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IMMISSION AUDIT REPORT - Project: 13228.02

South Kent Wind Project R3344 – Turbine T036

Chatham-Kent, Ontario

Prepared for:

South Kent Wind LP

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Executive Summary

Aercoustics Engineering Limited ("Aercoustics") was retained by South Kent Wind LP to complete the acoustic audit requirements outlined in the Renewable Energy Approval ("REA") for South Kent Wind Project ("SKWP"). SKWP operates under REA #2871-8UKGPC, issued on June 15, 2012.

In response to Section F of the REA, Aercoustics previously conducted acoustic immission audit (I-Audit) tests in the Fall of 2014 and Spring of 2015, and submitted the reports to the Ministry of Environment, Conservation and Parks ("MECP"). Based on these reports, the MECP requested that one immission audit ("I-Audit") test be reconducted due to a previously incomplete dataset.

This report presents the results of the I-Audit assessment for receptor R3344 near turbine T036. The I-Audit measurements conducted at R3344 in Fall 2014 was deemed incomplete and as a result, the audit at R3344 was reconducted to assess compliance of the sound pressure level and tonal audibility in the far field.

The monitoring near receptor R3344 was conducted over the following period:

Audit Receptor	Audit Start Date	Audit End Date	Monitoring Duration (weeks)
R3344	September 18, 2019	November 23, 2019	10

The audit has been completed as per the methodology outlined in Parts D and E5.5 RAM-I (Revised Assessment Methodology) of the "*MECP Compliance Protocol for Wind Turbine Noise*" (updated April 21, 2017).

Based on the results presented in this report, the assessment requirements outlined in the Compliance Protocol have been met and the cumulative sound impact calculated at R3344 complies with the MECP sound level limits at all wind bins with sufficient data for assessment.



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1 Introduction

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In response to Section F of the REA, Aercoustics previously conducted acoustic immission audit ("I-Audit") tests in the Fall of 2014 and Spring of 2015, and submitted the reports to the Ministry of Environment, Conservation and Parks ("MECP"). Based on these reports, the MECP requested that one I-Audit test be reconducted due to a previously incomplete dataset.

This report presents the results of the I-Audit assessment for receptor R3344 near turbine T036.

The audit was completed per the methodology outlined in Part D and Part E of the Compliance Protocol for Wind Turbine Noise ("Compliance Protocol" or "Protocol"), April 2017 revision. The Compliance Protocol is an Ontario MECP document used to evaluate noise from a wind turbine at nearby receptors.

2 Background

The following I-Audit reports, including two testing phases (Fall 2014 and Spring 2015), were submitted and reviewed by the MECP:

- ASSESSMENT REPORT Project: 13228.00, SOUTH KENT WIND LP Acoustic Audit – Receptor Measurements, dated January 30, 2015, revised January 10, 2019.
- ASSESSMENT REPORT Project: 13228.00, SOUTH KENT WIND LP 2nd Immission Audit, Receptor Measurements – Interim Report, dated June 26, 2015; and
- 3) ASSESSMENT REPORT Project: 13228.00, SOUTH KENT WIND LP 2nd Immission Audit, Receptor Measurements, dated November 12, 2015.

Based on MECP review of the I-Audit reports, the MECP provided feedback that the first set of I-Audits in the report dated January 30, 2015 were incomplete. In review of the revision submitted January 10, 2019, the MECP indicated that one additional immission test for the originally incomplete receptor was required to be conducted in accordance with the 2017 version of the Compliance Protocol. This receptor, R3344 near turbine T036, was selected for the additional immission test in consultation with the MECP. This report presents the results of these measurements.

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3 Facility Description

South Kent Wind Project is a wind facility comprising 124 Siemens SWT-101 wind turbines with name plate capacities of 2.221 MW, 2.126 MW, 1.903 MW, and 1.824 MW. The total name plate capacity of the facility is 270 megawatts. Each turbine has a hub height of 99.5 metres. The facility is located in the Chatham-Kent Municipality.

The facility has two large substation transformers rated at 148 and 129 MVA. The facility is designed to operate 24 hours per day, 7 days per week.

4 Audit Location

The receptor selection process, measurement equipment, and details regarding the monitoring locations are provided in this section.

4.1 Receptor Selection

Measurement equipment was erected at receptor R3344. The receptor and measurement location were the same as the previously incomplete I-Audit measurements conducted in Fall 2014. The original I-Audit locations were selected using the guidance provided in the REA for SKWP, with priority given to locations having high predicted sound impacts and frequent downwind conditions from SKWP turbines. The prevailing wind direction for the site is discussed in the following section. The predicted sound level and wind direction for R3344 are presented in Table 1 below.

Predicted sound impacts at the receptor were obtained from the Noise Assessment Report for SKWP prepared by Hatch and dated May 7, 2013. A sound model using the original assessment report parameters was created by Aercoustics to calculate predicted sound levels at monitor locations.

Receptor ID	Receptor Height (m)	Receptor SPL (dBA)	Monitor SPL (dBA)	Wind Direction from Nearest Turbine	Receptor Type	Notes
R3344	4.5	39.4	39.6	Downwind	Receptor	Measured location (measurements were previously conducted at this location)

Table 1: Receptor Details

4.1.1 Historical Wind Direction

Historical wind direction information was provided by SKWP and used to support selection of suitable audit receptors. This wind direction information is provided in Figure 1, and the prevailing downwind direction for the facility was determined to be 210°.



Figure 1: Historical Wind Rose used for Receptor Selection

4.2 Monitoring Location

The monitor was erected in the same location as the previously conducted I-Audit, approximately 60 metres from the coordinates of R3344, 25 metres closer to the nearest wind turbine (turbine T036) than the receptor. The monitor was erected at the receptor height of 4.5 metres. The ground cover between the measurement location and the nearest turbines was open field, predominantly covered with short crops.

Table 2 provides a summary of the receptor and monitor locations. Site photographs and plans are provided in Appendix A.

Audit Receptor	Measurement Duration	Location	Coordinates (UTM x,y, Zone 17T)	Distance to Test Turbine (m)	Predicted Overall Sound Level (dBA)
D0044	Sep 18, 2019 –	Receptor	416804 mE / 4691109 mN	854	39.4
K3344	Nov 23, 2019	Monitor	416746 mE / 4691128 mN	829	39.6

Table 2: Coordinates and Turbines to Receptor and Measurement Locations

4.3 Existing Ambient Environment

The ambient acoustic environment for the SKWP site is comprised of a mixture of many different ambient sources. The contribution of noise from flora, fauna, traffic, and industry near the monitor location were considered throughout the measurement campaign.

Existing ambient noise sources were categorized as either extraneous—such as short-term events, or frequency-specific noise—or constant noise sources as part of the existing ambient sound environment. In the case of extraneous noise sources, filtering was employed to reduce or remove it, as further discussed in Section 5.3.2. For constant noise sources identified as being a part of the existing ambient sound environment, efforts were made to ensure that the noise was equally present in both *Total Noise* and *Background* periods, as further discussed in Section 5.3.3.

4.3.1 Flora Noise

Ambient noise from flora refers to the noise generated by wind blowing over vegetation and foliage and is typically proportional to wind speed, with higher wind speeds generating increased amounts of noise. Due to its ever-present and broadband nature, noise from flora is considered a constant noise source as part of the existing ambient environment.

The monitor was located in a field with short crop cover, which had negligible noise impact on the measurements. An area of approximately 40x40 ft was cleared around the monitor prior to installation. The monitor was also located approximately 40 metres from a tree line to the east.

