

Project: **Kappel 2009** Description: Map shows noise by 6 m/s windspeed.

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Licensed user:
DONG Energy
Kraftværksvej 53
DK-7000 Fredericia
79 23 33 33
Vindkraftanalyse/PAUBS
Calculated:
05/11/2009 11:20/2.6.0.235

DECIBEL - Main Result

Calculation: Noise 0509 - 7 WTG 5.0-8.0 MW

DANISH RULES FOR NOISE CALCULATION.

The calculation is based on the "Bekendtgørelse nr. 1518 af 14. dec 2006" from the Danish Environmental Agency.

The noise impact from WTGs are not allowed to exceed the following limits: (Wind speeds in 10 m height)

- 1) At outdoor areas maximum 15 m from neighbor settlements in the open land.
 - a) 44 db(A) at wind speed 8 m/s.
 - b) 42 db(A) at wind speed 6 m/s.
 - 2) At outdoor areas in residential or recreational areas.
 - a) 39 db(A) at wind speed 8 m/s in residential areas.
 - b) 37 db(A) at wind speed 6 m/s in residential areas.
- If a WTG has pure tones in the noise emission, a penalty of 5 dB is added.



Scale 1:50,000

📍 New WTG 🟠 Noise sensitive area

WTGs

UTM WGS84 Zone: 32				WTG type			Noise data											
East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Creator	Name	First wind speed [m/s]	LwaRef [dB(A)]	Last wind speed [m/s]	LwaRef [dB(A)]	Pure tones	Octave data	
UTM WGS84 Zone: 32 [m]							[kW]	[m]	[m]									
1	628,781	6,070,732	0.9 DF126/5000	Yes	REpower	5 M-5,000	5,000	126.0	93.0	USER	Level 0 - guaranteed - 108.6 oct.dB(A) - 02/2009	6.0	107.4	8.0	108.6	No	Yes	
2	628,966	6,070,480	1.0 DF140/6000	Yes	DONG FUTURE	140/6000-6,000	6,000	140.0	103.0	USER	Level 0 - guaranteed - 109.2 oct.dB(A) - 02/2009	6.0	108.0	8.0	109.2	No	Yes	
3	629,227	6,070,250	1.5 DF160/8000	Yes	DONG FUTURE	160/8000-8,000	8,000	160.0	119.0	USER	Level 0 - guaranteed - 110.3 oct.dB(A) - 02/2009	6.0	109.1	8.0	110.3	No	Yes	
4	629,538	6,070,095	0.0 DF140/6000	Yes	DONG FUTURE	140/6000-6,000	6,000	140.0	103.0	USER	Level 0 - guaranteed - 109.2 oct.dB(A) - 02/2009	6.0	108.0	8.0	109.2	No	Yes	
5	629,807	6,069,988	0.0 DF126/5000	Yes	REpower	5 M-5,000	5,000	126.0	93.0	USER	Level 0 - guaranteed - 108.6 oct.dB(A) - 02/2009	6.0	107.4	8.0	108.6	No	Yes	
6	629,491	6,070,623	2.5 DF126/5000	Yes	REpower	5 M-5,000	5,000	126.0	93.0	USER	Level 0 - guaranteed - 108.6 oct.dB(A) - 02/2009	6.0	107.4	8.0	108.6	No	Yes	
7	629,839	6,070,475	0.0 DF126/5000	Yes	REpower	5 M-5,000	5,000	126.0	93.0	USER	Level 0 - guaranteed - 108.6 oct.dB(A) - 02/2009	6.0	107.4	8.0	108.6	No	Yes	

