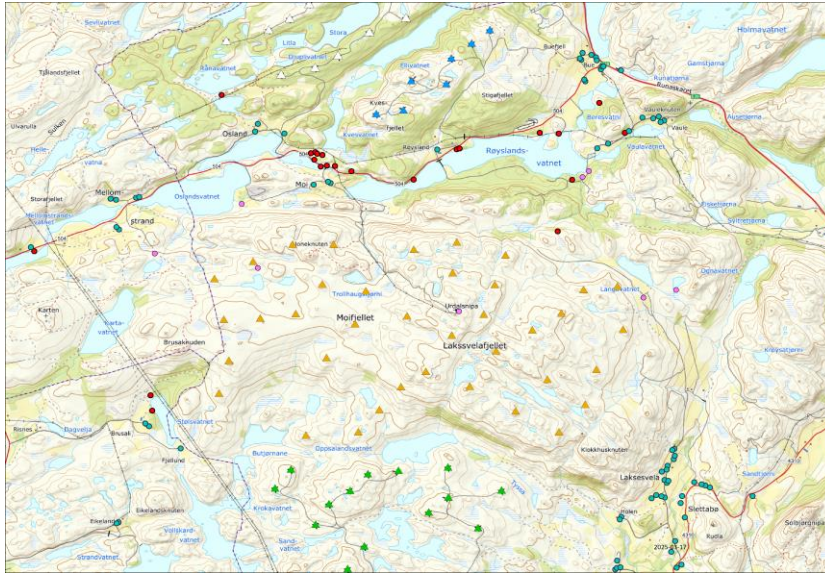


Calculation of noise immission from wind turbines

Wind farm Moifjellet - 38 Vestas V162-6.2 MW



Client information

Project: Wind farm Moifjellet

Client: Statkraft AS

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Project information

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Summary

Statkraft AS (Statkraft) are in the planing process for wind farm Moifjellet. To investigate the noise impact from the wind farm on nearby dwellings (houses) Statkraft has contracted Akustikkonsulten i Sverige AB (Akustikkonsulten) to perform calculations of noise levels in L_{den} outdoors. The wind farm consists of 38 wind turbines (WTG) of the WTG type Vestas V162-6.2 MW, with hub height 119 m and total height 200 m.

The calculations of L_{den} are performed with the Nordic environmental noise prediction method Nord2000 which is an approved method for calculation of wind turbine noise according to chapter 9.8.1. in the guidelines M-128/2014, *Veileder til retningslinje for behandling av støy i arealplanlegging (T-1442/2016)* (revised August 2018). The calculations are performed both as "**Worst case støyberegninger**" and "**Støyutredning basert på lokale vindforhold**" in accordance with chapter 9.8.2-9.8.3 in M-128/2014, according to the method description in page 6.

North of the project area the existing wind farms Måkaknuten and Stigafjellet is situated. South of the project area wind farm Bjerkreim is situated. All surrounding wind farms has presented noise calculations based on "**lokale vindforhold**" in their respective planning process and the same assumptions has been made in this report, to determine the noise contribution from those wind farms. However, the ground model, temperature and in some cases coordinates for calculation points, is different for calculations presented in this report. The results will therefor differ slightly compared to calculations made in each of the surrounding wind farms planning process.

The result is presented for 132 noise sensitive areas (NSA), residential dwellings, recreational dwellings and other, as the A-weighted L_{den} outdoors. The results are also presented in noise maps showing L_{den} as green zone (>40-45 dBA), yellow zone (>45-55 dBA) and red zone (>55 dBA). The result is compared to the noise limit $L_{den}=45$ dBA.

The following calculation cases is presented in this report:

- D01-1** - Wind farm Moifjellet "**Worst case støyberegninger**".
- D01-2** - Wind farms Bjerkreim, Måkaknuten and Stigafjellet "**lokale vindforhold**".
- D01-3** - Cumulative noise, **D01-1** + **D01-2** (mix of worst case and lokale vindforhold).
- D02-1** - Wind farm Moifjellet "**lokale vindforhold**".
- D02-3** - Cumulative noise, **D02-1** + **D01-2** "**lokale vindforhold**".

The results of the calculations are summarized below:

Calculation	Number of (Residential dwellings / Recreational dwellings / Other) with noise levels	
	$L_{den} \leq 45$ dBA	$L_{den} > 45$ dBA
D01-1	96 / 17 / 2	3 / 9 / 5
D01-2	99 / 23 / 7	0 / 3 / 0
D01-3	89 / 8 / 1	10 / 18 / 6
D02-1	99 / 26 / 3	0 / 0 / 4
D02-3	95 / 23 / 2	4 / 3 / 5

For Moifjellet alone, Calculation D01-1 "Worst case støyberegninger": 3 residential dwellings and 9 recreational dwellings have a calculated L_{den} over 45 dBA.

For the other wind farms, Bjerkreim, Måkaknuten and Stigafjellet (without Moifjellet) calculation D01-2 "lokale vindforhold": 0 residential dwellings and 3 recreational dwellings have a calculated L_{den} over 45 dBA.

For the cumulative noise, Calculation D01-3 (mix of worst case and lokale vindforhold, D01-1 + D01-2): 10 residential dwellings and 18 recreational dwellings have a calculated L_{den} over 45 dBA.

For Moifjellet alone, calculation D02-1 "lokale vindforhold": No residential dwellings or recreational dwellings have a calculated L_{den} exceeding 45 dBA.

For the cumulative noise, calculation D02-3 ("lokale vindforhold", D02-1 + D01-2): 4 residential dwellings and 3 recreational dwellings have a calculated L_{den} over 45 dBA. The 3 recreational dwellings are the same as already have a calculated L_{den} over 45 dBA from existing wind farms.

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Wind Farm	WTG type	Number of WTG	Hub height [m]	Total height [m]	Noise emission [dBA]
Moifjellet	Vestas V162-6.2 MW	38	119	200	92-105
Bjerkreim	Siemens SWT-DD-130	70	125	190	92,3-107
Måkaknuten & Stigafjellet	Siemens SWT-DD-130	29	115-125	180-190	92,3-107

Calculation parameters		Calculation cases	
Calculation program	SoundPLAN 8.2	D01-1	Noise from wind farm Moifjellet for "Worst case" with downwind from all wind directions for 8 m/s at 10 m height <u>without any</u> noise reducing measures. The highest noise emission for any given wind speed is used in the calculations. The used noise emission is presented in chp. "Noise data". WTG in operation 365 days a year (8760 hours).
Calculation standard	Nord2000	D01-2	Noise from wind farm Måkaknuten, Stigafjellet and Bjerkreim for 3-31 m/s at hub height for measured wind speed and wind direction distribution in 30° sectors, calculated as in the noise calculation reports, displayed at NVE:s webpage ¹⁾²⁾ . This represents a yearly average of L_{den} based on wind speeds on site, "lokale vindforhold". Observe that temperature and ground model differs from previous calculations and therefore slightly different calculated noise contribution is expected, compared to original reports.
Search radius	25 000 m	D01-3	Cumulative Noise: D01-1 + D01-2 .
Calculation height	4,0 m	D02-1	Noise from wind farm Moifjellet for 3-30 m/s at hub height for measured wind speed and wind direction distribution in 30° sectors based on wind speeds on site, "lokale vindforhold". The same wind statistics as in the Bjerkreim report ¹⁾ has been used, presented in the chp. "wind data".
Air absorption	ISO 9613-1	D02-3	Cumulative Noise: D02-1 + D01-2 .
Air pressure	1013,25 mBar		
Relative humidity	70 %		
Temperature	6,6 °C		
Temperature gradient	+0,05 °C/m		
Roughness length	0,3 m		
Wind speed height	10 m (Hub height for statistics)		
Wind speed	8 m/s (and Wind statistics)		
Standard deviation wind speed	0,5 m/s		
Wind direction	Downwind from all directions and wind statistics		
Turbulence strength parameter wind	0,12 m ⁴ /3/s ²		
Turbulence strength parameter temp.	0,008 K/s ²		
Effective flow resistivity	Impedance class D, E, F, H		
Coordinate system	UTM WGS84 Zone: 32		
Height data	Detailed spot heights		

¹⁾ Akustikkonsultens report "10-16075 Case F01-F02 Noise calculation Wind Farm Bjerkreim 190716" (<https://www.nve.no/konsesjon/konsesjonssaker/konsesjonssak/?id=32&type=A-6>)

²⁾ Akustikkonsultens report "10-16184 Case I01-I04 Noise calculation Wind Farm Måkaknuten 18100" (<https://www.nve.no/konsesjon/konsesjonssaker/konsesjonssak/?type=A-6&id=207>)

Information on calculation parameters

As the weather conditions varies during a normal year, weather parameters according to standard noise calculation methods are used, which are also identical to the values given in the ISA-Standard (International Standard Atmosphere), for air pressure and relative humidity 70 %. A yearly average of the temperature 6,6 °C is applied in the calculations, which is something that has been requested by authorities for many noise calculations of wind turbine noise in Norway recently. In this case, for a down wind calculation, the deviation from standardized 15 °C, causes in average +0,5 dB calculated noise levels with 6,6 °C compared to standardized 15 °C. For calculation points with L_{den} noise levels of 40 dBA or higher the average difference is +0,3 dB. For calculation points with L_{den} noise levels of 45 dBA or higher the average difference is +0,05 dB and min/max differences range from -0,5 to +0,4 dB.

It shall be noted that the calculations are performed for a positive temperature gradient which is comparable to moderate inversion. The used value +0,05 °C/m is also the highest approved value according to the measurement method for noise immission from wind turbines *Elforsk 98:24* as recommended for measurements in M-128/2014. The noise level at a positive temperature gradient is usually higher compared to a negative temperature gradient.

The effective flow resistivity in Nord2000 represent the ground impedance or hardness of the ground. In the guidelines for Nord2000 seven impedance classes are defined, impedance class A-H, where A represents the softest ground for example snow and H represents the hardest ground for example water. In the performed calculations areas with different impedance classes has been specified based on maps and satellite images as well as information from the client. The different areas are shown in a ground absorption map. In accordance to M-128/2014 a conservative approach is used when defining the impedance classes. For example areas with Mire are chosen as class D were class B is the recommended value in Nord2000 with the description "Soft forest floor (short, dense heather-like or thick moss)".

The calculations are performed with the assumption that the noise sensitive areas (NSA) are located 4,0 m above ground. The height of 4,0 m should be considered decisive according to M-128/2014. Although it shall be noted that sound immission measurements according to the measurement standard *Elforsk 98:24*, recommended in chapter 9.8.5 in M-128/2014, should be performed at 1,2-1,5 m above ground. According to the European directive on environmental noise it is also possible to use calculations on 1,5 m above ground for recreational areas and areas with one-story housing as an additional indicator. The result on 1,5 m above ground should also be considered more representative to the exposure of noise outside of a dwelling. Normally the noise level at 4,0 m height is marginally higher than on 1,5 m height.

Method description

The calculations are performed with the Nordic environmental noise prediction method Nord2000 which is an approved method for calculation of wind turbine noise according to chapter 9.8.1. in the guidelines M-128/2014. Nord2000 takes into account different aspects of noise spreading for example ground impedance, topography and wind direction. The calculations are performed both as "Worst case støyberegninger" (**Case D01:1**) and "Støyutredning basert på lokale vindforhold" (**Case D01:2, D02:1, D02:3**) in accordance with chapter 9.8.2-9.8.3 in M-128/2014. In Calculation (**Case D01:3**) a mix is used, where "lokale vindforhold" is used for the neighbouring wind farms and Worst case for Moifjellet.

The "Worst case støyberegninger" assumes specific weather conditions with a conservative transmission loss, high noise emission and the wind turbines in operation 8760 hours a year (365 days). This is equal to the noise immission during a day with downwind conditions and wind speed 8 m/s at 10 m height. The calculations according to "Støyutredning basert på lokale vindforhold" are based on long term wind measurements and also considering the wind speed dependence of the noise emission, both high and low noise emission depending on the wind speed. Such calculations represent a more accurate value of a yearly average L_{den} . The level of L_{den} based on "lokale vindforhold" is, according to Akustikkonsulten's experience, always lower than L_{den} for "worst case". This is also mentioned in chapter 9.8.3 in M-128/2014 where for example calculations considering different wind directions (Vindretning) is said to affect the calculation result with $\pm 1-2$ dB while different wind speed and noise emission (Vindhastighet og kildestøy) could affect the calculation result with up to 8 dB, both cases in comparison to "worst case" calculations.

Unfortunately, M-128/2014 do not present any detailed instructions on how to perform calculations assuming "lokale vindforhold". Akustikkonsulten suggests the method below to perform "Støyutredning basert på lokale vindforhold" based on long term wind measurements.

1. Sort the wind speed data so it corresponds to the wind speed dependency of the noise emission. For example, the cut-in wind speed, when the blades start to rotate and emit noise, is normally around 3 m/s at hub height for modern wind turbines. Based on wind and noise data for the current project the wind turbines has been assumed to not emit noise for wind speeds below 3 m/s, approx. 7,8 % of the year, and the highest noise emission (for the loudest noise setting) occurs for the wind speed 8 m/s at hub height and above, approx. 48 % of the year. For wind speeds between 3-9 m/s the noise emission is assumed to vary. The wind speed dependent noise emission is given in Table 4 for the used noise settings.
2. Divide the wind direction data in 30° sectors and calculate the percentual distribution for the wind speeds between 3 m/s to ≥ 9 m/s separately according, for more information see wind data. The percentage for each wind direction is used for the calculations in step 4, resulting in a NSA in a dominant wind direction gets more noise during a year.
3. Calculate the noise immission for each wind direction in 30° sectors for wind speeds between 3 m/s to ≥ 9 m/s, a total of 84 calculations. The 12 results, for each wind speed, are then weighted using the wind direction distribution calculated in step 2.
4. The last step is to calculate the yearly average based on the result in step 2-3. The yearly average is weighted using the wind speed distribution between 0-31 m/s (for more information see wind data).

The calculations in **Case D01:2, D02:1** and **D02:3** are performed according to the method described in point 1-4 above. Observe that one set of wind statistics have been used for Bjerkreim and Moifjellet. Another set of wind statistics have been used for Måkaknuten and Stigafjellet.

All noise calculations and reports produced by Akustikkonsulten undergoes a quality assurance check in accordance with Akustikkonsulten's quality system. Akustikkonsulten is one of few Acoustic consultants in the Nordic region that are accredited (by SWEDAC and in compliance with ILAC, International Laboratory Accreditation Cooperation) according to ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories as well as for the measurement standard for noise emission from wind turbines IEC 61400-11. Akustikkonsulten's consultants have more than 10 years of experience from noise calculations of wind turbine noise and have performed calculations for more than 500 wind farms over the years.

The performed "worst case" calculations are to be considered as conservative compared to the calculations based on "lokale vindforhold". In addition, the highest noise emission for wind speeds between 3 m/s-15 m/s is assumed in the "worst case" calculations, as recommended in M-128/2014 when there could be a risk for wind shadow.

Wind shadow

The former guidelines for wind turbine noise in Norway, *Veileder til Miljøverndepartementets retningslinje for behandling av støy i arealplanlegging (støyretningslinjen) (TA-2115/2005)*, had special recommendations for dwellings situated in wind shielded areas (wind shadow). But in the latest revision of the guidelines M-128/2014, dated August 2018, no special noise limits are given for these situations. The following recommendation is mentioned about wind shadow:

"Hvis en vindturbin er plassert høyt i terrenget og støymottaker ligger i le i dalformasjoner, kan maskeringen fra vindsuset reduseres vesentlig fordi mottaker er skjermet for vinden. Mottakeren ligger da i vindskygge, og vil høre støy fra vindturbinene bedre. Det finnes ikke spesielle støykrav ved vindskygge, men spesielt i detaljprosjekteringsfasen bør utreder være oppmerksom på støyfølsom bebyggelse som ligger i vindskygge. I slike tilfeller kan støy fra vindturbiner ofte høres best ved vindstyrker i 10 –12 m/s. Dette bør da legges til grunn for støyberegninger. "

Although, in the new guidelines M-128/2014 the old noise limit for wind shielded areas, $L_{den}=45$ dBA, is used for all areas. Implicating that the updated noise limit considers areas with wind shadows.

Noise data

WTG Type	Noise setting	Wind Speed [m/s]	Noise emission [dBA]
Vestas V162-6.2 MW	PO6200	3-4	95,6
Vestas V162-6.2 MW	PO6200	5	96,3
Vestas V162-6.2 MW	PO6200	6	97,5
Vestas V162-6.2 MW	PO6200	7	100,2
Vestas V162-6.2 MW	PO6200	8	102,5
Vestas V162-6.2 MW	PO6200	≥9	104,8

Reference noise data: 1/3-octave band spectrums and total sound power levels at different wind speed has been taken from the suppliers documents (Source: "Sound Performance Specification EnVentus™ V162 ", Document no.: 0180-3964 V00, 2024-10-31). The document is classified as restricted by Vestas and thus the data cannot be published.