4.3.2 Fauna Noise

Noise from fauna refers to noise typically arising from the activity of insects, birds, livestock, or dogs. Noise of this nature may be concentrated at high frequencies (such as crickets chirping) or limited to short-term events (such as dogs barking). Noise from fauna is considered extraneous noise.

Cricket noise was present at the monitor location and was especially prominent in the early fall months from September to November. There were no other significant sources of fauna noise identified at the monitor location.

4.3.3 Traffic Noise

Traffic noise may include short-term events such as individual car passbys (considered extraneous noise) or constant noise (i.e. "traffic hum") from high-volume or frequently travelled roads and highways.

The monitor was located approximately 100 metres from Harwich Road to the north-east. Due to the distance from the nearest road, individual car passbys were not a significant source of noise throughout the measurement campaign. The monitor was not located near any major highways and therefore constant traffic noise was not a concern during the measurements.

4.3.4 Industry Noise

No significant sources of industry noise were identified in the vicinity of the monitor.

4.3.5 Self-Generated Noise

Self-generated noise is noise which results from wind blowing over the monitoring equipment and is a factor at high wind speeds at the measurement position. This noise was minimized by a secondary wind screen installed around the microphone in accordance with Section D2.1.4 of the Protocol. The insertion loss of the wind screen has been tested and was accounted for in the analysis.

4.3.6 Other Sources

No other notable ambient noise sources were identified in the vicinity of the monitor.

5 Audit Methodology

For the duration of the measurement campaign, acoustic and weather data were logged simultaneously in one-minute intervals at the measurement location. Analysis and filtering were conducted in accordance with Sections D5.2 and E5.5 of the Protocol, with additional filters applied as needed—following the guidance in the Protocol—to remove or reduce extraneous ambient noise (see Section 5.3.2 below) and ensure representative ambient conditions (see Section 5.3.3 below).

Intervals that passed the filtering criteria were sorted into integer wind bins¹ depending on the measured wind speed at 10 metres above ground level ("10m-AGL") and classified as either *Total Noise* or *Background* depending on the operation of the nearby SKWP turbines. The *Turbine-Only* sound level for each wind bin was determined by logarithmically subtracting the average *Background* levels from the *Total Noise* level in wind bins with sufficient data for assessment.

The calculation of the average measured tonal audibility was determined in accordance with IEC 61400-11 Edition 3.0, as per Section D3.8.3 of the Protocol, with modifications to adapt the method to immission measurements. Calculations were conducted based on the narrowband spectra of the intervals within the tonality assessment dataset from 20 Hz to 3000 Hz with a frequency resolution of 2 Hz. As per IEC 61400-11, a tone would have to be present in at least 20% of the samples in order to be deemed relevant and evaluated under the penalty scheme (discussed in Section 5.4.3). This reduces the possibility of



¹ An integer wind bin spans 1 m/s, centred on each integer wind speed, open at the low end and closed at the high end.

intermittent tones related to either the unsteady operation of the turbines, or from other contaminating sources, being attributed to the steady state operation of the turbines.

The tonal assessment parameters were determined based on the E-Audit tests conducted for turbines of the same type as T036 (SWT-2.221-101), including T002 and T034. The frequencies of interest were determined to be 100 Hz, 140 Hz, and 510 Hz.

5.1 Measurement Equipment

The following acoustic and non-acoustic measurement equipment was installed at the monitor location:

- One (1) Type 1 sound level meter with microphone and pre-amplifier, installed at receptor height;
- One (1) primary and one (1) secondary² windscreen for the microphone; and
- One (1) anemometer, installed at 10m-AGL

The measurement equipment was configured to log one-minute equivalent sound levels (L_{eq}) in A-weighted broadband and $1/3^{rd}$ octave band frequencies. The microphone was installed at least 5 metres away from any large reflecting surfaces, as far away as practically possible from trees and other foliage, and in direct line of sight to the nearest SKWP turbines.

Table 3 lists the specific make, model, and serial numbers for the measurement equipment.

Audit Receptor	Equipment	Make/Model	Serial Number	Date of Last Calibration
	Data Acquisition Card	NI 9234	1822121	June 10, 2019
	Signal Conditioner	PCB 480E09	33660	June 18, 2019
R3344	Microphone	PCB 377B02	177761	June 19, 2019
	Pre-Amplifier	PCB 426E01	51464	June 19, 2019
	Weather Anemometer	Vaisala WXT536	M4910193	December 5, 2018

Table 3: Equipment Details

The measurement chain was calibrated before, during, and after the measurement campaign using a type 4231 Brüel & Kjær acoustic calibrator. The measurement equipment was also verified by laboratory calibration per the requirements in Section D2.3 of the Protocol; calibration certificates are provided in Appendix D.



² The 1/3 octave band insertion loss of the secondary windscreen has been tested and has been accounted for in the data analysis.

5.2 Measurement Parameters

Measurement equipment was configured to run from approximately 9pm to 6am, local time. The measurement parameters acquired and used in the audit are listed in Table 4.

Parameter Group	Measurement Parameters	Notes
	L _{Aeq}	dBA
Acoustic	L ₉₀	dBA
(microphone height)	1/3 rd Octave Band	dBA (20 Hz – 10 kHz)
	Signal Recording	Uncompressed raw files
	Wind Speed	m/s
M/a ath a r	Wind Direction	0-360°
(10-m beight)	Temperature	°C
(10-m height)	Humidity	0-100%
	Precipitation	mm
	Wind Speed	Provided by operator
Turbine	Yaw Angle	Provided by operator
(hub height)	Power Output	Provided by operator
	Rotational Speed	Provided by operator

Table 4: Measurement Parameters Used in the Study

SKWP wind turbine operational information was collected during the measurement campaign using the facility SCADA system and provided to Aercoustics by South Kent Wind LP.

5.3 Filtering Criteria

Intervals were included or excluded from analysis depending on several filtering criteria. Some of these criteria apply to all intervals and some apply only for *Total Noise* or *Background* intervals. Measurement intervals were first passed through the *All Intervals* filters, after which they were sorted into either *Total Noise* or *Background* categories based on the operation of the nearby turbines. Intervals were included in the assessment dataset if they met all the following criteria:

All Intervals

- Occurred between 10pm 5am
- Had no precipitation within one hour before or after
- Had an ambient temperature above -20°C
- Had minimal influence from extraneous ambient noise sources

Total Noise Intervals

- All nearby turbines were operating
- Test turbine was generating at least 85% of the maximum rated power output
- Monitor was located downwind of the test turbine

Background Intervals

• All nearby turbines were parked (i.e. not rotating)

5.3.1 Turbines in Study Area

As noted above, several filtering criteria were applied based on the operation of the nearest turbine and the turbines in the surrounding area. To verify the operation of these turbines, information from the facility SCADA was processed along with the acoustic and weather data.

The minimum number of turbines included in the study area for the receptor and verified for *Total Noise* measurements was selected based on the guidance of Section D3.8.1 of the Protocol:

D3.8.1 Overall equivalent sound level – wind turbines operational

"[...] At a minimum, all relevant turbines of the subject and adjacent wind facilities, typically within 3 km of the measurement location should be operational. In the event that an adjacent wind facility dominates the background sound levels, subsequent to approval by the Ministry, an alternative measurement location may be selected."

The minimum number of turbines included in the study area of the receptor and verified for *Background* measurements was selected based on the guidance of Section D3.5.2 of the Protocol:

D3.5.2 Acoustic measurements with wind turbines parked

"Ambient noise measurements shall be carried out at a point of reception with all turbines in the vicinity of the point of reception parked. The prediction model will be used to determine the number of turbines that require parking in order for the predicted noise contribution of the wind facility to fall to 30 dBA or 10 dB less than the applicable criterion."

