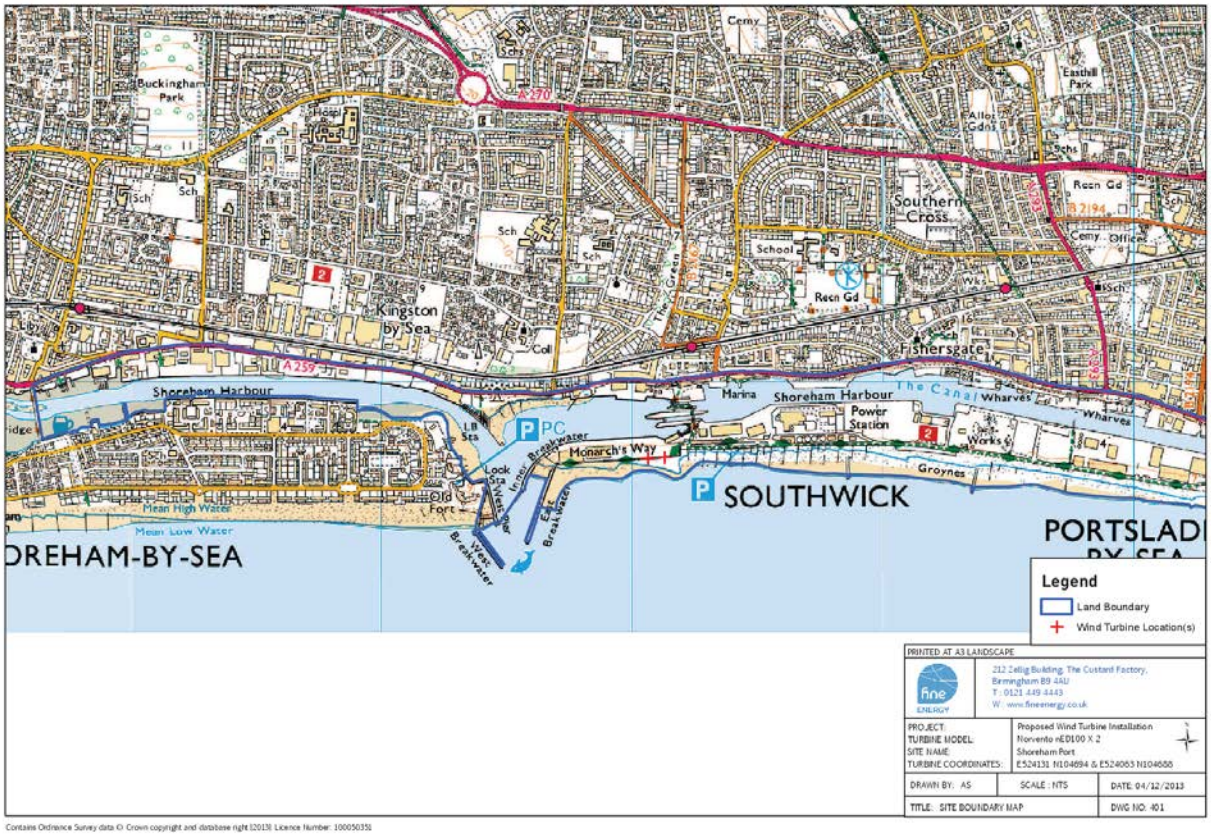
# Shoreham Port Noise Report

## Noise effect of two proposed Norvento nED100 turbines at Shoreham Port

SITE BOUNDARY MAP

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# 1. Introduction

This Noise report assesses the noise impact of two proposed Norvento nED100 wind turbines at Shoreham Port at the nearby dwellings.