WTG Type	Noise setting	Wind Speed [m/s]	Noise emission [dBA]
Siemens SWT-DD-130	Mode 1	3-4	92,3
Siemens SWT-DD-130	Mode 1	5	95,3
Siemens SWT-DD-130	Mode 1	6	98,3
Siemens SWT-DD-130	Mode 1	7	102,3
Siemens SWT-DD-130	Mode 1	8	105,6
Siemens SWT-DD-130	Mode 1	≥9	107,0

Reference noise data: Frequency spectrum and sound power levels has been taken from Akustikkonsultens report "10-16075 Case F01-F02 Noise calculation Wind Farm Bjerkreim 190716" (<https://www.nve.no/konsesjon/konsesjonssaker/konsesjonssak/?id=32&type=A-6>).

Disclaimer: The calculations are valid for the used noise emission and frequency spectrum. Akustikkonsulten gives no warranty on the accuracy of the noise emission data.

Wind data

Wind speed at hh [m/s]	Annual [Jan-Dec] [%]	Annual 0° [%]	Annual 30° [%]	Annual 60° [%]	Annual 90° [%]	Annual 120° [%]
0-2	7,76	0,60	0,52	0,48	0,62	0,84
3-4	15,58	1,51	1,01	0,65	1,25	1,92
5	9,56	1,26	0,55	0,33	0,97	1,47
6	9,67	1,40	0,37	0,29	1,06	1,66
7	9,62	1,25	0,22	0,17	1,14	1,79
8	9,43	1,15	0,14	0,10	1,16	1,95
9-31	38,37	2,83	0,11	0,08	4,95	11,51
Wind speed at hh [m/s]	Annual 150° [%]	Annual 180° [%]	Annual 210° [%]	Annual 240° [%]	Annual 270° [%]	Annual 300° [%]
0-2	0,81	0,63	0,60	0,74	0,71	0,62
3-4	1,53	1,40	1,03	1,37	1,27	1,14
5	0,87	0,80	0,44	0,50	0,60	0,65
6	0,93	0,74	0,46	0,40	0,49	0,62
7	1,04	0,71	0,49	0,38	0,44	0,60
8	1,05	0,73	0,49	0,38	0,36	0,53
9-31	4,02	3,69	1,91	1,02	1,19	2,01
Wind speed at hh [m/s]	Annual 330° [%]					
0-2	0,55					
3-4	1,53					
5	1,12					
6	1,25					
7	1,40					
8	1,40					
9-31	5,01					

Reference wind data: The wind speed distribution is from Akustikkonsultens report "10-16075 Case F01-F02 Noise calculation Wind Farm Bjerkreim 190716" (<https://www.nve.no/konsesjon/konsesjonssaker/konsesjonssak/?id=32&type=A-6>)

Wind distribution used in calculation

Case D01:2, D02:1 and D02:3: Both wind speed and wind direction distribution are used for wind speed 0-31 m/s, red values. This case represents a yearly average of L_{den} .

Disclaimer: The calculations are valid for the used wind speed distribution. Akustikkonsulten gives no warranty that the real wind distribution is the same.

Wind Farm Moifjellet

WTG	X [m]	Y [m]	Ground level [mas]	Hub height [m]	Turbine type	Noise emission [dBA]	Noise setting
VT_01	319805	6503654	360	119	Vestas V162-6.2 MW	104,8	PO6200
VT_02	320355	6503906	388	119	Vestas V162-6.2 MW	104,8	PO6200
VT_03	320915	6504155	421	119	Vestas V162-6.2 MW	104,8	PO6200
VT_04	321497	6504154	401	119	Vestas V162-6.2 MW	104,8	PO6200
VT_05	321335	6503575	439	119	Vestas V162-6.2 MW	104,8	PO6200
VT_06	320959	6503143	393	119	Vestas V162-6.2 MW	104,8	PO6200
VT_07	320454	6503079	402	119	Vestas V162-6.2 MW	104,8	PO6200
VT_08	319939	6503060	419	119	Vestas V162-6.2 MW	104,8	PO6200
VT_09	320009	6502460	398	119	Vestas V162-6.2 MW	104,8	PO6200
VT_10	319871	6501985	337	119	Vestas V162-6.2 MW	104,8	PO6200
VT_11	321394	6502504	389	119	Vestas V162-6.2 MW	104,8	PO6200
VT_12	321801	6502996	431	119	Vestas V162-6.2 MW	104,8	PO6200
VT_13	321953	6503477	423	119	Vestas V162-6.2 MW	104,8	PO6200
VT_14	322632	6504080	476	119	Vestas V162-6.2 MW	104,8	PO6200
VT_15	323243	6504188	471	119	Vestas V162-6.2 MW	104,8	PO6200
VT_16	323185	6503740	506	119	Vestas V162-6.2 MW	104,8	PO6200
VT_17	322538	6503112	486	119	Vestas V162-6.2 MW	104,8	PO6200
VT_18	321105	6501373	284	119	Vestas V162-6.2 MW	104,8	PO6200
VT_19	321846	6501419	324	119	Vestas V162-6.2 MW	104,8	PO6200
VT_20	322147	6501742	313	119	Vestas V162-6.2 MW	104,8	PO6200
VT_21	322452	6502079	412	119	Vestas V162-6.2 MW	104,8	PO6200
VT_22	322805	6502300	506	119	Vestas V162-6.2 MW	104,8	PO6200
VT_23	323171	6502829	527	119	Vestas V162-6.2 MW	104,8	PO6200
VT_24	323627	6503136	501	119	Vestas V162-6.2 MW	104,8	PO6200
VT_25	323782	6503568	504	119	Vestas V162-6.2 MW	104,8	PO6200
VT_26	323935	6503998	461	119	Vestas V162-6.2 MW	104,8	PO6200
VT_27	323426	6502084	495	119	Vestas V162-6.2 MW	104,8	PO6200
VT_28	323801	6502601	519	119	Vestas V162-6.2 MW	104,8	PO6200

Wind Farm Moifjellet

WTG	X [m]	Y [m]	Ground level [mas]	Hub height [m]	Turbine type	Noise emission [dBA]	Noise setting
VT_29	324315	6502907	530	119	Vestas V162-6.2 MW	104,8	PO6200
VT_30	324726	6503153	514	119	Vestas V162-6.2 MW	104,8	PO6200
VT_31	325041	6503494	446	119	Vestas V162-6.2 MW	104,8	PO6200
VT_32	325520	6503545	407	119	Vestas V162-6.2 MW	104,8	PO6200
VT_33	325602	6502915	425	119	Vestas V162-6.2 MW	104,8	PO6200
VT_34	325221	6502330	449	119	Vestas V162-6.2 MW	104,8	PO6200
VT_35	324527	6502184	490	119	Vestas V162-6.2 MW	104,8	PO6200
VT_36	324076	6501726	473	119	Vestas V162-6.2 MW	104,8	PO6200
VT_37	324695	6501419	460	119	Vestas V162-6.2 MW	104,8	PO6200
VT_38	325066	6501819	433	119	Vestas V162-6.2 MW	104,8	PO6200

Wind Farm Måkaknuten

WTG	X [m]	Y [m]	Ground level [mas]	Hub height [m]	Turbine type	Noise emission [dBA]	Noise setting
M01	320750	6506633	340	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M02	321233	6506735	353	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M03	321558	6506908	354	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M04	322003	6507249	349	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M05	322521	6507459	342	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M06	321460	6507821	375	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M07	321149	6507661	360	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M08	320872	6507450	347	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M09	320576	6507284	320	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M10	319973	6507124	316	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M11	321805	6508152	379	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M12	322117	6508349	404	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M13	322359	6508569	403	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M14	322692	6508756	435	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M15	323070	6508863	416	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M16	322490	6508006	372	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M17	322953	6508200	373	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M18	323290	6508466	395	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M19	323596	6508729	391	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M20	324141	6508910	378	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M21	323959	6509365	366	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M22	323507	6509459	360	125	Siemens SWT-DD-130	92,3-107,0	Mode 1

Wind Farm Stigafjellet

WTG	X [m]	Y [m]	Ground level [mas]	Hub height [m]	Turbine type	Noise emission [dBA]	Noise setting
S1	322100	6506060	421	115	Siemens SWT-DD-130	92,3-107,0	Mode 1
S2	322488	6506113	411	115	Siemens SWT-DD-130	92,3-107,0	Mode 1
S3	322598	6506542	399	115	Siemens SWT-DD-130	92,3-107,0	Mode 1
S4	323096	6506496	398	115	Siemens SWT-DD-130	92,3-107,0	Mode 1
S5	323167	6506869	385	115	Siemens SWT-DD-130	92,3-107,0	Mode 1
S6	323455	6507086	381	115	Siemens SWT-DD-130	92,3-107,0	Mode 1
S7	323711	6507282	373	115	Siemens SWT-DD-130	92,3-107,0	Mode 1

Wind Farm Bjerkreim

WTG	X [m]	Y [m]	Ground level [mas]	Hub height [m]	Turbine type	Noise emission [dBA]	Noise setting
E16	319300	6497649	249	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E20	319520	6498087	215	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E21	319928	6498138	245	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E22	320454	6498524	268	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E23	320460	6497883	280	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E24	320369	6497490	305	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E25	320087	6497238	251	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E41	320935	6497321	273	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E42	321319	6496749	230	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E43	321111	6499025	300	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E44	321623	6499035	309	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E45	321695	6499425	339	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E46	322264	6498980	300	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E47	321932	6499756	289	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E48	321430	6500372	335	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E49	321731	6500564	350	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E50	321982	6500810	345	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E51	322417	6500859	285	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E52	321242	6500072	275	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E53	320664	6500602	285	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E54	320891	6500877	312	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E55	321415	6498191	290	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E56	321856	6498558	287	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E57	321675	6497692	260	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E58	322209	6497960	250	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E59	322466	6498259	243	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E60	323076	6498707	280	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E61	322885	6499198	295	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E62	323554	6499080	280	125	Siemens SWT-DD-130	92,3-107,0	Mode 1

Wind Farm Bjerkreim

WTG	X [m]	Y [m]	Ground level [mas]	Hub height [m]	Turbine type	Noise emission [dBA]	Noise setting
E63	323546	6500023	290	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E64	322845	6500252	320	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E65	323126	6500466	309	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E66	323118	6500908	290	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E67	323878	6500572	275	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E68	322512	6497401	220	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E69	323113	6497733	221	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E70	323576	6497804	200	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G26	319688	6496853	235	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G27	318969	6496352	226	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G28	319082	6495863	230	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G29	319719	6495640	283	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G30	320104	6495691	246	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G31	320335	6496015	256	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G32	319315	6495310	246	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G33	319046	6495025	250	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G34	319291	6494325	218	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G35	319752	6494629	254	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G36	320098	6494023	205	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G37	319810	6495052	261	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G38	320327	6494855	230	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G39	320753	6494843	228	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G40	320902	6495205	225	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S01	317136	6499026	225	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S02	317511	6499063	215	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S03	316881	6498811	218	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S04	316892	6498383	220	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S05	316602	6498180	196	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S06	316423	6497647	182	125	Siemens SWT-DD-130	92,3-107,0	Mode 1

Wind Farm Bjerkreim

WTG	X [m]	Y [m]	Ground level [mas]	Hub height [m]	Turbine type	Noise emission [dBA]	Noise setting
S07	317173	6497851	200	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S08	318037	6498686	235	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S09	318202	6499115	250	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S10	317728	6498082	215	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S11	317743	6497453	200	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S12	318186	6497632	243	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S13	318559	6497709	247	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S14	318819	6497983	274	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S15	318947	6498311	261	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S17	319085	6497404	250	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S18	318695	6497186	235	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S19	318068	6496960	227	125	Siemens SWT-DD-130	92,3-107,0	Mode 1

Wind Farm Moifjellet

WTG	X [m]	Y [m]	Ground level [mas]	Hub height [m]	Turbine type	Noise emission [dBA]	Noise setting
VT_01	319805	6503654	360	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_02	320355	6503906	388	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_03	320915	6504155	421	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_04	321497	6504154	401	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_05	321335	6503575	439	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_06	320959	6503143	393	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_07	320454	6503079	402	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_08	319939	6503060	419	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_09	320009	6502460	398	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_10	319871	6501985	337	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_11	321394	6502504	389	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_12	321801	6502996	431	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_13	321953	6503477	423	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_14	322632	6504080	476	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_15	323243	6504188	471	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_16	323185	6503740	506	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_17	322538	6503112	486	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_18	321105	6501373	284	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_19	321846	6501419	324	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_20	322147	6501742	313	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_21	322452	6502079	412	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_22	322805	6502300	506	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_23	323171	6502829	527	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_24	323627	6503136	501	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_25	323782	6503568	504	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_26	323935	6503998	461	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_27	323426	6502084	495	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_28	323801	6502601	519	119	Vestas V162-6.2 MW	95,6-104,8	PO6200

Wind Farm Moifjellet

WTG	X [m]	Y [m]	Ground level [mas]	Hub height [m]	Turbine type	Noise emission [dBA]	Noise setting
VT_29	324315	6502907	530	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_30	324726	6503153	514	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_31	325041	6503494	446	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_32	325520	6503545	407	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_33	325602	6502915	425	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_34	325221	6502330	449	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_35	324527	6502184	490	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_36	324076	6501726	473	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_37	324695	6501419	460	119	Vestas V162-6.2 MW	95,6-104,8	PO6200
VT_38	325066	6501819	433	119	Vestas V162-6.2 MW	95,6-104,8	PO6200

Wind Farm Måkaknuten

WTG	X [m]	Y [m]	Ground level [mas]	Hub height [m]	Turbine type	Noise emission [dBA]	Noise setting
M01	320750	6506633	340	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M02	321233	6506735	353	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M03	321558	6506908	354	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M04	322003	6507249	349	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M05	322521	6507459	342	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M06	321460	6507821	375	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M07	321149	6507661	360	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M08	320872	6507450	347	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M09	320576	6507284	320	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M10	319973	6507124	316	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M11	321805	6508152	379	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M12	322117	6508349	404	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M13	322359	6508569	403	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M14	322692	6508756	435	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M15	323070	6508863	416	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M16	322490	6508006	372	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M17	322953	6508200	373	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M18	323290	6508466	395	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M19	323596	6508729	391	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M20	324141	6508910	378	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M21	323959	6509365	366	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
M22	323507	6509459	360	125	Siemens SWT-DD-130	92,3-107,0	Mode 1

Wind Farm Stigafjellet

WTG	X [m]	Y [m]	Ground level [mas]	Hub height [m]	Turbine type	Noise emission [dBA]	Noise setting
S1	322100	6506060	421	115	Siemens SWT-DD-130	92,3-107,0	Mode 1
S2	322488	6506113	411	115	Siemens SWT-DD-130	92,3-107,0	Mode 1
S3	322598	6506542	399	115	Siemens SWT-DD-130	92,3-107,0	Mode 1
S4	323096	6506496	398	115	Siemens SWT-DD-130	92,3-107,0	Mode 1
S5	323167	6506869	385	115	Siemens SWT-DD-130	92,3-107,0	Mode 1
S6	323455	6507086	381	115	Siemens SWT-DD-130	92,3-107,0	Mode 1
S7	323711	6507282	373	115	Siemens SWT-DD-130	92,3-107,0	Mode 1

Wind Farm Bjerkreim

WTG	X [m]	Y [m]	Ground level [mas]	Hub height [m]	Turbine type	Noise emission [dBA]	Noise setting
E16	319300	6497649	249	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E20	319520	6498087	215	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E21	319928	6498138	245	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E22	320454	6498524	268	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E23	320460	6497883	280	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E24	320369	6497490	305	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E25	320087	6497238	251	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E41	320935	6497321	273	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E42	321319	6496749	230	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E43	321111	6499025	300	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E44	321623	6499035	309	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E45	321695	6499425	339	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E46	322264	6498980	300	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E47	321932	6499756	289	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E48	321430	6500372	335	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E49	321731	6500564	350	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E50	321982	6500810	345	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E51	322417	6500859	285	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E52	321242	6500072	275	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E53	320664	6500602	285	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E54	320891	6500877	312	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E55	321415	6498191	290	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E56	321856	6498558	287	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E57	321675	6497692	260	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E58	322209	6497960	250	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E59	322466	6498259	243	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E60	323076	6498707	280	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E61	322885	6499198	295	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E62	323554	6499080	280	125	Siemens SWT-DD-130	92,3-107,0	Mode 1

