50
146	9.9	53.9	2475	217.0	224.4	0.3	13.2	10.6	7.5	11.1	99746.6	50
147	10.7	53.7	2782	217.0	224.5	1.0	13.2	10.9	7.6	11.1	99746.8	50
148	13.3	53.0	2716	217.0	218.5	6.9	12.9	13.5	9.7	11.7	99588.5	45
149	12.3	52.8	2746	217.0	218.5	7.1	13.0	12.4	10.5	11.7	99587.7	45
150	12.3	52.7	2727	217.0	218.5	6.1	12.9	12.5	10.6	11.7	99588.1	45
151	11.6	52.8	2704	217.0	218.5	4.7	12.8	11.8	7.3	11.6	99586.4	45
152	12.7	53.8	2741	217.0	218.5	4.3	12.9	12.8	9.4	11.6	99576.8	44
153	12.6	53.8	2787	217.0	218.5	4.8	13.2	12.8	10.7	11.6	99576.5	44
154	11.8	53.9	2768	217.0	218.5	4.8	13.1	11.9	10.0	11.6	99576.1	44
155	11.5	53.4	2731	217.0	220.9	3.8	12.9	11.6	9.8	11.6	99576.0	44
156	11.3	53.2	2603	217.0	221.3	2.1	12.8	11.4	8.9	11.6	99576.4	44
157	9.7	53.6	2388	217.0	221.3	1.1	12.9	10.8	8.1	11.6	99575.9	45
158	9.7	53.3	2371	217.0	221.3	0.7	13.1	10.5	7.0	11.6	99576.2	45
159	9.8	53.7	2419	217.0	221.3	0.4	13.1	10.4	7.1	11.6	99576.7	45
160	9.8	54.0	2430	217.0	221.3	-0.1	13.1	10.0	8.9	11.6	99576.2	45
161	9.2	54.5	2161	217.0	221.3	-0.8	13.0	10.0	10.2	11.6	99576.0	45
162	9.0	53.7	2070	217.0	221.3	-0.6	13.1	9.0	9.0	11.6	99576.0	45
163	8.8	53.1	1926	217.0	221.3	-1.0	13.0	8.3	10.1	11.6	99576.1	45
164	8.7	53.7	1857	217.0	221.3	-1.2	13.1	10.1	9.5	11.6	99576.7	45
165	8.5	53.8	1756	217.0	221.3	-1.2	13.1	9.9	8.7	11.6	99577.3	45
166	8.3	53.5	1681	217.0	221.3	-1.4	13.1	9.4	8.8	11.6	99576.5	45
167	8.2	53.7	1603	217.0	221.3	-1.5	13.1	8.5	8.8	11.6	99576.0	45
168	7.9	53.6	1455	217.0	221.3	-1.7	12.9	8.3	9.1	11.6	99576.1	45
169	7.7	52.7	1324	217.0	219.3	-1.8	12.6	7.2	8.6	11.6	99575.9	45
170	7.4	51.8	1208	217.0	218.0	-1.8	12.1	7.7	8.2	11.7	99575.8	46
171	7.3	51.2	1140	217.0	218.0	-1.8	11.9	7.2	8.2	11.7	99576.2	46
172	7.0	50.4	978	217.0	218.0	-1.8	11.3	6.8	9.3	11.7	99576.4	46
173	6.7	49.7	867	217.0	218.0	-1.6	10.9	7.0	10.2	11.7	99575.3	46
174	6.6	49.9	840	217.0	218.0	-1.5	10.8	6.1	10.1	11.7	99574.6	46
175	6.5	49.8	791	217.0	215.7	-1.5	10.6	7.0	9.7	11.7	99574.9	46
176	6.7	50.6	876	217.0	215.3	-1.5	11.0	6.9	9.5	11.7	99574.7	45

Table E.01 Measurement data - Turbine ON

***Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (-C)	Pressure (kPa)	Relative Humidity (%)
177	7.1	51.4	1043	217.0	215.3	-1.5	11.6	8.7	7.8	11.7	99575.0	45
178	11.5	53.3	2775	217.0	218.8	1.2	13.1	11.7	7.8	11.8	99520.5	44
179	11.6	53.3	2711	217.0	218.8	0.4	13.0	11.7	7.5	11.8	99520.5	44
180	10.7	53.9	2710	217.0	218.8	0.1	13.1	10.8	7.4	11.8	99519.9	44
181	11.3	54.2	2777	217.0	218.8	0.3	13.1	11.4	6.9	11.8	99519.6	44
182	11.2	53.7	2689	217.0	218.8	-0.6	13.0	11.3	6.4	11.8	99519.9	45
183	10.2	53.8	2567	217.0	218.9	-0.8	13.0	11.0	7.9	11.8	99521.2	45
184	9.6	53.7	2360	217.0	218.9	-0.9	13.0	9.5	9.6	11.8	99521.7	45
185	9.5	53.8	2304	217.0	218.8	-0.7	13.0	8.7	9.9	11.8	99521.9	45
186	8.7	53.8	1876	217.0	218.9	-1.2	12.9	9.9	10.1	11.8	99520.8	45
187	8.9	54.1	2019	217.0	218.9	0.0	13.2	8.9	10.2	11.8	99521.0	45
188	9.8	54.0	2429	217.0	218.9	0.9	13.2	10.0	9.9	11.9	99522.4	45
189	11.7	54.3	2835	217.0	218.9	2.4	13.5	11.9	9.5	11.9	99520.8	45
190	11.3	53.8	2864	217.0	219.0	4.3	13.5	11.4	10.2	11.9	99521.0	45
191	11.6	53.6	2777	217.0	221.4	3.6	13.1	11.7	10.3	11.9	99521.7	45
192	11.0	54.2	2822	217.0	221.6	4.7	13.4	11.1	9.8	11.9	99520.5	45
193	12.1	53.8	2822	217.0	221.6	5.4	13.3	12.2	8.8	12.0	99528.1	45
194	9.4	53.0	2234	217.0	221.6	2.2	12.7	9.0	10.0	12.0	99543.7	44
195	9.9	53.6	2487	217.0	221.6	2.2	13.0	11.6	9.7	12.0	99548.7	44
196	10.1	53.7	2561	217.0	221.6	1.4	13.0	11.3	9.2	12.0	99549.1	44
197	9.8	54.4	2440	217.0	221.6	0.8	13.1	9.4	9.4	12.0	99549.2	44
198	11.6	54.6	2836	217.0	221.5	3.0	13.5	11.7	9.9	12.0	99549.6	44
199	12.3	54.5	2827	217.0	219.1	4.2	13.4	12.5	9.1	12.0	99549.6	44
200	9.9	54.1	2463	217.0	218.5	1.9	12.9	11.5	9.8	12.0	99550.0	44
201	8.9	54.6	1985	217.0	218.5	0.0	12.9	9.1	9.6	12.0	99550.4	44
202	8.7	54.9	1874	217.0	218.6	-1.0	13.0	9.8	8.9	12.0	99550.7	44
203	8.4	54.7	1710	217.0	218.6	-0.8	13.1	9.2	7.8	12.0	99550.7	44
204	8.9	54.1	1999	217.0	218.5	0.2	13.1	8.8	8.6	12.0	99550.7	44
205	9.6	55.0	2327	217.0	218.6	0.5	13.2	10.6	11.3	12.0	99550.7	44
206	11.8	54.6	2917	217.0	218.6	3.9	13.8	11.9	10.8	12.0	99550.9	44
207	11.3	54.5	2934	217.0	218.6	6.7	13.9	11.4	9.7	12.0	99551.9	44
208	10.9	53.3	2772	217.0	218.5	5.4	13.1	11.0	9.1	12.0	99551.8	44
209	12.4	53.8	2784	217.0	218.6	5.4	13.2	12.6	8.1	12.0	99551.2	44
210	13.5	54.8	2959	217.0	218.5	9.2	14.0	13.7	7.5	12.0	99551.0	44
211	13.9	54.4	2871	217.0	218.5	10.0	13.6	14.0	7.2	12.0	99550.8	44
212	13.9	54.3	2809	217.0	220.3	10.5	13.4	14.0	8.3	12.0	99551.3	45
213	12.9	53.0	2748	217.0	221.3	9.7	13.0	13.1	8.6	12.0	99551.3	45
214	13.4	54.2	2828	217.0	221.2	11.0	13.4	13.5	8.8	12.0	99551.8	45
215	13.0	53.8	2785	217.0	221.3	11.2	13.3	13.2	10.1	12.0	99551.4	45
216	13.9	53.6	2794	217.0	221.3	11.8	13.3	14.0	9.4	12.0	99550.2	45
217	13.0	53.2	2748	217.0	221.3	11.2	13.1	13.1	9.0	12.0	99549.9	45
218	13.9	53.4	2768	217.0	221.3	11.5	13.2	14.0	9.1	12.0	99549.3	45
219	13.7	54.1	2742	217.0	221.3	11.4	13.1	13.8	9.5	12.0	99549.6	45
220	13.2	52.2	2650	217.0	221.3	9.3	12.6	13.3	8.1	12.0	99549.6	45
221	12.8	52.2	2651	217.0	221.2	7.5	12.6	13.0	10.2	12.0	99549.3	45
222	11.7	53.2	2667	217.0	221.2	5.7	12.6	11.9	11.3	12.0	99549.5	45
223	12.2	53.6	2785	217.0	221.2	6.6	13.2	12.3	9.5	12.0	99541.4	44
224	12.7	53.2	2788	217.0	221.2	6.9	13.2	12.9	9.5	12.1	99536.1	44
225	14.7	54.1	2864	217.0	221.2	8.6	13.6	14.9	10.1	12.1	99535.7	44
226	13.4	53.6	2870	217.0	221.3	9.9	13.6	13.6	9.9	12.1	99535.2	44
227	12.9	53.2	2770	217.0	221.3	9.4	13.1	13.0	8.3	12.1	99535.6	44
228	13.5	53.4	2824	217.0	221.2	10.4	13.4	13.6	6.7	12.1	99535.9	44
229	13.9	53.4	2757	217.0	221.3	10.1	13.1	14.0	6.9	12.1	99536.4	45
230	13.4	52.7	2724	217.0	221.3	9.0	13.0	13.5	8.1	12.1	99536.6	45
231	14.2	52.5	2597	217.0	221.3	7.0	12.5	14.4	9.7	12.1	99536.5	45
232	9.9	53.7	2508	217.0	223.8	6.2	12.9	14.3	8.3	12.1	99536.5	45
233	10.1	53.2	2560	217.0	224.0	4.6	12.7	11.4	9.3	12.1	99536.1	45
234	11.2	53.1	2686	217.0	224.0	3.7	12.9	11.3	10.2	12.1	99536.5	45
235	12.3	54.4	2842	217.0	224.0	5.8	13.5	12.4	10.1	12.1	99535.5	45
236			2587	217.0	224.0	4.2	12.9	9.7	9.0	12.2	99535.5	44
237	10.8	53.8	2666	217.0	224.0	3.0	12.9	10.9	10.4	12.2	99536.0	44
238	11.7	54.3	2833	217.0	224.0	5.0	13.4	11.8	10.9	12.2	99536.6	44
239	13.0	54.2	2818	217.0	223.7	5.7	13.3	13.1	9.7	12.2	99536.4	44
240	10.9	53.4	2730	217.0	221.6	4.4	13.0	11.0	8.5	12.2	99536.1	44
241	10.8	53.2	2648	217.0	221.6	2.8	12.8	11.0	10.9	12.2	99528.5	44
242	9.9	53.5	2486	217.0	221.5	1.3	12.9	10.9	10.9	12.3	99522.5	44
243			2731	217.0	219.9	2.7	13.3	9.9	9.7	12.3	99522.9	44
244	12.0	54.7	2954	217.0	219.1	6.6	14.0	12.2	9.0	12.3	99522.5	44
245	12.0	53.9	2853	217.0	219.2	7.1	13.5	12.2	9.5	12.3	99522.8	44
246	11.9	53.6	2780	217.0	219.2	6.9	13.2	12.0	9.1	12.3	99522.8	44
247	12.8	53.2	2782	217.0	219.2	6.8	13.2	12.9	9.5	12.2	99522.1	44
248	11.4	53.2	2728	217.0	219.1	6.0	12.9	11.6	9.7	12.2	99522.3	44
249	11.3	52.8	2615	217.0	219.1	3.5	12.7	11.5	9.4	12.2	99522.3	44
250	9.4	53.4	2251	217.0	219.1	1.6	12.7	10.5	11.2	12.2	99522.7	44
251	12.2	54.1	2705	217.0	219.1	3.1	13.3	12.4	9.1	12.2	99522.4	44
252	13.0	55.1	2977	217.0	219.2	7.4	14.1	13.1	8.2	12.2	99520.7	44
253	13.1	53.8	2906	217.0	219.2	8.7	13.7	13.2	8.4	12.2	99521.4	44
254	12.1	53.5	2845	217.0	219.2	9.2	13.5	12.2	7.6	12.2	99521.9	44
255	14.2	53.5	2850	217.0	219.1	10.3	13.5	14.4	8.8	12.2	99521.8	44
256	13.7	52.9	2749	217.0	219.2	9.6	13.0	13.9	8.7	12.2	99522.1	44
257	13.1	53.6	2747	217.0	219.2	9.2	13.0	13.3	9.4	12.2	99522.0	44
258	10.6	51.9	2638	217.0	221.8	4.5	12.5	10.7	9.0	12.2	99515.5	44
259	11.8	53.0	2750	217.0	221.8	4.9	13.0	11.9	7.3	12.2	99509.8	44
260	11.1	53.0	2755	217.0	221.8	4.4	13.0	11.2	7.4	12.2	99509.7	44
261	11.2	53.5	2858	217.0	221.8	6.2	13.5	11.4	6.7	12.2	99509.5	44
262	12.5	53.7	2820	217.0	220.3	7.1	13.3	12.7	7.1	12.2	99509.7	44
263	12.6	52.6	2656	217.0	219.3	4.2	12.7	12.8	7.4	12.2	99509.8	44
264	10.6	52.8	2614	217.0	219.3	2.9	12.8	10.7	8.6	12.2	99509.5	44

***Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (-C)	Pressure (kPa)	Relative Humidity (%)
265	12.4	54.0	2895	217.0	219.3	6.2	13.7	12.5	8.1	12.3	99509.5	44
266	13.0	54.8	3007	217.0	219.4	9.7	14.2	13.1	7.7	12.3	99509.4	44
267	13.1	54.4	2809	217.0	219.4	9.3	13.3	13.2	7.6	12.3	99509.3	44
268	12.2	52.5	2665	217.0	217.8	6.6	12.6	12.3	8.7	12.3	99508.5	44
269	12.8	54.3	2771	217.0	216.6	6.9	13.1	12.9	8.3	12.3	99509.2	44
270	13.1	54.2	2803	217.0	216.7	7.7	13.2	13.2	6.7	12.3	99509.8	44
271	12.9	53.6	2735	217.0	216.7	6.8	12.9	13.0	7.4	12.3	99510.4	44
272	13.7	54.3	2822	217.0	219.1	7.7	13.4	13.9	8.0	12.3	99510.5	44
273	14.5	53.8	2828	217.0	219.4	8.8	13.4	14.7	8.4	12.3	99510.3	44
274	13.0	54.3	2818	217.0	221.7	9.3	13.4	13.2	7.6	12.3	99510.7	44
275	13.6	53.5	2813	217.0	222.3	9.9	13.3	13.7	9.6	12.3	99510.5	44
276	11.9	52.3	2635	217.0	222.3	6.8	12.5	12.0	10.8	12.3	99504.0	44
277	11.9	52.9	2691	217.0	222.3	5.4	12.7	12.0	9.7	12.3	99497.0	44
278	13.5	54.3	2871	217.0	222.3	7.9	13.6	13.7	8.8	12.3	99496.7	44
279	13.2	54.7	2924	217.0	222.3	10.3	13.8	13.4	10.3	12.3	99495.9	44
280	14.1	54.1	2814	217.0	222.3	10.2	13.3	14.3	10.9	12.3	99495.7	44
281	12.6	52.5	2724	217.0	222.3	9.0	13.0	12.7	9.6	12.3	99495.8	44
282	12.1	52.5	2750	217.0	222.3	8.9	13.0	12.2	9.8	12.3	99496.4	44
283	12.5	52.1	2675	217.0	222.3	7.1	12.7	12.7	8.5	12.3	99497.6	44
284	11.2	52.0	2630	217.0	222.3	4.0	12.5	11.4	9.5	12.3	99497.4	44
285	11.0	53.0	2699	217.0	222.3	3.1	12.8	11.1	9.5	12.3	99497.1	44
286	11.5	53.5	2779	217.0	222.3	3.5	13.2	11.6	8.8	12.3	99496.1	44
287	11.5	53.4	2865	217.0	222.3	5.5	13.5	11.6	8.4	12.3	99495.8	44
288	11.0	52.9	2781	217.0	222.2	5.3	13.2	11.1	7.3	12.3	99490.8	44
289	10.8	53.4	2780	217.0	220.1	5.4	13.2	11.0	7.3	12.3	99484.2	44
290	10.9	52.6	2700	217.0	219.4	3.2	12.8	11.0	7.7	12.3	99483.6	44
291	9.8	53.4	2414	217.0	219.4	1.2	12.8	11.4	7.6	12.3	99483.1	44
292	9.2	53.7	2135	217.0	219.4	0.4	13.0	10.0	8.9	12.3	99483.6	44
293	8.9	53.7	1984	217.0	219.3	-0.5	13.0	9.5	8.5	12.3	99483.9	44
294	9.7	54.2	2407	217.0	219.4	0.2	13.2	9.5	9.3	12.3	99478.0	44
295			2601	217.0	219.4	0.0	13.1	10.0	9.8	12.3	99471.2	44
296			2712	217.0	219.3	-0.2	13.1	9.6	9.6	12.3	99470.8	44
297	9.7	54.0	2381	217.0	219.4	-0.5	13.0	9.6	9.6	12.3	99470.1	44
298	10.2	54.5	2565	217.0	219.3	-0.5	13.1	9.7	8.8	12.3	99470.5	44
299	11.3	55.4	2985	217.0	219.3	4.3	14.1	11.5	6.7	12.3	99470.8	44
300	12.8	54.8	2987	217.0	219.4	7.7	14.1	13.0	6.9	12.3	99470.6	44
301	13.7	54.2	2853	217.0	219.4	7.7	13.5	13.8	5.6	12.3	99470.0	44
302	13.3	53.2	2685	217.0	219.4	5.3	12.7	13.4	7.0	12.3	99470.6	44
303	9.1	54.0	2088	217.0	219.4	3.0	12.7	9.7	7.7	12.3	99471.2	44
304	10.0	54.0	2529	217.0	219.4	3.3	13.0	9.7	8.8	12.3	99470.9	44
305	12.7	54.3	2810	217.0	220.2	4.5	13.3	12.8	9.8	12.3	99471.3	44
306	11.8	53.2	2733	217.0	221.8	3.3	12.9	11.9	9.4	12.3	99471.5	44
307	9.9	53.6	2474	217.0	221.8	1.3	12.8	11.0	10.7	12.3	99471.3	44
308	10.5	54.5	2713	217.0	221.8	2.4	13.3	10.6	9.7	12.3	99471.4	44
309	10.5	53.6	2835	217.0	221.8	3.8	13.4	10.7	12.3	12.3	99471.4	44
310	10.6	53.2	2799	217.0	221.6	4.0	13.2	10.7	12.3	12.3	99471.3	44
311	11.1	53.8	2867	217.0	219.0	5.8	13.6	11.2	9.5	12.3	99467.3	44
312	10.6	52.9	2765	217.0	218.8	5.1	13.1	10.7	9.6	12.3	99458.7	44
313	9.8	52.8	2459	217.0	218.9	2.7	12.8	10.4	8.9	12.3	99458.4	44
314	11.2	53.7	2744	217.0	218.9	2.6	13.0	11.3	6.5	12.3	99458.5	44
315	10.0	53.7	2535	217.0	218.9	1.1	12.9	10.4	8.0	12.3	99458.3	44
316	10.9	54.4	2837	217.0	218.8	3.5	13.5	11.1	5.8	12.3	99458.4	44
317	12.3	55.0	2991	217.0	218.9	7.7	14.2	12.5	6.2	12.3	99458.3	44
318	12.8	53.2	2849	217.0	218.8	7.8	13.4	12.9	7.6	12.3	99458.3	44
319	12.2	52.7	2761	217.0	218.9	6.9	13.1	12.3	8.2	12.3	99457.6	44
320	11.7	52.4	2791	217.0	218.9	7.4	13.2	11.8	7.6	12.3	99457.6	44
321	11.5	53.2	2736	217.0	217.4	6.8	13.0	11.7	7.3	12.3	99457.8	44
322	12.1	53.1	2780	217.0	216.1	7.0	13.2	12.2	8.1	12.3	99458.5	44
323	12.3	53.5	2792	217.0	216.1	7.4	13.2	12.4	7.2	12.3	99459.1	44
324	10.9	53.4	2713	217.0	216.0	5.9	12.8	11.0	5.1	12.3	99458.8	44
325	9.9	53.3	2472	217.0	216.1	3.3	12.6	9.9	5.1	12.3	99459.3	44
326	10.9	53.7	2716	217.0	214.4	2.9	12.9	11.0	5.8	12.3	99458.6	44
327	9.4	53.4	2251	217.0	213.0	0.9	12.8	9.7	6.1	12.3	99458.8	44
328	9.5	54.3	2310	217.0	213.0	0.6	13.1	10.4	7.6	12.3	99459.0	44
329	9.7	54.0	2369	217.0	213.1	0.4	13.1	9.9	9.1	12.3	99454.5	44
330	9.3	54.0	2191	217.0	213.1	-0.9	13.1	9.7	7.0	12.4	99445.9	44
331	12.5	54.5	2712	217.0	213.1	1.5	13.3	12.6	6.7	12.4	99445.7	44
332	10.7	54.8	2898	217.0	213.0	4.4	13.7	10.8	7.8	12.4	99445.7	44
333	12.0	53.9	2780	217.0	213.0	3.8	13.1	12.1	7.5	12.4	99445.8	44
334	11.8	54.5	2845	217.0	213.0	5.2	13.5	12.0	7.6	12.4	99446.1	44
335	12.1	53.9	2846	217.0	213.0	6.1	13.5	12.3	6.5	12.4	99449.5	44
336	13.1	54.0	2898	217.0	213.0	8.5	13.7	13.2	7.5	12.4	99458.6	44
337	12.5	53.4	2732	217.0	213.0	7.1	13.0	12.7	6.3	12.4	99458.7	44
338	13.1	53.5	2800	217.0	213.0	7.0	13.3	13.3	6.4	12.4	99458.2	44
339	12.5	53.7	2809	217.0	213.0	7.9	13.4	12.6	6.3	12.4	99458.7	44
340	12.3	53.6	2790	217.0	213.0	8.1	13.2	12.4	8.0	12.4	99458.4	44
341	13.3	53.6	2774	217.0	214.1	8.1	13.2	13.4	6.4	12.5	99458.1	44
342	13.3	53.3	2825	217.0	215.6	9.2	13.4	13.4	7.2	12.5	99457.5	44
343	13.3	52.9	2768	217.0	215.6	9.0	13.1	13.4	6.1	12.5	99458.4	44
344	12.8	52.9	2757	217.0	215.6	8.7	13.1	12.9	9.8	12.5	99458.4	44
345	12.2	53.1	2783	217.0	215.6	9.2	13.2	12.3	8.2	12.5	99457.3	44
346	12.9	52.5	2686	217.0	215.6	7.3	12.7	13.0	8.1	12.5	99457.7	44
347	11.4	52.6	2724	217.0	215.6	6.8	12.9	11.5	7.5	12.5	99457.7	44
348	11.9	53.3	2816	217.0	215.6	8.1	13.3	12.1	7.0	12.5	99457.7	44
349	13.1	53.3	2753	217.0	215.5	7.5	13.1	13.2	7.4	12.5	99458.3	44
350	12.4	52.6	2708	217.0	215.6	6.1	12.8	12.5	8.1	12.5	99457.8	44
351	11.8	53.0	2723	217.0	215.5	5.5	12.9	11.9	7.6	12.5	99457.5	44
352	12.7	53.4	2793	217.0	215.6	6.1	13.2	12.9	7.9	12.5	99457.9	44

Table E.01 Measurement data - Turbine ON

***Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (-C)	Pressure (kPa)	Relative Humidity (%)
353	14.4	54.0	2870	217.0	215.5	8.1	13.6	14.6	8.5	12.5	99446.3	44
354	11.9	53.6	2746	217.0	217.0	7.2	13.1	12.1	8.4	12.5	99445.0	44
355	12.8	53.2	2729	217.0	218.2	6.4	12.9	13.0	8.2	12.5	99445.2	44
356	11.9	52.7	2756	217.0	218.2	6.1	13.0	12.0	10.2	12.5	99445.6	44
357	11.3	53.2	2758	217.0	218.2	6.0	13.0	11.4	10.7	12.5	99445.5	44
358	12.6	53.4	2765	217.0	218.2	5.9	13.1	12.7	9.8	12.5	99445.0	44
359			1663	217.0	220.4	15.3	10.5	11.2	11.4	12.6	99431.2	44
360	9.7	54.0	2388	217.0	224.6	1.1	13.1	9.2	7.6	9.2	99948.2	57
361	9.8	54.2	2422	217.0	224.6	0.7	13.1	9.9	6.8	9.2	99948.0	57
362	9.7	54.7	2407	217.0	224.6	0.1	13.1	9.8	6.6	9.2	99947.9	57
363			2625	217.0	224.6	0.1	13.1	9.4	6.8	9.2	99948.1	57
364			2750	217.0	224.6	-0.1	13.1	10.4	6.5	9.2	99948.7	57
365			2747	217.0	224.3	-0.4	13.1	9.9	7.0	9.2	99948.8	57
366			2764	217.0	222.3	-0.6	13.0	9.5	6.4	9.2	99947.9	57
367			2670	217.0	222.3	-0.8	13.0	9.7	5.9	9.2	99947.7	57
368	10.9	54.5	2707	217.0	222.3	-0.8	13.0	11.0	5.6	9.2	99947.7	57
369	10.8	54.7	2620	217.0	222.3	-0.8	13.0	10.9	6.0	9.3	99952.0	57
370	9.6	54.1	2351	217.0	222.3	-0.9	12.9	11.0	5.6	9.3	99960.4	57
371	8.8	53.9	1965	217.0	222.3	-1.1	13.0	9.6	5.8	9.3	99961.6	57
372	9.1	54.6	2099	217.0	222.3	-1.1	13.1	9.0	6.7	9.3	99961.4	57
373	9.0	54.4	2045	217.0	222.3	-1.1	13.1	8.4	6.8	9.4	99961.6	57
374	9.1	54.5	2096	217.0	222.3	-1.1	13.1	9.6	7.1	9.4	99961.6	57
375	9.3	53.9	2175	217.0	222.3	-1.0	13.2	9.9	7.4	9.4	99961.6	57
376	9.7	54.1	2394	217.0	222.3	-0.3	13.2	9.0	7.7	9.4	99961.8	57
377	9.9	54.7	2486	217.0	222.3	-0.2	13.1	10.3	7.5	9.4	99961.5	57
378	9.6	54.3	2327	217.0	222.3	-0.9	13.0	9.5	7.9	9.4	99959.0	57
379	9.4	54.3	2232	217.0	222.3	-1.0	13.1	9.4	7.6	9.4	99947.9	56
380	9.6	54.4	2335	217.0	222.3	-0.7	13.2	10.3	6.9	9.4	99947.4	56
381	9.9	54.2	2482	217.0	222.3	-0.2	13.1	10.1	6.4	9.4	99947.9	56
382	10.0	55.0	2537	217.0	222.3	-0.6	13.0	9.5	6.5	9.4	99947.9	56
383	10.0	54.0	2513	217.0	222.2	-0.8	13.0	10.5	6.5	9.4	99947.7	56
384	9.8	56.0	2414	217.0	221.9	-0.9	13.0	10.3	6.2	9.4	99949.2	56
385	9.2	55.0	2147	217.0	219.9	-1.0	13.0	9.7	5.9	9.5	99947.8	57
386	9.5	54.3	2294	217.0	219.8	-0.1	13.1	9.3	6.6	9.5	99947.8	57
387	9.6	54.3	2357	217.0	219.9	-0.4	13.1	9.2	7.0	9.5	99947.8	57
388	9.5	54.5	2302	217.0	219.9	-0.8	13.1	10.4	6.4	9.5	99947.9	57
389	9.0	53.9	2076	217.0	219.9	-1.1	13.0	10.0	5.7	9.5	99947.7	57
390	9.1	54.3	2102	217.0	219.9	-1.1	13.1	9.5	6.7	9.5	99947.4	57
391	9.5	54.3	2308	217.0	219.9	-0.7	13.2	8.6	6.0	9.5	99947.2	57
392	9.4	54.6	2253	217.0	219.9	-1.0	13.1	9.3	5.6	9.5	99947.4	57
393			1796	217.0	219.9	-1.2	13.0	8.7	7.6	9.5	99947.3	57
394	9.0	55.0	2052	217.0	219.9	-0.8	13.2	8.5	6.3	9.5	99947.8	57
395	9.2	54.6	2149	217.0	219.9	-1.0	13.2	9.7	5.9	9.5	99947.6	57
396	9.2	53.9	2158	217.0	219.9	-1.0	13.1	9.6	7.1	9.5	99948.0	57
397	8.8	54.6	1962	217.0	219.9	-1.1	13.1	8.7	6.5	9.5	99947.8	56
398	9.1	54.9	2126	217.0	219.9	-0.9	13.2	8.8	6.4	9.5	99947.7	56
399	8.7	54.3	1884	217.0	219.9	-1.2	13.0	8.2	7.0	9.5	99947.8	56
400	8.7	54.3	1867	217.0	219.9	-1.2	13.2	8.5	5.8	9.5	99947.5	56
401	8.9	54.4	2008	217.0	219.9	-1.1	13.2	9.2	6.6	9.5	99947.6	56
402	9.1	55.6	2111	217.0	219.9	-1.0	13.2	9.3	6.6	9.6	99947.5	56
403	9.4	55.2	2250	217.0	219.9	-0.9	13.2	9.8	6.7	9.6	99947.0	56
404	9.1	54.1	2090	217.0	219.9	-1.1	13.1	9.1	6.2	9.6	99947.2	56
405	8.8	53.9	1915	217.0	219.9	-1.1	13.1	9.4	4.7	9.6	99947.5	56
406	9.2	54.0	2131	217.0	219.9	-1.1	13.2	9.2	6.0	9.6	99947.9	56
407	9.1	54.1	2102	217.0	219.9	-1.1	13.1	8.7	6.1	9.6	99948.1	56
408	8.8	54.1	1969	217.0	219.9	-1.1	13.1	8.5	5.3	9.6	99947.8	56
409	8.6	54.1	1817	217.0	219.9	-1.2	13.1	9.0	5.6	9.6	99947.8	56
410	8.8	54.3	1957	217.0	219.9	-1.1	13.2	8.7	6.4	9.6	99947.3	56
411	9.1	54.1	2107	217.0	219.9	-0.9	13.2	8.6	5.6	9.6	99947.7	56
412	9.1	53.8	2116	217.0	219.9	-1.0	13.1	8.6	5.8	9.6	99947.2	56
413	9.6	54.2	2325	217.0	219.9	-0.3	13.2	9.7	6.3	9.6	99945.1	56
414	9.9	54.1	2462	217.0	219.9	-0.2	13.1	9.5	5.7	9.6	99934.6	56
415	9.8	53.9	2419	217.0	219.9	-0.8	13.0	9.9	5.7	9.6	99934.5	56
416	9.1	53.8	2091	217.0	219.9	-1.1	13.0	9.4	6.5	9.6	99933.7	56
417	9.1	54.1	2085	217.0	219.9	-1.0	13.1	8.3	7.1	9.6	99934.0	56
418	9.1	54.7	2110	217.0	219.9	-1.0	13.1	9.4	6.7	9.6	99934.4	56
419	9.2	55.8	2145	217.0	219.9	-1.1	13.1	10.0	6.4	9.6	99934.7	56
420	8.9	53.9	2019	217.0	219.9	-1.1	13.1	8.4	6.7	9.6	99934.1	56
421	8.9	54.1	2023	217.0	219.9	-1.1	13.1	8.4	6.5	9.6	99934.2	56
422	9.2	54.6	2144	217.0	219.9	-0.9	13.2	9.7	6.0	9.6	99934.3	56
423	9.1	54.3	2108	217.0	219.9	-1.1	13.1	8.5	6.0	9.6	99934.2	56
424	9.2	54.5	2144	217.0	219.9	-1.0	13.1	9.4	5.5	9.6	99934.3	56
425	9.6	55.6	2330	217.0	219.9	-0.5	13.2	8.4	4.9	9.6	99934.6	56
426	8.8	53.8	1916	217.0	219.9	-1.2	13.0	8.7	4.9	9.6	99935.0	57
427	8.4	53.8	1695	217.0	219.9	-1.4	13.0	7.7	6.2	9.6	99935.0	57
428	8.4	54.0	1693	217.0	219.6	-1.4	13.1	7.8	7.7	9.6	99934.5	57
429	8.6	54.3	1819	217.0	217.8	-1.2	13.2	8.8	8.1	9.6	99934.5	57
430	9.0	54.2	2061	217.0	217.8	-1.0	13.2	8.8	8.0	9.6	99935.0	57
431	9.0	53.9	2075	217.0	217.8	-1.1	13.1	9.2	7.4	9.6	99934.1	56
432	8.9	54.3	1979	217.0	217.8	-1.1	13.1	7.9	6.3	9.6	99934.5	55
433			2092	217.0	217.8	-0.9	13.2	8.2	5.9	9.6	99934.3	55
434			2192	217.0	217.8	-0.8	13.2	10.4	5.5	9.6	99934.1	55
435	9.0	54.0	2044	217.0	217.8	-1.1	13.0	10.0	5.4	9.6	99934.0	55
436	8.8	54.1	1938	217.0	217.8	-1.1	13.1	8.5	6.2	9.6	99934.1	55
437	9.2	54.5	2161	217.0	217.8	-0.7	13.2	10.7	5.6	9.6	99934.5	55
438	9.5	55.5	2278	217.0	217.8	-0.3	13.1	8.5	5.1	9.7	99934.6	56
439	9.4	54.1	2263	217.0	217.8	-0.8	13.1	8.9	5.6	9.7	99934.2	56
440	8.9	54.8	1990	217.0	217.8	-1.1	13.1	8.0	5.5	9.7	99934.5	56

***Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (-C)	Pressure (kPa)	Relative Humidity (%)
441	8.3	56.3	1661	217.0	217.8	-1.4	13.0	8.1	6.6	9.7	99934.9	56
442	8.8	54.5	1917	217.0	217.8	-1.0	13.2	9.2	7.1	9.7	99934.6	56
443	8.8	54.4	1947	217.0	217.8	-1.2	13.1	9.4	6.9	9.7	99934.8	56
444	9.1	54.3	2085	217.0	217.8	-1.0	13.2	8.3	6.3	9.7	99934.8	56
445	9.6	54.7	2329	217.0	217.8	0.0	13.2	8.4	6.8	9.7	99934.9	56
446	9.7	54.2	2396	217.0	217.8	-0.4	13.1	10.0	6.5	9.7	99934.7	56
447	9.4	54.0	2239	217.0	217.8	-0.9	13.0	9.4	5.8	9.7	99934.8	56
448	9.0	53.9	2065	217.0	217.8	-1.1	13.0	9.0	6.1	9.7	99933.1	56
449	8.0	53.4	1512	217.0	217.8	-1.6	12.8	7.8	6.4	9.7	99921.0	55
450	7.8	53.3	1379	217.0	217.8	-1.8	12.7	7.7	6.5	9.7	99921.3	55
451	7.7	53.2	1321	217.0	217.8	-1.8	12.5	7.9	5.4	9.7	99921.3	55
452	7.6	53.0	1291	217.0	217.7	-1.8	12.4	9.2	6.8	9.7	99921.0	55
453	8.0	53.9	1493	217.0	217.7	-1.6	13.0	9.0	7.4	9.7	99921.0	55
454	8.4	54.2	1691	217.0	217.7	-1.4	13.2	8.6	6.8	9.7	99920.6	55
455	8.5	54.2	1777	217.0	217.7	-1.3	13.2	8.1	6.5	9.7	99920.8	55
456	8.7	54.7	1873	217.0	217.7	-1.2	13.2	8.6	6.9	9.7	99920.7	55
457	8.6	55.6	1838	217.0	217.7	-1.2	13.1	8.2	6.0	9.7	99920.9	55
458	8.7	53.9	1891	217.0	217.7	-1.2	13.2	8.3	4.9	9.7	99921.2	55
459	8.6	54.3	1822	217.0	217.7	-1.2	13.1	8.3	5.5	9.7	99921.6	55
460	8.4	54.1	1714	217.0	217.7	-1.3	13.1	9.3	6.3	9.7	99921.2	55
461	8.8	54.0	1942	217.0	217.6	-1.1	13.2	8.8	5.7	9.7	99921.8	55
462	9.1	54.3	2083	217.0	217.6	-1.1	13.2	10.0	5.6	9.7	99921.5	55
463	9.3	54.1	2205	217.0	217.7	-0.6	13.2	10.2	6.4	9.7	99921.5	55
464	9.0	54.5	2071	217.0	217.7	-0.9	13.1	8.9	6.6	9.7	99921.8	55
465	8.8	54.1	1944	217.0	217.8	-1.1	13.1	10.4	6.3	9.7	99921.8	55
466	8.5	54.5	1758	217.0	217.8	-1.3	13.1	9.3	6.1	9.7	99921.6	55
467	8.1	53.9	1551	217.0	217.7	-1.6	13.0	8.3	6.9	9.7	99921.4	55
468	7.5	52.6	1240	217.0	217.7	-1.8	12.2	6.7	8.0	9.7	99921.5	55
469	6.7	50.8	895	217.0	217.7	-1.8	10.9	6.0	8.4	9.7	99921.8	55
470	6.3	49.3	728	217.0	217.7	-1.8	10.3	6.5	7.3	9.7	99922.0	55
471	7.7	53.3	1319	217.0	218.9	-1.1	12.4	8.7	7.6	9.7	99921.2	55
472	8.9	53.7	2000	217.0	220.0	1.3	13.2	9.5	7.1	9.7	99921.4	55
473	9.0	53.7	2065	217.0	220.1	1.0	13.1	9.1	7.1	9.8	99921.7	55
474	8.9	54.0	2004	217.0	220.1	0.2	13.1	8.6	7.9	9.8	99921.5	55
475	9.0	54.0	2052	217.0	220.1	-1.0	13.1	8.4	6.4	9.8	99921.2	55
476	8.3	53.6	1662	217.0	220.1	-1.4	13.0	8.1	5.9	9.8	99921.3	55
477	8.5	56.2	1760	217.0	220.1	-1.3	13.2	8.0	6.4	9.8	99921.5	55
478	8.9	54.7	2006	217.0	220.1	-1.1	13.2	7.7	6.1	9.8	99921.6	55
479	9.4	54.3	2239	217.0	220.1	-0.6	13.2	8.9	6.6	9.8	99921.6	55
480	9.7	54.3	2413	217.0	220.1	-0.5	13.0	9.4	6.6	9.8	99921.1	55
481	9.3	54.2	2208	217.0	220.1	-1.0	13.0	8.7	6.1	9.8	99921.3	55
482	8.6	54.9	1840	217.0	220.1	-1.2	13.0	8.2	6.3	9.8	99921.4	55
483	8.1	54.2	1567	217.0	220.0	-1.6	13.0	8.9	6.3	9.8	99921.3	55
484	8.7	54.5	1859	217.0	220.1	-1.1	13.2	8.2	8.3	9.8	99921.4	55
485	8.5	54.1	1787	217.0	220.1	-1.3	13.1	9.0	7.5	9.8	99921.5	55
486	8.8	53.8	1936	217.0	220.1	-1.1	13.2	8.0	7.4	9.8	99921.6	55
487	9.3	54.3	2202	217.0	220.1	-0.6	13.2	9.1	6.1	9.8	99921.3	55
488	10.1	53.9	2544	217.0	220.0	0.1	13.2	9.5	6.2	9.8	99921.5	55
489	10.4	53.7	2680	217.0	220.1	-0.1	13.1	10.5	6.4	9.8	99921.8	55
490	10.0	54.7	2522	217.0	220.1	-0.8	13.0	10.1	7.4	9.8	99921.5	55
491	9.6	54.6	2335	217.0	220.1	-0.8	13.0	9.8	7.3	9.8	99921.3	55
492	10.2	53.9	2577	217.0	220.1	-0.4	13.1	9.8	6.6	9.8	99921.2	55
493	9.7	53.5	2383	217.0	220.1	-0.9	13.0	9.8	5.9	9.8	99921.6	55
494	9.1	54.3	2111	217.0	220.1	-1.1	13.0	8.6	6.7	9.8	99921.4	55
495	8.8	54.7	1928	217.0	218.8	-1.1	13.0	7.9	6.3	9.8	99921.4	55
496	9.0	54.6	2042	217.0	217.7	-0.7	13.2	8.6	5.7	9.8	99921.6	55
497	8.8	54.5	1931	217.0	217.6	-1.2	13.1	9.0	5.2	9.8	99921.6	55
498	8.6	53.7	1806	217.0	217.7	-1.1	13.1	9.0	5.5	9.8	99921.7	55
499	9.0	54.3	2072	217.0	217.7	-0.7	13.2	8.7	5.7	9.8	99921.8	55
500	9.0	54.2	2031	217.0	217.7	-1.0	13.1	8.4	6.5	9.8	99921.8	55
501	8.2	53.6	1597	217.0	217.7	-1.5	13.0	7.8	7.1	9.8	99921.7	55
502	8.0	54.4	1480	217.0	217.7	-1.7	13.0	8.0	6.9	9.8	99921.1	55
503	7.8	54.7	1408	217.0	217.7	-1.8	12.8	7.2	6.8	9.8	99920.7	54
504	7.8	53.2	1409	217.0	217.6	-1.8	12.8	7.1	6.4	9.8	99921.2	54
505	7.8	53.2	1406	217.0	217.7	-1.8	12.8	7.2	6.1	9.8	99921.2	54
506	8.1	54.0	1565	217.0	217.7	-1.6	13.1	8.9	5.2	9.8	99921.0	54
507	8.4	54.3	1693	217.0	217.7	-1.4	13.2	8.5	4.6	9.8	99921.3	54
508	8.2	54.0	1594	217.0	217.7	-1.5	13.1	7.9	4.7	9.8	99921.3	55
509	8.2	53.9	1594	217.0	217.7	-1.5	13.1	7.8	5.2	9.8	99921.6	56
510	8.7	54.2	1859	217.0	217.7	-1.2	13.2	8.9	4.6	9.8	99921.5	56
511	8.8	54.2	1919	217.0	217.7	-1.1	13.1	9.0	4.8	9.8	99921.5	56
512	8.6	53.8	1819	217.0	217.7	-1.2	13.1	7.6	6.1	9.8	99921.4	56
513	8.4	54.1	1725	217.0	217.7	-1.3	13.1	9.0	6.9	9.8	99921.8	56
514	8.0	53.9	1510	217.0	217.7	-1.6	13.0	8.5	6.3	9.9	99921.7	55
515	7.6	53.4	1272	217.0	217.7	-1.8	12.3	7.3	6.2	9.9	99921.6	55
516	7.4	52.5	1175	217.0	216.4	-1.8	12.1	7.7	5.9	9.9	99921.9	55
517	7.8	53.1	1384	217.0	215.2	-1.8	12.7	7.7	6.1	9.9	99921.5	55
518	8.1	53.7	1538	217.0	215.0	-1.6	13.1	8.6	7.7	9.9	99921.6	55
519	8.0	53.7	1507	217.0	212.5	-1.6	13.0	7.9	7.3	9.9	99921.2	55
520	7.9	53.5	1457	217.0	212.4	-1.7	12.9	8.4	6.0	9.9	99909.0	55
521	8.0	53.8	1495	217.0	212.4	-1.7	13.0	7.3	5.5	9.9	99909.5	55
522	7.7	54.9	1315	217.0	212.5	-1.8	12.4	6.7	5.8	9.9	99909.7	55
523	7.3	51.5	1123	217.0	212.5	-1.8	11.8	6.9	5.8	9.9	99910.0	55
524	7.2	51.8	1066	217.0	212.5	-1.8	11.6	8.2	6.0	9.9	99909.4	55
525	7.4	52.8	1180	217.0	212.4	-1.8	12.0	7.6	6.4	9.9	99909.7	55
526	7.4	51.5	1172	217.0	212.4	-1.8	12.0	6.4	6.8	9.9	99908.8	55
527	7.0	50.9	1009	217.0	212.4	-1.8	11.3	6.8	5.7	9.9	99908.9	55
528	6.7	50.5	876	217.0	212.4	-1.6	10.9	6.7	7.7	9.9	99909.7	55