Calculation Results

Sound Level

Noise sensitive area			UTM WGS84 Zone: 32			Demands		Sound Level		Demands fulfilled ?	
No.	Name		East	North	Z	Imission height [m]	Wind speed [m/s]	Noise [dB(A)]	From WTGs [dB(A)]	Noise	
A	Sommerhuse		628,295	6,072,016	0.0	1.5	6.0	37.0	36.9	Yes	
A							8.0	39.0	38.4	Yes	
B	Højbakkegaard		629,264	6,071,714	3.4	1.5	6.0	42.0	40.8	Yes	
B							8.0	44.0	42.3	Yes	
C	Vesternæs		630,250	6,071,623	5.0	1.5	6.0	42.0	39.2	Yes	
C							8.0	44.0	40.8	Yes	
D	Ved Riddertofte (Str.vej 4)		630,567	6,069,655	2.5	1.5	6.0	42.0	41.7	Yes	
D							8.0	44.0	43.2	Yes	
E	Gottesgabe		630,613	6,070,997	5.0	1.5	6.0	42.0	40.9	Yes	
E							8.0	44.0	42.3	Yes	
F	Ravnegravene		629,769	6,071,103	3.4	1.5	6.0	42.0	46.0	No	
F							8.0	44.0	47.4	No	
G	Ravnegravene		629,993	6,071,193	4.1	1.5	6.0	42.0	43.9	No	
G							8.0	44.0	45.3	No	
H	Ravnegravene		629,834	6,070,986	2.7	1.5	6.0	42.0	47.2	No	
H							8.0	44.0	48.5	No	
I	Ravnegravene		630,095	6,070,990	3.0	1.5	6.0	42.0	45.2	No	
I							8.0	44.0	46.6	No	
J	Ravnegravene		629,844	6,070,838	2.5	1.5	6.0	42.0	49.3	No	
J							8.0	44.0	50.6	No	
K	Ravnegravene		630,061	6,070,833	2.5	1.5	6.0	42.0	47.3	No	
K							8.0	44.0	48.6	No	
L	Ravnegravene		629,987	6,070,627	2.5	1.5	6.0	42.0	51.6	No	
L							8.0	44.0	52.9	No	
M	Ravnegravene		630,000	6,070,523	2.4	1.5	6.0	42.0	53.0	No	
M							8.0	44.0	54.3	No	
N	Gottesgabe Strandvej 1		630,630	6,069,853	2.5	1.5	6.0	42.0	41.9	Yes	

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Noise sensitive area		UTM WGS84 Zone: 32			Demands		Sound Level	Demands fulfilled ?	
No.	Name	East	North	Z	Imission height	Wind speed	Noise	From WTGs	Noise
				[m]	[m]	[m/s]	[dB(A)]	[dB(A)]	
	N					8.0	44.0	43.4	Yes
	O Gottesgabe Strandvej 3	630,629	6,069,831	2.5	1.5	6.0	42.0	41.9	Yes
	O					8.0	44.0	43.3	Yes
	P Gottesgabe Strandvej 2	630,557	6,069,688	2.5	1.5	6.0	42.0	42.0	Yes
	P					8.0	44.0	43.4	Yes
	Q Gottesgabe Strandvej 5	630,631	6,069,606	2.5	1.5	6.0	42.0	40.9	Yes
	Q					8.0	44.0	42.4	Yes
	R Gottesgabe Strandvej 6	630,552	6,069,507	2.5	1.5	6.0	42.0	41.0	Yes
	R					8.0	44.0	42.5	Yes

Distances (m)**WTG**

NSA	1	2	3	5	4	6	7
A	1373	1676	1997	2530	2289	1836	2181
B	1094	1270	1464	1810	1643	1115	1366
C	1718	1719	1712	1694	1686	1255	1219
D	2085	1800	1466	829	1119	1447	1096
E	1851	1726	1574	1291	1404	1183	934
F	1055	1016	1010	1116	1034	554	632
G	1297	1250	1215	1220	1189	760	735
H	1082	1004	953	998	939	499	511
I	1339	1238	1140	1043	1055	707	575
J	1068	948	852	851	804	414	363
K	1283	1150	1017	883	905	607	422
L	1210	1031	848	664	696	496	212
M	1237	1035	820	569	630	519	169
N	2048	1779	1459	834	1119	1376	1007
O	2056	1785	1463	837	1122	1387	1019
P	2060	1777	1445	808	1098	1418	1066
Q	2166	1880	1545	908	1197	1528	1176
R	2154	1861	1520	887	1172	1540	1203

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DECIBEL - Assumptions for noise calculation

