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Enviro Acoustic Research

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Date: 28 March 2022
Ref: Wind Garden WF/OL

Savannah Environmental (Pty) Ltd
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Attention: Ms. Jo-Anne Thomas

Dear Madam

SPECIALIST OPINION: REVIEW OF THE OPTIMIZED LAYOUT FOR THE WIND GARDEN WIND FARM

The above-mentioned issue as well as report SE-WRWGWEF/ENIA/202105-Rev 1, dated May 2021, is of relevance (referred to as the 2021 assessment).

Background

I conducted an Environmental Noise Impact Assessment (ENIA) for the proposed Wind Garden Wind Farm (WF), considering the construction, operation and decommissioning phases. I used a worst-case noise emission level of 113.6 dBA (re 1 pW) for the construction phase, with the sound power emission level (SPL) of the Vestas V150-4.2 MW [1,2] wind turbine (WTG), emitting 104.9 dBA. With the modelled input data as used, the 2021 assessment indicated:

- A potential noise impact of a **low** significance during the day for the construction phase of the proposed WEF and no additional mitigation is required;
- A potential noise impact of a **medium** significance before mitigation for night-time construction activities, with proposed mitigation available to allow the reduction of the potential noise impact to a **low** significance;
- A potential noise impact of a **low** significance for operation of the proposed wind turbines at night. The daytime noise impact would be less than the potential night-time noise impact; and
- A potential noise impact of a **low** significance for the decommissioning of the proposed WEF.

The 2021 assessment did highlight that the development of the Wind Garden WF will not increase cumulative noises in the area.

Review of latest layout

After considering the comments received during the Environmental Impact Assessment process for the Wind Garden WF, the Applicant developed an optimized layout (see **Figure 1**) with a reduced number of WTG. The proposed WTG will also be slightly smaller, having a hub height of 115 m instead of the proposed 120 m, with the rotor diameter remaining 150 m. The applicant also requested that the acceptability of the optimized layout be reviewed in terms of the potential noise impact. This review considered the effect of the optimized layout during both the construction and operational phases, using the SPL of the following equipment:

- Construction – General noise source, worst-case – 113.6 dBA (re 1 pW);

- Operation – Standard Vestas V150-4.5 MW PO4 [3] (SPL of 105 dBA, re 1 PW); and
- Operation – Standard Vestas V162-6.0 MW PO6000 [4] (SPL of 104.3 dBA, re 1 PW).

The calculated maximum noise level contours are illustrated in:

- **Figure 2** for the Vestas V150-4.5 MW PO4 WTG; and
- **Figure 3** for the Vestas V162-6.0 MW PO6000 WTG.

The significance of the noise impact was assessed and presented in:

- **Table 1** for daytime construction activities;
- **Table 2** for night-time construction activities;
- **Table 3** for the operation of the Vestas V150-4.5 MW PO4 WTG (operational at night); and
- **Table 4** for the operation of the Vestas V162-6.0 MW PO6000 WTG (operational at night).

Therefore, the optimized layout will have:

- A potential noise impact of a **low** significance during the day for the construction phase of the proposed WEF and no additional mitigation is required (see **Table 1**);
- A potential noise impact of a **medium** significance for night-time construction activities before mitigation for night-time construction activities (see **Table 2**), with proposed mitigation available (as included in the 2021 assessment) to allow the reduction of the potential noise impact to a **low** significance;
- A potential noise impact of a **low** significance for operation of the proposed wind turbines at night (for both the Vestas V150-4.5 MW PO4 and V162-6.0 MW PO6000 WTGs). The daytime noise impact would be less than the potential night-time noise impact and will be insignificant (see **Table 3** and **Table 4**); and
- A potential noise impact of a **low** significance for the decommissioning of the proposed WEF.

Roads does not pass close to any NSR and the noise impact will be of a low significance for both the construction of these access roads as well as for construction road traffic. The development of the Wind Garden WF will not increase cumulative noises in the area.