The turbines in the study area of the receptor are listed in Table 5 below.

Audit	Turbines verified for <i>Total Noise</i>	Turbines verified for <i>Background</i>
Receptor	Measurements	Measurements
R3344	T026, T028, T029, T030, T031, T034, T035, T036, T041, T042, T108, T109, T120, T135, T155	T026, T028, T029, T030, T035, T036, T042, T108, T109, T120, T135

Table 5: Turbines Included in the Study Area

Parked turbines do not rotate or generate power. There is some idling of the blades (~2 RPM or less), but the acoustic impact of the turbines in this condition is negligible at the receptor. The turbines were confirmed to be running in their normal operating mode for the duration of the monitoring campaign. See Appendix B for a statement from the operator.

5.3.2 Removal of Extraneous Noise

'Extraneous noise' is defined as ambient sound sources unrelated to the operation of the wind facility. The removal or reduction of extraneous noise sources in the measurement data is important to ensure the assessment of turbine-only sound levels is as accurate and free of contamination as possible. The Protocol provides the following guidance regarding extraneous noise:

C2.4.7 Extraneous noise sources³

"Measurements are to be inhibited when the sound level is affected by noise from extraneous sources such as vehicle noise, dogs barking and wind gusts (i.e. other than wind turbine sound).

"The same result can also be achieved by digitally recording the sound level time history and later editing out the extraneous events and recalculating the descriptors such as Leq. This should address measurement situations where extraneous sounds were not inhibited."

D3.5 Acoustic measurements

"[...] In addition, if the background sound levels are greater than the applicable exclusion limits then the applicable limits are the background sound levels without extraneous noise sources."

D5.3 Effects of insects and fauna

"The analysis shall identify the influence of any insects, fauna, or other extraneous but constant sources of noise and verify them through sound recordings. Noise from insects

³ It is acknowledged that the measurements in this report follow Part D and Part E of the Protocol and this guidance is from Part C. Nevertheless, the guidance regarding the removal of extraneous noise in Part C is applicable here as the requirement to remove contamination from the measurement dataset follows good engineering principles for noise measurements.

can be removed from the 1/3rd octave spectra of each measurement. It has to be shown, however, that the contribution of the wind turbine noise in those frequencies is minimal."

D6 Assessment of compliance

"[...] However, if the background sound levels are greater than the applicable exclusion limits then the applicable limits are now the background sound levels without extraneous noise sources."

Extraneous noise can be steady or transient. Steady noise can be removed via filtering or removal of specific 1/3rd octave bands affected by the contamination (as per Protocol section D5.3). Transient noise can be removed or reduced from the dataset by automatic and manual filtering techniques.

Steady noise from crickets, identified at a frequency of 1600 Hz and above and verified through listening tests, was removed from the 1/3rd octave spectra for all measurements. The contribution from the wind turbine noise in those frequencies was evaluated as further discussed in Section 6.4.2.

Extraneous noise from car passbys and other short-term events was removed by manually removing intervals that had been verified through listening tests to have audible contamination.

5.3.3 Representative Ambient Conditions

The conditions present during the *Total Noise* and *Background* periods must be from similar weather and wind shear conditions, per Protocol section D3.8.2:

D3.8.2 Overall equivalent sound level – wind turbines parked

"Ambient noise measurements should be performed with the turbines parked and conducted within the same general measurement period and with the same weather and wind shear conditions. Measurements of ambient noise obtained during other periods are not recommended and should only be used with great caution to ensure that they represent the "current" ambient noise."

Background measurements were collected periodically throughout the measurement campaign to ensure the *Background* and *Total Noise* measurements were collected during similar conditions in the same seasons.

5.3.4 Adjacent Wind Facilities

No additional wind facilities were present in the area adjacent the receptor location.

5.4 Compliance Criteria

The minimum criteria required for an assessment of compliance per the Compliance Protocol are detailed in this section.

5.4.1 Sample Size Requirements

Requirements per the RAM-I methodology of the Compliance Protocol (Section E5.5) are used for this audit. Per Section E5.5 of the Protocol, an assessment dataset is considered complete if at least three wind bins from 1 - 7 m/s (inclusive) or two wind bins from 1 - 4 m/s (inclusive) are complete. A wind bin is considered complete if there are at least 60 valid *Total Noise* and 30 valid *Background* intervals.

For the purposes of the tonal audibility analysis of these far field measurements, per Section D3.8.3 of the protocol, a wind bin is considered complete if there are at least five (5) one-minute intervals for *Total Noise* and *Background*.

5.4.2 Sound Level Limits

Sound level limits vary with 10m-AGL wind speed and by class designation. The area surrounding the South Kent Wind Project site has previously been designated as Class 3. Exclusion limits for a Class 3 area are summarized in Table 6 below.

Table 6: MECP Exclusion Limits (Class 3)

Wind speed at 10 m height, 10m-AGL (m/s)	Sound Level Exclusion Limit (dBA)
≤ 6	40
7	43

These sound level limits apply to points of reception. Given that the predicted impact at the monitoring location is greater than the predicted impact at the receptor (see Table 2, Section 4.2), results at the monitor are conservative and can be used to show compliance at the receptor.

5.4.3 Tonal Penalty

Any applicable tonal penalties are based on the mean tonal audibility for each wind bin and are calculated according to Annex C of ISO 1996-2-2007, per Section E5.5.2 of the Protocol. The penalty scheme is summarized in Table 7 below.

Table 7: Calculation of Applicable Tonal Penalty

Mean Audibility, ΔL	Tonal Adjustment, K⊤
ΔL ≤ 4 dB	0 dB
4 dB < ΔL ≤ 10 dB	ΔL-4 dB
10 dB < ΔL	6 dB

5.5 Deviations

Any deviations from the methods prescribed in the Protocol are discussed in this section.

5.5.1 Measurement Bandwidth

As noted in Table 4, the measurement bandwidth used is 20 - 10,000 Hz. This is a deviation from the Protocol Section D2.1.1 requirement of a 20 - 20,000 Hz frequency response. Due to the high attenuation of noise levels at high frequencies, noise at the receptor from the wind facility above 10,000 Hz will be insignificant⁴.

6 Audit Results

Sound levels and weather conditions measured throughout the course of the I-Audit campaign are summarized in the following sections.

6.1 Audit Duration

The length of the monitoring campaign is summarized in Table 8 below.

Table 8: Length of Monitoring Campaign

Audit Receptor	Audit Start Date	Audit End Date	Monitoring Duration (weeks)
R3344	September 18, 2019	November 23, 2019	10

6.2 Weather Conditions

Throughout the measurement campaign, a variety of weather conditions were encountered. The range of weather conditions measured in the assessment dataset are summarized in Table 9. Note that the assessment dataset includes the *Total Noise* and *Background* data that remains after filtering.

Table 9: Range of Weather Conditions in Assessment Dataset

Audit Receptor	Atmospheric Pressure (hPa)	10m-AGL Wind Speed (m/s)	Relative Humidity (%)	Temperature (°C)	Hub-Height Wind Speed (m/s)
R3344	982 – 999	0.1 – 10.5	51 – 88	-2 – 25	0 – 16.4

During the audit period, the predominant wind direction was measured to be from the south-west. A wind rose detailing the measured wind directions observed during the entire measurement campaign is provided in Figure 2. Note that wind directions shown on the wind rose indicate the direction the wind is coming from. The purple shaded region represents the downwind condition from the test turbine at the monitor location.