Calculation: Noise 0509 - 7 WTG 5.0-8.0 MW

Noise calculation model:

Danish 2007

Wind speed:

6.0 m/s - 8.0 m/s, step 2.0 m/s

Terrain reduction:

1.5 dB(A) Onshore

Meteorological coefficient, C0:

0.0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Pure tone penalty are added to demand: 5.0 m/s

Height above ground level, when no value in NSA object:

1.5 m Don't allow override of model height with height from NSA object

Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:

0.0 dB(A)

Octave data required

Air absorption

	63	125	250	500	1,000	2,000	4,000	8,000
[db/km]	[db/km]	[db/km]	[db/km]	[db/km]	[db/km]	[db/km]	[db/km]	[db/km]
	0.1	0.4	1.0	2.0	3.6	8.8	29.0	104.5

WTG: REpower 5 M 5000 126.0 !O!

Noise: Level 0 - guaranteed - 108.6 oct.dB(A) - 02/2009

Source	Source/Date	Creator	Edited
PAUBS	03/02/2009	USER	03/02/2009 12:27

Status	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data							
				63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	6.0	107.4	No	88.1	94.0	98.8	102.5	102.8	97.9	92.3	81.6
From Windcat	8.0	108.6	No	91.7	96.7	100.9	103.5	103.6	98.7	92.4	82.2

WTG: DONG FUTURE 140/6000 6000 140.0 !O!

Noise: Level 0 - guaranteed - 109.2 oct.dB(A) - 02/2009

Source	Source/Date	Creator	Edited
PAUBS	03/02/2009	USER	03/02/2009 12:35

Status	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data							
				63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	6.0	108.0	No	88.7	94.6	99.4	103.1	103.4	98.5	92.9	82.2
From Windcat	8.0	109.2	No	92.3	97.3	101.5	104.1	104.2	99.3	93.0	82.8

WTG: DONG FUTURE 160/8000 8000 160.0 !O!

Noise: Level 0 - guaranteed - 110.3oct.dB(A) - 02/2009

Source	Source/Date	Creator	Edited
PAUBS	03/02/2009	USER	03/02/2009 12:35

Status	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data							
				63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	6.0	109.1	No	89.8	95.7	100.5	104.2	104.5	99.6	94.0	83.3
From Windcat	8.0	110.3	No	93.4	98.4	102.6	105.2	105.3	100.4	94.1	83.9

NSA: Sommerhuse-A

Predefined calculation standard Residential areas

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

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DECIBEL - Assumptions for noise calculation**Calculation:** Noise 0509 - 7 WTG 5.0-8.0 MW**Noise demand:**6.0 [m/s] 8.0 [m/s]
37.0 dB(A) 39.0 dB(A)**Distance demand:**0.0 m**NSA:** Højbakkegaard-B**Predefined calculation standard**Open land**Imission height(a.g.l.):**Use standard value from calculation model**Noise demand:**6.0 [m/s] 8.0 [m/s]
42.0 dB(A) 44.0 dB(A)**Distance demand:**0.0 m**NSA:** Ved Riddertoft (Str.vej 4)-D**Predefined calculation standard**Open land**Imission height(a.g.l.):**Use standard value from calculation model**Noise demand:**6.0 [m/s] 8.0 [m/s]
42.0 dB(A) 44.0 dB(A)**Distance demand:**0.0 m**NSA:** Gottesgabe-E**Predefined calculation standard**Open land**Imission height(a.g.l.):**Use standard value from calculation model**Noise demand:**6.0 [m/s] 8.0 [m/s]
42.0 dB(A) 44.0 dB(A)**Distance demand:**0.0 m**NSA:** Vesternæs-C**Predefined calculation standard**Open land**Imission height(a.g.l.):**Use standard value from calculation model**Noise demand:**6.0 [m/s] 8.0 [m/s]
42.0 dB(A) 44.0 dB(A)**Distance demand:**0.0 m**NSA:** Ravnegravene-F**Predefined calculation standard**Open land**Imission height(a.g.l.):**Use standard value from calculation model**Noise demand:**6.0 [m/s] 8.0 [m/s]
42.0 dB(A) 44.0 dB(A)**Distance demand:**0.0 m**NSA:** Ravnegravene-G**Predefined calculation standard**Open land**Imission height(a.g.l.):**Use standard value from calculation model