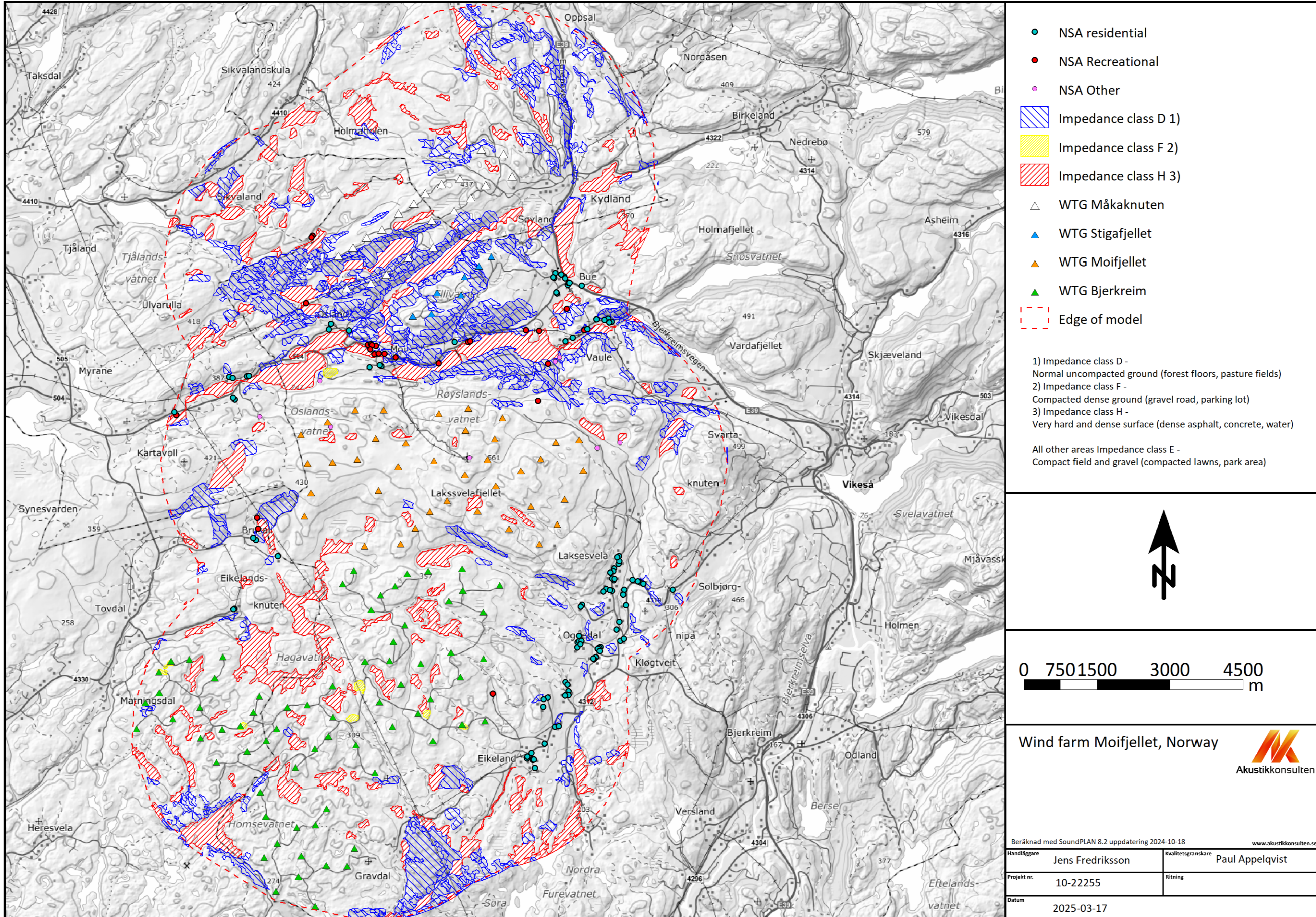
Wind Farm Bjerkreim

WTG	X [m]	Y [m]	Ground level [mas]	Hub height [m]	Turbine type	Noise emission [dBA]	Noise setting
E63	323546	6500023	290	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E64	322845	6500252	320	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E65	323126	6500466	309	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E66	323118	6500908	290	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E67	323878	6500572	275	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E68	322512	6497401	220	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E69	323113	6497733	221	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
E70	323576	6497804	200	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G26	319688	6496853	235	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G27	318969	6496352	226	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G28	319082	6495863	230	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G29	319719	6495640	283	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G30	320104	6495691	246	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G31	320335	6496015	256	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G32	319315	6495310	246	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G33	319046	6495025	250	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G34	319291	6494325	218	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G35	319752	6494629	254	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G36	320098	6494023	205	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G37	319810	6495052	261	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G38	320327	6494855	230	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G39	320753	6494843	228	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
G40	320902	6495205	225	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S01	317136	6499026	225	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S02	317511	6499063	215	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S03	316881	6498811	218	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S04	316892	6498383	220	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S05	316602	6498180	196	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S06	316423	6497647	182	125	Siemens SWT-DD-130	92,3-107,0	Mode 1

Wind Farm Bjerkreim

WTG	X [m]	Y [m]	Ground level [mas]	Hub height [m]	Turbine type	Noise emission [dBA]	Noise setting
S07	317173	6497851	200	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S08	318037	6498686	235	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S09	318202	6499115	250	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S10	317728	6498082	215	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S11	317743	6497453	200	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S12	318186	6497632	243	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S13	318559	6497709	247	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S14	318819	6497983	274	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S15	318947	6498311	261	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S17	319085	6497404	250	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S18	318695	6497186	235	125	Siemens SWT-DD-130	92,3-107,0	Mode 1
S19	318068	6496960	227	125	Siemens SWT-DD-130	92,3-107,0	Mode 1

Ground absorption map



Distance NSA-WTG

Horizontal distance NSA-WTG [m]																																						
NSA	T01	T02	T03	T04	T05	T06	T07	T08	T09	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	T21	T22	T23	T24	T25	T26	T27	T28	T29	T30	T31	T32	T33	T34	T35	T36	T37	T38
18	6978	6584	6214	5723	5562	5716	6162	6642	6407	6448	5086	4886	4975	4777	4414	4138	4286	5147	4414	4165	3949	3688	3598	3407	3593	3824	3031	2945	2747	2676	2817	2699	2072	1718	2111	2296	1611	1461
19	6004	5401	4791	4297	4770	5334	5771	6201	6502	6914	5462	4824	4372	3466	2981	3379	4265	6516	6055	5622	5176	4811	4173	3702	3243	2788	4754	4143	3716	3410	3052	3035	3670	4219	4395	4921	5140	4727
20	7584	7192	6822	6329	6170	6322	6766	7242	6998	7026	5685	5493	5583	5372	4993	4730	4894	5710	4983	4749	4547	4293	4205	4005	4174	4384	3637	3550	3332	3228	3325	3150	2545	2282	2715	2899	2212	2064
21	7407	7197	7023	6680	6308	6227	6540	6914	6488	6335	5465	5565	5864	6050	5915	5517	5241	4966	4398	4394	4442	4412	4690	4795	5158	5534	3910	4233	4386	4562	4878	4933	4311	3710	3635	3317	2852	3204
22	7558	7287	7049	6653	6342	6334	6694	7106	6732	6635	5597	5605	5844	5908	5694	5329	5185	5258	4621	4539	4506	4402	4572	4585	4899	5233	3827	4035	4079	4178	4438	4426	3792	3261	3331	3149	2567	2802
23	7521	7165	6834	6369	6160	6262	6684	7144	6858	6849	5588	5457	5596	5473	5146	4845	4908	5504	4795	4603	4450	4239	4234	4102	4325	4582	3595	3605	3476	3445	3606	3492	2865	2485	2793	2854	2168	2159
24	7139	6875	6647	6261	5938	5919	6274	6683	6307	6209	5178	5199	5449	5544	5355	4978	4797	4831	4195	4118	4094	4002	4198	4239	4572	4924	3441	3683	3769	3904	4194	4222	3594	3018	3016	2783	2238	2530
25	7369	7196	7063	6753	6347	6223	6506	6853	6398	6211	5453	5607	5939	6194	6104	5690	5344	4860	4343	4387	4484	4498	4833	4988	5374	5768	4046	4427	4634	4848	5190	5277	4665	4038	3893	3511	3117	3517
27	7024	6622	6243	5746	5597	5763	6214	6697	6473	6521	5143	4928	5006	4784	4407	4142	4317	5229	4493	4235	4009	3738	3626	3417	3587	3805	3081	2968	2745	2652	2772	2634	2013	1700	2132	2351	1672	1481
28	7583	7379	7211	6871	6495	6408	6716	7085	6653	6492	5644	5752	6055	6246	6111	5713	5434	5127	4569	4573	4628	4603	4885	4991	5354	5729	4104	4429	4580	4753	5065	5113	4489	3895	3828	3513	3045	3392
29	1539	1964	2475	3055	2996	2799	2392	1993	2477	2789	3493	3627	3618	4192	4796	4778	4281	4015	4509	4544	4618	4828	4970	5325	5393	5498	5482	5640	6048	6395	6650	7119	7301	7075	6463	6222	6913	7096
32	8157	8062	8005	7755	7298	7097	7314	7600	7088	6826	6326	6574	6955	7308	7277	6848	6409	5553	5163	5295	5472	5555	5962	6175	6582	6994	5179	5621	5879	6122	6478	6581	5972	5337	5151	4719	4388	4812
33	7515	7229	6974	6566	6271	6282	6654	7075	6716	6635	5554	5537	5760	5794	5561	5205	5094	5260	4606	4505	4450	4326	4469	4459	4760	5084	3736	3914	3933	4014	4262	4236	3601	3087	3189	3042	2437	2641
35	8042	7918	7832	7559	7121	6948	7189	7498	7005	6767	6175	6389	6751	7064	7005	6583	6184	5462	5026	5128	5275	5331	5709	5895	6292	6695	4922	5337	5568	5793	6137	6224	5610	4986	4831	4427	4060	4465
36	8064	7975	7925	7682	7220	7012	7223	7505	6990	6723	6241	6499	6884	7250	7228	6797	6345	5456	5076	5216	5400	5491	5908	6130	6541	6956	5126	5578	5848	6098	6460	6572	5967	5325	5124	4680	4365	4798
37	7068	6690	6337	5857	5674	5806	6243	6715	6460	6482	5157	4985	5097	4936	4592	4302	4407	5163	4437	4209	4017	3777	3725	3564	3771	4019	3123	3083	2922	2879	3039	2936	2306	1918	2258	2382	1691	1614
38	2327	2806	3331	3714	3203	2639	2217	1870	1471	1096	2701	3274	3645	4544	5115	4845	3991	2231	2969	3276	3617	4003	4487	5016	5314	5631	4582	5040	5610	6071	6471	6943	6866	6394	5687	5201	5817	6194
43	1978	1424	935	930	1470	1915	2104	2356	2849	3338	2543	2127	1729	1712	2200	2361	2339	3669	3676	3428	3210	3168	2952	3073	2959	2913	3692	3555	3763	3986	4127	4557	4875	4837	4374	4379	5023	5021
44	6284	5681	5072	4580	5054	5618	6054	6484	6786	7197	5741	5104	4654	3747	3257	3649	4539	6791	6322	5888	5441	5072	4431	3952	3495	3042	4998	4381	3937	3612	3237	3184	3819	4392	4601	5140	5335	4907
45	5927	5325	4715	4167	4550	5086	5560	6030	6250	6619	5079	4457	4060	3168	2591	2910	3810	6046	5510	5069	4615	4222	3580	3061	2622	2193	4061	3428	2935	2572	2173	2097	2731	3313	3560	4127	4276	3833
46	2168	1595	1055	910	1493	1983	2221	2511	2977	3461	2560	2096	1663	1535	1992	2179	2232	3706	3665	3393	3147	3076	2818	2905	2768	2701	3573	3402	3583	3790	3916	4341	4672	4655	4212	4244	4877	4856
47	6739	6135	5524	4981	5370	5906	6381	6850	7070	7437	5890	5271	4880	3989	3409	3716	4614	6838	6282	5841	5386	4986	4348	3815	3390	2978	4775	4136	3605	3195	2755	2557	3159	3808	4162	4763	4826	4342
48	7348	6975	6626	6148	5961	6087	6520	6989	6725	6737	5431	5269	5386	5228	4882	4594	4697	5408	4687	4471	4291	4058	4015	3856	4060	4303	3406	3374	3212	3159	3305	3181	2556	2199	2550	2665	1974	1906
50	1586	2005	2511	3091	3038	2846	2440	2043	2528	2839	3542	3672	3660	4228	4831	4816	4324	4066	4559	4593	4666	4874	5013	5366	5432	5533	5528	5683	6089	6435	6688	7156	7341	7118	6507	6268	6959	7140
51	7029	6749	6505	6106	5799	5799	6167	6586	6226	6146	5067	5062	5297	5364	5158	4788	4637	4771	4116	4016	3969	3857	4025	4047	4369	4713	3279	3493	3558	3681	3965	3987	3358	2788	2806	2603	2034	2306
52	7019	6613	6230	5730	5587	5758	6212	6696	6476	6529	5143	4922	4994	4763	4381	4120	4305	5241	4504	4242	4010	3735	3614	3398	3561	3774	3078	2954	2721	2620	2733	2590	1970	1670	2117	2350	1676	1467
53	7010	6648	6313	5846	5640	5749	6176	6640	6368	6373	5084	4940	5074	4955	4637	4329	4386	5041	4322	4113	3944	3723	3711	3585	3817	4087	3077	3084	2969	2962	3153	3081	2447	2006	2275	2335	1648	1648
54	7913	7761	7647	7350	6932	6788	7053	7383	6909	6697	6016	6195	6538	6809	6723	6309	5951	5366	4887	4956	5073	5102	5449	5608	5993	6387	4661	5047	5251	5457	5790	5862	5243	4630	4507	4132	3729	4115
58	2354	1933	1637	1777	2277	2650	2731	2860	3420	3914	3338	2967	2584	2506	2922	3145	3192	4426	4493	4265	4061	4024	3793	3878	3719	3612	4542	4379	4546	4730	4823	5228	5598	5614	5186	5220	5854	5828
59	2354	2021	1838	2073	2522	2834	2847	2906	3491	3979	3557	3238	2888	2880	3313	3523	3521	4604	4727	4526	4350	4339	4141	4249	4105	4007	4877	4741	4926	5120	5220	5627	5992	5997	5555	5567	6211	6200
60	2235	1907	1741	1998	2432	2731	2735	2789	3374	3862	3460	3154	2815	2839	3289	3485	3455	4498	4631	4437	4269	4267	4084	4206	4073	3989	4813	4690	4889	5093	5203	5615	5970	5961	5508	5508	6156	6155
61	2156	1587	1056	932	1510	1994	2224	2507	2978	3463	2579	2122	1692	1574	2032	2219	2266	3723	3689	3419	3177	3109	2855	2944	2807	2740	3609	3440	3622	3829	3955	4380	4711	4694	4250	4281	4915	4894
62	7602	7403	7242	6907	6526	6432	6736	7100	6663	6496	5667	5783	6091	6292	6163	5763	5474	5134	4584	4596	4659	4640	4930	5044	5410	5787	4148	4481	4640	4817	5133	5185	4561	3964	3889	3565	3106	3459
63	7474	7264	7091	6747	6375	6294	6608	6981	6554	6400	5532	5632	5931	6115	5978	5580	5308	5032	4465	4461	4509	4479																