Considering the optimized layout and the low potential for a noise impact to occur, it is my opinion that the optimized layout is acceptable in terms of noise for the Wind Garden WF. A full noise impact assessment with new modeling will not be required and the findings and recommendations as contained in the previous document (report SE-WRWGWF/ENIA/202105-Rev 1) will still be valid.

Should you require any further details, or have any additional questions, please do not hesitate to call me on the above numbers.

Yours Faithfully,

Morné de Jager
Enviro-Acoustic Research cc

References:

1. Vestas, 2017: '*V150-4.0 MW Third Octave Noise Emissions*'. DMS no.: 0067-4767_00, Vestas Wind Systems A/S, Denmark
2. Vestas, 2017: 'Performance Specification - *V150-4.0/4.2 MW 50/60 Hz*'. DMS no.: 0067-7067 V08, Vestas Wind Systems A/S, Denmark
3. Vestas, 2021: '*V150-4.5 MW Third Octave Noise Emission*'. DMS no.: 0071-7258_02, Vestas Wind Systems A/S, Denmark
4. Vestas, 2020: 'Performance Specification EnVentus™ - *V162-6.0 MW 50/60 Hz*'. DMS no.: 0098-0840 V00, Vestas Wind Systems A/S, Denmark

ANNEXURE 1:

FIGURES:

- **OPTIMIZED LAYOUT**
- **MODELED RESULTS**

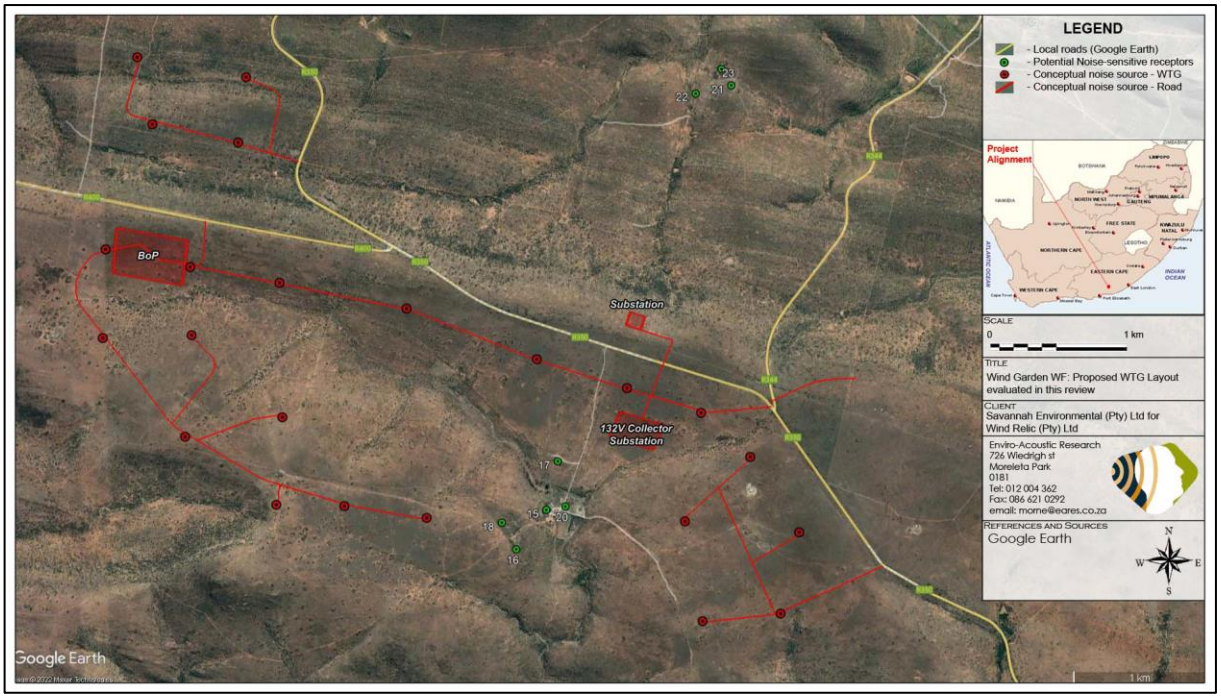

Figure 1: Optimized layout as evaluated in this review

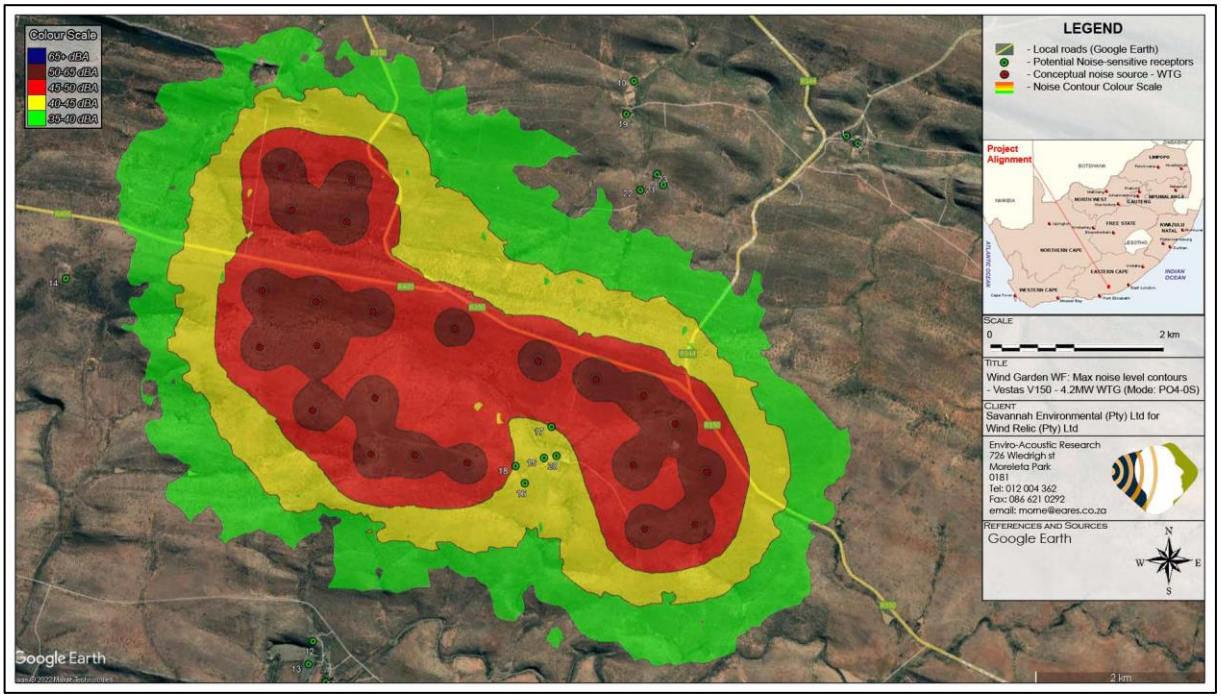

Figure 2: Calculated noise level contours for the Vestas V150-4.5 MW PO4 WTG

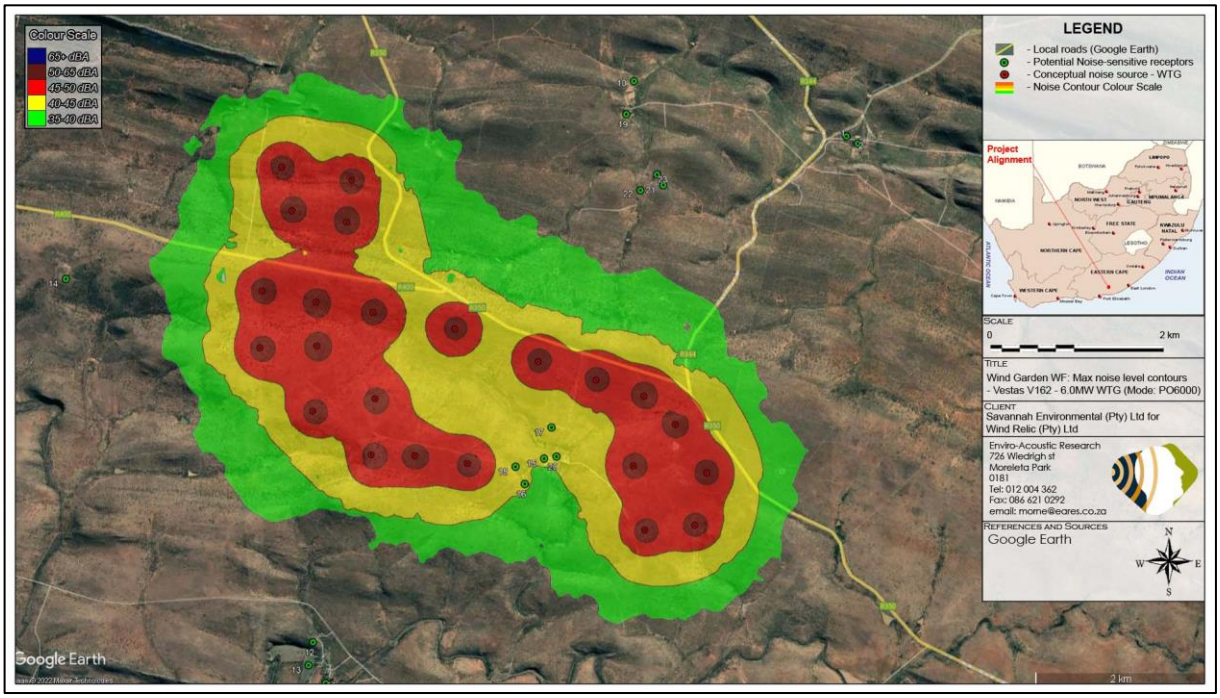

Figure 3: Calculated noise level contours for the Vestas V162-6.0 MW PO6000 WTG

ANNEXURE 3:

Significance of Noise Impact for amended layout considering various Scenarios

Table 1: Projected daytime construction noise levels and the significance of the noise impact for daytime construction activities

Potential Noise-sensitive development / Receptor(s)	Comments	Recommended Rating Levels (noise limit - daytime rating level, Rural)	Potential Existing Ambient Sound Levels (long-term average - Fast-weighted, low wind)	Projected Noise Level, Worst-case construction scenario	Change in rating level	Magnitude / Intensity	Duration	Extent	Probability of Impact Occurring	Significance
8	Residences	45	40.4	33.2	0.8	Minor	Temporary	Local	Improbable	Low
9	Residences	45	40.4	31.9	0.6	Minor	Temporary	Local	Improbable	Low