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⁴ From Table 2 of ISO 9613-2, acoustic frequencies above 8 kHz experience attenuation from atmospheric absorption alone of more than 80 dB/km.



Figure 2: Wind Rose (All Measured Data)

From Figure 2, the distribution of wind directions observed during the measurement campaign is similar to those expected based on the historical wind rose provided in Section 4.1.1. Wind roses for the assessment dataset are included in Appendix C.

6.3 Data Excluded due to Filtering Criteria

A range of power output and wind conditions were measured over the course of the audit campaign. Table 10 provides the amount of time during the measurements (between 9pm and 6am) where the two main filtering conditions (high turbine power and downwind conditions) were met, i.e. the percentage of time during the measurement campaign that a receptor experienced the maximum noise impact from the South Kent Wind Project facility.

Table 10: Prevalence of Suitable Turbine Conditions During Measurements

Audit Receptor	Test Turbine	Prevalence of Downwind	Prevalence of High Output (>85% power)	Prevalence of Downwind and High Output
R3344	T036	33%	4%	3%

These conditions represent the minimum requirements for valid *Total Noise* intervals. The additional filters discussed in Section 5.3 further reduced the assessment dataset.



6.4 Measured Sound Levels

Average measured sound levels by wind bin for *Total Noise* and *Background* periods are presented in Table 11 below.

Audit	Doriod	Magguramont Parameter			Win	ıd Bin (ı	m/s)		
Receptor ^F	Fenou			2	3	4	5	6	7
		Number of Samples	0	0	0	7	70	185	126
	Total Noise	Average L _{Aeq} (dBA)	-	-	-	-	42	42	45
D2244		Standard Deviation (dB)	-	-	-	-	0.9	1.2	1.8
K3344	Background	Number of Samples	231	74	0	12	43	63	77
		Average L _{Aeq} (dBA)	28	29	-	-	36	40	43
		Standard Deviation (dB)	2.8	2.8	-	-	1.7	1.4	1.3

Table 11: Average Measured Sound Leve	ls, RAM-I Analysis
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- Sound level not reported in wind bin if minimum sample size not met for *Total Noise* (60) or *Background* (30).

[†] Measured *Background* sound level is higher than the MECP exclusion limit in the wind bin.

It should be noted that the sound levels presented here are rounded to the nearest integer; all calculations and analysis are conducted using the un-rounded sound levels.

Measurement data points from Table 11 are also plotted in Figure 3 below.



Figure 3: Average Measured Total Noise and Background Sound Levels Monitor Near R3344

6.4.1 Tonal Adjustment

Tonal audibility results for R3344 in the far field of T036 are presented in Table 12 below.

Centre	Tanalia Damaratan		Wind Bin (m/s)						
Frequency	I onality Parameter		2	3	4	5	6	7	
	Data Points in Wind Bin	0	0	0	7	70	185	126	
	Data Points with Detected Tone	-	-	-	0	2	1	0	
100 Hz	Tonal Presence	-	-	-	0%	3%	1%	0%	
	Mean Tonal Audibility, ΔL (dB)	-	-	-	-	-1.5	-2.9	-	
	Tonal Adjustment, K _T (dB)	0	0	0	0	0	0	0	
	Data Points in Wind Bin	0	0	0	7	70	185	126	
	Data Points with Detected Tone	-	-	-	0	1	1	0	
140 Hz	Tonal Presence	-	-	-	0%	1%	1%	0%	
	Mean Tonal Audibility, ΔL (dB)	-	-	-	-	0.9	4.2	-	
	Tonal Adjustment, K⊤ (dB)	0	0	0	0	0	0	0	
	Data Points in Wind Bin	0	0	0	7	70	185	126	
	Data Points with Detected Tone	-	-	-	0	4	6	3	
510 Hz	Tonal Presence	-	-	-	0%	6%	3%	2%	
	Mean Tonal Audibility, ΔL (dB)	-	-	-	-	-6.8	-6.8	-6.5	
	Tonal Adjustment, K⊤ (dB)	0	0	0	0	0	0	0	

Toble	10.	Topolity	Accoment	Toblo
Iaple	12.	TOHAIILV	Assessment	Iaple

- Sound level not reported in wind bin if minimum sample size (5) not met.

From the results in Table 12, a 140 Hz tone was observed at 6 m/s but was not prevalent enough (only one interval for a tonal presence of less than 1%) for a tonal penalty to be applicable. No other tones were detected that exceeded the 4 dB threshold for tonal penalties. As a result, no tonal penalty is applicable.

6.4.2 Other Adjustments

As noted in Section 5.3.2, the 1/3rd octave band frequencies of 1600 Hz and above were removed from the assessment dataset due to contamination from cricket noise. The contribution from the wind facility at these excluded frequencies was determined at the monitor location by calculating the partial noise impact from the facility in the excluded frequency range. The impact from the facility at 1600 Hz and above was determined to be 24.5 dBA at the monitor. The impact has been added logarithmically to the final calculated Turbine-Only sound level at the monitor location shown in Table 14.

6.5 Turbine-Only Sound Levels

The average measured sound levels by wind bin for *Total Noise* and *Background* periods are presented in Table 13.

Audit	Moosuromont Poriod			W	/ind Bin (m	/s)		
Receptor			2	3	4	5	6	
	Total Noise (dBA)	-	-	-	-	42	42	45
	Background (dBA)	28	29	-	-	36	40	43
R3344	Signal to Noise (dBA)	-	-	-	-	5.7	2.8	2.4
K3344	Turbine-Only (dBA) [monitor location]	-	-	-	-	40	39*	42*
	Tonal Adjustment	-	-	-	-	0	0	0
- Sound le	evel not reported in w	ind bin if	minimum	sample	size not	met for	Total Nois	e (60) o

Table 13: Calculated Turbine-Only Sound Levels, RAM-I Analysis

- Sound level not reported in wind bin if minimum sample size not met for *Total Noise* (60) or *Background* (30).

* Signal-to-noise level less than 3 dB. Increased uncertainty in determination of Turbine-Only Sound Impact.

7 Assessment of Compliance

This section provides the results of the measurements and calculations as they pertain to the determination of compliance of the facility in accordance with the criteria listed in Section 5.4 of this report.

7.1 Assessment Table

Table 14 compares the final Turbine-Only sound levels for each wind bin at the Receptor location to the applicable exclusion limits and background sound levels. Final Turbine-Only sound levels at the Point of Reception are calculated by taking the Turbine-Only sound level at the measurement location and applying any applicable adjustments as indicated in Table 13.

F	Audit Receptor	Wind speed at 10m-AGL (m/s)		2	3	4	5	6	7
	D2244	Turbine-Only Sound Level (dBA)	-	-	-	-	40	39*	42*
	КЭЭ44	Background Sound Level (dBA)	28	29	-	-	36	40	43
	М	ECP Exclusion Limit (dBA)	40	40	40	40	40	40	43
		Compliance? (Y/N)	-	-	-	-	Yes	Yes	Yes
-	Sound le	vel not reported in wind bin if minim	um sar	nple siz	ze not	met for	r Total	Noise	(60) o

Table 14: Assessment Table

Background (30).

* Signal-to-noise level less than 3 dB. Increased uncertainty in determination of Turbine-Only Sound Impact.

7.2 Statement of Compliance

Based on the Receptor Turbine-Only sound levels presented in Table 14, sound immission levels at the audited receptor are in compliance with the applicable sound level limits.

8 Conclusion

Aercoustics was retained by South Kent Wind LP to complete I-Audit measurements at receptor R3344 near T036, which had be previously conducted and deemed incomplete by the MECP in response to the report submitted January 30, 2015.