# 2. Location of turbine and receptors

| Turbine ID | Turbine Type Name | Hub Height (m) | Rotor Diameter (m) | Capacity (kW) | Eastings (m) | Northings (m) | Height of base (m) |
|---|---|---|---|---|---|---|---|
| 1 | Norvento nED100 | 24.5 | 22.0 | 100 | 524043.0 | 104688.0 | 0 |
| 1 | Norvento nED100 | 24.5 | 22.0 | 100 | 524131.0 | 104694.0 | 0 |

Table 1 – Turbines Coordinates Table

| Dwelling ID | Dwelling name | Distance to nearest turbine (m) | Eastings (m) | Northings (m) | Altitude (m) | Turbine exclusion radius (m) |
|---|---|---|---|---|---|---|
| 1 | Dwelling 1 | 321.8 | 524123.2 | 105015.7 | 1.6 | 0.0 |

Table 2 – Dwelling Coordinates Table

# 3. Noise calculation method

Noise calculations have been carried out using GL Garrad Hassan's Windfarmer software, Version 4.2.20.0 based on the Complex ISO9613-2:1996(E) General model, in accordance with ETSU-R-97. Low Noise Mode data has been used for Norvento nED100 to calculate Sound Power Levels, which is an operation mode that has been accepted by the developer for this project.
For the Overall Sound Power Level of nED100 we have used the weighted sound level (LWAref) from the manufacturer's low noise data along with the manufacturer's quoted measurement uncertainty which is multiplied by a factor of 1.645, in accordance with IEC 61400 part 14.

We confirm that all Sound Levels and calculations are quoted in dB(A)eq, and we have taken 2dB reduction in to account at all the dwellings for the conversion between the LAeq and LA90, 10min descriptors, in accordance with paragraph 14 of the executive summary of ETSU-R-97.

Also, please note we have included a ground attenuation factor of 0.5 (guidance published in the March/April 2009 IOA bulletin suggests that the ISO 9613 method for predicting noise from wind turbines gives a more accurate result when either hard ground G=0 or semi-porous G=0.5 ground attenuation factors are used)

### Workbook Noise Options

| | |
|---|---|
| Form of noise model to be used | Complex (ISO9613) General |
| Ground Effect | Porous Ground |
| Ground factor around turbines | 0.50 |
| Ground factor everywhere else | 0.50 |
| Meteorological correction factor Co | 0.00 dB |
| $LA_{90}$ to $LA_{eq}$ conversion factor | 2.00 dB |
| Initial default noise limit to use when placing dwellings | 35.00 dB(A) |
| Relative to background noise | 0.00 dB(A) |
| Calculation grid spacing | 10.00 m |
| Height above ground for noise mapping | 4.00 m |
| Use DTM height data | Yes |
| Octave Spreading | Yes |

Atmospheric attenuation by octave band is:

| Octave band (Hz) | Attenuation coefficient (dB/km) |
|---|---|
| 31.5 | 0.00 |
| 63.0 | 0.10 |
| 125.0 | 0.40 |
| 250.0 | 1.00 |
| 500.0 | 1.90 |
| 1000.0 | 3.70 |
| 2000.0 | 9.70 |
| 4000.0 | 32.80 |
| 8000.0 | 117.00 |

Table 3 - Atmospheric Attenuation for Octave Bands of Noise

## 4. Noise calculation for the proposed nED100 turbine

Here is the low noise mode data for the proposed nED100 turbine:

| | | |
|---|---|---|
| Turbine type | Norvento nED100 | |
| Diameter | 22.0 | m |
| Hub height | 24.5 | m |
| Number of blades | 3 | |
| Cut-In wind speed | 3.5 | m/s |
| Cut-Out wind speed | 25.0 | m/s |
| Turbine produces tonal noise | No (explained in the Methodology below) | |
| Reference wind speed | 10.00 | m/s |
| Noise in octave bands | Yes | |

Overall Sound Power levels for the proposed nED100 turbine by octave band are summarised in Table 5. An uncertainty of 2.0dB (1.22 multiplied by a factor of 1.645 – in accordance with IEC 61400 part 14) has been included within the quoted values of Sound Power Level as confirmed in Low Noise Report by Aresse Engineering No. TR-13-015D (11th April 2013) in

table 8.9, page 19. The Uncertainty levels are confirmed in table 8.2, page 12 within the same report.

