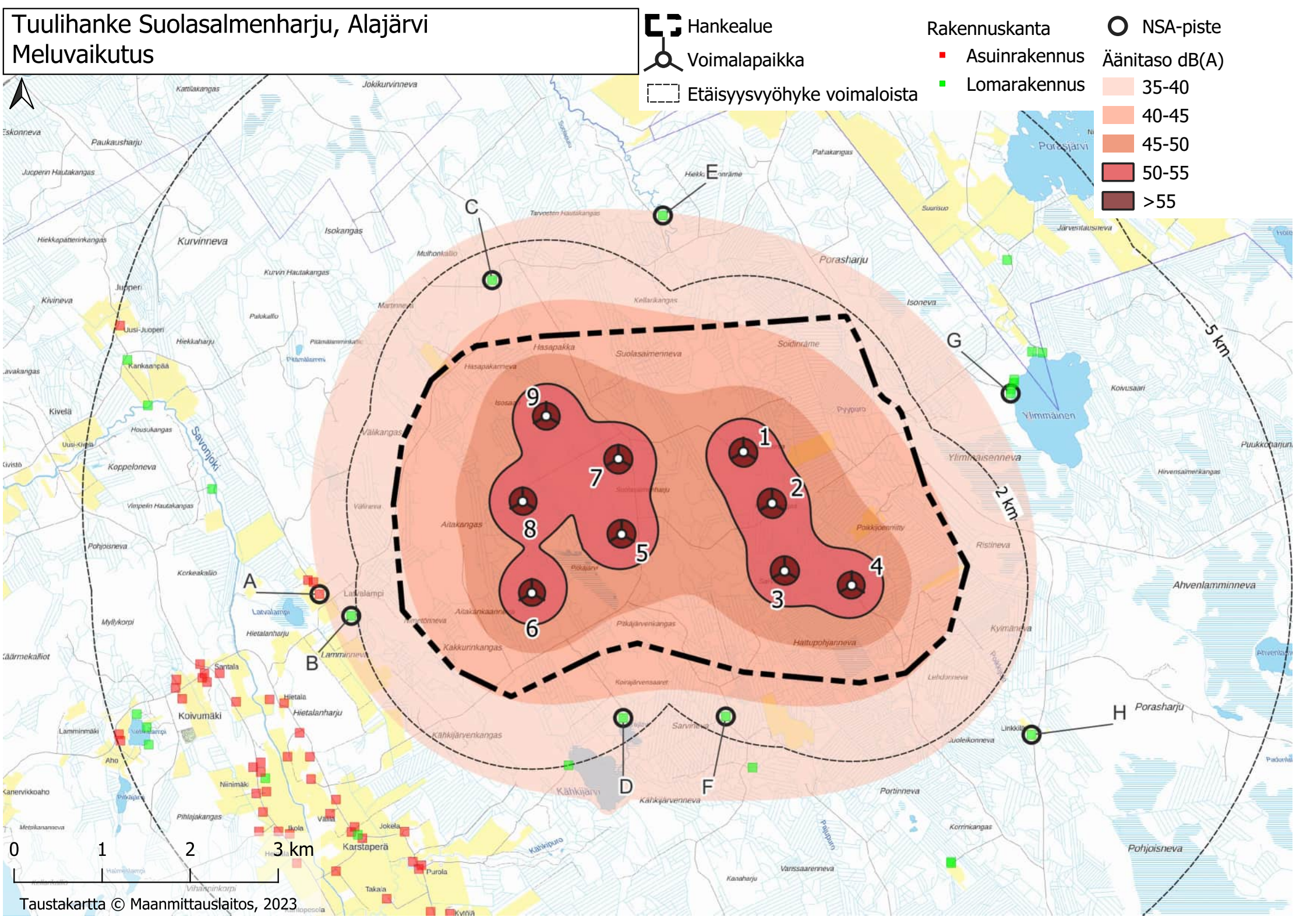
Liite 1. Suolasalmenharjun VE1 melumallinnustulosteita


Tuulihanke Suolasalmenharju, Alajärvi
Meluvaikutus
Hankealue
Voimalapaikka
Etäisyysvyöhyke voimaloista
Rakennuskanta
Asuinrakennus
Lomarakennus
NSA-piste
Äänitaso dB(A)
35-40
40-45
45-50
50-55
>55
A
B
C
D
E
F
G
H
1
2
3
4
5
6
7
8
9
5 km
2 km
0
1
2
3 km
Taustakartta © Maanmittauslaitos, 2023

Project:
Suolasalmenharju

Description:
Alajärven Suolasalmenharjun tuulivoimahanke
Ympäristövaikutusten arviointi
2023
Melumallinnus

Licensed user:
Sweco Finland Oy
Ilmalanportti 2
FI-00240 Helsinki

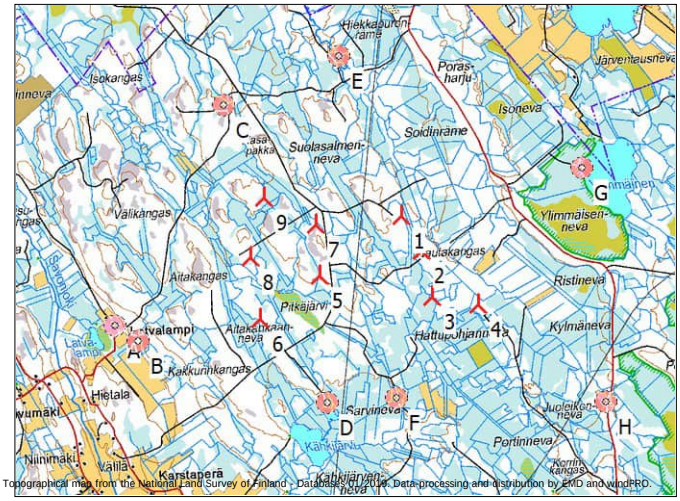
Juho Ali-Tolppa / juho.ali-tolppa@sweco.fi
Calculated:
16.8.2023 15.58/3.6.366

DECIBEL - Main Result

Calculation: Alajärvi Suolasalmenharju melumallinnus 16082023

Calculation is done according to Finnish guideline " Ympäristöhallinnon ohjeita 2 | 2014 " from the Ministry of the Environment of Finland

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



WTGs

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Noise data Creator	Name	Wind speed	LwA,ref	Uncertainty
			[m]					[kW]	[m]	[m]			[m/s]	[dB(A)]	[dB(A)]
1	358 459	7 001 683	165,2	VESTAS V172-7.2 7200...	Yes	VESTAS	V172-7.2-7 200	7 200	240,0	180,0	USER	PO7200-0S	8,0	110,1	2,0
2	358 785	7 001 098	170,3	VESTAS V172-7.2 7200...	Yes	VESTAS	V172-7.2-7 200	7 200	240,0	180,0	USER	PO7200-0S	8,0	110,1	2,0
3	358 926	7 000 329	166,3	VESTAS V172-7.2 7200...	Yes	VESTAS	V172-7.2-7 200	7 200	240,0	180,0	USER	PO7200-0S	8,0	110,1	2,0
4	359 689	7 000 167	163,4	VESTAS V172-7.2 7200...	Yes	VESTAS	V172-7.2-7 200	7 200	240,0	180,0	USER	PO7200-0S	8,0	110,1	2,0
5	357 076	7 000 746	170,5	VESTAS V172-7.2 7200...	Yes	VESTAS	V172-7.2-7 200	7 200	240,0	180,0	USER	PO7200-0S	8,0	110,1	2,0
6	356 056	7 000 079	164,5	VESTAS V172-7.2 7200...	Yes	VESTAS	V172-7.2-7 200	7 200	240,0	180,0	USER	PO7200-0S	8,0	110,1	2,0
7	357 040	7 001 604	175,2	VESTAS V172-7.2 7200...	Yes	VESTAS	V172-7.2-7 200	7 200	240,0	180,0	USER	PO7200-0S	8,0	110,1	2,0
8	355 953	7 001 119	168,7	VESTAS V172-7.2 7200...	Yes	VESTAS	V172-7.2-7 200	7 200	240,0	180,0	USER	PO7200-0S	8,0	110,1	2,0
9	356 219	7 002 089	171,3	VESTAS V172-7.2 7200...	Yes	VESTAS	V172-7.2-7 200	7 200	240,0	180,0	USER	PO7200-0S	8,0	110,1	2,0

Calculation Results

Sound level

Noise sensitive area No.	Name	East	North	Z	Immission height	Demands Noise	Sound level From WTGs	Uncertainty margin	WTG+Uncertainty margin	Distance to noise demand	Demands fulfilled ? Noise	2 dB penalty applied for one or more WTGs
				[m]	[m]	[dB(A)]	[dB(A)]	[dB]	[dB(A)]	[m]		
A	Noise sensitive point: Finnish normal frequency - User defined (2)	353 645	7 000 066	138,1	4,0	40,0	32,9	2,0	34,9	1 000	Yes	No
B	Noise sensitive point: Finnish normal frequency - User defined (1)	354 006	6 999 820	140,9	4,0	40,0	34,1	2,0	36,1	716	Yes	No
C	Noise sensitive point: Finnish normal frequency - User defined (8)	355 606	7 003 632	161,9	4,0	40,0	35,6	2,0	37,6	389	Yes	No
D	Noise sensitive point: Finnish normal frequency - User defined (3)	357 094	6 998 661	157,4	4,0	40,0	36,8	2,0	38,8	260	Yes	No
E	Noise sensitive point: Finnish normal frequency - User defined (7)	357 545	7 004 366	153,6	4,0	40,0	33,2	2,0	35,2	1 082	Yes	No
F	Noise sensitive point: Finnish normal frequency - User defined (4)	358 259	6 998 677	159,9	4,0	40,0	36,9	2,0	38,9	223	Yes	No
G	Noise sensitive point: Finnish normal frequency - User defined (6)	361 494	7 002 345	173,0	4,0	40,0	31,9	2,0	33,9	1 312	Yes	No
H	Noise sensitive point: Finnish normal frequency - User defined (5)	361 730	6 998 471	171,2	4,0	40,0	30,5	2,0	32,5	1 451	Yes	No

Distances (m)

WTG	A	B	C	D	E	F	G	H
1	5078	4828	3455	3316	2835	3012	3106	4585
2	5242	4947	4065	2966	3495	2477	2982	3947
3	5287	4946	4683	2478	4266	1782	3264	3364
4	6044	5693	5355	3000	4714	2065	2828	2655
5	3498	3207	3239	2086	3650	2383	4698	5181
6	2411	2067	3581	1758	4538	2611	5890	5897
7	3727	3520	2484	2943	2808	3170	4515	5640
8	2537	2341	2536	2711	3616	3359	5675	6356
9	3274	3170	1660	3538	2635	3975	5281	6593

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16.8.2023 15.58/3.6.366

DECIBEL - Assumptions for noise calculation

Calculation: Alajärvi Suolasalmenharju melumallinnus 16082023

Noise calculation model:
ISO 9613-2 Finland
Wind speed (in 10 m height):
8,0 m/s
Ground attenuation:
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Vesistöt
Area type with hard ground: VESISTOT
Ground factor for hard ground: 0,0
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 tones penalty is added to total noise impact at receptors
Noise sensitive area
Height above ground level, when no value in NSA object:
4,0 m; Don't allow override of model height with height from NSA object
Uncertainty margin:
Uncertainty added to source noise level of the WTGs in the calculation
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)
Octave data required
Frequency dependent 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]
0,10	0,38	1,12	2,36	4,08	8,78	26,60	95,00

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89

WTG: VESTAS V172-7.2 7200 240.0 !O!
Noise: PO7200-0S

Source	Source/Date	Creator	Edited
	13.10.2022	USER	9.8.2023 15.51

Document no. 0128-4336 V00

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Uncertainty [dB(A)]	Pure tones	Octave data 63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	180,0	8,0	110,1	2,0	No	91,0	99,9	104,0	105,0	103,8	99,5	91,8	80,8

Noise sensitive area: A Noise sensitive point: Finnish normal frequency - User defined (2)
Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

Noise sensitive area: B Noise sensitive point: Finnish normal frequency - User defined (1)
Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

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Calculated:
16.8.2023 15.58/3.6.366

DECIBEL - Assumptions for noise calculation

Calculation: Alajärvi Suolasalmenharju melumallinnus 16082023

Noise sensitive area: C Noise sensitive point: Finnish normal frequency - User defined (8)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

Noise sensitive area: D Noise sensitive point: Finnish normal frequency - User defined (3)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

Noise sensitive area: E Noise sensitive point: Finnish normal frequency - User defined (7)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

Noise sensitive area: F Noise sensitive point: Finnish normal frequency - User defined (4)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

Noise sensitive area: G Noise sensitive point: Finnish normal frequency - User defined (6)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

Noise sensitive area: H Noise sensitive point: Finnish normal frequency - User defined (5)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

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Calculated:
16.8.2023 15.58/3.6.366

DECIBEL - Detailed results

Calculation: Alajärvi Suolasalmenharju melumallinnus 16082023 Noise calculation model: ISO 9613-2 Finland 8,0 m/s

Assumptions

Calculated L(DW) = LWA,ref + K + Dc - (Adiv + Aatm + Agr + Abar + Amisc) - Cmet
(when calculated with ground attenuation, then Dc = Domega)

LWA,ref:	Sound pressure level at WTG
K:	Pure tone
Dc:	Directivity correction
Adiv:	the attenuation due to geometrical divergence
Aatm:	the attenuation due to atmospheric absorption
Agr:	the attenuation due to ground effect
Abar:	the attenuation due to a barrier
Amisc:	the attenuation due to miscellaneous other effects
Cmet:	Meteorological correction

Calculation Results

Noise sensitive area: A Noise sensitive point: Finnish normal frequency - User defined (2)

Wind speed: 8,0 m/s
WTG

No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1	5 078	5 082	0	18,02	2,00	20,02	110,1	0,00	85,12	-	-	0,00	0,00	-
2	5 242	5 246	0	17,59	2,00	19,59	110,1	0,00	85,40	-	-	0,00	0,00	-
3	5 287	5 291	0	17,46	2,00	19,46	110,1	0,00	85,47	-	-	0,00	0,00	-
4	6 044	6 047	0	15,77	2,00	17,77	110,1	0,00	86,63	-	-	0,00	0,00	-
5	3 498	3 504	0	23,03	2,00	25,03	110,1	0,00	81,89	-	-	0,00	0,00	-
6	2 411	2 420	0	27,78	2,00	29,78	110,1	0,00	78,67	-	-	0,00	0,00	-
7	3 727	3 733	0	22,20	2,00	24,20	110,1	0,00	82,44	-	-	0,00	0,00	-
8	2 537	2 545	0	27,15	2,00	29,15	110,1	0,00	79,11	-	-	0,00	0,00	-
9	3 274	3 281	0	23,90	2,00	25,90	110,1	0,00	81,32	-	-	0,00	0,00	-
Sum						34,89								

- Data undefined due to calculation with octave data

Noise sensitive area: B Noise sensitive point: Finnish normal frequency - User defined (1)

Wind speed: 8,0 m/s
WTG

No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1	4 828	4 832	0	18,71	2,00	20,71	110,1	0,00	84,68	-	-	0,00	0,00	-
2	4 947	4 951	0	18,38	2,00	20,38	110,1	0,00	84,89	-	-	0,00	0,00	-
3	4 946	4 951	0	18,38	2,00	20,38	110,1	0,00	84,89	-	-	0,00	0,00	-
4	5 693	5 697	0	16,50	2,00	18,50	110,1	0,00	86,11	-	-	0,00	0,00	-
5	3 207	3 214	0	24,18	2,00	26,18	110,1	0,00	81,14	-	-	0,00	0,00	-
6	2 067	2 077	0	29,66	2,00	31,66	110,1	0,00	77,35	-	-	0,00	0,00	-
7	3 520	3 526	0	22,95	2,00	24,95	110,1	0,00	81,95	-	-	0,00	0,00	-
8	2 341	2 350	0	28,14	2,00	30,14	110,1	0,00	78,42	-	-	0,00	0,00	-
9	3 170	3 177	0	24,32	2,00	26,32	110,1	0,00	81,04	-	-	0,00	0,00	-
Sum						36,09								

- Data undefined due to calculation with octave data

Noise sensitive area: C Noise sensitive point: Finnish normal frequency - User defined (8)

Wind speed: 8,0 m/s
WTG

No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1	3 455	3 460	0	23,20	2,00	25,20	110,1	0,00	81,78	-	-	0,00	0,00	-
2	4 065	4 069	0	21,04	2,00	23,04	110,1	0,00	83,19	-	-	0,00	0,00	-
3	4 683	4 686	0	19,13	2,00	21,13	110,1	0,00	84,42	-	-	0,00	0,00	-
4	5 355	5 358	0	17,29	2,00	19,29	110,1	0,00	85,58	-	-	0,00	0,00	-
5	3 239	3 244	0	24,04	2,00	26,04	110,1	0,00	81,22	-	-	0,00	0,00	-
6	3 581	3 585	0	22,73	2,00	24,73	110,1	0,00	82,09	-	-	0,00	0,00	-

To be continued on next page...

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Calculated:
16.8.2023 15.58/3.6.366

DECIBEL - Detailed results

Calculation: Alajärvi Suolasalmenharju melumallinnus 16082023 Noise calculation model: ISO 9613-2 Finland 8,0 m/s

...continued from previous page

WTG

No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
7	2 484	2 491	0	27,42	2,00	29,42	110,1	0,00	78,93	-	-	0,00	0,00	-
8	2 536	2 543	0	27,16	2,00	29,16	110,1	0,00	79,11	-	-	0,00	0,00	-
9	1 660	1 670	0	32,26	2,00	34,26	110,1	0,00	75,46	-	-	0,00	0,00	-
Sum						37,64								

- Data undefined due to calculation with octave data

Noise sensitive area: D Noise sensitive point: Finnish normal frequency - User defined (3)

Wind speed: 8,0 m/s

WTG

No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1	3 316	3 321	0	23,74	2,00	25,74	110,1	0,00	81,43	-	-	0,00	0,00	-
2	2 966	2 972	0	25,18	2,00	27,18	110,1	0,00	80,46	-	-	0,00	0,00	-
3	2 478	2 485	0	27,45	2,00	29,45	110,1	0,00	78,91	-	-	0,00	0,00	-
4	3 000	3 006	0	25,03	2,00	27,03	110,1	0,00	80,56	-	-	0,00	0,00	-
5	2 086	2 094	0	29,56	2,00	31,56	110,1	0,00	77,42	-	-	0,00	0,00	-
6	1 758	1 767	0	31,59	2,00	33,59	110,1	0,00	75,95	-	-	0,00	0,00	-
7	2 943	2 950	0	25,27	2,00	27,27	110,1	0,00	80,40	-	-	0,00	0,00	-
8	2 711	2 717	0	26,32	2,00	28,32	110,1	0,00	79,68	-	-	0,00	0,00	-
9	3 538	3 543	0	22,89	2,00	24,89	110,1	0,00	81,99	-	-	0,00	0,00	-
Sum						38,76								

- Data undefined due to calculation with octave data

Noise sensitive area: E Noise sensitive point: Finnish normal frequency - User defined (7)

Wind speed: 8,0 m/s

WTG

No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1	2 835	2 841	0	25,76	2,00	27,76	110,1	0,00	80,07	-	-	0,00	0,00	-
2	3 495	3 500	0	23,05	2,00	25,05	110,1	0,00	81,88	-	-	0,00	0,00	-
3	4 266	4 270	0	20,39	2,00	22,39	110,1	0,00	83,61	-	-	0,00	0,00	-
4	4 714	4 718	0	19,04	2,00	21,04	110,1	0,00	84,47	-	-	0,00	0,00	-
5	3 650	3 655	0	22,47	2,00	24,47	110,1	0,00	82,26	-	-	0,00	0,00	-
6	4 538	4 542	0	19,56	2,00	21,56	110,1	0,00	84,14	-	-	0,00	0,00	-
7	2 808	2 815	0	25,87	2,00	27,87	110,1	0,00	79,99	-	-	0,00	0,00	-
8	3 616	3 621	0	22,60	2,00	24,60	110,1	0,00	82,18	-	-	0,00	0,00	-
9	2 635	2 642	0	26,68	2,00	28,68	110,1	0,00	79,44	-	-	0,00	0,00	-
Sum						35,16								

- Data undefined due to calculation with octave data

Noise sensitive area: F Noise sensitive point: Finnish normal frequency - User defined (4)

Wind speed: 8,0 m/s

WTG

No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1	3 012	3 018	0	24,98	2,00	26,98	110,1	0,00	80,59	-	-	0,00	0,00	-
2	2 477	2 484	0	27,45	2,00	29,45	110,1	0,00	78,90	-	-	0,00	0,00	-
3	1 782	1 791	0	31,44	2,00	33,44	110,1	0,00	76,06	-	-	0,00	0,00	-
4	2 065	2 073	0	29,68	2,00	31,68	110,1	0,00	77,33	-	-	0,00	0,00	-
5	2 383	2 390	0	27,93	2,00	29,93	110,1	0,00	78,57	-	-	0,00	0,00	-
6	2 611	2 617	0	26,80	2,00	28,80	110,1	0,00	79,36	-	-	0,00	0,00	-
7	3 170	3 176	0	24,32	2,00	26,32	110,1	0,00	81,04	-	-	0,00	0,00	-
8	3 359	3 364	0	23,58	2,00	25,58	110,1	0,00	81,54	-	-	0,00	0,00	-
9	3 975	3 979	0	21,34	2,00	23,34	110,1	0,00	83,00	-	-	0,00	0,00	-
Sum						38,93								

- Data undefined due to calculation with octave data

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Calculated:
16.8.2023 15.58/3.6.366

DECIBEL - Detailed results

Calculation: Alajärvi Suolasalmenharju melumallinnus 16082023 Noise calculation model: ISO 9613-2 Finland 8,0 m/s

Noise sensitive area: G Noise sensitive point: Finnish normal frequency - User defined (6)

Wind speed: 8,0 m/s
WTG

No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1	3 106	3 110	0	24,59	2,00	26,59	110,1	0,00	80,86	-	-	0,00	0,00	-
2	2 982	2 987	0	25,11	2,00	27,11	110,1	0,00	80,51	-	-	0,00	0,00	-
3	3 264	3 269	0	23,94	2,00	25,94	110,1	0,00	81,29	-	-	0,00	0,00	-
4	2 828	2 833	0	25,79	2,00	27,79	110,1	0,00	80,05	-	-	0,00	0,00	-
5	4 698	4 701	0	19,09	2,00	21,09	110,1	0,00	84,44	-	-	0,00	0,00	-
6	5 890	5 893	0	16,09	2,00	18,09	110,1	0,00	86,41	-	-	0,00	0,00	-
7	4 515	4 519	0	19,63	2,00	21,63	110,1	0,00	84,10	-	-	0,00	0,00	-
8	5 675	5 677	0	16,54	2,00	18,54	110,1	0,00	86,08	-	-	0,00	0,00	-
9	5 281	5 283	0	17,48	2,00	19,48	110,1	0,00	85,46	-	-	0,00	0,00	-
Sum						33,91								

- Data undefined due to calculation with octave data

Noise sensitive area: H Noise sensitive point: Finnish normal frequency - User defined (5)

Wind speed: 8,0 m/s
WTG

No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1	4 585	4 588	0	19,42	2,00	21,42	110,1	0,00	84,23	-	-	0,00	0,00	-
2	3 947	3 951	0	21,44	2,00	23,44	110,1	0,00	82,93	-	-	0,00	0,00	-
3	3 364	3 369	0	23,55	2,00	25,55	110,1	0,00	81,55	-	-	0,00	0,00	-
4	2 655	2 660	0	26,59	2,00	28,59	110,1	0,00	79,50	-	-	0,00	0,00	-
5	5 181	5 184	0	17,74	2,00	19,74	110,1	0,00	85,29	-	-	0,00	0,00	-
6	5 897	5 900	0	16,07	2,00	18,07	110,1	0,00	86,42	-	-	0,00	0,00	-
7	5 640	5 643	0	16,61	2,00	18,61	110,1	0,00	86,03	-	-	0,00	0,00	-
8	6 356	6 358	0	15,16	2,00	17,16	110,1	0,00	87,07	-	-	0,00	0,00	-
9	6 593	6 595	0	14,71	2,00	16,71	110,1	0,00	87,38	-	-	0,00	0,00	-
Sum						32,48								

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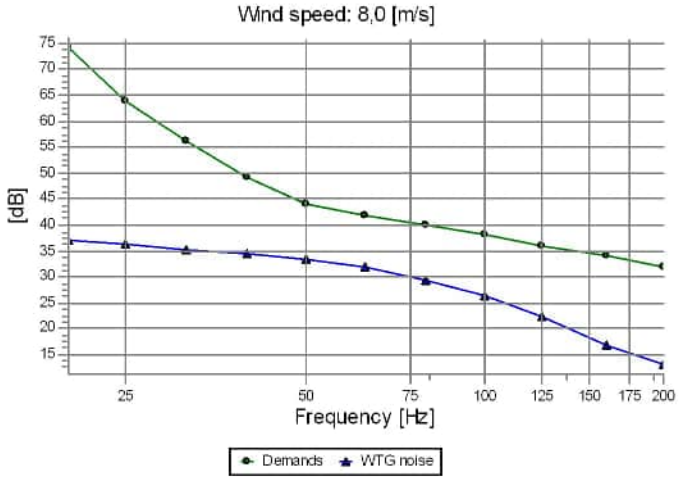
Calculated:
16.8.2023 16.32/3.6.366

DECIBEL - Detailed results, graphic

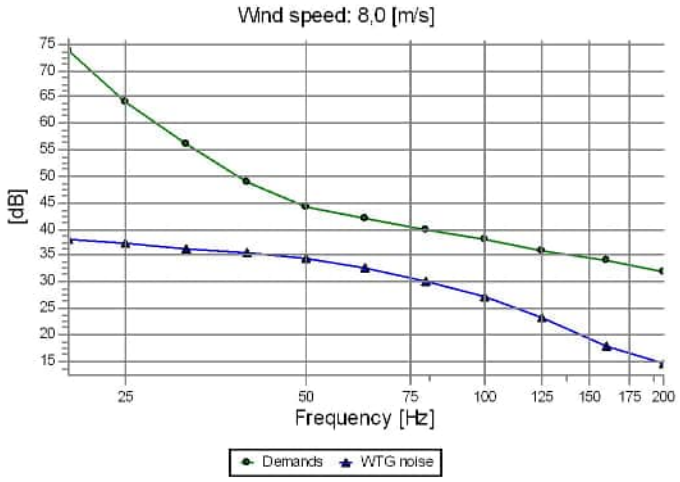
Calculation: Alajärvi Suolasalmenharju Melumallinnus 16082023 Pienitaajuinen sisämelu Noise calculation model: Finland Low frequency 8,0 m/s

A Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (2)



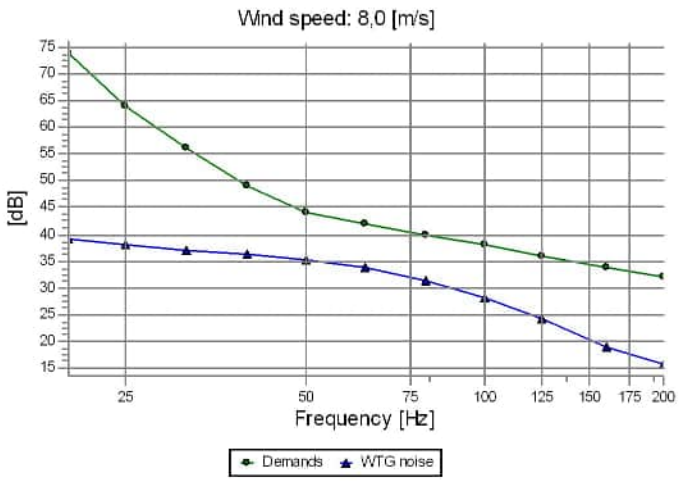
Frequency [Hz]	Demands [dB]	Sound level WTG noise [dB]	Demands fulfilled ?
20,0	74,0	37,2	Yes
25,0	64,0	36,4	Yes
31,5	56,0	35,3	Yes
40,0	49,0	34,5	Yes
50,0	44,0	33,5	Yes
63,0	42,0	31,9	Yes
80,0	40,0	29,4	Yes
100,0	38,0	26,2	Yes
125,0	36,0	22,2	Yes
160,0	34,0	16,9	Yes
200,0	32,0	13,3	Yes

B Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (1)



Frequency [Hz]	Demands [dB]	Sound level WTG noise [dB]	Demands fulfilled ?
20,0	74,0	38,0	Yes
25,0	64,0	37,1	Yes
31,5	56,0	36,1	Yes
40,0	49,0	35,3	Yes
50,0	44,0	34,3	Yes
63,0	42,0	32,7	Yes
80,0	40,0	30,2	Yes
100,0	38,0	27,0	Yes
125,0	36,0	23,1	Yes
160,0	34,0	17,8	Yes
200,0	32,0	14,3	Yes

C Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (8)



Frequency [Hz]	Demands [dB]	Sound level WTG noise [dB]	Demands fulfilled ?
20,0	74,0	39,0	Yes
25,0	64,0	38,2	Yes
31,5	56,0	37,1	Yes
40,0	49,0	36,4	Yes
50,0	44,0	35,3	Yes
63,0	42,0	33,7	Yes
80,0	40,0	31,3	Yes
100,0	38,0	28,2	Yes
125,0	36,0	24,3	Yes
160,0	34,0	19,0	Yes
200,0	32,0	15,6	Yes

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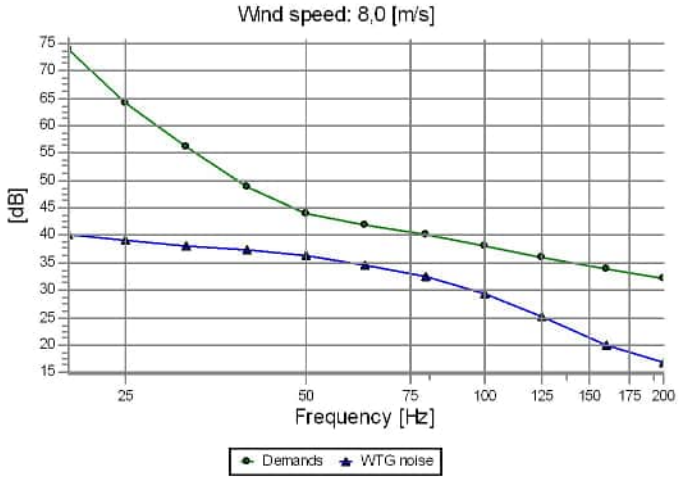
Calculated:
16.8.2023 16.32/3.6.366

DECIBEL - Detailed results, graphic

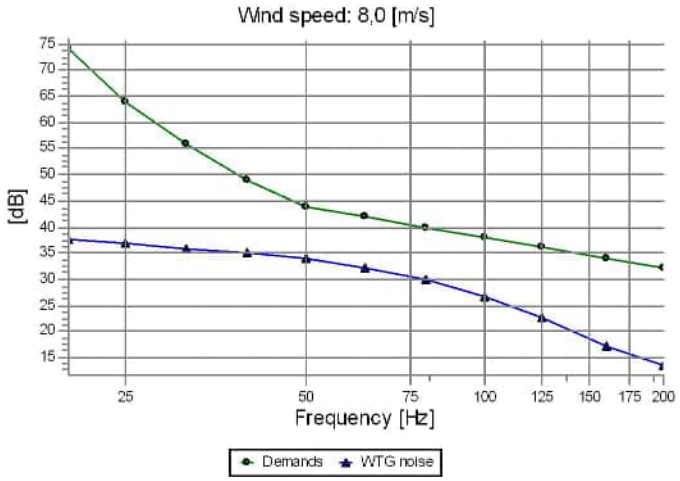
Calculation: Alajärvi Suolasalmenharju Melumallinnus 16082023 Pienitaajuinen sisämelu Noise calculation model: Finland Low frequency 8,0 m/s

D Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (3)



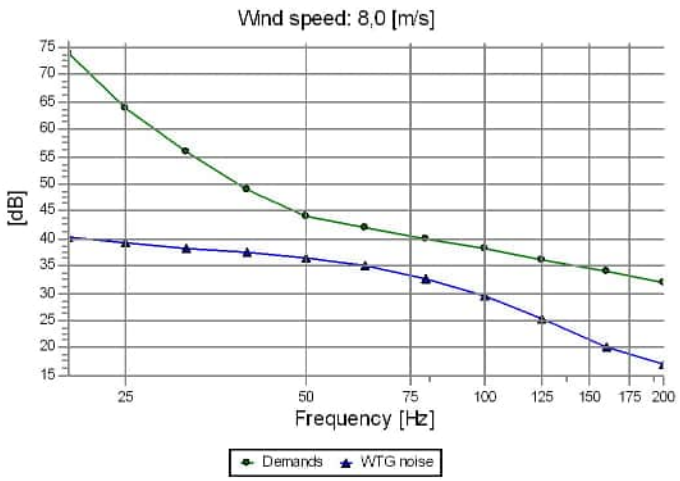
Frequency [Hz]	Demands [dB]	Sound level WTG noise [dB]	Demands fulfilled ?
20,0	74,0	40,0	Yes
25,0	64,0	39,2	Yes
31,5	56,0	38,2	Yes
40,0	49,0	37,4	Yes
50,0	44,0	36,4	Yes
63,0	42,0	34,8	Yes
80,0	40,0	32,4	Yes
100,0	38,0	29,2	Yes
125,0	36,0	25,4	Yes
160,0	34,0	20,1	Yes
200,0	32,0	16,8	Yes

E Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (7)



Frequency [Hz]	Demands [dB]	Sound level WTG noise [dB]	Demands fulfilled ?
20,0	74,0	37,6	Yes
25,0	64,0	36,7	Yes
31,5	56,0	35,7	Yes
40,0	49,0	34,9	Yes
50,0	44,0	33,9	Yes
63,0	42,0	32,3	Yes
80,0	40,0	29,8	Yes
100,0	38,0	26,6	Yes
125,0	36,0	22,6	Yes
160,0	34,0	17,2	Yes
200,0	32,0	13,7	Yes

F Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (4)

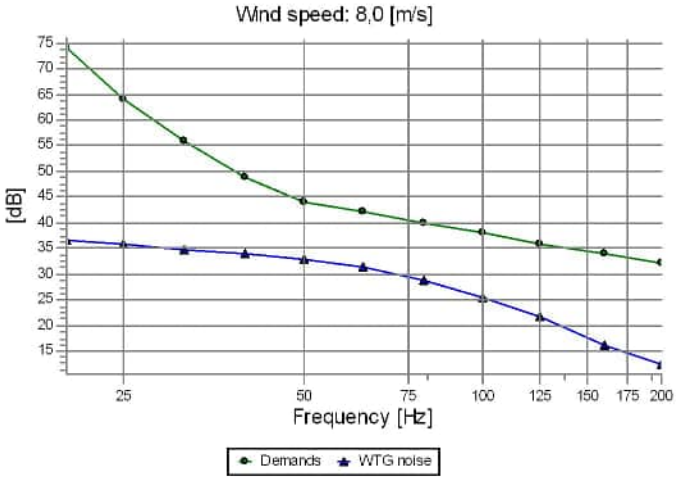


Frequency [Hz]	Demands [dB]	Sound level WTG noise [dB]	Demands fulfilled ?
20,0	74,0	40,1	Yes
25,0	64,0	39,3	Yes
31,5	56,0	38,3	Yes
40,0	49,0	37,5	Yes
50,0	44,0	36,5	Yes
63,0	42,0	34,9	Yes
80,0	40,0	32,5	Yes
100,0	38,0	29,3	Yes
125,0	36,0	25,5	Yes
160,0	34,0	20,3	Yes
200,0	32,0	16,9	Yes

DECIBEL - Detailed results, graphic

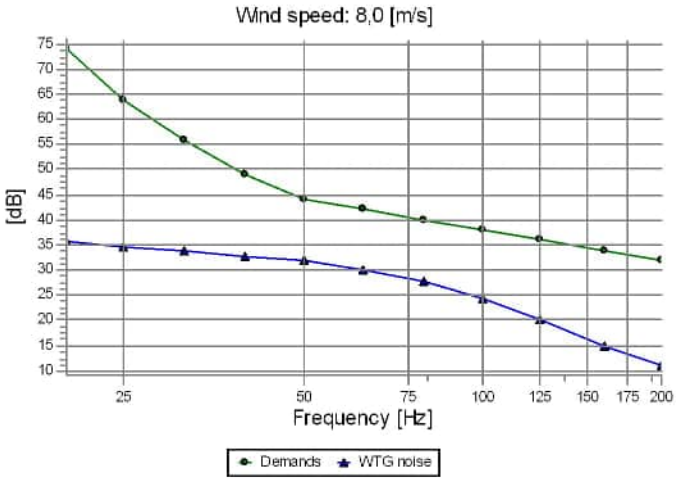
Calculation: Alajärvi Suolasalmenharju Melumallinnus 16082023 Pienitaajuinen sisämelu Noise calculation model: Finland Low frequency 8,0 m/s

G Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (6)



Frequency [Hz]	Sound level Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	36,7	Yes
25,0	64,0	35,8	Yes
31,5	56,0	34,7	Yes
40,0	49,0	34,0	Yes
50,0	44,0	32,9	Yes
63,0	42,0	31,3	Yes
80,0	40,0	28,8	Yes
100,0	38,0	25,6	Yes
125,0	36,0	21,6	Yes
160,0	34,0	16,1	Yes
200,0	32,0	12,5	Yes

H Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (5)



Frequency [Hz]	Sound level Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	35,6	Yes
25,0	64,0	34,7	Yes
31,5	56,0	33,7	Yes
40,0	49,0	32,9	Yes
50,0	44,0	31,8	Yes
63,0	42,0	30,2	Yes
80,0	40,0	27,7	Yes
100,0	38,0	24,4	Yes
125,0	36,0	20,3	Yes
160,0	34,0	14,8	Yes
200,0	32,0	11,1	Yes

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Calculated:
16.8.2023 16.32/3.6.366

DECIBEL - Assumptions for noise calculation

Calculation: Alajärvi Suolasalmenharju Melumallinnus 16082023 Pienitaajuinen sisämelu

Noise calculation model:
Finland Low frequency
Wind speed (in 10 m height):
8,0 m/s
Spectral distribution:
From 20,0 Hz to 200,0 Hz
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 is subtracted from demand
Model: 5,0 dB(A)
Height above ground level, when no value in NSA object:
4,0 m; Don't allow override of model height with height from NSA object
Uncertainty margin:
0,0 dB; Uncertainty margin in NSA has priority
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)
Low frequency calculation
dLsigma

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
7,6	8,3	9,2	10,3	11,5	13,0	14,8	16,8	18,8	21,1	22,8

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89

WTG: VESTAS V172-7.2 7200 240.0 !O!
Noise: PO7200-0S_2dB_uncertainty

Source	Source/Date	Creator	Edited
	21.6.2023	USER	16.8.2023 16.25

DOC nro. 0128-4336_00

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	180,0	8,0	104,5	61,2	67,1	72,5	77,9	82,8	87,2	91,0	94,2	96,9	98,9	100,4

Noise sensitive area: A Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: B Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

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DECIBEL - Assumptions for noise calculation

Calculation: Alajärvi Suolasalmenharju Melumallinnus 16082023 Pienitaajuinen sisämelu

Noise sensitive area: C Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: D Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: E Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: F Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: G Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: H Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

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DECIBEL - Assumptions for noise calculation

Calculation: Alajärvi Suolasalmenharju Melumallinnus 16082023 Pienitaajuinen sisämelu

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

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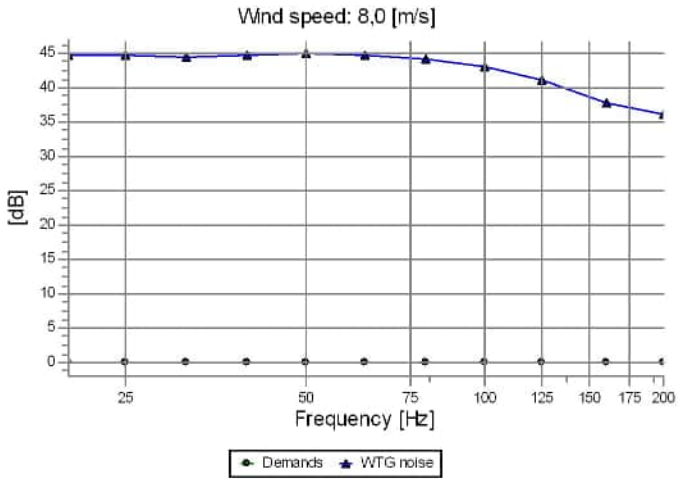
Calculated:
24.8.2023 14.01/3.6.366

DECIBEL - Detailed results, graphic

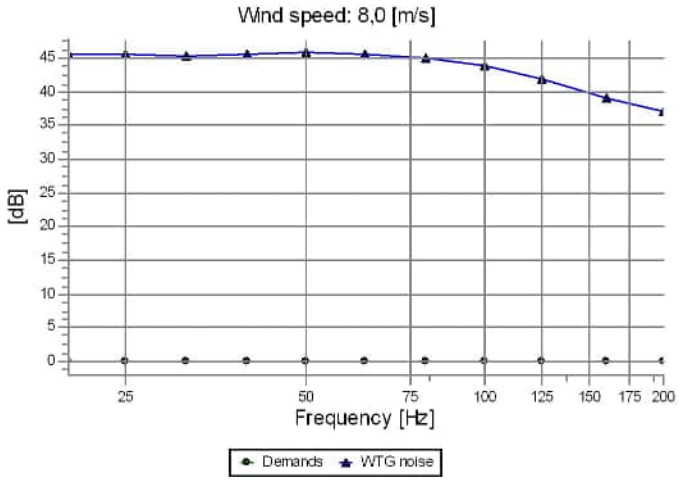
Calculation: Alajärvi Suolasalmenharju Melumallinnus 24082023 Pienitaajuinen ulkomelu Noise calculation model: Finland Low frequency 8,0 m/s

