

|                                                                                                                                                                                                                                                                                                                                                                                                                                     |                  |                                  |                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------------------------------|---------------------------------------------------------------------|
| <b>PM Number</b><br><b>KVT/BB/2018/N053 Rev. 1</b>                                                                                                                                                                                                                                                                                                                                                                                  |                  | <b>Date</b><br><b>2018-09-19</b> |                                                                     |
| <b>PM Title</b><br><b>Larvik</b><br><b>Preliminary Production Estimate</b>                                                                                                                                                                                                                                                                                                                                                          |                  |                                  |                                                                     |
| <b>Client</b><br>Havgul Nordic AS                                                                                                                                                                                                                                                                                                                                                                                                   |                  |                                  |                                                                     |
| <b>Client Reference</b><br>Kalle Hesstvedt                                                                                                                                                                                                                                                                                                                                                                                          |                  |                                  |                                                                     |
| <b>Objectives</b><br><br>Preliminary production estimate is made based on 39 years of WRF data.<br><br>A preliminary layout is suggested based on the wind analysis on site. The suggested layout meets the noise demands for the surrounding houses.                                                                                                                                                                               |                  |                                  |                                                                     |
| <b>Disclaimer</b><br><br>Although this Promemoria (PM), to the best of our knowledge, represents the state-of-the-art in wind energy assessment methods, and effort has been made to secure reliable results, Kjeller Vindteknikk (KVT) cannot in any way be held responsible neither to the use of the findings in this PM nor for any direct or indirect losses arising from such use or from errors of any kind in the contents. |                  |                                  |                                                                     |
| <b>Revision history</b>                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                                  |                                                                     |
| <b>Rev. number</b>                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Date</b>      | <b>Number of copies</b>          | <b>Comment</b>                                                      |
| 0                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2018-06-26       | Electronic file                  | Final                                                               |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2018-09-19       | Electronic file                  | Adjusted layout to fit noise demands. Results for HH 90 m and 120 m |
| <b>Name</b>                                                                                                                                                                                                                                                                                                                                                                                                                         |                  | <b>Digital Signature</b>         |                                                                     |
| Prepared by                                                                                                                                                                                                                                                                                                                                                                                                                         | Brian Riget Broe |                                  |                                                                     |
| In accordance to our QA system, a KVT PM is not internally reviewed, in contrary to a KVT report.                                                                                                                                                                                                                                                                                                                                   |                  |                                  |                                                                     |

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# 1. Task

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The purpose of this study is to give a preliminary estimate of the wind climate and for a given project area west of Larvik.

The project area should contain three wind turbines (WTG) each of a rated power of 3.3 MW and a hub height (HH) of 90 m or 120 m, results for both HH are presented. The rated power of 3.3 MW is derived from the information that the installed power of the future wind farm should be 10 MW in total and consist of three WTG.

The noise demands are taken into account to find the best optimized layout, which meet the noise requirements.

Based on the wind climate on site a preliminary layout is to be determined and an estimate of annual energy production (AEP) is to be estimated.

## 2. Input, Method, and Results

A model of the site has been prepared in the software WindPRO.

The model contains height contours with 5 m intervals. The height contours are retrieved from the DTM10 model which is available for free at [hoydedata.no](http://hoydedata.no). This website is maintained by Kartverket.

Further, the topographical map covering an area of at least 10 km from the project area in any direction has been retrieved free of charge from Kartverket. This map has been used as basis as well as satellite images from Google Earth to digitize the surface roughness which is a crucial input for the flow model, WAsP. The surface roughness has been divided in four categories, water surface, agricultural surface, forest, and populated areas (towns and villages).

WRF data covering the period from January 1979 to the end of February 2018 has been extracted for the four closest WRF grid points (in a 4 km x 4km grid) to the planning area.

The flow model, WAsP, has been run on basis of the model inputs described above to estimate the wind speed in the planning area with a resolution of 10 m.

The resulting resource map has been used to find reasonable first guess of turbine positions together with information of prevalent wind direction in order to reduce park effects and give as high energy yield as possible.

The result is given below in Table 1 for 3 x Vestas V126 3.3 MW Gridstreamer with hub height 120m, and in Table 2 for hub height 90 m. Detailed production estimates (Gross Energy Yield inclusive wake effects) for each turbine and HH can be found in the Appendix.

The turbine type has been chosen because

- it is from a leading manufacturer
- The rated power fits the conditions given
- The hub height given by the manufacturer as standard is 117m, which is close to the preferred hub height of 120 m. Estimations here are based on a hub height of 120 m.

The P50 has been estimated by using general assumptions based on KVT experience. The P50 includes

- Wake effects which are estimated by the wake model by N.O Jensen. This model is standard in WindPRO and has been applied to the chosen layout.
- General losses which typically appear in wind farm, such as electrical losses, unavailability, low temperature effects, high wind hysteresis losses.
- Losses due to icing. Based on the site elevation of 150 m this has been assumed negligible for this study.
- Turbulence and high wind shear which is estimated based on the fact that the site is inside and surrounded by forested areas.

Furthermore, the noise calculation are made according to the Norwegian guideline for noise demands (T-1442/2016).

*Table 1 Summary of the results for hub height of 120 m*

| Energy yield and simplified calculation of losses Vestas V126 120 m hub height |               |             |                  |
|--------------------------------------------------------------------------------|---------------|-------------|------------------|
| Number of Turbines                                                             |               | 3           |                  |
| Rated power of each turbine                                                    |               | 3.300 MW    |                  |
| Rated power of the wind farm                                                   |               | 9.9 MW      |                  |
| <b>Gross Annual Energy Yield</b>                                               |               | <b>40.1</b> | <b>GWh/annum</b> |
| <b>Production losses:</b>                                                      |               |             |                  |
| Wake losses                                                                    | 2.9 %         |             |                  |
| General losses                                                                 | 7.0 %         |             |                  |
| Icing                                                                          | 0.0 %         |             |                  |
| Turbulence and high wind shear                                                 | 1.0 %         |             |                  |
| <b>Total losses (Including wake losses)</b>                                    | <b>10.6 %</b> | <b>4.3</b>  | <b>GWh/annum</b> |
| <b>Net Annual Energy Yield, P(50)</b>                                          |               | <b>35.8</b> | <b>GWh/annum</b> |

*Table 2 Summary of the results for hub height of 90 m*

| Energy yield and simplified calculation of losses Vestas V126 90 m hub height |               |             |                  |
|-------------------------------------------------------------------------------|---------------|-------------|------------------|
| Number of Turbines                                                            |               | 3           |                  |
| Rated power of each turbine                                                   |               | 3.300 MW    |                  |
| Rated power of the wind farm                                                  |               | 9.9 MW      |                  |
| <b>Gross Annual Energy Yield</b>                                              |               | <b>34.5</b> | <b>GWh/annum</b> |
| <b>Production losses:</b>                                                     |               |             |                  |
| Wake losses                                                                   | 3.4 %         |             |                  |
| General losses                                                                | 7.0 %         |             |                  |
| Icing                                                                         | 0.0 %         |             |                  |
| Turbulence and high wind shear                                                | 1.0 %         |             |                  |
| <b>Total losses (Including wake losses)</b>                                   | <b>11.1 %</b> | <b>3.8</b>  | <b>GWh/annum</b> |
| <b>Net Annual Energy Yield, P(50)</b>                                         |               | <b>30.7</b> | <b>GWh/annum</b> |

# Appendix

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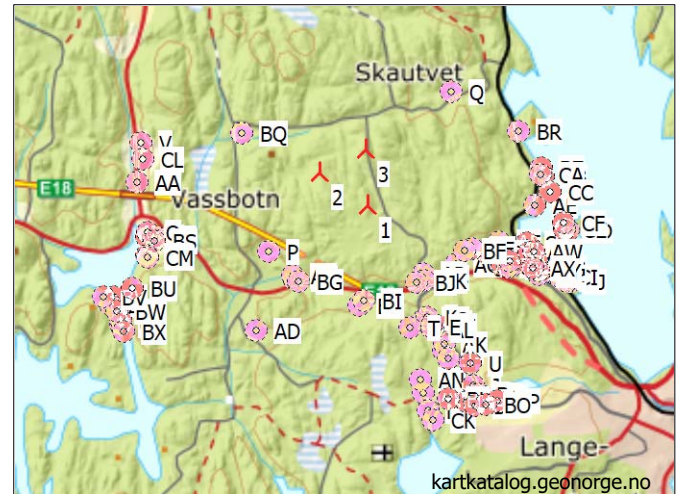
## DECIBEL - Main Result

### Calculation: Larvik Noise calculations, Best Estimate optimized Noise HH 90m

Norwegian rules for noise calculation.  
Calculation based on Veileder til retningslinje for behandling av støy i arealplanlegging (T-1442/2012)

Noise values in calculation:  
Total noise values are Lden values

All coordinates are in  
UTM (north)-WGS84 Zone: 32



▲ New WTG

■ Noise sensitive area

### WTGs

|   | Easting | Northing  | Z<br>[m] | Row<br>data/Description | WTG type |           |                     | Power,<br>rated<br>[kW] | Rotor<br>diameter<br>[m] | Hub<br>height<br>[m] | Setting                 | Noise data        |                                                                                              |                   | Wind<br>speed<br>[m/s]                 | Status                  | LwA,ref<br>[dB(A)]   | Pure<br>tones |
|---|---------|-----------|----------|-------------------------|----------|-----------|---------------------|-------------------------|--------------------------|----------------------|-------------------------|-------------------|----------------------------------------------------------------------------------------------|-------------------|----------------------------------------|-------------------------|----------------------|---------------|
|   |         |           |          |                         | Valid    | Manufact. | Type-generator      |                         |                          |                      |                         | Creator           | Name                                                                                         |                   |                                        |                         |                      |               |
| 1 | 555,203 | 6,548,453 | 160.0    | T1                      | Yes      | VESTAS    | V126-3.3 GridStream | 3,300                   | 126.0                    | 90.0                 | Day<br>Evening<br>Night | EMD<br>EMD<br>EMD | Level 0 - - Mode 0 - 04-2014<br>Level 0 - - Mode 0 - 04-2014<br>Level 0 - - Mode 0 - 04-2014 | 8.0<br>8.0<br>8.0 | User value<br>User value<br>User value | 107.5<br>107.5<br>107.5 | No h<br>No h<br>No h |               |
| 2 | 554,719 | 6,548,769 | 170.0    | T2                      | Yes      | VESTAS    | V126-3.3 GridStream | 3,300                   | 126.0                    | 90.0                 | Day<br>Evening<br>Night | EMD<br>EMD<br>EMD | Level 0 - - Mode 0 - 04-2014<br>Level 0 - - Mode 0 - 04-2014<br>Level 0 - - Mode 0 - 04-2014 | 8.0<br>8.0<br>8.0 | User value<br>User value<br>User value | 107.5<br>107.5<br>107.5 | No h<br>No h<br>No h |               |
| 3 | 555,174 | 6,549,009 | 190.0    | T3                      | Yes      | VESTAS    | V126-3.3 GridStream | 3,300                   | 126.0                    | 90.0                 | Day<br>Evening<br>Night | EMD<br>EMD<br>EMD | Level 0 - - Mode 0 - 04-2014<br>Level 0 - - Mode 0 - 04-2014<br>Level 0 - - Mode 0 - 04-2014 | 8.0<br>8.0<br>8.0 | User value<br>User value<br>User value | 107.5<br>107.5<br>107.5 | No h<br>No h<br>No h |               |

h) Generic octave distribution used

### Calculation Results

#### Sound level

| Noise sensitive area |           |         |           |          | Demands                |                  | Sound level          |                                 | Demands fulfilled ? |  |
|----------------------|-----------|---------|-----------|----------|------------------------|------------------|----------------------|---------------------------------|---------------------|--|
| No.                  | Name      | Easting | Northing  | Z<br>[m] | Imission height<br>[m] | Noise<br>[dB(A)] | From WTGs<br>[dB(A)] | Distance to noise demand<br>[m] | Noise               |  |
| A                    | 8367132   | 557,082 | 6,547,795 | 40.0     | 5.0                    | 45.0             | 37.6                 | 1,096                           | Yes                 |  |
|                      | A Day     |         |           |          |                        |                  | 31.2                 |                                 |                     |  |
|                      | A Evening |         |           |          |                        |                  | 31.2                 |                                 |                     |  |
|                      | A Night   |         |           |          |                        |                  | 31.2                 |                                 |                     |  |
| B                    | 8370184   | 556,339 | 6,546,578 | 110.0    | 5.0                    | 45.0             | 36.3                 | 1,334                           | Yes                 |  |
|                      | B Day     |         |           |          |                        |                  | 29.9                 |                                 |                     |  |
|                      | B Evening |         |           |          |                        |                  | 29.9                 |                                 |                     |  |
|                      | B Night   |         |           |          |                        |                  | 29.9                 |                                 |                     |  |
| C                    | 8370664   | 556,905 | 6,547,880 | 67.8     | 5.0                    | 45.0             | 38.6                 | 901                             | Yes                 |  |
|                      | C Day     |         |           |          |                        |                  | 32.2                 |                                 |                     |  |
|                      | C Evening |         |           |          |                        |                  | 32.2                 |                                 |                     |  |
|                      | C Night   |         |           |          |                        |                  | 32.2                 |                                 |                     |  |
| D                    | 8371644   | 557,246 | 6,547,721 | 40.0     | 5.0                    | 45.0             | 36.7                 | 1,276                           | Yes                 |  |
|                      | D Day     |         |           |          |                        |                  | 30.3                 |                                 |                     |  |
|                      | D Evening |         |           |          |                        |                  | 30.3                 |                                 |                     |  |
|                      | D Night   |         |           |          |                        |                  | 30.3                 |                                 |                     |  |
| E                    | 8372004   | 555,854 | 6,547,243 | 120.0    | 5.0                    | 45.0             | 40.9                 | 516                             | Yes                 |  |
|                      | E Day     |         |           |          |                        |                  | 34.5                 |                                 |                     |  |
|                      | E Evening |         |           |          |                        |                  | 34.5                 |                                 |                     |  |
|                      | E Night   |         |           |          |                        |                  | 34.5                 |                                 |                     |  |
| F                    | 8373388   | 557,187 | 6,547,728 | 40.0     | 5.0                    | 45.0             | 36.9                 | 1,219                           | Yes                 |  |
|                      | F Day     |         |           |          |                        |                  | 30.5                 |                                 |                     |  |
|                      | F Evening |         |           |          |                        |                  | 30.5                 |                                 |                     |  |
|                      | F Night   |         |           |          |                        |                  | 30.5                 |                                 |                     |  |
| G                    | 8373450   | 556,309 | 6,546,527 | 110.2    | 5.0                    | 45.0             | 36.2                 | 1,363                           | Yes                 |  |
|                      | G Day     |         |           |          |                        |                  | 29.8                 |                                 |                     |  |

To be continued on next page...

## DECIBEL - Main Result

**Calculation:** Larvik Noise calculations, Best Estimate optimized Noise HH 90m

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| Noise sensitive area |             |         |           | Demands  |                        | Sound level      |                      | Demands fulfilled ?             |       |
|----------------------|-------------|---------|-----------|----------|------------------------|------------------|----------------------|---------------------------------|-------|
| No.                  | Name        | Easting | Northing  | Z<br>[m] | Imission height<br>[m] | Noise<br>[dB(A)] | From WTGs<br>[dB(A)] | Distance to noise demand<br>[m] | Noise |
|                      | G Evening   |         |           |          |                        |                  | 29.8                 |                                 |       |
|                      | G Night     |         |           |          |                        |                  | 29.8                 |                                 |       |
|                      | H 8373477   | 557,160 | 6,547,745 | 40.0     | 5.0                    | 45.0             | 37.1                 | 1,187                           | Yes   |
|                      | H Day       |         |           |          |                        |                  | 30.7                 |                                 |       |
|                      | H Evening   |         |           |          |                        |                  | 30.7                 |                                 |       |
|                      | H Night     |         |           |          |                        |                  | 30.7                 |                                 |       |
|                      | I 8373566   | 556,036 | 6,546,937 | 120.0    | 5.0                    | 45.0             | 38.7                 | 872                             | Yes   |
|                      | I Day       |         |           |          |                        |                  | 32.3                 |                                 |       |
|                      | I Evening   |         |           |          |                        |                  | 32.3                 |                                 |       |
|                      | I Night     |         |           |          |                        |                  | 32.3                 |                                 |       |
|                      | J 8373841   | 556,291 | 6,546,670 | 117.5    | 5.0                    | 45.0             | 36.8                 | 1,231                           | Yes   |
|                      | J Day       |         |           |          |                        |                  | 30.4                 |                                 |       |
|                      | J Evening   |         |           |          |                        |                  | 30.4                 |                                 |       |
|                      | J Night     |         |           |          |                        |                  | 30.4                 |                                 |       |
|                      | K 16608920  | 555,819 | 6,547,343 | 119.4    | 5.0                    | 45.0             | 41.7                 | 412                             | Yes   |
|                      | K Day       |         |           |          |                        |                  | 35.3                 |                                 |       |
|                      | K Evening   |         |           |          |                        |                  | 35.3                 |                                 |       |
|                      | K Night     |         |           |          |                        |                  | 35.3                 |                                 |       |
|                      | L 25079760  | 552,742 | 6,547,220 | 56.8     | 5.0                    | 45.0             | 35.2                 | 1,611                           | Yes   |
|                      | L Day       |         |           |          |                        |                  | 28.8                 |                                 |       |
|                      | L Evening   |         |           |          |                        |                  | 28.8                 |                                 |       |
|                      | L Night     |         |           |          |                        |                  | 28.8                 |                                 |       |
|                      | M 25080696  | 555,841 | 6,546,415 | 130.8    | 5.0                    | 45.0             | 36.6                 | 1,279                           | Yes   |
|                      | M Day       |         |           |          |                        |                  | 30.2                 |                                 |       |
|                      | M Evening   |         |           |          |                        |                  | 30.2                 |                                 |       |
|                      | M Night     |         |           |          |                        |                  | 30.2                 |                                 |       |
|                      | N 140805912 | 552,991 | 6,548,099 | 54.8     | 5.0                    | 45.0             | 38.2                 | 975                             | Yes   |
|                      | N Day       |         |           |          |                        |                  | 31.8                 |                                 |       |
|                      | N Evening   |         |           |          |                        |                  | 31.8                 |                                 |       |
|                      | N Night     |         |           |          |                        |                  | 31.8                 |                                 |       |
|                      | O 140806099 | 552,999 | 6,548,146 | 56.2     | 5.0                    | 45.0             | 38.3                 | 952                             | Yes   |
|                      | O Day       |         |           |          |                        |                  | 31.9                 |                                 |       |
|                      | O Evening   |         |           |          |                        |                  | 31.9                 |                                 |       |
|                      | O Night     |         |           |          |                        |                  | 31.9                 |                                 |       |
|                      | P 140806129 | 554,213 | 6,547,978 | 79.3     | 5.0                    | 45.0             | 45.0                 | 3                               | Yes   |
|                      | P Day       |         |           |          |                        |                  | 38.6                 |                                 |       |
|                      | P Evening   |         |           |          |                        |                  | 38.6                 |                                 |       |
|                      | P Night     |         |           |          |                        |                  | 38.6                 |                                 |       |
|                      | Q 140811068 | 556,022 | 6,549,598 | 60.0     | 5.0                    | 45.0             | 43.7                 | 162                             | Yes   |
|                      | Q Day       |         |           |          |                        |                  | 37.3                 |                                 |       |
|                      | Q Evening   |         |           |          |                        |                  | 37.3                 |                                 |       |
|                      | Q Night     |         |           |          |                        |                  | 37.3                 |                                 |       |
|                      | R 140811092 | 556,813 | 6,547,918 | 70.0     | 5.0                    | 45.0             | 39.2                 | 801                             | Yes   |
|                      | R Day       |         |           |          |                        |                  | 32.8                 |                                 |       |
|                      | R Evening   |         |           |          |                        |                  | 32.8                 |                                 |       |
|                      | R Night     |         |           |          |                        |                  | 32.8                 |                                 |       |
|                      | S 140811149 | 556,804 | 6,548,100 | 43.9     | 5.0                    | 45.0             | 39.6                 | 734                             | Yes   |
|                      | S Day       |         |           |          |                        |                  | 33.2                 |                                 |       |
|                      | S Evening   |         |           |          |                        |                  | 33.2                 |                                 |       |
|                      | S Night     |         |           |          |                        |                  | 33.2                 |                                 |       |
|                      | T 140811246 | 555,648 | 6,547,231 | 120.0    | 5.0                    | 45.0             | 41.5                 | 444                             | Yes   |
|                      | T Day       |         |           |          |                        |                  | 35.1                 |                                 |       |
|                      | T Evening   |         |           |          |                        |                  | 35.1                 |                                 |       |
|                      | T Night     |         |           |          |                        |                  | 35.1                 |                                 |       |
|                      | U 140811327 | 556,263 | 6,546,886 | 104.6    | 5.0                    | 45.0             | 37.8                 | 1,034                           | Yes   |
|                      | U Day       |         |           |          |                        |                  | 31.4                 |                                 |       |
|                      | U Evening   |         |           |          |                        |                  | 31.4                 |                                 |       |
|                      | U Night     |         |           |          |                        |                  | 31.4                 |                                 |       |
|                      | V 140811416 | 552,919 | 6,549,040 | 70.8     | 5.0                    | 45.0             | 38.3                 | 954                             | Yes   |
|                      | V Day       |         |           |          |                        |                  | 31.9                 |                                 |       |
|                      | V Evening   |         |           |          |                        |                  | 31.9                 |                                 |       |
|                      | V Night     |         |           |          |                        |                  | 31.9                 |                                 |       |
|                      | W 162843931 | 553,116 | 6,548,090 | 83.7     | 5.0                    | 45.0             | 38.8                 | 860                             | Yes   |
|                      | W Day       |         |           |          |                        |                  | 32.4                 |                                 |       |
|                      | W Evening   |         |           |          |                        |                  | 32.4                 |                                 |       |

To be continued on next page...