The I-Audit measurements were conducted in accordance with the MECP Compliance Protocol for Wind Turbine Noise from September 18, 2019 to November 23, 2019 at receptor R3344 near T036.

Based on the results presented in this report, the assessment requirements outlined in the Compliance Protocol have been met and the cumulative sound impact calculated at R3344 complies with the MECP sound level limits at all wind bins with sufficient data for assessment.



Appendix A Site Details



aercoustics.com



Legend

Ontario HWY 401

Campaign Monitor Spring 2015 Campaign Monitor **Receptor Locations South Kent Turbines** Third Party Turbines Talbot Chatam Front Line Port Alma **Bisnett Line** Raleigh Erieau Blenheim Ν Project ID: 13228.02 Drawn by: AA Reveiwed by: AD Date: February 12, 2020 Revision: 1 Scale: As Indicated

South Kent Wind Project Immission Audit Report R3344 - T036

Appendix A.1

Site Plan Overview





Legend

- Campaign Receptor
- 🔶 Campaign Monitor
- South Kent Turbines
- --- Harwich Road

 Project ID:
 13228.02

 Drawn by:
 AA

 Reveiwed by:
 AD

 Date:
 November 29, 2019

 Revision:
 1

 Scale:
 As Indicated

South Kent Wind Project Immission Audit Report R3344 - T036

Appendix A.2

Monitor and Receptor Location





 Project ID:
 13228.02

 Drawn by:
 AA

 Reveiwed by:
 AD

 Date:
 November 29, 2019

 Revision:
 1

 Scale:
 As Indicated

South Kent Wind Project Immission Audit Report R3344 - T036

Appendix A.3 Monitor to T036





Project ID:13228.02Drawn by:AAReveiwed by:ADDate:February 11,
2020Revision:1Scale:As Indicated

South Kent Wind Project Immission Audit Report R3344 - T036



Monitor to Receptor



Appendix B Statement from the Operator



aercoustics.com



SP South Kent Wind LP 2050 Derry Road West 2nd Floor Mississauga, ON L5N 0B9 www.southkentwind.com

February 12, 2020

Director, Environmental Approvals Access and Service Integration Branch Ministry of Environment 2 St. St Clair Avenue West, Floor 12A Toronto ON M4V 1L5

Subject: South Kent Wind Project (REA #2871-8UKGPC) Receptor Imission Audit 2019-2020

Dear Director

Please accept this letter as confirmation that all turbines tested during the acoustics measurement campaign conducted by Aercoustics Engineering Limited from September 18, 2019 to January 22, 2020 were operating normally for the duration of the campaign, with the exception of specific time periods during which the turbines were placed in remote owner stop to facilitate ambient noise measurements.

The turbines placed in remote owner stop for ambient measurements were different depending on the receptor targeted, and were as follows:

- R4368: T001, T002, T003, T004, T006, T106, T118, T138, T166
- R3287: T031, T032, T033, T034, T035, T036, T039, T040, T041, T108, T135, T156
- R3344: T026, T028, T029, T030, T035, T036, T042, T108, T109, T120, T135
- R3167: T032, T033, T037, T038, T039, T040, T045, T046
- R2794: T055, T056, T057, T060, T100, T111, T164
- R4248: T001, T002, T003, T004, T006, T093, T102, T138, T152, T166, T167

The turbines verified for operational measurements were different depending on the receptor targeted, and were as follows:

- R4368: T001, T002, T003, T004, T006, T007, T008, T093, T106, T107, T118, T138, T166, T167
- R3287: T024, T029, T030, T031, T032, T033, T034, T035, T036, T039, T040, T041, T042, T108, T120, T135, T155, T156
- R3344: T026, T028, T029, T030, T031, T034, T035, T036, T041, T042, T108, T109, T120, T135, T155
- R3167: T032, T033, T034, T037, T038, T039, T040, T041, T044, T045, T046
- R2794: T054, T055, T056, T057, T058, T060, T097, T100, T111, T163, T164
- R4248: T001, T002, T003, T004, T006, T093, T102, T138, T152, T166, T167

Sincerely,

Ne

Kevin Aikenhead Facility Manager South Kent Wind C: 519-350-9373

Appendix C Wind Roses







Project ID: 13228.02 Drawn by: AA Reveiwed by: AD Date: February 14, 2020 Revision: 1 Scale: As Indicated South Kent Wind Project Immission Audit Report R3344 - T036 Appendix C.1

Supplementary Wind Rose based on Assessment Data Total Noise







Drawn by: AA Reveiwed by: AD Date: February 14, 2020 Revision: 1 Scale: As Indicated South Kent Wind Project Immission Audit Report R3344 - T036 Appendix C.2 Supplementary Wind Rose

Project ID: 13228.02

Supplementary Wind Rose based on Assessment Data Background Noise



Appendix D Calibration Certificates



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CALIBRATION CERTIFICATES

Details are disclosed in the table below regarding the calibration of the equipment used for the Immission Audit at monitor location R3344. The associated calibration certificates are provided in this appendix.

Audit Receptor	Equipment	Make/Model	Serial Number	Date of Last Calibration
	Data Acquisition Card	NI 9234	1822121	June 10, 2019
	Signal Conditioner	PCB 480E09	33660	June 18, 2019
R3344	Microphone	PCB 377B02	177761	June 19, 2019
	Pre-Amplifier	PCB 426E01	51464	June 19, 2019
	Weather Anemometer	Vaisala WXT536	M4910193	December 5, 2018



CERTIFICATE of CALIBRATION

Make	:	PCB	Piezotronic

Model : 378B02

Reference # : 157558

Customer :

Aercoustics Engineering Ltd Mississauga, ON

Descr. : Microphone System 1/2" Free Field

Serial # : 132193

P. Order :

2019.06.14C

Asset # : 01162

Cal. status : Received in spec's, no adjustment made. Preamp System with Mic 377B02 s/n 177761

Navair Technologies certifies that the above listed instrument was calibrated on date noted and was released from this laboratory performing in accordance with the specifications set forth by the manufacturer.

Unless otherwise noted in the calibration report a 4:1 accuracy ratio was maintained for this calibration.

Our Quality System system complies with the requirements of ISO-9001-2015 and is registered under certificate CA96/269, working standards used for calibration are certified by or traceable to the National Research Council of Canada or the National Institute of Standards and Technology.

Calibrated : Jun 19, 2019

Cal. Due :

By :

Petro Onasko

Temperature : 23 °C \pm 2 °C Relative Humidity : 30% to 70%

Standards used : J-216 J-324 J-333 J-420 J-512

Jun 19, 2021

Navair Technologies

REPAIR AND CALIBRATION TRACEABLE TO NRC AND NIST 6375 Dixie Rd. Mississauga, ON, L5T 2E7 http://www.navair.com

Phone : 800-668-7440 Fax:

Fax: 905 565 8325

http://www.navair.com e-Mail: service @ navair.com

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6375 Dixie Rd Unit # 7 Mississauga ON L5T 2E7 Tel: (905) 565-1583 Fax: (905) 565-8325

Form: 378B02

Approved by: JR

Ver 1.0

157558

Feb-16

Calibration Report for Certificate :

Make	Model	Serial	Asset	
PCB Piezotronics	378B02	132193	01162	
PCB Piezotronics	426E01	051464	01162	
PCB Piezotronics	377B02	177761	01162	

Sensitivity at 250 Hz

Specs Nom	Unit	Min	Reading	Max	In/Out
50	mV/Pa	39.72	48.52	62.94	In
-26.02	dB re 1V/Pa	-28.02	-26.28	-24.02	In
0	dB re 50mV/Pa	-2	-0.26	2	In

Ambient Conditions: Static Pressure Temperature

Temperature Rel.Humidity 98.8 kPa 24.9°C 46.0%

Frequency response

10.070			
	Lower	Upper	
Freq	Pressure	Free Field	
Hz	dB	dB	
31.5	-0.03	-0.03	
63.1	-0.01	-0.01	
125.9	0.00	0.00	
251.3	0.00	0.00	ref
502.5	-0.01	-0.01	
1005.1	-0.07	-0.04	
1978.7	-0.18	0.08	
3957.5	-0.60	0.30	
7914.9	-2.38	0.42	
12663	-6.20	-0.80	
15830	-7.11	-0.65	



CERTIFICATE of CALIBRATION

Make : PCB Piezotronics

Reference # : 157551

Model : 480E09

Customer :

Aercoustics Engineering Ltd Mississauga, ON

2019.06.14C

Descr. : Conditioning Amplifier

Serial # : 33660

P. Order :

Asset # : 00154

Cal. status : Received in spec's, no adjustment made.