Table E.01 Measurement data - Turbine ON

Project: Belle River Wind Power Project - Turbine T53 - IEC 61400-11 Measurement

Report ID: 17095.01.T53.RP1

Created on: 11/13/2018

***Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (oC)	Pressure (kPa)	Relative Humidity (%)
529	6.5	49.1	798	217.0	212.4	-1.5	10.5	7.6	8.2	9.9	99909.1	55
530	6.2	49.4	704	217.0	212.4	-1.5	10.1	6.0	7.9	9.9	99908.8	55
531	6.1	48.4	668	217.0	212.4	-1.5	10.0	6.5	7.2	9.9	99909.5	54
532	6.3	48.4	739	217.0	212.4	-1.5	10.4	6.4	6.2	9.9	99909.3	54
533	7.2	51.3	1092	217.0	212.5	-1.5	11.8	8.1	5.7	9.9	99909.4	54
534	7.6	52.6	1293	217.0	212.5	-2.1	12.4	7.3	5.4	9.9	99909.4	54
535	7.6	52.8	1293	217.0	212.4	-2.1	12.4	7.5	5.0	9.9	99909.6	54
536	7.7	53.3	1341	217.0	212.4	-2.1	12.6	7.8	4.8	9.9	99909.5	54
537	7.9	53.5	1416	217.0	212.4	-2.1	12.8	8.5	4.7	9.9	99909.4	54
538	7.8	53.3	1404	217.0	212.4	-2.1	12.8	7.9	5.5	10.0	99909.4	55
539	7.8	53.3	1377	217.0	212.4	-2.1	12.7	7.4	5.2	10.0	99909.4	55
540	7.6	53.8	1272	217.0	212.4	-1.6	12.3	6.9	6.7	10.0	99909.0	55
541	7.4	52.3	1198	217.0	212.4	-1.5	12.1	6.3	6.0	10.0	99909.5	55
542	7.5	53.8	1254	217.0	212.4	-1.5	12.3	7.6	4.9	10.0	99909.6	55
543	8.5	54.1	1750	217.0	212.4	0.6	13.2	9.5	4.9	10.0	99909.6	55
544	8.6	53.4	1804	217.0	212.5	0.8	13.1	9.9	6.3	10.0	99908.8	56
545	8.3	54.4	1648	217.0	212.5	-0.2	13.0	8.1	6.7	10.0	99908.6	56
546	7.8	53.4	1406	217.0	212.5	-1.7	12.7	7.6	5.8	10.0	99908.2	56
547	7.4	52.1	1196	217.0	214.4	-1.8	12.1	7.8	5.4	10.0	99908.4	56
548	7.3	52.1	1139	217.0	215.2	-1.8	11.8	7.4	4.8	10.0	99908.3	56
549	7.4	52.3	1201	217.0	215.1	-1.8	12.1	7.6	6.0	10.0	99908.7	55
550	8.3	53.8	1671	217.0	215.1	-0.4	13.2	7.5	5.2	10.1	99908.1	55
551	9.0	54.0	2056	217.0	215.1	0.3	13.3	9.1	6.4	10.1	99908.2	55
552	9.4	54.1	2235	217.0	215.1	0.0	13.2	10.0	6.6	10.1	99908.2	55
553	9.6	54.4	2327	217.0	215.2	-0.2	13.1	9.9	6.4	10.1	99907.7	55
554	10.0	54.3	2518	217.0	215.2	-0.2	13.1	9.9	5.5	10.1	99907.6	55
555	10.6	55.3	2643	217.0	215.1	-0.5	13.1	10.7	4.7	10.1	99907.7	54
556			2612	217.0	215.1	-0.8	13.0	10.5	4.6	10.2	99907.6	54
557			2587	217.0	215.2	-0.8	13.0	10.0	4.7	10.2	99907.8	54
558	9.9	54.0	2471	217.0	215.2	-0.9	13.0	10.5	5.6	10.2	99909.7	54
559	9.1	54.5	2106	217.0	215.2	-1.1	13.0	9.4	5.7	10.2	99910.0	54
560	9.2	54.5	2150	217.0	215.2	-0.9	13.2	8.8	4.2	10.2	99914.0	54
561	8.3	54.8	1657	217.0	215.2	-1.4	12.9	8.7	6.4	10.3	99921.7	55
562	8.3	54.2	1635	217.0	215.2	-1.5	13.1	8.7	6.0	10.3	99921.4	55
563	9.1	54.2	2092	217.0	215.2	-0.3	13.3	8.9	6.6	10.3	99921.3	55
564	9.0	53.5	2065	217.0	215.2	-0.4	13.1	9.0	7.0	10.3	99921.2	55
565	8.5	54.7	1768	217.0	215.2	-1.3	13.0	8.2	7.7	10.3	99921.6	55
566			1440	217.0	215.1	-1.7	12.9	7.3	7.0	10.3	99921.9	55
567			1326	217.0	215.1	-1.8	12.5	7.5	6.3	10.4	99921.6	54
568	7.6	52.5	1263	217.0	215.1	-1.8	12.3	7.5	6.2	10.4	99921.6	54
569	7.8	53.4	1390	217.0	215.1	-1.8	12.8	8.0	5.7	10.4	99921.7	54
570	7.8	53.2	1384	217.0	215.1	-1.8	12.7	8.0	6.0	10.4	99921.9	54
571	7.5	51.9	1225	217.0	215.1	-1.8	12.2	8.4	7.4	10.4	99921.9	54
572	7.8	53.5	1397	217.0	215.1	-1.6	12.8	8.7	7.5	10.4	99922.0	54
573	8.2	54.3	1574	217.0	215.1	-1.5	13.1	8.6	6.4	10.4	99921.4	54
574	7.9	53.8	1441	217.0	215.1	-1.7	12.9	8.9	5.7	10.4	99921.5	54
575	8.1	54.0	1565	217.0	215.0	-1.6	13.1	8.4	6.9	10.4	99921.7	54
576	8.0	54.0	1472	217.0	212.3	-1.7	12.9	6.8	7.4	10.4	99922.0	54
577	7.7	53.2	1345	217.0	211.9	-1.8	12.6	8.7	7.3	10.4	99921.5	54
578	8.4	54.1	1737	217.0	211.9	-0.2	13.1	10.3	7.2	10.4	99921.8	54
579	9.7	53.6	2397	217.0	212.0	1.4	13.2	9.7	7.5	10.4	99921.4	54
580	9.8	54.0	2447	217.0	212.0	1.1	13.1	8.9	6.7	10.4	99920.9	54
581			2611	217.0	212.0	0.9	13.1	9.6	6.2	10.4	99921.4	54
582			2342	217.0	212.0	-0.3	13.0	11.0	6.2	10.4	99921.3	54
583			2343	217.0	212.0	-0.6	13.1	10.8	6.3	10.4	99921.2	54
584			2525	217.0	212.0	-0.5	13.1	9.5	6.7	10.4	99921.5	54
585			2644	217.0	212.0	-0.6	13.1	9.9	7.1	10.4	99921.6	53
586			1945	217.0	212.0	-1.1	12.9	9.3	6.8	10.4	99921.7	53
587			1522	217.0	211.8	-1.6	13.0	8.0	6.2	10.4	99921.2	53
588			1522	217.0	209.4	-1.6	13.1	8.3	5.9	10.4	99921.7	53
589			1643	217.0	209.2	-1.4	13.2	8.4	5.8	10.4	99921.0	53
590			1610	217.0	209.2	-1.5	13.1	7.9	7.7	10.4	99919.3	53
591			1618	217.0	209.2	-1.5	13.1	7.9	6.6	10.5	99909.7	53
592			1847	217.0	209.2	-0.9	13.2	9.7	7.7	10.5	99909.3	53
593			2301	217.0	210.3	0.6	13.2	11.9	6.9	10.5	99909.7	53
594			2376	217.0	211.7	0.2	13.1	11.0	5.3	10.5	99909.8	53
595			2633	217.0	211.7	0.2	13.1	10.6	6.3	10.5	99909.5	53
596			2303	217.0	211.7	-0.9	13.0	10.9	5.5	10.5	99913.1	53
597			2183	217.0	211.7	-0.9	13.1	11.0	6.4	10.5	99921.7	53
598			2341	217.0	211.7	-0.1	13.1	10.7	6.1	10.5	99922.0	53
599			2090	217.0	212.5	-1.0	13.1	10.4	6.9	10.5	99922.2	53
600			2412	217.0	214.0	0.1	13.2	9.8	6.6	10.5	99922.4	53
601			2429	217.0	214.0	-0.4	13.1	9.7	5.9	10.5	99921.7	53
602			2305	217.0	214.0	-1.0	13.1	9.6	5.9	10.5	99909.1	53
603			2193	217.0	214.0	-1.0	13.1	9.2	7.3	10.5	99909.4	53
604			1996	217.0	214.0	-1.1	13.0	9.3	6.8	10.5	99909.6	53
605			2065	217.0	214.0	-1.1	13.2	8.7	6.6	10.5	99909.8	53
606			1861	217.0	214.0	-1.2	13.1	9.7	6.8	10.5	99909.9	53
607			2108	217.0	214.0	-0.3	13.2	10.7	6.8	10.5	99910.2	53
608			2112	217.0	214.0	-0.3	13.1	9.6	7.8	10.5	99909.5	53
609			2226	217.0	214.0	-0.5	13.1	9.9	8.1	10.5	99910.3	53
610			2335	217.0	214.0	-0.4	13.1	10.4	8.5	10.5	99909.9	53
611			2424	217.0	214.0	-0.6	13.1	10.3	8.1	10.5	99909.9	53

Table E.02 Measurement data - Background

Project: Belle River Wind Power Project - Turbine T53 - IEC 61400-11 Measurement

Report ID: 17095.01.T53.RP1

Created on: 11/13/2018

***Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Rotor RPM	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
1	6.3	46.0	0.4	5.1	11	99815.0	52
2	8.2	46.3	0.3	6.5	11	99814.9	52
3	7.0	45.9	0.4	5.6	11	99814.3	52
4	9.2	45.4	0.3	7.4	11	99815.5	52
5	7.6	44.1	0.5	6.1	11	99804.9	51
6	10.1	42.9	0.4	8.0	11	99803.5	51
7	9.7	43.0	0.4	7.7	11	99803.1	51
8	8.7	43.3	0.5	6.9	11	99803.5	51
9	8.9	41.5	0.4	7.1	11	99803.3	51
10	8.6	41.9	0.4	6.9	11	99803.5	51
11	8.2	44.4	0.5	6.6	11	99802.5	51
12	9.4	42.4	0.3	7.5	11	99802.8	51
13	8.0	40.9	0.3	6.4	11	99803.0	51
14	12.8	42.1	0.4	10.2	11	99802.9	51
15	13.2	40.7	0.4	10.5	11	99803.1	51
16	11.8	40.5	0.3	9.4	11	99803.6	51
17	11.7	41.1	0.4	9.4	11	99803.7	50
18	10.2	41.9	0.5	8.2	11	99803.2	49
19	10.4	43.4	0.4	8.3	11	99803.8	49
20	10.6	41.9	0.4	8.4	11	99803.0	49
21	10.2	43.6	0.3	8.2	11	99801.8	49
22	12.3	43.1	0.3	9.8	11	99803.5	49
23	12.0	42.4	0.4	9.6	11	99803.5	50
24	7.9	42.7	0.4	6.3	11	99803.9	50
25	12.1	40.3	0.4	9.7	11	99804.9	50
26	14.1	41.7	0.4	11.3	11	99804.5	50
27	12.9	40.4	0.3	10.3	11	99804.6	50
28	11.4	42.5	0.3	9.1	11	99804.7	50
29	11.1	42.3	0.4	8.8	11	99804.3	50
30	11.6	41.2	0.4	9.3	11	99804.1	50
31	10.7	40.3	0.4	8.5	11	99804.5	50
32	10.8	40.0	0.4	8.6	11	99804.2	50
33	11.0	40.3	0.2	8.8	11	99804.1	50
34	10.9	42.6	0.4	8.7	11	99803.2	50
35	9.5	41.2	0.4	7.6	11	99804.3	50
36	9.9	41.2	0.5	7.9	11	99804.3	50
37	9.2	41.0	0.4	7.4	11	99804.3	50
38	9.6	42.1	0.4	7.7	11	99804.3	50
39	10.9	41.3	0.7	8.7	11	99804.3	50
40	10.7	41.1	0.7	8.5	11	99803.0	50
41	9.2	41.9	0.4	7.3	11	99790.5	50
42	8.7	42.0	0.4	6.9	11	99789.6	50
43	8.1	47.2	0.5	6.5	11	99789.8	50
44	8.3	46.3	0.6	6.6	11	99790.6	50
45	7.6	44.0	0.4	6.1	11	99790.7	50
46	6.8	42.6	0.5	5.4	11	99791.2	50
47	7.3	41.1	0.6	5.8	11	99790.6	51
48	10.1	41.0	0.4	8.0	11	99791.1	51
49	10.1	41.4	0.4	8.1	11	99791.7	51
50	9.9	42.9	0.4	7.9	11	99791.3	51
51	8.0	42.1	0.5	6.4	11	99791.2	51
52	8.2	40.5	0.4	6.5	11	99793.5	51
53	10.4	41.5	0.4	8.3	11	99803.6	51
54	9.5	41.0	0.6	7.6	11	99802.5	51
55	8.0	41.2	0.4	6.3	11	99802.7	51
56	6.6	40.8	0.4	5.3	11	99803.7	51
57	8.6	41.3	0.4	6.8	11	99803.9	51
58	9.8	42.6	0.5	7.8	11	99802.8	51
59	9.7	42.4	0.5	7.7	11	99802.7	51
60	9.0	43.5	0.3	7.2	11	99802.6	51
61	8.5	41.4	0.3	6.8	11	99802.6	51
62	9.3	40.7	0.3	7.4	11	99802.7	51
63	9.0	41.9	0.4	7.2	11	99802.9	51
64	8.6	42.9	0.4	6.9	11	99805.6	51
65	8.5	42.2	0.3	6.7	11	99815.6	51
66	9.7	41.6	0.3	7.8	11	99815.7	51
67	10.3	41.0	0.3	8.2	11	99816.1	51
68	11.5	41.1	0.3	9.2	11	99815.9	51
69	11.5	40.5	0.5	9.2	11	99814.6	51
70	11.7	40.6	0.5	9.3	11	99812.3	51
71	10.6	40.3	0.4	8.4	11	99801.3	51
72	8.1	40.3	0.4	6.5	11	99801.8	51
73	6.2	40.6	0.3	5.0	11	99802.1	51
74	6.9	40.0	0.3	5.5	11	99802.0	51
75	8.2	39.7	0.4	6.6	11	99802.0	51
76	9.5	40.5	0.5	7.6	11	99802.7	51
77	10.7	39.9	0.4	8.5	11	99803.6	51
78	9.5	40.8	0.4	7.6	11	99803.7	51
79	9.9	41.0	0.4	7.9	11	99802.6	51
80	11.5	41.1	0.4	9.2	11	99801.4	51
81	12.7	42.4	0.4	10.2	11	99801.8	51
82	10.6	42.7	0.5	8.4	11	99801.9	51
83	10.4	42.3	0.5	8.3	11	99801.9	50

***Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Rotor RPM	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
84	11.0	42.5	0.5	8.8	11	99801.9	50
85	11.3	40.5	0.4	9.0	11	99801.9	50
86	9.6	42.6	0.5	7.7	11	99802.0	50
87	10.0	41.6	0.6	8.0	11	99802.1	50
88	10.2	41.1	0.4	8.1	11	99795.0	50
89	11.2	42.4	0.4	8.9	11	99788.1	51
90	12.3	39.8	0.3	9.8	11	99788.0	51
91	11.2	40.4	0.4	9.0	11	99788.1	51
92	11.4	40.7	0.3	9.1	11	99787.4	51
93	10.3	40.7	0.2	8.2	11	99787.9	51
94	11.9	40.3	0.3	9.5	11	99789.5	50
95	11.3	40.7	0.2	9.0	11	99790.0	50
96	9.6	41.2	0.2	7.6	11	99789.8	50
97	9.7	42.2	0.2	7.8	11	99789.7	50
98	10.3	40.8	0.2	8.2	11	99789.8	50
99	11.4	39.5	0.2	9.1	11	99789.8	50
100	11.0	40.1	0.3	8.7	11	99783.4	50
101	10.2	40.5	0.2	8.2	11	99776.8	51
102	10.0	41.5	0.2	7.9	11	99776.9	51
103	9.9	39.7	0.3	7.9	11	99776.9	51
104	9.9	40.1	0.3	7.9	11	99777.3	51
105	9.2	42.6	0.3	7.4	11	99746.6	50
106	10.7	43.1	0.5	8.5	11	99746.1	50
107	9.6	42.9	0.4	7.7	11	99746.5	50
108	10.2	42.7	0.5	8.1	11	99746.6	50
109	10.2	41.4	0.3	8.1	11	99747.4	50
110	10.4	42.2	0.3	8.3	11	99747.3	50
111	9.8	41.9	0.4	7.8	11	99746.8	50
112	10.8	42.6	0.4	8.6	11	99746.4	50
113	10.9	41.6	0.4	8.7	11	99746.2	50
114	9.0	42.3	0.5	7.2	11	99747.0	50
115	8.6	42.8	0.3	6.9	11	99747.7	50
116	10.3	43.7	0.3	8.2	11	99743.6	50
117	9.4	43.9	0.4	7.5	11	99734.2	50
118	10.1	43.4	0.3	8.0	11	99734.0	50
119	9.3	45.4	0.2	7.4	11	99734.3	50
120	8.5	42.9	0.7	6.8	11	99734.7	50
121	8.6	41.0	0.7	6.9	11	99735.2	50
122	8.5	40.7	0.6	6.8	11	99735.1	50
123	10.1	41.1	0.4	8.1	11	99735.2	50
124	9.7	40.6	0.5	7.7	11	99734.5	50
125	8.1	41.1	0.4	6.5	11	99734.0	50
126	7.2	40.5	0.5	5.8	11	99733.8	50
127	8.1	41.1	0.4	6.4	11	99734.8	50
128	8.4	41.0	0.4	6.7	11	99734.0	50
129	9.3	41.2	0.5	7.4	11	99733.8	50
130	11.7	41.8	0.3	9.3	11	99733.9	50
131	12.0	41.9	0.4	9.6	11	99733.8	50
132	11.6	41.3	0.4	9.2	11	99733.5	50
133	13.7	42.0	0.3	10.9	11	99732.7	50
134	13.9	45.5	0.4	11.1	11	99729.2	49
135	15.3	45.9	0.2	12.2	11	99720.1	47
136	13.5	42.8	0.2	10.7	11	99719.6	47
137	14.3	44.2	0.2	11.4	11	99719.9	47
138	13.1	43.6	0.2	10.4	11	99720.7	47
139	12.7	42.9	0.4	10.1	11	99720.7	47
140	11.1	43.9	0.5	8.8	11	99715.8	47
141	10.5	43.7	0.4	8.4	11	99706.3	47
142	9.9	42.7	0.4	7.9	11	99706.8	47
143	11.0	42.7	0.5	8.8	11	99707.6	47
144	9.7	44.1	0.3	7.7	11	99706.7	47
145	11.0	40.5	0.3	8.8	11	99706.7	47
146	12.1	40.9	0.4	9.7	11	99706.6	47
147	12.1	41.7	0.1	9.6	11	99706.8	47
148	10.4	41.5	0.2	8.3	11	99707.7	47
149	12.1	41.6	0.4	9.6	11	99707.9	47
150	13.7	43.0	0.3	11.0	11	99706.7	47
151	13.3	41.2	0.5	10.6	11	99706.3	47
152	11.6	41.3	0.5	9.2	12	99706.7	46
153	10.7	42.7	0.4	8.5	12	99706.2	45
154	12.8	41.7	0.5	10.2	12	99706.9	45
155	11.4	41.6	0.5	9.1	12	99706.5	45
156	13.4	41.2	0.4	10.7	12	99707.5	45
157	12.2	40.9	0.4	9.7	12	99707.6	45
158	12.0	40.5	0.4	9.5	12	99707.5	45
159	13.4	41.1	0.4	10.7	12	99708.2	44
160	13.5	41.3	0.5	10.7	12	99708.9	44
161	14.2	40.9	0.4	11.4	12	99708.2	44
162	11.1	41.5	0.3	8.9	12	99708.1	44
163	9.2	42.6	0.3	7.3	12	99707.7	44
164	8.5	43.2	0.4	6.8	12	99707.6	44
165	9.0	43.1	0.5	7.2	12	99708.5	44
166			0.5	8.4	12	99708.5	44

***Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Rotor RPM	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
167			0.5	8.6	12	99707.5	44
168			0.4	10.2	12	99707.6	44
169	14.0	44.4	0.5	11.1	12	99707.8	44
170	12.7	43.2	0.5	10.1	12	99700.6	44
171	12.1	44.7	0.4	9.6	12	99696.7	44
172	10.1	44.5	0.4	8.0	12	99696.5	44
173	9.3	45.1	0.4	7.4	12	99695.1	44
174	11.8	46.7	0.4	9.4	12	99695.0	44
175			0.5	9.8	12	99695.5	44
176	14.3	43.2	0.4	11.4	13	99441.9	44
177	12.6	43.1	0.5	10.1	13	99430.2	44
178	14.3	42.9	0.4	11.4	13	99430.5	44
179	14.5	44.7	0.4	11.6	13	99430.5	44
180			0.6	11.5	13	99430.5	44
181	12.5	44.0	0.5	10.0	13	99430.1	44
182	13.4	42.0	0.5	10.7	13	99430.4	44
183	12.6	41.3	0.3	10.1	13	99417.0	44
184	12.6	40.9	0.2	10.0	13	99417.2	44
185	12.3	40.7	0.4	9.8	13	99417.2	44
186	11.6	41.4	0.3	9.2	13	99417.1	44
187	11.2	40.2	0.3	8.9	13	99417.2	44
188	8.9	42.3	0.4	7.1	13	99419.4	44
189	9.9	42.9	0.5	7.9	13	99430.4	44
190	11.7	43.4	0.4	9.3	13	99430.8	44
191	12.7	42.9	0.4	10.2	13	99430.5	44
192	13.5	45.9	0.3	10.7	13	99430.6	44
193			0.3	10.4	13	99430.8	44
194			0.3	8.8	13	99430.6	44
195			0.3	8.6	13	99417.0	44
196	9.0	43.7	0.4	7.2	13	99417.1	44
197	9.4	41.8	0.4	7.5	13	99416.3	44
198	9.8	40.9	0.3	7.8	13	99416.0	44
199	10.1	44.0	0.3	8.0	13	99415.9	44
200	9.2	42.2	0.4	7.3	13	99416.6	44
201	9.4	41.6	0.4	7.5	13	99416.6	44
202	9.2	44.2	0.4	7.4	13	99417.0	44
203	8.9	44.0	0.4	7.1	13	99417.4	44
204	9.6	43.0	0.3	7.6	13	99417.1	44
205	11.5	43.2	0.3	9.1	13	99417.4	44
206	9.8	41.7	0.3	7.8	13	99417.2	44
207	9.8	41.2	0.3	7.8	13	99415.8	44
208	10.6	41.6	0.4	8.5	13	99416.3	44
209	11.2	41.7	0.4	8.9	13	99417.4	44
210	9.8	41.1	0.4	7.8	13	99416.7	44
211	11.2	39.8	0.3	9.0	13	99416.8	44
212	13.4	39.9	0.3	10.7	13	99416.0	44
213	11.3	41.0	0.5	9.0	13	99416.4	43
214	10.0	41.7	0.4	8.0	13	99416.3	43
215	10.2	42.0	0.4	8.2	13	99416.3	43
216	11.0	43.1	0.4	8.8	13	99415.8	43
217	11.7	43.6	0.4	9.4	13	99416.0	43
218	12.8	41.5	0.5	10.2	13	99411.3	43
219	12.8	45.2	0.4	10.2	13	99403.0	43
220	10.9	42.4	0.2	8.7	13	99403.4	43
221	8.4	41.5	0.1	6.7	13	99404.1	43
222	8.5	41.6	0.2	6.8	13	99403.7	43
223	11.2	42.3	0.6	9.0	13	99403.0	43
224	8.6	41.7	0.8	6.9	13	99405.3	43
225	7.2	41.9	0.5	5.8	13	99403.6	44
226	8.1	41.9	0.1	6.5	13	99403.8	44
227	9.7	41.6	0.2	7.8	13	99403.8	44
228	9.1	42.0	0.3	7.2	13	99403.9	44
229	9.9	41.2	0.4	7.9	13	99403.9	44
230	8.2	40.8	0.3	6.6	13	99404.3	44
231	9.7	43.9	0.2	7.8	13	99403.8	43
232	10.3	45.9	0.2	8.2	13	99403.3	43
233	10.9	43.9	0.3	8.7	13	99404.2	43
234	10.5	43.2	0.4	8.4	13	99404.7	43
235	9.4	45.5	0.3	7.5	13	99404.0	43
236	7.3	42.9	0.5	5.8	13	99398.7	44
237	10.2	42.3	0.4	8.2	13	99390.6	44
238	7.5	43.3	0.5	6.0	13	99390.8	44
239	6.7	43.4	0.4	5.4	13	99391.1	44
240	10.4	42.7	0.4	8.3	13	99390.6	44
241	10.3	42.8	0.4	8.2	13	99390.2	44
242	9.0	41.7	0.4	7.2	13	99390.3	43
243	10.1	42.3	0.5	8.0	13	99390.5	43
244	11.6	43.3	0.6	9.2	13	99390.7	43
245	10.1	42.7	0.7	8.0	13	99390.7	43
246	8.4	42.1	0.7	6.7	13	99389.6	43
247	8.8	43.5	0.6	7.0	13	99391.1	43
248	8.8	44.1	0.5	7.0	13	99387.7	43
249	8.5	42.7	0.5	6.8	13	99378.5	44

Table E.02 Measurement data - Background

Project: Belle River Wind Power Project - Turbine T53 - IEC 61400-11 Measurement
Report ID: 17095.01.T53.RP1

Created on: 11/13/2018

***Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Rotor RPM	10m Anemometer Wind Speed (m/s)	Air Temperature (C)	Pressure (kPa)	Relative Humidity (%)
250	10.9	42.3	0.3	8.7	13	99379.2	44
251	11.0	43.6	0.5	8.8	13	99379.3	44
252	11.1	43.6	0.6	8.9	13	99379.2	44
253	10.8	45.0	0.6	8.6	13	99378.8	44
254			0.4	9.3	13	99379.1	44
255			0.3	10.4	13	99379.3	43
256			0.3	7.8	13	99378.5	43
257			0.4	8.6	13	99378.1	43
258			0.4	10.8	13	99378.4	43
259	13.0	44.7	0.5	10.4	13	99378.9	43
260	11.4	44.8	0.4	9.1	13	99378.7	43
261	11.0	44.0	0.5	8.8	13	99378.3	43
262	9.3	44.8	0.2	7.4	13	99377.7	43
263	7.9	44.1	0.3	6.3	13	99377.6	43
264	8.4	44.0	0.5	6.7	13	99378.0	43
265	8.1	46.2	0.5	6.5	13	99376.6	43
266	7.7	43.1	0.4	6.1	13	99366.6	43
267	6.4	43.4	0.6	5.1	13	99362.3	43
268	7.4	42.8	0.5	5.9	13	99362.3	43
269	5.7	43.7	0.5	4.5	13	99362.2	43
270	7.9	46.4	0.6	6.3	13	99362.4	43
271	10.0	46.0	0.4	8.0	13	99361.7	43
272			0.4	6.2	13	99353.5	43
273	7.5	47.2	0.5	6.0	13	99349.3	43
274	6.8	45.0	0.3	5.5	13	99349.2	43
275	7.1	43.5	0.2	5.6	13	99349.0	43
276	9.3	43.2	0.4	7.4	13	99348.6	43
277	11.6	44.1	0.4	9.3	13	99348.5	43
278	10.5	42.9	0.5	8.3	13	99348.2	43
279	8.9	44.9	0.5	7.1	13	99348.1	43
280	7.8	46.8	0.5	6.2	13	99348.5	43
281			0.6	5.9	13	99348.5	43
282			0.5	5.9	13	99347.4	43
283	7.7	47.1	0.6	6.2	13	99348.0	43
284	7.5	45.9	0.4	6.0	13	99348.0	43
285	7.3	44.2	0.5	5.9	13	99348.1	43
286	6.8	42.7	0.4	5.4	13	99348.2	43
287	7.0	43.2	0.4	5.5	13	99348.4	43
288	6.4	42.7	0.4	5.1	13	99347.9	43
289			0.4	5.9	13	99347.9	43
290	7.7	43.6	0.5	6.1	13	99347.8	44
291	10.2	42.8	0.5	8.1	13	99347.4	44
292	10.1	43.1	0.6	8.0	13	99347.0	44
293	8.9	41.3	0.5	7.1	13	99346.8	44
294	7.8	41.4	0.4	6.2	13	99347.2	44
295	9.1	41.7	0.3	7.2	13	99348.7	44
296	11.1	42.8	0.4	8.9	13	99348.5	43
297	9.6	42.0	0.4	7.7	13	99348.1	43
298	10.0	41.8	0.3	8.0	13	99348.3	43
299	8.7	41.9	0.3	6.9	13	99348.2	43
300	7.0	44.4	0.2	5.6	13	99348.3	43
301	8.2	46.5	0.3	6.5	13	99349.4	43
302			0.4	7.3	13	99350.3	44
303	8.3	46.3	0.5	6.6	13	99350.4	44
304	7.8	46.0	0.5	6.3	13	99349.9	44
305	9.2	43.9	0.5	7.4	13	99349.3	44
306	13.5	42.7	0.5	10.7	13	99347.9	44
307	13.0	42.0	0.4	10.3	13	99347.6	44
308	11.9	41.6	0.4	9.5	13	99348.2	43
309	12.3	41.9	0.5	9.8	13	99348.8	43
310	13.6	43.8	0.6	10.8	13	99348.8	43
311	12.3	44.0	0.8	9.8	13	99348.9	43
312	10.5	43.9	0.6	8.4	13	99352.2	43
313	10.4	45.5	0.5	8.3	13	99361.9	43
314			0.4	10.3	13	99362.8	43
315	11.1	45.8	0.6	8.8	13	99363.8	43
316	11.8	43.7	0.5	9.4	13	99364.4	43
317	13.3	42.8	0.5	10.6	13	99365.0	43
318	13.1	43.1	0.4	10.5	13	99365.1	43
319	13.5	42.8	0.6	10.7	13	99365.3	43
320	11.6	42.5	0.4	9.2	13	99365.0	42
321	10.1	45.4	0.5	8.1	13	99365.3	42
322	9.2	44.3	0.6	7.4	13	99365.5	42
323	12.0	43.3	0.5	9.6	13	99365.4	42
324	12.6	43.8	0.6	10.0	13	99364.9	42
325	10.9	43.0	0.5	8.7	13	99365.1	42
326	9.6	44.1	0.5	7.6	13	99365.7	42
327			0.5	8.0	13	99366.1	42
328			0.4	7.6	13	99366.0	42
329			0.5	8.9	13	99366.1	42
330			0.7	8.0	13	99365.9	42
331	10.6	45.7	0.7	8.4	13	99364.9	42
332	10.6	46.0	0.6	8.5	13	99365.4	43

***Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Rotor RPM	10m Anemometer Wind Speed (m/s)	Air Temperature (C)	Pressure (kPa)	Relative Humidity (%)
333	11.9	46.7	0.6	9.5	13	99365.5	43
334	14.5	46.7	0.5	11.5	13	99365.9	43
335	12.2	46.7	0.5	9.7	13	99365.5	43
336	11.8	46.5	0.5	9.4	13	99364.5	43
337	11.1	45.0	0.5	8.9	13	99365.3	43
338	12.3	45.3	0.4	9.8	13	99365.3	43
339	9.6	45.8	0.6	7.6	13	99365.0	43
340	13.4	42.8	0.6	10.7	13	99365.1	43
341	14.5	44.9	0.5	11.5	13	99365.7	43
342	11.7	43.8	0.5	9.3	13	99365.7	43
343	9.3	45.8	0.6	7.4	13	99366.0	43
344	10.7	43.8	0.6	8.5	13	99365.7	43
345	10.6	43.4	0.5	8.4	13	99365.4	43
346	10.9	42.3	0.5	8.7	13	99365.4	43
347	11.0	44.2	0.5	8.8	13	99365.2	43
348	10.7	43.6	0.6	8.5	13	99365.5	43
349	12.5	43.7	0.6	10.0	13	99362.0	43
350	8.9	45.8	0.5	7.1	13	99352.5	42
351	9.1	44.4	0.7	7.2	13	99352.7	42
352	11.0	44.4	0.5	8.8	13	99352.6	42
353			0.4	8.1	13	99352.6	42
354			0.5	8.8	13	99352.9	42
355			0.5	10.6	13	99348.7	42
356			0.4	9.3	13	99339.2	43
357	11.3	45.5	0.5	9.0	13	99338.6	43
358	12.1	44.9	0.5	9.7	13	99339.1	43
359	11.0	44.1	0.4	8.8	13	99339.6	43
360	11.1	43.8	0.5	8.8	13	99340.2	43
361	10.1	43.7	0.4	8.0	13	99343.5	43
362	9.5	42.4	0.5	7.6	13	99353.0	43
363	8.7	43.1	0.7	6.9	13	99352.7	43

aercoustics

Aercoustics Engineering Ltd.
1004 Middlegate Road, Suite 1100
Mississauga, ON L4Y 0G1

Tel: 416-249-3361
Fax 416-249-3613
aercoustics.com

Appendix F
Supplementary Information for the Regulator

aercoustics

Aercoustics Engineering Ltd.
1004 Middlegate Road, Suite 1100
Mississauga, ON L4Y 0G1

Tel: 416-249-3361
Fax 416-249-3613
aercoustics.com

Appendix F.01
Calibration Certificates

ISO17025

As Left RECALIBRATION CERTIFICATE

Sales Region:	NA
Account:	Aercoustics Engineering Limited
Instrument:	LMS SCADAS
Manufacturer:	Siemens Industry Software B.V.
Type:	SCR202
Serial number(s):	22163146
Calibration method:	Two calibrated external standards (DC voltage and frequency) are used to calibrate the internal LMS SCADAS references: time/frequency accuracy of the internal system clock and amplitude accuracy of the internal signal sources. All input channels are calibrated against the internal references.
Ambient conditions:	The calibrations have been carried out in a controlled environment, at an ambient temperature of 23.3°C ± 0.3°C and a relative humidity of 21% ± 5%.
Calibration date:	February 27, 2018
Results:	The calibration results, together with their associated uncertainties, are included in this calibration certificate. *Calibration results within specification.*
Uncertainty:	The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with publication EA-4/02.
Traceability:	The measurements have been executed using methods for which the traceability to international standards has been demonstrated towards the Raad voor Accreditatie.

Breda, *February 27, 2018*

Calibration performed by:

Hans Dam, Customer Service Engineer

Certificate approved by:

F.Lemmens, Production Manager

The Raad voor Accreditatie is one of the signatories of the Multilateral Agreement of the European Cooperation for Accreditation (EA) for the mutual recognition of calibration certificates.

Siemens Industry Software B.V.
Weidehek 53
4824 AT Breda
The Netherlands
Phone: +31 76 573 6363

CALIBRATION RvA K 159

ilac-MRA

West Caldwell Calibration Laboratories Inc.

Certificate of Calibration

for

MICROPHONE UNIT

Manufactured by:	BRUEL & KJAER
Model No:	4189-A-021
Serial No:	2622169
Calibration Recall No:	28016

Submitted By:

Customer:

Company: Aercoustics Engineering LTD.

Address:

The subject instrument was calibrated to the indicated specification using standards traceable to the National Institute of Standards and Technology or to accepted values of natural physical constants. This document certifies that the instrument met the following specification upon its return to the submitter.

West Caldwell Calibration Laboratories Procedure No. 4189-A-021 BRUE

Upon receipt for Calibration, the instrument was found to be:

Within (X)

tolerance of the indicated specification. See attached Report of Calibration.

West Caldwell Calibration Laboratories' calibration control system meets the requirements, ISO 10012-1 MIL-STD-45662A, ANSI/NCSL Z540-1, IEC Guide 25, ISO 9001:2008 and ISO 17025.

Note: With this Certificate, Report of Calibration is included.

Approved by: FC

Felix Christopher (QA Mgr.)

Calibration Date: 05-Sep-17

Certificate No: 28016 - 1

QA Doc. #1051 Rev. 2.0 10/1/01

ISO/IEC 17025:2005

ACCREDITED

Calibration Lab. Cert. # 1533.01

West Caldwell Calibration Laboratories, Inc.
uncompromised calibration
1575 State Route 96, Victor, NY 14564, U.S.A.