## DECIBEL - Main Result

**Calculation:** Larvik Noise calculations, Best Estimate optimized Noise HH 90m

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| Noise sensitive area |            |         |           | Demands  |                        | Sound level      |                      | Demands fulfilled ?             |       |
|----------------------|------------|---------|-----------|----------|------------------------|------------------|----------------------|---------------------------------|-------|
| No.                  | Name       | Easting | Northing  | Z<br>[m] | Imission height<br>[m] | Noise<br>[dB(A)] | From WTGs<br>[dB(A)] | Distance to noise demand<br>[m] | Noise |
|                      | W Night    |         |           |          |                        |                  | 32.4                 |                                 |       |
| X                    | 162843958  | 553,064 | 6,548,097 | 73.6     | 5.0                    | 45.0             | 38.6                 | 907                             | Yes   |
|                      | X Day      |         |           |          |                        |                  | 32.2                 |                                 |       |
|                      | X Evening  |         |           |          |                        |                  | 32.2                 |                                 |       |
|                      | X Night    |         |           |          |                        |                  | 32.2                 |                                 |       |
| Y                    | 162844288  | 552,678 | 6,547,504 | 50.0     | 5.0                    | 45.0             | 35.6                 | 1,510                           | Yes   |
|                      | Y Day      |         |           |          |                        |                  | 29.2                 |                                 |       |
|                      | Y Evening  |         |           |          |                        |                  | 29.2                 |                                 |       |
|                      | Y Night    |         |           |          |                        |                  | 29.2                 |                                 |       |
| Z                    | 162844296  | 552,635 | 6,547,421 | 50.0     | 5.0                    | 45.0             | 35.3                 | 1,590                           | Yes   |
|                      | Z Day      |         |           |          |                        |                  | 28.9                 |                                 |       |
|                      | Z Evening  |         |           |          |                        |                  | 28.9                 |                                 |       |
|                      | Z Night    |         |           |          |                        |                  | 28.9                 |                                 |       |
| AA                   | 162844369  | 552,886 | 6,548,645 | 60.0     | 5.0                    | 45.0             | 38.2                 | 969                             | Yes   |
|                      | AA Day     |         |           |          |                        |                  | 31.8                 |                                 |       |
|                      | AA Evening |         |           |          |                        |                  | 31.8                 |                                 |       |
|                      | AA Night   |         |           |          |                        |                  | 31.8                 |                                 |       |
| AB                   | 162877267  | 554,467 | 6,547,739 | 78.8     | 5.0                    | 45.0             | 44.9                 | 41                              | Yes   |
|                      | AB Day     |         |           |          |                        |                  | 38.5                 |                                 |       |
|                      | AB Evening |         |           |          |                        |                  | 38.5                 |                                 |       |
|                      | AB Night   |         |           |          |                        |                  | 38.5                 |                                 |       |
| AC                   | 162877275  | 554,472 | 6,547,705 | 73.6     | 5.0                    | 45.0             | 44.6                 | 67                              | Yes   |
|                      | AC Day     |         |           |          |                        |                  | 38.2                 |                                 |       |
|                      | AC Evening |         |           |          |                        |                  | 38.2                 |                                 |       |
|                      | AC Night   |         |           |          |                        |                  | 38.2                 |                                 |       |
| AD                   | 162877291  | 554,107 | 6,547,182 | 87.6     | 5.0                    | 45.0             | 40.0                 | 676                             | Yes   |
|                      | AD Day     |         |           |          |                        |                  | 33.6                 |                                 |       |
|                      | AD Evening |         |           |          |                        |                  | 33.6                 |                                 |       |
|                      | AD Night   |         |           |          |                        |                  | 33.6                 |                                 |       |
| AE                   | 162877321  | 556,877 | 6,548,473 | 31.6     | 5.0                    | 45.0             | 39.7                 | 732                             | Yes   |
|                      | AE Day     |         |           |          |                        |                  | 33.3                 |                                 |       |
|                      | AE Evening |         |           |          |                        |                  | 33.3                 |                                 |       |
|                      | AE Night   |         |           |          |                        |                  | 33.3                 |                                 |       |
| AF                   | 162877399  | 556,532 | 6,548,099 | 40.0     | 5.0                    | 45.0             | 41.3                 | 475                             | Yes   |
|                      | AF Day     |         |           |          |                        |                  | 34.9                 |                                 |       |
|                      | AF Evening |         |           |          |                        |                  | 34.9                 |                                 |       |
|                      | AF Night   |         |           |          |                        |                  | 34.9                 |                                 |       |
| AG                   | 162877437  | 555,785 | 6,547,327 | 116.8    | 5.0                    | 45.0             | 41.7                 | 410                             | Yes   |
|                      | AG Day     |         |           |          |                        |                  | 35.3                 |                                 |       |
|                      | AG Evening |         |           |          |                        |                  | 35.3                 |                                 |       |
|                      | AG Night   |         |           |          |                        |                  | 35.3                 |                                 |       |
| AH                   | 162877461  | 555,821 | 6,547,284 | 120.0    | 5.0                    | 45.0             | 41.3                 | 465                             | Yes   |
|                      | AH Day     |         |           |          |                        |                  | 34.9                 |                                 |       |
|                      | AH Evening |         |           |          |                        |                  | 34.9                 |                                 |       |
|                      | AH Night   |         |           |          |                        |                  | 34.9                 |                                 |       |
| AI                   | 162877488  | 555,920 | 6,547,253 | 126.3    | 5.0                    | 45.0             | 40.8                 | 540                             | Yes   |
|                      | AI Day     |         |           |          |                        |                  | 34.4                 |                                 |       |
|                      | AI Evening |         |           |          |                        |                  | 34.4                 |                                 |       |
|                      | AI Night   |         |           |          |                        |                  | 34.4                 |                                 |       |
| AJ                   | 162877577  | 555,986 | 6,547,011 | 120.0    | 5.0                    | 45.0             | 39.2                 | 783                             | Yes   |
|                      | AJ Day     |         |           |          |                        |                  | 32.8                 |                                 |       |
|                      | AJ Evening |         |           |          |                        |                  | 32.8                 |                                 |       |
|                      | AJ Night   |         |           |          |                        |                  | 32.8                 |                                 |       |
| AK                   | 162877585  | 555,991 | 6,547,078 | 120.0    | 5.0                    | 45.0             | 39.6                 | 727                             | Yes   |
|                      | AK Day     |         |           |          |                        |                  | 33.2                 |                                 |       |
|                      | AK Evening |         |           |          |                        |                  | 33.2                 |                                 |       |
|                      | AK Night   |         |           |          |                        |                  | 33.2                 |                                 |       |
| AL                   | 162877593  | 555,875 | 6,547,215 | 120.0    | 5.0                    | 45.0             | 40.7                 | 551                             | Yes   |
|                      | AL Day     |         |           |          |                        |                  | 34.3                 |                                 |       |
|                      | AL Evening |         |           |          |                        |                  | 34.3                 |                                 |       |
|                      | AL Night   |         |           |          |                        |                  | 34.3                 |                                 |       |
| AM                   | 162877607  | 556,288 | 6,546,570 | 114.5    | 5.0                    | 45.0             | 36.4                 | 1,315                           | Yes   |
|                      | AM Day     |         |           |          |                        |                  | 30.0                 |                                 |       |
|                      | AM Evening |         |           |          |                        |                  | 30.0                 |                                 |       |
|                      | AM Night   |         |           |          |                        |                  | 30.0                 |                                 |       |

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## DECIBEL - Main Result

**Calculation:** Larvik Noise calculations, Best Estimate optimized Noise HH 90m

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| Noise sensitive area |            |         |           | Demands  |                        | Sound level      |                      | Demands fulfilled ?             |       |
|----------------------|------------|---------|-----------|----------|------------------------|------------------|----------------------|---------------------------------|-------|
| No.                  | Name       | Easting | Northing  | Z<br>[m] | Imission height<br>[m] | Noise<br>[dB(A)] | From WTGs<br>[dB(A)] | Distance to noise demand<br>[m] | Noise |
| AN                   | 162877658  | 555,762 | 6,546,715 | 122.9    | 5.0                    | 45.0             | 38.2                 | 969                             | Yes   |
|                      | AN Day     |         |           |          |                        |                  | 31.8                 |                                 |       |
|                      | AN Evening |         |           |          |                        |                  | 31.8                 |                                 |       |
|                      | AN Night   |         |           |          |                        |                  | 31.8                 |                                 |       |
| AO                   | 162877704  | 555,788 | 6,546,584 | 120.0    | 5.0                    | 45.0             | 37.5                 | 1,101                           | Yes   |
|                      | AO Day     |         |           |          |                        |                  | 31.1                 |                                 |       |
|                      | AO Evening |         |           |          |                        |                  | 31.1                 |                                 |       |
|                      | AO Night   |         |           |          |                        |                  | 31.1                 |                                 |       |
| AP                   | 162877712  | 556,408 | 6,546,553 | 104.8    | 5.0                    | 45.0             | 36.0                 | 1,392                           | Yes   |
|                      | AP Day     |         |           |          |                        |                  | 29.6                 |                                 |       |
|                      | AP Evening |         |           |          |                        |                  | 29.6                 |                                 |       |
|                      | AP Night   |         |           |          |                        |                  | 29.6                 |                                 |       |
| AQ                   | 162877828  | 556,103 | 6,547,876 | 88.1     | 5.0                    | 45.0             | 43.3                 | 195                             | Yes   |
|                      | AQ Day     |         |           |          |                        |                  | 36.9                 |                                 |       |
|                      | AQ Evening |         |           |          |                        |                  | 36.9                 |                                 |       |
|                      | AQ Night   |         |           |          |                        |                  | 36.9                 |                                 |       |
| AR                   | 162877844  | 555,777 | 6,547,770 | 92.7     | 5.0                    | 45.0             | 44.6                 | 34                              | Yes   |
|                      | AR Day     |         |           |          |                        |                  | 38.2                 |                                 |       |
|                      | AR Evening |         |           |          |                        |                  | 38.2                 |                                 |       |
|                      | AR Night   |         |           |          |                        |                  | 38.2                 |                                 |       |
| AS                   | 162877852  | 555,798 | 6,547,740 | 89.0     | 5.0                    | 45.0             | 44.2                 | 70                              | Yes   |
|                      | AS Day     |         |           |          |                        |                  | 37.8                 |                                 |       |
|                      | AS Evening |         |           |          |                        |                  | 37.8                 |                                 |       |
|                      | AS Night   |         |           |          |                        |                  | 37.8                 |                                 |       |
| AT                   | 162877968  | 556,402 | 6,547,991 | 55.8     | 5.0                    | 45.0             | 41.8                 | 394                             | Yes   |
|                      | AT Day     |         |           |          |                        |                  | 35.4                 |                                 |       |
|                      | AT Evening |         |           |          |                        |                  | 35.4                 |                                 |       |
|                      | AT Night   |         |           |          |                        |                  | 35.4                 |                                 |       |
| AU                   | 162877976  | 556,910 | 6,547,929 | 76.0     | 5.0                    | 45.0             | 38.7                 | 888                             | Yes   |
|                      | AU Day     |         |           |          |                        |                  | 32.3                 |                                 |       |
|                      | AU Evening |         |           |          |                        |                  | 32.3                 |                                 |       |
|                      | AU Night   |         |           |          |                        |                  | 32.3                 |                                 |       |
| AV                   | 162878018  | 556,831 | 6,548,001 | 65.4     | 5.0                    | 45.0             | 39.3                 | 789                             | Yes   |
|                      | AV Day     |         |           |          |                        |                  | 32.9                 |                                 |       |
|                      | AV Evening |         |           |          |                        |                  | 32.9                 |                                 |       |
|                      | AV Night   |         |           |          |                        |                  | 32.9                 |                                 |       |
| AW                   | 162878026  | 556,879 | 6,548,010 | 75.6     | 5.0                    | 45.0             | 39.0                 | 832                             | Yes   |
|                      | AW Day     |         |           |          |                        |                  | 32.6                 |                                 |       |
|                      | AW Evening |         |           |          |                        |                  | 32.6                 |                                 |       |
|                      | AW Night   |         |           |          |                        |                  | 32.6                 |                                 |       |
| AX                   | 162878085  | 556,868 | 6,547,846 | 66.9     | 5.0                    | 45.0             | 38.7                 | 879                             | Yes   |
|                      | AX Day     |         |           |          |                        |                  | 32.3                 |                                 |       |
|                      | AX Evening |         |           |          |                        |                  | 32.3                 |                                 |       |
|                      | AX Night   |         |           |          |                        |                  | 32.3                 |                                 |       |
| AY                   | 162878093  | 556,925 | 6,547,825 | 60.7     | 5.0                    | 45.0             | 38.4                 | 940                             | Yes   |
|                      | AY Day     |         |           |          |                        |                  | 32.0                 |                                 |       |
|                      | AY Evening |         |           |          |                        |                  | 32.0                 |                                 |       |
|                      | AY Night   |         |           |          |                        |                  | 32.0                 |                                 |       |
| AZ                   | 162878166  | 556,927 | 6,547,778 | 56.2     | 5.0                    | 45.0             | 38.3                 | 960                             | Yes   |
|                      | AZ Day     |         |           |          |                        |                  | 31.9                 |                                 |       |
|                      | AZ Evening |         |           |          |                        |                  | 31.9                 |                                 |       |
|                      | AZ Night   |         |           |          |                        |                  | 31.9                 |                                 |       |
| BA                   | 162878174  | 556,653 | 6,547,859 | 78.2     | 5.0                    | 45.0             | 39.9                 | 677                             | Yes   |
|                      | BA Day     |         |           |          |                        |                  | 33.5                 |                                 |       |
|                      | BA Evening |         |           |          |                        |                  | 33.5                 |                                 |       |
|                      | BA Night   |         |           |          |                        |                  | 33.5                 |                                 |       |
| BB                   | 162878182  | 556,561 | 6,547,874 | 80.0     | 5.0                    | 45.0             | 40.5                 | 588                             | Yes   |
|                      | BB Day     |         |           |          |                        |                  | 34.1                 |                                 |       |
|                      | BB Evening |         |           |          |                        |                  | 34.1                 |                                 |       |
|                      | BB Night   |         |           |          |                        |                  | 34.1                 |                                 |       |
| BC                   | 162878190  | 556,618 | 6,547,852 | 80.0     | 5.0                    | 45.0             | 40.1                 | 648                             | Yes   |
|                      | BC Day     |         |           |          |                        |                  | 33.7                 |                                 |       |
|                      | BC Evening |         |           |          |                        |                  | 33.7                 |                                 |       |
|                      | BC Night   |         |           |          |                        |                  | 33.7                 |                                 |       |
| BD                   | 162878263  | 556,642 | 6,547,908 | 72.5     | 5.0                    | 45.0             | 40.1                 | 647                             | Yes   |