10	Residences	45	40.4	32.7	0.7	Minor	Temporary	Local	Improbable	Low
11	Residences	45	40.4	34.0	0.9	Minor	Temporary	Local	Improbable	Low
12	Residences	45	40.4	35.6	1.2	Minor	Temporary	Local	Improbable	Low
13	Undefined	45	40.4	31.7	0.5	Minor	Temporary	Local	Improbable	Low
14	Undefined. No access.	45	40.4	36.1	1.4	Minor	Temporary	Local	Improbable	Low
15	Residences	45	40.4	48.7	8.9	High	Temporary	Local	Possible	Low
16	*Empty house, not to be used in future*	*45*	*40.4*	*48.6*	*8.8*	*High*	*Temporary*	*Local*	*Possible*	***Low***
17	*Empty house, not to be used in future*	*45*	*40.4*	*50.0*	*10.1*	*Very High*	*Temporary*	*Local*	*Likely*	***Medium***
18	*Empty house, not to be used in future*	*45*	*40.4*	*49.2*	*9.3*	*High*	*Temporary*	*Local*	*Possible*	***Low***
19	Residences	45	40.4	32.9	0.7	Minor	Temporary	Local	Improbable	Low
20	Hunting lodge.	45	40.4	48.6	8.8	High	Temporary	Local	Possible	Low
21	*Shed*	*45*	*40.4*	*36.1*	*1.4*	*Minor*	*Temporary*	*Local*	*Improbable*	***Low***
22	*Empty house, not to be used in future*	*45*	*40.4*	*36.9*	*1.6*	*Minor*	*Temporary*	*Local*	*Improbable*	***Low***
23	Residences	45	40.4	36.0	1.3	Minor	Temporary	Local	Improbable	Low

