

Project:
Friestad

Licensed user:
Meventus AS
Kongsgård Allé 59
NO-4632 Kristiansand
+47 3860 7115
Data / data@meventus.com
Calculated:
26.04.2019 15:07/3.2.743

NORD2000 - Main Result

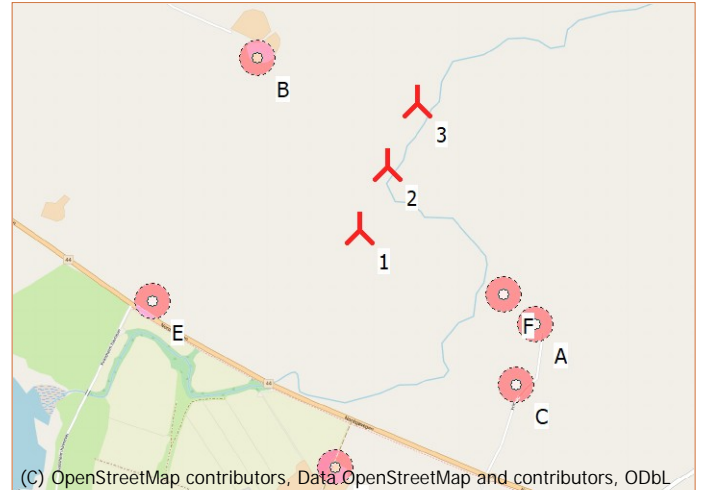
Calculation: 201904_3xE48 E4_0.8MW_64mHH_wc_FineRes

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
Wind direction All receptors downwind
Height above ground level for receiver 4.0 m
Wind speed has been extrapolated to calculation height using IEC profile shear (z0 = 0.05m)
No stability correction
Version 5.022



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

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	307,703	6,494,826	11.1	ENERCON E-48 800 4...	Yes	ENERCON	E-48-800	800	48.0	64.0	Day Evening Night	EMD EMD EMD	Level 0 - official - 800kW - 02/2011 Level 0 - official - 800kW - 02/2011 Level 0 - official - 800kW - 02/2011
2	307,788	6,494,991	9.4	ENERCON E-48 800 4...	Yes	ENERCON	E-48-800	800	48.0	64.0	Day Evening Night	EMD EMD EMD	Level 0 - official - 800kW - 02/2011 Level 0 - official - 800kW - 02/2011 Level 0 - official - 800kW - 02/2011
3	307,872	6,495,157	12.8	ENERCON E-48 800 4...	Yes	ENERCON	E-48-800	800	48.0	64.0	Day Evening Night	EMD EMD EMD	Level 0 - official - 800kW - 02/2011 Level 0 - official - 800kW - 02/2011 Level 0 - official - 800kW - 02/2011

Calculation Results

Sound level

No.	Name	Easting	Northing	Z	Imission height [m]	Sound level	
						From WTGs	[dB(A)]
A A	Friestad Øst	308,159	6,494,555	14.4	4.0	47.0	
A	Day					40.7	
A	Evening					40.7	
A	Night					40.7	
B B	Friestad Heia	307,457	6,495,296	15.0	4.0	49.2	
B	Day					42.8	
B	Evening					42.8	
B	Night					42.8	
C C	Friestad Friestad Gård	308,101	6,494,395	17.2	4.0	45.7	
C	Day					39.3	
C	Evening					39.3	
C	Night					39.3	
D D	Friestad Kvassheim	307,611	6,494,201	13.9	4.0	44.3	
D	Day					37.9	
D	Evening					37.9	
D	Night					37.9	
E E	Friestad Sor	307,146	6,494,665	7.5	4.0	45.3	
E	Day					38.9	
E	Evening					38.9	
E	Night					38.9	
F F	Friestad Øst Fritidsbolig	308,076	6,494,635	10.4	4.0	49.3	

To be continued on next page...

