

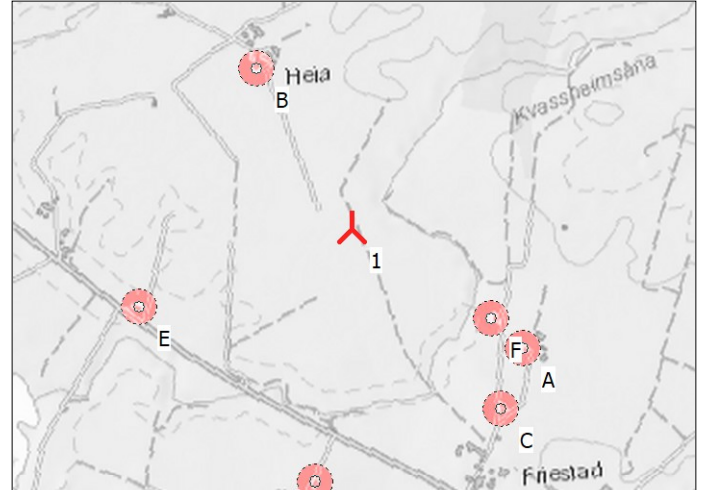
## NORD2000 - Main Result

Calculation: 202012\_1xE82 E4\_2.35MW\_68.9mHH\_wc\_Alt0\_FineRes

### Assumptions

Weather stability	70.0 %
Relative humidity	8.0 °C
Air temperature	2.0 m
Height for air temperature	Night:Clear sky
Stability parameters	0.0100
Inverse Monin Obukhov length	0.0500
Temperature scale T*	
Terrain	
Elevation based on object	
Elevation Grid Data Object: Friestad_EMDGrid_0.wpg (1)	
Roughness based on line object	
Roughness lines - exported from Area object (Roughness): REGIONS_Friestad_3.w2r (6)	
Terrain type based on area object	
Terrain Hardness (Background: 2000)	
Month for calculation	January
Wind speed criteria	
Uniform wind speed at 10 m agl.	
Wind speed	Max noise wind speed
Max noise wind speed	All receptors downwind
Wind direction	4.0 m
Height above ground level for receiver	
Wind speed has been extrapolated to calculation height using IEC profile shear (z0 = 0.05m)	
No stability correction	6.005
Version	

All coordinates are in  
UTM (north)-ETRS89 Zone: 32



Scale 1:20 000  
New WTG Noise sensitive area

### WTGs

Easting	Northing	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Setting	Noise data	
				Valid	Manufact.	Type-generator					Creator	Name
1	307 707	6 494 870	11.8 ENERCON E-82 E4-Frie...	Yes	ENERCON	E-82 E4-Friestad-2	350	2 350	82.0	68.9	Day	USER Level 0 - 2350kW - 102.0 dB - 06/2018
											Evening	USER Level 0 - 2350kW - 102.0 dB - 06/2018
											Night	USER Level 0 - 2350kW - 102.0 dB - 06/2018

### Calculation Results

#### Sound level

Noise sensitive area		Easting	Northing	Z [m]	Immission height [m]	Sound level	
No.	Name					From WTGs	[dB(A)]
A A	Friestad Øst	308 159	6 494 555	14.4	4.0	42.2	
A	Day					35.8	
A	Evening					35.8	
A	Night					35.8	
B B	Friestad Heia	307 457	6 495 296	15.0	4.0	43.2	
B	Day					36.9	
B	Evening					36.9	
B	Night					36.9	
C C	Friestad Friestad Gård	308 101	6 494 395	17.2	4.0	41.0	
C	Day					34.6	
C	Evening					34.6	
C	Night					34.6	
D D	Friestad Kvasshheim	307 611	6 494 201	13.9	4.0	40.1	
D	Day					33.7	
D	Evening					33.7	
D	Night					33.7	
E E	Friestad Sør	307 146	6 494 665	7.5	4.0	41.4	
E	Day					35.0	
E	Evening					35.0	
E	Night					35.0	
F F	Friestad Øst Fritidsbolig	308 076	6 494 635	10.4	4.0	44.4	
F	Day					38.0	
F	Evening					38.0	
F	Night					38.0	

Project:  
Friestad

Licensed user:  
Meventus AS  
Kongsgård Allé 59  
NO-4632 Kristiansand  
+47 3860 7115  
Håkon Sletsjøe / Hakon@meventus.com  
Calculated:  
15.12.2020 09:17/3.4.388

## NORD2000 - Assumptions for NORD2000 calculation

Calculation: 202012\_1xE82 E4\_2.35MW\_68.9mHH\_wc\_Alt0\_FineRes

### Assumptions

Weather stability  
Relative humidity 70.0 %  
Air temperature 8.0 °C  
Height for air temperature 2.0 m  
Stability parameters Night; Clear sky  
Inverse Monin Obukhov length 0.0100  
Temperature scale T\* 0.0500