West Caldwell Calibration Laboratories, Inc.
uncompromised calibration
1575 State Route 96, Victor NY 14564

ISO/IEC 17025: 2005
ACCREDITED
Calibration Lab. Cert. # 1533.01

REPORT OF CALIBRATION

for

Brüel & Kjær Microphone Unit

Model No.: 4189-A-021 — **Serial No.: 2622169**
Mic. Model No.: 4189 — **Serial No.: 2625417**
Preamp. Model No.: 2671 — **Serial No.: 2614900**
Company: Aercoustics Engineering LTD. — **I. D. No.: XXXX**

Calibration results:

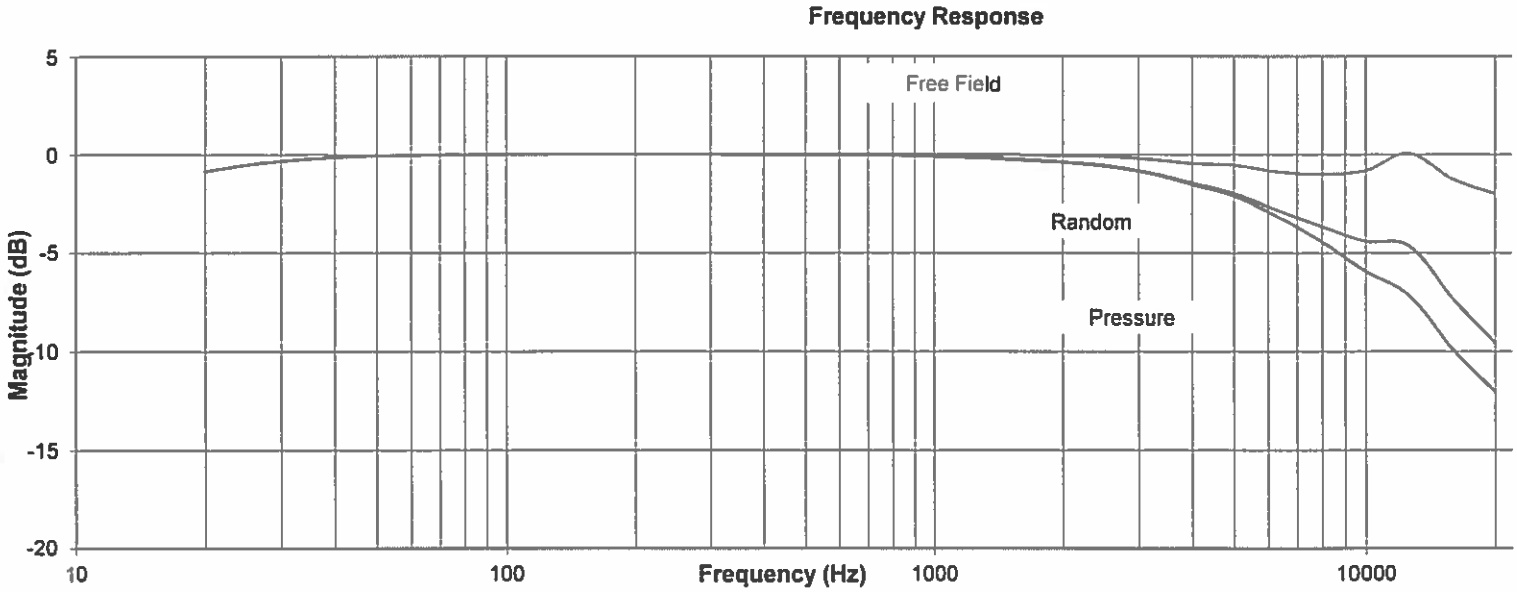
Before & after data same: ...X...

Combined Sensitivity @ 250 Hz and pressure of 98.432 kPa
(Sens. with mic. and preamp.) 0 Volts Polarization voltage (External):
-26.54 dB re.1V/Pascal
47.10 mV/Pascal
0.54 Ko (- dB re 50 mV/Pascal)
Sensitivity: Pass
Freq. Response: Pass
All tests: Pass

Ambient Temperature:	21.8	°C
Ambient Humidity:	56.4	% RH
Ambient Pressure:	98.432	kPa
Calibration Date:	5-Sep-2017	
Calibration Due:	5-Sep-2018	
Report Number:	28016 -1	
Control Number:	28016	

The above listed instrument meets or exceeds the tested manufacturer's specifications.
The IEC 651:1979 & 1993 Type 1 specification passed.
This Calibration is traceable through NIST test numbers: 683/284413-14
The expanded uncertainty of calibration: 0.079dB at 95% confidence level with a coverage factor of k=2.

The pressure response recorded with electroacoustic method.



The above listed instrument was checked using calibration procedure documented in West Caldwell Calibration Laboratories Inc. procedure : **Rev. 7.0 Jan. 24, 2014 Doc. # 1038 P4189A021B&K**
Calibration was performed by West Caldwell Calibration Laboratories Inc. under Operating Procedures intended to implement the requirements of ISO10012-1, IEC Guide 25, ANSI/NCSL Z540-1, (MIL-STD-45662A) and ISO 9001:2008, ISO 17025

Measurements performed by: .....
James Zhu

Calibrated on WCCL system type 9700

West Caldwell Calibration Laboratories Inc.
1575 State Route 96, Victor NY 14564
Tel. (585) 586-3900 FAX (585) 586-4327

Calibration Data Record

for

Brüel & Kjær Microphone Unit **Model No.: 4189-A-021** **Serial No.: 2622169**
Company: Aercoustics Engineering LTD. **I. D. No.: XXXX**

Frequency Response (Reference = 0 dB @ 250Hz)

Frequency [Hz]	Pressure [dB]	Free Field (dB)	Random (dB)
19.95	-0.85	-0.85	-0.85
25.12	-0.51	-0.51	-0.51
31.62	-0.28	-0.28	-0.28
39.81	-0.14	-0.14	-0.14
50.12	-0.06	-0.06	-0.06
63.10	-0.02	-0.02	-0.02
79.43	-0.01	-0.01	-0.01
100.00	0.00	0.00	0.00
125.89	0.00	0.00	0.00
158.49	0.00	0.00	0.00
199.53	0.01	0.01	0.01
251.19	0.00	0.00	0.00
316.23	0.00	0.00	0.00
398.11	-0.01	0.00	-0.01
501.19	-0.01	0.01	-0.01
630.96	-0.02	0.01	-0.02
794.33	-0.05	0.02	-0.05
1000.00	-0.09	0.01	-0.11
1258.93	-0.14	0.01	-0.17
1584.89	-0.23	-0.01	-0.29
1995.26	-0.39	-0.06	-0.39
2511.89	-0.59	-0.11	-0.55
3162.28	-0.94	-0.23	-0.91
3981.07	-1.51	-0.45	-1.42
5011.87	-2.11	-0.53	-1.97
6309.57	-3.15	-0.87	-2.83
7943.28	-4.38	-1.00	-3.63
10000.00	-5.92	-0.80	-4.39
12589.25	-7.13	0.07	-4.62
15848.93	-9.80	-1.21	-7.22
19952.62	-12.02	-1.97	-9.54

Freq. response: Expanded Uncertainty (dB) with coverage factor K = 2
20 to 63Hz 0.1dB, 63 to 12.5kHz 0.094dB, 12.5k to 16kHz 0.10dB, 16k to 20kHz 0.5dB.

Instruments used for calibration:			Date of Cal.	Traceability No.	Re-cal. Due Date
Brüel & Kjær	4226	S/N 1445428	3-Nov-2016	683/284413-14	3-Nov-2017
Brüel & Kjær	3560	S/N 2202374	3-Nov-2016	683/284413-14	3-Nov-2017
HP	33120A	S/N 36043716	1-Oct-2016	,287708	1-Oct-2017
HP	34401A	S/N 36064102	1-Oct-2016	,287708	1-Oct-2017

Cal. Date: 5-Sep-2017 **Tested by: James Zhu**

Calibrated on WCCL system type 9700

West Caldwell Calibration Laboratories Inc.

Certificate of Calibration

for

ACOUSTICAL CALIBRATOR

Manufactured by:	BRUEL & KJAER
Model No:	4231
Serial No:	2513182
Calibration Recall No:	29034

Submitted By:

Customer:

Company: Aercoustics Engineering Ltd.

Address:

The subject instrument was calibrated to the indicated specification using standards traceable to the National Institute of Standards and Technology or to accepted values of natural physical constants. This document certifies that the instrument met the following specification upon its return to the submitter.

West Caldwell Calibration Laboratories Procedure No. 4231 BRUE

Upon receipt for Calibration, the instrument was found to be:

Within (X)

tolerance of the indicated specification. See attached Report of Calibration.
The information supplied relates to the calibrated item listed above.
West Caldwell Calibration Laboratories' calibration control system meets the requirements, ISO 10012-1 MIL-STD-45662A, ANSI/NCSL Z540-1, IEC Guide 25, ISO 9001:2008 and ISO 17025.

Note: With this Certificate, Report of Calibration is included.

Approved by: FC

Calibration Date: 25-Jul-18

Felix Christopher (QA Mgr.)

Certificate No: 29034 - 1

ISO/IEC 17025:2005

West Caldwell Calibration Laboratories, Inc.
uncompromised calibration
1575 State Route 96, Victor, NY 14564, U.S.A.

ACCREDITED

Calibration Lab. Cert. # 1533.01

uncompromised calibration
West Caldwell Calibration Laboratories, Inc.
1575 State Route 96, Victor NY 14564

ISO/IEC 17025: 2005
ACCREDITED
Calibration Lab. Cert. # 1533.01

REPORT OF CALIBRATION

for

Brüel & Kjær Sound Calibrator **Model No.: 4231** **Serial No.: 2513182**
Company: Aercoustics Engineering LTD. **ID No.: XXXX**

Calibration results:

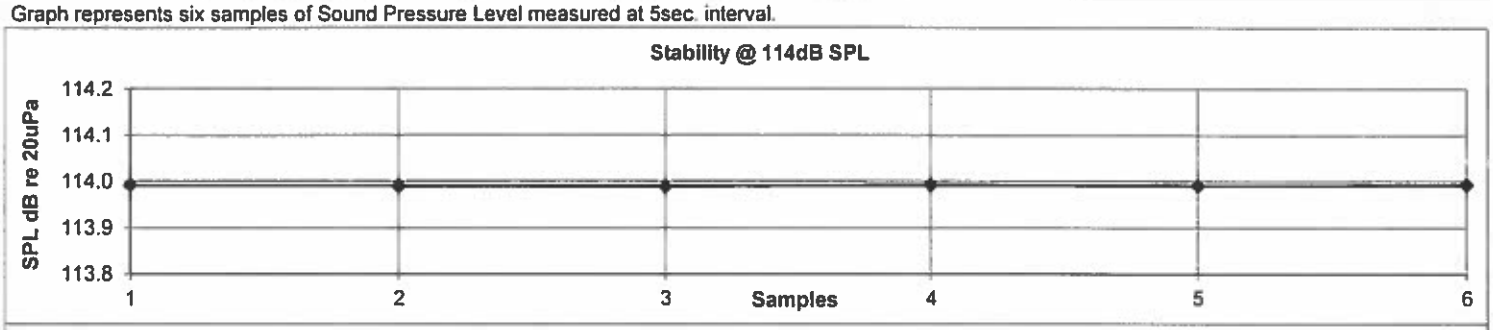
Before data: ..... **After data:** .....
Before & after data same: ...X.....
Sound Pressure Level at 1000.0 Hz and pressure of 1013 hPa (mbar)
was 113.99 dB re 20µPa
(Calibrator tested with ½" adaptor UC 0210)
IEC 1094-4 Type WS 2 P Microphone was used for measurement.

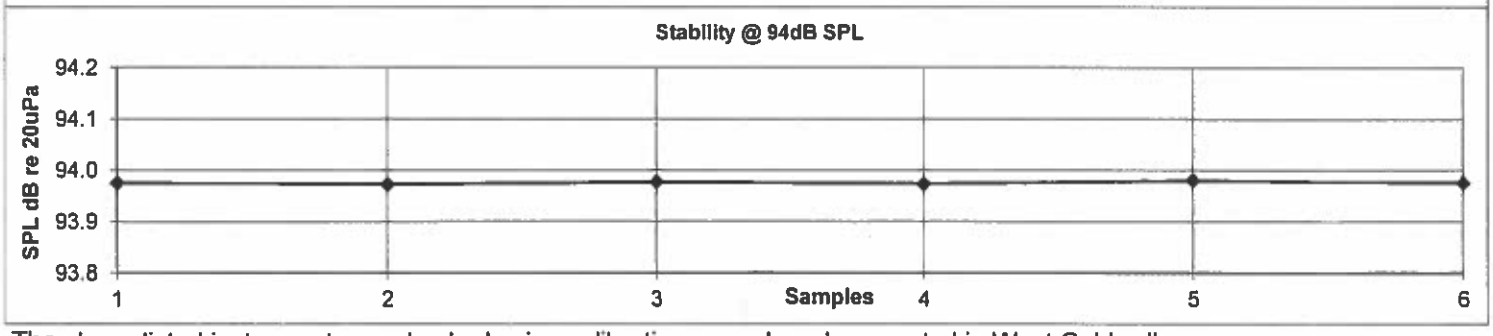
	114dB	94dB
Sound Pressure Level:	Pass	Pass
Frequency:	Pass	Pass
Distortion:	Pass	Pass
Stability:	Pass	Pass
All tested parameters:		Pass

Laboratory Environment:		
Ambient Temperature:	23.0	°C
Ambient Humidity:	47.0	% RH
Ambient Pressure:	98.901	kPa
Calibration Date:	25-Jul-2018	
Calibration Due:	25-Jul-2019	
Report Number:	29034 -1	
Control Number:	29034	

The above listed instrument meets or exceeds the tested manufacturer's specifications
The IEC 60942:2003 Class 1 specifications, passed.
The ANSI S1.4-1984 specifications, passed.
This Calibration is traceable through NIST test numbers: 683/284413-14
The expanded uncertainty of calibration: 0.11 dB at 95% confidence level with a coverage factor of k=2.

Graph represents six samples of Sound Pressure Level measured at 5sec. interval.





The above listed instrument was checked using calibration procedure documented in West Caldwell Calibration Laboratories Inc. procedure : **Rev. 7.0 Jan. 24, 2014 Doc. # 1038 4231B&K**

Calibration was performed by West Caldwell Calibration Laboratories Inc. under Operating Procedures intended to implement the requirements of ISO10012-1, IEC Guide 25, ANSI/NCSL Z540-1, (MIL-STD-45662A) and ISO 9001:2008, ISO 17025

Cal. Date: 25-Jul-2018 Measurements performed by: MS
Calibrated on WCCL system type 9700 **Matthew Smith**

Rev. 7.0 Jan. 24, 2014 Doc. # 1038 4231B&K

West Caldwell Calibration Laboratories Inc.
1575 State Route 96, Victor NY 14564
Tel. (585) 586-3900 FAX (585) 586-4327

Calibration Data Record

for

Brüel & Kjær Sound Calibrator **Model No.: 4231** **Serial No.: 2513182**
Company: Aercoustics Engineering LTD.

All tested parameters: Pass

Measured Sound Pressure Level (Six samples measured at 5 sec. interval)

Sample	1	113.99 dB re 20μPa	93.98 dB re 20μPa	
	2	113.99	93.97	
	3	113.99	93.98	
	4	113.99	93.97	
	5	113.99	93.98	
	6	113.99	93.98	
	Average	**113.99** Spec. 114dB ± 0.2dB	**93.98**	Spec. 94dB ± 0.2dB

Frequency measured (Three samples at 30 sec. Interval)

Sample	1	999.98 Hz	999.97 Hz	
	2	999.98	1000.00	
	3	999.98	999.98	
	Average	**999.98**	**999.98**	Spec. 1000Hz ±0.1%

The Frequency expanded uncertainty of calibration:45μHz/Hz at 95% confidence level with a coverage factor of k=2.