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## DECIBEL - Main Result

**Calculation:** Larvik Noise calculations, Best Estimate optimized Noise HH 90m

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| Noise sensitive area |           |         |           | Demands  |                        | Sound level      |                      | Demands fulfilled ?             |       |
|----------------------|-----------|---------|-----------|----------|------------------------|------------------|----------------------|---------------------------------|-------|
| No.                  | Name      | Easting | Northing  | Z<br>[m] | Imission height<br>[m] | Noise<br>[dB(A)] | From WTGs<br>[dB(A)] | Distance to noise demand<br>[m] | Noise |
| BD                   | Day       |         |           |          |                        |                  | 33.7                 |                                 |       |
| BD                   | Evening   |         |           |          |                        |                  | 33.7                 |                                 |       |
| BD                   | Night     |         |           |          |                        |                  | 33.7                 |                                 |       |
| BE                   | 162878336 | 556,256 | 6,548,029 | 83.5     | 5.0                    | 45.0             | 42.9                 | 246                             | Yes   |
| BE                   | Day       |         |           |          |                        |                  | 36.5                 |                                 |       |
| BE                   | Evening   |         |           |          |                        |                  | 36.5                 |                                 |       |
| BE                   | Night     |         |           |          |                        |                  | 36.5                 |                                 |       |
| BF                   | 162878344 | 556,187 | 6,548,016 | 95.7     | 5.0                    | 45.0             | 43.4                 | 190                             | Yes   |
| BF                   | Day       |         |           |          |                        |                  | 37.0                 |                                 |       |
| BF                   | Evening   |         |           |          |                        |                  | 37.0                 |                                 |       |
| BF                   | Night     |         |           |          |                        |                  | 37.0                 |                                 |       |
| BG                   | 162878395 | 554,518 | 6,547,684 | 70.2     | 5.0                    | 45.0             | 44.7                 | 63                              | Yes   |
| BG                   | Day       |         |           |          |                        |                  | 38.3                 |                                 |       |
| BG                   | Evening   |         |           |          |                        |                  | 38.3                 |                                 |       |
| BG                   | Night     |         |           |          |                        |                  | 38.3                 |                                 |       |
| BH                   | 162878425 | 555,128 | 6,547,446 | 87.3     | 5.0                    | 45.0             | 43.9                 | 138                             | Yes   |
| BH                   | Day       |         |           |          |                        |                  | 37.5                 |                                 |       |
| BH                   | Evening   |         |           |          |                        |                  | 37.5                 |                                 |       |
| BH                   | Night     |         |           |          |                        |                  | 37.5                 |                                 |       |
| BI                   | 162878433 | 555,181 | 6,547,493 | 83.5     | 5.0                    | 45.0             | 44.0                 | 92                              | Yes   |
| BI                   | Day       |         |           |          |                        |                  | 37.6                 |                                 |       |
| BI                   | Evening   |         |           |          |                        |                  | 37.6                 |                                 |       |
| BI                   | Night     |         |           |          |                        |                  | 37.6                 |                                 |       |
| BJ                   | 162878468 | 555,711 | 6,547,691 | 85.7     | 5.0                    | 45.0             | 44.3                 | 58                              | Yes   |
| BJ                   | Day       |         |           |          |                        |                  | 37.9                 |                                 |       |
| BJ                   | Evening   |         |           |          |                        |                  | 37.9                 |                                 |       |
| BJ                   | Night     |         |           |          |                        |                  | 37.9                 |                                 |       |
| BK                   | 162878530 | 555,786 | 6,547,703 | 80.2     | 5.0                    | 45.0             | 43.9                 | 93                              | Yes   |
| BK                   | Day       |         |           |          |                        |                  | 37.5                 |                                 |       |
| BK                   | Evening   |         |           |          |                        |                  | 37.5                 |                                 |       |
| BK                   | Night     |         |           |          |                        |                  | 37.5                 |                                 |       |
| BL                   | 162878816 | 556,038 | 6,546,525 | 130.0    | 5.0                    | 45.0             | 36.8                 | 1,245                           | Yes   |
| BL                   | Day       |         |           |          |                        |                  | 30.4                 |                                 |       |
| BL                   | Evening   |         |           |          |                        |                  | 30.4                 |                                 |       |
| BL                   | Night     |         |           |          |                        |                  | 30.4                 |                                 |       |
| BM                   | 162879197 | 556,228 | 6,546,502 | 117.1    | 5.0                    | 45.0             | 36.3                 | 1,346                           | Yes   |
| BM                   | Day       |         |           |          |                        |                  | 29.9                 |                                 |       |
| BM                   | Evening   |         |           |          |                        |                  | 29.9                 |                                 |       |
| BM                   | Night     |         |           |          |                        |                  | 29.9                 |                                 |       |
| BN                   | 162879235 | 556,312 | 6,546,461 | 110.9    | 5.0                    | 45.0             | 35.9                 | 1,422                           | Yes   |
| BN                   | Day       |         |           |          |                        |                  | 29.5                 |                                 |       |
| BN                   | Evening   |         |           |          |                        |                  | 29.5                 |                                 |       |
| BN                   | Night     |         |           |          |                        |                  | 29.5                 |                                 |       |
| BO                   | 162879316 | 556,416 | 6,546,476 | 107.1    | 5.0                    | 45.0             | 35.7                 | 1,461                           | Yes   |
| BO                   | Day       |         |           |          |                        |                  | 29.3                 |                                 |       |
| BO                   | Evening   |         |           |          |                        |                  | 29.3                 |                                 |       |
| BO                   | Night     |         |           |          |                        |                  | 29.3                 |                                 |       |
| BP                   | 162879324 | 556,533 | 6,546,520 | 100.4    | 5.0                    | 45.0             | 35.6                 | 1,489                           | Yes   |
| BP                   | Day       |         |           |          |                        |                  | 29.2                 |                                 |       |
| BP                   | Evening   |         |           |          |                        |                  | 29.2                 |                                 |       |
| BP                   | Night     |         |           |          |                        |                  | 29.2                 |                                 |       |
| BQ                   | 162880527 | 553,928 | 6,549,153 | 124.8    | 5.0                    | 45.0             | 45.0                 | 1                               | Yes   |
| BQ                   | Day       |         |           |          |                        |                  | 38.6                 |                                 |       |
| BQ                   | Evening   |         |           |          |                        |                  | 38.6                 |                                 |       |
| BQ                   | Night     |         |           |          |                        |                  | 38.6                 |                                 |       |
| BR                   | 162880543 | 556,708 | 6,549,211 | 30.0     | 5.0                    | 45.0             | 40.4                 | 613                             | Yes   |
| BR                   | Day       |         |           |          |                        |                  | 34.0                 |                                 |       |
| BR                   | Evening   |         |           |          |                        |                  | 34.0                 |                                 |       |
| BR                   | Night     |         |           |          |                        |                  | 34.0                 |                                 |       |
| BS                   | 162883933 | 553,073 | 6,548,066 | 72.9     | 5.0                    | 45.0             | 38.5                 | 909                             | Yes   |
| BS                   | Day       |         |           |          |                        |                  | 32.2                 |                                 |       |
| BS                   | Evening   |         |           |          |                        |                  | 32.2                 |                                 |       |
| BS                   | Night     |         |           |          |                        |                  | 32.2                 |                                 |       |
| BT                   | 162883941 | 552,991 | 6,547,917 | 57.0     | 5.0                    | 45.0             | 37.8                 | 1,042                           | Yes   |
| BT                   | Day       |         |           |          |                        |                  | 31.4                 |                                 |       |

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## DECIBEL - Main Result

**Calculation:** Larvik Noise calculations, Best Estimate optimized Noise HH 90m

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| Noise sensitive area |            |         |           | Demands  |                        | Sound level      |                      | Demands fulfilled ?             |       |
|----------------------|------------|---------|-----------|----------|------------------------|------------------|----------------------|---------------------------------|-------|
| No.                  | Name       | Easting | Northing  | Z<br>[m] | Imission height<br>[m] | Noise<br>[dB(A)] | From WTGs<br>[dB(A)] | Distance to noise demand<br>[m] | Noise |
|                      | BT Evening |         |           |          |                        |                  | 31.4                 |                                 |       |
|                      | BT Night   |         |           |          |                        |                  | 31.4                 |                                 |       |
| BU                   | 162884018  | 552,851 | 6,547,587 | 70.0     | 5.0                    | 45.0             | 36.5                 | 1,319                           | Yes   |
|                      | BU Day     |         |           |          |                        |                  | 30.1                 |                                 |       |
|                      | BU Evening |         |           |          |                        |                  | 30.1                 |                                 |       |
|                      | BU Night   |         |           |          |                        |                  | 30.1                 |                                 |       |
| BV                   | 162884026  | 552,567 | 6,547,499 | 52.5     | 5.0                    | 45.0             | 35.2                 | 1,609                           | Yes   |
|                      | BV Day     |         |           |          |                        |                  | 28.8                 |                                 |       |
|                      | BV Evening |         |           |          |                        |                  | 28.8                 |                                 |       |
|                      | BV Night   |         |           |          |                        |                  | 28.8                 |                                 |       |
| BW                   | 162884034  | 552,705 | 6,547,358 | 50.0     | 5.0                    | 45.0             | 35.4                 | 1,563                           | Yes   |
|                      | BW Day     |         |           |          |                        |                  | 29.0                 |                                 |       |
|                      | BW Evening |         |           |          |                        |                  | 29.0                 |                                 |       |
|                      | BW Night   |         |           |          |                        |                  | 29.0                 |                                 |       |
| BX                   | 162884050  | 552,775 | 6,547,157 | 55.9     | 5.0                    | 45.0             | 35.2                 | 1,622                           | Yes   |
|                      | BX Day     |         |           |          |                        |                  | 28.8                 |                                 |       |
|                      | BX Evening |         |           |          |                        |                  | 28.8                 |                                 |       |
|                      | BX Night   |         |           |          |                        |                  | 28.8                 |                                 |       |
| BY                   | 162884069  | 552,745 | 6,547,269 | 52.6     | 5.0                    | 45.0             | 35.3                 | 1,580                           | Yes   |
|                      | BY Day     |         |           |          |                        |                  | 29.0                 |                                 |       |
|                      | BY Evening |         |           |          |                        |                  | 29.0                 |                                 |       |
|                      | BY Night   |         |           |          |                        |                  | 29.0                 |                                 |       |
| BZ                   | 163016370  | 556,941 | 6,548,848 | 30.0     | 5.0                    | 45.0             | 39.4                 | 760                             | Yes   |
|                      | BZ Day     |         |           |          |                        |                  | 33.0                 |                                 |       |
|                      | BZ Evening |         |           |          |                        |                  | 33.0                 |                                 |       |
|                      | BZ Night   |         |           |          |                        |                  | 33.0                 |                                 |       |
| CA                   | 163016389  | 556,929 | 6,548,779 | 30.0     | 5.0                    | 45.0             | 39.5                 | 745                             | Yes   |
|                      | CA Day     |         |           |          |                        |                  | 33.1                 |                                 |       |
|                      | CA Evening |         |           |          |                        |                  | 33.1                 |                                 |       |
|                      | CA Night   |         |           |          |                        |                  | 33.1                 |                                 |       |
| CB                   | 163016397  | 556,964 | 6,548,763 | 30.0     | 5.0                    | 45.0             | 39.3                 | 780                             | Yes   |
|                      | CB Day     |         |           |          |                        |                  | 32.9                 |                                 |       |
|                      | CB Evening |         |           |          |                        |                  | 32.9                 |                                 |       |
|                      | CB Night   |         |           |          |                        |                  | 32.9                 |                                 |       |
| CC                   | 163016400  | 557,033 | 6,548,606 | 30.0     | 5.0                    | 45.0             | 38.9                 | 859                             | Yes   |
|                      | CC Day     |         |           |          |                        |                  | 32.5                 |                                 |       |
|                      | CC Evening |         |           |          |                        |                  | 32.5                 |                                 |       |
|                      | CC Night   |         |           |          |                        |                  | 32.5                 |                                 |       |
| CD                   | 163016486  | 557,216 | 6,548,227 | 30.6     | 5.0                    | 45.0             | 37.6                 | 1,105                           | Yes   |
|                      | CD Day     |         |           |          |                        |                  | 31.2                 |                                 |       |
|                      | CD Evening |         |           |          |                        |                  | 31.2                 |                                 |       |
|                      | CD Night   |         |           |          |                        |                  | 31.2                 |                                 |       |
| CE                   | 163016494  | 557,185 | 6,548,234 | 30.0     | 5.0                    | 45.0             | 37.8                 | 1,073                           | Yes   |
|                      | CE Day     |         |           |          |                        |                  | 31.4                 |                                 |       |
|                      | CE Evening |         |           |          |                        |                  | 31.4                 |                                 |       |
|                      | CE Night   |         |           |          |                        |                  | 31.4                 |                                 |       |
| CF                   | 163016516  | 557,173 | 6,548,308 | 30.0     | 5.0                    | 45.0             | 37.9                 | 1,047                           | Yes   |
|                      | CF Day     |         |           |          |                        |                  | 31.5                 |                                 |       |
|                      | CF Evening |         |           |          |                        |                  | 31.5                 |                                 |       |
|                      | CF Night   |         |           |          |                        |                  | 31.5                 |                                 |       |
| CG                   | 163016532  | 556,955 | 6,547,847 | 60.0     | 5.0                    | 45.0             | 38.3                 | 959                             | Yes   |
|                      | CG Day     |         |           |          |                        |                  | 31.9                 |                                 |       |
|                      | CG Evening |         |           |          |                        |                  | 31.9                 |                                 |       |
|                      | CG Night   |         |           |          |                        |                  | 31.9                 |                                 |       |
| CH                   | 163016540  | 556,962 | 6,547,792 | 51.6     | 5.0                    | 45.0             | 38.1                 | 987                             | Yes   |
|                      | CH Day     |         |           |          |                        |                  | 31.7                 |                                 |       |
|                      | CH Evening |         |           |          |                        |                  | 31.7                 |                                 |       |
|                      | CH Night   |         |           |          |                        |                  | 31.7                 |                                 |       |
| CI                   | 163016567  | 557,137 | 6,547,764 | 40.0     | 5.0                    | 45.0             | 37.2                 | 1,158                           | Yes   |
|                      | CI Day     |         |           |          |                        |                  | 30.8                 |                                 |       |
|                      | CI Evening |         |           |          |                        |                  | 30.8                 |                                 |       |
|                      | CI Night   |         |           |          |                        |                  | 30.8                 |                                 |       |
| CJ                   | 163016575  | 557,213 | 6,547,717 | 40.0     | 5.0                    | 45.0             | 36.8                 | 1,246                           | Yes   |
|                      | CJ Day     |         |           |          |                        |                  | 30.4                 |                                 |       |
|                      | CJ Evening |         |           |          |                        |                  | 30.4                 |                                 |       |

To be continued on next page...

## DECIBEL - Main Result

**Calculation:** Larvik Noise calculations, Best Estimate optimized Noise HH 90m

...continued from previous page

| Noise sensitive area |            |         |           | Demands  |                        | Sound level      | Demands fulfilled ?  |                                 |       |
|----------------------|------------|---------|-----------|----------|------------------------|------------------|----------------------|---------------------------------|-------|
| No.                  | Name       | Easting | Northing  | Z<br>[m] | Imission height<br>[m] | Noise<br>[dB(A)] | From WTGs<br>[dB(A)] | Distance to noise demand<br>[m] | Noise |
|                      | CJ Night   |         |           |          |                        |                  | 30.4                 |                                 |       |
| CK                   | 163067390  | 555,886 | 6,546,318 | 138.5    | 5.0                    | 45.0             | 36.1                 | 1,385                           | Yes   |
|                      | CK Day     |         |           |          |                        |                  | 29.7                 |                                 |       |
|                      | CK Evening |         |           |          |                        |                  | 29.7                 |                                 |       |
|                      | CK Night   |         |           |          |                        |                  | 29.7                 |                                 |       |
| CL                   | 163067501  | 552,948 | 6,548,882 | 90.0     | 5.0                    | 45.0             | 38.5                 | 908                             | Yes   |
|                      | CL Day     |         |           |          |                        |                  | 32.1                 |                                 |       |
|                      | CL Evening |         |           |          |                        |                  | 32.1                 |                                 |       |
|                      | CL Night   |         |           |          |                        |                  | 32.1                 |                                 |       |
| CM                   | 163067536  | 553,008 | 6,547,895 | 60.0     | 5.0                    | 45.0             | 37.9                 | 1,035                           | Yes   |
|                      | CM Day     |         |           |          |                        |                  | 31.5                 |                                 |       |
|                      | CM Evening |         |           |          |                        |                  | 31.5                 |                                 |       |
|                      | CM Night   |         |           |          |                        |                  | 31.5                 |                                 |       |

## Distances (m)

### WTG

| NSA | 1    | 2    | 3    |
|-----|------|------|------|
| A   | 1990 | 2556 | 2262 |
| B   | 2192 | 2725 | 2696 |
| C   | 1796 | 2360 | 2067 |
| D   | 2169 | 2735 | 2439 |
| E   | 1374 | 1902 | 1892 |
| F   | 2112 | 2679 | 2386 |
| G   | 2221 | 2749 | 2729 |
| H   | 2080 | 2647 | 2354 |
| I   | 1729 | 2256 | 2244 |
| J   | 2088 | 2622 | 2592 |
| K   | 1269 | 1801 | 1786 |
| L   | 2753 | 2511 | 3019 |
| M   | 2135 | 2608 | 2678 |
| N   | 2241 | 1853 | 2365 |
| O   | 2226 | 1829 | 2340 |
| P   | 1098 | 939  | 1409 |
| Q   | 1408 | 1545 | 1033 |
| R   | 1696 | 2261 | 1969 |
| S   | 1639 | 2190 | 1866 |
| T   | 1300 | 1797 | 1840 |
| U   | 1891 | 2435 | 2386 |
| V   | 2359 | 1820 | 2255 |
| W   | 2119 | 1741 | 2254 |
| X   | 2169 | 1786 | 2298 |
| Y   | 2698 | 2401 | 2914 |
| Z   | 2768 | 2482 | 2994 |
| AA  | 2325 | 1837 | 2317 |
| AB  | 1026 | 1060 | 1453 |
| AC  | 1046 | 1092 | 1481 |
| AD  | 1679 | 1701 | 2116 |
| AE  | 1674 | 2178 | 1785 |
| AF  | 1375 | 1933 | 1635 |
| AG  | 1267 | 1793 | 1789 |
| AH  | 1322 | 1849 | 1842 |
| AI  | 1398 | 1934 | 1908 |
| AJ  | 1641 | 2167 | 2157 |
| AK  | 1584 | 2116 | 2097 |
| AL  | 1408 | 1937 | 1926 |
| AM  | 2173 | 2701 | 2681 |
| AN  | 1825 | 2304 | 2368 |
| AO  | 1958 | 2432 | 2501 |
| AP  | 2250 | 2786 | 2748 |
| AQ  | 1069 | 1647 | 1465 |
| AR  | 892  | 1455 | 1378 |
| AS  | 928  | 1491 | 1414 |
| AT  | 1284 | 1854 | 1595 |

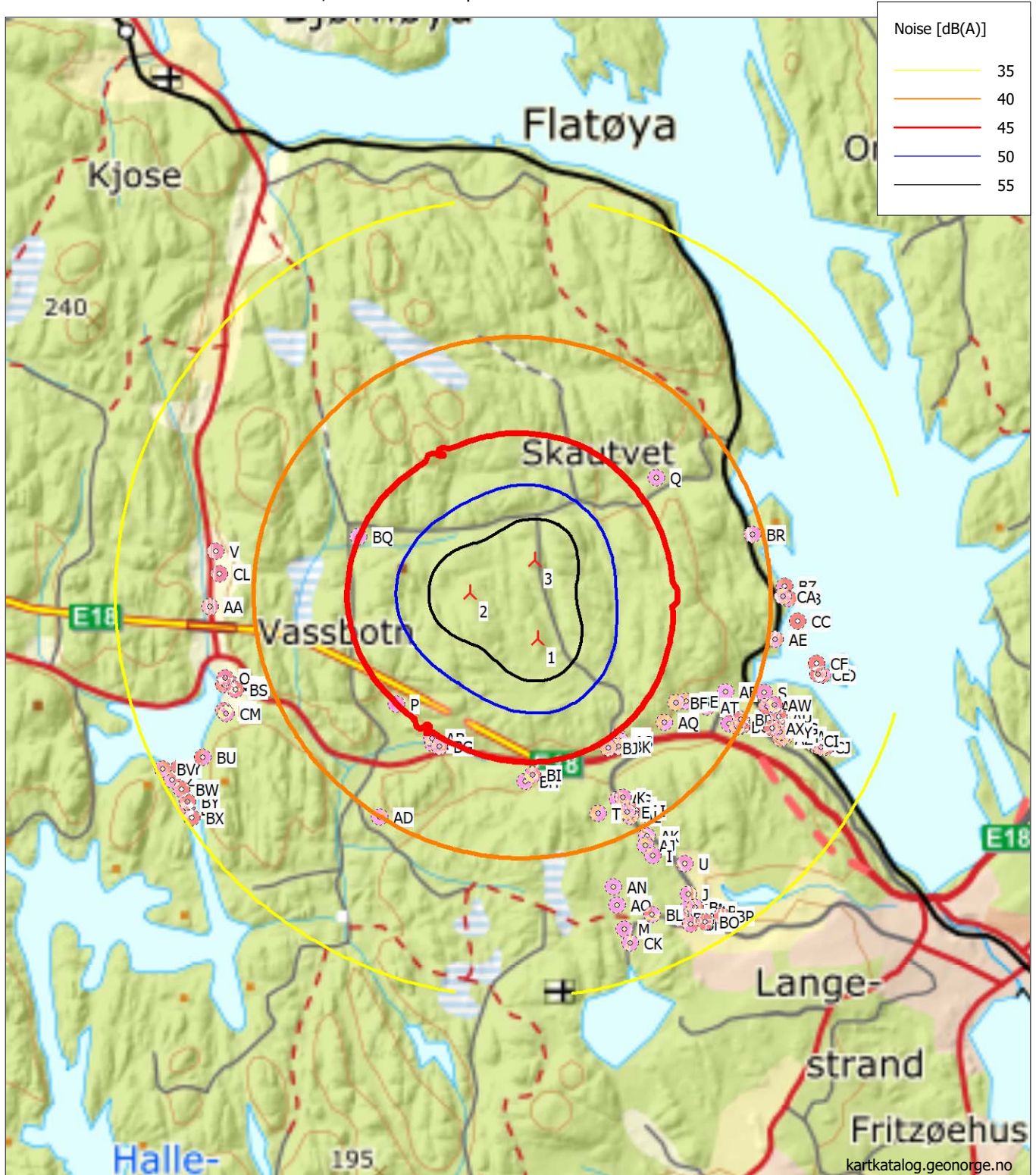
To be continued on next page...