Navair Technologies certifies that the above listed instrument was calibrated on date noted and was released from this laboratory performing in accordance with the specifications set forth by the manufacturer.

Unless otherwise noted in the calibration report a 4:1 accuracy ratio was maintained for this calibration.

Our Quality System system complies with the requirements of ISO-9001-2015 and is registered under certificate CA96/269, working standards used for calibration are certified by or traceable to the National Research Council of Canada or the National Institute of Standards and Technology.

Calibrated : Jun 18, 2019

Cal. Due :

By :

Petro Onasko

Temperature : 23 °C \pm 2 °C Relative Humidity : 30% to 70%

Standards used : J-233 J-255 J-367 J-512

Jun 18, 2021

Navair Technologies

REPAIR AND CALIBRATION TRACEABLE TO NRC AND NIST 6375 Dixie Rd. Mississauga, ON, L5T 2E7 http://www.navair.com

Phone : 800-668-7440

Fax: 905 565 8325

http: // www.navair.com e-Mail: service @ navair.com

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Form: 480E09	Approved by:	J. Raposo	Jun-18	Ver 1.2
Calibration Repor	t for Certificate :			157551
Make	Model	Serial №	Asset	2
PCB Piezotronics	480E09	00033660	00154	
T 1	Min	Reading	Max	In/Out

Gain accuracy at 1 kHz

Gain Set

• 1	1.000 V	0.9800	0.9999	1.0200	In
• 10	0.100 V	0.9800	0.9994	1.0200	In
• 100	0.010 V	0.9800	0.9970	1.0200	In

Gain Flatness

Gain • 1

10 Hz	1.000 V	-5.0	0.2%	5.0	In
10 kHz	1.000 V	-5.0	0.0%	5.0	In
50 kHz	1.000 V	-5.0	0.1%	5.0	In
100 kHz	1.000 V	-5.0	0.1%	5.0	In

Gain • 10

10 Hz	0.100 V	-5.0	0.2%	5.0	In
10 kHz	0.100 V	-5.0	0.0%	5.0	In
50 kHz	0.100 V	-5.0	-0.1%	5.0	In
100 kHz	0.100 V	-5.0	-1.0%	5.0	In

Gain • 100

10 Hz	0.010 V	-5.0	0.2%	5.0	In
10 kHz	0.010 V	-5.0	0.9%	5.0	In
50 kHz	0.010 V	-5.0	1.1%	5.0	In

Compliant Calibration Certificate

Template Revision Eeb2018

Certificate Number:	6050805.1	OE Number:	21685752	CALIBRATED SN/ID 1822121
Date Printed:	10-JUN-2019	Page:	1 of 14	DATE: 10-JUN-2019
Customer:	Aercoustics Engineering LTD (CA)		ni.com/calibration
	1004 Middlegate Rd No 1100 ONTARIO MISSISSAUGA, L4Y 1 CANADA	M4		
Manufacturer:	National Instruments	Model:	NI 9234	
Serial Number:	1822121			
Part Number:	195551B-01L	Description:	MODULE ASSY,NI 9 CONFIGURABLE	234, 4 Al
Calibration Date:	10-JUN-2019	Recommended Calibration Due:	10-JUN-2020	
Procedure Name:	NI 9234	Verification Results:	As Found: Passed As Left: Passed	
Procedure Version:	3.6.1.0	Calibration Executive Version:	4.6.2.0	
Lab Technician:	Rogelio Gaytan	Driver Info:	NI-DAQmx:17.6.0	
Temperature:	22.9° C	Humidity:	44.5% RH	

The data found in this certificate must be interpreted as:

As Found

The calibration data of the unit as received by National Instruments.

As Left The calibration data of the unit when returned from National Instruments.

The As Found and As Left readings are identical for units not adjusted or repaired.

This calibration conforms to ANSI/NCSL Z540.1-1994 (R2002) requirements.

The TUR (Test Uncertainty Ratio) of this calibration is maintained at a ratio of 4:1 or greater, unless otherwise indicated in the measurements. A TUR determination is not possible for singled sided specification limits and therefore the absence of a value should not be interpreted as a TUR of 4:1 or greater, but rather undetermined. When provided, the expanded measurement uncertainty is calculated according to the Guide to the Expression of Uncertainty in Measurement (GUM) for a confidence level of approximately 95%. The uncertainty is calculated at time of calibration and does not include the object long-term stability and different environmental and operational conditions.

Results are reviewed to establish where any measurement results exceeded the manufacturer's specifications. Measured values greater than the Manufacturer's specification limits are marked as 'Failed', measured values within the Manufacturer's specifications are marked as 'Passed'.

This certificate applies exclusively to the item identified above and shall not be reproduced except in full, without National Instruments written authorization. Calibration certificates without signatures are not valid.

The Calibration Certificate can be viewed or downloaded online at <u>www.ni.com/calibration/</u>. To request a hard copy, contact NI Customer Service at Tel:(800) 531-5066 or E-mail customer.service@NI.com

Ted Talley Technical Manager



Calibration Notes

Туре	Note	
Asset	Verification and adjustment were performed.	-

Standards Used

Manufacturer	Model	Туре	Tracking Number	Calibration Due Notes
Fluke	5720A	Calibrator	9379	09-JUL-2019
National Instruments	PXI-4461	Function generator	9520	20-AUG-2019
National Instruments	PXI-4071	Digital multimeter	9840	17-MAY-2020
National Instruments	PXI-4132	SMU	9170	06-MAY-2020

The standards used in this calibration are traceable to NIST and/or other National Measurement Institutes (NMI's) that are signatories of the International Committee of Weights and Measures (CIPM) mutual recognition agreement (MRA).