A Noise sensitive point: Finnish low frequency - User defined (2)



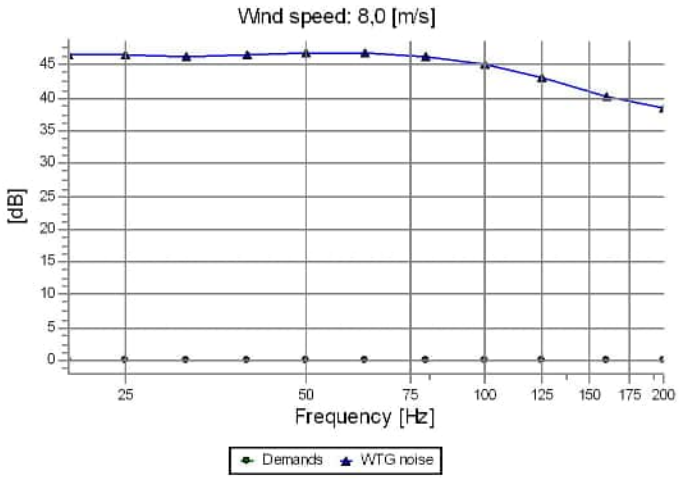
Frequency [Hz]	Sound level WTG noise [dB]
20,0	44,8
25,0	44,7
31,5	44,5
40,0	44,8
50,0	45,0
63,0	44,9
80,0	44,2
100,0	43,0
125,0	41,0
160,0	38,0
200,0	36,1

B Noise sensitive point: Finnish low frequency - User defined (1)



Frequency [Hz]	Sound level WTG noise [dB]
20,0	45,6
25,0	45,4
31,5	45,3
40,0	45,6
50,0	45,8
63,0	45,7
80,0	45,0
100,0	43,8
125,0	41,9
160,0	38,9
200,0	37,1

C Noise sensitive point: Finnish low frequency - User defined (8)

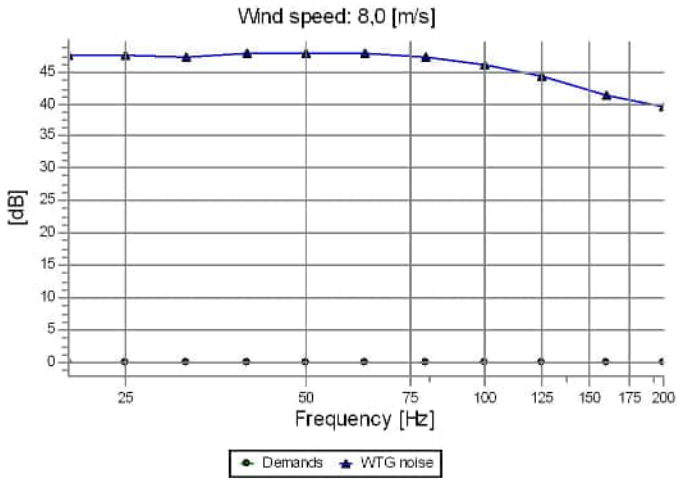


Frequency [Hz]	Sound level WTG noise [dB]
20,0	46,6
25,0	46,5
31,5	46,3
40,0	46,7
50,0	46,8
63,0	46,7
80,0	46,1
100,0	45,0
125,0	43,1
160,0	40,1
200,0	38,4

DECIBEL - Detailed results, graphic

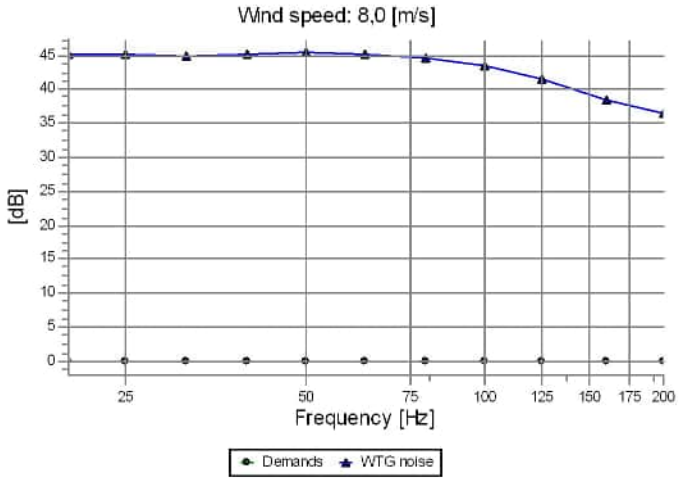
Calculation: Alajärvi Suolasalmenharju Melumallinnus 24082023 Pienitaajuinen ulkomelu Noise calculation model: Finland Low frequency 8,0 m/s

D Noise sensitive point: Finnish low frequency - User defined (3)



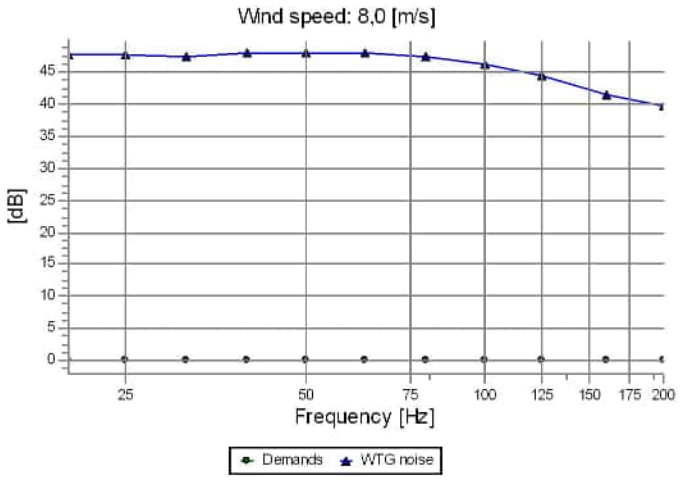
Frequency [Hz]	Sound level WTG noise [dB]
20,0	47,6
25,0	47,5
31,5	47,4
40,0	47,7
50,0	47,9
63,0	47,8
80,0	47,2
100,0	46,0
125,0	44,2
160,0	41,2
200,0	39,6

E Noise sensitive point: Finnish low frequency - User defined (7)



Frequency [Hz]	Sound level WTG noise [dB]
20,0	45,2
25,0	45,0
31,5	44,9
40,0	45,2
50,0	45,4
63,0	45,3
80,0	44,6
100,0	43,4
125,0	41,4
160,0	38,3
200,0	36,5

F Noise sensitive point: Finnish low frequency - User defined (4)

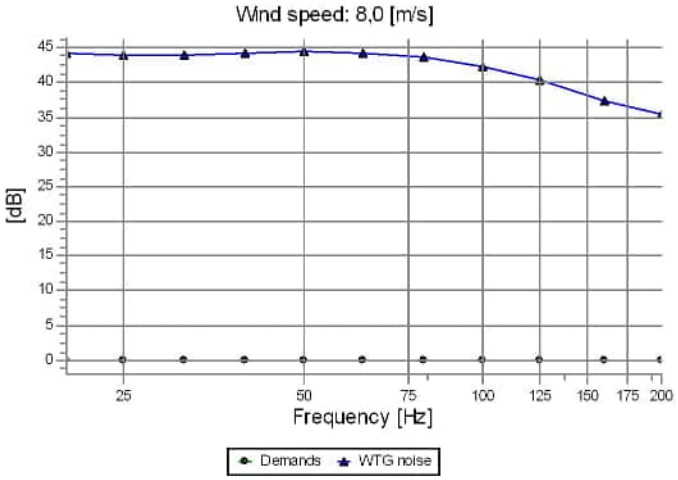


Frequency [Hz]	Sound level WTG noise [dB]
20,0	47,7
25,0	47,6
31,5	47,5
40,0	47,8
50,0	48,0
63,0	47,9
80,0	47,3
100,0	46,1
125,0	44,3
160,0	41,4
200,0	39,7

DECIBEL - Detailed results, graphic

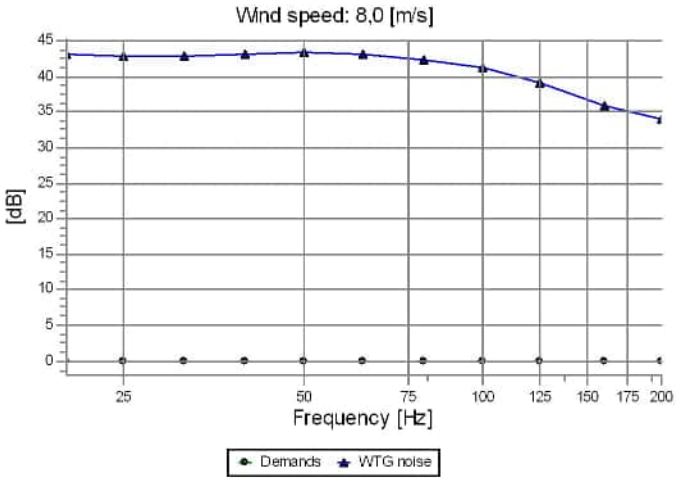
Calculation: Alajärvi Suolasalmenharju Melumallinnus 24082023 Pienitaajuinen ulkomelu Noise calculation model: Finland Low frequency 8,0 m/s

G Noise sensitive point: Finnish low frequency - User defined (6)



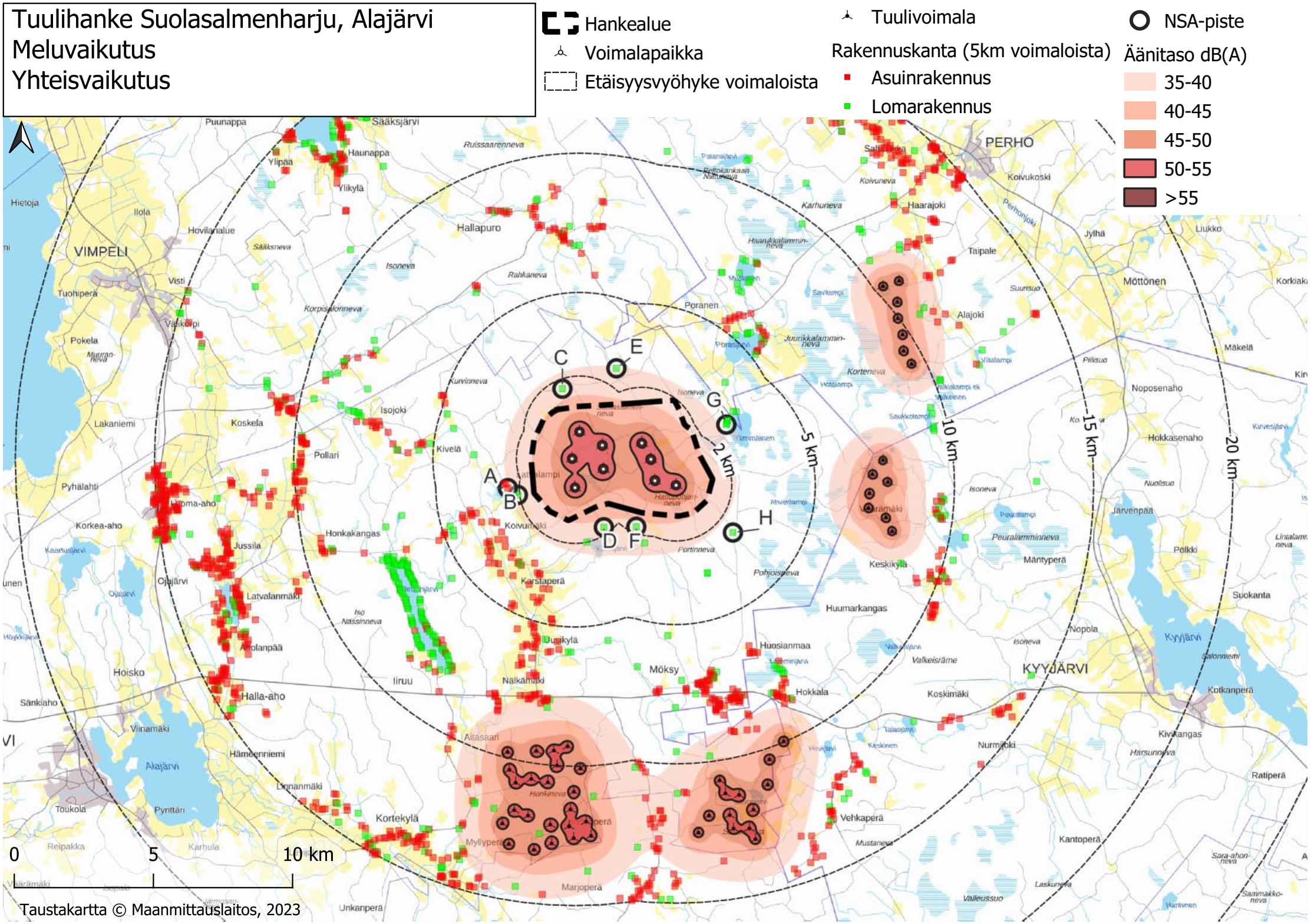
Frequency [Hz]	Sound level WTG noise [dB]
20,0	44,3
25,0	44,1
31,5	43,9
40,0	44,3
50,0	44,4
63,0	44,3
80,0	43,6
100,0	42,4
125,0	40,4
160,0	37,2
200,0	35,3

H Noise sensitive point: Finnish low frequency - User defined (5)



Frequency [Hz]	Sound level WTG noise [dB]
20,0	43,2
25,0	43,0
31,5	42,9
40,0	43,2
50,0	43,3
63,0	43,2
80,0	42,5
100,0	41,2
125,0	39,1
160,0	35,9
200,0	33,9

Liite 2. VE1 Yhteisvaikutusmallinnuksen mallinnustulosteita


Tuulihanke Suolasalmenharju, Alajärvi
Meluvaikutus
Yhteisvaikutus
Hankealue
Voimalapaikka
Etäisyysvyöhyke voimaloista
Tuulivoimala
NSA-piste
Rakennuskanta (5km voimaloista)
Asuinrakennus
Lomarakennus
Äänitaso dB(A)
35-40
40-45
45-50
50-55
>55
A
B
C
D
E
F
G
H
2 km
5 km
10 km
15 km
20 km
0
5
10 km
Taustakartta © Maanmittauslaitos, 2023

Project:
Suolasalmenharju

Description:
Alajärven Suolasalmenharjun tuulivoimahanke
Ympäristövaikutusten arviointi
2023
Melun yhteisvaikutusmallinnus

Licensed user:
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Ilmalanportti 2
FI-00240 Helsinki

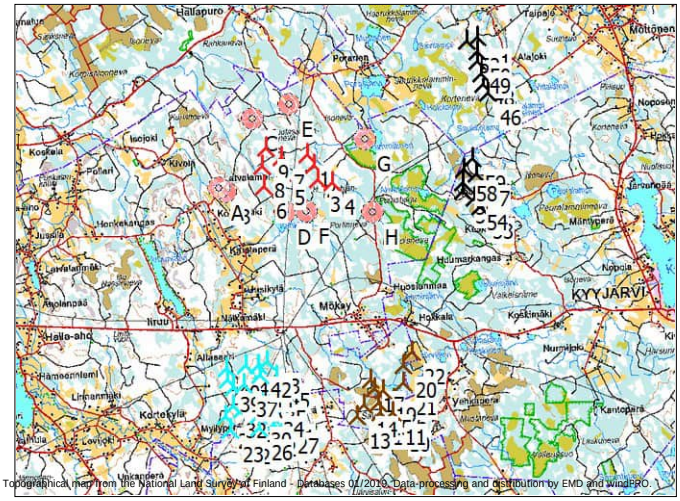
Juho Ali-Tolppa / juho.ali-tolppa@sweco.fi
Calculated:
17.10.2023 21.48/3.6.377

DECIBEL - Main Result

Calculation: Alajärvi Suolasalmenharju Melun yhteisvaikutusmallinnus 17102023

Calculation is done according to Finnish guideline " Ympäristöhallinnon ohjeita 2 | 2014 " from the Ministry of the Environment of Finland

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



WTGs

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Noise data Creator	Name	Wind speed	LwA,ref	Uncertainty
			[m]					[kW]	[m]	[m]			[m/s]	[dB(A)]	[dB(A)]
1	358 459	7 001 683	165,2	VESTAS V172-7.2 7200 240.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	240,0	180,0	USER	PO7200-0S	8,0	110,1	2,0
2	358 785	7 001 098	170,3	VESTAS V172-7.2 7200 240.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	240,0	180,0	USER	PO7200-0S	8,0	110,1	2,0
3	358 926	7 000 329	166,3	VESTAS V172-7.2 7200 240.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	240,0	180,0	USER	PO7200-0S	8,0	110,1	2,0
4	359 689	7 000 167	163,4	VESTAS V172-7.2 7200 240.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	240,0	180,0	USER	PO7200-0S	8,0	110,1	2,0
5	357 076	7 000 746	170,5	VESTAS V172-7.2 7200 240.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	240,0	180,0	USER	PO7200-0S	8,0	110,1	2,0
6	356 056	7 000 079	164,5	VESTAS V172-7.2 7200 240.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	240,0	180,0	USER	PO7200-0S	8,0	110,1	2,0
7	357 040	7 001 604	175,2	VESTAS V172-7.2 7200 240.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	240,0	180,0	USER	PO7200-0S	8,0	110,1	2,0
8	355 953	7 001 119	168,7	VESTAS V172-7.2 7200 240.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	240,0	180,0	USER	PO7200-0S	8,0	110,1	2,0
9	356 219	7 002 089	171,3	VESTAS V172-7.2 7200 240.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	240,0	180,0	USER	PO7200-0S	8,0	110,1	2,0
AP01	367 452	6 998 511	170,8	Siemens Gamesa SG 6.0-155 66...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP02	367 229	6 999 008	178,0	Siemens Gamesa SG 6.0-155 66...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP03	366 597	6 999 343	185,3	Siemens Gamesa SG 6.0-155 66...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP04	366 633	6 999 876	175,0	Siemens Gamesa SG 6.0-155 66...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP05	367 296	7 000 281	180,3	Siemens Gamesa SG 6.0-155 66...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP06	366 743	7 000 559	181,3	Siemens Gamesa SG 6.0-155 66...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP07	367 123	7 001 069	178,3	Siemens Gamesa SG 6.0-155 66...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP08	368 149	7 004 519	185,5	Siemens Gamesa SG 6.0-155 66...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP09	367 859	7 004 990	188,9	Siemens Gamesa SG 6.0-155 66...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP10	367 827	7 005 574	184,5	Siemens Gamesa SG 6.0-155 66...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP11	367 658	7 006 158	182,5	Siemens Gamesa SG 6.0-155 66...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP12	367 637	7 006 747	181,7	Siemens Gamesa SG 6.0-155 66...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP13	367 702	7 007 505	176,5	Siemens Gamesa SG 6.0-155 66...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP14	367 119	7 007 309	179,8	Siemens Gamesa SG 6.0-155 66...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
L01	353 679	6 987 286	150,6	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L02	354 585	6 987 085	162,9	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L03	355 219	6 987 313	161,6	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L04	356 009	6 987 498	164,6	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L05	356 634	6 987 584	169,6	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L06	355 849	6 987 929	169,1	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L07	353 449	6 988 027	135,1	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L08	355 168	6 987 987	163,8	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L09	356 460	6 988 096	171,5	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L10	353 875	6 988 505	145,8	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L11	354 371	6 988 310	149,7	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L12	355 897	6 988 530	166,0	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L15	356 017	6 989 168	169,2	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L16	353 926	6 989 492	160,4	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L17	354 487	6 989 627	161,2	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L18	355 081	6 989 503	158,5	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L19	353 699	6 989 952	154,7	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L22	355 415	6 990 109	167,4	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L23	356 257	6 989 999	165,2	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L24	353 633	6 990 594	147,5	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L25	354 667	6 990 629	148,8	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L26	355 297	6 990 644	163,1	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L27	355 792	6 990 794	161,3	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
M01	362 542	6 987 466	192,9	VESTAS V162-6.0 6000 162.0 !O...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	USER	Level 0 - - Mode PO6000 - 12-2020	8,0	106,3	0,0
M02	360 490	6 987 699	201,7	VESTAS V162-6.0 6000 162.0 !O...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	USER	Level 0 - - Mode PO6000 - 12-2020	8,0	106,3	0,0
M04	361 752	6 987 845	190,3	VESTAS V162-6.0 6000 162.0 !O...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	USER	Level 0 - - Mode PO6000 - 12-2020	8,0	106,3	0,0
M05	362 323	6 987 853	188,6	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
M07	360 871	6 988 310	192,5	VESTAS V162-6.0 6000 162.0 !O...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	USER	Level 0 - - Mode PO6000 - 12-2020	8,0	106,3	0,0
M08	361 618	6 988 328	191,9	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
M09	362 466	6 988 521	182,7	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
M11	361 462	6 989 109	184,7	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
M12	361 952	6 989 053	182,7	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
M13	361 253	6 989 574	191,3	VESTAS V162-6.0 6000 162.0 !O...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	USER	Level 0 - - Mode PO6000 - 12-2020	8,0	106,3	0,0
M14	362 982	6 989 422	185,2	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
M15	363 044	6 990 324	183,7	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
M16	363 556	6 990 972	185,2	VESTAS V162-6.2 6200 162.0 !O...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0

Calculation Results

Licensed user:
Sweco Finland Oy
Ilmalanportti 2
FI-00240 Helsinki

Juho Ali-Tolppa / juho.ali-tolppa@sweco.fi
Calculated:
17.10.2023 21.48/3.6.377

DECIBEL - Main Result

Calculation: Alajärvi Suolasalmenharju Melun yhteisvaikutusmallinnus 17102023

Sound level

Noise sensitive area No.	Name	East	North	Z	Immission height	Demands Noise	Sound level From WTGs	Uncertainty margin	WTG+Uncertainty margin	Distance to noise demand	Demands fulfilled ? Noise	2 dB penalty applied for one or more WTGs
				[m]	[m]	[dB(A)]	[dB(A)]	[dB]	[dB(A)]	[m]		
A	Noise sensitive point: Finnish normal frequency - User defined (2)	353 645	7 000 066	138,1	4,0	40,0	33,0	2,0	35,0	993	Yes	No
B	Noise sensitive point: Finnish normal frequency - User defined (1)	354 006	6 999 820	140,9	4,0	40,0	34,2	2,0	36,2	710	Yes	No
C	Noise sensitive point: Finnish normal frequency - User defined (8)	355 606	7 003 632	161,9	4,0	40,0	35,7	2,0	37,7	385	Yes	No
D	Noise sensitive point: Finnish normal frequency - User defined (3)	357 094	6 998 661	157,4	4,0	40,0	36,9	2,0	38,9	247	Yes	No
E	Noise sensitive point: Finnish normal frequency - User defined (7)	357 545	7 004 366	153,6	4,0	40,0	33,2	2,0	35,2	1 076	Yes	No
F	Noise sensitive point: Finnish normal frequency - User defined (4)	358 259	6 998 677	159,9	4,0	40,0	37,0	2,0	39,0	210	Yes	No
G	Noise sensitive point: Finnish normal frequency - User defined (6)	361 494	7 002 345	173,0	4,0	40,0	32,3	2,0	34,3	1 302	Yes	No
H	Noise sensitive point: Finnish normal frequency - User defined (5)	361 730	6 998 471	171,2	4,0	40,0	31,0	2,0	33,0	1 441	Yes	No

Distances (m)

WTG	A	B	C	D	E	F	G	H
1	5078	4828	3455	3316	2835	3012	3106	4585
2	5242	4947	4065	2966	3495	2477	2982	3947
3	5287	4946	4683	2478	4266	1782	3264	3364
4	6044	5693	5355	3000	4714	2065	2828	2655
5	3498	3207	3239	2086	3650	2383	4698	5181
6	2411	2067	3581	1758	4538	2611	5890	5897
7	3727	3520	2484	2943	2808	3170	4515	5640
8	2537	2341	2536	2711	3616	3359	5675	6356
9	3274	3170	1660	3538	2635	3975	5281	6593
AP01	13894	13510	12906	10359	11508	9195	7085	5722
AP02	13625	13248	12509	10141	11067	8976	6635	5525
AP03	12972	12600	11798	9527	10352	8365	5921	4944
AP04	12989	12627	11649	9616	10137	8459	5701	5100
AP05	13652	13298	12161	10330	10572	9178	6158	5853
AP06	13107	12759	11553	9834	9955	8690	5545	5430
AP07	13515	13177	11799	10314	10130	9181	5772	5986
AP08	15172	14904	12575	12511	10605	11486	7001	8820
AP09	15042	14787	12328	12488	10333	11490	6893	8948
AP10	15214	14971	12375	12767	10353	11794	7109	9361
AP11	15280	15052	12314	12954	10270	12013	7248	9707
AP12	15505	15290	12428	13287	10369	12372	7558	10168
AP13	15904	15705	12701	13811	10631	12927	8073	10830
AP14	15297	15101	12086	13240	10016	12370	7502	10352
L01	12780	12538	16459	11876	17512	12278	16966	13781
L02	13015	12748	16578	11845	17533	12161	16751	13442
L03	12850	12566	16323	11502	17211	11764	16289	12918
L04	12788	12484	16139	11215	16938	11404	15827	12375
L05	12834	12515	16080	11086	16807	11212	15540	12020
L06	12335	12032	15704	10803	16524	11015	15481	12071
L07	12041	11806	15753	11241	16845	11687	16423	13329
L08	12174	11890	15651	10846	16551	11128	15689	12368
L09	12296	11978	15559	10584	16306	10733	15112	11636
L10	11563	11315	15225	10653	16280	11077	15798	12689
L11	11778	11516	15372	10703	16367	11073	15739	12546
L12	11753	11447	15104	10201	15921	10418	14905	11525
L15	11153	10840	14469	9553	15275	9770	14269	10917
L16	10577	10328	14239	9701	15308	10156	14915	11896
L17	10472	10204	14049	9402	15052	9804	14520	11431
L18	10660	10373	14139	9376	15066	9709	14354	11164
L19	10114	9872	13812	9347	14918	9845	14640	11707
L22	10113	9812	13524	8715	14415	9028	13663	10479
L23	10400	10075	13648	8702	14424	8906	13410	10085
L24	9472	9233	13186	8778	14317	9314	14138	11297
L25	9492	9215	13036	8390	14035	8814	13560	10554
L26	9565	9266	12991	8215	13905	8562	13240	10131
L27	9517	9200	12839	7973	13684	8260	12881	9705
M01	15424	15016	17591	12450	17623	12002	14916	11034
M02	14134	13746	16664	11475	16925	11203	14680	10843
M04	14665	14262	16941	11776	17048	11382	14502	10626
M05	14982	14573	17149	12006	17190	11562	14515	10634

To be continued on next page...

DECIBEL - Main Result

Calculation: Alajärvi Suolasalmenharju Melun yhteisvaikutusmallinnus 17102023

...continued from previous page

WTG	A	B	C	D	E	F	G	H
M07	13799	13402	16201	11018	16397	10692	14049	10197
M08	14189	13784	16442	11280	16547	10881	14017	10143
M09	14529	14115	16595	11475	16592	10993	13858	9977
M11	13459	13050	15659	10503	15752	10090	13236	9365
M12	13795	13382	15901	10766	15935	10309	13300	9421
M13	12959	12549	15149	9992	15249	9583	12773	8909
M14	14158	13736	16010	10955	15902	10390	13008	9134
M15	13537	13110	15246	10243	15081	9627	12121	8252
M16	13450	13018	14949	10043	14681	9350	11558	7717

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Calculated:
17.10.2023 21.48/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Alajärvi Suolasalmenharju Melun yhteisvaikutusmallinnus 17102023

Noise calculation model:
ISO 9613-2 Finland
Wind speed (in 10 m height):
8,0 m/s
Ground attenuation:
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Vesistöt
Area type with hard ground: VESISTOT
Ground factor for hard ground: 0,0
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 tones penalty is added to total noise impact at receptors
Noise sensitive area
Height above ground level, when no value in NSA object:
4,0 m; Don't allow override of model height with height from NSA object
Uncertainty margin:
Uncertainty added to source noise level of the WTGs in the calculation
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)
Octave data required
Frequency dependent 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]
0,10	0,38	1,12	2,36	4,08	8,78	26,60	95,00

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89

WTG: VESTAS V172-7.2 7200 240.0 !O!
Noise: PO7200-0S

Source	Source/Date	Creator	Edited
	13.10.2022	USER	9.8.2023 15.51

Document no. 0128-4336 V00

						Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Uncertainty [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	180,0	8,0	110,1	2,0	No	91,0	99,9	104,0	105,0	103,8	99,5	91,8	80,8

WTG: VESTAS V162-6.0 6000 162.0 !O!
Noise: Level 0 - - Mode PO6000 - 12-2020

Source	Source/Date	Creator	Edited
Manufacturer	7.12.2020	USER	14.8.2023 13.34

(Document n. 0098-0840 V03.)

Mallinnuksen (139 HH, 162 RD) lähtötiedot Numerola Oy:n laatimasta meluselvityksestä TV-2021-1881-1
"Third octave noise emission EnVentus V162-6.0 MW. Document no 0095-3732_01. 2020-11-03."

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	139,0	8,0	106,3	No	87,4	94,9	99,5	101,3	100,4	96,6	90,1	80,6

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Calculated:
17.10.2023 21.48/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Alajärvi Suolasalmenharju Melun yhteisvaikutusmallinnus 17102023

WTG: VESTAS V162-6.2 6200 162.0 !O!
Noise: Level 0 - Measured - Mode PO6200 - 06-2021

Source	Source/Date	Creator	Edited
Manufacturer	30.6.2021	USER	17.10.2023 12.56

(Document no.: 0107-3707 V00.)

139m napakorkeuden 10m korkeudella 8 m/s 1/3-oktaavitiedot Möksy-Louhukangas rakennuslupavaiheen meluselvityksestä (s.27): TV2021-188-1 "Third octave noise emission EnVentus V162-6.2 MW. Document no 0105-5200_00,2020-06-22"

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	139,0	8,0	106,8	No	87,9	95,4	100,0	101,8	100,9	97,1	90,6	81,1

WTG: VESTAS V162-6.2 6200 162.0 !O!
Noise: Level 0 - Measured - Mode PO6200 - 06-2021

Source	Source/Date	Creator	Edited
Manufacturer	30.6.2021	USER	17.10.2023 12.56

(Document no.: 0107-3707 V00.)

139m napakorkeuden 10m korkeudella 8 m/s 1/3-oktaavitiedot Möksy-Louhukangas rakennuslupavaiheen meluselvityksestä (s.27): TV2021-188-1 "Third octave noise emission EnVentus V162-6.2 MW. Document no 0105-5200_00,2020-06-22"

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	139,0	8,0	106,8	No	87,9	95,4	100,0	101,8	100,9	97,1	90,6	81,1

WTG: Siemens Gamesa SG 6.0-155 6600 155.0 !O!
Noise: (AM 0, 6.6MW) - 105dB(A)

Source	Source/Date	Creator	Edited
SGRE	19.3.2020	USER	17.10.2023 13.04

Siemens Gamesa Renewable Energy and its affiliates reserve the right to change the above specifications without prior notice.

Lähde 1/3-oktaavijakaumalle: FCG: Kämppäkankaan tuulivoimahanke, melu- ja varjostusmallinnusraportti 30.5.2023 ,s.7 (Taulukko 3)
"Valmistajan tiedot asiakirjasta no. SG-F18.16-IN-01318_R01. Asiakirjan päivämäärä: 2021-11-09"
Lähtömelutasoon lisätty varmuusarvo 1.5 dB

						Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Uncertainty [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	162,9	8,0	105,0	1,5	No	84,6	92,0	96,6	98,9	98,7	99,0	92,4	77,4

Noise sensitive area: A Noise sensitive point: Finnish normal frequency - User defined (2)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

Noise sensitive area: B Noise sensitive point: Finnish normal frequency - User defined (1)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

Noise sensitive area: C Noise sensitive point: Finnish normal frequency - User defined (8)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

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DECIBEL - Assumptions for noise calculation

Calculation: Alajärvi Suolasalmenharju Melun yhteisvaikutusmallinnus 17102023

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

Noise sensitive area: D Noise sensitive point: Finnish normal frequency - User defined (3)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

Noise sensitive area: E Noise sensitive point: Finnish normal frequency - User defined (7)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

Noise sensitive area: F Noise sensitive point: Finnish normal frequency - User defined (4)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

Noise sensitive area: G Noise sensitive point: Finnish normal frequency - User defined (6)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

Noise sensitive area: H Noise sensitive point: Finnish normal frequency - User defined (5)

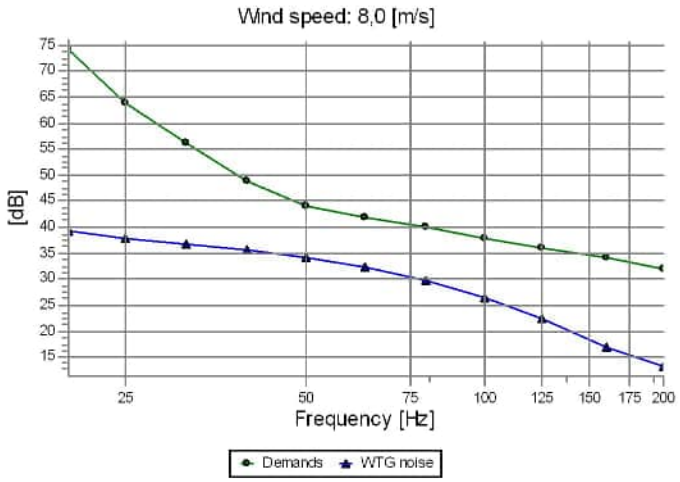
Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

DECIBEL - Detailed results, graphic

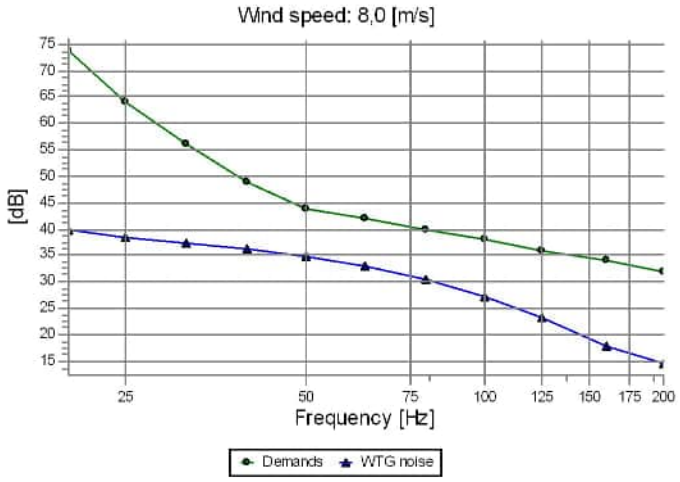
Calculation: Alajärvi Suolasalmenharju Melun yhteisvaikutusmallinnus 17102023 Pienitaajuinen sisämelu Noise calculation model: Finland Low frequency 8,0 m/s

A Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (2)



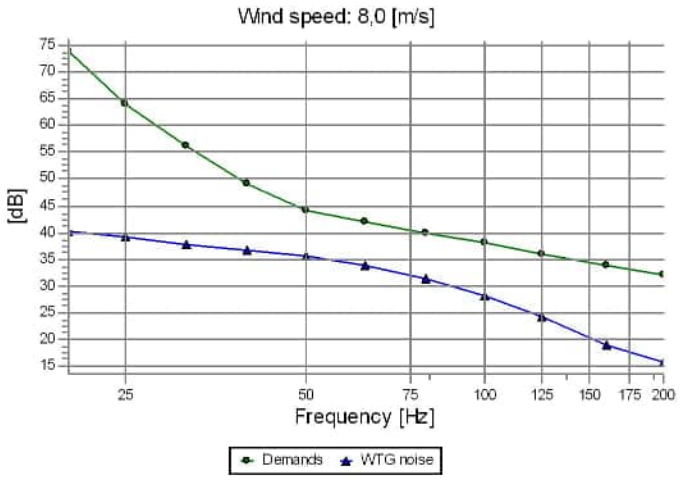
Frequency [Hz]	Sound level Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	39,5	Yes
25,0	64,0	38,0	Yes
31,5	56,0	36,6	Yes
40,0	49,0	35,5	Yes
50,0	44,0	34,2	Yes
63,0	42,0	32,3	Yes
80,0	40,0	29,8	Yes
100,0	38,0	26,5	Yes
125,0	36,0	22,4	Yes
160,0	34,0	17,0	Yes
200,0	32,0	13,4	Yes

B Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (1)



Frequency [Hz]	Sound level Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	40,0	Yes
25,0	64,0	38,6	Yes
31,5	56,0	37,2	Yes
40,0	49,0	36,2	Yes
50,0	44,0	34,9	Yes
63,0	42,0	33,1	Yes
80,0	40,0	30,5	Yes
100,0	38,0	27,3	Yes
125,0	36,0	23,3	Yes
160,0	34,0	17,9	Yes
200,0	32,0	14,4	Yes

C Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (8)

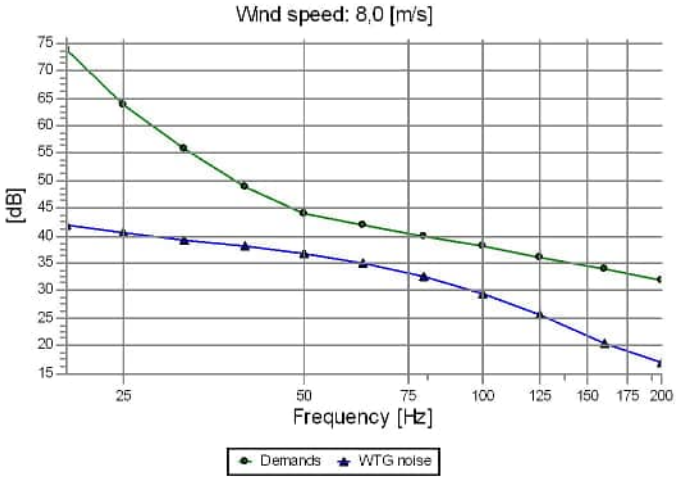


Frequency [Hz]	Sound level Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	40,3	Yes
25,0	64,0	39,1	Yes
31,5	56,0	37,8	Yes
40,0	49,0	36,9	Yes
50,0	44,0	35,7	Yes
63,0	42,0	34,0	Yes
80,0	40,0	31,5	Yes
100,0	38,0	28,3	Yes
125,0	36,0	24,4	Yes
160,0	34,0	19,1	Yes
200,0	32,0	15,7	Yes

DECIBEL - Detailed results, graphic

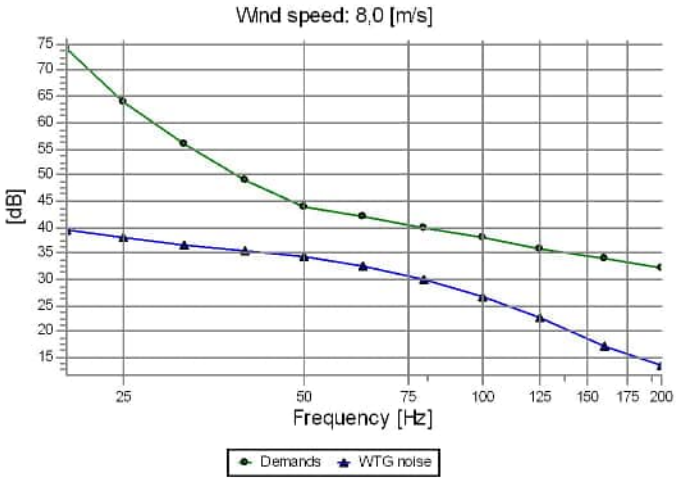
Calculation: Alajärvi Suolasalmenharju Melun yhteisvaikutusmallinnus 17102023 Pienitaajuinen sisämelu Noise calculation model: Finland Low frequency 8,0 m/s

D Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (3)



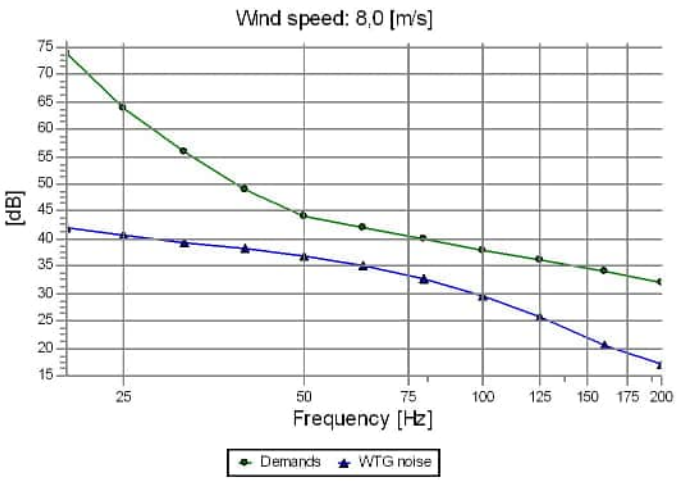
Frequency [Hz]	Demands [dB]	Sound level WTG noise [dB]	Demands fulfilled ?
20,0	74,0	41,8	Yes
25,0	64,0	40,5	Yes
31,5	56,0	39,1	Yes
40,0	49,0	38,1	Yes
50,0	44,0	36,9	Yes
63,0	42,0	35,1	Yes
80,0	40,0	32,6	Yes
100,0	38,0	29,4	Yes
125,0	36,0	25,5	Yes
160,0	34,0	20,2	Yes
200,0	32,0	16,8	Yes

E Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (7)



Frequency [Hz]	Demands [dB]	Sound level WTG noise [dB]	Demands fulfilled ?
20,0	74,0	39,5	Yes
25,0	64,0	38,1	Yes
31,5	56,0	36,7	Yes
40,0	49,0	35,6	Yes
50,0	44,0	34,4	Yes
63,0	42,0	32,6	Yes
80,0	40,0	30,0	Yes
100,0	38,0	26,8	Yes
125,0	36,0	22,7	Yes
160,0	34,0	17,3	Yes
200,0	32,0	13,7	Yes

F Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (4)

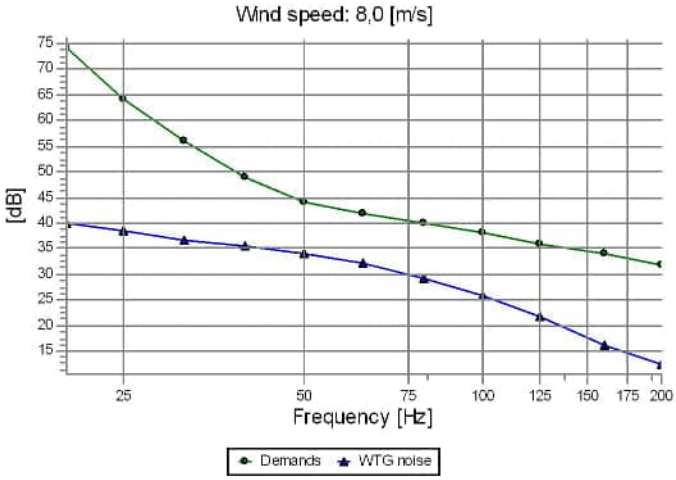


Frequency [Hz]	Demands [dB]	Sound level WTG noise [dB]	Demands fulfilled ?
20,0	74,0	41,9	Yes
25,0	64,0	40,6	Yes
31,5	56,0	39,3	Yes
40,0	49,0	38,2	Yes
50,0	44,0	37,0	Yes
63,0	42,0	35,3	Yes
80,0	40,0	32,7	Yes
100,0	38,0	29,5	Yes
125,0	36,0	25,6	Yes
160,0	34,0	20,4	Yes
200,0	32,0	17,0	Yes

DECIBEL - Detailed results, graphic

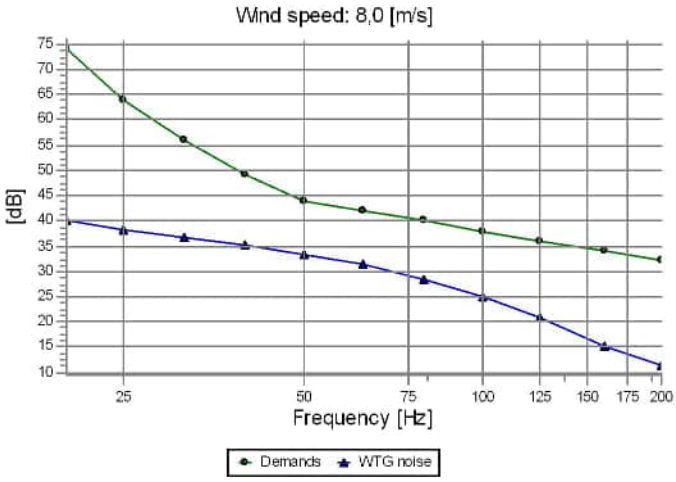
Calculation: Alajärvi Suolasalmenharju Melun yhteisvaikutusmallinnus 17102023 Pienitaajuinen sisämelu Noise calculation model: Finland Low frequency 8,0 m/s

G Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (6)



Frequency [Hz]	Sound level Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	40,1	Yes
25,0	64,0	38,4	Yes
31,5	56,0	36,8	Yes
40,0	49,0	35,5	Yes
50,0	44,0	33,9	Yes
63,0	42,0	32,1	Yes
80,0	40,0	29,3	Yes
100,0	38,0	26,0	Yes
125,0	36,0	21,9	Yes
160,0	34,0	16,4	Yes
200,0	32,0	12,7	Yes

H Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (5)



Frequency [Hz]	Sound level Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	40,3	Yes
25,0	64,0	38,4	Yes
31,5	56,0	36,7	Yes
40,0	49,0	35,1	Yes
50,0	44,0	33,4	Yes
63,0	42,0	31,4	Yes
80,0	40,0	28,6	Yes
100,0	38,0	25,1	Yes
125,0	36,0	21,0	Yes
160,0	34,0	15,3	Yes
200,0	32,0	11,5	Yes

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Calculated:
17.10.2023 13.05/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Alajärvi Suolasalmenharju Melun yhteisvaikutusmallinnus 17102023 Pienitaajuinen sisämelu

Noise calculation model:
Finland Low frequency
Wind speed (in 10 m height):
8,0 m/s
Spectral distribution:
From 20,0 Hz to 200,0 Hz
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 is subtracted from demand
Model: 5,0 dB(A)
Height above ground level, when no value in NSA object:
4,0 m; Don't allow override of model height with height from NSA object
Uncertainty margin:
0,0 dB; Uncertainty margin in NSA has priority
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)
Low frequency calculation
dLsigma

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
7,6	8,3	9,2	10,3	11,5	13,0	14,8	16,8	18,8	21,1	22,8

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89

WTG: VESTAS V172-7.2 7200 240.0 !O!
Noise: PO7200-0S_2dB_uncertainty

Source	Source/Date	Creator	Edited
	21.6.2023	USER	16.8.2023 16.25

DOC nro. 0128-4336_00

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	180,0	8,0	104,5	61,2	67,1	72,5	77,9	82,8	87,2	91,0	94,2	96,9	98,9	100,4

WTG: VESTAS V162-6.0 6000 162.0 !O!
Noise: Level 0 - - Mode PO6000 - 12-2020

Source	Source/Date	Creator	Edited
Manufacturer	7.12.2020	USER	14.8.2023 13.34

(Document n. 0098-0840 V03.)