**DECIBEL - Main Result****Calculation:** Larvik Noise calculations, Best Estimate optimized Noise HH 90m*...continued from previous page***WTG**

| NSA | 1    | 2    | 3    |
|-----|------|------|------|
| AU  | 1785 | 2347 | 2045 |
| AV  | 1689 | 2247 | 1939 |
| AW  | 1733 | 2290 | 1976 |
| AX  | 1772 | 2339 | 2055 |
| AY  | 1832 | 2400 | 2114 |
| AZ  | 1851 | 2420 | 2142 |
| BA  | 1566 | 2137 | 1873 |
| BB  | 1476 | 2048 | 1792 |
| BC  | 1537 | 2109 | 1850 |
| BD  | 1538 | 2107 | 1835 |
| BE  | 1135 | 1706 | 1460 |
| BF  | 1076 | 1650 | 1419 |
| BG  | 1030 | 1103 | 1478 |
| BH  | 1010 | 1385 | 1563 |
| BI  | 960  | 1357 | 1516 |
| BJ  | 915  | 1465 | 1423 |
| BK  | 950  | 1508 | 1442 |
| BL  | 2101 | 2603 | 2630 |
| BM  | 2204 | 2723 | 2719 |
| BN  | 2279 | 2804 | 2790 |
| BO  | 2319 | 2853 | 2821 |
| BP  | 2346 | 2889 | 2836 |
| BQ  | 1455 | 879  | 1254 |
| BR  | 1685 | 2038 | 1547 |
| BS  | 2165 | 1789 | 2303 |
| BT  | 2276 | 1926 | 2441 |
| BU  | 2507 | 2210 | 2723 |
| BV  | 2804 | 2498 | 3013 |
| BW  | 2727 | 2458 | 2969 |
| BX  | 2752 | 2525 | 3030 |
| BY  | 2729 | 2479 | 2988 |
| BZ  | 1782 | 2224 | 1775 |
| CA  | 1756 | 2210 | 1770 |
| CB  | 1788 | 2245 | 1807 |
| CC  | 1836 | 2320 | 1902 |
| CD  | 2026 | 2556 | 2187 |
| CE  | 1994 | 2524 | 2155 |
| CF  | 1974 | 2497 | 2118 |
| CG  | 1853 | 2419 | 2127 |
| CH  | 1879 | 2447 | 2163 |
| CI  | 2052 | 2618 | 2324 |
| CJ  | 2139 | 2706 | 2413 |
| CK  | 2241 | 2714 | 2783 |
| CL  | 2296 | 1775 | 2230 |
| CM  | 2265 | 1921 | 2435 |

## DECIBEL - Map Highest noise value

**Calculation:** Larvik Noise calculations, Best Estimate optimized Noise HH 90m



## PARK - Main Result

**Calculation:** Larvik 3 x V126 3.3 MW HH 90 m, Best Estimate of AEP for optimization

### Wake Model

N.O. Jensen (RISØ/EMD)

#### Calculation Settings

|                                     |                                                    |
|-------------------------------------|----------------------------------------------------|
| Air density calculation mode        | Individual per WTG                                 |
| Result for WTG at hub altitude      | 1.224 kg/m <sup>3</sup> to 1.228 kg/m <sup>3</sup> |
| Air density relative to standard    | 100.0 % to 100.3 %                                 |
| Hub altitude above sea level (asl)  | 250.0 m to 280.0 m                                 |
| Annual mean temperature at hub alt. | 5.4 °C to 5.6 °C                                   |
| Pressure at WTGs                    | 979.1 hPa to 982.8 hPa                             |

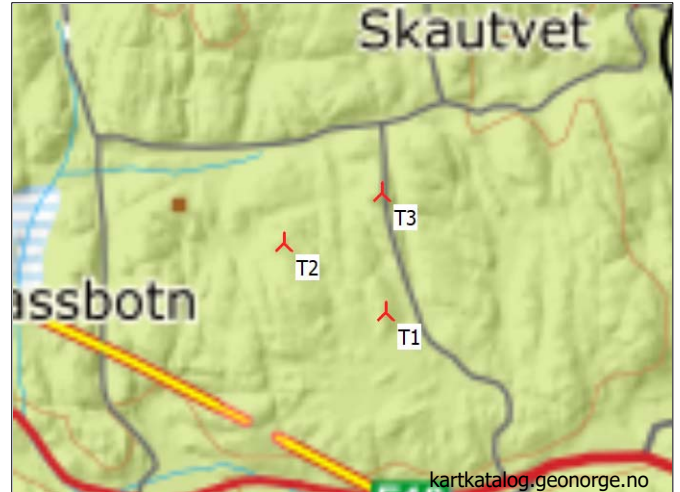
#### Wake Model Parameters

|                          |                     |
|--------------------------|---------------------|
| Terrain type             | Wake decay constant |
| HH:150m Forested/complex | 0.074               |

#### Displacement heights from objects

#### Wake calculation settings

| Angle [°]                     | Wind speed [m/s] |
|-------------------------------|------------------|
| start end step start end step |                  |
| 0.5 360.0 1.0                 | 0.5 30.5 1.0     |



Scale 1:35,000

▲ New WTG

### Resource file(s)

L:\KUNDER\422\_Havgul\_Nordic\_AS\001\_Larvik\_preliminary\_analysis\Analyses\2018\_06\_Prelim\_EYA\04\_WAsP\03\_Wind\_maps\2\2\_loc2\_90m.wrg

### Calculated Annual Energy for Wind Farm

| WTG combination | Result   | GROSS (no loss) | Park       | Capacity | Mean WTG | Full load    | Mean wind speed |
|-----------------|----------|-----------------|------------|----------|----------|--------------|-----------------|
|                 | PARK     | Free WTGs       | efficiency | factor   | result   | hours        | @hub height     |
|                 | [MWh/y]  | [MWh/y]         | [%]        | [%]      | [MWh/y]  | [Hours/year] | [m/s]           |
| Wind farm       | 33,329.9 | 34,493.1        | 96.6       | 38.4     | 11,110.0 | 3,367        | 6.8             |

\*) Based on wake reduced results, but no other losses included

### Calculated Annual Energy for each of 3 new WTGs with total 9.9 MW rated power

| WTG type |       |           |                            | Power curve  |                |            |         | Annual Energy               |          | Park       |                 |                      |
|----------|-------|-----------|----------------------------|--------------|----------------|------------|---------|-----------------------------|----------|------------|-----------------|----------------------|
| Links    | Valid | Manufact. | Type-generator             | Power, rated | Rotor diameter | Hub height | Creator | Name                        | Result   | Efficiency | Capacity factor | Free mean wind speed |
|          |       |           |                            | [kW]         | [m]            | [m]        |         |                             | [MWh]    | [%]        | [%]             | [m/s]                |
| 1 A      | Yes   | VESTAS    | V126-3.3 GridStreame-3,300 | 3,300        | 126.0          | 90.0       | EMD     | Level 0 -- Mode 0 - 04-2014 | 10,748.1 | 96.92      | 37.2            | 6.67                 |
| 2 A      | Yes   | VESTAS    | V126-3.3 GridStreame-3,300 | 3,300        | 126.0          | 90.0       | EMD     | Level 0 -- Mode 0 - 04-2014 | 10,917.5 | 96.64      | 37.7            | 6.75                 |
| 3 A      | Yes   | VESTAS    | V126-3.3 GridStreame-3,300 | 3,300        | 126.0          | 90.0       | EMD     | Level 0 -- Mode 0 - 04-2014 | 11,664.4 | 96.35      | 40.3            | 7.02                 |

Annual Energy results do not include any losses apart from wake losses. Additional losses and uncertainty must be considered for an investment decision.

### WTG siting

#### UTM (north)-WGS84 Zone: 32

|       | Easting | Northing  | Z     | Row data/Description |
|-------|---------|-----------|-------|----------------------|
|       |         |           | [m]   |                      |
| 1 New | 555,203 | 6,548,453 | 160.0 | T1                   |
| 2 New | 554,719 | 6,548,769 | 170.0 | T2                   |
| 3 New | 555,174 | 6,549,009 | 190.0 | T3                   |

## PARK - Wind Data Analysis

**Calculation:** Larvik 3 x V126 3.3 MW HH 90 m, Best Estimate of AEP for optimization **Wind data:** A - Resource file(s); Hub height: 90.0

### Site coordinates

UTM (north)-WGS84 Zone: 32

East: 555,203 North: 6,548,453

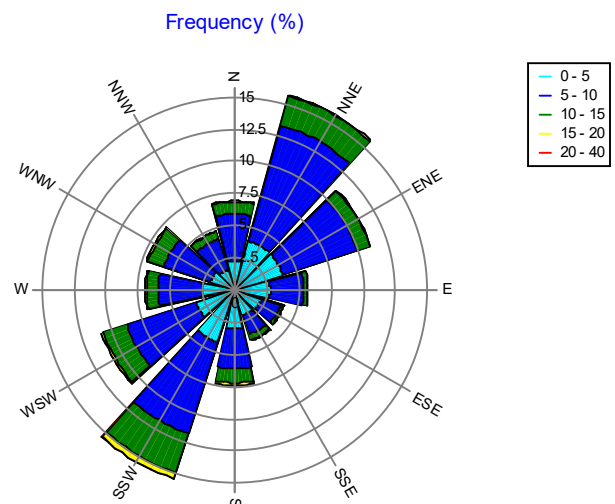
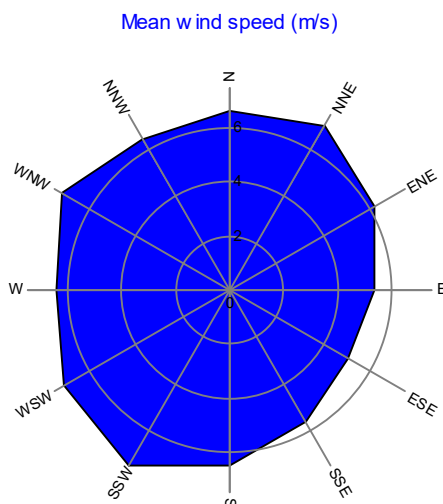
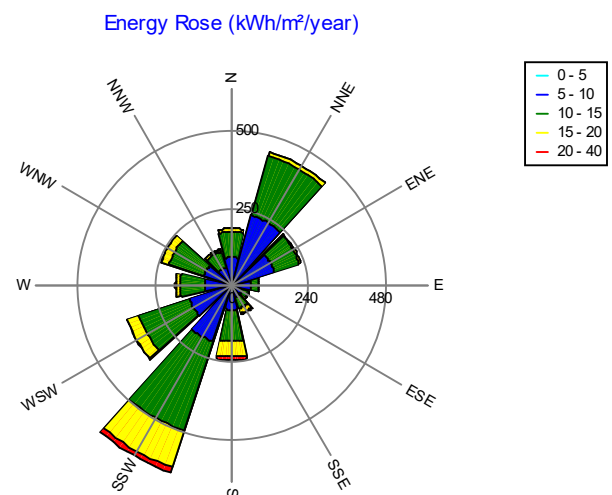
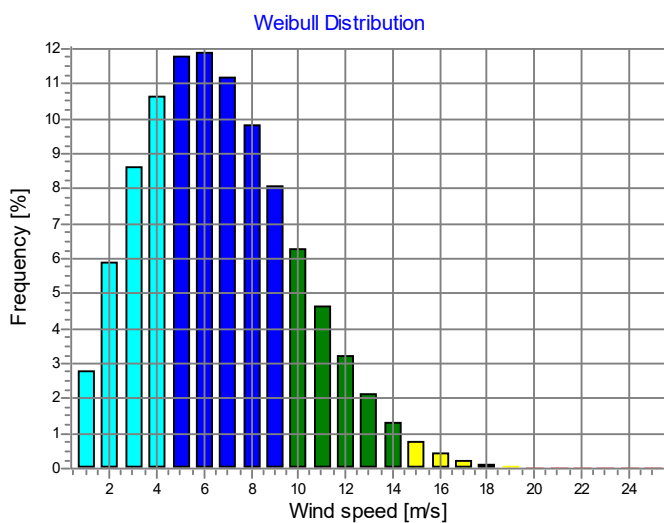
T1

## Resource file

L:\KUNDER\422\_Havgul\_Nordic\_AS\001\_Larvik\_preliminary\_analysis\Analyses\2018\_06\_Prelim\_EYA\04\_WAsP\03\_Wind\_maps\A2\A2\_loc2\_90m.wrg

## Weibull Data

| Sector | A- parameter<br>[m/s] | Wind speed<br>[m/s] | k- parameter | Frequency<br>[%] |
|--------|-----------------------|---------------------|--------------|------------------|
| 0 N    | 7.50                  | 6.65                | 2.320        | 6.9              |
| 1 NNE  | 7.92                  | 7.04                | 2.690        | 15.7             |
| 2 ENE  | 7.02                  | 6.22                | 2.430        | 11.1             |
| 3 E    | 6.10                  | 5.40                | 2.100        | 5.7              |
| 4 ESE  | 5.70                  | 5.07                | 1.810        | 4.0              |
| 5 SSE  | 6.30                  | 5.64                | 1.620        | 4.1              |
| 6 S    | 7.30                  | 6.50                | 1.770        | 7.4              |
| 7 SSW  | 8.47                  | 7.50                | 2.130        | 15.4             |
| 8 WSW  | 8.00                  | 7.09                | 2.283        | 10.8             |
| 9 W    | 7.30                  | 6.46                | 2.150        | 6.9              |
| 10 WNW | 8.10                  | 7.18                | 2.330        | 7.2              |
| 11 NNW | 7.30                  | 6.47                | 2.230        | 4.8              |
| All    | 7.53                  | 6.67                | 2.149        | 100.0            |



## PARK - Wind Data Analysis

**Calculation:** Larvik 3 x V126 3.3 MW HH 90 m, Best Estimate of AEP for optimization **Wind data:** A - Resource file(s); Hub height: 90.0

### Site coordinates

UTM (north)-WGS84 Zone: 32  
East: 554,719 North: 6,548,769  
T2

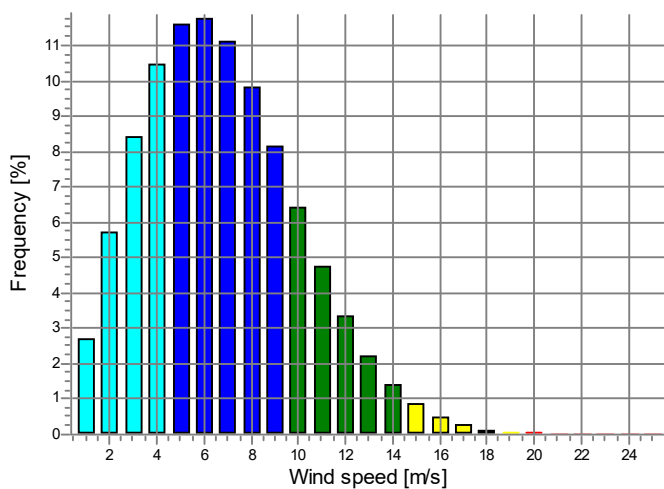
### Resource file

L:\KUNDER\422\_Havgul\_Nordic\_AS\001\_Larvik\_preliminary\_analysis\Analyses\2018\_06\_Prelim\_EYA\04\_WAsP\03\_Wind\_maps\2\2\_loc2\_90m.wrg

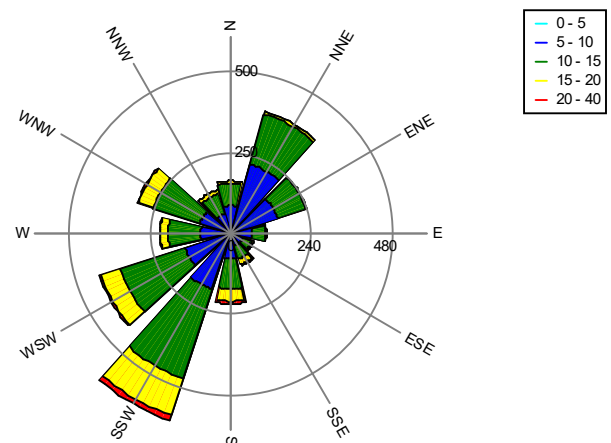
### Weibull Data

| Sector | A- parameter<br>[m/s] | Wind speed<br>[m/s] | k- parameter | Frequency<br>[%] |
|--------|-----------------------|---------------------|--------------|------------------|
| 0 N    | 7.30                  | 6.47                | 2.320        | 6.6              |
| 1 NNE  | 7.70                  | 6.85                | 2.699        | 14.9             |
| 2 ENE  | 7.10                  | 6.30                | 2.460        | 11.4             |
| 3 E    | 6.40                  | 5.67                | 2.100        | 6.1              |
| 4 ESE  | 6.00                  | 5.34                | 1.790        | 4.2              |
| 5 SSE  | 6.41                  | 5.74                | 1.620        | 4.2              |
| 6 S    | 7.10                  | 6.32                | 1.780        | 7.3              |
| 7 SSW  | 8.49                  | 7.52                | 2.130        | 14.6             |
| 8 WSW  | 8.40                  | 7.44                | 2.280        | 11.2             |
| 9 W    | 7.60                  | 6.73                | 2.150        | 7.4              |
| 10 WNW | 8.61                  | 7.63                | 2.320        | 7.5              |
| 11 NNW | 7.60                  | 6.73                | 2.230        | 4.9              |
| All    | 7.62                  | 6.75                | 2.147        | 100.0            |

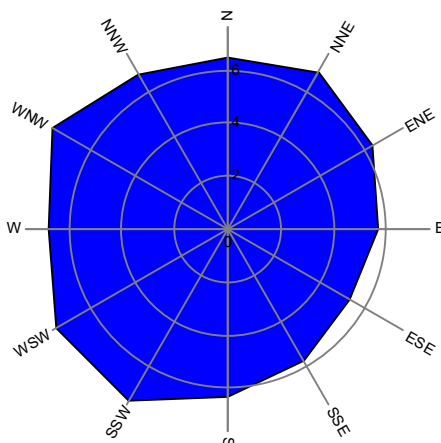
Weibull Distribution



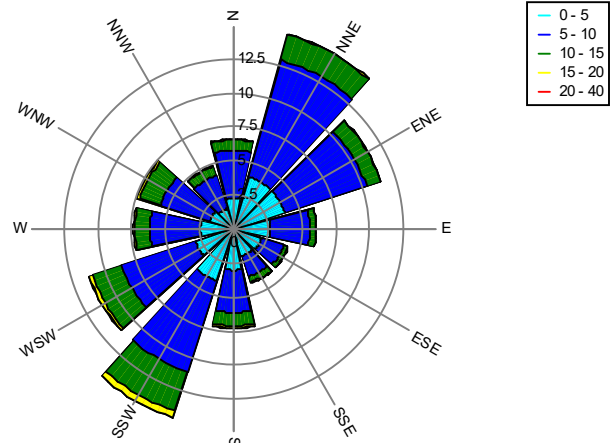
Energy Rose (kWh/m²/year)



Mean wind speed (m/s)



Frequency (%)



## PARK - Wind Data Analysis

**Calculation:** Larvik 3 x V126 3.3 MW HH 90 m, Best Estimate of AEP for optimization **Wind data:** A - Resource file(s); Hub height: 90.0

### Site coordinates

UTM (north)-WGS84 Zone: 32  
East: 555,174 North: 6,549,009  
T3

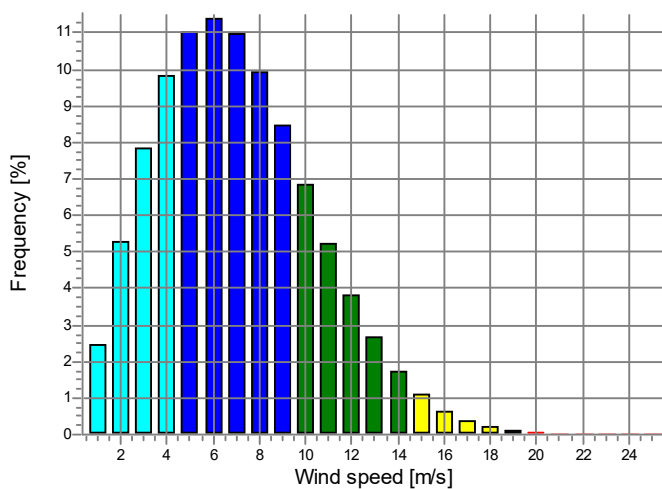
### Resource file

L:\KUNDER\422\_Havgul\_Nordic\_AS\001\_Larvik\_preliminary\_analysis\Analysis\2018\_06\_Prelim\_EYA\04\_WAsP\03\_Wind\_maps\02\02\_loc2\_90m.wrg