Distance NSA-WTG

Horizontal distance NSA-WTG [m]																																						
NSA	T01	T02	T03	T04	T05	T06	T07	T08	T09	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	T21	T22	T23	T24	T25	T26	T27	T28	T29	T30	T31	T32	T33	T34	T35	T36	T37	T38
75	8141	8046	7989	7739	7282	7081	7298	7585	7074	6812	6310	6558	6938	7292	7260	6832	6393	5538	5147	5279	5456	5538	5946	6159	6566	6978	5162	5604	5863	6106	6463	6566	5957	5322	5135	4702	4372	4796
76	8165	8069	8010	7759	7303	7103	7321	7609	7098	6837	6332	6578	6958	7309	7276	6848	6411	5562	5169	5301	5476	5557	5962	6174	6580	6991	5179	5619	5875	6117	6472	6573	5963	5329	5146	4716	4382	4805
77	8039	7949	7897	7653	7191	6985	7198	7481	6967	6702	6214	6469	6854	7218	7195	6764	6314	5433	5049	5188	5371	5459	5875	6096	6507	6922	5093	5544	5813	6063	6425	6536	5931	5290	5089	4645	4330	4762
81	6729	6406	6116	5684	5424	5479	5879	6325	6012	5981	4778	4701	4889	4874	4624	4275	4212	4626	3928	3763	3649	3480	3567	3527	3819	4140	2862	2989	2989	3076	3340	3348	2717	2162	2247	2143	1507	1700
82	6729	6410	6124	5695	5429	5480	5878	6321	6005	5971	4777	4706	4897	4890	4645	4294	4222	4613	3918	3758	3649	3485	3579	3546	3842	4166	2870	3006	3014	3106	3374	3385	2755	2196	2271	2155	1525	1730
83	7567	7236	6932	6485	6245	6314	6719	7166	6853	6817	5619	5529	5698	5632	5337	5015	5016	5457	4765	4605	4487	4307	4356	4268	4520	4801	3678	3750	3674	3683	3875	3791	3159	2727	2962	2946	2280	2352
84	8262	7863	7480	6978	6837	7001	7448	7927	7687	7715	6371	6168	6244	5995	5588	5349	5556	6397	5671	5438	5234	4974	4864	4637	4775	4953	4317	4203	3945	3796	3837	3600	3035	2877	3366	3582	2896	2717
85	6976	6565	6175	5671	5537	5716	6173	6660	6448	6509	5109	4877	4940	4695	4305	4050	4253	5229	4491	4220	3980	3697	3560	3332	3487	3692	3040	2897	2649	2536	2641	2492	1874	1592	2060	2318	1652	1413
86	6954	6545	6157	5655	5517	5694	6150	6637	6423	6481	5085	4856	4922	4682	4296	4038	4234	5200	4462	4193	3955	3674	3542	3318	3477	3686	3016	2880	2638	2532	2643	2499	1879	1584	2043	2293	1625	1395
87	7371	7005	6663	6190	5994	6110	6539	7005	6733	6737	5448	5298	5423	5281	4943	4649	4735	5402	4685	4478	4308	4083	4056	3909	4122	4372	3434	3420	3273	3232	3387	3271	2644	2272	2600	2692	2003	1961
88	6988	6598	6233	5745	5578	5726	6170	6648	6409	6445	5091	4898	4993	4805	4447	4168	4304	5139	4407	4163	3954	3697	3617	3435	3626	3862	3041	2967	2779	2716	2863	2751	2122	1757	2135	2304	1617	1485
89	7022	6643	6288	5808	5626	5760	6198	6671	6419	6443	5114	4939	5049	4885	4541	4251	4359	5127	4399	4168	3974	3731	3676	3513	3719	3968	3077	3033	2871	2828	2989	2889	2258	1867	2207	2337	1646	1563
90	7075	6695	6339	5858	5678	5813	6251	6725	6473	6497	5167	4991	5099	4932	4585	4297	4410	5180	4453	4222	4027	3784	3726	3560	3763	4008	3130	3082	2915	2866	3022	2914	2285	1906	2255	2389	1699	1610
91	7134	6770	6433	5964	5762	5874	6301	6767	6495	6500	5210	5063	5194	5065	4740	4437	4505	5167	4448	4240	4070	3847	3829	3694	3919	4182	3200	3198	3070	3050	3228	3139	2507	2091	2385	2458	1769	1752
92	7086	6722	6385	5917	5714	5825	6252	6718	6446	6451	5161	5015	5146	5021	4698	4394	4458	5119	4400	4191	4021	3799	3782	3650	3878	4143	3151	3153	3029	3014	3196	3113	2480	2055	2340	2410	1721	1709
93	6975	6618	6289	5827	5614	5716	6139	6601	6323	6323	5045	4910	5051	4946	4637	4324	4365	4987	4271	4067	3906	3692	3693	3578	3819	4096	3048	3071	2971	2978	3179	3118	2483	2024	2269	2307	1623	1649
94	7420	7031	6663	6172	6009	6158	6602	7078	6834	6863	5521	5331	5424	5221	4849	4580	4734	5549	4821	4585	4383	4130	4046	3852	4028	4247	3474	3393	3185	3093	3204	3046	2433	2142	2559	2736	2048	1908
95	7529	7138	6768	6276	6116	6267	6711	7187	6943	6972	5630	5439	5530	5321	4944	4679	4840	5657	4929	4695	4492	4238	4152	3953	4124	4337	3582	3497	3282	3182	3283	3113	2506	2234	2662	2845	2157	2011
96	6184	5585	4981	4512	5012	5581	6001	6414	6743	7168	5752	5113	4648	3748	3299	3712	4585	6829	6392	5962	5521	5165	4531	4074	3615	3159	5134	4530	4117	3820	3467	3451	4086	4635	4803	5321	5552	5142
97	6115	5515	4910	4436	4931	5500	5923	6339	6663	7086	5663	5025	4562	3660	3206	3617	4492	6737	6296	5867	5425	5067	4433	3975	3516	3059	5034	4429	4016	3720	3368	3356	3991	4537	4703	5220	5452	5043
98	6107	5508	4903	4431	4928	5497	5919	6333	6660	7083	5665	5026	4562	3661	3210	3623	4496	6740	6302	5873	5431	5075	4442	3985	3526	3070	5046	4442	4031	3737	3387	3378	4013	4557	4720	5235	5470	5063
99	6310	5709	5102	4622	5109	5677	6105	6526	6842	7260	5823	5185	4728	3823	3352	3754	4637	6886	6432	6000	5555	5191	4553	4083	3625	3169	5135	4523	4090	3775	3407	3365	3999	4566	4762	5295	5502	5079
100	6275	5675	5070	4594	5087	5655	6080	6497	6819	7240	5811	5173	4712	3809	3346	3753	4632	6879	6432	6000	5557	5196	4559	4094	3635	3179	5149	4540	4114	3805	3442	3409	4044	4604	4791	5319	5534	5116
101	6298	5697	5090	4607	5091	5658	6088	6511	6824	7241	5800	5162	4706	3801	3325	3725	4610	6860	6402	5970	5524	5159	4521	4049	3591	3136	5100	4487	4052	3735	3365	3322	3957	4524	4723	5256	5461	5038
102	6316	5714	5105	4615	5091	5655	6090	6518	6823	7235	5782	5145	4694	3787	3299	3693	4582	6834	6367	5933	5486	5117	4477	3998	3541	3087	5044	4428	3984	3659	3283	3229	3864	4438	4648	5188	5382	4954
103	6338	5736	5126	4636	5110	5675	6110	6539	6843	7254	5799	5162	4712	3805	3315	3708	4597	6849	6381	5946	5499	5129	4489	4009	3552	3099	5054	4436	3990	3663	3285	3228	3862	4438	4652	5194	5385	4955
104	6529	5925	5314	4813	5273	5833	6277	6714	7003	7406	5930	5294	4854	3946	3434	3811	4708	6961	6472	6035	5585	5207	4564	4069	3616	3168	5099	4474	4005	3655	3258	3163	3793	4392	4644	5203	5362	4916
105	6007	5404	4794	4302	4778	5342	5777	6206	6510	6923	5474	4836	4383	3477	2995	3395	4280	6530	6072	5639	5194	4830	4192	3722	3264	2809	4776	4166	3741	3437	3080	3065	3700	4247	4422	4946	5167	4755
106	6270	5667	5056	4511	4899	5436	5910	6378	6600	6969	5427	4806	4411	3518	2941	3256	4156	6388	5844	5403	4949	4552	3911	3386	2953	2531	4370	3734	3223	2838	2417	2284	2909	3524	3820	4403	4515	4052
107	6516	5912	5300	4760	5157	5697	6168	6634	6863	7235	5697	5074	4675	3780	3208	3527	4427	6660	6116	5675	5221	4824	4183	3657	3224	2803	4636	3999	3482	3089	2660	2500	3117	3748	4066	4656	4750	4278
108	6655	6051	5440	4897	5287	5824	6298	6766	6988	7356	5810	5191	4798	3906	3328	3637	4535	6762	6209	5767	5313	4913	4274	3743	3316	2902	4708	4070	3542	3137	2699	2513	3120	3764	4107	4705	4777	4296
109	6789	6187	5576	5029	5411	5944	6421	6893	7106	7469	5916	5300	4914	4027	3442	3741	4636	6854	6291	5849	5395	4992	4356	3821	3400	2995	4769	4130	3592	3176	2731	2518	3113	3769	4136	4742	4792	4302
111	2507	2901	3361	3671	3115	2543	2197	1965	1439	961	2448	3061	3480	4388	4930	4623	3741	1787	2529	2873	3248	3650	4178	4719	5049	5395	4195	4690	5274	5744	6160	6625	6507	6003	5294	4779	5373	5773
112	3788	4242	4732	5059	4505	3933	3578	3299	2816	2349	3793	4420	4856	5764	6291	5965	5070	2940	3640	4042	4460	4875	5447	5996	6354	67												

Distance NSA-WTG

Horizontal distance NSA-WTG [m]																																						
NSA	T01	T02	T03	T04	T05	T06	T07	T08	T09	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	T21	T22	T23	T24	T25	T26	T27	T28	T29	T30	T31	T32	T33	T34	T35	T36	T37	T38
144	7588	7392	7234	6902	6518	6420	6722	7084	6645	6476	5655	5775	6085	6292	6168	5766	5471	5114	4569	4584	4651	4636	4930	5048	5416	5795	4148	4486	4649	4830	5148	5204	4581	3981	3899	3569	3116	3474
145	7538	7272	7038	6646	6330	6316	6674	7083	6705	6604	5577	5592	5836	5909	5701	5333	5179	5226	4594	4518	4490	4391	4570	4590	4909	5246	3821	4038	4092	4197	4463	4456	3822	3285	3342	3149	2575	2821
146	7955	7799	7679	7376	6963	6826	7095	7429	6959	6750	6054	6225	6563	6824	6731	6319	5972	5416	4929	4992	5103	5125	5463	5615	5996	6387	4676	5053	5248	5447	5776	5841	5220	4613	4502	4137	3723	4100
147	7336	7170	7045	6742	6330	6197	6473	6816	6355	6162	5426	5591	5929	6197	6116	5700	5339	4815	4309	4362	4468	4491	4837	5003	5393	5791	4050	4442	4661	4884	5230	5326	4716	4083	3923	3529	3151	3560
149	7822	7507	7219	6784	6527	6575	6968	7406	7073	7017	5866	5803	5991	5952	5670	5341	5312	5648	4972	4837	4743	4583	4661	4593	4856	5145	3965	4067	4012	4032	4230	4147	3515	3079	3292	3242	2589	2692
151	6938	6552	6191	5707	5533	5676	6118	6595	6351	6384	5038	4851	4952	4775	4424	4139	4262	5076	4345	4104	3899	3647	3576	3403	3603	3846	2992	2929	2754	2704	2863	2762	2131	1744	2100	2253	1564	1453
156	3812	4267	4759	5087	4533	3961	3605	3324	2843	2376	3822	4450	4885	5793	6320	5994	5100	2970	3670	4071	4490	4904	5477	6026	6384	6752	5383	5932	6528	7005	7439	7890	7712	7156	6451	5884	6411	6864
157	7449	7291	7174	6877	6459	6318	6588	6924	6457	6255	5547	5721	6064	6342	6266	5849	5479	4915	4422	4485	4600	4630	4983	5154	5545	5945	4196	4593	4816	5039	5386	5481	4870	4239	4078	3681	3306	3716
158	1172	869	942	1438	1646	1789	1701	1719	2307	2794	2556	2387	2178	2532	3103	3161	2866	3508	3728	3595	3506	3588	3549	3799	3782	3819	4197	4205	4519	4809	5011	5464	5715	5584	5042	4928	5606	5692
163	6552	6013	5478	4901	5020	5408	5917	6432	6432	6660	5061	4583	4402	3767	3186	3179	3837	5667	4969	4563	4156	3750	3255	2753	2574	2469	3256	2710	2126	1667	1314	836	958	1634	2257	2892	2667	2124
165	929	1402	1960	2541	2421	2191	1776	1384	1895	2246	2877	3027	3046	3673	4287	4236	3697	3421	3897	3928	4004	4220	4382	4754	4846	4976	4875	5050	5474	5834	6106	6579	6737	6490	5868	5615	6305	6497
166	6093	5562	5036	4461	4562	4940	5448	5963	5957	6184	4586	4111	3941	3332	2766	2730	3367	5197	4503	4094	3683	3276	2780	2280	2118	2049	2793	2237	1651	1191	858	403	560	1258	1824	2466	2309	1778
169	3930	3327	2718	2240	2752	3324	3731	4142	4478	4913	3569	2939	2448	1598	1368	1817	2544	4699	4367	3969	3566	3286	2728	2450	2060	1705	3477	3007	2858	2823	2735	3037	3541	3784	3608	3920	4384	4158
175	640	103	593	1125	948	870	749	906	1428	1922	1642	1611	1571	2225	2845	2765	2234	2548	2798	2707	2680	2831	2925	3280	3371	3518	3474	3595	4001	4357	4632	5107	5261	5028	4423	4216	4906	5060
176	2697	2484	2414	2710	3120	3374	3315	3289	3890	4364	4122	3850	3526	3545	3974	4189	4171	5118	5297	5122	4970	4979	4800	4915	4769	4663	5529	5404	5592	5782	5874	6274	6649	6662	6220	6224	6872	6865
177	2236	1695	1216	1165	1729	2190	2385	2632	3129	3619	2801	2359	1936	1799	2229	2439	2511	3937	3921	3658	3420	3354	3095	3171	3018	2929	3851	3673	3841	4034	4144	4559	4909	4910	4479	4520	5151	5121
178	2306	1758	1261	1169	1745	2220	2432	2691	3180	3668	2815	2357	1923	1747	2162	2382	2483	3957	3925	3654	3406	3330	3055	3118	2956	2858	3817	3626	3783	3968	4072	4485	4840	4850	4427	4479	5105	5068
179	2385	1826	1306	1160	1749	2242	2475	2752	3228	3714	2813	2335	1888	1662	2060	2293	2427	3963	3909	3627	3367	3277	2985	3032	2859	2752	3751	3546	3690	3868	3965	4376	4736	4756	4342	4406	5026	4980
180	2509	1929	1367	1112	1713	2239	2518	2832	3278	3756	2756	2242	1772	1454	1824	2073	2266	3918	3819	3517	3235	3120	2796	2817	2629	2511	3570	3339	3465	3632	3723	4131	4497	4527	4126	4211	4821	4762
184	3500	3005	2548	2020	1977	2317	2823	3339	3348	3613	2004	1487	1352	1094	994	552	742	2833	2280	1839	1387	1011	380	357	629	1039	1121	793	1079	1452	1791	2272	2344	2130	1609	1673	2274	2259
186	3182	2578	1967	1487	2013	2586	2981	3388	3732	4174	2890	2276	1773	1035	1110	1482	2005	4042	3779	3408	3041	2820	2349	2215	1928	1716	3133	2772	2776	2870	2904	3287	3696	3803	3490	3684	4233	4097
187	5088	4483	3871	3353	3802	4361	4808	5251	5531	5935	4471	3834	3386	2478	1993	2398	3278	5527	5077	4647	4205	3851	3219	2775	2317	1862	3842	3254	2890	2660	2383	2504	3113	3556	3613	4084	4385	4028
188	5331	4726	4113	3587	4019	4573	5028	5478	5743	6138	4651	4016	3581	2673	2156	2539	3432	5685	5211	4776	4330	3962	3323	2854	2396	1940	3911	3305	2902	2631	2316	2387	3010	3494	3604	4104	4365	3983
189	6040	5435	4822	4305	4746	5301	5754	6201	6471	6867	5376	4742	4310	3402	2877	3247	4145	6398	5905	5468	5017	4639	3997	3504	3050	2601	4538	3916	3459	3126	2747	2699	3334	3902	4115	4661	4847	4418
190	6204	5601	4991	4445	4833	5370	5844	6313	6535	6904	5363	4742	4346	3453	2876	3193	4093	6326	5785	5343	4889	4493	3852	3329	2893	2470	4316	3680	3173	2793	2376	2254	2881	3490	3776	4356	4475	4017
191	5543	4945	4339	3779	4132	4656	5139	5617	5815	6173	4619	4003	3621	2742	2148	2445	3343	5571	5029	4588	4133	3739	3097	2577	2139	1714	3579	2948	2466	2122	1747	1741	2374	2911	3111	3664	3843	3420
192	5435	4838	4233	3671	4017	4539	5023	5504	5697	6053	4498	3883	3503	2626	2030	2323	3221	5449	4907	4466	4012	3618	2976	2457	2017	1591	3463	2833	2357	2023	1660	1682	2311	2830	3012	3558	3750	3335
193	5280	4683	4079	3516	3863	4387	4870	5350	5546	5904	4353	3735	3352	2473	1879	2180	3079	5313	4779	4338	3884	3494	2851	2339	1894	1460	3358	2732	2275	1964	1625	1692	2312	2802	2948	3479	3697	3297
194	6582	6482	6430	6195	5725	5517	5736	6031	5531	5291	4746	5007	5401	5806	5828	5387	4882	3990	3582	3721	3917	4029	4484	4755	5186	5619	3716	4219	4561	4871	5273	5459	4898	4215	3881	3360	3182	3682
195	2301	1794	1371	1384	1932	2368	2528	2737	3258	3751	3005	2582	2168	2034	2448	2671	2749	4129	4136	3882	3652	3591	3334	3405	3244	3141	4091	3911	4071	4255	4354	4763	5125	5139	4714	4760	5389	5356
196	2349	1835	1398	1385	1942	2388	2559	2777	3293	3785	3015	2581	2160	2001	2404	2635	2732	4144	4141	3881	3644	3577	3309	3371	3204	3094	4069	3881	4034	4213	4307	4713	5080	5100	4681	4734	5360	5321
197	2380	1851	1385	1329	1899	2362	2553	2791	3294	3785	2971	2521	2089	1901	2298	2533	2649	4108	4087	3818	3573	3496	3217	3271	3099	2986	3981	3784	3930	4106	4198	4605	4972	4995	4581	4641	5264	5220
198	2346	1827	1381	1357	1917	2368	2544	2769	3281	3773	2990	2552	2129	1965	2369	2599	2699	4121	4113	3852	3613	3544	3275	3336	3168	3060	4035	3846	3998	4178	4272	4680	5045	5065	4646	4699	5325	5286
199	2253	1732	1287	1279	1832	2276	2449	2673	3185	3677	2905	2476	2060	1933	2357	2572	2642	4033	40																			