### Terrain

Elevation based on object  
Elevation Grid Data Object: Friestad\_EMDGrid\_0.wpg (1)  
Roughness based on line object  
Roughness lines - exported from Area object (Roughness): REGIONS\_Friestad\_3.w2r (6)  
Terrain type based on area object  
Terrain Hardness (Background: 2000)  
Month for calculation January

### Wind speed criteria

Uniform wind speed at 10 m agl.  
Wind speed Max noise wind speed  
Max noise wind speed All receptors downwind  
Wind direction 4.0 m  
Height above ground level for receiver  
Wind speed has been extrapolated to calculation height using  
IEC profile shear ( $z_0 = 0.05\text{m}$ )  
No stability correction 6.005  
Version

All coordinates are in  
UTM (north)-ETRS89 Zone: 32

### Setup for Lden calculation

Variant	Name	From hour	To hour	Hours	Penalty [dB]	Days per year
1	Day	7	19	12	0	365
2	Evening	19	23	4	5	365
3	Night	23	7	8	10	365

Project:  
Friestad

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Calculated:  
15.12.2020 09:17/3.4.388

## NORD2000 - Assumptions for NORD2000 calculation

Calculation: 202012\_1xE82 E4\_2.35MW\_68.9mHH\_wc\_Alt0\_FineRes

WTG: ENERCON E-82 E4-Friestad 2350 82.0 !O!

Noise: Level 0 - 2350kW - 102.0 dB - 06/2018

Source	Source/Date	Creator	Edited
Enercon	18.06.2018	USER	05.11.2018 12:35

Wind speed [m/s]	LwA_ref [dB(A)]	Octave data								
		63 [dB(A)]	125 [dB(A)]	250 [dB(A)]	500 [dB(A)]	1000 [dB(A)]	2000 [dB(A)]	4000 [dB(A)]	8000 [dB(A)]	
7.0	96.3	80.8	85.8	87.9	90.2	90.4	89.0	82.2	67.1	
8.0	98.6	82.8	87.8	89.9	92.5	92.8	91.5	84.8	69.8	
9.0	100.0	84.2	89.3	91.5	94.1	94.3	92.6	85.5	70.6	
10.0	100.9	85.1	90.3	92.6	95.2	95.2	93.4	85.9	70.7	
11.0	101.5	85.6	90.8	93.2	95.8	95.8	94.0	86.4	71.0	
12.0	102.0	86.0	91.2	93.5	96.1	96.4	94.6	87.4	72.5	
13.0	102.0	85.8	90.8	92.6	95.1	96.2	96.0	89.9	73.7	
14.0	102.0	85.5	90.4	92.1	94.5	96.4	96.7	89.3	72.7	
15.0	102.0	85.6	90.5	92.1	94.6	96.4	96.6	89.1	72.0	

NSA: A Friestad Øst-A

Predefined calculation standard: Yellow zone

Immission height(a.g.l.): Use standard value from calculation model

Distance demand: 0.0 m

NSA: B Friestad Heia-B

Predefined calculation standard: Yellow zone

Immission height(a.g.l.): Use standard value from calculation model

Distance demand: 0.0 m

NSA: C Friestad Friestad Gård-C

Predefined calculation standard: Yellow zone

Immission height(a.g.l.): Use standard value from calculation model

Distance demand: 0.0 m

NSA: D Friestad Kvasheim-D

Predefined calculation standard: Yellow zone

Immission height(a.g.l.): Use standard value from calculation model

Distance demand: 0.0 m

NSA: E Friestad Sør-E

Predefined calculation standard: Yellow zone

Immission height(a.g.l.): Use standard value from calculation model

Distance demand: 0.0 m

NSA: F Friestad Øst Fritidsbolig-F

Predefined calculation standard: Yellow zone

Immission height(a.g.l.): Use standard value from calculation model

Distance demand: 0.0 m

## NORD2000 - Details

Calculation: 202012\_1xE82 E4\_2.35MW\_68.9mHH\_wc\_Alt0\_FineRes

Calculation Results

### Noise sensitive area: A A Friestad Øst

WTG		Sound level										Source noise	Octave data [Hz]								
No.	Distance	Wind speed at hub height	Variant	63	125	250	500	1000	2000	4000	8000	LwA,ref	63	125	250	500	1000	2000	4000	8000	
	[m]	[m/s]		[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	
1	551	12.0	Day	35.79	21.6	23.5	29.3	31.3	30.0	23.8	1.7	-55.8	102.01	86.0	91.2	93.5	96.1	96.4	94.6	87.4	72.5
1	551	12.0	Evening	35.79	21.6	23.5	29.3	31.3	30.0	23.8	1.7	-55.8	102.01	86.0	91.2	93.5	96.1	96.4	94.6	87.4	72.5
1	551	12.0	Night	35.79	21.6	23.5	29.3	31.3	30.0	23.8	1.7	-55.8	102.01	86.0	91.2	93.5	96.1	96.4	94.6	87.4	72.5