Calibration Results

As Found		e etc. sant is in the							
Verify Acc	uracy	and the	t she a see	Sec.				1	
Lower Range	Upper Range	Channel	Test Value	Low Limit	Reading	High Limit	Status	Notes	0
-5 V	5 V	0	4.00000 V	3.99520 V	4.00007 V	4.00480 V	Passed		
-5 V	5 V	0	0.00000 V	-0.00120 V	-0.00000 V	0.00120 V	Passed		
-5 V	5 V	0	-4.00000 V	-4.00480 V	-4.00006 V	-3.99520 V	Passed		
-5 V	5 V	1	4.00000 V	3.99520 V	4.00008 V	4.00480 V	Passed		
-5 V	5 V	1	0.00000 V	-0.00120 V	-0.00001 V	0.00120 V	Passed		
-5 V	5 V	1	-4.00000 V	-4.00480 V	-4.00007 V	-3.99520 V	Passed		
-5 V	5 V	2	4.00000 V	3.99520 V	4.00012 V	4.00480 V	Passed		
-5 V	5 V	2	0.00000 V	-0.00120 V	0.00005 V	0.00120 V	Passed		
-5 V	5 V	2	-4.00000 V	-4.00480 V	-4.00002 V	-3.99520 V	Passed		
-5 V	5 V	3	4.00000 V	3.99520 V	4.00012 V	4.00480 V	Passed		
-5 V	5 V	3	0.00000 V	-0.00120 V	0.00003 V	0.00120 V	Passed		
-5 V	5 V	3	-4.00000 V	-4.00480 V	-4.00003 V	-3.99520 V	Passed		



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As Found

1944 (1) N	11. S. M.	
Verify	Gain	Matching

Max Gain Difference	Rate	Samples Rate per	Tost Value	Low Limit	Reading	High Limit	Status	Notes
for Channel	Thate the second second	Channel	Test value	Low Limit	Reading	riigii Liinit	Status	Notes
0	10240	10240	4 V	-0.040 dB	-0.000 dB	0.040 dB	Passed	
1	10240	10240	4 V	-0.040 dB	-0.000 dB	0.040 dB	Passed	
2	10240	10240	4 V	-0.040 dB	0.000 dB	0.040 dB	Passed	
3	10240	10240	4 V	-0.040 dB	0.000 dB	0.040 dB	Passed	



As Found

-

Verify Phase	rify Phase Matching									
Max Phase Difference for Channel	Rate	Samples per Channel	Test Value	Low Limit	Reading	High Limit	Status Notes			
0	51200	16384	1000 Hz	-0.085 Degrees	-0.008 Degrees	0.085 Degrees	Passed			
1	51200	16384	1000 Hz	-0.085 Degrees	0.009 Degrees	0.085 Degrees	Passed			
2	51200	16384	1000 Hz	-0.085 Degrees	-0.009 Degrees	0.085 Degrees	Passed			
3	51200	16384	1000 Hz	-0.085 Degrees	0.009 Degrees	0.085 Degrees	Passed			
0	51200	16384	10000 Hz	-0.490 Degrees	-0.077 Degrees	0.490 Degrees	Passed			
1	51200	16384	10000 Hz	-0.490 Degrees	0.081 Degrees	0.490 Degrees	Passed			
2	51200	16384	10000 Hz	-0.490 Degrees	-0.091 Degrees	0.490 Degrees	Passed			
3	51200	16384	10000 Hz	-0.490 Degrees	0.091 Degrees	0.490 Degrees	Passed			



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As Found

Verify Common Mode Rejection Ratio								
Channel	Rate	Samples per Channel	Test Value	Low Limit	Reading	High Limit	Status	Notes
0	51200	16384	1000 Hz	40.000 dB	51.997 dB	100.000 dB	Passed	
1	51200	16384	1000 Hz	40.000 dB	50.993 dB	100.000 dB	Passed	
2	51200	16384	1000 Hz	40.000 dB	53.511 dB	100.000 dB	Passed	
3	51200	16384	1000 Hz	40.000 dB	54.872 dB	100.000 dB	Passed	



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As Found

Verify IEF	E Current					t i ju	and a gr	e algebra e a a a
Channel	Rate	DMM Range	Test Value	Low Limit	Reading	High Limit	Status	Notes
0	51200	0.01 A	2.000 mA	2.000 mA	2.070 mA	2.200 mA	Passed	
1	51200	0.01 A	2.000 mA	2.000 mA	2.073 mA	2.200 mA	Passed	
2	51200	0.01 A	2.000 mA	2.000 mA	2.075 mA	2.200 mA	Passed	all a faile age
3	51200	0.01 A	2.000 mA	2.000 mA	2.077 mA	2.200 mA	Passed	



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Verify IEPE	Compliance	Voltage						$(1,1)^{-1} = (1,$		
Channel	Rate	SMU Voltage Limit	Test Value	Low Limit	Reading	High Limit	Status	Notes		
0	51200	24 V	2 mA	19.000 V	20.867 V	24.000 V	Passed			
1	51200	24 V	2 mA	19.000 V	20.870 V	24.000 V	Passed	na na sa		
2	51200	24 V	2 mA	19.000 V	20.873 V	24.000 V	Passed			
3	51200	24 V	2 mA	19.000 V	20.863 V	24.000 V	Passed			



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As Left

Verify Acc	uracy						eige i	the state of t
Lower Range	Upper Range	Channel	Test Value	Low Limit	Reading	High Limit	Status	Notes
-5 V	5 V	0	4.00000 V	3.99520 V	4.00001 V	4.00480 V	Passed	
-5 V	5 V	0	0.00000 V	-0.00120 V	0.00000 V	0.00120 V	Passed	
-5 V	5 V	0	-4.00000 V	-4.00480 V	-3.99999 V	-3.99520 V	Passed	gini wa ka incisa
-5 V	5 V	1	4.00000 V	3.99520 V	4.00000 V	4.00480 V	Passed	
-5 V	5 V	1	0.00000 V	-0.00120 V	-0.00001 V	0.00120 V	Passed	la de la compañía de
-5 V	5 V	1	-4.00000 V	-4.00480 V	-4.00001 V	-3.99520 V	Passed	
-5 V	5 V	2	4.00000 V	3.99520 V	3.99980 V	4.00480 V	Passed	
-5 V	5 V	2	0.00000 V	-0.00120 V	-0.00021 V	0.00120 V	Passed	
-5 V	5 V	2	-4.00000 V	-4.00480 V	-4.00021 V	-3.99520 V	Passed	
-5 V	5 V	3	4.00000 V	3.99520 V	4.00002 V	4.00480 V	Passed	
-5 V	5 V	3	0.00000 V	-0.00120 V	0.00000 V	0.00120 V	Passed	
-5 V	5 V	3	-4.00000 V	-4.00480 V	-3.99998 V	-3.99520 V	Passed	



1 .

As Left

Verify Gain Matching								
Max Gain Difference for Channel	Rate	Samples per Channel	Test Value	Low Limit	Reading	High Limit	Status	Notes
0	10240	10240	4 V	-0.040 dB	-0.000 dB	0.040 dB	Passed	
1 -	10240	10240	4 V	-0.040 dB	0.000 dB	0.040 dB	Passed	
2	10240	10240	4 V	-0.040 dB	-0.000 dB	0.040 dB	Passed	
3	10240	10240	4 V	-0.040 dB	-0.000 dB	0.040 dB	Passed	



As Left

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Verify Phase	Matching	**				(x_1, y_2, z_2, δ)	Selection in the	Carl and a starting
Max Phase Difference for Channel	Rate	Samples per Channel	Test Value	Low Limit	Reading	High Limit	Status	Notes
0	51200	16384	1000 Hz	-0.085 Degrees	-0.009 Degrees	0.085 Degrees	Passed	().
1	51200	16384	1000 Hz	-0.085 Degrees	0.009 Degrees	0.085 Degrees	Passed	
2	51200	16384	1000 Hz	-0.085 Degrees	-0.009 Degrees	0.085 Degrees	Passed	ant o a e numere e
3	51200	16384	1000 Hz	-0.085 Degrees	0.009 Degrees	0.085 Degrees	Passed	
0	51200	16384	10000 Hz	-0.490 Degrees	-0.079 Degrees	0.490 Degrees	Passed	
1	51200	16384	10000 Hz	-0.490 Degrees	0.081 Degrees	0.490 Degrees	Passed	
2	51200	16384	10000 Hz	-0.490 Degrees	-0.091 Degrees	0.490 Degrees	Passed	
3	51200	16384	10000 Hz	-0.490 Degrees	0.091 Degrees	0.490 Degrees	Passed	