Mallinnuksen (139 HH, 162 RD) lähtötiedot Numerola Oy:n laatimasta meluselvityksestä TV-2021-1881-1
"Third octave noise emission EnVentus V162-6.0 MW. Document no 0095-3732_01. 2020-11-03."

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	139,0	8,0	97,7	62,4	66,8	71,1	75,2	78,7	82,0	85,0	87,5	89,8	91,9	93,4

DECIBEL - Assumptions for noise calculation

Calculation: Alajärvi Suolasalmenharju Melun yhteisvaikutusmallinnus 17102023 Pienitaajuinen sisämelu

WTG: VESTAS V162-6.2 6200 162.0 !O!
Noise: Level 0 - Measured - Mode PO6200 - 06-2021

Source	Source/Date	Creator	Edited
Manufacturer	30.6.2021	USER	17.10.2023 12.56

(Document no.: 0107-3707 V00.)

139m napakorkeuden 10m korkeudella 8 m/s 1/3-oktaavitiedot Möksy-Louhukangas rakennuslupavaiheen meluselvityksestä (s.27): TV2021-188-1
"Third octave noise emission EnVentus V162-6.2 MW. Document no 0105-5200_00,2020-06-22"

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	139,0	8,0	98,2	62,9	67,3	71,6	75,7	79,2	82,5	85,5	88,0	90,3	92,4	93,9

WTG: VESTAS V162-6.2 6200 162.0 !O!
Noise: Level 0 - Measured - Mode PO6200 - 06-2021

Source	Source/Date	Creator	Edited
Manufacturer	30.6.2021	USER	17.10.2023 12.56

(Document no.: 0107-3707 V00.)

139m napakorkeuden 10m korkeudella 8 m/s 1/3-oktaavitiedot Möksy-Louhukangas rakennuslupavaiheen meluselvityksestä (s.27): TV2021-188-1
"Third octave noise emission EnVentus V162-6.2 MW. Document no 0105-5200_00,2020-06-22"

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	139,0	8,0	98,2	62,9	67,3	71,6	75,7	79,2	82,5	85,5	88,0	90,3	92,4	93,9

WTG: Siemens Gamesa SG 6.0-155 6600 155.0 !O!
Noise: (AM 0, 6.6MW) - 105dB(A) + 1.5 dB uncertainty

Source	Source/Date	Creator	Edited
SGRE	19.3.2020	USER	17.10.2023 12.59

Siemens Gamesa Renewable Energy and its affiliates reserve the right to change the above specifications without prior notice.

Lähde 1/3-oktaavijakaumalle: FCG: Kämppäkankaan tuulivoimahanke, melu- ja varjostusmallinnusraportti 30.5.2023 ,s.7 (Taulukko 3)
"Valmistajan tiedot asiakirjasta no. SG-F18.16-IN-01318_R01. Asiakirjan päivämäärä: 2021-11-09"
Lähtömelutasoon lisätty varmuusarvo 1.5 dB

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	162,9	8,0	96,0	63,2	67,6	71,6	75,1	78,0	81,5	83,0	85,9	89,0	90,3	90,9

Noise sensitive area: A Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: B Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

DECIBEL - Assumptions for noise calculation

Calculation: Alajärvi Suolasalmenharju Melun yhteisvaikutusmallinnus 17102023 Pienitaajuinen sisämelu

Noise sensitive area: C Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: D Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: E Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: F Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: G Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: H Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

Licensed user:
Sweco Finland Oy
Ilmalanportti 2
FI-00240 Helsinki

Juho Ali-Tolppa / juho.ali-tolppa@sweco.fi

DECIBEL - Assumptions for noise calculation

Calculation: Alajärvi Suolasalmenharju Melun yhteisvaikutusmallinnus 17102023 Pienitaajuinen sisämelu

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

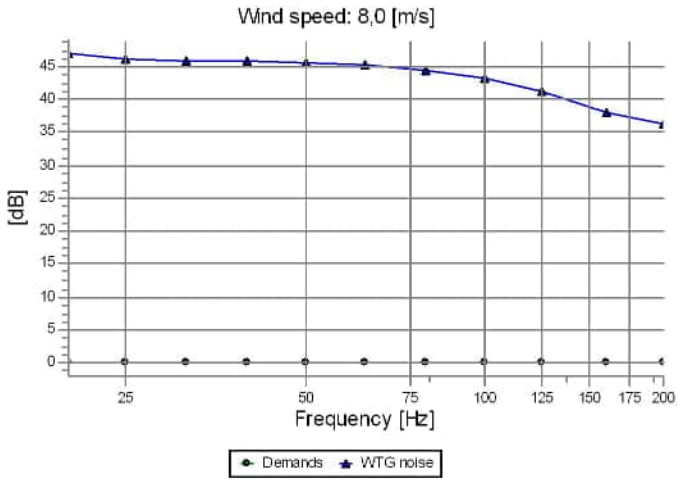
Licensed user:
Sweco Finland Oy
Ilmalanportti 2
FI-00240 Helsinki

Juho Ali-Tolppa / juho.ali-tolppa@sweco.fi
Calculated:
18.10.2023 13.04/3.6.377

DECIBEL - Detailed results, graphic

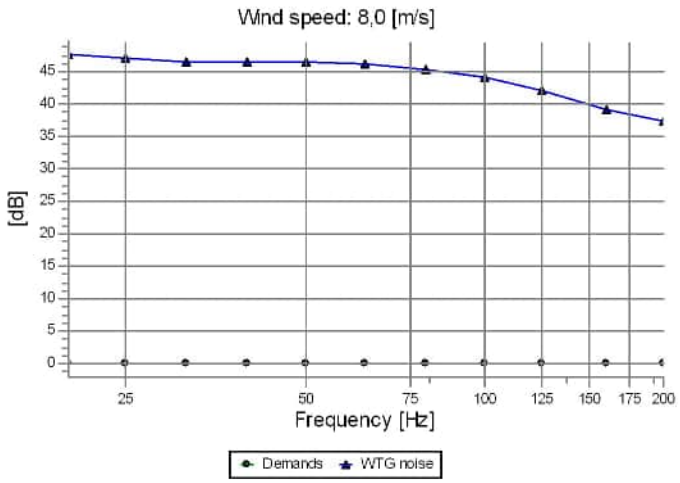
Calculation: Alajärvi Suolasalmenharju Melun yhteisvaikutusmallinnus 18102023 Pienitaajuinen ulkomelu Noise calculation model: Finland Low frequency 8,0 m/s

A Noise sensitive point: User defined (2)



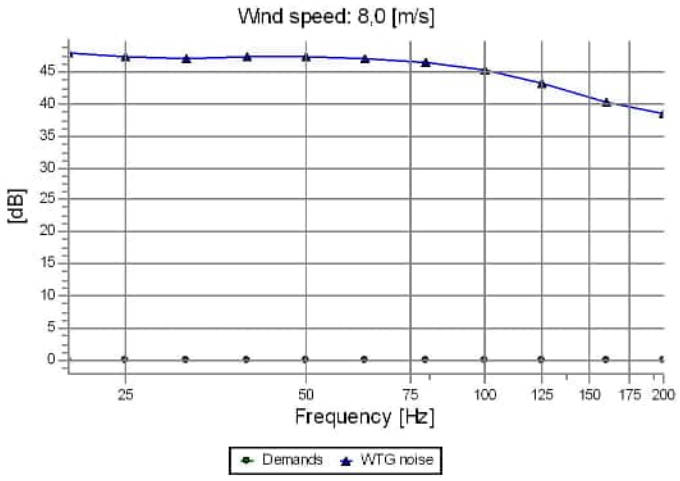
Frequency [Hz]	Sound level WTG noise [dB]
20,0	47,1
25,0	46,3
31,5	45,8
40,0	45,8
50,0	45,7
63,0	45,3
80,0	44,6
100,0	43,3
125,0	41,2
160,0	38,1
200,0	36,2

B Noise sensitive point: User defined (1)



Frequency [Hz]	Sound level WTG noise [dB]
20,0	47,6
25,0	46,9
31,5	46,4
40,0	46,5
50,0	46,4
63,0	46,1
80,0	45,3
100,0	44,1
125,0	42,1
160,0	39,0
200,0	37,2

C Noise sensitive point: User defined (8)



Frequency [Hz]	Sound level WTG noise [dB]
20,0	47,9
25,0	47,4
31,5	47,0
40,0	47,2
50,0	47,2
63,0	47,0
80,0	46,3
100,0	45,1
125,0	43,2
160,0	40,2
200,0	38,5

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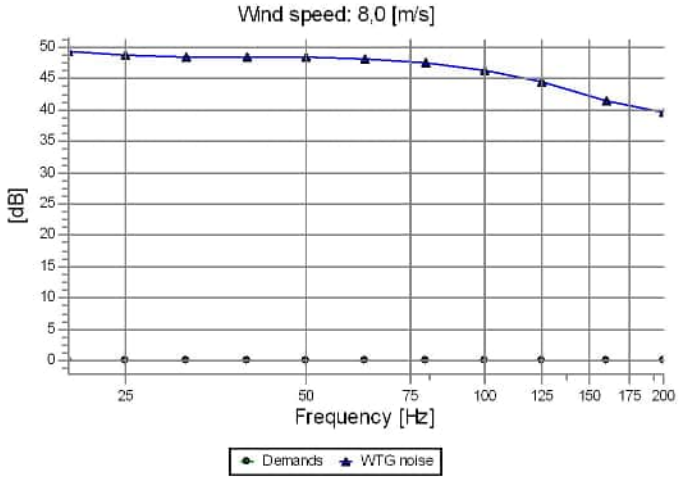
Juho Ali-Tolppa / juho.ali-tolppa@sweco.fi
Calculated:
18.10.2023 13.04/3.6.377

DECIBEL - Detailed results, graphic

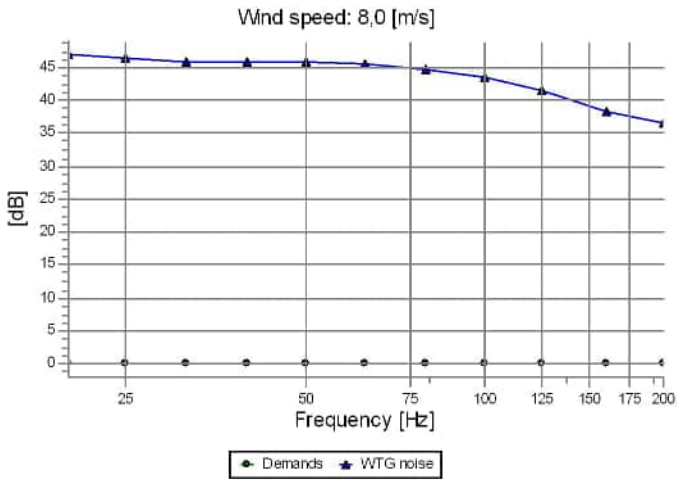
Calculation: Alajärvi Suolasalmenharju Melun yhteisvaikutusmallinnus 18102023 Pienitaajuinen ulkomelu Noise calculation model: Finland Low frequency 8,0 m/s

D Noise sensitive point: User defined (3)



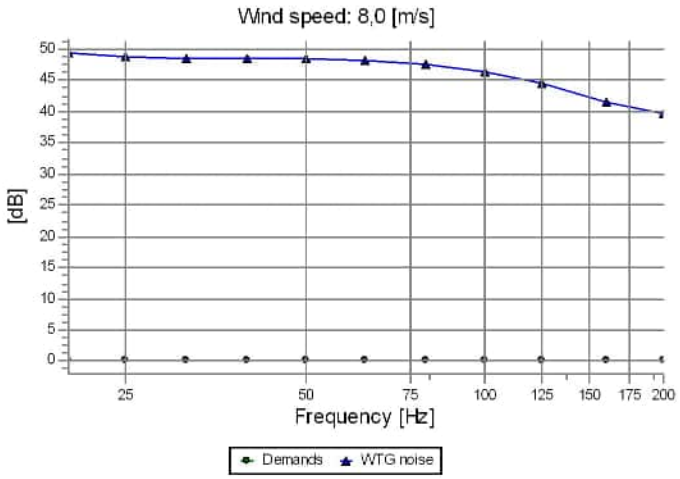
Frequency [Hz]	Sound level WTG noise [dB]
20,0	49,4
25,0	48,8
31,5	48,3
40,0	48,4
50,0	48,4
63,0	48,1
80,0	47,4
100,0	46,2
125,0	44,3
160,0	41,3
200,0	39,6

E Noise sensitive point: User defined (7)



Frequency [Hz]	Sound level WTG noise [dB]
20,0	47,1
25,0	46,4
31,5	45,9
40,0	45,9
50,0	45,9
63,0	45,6
80,0	44,8
100,0	43,6
125,0	41,5
160,0	38,4
200,0	36,5

F Noise sensitive point: User defined (4)

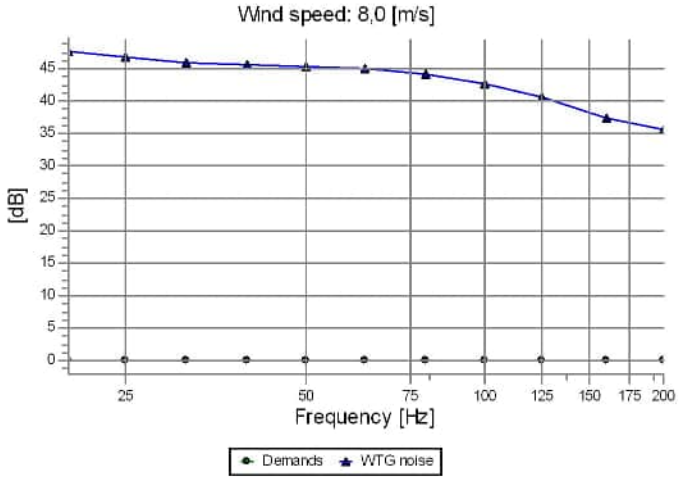


Frequency [Hz]	Sound level WTG noise [dB]
20,0	49,5
25,0	48,9
31,5	48,5
40,0	48,5
50,0	48,5
63,0	48,3
80,0	47,5
100,0	46,3
125,0	44,4
160,0	41,5
200,0	39,8

DECIBEL - Detailed results, graphic

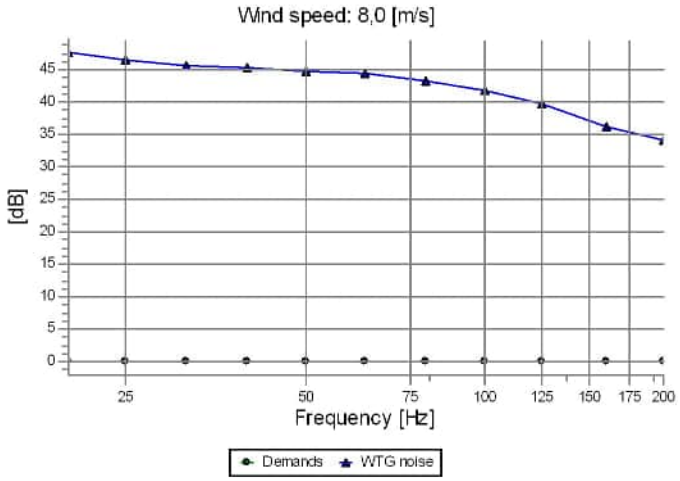
Calculation: Alajärvi Suolasalmenharju Melun yhteisvaikutusmallinnus 18102023 Pienitaajuinen ulkomelu Noise calculation model: Finland Low frequency 8,0 m/s

G Noise sensitive point: User defined (6)



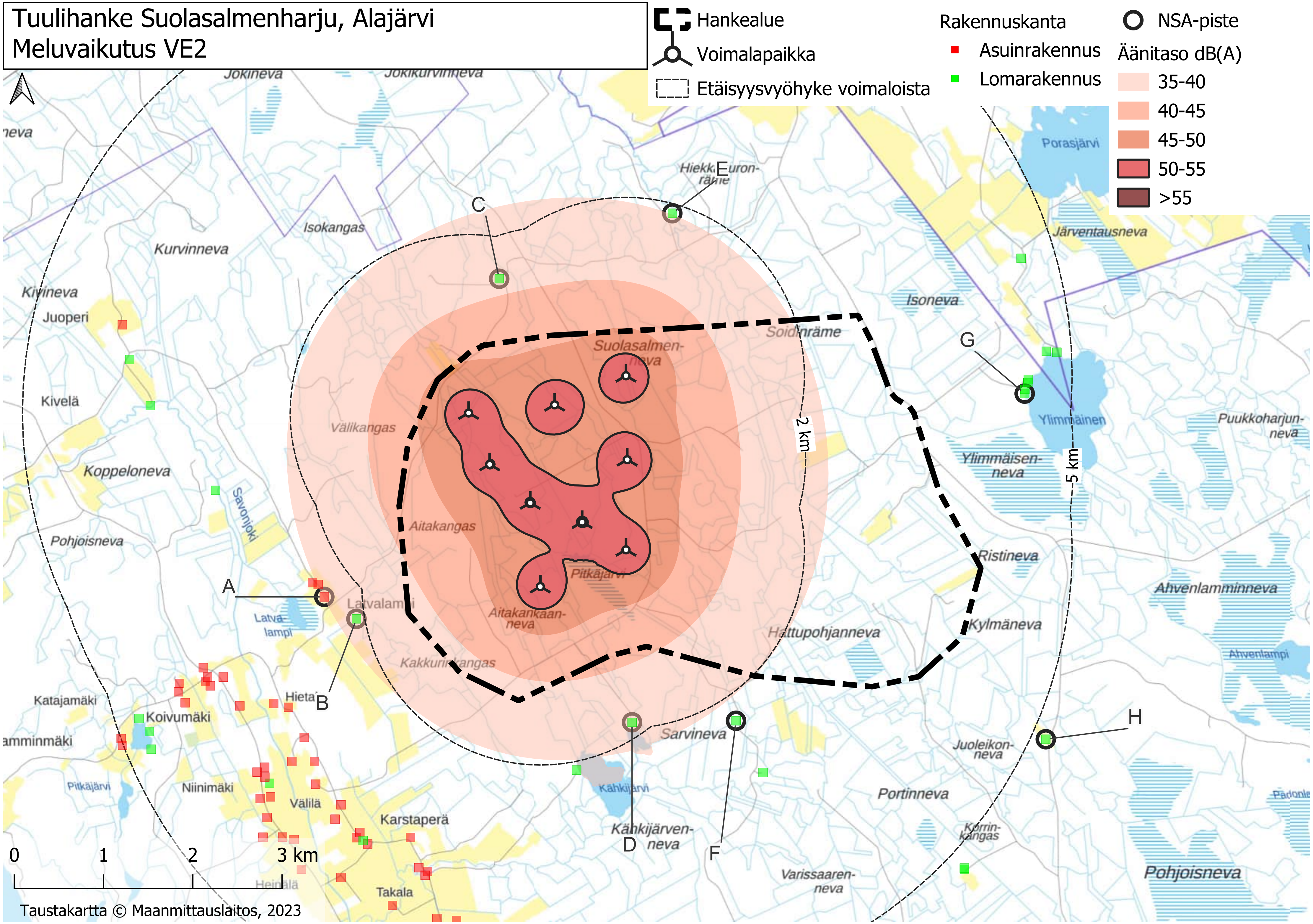
Frequency [Hz]	Sound level WTG noise [dB]
20,0	47,7
25,0	46,7
31,5	46,0
40,0	45,8
50,0	45,4
63,0	45,1
80,0	44,1
100,0	42,8
125,0	40,7
160,0	37,5
200,0	35,5

H Noise sensitive point: User defined (5)



Frequency [Hz]	Sound level WTG noise [dB]
20,0	47,9
25,0	46,7
31,5	45,9
40,0	45,4
50,0	44,9
63,0	44,4
80,0	43,4
100,0	41,9
125,0	39,8
160,0	36,4
200,0	34,3

Liite 3. Suolasalmenharju VE2 melumallinnustulosteita



Tuulihanke Suolasalmenharju, Alajärvi
Meluvaikutus VE2
Hankealue
Voimalapaikka
Etäisyysvyöhyke voimaloista
Rakennuskanta
Asuinrakennus
Lomarakennus
NSA-piste
Äänitaso dB(A)
35-40
40-45
45-50
50-55
>55
A
B
C
D
E
F
G
H
2 km
5 km
0
1
2
3 km
Taustakartta © Maanmittauslaitos, 2023

Project:
Suolasalmenharju

Description:
Alajärven Suolasalmenharjun tuulivoimahanke
Ympäristövaikutusten arviointi
2024
Melumallinnus VE2

Licensed user:
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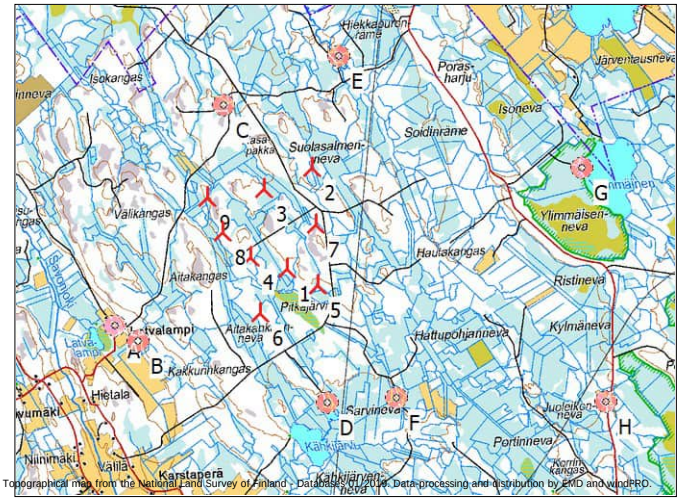
Juho Ali-Tolppa / juho.ali-tolppa@sweco.fi
Calculated:
27.3.2024 15.46/3.6.377

DECIBEL - Main Result

Calculation: Alajärvi Suolasalmenharju VE2 melumallinnus 27032024

Calculation is done according to Finnish guideline " Ympäristöhallinnon ohjeita 2 | 2014 " from the Ministry of the Environment of Finland

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



WTGs

	East	North	Z [m]	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Noise data Creator	Name	Wind speed [m/s]	LwA,ref [dB(A)]	Uncertainty [dB(A)]
1	356 535	7 000 904	167,3	VESTAS V172-7.2 720...	Yes	VESTAS	V172-7.2-7 200	7 200	180,0	180,0	USER	PO7200	8,0	106,9	2,5
2	357 026	7 002 544	164,1	VESTAS V172-7.2 720...	Yes	VESTAS	V172-7.2-7 200	7 200	180,0	180,0	USER	PO7200	8,0	106,9	2,5
3	356 227	7 002 219	170,7	VESTAS V172-7.2 720...	Yes	VESTAS	V172-7.2-7 200	7 200	180,0	180,0	USER	PO7200	8,0	106,9	2,5
4	355 953	7 001 119	168,7	VESTAS V172-7.2 720...	Yes	VESTAS	V172-7.2-7 200	7 200	180,0	180,0	USER	PO7200	8,0	106,9	2,5
5	357 026	7 000 594	168,9	VESTAS V172-7.2 720...	Yes	VESTAS	V172-7.2-7 200	7 200	180,0	180,0	USER	PO7200	8,0	106,9	2,5
6	356 066	7 000 181	168,3	VESTAS V172-7.2 720...	Yes	VESTAS	V172-7.2-7 200	7 200	180,0	180,0	USER	PO7200	8,0	106,9	2,5
7	357 040	7 001 604	175,2	VESTAS V172-7.2 720...	Yes	VESTAS	V172-7.2-7 200	7 200	180,0	180,0	USER	PO7200	8,0	106,9	2,5
8	355 498	7 001 550	163,5	VESTAS V172-7.2 720...	Yes	VESTAS	V172-7.2-7 200	7 200	180,0	180,0	USER	PO7200	8,0	106,9	2,5
9	355 263	7 002 127	159,3	VESTAS V172-7.2 720...	Yes	VESTAS	V172-7.2-7 200	7 200	180,0	180,0	USER	PO7200	8,0	106,9	2,5

Calculation Results

Sound level

Noise sensitive area No.	Name	East	North	Z [m]	Immission height [m]	Demands Noise [dB(A)]	Sound level From WTGs [dB(A)]	Uncertainty margin [dB]	WTG+Uncertainty margin [dB(A)]	Demands fulfilled ? Noise	2 dB penalty applied for one or more WTGs
A	Noise sensitive point: Finnish normal frequency - User defined (2)	353 645	7 000 066	138,1	4,0	40,0	32,5	2,5	35,0	Yes	No
B	Noise sensitive point: Finnish normal frequency - User defined (1)	354 006	6 999 820	140,9	4,0	40,0	33,4	2,5	35,9	Yes	No
C	Noise sensitive point: Finnish normal frequency - User defined (8)	355 606	7 003 632	161,9	4,0	40,0	36,4	2,5	38,9	Yes	No
D	Noise sensitive point: Finnish normal frequency - User defined (3)	357 094	6 998 661	157,4	4,0	40,0	33,9	2,5	36,4	Yes	No
E	Noise sensitive point: Finnish normal frequency - User defined (7)	357 545	7 004 366	153,6	4,0	40,0	32,4	2,5	34,9	Yes	No
F	Noise sensitive point: Finnish normal frequency - User defined (4)	358 259	6 998 677	159,9	4,0	40,0	31,5	2,5	34,0	Yes	No
G	Noise sensitive point: Finnish normal frequency - User defined (6)	361 494	7 002 345	173,0	4,0	40,0	25,1	2,5	27,6	Yes	No
H	Noise sensitive point: Finnish normal frequency - User defined (5)	361 730	6 998 471	171,2	4,0	40,0	23,2	2,5	25,7	Yes	No

Distances (m)

WTG	A	B	C	D	E	F	G	H
1	3009	2752	2881	2312	3606	2816	5164	5737
2	4192	4067	1788	3884	1894	4059	4472	6223
3	3362	3269	1543	3662	2520	4083	5268	6659
4	2537	2341	2536	2711	3616	3359	5675	6356
5	3422	3118	3354	1934	3808	2279	4799	5161
6	2423	2092	3481	1836	4438	2659	5843	5917
7	3727	3520	2484	2943	2808	3170	4515	5640
8	2374	2285	2084	3301	3481	3984	6048	6951
9	2620	2628	1543	3921	3197	4569	6235	7430

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Calculated:
27.3.2024 15.46/3.6.377

DECIBEL - Detailed results

Calculation: Alajärvi Suolasalmenharju VE2 melumallinnus 27032024 Noise calculation model: ISO 9613-2 Finland 8,0 m/s

Assumptions

Calculated L(DW) = LWA,ref + K + Dc - (Adiv + Aatm + Agr + Abar + Amisc) - Cmet
(when calculated with ground attenuation, then Dc = Domega)

LWA,ref:	Sound pressure level at WTG
K:	Pure tone
Dc:	Directivity correction
Adiv:	the attenuation due to geometrical divergence
Aatm:	the attenuation due to atmospheric absorption
Agr:	the attenuation due to ground effect
Abar:	the attenuation due to a barrier
Amisc:	the attenuation due to miscellaneous other effects
Cmet:	Meteorological correction

Calculation Results

Noise sensitive area: A Noise sensitive point: Finnish normal frequency - User defined (2)

Wind speed: 8,0 m/s
WTG

No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1	3 009	3 015	0	22,47	2,50	24,97	106,9	0,00	80,59	-	-	0,00	0,00	-
2	4 192	4 197	0	18,31	2,50	20,81	106,9	0,00	83,46	-	-	0,00	0,00	-
3	3 362	3 368	0	21,10	2,50	23,60	106,9	0,00	81,55	-	-	0,00	0,00	-
4	2 537	2 545	0	24,53	2,50	27,03	106,9	0,00	79,11	-	-	0,00	0,00	-
5	3 422	3 428	0	20,88	2,50	23,38	106,9	0,00	81,70	-	-	0,00	0,00	-
6	2 423	2 432	0	25,08	2,50	27,58	106,9	0,00	78,72	-	-	0,00	0,00	-
7	3 727	3 733	0	19,80	2,50	22,30	106,9	0,00	82,44	-	-	0,00	0,00	-
8	2 374	2 383	0	25,32	2,50	27,82	106,9	0,00	78,54	-	-	0,00	0,00	-
9	2 620	2 628	0	24,15	2,50	26,65	106,9	0,00	79,39	-	-	0,00	0,00	-
Sum						35,05								

- Data undefined due to calculation with octave data

Noise sensitive area: B Noise sensitive point: Finnish normal frequency - User defined (1)

Wind speed: 8,0 m/s
WTG

No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1	2 752	2 759	0	23,56	2,50	26,06	106,9	0,00	79,82	-	-	0,00	0,00	-
2	4 067	4 072	0	18,70	2,50	21,20	106,9	0,00	83,20	-	-	0,00	0,00	-
3	3 269	3 276	0	21,44	2,50	23,94	106,9	0,00	81,31	-	-	0,00	0,00	-
4	2 341	2 350	0	25,49	2,50	27,99	106,9	0,00	78,42	-	-	0,00	0,00	-
5	3 118	3 125	0	22,03	2,50	24,53	106,9	0,00	80,90	-	-	0,00	0,00	-
6	2 092	2 102	0	26,81	2,50	29,31	106,9	0,00	77,45	-	-	0,00	0,00	-
7	3 520	3 526	0	20,52	2,50	23,02	106,9	0,00	81,95	-	-	0,00	0,00	-
8	2 285	2 294	0	25,77	2,50	28,27	106,9	0,00	78,21	-	-	0,00	0,00	-
9	2 628	2 635	0	24,11	2,50	26,61	106,9	0,00	79,42	-	-	0,00	0,00	-
Sum						35,89								

- Data undefined due to calculation with octave data

Noise sensitive area: C Noise sensitive point: Finnish normal frequency - User defined (8)

Wind speed: 8,0 m/s
WTG

No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1	2 881	2 887	0	23,00	2,50	25,50	106,9	0,00	80,21	-	-	0,00	0,00	-
2	1 788	1 797	0	28,62	2,50	31,12	106,9	0,00	76,09	-	-	0,00	0,00	-
3	1 543	1 554	0	30,26	2,50	32,76	106,9	0,00	74,83	-	-	0,00	0,00	-
4	2 536	2 543	0	24,54	2,50	27,04	106,9	0,00	79,11	-	-	0,00	0,00	-
5	3 354	3 359	0	21,13	2,50	23,63	106,9	0,00	81,52	-	-	0,00	0,00	-
6	3 481	3 486	0	20,67	2,50	23,17	106,9	0,00	81,85	-	-	0,00	0,00	-

To be continued on next page...