Point calculations D01

NSA	X [m]	Y [m]	Z _{ground} [mas]	Calculation height [m]	L _{den} [dBA]		
					(D01-1)	(D01-2)	(D01-3)
					Moifjellet (Worst case)	Other wind farms (lokale vindforhold)	Cumulative
18	326234	6500942	184	4,0 m	40	33	41
19	325067	6506546	240	4,0 m	41	40	43
20	326770	6500654	187	4,0 m	41	36	42
21	325238	6498620	136	4,0 m	38	39	41
22	325861	6499132	119	4,0 m	40	38	42
23	326480	6500188	160	4,0 m	41	37	43
24	325480	6499323	137	4,0 m	41	39	43
25	324876	6498307	177	4,0 m	39	40	42
27	326323	6501036	183	4,0 m	43	33	43
28	325307	6498436	131	4,0 m	39	39	42
29	318451	6504386	271	4,0 m	43	37	44
32	324569	6497033	113	4,0 m	36	41	42
33	325952	6499331	128	4,0 m	41	38	43
35	324812	6497361	117	4,0 m	37	41	43
36	324448	6497061	115	4,0 m	37	42	43
37	326223	6500694	174	4,0 m	42	35	43
38	318879	6501519	239	4,0 m	41	39	43
43	321215	6505041	262	4,0 m	48	43	49
44	325290	6506721	235	4,0 m	40	40	43
45	325390	6505638	243	4,0 m	43	35	44
46	321453	6505063	256	4,0 m	48	43	49
47	326109	6506033	246	4,0 m	40	33	41
48	326442	6500501	166	4,0 m	43	37	44
50	318418	6504424	270	4,0 m	43	37	44
51	325517	6499558	153	4,0 m	42	38	43
52	326338	6501088	185	4,0 m	43	33	43
53	326072	6500514	172	4,0 m	41	35	42
54	325021	6497704	123	4,0 m	37	37	40
58	320798	6505788	249	4,0 m	41	44	46

Point calculations D01

NSA	X [m]	Y [m]	Z _{ground} [mas]	Calculation height [m]	L _{den} [dBA]		
					(D01-1)	(D01-2)	(D01-3)
					Moifjellet (Worst case)	Other wind farms (lokale vindforhold)	Cumulative
59	320422	6505926	265	4,0 m	43	45	47
60	320383	6505813	251	4,0 m	43	42	46
61	321419	6505083	257	4,0 m	47	43	49
62	325266	6498366	132	4,0 m	39	39	42
63	325283	6498569	134	4,0 m	39	39	42
64	325302	6498359	133	4,0 m	39	39	42
65	325491	6499430	142	4,0 m	41	39	43
66	326363	6499456	131	4,0 m	40	37	42
67	325925	6499317	127	4,0 m	40	38	42
68	325903	6499297	124	4,0 m	40	38	42
69	325940	6499252	128	4,0 m	40	39	42
70	325516	6499454	143	4,0 m	41	38	43
71	325565	6499461	141	4,0 m	41	38	43
72	325544	6499384	139	4,0 m	41	38	43
73	325824	6499090	118	4,0 m	40	38	42
74	324612	6496864	111	4,0 m	36	41	42
75	324565	6497049	114	4,0 m	37	41	42
76	324590	6497038	112	4,0 m	36	41	42
77	324455	6497096	118	4,0 m	37	42	43
81	325579	6500198	158	4,0 m	43	39	44
82	325556	6500160	155	4,0 m	43	39	45
83	326343	6499844	139	4,0 m	41	36	42
84	327442	6500501	202	4,0 m	38	33	39
85	326331	6501189	194	4,0 m	42	32	42
86	326301	6501171	197	4,0 m	42	32	43
87	326419	6500400	163	4,0 m	42	37	43
88	326221	6500885	177	4,0 m	39	33	40
89	326192	6500735	178	4,0 m	42	34	43
90	326244	6500722	176	4,0 m	42	34	43

Point calculations D01

NSA	X [m]	Y [m]	Z _{ground} [mas]	Calculation height [m]	L _{den} [dBA]		
					(D01-1)	(D01-2)	(D01-3)
					Moifjellet (Worst case)	Other wind farms (lokale vindforhold)	Cumulative
91	326194	6500479	163	4,0 m	42	36	43
92	326148	6500496	164	4,0 m	42	35	43
93	326009	6500466	173	4,0 m	41	36	42
94	326613	6500702	174	4,0 m	42	36	43
95	326718	6500671	181	4,0 m	42	36	43
96	325030	6506961	261	4,0 m	39	38	42
97	325011	6506862	256	4,0 m	40	38	42
98	324990	6506881	259	4,0 m	40	37	42
99	325218	6506896	234	4,0 m	40	39	42
100	325155	6506934	238	4,0 m	39	38	41
101	325230	6506854	233	4,0 m	40	38	42
102	325301	6506767	238	4,0 m	40	41	43
103	325326	6506767	239	4,0 m	40	40	43
104	325576	6506708	243	4,0 m	39	40	42
105	325054	6506574	241	4,0 m	41	40	43
106	325688	6505823	243	4,0 m	41	30	42
107	325876	6506020	251	4,0 m	41	35	42
108	326031	6506006	239	4,0 m	41	34	42
109	326186	6505973	242	4,0 m	40	34	41
111	319327	6501193	225	4,0 m	43	41	46
112	318446	6500118	219	4,0 m	39	45	46
113	318826	6501559	241	4,0 m	41	40	44
114	318335	6504836	249	4,0 m	42	34	43
115	318696	6504851	255	4,0 m	43	36	44
116	318740	6504863	255	4,0 m	44	36	45
137	326286	6499687	144	4,0 m	39	35	40
138	325236	6505570	235	4,0 m	43	37	44
139	326137	6505953	246	4,0 m	40	35	41
140	326835	6500625	190	4,0 m	41	36	42

Point calculations D01

					L_{den} [dBA]		
					(D01-1)	(D01-2)	(D01-3)
NSA	X [m]	Y [m]	Z_{ground} [mas]	Calculation height [m]	Moifjellet (Worst case)	Other wind farms (lokale vindforhold)	Cumulative
141	318410	6504821	249	4,0 m	42	35	43
142	317204	6504129	246	4,0 m	40	36	41
143	324536	6497172	119	4,0 m	37	42	43
144	325230	6498349	131	4,0 m	39	39	42
145	325811	6499098	118	4,0 m	40	38	42
146	325102	6497719	123	4,0 m	38	38	41
147	324787	6498270	187	4,0 m	39	38	41
149	326433	6499500	136	4,0 m	41	37	42
151	326155	6500857	191	4,0 m	38	33	39
156	318421	6500103	218	4,0 m	38	45	46
157	324784	6498114	189	4,0 m	37	35	39
158	320193	6504760	253	4,0 m	48	39	48
163	326355	6503507	335	4,0 m	49	35	49
165	318959	6504037	302	4,0 m	45	37	46
166	325893	6503393	360	4,0 m	50	34	50
169	323244	6505556	234	4,0 m	45	41	47
175	320421	6503827	375	4,0 m	59	38	59
176	319908	6506349	284	4,0 m	41	40	44
177	321314	6505304	242	4,0 m	46	40	47
178	321401	6505319	243	4,0 m	46	40	47
179	321518	6505314	249	4,0 m	46	39	47
180	321751	6505237	242	4,0 m	46	33	46
184	323275	6503195	554	4,0 m	56	39	56
186	322632	6505115	231	4,0 m	46	37	47
187	324421	6505795	238	4,0 m	43	36	44
188	324692	6505784	236	4,0 m	43	37	44
189	325267	6506232	241	4,0 m	41	39	43
190	325628	6505796	250	4,0 m	42	30	42
191	325117	6505239	236	4,0 m	43	38	44

Point calculations D01

NSA	X [m]	Y [m]	Z _{ground} [mas]	Calculation height [m]	L _{den} [dBA]		
					(D01-1)	(D01-2)	(D01-3)
					Moifjellet (Worst case)	Other wind farms (lokale vindforhold)	Cumulative
192	325029	6505154	231	4,0 m	43	38	44
193	324880	6505111	246	4,0 m	44	38	45
194	323746	6498382	174	4,0 m	39	47	47
195	321177	6505501	250	4,0 m	45	40	46
196	321238	6505515	254	4,0 m	45	41	46
197	321339	6505474	263	4,0 m	46	44	48
198	321264	6505491	258	4,0 m	46	42	47
199	321224	6505404	250	4,0 m	45	42	47
201	318901	6501970	231	4,0 m	45	39	46
202	317250	6504070	244	4,0 m	40	35	41
206	320043	6507720	297	4,0 m	38	49	49
207	320024	6507690	296	4,0 m	38	49	49
214	323284	6505567	236	4,0 m	45	43	47
224	318925	6501746	227	4,0 m	46	38	47
225	324676	6504360	375	4,0 m	49	39	49
226	322967	6505552	241	4,0 m	45	44	48

Information

NSA 18-158 & 226, is residential dwellings.

NSA 163-224, marked with **green**, is recreational dwellings and marked with **purple** is other calculation points (not dwellings).

Point calculations D02

NSA	X [m]	Y [m]	Z _{ground} [mas]	Calculation height [m]	L _{den} [dBA] (lokale vindforhold)		
					Moifjellet (D02-1)	Other wind farms (D01-2)	Cumulative (D02-3)
18	326234	6500942	184	4,0 m	33	33	36
19	325067	6506546	240	4,0 m	38	40	42
20	326770	6500654	187	4,0 m	38	36	40
21	325238	6498620	136	4,0 m	35	39	40
22	325861	6499132	119	4,0 m	36	38	40
23	326480	6500188	160	4,0 m	36	37	39
24	325480	6499323	137	4,0 m	37	39	41
25	324876	6498307	177	4,0 m	36	40	41
27	326323	6501036	183	4,0 m	36	33	38
28	325307	6498436	131	4,0 m	35	39	40
29	318451	6504386	271	4,0 m	40	37	41
32	324569	6497033	113	4,0 m	33	41	42
33	325952	6499331	128	4,0 m	37	38	41
35	324812	6497361	117	4,0 m	33	41	42
36	324448	6497061	115	4,0 m	33	42	43
37	326223	6500694	174	4,0 m	36	35	38
38	318879	6501519	239	4,0 m	38	39	42
43	321215	6505041	262	4,0 m	44	43	46
44	325290	6506721	235	4,0 m	37	40	42
45	325390	6505638	243	4,0 m	40	35	41
46	321453	6505063	256	4,0 m	44	43	47
47	326109	6506033	246	4,0 m	37	33	39
48	326442	6500501	166	4,0 m	38	37	40
50	318418	6504424	270	4,0 m	40	37	41
51	325517	6499558	153	4,0 m	37	38	41
52	326338	6501088	185	4,0 m	36	33	37
53	326072	6500514	172	4,0 m	35	35	38
54	325021	6497704	123	4,0 m	33	37	39
58	320798	6505788	249	4,0 m	38	44	45

Point calculations D02

NSA	X [m]	Y [m]	Z _{ground} [mas]	Calculation height [m]	L _{den} [dBA] (lokale vindforhold)		
					Moifjellet (D02-1)	Other wind farms (D01-2)	Cumulative (D02-3)
59	320422	6505926	265	4,0 m	40	45	46
60	320383	6505813	251	4,0 m	40	42	44
61	321419	6505083	257	4,0 m	44	43	47
62	325266	6498366	132	4,0 m	35	39	41
63	325283	6498569	134	4,0 m	35	39	41
64	325302	6498359	133	4,0 m	35	39	41
65	325491	6499430	142	4,0 m	36	39	41
66	326363	6499456	131	4,0 m	36	37	39
67	325925	6499317	127	4,0 m	37	38	40
68	325903	6499297	124	4,0 m	37	38	40
69	325940	6499252	128	4,0 m	37	39	41
70	325516	6499454	143	4,0 m	36	38	40
71	325565	6499461	141	4,0 m	37	38	41
72	325544	6499384	139	4,0 m	37	38	41
73	325824	6499090	118	4,0 m	36	38	40
74	324612	6496864	111	4,0 m	33	41	42
75	324565	6497049	114	4,0 m	33	41	42
76	324590	6497038	112	4,0 m	33	41	41
77	324455	6497096	118	4,0 m	33	42	42
81	325579	6500198	158	4,0 m	37	39	41
82	325556	6500160	155	4,0 m	38	39	42
83	326343	6499844	139	4,0 m	36	36	39
84	327442	6500501	202	4,0 m	32	33	35
85	326331	6501189	194	4,0 m	34	32	37
86	326301	6501171	197	4,0 m	34	32	36
87	326419	6500400	163	4,0 m	37	37	40
88	326221	6500885	177	4,0 m	30	33	35
89	326192	6500735	178	4,0 m	35	34	37
90	326244	6500722	176	4,0 m	36	34	38

Point calculations D02

NSA	X [m]	Y [m]	Z _{ground} [mas]	Calculation height [m]	L _{den} [dBA] (lokale vindforhold)		
					Moifjellet (D02-1)	Other wind farms (D01-2)	Cumulative (D02-3)
91	326194	6500479	163	4,0 m	36	36	39
92	326148	6500496	164	4,0 m	36	35	38
93	326009	6500466	173	4,0 m	35	36	38
94	326613	6500702	174	4,0 m	38	36	40
95	326718	6500671	181	4,0 m	38	36	40
96	325030	6506961	261	4,0 m	36	38	40
97	325011	6506862	256	4,0 m	37	38	40
98	324990	6506881	259	4,0 m	37	37	40
99	325218	6506896	234	4,0 m	37	39	41
100	325155	6506934	238	4,0 m	36	38	40
101	325230	6506854	233	4,0 m	36	38	40
102	325301	6506767	238	4,0 m	37	41	42
103	325326	6506767	239	4,0 m	37	40	42
104	325576	6506708	243	4,0 m	36	40	41
105	325054	6506574	241	4,0 m	38	40	42
106	325688	6505823	243	4,0 m	38	30	39
107	325876	6506020	251	4,0 m	38	35	40
108	326031	6506006	239	4,0 m	37	34	39
109	326186	6505973	242	4,0 m	36	34	39
111	319327	6501193	225	4,0 m	40	41	44
112	318446	6500118	219	4,0 m	36	45	45
113	318826	6501559	241	4,0 m	38	40	42
114	318335	6504836	249	4,0 m	39	34	40
115	318696	6504851	255	4,0 m	40	36	42
116	318740	6504863	255	4,0 m	41	36	42
137	326286	6499687	144	4,0 m	34	35	38
138	325236	6505570	235	4,0 m	40	37	42
139	326137	6505953	246	4,0 m	37	35	39
140	326835	6500625	190	4,0 m	37	36	39