Distortion measured	-50.8 dB	-46.5 dB	Spec. ≤-40dB

Instruments used for calibration:			Date of Cal.	Traceability No.	Re-cal. Due Date
Brüel & Kjær	4231	S/N 2205493	25-Aug-2017	683/284413-14	25-Aug-2018
Brüel & Kjær	4134	S/N 1942286	25-Aug-2017	683/284413-14	25-Aug-2018
Brüel & Kjær	2669	S/N 1835082	25-Aug-2017	683/284413-14	25-Aug-2018
HP	34401A	S/N US360641	25-Aug-2017	,287708	25-Aug-2018
Brüel & Kjær	2636	S/N 1324082	25-Aug-2017	683/284413-14	25-Aug-2018
HP	33120A	S/N US360437	25-Aug-2017	,287708	25-Aug-2018

Cal. Date: 25-Jul-2018 **Tested by: Matthew Smith**

Calibrated on WCCL system type 9700

Rev. 7.0 Jan. 24, 2014 Doc. # 1038 4231B&K

SOH Wind Engineering LLC

141 Leroy Road · Williston, VT 05495 · USA

Tel 802.316.4368 · Fax 802.735.9106 · www.sohwind.com

CERTIFICATE FOR CALIBRATION OF SONIC ANEMOMETER

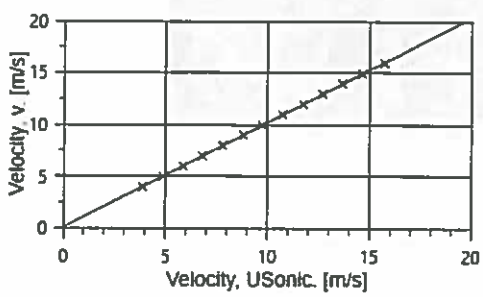
Certificate number: 18.US1.05011 **Date of issue:** September 28, 2018
Type: Vaisala Weather Transmitter, WXT520 **Serial number:** k4250007
Manufacturer: Vaisala, Oyj, Pl 26, FIN-00421 Helsinki, Finland
Client: Aercoustics Engineering Ltd., 1004 Middlegate RD, Suite 1100, S.Tower, Mississauga, ON L4Y 1M4, Canada

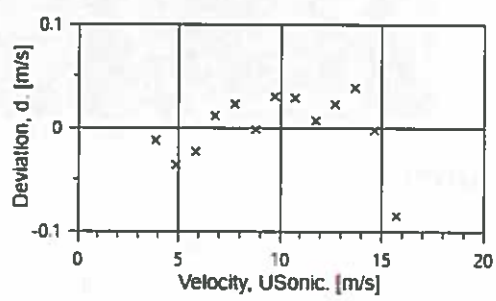
Anemometer received: September 28, 2018 **Anemometer calibrated:** September 28, 2018
Calibrated by: MEJ **Procedure:** MEASNET, IEC 61400-12-1:2017 Annex F
Certificate prepared by: EJF **Approved by:** Calibration engineer, EJF

Calibration equation obtained: v [m/s] = 1.01370 · f [m/s] + 0.06230

Standard uncertainty, slope: 0.00263 **Standard uncertainty, offset:** 0.44596
Covariance: -0.0000692 (m/s)²/m/s **Coefficient of correlation:** $\rho = 0.999962$
Absolute maximum deviation: -0.085 m/s at 15.914 m/s
Barometric pressure: 1004.6 hPa **Relative humidity:** 41.7%

Succession	Velocity pressure, q. [Pa]	Temperature in wind tunnel [°C]	d.p. box [°C]	Wind velocity, v. [m/s]	Anemometer Output, f. [m/s]	Deviation, d. [m/s]	Uncertainty u_c (k=2) [m/s]
2	9.14	26.3	26.6	3.966	3.8633	-0.012	0.020
4	14.39	26.4	26.7	4.976	4.8828	-0.036	0.023
6	20.73	26.4	26.7	5.973	5.8533	-0.023	0.026
8	28.21	26.4	26.7	6.967	6.8000	0.012	0.029
10	36.96	26.4	26.7	7.974	7.7828	0.023	0.033
12	46.92	26.3	26.7	8.985	8.8033	-0.002	0.037
13-last	57.63	26.3	26.7	9.957	9.7310	0.030	0.041
11	69.92	26.3	26.7	10.968	10.7300	0.029	0.045
9	83.41	26.3	26.7	11.980	11.7500	0.007	0.049
7	97.59	26.3	26.7	12.959	12.7000	0.023	0.053
5	113.15	26.3	26.7	13.955	13.6667	0.039	0.057
3	129.18	26.3	26.6	14.911	14.6500	-0.002	0.061
1-first	147.16	26.3	26.6	15.914	15.7214	-0.085	0.065





ilac-MRA

ANAB ACCREDITED CALIBRATION LABORATORY

AC-1746

SOH Wind Engineering LLC measnet USA

EQUIPMENT USED

Serial Number	Description
Njord1	Wind tunnel, blockage factor = 1.0035
2254	Control cup anemometer
-	Mounting tube, D = 19 mm
TT002	Summit Electronics, 1XPT100, 0-10V Output, wind tunnel temp.
TP001	PR Electronics 5102, 0-10V Output, differential pressure box temp.
DP005	Setra Model 239, 0-1inWC, differential pressure transducer
HY003	Dwyer RHP-2D20, 0-10V Output, humidity transmitter
BP003	Setra M278, 0-5VDC Output, barometer
PL8	Pitot tube
XB002	Computer Board, 16 bit A/D data acquisition board
9PRZRW1	PC dedicated to data acquisition

Traceable calibrations of the equipment are carried out by external accredited institutions: Atlantic Scale, Essco Calibration Labs & Furness Controls. A real-time analysis module within the data acquisition software detects pulse frequency.

Photo of the wind tunnel setup. The cross-sectional area is 2.5m x 2.5m.

UNCERTAINTIES

The documented uncertainty is the total combined uncertainty at 95% confidence level (k=2) in accordance with EA-4/02. The uncertainty at 10 m/s comply with the requirements in the IEC 61400-12-1:2005 procedure. See Document US.12.01.004 for further details.

COMMENTS

This sensor was calibrated at 90°.

Certificate number: 18.US1.05011

SOH Wind Engineering LLC

141 Leroy Road · Williston, VT 05495 · USA

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CERTIFICATE FOR CALIBRATION OF SONIC ANEMOMETER

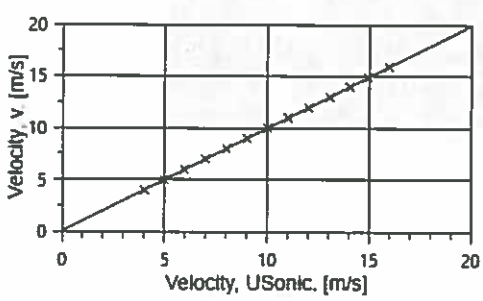
Certificate number: 18.US1.05010 **Date of issue:** September 28, 2018
Type: Vaisala Weather Transmitter, WXT520 **Serial number:** k4250007
Manufacturer: Vaisala, Oyj, PI 26, FIN-00421 Helsinki, Finland
Client: Aercoustics Engineering Ltd., 1004 Middlegate RD, Suite 1100, S.Tower, Mississauga, ON L4Y 1M4, Canada

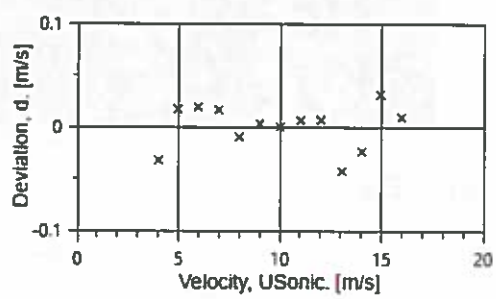
Anemometer received: September 28, 2018 **Anemometer calibrated:** September 28, 2018
Calibrated by: MEJ **Procedure:** MEASNET, IEC 61400-12-1:2017 Annex F
Certificate prepared by: EJF **Approved by:** Calibration engineer, EJF

Calibration equation obtained: v [m/s] = 0.99242 · f [m/s] + 0.03258

Standard uncertainty, slope: 0.00169 **Standard uncertainty, offset:** 0.54886
Covariance: -0.0000280 (m/s)²/m/s **Coefficient of correlation:** $\rho = 0.999984$
Absolute maximum deviation: -0.043 m/s at 12.957 m/s
Barometric pressure: 1004.7 hPa **Relative humidity:** 42.1%

Succession	Velocity pressure, q. [Pa]	Temperature in wind tunnel [°C]	d.p. box [°C]	Wind velocity, v, [m/s]	Anemometer Output, f. [m/s]	Deviation, d. [m/s]	Uncertainty u_c (k=2) [m/s]
2	9.17	26.0	26.6	3.970	4.0000	-0.032	0.020
4	14.42	26.1	26.7	4.978	4.9655	0.017	0.023
6	20.76	26.1	26.7	5.973	5.9667	0.019	0.026
8	28.34	26.1	26.7	6.979	6.9833	0.016	0.029
10	37.04	26.1	26.7	7.979	8.0167	-0.010	0.033
12	46.92	26.1	26.7	8.981	9.0133	0.003	0.037
13-last	57.79	26.1	26.7	9.967	10.0103	0.000	0.041
11	70.03	26.1	26.7	10.972	11.0167	0.006	0.045
9	83.27	26.1	26.7	11.965	12.0167	0.007	0.049
7	97.66	26.1	26.7	12.957	13.0667	-0.043	0.053
5	113.17	26.1	26.7	13.949	14.0467	-0.024	0.057
3	129.15	26.0	26.7	14.901	14.9500	0.031	0.061
1-first	147.15	26.0	26.6	15.904	15.9833	0.009	0.065





ilac-MRA

ANAB ACCREDITED CALIBRATION LABORATORY

AC-1746

SOH Wind Engineering LLC · measnet · USA

EQUIPMENT USED

Serial Number	Description
Njord1	Wind tunnel, blockage factor = 1.0035
2254	Control cup anemometer
-	Mounting tube, D = 19 mm
TT002	Summit Electronics, 1XPT100, 0-10V Output, wind tunnel temp.
TP001	PR Electronics 5102, 0-10V Output, differential pressure box temp.
DP005	Setra Model 239, 0-1inWC, differential pressure transducer
HY003	Dwyer RHP-2D20, 0-10V Output, humidity transmitter
BP003	Setra M278, 0-5VDC Output, barometer
PL8	Pitot tube
XB002	Computer Board, 16 bit A/D data acquisition board
9PRZRW1	PC dedicated to data acquisition

Traceable calibrations of the equipment are carried out by external accredited institutions: Atlantic Scale, Essco Calibration Labs & Furness Controls. A real-time analysis module within the data acquisition software detects pulse frequency.

Photo of the wind tunnel setup. The cross-sectional area is 2.5m x 2.5m.

UNCERTAINTIES

The documented uncertainty is the total combined uncertainty at 95% confidence level (k=2) in accordance with EA-4/02. The uncertainty at 10 m/s comply with the requirements in the IEC 61400-12-1:2005 procedure. See Document US.12.01.004 for further details.

COMMENTS

This sensor was calibrated at 0°.

Certificate number: 18.US1.05010

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CERTIFICATE OF CALIBRATION

SCC Accredited LAB
LAB Accrédité CCN
SCC Lab No 827

CLAS NRC CNRC
CLAS 2016-02

Customer: AEROCOUSTICS ENGINEERING LTD
1004 MIDDLEGATE ROAD
SUITE 1100
MISSISSAUGA, ON L4Y 1M4
PO Number: 2017.01.12C

Certificate/SO Number: 33-Q0M0D-20-1 Revision 0

Manufacturer: Nokeval
Model Number: 7470
Description: Serial to Analog Converter
Serial Number: A165164
ID: NONE

As-Found: In Tolerance
As-Left: In Tolerance

Calibration Date: Feb 02, 2017
Due Date: Feb 02, 2019

Calibrated To: Manufacturer Specification
Calibration Procedure: 1-AC58014-0

Transcat Calibration Laboratories have been audited and found in compliance with ISO/IEC 17025:2005. Accredited calibrations performed within the Lab's Scope of Accreditation are indicated by the presence of the Accrediting Body's Logo and Certificate Number on this Certificate of Calibration. Any measurements on an accredited calibration not covered by that Lab's Scope of Accreditation are listed in the notes section of the certificate. This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, SCC, NRC, CLAS, ANAB or any agency of the Federal Government. NVLAP, NIST, SCC, NRC, CLAS or ANAB do not guarantee the accuracy of an individual calibration by accredited laboratories.

Transcat calibrations, as applicable, are performed in compliance with the requirements of the Transcat Quality Manual Revision I, ISO 9001:2008, ANSI/NCSL Z540.1-1994 (R2002), and ISO 10012:2003. When specified contractually, the requirements of ISO TS16949:2009, 10CFR21, 10CFR50 App. B and ASME NQA-1:2012 are also covered. Complete records of work performed are maintained by Transcat and are available for inspection. Laboratory standards used in the performance of this calibration are shown on the Supplemental Report.

Transcat documents the traceability of measurements to the SI units through the National Institute of Standards and Technology (NIST), or the National Research Council of Canada (NRC), or other recognized national measurement institutes (NMI) that are signatories to the CIPM Mutual Recognition Arrangement, or accepted fundamental and/or natural physical constants, or by the use of specified methods, consensus standards or ratio type measurements. Documentation supporting traceability information is available for review at a Transcat facility. The measured quantity and the measurement uncertainty are required for further dissemination of traceability.

Uncertainties are reported with a coverage factor k=2, providing a level of confidence of approximately 95%. All calibrations have been performed using processes having a TUR of 4:1 or better (3:1 for mass calibrations), unless otherwise noted on the Supplemental Report. The Test Uncertainty Ratio (TUR) is calculated in accordance with NCSL International RP-18. For mass calibrations: Conventional mass referenced to 8.0 g/cm³.

The results in this report relate only to the item calibrated or tested, and the determination of in or out of tolerance is specific to the model/serial no. referenced above based on the tolerances shown on the supplemental report; these tolerances are either the original equipment manufacturer's (OEM's) warranted specifications or the client's requested specifications. Any number of factors can cause a unit to drift out of tolerance at any time following its calibration. Limitations on the uses of this instrument are detailed in the OEM's operating instructions. This certificate may not be reproduced except in full, without the written approval of Transcat. Additional information, if applicable may be included on separate report(s).

Date Received: January 17, 2017
Service Level : R9

Customer Number: 9-322110-000

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SCC Lab No 827

CLAS ARC·CNRC
CLAS 2016-02

Customer: AEROCOUSTICS ENGINEERING LTD
1004 MIDDLEGATE ROAD
SUITE 1100
MISSISSAUGA, ON L4Y 1M4
PO Number: 2017.01.12C

Certificate/SO Number: 33-Q0M0D-20-1 Revision 0

As Found/As Left Data

Description	Setpoints	Accuracy	Low Limit	High Limit	As Found / As Left	OOT	Cal Process Uncertainty (k=2; ±)	Measurement Uncertainty (k=2; ±)	Units	TUR
DC Current % Source - 4-20mA Ch #1										
4 - 20mA	0%	±(0.1% Span)	3.984	4.016	4.002 mA		1.6e-004	1.9e-003	mA	100.0 : 1
	25%	±(0.1% Span)	7.984	8.016	8.003 mA		2.7e-004	1.9e-003	mA	59.3 : 1
	50%	±(0.1% Span)	11.984	12.016	12.000 mA		1.1e-003	2.2e-003	mA	14.5 : 1
	75%	±(0.1% Span)	15.984	16.016	16.001 mA		1.3e-003	2.3e-003	mA	12.3 : 1
	100%	±(0.1% Span)	19.984	20.016	20.001 mA		1.4e-003	2.3e-003	mA	11.4 : 1
DC Current % Source - 4-20mA Ch #2										
4 - 20mA	0%	±(0.1% Span)	3.984	4.016	4.004 mA		1.6e-004	1.9e-003	mA	100.0 : 1
	25%	±(0.1% Span)	7.984	8.016	7.998 mA		2.7e-004	1.9e-003	mA	59.3 : 1
	50%	±(0.1% Span)	11.984	12.016	12.000 mA		1.1e-003	2.2e-003	mA	14.5 : 1
	75%	±(0.1% Span)	15.984	16.016	16.001 mA		1.3e-004	1.9e-003	mA	100.0 : 1
	100%	±(0.1% Span)	19.984	20.016	20.001 mA		1.4e-003	2.3e-003	mA	11.4 : 1
DC Current % Source - 4-20mA Ch #3										
4 - 20mA	0%	±(0.1% Span)	3.984	4.016	3.999 mA		1.6e-004	1.9e-003	mA	100.0 : 1
	25%	±(0.1% Span)	7.984	8.016	8.000 mA		2.7e-004	1.9e-003	mA	59.3 : 1
	50%	±(0.1% Span)	11.984	12.016	12.003 mA		1.1e-003	2.2e-003	mA	14.5 : 1
	75%	±(0.1% Span)	15.984	16.016	16.004 mA		1.3e-003	2.3e-003	mA	12.3 : 1
	100%	±(0.1% Span)	19.984	20.016	19.999 mA		1.1e-003	2.2e-003	mA	14.5 : 1
DC Current % Source - 4-20mA Ch #4										
4 - 20mA	0%	±(0.1% Span)	3.984	4.016	4.003 mA		1.6e-004	1.9e-003	mA	100.0 : 1
	25%	±(0.1% Span)	7.984	8.016	8.006 mA		2.7e-004	1.9e-003	mA	59.3 : 1
	50%	±(0.1% Span)	11.984	12.016	12.010 mA		1.1e-003	2.2e-003	mA	14.5 : 1
	75%	±(0.1% Span)	15.984	16.016	16.007 mA		1.3e-003	2.3e-003	mA	12.3 : 1
	100%	±(0.1% Span)	19.984	20.016	20.008 mA		1.4e-003	2.3e-003	mA	11.4 : 1