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DECIBEL - Assumptions for noise calculation

Calculation: Noise 0509 - 7 WTG 5.0-8.0 MW

Noise demand:

6.0 [m/s] 8.0 [m/s]
 42.0 dB(A) 44.0 dB(A)

Distance demand:0.0 m

NSA: Ravnegravene-H

Predefined calculation standardOpen land

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

Noise demand:

6.0 [m/s] 8.0 [m/s]
 42.0 dB(A) 44.0 dB(A)

Distance demand:0.0 m

NSA: Ravnegravene-I

Predefined calculation standardOpen land

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

Noise demand:

6.0 [m/s] 8.0 [m/s]
 42.0 dB(A) 44.0 dB(A)

Distance demand:0.0 m

NSA: Ravnegravene-J

Predefined calculation standardOpen land

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

Noise demand:

6.0 [m/s] 8.0 [m/s]
 42.0 dB(A) 44.0 dB(A)

Distance demand:0.0 m

NSA: Ravnegravene-K

Predefined calculation standardOpen land

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

Noise demand:

6.0 [m/s] 8.0 [m/s]
 42.0 dB(A) 44.0 dB(A)

Distance demand:0.0 m

NSA: Ravnegravene-L

Predefined calculation standardOpen land

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

Noise demand:

6.0 [m/s] 8.0 [m/s]
 42.0 dB(A) 44.0 dB(A)

Distance demand:0.0 m

NSA: Ravnegravene-M

Predefined calculation standardOpen land

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

Project:

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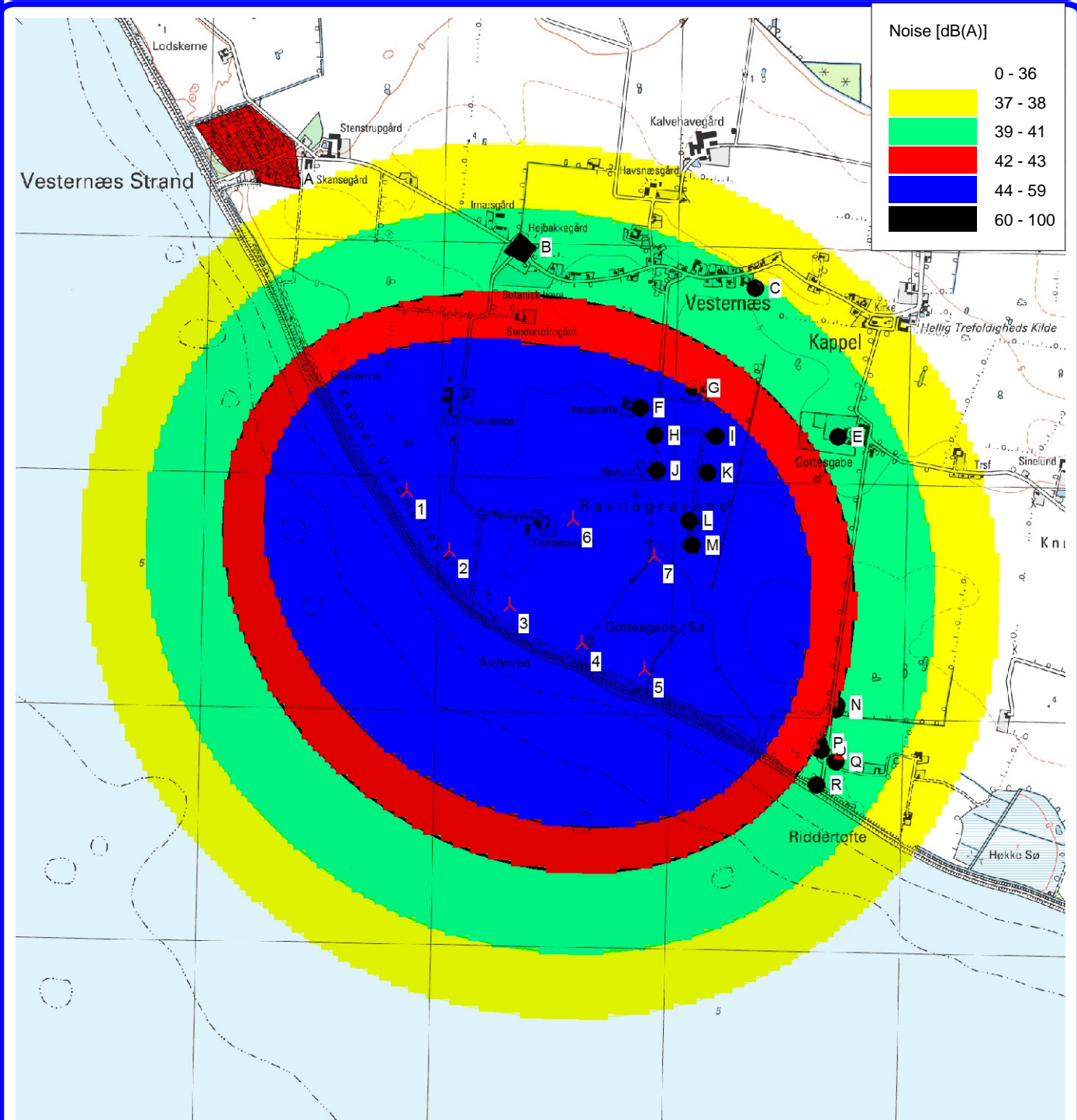
DECIBEL - Assumptions for noise calculation**Calculation:** Noise 0509 - 7 WTG 5.0-8.0 MW**Noise demand:**6.0 [m/s] 8.0 [m/s]
42.0 dB(A) 44.0 dB(A)**Distance demand:**0.0 m**NSA:** Gottesgabe Strandvej 1-N**Predefined calculation standard**Open land**Imission height(a.g.l.):**Use standard value from calculation model**Noise demand:**6.0 [m/s] 8.0 [m/s]
42.0 dB(A) 44.0 dB(A)**Distance demand:**0.0 m**NSA:** Gottesgabe Strandvej 3-O**Predefined calculation standard**Open land**Imission height(a.g.l.):**Use standard value from calculation model**Noise demand:**6.0 [m/s] 8.0 [m/s]
42.0 dB(A) 44.0 dB(A)**Distance demand:**0.0 m**NSA:** Gottesgabe Strandvej 2-P**Predefined calculation standard**Open land**Imission height(a.g.l.):**Use standard value from calculation model**Noise demand:**6.0 [m/s] 8.0 [m/s]
42.0 dB(A) 44.0 dB(A)**Distance demand:**0.0 m**NSA:** Gottesgabe Strandvej 5-Q**Predefined calculation standard**Open land**Imission height(a.g.l.):**Use standard value from calculation model**Noise demand:**6.0 [m/s] 8.0 [m/s]
42.0 dB(A) 44.0 dB(A)**Distance demand:**0.0 m**NSA:** Gottesgabe Strandvej 6-R**Predefined calculation standard**Open land**Imission height(a.g.l.):**Use standard value from calculation model**Noise demand:**6.0 [m/s] 8.0 [m/s]
42.0 dB(A) 44.0 dB(A)**Distance demand:**0.0 m

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DECIBEL - KMS map: DISC01.IT

Calculation: Noise 0509 - 7 WTG 5.0-8.0 MW File: DISC01.IT



0 250 500 750 1000m

Map: Vesternæs 1411 III NV, Print scale 1:25,000, Map center UTM WGS 84 Zone: 32 East: 629,310 North: 6,070,360
 Noise calculation model: Danish 2007. Wind speed: 6.0 m/s

▲ New WTG ■ Noise sensitive area
— 37.0 dB(A) — 39.0 dB(A) — 42.0 dB(A) — 44.0 dB(A) — 60.0 dB(A)
 Height above sea level from active line object