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27.3.2024 15.46/3.6.377

DECIBEL - Detailed results

Calculation: Alajärvi Suolasalmenharju VE2 melumallinnus 27032024 Noise calculation model: ISO 9613-2 Finland 8,0 m/s

...continued from previous page

WTG

No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
7	2 484	2 491	0	24,79	2,50	27,29	106,9	0,00	78,93	-	-	0,00	0,00	-
8	2 084	2 092	0	26,86	2,50	29,36	106,9	0,00	77,41	-	-	0,00	0,00	-
9	1 543	1 552	0	30,28	2,50	32,78	106,9	0,00	74,82	-	-	0,00	0,00	-
Sum						38,91								

- Data undefined due to calculation with octave data

Noise sensitive area: D Noise sensitive point: Finnish normal frequency - User defined (3)

Wind speed: 8,0 m/s

WTG

No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1	2 312	2 320	0	25,65	2,50	28,15	106,9	0,00	78,31	-	-	0,00	0,00	-
2	3 884	3 889	0	19,29	2,50	21,79	106,9	0,00	82,80	-	-	0,00	0,00	-
3	3 662	3 667	0	20,03	2,50	22,53	106,9	0,00	82,29	-	-	0,00	0,00	-
4	2 711	2 717	0	23,74	2,50	26,24	106,9	0,00	79,68	-	-	0,00	0,00	-
5	1 934	1 943	0	27,72	2,50	30,22	106,9	0,00	76,77	-	-	0,00	0,00	-
6	1 836	1 845	0	28,32	2,50	30,82	106,9	0,00	76,32	-	-	0,00	0,00	-
7	2 943	2 950	0	22,74	2,50	25,24	106,9	0,00	80,40	-	-	0,00	0,00	-
8	3 301	3 306	0	21,33	2,50	23,83	106,9	0,00	81,39	-	-	0,00	0,00	-
9	3 921	3 925	0	19,17	2,50	21,67	106,9	0,00	82,88	-	-	0,00	0,00	-
Sum						36,42								

- Data undefined due to calculation with octave data

Noise sensitive area: E Noise sensitive point: Finnish normal frequency - User defined (7)

Wind speed: 8,0 m/s

WTG

No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1	3 606	3 611	0	20,22	2,50	22,72	106,9	0,00	82,15	-	-	0,00	0,00	-
2	1 894	1 903	0	27,96	2,50	30,46	106,9	0,00	76,59	-	-	0,00	0,00	-
3	2 520	2 527	0	24,62	2,50	27,12	106,9	0,00	79,05	-	-	0,00	0,00	-
4	3 616	3 621	0	20,19	2,50	22,69	106,9	0,00	82,18	-	-	0,00	0,00	-
5	3 808	3 813	0	19,54	2,50	22,04	106,9	0,00	82,62	-	-	0,00	0,00	-
6	4 438	4 442	0	17,58	2,50	20,08	106,9	0,00	83,95	-	-	0,00	0,00	-
7	2 808	2 815	0	23,31	2,50	25,81	106,9	0,00	79,99	-	-	0,00	0,00	-
8	3 481	3 486	0	20,67	2,50	23,17	106,9	0,00	81,85	-	-	0,00	0,00	-
9	3 197	3 202	0	21,73	2,50	24,23	106,9	0,00	81,11	-	-	0,00	0,00	-
Sum						34,93								

- Data undefined due to calculation with octave data

Noise sensitive area: F Noise sensitive point: Finnish normal frequency - User defined (4)

Wind speed: 8,0 m/s

WTG

No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1	2 816	2 822	0	23,28	2,50	25,78	106,9	0,00	80,01	-	-	0,00	0,00	-
2	4 059	4 063	0	18,73	2,50	21,23	106,9	0,00	83,18	-	-	0,00	0,00	-
3	4 083	4 087	0	18,65	2,50	21,15	106,9	0,00	83,23	-	-	0,00	0,00	-
4	3 359	3 364	0	21,12	2,50	23,62	106,9	0,00	81,54	-	-	0,00	0,00	-
5	2 279	2 286	0	25,82	2,50	28,32	106,9	0,00	78,18	-	-	0,00	0,00	-
6	2 659	2 665	0	23,98	2,50	26,48	106,9	0,00	79,52	-	-	0,00	0,00	-
7	3 170	3 176	0	21,83	2,50	24,33	106,9	0,00	81,04	-	-	0,00	0,00	-
8	3 984	3 988	0	18,97	2,50	21,47	106,9	0,00	83,02	-	-	0,00	0,00	-
9	4 569	4 573	0	17,21	2,50	19,71	106,9	0,00	84,20	-	-	0,00	0,00	-
Sum						33,98								

- Data undefined due to calculation with octave data

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Calculated:
27.3.2024 15.46/3.6.377

DECIBEL - Detailed results

Calculation: Alajärvi Suolasalmenharju VE2 melumallinnus 27032024 Noise calculation model: ISO 9613-2 Finland 8,0 m/s

Noise sensitive area: G Noise sensitive point: Finnish normal frequency - User defined (6)

Wind speed: 8,0 m/s

WTG No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1	5 164	5 167	0	15,62	2,50	18,12	106,9	0,00	85,26	-	-	0,00	0,00	-
2	4 472	4 476	0	17,49	2,50	19,99	106,9	0,00	84,02	-	-	0,00	0,00	-
3	5 268	5 271	0	15,36	2,50	17,86	106,9	0,00	85,44	-	-	0,00	0,00	-
4	5 675	5 677	0	14,44	2,50	16,94	106,9	0,00	86,08	-	-	0,00	0,00	-
5	4 799	4 802	0	16,58	2,50	19,08	106,9	0,00	84,63	-	-	0,00	0,00	-
6	5 843	5 845	0	14,12	2,50	16,62	106,9	0,00	86,34	-	-	0,00	0,00	-
7	4 515	4 519	0	17,36	2,50	19,86	106,9	0,00	84,10	-	-	0,00	0,00	-
8	6 048	6 050	0	13,73	2,50	16,23	106,9	0,00	86,64	-	-	0,00	0,00	-
9	6 235	6 237	0	13,38	2,50	15,88	106,9	0,00	86,90	-	-	0,00	0,00	-
Sum						27,63								

- Data undefined due to calculation with octave data

Noise sensitive area: H Noise sensitive point: Finnish normal frequency - User defined (5)

Wind speed: 8,0 m/s

WTG No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1	5 737	5 740	0	14,32	2,50	16,82	106,9	0,00	86,18	-	-	0,00	0,00	-
2	6 223	6 225	0	13,40	2,50	15,90	106,9	0,00	86,88	-	-	0,00	0,00	-
3	6 659	6 661	0	12,62	2,50	15,12	106,9	0,00	87,47	-	-	0,00	0,00	-
4	6 356	6 358	0	13,16	2,50	15,66	106,9	0,00	87,07	-	-	0,00	0,00	-
5	5 161	5 164	0	15,63	2,50	18,13	106,9	0,00	85,26	-	-	0,00	0,00	-
6	5 917	5 919	0	13,97	2,50	16,47	106,9	0,00	86,45	-	-	0,00	0,00	-
7	5 640	5 643	0	14,51	2,50	17,01	106,9	0,00	86,03	-	-	0,00	0,00	-
8	6 951	6 953	0	12,13	2,50	14,63	106,9	0,00	87,84	-	-	0,00	0,00	-
9	7 430	7 431	0	11,35	2,50	13,85	106,9	0,00	88,42	-	-	0,00	0,00	-
Sum						25,67								

- Data undefined due to calculation with octave data

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Calculated:
27.3.2024 15.46/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Alajärvi Suolasalmenharju VE2 melumallinnus 27032024

Noise calculation model:
ISO 9613-2 Finland
Wind speed (in 10 m height):
8,0 m/s
Ground attenuation:
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Vesistöt
Area type with hard ground: VESISTOT
Ground factor for hard ground: 0,0
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 tones penalty is added to total noise impact at receptors
Noise sensitive area
Height above ground level, when no value in NSA object:
4,0 m; Don't allow override of model height with height from NSA object
Uncertainty margin:
Uncertainty added to source noise level of the WTGs in the calculation
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)
Octave data required
Frequency dependent 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]
0,10	0,38	1,12	2,36	4,08	8,78	26,60	95,00

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89

WTG: VESTAS V172-7.2 7200 180.0 !-!
Noise: PO7200

Source	Source/Date	Creator	Edited
	13.10.2022	USER	20.6.2023 14.08

Document no. 0128-4336 V00

						Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Uncertainty [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	180,0	8,0	106,9	2,5	No	90,5	98,2	101,3	101,5	99,8	95,2	87,6	76,9

Noise sensitive area: A Noise sensitive point: Finnish normal frequency - User defined (2)
Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

Noise sensitive area: B Noise sensitive point: Finnish normal frequency - User defined (1)
Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

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Calculated:
27.3.2024 15.46/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Alajärvi Suolasalmenharju VE2 melumallinnus 27032024

Noise sensitive area: C Noise sensitive point: Finnish normal frequency - User defined (8)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

Noise sensitive area: D Noise sensitive point: Finnish normal frequency - User defined (3)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

Noise sensitive area: E Noise sensitive point: Finnish normal frequency - User defined (7)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

Noise sensitive area: F Noise sensitive point: Finnish normal frequency - User defined (4)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

Noise sensitive area: G Noise sensitive point: Finnish normal frequency - User defined (6)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

Noise sensitive area: H Noise sensitive point: Finnish normal frequency - User defined (5)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

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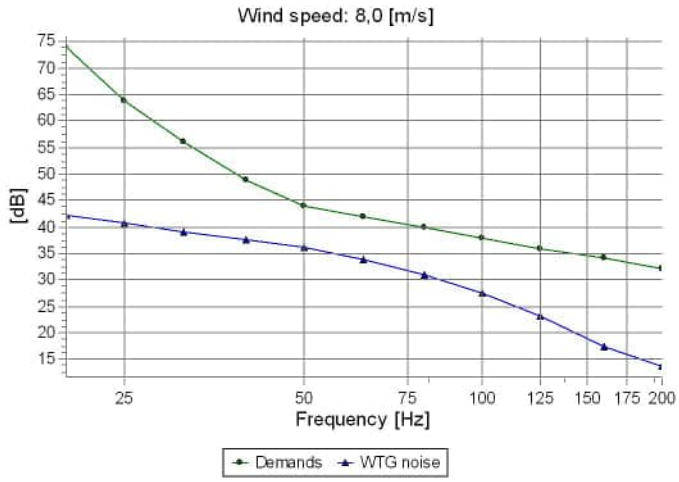
15.4.2024 14.44/3.6.377

DECIBEL - Detailed results, graphic

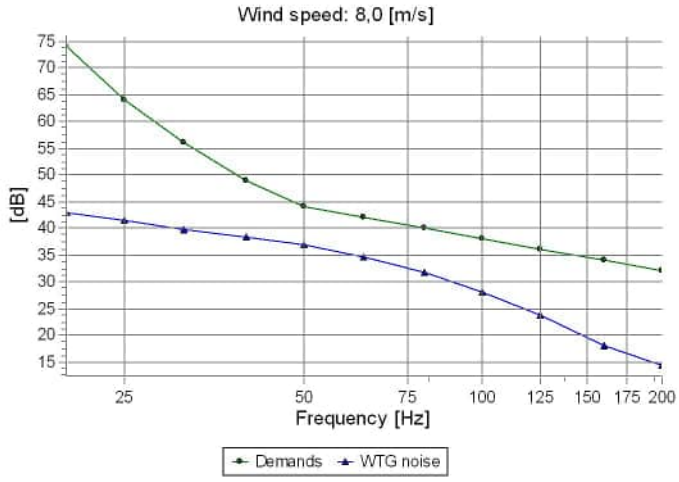
Calculation: Alajärvi Suolasalmenharju VE2 pienitaajuinen sisämelu 15042024 Noise calculation model: Finland Low frequency 8,0 m/s

A Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (2)



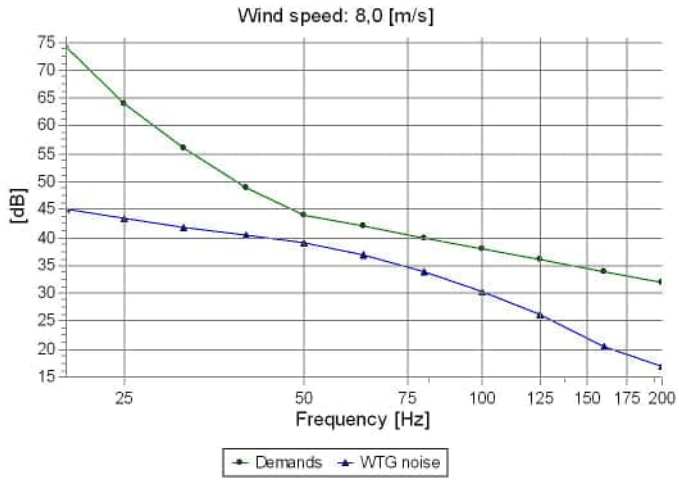
Frequency [Hz]	Sound level Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	42,3	Yes
25,0	64,0	40,8	Yes
31,5	56,0	39,1	Yes
40,0	49,0	37,7	Yes
50,0	44,0	36,2	Yes
63,0	42,0	34,0	Yes
80,0	40,0	31,0	Yes
100,0	38,0	27,4	Yes
125,0	36,0	23,1	Yes
160,0	34,0	17,4	Yes
200,0	32,0	13,6	Yes

B Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (1)



Frequency [Hz]	Sound level Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	42,9	Yes
25,0	64,0	41,3	Yes
31,5	56,0	39,7	Yes
40,0	49,0	38,3	Yes
50,0	44,0	36,8	Yes
63,0	42,0	34,6	Yes
80,0	40,0	31,6	Yes
100,0	38,0	28,1	Yes
125,0	36,0	23,7	Yes
160,0	34,0	18,1	Yes
200,0	32,0	14,4	Yes

C Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (8)



Frequency [Hz]	Sound level Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	45,0	Yes
25,0	64,0	43,5	Yes
31,5	56,0	41,9	Yes
40,0	49,0	40,5	Yes
50,0	44,0	38,9	Yes
63,0	42,0	36,8	Yes
80,0	40,0	33,9	Yes
100,0	38,0	30,3	Yes
125,0	36,0	26,1	Yes
160,0	34,0	20,6	Yes
200,0	32,0	17,0	Yes

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Calculated:
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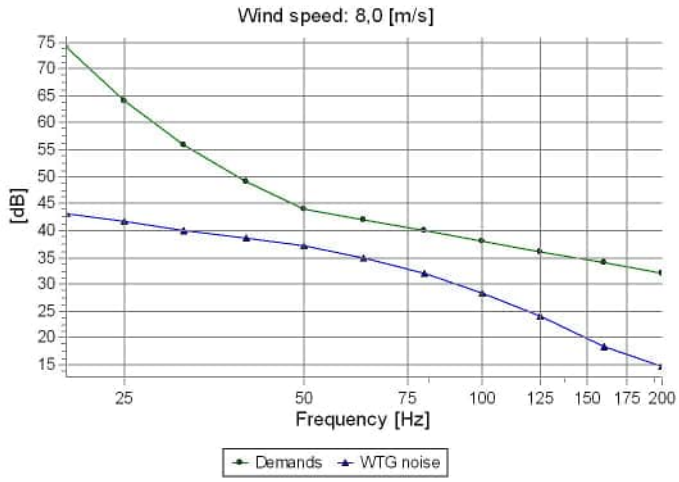
DECIBEL - Detailed results, graphic

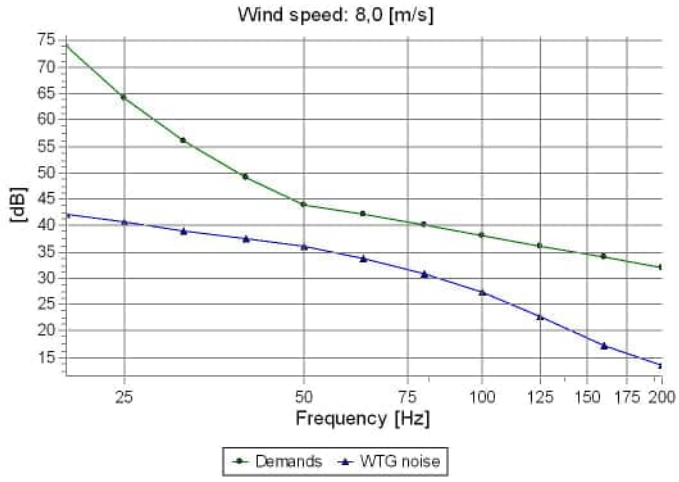
Calculation: Alajärvi Suolasalmenharju VE2 pienitaajuinen sisämelu 15042024 Noise calculation model: Finland Low frequency 8,0 m/s

D Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (3)



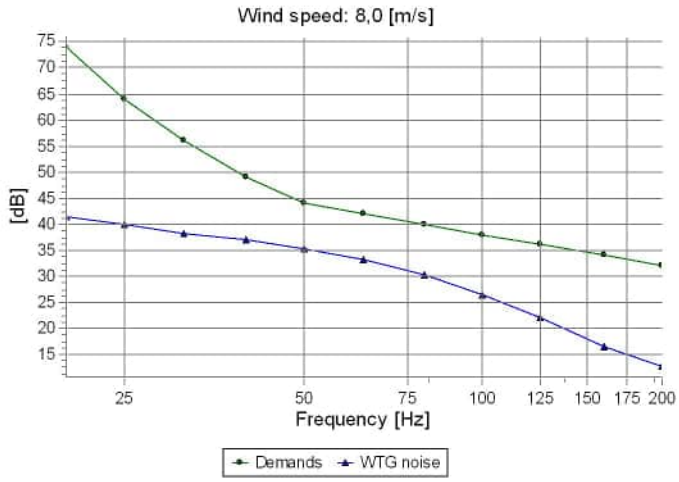
Frequency [Hz]	Sound level Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	43,2	Yes
25,0	64,0	41,6	Yes
31,5	56,0	40,0	Yes
40,0	49,0	38,6	Yes
50,0	44,0	37,1	Yes
63,0	42,0	34,9	Yes
80,0	40,0	31,9	Yes
100,0	38,0	28,4	Yes
125,0	36,0	24,1	Yes
160,0	34,0	18,4	Yes
200,0	32,0	14,8	Yes

E Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (7)



Frequency [Hz]	Sound level Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	42,1	Yes
25,0	64,0	40,6	Yes
31,5	56,0	38,9	Yes
40,0	49,0	37,5	Yes
50,0	44,0	36,0	Yes
63,0	42,0	33,8	Yes
80,0	40,0	30,8	Yes
100,0	38,0	27,2	Yes
125,0	36,0	22,9	Yes
160,0	34,0	17,2	Yes
200,0	32,0	13,4	Yes

F Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (4)



Frequency [Hz]	Sound level Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	41,5	Yes
25,0	64,0	39,9	Yes
31,5	56,0	38,3	Yes
40,0	49,0	36,9	Yes
50,0	44,0	35,3	Yes
63,0	42,0	33,1	Yes
80,0	40,0	30,2	Yes
100,0	38,0	26,5	Yes
125,0	36,0	22,1	Yes
160,0	34,0	16,4	Yes
200,0	32,0	12,6	Yes

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Calculated:
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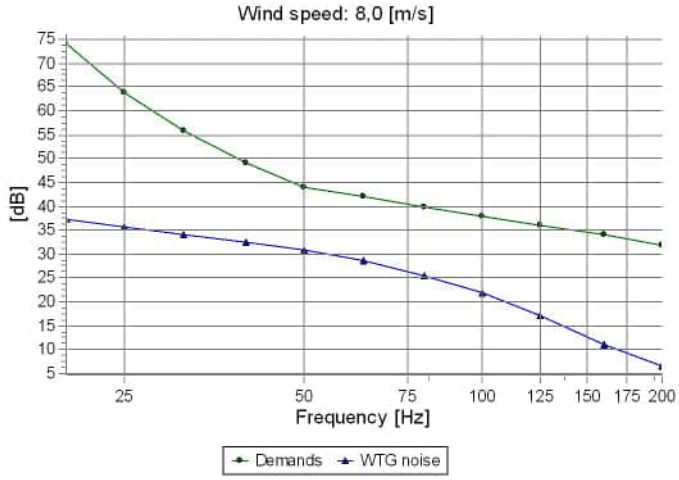
DECIBEL - Detailed results, graphic

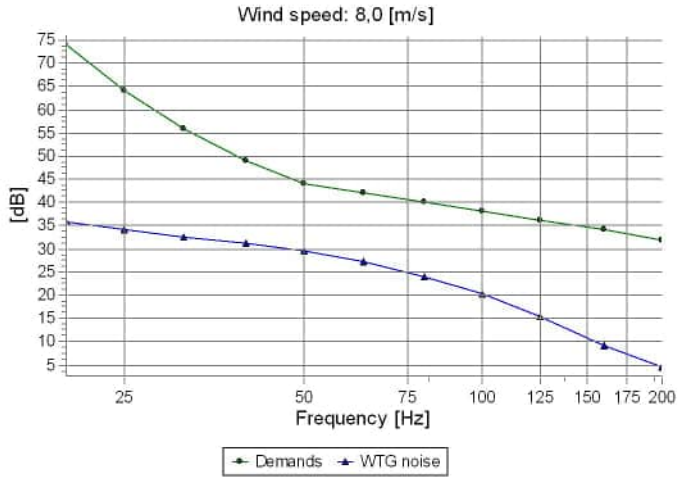
Calculation: Alajärvi Suolasalmenharju VE2 pienitaajuinen sisämelu 15042024 Noise calculation model: Finland Low frequency 8,0 m/s

G Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (6)



Frequency [Hz]	Sound level Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	37,2	Yes
25,0	64,0	35,6	Yes
31,5	56,0	34,0	Yes
40,0	49,0	32,5	Yes
50,0	44,0	30,9	Yes
63,0	42,0	28,6	Yes
80,0	40,0	25,6	Yes
100,0	38,0	21,8	Yes
125,0	36,0	17,1	Yes
160,0	34,0	11,0	Yes
200,0	32,0	6,6	Yes

H Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (5)



Frequency [Hz]	Sound level Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	35,9	Yes
25,0	64,0	34,2	Yes
31,5	56,0	32,6	Yes
40,0	49,0	31,1	Yes
50,0	44,0	29,5	Yes
63,0	42,0	27,2	Yes
80,0	40,0	24,1	Yes
100,0	38,0	20,2	Yes
125,0	36,0	15,4	Yes
160,0	34,0	9,1	Yes
200,0	32,0	4,5	Yes

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DECIBEL - Assumptions for noise calculation

Calculation: Alajärvi Suolasalmenharju VE2 pienitaajuinen sisämelu 15042024

Noise calculation model:
Finland Low frequency
Wind speed (in 10 m height):
8,0 m/s
Spectral distribution:
From 20,0 Hz to 200,0 Hz
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 is subtracted from demand
Model: 5,0 dB(A)
Height above ground level, when no value in NSA object:
4,0 m; Don't allow override of model height with height from NSA object
Uncertainty margin:
0,0 dB; Uncertainty margin in NSA has priority
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)
Low frequency calculation
dLsigma

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
7,6	8,3	9,2	10,3	11,5	13,0	14,8	16,8	18,8	21,1	22,8

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89

WTG: VESTAS V172-7.2 7200 180.0 !-!
Noise: PO7200_2.5dB_uncertainty

Source	Source/Date	Creator	Edited
Vestas	30.6.2022	USER	5.4.2024 12.37

Third octave noise emission
V172-7.2 MW 50/60 Hz
Doc. 0128-4336_00

2.5 dB uncertainty added to source noise level

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	180,0	8,0	103,2	64,6	69,8	74,6	79,3	83,7	87,5	90,8	93,6	95,8	97,5	98,6

Noise sensitive area: A Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: B Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

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Calculated:
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DECIBEL - Assumptions for noise calculation

Calculation: Alajärvi Suolasalmenharju VE2 pienitaajuinen sisämelu 15042024

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: C Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: D Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: E Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: F Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: G Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: H Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

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DECIBEL - Assumptions for noise calculation

Calculation: Alajärvi Suolasalmenharju VE2 pienitaajuinen sisämelu 15042024

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

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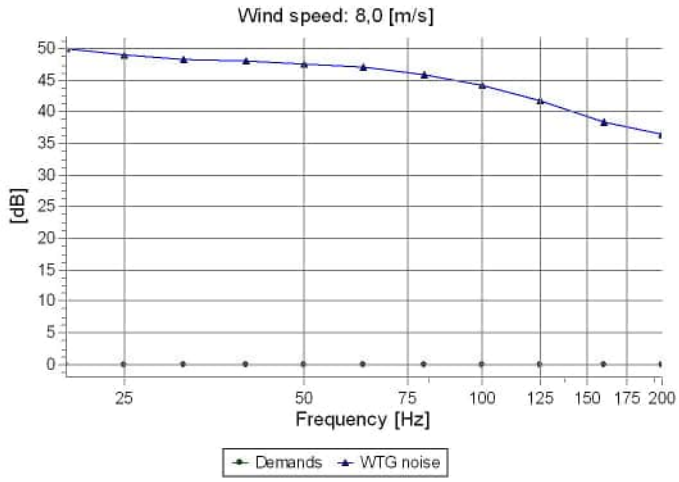
Calculated:
15.4.2024 14.50/3.6.377

DECIBEL - Detailed results, graphic

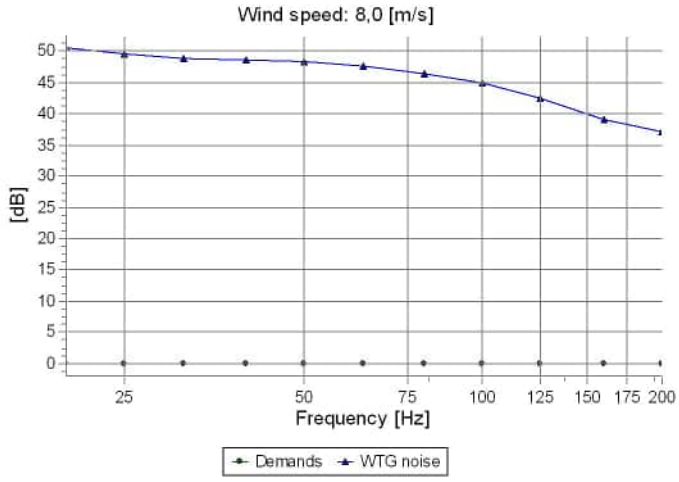
Calculation: Alajärvi Suolasalmenharju VE2 pienitaajuinen ulkomelu 15042024 Noise calculation model: Finland Low frequency 8,0 m/s

A Noise sensitive point: Finnish low frequency - User defined (2)



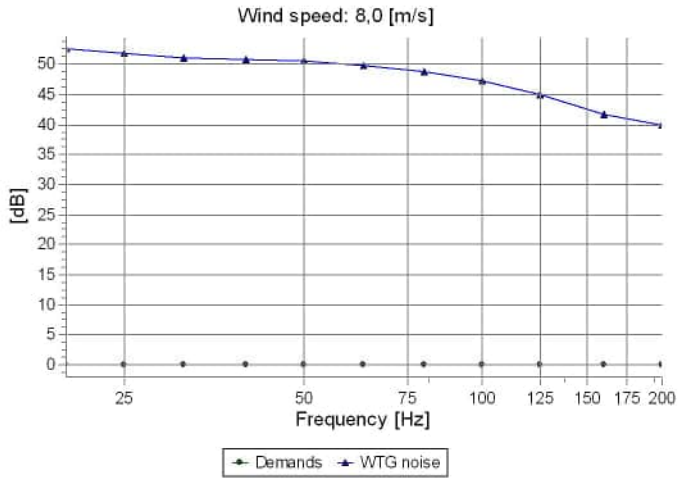
Frequency [Hz]	Sound level WTG noise [dB]
20,0	49,9
25,0	49,1
31,5	48,3
40,0	48,0
50,0	47,7
63,0	47,0
80,0	45,8
100,0	44,2
125,0	41,9
160,0	38,5
200,0	36,4

B Noise sensitive point: Finnish low frequency - User defined (1)



Frequency [Hz]	Sound level WTG noise [dB]
20,0	50,5
25,0	49,6
31,5	48,9
40,0	48,6
50,0	48,3
63,0	47,6
80,0	46,4
100,0	44,9
125,0	42,5
160,0	39,2
200,0	37,2

C Noise sensitive point: Finnish low frequency - User defined (8)



Frequency [Hz]	Sound level WTG noise [dB]
20,0	52,6
25,0	51,8
31,5	51,1
40,0	50,8
50,0	50,4
63,0	49,8
80,0	48,7
100,0	47,1
125,0	44,9
160,0	41,7
200,0	39,8

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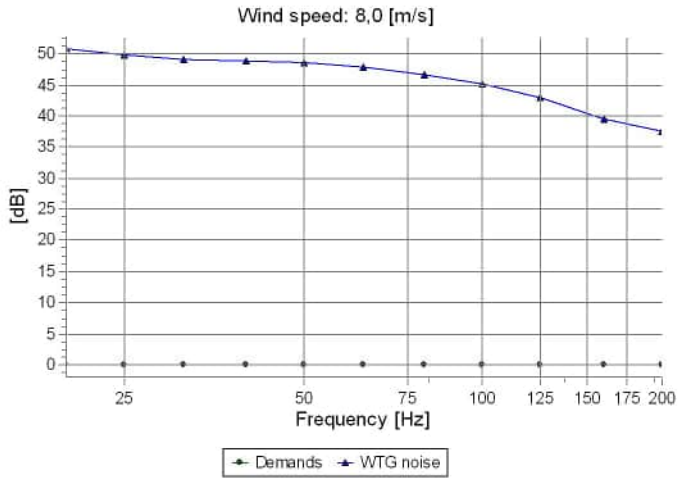
Calculated:
15.4.2024 14.50/3.6.377

DECIBEL - Detailed results, graphic

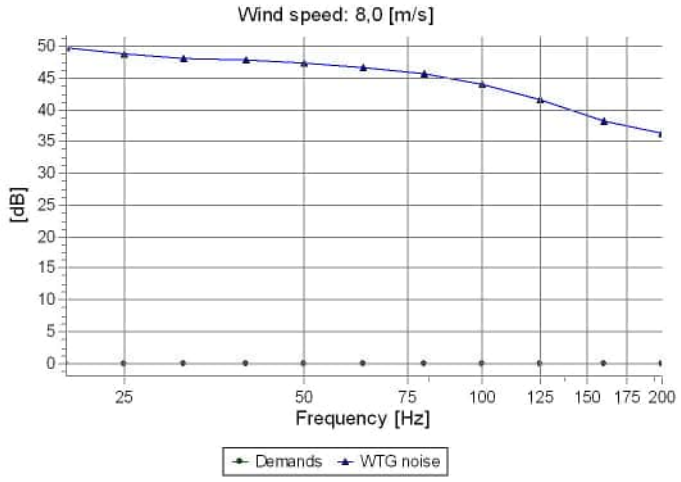
Calculation: Alajärvi Suolasalmenharju VE2 pienitaajuinen ulkomelu 15042024 Noise calculation model: Finland Low frequency 8,0 m/s

D Noise sensitive point: Finnish low frequency - User defined (3)



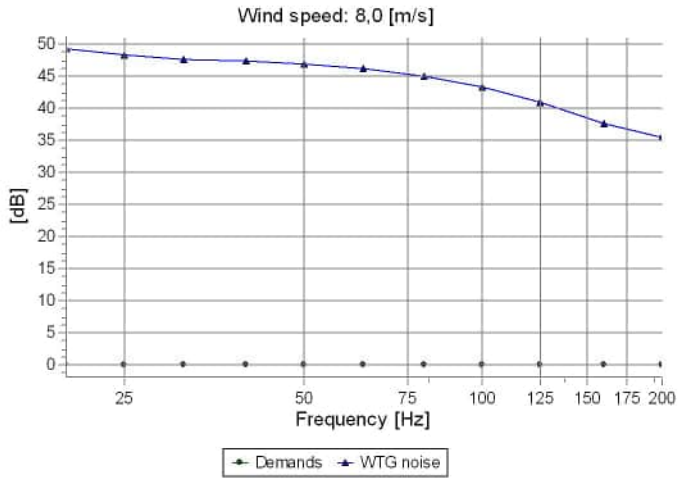
Frequency [Hz]	Sound level WTG noise [dB]
20,0	50,8
25,0	49,9
31,5	49,2
40,0	48,9
50,0	48,6
63,0	47,9
80,0	46,7
100,0	45,2
125,0	42,9
160,0	39,5
200,0	37,6

E Noise sensitive point: Finnish low frequency - User defined (7)



Frequency [Hz]	Sound level WTG noise [dB]
20,0	49,7
25,0	48,9
31,5	48,1
40,0	47,8
50,0	47,5
63,0	46,8
80,0	45,6
100,0	44,0
125,0	41,7
160,0	38,3
200,0	36,2

F Noise sensitive point: Finnish low frequency - User defined (4)



Frequency [Hz]	Sound level WTG noise [dB]
20,0	49,1
25,0	48,2
31,5	47,5
40,0	47,2
50,0	46,8
63,0	46,1
80,0	45,0
100,0	43,3
125,0	40,9
160,0	37,5
200,0	35,4

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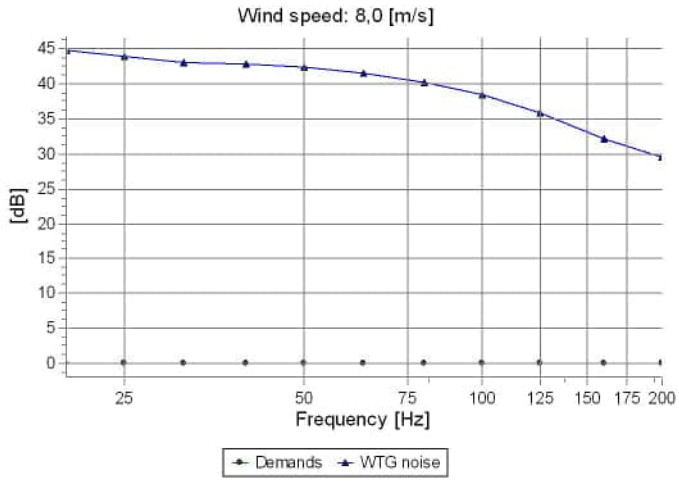
Calculated:
15.4.2024 14.50/3.6.377

DECIBEL - Detailed results, graphic

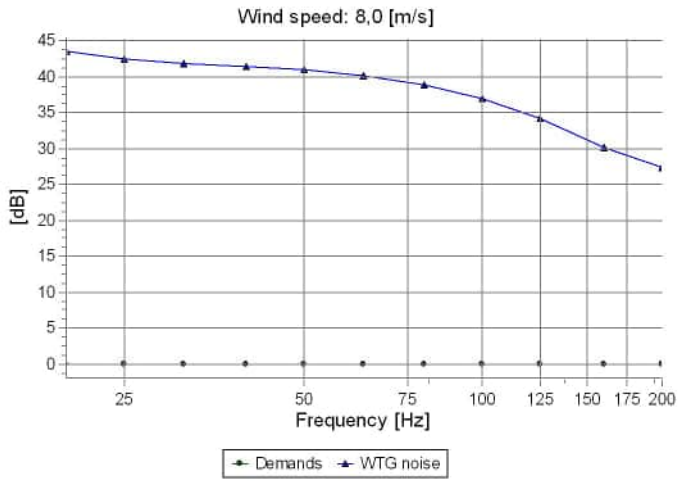
Calculation: Alajärvi Suolasalmenharju VE2 pienitaajuinen ulkomelu 15042024 Noise calculation model: Finland Low frequency 8,0 m/s

G Noise sensitive point: Finnish low frequency - User defined (6)



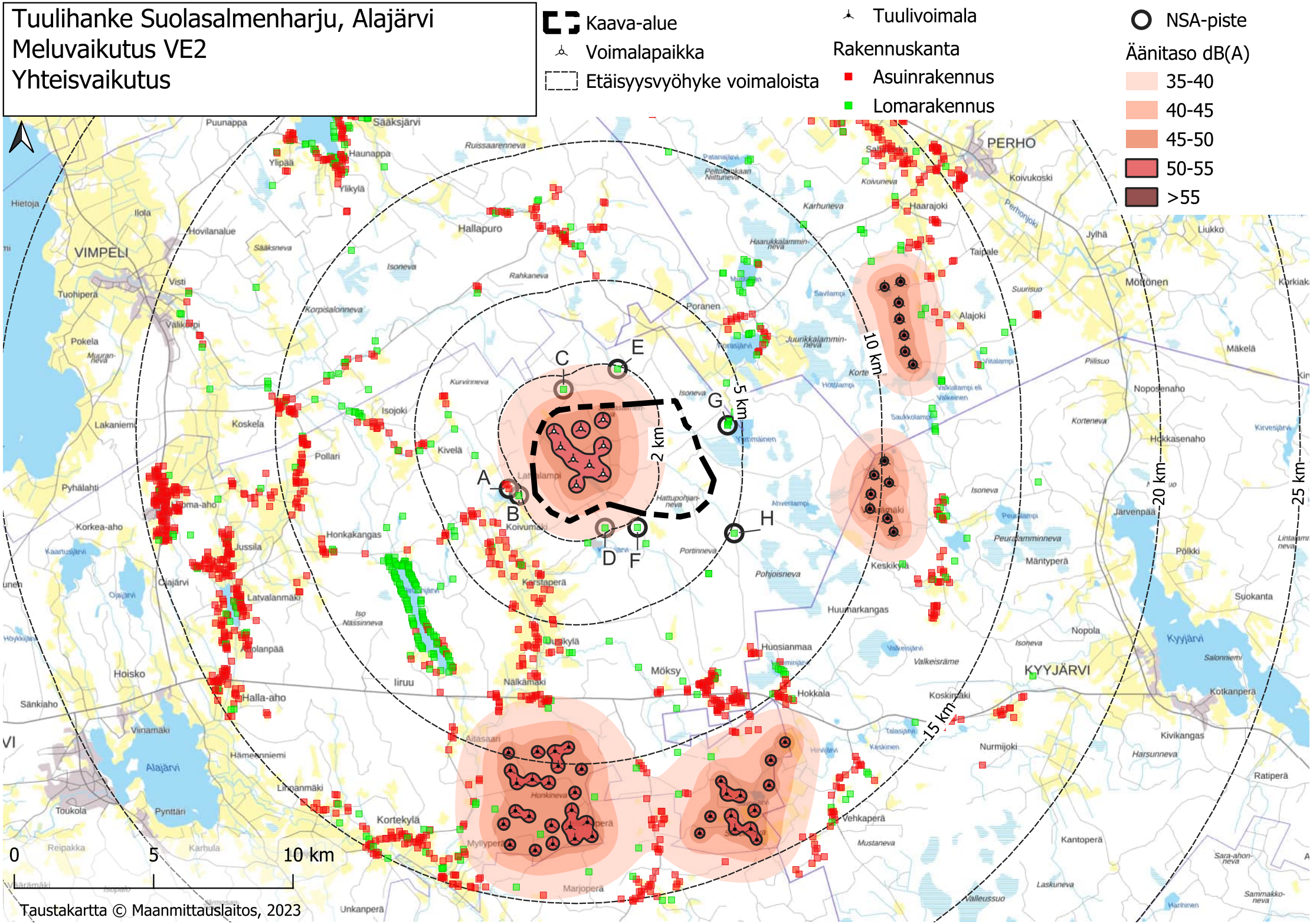
Frequency [Hz]	Sound level WTG noise [dB]
20,0	44,8
25,0	43,9
31,5	43,2
40,0	42,8
50,0	42,4
63,0	41,6
80,0	40,4
100,0	38,6
125,0	35,9
160,0	32,1
200,0	29,4

H Noise sensitive point: Finnish low frequency - User defined (5)



Frequency [Hz]	Sound level WTG noise [dB]
20,0	43,5
25,0	42,5
31,5	41,8
40,0	41,4
50,0	41,0
63,0	40,2
80,0	38,9
100,0	37,0
125,0	34,2
160,0	30,2
200,0	27,3

Liite 4. VE2 Yhteisvaikutusmallinnuksen mallinnustulosteita


Tuulihanke Suolasalmenharju, Alajärvi
Meluvaikutus VE2
Yhteisvaikutus
Kaava-alue
Voimalapaikka
Etäisyysvyöhyke voimaloista
Tuulivoimala
NSA-piste
Rakennuskanta
Asuinrakennus
Lomarakennus
Äänitaso dB(A)
35-40
40-45
45-50
50-55
>55
A
B
C
D
E
F
G
H
2 km
5 km
10 km
15 km
20 km
25 km
0
5
10 km
VIMPELI
PERHO
KYYJÄRVI
Alajärvi
Taustakartta © Maanmittauslaitos, 2023

Project:
Suolasalmenharju

Description:
Alajärven Suolasalmenharjun tuulivoimahanke
Ympäristövaikutusten arviointi
2024
Yhteisvaikutusmallinnus, Melu VE2

Licensed user:
Sweco Finland Oy
Ilmalanportti 2
FI-00240 Helsinki

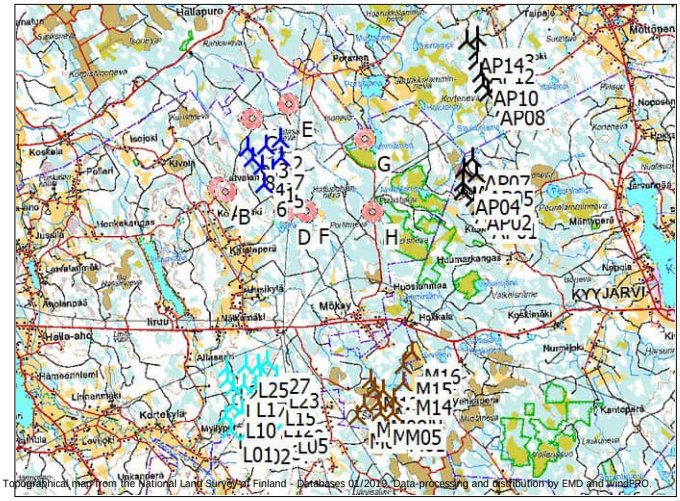
Juho Ali-Tolppa / juho.ali-tolppa@sweco.fi
Calculated:
9.4.2024 23.38/3.6.377

DECIBEL - Main Result

Calculation: Yhteisvaikutusmallinnus Alajärvi Suolasalmenharju VE2 melumallinnus 09042024

Calculation is done according to Finnish guideline " Ympäristöhallinnon ohjeita 2 | 2014 " from the Ministry of the Environment of Finland

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



WTGs

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Noise data Creator	Name	Wind speed	LwA,ref	Uncertainty
			[m]					[kW]	[m]	[m]			[m/s]	[dB(A)]	[dB(A)]
1	356 535	7 000 904	167,3	VESTAS V172-7.2 7200 180.0 !-!...Yes		VESTAS	V172-7.2-7 200	7 200	180,0	180,0	USER	PO7200	8,0	106,9	2,5
2	357 026	7 002 544	164,1	VESTAS V172-7.2 7200 180.0 !-!...Yes		VESTAS	V172-7.2-7 200	7 200	180,0	180,0	USER	PO7200	8,0	106,9	2,5
3	356 227	7 002 219	170,7	VESTAS V172-7.2 7200 180.0 !-!...Yes		VESTAS	V172-7.2-7 200	7 200	180,0	180,0	USER	PO7200	8,0	106,9	2,5
4	355 953	7 001 119	168,7	VESTAS V172-7.2 7200 180.0 !-!...Yes		VESTAS	V172-7.2-7 200	7 200	180,0	180,0	USER	PO7200	8,0	106,9	2,5
5	357 026	7 000 594	168,9	VESTAS V172-7.2 7200 180.0 !-!...Yes		VESTAS	V172-7.2-7 200	7 200	180,0	180,0	USER	PO7200	8,0	106,9	2,5
6	356 066	7 000 181	168,3	VESTAS V172-7.2 7200 180.0 !-!...Yes		VESTAS	V172-7.2-7 200	7 200	180,0	180,0	USER	PO7200	8,0	106,9	2,5
7	357 040	7 001 604	175,2	VESTAS V172-7.2 7200 180.0 !-!...Yes		VESTAS	V172-7.2-7 200	7 200	180,0	180,0	USER	PO7200	8,0	106,9	2,5
8	355 498	7 001 550	163,5	VESTAS V172-7.2 7200 180.0 !-!...Yes		VESTAS	V172-7.2-7 200	7 200	180,0	180,0	USER	PO7200	8,0	106,9	2,5
9	355 263	7 002 127	159,3	VESTAS V172-7.2 7200 180.0 !-!...Yes		VESTAS	V172-7.2-7 200	7 200	180,0	180,0	USER	PO7200	8,0	106,9	2,5
AP01	367 452	6 998 511	170,8	Siemens Gamesa SG 6.0-155 66...Yes		Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP02	367 229	6 999 008	178,0	Siemens Gamesa SG 6.0-155 66...Yes		Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP03	366 597	6 999 343	185,3	Siemens Gamesa SG 6.0-155 66...Yes		Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP04	366 633	6 999 876	175,0	Siemens Gamesa SG 6.0-155 66...Yes		Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP05	367 296	7 000 281	180,3	Siemens Gamesa SG 6.0-155 66...Yes		Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP06	366 743	7 000 559	181,3	Siemens Gamesa SG 6.0-155 66...Yes		Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP07	367 123	7 001 069	178,3	Siemens Gamesa SG 6.0-155 66...Yes		Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP08	368 149	7 004 519	185,5	Siemens Gamesa SG 6.0-155 66...Yes		Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP09	367 859	7 004 990	188,9	Siemens Gamesa SG 6.0-155 66...Yes		Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP10	367 827	7 005 574	184,5	Siemens Gamesa SG 6.0-155 66...Yes		Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP11	367 658	7 006 158	182,5	Siemens Gamesa SG 6.0-155 66...Yes		Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP12	367 637	7 006 747	181,7	Siemens Gamesa SG 6.0-155 66...Yes		Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP13	367 702	7 007 505	176,5	Siemens Gamesa SG 6.0-155 66...Yes		Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
AP14	367 119	7 007 309	179,8	Siemens Gamesa SG 6.0-155 66...Yes		Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,9	USER	(AM 0, 6.6MW) - 105dB(A)	8,0	105,0	1,5
L01	353 679	6 987 286	150,6	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L02	354 585	6 987 085	162,9	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L03	355 219	6 987 313	161,6	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L04	356 009	6 987 498	164,6	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L05	356 634	6 987 584	169,6	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L06	355 849	6 987 929	169,1	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L07	353 449	6 988 027	135,1	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L08	355 168	6 987 987	163,8	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L09	356 460	6 988 096	171,5	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L10	353 875	6 988 505	145,8	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L11	354 371	6 988 310	149,7	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L12	355 897	6 988 530	166,0	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L15	356 017	6 989 168	169,2	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L16	353 926	6 989 492	160,4	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L17	354 487	6 989 627	161,2	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L18	355 081	6 989 503	158,5	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L19	353 699	6 989 952	154,7	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L22	355 415	6 990 109	167,4	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L23	356 257	6 989 999	165,2	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L24	353 633	6 990 594	147,5	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L25	354 667	6 990 629	148,8	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L26	355 297	6 990 644	163,1	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
L27	355 792	6 990 794	161,3	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
M01	362 542	6 987 466	192,9	VESTAS V162-6.0 6000 162.0 !O...Yes		VESTAS	V162-6.0-6 000	6 000	162,0	139,0	USER	Level 0 - - Mode PO6000 - 12-2020	8,0	106,3	0,0
M02	360 490	6 987 699	201,7	VESTAS V162-6.0 6000 162.0 !O...Yes		VESTAS	V162-6.0-6 000	6 000	162,0	139,0	USER	Level 0 - - Mode PO6000 - 12-2020	8,0	106,3	0,0
M04	361 752	6 987 845	190,3	VESTAS V162-6.0 6000 162.0 !O...Yes		VESTAS	V162-6.0-6 000	6 000	162,0	139,0	USER	Level 0 - - Mode PO6000 - 12-2020	8,0	106,3	0,0
M05	362 323	6 987 853	188,6	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
M07	360 871	6 988 310	192,5	VESTAS V162-6.0 6000 162.0 !O...Yes		VESTAS	V162-6.0-6 000	6 000	162,0	139,0	USER	Level 0 - - Mode PO6000 - 12-2020	8,0	106,3	0,0
M08	361 618	6 988 328	191,9	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
M09	362 466	6 988 521	182,7	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
M11	361 462	6 989 109	184,7	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
M12	361 952	6 989 053	182,7	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
M13	361 253	6 989 574	191,3	VESTAS V162-6.0 6000 162.0 !O...Yes		VESTAS	V162-6.0-6 000	6 000	162,0	139,0	USER	Level 0 - - Mode PO6000 - 12-2020	8,0	106,3	0,0
M14	362 982	6 989 422	185,2	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
M15	363 044	6 990 324	183,7	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0
M16	363 556	6 990 972	185,2	VESTAS V162-6.2 6200 162.0 !O...Yes		VESTAS	V162-6.2-6 200	6 200	162,0	139,0	USER	Level 0 - Measured - Mode PO6200 - 06-2021	8,0	106,8	0,0

Calculation Results

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Calculated:
9.4.2024 23.38/3.6.377

DECIBEL - Main Result

Calculation: Yhteisvaikutusmallinnus Alajärvi Suolasalmenharju VE2 melumallinnus 09042024

Sound level

Noise sensitive area No.	Name	East	North	Z	Immission height	Demands Noise	Sound level From WTGs	Uncertainty margin	WTG+Uncertainty margin	Demands fulfilled ? Noise	2 dB penalty applied for one or more WTGs
				[m]	[m]	[dB(A)]	[dB(A)]	[dB]	[dB(A)]		
A	Noise sensitive point: Finnish normal frequency - User defined (2)	353 645	7 000 066	138,1	4,0	40,0	32,7	2,5	35,2	Yes	No
B	Noise sensitive point: Finnish normal frequency - User defined (1)	354 006	6 999 820	140,9	4,0	40,0	33,5	2,5	36,0	Yes	No
C	Noise sensitive point: Finnish normal frequency - User defined (8)	355 606	7 003 632	161,9	4,0	40,0	36,4	2,5	38,9	Yes	No
D	Noise sensitive point: Finnish normal frequency - User defined (3)	357 094	6 998 661	157,4	4,0	40,0	34,1	2,5	36,6	Yes	No
E	Noise sensitive point: Finnish normal frequency - User defined (7)	357 545	7 004 366	153,6	4,0	40,0	32,5	2,5	35,0	Yes	No
F	Noise sensitive point: Finnish normal frequency - User defined (4)	358 259	6 998 677	159,9	4,0	40,0	31,7	2,5	34,2	Yes	No
G	Noise sensitive point: Finnish normal frequency - User defined (6)	361 494	7 002 345	173,0	4,0	40,0	26,4	2,5	28,9	Yes	No
H	Noise sensitive point: Finnish normal frequency - User defined (5)	361 730	6 998 471	171,2	4,0	40,0	25,3	2,5	27,8	Yes	No

Distances (m)

WTG	A	B	C	D	E	F	G	H
1	3009	2752	2881	2312	3606	2816	5164	5737
2	4192	4067	1788	3884	1894	4059	4472	6223
3	3362	3269	1543	3662	2520	4083	5268	6659
4	2537	2341	2536	2711	3616	3359	5675	6356
5	3422	3118	3354	1934	3808	2279	4799	5161
6	2423	2092	3481	1836	4438	2659	5843	5917
7	3727	3520	2484	2943	2808	3170	4515	5640
8	2374	2285	2084	3301	3481	3984	6048	6951
9	2620	2628	1543	3921	3197	4569	6235	7430
AP01	13894	13510	12906	10359	11508	9195	7085	5722
AP02	13625	13248	12509	10141	11067	8976	6635	5525
AP03	12972	12600	11798	9527	10352	8365	5921	4944
AP04	12989	12627	11649	9616	10137	8459	5701	5100
AP05	13652	13298	12161	10330	10572	9178	6158	5853
AP06	13107	12759	11553	9834	9955	8690	5545	5430
AP07	13515	13177	11799	10314	10130	9181	5772	5986
AP08	15172	14904	12575	12511	10605	11486	7001	8820
AP09	15042	14787	12328	12488	10333	11490	6893	8948
AP10	15214	14971	12375	12767	10353	11794	7109	9361
AP11	15280	15052	12314	12954	10270	12013	7248	9707
AP12	15505	15290	12428	13287	10369	12372	7558	10168
AP13	15904	15705	12701	13811	10631	12927	8073	10830
AP14	15297	15101	12086	13240	10016	12370	7502	10352
L01	12780	12538	16459	11876	17512	12278	16966	13781
L02	13015	12748	16578	11845	17533	12161	16751	13442
L03	12850	12566	16323	11502	17211	11764	16289	12918
L04	12788	12484	16139	11215	16938	11404	15827	12375
L05	12834	12515	16080	11086	16807	11212	15540	12020
L06	12335	12032	15704	10803	16524	11015	15481	12071
L07	12041	11806	15753	11241	16845	11687	16423	13329
L08	12174	11890	15651	10846	16551	11128	15689	12368
L09	12296	11978	15559	10584	16306	10733	15112	11636
L10	11563	11315	15225	10653	16280	11077	15798	12689
L11	11778	11516	15372	10703	16367	11073	15739	12546
L12	11753	11447	15104	10201	15921	10418	14905	11525
L15	11153	10840	14469	9553	15275	9770	14269	10917
L16	10577	10328	14239	9701	15308	10156	14915	11896
L17	10472	10204	14049	9402	15052	9804	14520	11431
L18	10660	10373	14139	9376	15066	9709	14354	11164
L19	10114	9872	13812	9347	14918	9845	14640	11707
L22	10113	9812	13524	8715	14415	9028	13663	10479
L23	10400	10075	13648	8702	14424	8906	13410	10085
L24	9472	9233	13186	8778	14317	9314	14138	11297
L25	9492	9215	13036	8390	14035	8814	13560	10554
L26	9565	9266	12991	8215	13905	8562	13240	10131
L27	9517	9200	12839	7973	13684	8260	12881	9705
M01	15424	15016	17591	12450	17623	12002	14916	11034
M02	14134	13746	16664	11475	16925	11203	14680	10843
M04	14665	14262	16941	11776	17048	11382	14502	10626

To be continued on next page...