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Verify Common Mode Rejection Ratio								्रिया संस्थित द्वादा स्थल वि	
Channel	Rate	Samples per Channel	Test Value	Low Limit	Reading	High Limit	Status	Notes	
0	51200	16384	1000 Hz	40.000 dB	52.490 dB	100.000 dB	Passed	ter en se ser en se	
1	51200	16384	1000 Hz	40.000 dB	51.086 dB	100.000 dB	Passed		
2	51200	16384	1000 Hz	40.000 dB	53.980 dB	100.000 dB	Passed		
3	51200	16384	1000 Hz	40.000 dB	52.098 dB	100.000 dB	Passed		
				and the first of		2	a	- 10 - 40 - 30	



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Verify	IEPE	Current
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Channel	Rate	DMM Range	Test Value	Low Limit	Reading	High Limit	Status	Notes
0	51200	0.01 A	2.000 mA	2.000 mA	2.070 mA	2.200 mA	Passed	
1	51200	0.01 A	2.000 mA	2.000 mA	2.073 mA	2.200 mA	Passed	a series and a series of the
2	51200	0.01 A	2.000 mA	2.000 mA	2.075 mA	2.200 mA	Passed	the states and
3	51200	0.01 A	2.000 mA	2.000 mA	2.077 mA	2.200 mA	Passed	an a



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As Left Verify IEPE Compliance Voltage								
							1.011111	
Channel	Rate	SMU Voltage Limit	Test Value	Low Limit	Reading	High Limit	Status	Notes
0	51200	24 V	2 mA	19.000 V	20.866 V	24.000 V	Passed	a an anna an tartain. A
1	51200	24 V	2 mA	19.000 V	20.870 V	24.000 V	Passed	
2	51200	24 V	2 mA	19.000 V	20.874 V	24.000 V	Passed	
3	51200	24 V	2 mA	19.000 V	20.864 V	24.000 V	Passed	



VAISALA

Test report no. B20-18490001

TEST REPORT

Product familyW.Product typeW.Order code68Serial numberM4ManufacturerVaTest date51Asset#01

WXT530 series WXT536 6B1B2A4D1B1B M4910193 Vaisala Oyj, Finland 5 December 2018 01005

This test report certifies that the product was thoroughly tested and inspected, and found to meet its published test limits when it was shipped from Vaisala.

Test results							
Test	Result	Lower limit	Upper limit	Unit			
Rain response	404	345	575	mV			
Zero wind speed	0	0	0.4	m/s			
Pressure difference	-0.07	-1	1	hPa			
Temperature difference	0.21	-2	2	°C			
Humidity difference	-1.59	-10	10	%RH			
Heating current	0.73	0.6	0.8	A			
Current (service port)	1.2	0.5	2	mA			
Communication (service port)	pass	PASS	PASS	-			
Current (main port)	0.83	0.5	2	mA			
Communication (main port)	pass	PASS	PASS	-			

Ambient conditions / Humidity 14.98 ±5 %RH, Temperature 21.63 ±1 °C, Pressure 1015.07 ±1 hPa.

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CALIBRATION SHEET

Instrument Serial number Manufacturer Test date

VAISALA

WXTPTU P3350063 Vaisala Oyj, Finland 12th October 2018

This test report certifies that the instrument was thoroughly tested and inspected, and found to meet its published test limits when it was shipped from Vaisala.

Test phase of calibration	Reference	Observed	Error*	Uncertainty**			
process	value	value					
Pressure	1076.1 hPa	1076.0 hPa	-0.1 hPa	± 0.4 hPa			
Pressure	900.0 hPa	900.1 hPa	0.1 hPa	± 0.4 hPa			
Pressure	796.9 hPa	797.1 hPa	0.2 hPa	± 0.4 hPa			
Pressure	596.7 hPa	596.4 hPa	-0.3 hPa	± 0.4 hPa			
Temperature	59.7 °C	59.7 °C	0.0 °C	± 0.2 °C			
Temperature	24.9 °C	24.9 °C	0.0 °C	± 0.2 °C			
Temperature	-5.7 °C	-5.7 °C	0.0 °C	± 0.2 °C			
Temperature	-32.4 °C	-32.3 °C	0.1 °C	± 0.2 °C			
Temperature	-51.7 °C	-51.7 °C	0.0 °C	± 0.2 °C			
Relative humidity	29.8 %RH	29.8 %RH	0.0 %RH	± 2 %RH			
Relative humidity	56.9 %RH	56.9 %RH	- 0.0 %RH	± 2 %RH			
Relative humidity	92.1 %RH	92.1 %RH	0.0 %RH	± 3 %RH			

*The test points for error values are polynomial fitting curve fitting points.

**The calibration uncertainty given at 95 % confidence level, k = 2

Traceability

The working standards for pressure and temperature are calibrated at Vaisala Measurement Standards Laboratory (MSL) by using MSL working standards traceable to National Institute of Standards and Technology (NIST, USA). The relative humidity values are calculated from measured temperature and dew-point temperature values. The dew-point working standards are traceable to the Finnish National Humidity Laboratory (MIKES).

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Appendix E MECP I-Audit Checklist



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MECP I-Audit Checklist

Wind Energy Project – Screening Document – Acoustic Audit Report – Immission Information Required in the Acoustic Audit Report – Immission

Item #	Description	Complete?	Comment
1	Did the Sound level Meter meet the Type 1 Sound level meter	\checkmark	
	requirements according to the IEC standard 61672-1 Sound level Meters,		
0	Part 1: Specifications? Section D2.1.1		
2	Was the complete sound measurement system, including any recording,	v	
	the measurement session at one or more frequencies using an ecoustic		
	calibrator on the microphone (must not exceed ± 0.5 dB)2 Section D2.1.3		
	calibrator on the microphone (must hot exceed ±0.00b): Section b2.1.5		
3	Are valid calibration certificate(s) of the noise monitoring equipment and	\checkmark	
	calibration traceable to a qualified laboratory? Is the validity duration of the		
	calibration stated for each item of equipment? Section D2.3		
4	Was the predictable waret appendence auch as high wind about and		
4	wind direction toward the Recentor considered? Section D3.2		
5	Is there a Wind Rose showing the wind directions at the site? Section D7	\checkmark	
	(1e)		
6	Did the results cover a wind speed range of at least 4-7 m/s as outlined in	\checkmark	
	section D 3.8.?		
7	Was the weather report during the measurement campaign included in the	\checkmark	
0	report? Section D7 (1c)		
8	Did the audit state there was compliance with the limits at each wind	v	
9	Are pictures of the poise measurement setup near Point of reception	√	
0	provided? Section D3.3.2 & D3.4		
10	Was there justification of the Receptor location choice(s) prior to	\checkmark	
	commencement of the I-Audit? Section D4.1		
11	Was there sufficient valid data for different wind speeds? Section D5.2 # 3	\checkmark	
12	Was the turbine (operational) specific information during the measurement	\checkmark	
	campaign in tabular form (i.e. wind speed at hub height, anemometer wind		
	speed at 10 m height, air temperature and pressure and relative humidity)		
13	Section D3.7 Were all the calculated standard deviations at all relevant integer wind	✓	
10	speeds provided? Section D7 (2d)		
14	Compliance statement	✓	
15	All data included in an Excel spreadsheet	\checkmark	
16	If deviations from standard; was justification of the deviations provided	\checkmark	

End of Report



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