### Noise sensitive area: B B Friestad Heia

WTG		Sound level										Source noise	Octave data [Hz]								
No.	Distance	Wind speed at hub height	Variant	63	125	250	500	1000	2000	4000	8000	LwA,ref	63	125	250	500	1000	2000	4000	8000	
	[m]	[m/s]		[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	
1	494	12.0	Day	36.85	19.2	26.2	30.0	32.3	31.1	25.3	4.7	-49.4	102.01	86.0	91.2	93.5	96.1	96.4	94.6	87.4	72.5
1	494	12.0	Evening	36.85	19.2	26.2	30.0	32.3	31.1	25.3	4.7	-49.4	102.01	86.0	91.2	93.5	96.1	96.4	94.6	87.4	72.5
1	494	12.0	Night	36.85	19.2	26.2	30.0	32.3	31.1	25.3	4.7	-49.4	102.01	86.0	91.2	93.5	96.1	96.4	94.6	87.4	72.5

### Noise sensitive area: C C Friestad Friestad Gård

WTG		Sound level										Source noise	Octave data [Hz]								
No.	Distance	Wind speed at hub height	Variant	63	125	250	500	1000	2000	4000	8000	LwA,ref	63	125	250	500	1000	2000	4000	8000	
	[m]	[m/s]		[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	
1	617	12.0	Day	34.64	20.4	21.9	28.4	30.2	28.7	22.1	-1.5	-62.7	102.01	86.0	91.2	93.5	96.1	96.4	94.6	87.4	72.5
1	617	12.0	Evening	34.64	20.4	21.9	28.4	30.2	28.7	22.1	-1.5	-62.7	102.01	86.0	91.2	93.5	96.1	96.4	94.6	87.4	72.5
1	617	12.0	Night	34.64	20.4	21.9	28.4	30.2	28.7	22.1	-1.5	-62.7	102.01	86.0	91.2	93.5	96.1	96.4	94.6	87.4	72.5

### Noise sensitive area: D D Friestad Kvassheim

WTG		Sound level										Source noise	Octave data [Hz]								
No.	Distance	Wind speed at hub height	Variant	63	125	250	500	1000	2000	4000	8000	LwA,ref	63	125	250	500	1000	2000	4000	8000	
	[m]	[m/s]		[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	
1	676	12.0	Day	33.74	19.3	20.9	28.0	29.1	27.7	20.7	-4.3	-68.6	102.01	86.0	91.2	93.5	96.1	96.4	94.6	87.4	72.5
1	676	12.0	Evening	33.74	19.3	20.9	28.0	29.1	27.7	20.7	-4.3	-68.6	102.01	86.0	91.2	93.5	96.1	96.4	94.6	87.4	72.5
1	676	12.0	Night	33.74	19.3	20.9	28.0	29.1	27.7	20.7	-4.3	-68.6	102.01	86.0	91.2	93.5	96.1	96.4	94.6	87.4	72.5