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NORD2000 - Main Result

Calculation: 201904_3xE48 E4_0.8MW_64mHH_wc_FineRes

...continued from previous page

Noise sensitive area					Sound level	
No.	Name	Easting	Northing	Z [m]	Imission height [m]	From WTGs [dB(A)]
	F Day					42.9
	F Evening					42.9
	F Night					42.9

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NORD2000 - Assumptions for NORD2000 calculation

Calculation: 201904_3xE48 E4_0.8MW_64mHH_wc_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 (z0 = 0.05m)	
No stability correction	5.022
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

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NORD2000 - Assumptions for NORD2000 calculation

Calculation: 201904_3xE48 E4_0.8MW_64mHH_wc_FineRes

WTG: ENERCON E-48 800 48.0 IO!

Noise: Level 0 - official - 800kW - 02/2011

Source Source/Date Creator Edited

Enercon 04.02.2011 EMD 26.02.2015 12:24

According to Enercon specification SIAS-04-SPL E48 OM I Rev3_0ger-ger.pdf dated 04-02-2011

Wind speed [m/s]	LwA,ref [dB(A)]
7.0	95.0
8.0	98.1
9.0	100.2
10.0	101.4
11.0	101.8
12.0	102.4
13.0	102.5
14.0	102.5
15.0	102.5

NSA: A Friestad Øst-A

Predefined calculation standard: Yellow zone

Imission 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

Imission 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

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

Distance demand: 0.0 m

NSA: D Friestad Kvasseheim-D

Predefined calculation standard: Yellow zone

Imission 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

Imission 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

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

Distance demand: 0.0 m

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NORD2000 - Details

Calculation: 201904_3xE48 E4_0.8MW_64mHH_wc_FineRes

Calculation Results

Noise sensitive area: A A Friestad Øst

WTG No.	Distance	Wind speed at hub height	Variant	Sound level	Octave data [Hz]								Source noise LwA,ref	Octave data [Hz]							
					63	125	250	500	1000	2000	4000	8000		63	125	250	500	1000	2000	4000	8000
1	531	13.0	Day	36.78	19.9	23.4	30.6	32.7	30.9	23.7	4.6	-46.3	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
1	531	13.0	Evening	36.78	19.9	23.4	30.6	32.7	30.9	23.7	4.6	-46.3	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
1	531	13.0	Night	36.78	19.9	23.4	30.6	32.7	30.9	23.7	4.6	-46.3	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
2	573	13.0	Day	36.04	18.4	22.7	30.0	31.9	30.1	22.6	2.5	-50.8	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
2	573	13.0	Evening	36.04	18.4	22.7	30.0	31.9	30.1	22.6	2.5	-50.8	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
2	573	13.0	Night	36.04	18.4	22.7	30.0	31.9	30.1	22.6	2.5	-50.8	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
3	667	14.0	Day	34.52	17.1	21.3	28.8	30.4	28.4	20.3	-2.1	-60.5	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
3	667	14.0	Evening	34.52	17.1	21.3	28.8	30.4	28.4	20.3	-2.1	-60.5	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
3	667	14.0	Night	34.52	17.1	21.3	28.8	30.4	28.4	20.3	-2.1	-60.5	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7