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Calculated:
9.4.2024 23.38/3.6.377

DECIBEL - Main Result

Calculation: Yhteisvaikutusmallinnus Alajärvi Suolasalmenharju VE2 melumallinnus 09042024

...continued from previous page

WTG	A	B	C	D	E	F	G	H
M05	14982	14573	17149	12006	17190	11562	14515	10634
M07	13799	13402	16201	11018	16397	10692	14049	10197
M08	14189	13784	16442	11280	16547	10881	14017	10143
M09	14529	14115	16595	11475	16592	10993	13858	9977
M11	13459	13050	15659	10503	15752	10090	13236	9365
M12	13795	13382	15901	10766	15935	10309	13300	9421
M13	12959	12549	15149	9992	15249	9583	12773	8909
M14	14158	13736	16010	10955	15902	10390	13008	9134
M15	13537	13110	15246	10243	15081	9627	12121	8252
M16	13450	13018	14949	10043	14681	9350	11558	7717

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Calculated:
9.4.2024 23.38/3.6.377

DECIBEL - Detailed results

Calculation: Yhteisvaikutusmallinnus Alajärvi Suolasalmenharju VE2 melumallinnus 09042024 Noise calculation model: ISO 9613-2 Finland 8,0 m/s

Assumptions

Calculated L(DW) = LWA,ref + K + Dc - (Adiv + Aatm + Agr + Abar + Amisc) - Cmet
(when calculated with ground attenuation, then Dc = Domega)

LWA,ref:	Sound pressure level at WTG
K:	Pure tone
Dc:	Directivity correction
Adiv:	the attenuation due to geometrical divergence
Aatm:	the attenuation due to atmospheric absorption
Agr:	the attenuation due to ground effect
Abar:	the attenuation due to a barrier
Amisc:	the attenuation due to miscellaneous other effects
Cmet:	Meteorological correction

Calculation Results

Noise sensitive area: A Noise sensitive point: Finnish normal frequency - User defined (2)

Wind speed: 8,0 m/s
WTG

No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1	3 009	3 015	0	22,47	2,50	24,97	106,9	0,00	80,59	-	-	0,00	0,00	-
2	4 192	4 197	0	18,31	2,50	20,81	106,9	0,00	83,46	-	-	0,00	0,00	-
3	3 362	3 368	0	21,10	2,50	23,60	106,9	0,00	81,55	-	-	0,00	0,00	-
4	2 537	2 545	0	24,53	2,50	27,03	106,9	0,00	79,11	-	-	0,00	0,00	-
5	3 422	3 428	0	20,88	2,50	23,38	106,9	0,00	81,70	-	-	0,00	0,00	-
6	2 423	2 432	0	25,08	2,50	27,58	106,9	0,00	78,72	-	-	0,00	0,00	-
7	3 727	3 733	0	19,80	2,50	22,30	106,9	0,00	82,44	-	-	0,00	0,00	-
8	2 374	2 383	0	25,32	2,50	27,82	106,9	0,00	78,54	-	-	0,00	0,00	-
9	2 620	2 628	0	24,15	2,50	26,65	106,9	0,00	79,39	-	-	0,00	0,00	-
AP01	13 894	13 895	0	-2,07	1,50	-0,57	105,0	0,00	93,86	-	-	0,00	0,00	-
AP02	13 625	13 626	0	-1,82	1,50	-0,32	105,0	0,00	93,69	-	-	0,00	0,00	-
AP03	12 972	12 973	0	-1,14	1,50	0,36	105,0	0,00	93,26	-	-	0,00	0,00	-
AP04	12 989	12 990	0	-1,20	1,50	0,30	105,0	0,00	93,27	-	-	0,00	0,00	-
AP05	13 652	13 654	0	-1,85	1,50	-0,35	105,0	0,00	93,71	-	-	0,00	0,00	-
AP06	13 107	13 108	0	-1,32	1,50	0,18	105,0	0,00	93,35	-	-	0,00	0,00	-
AP07	13 515	13 516	0	-1,72	1,50	-0,22	105,0	0,00	93,62	-	-	0,00	0,00	-
AP08	15 172	15 173	0	-3,19	1,50	-1,69	105,0	0,00	94,62	-	-	0,00	0,00	-
AP09	15 042	15 044	0	-3,11	1,50	-1,61	105,0	0,00	94,55	-	-	0,00	0,00	-
AP10	15 214	15 215	0	-3,25	1,50	-1,75	105,0	0,00	94,65	-	-	0,00	0,00	-
AP11	15 280	15 281	0	-3,32	1,50	-1,82	105,0	0,00	94,68	-	-	0,00	0,00	-
AP12	15 505	15 506	0	-3,51	1,50	-2,01	105,0	0,00	94,81	-	-	0,00	0,00	-
AP13	15 904	15 905	0	-3,85	1,50	-2,35	105,0	0,00	95,03	-	-	0,00	0,00	-
AP14	15 297	15 299	0	-3,34	1,50	-1,84	105,0	0,00	94,69	-	-	0,00	0,00	-
L01	12 780	12 781	0	2,47	0,00	2,47	106,8	0,00	93,13	-	-	0,00	0,00	-
L02	13 015	13 016	0	2,23	0,00	2,23	106,8	0,00	93,29	-	-	0,00	0,00	-
L03	12 850	12 851	0	2,40	0,00	2,40	106,8	0,00	93,18	-	-	0,00	0,00	-
L04	12 788	12 789	0	2,46	0,00	2,46	106,8	0,00	93,14	-	-	0,00	0,00	-
L05	12 834	12 835	0	2,41	0,00	2,41	106,8	0,00	93,17	-	-	0,00	0,00	-
L06	12 335	12 336	0	2,94	0,00	2,94	106,8	0,00	92,82	-	-	0,00	0,00	-
L07	12 041	12 041	0	3,26	0,00	3,26	106,8	0,00	92,61	-	-	0,00	0,00	-
L08	12 174	12 175	0	3,11	0,00	3,11	106,8	0,00	92,71	-	-	0,00	0,00	-
L09	12 296	12 297	0	2,98	0,00	2,98	106,8	0,00	92,80	-	-	0,00	0,00	-
L10	11 563	11 564	0	3,79	0,00	3,79	106,8	0,00	92,26	-	-	0,00	0,00	-
L11	11 778	11 779	0	3,54	0,00	3,54	106,8	0,00	92,42	-	-	0,00	0,00	-
L12	11 753	11 754	0	3,57	0,00	3,57	106,8	0,00	92,40	-	-	0,00	0,00	-
L15	11 153	11 154	0	4,26	0,00	4,26	106,8	0,00	91,95	-	-	0,00	0,00	-
L16	10 577	10 579	0	4,96	0,00	4,96	106,8	0,00	91,49	-	-	0,00	0,00	-
L17	10 472	10 473	0	5,09	0,00	5,09	106,8	0,00	91,40	-	-	0,00	0,00	-
L18	10 660	10 661	0	4,86	0,00	4,86	106,8	0,00	91,56	-	-	0,00	0,00	-
L19	10 114	10 115	0	5,55	0,00	5,55	106,8	0,00	91,10	-	-	0,00	0,00	-
L22	10 113	10 114	0	5,55	0,00	5,55	106,8	0,00	91,10	-	-	0,00	0,00	-
L23	10 400	10 401	0	5,18	0,00	5,18	106,8	0,00	91,34	-	-	0,00	0,00	-

To be continued on next page...

DECIBEL - Detailed results

Calculation: Yhteisvaikutusmallinnus Alajärvi Suolasalmenharju VE2 melumallinnus 09042024 Noise calculation model: ISO 9613-2 Finland 8,0 m/s

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WTG No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
L24	9 472	9 473	0	6,41	0,00	6,41	106,8	0,00	90,53	-	-	0,00	0,00	-
L25	9 492	9 493	0	6,38	0,00	6,38	106,8	0,00	90,55	-	-	0,00	0,00	-
L26	9 565	9 566	0	6,28	0,00	6,28	106,8	0,00	90,62	-	-	0,00	0,00	-
L27	9 517	9 518	0	6,35	0,00	6,35	106,8	0,00	90,57	-	-	0,00	0,00	-
M01	15 424	15 425	0	-0,50	0,00	-0,50	106,3	0,00	94,76	-	-	0,00	0,00	-
M02	14 134	14 136	0	0,64	0,00	0,64	106,3	0,00	94,01	-	-	0,00	0,00	-
M04	14 665	14 666	0	0,16	0,00	0,16	106,3	0,00	94,33	-	-	0,00	0,00	-
M05	14 982	14 983	0	0,38	0,00	0,38	106,8	0,00	94,51	-	-	0,00	0,00	-
M07	13 799	13 800	0	0,96	0,00	0,96	106,3	0,00	93,80	-	-	0,00	0,00	-
M08	14 189	14 191	0	1,09	0,00	1,09	106,8	0,00	94,04	-	-	0,00	0,00	-
M09	14 529	14 530	0	0,78	0,00	0,78	106,8	0,00	94,25	-	-	0,00	0,00	-
M11	13 459	13 460	0	1,79	0,00	1,79	106,8	0,00	93,58	-	-	0,00	0,00	-
M12	13 795	13 796	0	1,46	0,00	1,46	106,8	0,00	93,79	-	-	0,00	0,00	-
M13	12 959	12 960	0	1,79	0,00	1,79	106,3	0,00	93,25	-	-	0,00	0,00	-
M14	14 158	14 159	0	1,12	0,00	1,12	106,8	0,00	94,02	-	-	0,00	0,00	-
M15	13 537	13 538	0	1,71	0,00	1,71	106,8	0,00	93,63	-	-	0,00	0,00	-
M16	13 450	13 451	0	1,80	0,00	1,80	106,8	0,00	93,58	-	-	0,00	0,00	-
Sum						35,17								

- Data undefined due to calculation with octave data

Noise sensitive area: B Noise sensitive point: Finnish normal frequency - User defined (1)

Wind speed: 8,0 m/s

WTG No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1	2 752	2 759	0	23,56	2,50	26,06	106,9	0,00	79,82	-	-	0,00	0,00	-
2	4 067	4 072	0	18,70	2,50	21,20	106,9	0,00	83,20	-	-	0,00	0,00	-
3	3 269	3 276	0	21,44	2,50	23,94	106,9	0,00	81,31	-	-	0,00	0,00	-
4	2 341	2 350	0	25,49	2,50	27,99	106,9	0,00	78,42	-	-	0,00	0,00	-
5	3 118	3 125	0	22,03	2,50	24,53	106,9	0,00	80,90	-	-	0,00	0,00	-
6	2 092	2 102	0	26,81	2,50	29,31	106,9	0,00	77,45	-	-	0,00	0,00	-
7	3 520	3 526	0	20,52	2,50	23,02	106,9	0,00	81,95	-	-	0,00	0,00	-
8	2 285	2 294	0	25,77	2,50	28,27	106,9	0,00	78,21	-	-	0,00	0,00	-
9	2 628	2 635	0	24,11	2,50	26,61	106,9	0,00	79,42	-	-	0,00	0,00	-
AP01	13 510	13 511	0	-1,70	1,50	-0,20	105,0	0,00	93,61	-	-	0,00	0,00	-
AP02	13 248	13 250	0	-1,46	1,50	0,04	105,0	0,00	93,44	-	-	0,00	0,00	-
AP03	12 600	12 602	0	-0,76	1,50	0,74	105,0	0,00	93,01	-	-	0,00	0,00	-
AP04	12 627	12 629	0	-0,83	1,50	0,67	105,0	0,00	93,03	-	-	0,00	0,00	-
AP05	13 298	13 300	0	-1,51	1,50	-0,01	105,0	0,00	93,48	-	-	0,00	0,00	-
AP06	12 759	12 760	0	-0,96	1,50	0,54	105,0	0,00	93,12	-	-	0,00	0,00	-
AP07	13 177	13 178	0	-1,39	1,50	0,11	105,0	0,00	93,40	-	-	0,00	0,00	-
AP08	14 904	14 905	0	-2,96	1,50	-1,46	105,0	0,00	94,47	-	-	0,00	0,00	-
AP09	14 787	14 788	0	-2,86	1,50	-1,36	105,0	0,00	94,40	-	-	0,00	0,00	-
AP10	14 971	14 973	0	-3,05	1,50	-1,55	105,0	0,00	94,51	-	-	0,00	0,00	-
AP11	15 052	15 053	0	-3,13	1,50	-1,63	105,0	0,00	94,55	-	-	0,00	0,00	-
AP12	15 290	15 292	0	-3,33	1,50	-1,83	105,0	0,00	94,69	-	-	0,00	0,00	-
AP13	15 705	15 706	0	-3,68	1,50	-2,18	105,0	0,00	94,92	-	-	0,00	0,00	-
AP14	15 101	15 102	0	-3,17	1,50	-1,67	105,0	0,00	94,58	-	-	0,00	0,00	-
L01	12 538	12 539	0	2,72	0,00	2,72	106,8	0,00	92,97	-	-	0,00	0,00	-
L02	12 748	12 749	0	2,50	0,00	2,50	106,8	0,00	93,11	-	-	0,00	0,00	-
L03	12 566	12 567	0	2,69	0,00	2,69	106,8	0,00	92,98	-	-	0,00	0,00	-
L04	12 484	12 485	0	2,78	0,00	2,78	106,8	0,00	92,93	-	-	0,00	0,00	-
L05	12 515	12 516	0	2,75	0,00	2,75	106,8	0,00	92,95	-	-	0,00	0,00	-
L06	12 032	12 033	0	3,26	0,00	3,26	106,8	0,00	92,61	-	-	0,00	0,00	-
L07	11 806	11 807	0	3,51	0,00	3,51	106,8	0,00	92,44	-	-	0,00	0,00	-
L08	11 890	11 891	0	3,42	0,00	3,42	106,8	0,00	92,50	-	-	0,00	0,00	-
L09	11 978	11 979	0	3,32	0,00	3,32	106,8	0,00	92,57	-	-	0,00	0,00	-
L10	11 315	11 316	0	4,07	0,00	4,07	106,8	0,00	92,07	-	-	0,00	0,00	-
L11	11 516	11 517	0	3,84	0,00	3,84	106,8	0,00	92,23	-	-	0,00	0,00	-
L12	11 447	11 448	0	3,92	0,00	3,92	106,8	0,00	92,17	-	-	0,00	0,00	-
L15	10 840	10 841	0	4,64	0,00	4,64	106,8	0,00	91,70	-	-	0,00	0,00	-
L16	10 328	10 329	0	5,27	0,00	5,27	106,8	0,00	91,28	-	-	0,00	0,00	-

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Calculated:
9.4.2024 23.38/3.6.377

DECIBEL - Detailed results

Calculation: Yhteisvaikutusmallinnus Alajärvi Suolasalmenharju VE2 melumallinnus 09042024 Noise calculation model: ISO 9613-2 Finland 8,0 m/s

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WTG No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
L17	10 204	10 205	0	5,44	0,00	5,44	106,8	0,00	91,18	-	-	0,00	0,00	-
L18	10 373	10 374	0	5,22	0,00	5,22	106,8	0,00	91,32	-	-	0,00	0,00	-
L19	9 872	9 873	0	5,87	0,00	5,87	106,8	0,00	90,89	-	-	0,00	0,00	-
L22	9 812	9 814	0	5,95	0,00	5,95	106,8	0,00	90,84	-	-	0,00	0,00	-
L23	10 075	10 076	0	5,60	0,00	5,60	106,8	0,00	91,07	-	-	0,00	0,00	-
L24	9 233	9 235	0	6,75	0,00	6,75	106,8	0,00	90,31	-	-	0,00	0,00	-
L25	9 215	9 216	0	6,77	0,00	6,77	106,8	0,00	90,29	-	-	0,00	0,00	-
L26	9 266	9 267	0	6,70	0,00	6,70	106,8	0,00	90,34	-	-	0,00	0,00	-
L27	9 200	9 202	0	6,79	0,00	6,79	106,8	0,00	90,28	-	-	0,00	0,00	-
M01	15 016	15 017	0	-0,15	0,00	-0,15	106,3	0,00	94,53	-	-	0,00	0,00	-
M02	13 746	13 748	0	1,01	0,00	1,01	106,3	0,00	93,76	-	-	0,00	0,00	-
M04	14 262	14 263	0	0,53	0,00	0,53	106,3	0,00	94,08	-	-	0,00	0,00	-
M05	14 573	14 574	0	0,74	0,00	0,74	106,8	0,00	94,27	-	-	0,00	0,00	-
M07	13 402	13 403	0	1,34	0,00	1,34	106,3	0,00	93,54	-	-	0,00	0,00	-
M08	13 784	13 786	0	1,47	0,00	1,47	106,8	0,00	93,79	-	-	0,00	0,00	-
M09	14 115	14 116	0	1,16	0,00	1,16	106,8	0,00	93,99	-	-	0,00	0,00	-
M11	13 050	13 051	0	2,19	0,00	2,19	106,8	0,00	93,31	-	-	0,00	0,00	-
M12	13 382	13 383	0	1,86	0,00	1,86	106,8	0,00	93,53	-	-	0,00	0,00	-
M13	12 549	12 551	0	2,21	0,00	2,21	106,3	0,00	92,97	-	-	0,00	0,00	-
M14	13 736	13 737	0	1,52	0,00	1,52	106,8	0,00	93,76	-	-	0,00	0,00	-
M15	13 110	13 111	0	2,13	0,00	2,13	106,8	0,00	93,35	-	-	0,00	0,00	-
M16	13 018	13 020	0	2,23	0,00	2,23	106,8	0,00	93,29	-	-	0,00	0,00	-
Sum						36,00								

- Data undefined due to calculation with octave data

Noise sensitive area: C Noise sensitive point: Finnish normal frequency - User defined (8)

Wind speed: 8,0 m/s

WTG No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1	2 881	2 887	0	23,00	2,50	25,50	106,9	0,00	80,21	-	-	0,00	0,00	-
2	1 788	1 797	0	28,62	2,50	31,12	106,9	0,00	76,09	-	-	0,00	0,00	-
3	1 543	1 554	0	30,26	2,50	32,76	106,9	0,00	74,83	-	-	0,00	0,00	-
4	2 536	2 543	0	24,54	2,50	27,04	106,9	0,00	79,11	-	-	0,00	0,00	-
5	3 354	3 359	0	21,13	2,50	23,63	106,9	0,00	81,52	-	-	0,00	0,00	-
6	3 481	3 486	0	20,67	2,50	23,17	106,9	0,00	81,85	-	-	0,00	0,00	-
7	2 484	2 491	0	24,79	2,50	27,29	106,9	0,00	78,93	-	-	0,00	0,00	-
8	2 084	2 092	0	26,86	2,50	29,36	106,9	0,00	77,41	-	-	0,00	0,00	-
9	1 543	1 552	0	30,28	2,50	32,78	106,9	0,00	74,82	-	-	0,00	0,00	-
AP01	12 906	12 907	0	-1,11	1,50	0,39	105,0	0,00	93,22	-	-	0,00	0,00	-
AP02	12 509	12 510	0	-0,71	1,50	0,79	105,0	0,00	92,95	-	-	0,00	0,00	-
AP03	11 798	11 800	0	0,06	1,50	1,56	105,0	0,00	92,44	-	-	0,00	0,00	-
AP04	11 649	11 651	0	0,23	1,50	1,73	105,0	0,00	92,33	-	-	0,00	0,00	-
AP05	12 161	12 162	0	-0,32	1,50	1,18	105,0	0,00	92,70	-	-	0,00	0,00	-
AP06	11 553	11 555	0	0,37	1,50	1,87	105,0	0,00	92,26	-	-	0,00	0,00	-
AP07	11 799	11 800	0	0,11	1,50	1,61	105,0	0,00	92,44	-	-	0,00	0,00	-
AP08	12 575	12 576	0	-0,76	1,50	0,74	105,0	0,00	92,99	-	-	0,00	0,00	-
AP09	12 328	12 330	0	-0,52	1,50	0,98	105,0	0,00	92,82	-	-	0,00	0,00	-
AP10	12 375	12 376	0	-0,56	1,50	0,94	105,0	0,00	92,85	-	-	0,00	0,00	-
AP11	12 314	12 316	0	-0,44	1,50	1,06	105,0	0,00	92,81	-	-	0,00	0,00	-
AP12	12 428	12 429	0	-0,54	1,50	0,96	105,0	0,00	92,89	-	-	0,00	0,00	-
AP13	12 701	12 703	0	-0,85	1,50	0,65	105,0	0,00	93,08	-	-	0,00	0,00	-
AP14	12 086	12 088	0	-0,19	1,50	1,31	105,0	0,00	92,65	-	-	0,00	0,00	-
L01	16 459	16 459	0	-0,86	0,00	-0,86	106,8	0,00	95,33	-	-	0,00	0,00	-
L02	16 578	16 579	0	-0,95	0,00	-0,95	106,8	0,00	95,39	-	-	0,00	0,00	-
L03	16 323	16 324	0	-0,75	0,00	-0,75	106,8	0,00	95,26	-	-	0,00	0,00	-
L04	16 139	16 139	0	-0,60	0,00	-0,60	106,8	0,00	95,16	-	-	0,00	0,00	-
L05	16 080	16 081	0	-0,55	0,00	-0,55	106,8	0,00	95,13	-	-	0,00	0,00	-
L06	15 704	15 705	0	-0,24	0,00	-0,24	106,8	0,00	94,92	-	-	0,00	0,00	-
L07	15 753	15 754	0	-0,28	0,00	-0,28	106,8	0,00	94,95	-	-	0,00	0,00	-
L08	15 651	15 651	0	-0,20	0,00	-0,20	106,8	0,00	94,89	-	-	0,00	0,00	-
L09	15 559	15 560	0	-0,12	0,00	-0,12	106,8	0,00	94,84	-	-	0,00	0,00	-

To be continued on next page...

Licensed user:
Sweco Finland Oy
Ilmalanportti 2
FI-00240 Helsinki

Juho Ali-Tolppa / juho.ali-tolppa@sweco.fi
Calculated:
9.4.2024 23.38/3.6.377

DECIBEL - Detailed results

Calculation: Yhteisvaikutusmallinnus Alajärvi Suolasalmenharju VE2 melumallinnus 09042024 Noise calculation model: ISO 9613-2 Finland 8,0 m/s

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WTG No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
L10	15 225	15 226	0	0,17	0,00	0,17	106,8	0,00	94,65	-	-	0,00	0,00	-
L11	15 372	15 372	0	0,04	0,00	0,04	106,8	0,00	94,73	-	-	0,00	0,00	-
L12	15 104	15 105	0	0,27	0,00	0,27	106,8	0,00	94,58	-	-	0,00	0,00	-
L15	14 469	14 470	0	0,84	0,00	0,84	106,8	0,00	94,21	-	-	0,00	0,00	-
L16	14 239	14 240	0	1,05	0,00	1,05	106,8	0,00	94,07	-	-	0,00	0,00	-
L17	14 049	14 049	0	1,22	0,00	1,22	106,8	0,00	93,95	-	-	0,00	0,00	-
L18	14 139	14 139	0	1,14	0,00	1,14	106,8	0,00	94,01	-	-	0,00	0,00	-
L19	13 812	13 812	0	1,45	0,00	1,45	106,8	0,00	93,81	-	-	0,00	0,00	-
L22	13 524	13 525	0	1,73	0,00	1,73	106,8	0,00	93,62	-	-	0,00	0,00	-
L23	13 648	13 648	0	1,61	0,00	1,61	106,8	0,00	93,70	-	-	0,00	0,00	-
L24	13 186	13 187	0	2,06	0,00	2,06	106,8	0,00	93,40	-	-	0,00	0,00	-
L25	13 036	13 037	0	2,21	0,00	2,21	106,8	0,00	93,30	-	-	0,00	0,00	-
L26	12 991	12 992	0	2,25	0,00	2,25	106,8	0,00	93,27	-	-	0,00	0,00	-
L27	12 839	12 839	0	2,41	0,00	2,41	106,8	0,00	93,17	-	-	0,00	0,00	-
M01	17 591	17 592	0	-2,24	0,00	-2,24	106,3	0,00	95,91	-	-	0,00	0,00	-
M02	16 664	16 665	0	-1,52	0,00	-1,52	106,3	0,00	95,44	-	-	0,00	0,00	-
M04	16 941	16 942	0	-1,74	0,00	-1,74	106,3	0,00	95,58	-	-	0,00	0,00	-
M05	17 149	17 150	0	-1,40	0,00	-1,40	106,8	0,00	95,69	-	-	0,00	0,00	-
M07	16 201	16 202	0	-1,15	0,00	-1,15	106,3	0,00	95,19	-	-	0,00	0,00	-
M08	16 442	16 443	0	-0,85	0,00	-0,85	106,8	0,00	95,32	-	-	0,00	0,00	-
M09	16 595	16 596	0	-0,97	0,00	-0,97	106,8	0,00	95,40	-	-	0,00	0,00	-
M11	15 659	15 659	0	-0,20	0,00	-0,20	106,8	0,00	94,90	-	-	0,00	0,00	-
M12	15 901	15 901	0	-0,41	0,00	-0,41	106,8	0,00	95,03	-	-	0,00	0,00	-
M13	15 149	15 150	0	-0,27	0,00	-0,27	106,3	0,00	94,61	-	-	0,00	0,00	-
M14	16 010	16 011	0	-0,50	0,00	-0,50	106,8	0,00	95,09	-	-	0,00	0,00	-
M15	15 246	15 247	0	0,15	0,00	0,15	106,8	0,00	94,66	-	-	0,00	0,00	-
M16	14 949	14 949	0	0,41	0,00	0,41	106,8	0,00	94,49	-	-	0,00	0,00	-
Sum						38,94								

- Data undefined due to calculation with octave data

Noise sensitive area: D Noise sensitive point: Finnish normal frequency - User defined (3)

Wind speed: 8,0 m/s

WTG No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1	2 312	2 320	0	25,65	2,50	28,15	106,9	0,00	78,31	-	-	0,00	0,00	-
2	3 884	3 889	0	19,29	2,50	21,79	106,9	0,00	82,80	-	-	0,00	0,00	-
3	3 662	3 667	0	20,03	2,50	22,53	106,9	0,00	82,29	-	-	0,00	0,00	-
4	2 711	2 717	0	23,74	2,50	26,24	106,9	0,00	79,68	-	-	0,00	0,00	-
5	1 934	1 943	0	27,72	2,50	30,22	106,9	0,00	76,77	-	-	0,00	0,00	-
6	1 836	1 845	0	28,32	2,50	30,82	106,9	0,00	76,32	-	-	0,00	0,00	-
7	2 943	2 950	0	22,74	2,50	25,24	106,9	0,00	80,40	-	-	0,00	0,00	-
8	3 301	3 306	0	21,33	2,50	23,83	106,9	0,00	81,39	-	-	0,00	0,00	-
9	3 921	3 925	0	19,17	2,50	21,67	106,9	0,00	82,88	-	-	0,00	0,00	-
AP01	10 359	10 360	0	1,77	1,50	3,27	105,0	0,00	91,31	-	-	0,00	0,00	-
AP02	10 141	10 142	0	2,05	1,50	3,55	105,0	0,00	91,12	-	-	0,00	0,00	-
AP03	9 527	9 529	0	2,86	1,50	4,36	105,0	0,00	90,58	-	-	0,00	0,00	-
AP04	9 616	9 618	0	2,76	1,50	4,26	105,0	0,00	90,66	-	-	0,00	0,00	-
AP05	10 330	10 331	0	1,80	1,50	3,30	105,0	0,00	91,28	-	-	0,00	0,00	-
AP06	9 834	9 836	0	2,44	1,50	3,94	105,0	0,00	90,86	-	-	0,00	0,00	-
AP07	10 314	10 316	0	1,82	1,50	3,32	105,0	0,00	91,27	-	-	0,00	0,00	-
AP08	12 511	12 513	0	-0,71	1,50	0,79	105,0	0,00	92,95	-	-	0,00	0,00	-
AP09	12 488	12 489	0	-0,68	1,50	0,82	105,0	0,00	92,93	-	-	0,00	0,00	-
AP10	12 767	12 768	0	-0,95	1,50	0,55	105,0	0,00	93,12	-	-	0,00	0,00	-
AP11	12 954	12 955	0	-1,11	1,50	0,39	105,0	0,00	93,25	-	-	0,00	0,00	-
AP12	13 287	13 288	0	-1,43	1,50	0,07	105,0	0,00	93,47	-	-	0,00	0,00	-
AP13	13 811	13 812	0	-1,95	1,50	-0,45	105,0	0,00	93,81	-	-	0,00	0,00	-
AP14	13 240	13 241	0	-1,41	1,50	0,09	105,0	0,00	93,44	-	-	0,00	0,00	-
L01	11 876	11 877	0	3,87	0,00	3,87	106,8	0,00	92,49	-	-	0,00	0,00	-
L02	11 845	11 845	0	3,91	0,00	3,91	106,8	0,00	92,47	-	-	0,00	0,00	-
L03	11 502	11 502	0	4,29	0,00	4,29	106,8	0,00	92,22	-	-	0,00	0,00	-
L04	11 215	11 216	0	4,60	0,00	4,60	106,8	0,00	92,00	-	-	0,00	0,00	-

To be continued on next page...

DECIBEL - Detailed results

Calculation: Yhteisvaikutusmallinnus Alajärvi Suolasalmenharju VE2 melumallinnus 09042024 Noise calculation model: ISO 9613-2 Finland 8,0 m/s

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WTG No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
L05	11 086	11 087	0	4,74	0,00	4,74	106,8	0,00	91,90	-	-	0,00	0,00	-
L06	10 803	10 804	0	5,11	0,00	5,11	106,8	0,00	91,67	-	-	0,00	0,00	-
L07	11 241	11 242	0	4,60	0,00	4,60	106,8	0,00	92,02	-	-	0,00	0,00	-
L08	10 846	10 847	0	5,08	0,00	5,08	106,8	0,00	91,71	-	-	0,00	0,00	-
L09	10 584	10 585	0	5,36	0,00	5,36	106,8	0,00	91,49	-	-	0,00	0,00	-
L10	10 653	10 654	0	5,32	0,00	5,32	106,8	0,00	91,55	-	-	0,00	0,00	-
L11	10 703	10 704	0	5,26	0,00	5,26	106,8	0,00	91,59	-	-	0,00	0,00	-
L12	10 201	10 202	0	5,87	0,00	5,87	106,8	0,00	91,17	-	-	0,00	0,00	-
L15	9 553	9 554	0	6,74	0,00	6,74	106,8	0,00	90,60	-	-	0,00	0,00	-
L16	9 701	9 702	0	6,56	0,00	6,56	106,8	0,00	90,74	-	-	0,00	0,00	-
L17	9 402	9 403	0	6,98	0,00	6,98	106,8	0,00	90,47	-	-	0,00	0,00	-
L18	9 376	9 377	0	7,02	0,00	7,02	106,8	0,00	90,44	-	-	0,00	0,00	-
L19	9 347	9 348	0	7,05	0,00	7,05	106,8	0,00	90,41	-	-	0,00	0,00	-
L22	8 715	8 716	0	7,99	0,00	7,99	106,8	0,00	89,81	-	-	0,00	0,00	-
L23	8 702	8 703	0	7,97	0,00	7,97	106,8	0,00	89,79	-	-	0,00	0,00	-
L24	8 778	8 779	0	7,72	0,00	7,72	106,8	0,00	89,87	-	-	0,00	0,00	-
L25	8 390	8 391	0	8,48	0,00	8,48	106,8	0,00	89,48	-	-	0,00	0,00	-
L26	8 215	8 216	0	8,77	0,00	8,77	106,8	0,00	89,29	-	-	0,00	0,00	-
L27	7 973	7 974	0	9,15	0,00	9,15	106,8	0,00	89,03	-	-	0,00	0,00	-
M01	12 450	12 451	0	2,33	0,00	2,33	106,3	0,00	92,90	-	-	0,00	0,00	-
M02	11 475	11 477	0	3,55	0,00	3,55	106,3	0,00	92,20	-	-	0,00	0,00	-
M04	11 776	11 777	0	3,11	0,00	3,11	106,3	0,00	92,42	-	-	0,00	0,00	-
M05	12 006	12 007	0	3,31	0,00	3,31	106,8	0,00	92,59	-	-	0,00	0,00	-
M07	11 018	11 020	0	4,04	0,00	4,04	106,3	0,00	91,84	-	-	0,00	0,00	-
M08	11 280	11 281	0	4,17	0,00	4,17	106,8	0,00	92,05	-	-	0,00	0,00	-
M09	11 475	11 476	0	3,90	0,00	3,90	106,8	0,00	92,20	-	-	0,00	0,00	-
M11	10 503	10 504	0	5,09	0,00	5,09	106,8	0,00	91,43	-	-	0,00	0,00	-
M12	10 766	10 768	0	4,74	0,00	4,74	106,8	0,00	91,64	-	-	0,00	0,00	-
M13	9 992	9 994	0	5,25	0,00	5,25	106,3	0,00	90,99	-	-	0,00	0,00	-
M14	10 955	10 956	0	4,52	0,00	4,52	106,8	0,00	91,79	-	-	0,00	0,00	-
M15	10 243	10 244	0	5,39	0,00	5,39	106,8	0,00	91,21	-	-	0,00	0,00	-
M16	10 043	10 044	0	5,64	0,00	5,64	106,8	0,00	91,04	-	-	0,00	0,00	-
Sum						36,58								

- Data undefined due to calculation with octave data

Noise sensitive area: E Noise sensitive point: Finnish normal frequency - User defined (7)

Wind speed: 8,0 m/s

WTG No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1	3 606	3 611	0	20,22	2,50	22,72	106,9	0,00	82,15	-	-	0,00	0,00	-
2	1 894	1 903	0	27,96	2,50	30,46	106,9	0,00	76,59	-	-	0,00	0,00	-
3	2 520	2 527	0	24,62	2,50	27,12	106,9	0,00	79,05	-	-	0,00	0,00	-
4	3 616	3 621	0	20,19	2,50	22,69	106,9	0,00	82,18	-	-	0,00	0,00	-
5	3 808	3 813	0	19,54	2,50	22,04	106,9	0,00	82,62	-	-	0,00	0,00	-
6	4 438	4 442	0	17,58	2,50	20,08	106,9	0,00	83,95	-	-	0,00	0,00	-
7	2 808	2 815	0	23,31	2,50	25,81	106,9	0,00	79,99	-	-	0,00	0,00	-
8	3 481	3 486	0	20,67	2,50	23,17	106,9	0,00	81,85	-	-	0,00	0,00	-
9	3 197	3 202	0	21,73	2,50	24,23	106,9	0,00	81,11	-	-	0,00	0,00	-
AP01	11 508	11 509	0	0,39	1,50	1,89	105,0	0,00	92,22	-	-	0,00	0,00	-
AP02	11 067	11 069	0	0,95	1,50	2,45	105,0	0,00	91,88	-	-	0,00	0,00	-
AP03	10 352	10 354	0	1,82	1,50	3,32	105,0	0,00	91,30	-	-	0,00	0,00	-
AP04	10 137	10 138	0	2,11	1,50	3,61	105,0	0,00	91,12	-	-	0,00	0,00	-
AP05	10 572	10 574	0	1,56	1,50	3,06	105,0	0,00	91,48	-	-	0,00	0,00	-
AP06	9 955	9 956	0	2,35	1,50	3,85	105,0	0,00	90,96	-	-	0,00	0,00	-
AP07	10 130	10 131	0	2,11	1,50	3,61	105,0	0,00	91,11	-	-	0,00	0,00	-
AP08	10 605	10 607	0	1,45	1,50	2,95	105,0	0,00	91,51	-	-	0,00	0,00	-
AP09	10 333	10 335	0	1,79	1,50	3,29	105,0	0,00	91,29	-	-	0,00	0,00	-
AP10	10 353	10 354	0	1,84	1,50	3,34	105,0	0,00	91,30	-	-	0,00	0,00	-
AP11	10 270	10 272	0	1,97	1,50	3,47	105,0	0,00	91,23	-	-	0,00	0,00	-
AP12	10 369	10 371	0	1,86	1,50	3,36	105,0	0,00	91,32	-	-	0,00	0,00	-
AP13	10 631	10 632	0	1,46	1,50	2,96	105,0	0,00	91,53	-	-	0,00	0,00	-

To be continued on next page...