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CERTIFICATE OF CALIBRATION

SCC Accredited LAB
LAB Accrédité CCN
SCC Lab No 827

CLAS ARC·CNRC
CLAS 2016-02

Customer: AEROCOUSTICS ENGINEERING LTD
1004 MIDDLEGATE ROAD
SUITE 1100
MISSISSAUGA, ON L4Y 1M4
PO Number: 2017.01.12C

Certificate/SO Number: 33-Q0M0D-20-1 Revision 0

As Found/As Left Data

Description	Setpoints	Accuracy	Low Limit	High Limit	As Found / As Left	OOT	Cal Process Uncertainty (k=2; ±)	Measurement Uncertainty (k=2; ±)	Units	TUR
DC Current % Source - 0-20mA Ch #1										
0 - 20mA	0%	±(0.1% Span)	-0.020	0.020	0.000 mA		9.2e-007	2.3e-003	mA	100.0 : 1
	25%	±(0.1% Span)	4.980	5.020	5.003 mA		1.9e-004	2.3e-003	mA	100.0 : 1
	50%	±(0.1% Span)	9.980	10.020	10.002 mA		3.2e-004	2.3e-003	mA	62.5 : 1
	75%	±(0.1% Span)	14.980	15.020	14.999 mA		1.2e-003	2.6e-003	mA	16.7 : 1
	100%	±(0.1% Span)	19.980	20.020	20.000 mA		1.4e-003	2.7e-003	mA	14.3 : 1
DC Current % Source - 0-20mA Ch #2										
0 - 20mA	0%	±(0.1% Span)	-0.020	0.020	0.000 mA		9.2e-007	2.3e-003	mA	100.0 : 1
	25%	±(0.1% Span)	4.980	5.020	4.999 mA		1.9e-004	2.3e-003	mA	100.0 : 1
	50%	±(0.1% Span)	9.980	10.020	10.002 mA		3.2e-004	2.3e-003	mA	62.5 : 1
	75%	±(0.1% Span)	14.980	15.020	14.999 mA		1.3e-003	2.7e-003	mA	15.4 : 1
	100%	±(0.1% Span)	19.980	20.020	20.000 mA		1.4e-003	2.7e-003	mA	14.3 : 1
DC Current % Source - 0-20mA Ch #3										
0 - 20mA	0%	±(0.1% Span)	-0.020	0.020	0.001 mA		9.2e-007	2.3e-003	mA	100.0 : 1
	25%	±(0.1% Span)	4.980	5.020	5.001 mA		1.9e-004	2.3e-003	mA	100.0 : 1
	50%	±(0.1% Span)	9.980	10.020	10.000 mA		3.2e-004	2.3e-003	mA	62.5 : 1
	75%	±(0.1% Span)	14.980	15.020	15.002 mA		1.2e-003	2.6e-003	mA	16.7 : 1
	100%	±(0.1% Span)	19.980	20.020	19.998 mA		1.4e-003	2.7e-003	mA	14.3 : 1
DC Current % Source - 0-20mA Ch #4										
0 - 20mA	0%	±(0.1% Span)	-0.020	0.020	0.002 mA		9.2e-007	2.3e-003	mA	100.0 : 1
	25%	±(0.1% Span)	4.980	5.020	5.004 mA		1.9e-004	2.3e-003	mA	100.0 : 1
	50%	±(0.1% Span)	9.980	10.020	10.006 mA		3.2e-004	2.3e-003	mA	62.5 : 1
	75%	±(0.1% Span)	14.980	15.020	15.011 mA		1.3e-003	2.7e-003	mA	15.4 : 1
	100%	±(0.1% Span)	19.980	20.020	20.008 mA		1.4e-003	2.7e-003	mA	14.3 : 1

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As Found/As Left Data

Description	Setpoints	Accuracy	Low Limit	High Limit	As Found / As Left	OOT	Cal Process Uncertainty (k=2; ±)	Measurement Uncertainty (k=2; ±)	Units	TUR
DC Voltage % Source - 0-5V Ch#1										
0 -5V	0%	±(0.1% Span)	-0.0050	0.0050	0.0006 V		5.0e-007	5.8e-004	V	100.0 : 1
	20%	±(0.1% Span)	0.9950	1.0050	0.9987 V		5.5e-006	5.8e-004	V	100.0 : 1
	40%	±(0.1% Span)	1.9950	2.0050	2.0004 V		1.1e-005	5.8e-004	V	100.0 : 1
	60%	±(0.1% Span)	2.9950	3.0050	2.9994 V		1.6e-005	5.8e-004	V	100.0 : 1
	80%	±(0.1% Span)	3.9950	4.0050	4.0011 V		2.1e-005	5.8e-004	V	100.0 : 1
	100%	±(0.1% Span)	4.9950	5.0050	5.0001 V		2.6e-005	5.8e-004	V	100.0 : 1
DC Voltage % Source - 0-5V Ch#2										
0 -5V	0%	±(0.1% Span)	-0.0050	0.0050	0.0000 V		5.8e-007	5.8e-004	V	100.0 : 1
	20%	±(0.1% Span)	0.9950	1.0050	1.0010 V		5.5e-006	5.8e-004	V	100.0 : 1
	40%	±(0.1% Span)	1.9950	2.0050	2.0000 V		2.2e-005	5.8e-004	V	100.0 : 1
	60%	±(0.1% Span)	2.9950	3.0050	3.0000 V		1.6e-005	5.8e-004	V	100.0 : 1
	80%	±(0.1% Span)	3.9950	4.0050	4.0020 V		2.1e-005	5.8e-004	V	100.0 : 1
	100%	±(0.1% Span)	4.9950	5.0050	5.0000 V		2.6e-005	5.8e-004	V	100.0 : 1
DC Voltage % Source - 0-5V Ch#3										
0 -5V	0%	±(0.1% Span)	-0.0050	0.0050	0.0001 V		5.0e-007	5.8e-004	V	100.0 : 1
	20%	±(0.1% Span)	0.9950	1.0050	1.0000 V		5.5e-006	5.8e-004	V	100.0 : 1
	40%	±(0.1% Span)	1.9950	2.0050	2.0005 V		1.1e-005	5.8e-004	V	100.0 : 1
	60%	±(0.1% Span)	2.9950	3.0050	2.9993 V		1.6e-005	5.8e-004	V	100.0 : 1
	80%	±(0.1% Span)	3.9950	4.0050	4.0000 V		2.1e-005	5.8e-004	V	100.0 : 1
	100%	±(0.1% Span)	4.9950	5.0050	5.0013 V		2.6e-005	5.8e-004	V	100.0 : 1

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DC Voltage % Source - 0-5V Ch#4										
0 -5V	0%	±(0.1% Span)	-0.0050	0.0050	0.0004 V		5.0e-007	5.8e-004	V	100.0 : 1
	20%	±(0.1% Span)	0.9950	1.0050	1.0010 V		5.5e-006	5.8e-004	V	100.0 : 1
	40%	±(0.1% Span)	1.9950	2.0050	2.0000 V		1.1e-005	5.8e-004	V	100.0 : 1
	60%	±(0.1% Span)	2.9950	3.0050	3.0020 V		1.6e-005	5.8e-004	V	100.0 : 1
	80%	±(0.1% Span)	3.9950	4.0050	4.0020 V		2.1e-005	5.8e-004	V	100.0 : 1
	100%	±(0.1% Span)	4.9950	5.0050	5.0036 V		2.6e-005	5.8e-004	V	100.0 : 1
DC Voltage % Source - 0-10V Ch#1										
0 - 10V	0%	±(0.1% Span)	-0.010	0.010	0.001 V		5.0e-007	1.2e-003	V	100.0 : 1
	20%	±(0.1% Span)	1.990	2.010	2.000 V		1.1e-005	1.2e-003	V	100.0 : 1
	40%	±(0.1% Span)	3.990	4.010	4.001 V		2.1e-005	1.2e-003	V	100.0 : 1
	60%	±(0.1% Span)	5.990	6.010	6.002 V		3.1e-005	1.2e-003	V	100.0 : 1
	80%	±(0.1% Span)	7.990	8.010	7.999 V		4.1e-005	1.2e-003	V	100.0 : 1
	100%	±(0.1% Span)	9.990	10.010	9.999 V		5.2e-005	1.2e-003	V	100.0 : 1
DC Voltage % Source - 0-10V Ch#2										
0 - 10V	0%	±(0.1% Span)	-0.010	0.010	0.001 V		5.0e-007	1.2e-003	V	100.0 : 1
	20%	±(0.1% Span)	1.990	2.010	2.000 V		1.1e-005	1.2e-003	V	100.0 : 1
	40%	±(0.1% Span)	3.990	4.010	4.002 V		2.1e-005	1.2e-003	V	100.0 : 1
	60%	±(0.1% Span)	5.990	6.010	6.002 V		3.1e-005	1.2e-003	V	100.0 : 1
	80%	±(0.1% Span)	7.990	8.010	8.006 V		4.1e-005	1.2e-003	V	100.0 : 1
	100%	±(0.1% Span)	9.990	10.010	9.999 V		5.2e-005	1.2e-003	V	100.0 : 1

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As Found/As Left Data

Description	Setpoints	Accuracy	Low Limit	High Limit	As Found / As Left	OOT	Cal Process Uncertainty (k=2; ±)	Measurement Uncertainty (k=2; ±)	Units	TUR
DC Voltage % Source - 0-10V Ch#3										
0 - 10V	0%	±(0.1% Span)	-0.010	0.010	0.001 V		5.0e-007	1.2e-003	V	100.0 : 1
	20%	±(0.1% Span)	1.990	2.010	2.001 V		1.1e-005	1.2e-003	V	100.0 : 1
	40%	±(0.1% Span)	3.990	4.010	4.000 V		2.1e-005	1.2e-003	V	100.0 : 1
	60%	±(0.1% Span)	5.990	6.010	6.000 V		3.1e-005	1.2e-003	V	100.0 : 1
	80%	±(0.1% Span)	7.990	8.010	8.001 V		4.1e-005	1.2e-003	V	100.0 : 1
	100%	±(0.1% Span)	9.990	10.010	10.000 V		5.2e-005	1.2e-003	V	100.0 : 1
DC Voltage % Source - 0-10V Ch#4										
0 - 10V	0%	±(0.1% Span)	-0.010	0.010	0.000 V		5.0e-007	1.2e-003	V	100.0 : 1
	20%	±(0.1% Span)	1.990	2.010	2.000 V		1.1e-005	1.2e-003	V	100.0 : 1
	40%	±(0.1% Span)	3.990	4.010	4.002 V		2.1e-005	1.2e-003	V	100.0 : 1
	60%	±(0.1% Span)	5.990	6.010	6.003 V		3.1e-005	1.2e-003	V	100.0 : 1
	80%	±(0.1% Span)	7.990	8.010	8.004 V		4.1e-005	1.2e-003	V	100.0 : 1
	100%	±(0.1% Span)	9.990	10.010	10.003 V		5.2e-005	1.2e-003	V	100.0 : 1

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CERTIFICATE OF CALIBRATION

SCC Accredited LAB
LAB Accrédité CCN
SCC Lab No 827

CLAS NRC·CNRC
CLAS 2016-02

Customer: AEROCOUSTICS ENGINEERING LTD
1004 MIDDLEGATE ROAD
SUITE 1100
MISSISSAUGA, ON L4Y 1M4
PO Number: 2017.01.12C

Certificate/SO Number: 33-Q0M0D-20-1 Revision 0

Traceable Standards

Asset	Manufacturer	Model Number	Description	Cal Date	Due Date	Traceability Number
N0118	Agilent/HP	3458A Opt 002	Multimeter, 8.5 Digit	22-Nov-16	30-Nov-17	5-&N0118-727-1

Environmental Data

Temperature	Relative Humidity	Temp / RH Asset
69.30°F /20.72°C	35.30%	N0438A

Calibrated At:
4043 Carling Avenue
Ottawa, ON K2K 2A4

Facility Responsible:
4043 Carling Avenue
Ottawa, ON K2K 2A4
800-828-1470

Calibrated By:
Digitally Signed On February 02, 2017
By Mark King

Mark King
Calibration Technician

Reviewed By:
Digitally Signed On February 02, 2017
By Francis Kane for

Robert Whittaker
Lab Manager

Unit Barcode: 901B0188547

Date Received: January 17, 2017
Service Level : R9

Customer Number: 9-322110-000

OPS-F20-014R0 11/10/2016 FP001R0 10/14/2016

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Appendix F.02
Summary of Measurement Results

Summary of Measurement Results

1.1 Sound Power Levels

From Table 12 of IEC test report 17095.01.T53.RP1:

Wind Speed (m/s)	Apparent L_{WA}, (dBA)	Maximum Sound Power Level (dBA)* REA # 2765-A4ER2P
7.5	102.3	104.5
8	103.7	104.5
8.5	104.3	104.5
9	104.4	104.5
9.5	104.3	104.5
10	104.2	104.5
10.5	103.9	104.5
11	103.8	104.5
11.5	104.0	104.5
12	103.6	104.5
12.5	103.8	104.5

*Includes +0.5 dB, per Section E3.1 of the MOECC Compliance Protocol for Wind Turbine Noise

1.2 Tonal Audibility Values

From Table 14 of IEC test report 17095.01.T53.RP1:

Wind Speed (m/s)	Frequency (Hz)	Tonal audibility, ΔL_a (dB)	Tonal Audibility from AAR* (dB)
8	72	-2.6	3
8.5	72	-2.7	3
9	72	-1.7	3
9.5	71	-1.2	3
10	71	-2.0	3
10.5	72	-2.4	3
11.5	73	-2.9	3
12	73	-2.8	3

*Belle River Wind Project Noise Impact Assessment Report (November 27, 2015)

1.3 Statement of Compliance

Based on the results in Table 12 of the IEC 61400-11 test report to which this statement is attached, the maximum apparent sound power level of the test turbine complies with the sound level in REA # 2765-A4ER2P and Section E3.1 of the MOECC Compliance Protocol for Wind Turbine Noise.

Based on the results in Table 14 of the IEC 61400-11 to which this statement is attached, the tonal audibility of the test turbine complies with the maximum tonal audibility of 3 dB as indicated in the statement from the manufacturer dated July 15, 2015, found in Appendix E of the Noise Impact Assessment Report dated November 27, 2015.

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Appendix F.03
E-Audit Checklist

Appendix F.03 - (2017 Compliance Protocol Appendix F6): E-Audit checklist for IEC 61400-11:2013

Wind Energy Project – Screening Document – Acoustic Audit Report – Emission IEC61400-11:2013 Standard

Information Required in the Acoustic Audit Report – Emission

Item #	Description	Complete?	Comment
1	Characterization of the wind turbine Items 1 to 26; IEC61400-11:2013, Section 10.2	✓	Report Section 2.1
2	Physical environment Items 27 to 33; IEC61400-11:2013, Section 10.3, Physical Environment	✓	Report Section 2.2, 3.2, 4.2, Appendix A
3	Measurement instrumentation Items 34 to 39; IEC61400-11:2013, Section 10.4, Instrumentation	✓	Report Section 3, Appendix F.01
4	Acoustic data Items 40 to 52; IEC61400-11:2013, Section 10.5, Acoustic Data	✓	Report Section 4, 3.3, Appendix C, Appendix D,
5	Non-acoustic data Items 50 to 53, and 56; IEC61400-11:2003 Section 10.6, Non-Acoustic Data Items 59 and 60; NPC-233, Section 12.3, Acoustic Audit – Acoustical Data, bullet point number 8, All necessary and supporting calculations	✓	Report Section 3, Appendix E
6	Uncertainty the apparent sound power level at integer wind speeds one-third octave band spectrum of the noise at the reference position at each integer wind speed the Tonality of the sound emissions of the wind turbine measured at the reference position	✓	Report Section 4, Appendix C
7	Additional information Item 60; NPC-233, Section 10, Report Format, bullet point number 4, Conclusions and Recommendations Item 61; NPC-233, Section 12.3, Acoustic Audit – Acoustical Data, bullet point number 8, All necessary and supporting calculations Item 62; NPC-233, Section 12.3, Acoustic Audit – Acoustical Data, bullet point number 3, Details of measurement procedure	✓	Report Section 3, Appendix F, data in Excel provided separately
8	Items 68 to 72; IEC61400-11:2013, Section 10.5, Acoustic Data	⊘	Optional information, not provided in this report
9	Non-acoustic data Items 73 to 74 are from IEC61400-11:2013, Section 10.6, Non-Acoustic Data	⊘	Optional information, not provided in this report

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End of Report