Noise sensitive area: B B Friestad Heia

WTG No.	Distance	Wind speed at hub height	Variant	Sound level	Octave data [Hz]								Source noise LwA,ref	Octave data [Hz]							
					63	125	250	500	1000	2000	4000	8000		63	125	250	500	1000	2000	4000	8000
1	531	15.0	Day	36.82	17.9	25.4	30.4	32.7	30.9	23.7	4.6	-46.3	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
1	531	15.0	Evening	36.82	17.9	25.4	30.4	32.7	30.9	23.7	4.6	-46.3	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
1	531	15.0	Night	36.82	17.9	25.4	30.4	32.7	30.9	23.7	4.6	-46.3	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
2	450	15.0	Day	38.37	19.6	25.8	31.9	34.2	32.6	26.0	8.9	-37.0	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
2	450	15.0	Evening	38.37	19.6	25.8	31.9	34.2	32.6	26.0	8.9	-37.0	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
2	450	15.0	Night	38.37	19.6	25.8	31.9	34.2	32.6	26.0	8.9	-37.0	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
3	438	13.0	Day	38.66	21.9	24.7	32.3	34.5	32.9	26.4	9.6	-35.6	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
3	438	13.0	Evening	38.66	21.9	24.7	32.3	34.5	32.9	26.4	9.6	-35.6	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
3	438	13.0	Night	38.66	21.9	24.7	32.3	34.5	32.9	26.4	9.6	-35.6	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7

Noise sensitive area: C C Friestad Friestad Gård

WTG No.	Distance	Wind speed at hub height	Variant	Sound level	Octave data [Hz]								Source noise LwA,ref	Octave data [Hz]							
					63	125	250	500	1000	2000	4000	8000		63	125	250	500	1000	2000	4000	8000
1	587	13.0	Day	35.79	19.1	22.3	29.7	31.7	29.8	22.3	1.8	-52.3	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
1	587	13.0	Evening	35.79	19.1	22.3	29.7	31.7	29.8	22.3	1.8	-52.3	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
1	587	13.0	Night	35.79	19.1	22.3	29.7	31.7	29.8	22.3	1.8	-52.3	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
2	673	14.0	Day	34.46	18.5	21.2	28.7	30.3	28.3	20.1	-2.4	-61.1	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
2	673	14.0	Evening	34.46	18.5	21.2	28.7	30.3	28.3	20.1	-2.4	-61.1	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
2	673	14.0	Night	34.46	18.5	21.2	28.7	30.3	28.3	20.1	-2.4	-61.1	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
3	796	15.0	Day	32.72	15.7	19.7	27.1	28.7	26.4	17.4	-8.0	-72.5	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
3	796	15.0	Evening	32.72	15.7	19.7	27.1	28.7	26.4	17.4	-8.0	-72.5	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
3	796	15.0	Night	32.72	15.7	19.7	27.1	28.7	26.4	17.4	-8.0	-72.5	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7

Noise sensitive area: D D Friestad Kvassheim

WTG No.	Distance	Wind speed at hub height	Variant	Sound level	Octave data [Hz]								Source noise LwA,ref	Octave data [Hz]							
					63	125	250	500	1000	2000	4000	8000		63	125	250	500	1000	2000	4000	8000
1	632	13.0	Day	35.08	18.1	21.4	29.5	30.8	29.0	21.1	-0.4	-57.0	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
1	632	13.0	Evening	35.08	18.1	21.4	29.5	30.8	29.0	21.1	-0.4	-57.0	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
1	632	13.0	Night	35.08	18.1	21.4	29.5	30.8	29.0	21.1	-0.4	-57.0	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
2	810	13.0	Day	32.74	16.4	20.2	27.6	28.3	26.2	17.1	-8.6	-73.7	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
2	810	13.0	Evening	32.74	16.4	20.2	27.6	28.3	26.2	17.1	-8.6	-73.7	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
2	810	13.0	Night	32.74	16.4	20.2	27.6	28.3	26.2	17.1	-8.6	-73.7	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
3	991	12.0	Day	30.56	13.1	18.4	25.7	26.2	23.7	13.3	-16.4	-88.3	102.39	84.0	91.0	94.4	97.0	96.8	93.9	89.1	79.6
3	991	12.0	Evening	30.56	13.1	18.4	25.7	26.2	23.7	13.3	-16.4	-88.3	102.39	84.0	91.0	94.4	97.0	96.8	93.9	89.1	79.6
3	991	12.0	Night	30.56	13.1	18.4	25.7	26.2	23.7	13.3	-16.4	-88.3	102.39	84.0	91.0	94.4	97.0	96.8	93.9	89.1	79.6