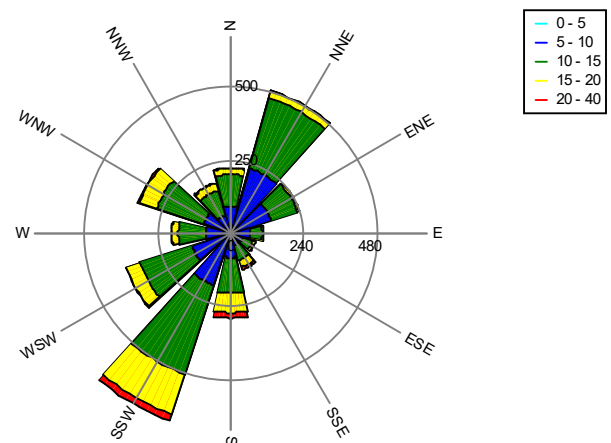
### Weibull Data

| Sector | A- parameter<br>[m/s] | Wind speed<br>[m/s] | k- parameter | Frequency<br>[%] |
|--------|-----------------------|---------------------|--------------|------------------|
| 0 N    | 8.00                  | 7.09                | 2.317        | 6.9              |
| 1 NNE  | 8.30                  | 7.38                | 2.700        | 15.4             |
| 2 ENE  | 7.20                  | 6.38                | 2.440        | 10.8             |
| 3 E    | 6.56                  | 5.81                | 2.110        | 5.8              |
| 4 ESE  | 6.40                  | 5.69                | 1.810        | 4.2              |
| 5 SSE  | 6.80                  | 6.09                | 1.620        | 4.3              |
| 6 S    | 7.70                  | 6.85                | 1.780        | 7.6              |
| 7 SSW  | 8.70                  | 7.70                | 2.140        | 15.0             |
| 8 WSW  | 8.25                  | 7.31                | 2.300        | 10.5             |
| 9 W    | 7.56                  | 6.70                | 2.140        | 6.9              |
| 10 WNW | 8.90                  | 7.89                | 2.330        | 7.5              |
| 11 NNW | 8.20                  | 7.26                | 2.227        | 5.0              |
| All    | 7.93                  | 7.02                | 2.156        | 100.0            |

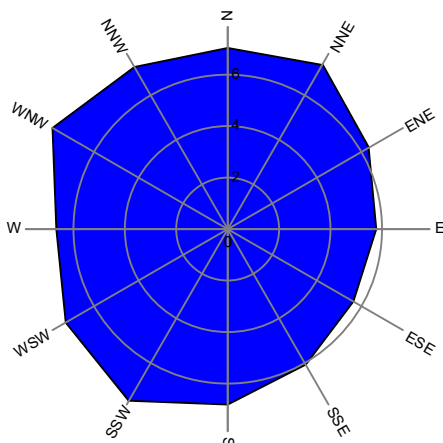
Weibull Distribution



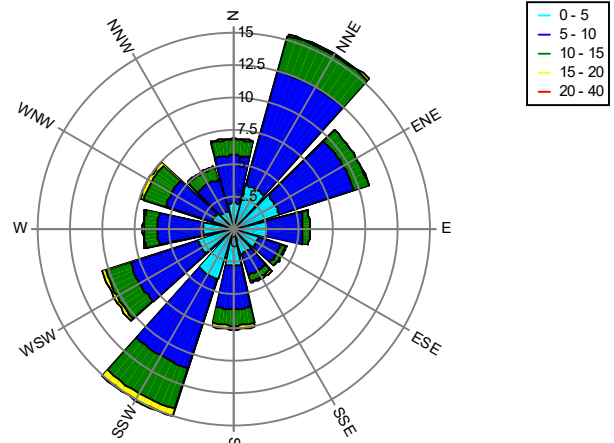
Energy Rose (kWh/m²/year)



Mean wind speed (m/s)



Frequency (%)



## PARK - Map

**Calculation:** Larvik 3 x V126 3.3 MW HH 90 m, Best Estimate of AEP for optimization



Map: Topografisk norgeskart, Print scale 1:45,000, Map center UTM (north)-WGS84 Zone: 32 East: 554,961 North: 6,548,731

▲ New WTG

## DECIBEL - Main Result

### Calculation: Larvik Noise calculations, Best Estimate optimized Noise HH 120m

Norwegian rules for noise calculation.  
Calculation based on Veileder til retningslinje for behandling av støy i arealplanlegging (T-1442/2012)

Noise values in calculation:  
Total noise values are Lden values

All coordinates are in  
UTM (north)-WGS84 Zone: 32



New WTG

Noise sensitive area

### WTGs

|   | Easting | Northing  | Z<br>[m] | Row<br>data/Description | WTG type |           |                     | Power,<br>rated<br>[kW] | Rotor<br>diameter<br>[m] | Hub<br>height<br>[m] | Setting | Noise data |                              | Wind<br>speed<br>[m/s] | Status     | LwA,ref<br>[dB(A)] | Pure<br>tones |
|---|---------|-----------|----------|-------------------------|----------|-----------|---------------------|-------------------------|--------------------------|----------------------|---------|------------|------------------------------|------------------------|------------|--------------------|---------------|
|   |         |           |          |                         | Valid    | Manufact. | Type-generator      |                         |                          |                      |         | Creator    | Name                         |                        |            |                    |               |
| 1 | 555,203 | 6,548,453 | 160.0    | T1                      | Yes      | VESTAS    | V126-3.3 GridStream | 3,300                   | 126.0                    | 120.0                | Day     | EMD        | Level 0 - - Mode 0 - 04-2014 | 8.0                    | User value | 107.5              | No h          |
|   |         |           |          |                         |          |           |                     |                         |                          |                      | Evening | EMD        | Level 0 - - Mode 0 - 04-2014 | 8.0                    | User value | 107.5              | No h          |
|   |         |           |          |                         |          |           |                     |                         |                          |                      | Night   | EMD        | Level 0 - - Mode 0 - 04-2014 | 8.0                    | User value | 107.5              | No h          |
| 2 | 554,719 | 6,548,769 | 170.0    | T2                      | Yes      | VESTAS    | V126-3.3 GridStream | 3,300                   | 126.0                    | 120.0                | Day     | EMD        | Level 0 - - Mode 0 - 04-2014 | 8.0                    | User value | 107.5              | No h          |
|   |         |           |          |                         |          |           |                     |                         |                          |                      | Evening | EMD        | Level 0 - - Mode 0 - 04-2014 | 8.0                    | User value | 107.5              | No h          |
|   |         |           |          |                         |          |           |                     |                         |                          |                      | Night   | EMD        | Level 0 - - Mode 0 - 04-2014 | 8.0                    | User value | 107.5              | No h          |
| 3 | 555,174 | 6,549,009 | 190.0    | T3                      | Yes      | VESTAS    | V126-3.3 GridStream | 3,300                   | 126.0                    | 120.0                | Day     | EMD        | Level 0 - - Mode 0 - 04-2014 | 8.0                    | User value | 107.5              | No h          |
|   |         |           |          |                         |          |           |                     |                         |                          |                      | Evening | EMD        | Level 0 - - Mode 0 - 04-2014 | 8.0                    | User value | 107.5              | No h          |
|   |         |           |          |                         |          |           |                     |                         |                          |                      | Night   | EMD        | Level 0 - - Mode 0 - 04-2014 | 8.0                    | User value | 107.5              | No h          |

h) Generic octave distribution used

### Calculation Results

#### Sound level

| Noise sensitive area |           |         |           | Demands  |                        | Sound level      |                      | Demands fulfilled ?             |       |
|----------------------|-----------|---------|-----------|----------|------------------------|------------------|----------------------|---------------------------------|-------|
| No.                  | Name      | Easting | Northing  | Z<br>[m] | Imission height<br>[m] | Noise<br>[dB(A)] | From WTGs<br>[dB(A)] | Distance to noise demand<br>[m] | Noise |
| A                    | 8367132   | 557,082 | 6,547,795 | 40.0     | 5.0                    | 45.0             | 37.5                 | 1,100                           | Yes   |
|                      | A Day     |         |           |          |                        |                  | 31.1                 |                                 |       |
|                      | A Evening |         |           |          |                        |                  | 31.1                 |                                 |       |
|                      | A Night   |         |           |          |                        |                  | 31.1                 |                                 |       |
| B                    | 8370184   | 556,339 | 6,546,578 | 110.0    | 5.0                    | 45.0             | 36.3                 | 1,339                           | Yes   |
|                      | B Day     |         |           |          |                        |                  | 29.9                 |                                 |       |
|                      | B Evening |         |           |          |                        |                  | 29.9                 |                                 |       |
|                      | B Night   |         |           |          |                        |                  | 29.9                 |                                 |       |
| C                    | 8370664   | 556,905 | 6,547,880 | 67.8     | 5.0                    | 45.0             | 38.6                 | 904                             | Yes   |
|                      | C Day     |         |           |          |                        |                  | 32.2                 |                                 |       |
|                      | C Evening |         |           |          |                        |                  | 32.2                 |                                 |       |
|                      | C Night   |         |           |          |                        |                  | 32.2                 |                                 |       |
| D                    | 8371644   | 557,246 | 6,547,721 | 40.0     | 5.0                    | 45.0             | 36.7                 | 1,279                           | Yes   |
|                      | D Day     |         |           |          |                        |                  | 30.3                 |                                 |       |
|                      | D Evening |         |           |          |                        |                  | 30.3                 |                                 |       |
|                      | D Night   |         |           |          |                        |                  | 30.3                 |                                 |       |
| E                    | 8372004   | 555,854 | 6,547,243 | 120.0    | 5.0                    | 45.0             | 40.9                 | 521                             | Yes   |
|                      | E Day     |         |           |          |                        |                  | 34.5                 |                                 |       |
|                      | E Evening |         |           |          |                        |                  | 34.5                 |                                 |       |
|                      | E Night   |         |           |          |                        |                  | 34.5                 |                                 |       |
| F                    | 8373388   | 557,187 | 6,547,728 | 40.0     | 5.0                    | 45.0             | 36.9                 | 1,222                           | Yes   |
|                      | F Day     |         |           |          |                        |                  | 30.5                 |                                 |       |
|                      | F Evening |         |           |          |                        |                  | 30.5                 |                                 |       |
|                      | F Night   |         |           |          |                        |                  | 30.5                 |                                 |       |
| G                    | 8373450   | 556,309 | 6,546,527 | 110.2    | 5.0                    | 45.0             | 36.2                 | 1,368                           | Yes   |
|                      | G Day     |         |           |          |                        |                  | 29.8                 |                                 |       |

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## DECIBEL - Main Result

**Calculation:** Larvik Noise calculations, Best Estimate optimized Noise HH 120m

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| Noise sensitive area |           |         |           | Demands  |                        | Sound level      |                      | Demands fulfilled ?             |       |
|----------------------|-----------|---------|-----------|----------|------------------------|------------------|----------------------|---------------------------------|-------|
| No.                  | Name      | Easting | Northing  | Z<br>[m] | Imission height<br>[m] | Noise<br>[dB(A)] | From WTGs<br>[dB(A)] | Distance to noise demand<br>[m] | Noise |
| G                    | Evening   |         |           |          |                        |                  | 29.8                 |                                 |       |
| G                    | Night     |         |           |          |                        |                  | 29.8                 |                                 |       |
| H                    | 8373477   | 557,160 | 6,547,745 | 40.0     | 5.0                    | 45.0             | 37.1                 | 1,191                           | Yes   |
| H                    | Day       |         |           |          |                        |                  | 30.7                 |                                 |       |
| H                    | Evening   |         |           |          |                        |                  | 30.7                 |                                 |       |
| H                    | Night     |         |           |          |                        |                  | 30.7                 |                                 |       |
| I                    | 8373566   | 556,036 | 6,546,937 | 120.0    | 5.0                    | 45.0             | 38.7                 | 877                             | Yes   |
| I                    | Day       |         |           |          |                        |                  | 32.3                 |                                 |       |
| I                    | Evening   |         |           |          |                        |                  | 32.3                 |                                 |       |
| I                    | Night     |         |           |          |                        |                  | 32.3                 |                                 |       |
| J                    | 8373841   | 556,291 | 6,546,670 | 117.5    | 5.0                    | 45.0             | 36.8                 | 1,235                           | Yes   |
| J                    | Day       |         |           |          |                        |                  | 30.4                 |                                 |       |
| J                    | Evening   |         |           |          |                        |                  | 30.4                 |                                 |       |
| J                    | Night     |         |           |          |                        |                  | 30.4                 |                                 |       |
| K                    | 16608920  | 555,819 | 6,547,343 | 119.4    | 5.0                    | 45.0             | 41.6                 | 417                             | Yes   |
| K                    | Day       |         |           |          |                        |                  | 35.2                 |                                 |       |
| K                    | Evening   |         |           |          |                        |                  | 35.2                 |                                 |       |
| K                    | Night     |         |           |          |                        |                  | 35.2                 |                                 |       |
| L                    | 25079760  | 552,742 | 6,547,220 | 56.8     | 5.0                    | 45.0             | 35.2                 | 1,615                           | Yes   |
| L                    | Day       |         |           |          |                        |                  | 28.8                 |                                 |       |
| L                    | Evening   |         |           |          |                        |                  | 28.8                 |                                 |       |
| L                    | Night     |         |           |          |                        |                  | 28.8                 |                                 |       |
| M                    | 25080696  | 555,841 | 6,546,415 | 130.8    | 5.0                    | 45.0             | 36.6                 | 1,284                           | Yes   |
| M                    | Day       |         |           |          |                        |                  | 30.2                 |                                 |       |
| M                    | Evening   |         |           |          |                        |                  | 30.2                 |                                 |       |
| M                    | Night     |         |           |          |                        |                  | 30.2                 |                                 |       |
| N                    | 140805912 | 552,991 | 6,548,099 | 54.8     | 5.0                    | 45.0             | 38.2                 | 979                             | Yes   |
| N                    | Day       |         |           |          |                        |                  | 31.8                 |                                 |       |
| N                    | Evening   |         |           |          |                        |                  | 31.8                 |                                 |       |
| N                    | Night     |         |           |          |                        |                  | 31.8                 |                                 |       |
| O                    | 140806099 | 552,999 | 6,548,146 | 56.2     | 5.0                    | 45.0             | 38.3                 | 957                             | Yes   |
| O                    | Day       |         |           |          |                        |                  | 31.9                 |                                 |       |
| O                    | Evening   |         |           |          |                        |                  | 31.9                 |                                 |       |
| O                    | Night     |         |           |          |                        |                  | 31.9                 |                                 |       |
| P                    | 140806129 | 554,213 | 6,547,978 | 79.3     | 5.0                    | 45.0             | 44.9                 | 8                               | Yes   |
| P                    | Day       |         |           |          |                        |                  | 38.5                 |                                 |       |
| P                    | Evening   |         |           |          |                        |                  | 38.5                 |                                 |       |
| P                    | Night     |         |           |          |                        |                  | 38.5                 |                                 |       |
| Q                    | 140811068 | 556,022 | 6,549,598 | 60.0     | 5.0                    | 45.0             | 43.7                 | 169                             | Yes   |
| Q                    | Day       |         |           |          |                        |                  | 37.3                 |                                 |       |
| Q                    | Evening   |         |           |          |                        |                  | 37.3                 |                                 |       |
| Q                    | Night     |         |           |          |                        |                  | 37.3                 |                                 |       |
| R                    | 140811092 | 556,813 | 6,547,918 | 70.0     | 5.0                    | 45.0             | 39.2                 | 804                             | Yes   |
| R                    | Day       |         |           |          |                        |                  | 32.8                 |                                 |       |
| R                    | Evening   |         |           |          |                        |                  | 32.8                 |                                 |       |
| R                    | Night     |         |           |          |                        |                  | 32.8                 |                                 |       |
| S                    | 140811149 | 556,804 | 6,548,100 | 43.9     | 5.0                    | 45.0             | 39.6                 | 739                             | Yes   |
| S                    | Day       |         |           |          |                        |                  | 33.2                 |                                 |       |
| S                    | Evening   |         |           |          |                        |                  | 33.2                 |                                 |       |
| S                    | Night     |         |           |          |                        |                  | 33.2                 |                                 |       |
| T                    | 140811246 | 555,648 | 6,547,231 | 120.0    | 5.0                    | 45.0             | 41.4                 | 450                             | Yes   |
| T                    | Day       |         |           |          |                        |                  | 35.0                 |                                 |       |
| T                    | Evening   |         |           |          |                        |                  | 35.0                 |                                 |       |
| T                    | Night     |         |           |          |                        |                  | 35.0                 |                                 |       |
| U                    | 140811327 | 556,263 | 6,546,886 | 104.6    | 5.0                    | 45.0             | 37.8                 | 1,039                           | Yes   |
| U                    | Day       |         |           |          |                        |                  | 31.4                 |                                 |       |
| U                    | Evening   |         |           |          |                        |                  | 31.4                 |                                 |       |
| U                    | Night     |         |           |          |                        |                  | 31.4                 |                                 |       |
| V                    | 140811416 | 552,919 | 6,549,040 | 70.8     | 5.0                    | 45.0             | 38.2                 | 958                             | Yes   |
| V                    | Day       |         |           |          |                        |                  | 31.9                 |                                 |       |
| V                    | Evening   |         |           |          |                        |                  | 31.9                 |                                 |       |
| V                    | Night     |         |           |          |                        |                  | 31.9                 |                                 |       |
| W                    | 162843931 | 553,116 | 6,548,090 | 83.7     | 5.0                    | 45.0             | 38.8                 | 865                             | Yes   |
| W                    | Day       |         |           |          |                        |                  | 32.4                 |                                 |       |
| W                    | Evening   |         |           |          |                        |                  | 32.4                 |                                 |       |