DECIBEL - Detailed results

Calculation: Yhteisvaikutusmallinnus Alajärvi Suolasalmenharju VE2 melumallinnus 09042024 Noise calculation model: ISO 9613-2 Finland 8,0 m/s

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WTG No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
AP14	10 016	10 018	0	2,25	1,50	3,75	105,0	0,00	91,02	-	-	0,00	0,00	-
L01	17 512	17 513	0	-1,68	0,00	-1,68	106,8	0,00	95,87	-	-	0,00	0,00	-
L02	17 533	17 534	0	-1,69	0,00	-1,69	106,8	0,00	95,88	-	-	0,00	0,00	-
L03	17 211	17 212	0	-1,44	0,00	-1,44	106,8	0,00	95,72	-	-	0,00	0,00	-
L04	16 938	16 939	0	-1,22	0,00	-1,22	106,8	0,00	95,58	-	-	0,00	0,00	-
L05	16 807	16 807	0	-1,13	0,00	-1,13	106,8	0,00	95,51	-	-	0,00	0,00	-
L06	16 524	16 525	0	-0,90	0,00	-0,90	106,8	0,00	95,36	-	-	0,00	0,00	-
L07	16 845	16 845	0	-1,16	0,00	-1,16	106,8	0,00	95,53	-	-	0,00	0,00	-
L08	16 550	16 551	0	-0,92	0,00	-0,92	106,8	0,00	95,38	-	-	0,00	0,00	-
L09	16 306	16 307	0	-0,72	0,00	-0,72	106,8	0,00	95,25	-	-	0,00	0,00	-
L10	16 280	16 281	0	-0,71	0,00	-0,71	106,8	0,00	95,23	-	-	0,00	0,00	-
L11	16 367	16 368	0	-0,79	0,00	-0,79	106,8	0,00	95,28	-	-	0,00	0,00	-
L12	15 921	15 922	0	-0,41	0,00	-0,41	106,8	0,00	95,04	-	-	0,00	0,00	-
L15	15 275	15 275	0	0,14	0,00	0,14	106,8	0,00	94,68	-	-	0,00	0,00	-
L16	15 308	15 309	0	0,10	0,00	0,10	106,8	0,00	94,70	-	-	0,00	0,00	-
L17	15 052	15 053	0	0,32	0,00	0,32	106,8	0,00	94,55	-	-	0,00	0,00	-
L18	15 066	15 067	0	0,30	0,00	0,30	106,8	0,00	94,56	-	-	0,00	0,00	-
L19	14 918	14 919	0	0,44	0,00	0,44	106,8	0,00	94,47	-	-	0,00	0,00	-
L22	14 415	14 416	0	0,89	0,00	0,89	106,8	0,00	94,18	-	-	0,00	0,00	-
L23	14 424	14 425	0	0,90	0,00	0,90	106,8	0,00	94,18	-	-	0,00	0,00	-
L24	14 317	14 318	0	0,98	0,00	0,98	106,8	0,00	94,12	-	-	0,00	0,00	-
L25	14 035	14 036	0	1,24	0,00	1,24	106,8	0,00	93,94	-	-	0,00	0,00	-
L26	13 905	13 905	0	1,36	0,00	1,36	106,8	0,00	93,86	-	-	0,00	0,00	-
L27	13 684	13 685	0	1,58	0,00	1,58	106,8	0,00	93,72	-	-	0,00	0,00	-
M01	17 623	17 624	0	-2,26	0,00	-2,26	106,3	0,00	95,92	-	-	0,00	0,00	-
M02	16 925	16 926	0	-1,73	0,00	-1,73	106,3	0,00	95,57	-	-	0,00	0,00	-
M04	17 048	17 049	0	-1,82	0,00	-1,82	106,3	0,00	95,63	-	-	0,00	0,00	-
M05	17 190	17 191	0	-1,43	0,00	-1,43	106,8	0,00	95,71	-	-	0,00	0,00	-
M07	16 397	16 398	0	-1,31	0,00	-1,31	106,3	0,00	95,30	-	-	0,00	0,00	-
M08	16 547	16 548	0	-0,93	0,00	-0,93	106,8	0,00	95,38	-	-	0,00	0,00	-
M09	16 592	16 592	0	-0,97	0,00	-0,97	106,8	0,00	95,40	-	-	0,00	0,00	-
M11	15 752	15 752	0	-0,28	0,00	-0,28	106,8	0,00	94,95	-	-	0,00	0,00	-
M12	15 935	15 936	0	-0,43	0,00	-0,43	106,8	0,00	95,05	-	-	0,00	0,00	-
M13	15 249	15 250	0	-0,35	0,00	-0,35	106,3	0,00	94,67	-	-	0,00	0,00	-
M14	15 902	15 903	0	-0,41	0,00	-0,41	106,8	0,00	95,03	-	-	0,00	0,00	-
M15	15 081	15 082	0	0,29	0,00	0,29	106,8	0,00	94,57	-	-	0,00	0,00	-
M16	14 681	14 681	0	0,65	0,00	0,65	106,8	0,00	94,34	-	-	0,00	0,00	-
Sum						35,02								

- Data undefined due to calculation with octave data

Noise sensitive area: F Noise sensitive point: Finnish normal frequency - User defined (4)

Wind speed: 8,0 m/s

WTG No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1	2 816	2 822	0	23,28	2,50	25,78	106,9	0,00	80,01	-	-	0,00	0,00	-
2	4 059	4 063	0	18,73	2,50	21,23	106,9	0,00	83,18	-	-	0,00	0,00	-
3	4 083	4 087	0	18,65	2,50	21,15	106,9	0,00	83,23	-	-	0,00	0,00	-
4	3 359	3 364	0	21,12	2,50	23,62	106,9	0,00	81,54	-	-	0,00	0,00	-
5	2 279	2 286	0	25,82	2,50	28,32	106,9	0,00	78,18	-	-	0,00	0,00	-
6	2 659	2 665	0	23,98	2,50	26,48	106,9	0,00	79,52	-	-	0,00	0,00	-
7	3 170	3 176	0	21,83	2,50	24,33	106,9	0,00	81,04	-	-	0,00	0,00	-
8	3 984	3 988	0	18,97	2,50	21,47	106,9	0,00	83,02	-	-	0,00	0,00	-
9	4 569	4 573	0	17,21	2,50	19,71	106,9	0,00	84,20	-	-	0,00	0,00	-
AP01	9 195	9 196	0	3,33	1,50	4,83	105,0	0,00	90,27	-	-	0,00	0,00	-
AP02	8 976	8 978	0	3,64	1,50	5,14	105,0	0,00	90,06	-	-	0,00	0,00	-
AP03	8 365	8 367	0	4,55	1,50	6,05	105,0	0,00	89,45	-	-	0,00	0,00	-
AP04	8 459	8 461	0	4,44	1,50	5,94	105,0	0,00	89,55	-	-	0,00	0,00	-
AP05	9 178	9 180	0	3,34	1,50	4,84	105,0	0,00	90,26	-	-	0,00	0,00	-
AP06	8 690	8 692	0	4,06	1,50	5,56	105,0	0,00	89,78	-	-	0,00	0,00	-
AP07	9 181	9 183	0	3,34	1,50	4,84	105,0	0,00	90,26	-	-	0,00	0,00	-
AP08	11 486	11 488	0	0,41	1,50	1,91	105,0	0,00	92,20	-	-	0,00	0,00	-

To be continued on next page...

Licensed user:
Sweco Finland Oy
Ilmalanportti 2
FI-00240 Helsinki

Juho Ali-Tolppa / juho.ali-tolppa@sweco.fi
Calculated:
9.4.2024 23.38/3.6.377

DECIBEL - Detailed results

Calculation: Yhteisvaikutusmallinnus Alajärvi Suolasalmenharju VE2 melumallinnus 09042024 Noise calculation model: ISO 9613-2 Finland 8,0 m/s

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WTG No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
AP09	11 490	11 491	0	0,41	1,50	1,91	105,0	0,00	92,21	-	-	0,00	0,00	-
AP10	11 794	11 796	0	0,06	1,50	1,56	105,0	0,00	92,43	-	-	0,00	0,00	-
AP11	12 013	12 014	0	-0,16	1,50	1,34	105,0	0,00	92,59	-	-	0,00	0,00	-
AP12	12 372	12 373	0	-0,51	1,50	0,99	105,0	0,00	92,85	-	-	0,00	0,00	-
AP13	12 927	12 928	0	-1,08	1,50	0,42	105,0	0,00	93,23	-	-	0,00	0,00	-
AP14	12 370	12 371	0	-0,50	1,50	1,00	105,0	0,00	92,85	-	-	0,00	0,00	-
L01	12 278	12 278	0	3,00	0,00	3,00	106,8	0,00	92,78	-	-	0,00	0,00	-
L02	12 161	12 162	0	3,12	0,00	3,12	106,8	0,00	92,70	-	-	0,00	0,00	-
L03	11 764	11 765	0	3,56	0,00	3,56	106,8	0,00	92,41	-	-	0,00	0,00	-
L04	11 404	11 404	0	3,97	0,00	3,97	106,8	0,00	92,14	-	-	0,00	0,00	-
L05	11 212	11 213	0	4,19	0,00	4,19	106,8	0,00	91,99	-	-	0,00	0,00	-
L06	11 015	11 016	0	4,43	0,00	4,43	106,8	0,00	91,84	-	-	0,00	0,00	-
L07	11 687	11 687	0	3,65	0,00	3,65	106,8	0,00	92,35	-	-	0,00	0,00	-
L08	11 128	11 129	0	4,29	0,00	4,29	106,8	0,00	91,93	-	-	0,00	0,00	-
L09	10 733	10 734	0	4,77	0,00	4,77	106,8	0,00	91,62	-	-	0,00	0,00	-
L10	11 077	11 077	0	4,35	0,00	4,35	106,8	0,00	91,89	-	-	0,00	0,00	-
L11	11 073	11 073	0	4,36	0,00	4,36	106,8	0,00	91,89	-	-	0,00	0,00	-
L12	10 418	10 419	0	5,16	0,00	5,16	106,8	0,00	91,36	-	-	0,00	0,00	-
L15	9 770	9 771	0	6,00	0,00	6,00	106,8	0,00	90,80	-	-	0,00	0,00	-
L16	10 156	10 157	0	5,49	0,00	5,49	106,8	0,00	91,14	-	-	0,00	0,00	-
L17	9 804	9 805	0	5,96	0,00	5,96	106,8	0,00	90,83	-	-	0,00	0,00	-
L18	9 709	9 710	0	6,09	0,00	6,09	106,8	0,00	90,74	-	-	0,00	0,00	-
L19	9 845	9 846	0	5,90	0,00	5,90	106,8	0,00	90,86	-	-	0,00	0,00	-
L22	9 028	9 029	0	7,04	0,00	7,04	106,8	0,00	90,11	-	-	0,00	0,00	-
L23	8 906	8 907	0	7,22	0,00	7,22	106,8	0,00	89,99	-	-	0,00	0,00	-
L24	9 314	9 315	0	6,63	0,00	6,63	106,8	0,00	90,38	-	-	0,00	0,00	-
L25	8 814	8 815	0	7,36	0,00	7,36	106,8	0,00	89,90	-	-	0,00	0,00	-
L26	8 562	8 563	0	7,74	0,00	7,74	106,8	0,00	89,65	-	-	0,00	0,00	-
L27	8 260	8 261	0	8,21	0,00	8,21	106,8	0,00	89,34	-	-	0,00	0,00	-
M01	12 002	12 003	0	2,80	0,00	2,80	106,3	0,00	92,59	-	-	0,00	0,00	-
M02	11 203	11 204	0	3,71	0,00	3,71	106,3	0,00	91,99	-	-	0,00	0,00	-
M04	11 382	11 383	0	3,50	0,00	3,50	106,3	0,00	92,13	-	-	0,00	0,00	-
M05	11 562	11 563	0	3,79	0,00	3,79	106,8	0,00	92,26	-	-	0,00	0,00	-
M07	10 692	10 693	0	4,32	0,00	4,32	106,3	0,00	91,58	-	-	0,00	0,00	-
M08	10 881	10 882	0	4,59	0,00	4,59	106,8	0,00	91,73	-	-	0,00	0,00	-
M09	10 993	10 994	0	4,45	0,00	4,45	106,8	0,00	91,82	-	-	0,00	0,00	-
M11	10 090	10 091	0	5,58	0,00	5,58	106,8	0,00	91,08	-	-	0,00	0,00	-
M12	10 309	10 310	0	5,30	0,00	5,30	106,8	0,00	91,27	-	-	0,00	0,00	-
M13	9 583	9 584	0	5,76	0,00	5,76	106,3	0,00	90,63	-	-	0,00	0,00	-
M14	10 390	10 392	0	5,19	0,00	5,19	106,8	0,00	91,33	-	-	0,00	0,00	-
M15	9 627	9 629	0	6,20	0,00	6,20	106,8	0,00	90,67	-	-	0,00	0,00	-
M16	9 350	9 351	0	6,58	0,00	6,58	106,8	0,00	90,42	-	-	0,00	0,00	-
Sum						34,24								

- Data undefined due to calculation with octave data

Noise sensitive area: G Noise sensitive point: Finnish normal frequency - User defined (6)

Wind speed: 8,0 m/s

WTG No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1	5 164	5 167	0	15,62	2,50	18,12	106,9	0,00	85,26	-	-	0,00	0,00	-
2	4 472	4 476	0	17,49	2,50	19,99	106,9	0,00	84,02	-	-	0,00	0,00	-
3	5 268	5 271	0	15,36	2,50	17,86	106,9	0,00	85,44	-	-	0,00	0,00	-
4	5 675	5 677	0	14,44	2,50	16,94	106,9	0,00	86,08	-	-	0,00	0,00	-
5	4 799	4 802	0	16,58	2,50	19,08	106,9	0,00	84,63	-	-	0,00	0,00	-
6	5 843	5 845	0	14,12	2,50	16,62	106,9	0,00	86,34	-	-	0,00	0,00	-
7	4 515	4 519	0	17,36	2,50	19,86	106,9	0,00	84,10	-	-	0,00	0,00	-
8	6 048	6 050	0	13,73	2,50	16,23	106,9	0,00	86,64	-	-	0,00	0,00	-
9	6 235	6 237	0	13,38	2,50	15,88	106,9	0,00	86,90	-	-	0,00	0,00	-
AP01	7 085	7 087	0	7,97	1,50	9,47	105,0	0,00	88,01	-	-	0,00	0,00	-
AP02	6 635	6 637	0	8,81	1,50	10,31	105,0	0,00	87,44	-	-	0,00	0,00	-
AP03	5 921	5 923	0	10,28	1,50	11,78	105,0	0,00	86,45	-	-	0,00	0,00	-

To be continued on next page...

DECIBEL - Detailed results

Calculation: Yhteisvaikutusmallinnus Alajärvi Suolasalmenharju VE2 melumallinnus 09042024 Noise calculation model: ISO 9613-2 Finland 8,0 m/s

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WTG No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
AP04	5 701	5 704	0	10,74	1,50	12,24	105,0	0,00	86,12	-	-	0,00	0,00	-
AP05	6 158	6 161	0	9,76	1,50	11,26	105,0	0,00	86,79	-	-	0,00	0,00	-
AP06	5 545	5 547	0	11,07	1,50	12,57	105,0	0,00	85,88	-	-	0,00	0,00	-
AP07	5 772	5 774	0	10,59	1,50	12,09	105,0	0,00	86,23	-	-	0,00	0,00	-
AP08	7 001	7 003	0	8,07	1,50	9,57	105,0	0,00	87,91	-	-	0,00	0,00	-
AP09	6 893	6 895	0	8,26	1,50	9,76	105,0	0,00	87,77	-	-	0,00	0,00	-
AP10	7 109	7 111	0	7,86	1,50	9,36	105,0	0,00	88,04	-	-	0,00	0,00	-
AP11	7 248	7 250	0	7,58	1,50	9,08	105,0	0,00	88,21	-	-	0,00	0,00	-
AP12	7 558	7 560	0	6,98	1,50	8,48	105,0	0,00	88,57	-	-	0,00	0,00	-
AP13	8 073	8 074	0	6,06	1,50	7,56	105,0	0,00	89,14	-	-	0,00	0,00	-
AP14	7 502	7 504	0	6,99	1,50	8,49	105,0	0,00	88,51	-	-	0,00	0,00	-
L01	16 966	16 966	0	-1,26	0,00	-1,26	106,8	0,00	95,59	-	-	0,00	0,00	-
L02	16 751	16 751	0	-1,09	0,00	-1,09	106,8	0,00	95,48	-	-	0,00	0,00	-
L03	16 289	16 289	0	-0,72	0,00	-0,72	106,8	0,00	95,24	-	-	0,00	0,00	-
L04	15 827	15 828	0	-0,34	0,00	-0,34	106,8	0,00	94,99	-	-	0,00	0,00	-
L05	15 540	15 541	0	-0,10	0,00	-0,10	106,8	0,00	94,83	-	-	0,00	0,00	-
L06	15 481	15 482	0	-0,05	0,00	-0,05	106,8	0,00	94,80	-	-	0,00	0,00	-
L07	16 423	16 424	0	-0,83	0,00	-0,83	106,8	0,00	95,31	-	-	0,00	0,00	-
L08	15 689	15 690	0	-0,23	0,00	-0,23	106,8	0,00	94,91	-	-	0,00	0,00	-
L09	15 112	15 112	0	0,26	0,00	0,26	106,8	0,00	94,59	-	-	0,00	0,00	-
L10	15 798	15 798	0	-0,32	0,00	-0,32	106,8	0,00	94,97	-	-	0,00	0,00	-
L11	15 739	15 739	0	-0,27	0,00	-0,27	106,8	0,00	94,94	-	-	0,00	0,00	-
L12	14 905	14 906	0	0,45	0,00	0,45	106,8	0,00	94,47	-	-	0,00	0,00	-
L15	14 269	14 270	0	1,02	0,00	1,02	106,8	0,00	94,09	-	-	0,00	0,00	-
L16	14 915	14 916	0	0,44	0,00	0,44	106,8	0,00	94,47	-	-	0,00	0,00	-
L17	14 520	14 520	0	0,79	0,00	0,79	106,8	0,00	94,24	-	-	0,00	0,00	-
L18	14 354	14 354	0	0,94	0,00	0,94	106,8	0,00	94,14	-	-	0,00	0,00	-
L19	14 640	14 640	0	0,68	0,00	0,68	106,8	0,00	94,31	-	-	0,00	0,00	-
L22	13 663	13 663	0	1,59	0,00	1,59	106,8	0,00	93,71	-	-	0,00	0,00	-
L23	13 410	13 411	0	1,84	0,00	1,84	106,8	0,00	93,55	-	-	0,00	0,00	-
L24	14 138	14 138	0	1,14	0,00	1,14	106,8	0,00	94,01	-	-	0,00	0,00	-
L25	13 560	13 560	0	1,69	0,00	1,69	106,8	0,00	93,65	-	-	0,00	0,00	-
L26	13 240	13 241	0	2,01	0,00	2,01	106,8	0,00	93,44	-	-	0,00	0,00	-
L27	12 881	12 881	0	2,37	0,00	2,37	106,8	0,00	93,20	-	-	0,00	0,00	-
M01	14 916	14 916	0	-0,05	0,00	-0,05	106,3	0,00	94,47	-	-	0,00	0,00	-
M02	14 680	14 681	0	0,15	0,00	0,15	106,3	0,00	94,34	-	-	0,00	0,00	-
M04	14 502	14 503	0	0,31	0,00	0,31	106,3	0,00	94,23	-	-	0,00	0,00	-
M05	14 515	14 516	0	0,79	0,00	0,79	106,8	0,00	94,24	-	-	0,00	0,00	-
M07	14 049	14 050	0	0,72	0,00	0,72	106,3	0,00	93,95	-	-	0,00	0,00	-
M08	14 017	14 018	0	1,25	0,00	1,25	106,8	0,00	93,93	-	-	0,00	0,00	-
M09	13 858	13 859	0	1,44	0,00	1,44	106,8	0,00	93,83	-	-	0,00	0,00	-
M11	13 236	13 236	0	2,01	0,00	2,01	106,8	0,00	93,44	-	-	0,00	0,00	-
M12	13 300	13 301	0	1,95	0,00	1,95	106,8	0,00	93,48	-	-	0,00	0,00	-
M13	12 773	12 773	0	1,98	0,00	1,98	106,3	0,00	93,13	-	-	0,00	0,00	-
M14	13 008	13 009	0	2,30	0,00	2,30	106,8	0,00	93,28	-	-	0,00	0,00	-
M15	12 121	12 122	0	3,29	0,00	3,29	106,8	0,00	92,67	-	-	0,00	0,00	-
M16	11 558	11 559	0	4,12	0,00	4,12	106,8	0,00	92,26	-	-	0,00	0,00	-
Sum						28,92								

- Data undefined due to calculation with octave data

Noise sensitive area: H Noise sensitive point: Finnish normal frequency - User defined (5)

Wind speed: 8,0 m/s

WTG No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1	5 737	5 740	0	14,32	2,50	16,82	106,9	0,00	86,18	-	-	0,00	0,00	-
2	6 223	6 225	0	13,40	2,50	15,90	106,9	0,00	86,88	-	-	0,00	0,00	-
3	6 659	6 661	0	12,62	2,50	15,12	106,9	0,00	87,47	-	-	0,00	0,00	-
4	6 356	6 358	0	13,16	2,50	15,66	106,9	0,00	87,07	-	-	0,00	0,00	-
5	5 161	5 164	0	15,63	2,50	18,13	106,9	0,00	85,26	-	-	0,00	0,00	-
6	5 917	5 919	0	13,97	2,50	16,47	106,9	0,00	86,45	-	-	0,00	0,00	-
7	5 640	5 643	0	14,51	2,50	17,01	106,9	0,00	86,03	-	-	0,00	0,00	-

To be continued on next page...

DECIBEL - Detailed results

Calculation: Yhteisvaikutusmallinnus Alajärvi Suolasalmenharju VE2 melumallinnus 09042024 Noise calculation model: ISO 9613-2 Finland 8,0 m/s

...continued from previous page

WTG No.	Distance	Sound distance	Penalty	From WTGs	Uncertainty margin	WTG+Uncertainty margin	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB]	[dB(A)]	[dB]	[dB]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
8	6 951	6 953	0	12,13	2,50	14,63	106,9	0,00	87,84	-	-	0,00	0,00	-
9	7 430	7 431	0	11,35	2,50	13,85	106,9	0,00	88,42	-	-	0,00	0,00	-
AP01	5 722	5 724	0	9,43	1,50	10,93	105,0	0,00	86,15	-	-	0,00	0,00	-
AP02	5 525	5 527	0	9,86	1,50	11,36	105,0	0,00	85,85	-	-	0,00	0,00	-
AP03	4 944	4 947	0	11,27	1,50	12,77	105,0	0,00	84,89	-	-	0,00	0,00	-
AP04	5 100	5 103	0	10,87	1,50	12,37	105,0	0,00	85,16	-	-	0,00	0,00	-
AP05	5 853	5 855	0	9,18	1,50	10,68	105,0	0,00	86,35	-	-	0,00	0,00	-
AP06	5 430	5 433	0	10,11	1,50	11,61	105,0	0,00	85,70	-	-	0,00	0,00	-
AP07	5 986	5 988	0	8,85	1,50	10,35	105,0	0,00	86,55	-	-	0,00	0,00	-
AP08	8 820	8 821	0	3,86	1,50	5,36	105,0	0,00	89,91	-	-	0,00	0,00	-
AP09	8 948	8 950	0	3,67	1,50	5,17	105,0	0,00	90,04	-	-	0,00	0,00	-
AP10	9 361	9 363	0	3,09	1,50	4,59	105,0	0,00	90,43	-	-	0,00	0,00	-
AP11	9 707	9 709	0	2,61	1,50	4,11	105,0	0,00	90,74	-	-	0,00	0,00	-
AP12	10 168	10 169	0	2,01	1,50	3,51	105,0	0,00	91,15	-	-	0,00	0,00	-
AP13	10 830	10 831	0	1,18	1,50	2,68	105,0	0,00	91,69	-	-	0,00	0,00	-
AP14	10 352	10 353	0	1,77	1,50	3,27	105,0	0,00	91,30	-	-	0,00	0,00	-
L01	13 781	13 782	0	1,48	0,00	1,48	106,8	0,00	93,79	-	-	0,00	0,00	-
L02	13 442	13 443	0	1,81	0,00	1,81	106,8	0,00	93,57	-	-	0,00	0,00	-
L03	12 918	12 919	0	2,33	0,00	2,33	106,8	0,00	93,22	-	-	0,00	0,00	-
L04	12 375	12 375	0	2,90	0,00	2,90	106,8	0,00	92,85	-	-	0,00	0,00	-
L05	12 020	12 021	0	3,28	0,00	3,28	106,8	0,00	92,60	-	-	0,00	0,00	-
L06	12 071	12 072	0	3,22	0,00	3,22	106,8	0,00	92,64	-	-	0,00	0,00	-
L07	13 329	13 329	0	1,92	0,00	1,92	106,8	0,00	93,50	-	-	0,00	0,00	-
L08	12 368	12 369	0	2,90	0,00	2,90	106,8	0,00	92,85	-	-	0,00	0,00	-
L09	11 636	11 637	0	3,70	0,00	3,70	106,8	0,00	92,32	-	-	0,00	0,00	-
L10	12 689	12 690	0	2,56	0,00	2,56	106,8	0,00	93,07	-	-	0,00	0,00	-
L11	12 546	12 546	0	2,71	0,00	2,71	106,8	0,00	92,97	-	-	0,00	0,00	-
L12	11 525	11 526	0	3,83	0,00	3,83	106,8	0,00	92,23	-	-	0,00	0,00	-
L15	10 917	10 918	0	4,54	0,00	4,54	106,8	0,00	91,76	-	-	0,00	0,00	-
L16	11 896	11 897	0	3,41	0,00	3,41	106,8	0,00	92,51	-	-	0,00	0,00	-
L17	11 431	11 431	0	3,94	0,00	3,94	106,8	0,00	92,16	-	-	0,00	0,00	-
L18	11 164	11 164	0	4,25	0,00	4,25	106,8	0,00	91,96	-	-	0,00	0,00	-
L19	11 707	11 708	0	3,62	0,00	3,62	106,8	0,00	92,37	-	-	0,00	0,00	-
L22	10 479	10 479	0	5,08	0,00	5,08	106,8	0,00	91,41	-	-	0,00	0,00	-
L23	10 085	10 086	0	5,59	0,00	5,59	106,8	0,00	91,07	-	-	0,00	0,00	-
L24	11 297	11 297	0	4,10	0,00	4,10	106,8	0,00	92,06	-	-	0,00	0,00	-
L25	10 554	10 554	0	4,99	0,00	4,99	106,8	0,00	91,47	-	-	0,00	0,00	-
L26	10 131	10 132	0	5,53	0,00	5,53	106,8	0,00	91,11	-	-	0,00	0,00	-
L27	9 705	9 705	0	6,09	0,00	6,09	106,8	0,00	90,74	-	-	0,00	0,00	-
M01	11 034	11 036	0	3,92	0,00	3,92	106,3	0,00	91,86	-	-	0,00	0,00	-
M02	10 843	10 844	0	4,13	0,00	4,13	106,3	0,00	91,70	-	-	0,00	0,00	-
M04	10 626	10 627	0	4,40	0,00	4,40	106,3	0,00	91,53	-	-	0,00	0,00	-
M05	10 634	10 635	0	4,89	0,00	4,89	106,8	0,00	91,53	-	-	0,00	0,00	-
M07	10 197	10 198	0	4,94	0,00	4,94	106,3	0,00	91,17	-	-	0,00	0,00	-
M08	10 143	10 145	0	5,51	0,00	5,51	106,8	0,00	91,12	-	-	0,00	0,00	-
M09	9 977	9 978	0	5,77	0,00	5,77	106,8	0,00	90,98	-	-	0,00	0,00	-
M11	9 365	9 366	0	6,56	0,00	6,56	106,8	0,00	90,43	-	-	0,00	0,00	-
M12	9 421	9 422	0	6,48	0,00	6,48	106,8	0,00	90,48	-	-	0,00	0,00	-
M13	8 909	8 910	0	6,72	0,00	6,72	106,3	0,00	90,00	-	-	0,00	0,00	-
M14	9 134	9 136	0	6,89	0,00	6,89	106,8	0,00	90,21	-	-	0,00	0,00	-
M15	8 252	8 254	0	8,22	0,00	8,22	106,8	0,00	89,33	-	-	0,00	0,00	-
M16	7 717	7 719	0	9,09	0,00	9,09	106,8	0,00	88,75	-	-	0,00	0,00	-
Sum						27,76								

- Data undefined due to calculation with octave data

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Calculated:
9.4.2024 23.38/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Yhteisvaikutusmallinnus Alajärvi Suolasalmenharju VE2 melumallinnus 09042024

Noise calculation model:
ISO 9613-2 Finland
Wind speed (in 10 m height):
8,0 m/s
Ground attenuation:
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Vesistöt
Area type with hard ground: VESISTOT
Ground factor for hard ground: 0,0
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 tones penalty is added to total noise impact at receptors
Noise sensitive area
Height above ground level, when no value in NSA object:
4,0 m; Don't allow override of model height with height from NSA object
Uncertainty margin:
Uncertainty added to source noise level of the WTGs in the calculation
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)
Octave data required
Frequency dependent 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]
0,10	0,38	1,12	2,36	4,08	8,78	26,60	95,00

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89

WTG: VESTAS V162-6.0 6000 162.0 !O!
Noise: Level 0 - - Mode PO6000 - 12-2020

Source	Source/Date	Creator	Edited
Manufacturer	7.12.2020	USER	14.8.2023 13.34

(Document n. 0098-0840 V03.)

Mallinnuksen (139 HH, 162 RD) lähtötiedot Numerola Oy:n laatimasta meluselvityksestä TV-2021-1881-1
"Third octave noise emission EnVentus V162-6.0 MW. Document no 0095-3732_01. 2020-11-03."

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	139,0	8,0	106,3	No	87,4	94,9	99,5	101,3	100,4	96,6	90,1	80,6

WTG: VESTAS V162-6.2 6200 162.0 !O!
Noise: Level 0 - Measured - Mode PO6200 - 06-2021

Source	Source/Date	Creator	Edited
Manufacturer	30.6.2021	USER	17.10.2023 12.56

(Document no.: 0107-3707 V00.)

139m napakorkeuden 10m korkeudella 8 m/s 1/3-oktaavitiedot Möksy-Louhukangas rakennuslupavaiheen meluselvityksestä (s.27): TV2021-188-1
"Third octave noise emission EnVentus V162-6.2 MW. Document no 0105-5200_00,2020-06-22"

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	139,0	8,0	106,8	No	87,9	95,4	100,0	101,8	100,9	97,1	90,6	81,1

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DECIBEL - Assumptions for noise calculation

Calculation: Yhteisvaikutusmallinnus Alajärvi Suolasalmenharju VE2 melumallinnus 09042024

WTG: VESTAS V162-6.2 6200 162.0 !O!
Noise: Level 0 - Measured - Mode PO6200 - 06-2021

Source	Source/Date	Creator	Edited
Manufacturer	30.6.2021	USER	17.10.2023 12.56

(Document no.: 0107-3707 V00.)

139m napakorkeuden 10m korkeudella 8 m/s 1/3-oktaavitiedot Möksy-Louhukangas rakennuslupavaiheen meluselvityksestä (s.27): TV2021-188-1 "Third octave noise emission EnVentus V162-6.2 MW. Document no 0105-5200_00,2020-06-22"

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	139,0	8,0	106,8	No	87,9	95,4	100,0	101,8	100,9	97,1	90,6	81,1

WTG: Siemens Gamesa SG 6.0-155 6600 155.0 !O!
Noise: (AM 0, 6.6MW) - 105dB(A)

Source	Source/Date	Creator	Edited
SGRE	19.3.2020	USER	9.4.2024 17.09

Siemens Gamesa Renewable Energy and its affiliates reserve the right to change the above specifications without prior notice.

Lähde 1/3-oktaavijakaumalle: FCG: Kämppäkankaan tuulivoimahanke, melu- ja varjostusmallinnusraportti 30.5.2023 ,s.7 (Taulukko 3)
"Valmistajan tiedot asiakirjasta no. SG-F18.16-IN-01318_R01. Asiakirjan päivämäärä: 2021-11-09"
Lähtömelutasoon lisätty varmuusarvo 1.5 dB

						Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Uncertainty [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	162,9	8,0	105,0	1,5	No	84,6	92,0	96,6	98,9	98,7	99,0	92,4	77,4

WTG: VESTAS V172-7.2 7200 180.0 !-!
Noise: PO7200

Source	Source/Date	Creator	Edited
	13.10.2022	USER	20.6.2023 14.08

Document no. 0128-4336 V00

						Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Uncertainty [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	180,0	8,0	106,9	2,5	No	90,5	98,2	101,3	101,5	99,8	95,2	87,6	76,9

Noise sensitive area: A Noise sensitive point: Finnish normal frequency - User defined (2)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

Noise sensitive area: B Noise sensitive point: Finnish normal frequency - User defined (1)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

Noise sensitive area: C Noise sensitive point: Finnish normal frequency - User defined (8)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

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Calculated:
9.4.2024 23.38/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Yhteisvaikutusmallinnus Alajärvi Suolasalmenharju VE2 melumallinnus 09042024

Noise sensitive area: D Noise sensitive point: Finnish normal frequency - User defined (3)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

Noise sensitive area: E Noise sensitive point: Finnish normal frequency - User defined (7)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

Noise sensitive area: F Noise sensitive point: Finnish normal frequency - User defined (4)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

Noise sensitive area: G Noise sensitive point: Finnish normal frequency - User defined (6)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

Noise sensitive area: H Noise sensitive point: Finnish normal frequency - User defined (5)

Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)
No distance demand
Pure tone penalty: 0 dB

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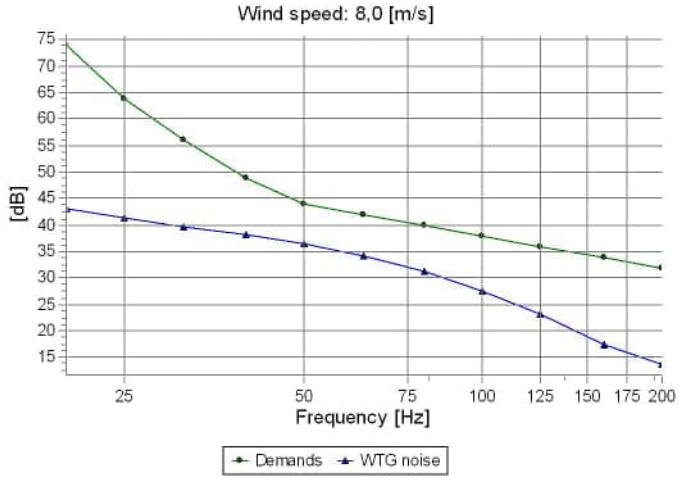
Calculated:
15.4.2024 14.48/3.6.377

DECIBEL - Detailed results, graphic

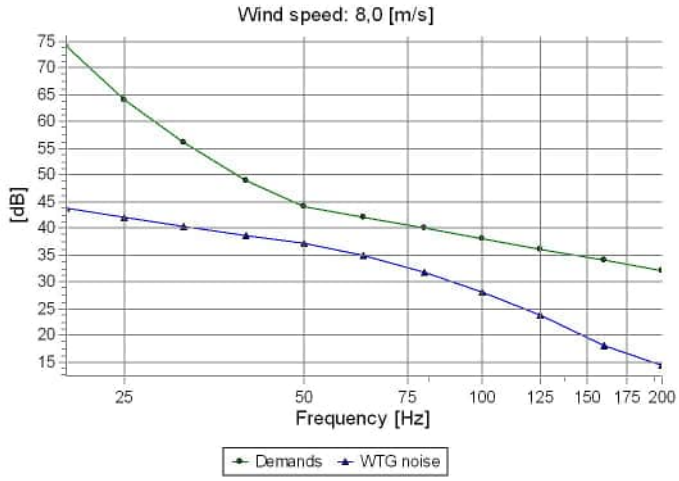
Calculation: Alajärvi Suolasalmenharju VE2 yhteisvaikutukset pienitaajuinen sisämelu 15042024 Noise calculation model: Finland Low frequency 8,0 m/s

A Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (2)



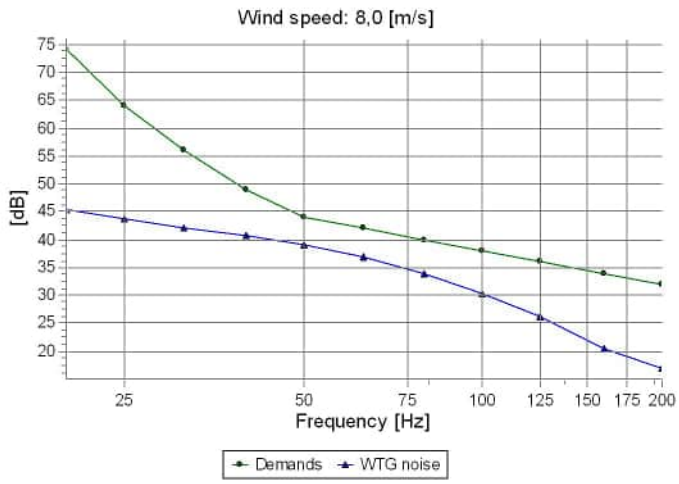
Frequency [Hz]	Sound level Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	43,1	Yes
25,0	64,0	41,4	Yes
31,5	56,0	39,7	Yes
40,0	49,0	38,2	Yes
50,0	44,0	36,5	Yes
63,0	42,0	34,3	Yes
80,0	40,0	31,3	Yes
100,0	38,0	27,6	Yes
125,0	36,0	23,2	Yes
160,0	34,0	17,5	Yes
200,0	32,0	13,7	Yes

B Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (1)



Frequency [Hz]	Sound level Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	43,7	Yes
25,0	64,0	42,0	Yes
31,5	56,0	40,3	Yes
40,0	49,0	38,8	Yes
50,0	44,0	37,1	Yes
63,0	42,0	34,8	Yes
80,0	40,0	31,9	Yes
100,0	38,0	28,2	Yes
125,0	36,0	23,9	Yes
160,0	34,0	18,2	Yes
200,0	32,0	14,4	Yes

C Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (8)



Frequency [Hz]	Sound level Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	45,4	Yes
25,0	64,0	43,8	Yes
31,5	56,0	42,1	Yes
40,0	49,0	40,7	Yes
50,0	44,0	39,1	Yes
63,0	42,0	36,9	Yes
80,0	40,0	33,9	Yes
100,0	38,0	30,4	Yes
125,0	36,0	26,1	Yes
160,0	34,0	20,6	Yes
200,0	32,0	17,0	Yes

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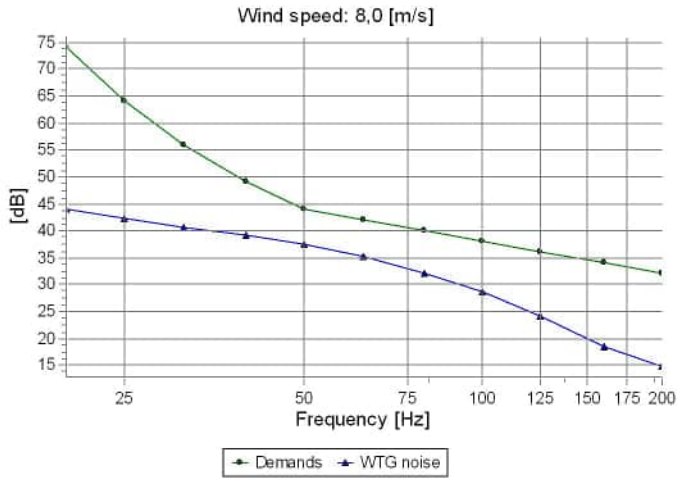
Calculated:
15.4.2024 14.48/3.6.377

DECIBEL - Detailed results, graphic

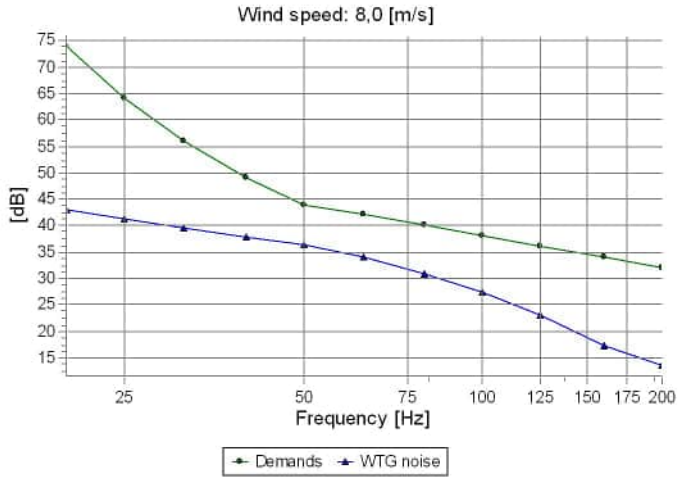
Calculation: Alajärvi Suolasalmenharju VE2 yhteisvaikutukset pienitaajuinen sisämelu 15042024 Noise calculation model: Finland Low frequency 8,0 m/s

D Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (3)