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NORD2000 - Details

Calculation: 201904_3xE48 E4_0.8MW_64mHH_wc_FineRes

Noise sensitive area: E E Friestad Sør

WTG No.	Distance	Wind speed at hub height [m/s]	Variant	Sound level [dB(A)]	Octave data [Hz]								Source noise LwA,ref [dB(A)]	Octave data [Hz]							
					63	125	250	500	1000	2000	4000	8000		63	125	250	500	1000	2000	4000	8000
1	580	15.0	Day	35.94	19.0	22.8	30.0	31.7	29.9	22.4	2.1	-51.7	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
1	580	15.0	Evening	35.94	19.0	22.8	30.0	31.7	29.9	22.4	2.1	-51.7	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
1	580	15.0	Night	35.94	19.0	22.8	30.0	31.7	29.9	22.4	2.1	-51.7	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
2	720	15.0	Day	33.80	17.8	21.1	28.2	29.6	27.5	19.1	-4.6	-65.6	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
2	720	15.0	Evening	33.80	17.8	21.1	28.2	29.6	27.5	19.1	-4.6	-65.6	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
2	720	15.0	Night	33.80	17.8	21.1	28.2	29.6	27.5	19.1	-4.6	-65.6	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
3	877	15.0	Day	31.80	16.4	20.4	26.2	27.6	25.2	15.7	-11.5	-79.4	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
3	877	15.0	Evening	31.80	16.4	20.4	26.2	27.6	25.2	15.7	-11.5	-79.4	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
3	877	15.0	Night	31.80	16.4	20.4	26.2	27.6	25.2	15.7	-11.5	-79.4	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7