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## DECIBEL - Main Result

**Calculation:** Larvik Noise calculations, Best Estimate optimized Noise HH 120m

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| Noise sensitive area |            |         |           | Demands  |                        | Sound level      |                      | Demands fulfilled ?             |       |
|----------------------|------------|---------|-----------|----------|------------------------|------------------|----------------------|---------------------------------|-------|
| No.                  | Name       | Easting | Northing  | Z<br>[m] | Imission height<br>[m] | Noise<br>[dB(A)] | From WTGs<br>[dB(A)] | Distance to noise demand<br>[m] | Noise |
|                      | W Night    |         |           |          |                        |                  | 32.4                 |                                 |       |
| X                    | 162843958  | 553,064 | 6,548,097 | 73.6     | 5.0                    | 45.0             | 38.5                 | 911                             | Yes   |
|                      | X Day      |         |           |          |                        |                  | 32.1                 |                                 |       |
|                      | X Evening  |         |           |          |                        |                  | 32.1                 |                                 |       |
|                      | X Night    |         |           |          |                        |                  | 32.1                 |                                 |       |
| Y                    | 162844288  | 552,678 | 6,547,504 | 50.0     | 5.0                    | 45.0             | 35.6                 | 1,515                           | Yes   |
|                      | Y Day      |         |           |          |                        |                  | 29.2                 |                                 |       |
|                      | Y Evening  |         |           |          |                        |                  | 29.2                 |                                 |       |
|                      | Y Night    |         |           |          |                        |                  | 29.2                 |                                 |       |
| Z                    | 162844296  | 552,635 | 6,547,421 | 50.0     | 5.0                    | 45.0             | 35.3                 | 1,594                           | Yes   |
|                      | Z Day      |         |           |          |                        |                  | 28.9                 |                                 |       |
|                      | Z Evening  |         |           |          |                        |                  | 28.9                 |                                 |       |
|                      | Z Night    |         |           |          |                        |                  | 28.9                 |                                 |       |
| AA                   | 162844369  | 552,886 | 6,548,645 | 60.0     | 5.0                    | 45.0             | 38.2                 | 974                             | Yes   |
|                      | AA Day     |         |           |          |                        |                  | 31.8                 |                                 |       |
|                      | AA Evening |         |           |          |                        |                  | 31.8                 |                                 |       |
|                      | AA Night   |         |           |          |                        |                  | 31.8                 |                                 |       |
| AB                   | 162877267  | 554,467 | 6,547,739 | 78.8     | 5.0                    | 45.0             | 44.8                 | 46                              | Yes   |
|                      | AB Day     |         |           |          |                        |                  | 38.4                 |                                 |       |
|                      | AB Evening |         |           |          |                        |                  | 38.4                 |                                 |       |
|                      | AB Night   |         |           |          |                        |                  | 38.4                 |                                 |       |
| AC                   | 162877275  | 554,472 | 6,547,705 | 73.6     | 5.0                    | 45.0             | 44.6                 | 72                              | Yes   |
|                      | AC Day     |         |           |          |                        |                  | 38.2                 |                                 |       |
|                      | AC Evening |         |           |          |                        |                  | 38.2                 |                                 |       |
|                      | AC Night   |         |           |          |                        |                  | 38.2                 |                                 |       |
| AD                   | 162877291  | 554,107 | 6,547,182 | 87.6     | 5.0                    | 45.0             | 40.0                 | 688                             | Yes   |
|                      | AD Day     |         |           |          |                        |                  | 33.6                 |                                 |       |
|                      | AD Evening |         |           |          |                        |                  | 33.6                 |                                 |       |
|                      | AD Night   |         |           |          |                        |                  | 33.6                 |                                 |       |
| AE                   | 162877321  | 556,877 | 6,548,473 | 31.6     | 5.0                    | 45.0             | 39.7                 | 737                             | Yes   |
|                      | AE Day     |         |           |          |                        |                  | 33.3                 |                                 |       |
|                      | AE Evening |         |           |          |                        |                  | 33.3                 |                                 |       |
|                      | AE Night   |         |           |          |                        |                  | 33.3                 |                                 |       |
| AF                   | 162877399  | 556,532 | 6,548,099 | 40.0     | 5.0                    | 45.0             | 41.2                 | 479                             | Yes   |
|                      | AF Day     |         |           |          |                        |                  | 34.8                 |                                 |       |
|                      | AF Evening |         |           |          |                        |                  | 34.8                 |                                 |       |
|                      | AF Night   |         |           |          |                        |                  | 34.8                 |                                 |       |
| AG                   | 162877437  | 555,785 | 6,547,327 | 116.8    | 5.0                    | 45.0             | 41.7                 | 415                             | Yes   |
|                      | AG Day     |         |           |          |                        |                  | 35.3                 |                                 |       |
|                      | AG Evening |         |           |          |                        |                  | 35.3                 |                                 |       |
|                      | AG Night   |         |           |          |                        |                  | 35.3                 |                                 |       |
| AH                   | 162877461  | 555,821 | 6,547,284 | 120.0    | 5.0                    | 45.0             | 41.3                 | 469                             | Yes   |
|                      | AH Day     |         |           |          |                        |                  | 34.9                 |                                 |       |
|                      | AH Evening |         |           |          |                        |                  | 34.9                 |                                 |       |
|                      | AH Night   |         |           |          |                        |                  | 34.9                 |                                 |       |
| AI                   | 162877488  | 555,920 | 6,547,253 | 126.3    | 5.0                    | 45.0             | 40.7                 | 544                             | Yes   |
|                      | AI Day     |         |           |          |                        |                  | 34.3                 |                                 |       |
|                      | AI Evening |         |           |          |                        |                  | 34.3                 |                                 |       |
|                      | AI Night   |         |           |          |                        |                  | 34.3                 |                                 |       |
| AJ                   | 162877577  | 555,986 | 6,547,011 | 120.0    | 5.0                    | 45.0             | 39.2                 | 788                             | Yes   |
|                      | AJ Day     |         |           |          |                        |                  | 32.8                 |                                 |       |
|                      | AJ Evening |         |           |          |                        |                  | 32.8                 |                                 |       |
|                      | AJ Night   |         |           |          |                        |                  | 32.8                 |                                 |       |
| AK                   | 162877585  | 555,991 | 6,547,078 | 120.0    | 5.0                    | 45.0             | 39.5                 | 732                             | Yes   |
|                      | AK Day     |         |           |          |                        |                  | 33.1                 |                                 |       |
|                      | AK Evening |         |           |          |                        |                  | 33.1                 |                                 |       |
|                      | AK Night   |         |           |          |                        |                  | 33.1                 |                                 |       |
| AL                   | 162877593  | 555,875 | 6,547,215 | 120.0    | 5.0                    | 45.0             | 40.7                 | 556                             | Yes   |
|                      | AL Day     |         |           |          |                        |                  | 34.3                 |                                 |       |
|                      | AL Evening |         |           |          |                        |                  | 34.3                 |                                 |       |
|                      | AL Night   |         |           |          |                        |                  | 34.3                 |                                 |       |
| AM                   | 162877607  | 556,288 | 6,546,570 | 114.5    | 5.0                    | 45.0             | 36.4                 | 1,320                           | Yes   |
|                      | AM Day     |         |           |          |                        |                  | 30.0                 |                                 |       |
|                      | AM Evening |         |           |          |                        |                  | 30.0                 |                                 |       |
|                      | AM Night   |         |           |          |                        |                  | 30.0                 |                                 |       |

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## DECIBEL - Main Result

**Calculation:** Larvik Noise calculations, Best Estimate optimized Noise HH 120m

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| Noise sensitive area |            |         |           | Demands  |                        | Sound level      |                      | Demands fulfilled ?             |       |
|----------------------|------------|---------|-----------|----------|------------------------|------------------|----------------------|---------------------------------|-------|
| No.                  | Name       | Easting | Northing  | Z<br>[m] | Imission height<br>[m] | Noise<br>[dB(A)] | From WTGs<br>[dB(A)] | Distance to noise demand<br>[m] | Noise |
| AN                   | 162877658  | 555,762 | 6,546,715 | 122.9    | 5.0                    | 45.0             | 38.2                 | 975                             | Yes   |
|                      | AN Day     |         |           |          |                        |                  | 31.8                 |                                 |       |
|                      | AN Evening |         |           |          |                        |                  | 31.8                 |                                 |       |
|                      | AN Night   |         |           |          |                        |                  | 31.8                 |                                 |       |
| AO                   | 162877704  | 555,788 | 6,546,584 | 120.0    | 5.0                    | 45.0             | 37.5                 | 1,107                           | Yes   |
|                      | AO Day     |         |           |          |                        |                  | 31.1                 |                                 |       |
|                      | AO Evening |         |           |          |                        |                  | 31.1                 |                                 |       |
|                      | AO Night   |         |           |          |                        |                  | 31.1                 |                                 |       |
| AP                   | 162877712  | 556,408 | 6,546,553 | 104.8    | 5.0                    | 45.0             | 36.0                 | 1,397                           | Yes   |
|                      | AP Day     |         |           |          |                        |                  | 29.6                 |                                 |       |
|                      | AP Evening |         |           |          |                        |                  | 29.6                 |                                 |       |
|                      | AP Night   |         |           |          |                        |                  | 29.6                 |                                 |       |
| AQ                   | 162877828  | 556,103 | 6,547,876 | 88.1     | 5.0                    | 45.0             | 43.3                 | 200                             | Yes   |
|                      | AQ Day     |         |           |          |                        |                  | 36.9                 |                                 |       |
|                      | AQ Evening |         |           |          |                        |                  | 36.9                 |                                 |       |
|                      | AQ Night   |         |           |          |                        |                  | 36.9                 |                                 |       |
| AR                   | 162877844  | 555,777 | 6,547,770 | 92.7     | 5.0                    | 45.0             | 44.5                 | 39                              | Yes   |
|                      | AR Day     |         |           |          |                        |                  | 38.1                 |                                 |       |
|                      | AR Evening |         |           |          |                        |                  | 38.1                 |                                 |       |
|                      | AR Night   |         |           |          |                        |                  | 38.1                 |                                 |       |
| AS                   | 162877852  | 555,798 | 6,547,740 | 89.0     | 5.0                    | 45.0             | 44.1                 | 76                              | Yes   |
|                      | AS Day     |         |           |          |                        |                  | 37.7                 |                                 |       |
|                      | AS Evening |         |           |          |                        |                  | 37.7                 |                                 |       |
|                      | AS Night   |         |           |          |                        |                  | 37.7                 |                                 |       |
| AT                   | 162877968  | 556,402 | 6,547,991 | 55.8     | 5.0                    | 45.0             | 41.8                 | 397                             | Yes   |
|                      | AT Day     |         |           |          |                        |                  | 35.4                 |                                 |       |
|                      | AT Evening |         |           |          |                        |                  | 35.4                 |                                 |       |
|                      | AT Night   |         |           |          |                        |                  | 35.4                 |                                 |       |
| AU                   | 162877976  | 556,910 | 6,547,929 | 76.0     | 5.0                    | 45.0             | 38.7                 | 892                             | Yes   |
|                      | AU Day     |         |           |          |                        |                  | 32.3                 |                                 |       |
|                      | AU Evening |         |           |          |                        |                  | 32.3                 |                                 |       |
|                      | AU Night   |         |           |          |                        |                  | 32.3                 |                                 |       |
| AV                   | 162878018  | 556,831 | 6,548,001 | 65.4     | 5.0                    | 45.0             | 39.3                 | 793                             | Yes   |
|                      | AV Day     |         |           |          |                        |                  | 32.9                 |                                 |       |
|                      | AV Evening |         |           |          |                        |                  | 32.9                 |                                 |       |
|                      | AV Night   |         |           |          |                        |                  | 32.9                 |                                 |       |
| AW                   | 162878026  | 556,879 | 6,548,010 | 75.6     | 5.0                    | 45.0             | 39.0                 | 836                             | Yes   |
|                      | AW Day     |         |           |          |                        |                  | 32.6                 |                                 |       |
|                      | AW Evening |         |           |          |                        |                  | 32.6                 |                                 |       |
|                      | AW Night   |         |           |          |                        |                  | 32.6                 |                                 |       |
| AX                   | 162878085  | 556,868 | 6,547,846 | 66.9     | 5.0                    | 45.0             | 38.7                 | 882                             | Yes   |
|                      | AX Day     |         |           |          |                        |                  | 32.3                 |                                 |       |
|                      | AX Evening |         |           |          |                        |                  | 32.3                 |                                 |       |
|                      | AX Night   |         |           |          |                        |                  | 32.3                 |                                 |       |
| AY                   | 162878093  | 556,925 | 6,547,825 | 60.7     | 5.0                    | 45.0             | 38.4                 | 943                             | Yes   |
|                      | AY Day     |         |           |          |                        |                  | 32.0                 |                                 |       |
|                      | AY Evening |         |           |          |                        |                  | 32.0                 |                                 |       |
|                      | AY Night   |         |           |          |                        |                  | 32.0                 |                                 |       |
| AZ                   | 162878166  | 556,927 | 6,547,778 | 56.2     | 5.0                    | 45.0             | 38.3                 | 963                             | Yes   |
|                      | AZ Day     |         |           |          |                        |                  | 31.9                 |                                 |       |
|                      | AZ Evening |         |           |          |                        |                  | 31.9                 |                                 |       |
|                      | AZ Night   |         |           |          |                        |                  | 31.9                 |                                 |       |
| BA                   | 162878174  | 556,653 | 6,547,859 | 78.2     | 5.0                    | 45.0             | 39.9                 | 680                             | Yes   |
|                      | BA Day     |         |           |          |                        |                  | 33.5                 |                                 |       |
|                      | BA Evening |         |           |          |                        |                  | 33.5                 |                                 |       |
|                      | BA Night   |         |           |          |                        |                  | 33.5                 |                                 |       |
| BB                   | 162878182  | 556,561 | 6,547,874 | 80.0     | 5.0                    | 45.0             | 40.5                 | 591                             | Yes   |
|                      | BB Day     |         |           |          |                        |                  | 34.1                 |                                 |       |
|                      | BB Evening |         |           |          |                        |                  | 34.1                 |                                 |       |
|                      | BB Night   |         |           |          |                        |                  | 34.1                 |                                 |       |
| BC                   | 162878190  | 556,618 | 6,547,852 | 80.0     | 5.0                    | 45.0             | 40.1                 | 652                             | Yes   |
|                      | BC Day     |         |           |          |                        |                  | 33.7                 |                                 |       |
|                      | BC Evening |         |           |          |                        |                  | 33.7                 |                                 |       |
|                      | BC Night   |         |           |          |                        |                  | 33.7                 |                                 |       |
| BD                   | 162878263  | 556,642 | 6,547,908 | 72.5     | 5.0                    | 45.0             | 40.1                 | 650                             | Yes   |

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## DECIBEL - Main Result

**Calculation:** Larvik Noise calculations, Best Estimate optimized Noise HH 120m

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| Noise sensitive area |              |         |           | Demands  |                        | Sound level      |                      | Demands fulfilled ?             |       |
|----------------------|--------------|---------|-----------|----------|------------------------|------------------|----------------------|---------------------------------|-------|
| No.                  | Name         | Easting | Northing  | Z<br>[m] | Imission height<br>[m] | Noise<br>[dB(A)] | From WTGs<br>[dB(A)] | Distance to noise demand<br>[m] | Noise |
|                      | BD Day       |         |           |          |                        |                  | 33.7                 |                                 |       |
|                      | BD Evening   |         |           |          |                        |                  | 33.7                 |                                 |       |
|                      | BD Night     |         |           |          |                        |                  | 33.7                 |                                 |       |
|                      | BE 162878336 | 556,256 | 6,548,029 | 83.5     | 5.0                    | 45.0             | 42.9                 | 249                             | Yes   |
|                      | BE Day       |         |           |          |                        |                  | 36.5                 |                                 |       |
|                      | BE Evening   |         |           |          |                        |                  | 36.5                 |                                 |       |
|                      | BE Night     |         |           |          |                        |                  | 36.5                 |                                 |       |
|                      | BF 162878344 | 556,187 | 6,548,016 | 95.7     | 5.0                    | 45.0             | 43.4                 | 194                             | Yes   |
|                      | BF Day       |         |           |          |                        |                  | 37.0                 |                                 |       |
|                      | BF Evening   |         |           |          |                        |                  | 37.0                 |                                 |       |
|                      | BF Night     |         |           |          |                        |                  | 37.0                 |                                 |       |
|                      | BG 162878395 | 554,518 | 6,547,684 | 70.2     | 5.0                    | 45.0             | 44.6                 | 69                              | Yes   |
|                      | BG Day       |         |           |          |                        |                  | 38.2                 |                                 |       |
|                      | BG Evening   |         |           |          |                        |                  | 38.2                 |                                 |       |
|                      | BG Night     |         |           |          |                        |                  | 38.2                 |                                 |       |
|                      | BH 162878425 | 555,128 | 6,547,446 | 87.3     | 5.0                    | 45.0             | 43.9                 | 144                             | Yes   |
|                      | BH Day       |         |           |          |                        |                  | 37.5                 |                                 |       |
|                      | BH Evening   |         |           |          |                        |                  | 37.5                 |                                 |       |
|                      | BH Night     |         |           |          |                        |                  | 37.5                 |                                 |       |
|                      | BI 162878433 | 555,181 | 6,547,493 | 83.5     | 5.0                    | 45.0             | 43.9                 | 97                              | Yes   |
|                      | BI Day       |         |           |          |                        |                  | 37.6                 |                                 |       |
|                      | BI Evening   |         |           |          |                        |                  | 37.6                 |                                 |       |
|                      | BI Night     |         |           |          |                        |                  | 37.6                 |                                 |       |
|                      | BJ 162878468 | 555,711 | 6,547,691 | 85.7     | 5.0                    | 45.0             | 44.2                 | 63                              | Yes   |
|                      | BJ Day       |         |           |          |                        |                  | 37.8                 |                                 |       |
|                      | BJ Evening   |         |           |          |                        |                  | 37.8                 |                                 |       |
|                      | BJ Night     |         |           |          |                        |                  | 37.8                 |                                 |       |
|                      | BK 162878530 | 555,786 | 6,547,703 | 80.2     | 5.0                    | 45.0             | 43.9                 | 98                              | Yes   |
|                      | BK Day       |         |           |          |                        |                  | 37.5                 |                                 |       |
|                      | BK Evening   |         |           |          |                        |                  | 37.5                 |                                 |       |
|                      | BK Night     |         |           |          |                        |                  | 37.5                 |                                 |       |
|                      | BL 162878816 | 556,038 | 6,546,525 | 130.0    | 5.0                    | 45.0             | 36.8                 | 1,250                           | Yes   |
|                      | BL Day       |         |           |          |                        |                  | 30.4                 |                                 |       |
|                      | BL Evening   |         |           |          |                        |                  | 30.4                 |                                 |       |
|                      | BL Night     |         |           |          |                        |                  | 30.4                 |                                 |       |
|                      | BM 162879197 | 556,228 | 6,546,502 | 117.1    | 5.0                    | 45.0             | 36.2                 | 1,351                           | Yes   |
|                      | BM Day       |         |           |          |                        |                  | 29.9                 |                                 |       |
|                      | BM Evening   |         |           |          |                        |                  | 29.9                 |                                 |       |
|                      | BM Night     |         |           |          |                        |                  | 29.9                 |                                 |       |
|                      | BN 162879235 | 556,312 | 6,546,461 | 110.9    | 5.0                    | 45.0             | 35.9                 | 1,427                           | Yes   |
|                      | BN Day       |         |           |          |                        |                  | 29.5                 |                                 |       |
|                      | BN Evening   |         |           |          |                        |                  | 29.5                 |                                 |       |
|                      | BN Night     |         |           |          |                        |                  | 29.5                 |                                 |       |
|                      | BO 162879316 | 556,416 | 6,546,476 | 107.1    | 5.0                    | 45.0             | 35.7                 | 1,466                           | Yes   |
|                      | BO Day       |         |           |          |                        |                  | 29.3                 |                                 |       |
|                      | BO Evening   |         |           |          |                        |                  | 29.3                 |                                 |       |
|                      | BO Night     |         |           |          |                        |                  | 29.3                 |                                 |       |
|                      | BP 162879324 | 556,533 | 6,546,520 | 100.4    | 5.0                    | 45.0             | 35.6                 | 1,494                           | Yes   |
|                      | BP Day       |         |           |          |                        |                  | 29.2                 |                                 |       |
|                      | BP Evening   |         |           |          |                        |                  | 29.2                 |                                 |       |
|                      | BP Night     |         |           |          |                        |                  | 29.2                 |                                 |       |
|                      | BQ 162880527 | 553,928 | 6,549,153 | 124.8    | 5.0                    | 45.0             | 44.9                 | 6                               | Yes   |
|                      | BQ Day       |         |           |          |                        |                  | 38.5                 |                                 |       |
|                      | BQ Evening   |         |           |          |                        |                  | 38.5                 |                                 |       |
|                      | BQ Night     |         |           |          |                        |                  | 38.5                 |                                 |       |
|                      | BR 162880543 | 556,708 | 6,549,211 | 30.0     | 5.0                    | 45.0             | 40.4                 | 618                             | Yes   |
|                      | BR Day       |         |           |          |                        |                  | 34.0                 |                                 |       |
|                      | BR Evening   |         |           |          |                        |                  | 34.0                 |                                 |       |
|                      | BR Night     |         |           |          |                        |                  | 34.0                 |                                 |       |
|                      | BS 162883933 | 553,073 | 6,548,066 | 72.9     | 5.0                    | 45.0             | 38.5                 | 913                             | Yes   |
|                      | BS Day       |         |           |          |                        |                  | 32.1                 |                                 |       |
|                      | BS Evening   |         |           |          |                        |                  | 32.1                 |                                 |       |
|                      | BS Night     |         |           |          |                        |                  | 32.1                 |                                 |       |
|                      | BT 162883941 | 552,991 | 6,547,917 | 57.0     | 5.0                    | 45.0             | 37.8                 | 1,046                           | Yes   |
|                      | BT Day       |         |           |          |                        |                  | 31.4                 |                                 |       |

To be continued on next page...