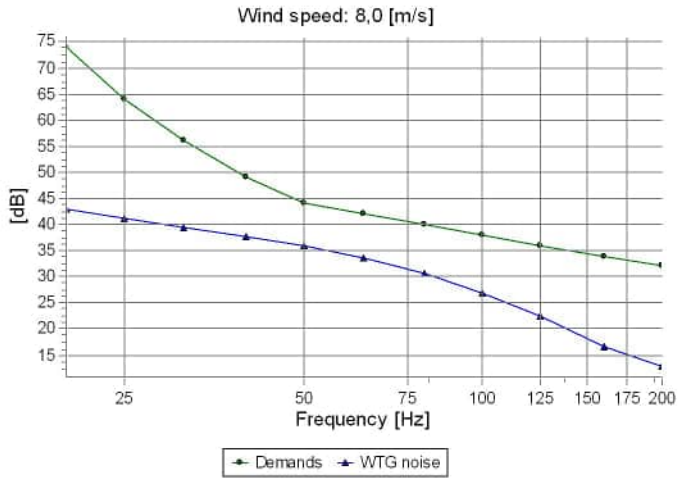
Frequency [Hz]	Sound level Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	44,1	Yes
25,0	64,0	42,4	Yes
31,5	56,0	40,7	Yes
40,0	49,0	39,2	Yes
50,0	44,0	37,5	Yes
63,0	42,0	35,2	Yes
80,0	40,0	32,2	Yes
100,0	38,0	28,6	Yes
125,0	36,0	24,3	Yes
160,0	34,0	18,6	Yes
200,0	32,0	14,9	Yes

E Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (7)



Frequency [Hz]	Sound level Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	42,9	Yes
25,0	64,0	41,2	Yes
31,5	56,0	39,4	Yes
40,0	49,0	37,9	Yes
50,0	44,0	36,3	Yes
63,0	42,0	34,0	Yes
80,0	40,0	31,0	Yes
100,0	38,0	27,4	Yes
125,0	36,0	23,0	Yes
160,0	34,0	17,3	Yes
200,0	32,0	13,5	Yes

F Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (4)



Frequency [Hz]	Sound level Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	42,9	Yes
25,0	64,0	41,1	Yes
31,5	56,0	39,3	Yes
40,0	49,0	37,7	Yes
50,0	44,0	36,0	Yes
63,0	42,0	33,7	Yes
80,0	40,0	30,6	Yes
100,0	38,0	26,9	Yes
125,0	36,0	22,5	Yes
160,0	34,0	16,7	Yes
200,0	32,0	12,8	Yes

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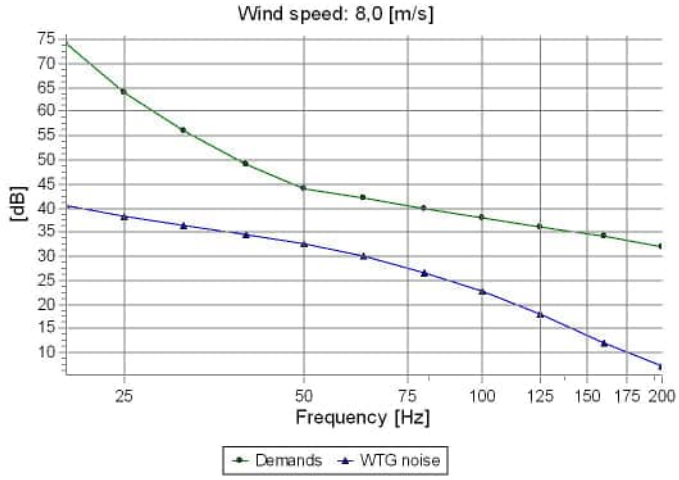
Calculated:
15.4.2024 14.48/3.6.377

DECIBEL - Detailed results, graphic

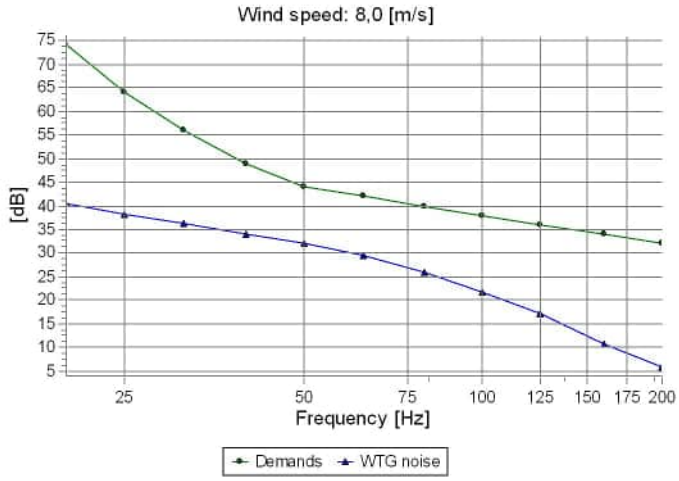
Calculation: Alajärvi Suolasalmenharju VE2 yhteisvaikutukset pienitaajuinen sisämelu 15042024 Noise calculation model: Finland Low frequency 8,0 m/s

G Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (6)



Frequency [Hz]	Sound level Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	40,4	Yes
25,0	64,0	38,4	Yes
31,5	56,0	36,4	Yes
40,0	49,0	34,5	Yes
50,0	44,0	32,5	Yes
63,0	42,0	30,0	Yes
80,0	40,0	26,6	Yes
100,0	38,0	22,7	Yes
125,0	36,0	18,1	Yes
160,0	34,0	11,8	Yes
200,0	32,0	7,3	Yes

H Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night (5)



Frequency [Hz]	Sound level Demands [dB]	WTG noise [dB]	Demands fulfilled ?
20,0	74,0	40,4	Yes
25,0	64,0	38,2	Yes
31,5	56,0	36,2	Yes
40,0	49,0	34,2	Yes
50,0	44,0	32,0	Yes
63,0	42,0	29,4	Yes
80,0	40,0	25,9	Yes
100,0	38,0	21,9	Yes
125,0	36,0	17,2	Yes
160,0	34,0	10,8	Yes
200,0	32,0	6,0	Yes

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Calculated:
15.4.2024 14.48/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Alajärvi Suolasalmenharju VE2 yhteisvaikutukset pienitaajuinen sisämelu 15042024

Noise calculation model:
Finland Low frequency
Wind speed (in 10 m height):
8,0 m/s
Spectral distribution:
From 20,0 Hz to 200,0 Hz
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 is subtracted from demand
Model: 5,0 dB(A)
Height above ground level, when no value in NSA object:
4,0 m; Don't allow override of model height with height from NSA object
Uncertainty margin:
0,0 dB; Uncertainty margin in NSA has priority
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)
Low frequency calculation
dLsigma

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
7,6	8,3	9,2	10,3	11,5	13,0	14,8	16,8	18,8	21,1	22,8

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89

WTG: VESTAS V162-6.0 6000 162.0 !O!
Noise: Level 0 - - Mode PO6000 - 12-2020

Source	Source/Date	Creator	Edited
Manufacturer	7.12.2020	USER	14.8.2023 13.34

(Document n. 0098-0840 V03.)

Mallinnuksen (139 HH, 162 RD) lähtötiedot Numerola Oy:n laatimasta meluselvityksestä TV-2021-1881-1
"Third octave noise emission EnVentus V162-6.0 MW. Document no 0095-3732_01. 2020-11-03."

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	139,0	8,0	97,7	62,4	66,8	71,1	75,2	78,7	82,0	85,0	87,5	89,8	91,9	93,4

WTG: VESTAS V162-6.2 6200 162.0 !O!
Noise: Level 0 - Measured - Mode PO6200 - 06-2021

Source	Source/Date	Creator	Edited
Manufacturer	30.6.2021	USER	17.10.2023 12.56

(Document no.: 0107-3707 V00.)

139m napakorkeuden 10m korkeudella 8 m/s 1/3-oktaavitiedot Möksy-Louhukangas rakennuslupavaiheen meluselvityksestä (s.27): TV2021-188-1
"Third octave noise emission EnVentus V162-6.2 MW. Document no 0105-5200_00,2020-06-22"

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	139,0	8,0	98,2	62,9	67,3	71,6	75,7	79,2	82,5	85,5	88,0	90,3	92,4	93,9

DECIBEL - Assumptions for noise calculation

Calculation: Alajärvi Suolasalmenharju VE2 yhteisvaikutukset pienitaajuinen sisämelu 15042024

WTG: VESTAS V162-6.2 6200 162.0 !O!
Noise: Level 0 - Measured - Mode PO6200 - 06-2021

Source	Source/Date	Creator	Edited
Manufacturer	30.6.2021	USER	17.10.2023 12.56

(Document no.: 0107-3707 V00.)

139m napakorkeuden 10m korkeudella 8 m/s 1/3-oktaavitiedot Möksy-Louhukangas rakennuslupavaiheen meluselvityksestä (s.27): TV2021-188-1
"Third octave noise emission EnVentus V162-6.2 MW. Document no 0105-5200_00,2020-06-22"

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	139,0	8,0	98,2	62,9	67,3	71,6	75,7	79,2	82,5	85,5	88,0	90,3	92,4	93,9

WTG: Siemens Gamesa SG 6.0-155 6600 155.0 !O!
Noise: (AM 0, 6.6MW) - 105dB(A) + 1.5 dB uncertainty

Source	Source/Date	Creator	Edited
SGRE	19.3.2020	USER	17.10.2023 12.59

Siemens Gamesa Renewable Energy and its affiliates reserve the right to change the above specifications without prior notice.

Lähde 1/3-oktaavijakaumalle: FCG: Kämppäkankaan tuulivoimahanke, melu- ja varjostusmallinnusraportti 30.5.2023 ,s.7 (Taulukko 3)
"Valmistajan tiedot asiakirjasta no. SG-F18.16-IN-01318_R01. Asiakirjan päivämäärä: 2021-11-09"
Lähtömelutasoon lisätty varmuusarvo 1.5 dB

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	162,9	8,0	96,0	63,2	67,6	71,6	75,1	78,0	81,5	83,0	85,9	89,0	90,3	90,9

WTG: VESTAS V172-7.2 7200 180.0 !-!
Noise: PO7200_2.5dB_uncertainty

Source	Source/Date	Creator	Edited
Vestas	30.6.2022	USER	5.4.2024 12.37

Third octave noise emission
V172-7.2 MW 50/60 Hz
Doc. 0128-4336_00

2.5 dB uncertainty added to source noise level

Status	Hub height	Wind speed	LwA,ref	20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
	[m]	[m/s]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	180,0	8,0	103,2	64,6	69,8	74,6	79,3	83,7	87,5	90,8	93,6	95,8	97,5	98,6

Noise sensitive area: A Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: B Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

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DECIBEL - Assumptions for noise calculation

Calculation: Alajärvi Suolasalmenharju VE2 yhteisvaikutukset pienitaajuinen sisämelu 15042024

Noise sensitive area: C Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: D Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: E Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: F Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: G Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

Noise sensitive area: H Noise sensitive point: Finnish low frequency - Residential health guide 2003, indoor - night

Predefined calculation standard: Residential health guide 2003, indoor - night
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

Noise demand:

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DECIBEL - Assumptions for noise calculation

Calculation: Alajärvi Suolasalmenharju VE2 yhteisvaikutukset pienitaajuinen sisämelu 15042024

20,0 Hz	25,0 Hz	31,5 Hz	40,0 Hz	50,0 Hz	63,0 Hz	80,0 Hz	100,0 Hz	125,0 Hz	160,0 Hz	200,0 Hz
74,0 dB	64,0 dB	56,0 dB	49,0 dB	44,0 dB	42,0 dB	40,0 dB	38,0 dB	36,0 dB	34,0 dB	32,0 dB

No distance demand

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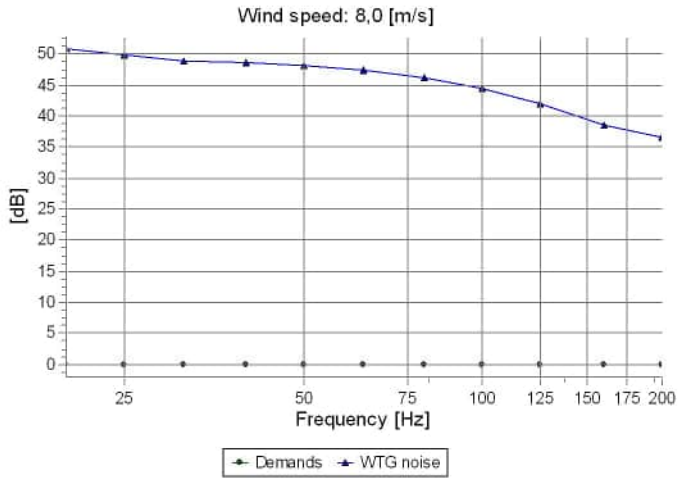
Calculated:
15.4.2024 14.51/3.6.377

DECIBEL - Detailed results, graphic

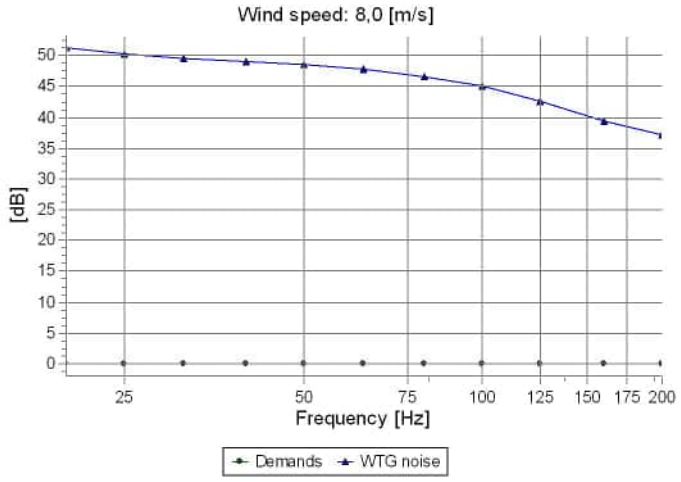
Calculation: Alajärvi Suolasalmenharju VE2 yhteisvaikutukset pienitaajuinen ulkomelu 15042024 Noise calculation model: Finland Low frequency 8,0 m/s

A Noise sensitive point: Finnish low frequency - User defined (2)



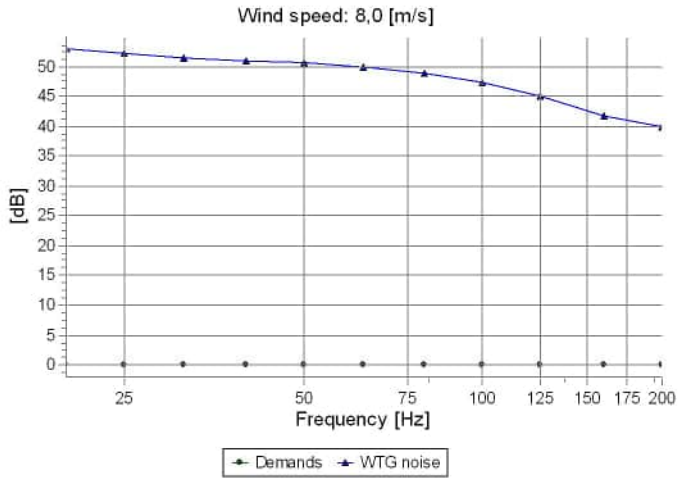
Frequency [Hz]	Sound level WTG noise [dB]
20,0	50,7
25,0	49,7
31,5	48,9
40,0	48,5
50,0	48,0
63,0	47,3
80,0	46,1
100,0	44,4
125,0	42,0
160,0	38,6
200,0	36,5

B Noise sensitive point: Finnish low frequency - User defined (1)



Frequency [Hz]	Sound level WTG noise [dB]
20,0	51,3
25,0	50,3
31,5	49,5
40,0	49,1
50,0	48,6
63,0	47,8
80,0	46,7
100,0	45,0
125,0	42,7
160,0	39,3
200,0	37,2

C Noise sensitive point: Finnish low frequency - User defined (8)



Frequency [Hz]	Sound level WTG noise [dB]
20,0	53,0
25,0	52,1
31,5	51,3
40,0	51,0
50,0	50,6
63,0	49,9
80,0	48,7
100,0	47,2
125,0	44,9
160,0	41,7
200,0	39,8

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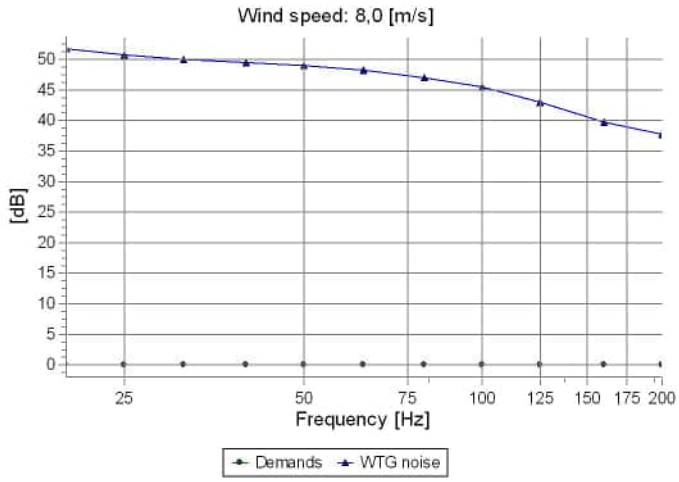
DECIBEL - Detailed results, graphic

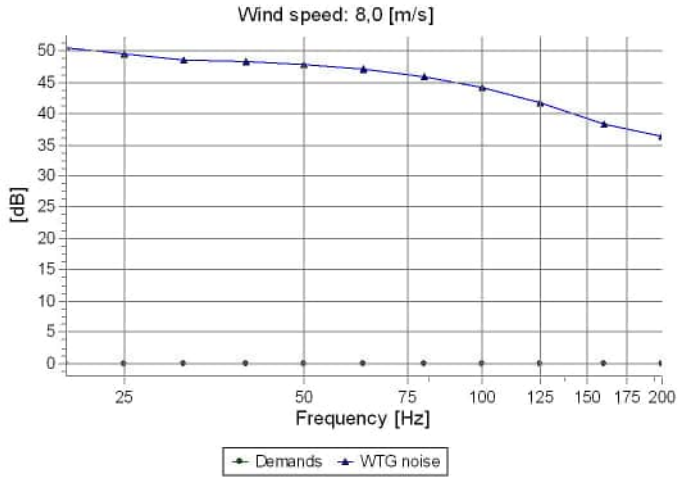
Calculation: Alajärvi Suolasalmenharju VE2 yhteisvaikutukset pienitaajuinen ulkomelu 15042024 Noise calculation model: Finland Low frequency 8,0 m/s

D Noise sensitive point: Finnish low frequency - User defined (3)



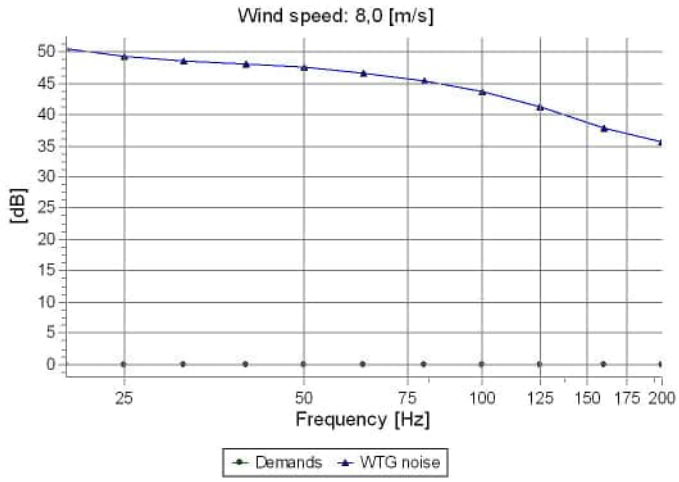
Frequency [Hz]	Sound level WTG noise [dB]
20,0	51,7
25,0	50,7
31,5	49,9
40,0	49,5
50,0	49,0
63,0	48,2
80,0	47,0
100,0	45,4
125,0	43,1
160,0	39,7
200,0	37,7

E Noise sensitive point: Finnish low frequency - User defined (7)



Frequency [Hz]	Sound level WTG noise [dB]
20,0	50,5
25,0	49,5
31,5	48,6
40,0	48,2
50,0	47,8
63,0	47,0
80,0	45,8
100,0	44,2
125,0	41,8
160,0	38,4
200,0	36,3

F Noise sensitive point: Finnish low frequency - User defined (4)



Frequency [Hz]	Sound level WTG noise [dB]
20,0	50,5
25,0	49,4
31,5	48,5
40,0	48,0
50,0	47,5
63,0	46,7
80,0	45,4
100,0	43,7
125,0	41,3
160,0	37,8
200,0	35,6

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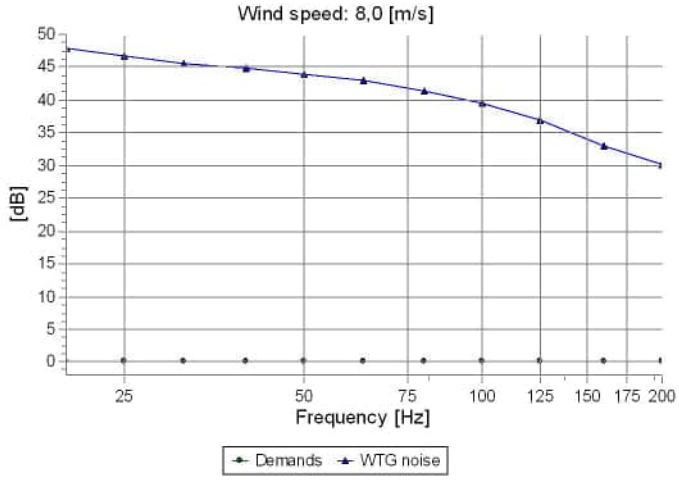
Calculated:
15.4.2024 14.51/3.6.377

DECIBEL - Detailed results, graphic

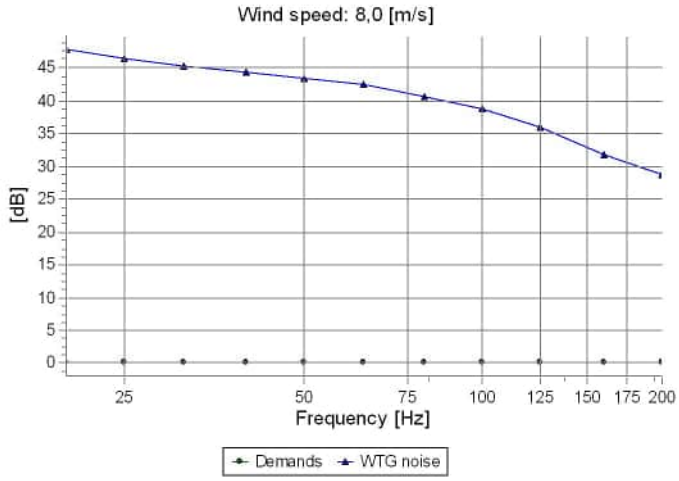
Calculation: Alajärvi Suolasalmenharju VE2 yhteisvaikutukset pienitaajuinen ulkomelu 15042024 Noise calculation model: Finland Low frequency 8,0 m/s

G Noise sensitive point: Finnish low frequency - User defined (6)



Frequency [Hz]	Sound level WTG noise [dB]
20,0	48,0
25,0	46,7
31,5	45,6
40,0	44,8
50,0	44,0
63,0	43,0
80,0	41,4
100,0	39,5
125,0	36,9
160,0	32,9
200,0	30,1

H Noise sensitive point: Finnish low frequency - User defined (5)



Frequency [Hz]	Sound level WTG noise [dB]
20,0	48,0
25,0	46,5
31,5	45,4
40,0	44,5
50,0	43,5
63,0	42,4
80,0	40,7
100,0	38,7
125,0	36,0
160,0	31,9
200,0	28,8

Alajärven Suolasalmenharjun tuulivoimapuisto

Välkeselvitys

LUONNOS

SWECO

Muutosluettelo

Versio:	Päiväys:	Muutoksen kuvaus	Tarkastettu	Hyväksyjä
01	18.10.2023		Tuomo Pynnönen	Pekka Lähde
02	22.04.2024	Täydennetty Suolasalmenharjun hankevaihtoehto VE2	Tiina Mönkäre	Tiina Mönkäre

Projekti:	Alajärven Suolasalmenharjun tuulivoimapuiston välkeselvitys
Työnumero:	25006696
Asiakas:	Pohjan Voima Oy
Päiväys:	10.05.2024
Tekijä:	Juho Ali-Tolppa

Sisältö

1. Johdanto

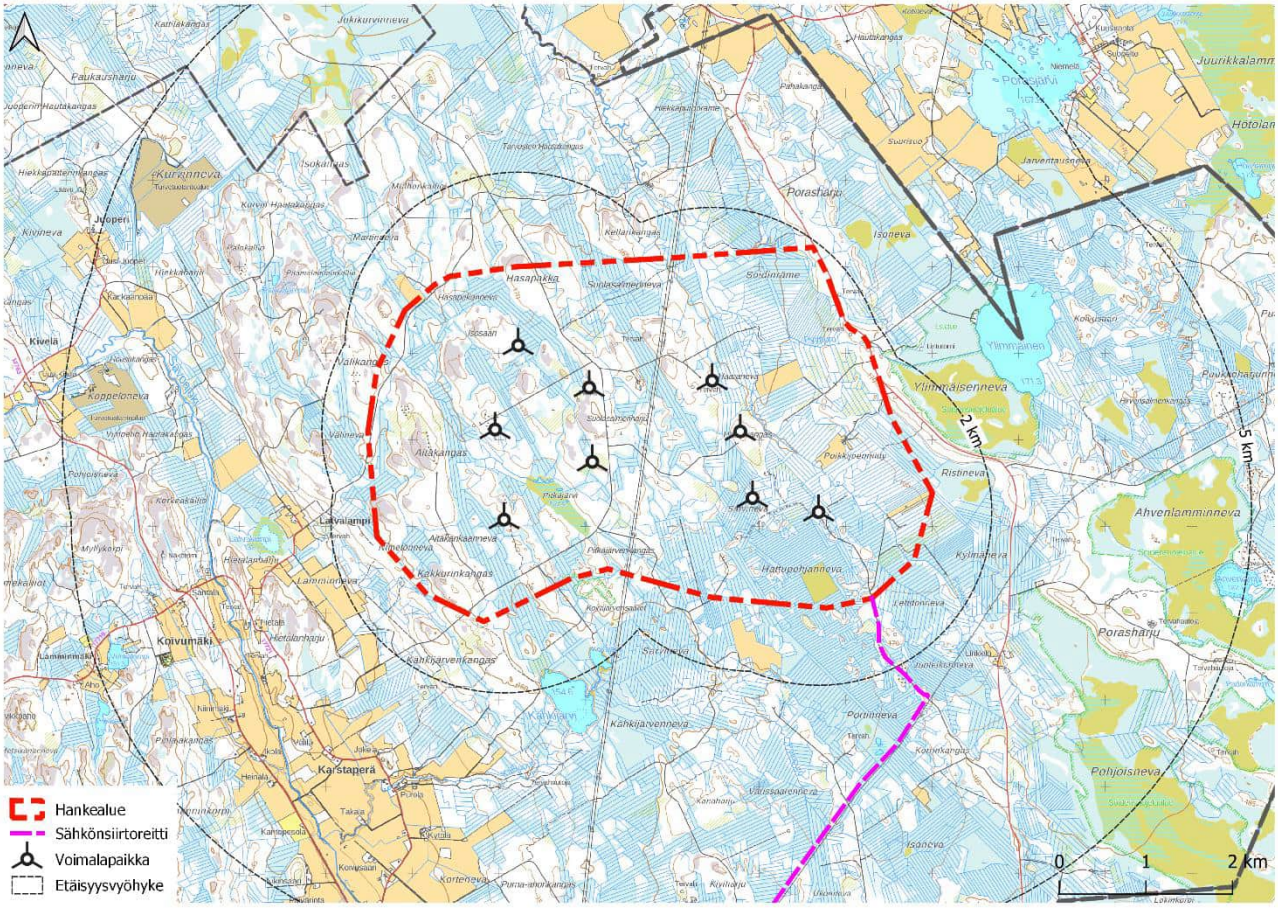
Tässä välkeselvityksessä on arvioitu mallintaen Alajärven kaupunkiin suunnitellun Suolasalmenharjun tuulivoimapuiston voimaloiden välkevaikutuksia. Suunniteltu Suolasalmenharjun hanke koostuu yhteensä 9 tuulivoimalasta. Välkemallinnus on tehty windPRO 3.6 -ohjelmiston SHADOW-moduulilla ja siinä on seurattu ympäristöministeriön ohjeistusta (Ympäristöministeriö, 2016).

Välkemallinnuksissa on käytetty Suolasalmenharjun voimaloissa Vestaksen V162-7.2 MW-voimalan lapalähtötietoja. Suolasalmenharjun hankevaihtoehdon VE1 mallinnuksissa voimaloiden napakorkeus oli 180 metriä ja roottorin halkaisija 240 metriä ja Suolasalmenharjun hankevaihtoehdon VE2 mallinnuksissa voimaloiden napakorkeus oli 180 metriä ja roottorin halkaisija oli 180 metriä. Välkevaikutukset on mallinnettu ilman puuston vaikutuksen huomioimista.

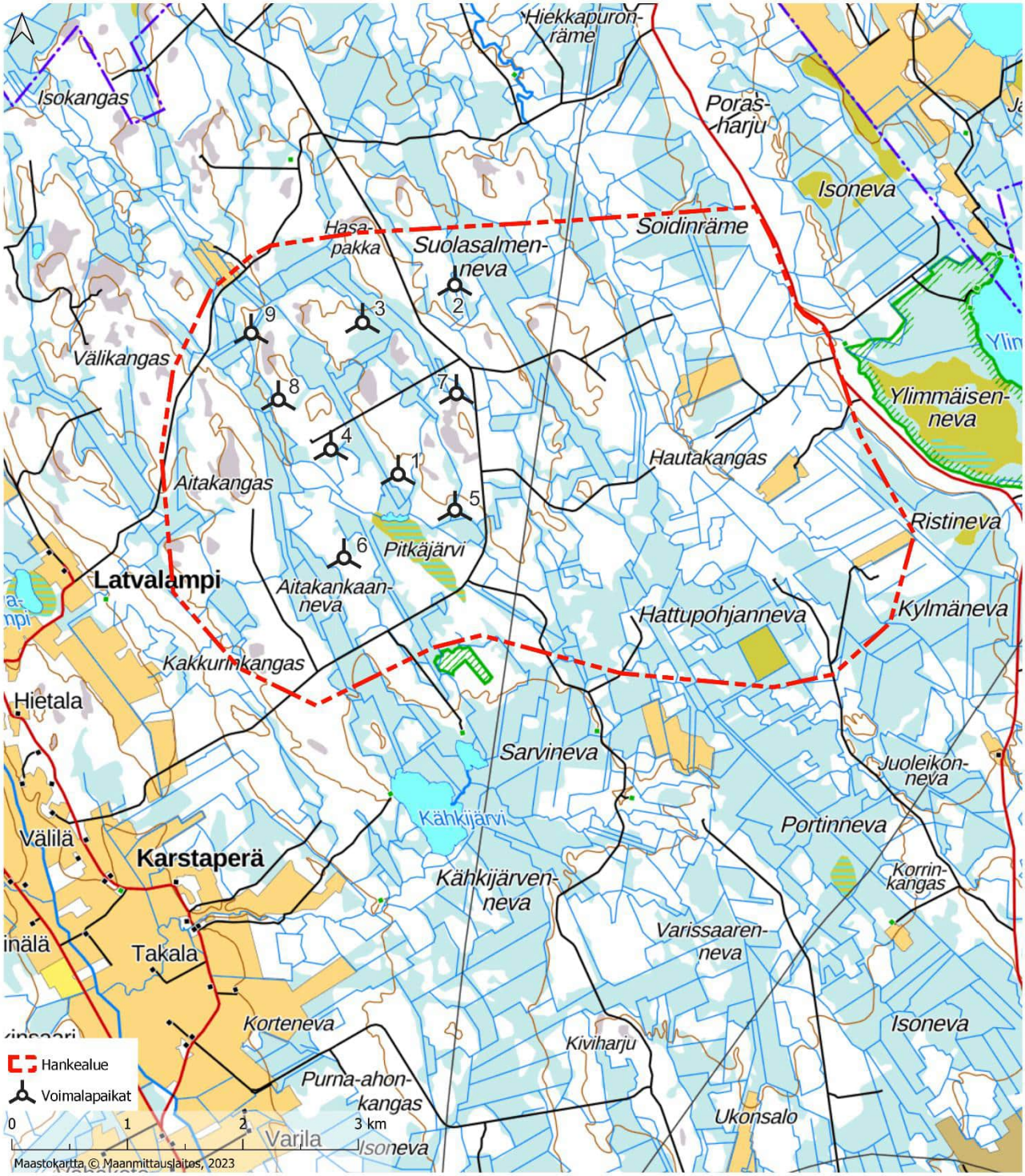
Tässä välkeselvityksessä on tarkasteltu Suolasalmenharjun osalta kahta hankevaihtoehtoa:

- VE1 (9 voimalaa)
- VE2 (9 voimalaa)

Hankeavaihtoehdon VE1 voimaloiden sijainnit on esitetty kuvassa 1 ja hankevaihtoehdon VE2 voimaloiden sijainnit on esitetty kuvassa 2. Hankevaihtoehdon VE1 ja VE2 voimaloiden koordinaatit on esitetty liitteiden mallinnustulosteissa.

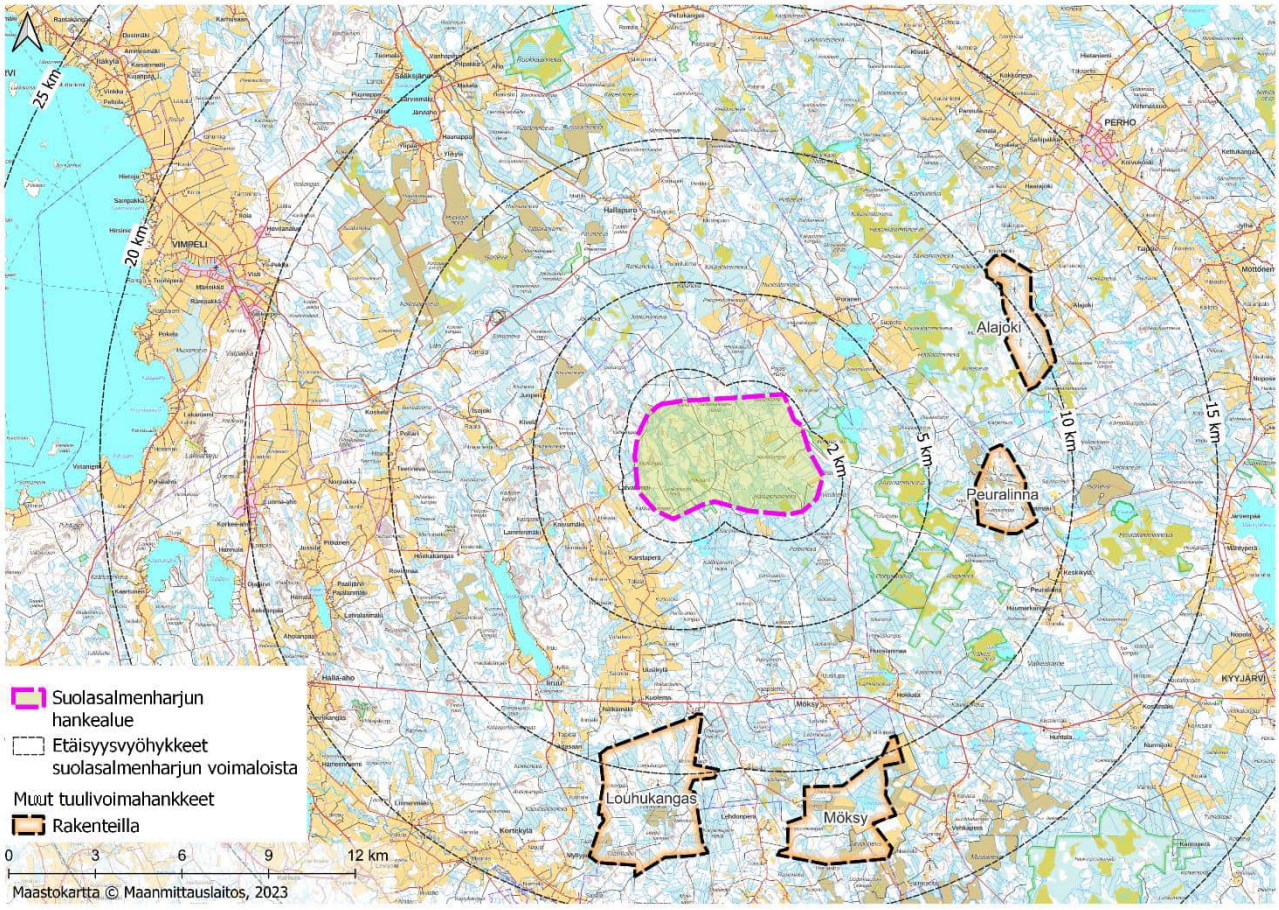


Kuva 1. Suolasalmenharjun tuulivoimahankkeen voimaloiden sijainnit VE1



Kuva 2. Suolasalmenharjun tuulivoimahankkeen voimaloiden sijainnit VE2

Tässä välkeselvityksessä on lisäksi tarkasteltu välkkeen yhteisvaikutuksia Möksyn ja Louhukankaan sekä Alajoki-Peuralinnan tuulivoimapuistojen kanssa. Yhteisvaikutusmallinnuksen tuulivoimapuistojen sijainnit kartalla on esitetty kuvassa 3 ja tuulivoimaloiden koordinaatit on esitetty mallinnusliitteissä.



Kuva 3. Yhteisvaikutustarkastelun tuulivoimapuistojen sijainnit

2. Välke

Välkettä eli valon ja varjon vilkkumista aiheutuu auringon paistaessa tuulivoimalan takaa. Roottorin lapojen pyöriminen aiheuttaa liikkuvan varjon, joka voi tuulivoimalan sijainnista, koosta ja auringon kulmasta riippuen ulottua jopa 1–3 kilometrin päähän tuulivoimalasta. (Ympäristöministeriö, 2016)

Välkevaikutus riippuu sääoloista. Välkettä on usein havaittavissa vain aurinkoisina päivinä ja tiettyinä aikoina vuorokaudesta. Vaikutuksen lieventämiseksi tuulivoimalat voidaan ohjelmoida pysähtymään välkkeen kannalta kriittisiksi ajoiksi. (Ympäristöministeriö, 2016)

3. Välkkeen ohjearvot

Suomessa ei ole määritelty välkevaikutuksille virallisia raja- tai ohjearvoja. Ympäristöhallinnon ohjeen (Ympäristöministeriö, 2016) mukaan on suositeltavaa käyttää apuna muiden maiden suosituksia välkkeen rajoittamisesta. Esimerkiksi Saksassa on rajoitettava maksimissaan kahdeksaan tuntiin vuodessa välkkeen määrä ns. todellisessa tilanteessa. Tanskassa sovelletaan tyypillisesti todellisen tilanteen raja-arvona kymmenentä tuntia vuodessa. Ruotsissa suositusarvot todellisen tilanteen välkevaikutuksille ovat enintään 8 tuntia vuodessa ja 30 minuuttia päivässä. (Ympäristöministeriö, 2016) Todellisen tilanteen mallinnuksessa huomioidaan tilastoidut arvot auringonpaistetunneista sekä tuulen suunnan jakaumasta.

Lisäksi Saksassa on raja-arvo 30 minuuttia välkettä päivässä sekä 30 tuntia välkettä vuodessa teoreettisessa maksimitilanteessa (Ympäristöministeriö, 2016). Teoreettisella maksimitilanteen mallinnuksella tarkoitetaan tilannetta, jossa oletetaan auringon paistavan aina (auringonnoususta auringonlaskuun), turbiinien olevan aina käynnissä ja roottorin olevan kohtisuorassa tarkastelurakennuksia kohti.

4. Lähtötiedot ja menetelmät

4.1 Lähtötiedot

Tuulivoimaloiden aiheuttamien välkevaikutuksen laskennassa varjot huomioidaan, jos aurinko on vähintään yli 3 astetta horisontin yläpuolella ja varjoksi lasketaan, kun siipi peittää vähintään 20 % auringosta. Tuulivoimalan lapaprofiilitietojen (lavan maksimileveyden ja lavan leveyden 90 % etäisyydellä lavan tyvestä) keskiarvon avulla ohjelmisto laskee maksimietäisyyden voimaloista, jossa välkevaikutukset lasketaan.

Mallinnuksissa Suolasalmenharjun voimaloissa on käytetty Vestaksen voimalalle V162-7.2 MW windPRO:n voimalatietoihin ilmoitettuja lavan maksimileveyden ja lavan leveyden 90 % etäisyydellä tyvestä mittoja. Kyseiset mallinnuksissa käytetyt mitat ovat:

- Lavan maksimileveys: 4,32 m
- Lavan leveys 90% etäisyydellä tyvestä: 1,68m

Mallinnuksissa napakorkeus Suolasalmenharjun hankevaihtoehdon VE1 voimaloissa on 180m ja roottorin halkaisija 240 m.Vaihtoehdon VE2 voimaloissa napakorkeus on 180 metriä ja roottorin halkaisija 180 metriä.

Auringon keskimääräiset paistetunnit perustuvat Seinäjoen Pelmaan sääaseman pitkäaikaisiin säätietoihin 1991-2020 (Ilmatieteen laitos, 2021). Laskentojen tuulen suuntana ja nopeusjakaumana käytettiin Ilmatieteen laitoksen Tuuliatlaksen dataa hankealueelta. Alla olevissa taulukoissa on esitetty todellisen tilanteen välkemäärän mallinnuksessa käytetyt auringonpaistetunnit (Taulukko 1) ja tuulisuusdata (Taulukko 2). Taulukossa 2 esitetyissä tuulisuusarvoissa on huomioitu aineistossa esitetty tuotantotappioarvio (6,66 %).