Noise sensitive area: F F Friestad Øst Fritidsbolig

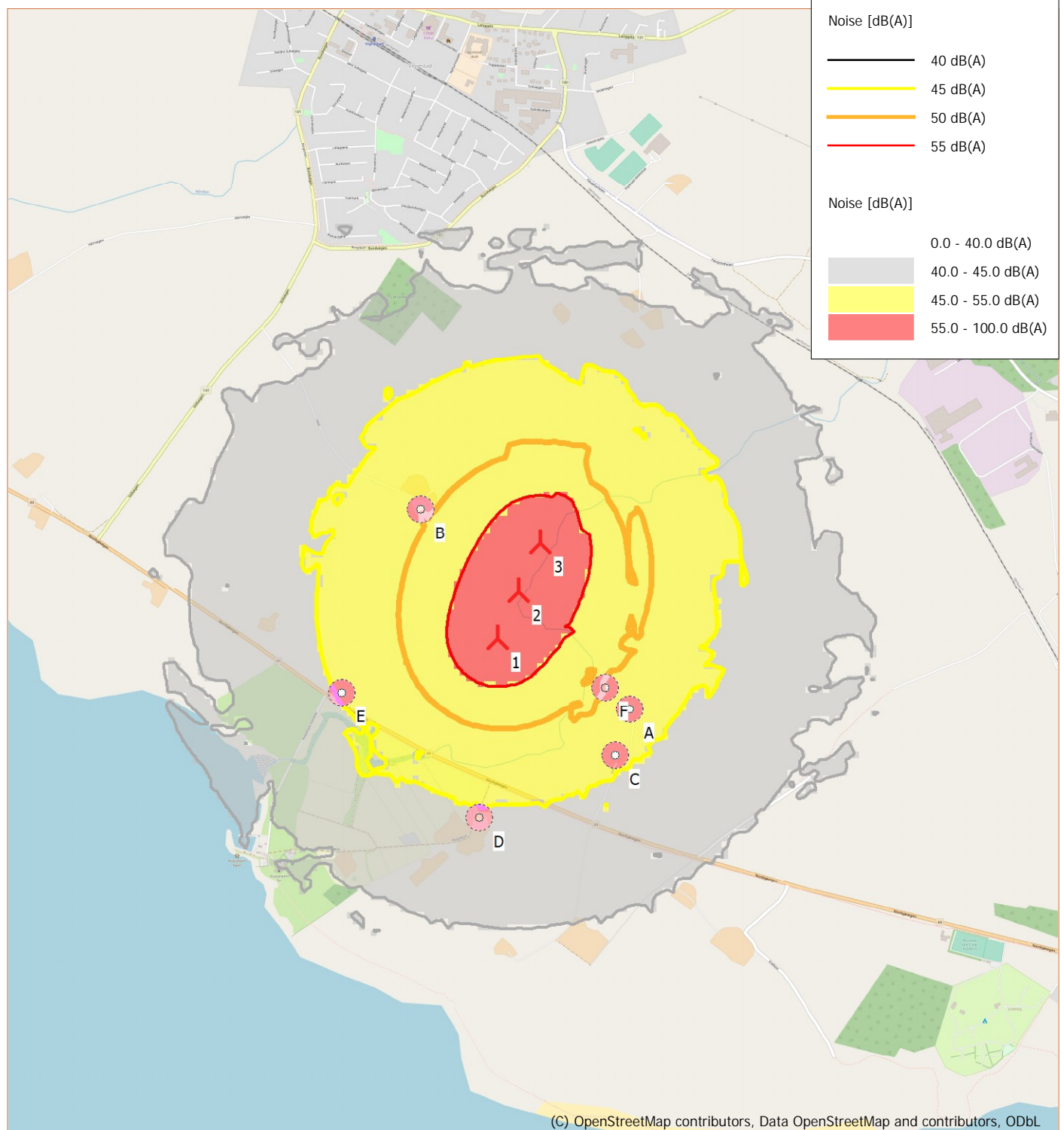
WTG No.	Distance	Wind speed at hub height [m/s]	Variant	Sound level [dB(A)]	Octave data [Hz]								Source noise LwA,ref [dB(A)]	Octave data [Hz]							
					63	125	250	500	1000	2000	4000	8000		63	125	250	500	1000	2000	4000	8000
1	419	13.0	Day	39.40	18.2	28.9	32.9	35.1	33.4	26.9	10.6	-33.4	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
1	419	13.0	Evening	39.40	18.2	28.9	32.9	35.1	33.4	26.9	10.6	-33.4	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
1	419	13.0	Night	39.40	18.2	28.9	32.9	35.1	33.4	26.9	10.6	-33.4	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
2	458	14.0	Day	38.18	19.9	25.6	31.7	34.0	32.4	25.8	8.4	-38.0	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
2	458	14.0	Evening	38.18	19.9	25.6	31.7	34.0	32.4	25.8	8.4	-38.0	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
2	458	14.0	Night	38.18	19.9	25.6	31.7	34.0	32.4	25.8	8.4	-38.0	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
3	560	13.0	Day	36.39	17.8	23.0	30.3	32.3	30.5	23.1	3.1	-49.6	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
3	560	13.0	Evening	36.39	17.8	23.0	30.3	32.3	30.5	23.1	3.1	-49.6	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7
3	560	13.0	Night	36.39	17.8	23.0	30.3	32.3	30.5	23.1	3.1	-49.6	102.49	84.1	91.1	94.5	97.1	96.9	94.0	89.2	79.7

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26.04.2019 15:07/3.2.743

NORD2000 - Highest noise value

Calculation: 201904_3xE48 E4_0.8MW_64mHH_wc_FineRes



(C) OpenStreetMap contributors, Data OpenStreetMap and contributors, ODbL

0 250 500 750 1000m

Map: EMD OpenStreetMap , Print scale 1:20,000, Map center UTM (north)-ETRS89 Zone: 32 East: 307,750 North: 6,495,000

New WTG

Noise sensitive area