## DECIBEL - Main Result

**Calculation:** Larvik Noise calculations, Best Estimate optimized Noise HH 120m

...continued from previous page

| Noise sensitive area |            |         |           | Demands  |                        | Sound level      |                      | Demands fulfilled ?             |       |
|----------------------|------------|---------|-----------|----------|------------------------|------------------|----------------------|---------------------------------|-------|
| No.                  | Name       | Easting | Northing  | Z<br>[m] | Imission height<br>[m] | Noise<br>[dB(A)] | From WTGs<br>[dB(A)] | Distance to noise demand<br>[m] | Noise |
|                      | BT Evening |         |           |          |                        |                  | 31.4                 |                                 |       |
|                      | BT Night   |         |           |          |                        |                  | 31.4                 |                                 |       |
| BU                   | 162884018  | 552,851 | 6,547,587 | 70.0     | 5.0                    | 45.0             | 36.5                 | 1,324                           | Yes   |
|                      | BU Day     |         |           |          |                        |                  | 30.1                 |                                 |       |
|                      | BU Evening |         |           |          |                        |                  | 30.1                 |                                 |       |
|                      | BU Night   |         |           |          |                        |                  | 30.1                 |                                 |       |
| BV                   | 162884026  | 552,567 | 6,547,499 | 52.5     | 5.0                    | 45.0             | 35.2                 | 1,613                           | Yes   |
|                      | BV Day     |         |           |          |                        |                  | 28.8                 |                                 |       |
|                      | BV Evening |         |           |          |                        |                  | 28.8                 |                                 |       |
|                      | BV Night   |         |           |          |                        |                  | 28.8                 |                                 |       |
| BW                   | 162884034  | 552,705 | 6,547,358 | 50.0     | 5.0                    | 45.0             | 35.4                 | 1,568                           | Yes   |
|                      | BW Day     |         |           |          |                        |                  | 29.0                 |                                 |       |
|                      | BW Evening |         |           |          |                        |                  | 29.0                 |                                 |       |
|                      | BW Night   |         |           |          |                        |                  | 29.0                 |                                 |       |
| BX                   | 162884050  | 552,775 | 6,547,157 | 55.9     | 5.0                    | 45.0             | 35.2                 | 1,626                           | Yes   |
|                      | BX Day     |         |           |          |                        |                  | 28.8                 |                                 |       |
|                      | BX Evening |         |           |          |                        |                  | 28.8                 |                                 |       |
|                      | BX Night   |         |           |          |                        |                  | 28.8                 |                                 |       |
| BY                   | 162884069  | 552,745 | 6,547,269 | 52.6     | 5.0                    | 45.0             | 35.3                 | 1,584                           | Yes   |
|                      | BY Day     |         |           |          |                        |                  | 28.9                 |                                 |       |
|                      | BY Evening |         |           |          |                        |                  | 28.9                 |                                 |       |
|                      | BY Night   |         |           |          |                        |                  | 28.9                 |                                 |       |
| BZ                   | 163016370  | 556,941 | 6,548,848 | 30.0     | 5.0                    | 45.0             | 39.4                 | 764                             | Yes   |
|                      | BZ Day     |         |           |          |                        |                  | 33.0                 |                                 |       |
|                      | BZ Evening |         |           |          |                        |                  | 33.0                 |                                 |       |
|                      | BZ Night   |         |           |          |                        |                  | 33.0                 |                                 |       |
| CA                   | 163016389  | 556,929 | 6,548,779 | 30.0     | 5.0                    | 45.0             | 39.4                 | 749                             | Yes   |
|                      | CA Day     |         |           |          |                        |                  | 33.1                 |                                 |       |
|                      | CA Evening |         |           |          |                        |                  | 33.1                 |                                 |       |
|                      | CA Night   |         |           |          |                        |                  | 33.1                 |                                 |       |
| CB                   | 163016397  | 556,964 | 6,548,763 | 30.0     | 5.0                    | 45.0             | 39.2                 | 784                             | Yes   |
|                      | CB Day     |         |           |          |                        |                  | 32.8                 |                                 |       |
|                      | CB Evening |         |           |          |                        |                  | 32.8                 |                                 |       |
|                      | CB Night   |         |           |          |                        |                  | 32.8                 |                                 |       |
| CC                   | 163016400  | 557,033 | 6,548,606 | 30.0     | 5.0                    | 45.0             | 38.8                 | 863                             | Yes   |
|                      | CC Day     |         |           |          |                        |                  | 32.4                 |                                 |       |
|                      | CC Evening |         |           |          |                        |                  | 32.4                 |                                 |       |
|                      | CC Night   |         |           |          |                        |                  | 32.4                 |                                 |       |
| CD                   | 163016486  | 557,216 | 6,548,227 | 30.6     | 5.0                    | 45.0             | 37.6                 | 1,109                           | Yes   |
|                      | CD Day     |         |           |          |                        |                  | 31.2                 |                                 |       |
|                      | CD Evening |         |           |          |                        |                  | 31.2                 |                                 |       |
|                      | CD Night   |         |           |          |                        |                  | 31.2                 |                                 |       |
| CE                   | 163016494  | 557,185 | 6,548,234 | 30.0     | 5.0                    | 45.0             | 37.7                 | 1,077                           | Yes   |
|                      | CE Day     |         |           |          |                        |                  | 31.3                 |                                 |       |
|                      | CE Evening |         |           |          |                        |                  | 31.3                 |                                 |       |
|                      | CE Night   |         |           |          |                        |                  | 31.3                 |                                 |       |
| CF                   | 163016516  | 557,173 | 6,548,308 | 30.0     | 5.0                    | 45.0             | 37.9                 | 1,051                           | Yes   |
|                      | CF Day     |         |           |          |                        |                  | 31.5                 |                                 |       |
|                      | CF Evening |         |           |          |                        |                  | 31.5                 |                                 |       |
|                      | CF Night   |         |           |          |                        |                  | 31.5                 |                                 |       |
| CG                   | 163016532  | 556,955 | 6,547,847 | 60.0     | 5.0                    | 45.0             | 38.3                 | 963                             | Yes   |
|                      | CG Day     |         |           |          |                        |                  | 31.9                 |                                 |       |
|                      | CG Evening |         |           |          |                        |                  | 31.9                 |                                 |       |
|                      | CG Night   |         |           |          |                        |                  | 31.9                 |                                 |       |
| CH                   | 163016540  | 556,962 | 6,547,792 | 51.6     | 5.0                    | 45.0             | 38.1                 | 990                             | Yes   |
|                      | CH Day     |         |           |          |                        |                  | 31.7                 |                                 |       |
|                      | CH Evening |         |           |          |                        |                  | 31.7                 |                                 |       |
|                      | CH Night   |         |           |          |                        |                  | 31.7                 |                                 |       |
| CI                   | 163016567  | 557,137 | 6,547,764 | 40.0     | 5.0                    | 45.0             | 37.2                 | 1,162                           | Yes   |
|                      | CI Day     |         |           |          |                        |                  | 30.8                 |                                 |       |
|                      | CI Evening |         |           |          |                        |                  | 30.8                 |                                 |       |
|                      | CI Night   |         |           |          |                        |                  | 30.8                 |                                 |       |
| CJ                   | 163016575  | 557,213 | 6,547,717 | 40.0     | 5.0                    | 45.0             | 36.8                 | 1,250                           | Yes   |
|                      | CJ Day     |         |           |          |                        |                  | 30.4                 |                                 |       |
|                      | CJ Evening |         |           |          |                        |                  | 30.4                 |                                 |       |

To be continued on next page...

## DECIBEL - Main Result

**Calculation:** Larvik Noise calculations, Best Estimate optimized Noise HH 120m

...continued from previous page

| Noise sensitive area |            |         |           |          | Demands                |                  | Sound level          |                                 | Demands fulfilled ? |  |
|----------------------|------------|---------|-----------|----------|------------------------|------------------|----------------------|---------------------------------|---------------------|--|
| No.                  | Name       | Easting | Northing  | Z<br>[m] | Imission height<br>[m] | Noise<br>[dB(A)] | From WTGs<br>[dB(A)] | Distance to noise demand<br>[m] | Noise               |  |
|                      | CJ Night   |         |           |          |                        |                  | 30.4                 |                                 |                     |  |
| CK                   | 163067390  | 555,886 | 6,546,318 | 138.5    | 5.0                    | 45.0             | 36.1                 | 1,390                           | Yes                 |  |
|                      | CK Day     |         |           |          |                        |                  | 29.7                 |                                 |                     |  |
|                      | CK Evening |         |           |          |                        |                  | 29.7                 |                                 |                     |  |
|                      | CK Night   |         |           |          |                        |                  | 29.7                 |                                 |                     |  |
| CL                   | 163067501  | 552,948 | 6,548,882 | 90.0     | 5.0                    | 45.0             | 38.5                 | 913                             | Yes                 |  |
|                      | CL Day     |         |           |          |                        |                  | 32.1                 |                                 |                     |  |
|                      | CL Evening |         |           |          |                        |                  | 32.1                 |                                 |                     |  |
|                      | CL Night   |         |           |          |                        |                  | 32.1                 |                                 |                     |  |
| CM                   | 163067536  | 553,008 | 6,547,895 | 60.0     | 5.0                    | 45.0             | 37.9                 | 1,039                           | Yes                 |  |
|                      | CM Day     |         |           |          |                        |                  | 31.5                 |                                 |                     |  |
|                      | CM Evening |         |           |          |                        |                  | 31.5                 |                                 |                     |  |
|                      | CM Night   |         |           |          |                        |                  | 31.5                 |                                 |                     |  |

## Distances (m)

### WTG

| NSA | 1    | 2    | 3    |
|-----|------|------|------|
| A   | 1990 | 2556 | 2262 |
| B   | 2192 | 2725 | 2696 |
| C   | 1796 | 2360 | 2067 |
| D   | 2169 | 2735 | 2439 |
| E   | 1374 | 1902 | 1892 |
| F   | 2112 | 2679 | 2386 |
| G   | 2221 | 2749 | 2729 |
| H   | 2080 | 2647 | 2354 |
| I   | 1729 | 2256 | 2244 |
| J   | 2088 | 2622 | 2592 |
| K   | 1269 | 1801 | 1786 |
| L   | 2753 | 2511 | 3019 |
| M   | 2135 | 2608 | 2678 |
| N   | 2241 | 1853 | 2365 |
| O   | 2226 | 1829 | 2340 |
| P   | 1098 | 939  | 1409 |
| Q   | 1408 | 1545 | 1033 |
| R   | 1696 | 2261 | 1969 |
| S   | 1639 | 2190 | 1866 |
| T   | 1300 | 1797 | 1840 |
| U   | 1891 | 2435 | 2386 |
| V   | 2359 | 1820 | 2255 |
| W   | 2119 | 1741 | 2254 |
| X   | 2169 | 1786 | 2298 |
| Y   | 2698 | 2401 | 2914 |
| Z   | 2768 | 2482 | 2994 |
| AA  | 2325 | 1837 | 2317 |
| AB  | 1026 | 1060 | 1453 |
| AC  | 1046 | 1092 | 1481 |
| AD  | 1679 | 1701 | 2116 |
| AE  | 1674 | 2178 | 1785 |
| AF  | 1375 | 1933 | 1635 |
| AG  | 1267 | 1793 | 1789 |
| AH  | 1322 | 1849 | 1842 |
| AI  | 1398 | 1934 | 1908 |
| AJ  | 1641 | 2167 | 2157 |
| AK  | 1584 | 2116 | 2097 |
| AL  | 1408 | 1937 | 1926 |
| AM  | 2173 | 2701 | 2681 |
| AN  | 1825 | 2304 | 2368 |
| AO  | 1958 | 2432 | 2501 |
| AP  | 2250 | 2786 | 2748 |
| AQ  | 1069 | 1647 | 1465 |
| AR  | 892  | 1455 | 1378 |
| AS  | 928  | 1491 | 1414 |
| AT  | 1284 | 1854 | 1595 |

To be continued on next page...

**DECIBEL - Main Result****Calculation:** Larvik Noise calculations, Best Estimate optimized Noise HH 120m

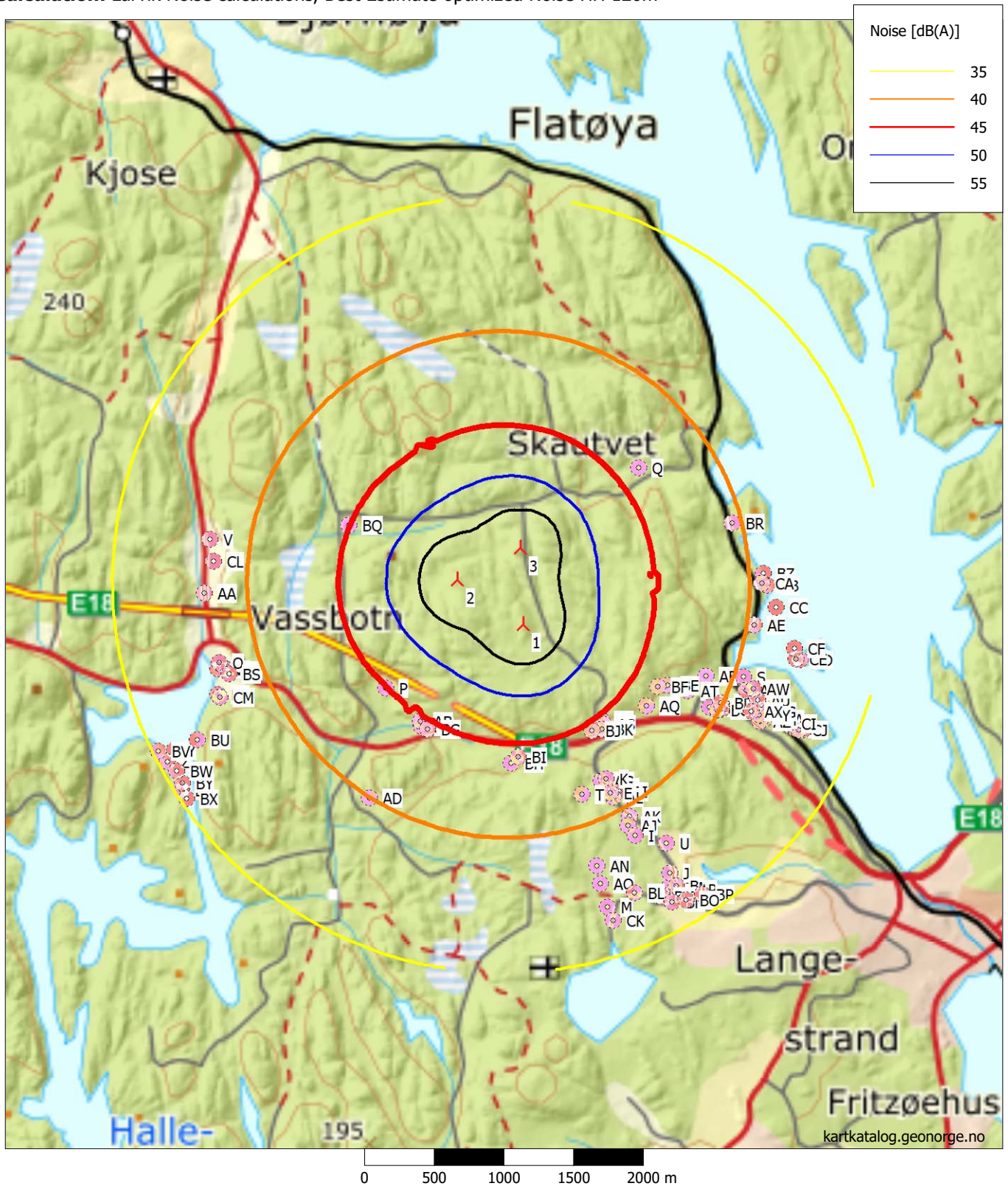
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**WTG**

| NSA | 1    | 2    | 3    |
|-----|------|------|------|
| AU  | 1785 | 2347 | 2045 |
| AV  | 1689 | 2247 | 1939 |
| AW  | 1733 | 2290 | 1976 |
| AX  | 1772 | 2339 | 2055 |
| AY  | 1832 | 2400 | 2114 |
| AZ  | 1851 | 2420 | 2142 |
| BA  | 1566 | 2137 | 1873 |
| BB  | 1476 | 2048 | 1792 |
| BC  | 1537 | 2109 | 1850 |
| BD  | 1538 | 2107 | 1835 |
| BE  | 1135 | 1706 | 1460 |
| BF  | 1076 | 1650 | 1419 |
| BG  | 1030 | 1103 | 1478 |
| BH  | 1010 | 1385 | 1563 |
| BI  | 960  | 1357 | 1516 |
| BJ  | 915  | 1465 | 1423 |
| BK  | 950  | 1508 | 1442 |
| BL  | 2101 | 2603 | 2630 |
| BM  | 2204 | 2723 | 2719 |
| BN  | 2279 | 2804 | 2790 |
| BO  | 2319 | 2853 | 2821 |
| BP  | 2346 | 2889 | 2836 |
| BQ  | 1455 | 879  | 1254 |
| BR  | 1685 | 2038 | 1547 |
| BS  | 2165 | 1789 | 2303 |
| BT  | 2276 | 1926 | 2441 |
| BU  | 2507 | 2210 | 2723 |
| BV  | 2804 | 2498 | 3013 |
| BW  | 2727 | 2458 | 2969 |
| BX  | 2752 | 2525 | 3030 |
| BY  | 2729 | 2479 | 2988 |
| BZ  | 1782 | 2224 | 1775 |
| CA  | 1756 | 2210 | 1770 |
| CB  | 1788 | 2245 | 1807 |
| CC  | 1836 | 2320 | 1902 |
| CD  | 2026 | 2556 | 2187 |
| CE  | 1994 | 2524 | 2155 |
| CF  | 1974 | 2497 | 2118 |
| CG  | 1853 | 2419 | 2127 |
| CH  | 1879 | 2447 | 2163 |
| CI  | 2052 | 2618 | 2324 |
| CJ  | 2139 | 2706 | 2413 |
| CK  | 2241 | 2714 | 2783 |
| CL  | 2296 | 1775 | 2230 |
| CM  | 2265 | 1921 | 2435 |

## DECIBEL - Map Highest noise value

**Calculation:** Larvik Noise calculations, Best Estimate optimized Noise HH 120m



Map: Topografisk norgeskart , Print scale 1:40,000, Map center UTM (north)-WGS84 Zone: 32 East: 554,961 North: 6,548,731  
 New WTG  Noise sensitive area  
 Noise calculation model: Norwegian 2012. Wind speed: Highest noise value  
 Height above sea level from active line object

## PARK - Main Result

**Calculation:** Larvik 3 x V126 3p3 MW HH 120 m, Best Estimate of AEP for optimization

### Wake Model

N.O. Jensen (RISØ/EMD)

#### Calculation Settings

|                                     |                                                    |
|-------------------------------------|----------------------------------------------------|
| Air density calculation mode        | Individual per WTG                                 |
| Result for WTG at hub altitude      | 1.221 kg/m <sup>3</sup> to 1.224 kg/m <sup>3</sup> |
| Air density relative to standard    | 99.7 % to 100.0 %                                  |
| Hub altitude above sea level (asl)  | 280.0 m to 310.0 m                                 |
| Annual mean temperature at hub alt. | 5.2 °C to 5.4 °C                                   |
| Pressure at WTGs                    | 975.5 hPa to 979.1 hPa                             |

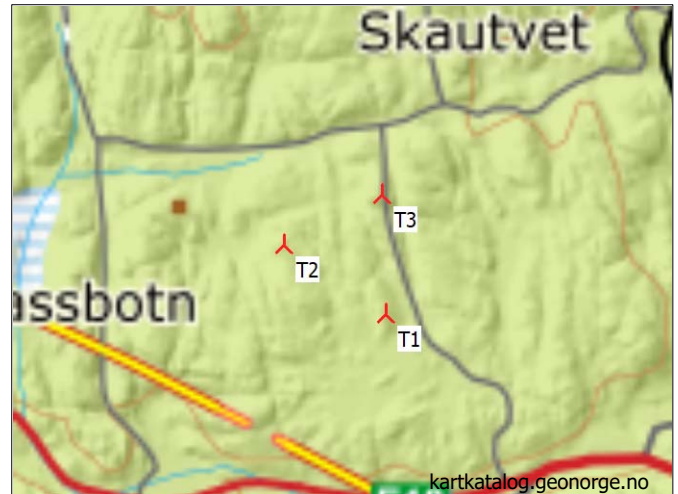
#### Wake Model Parameters

|                          |                     |
|--------------------------|---------------------|
| Terrain type             | Wake decay constant |
| HH:150m Forested/complex | 0.074               |

#### Displacement heights from objects

#### Wake calculation settings

| Angle [°]                     | Wind speed [m/s] |
|-------------------------------|------------------|
| start end step start end step |                  |
| 0.5 360.0 1.0                 | 0.5 30.5 1.0     |



Scale 1:35,000

▲ New WTG

### Resource file(s)

L:\KUNDER\422\_Havgul\_Nordic\_AS\001\_Larvik\_preliminary\_analysis\Analyses\2018\_06\_Prelim\_EYA\04\_WAsP\03\_Wind\_maps\2\2\_loc2.wrg

### Calculated Annual Energy for Wind Farm

| WTG combination | Result   | GROSS (no loss) | Park       | Capacity | Mean WTG | Full load    | Mean wind speed |
|-----------------|----------|-----------------|------------|----------|----------|--------------|-----------------|
|                 | PARK     | Free WTGs       | efficiency | factor   | result   | hours        | @hub height     |
|                 | [MWh/y]  | [MWh/y]         | [%]        | [%]      | [MWh/y]  | [Hours/year] | [m/s]           |
| Wind farm       | 38,888.3 | 40,051.3        | 97.1       | 44.8     | 12,962.8 | 3,928        | 7.5             |

\*) Based on wake reduced results, but no other losses included

### Calculated Annual Energy for each of 3 new WTGs with total 9.9 MW rated power

| WTG type |       |           |                            | Power curve  |                |            |         | Annual Energy                |          | Park       |                 |                      |
|----------|-------|-----------|----------------------------|--------------|----------------|------------|---------|------------------------------|----------|------------|-----------------|----------------------|
| Links    | Valid | Manufact. | Type-generator             | Power, rated | Rotor diameter | Hub height | Creator | Name                         | Result   | Efficiency | Capacity factor | Free mean wind speed |
|          |       |           |                            | [kW]         | [m]            | [m]        |         |                              | [MWh]    | [%]        | [%]             | [m/s]                |
| 1 A      | Yes   | VESTAS    | V126-3.3 GridStreame-3,300 | 3,300        | 126.0          | 120.0      | EMD     | Level 0 - - Mode 0 - 04-2014 | 12,725.5 | 97.39      | 44.0            | 7.37                 |
| 2 A      | Yes   | VESTAS    | V126-3.3 GridStreame-3,300 | 3,300        | 126.0          | 120.0      | EMD     | Level 0 - - Mode 0 - 04-2014 | 12,876.6 | 97.09      | 44.5            | 7.45                 |
| 3 A      | Yes   | VESTAS    | V126-3.3 GridStreame-3,300 | 3,300        | 126.0          | 120.0      | EMD     | Level 0 - - Mode 0 - 04-2014 | 13,286.2 | 96.83      | 45.9            | 7.63                 |

Annual Energy results do not include any losses apart from wake losses. Additional losses and uncertainty must be considered for an investment decision.