Point calculations D02

NSA	X [m]	Y [m]	Z _{ground} [mas]	Calculation height [m]	L _{den} [dBA] (lokale vindforhold)		
					Moifjellet (D02-1)	Other wind farms (D01-2)	Cumulative (D02-3)
141	318410	6504821	249	4,0 m	39	35	41
142	317204	6504129	246	4,0 m	36	36	39
143	324536	6497172	119	4,0 m	33	42	43
144	325230	6498349	131	4,0 m	35	39	41
145	325811	6499098	118	4,0 m	36	38	40
146	325102	6497719	123	4,0 m	34	38	39
147	324787	6498270	187	4,0 m	35	38	40
149	326433	6499500	136	4,0 m	37	37	40
151	326155	6500857	191	4,0 m	29	33	34
156	318421	6500103	218	4,0 m	35	45	45
157	324784	6498114	189	4,0 m	33	35	37
158	320193	6504760	253	4,0 m	43	39	45
163	326355	6503507	335	4,0 m	46	35	46
165	318959	6504037	302	4,0 m	42	37	43
166	325893	6503393	360	4,0 m	47	34	47
169	323244	6505556	234	4,0 m	42	41	44
175	320421	6503827	375	4,0 m	56	38	56
176	319908	6506349	284	4,0 m	38	40	42
177	321314	6505304	242	4,0 m	43	40	45
178	321401	6505319	243	4,0 m	43	40	45
179	321518	6505314	249	4,0 m	43	39	44
180	321751	6505237	242	4,0 m	43	33	43
184	323275	6503195	554	4,0 m	53	39	53
186	322632	6505115	231	4,0 m	42	37	43
187	324421	6505795	238	4,0 m	40	36	42
188	324692	6505784	236	4,0 m	40	37	42
189	325267	6506232	241	4,0 m	38	39	42
190	325628	6505796	250	4,0 m	39	30	40
191	325117	6505239	236	4,0 m	40	38	42

Point calculations D02

NSA	X [m]	Y [m]	Z _{ground} [mas]	Calculation height [m]	L _{den} [dBA] (lokale vindforhold)		
					Moifjellet (D02-1)	Other wind farms (D01-2)	Cumulative (D02-3)
192	325029	6505154	231	4,0 m	39	38	42
193	324880	6505111	246	4,0 m	40	38	42
194	323746	6498382	174	4,0 m	35	47	47
195	321177	6505501	250	4,0 m	42	40	44
196	321238	6505515	254	4,0 m	41	41	44
197	321339	6505474	263	4,0 m	43	44	47
198	321264	6505491	258	4,0 m	42	42	45
199	321224	6505404	250	4,0 m	42	42	45
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202	317250	6504070	244	4,0 m	37	35	39
206	320043	6507720	297	4,0 m	35	49	49
207	320024	6507690	296	4,0 m	35	49	49
214	323284	6505567	236	4,0 m	42	43	46
224	318925	6501746	227	4,0 m	43	38	44
225	324676	6504360	375	4,0 m	45	39	46
226	322967	6505552	241	4,0 m	42	44	46

Information

NSA 18-158 & 226, is residential dwellings.

NSA 163-224, marked with **green**, is recreational dwellings and marked with **purple** is other calculation points (not dwellings).

Information on results

The calculations are performed with the assumption that the noise sensitive area (NSA) are located 4,0 m above ground. The height of 4,0 m should be considered decisive according to the Norwegian guidelines on noise. According to the European directive on environmental noise it is also possible to use calculations on 1,5 m above ground for recreational areas and areas with one-storey housing as an additional indicator. For indexing of NSA see the noise maps.

Note that if the point calculation and noise map show contradictory results, it is primary the point calculation that should be used. The noise map should be considered as a complement to the point calculation.

The calculation result is rounded to the nearest integer value according to the guidelines *Veileder til retningslinje for behandling av støy i arealplanlegging (T-1442/2016)*:

"Når det skal rundes av til nærmeste hele tall ser vi på første siffer rett etter kommaet.

-er sifferet 0, 1, 2, 3 eller 4 tar vi vekk alle desimalsifrene og beholder det hele tallet slik som det var

-er sifferet 5, 6, 7, 8 eller 9 tar vi vekk alle desimalsifrene og øker det hele tallet med 1

Eksempel; 54,499 = 54

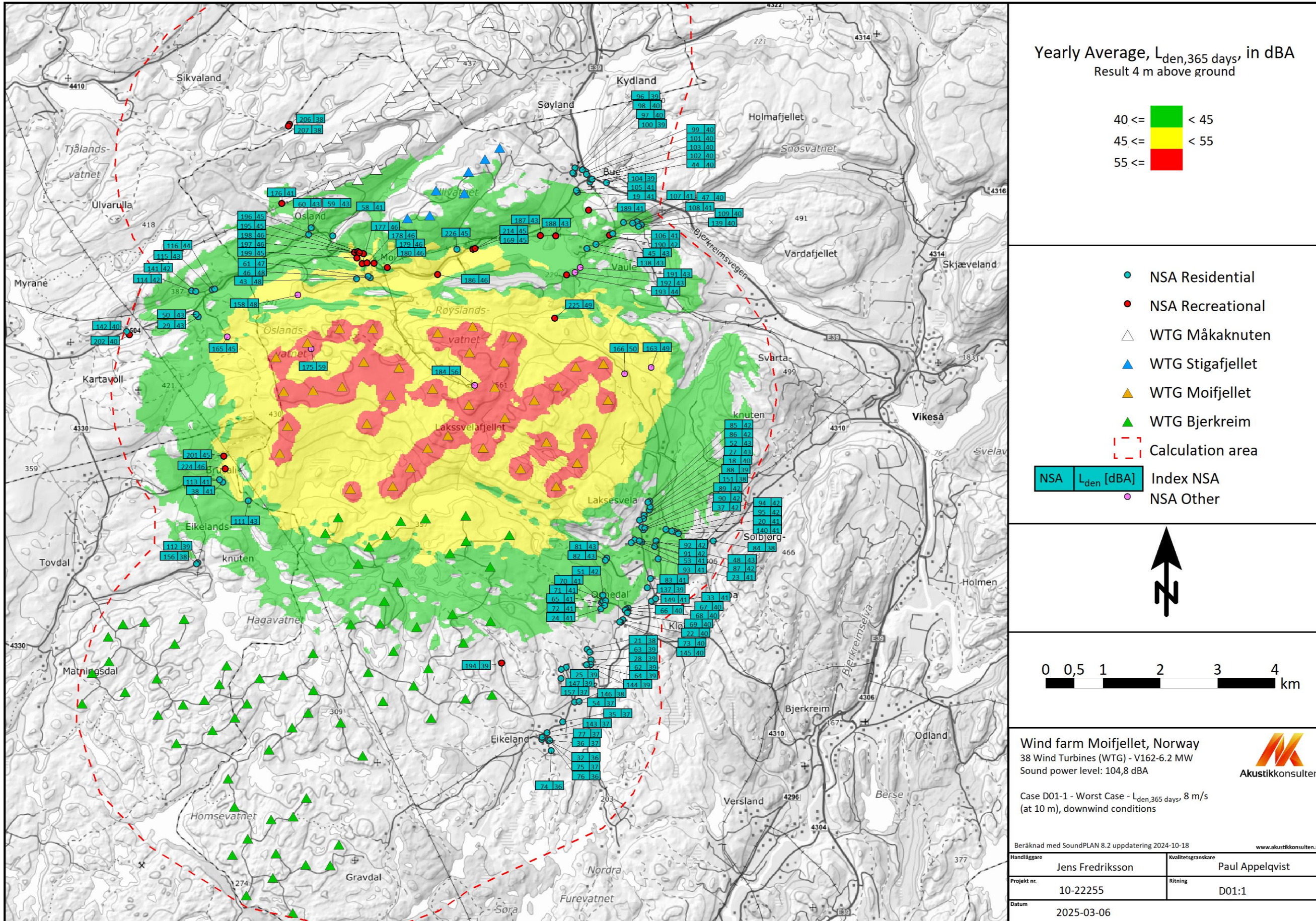
54,511 = 55"

Calculated noise levels should always be presented as integer values according to this rounding principle, which is common knowledge for noise consultants.

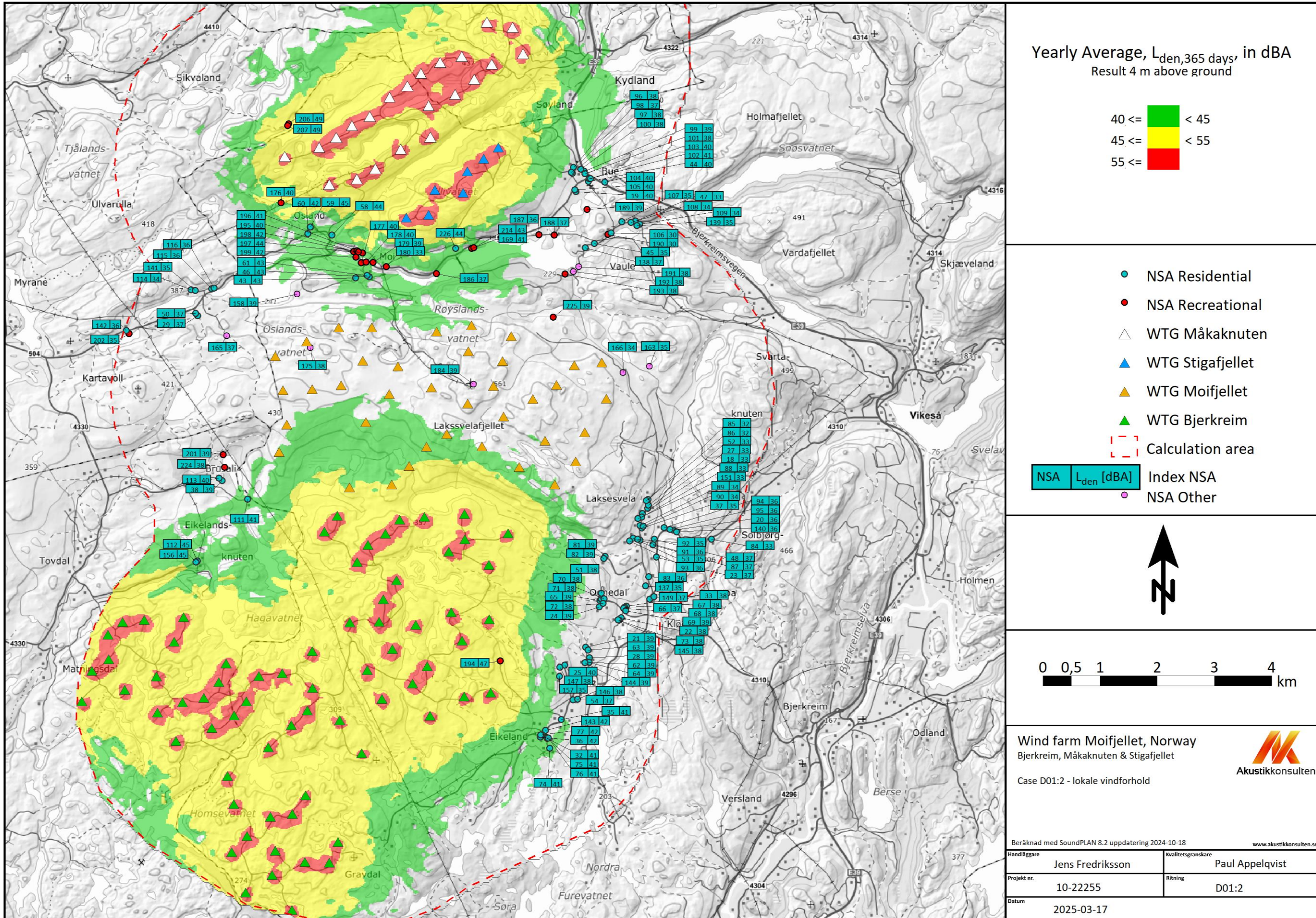
L_{den} has been calculated with a penalty of 5 dB for L_e (evening 19-23) and 10 dB for L_n (night 23-07) which is resulting in an addition of 6,4 dBA to the calculated equivalent sound level.

The noise limit has been assumed to be $L_{den}=45$ dBA according to T-1442 and if the calculated value is above the limit 45 dBA it is marked with red.