| Wind speed (m/s) | Difference to Reference (dB(A)) |
|---|---|
| 0.0 | 0.00 |
| 1.0 | 0.00 |
| 2.0 | 0.00 |
| 3.0 | 0.00 |
| 4.0 | 0.00 |
| 5.0 | 0.00 |
| 6.0 | 0.00 |
| 7.0 | 0.00 |
| 8.0 | -3.30 |
| 9.0 | -1.10 |
| 10.0 | 0.00 |
| 11.0 | 0.90 |
| 12.0 | 0.50 |
| 13.0 | 0.30 |
| 14.0 | 0.00 |
| 15.0 | 0.00 |
| 16.0 | 0.00 |
| 17.0 | 0.00 |
| 18.0 | 0.00 |
| 19.0 | 0.00 |
| 20.0 | 0.00 |

Table 4 - Noise as a function of wind speed for Norvento nED100

The full Octave Band Sound Power Levels are calculated using 1/3rd octave Band Sound Power Levels as summarised in Table 8.9, page 19. The 1/3rd octave band Sound Levels (including the Uncertainties specified for each) are added logarithmically for each respective full octave band.
E.g. to calculate sound power level at full Octave Band 63 Hz frequency, 1/3rd Octave Band Sound Power levels at 50 Hz, 63 Hz and 80 Hz i.e. 66.35 dB, 68.33 dB and 73.19 dB are combined using the below equation:

$$L_{\Sigma} = 10 \times \log\left(10^{\frac{L1}{10}} + 10^{\frac{L2}{10}} + 10^{\frac{L3}{10}}\right) \text{ in dB}$$

This gives an overall Sound Power Level of 73.05 at 63Hz full Octave band frequency. Uncertainty of 2.0 dB(A) is then added to give 75.05 Sound Power Level as shown in Table 5. The similar approach has been used to calculate the rest of the full octave sound power levels.

| Octave band (Hz) | Sound Power Level (dB(A)) |
|---|---|
| 31.5 | 69.20 |
| 63.0 | 75.05 |
| 125.0 | 83.00 |
| 250.0 | 89.63 |
| 500.0 | 92.23 |
| 1000.0 | 94.08 |
| 2000.0 | 92.50 |
| 4000.0 | 83.46 |
| 8000.0 | 68.67 |

Table 5 - Sound Power Level for Norvento nED100 (including 2.0dB(A) uncertainty)

A copy of Low Noise Report by Aresse Engineering No. TR-13-015D (11th April 2013) is available on request.

# 5. Noise impact on receptors by two proposed nED100 turbine

(referred to Noise Map)

| Dwelling ID | Noise prediction (dB(A)) | Noise limit type | Absolute noise limit (dB(A)) | Relative to background noise limit (dB(A)) | Background noise reference ID |
|---|---|---|---|---|---|
| 1 | 37.69 | Absolute | 35.00 | Not applicable | Not applicable |