### Noise sensitive area: E E Friestad Sør

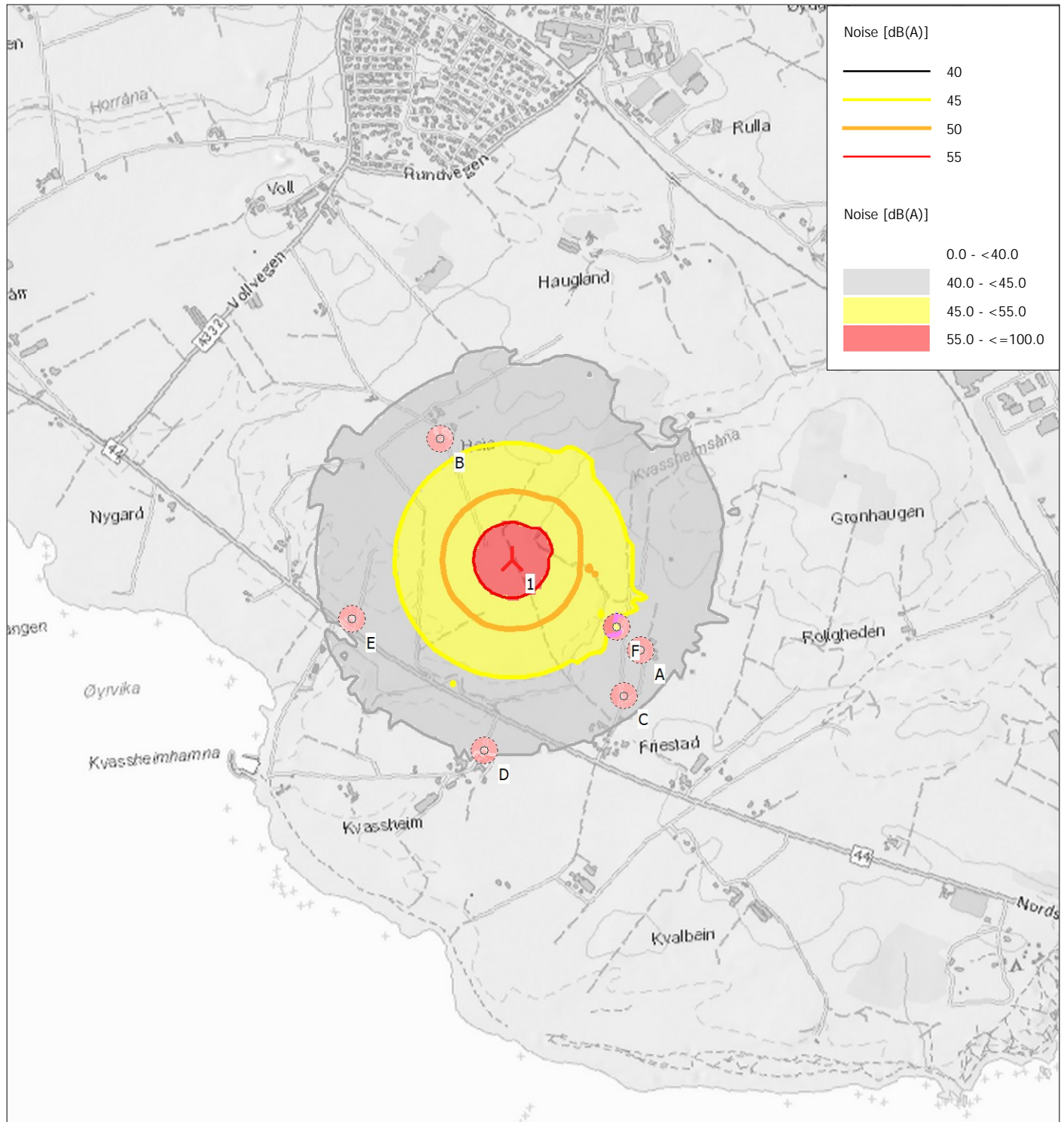
WTG		Sound level										Source noise	Octave data [Hz]								
No.	Distance	Wind speed at hub height	Variant	63	125	250	500	1000	2000	4000	8000	LwA,ref	63	125	250	500	1000	2000	4000	8000	
	[m]	[m/s]		[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	
1	597	12.0	Day	34.98	20.2	22.4	28.9	30.4	29.1	22.6	-0.6	-60.7	102.01	86.0	91.2	93.5	96.1	96.4	94.6	87.4	72.5
1	597	12.0	Evening	34.98	20.2	22.4	28.9	30.4	29.1	22.6	-0.6	-60.7	102.01	86.0	91.2	93.5	96.1	96.4	94.6	87.4	72.5
1	597	12.0	Night	34.98	20.2	22.4	28.9	30.4	29.1	22.6	-0.6	-60.7	102.01	86.0	91.2	93.5	96.1	96.4	94.6	87.4	72.5

### Noise sensitive area: F F Friestad Øst Fritidsbolig

WTG		Sound level										Source noise	Octave data [Hz]								
No.	Distance	Wind speed at hub height	Variant	63	125	250	500	1000	2000	4000	8000	LwA,ref	63	125	250	500	1000	2000	4000	8000	
	[m]	[m/s]		[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	[dB(A)]	
1	438	12.0	Day	38.02	19.3	28.3	30.9	33.3	32.3	27.0	7.7	-42.9	102.01	86.0	91.2	93.5	96.1	96.4	94.6	87.4	72.5
1	438	12.0	Evening	38.02	19.3	28.3	30.9	33.3	32.3	27.0	7.7	-42.9	102.01	86.0	91.2	93.5	96.1	96.4	94.6	87.4	72.5
1	438	12.0	Night	38.02	19.3	28.3	30.9	33.3	32.3	27.0	7.7	-42.9	102.01	86.0	91.2	93.5	96.1	96.4	94.6	87.4	72.5

### NORD2000 - Highest noise value

Calculation: 202012\_1xE82 E4\_2.35MW\_68.9mHH\_wc\_Alt0\_FineRes



Map: Bitmap map: Friestad\_backgroundMap.png , Print scale 1:20 000, Map center UTM (north)-ETRS89 Zone: 32 East: 307 599 North: 6 494 700

New WTG Noise sensitive area