Table 2: Projected night-time construction noise levels and the significance of the noise impact for night-time construction activities

Potential Noise-sensitive development / Receptor(s)	Comments	Recommended Rating Levels (noise limit - night-time rating level, Rural)	Potential Existing Ambient Sound Levels (long-term average - Fast-weighted)	Projected Noise Level, Worst-case construction scenario	Change in rating level	Magnitude / Intensity	Duration	Extent	Probability of Impact Occurring	Significance
8	Residences	35	36.4	33.2	1.7	Minor	Temporary	Regional	Improbable	Low
9	Residences	35	36.4	31.9	1.3	Minor	Temporary	Regional	Improbable	Low
10	Residences	35	36.4	32.7	1.5	Minor	Temporary	Regional	Improbable	Low
11	Residences	35	36.4	34.0	2.0	Minor	Temporary	Regional	Improbable	Low
12	Residences	35	36.4	35.6	2.6	Minor	Temporary	Regional	Improbable	Low
13	Undefined	35	36.4	31.7	1.3	Minor	Temporary	Regional	Improbable	Low
14	Undefined. No access.	35	36.4	36.1	2.9	Minor	Temporary	Regional	Improbable	Low
15	Residences	35	36.4	48.7	12.5	Very High	Temporary	Regional	Highly Likely	Medium
16	*Empty house, not to be used in future*	*35*	*36.4*	*48.6*	*12.5*	*Very High*	*Temporary*	*Regional*	*Highly Likely*	*Medium*
17	*Empty house, not to be used in future*	*35*	*36.4*	*50.0*	*13.8*	*Very High*	*Temporary*	*Regional*	*Highly Likely*	*Medium*
18	*Empty house, not to be used in future*	*35*	*36.4*	*49.2*	*13.0*	*Very High*	*Temporary*	*Regional*	*Highly Likely*	*Medium*
19	Residences	35	36.4	32.9	1.6	Minor	Temporary	Regional	Improbable	Low
20	Hunting lodge.	35	36.4	48.6	12.5	Very High	Temporary	Regional	Highly Likely	Medium
21	*Shed*	*35*	*36.4*	*36.1*	*2.9*	*Minor*	*Temporary*	*Regional*	*Improbable*	*Low*
22	*Empty house, not to be used in future*	*35*	*36.4*	*36.9*	*3.3*	*Low*	*Temporary*	*Regional*	*Improbable*	*Low*
23	Residences	35	36.4	36.0	2.8	Minor	Temporary	Regional	Improbable	Low

Table 3: Projected operational noise levels and the significance of the noise impact for night-time operational activities using the Vestas V150-4.5 MW PO4 WTG