Table 6 - Noise at the nearby Dwellings

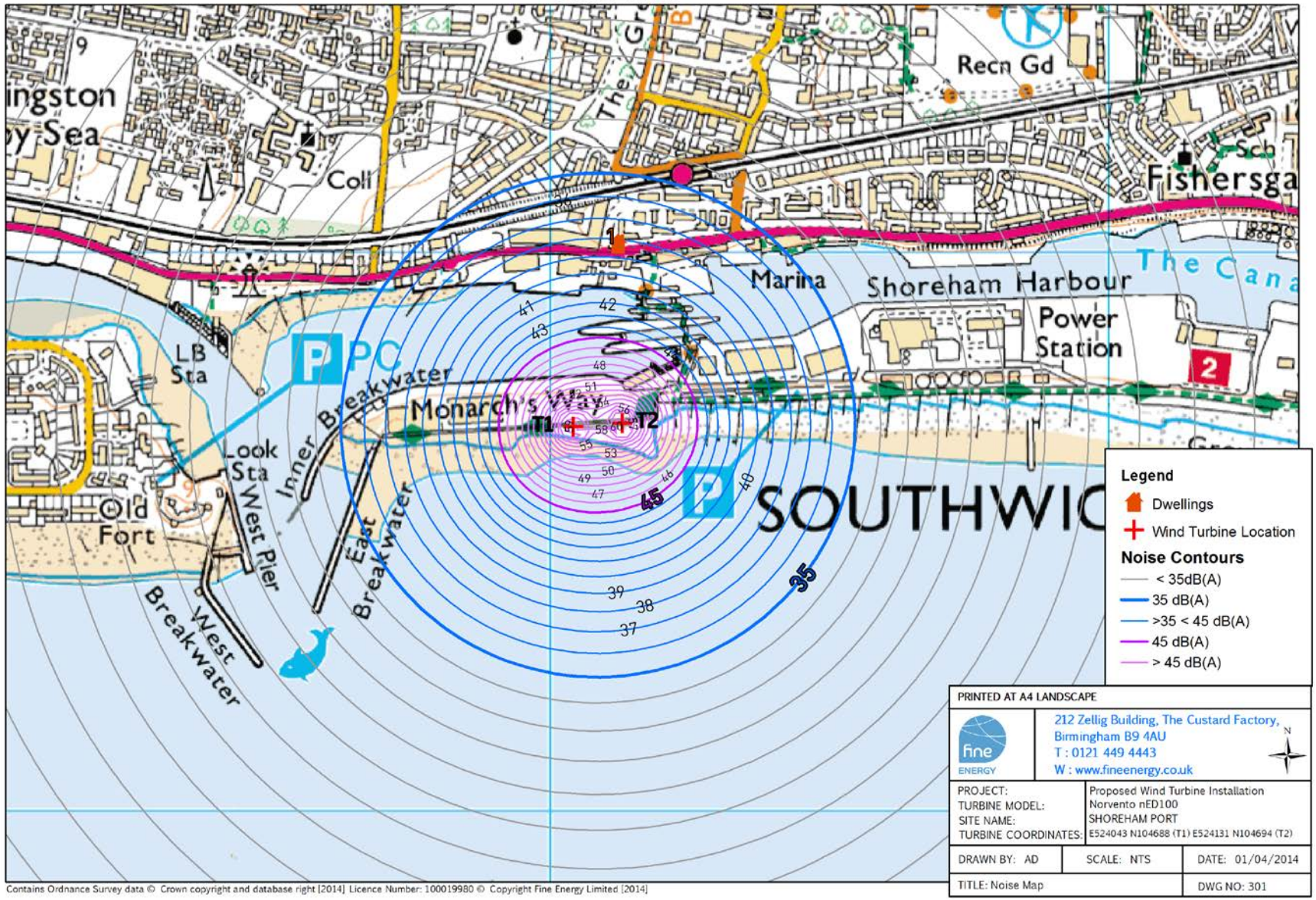
# 6. Conclusion

PAN45 / ETSU-R-97 states that an acceptable Sound Power Level received at the curtilage of a neighbouring noise-sensitive property must be no greater than 35dB(A) during daylight hours for uninvolved properties and 45dB(A) for financially involved properties.

The above table suggests that our proposed turbines at Shoreham Port exceeds the prescribed Noise Limit of 35dB(A) as prescribed by ETSU –R–97 Guidance for the nearby uninvolved property.

However, It should be noted that the prevailing Noise due to A259, north of the proposed site along the coast, and Shoreham Port are contributing to the background noise. Therefore a background study is recommended to prove that the Sound Power Level from the proposed two turbines is not going to affect the Noise already perceived by the nearby uninvolved properties.

# NOISE MAP

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