### WTG siting

#### UTM (north)-WGS84 Zone: 32

|       | Easting | Northing  | Z     | Row data/Description |
|-------|---------|-----------|-------|----------------------|
|       |         |           | [m]   |                      |
| 1 New | 555,203 | 6,548,453 | 160.0 | T1                   |
| 2 New | 554,719 | 6,548,769 | 170.0 | T2                   |
| 3 New | 555,174 | 6,549,009 | 190.0 | T3                   |

## PARK - Wind Data Analysis

**Calculation:** Larvik 3 x V126 3p3 MW HH 120 m, Best Estimate of AEP for optimization **Wind data:** A - Resource file(s); Hub height: 120.0

### Site coordinates

UTM (north)-WGS84 Zone: 32  
East: 555,203 North: 6,548,453  
T1

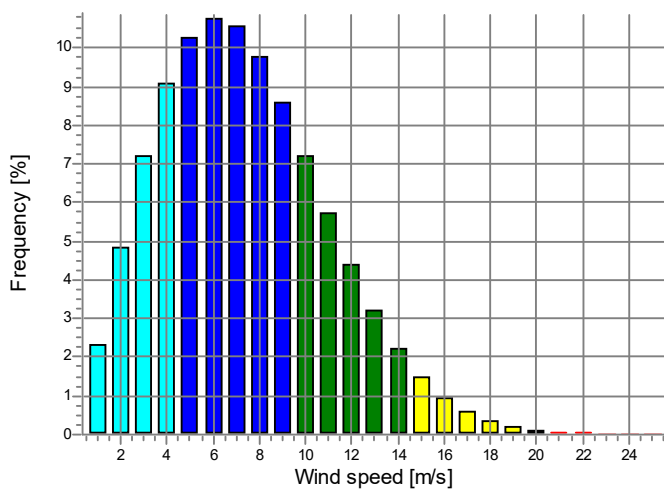
### Resource file

L:\KUNDER\422\_Havgul\_Nordic\_AS\001\_Larvik\_preliminary\_analysis\Analysis\2018\_06\_Prelim\_EYA\04\_WAsP\03\_Wind\_maps\02\_loc2.wrg

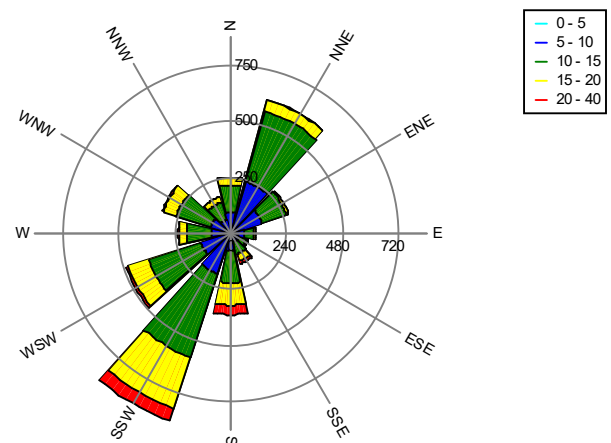
### Weibull Data

| Sector | A- parameter<br>[m/s] | Wind speed<br>[m/s] | k- parameter | Frequency<br>[%] |
|--------|-----------------------|---------------------|--------------|------------------|
| 0 N    | 8.30                  | 7.35                | 2.310        | 6.9              |
| 1 NNE  | 8.80                  | 7.83                | 2.740        | 15.9             |
| 2 ENE  | 7.40                  | 6.56                | 2.400        | 10.9             |
| 3 E    | 6.50                  | 5.76                | 2.040        | 5.6              |
| 4 ESE  | 6.30                  | 5.61                | 1.770        | 4.0              |
| 5 SSE  | 7.10                  | 6.36                | 1.610        | 4.1              |
| 6 S    | 8.30                  | 7.39                | 1.760        | 7.5              |
| 7 SSW  | 9.40                  | 8.32                | 2.145        | 15.6             |
| 8 WSW  | 8.97                  | 7.94                | 2.300        | 10.7             |
| 9 W    | 8.00                  | 7.08                | 2.150        | 6.8              |
| 10 WNW | 8.90                  | 7.89                | 2.320        | 7.2              |
| 11 NNW | 8.10                  | 7.17                | 2.180        | 4.8              |
| All    | 8.32                  | 7.37                | 2.133        | 100.0            |

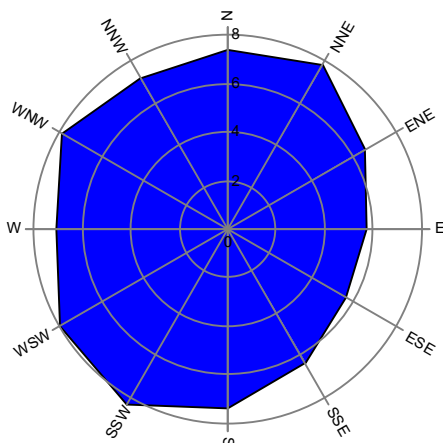
Weibull Distribution



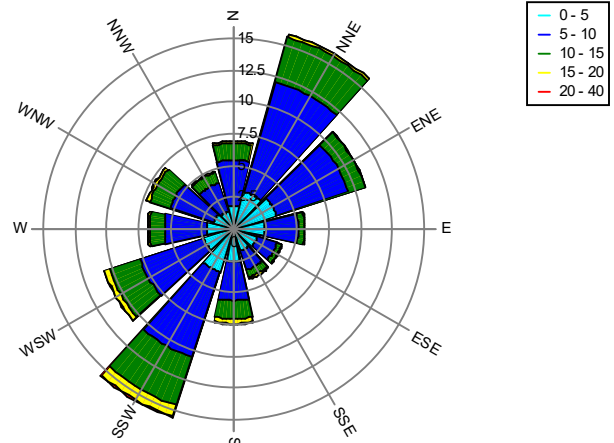
Energy Rose (kWh/m²/year)



Mean wind speed (m/s)



Frequency (%)



## PARK - Wind Data Analysis

**Calculation:** Larvik 3 x V126 3p3 MW HH 120 m, Best Estimate of AEP for optimization **Wind data:** A - Resource file(s); Hub height: 120.0

### Site coordinates

UTM (north)-WGS84 Zone: 32  
East: 554,719 North: 6,548,769  
T2

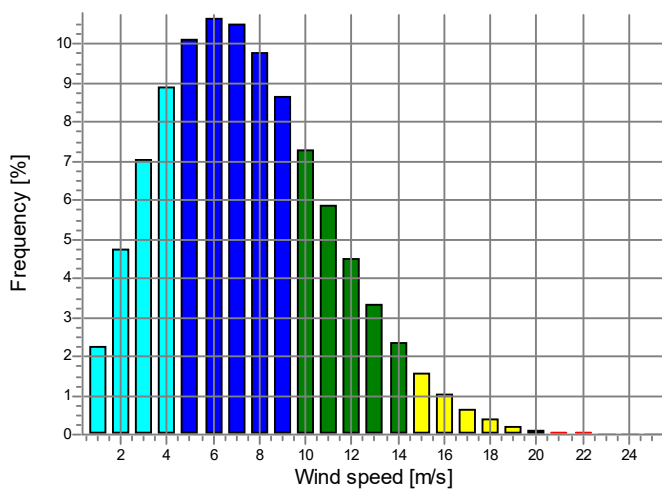
### Resource file

L:\KUNDER\422\_Havgul\_Nordic\_AS\001\_Larvik\_preliminary\_analysis\Analysis\2018\_06\_Prelim\_EYA\04\_WAsP\03\_Wind\_maps\A2\A2\_loc2.wrg

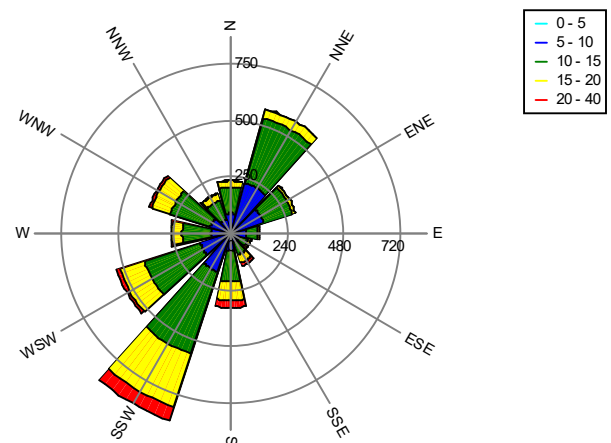
### Weibull Data

| Sector | A- parameter<br>[m/s] | Wind speed<br>[m/s] | k- parameter | Frequency<br>[%] |
|--------|-----------------------|---------------------|--------------|------------------|
| 0 N    | 8.20                  | 7.26                | 2.310        | 6.7              |
| 1 NNE  | 8.70                  | 7.74                | 2.740        | 15.3             |
| 2 ENE  | 7.60                  | 6.74                | 2.421        | 11.2             |
| 3 E    | 6.80                  | 6.02                | 2.040        | 5.8              |
| 4 ESE  | 6.50                  | 5.79                | 1.760        | 4.1              |
| 5 SSE  | 7.30                  | 6.54                | 1.620        | 4.1              |
| 6 S    | 8.10                  | 7.21                | 1.770        | 7.4              |
| 7 SSW  | 9.50                  | 8.41                | 2.140        | 15.0             |
| 8 WSW  | 9.10                  | 8.06                | 2.290        | 11.0             |
| 9 W    | 8.20                  | 7.26                | 2.140        | 7.1              |
| 10 WNW | 9.31                  | 8.25                | 2.310        | 7.4              |
| 11 NNW | 8.31                  | 7.36                | 2.180        | 4.9              |
| All    | 8.41                  | 7.45                | 2.137        | 100.0            |

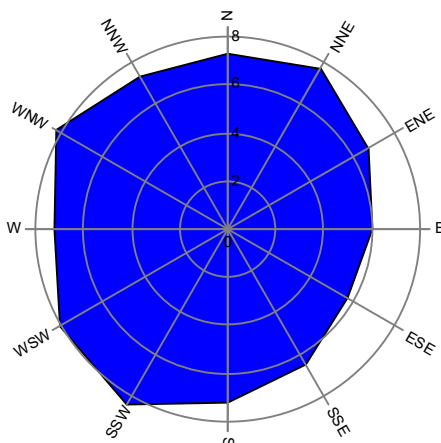
Weibull Distribution



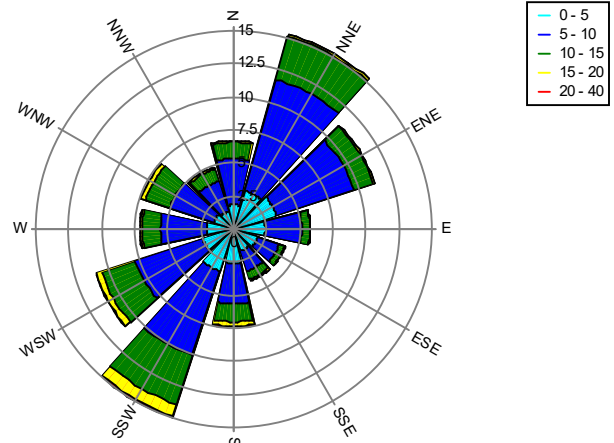
Energy Rose (kWh/m<sup>2</sup>/year)



Mean wind speed (m/s)



Frequency (%)



## PARK - Wind Data Analysis

**Calculation:** Larvik 3 x V126 3p3 MW HH 120 m, Best Estimate of AEP for optimization **Wind data:** A - Resource file(s); Hub height: 120.0

### Site coordinates

UTM (north)-WGS84 Zone: 32

East: 555,174 North: 6,549,009

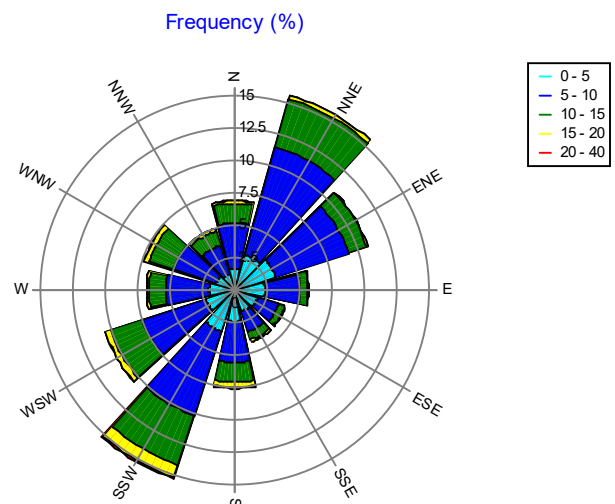
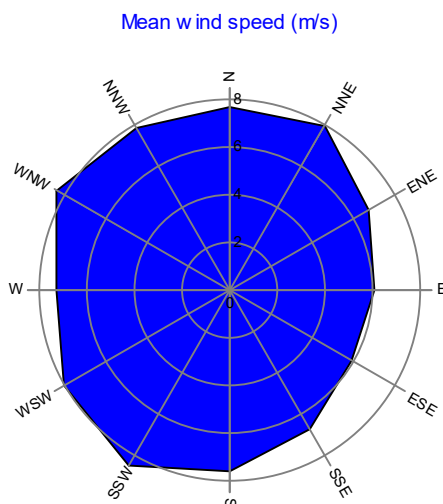
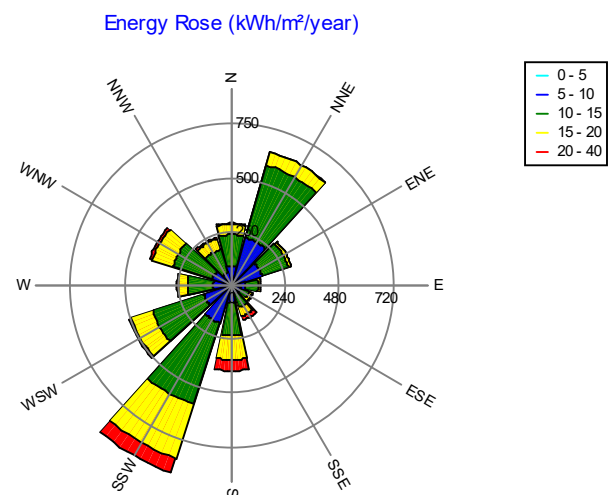
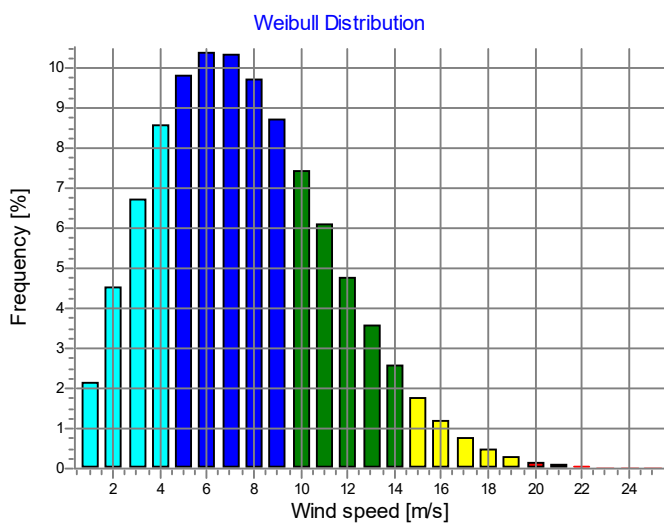
T3

## Resource file

L:\KUNDER\422\_Havgul\_Nordic\_AS\001\_Larvik\_preliminary\_analysis\Analyses\2018\_06\_Prelim\_EYA\04\_WAsP\03\_Wind\_maps\A2\A2\_loc2.wrg

## Weibull Data

| Sector | A- parameter<br>[m/s] | Wind speed<br>[m/s] | k- parameter | Frequency<br>[%] |
|--------|-----------------------|---------------------|--------------|------------------|
| 0 N    | 8.70                  | 7.71                | 2.310        | 6.9              |
| 1 NNE  | 9.00                  | 8.01                | 2.740        | 15.6             |
| 2 ENE  | 7.60                  | 6.74                | 2.410        | 10.8             |
| 3 E    | 6.90                  | 6.11                | 2.040        | 5.7              |
| 4 ESE  | 6.70                  | 5.96                | 1.770        | 4.1              |
| 5 SSE  | 7.50                  | 6.72                | 1.610        | 4.2              |
| 6 S    | 8.54                  | 7.60                | 1.770        | 7.6              |
| 7 SSW  | 9.60                  | 8.50                | 2.150        | 15.3             |
| 8 WSW  | 9.10                  | 8.06                | 2.310        | 10.5             |
| 9 W    | 8.20                  | 7.26                | 2.140        | 6.8              |
| 10 WNW | 9.50                  | 8.42                | 2.320        | 7.4              |
| 11 NNW | 8.89                  | 7.88                | 2.170        | 5.0              |
| All    | 8.61                  | 7.63                | 2.138        | 100.0            |



## PARK - Map

**Calculation:** Larvik 3 x V126 3p3 MW HH 120 m, Best Estimate of AEP for optimization



Map: Topografisk norgeskart , Print scale 1:45,000, Map center UTM (north)-WGS84 Zone: 32 East: 554,961 North: 6,548,731

⚡ New WTG