Potential Noise-sensitive development / Receptor(s)	Comments	Recommended Rating Levels (noise limit - night-time rating level, IFC/WHO)	Potential Existing Ambient Sound Levels (Estimated considering wind speed)	Projected Noise Level	Change in rating level	Magnitude / Intensity	Duration	Extent	Probability of Impact Occurring	Significance
8	Residences	45	42.5	26.5	0.1	Minor	Long-term	Local	Improbable	Low
9	Residences	45	42.5	25.2	0.1	Minor	Long-term	Local	Improbable	Low
10	Residences	45	42.5	26.5	0.1	Minor	Long-term	Local	Improbable	Low
11	Residences	45	42.5	28.2	0.2	Minor	Long-term	Local	Improbable	Low
12	Residences	45	42.5	29.5	0.2	Minor	Long-term	Local	Improbable	Low
13	Undefined	45	42.5	25.1	0.1	Minor	Long-term	Local	Improbable	Low
14	Undefined. No access.	45	42.5	30.9	0.3	Minor	Long-term	Local	Improbable	Low
15	Residences	45	42.5	41.2	2.4	Minor	Long-term	Local	Possible	Low
16	*Empty house, not to be used in future*	*45*	*42.5*	*40.9*	*2.3*	*Minor*	*Long-term*	*Local*	*Possible*	***Low***
17	*Empty house, not to be used in future*	*45*	*42.5*	*42.4*	*3.0*	*Minor*	*Long-term*	*Local*	*Possible*	***Low***
18	*Empty house, not to be used in future*	*45*	*42.5*	*42.1*	*2.8*	*Minor*	*Long-term*	*Local*	*Possible*	***Low***
19	Residences	45	42.5	25.4	0.1	Minor	Long-term	Local	Improbable	Low
20	Hunting lodge.	45	42.5	41.4	2.5	Minor	Long-term	Local	Possible	Low
21	*Shed*	*45*	*42.5*	*31.3*	*0.3*	*Minor*	*Long-term*	*Local*	*Improbable*	***Low***
22	*Empty house, not to be used in future*	*45*	*42.5*	*31.8*	*0.4*	*Minor*	*Long-term*	*Local*	*Improbable*	***Low***
23	Residences	45	42.5	31.4	0.3	Minor	Long-term	Local	Improbable	Low

Table 4: Projected operational noise levels and the significance of the noise impact for night-time operational activities using the Vestas V162-6.0 MW PO6000 WTG

Potential Noise-sensitive development / Receptor(s)	Comments	Recommended Rating Levels (noise limit - night-time rating level, IFC/WHO)	Potential Existing Ambient Sound Levels (Estimated considering wind speed)	Projected Noise Level	Change in rating level	Magnitude / Intensity	Duration	Extent	Probability of Impact Occurring	Significance
8	Residences	45	42.5	25.9	0.1	Minor	Long-term	Local	Improbable	Low
9	Residences	45	42.5	24.7	0.1	Minor	Long-term	Local	Improbable	Low
10	Residences	45	42.5	25.5	0.1	Minor	Long-term	Local	Improbable	Low
11	Residences	45	42.5	27.5	0.1	Minor	Long-term	Local	Improbable	Low
12	Residences	45	42.5	28.6	0.2	Minor	Long-term	Local	Improbable	Low
13	Undefined	45	42.5	24.6	0.1	Minor	Long-term	Local	Improbable	Low
14	Undefined. No access.	45	42.5	29.9	0.2	Minor	Long-term	Local	Improbable	Low
15	Residences	45	42.5	40.5	2.1	Minor	Long-term	Local	Possible	Low
16	*Empty house, not to be used in future*	*45*	*42.5*	*40.2*	*2.0*	*Minor*	*Long-term*	*Local*	*Possible*	***Low***
17	*Empty house, not to be used in future*	*45*	*42.5*	*41.7*	*2.6*	*Minor*	*Long-term*	*Local*	*Possible*	***Low***
18	*Empty house, not to be used in future*	*45*	*42.5*	*41.4*	*2.5*	*Minor*	*Long-term*	*Local*	*Possible*	***Low***
19	Residences	45	42.5	24.9	0.1	Minor	Long-term	Local	Improbable	Low
20	Hunting lodge.	45	42.5	40.8	2.2	Minor	Long-term	Local	Possible	Low
21	*Shed*	*45*	*42.5*	*30.5*	*0.3*	*Minor*	*Long-term*	*Local*	*Improbable*	***Low***
22	*Empty house, not to be used in future*	*45*	*42.5*	*30.8*	*0.3*	*Minor*	*Long-term*	*Local*	*Improbable*	***Low***
23	Residences	45	42.5	30.7	0.3	Minor	Long-term	Local	Improbable	Low