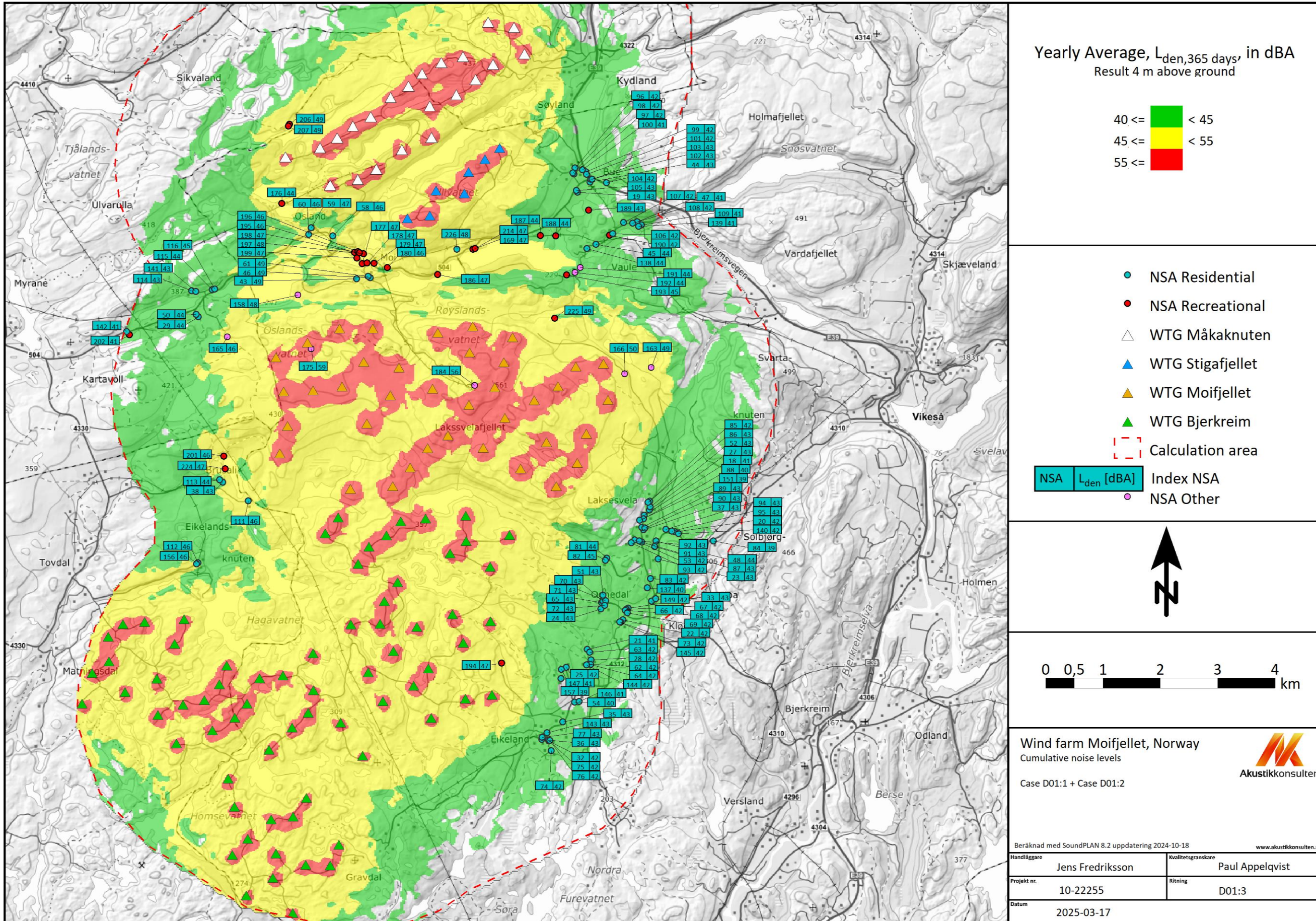
Noise Map - Case D01-1



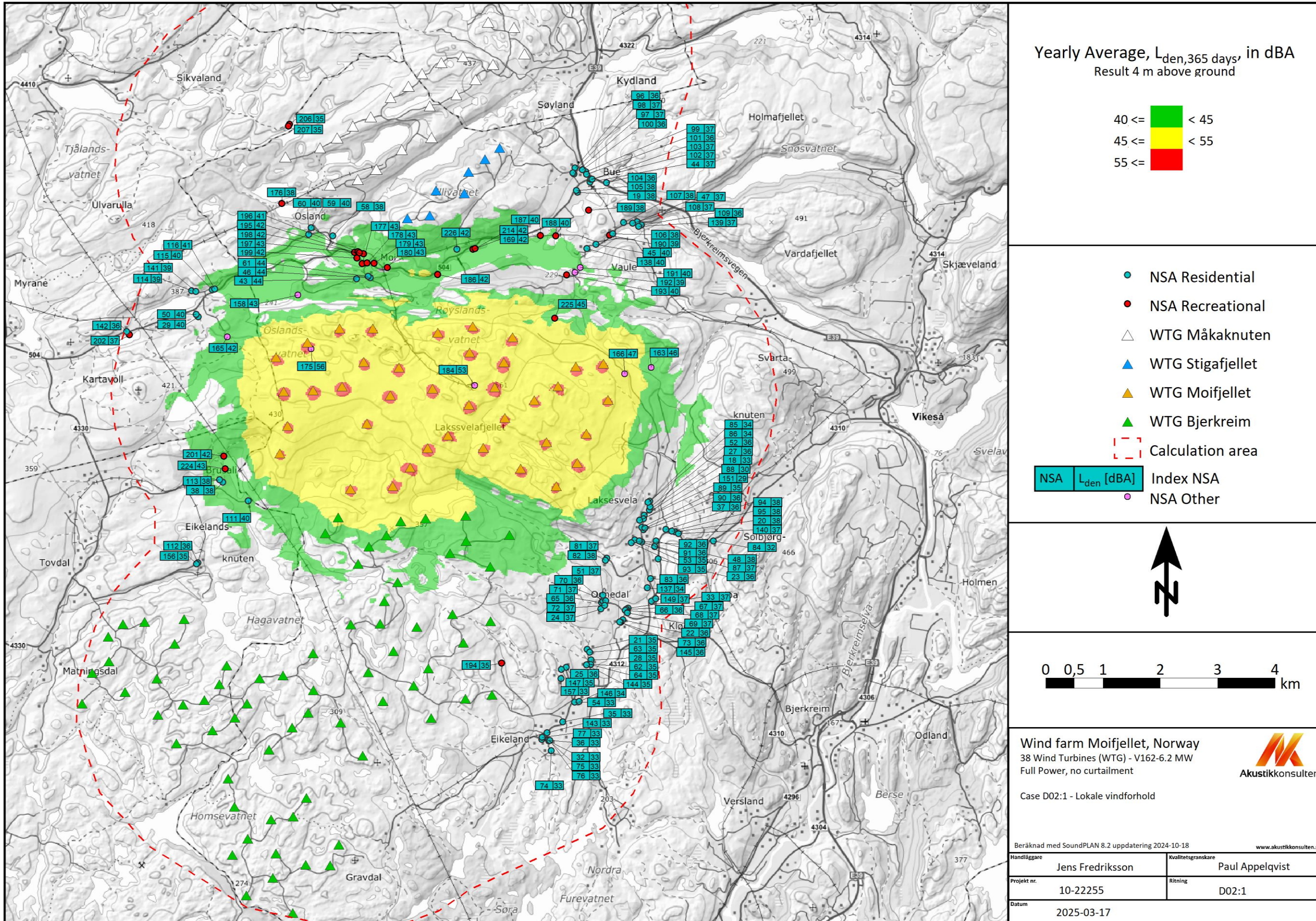
Noise Map - Case D01-2



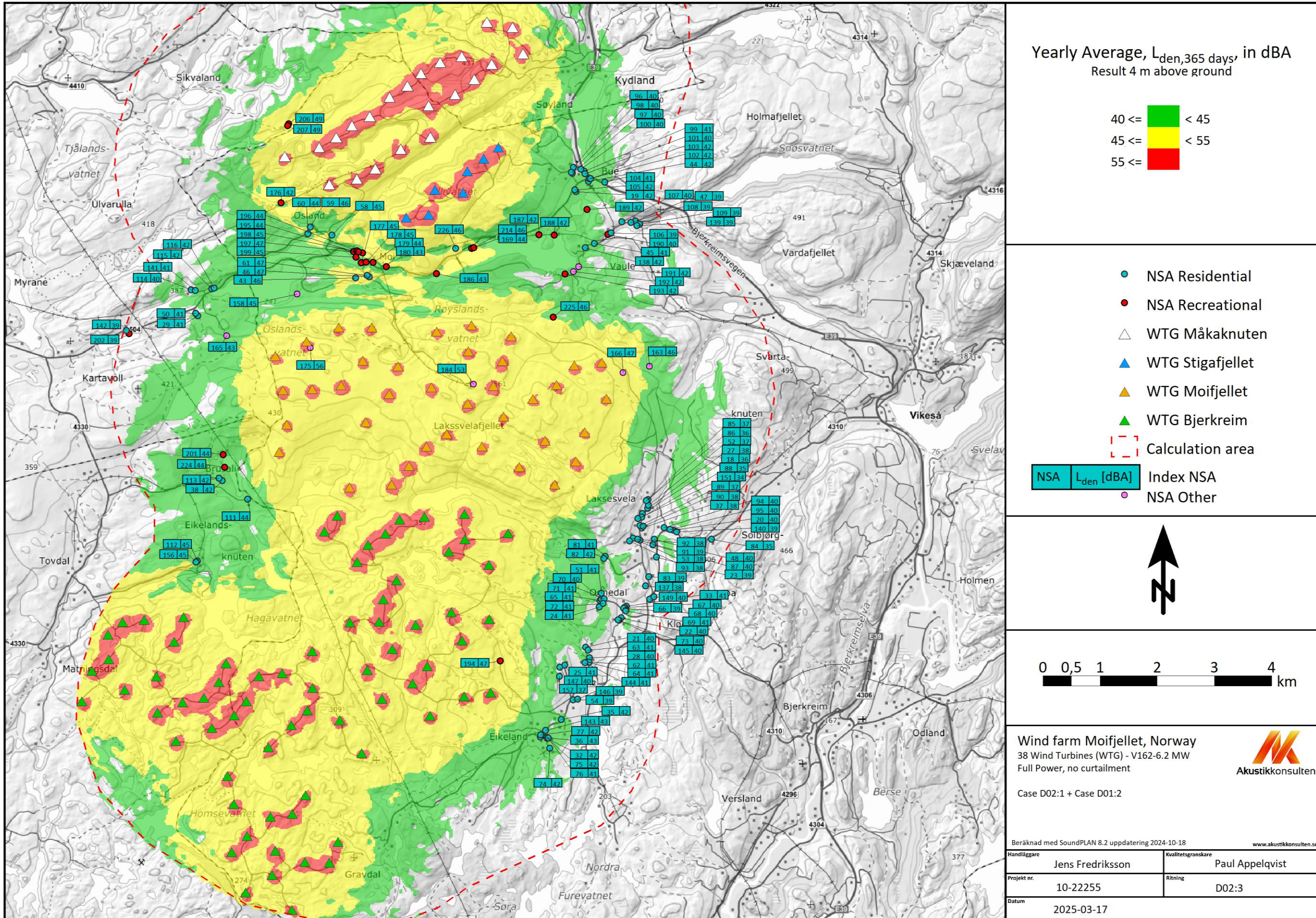
Noise Map - Case D01-3



Noise Map - Case D02-1



Noise Map - Case D02-3





Akustikkonsulten

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PM 01

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Moifjellet Wind Farm

Calculations of noise from wind turbines and traffic

1 Background

Akustikkonsulten i Sverige AB (Akustikkonsulten) has been commissioned by Statkraft to investigate cumulative noise levels from Statkrafts planned wind farm Moifjellet, together with existing wind farms Stigafjellet, Måkaknuten and Bjerkreim. In addition to that, authorities have requested a calculation of noise levels from the wind farms together with traffic noise from E39 based on the method.

2 Sources

The following sources have been used in this PM:

- Akustikkonsultens calculation report of wind turbine noise “10-22255-D01 Noise calculation wind farm Moifjellet 250318”. The report contains calculated noise levels from wind farm Moifjellet alone and together with nearby wind farms Stigafjellet, Måkaknuten and Bjerkreim.
- COWI AS road traffic noise report “E39 BÅ – Støyrapport” (2020-05-15).
- SINTEF, “Rapport - Metode for å beregne samlet støybelastning”, report nr. 2023:01232 (2023-11-17).

3 Calculations

Calculating traffic noise, from a road that has not yet been built, is not feasible for an outside party without detailed knowledge of the plans. Assessment of cumulative noise, in accordance with the SINTEF method, from wind turbines and road traffic (samlet støybelastning) has therefore, at this stage, been done based on road traffic noise levels obtained through COWI’s calculation report. Assessment has been made for the relevant residential buildings, covered in both reports (COWIs and Akustikkonsultens). There are residents further away from road E39, closer to the wind farms, where there is no information on the road traffic noise levels in the COWI report and its therefor not possible to assess.

In the COWI report there are multiple alternative plans for road E39 . In this PM cumulative noise from three of the alternatives, all at calculation height 4 m above ground, has been investigated together with the wind turbine noise. Those are:

- “0-alternativet”
- “A1-B1-C1-D2 uten tiltak”
- “A1-B1-C1-D2 med tiltak”

The noise maps from these 3 calculations are attached in the end of this PM.

The SINTEF method states correction factor for different noise sources. There is no correction factor mentioned for wind turbine noise so in this the same factor as for industrial noise has been utilized (0 dB). The method states that the combined (cumulative) noise level should be compared to the reference sources limit values ($L_{den} > 55$ dB “gul sone”, $L_{den} > 65$ dB “rød sone”).

Road traffic noise is only reported in intervals, and it is therefore not possible to calculate exact cumulative levels. Therefor the cumulative noise levels are also given as intervals.

It shall be noted that the SINTEF method states that:

”Det foreslås at samlet støybelastning bare beregnes for samferdselskilder (fly, vei, bane) og industri (inklusive havner og terminaler). Dette på grunn av manglende erfaringsgrunnlag og veletablerte dose-responskurver for øvrige kilder.”

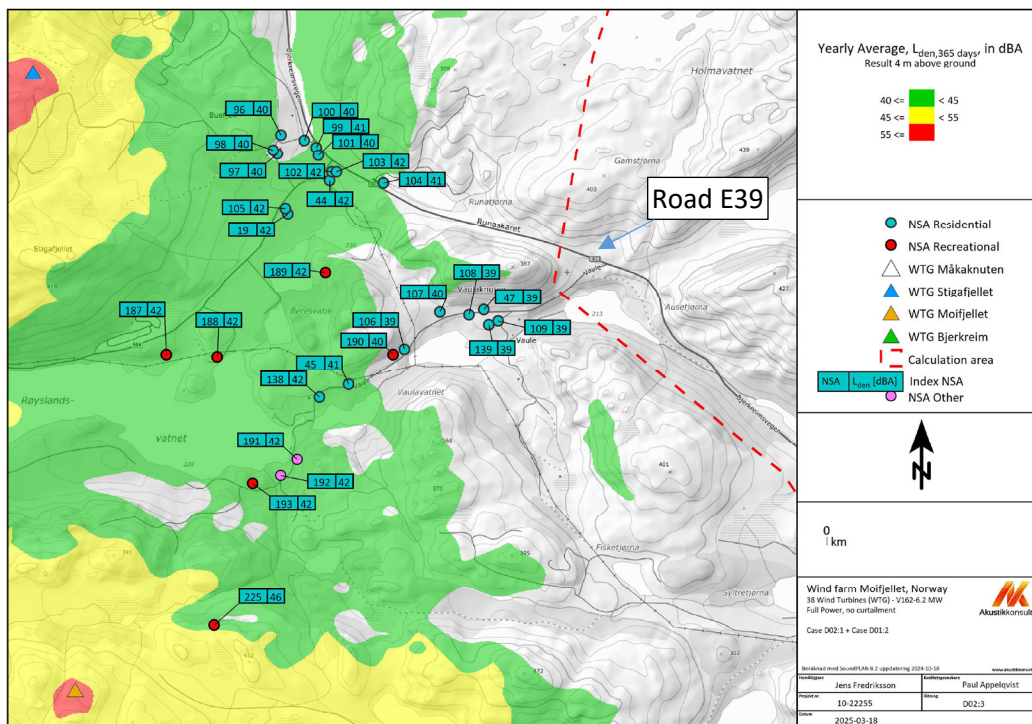


Figure 1. Overview of calculation points (NSAs) for wind turbine noise. Calculated noise levels are the calculated yearly average (lokale vindforhold) of the existing wind farms together with wind farm Moifjellet.

Table 1. Cumulative noise “Samlet støybelastning” from wind turbines and road E39 (0-alternativet). $L_{den} > 55$ dB “gul sone” has been marked in yellow, $L_{den} > 65$ dB “rød sone” has been marked in red.

NSA	Wind turbine noise - “lokale vindforhold” (Case D02-3), L_{DEN}	Road noise - Vegtrafikk for 0-alternativet, L_{DEN}	Samlet støybelastning, road+wind turbines, L_{DEN}
19	42 dBA	40-55 dBA	44-55 dBA
44	42 dBA	55-60 dBA	55-60 dBA
47	39 dBA	40-55 dBA	42-55 dBA
96	40 dBA	60-65 dBA	60-65 dBA
97	40 dBA	55-60 dBA	55-60 dBA
98	40 dBA	60-65 dBA	60-65 dBA
99	41 dBA	75-80 dBA	75-80 dBA
100	40 dBA	65-70 dBA	65-70 dBA
101	40 dBA	70-75 dBA	70-75 dBA
102	42 dBA	70-75 dBA	70-75 dBA
103	42 dBA	70-75 dBA	70-75 dBA
104	41 dBA	70-75 dBA	70-75 dBA
105	42 dBA	40-55 dBA	44-55 dBA
106	39 dBA	40-55 dBA	42-55 dBA
107	40 dBA	40-55 dBA	43-55 dBA
108	39 dBA	≤40 dBA	39-42 dBA
109	39 dBA	40-55 dBA	42-55 dBA
139	39 dBA	40-55 dBA	43-55 dBA
189*	42 dBA	≤40 dBA	42-44 dBA
190	40 dBA	40-55 dBA	43-55 dBA

* Recreational dwelling.



Table 2. Cumulative noise "Samlet støybelastning" from wind turbines and road E39 (A1-B1-C1-D2 uten tiltak). $L_{den} > 55$ dB "gul sone" has been marked in yellow, $L_{den} > 65$ dB "rød sone" has been marked in red.

NSA	Wind turbine noise - lokale vindforhold (Case D02-3), L_{DEN}	Road noise - Vegtrafikk for A1-B1-C1-D2 uten tiltak, L_{DEN}	Samlet støybelastning, road+wind turbines, L_{DEN}
19	42 dBA	40-55 dBA	44-55 dBA
44	42 dBA	55-60 dBA	55-60 dBA
47	39 dBA	≤40 dBA	39-42 dBA
96	40 dBA	60-65 dBA	60-65 dBA
97	40 dBA	55-60 dBA	55-60 dBA
98	40 dBA	60-65 dBA	60-65 dBA
99	41 dBA	70-75 dBA	70-75 dBA
100	40 dBA	65-70 dBA	65-70 dBA
101	40 dBA	65-70 dBA	65-70 dBA
102	42 dBA	65-70 dBA	65-70 dBA
103	42 dBA	65-70 dBA	65-70 dBA
104	41 dBA	_**	_**
105	42 dBA	40-55 dBA	44-55 dBA
106	39 dBA	≤40 dBA	39-42dBA
107	40 dBA	≤40 dBA	40-43 dBA
108	39 dBA	≤40 dBA	39-42 dBA
109	39 dBA	40-55 dBA	42-55 dBA
139	39 dBA	40-55 dBA	43-55 dBA
189*	42 dBA	≤40 dBA	42-44 dBA
190*	40 dBA	≤40 dBA	40-43 dBA

* Recreational dwelling.

**Building removed.

Table 3. Cumulative noise “Samlet støybelastning” from wind turbines and road E39 (A1-B1-C1-D2 Med tiltak). $L_{den} > 55$ dB “gul sone” has been marked in yellow, $L_{den} > 65$ dB “rød sone” has been marked in red.

NSA	Wind turbine noise - lokale vindforhold (Case D02-3), L_{DEN}	Road noise - Vegtrafikk for A1-B1-C1-D2 uten tiltak, L_{DEN}	Samlet støybelastning, road+wind turbines, L_{DEN}
19	42 dBA	40-55 dBA	44-55 dBA
44	42 dBA	55-60 dBA	55-60 dBA
47	39 dBA	≤40 dBA	39-42 dBA
96	40 dBA	60-65 dBA	60-65 dBA
97	40 dBA	55-60 dBA	55-60 dBA
98	40 dBA	55-60 dBA	55-60 dBA
99	41 dBA	65-70 dBA	65-70 dBA
100	40 dBA	60-65 dBA	60-65 dBA
101	40 dBA	60-65 dBA	60-65 dBA
102	42 dBA	65-70 dBA	65-70 dBA
103	42 dBA	65-70 dBA	65-70 dBA
104	41 dBA	-**	-**
105	42 dBA	40-55 dBA	44-55 dBA
106	39 dBA	≤40 dBA	39-42dBA
107	40 dBA	≤40 dBA	40-43 dBA
108	39 dBA	≤40 dBA	39-42 dBA
109	39 dBA	40-55 dBA	42-55 dBA
139	39 dBA	40-55 dBA	43-55 dBA
189*	42 dBA	≤40 dBA	42-44 dBA
190*	40 dBA	≤40 dBA	40-43 dBA

* Recreational dwelling.

**Building removed.

Comment:

The wind turbine noise does not cause any cumulative levels (“Samlet støybelastning”) to exceed any noise limits, that wasn’t already exceeded from road traffic noise alone, in any of the 3 investigated cases.

4 Conclusions

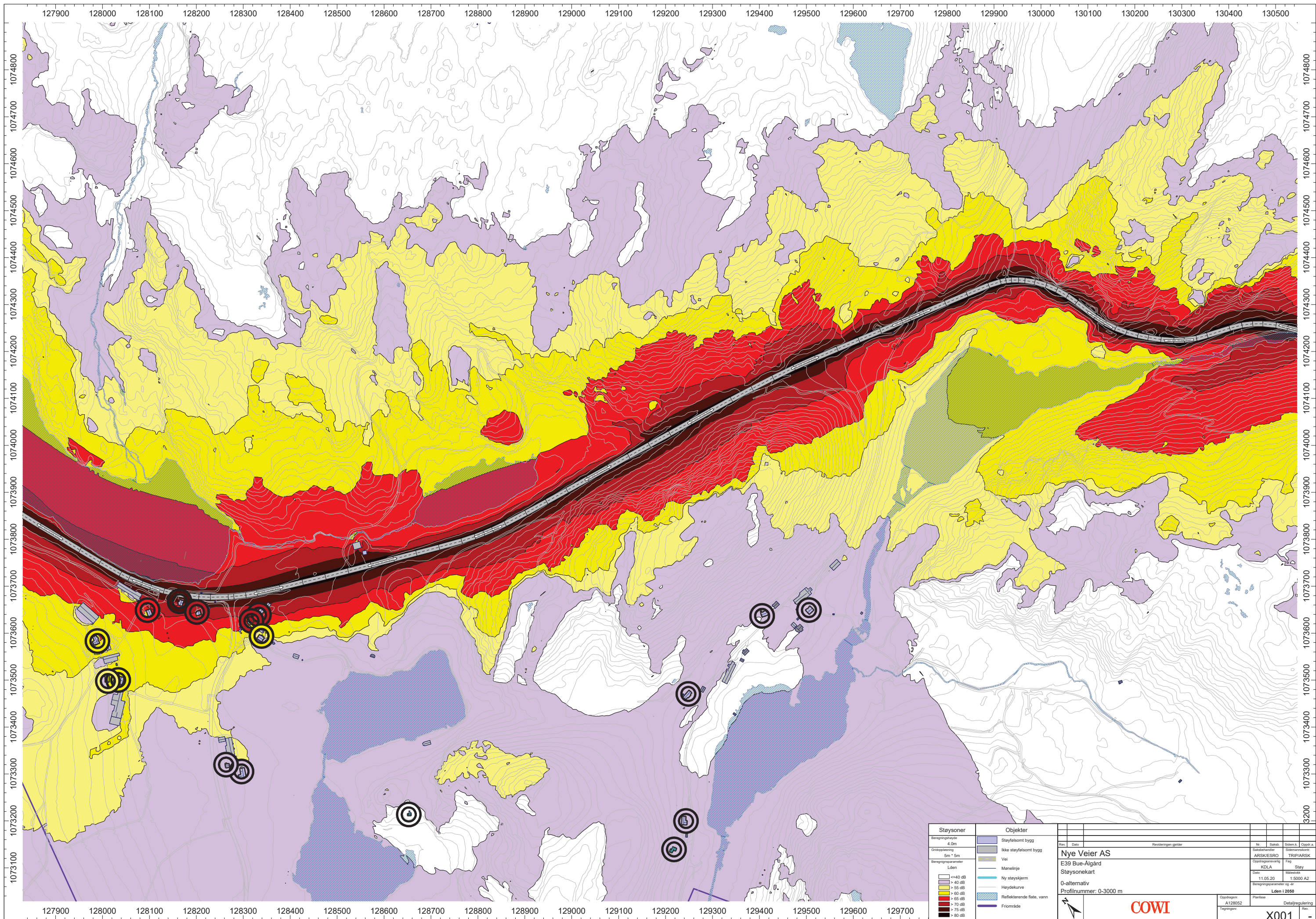
Noise from road traffic (the reference source in the SINTEF-method) has a limit value of $L_{den} > 55$ dB “gul sone”, $L_{den} > 65$ dB “rød sone”). Since wind turbine noise is limited to 45 dBA for “gul sone”, 10 dB below, the wind turbine noise will not have a cumulative impact such that it can cause a cumulative exceedance of $L_{den} > 55$ dBA. This assuming that the same SINTEF correction factor as for industrial noise should be utilized for wind turbines (+0 dB).

Example: 45 dBA wind turbine noise (+ 0 dB correction factor) + 55 dBA road traffic noise = 55 dBA cumulative noise.

This follows the same reasoning as is stated in the SINTEF method:

“I praksis vil det for tilfeller ved stor differanse mellom støykildene, > 10 dB, være den kraftigste kilden som vil dominere støybildet og en beregning med samlet støybelastning vil gi lite endring.”

In the calculations presented in this PM, the wind turbine noise for yearly average, based on “lokale vindforhold”, have been used. It shall be noted that none of the NSAs have a calculated wind turbine noise level that exceeds 45 dBA for the “worst case” calculations either (see calculation D01-3 in Akustikkonsultens calculation report of wind turbine noise “10-22255-D01 Noise calculation wind farm Moifjellet 250318”).

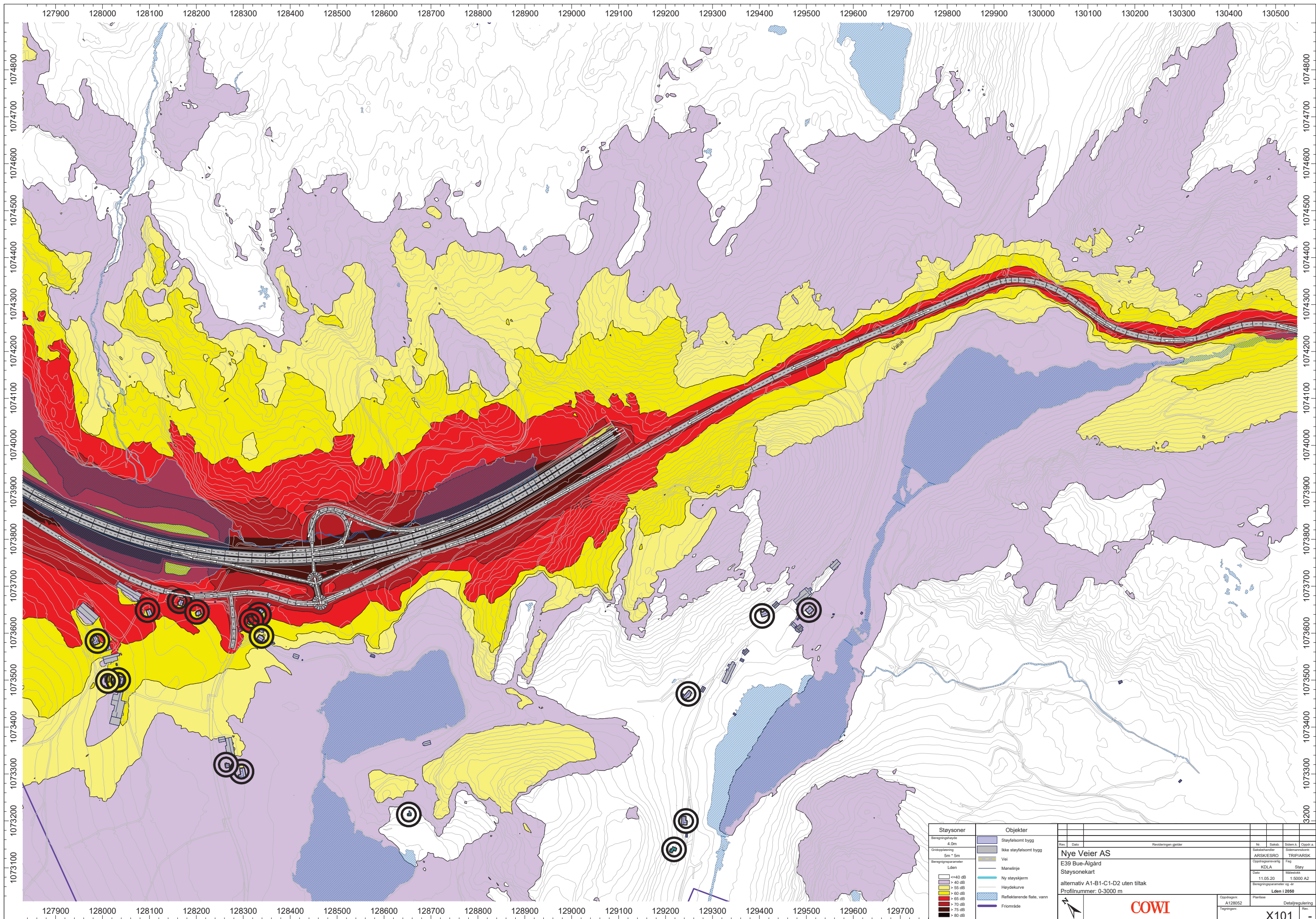


Støysoner	
Beregningstype	4,0m
Gridoppløsning	5m * 5m
Beregningparameter	Lden
	<=40 dB
	> 40 dB
	> 55 dB
	> 60 dB
	> 65 dB
	> 70 dB
	> 75 dB
	> 80 dB

Objekter	
	Støyfølsomt bygg
	Ikke støyfølsomt bygg
	Vei
	Manslinje
	Ny støyskjerm
	Høydekurve
	Reflekterende flate, vann
	Friomsråde

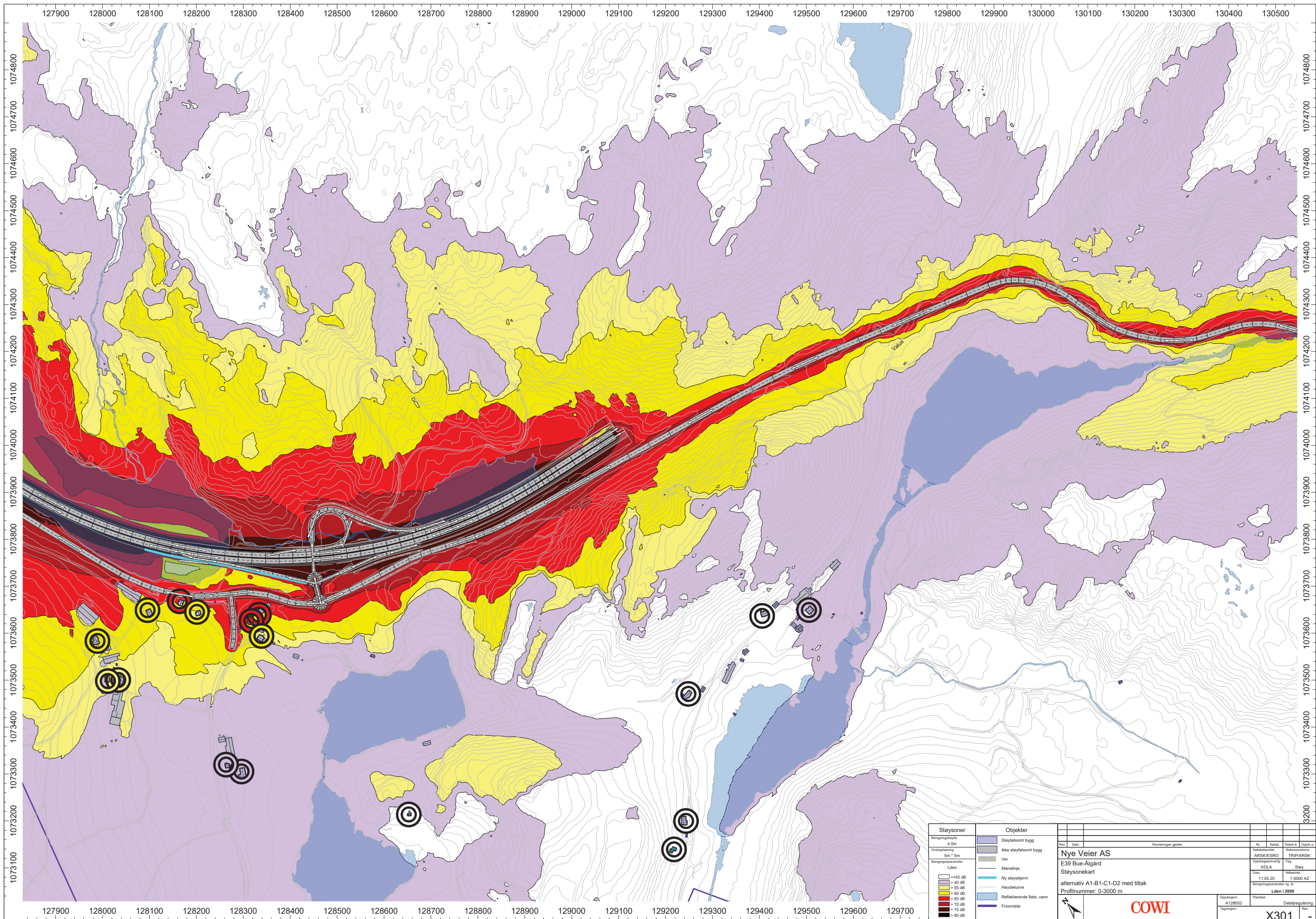
Rev.:	Dato:	Revisjonen gjelder:	Nr.:	Saksn.:	Sesjon.k.:	Oppdr.:
Nye Veier AS E39 Bue-Algård Støysonekart 0-alternativ Profilnummer: 0-3000 m			ARSK/ESRD TRIP/ARSK Oppdragsleder KDLA Fag 11.05.20 Målestokk 1:5000 A2 Beregningparameter og år Lden 12050			
Oppdragsnr.:		Prosjekt:		Detaljeringsgrad:		
A128652				X001		
Tegningsnr.:						

COWI



Støysoner		Objekter	
Beregningshøyde	4,0m	Støyfalsomt bygg	
Grunnsporing	5m * 5m	Ikke støyfalsomt bygg	
Beregningparameter	Lden	Vei	
	<= 40 dB	Manslinje	
	> 40 dB	Ny støy skjerm	
	> 55 dB	Høydekurve	
	> 60 dB	Reflekterende flate, vann	
	> 65 dB	Friomsråde	
	> 70 dB		
	> 75 dB		
	> 80 dB		

Rev.	Dato	Revisjonen gjelder	Nr.	Saksn.	Sesjon k.	Oppdr.
Nye Veier AS E39 Bue-Algård Støysonekart alternativ A1-B1-C1-D2 uten tiltak Profilnummer: 0-3000 m			ARSK/ESRD KDLA 11.05.20 1:5000 A2 Lden 12050	TRIP/ARSK Fag Målestokk 1:5000 A2 Lden 12050		
Oppdragsnr.: A120052 Tegningsnr.:		Planfase:	Detaljregulering			
			COWI			
			X101			



Støysoner		Objekter	
Beregningstype	4,5m	Støyfalsomt bygg	
Grønnsprengning	5m * 5m	Ikke støyfalsomt bygg	
Beregningparameter	Lden	Vei	
	<= 40 dB	Manslinje	
	> 40 dB	Ny støyskjerm	
	> 55 dB	Høydekurve	
	> 60 dB	Reflekterende flate, vann	
	> 65 dB	Friområde	
	> 70 dB		
	> 75 dB		
	> 80 dB		

Rev.	Dato	Revisjonen gjelder	Nr.	Saksn.	Sesjon k.	Oppdr. n.
Nye Veier AS E39 Bue-Algård Støysonekart alternativ A1-B1-C1-D2 med tiltak Profilnummer: 0-3000 m			Saksbehandler ARSK/ESRD	Saksnummer TRIP/ARSK	Oppdragsleder KDLA	Fag Støy
			Dato 11.05.20	Målestokk 1:5000 A2	Beregningparameter og år Lden 2050	
			Oppdragsnr. A128052	Planfase Detaljregulering	Tegningsnr. X301	