Taulukko 1. Auringopaistetunnit Seinäjoen Pelmaan sääasemalla (Ilmatieteenlaitos, 2021)

Kuukausi	Auringonpaistetunnit/kk (keskiarvo)	Auringonpaistetunnit/pv (keskiarvo)
Tammikuu	30	0,97
Helmikuu	71	2,54
Maaliskuu	145	4,68
Huhtikuu	189	6,30
Toukokuu	267	8,61
Kesäkuu	276	9.20
Heinäkuu	268	8,65
Elokuu	207	6,68
Syyskuu	140	4,67
Lokakuu	80	2,58
Marraskuu	31	1,03
Joulukuu	17	0,55

Taulukko 2. Mallinnuksessa käytetty tuulisuusdata (Ilmatieteen laitos 2009).

Ilmansuunta	Frekvenssi koko aineistolle (%)	Tuulisuus tuotantotappio huomioiden (h/v)
N	7,02	574
NNE	4,61	377
ENE	4,12	337
E	4,16	340
ESE	6,75	552
SSE	7,89	645
S	9,86	806
SSW	15,05	1231
WSW	14,57	1191
W	11,26	921
WNW	7,57	619
NNW	7,15	585

Voimaloista aiheutuvaa välkettä tarkasteltiin kahdeksan reseptoripisteen kohdalla Suolasalmenharjun tuulivoimaloiden lähistössä. Selvityksessä tarkastellut reseptoripisteiden koordinaatit on esitetty taulukossa 3.

Taulukko 3. Välkeselvityksessä tarkastellut reseptoripisteet

Tunnus	Rakennusluokitus	Itä (ETRS-TM35FIN)	Pohjoinen (ETRS-TM35FIN)
A	Asuinrakennus	353 645	7 000 066
B	Lomarakennus	354 006	6 999 820
C	Lomarakennus	355 606	7 003 632
D	Lomarakennus	357 094	6 998 661
E	Lomarakennus	357 545	7 004 366
F	Lomarakennus	358 259	6 998 677
G	Lomarakennus	361 494	7 002 345
H	Lomarakennus	361 730	6 998 471

4.2 Menetelmät

Tuulivoimaloiden aiheuttama välke on mallinnettu windPRO 3.6 -ohjelman SHADOW-moduulilla. Välkkeen havaintokorkeutena käytettiin 1,5 metriä. Välkevaikutuksen havainnointi-ikkunan leveys on 2m, korkeus 2m ja ikkunan oletetaan sijaitsevan 1 metrin korkeudella maanpinnasta. Mallinnukset tehtiin reseptoripisteiden

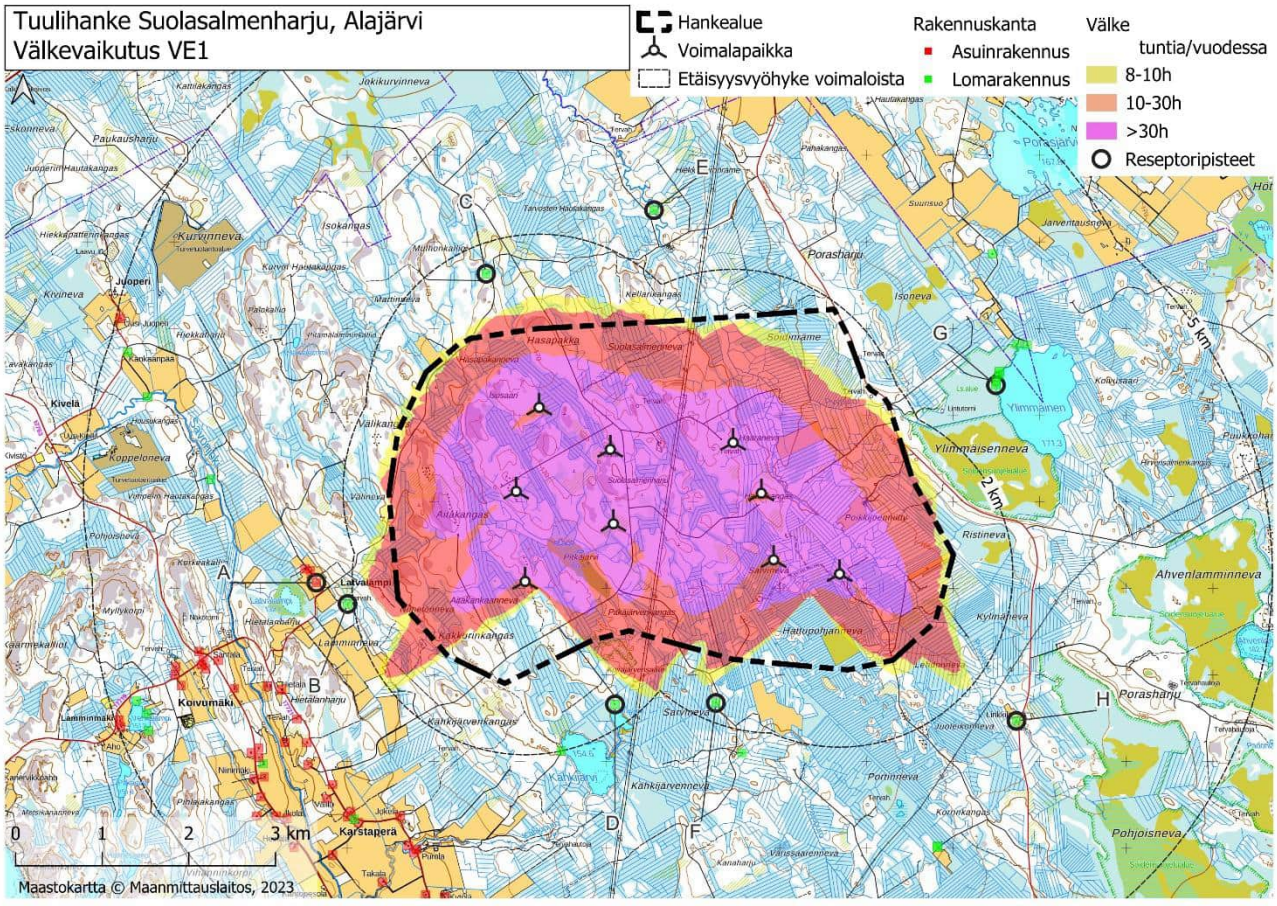
ollessa ns. kasvihuone-tilassa, jossa rakennukseen kohdistuvaa välkettä huomioidaan ilmansuunnasta riippumatta.

Maaston korkeusaineistona mallinnuksissa on käytetty Maanmittauslaitoksen kymmenen metrin korkeusmallia. Mallinnukset tehtiin ilman puuston vaikutuksen huomioimista.

5. Välkevaikutukset

5.1 Suolasalmenharjun hanke

VE1:n välkemallinnuksen tuloksien mukaiset ns. todellisen tilanteen välkevaikutusajat (h/v) ja teoreettisen maksimitilanteen välkevaikutusajat (h/v ja min/pv) on esitetty taulukossa 4. Mallinnustulosten mukainen välkevyöhykekartta ns. todellisen tilanteen välkevaikutuksille on esitetty kuvassa 4.



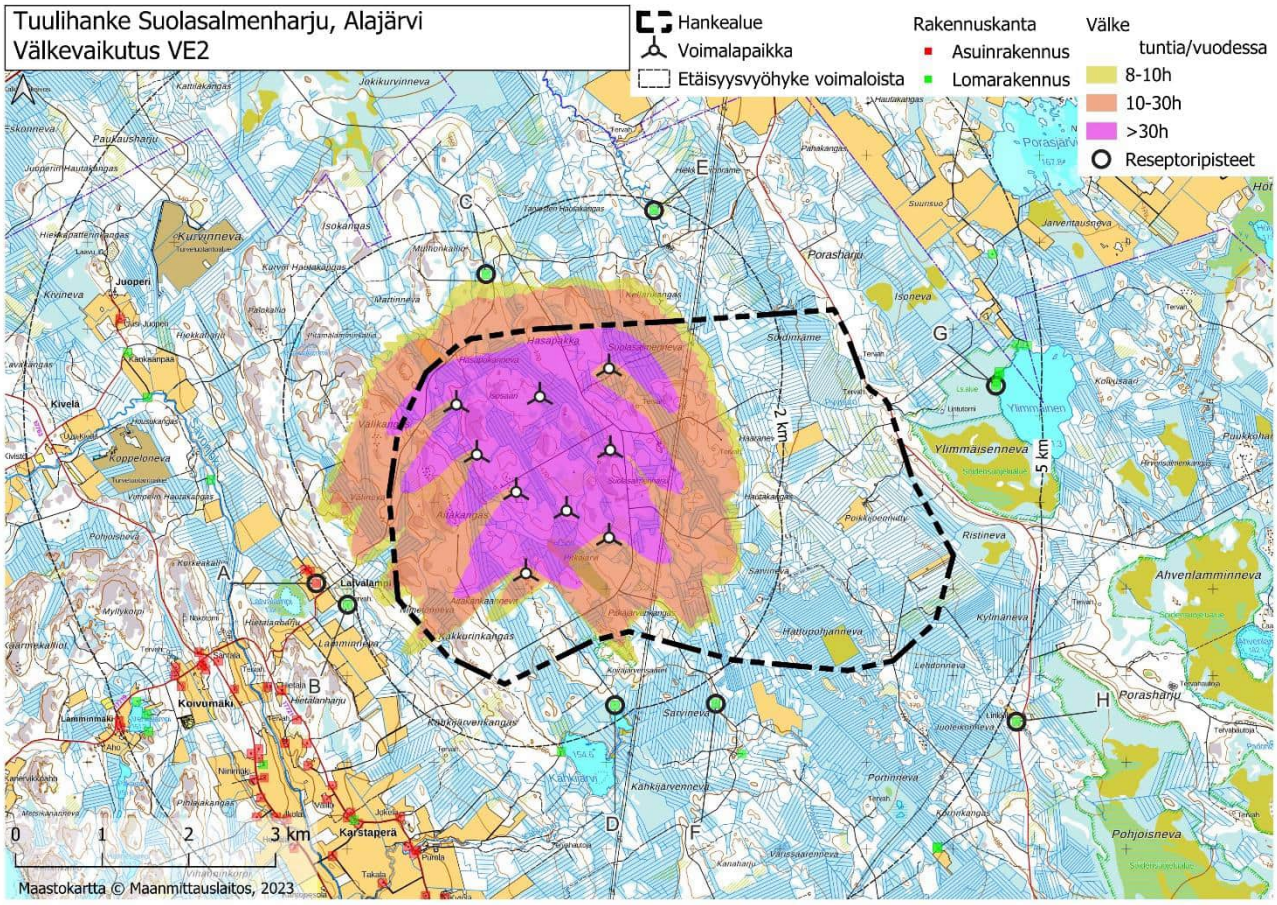
Kuva 4. Suolasalmenharjun VE1:n ns. todellisen tilanteen mallinnustulosten mukainen välkevyöhykekartta.

Mallinnustuloksien perusteella ns. todellisen tilanteen välkevaikutusajat eivät ylitä Saksan raja-arvoa (8 h/v) ja Ruotsissa käytettyä suositusarvoa (8 h/v) tarkastelupisteiden kohdalla Suolasalmenharjun VE1:n mallinnuksessa. VE1:n mallinnustulosten perusteella teoreettisen maksimiväl kkeen päiväkohtainen maksimiväl kemäärä ylittää Saksan päiväkohtaisen raja-arvon (30 min/pv) yhden tarkastelupisteen kohdalla (lomarakennus C). Hankevaihtoehdon VE1:n mallinnustuloksien perusteella teoreettisen maksimiväl kkeen välkevaikutusaika ei ylitä Saksan vuotuista raja-arvoa (30 h/v) tarkastelupisteiden kohdalla. (Taulukko 4)

Taulukko 4. Suolasalmenharjun VE1-layoutin välkemallinnuksen tulokset tarkastelupisteiden (A-H) kohdalla. Saksan teoreettisen maksimivälkkeen raja-arvon ylitys on lihavoitu.

Tarkastelurakennus	Ns. todellisen tilanteen välkevaikutus (h:min/v)	Teoreettisen maksimitilanteen vuotuinen välkevaikutus (h:min/v)	Teoreettisen maksimitilanteen päiväkohtainen maksimivälkevaikutus (h:min/pv)
A	0:00	0:00	0:00
B	0:00	0:00	0:00
C	3:02	28:22	**0:35**
D	1:07	4:14	0:13
E	0:00	0:00	0:00
F	0:00	0:00	0:00
G	0:00	0:00	0:00
H	0:00	0:00	0:00

Suolasalmenharjun VE2:n välkemallinnuksien mukaiset ns. todellisen tilanteen välkevaikutusajat (h/v) ja teoreettisen maksimivälkkeen välkevaikutusajat (h/v ja min/pv) on esitetty taulukossa 5. Hankevaihtoehdon VE2 mallinnustulosten mukainen välkevyöhykekartta ns. todellisen tilanteen välkevaikutuksille on esitetty kuvassa 5.



Kuva 5. Suolasalmenharjun VE2:n ns. todellisen tilanteen mallinnustuloksen mukainen välkevyöhykekartta.

Mallinnustuloksien perusteella ns. todellisen tilanteen välkevaikutusajat eivät ylitä Saksan raja-arvoa (8 h/v) ja Ruotsissa käytettyä suositusarvoa (8 h/v) tarkastelupisteiden kohdalla Suolasalmenharjun VE2 mallinnuksessa. VE2:n mallinnustulosten perusteella teoreettisen maksimivälkkeen päiväkohtainen maksimivälkeaika ylittää Saksan päiväkohtaisen raja-arvon (30 min/pv) yhden tarkastelupisteen kohdalla (lomarakennus C). VE2:n mallinnustuloksien perusteella teoreettisen maksimitilanteen välkemäärä ylittää Saksan vuotuisen raja-arvon (30 h/v) yhden tarkastelupisteen (lomarakennus C) kohdalla. (Taulukko 5)

Taulukko 5. Suolasalmenharjun VE2-layoutin välkemallinnuksen tulokset tarkastelupisteiden (A-H) kohdalla. Saksan teoreettisen maksimivälkkeen raja-arvon ylitykset on lihavoitu taulukossa.

Tarkastelurakennus	Ns. todellisen tilanteen välkevaikutus (h:min/v)	Teoreettinen maksimivälkevaikutus (h:min/v)	Teoreettisen maksimivälkkeen päiväkohtainen maksimivälkevaikutus (h:min/pv)
A	0:00	0:00	0:00
B	0:00	0:00	0:00
C	6:03	**53:18**	**0:52**
D	0:00	0:00	0:00
E	1:40	17:55	0:24
F	0:00	0:00	0:00
G	0:00	0:00	0:00
H	0:00	0:00	0:00

5.2 Yhteisvaikutukset

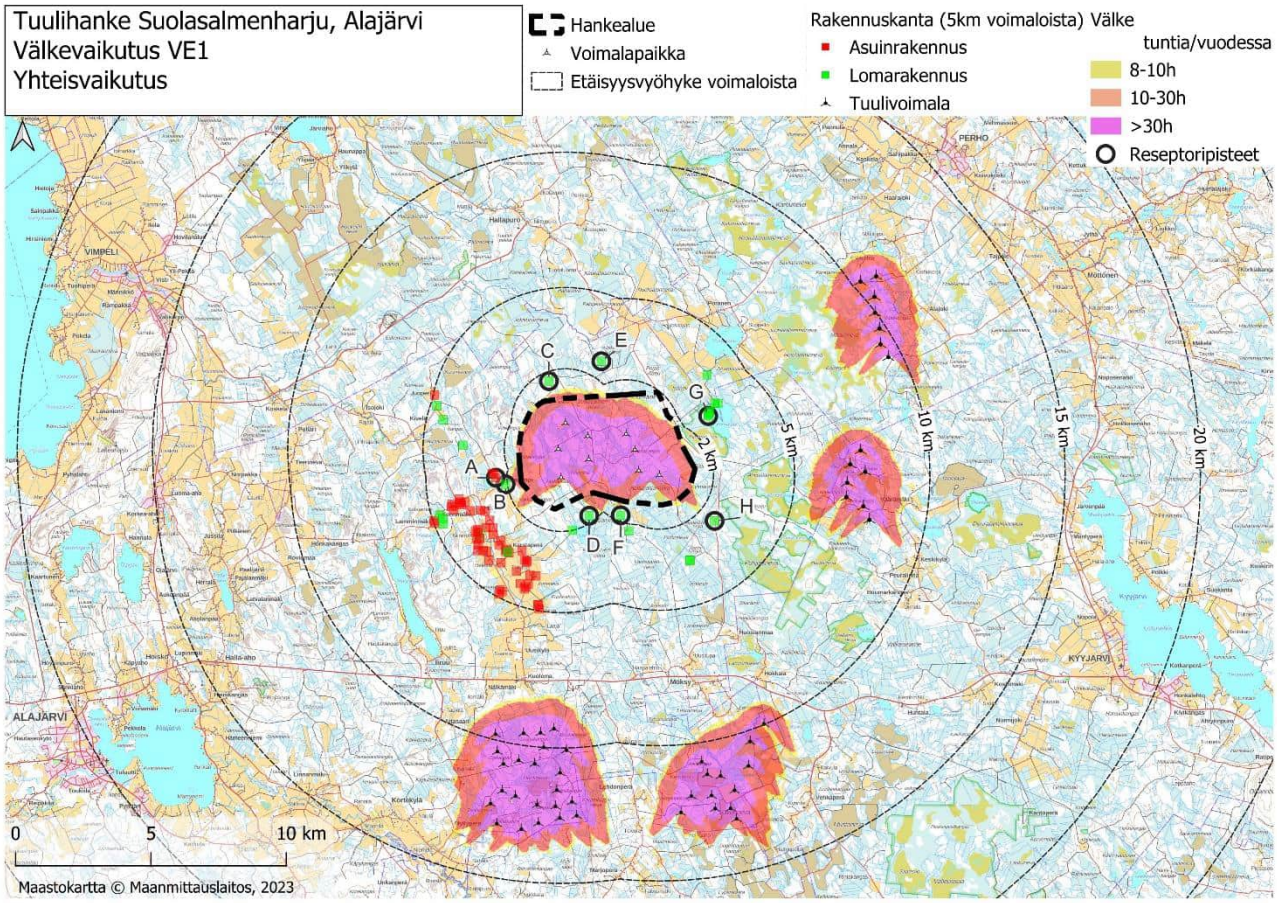
Suolasalmenharjun tuulivoimapuiston voimaloiden välkevaikutusten lisäksi tässä selvityksessä tarkasteltiin välkkeen yhteisvaikutuksia mallintaen Möksyn ja Louhukankaan sekä Alajoki-Peuralinnan tuulivoimapuistojen kanssa. Yhteisvaikutusmallinnuksessa käytettyjen tuulivoimapuistojen tuulivoimalamäärät, napakorkeudet, roottorin halkaisijat, voimalatyypit, lavan maksimileveydet sekä lavan leveydet 90 % etäisyydellä lavan tyvestä on esitetty taulukossa 6.

Yhteisvaikutusten arvioinnissa välkevaikutuksia mallinnettiin luvussa 4 esitetyin lähtötiedoin sekä menetelmin ja reseptoripisteinä käytettiin taulukossa 3 esitettyjä reseptoripisteitä. Myös yhteisvaikutusmallinnuksissa käytetyt voimalatyyppien lavan maksimileveydet sekä leveydet 90 % etäisyydellä tyvestä mitat ovat windPRO:n voimalakatalogiin ilmoitettuja mittoja. Yhteisvaikutusten arvioinnin voimaloiden sijaintikoordinaatit on esitetty liitteen 2 mallinnustulosteissa.

Taulukko 6. Yhteisvaikutusten arvioinnissa käytettyjen tuulivoimapuistojen tiedot

Tuulivoimapuisto	Tuulivoimaloiden määrä	Napakorkeus (m)	Roottorin halkaisija (m)	Voimalatyyppi	Lavan maksimileveys (m)	Lavan leveys 90 % etäisyydellä tyvestä (m)
Suolasalmenharju	9 (VE1)	180	240	Vestas V162 – 7.2 MW	4,32	1,68
	9 (VE2)	180	180	Vestas V162 – 7.2 MW	4,32	1,68
Möksy	13	139	162	Vestas V162	4,32	1,68
Louhukangas	23	139	162	Vestas V162	4,32	1,68
Alajoki-Peuralinna	14	162,5	155	Siemens Gamesa SG 6.0–155	4,50	1,40

Suolasalmenharjun VE1 layoutin välkeyhteisvaikutusmallinnuksen ns. todellisen tilanteen (h:min/v) ja teoreettisen maksimitilanteen (h:min/v ja h:min/pv) mallinnustulokset on esitetty taulukossa . Yhteisvaikutusmallinnuksen todellisen tilanteen (h/v) välkevyöhykekartta on esitetty kuvassa 6.



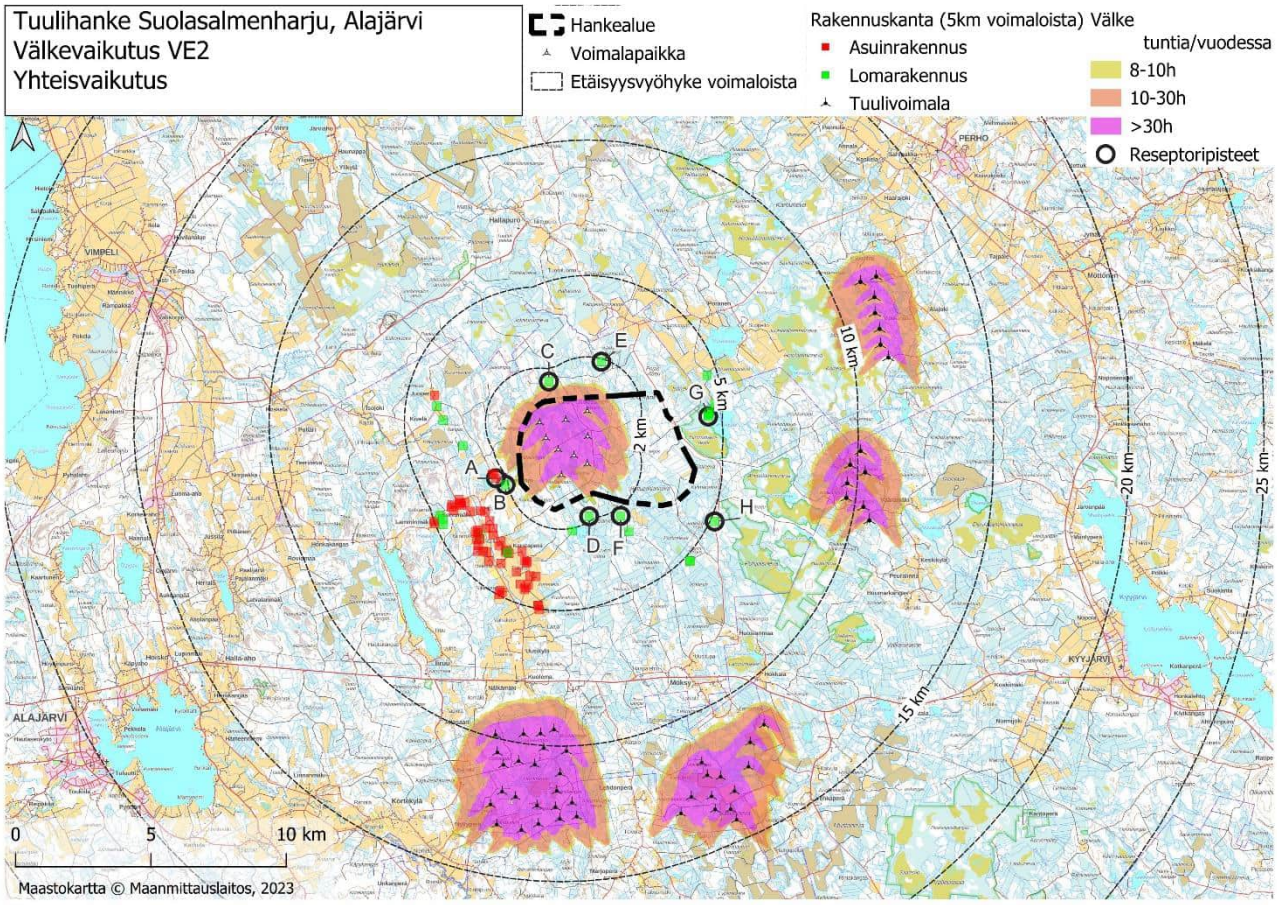
Kuva 6. Suolasalmenharjun VE1:n yhteisvaikutusmallinnuksen ns. todellisen tilanteen mallinnustuloksen mukainen välkevyöhykekartta.

Yhteisvaikutusten mallinnustuloksien perusteella ns. todellisen tilanteen tai teoreettisen maksimitilanteen välkevaikutusajat eivät kasva tarkastelupisteissä verrattuna pelkän Suolasalmenharjun tuulivoimapuiston välkemallinnustuloksiin (Taulukko 7). Mallinnustulosten perusteella todellisen tilanteen välkevaikutuksen välkevyöhykkeet eivät yhdisty yhteisvaikutustarkastelun puistoista Suolasalmenharjun puiston kanssa (Kuva 6). Mallinnustulosten perusteella Suolasalmenharjun tuulivoimaloista ja tarkasteltujen tuulivoimapuistojen tuulivoimaloista ei aiheudu välkkeen yhteisvaikutuksia.

Taulukko 7. Suolasalmenharjun VE1:n yhteisvaikutusten välkemallinnuksen tulokset ilman puuston vaikutuksen huomioimista. Saksan teoreettisen maksimivälkkeen raja-arvon ylitys on lihavoitu.

Tarkastelupiste	Ns. todellisen tilanteen välkevaikutus (h/v)	Teoreettisen maksimitilanteen välkevaikutus (h/v)	Teoreettisen maksimitilanteen päiväkohtainen maksimivälkevaikutus (h:min/pv)
A	0:00	0:00	0:00
B	0:00	0:00	0:00
C	3:02	28:22	**0:35**
D	1:07	4:14	0:13
E	0:00	0:00	0:00
F	0:00	0:00	0:00
G	0:00	0:00	0:00
H	0:00	0:00	0:00

Suolasalmenharjun VE2 layoutin välkeyhteisvaikutusmallinnuksen ns. todellisen tilanteen (h:min/v) ja teoreettisen maksimitilanteen (h:min/v ja h:min/pv) mallinnustulokset on esitetty taulukossa 8. Hankevaihtoehdon VE2 yhteisvaikutusmallinnuksen ns. todellisen tilanteen (h/v) mallinnustulosten mukainen välkevyöhykekartta on esitetty kuvassa 7.



Kuva 7. Suolasalmenharjun VE2:n yhteisvaikutusmallinnuksen ns. todellisen tilanteen välkevyöhykekartta.

Yhteisvaikutusten mallinnustuloksien perusteella ns. todelliseen tilanteen tai teoreettisen maksimitilanteen välkevaikutusajat eivät kasva tarkastelupisteissä verrattuna pelkän Suolasalmenharjun VE2 tuulivoimapuiston välkemallinnustuloksiin (Taulukko 8). Mallinnustulosten perusteella ns. todellisen tilanteen välkevaikutuksen välkevyöhykkeet eivät yhdisty yhteisvaikutustarkastelun puistoista Suolasalmenharjun puiston vyöhykkeiden kanssa (Kuva 7). Mallinnustulosten perusteella Suolasalmenharjun tuulivoimaloista ja tarkasteltujen tuulivoimapuistojen tuulivoimaloista ei aiheudu välkkeen yhteisvaikutuksia.

Taulukko 8. Suolasalmenharjun VE2:n yhteisvaikutusten välkemallinnuksen tulokset ilman puuston vaikutuksen huomioimista. Saksan teoreettisen maksimivälkkeen raja-arvon ylitykset on lihavoitu taulukossa.

Tarkastelupiste	Ns. todellisen tilanteen välkevaikutus (h:min/v)	Teoreettisen maksimitilanteen välkevaikutus (h:min/v)	Teoreettisen maksimitilanteen päiväkohtainen maksimivälkevaikutus (h:min/pv)
A	0:00	0:00	0:00
B	0:00	0:00	0:00
C	6:03	**53:18**	**0:52**
D	0:00	0:00	0:00
E	1:40	17:55	0:24
F	0:00	0:00	0:00
G	0:00	0:00	0:00
H	0:00	0:00	0:00

5.3 Epävarmuustekijät

Ns. todellisen tilanteen välkevaikutuksen mallinnustulos edustaa keskimääräistä varjostustilannetta, jossa on käytetty auringonpaistetuntien ja tuulisuuden tilastoituja arvoja. Välkkeen määrä saattaa poiketa mallinnetuista arvoista, mikäli sääolosuhteet eroavat merkittävästi käytetyistä tilastoiduista arvoista. Välkkeen muodostumiseen vaikuttaa tuulivoimaloiden käyttöaste, jonka pienentyessä välke yksittäisessä pisteessä saattaa pienentyä.

Mallinnuksissa reseptoripisteissä käytettiin niin sanottua kasvihuone -oletusta, jossa rakennukseen kohdistuvaa välkettä tarkastellaan ilmansuunnasta riippumatta. Todellisessa tilanteessa sisätiloihin muodostuu mahdollisesti välkettä vain niihin huoneisiin, joissa on ikkunoita tuulivoimaloita kohden. Myös mallinnuksessa käytettävän havainnointi-ikkunan koko vaikuttaa mallinnustulokseen.

Välkemallinnus on tehty ilman puuston vaikutuksen huomioimista. Puusto voi rajoittaa rakennuksiin kohdistuvaa välkevaikutusta huomattavasti, mutta puuston peittävyys vaihtelee vuodenaikojen ja vuosien välillä, mikä lisää puustosta aiheutuvaa epävarmuutta.

6. Yhteenveto

Tässä välkeselvityksessä on arvioitu mallintaen suunnitellun Alajärven Suolasalmenharjun tuulivoimapuiston välkevaikutuksia. Välkemallinnukset tehtiin Suolasalmenharjun 9 voimalan hankevaihtoehdoille VE1 ja VE2. Mallinnukset tehtiin ilman puuston vaikutuksen huomioimista. Mallinnuksissa Suolasalmenharjun hankevaihtoehdon VE1 voimaloiden napakorkeus oli 180 m ja roottorin halkaisija 240 m. Suolasalmenharjun hankevaihtoehdon VE2 voimaloiden napakorkeus oli 180 m ja roottorin halkaisija 180 m mallinnuksissa.

Mallinnustulosten perusteella ns. todellisen tilanteen välkevaikutus ei ylitä Saksan raja-arvoa (8 h/v) ja Ruotsin vuotuista suositusarvoa (8 h/v) Suolasalmenharjun tuulivoimapuiston välkevaikutusalueen asuin- tai lomarakennusten kohdalla Suolasalmenharjun hankevaihtoehdon VE1 ja VE2 mallinnuksissa.

Hankevaihtoehdon VE1 mallinnustulosten perusteella teoreettisen maksimitilanteen välkevaikutusaika ei ylitä Saksan vuotuista raja-arvoa (30 h/v) Suolasalmenharjun tuulivoimapuiston vaikutusalueen asuin- tai lomarakennusten kohdalla. Hankevaihtoehdon VE1 mallinnustulosten perusteella teoreettisen

maksimivälkkeen päiväkohtainen maksimivälkevaikutusaika ylittää Saksan raja-arvon (30 min/pv) hankevaihtoehdon VE1 mallinnuksessa tarkastelurakennuksen C kohdalla.

Suolasalmenharjun VE2 hankevaihtoehdon mallinnustulosten perusteella teoreettisen maksimivälkkeen välkevaikutusaika ylittää Saksan vuotuisen raja-arvon (30 h/v) yhden tarkastelurakennuksen kohdalla (lomarakennus C). Hankevaihtoehdon VE2 mallinnustulosten perusteella teoreettisen maksimivälkkeen päiväkohtainen maksimivälkevaikutusaika ylittää Saksan raja-arvon (30 min/pv) hankevaihtoehdon VE1 mallinnuksessa yhden tarkastelurakennuksen (lomarakennus C) kohdalla.

Lisäksi välkeselvityksessä tarkasteltiin mallintaen välkkeen yhteisvaikutuksia Möksyn ja Louhukankaan sekä Alajoki-Peuralinnan tuulivoimapuistojen kanssa. Yhteisvaikutusmallinnukset tehtiin myös ilman puuston vaikutuksen huomioimista. Yhteisvaikutusmallinnustulosten perusteella tarkastelupisteissä välkkeen ns. todellisen tilanteen tai teoreettisen maksimivälkkeen välkevaikutusajat eivät kasva pelkän Suolasalmenharjun tuulivoimapuiston mallinnetuista arvoista. Mallinnustulosten perusteella välkeselvityksessä tarkastelluista tuulivoimapuistoista ja Suolasalmenharjun tuulivoimapuistosta ei aiheudu välkkeen yhteisvaikutuksia Suolasalmenharjun VE1 ja VE2 yhteisvaikutusmallinnustuloksien perusteella.

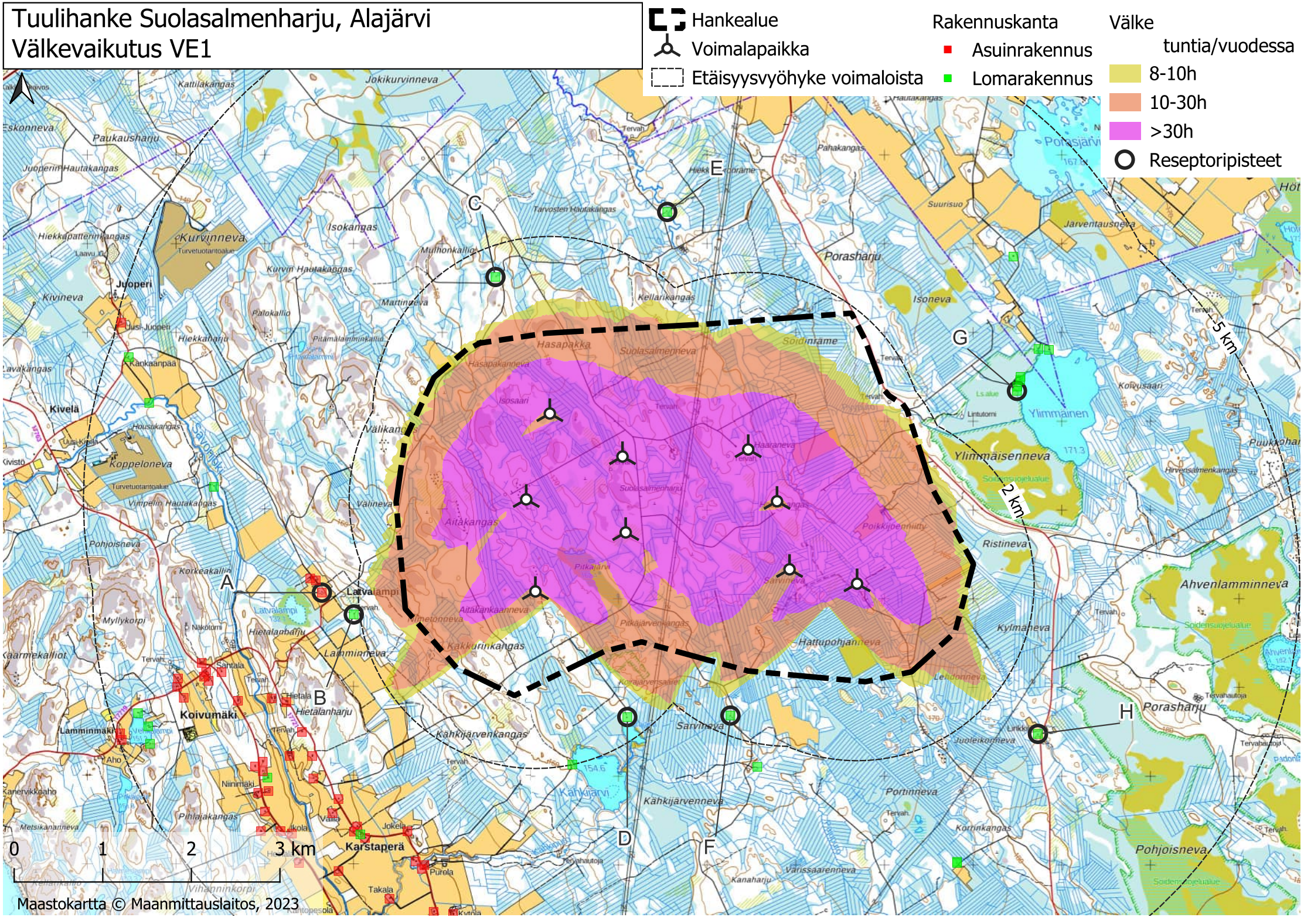
7. Lähteet

Ilmatieteen laitos, 2009. Suomen Tuuliatlas. Tuulisuustiedot koordinaattipisteessä Lat. 63.11817, Long. 24.17985. http://tuuliatlas.fmi.fi/fi/ (Luettu 15.03.2023).

Ilmatieteen laitos, 2021. Tilastoja Suomen ilmastosta ja merestä 1991–2020. Raportteja 8/2021.

Ympäristöministeriö, 2016. Tuulivoimarakentamisen suunnittelu Päivitys 2016. Ympäristöministeriö, Ympäristöhallinnon ohjeita 5/2016, http://urn.fi/URN:ISBN:978-952-11-4634-3.

LIITE 1. Suolasalmenharjun tuulivoimapuiston VE1 ja VE2 välkemallinnustulosteita


Tuulihanke Suolasalmenharju, Alajärvi
Välkevaikutus VE1
Hankealue
Voimalapaikka
Etäisyysvyöhyke voimaloista
Rakennuskanta
Asuinrakennus
Lomarakennus
Välke
tuntia/vuodessa
8-10h
10-30h
>30h
Reseptoripisteet
A
B
C
D
E
F
G
H
1,5 km
2 km
0
1
2
3 km
Maastokartta © Maanmittauslaitos, 2023

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Ilmalanportti 2
FI-00240 Helsinki

Juho Ali-Tolppa / juho.ali-tolppa@sweco.fi

Calculated:
19.6.2023 9.39/3.6.361

SHADOW - Main Result

Calculation: Alajärvi Suolasalmenharju Välkemallinnus 19062023

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) []

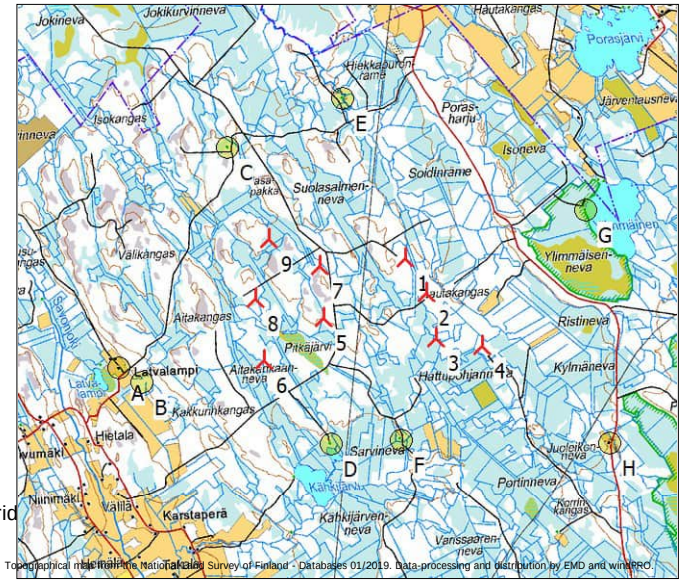
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,97	2,54	4,68	6,30	8,61	9,20	8,65	6,68	4,67	2,58	1,03	0,55

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
574	377	337	340	552	645	806	1 231	1 191	921	619	585	8 178

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Elevation Grid Data Object: Suolasalmenharju_EMDGrid
Receptor grid resolution: 1,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



WTGs

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
1	358 459	7 001 683	165,2	VESTAS V162-7.2 7200 240.0 !O! h...	Yes	VESTAS	V162-7.2-7 200	7 200	240,0	180,0	2 036	9,5
2	358 785	7 001 098	171,2	VESTAS V162-7.2 7200 240.0 !O! h...	Yes	VESTAS	V162-7.2-7 200	7 200	240,0	180,0	2 036	9,5
3	358 926	7 000 329	165,9	VESTAS V162-7.2 7200 240.0 !O! h...	Yes	VESTAS	V162-7.2-7 200	7 200	240,0	180,0	2 036	9,5
4	359 689	7 000 167	163,3	VESTAS V162-7.2 7200 240.0 !O! h...	Yes	VESTAS	V162-7.2-7 200	7 200	240,0	180,0	2 036	9,5
5	357 076	7 000 746	171,2	VESTAS V162-7.2 7200 240.0 !O! h...	Yes	VESTAS	V162-7.2-7 200	7 200	240,0	180,0	2 036	9,5
6	356 056	7 000 079	165,1	VESTAS V162-7.2 7200 240.0 !O! h...	Yes	VESTAS	V162-7.2-7 200	7 200	240,0	180,0	2 036	9,5
7	357 040	7 001 604	175,5	VESTAS V162-7.2 7200 240.0 !O! h...	Yes	VESTAS	V162-7.2-7 200	7 200	240,0	180,0	2 036	9,5
8	355 953	7 001 119	168,2	VESTAS V162-7.2 7200 240.0 !O! h...	Yes	VESTAS	V162-7.2-7 200	7 200	240,0	180,0	2 036	9,5
9	356 219	7 002 089	171,8	VESTAS V162-7.2 7200 240.0 !O! h...	Yes	VESTAS	V162-7.2-7 200	7 200	240,0	180,0	2 036	9,5

Shadow receptor-Input

No.	East	North	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
A	353 645	7 000 066	138,2	2,0	2,0	1,0	90,0	"Green house mode"	3,0
B	354 006	6 999 820	140,2	2,0	2,0	1,0	90,0	"Green house mode"	3,0
C	355 606	7 003 632	161,7	2,0	2,0	1,0	90,0	"Green house mode"	3,0
D	357 094	6 998 661	156,3	2,0	2,0	1,0	90,0	"Green house mode"	3,0
E	357 545	7 004 366	153,6	2,0	2,0	1,0	90,0	"Green house mode"	3,0
F	358 259	6 998 677	160,4	2,0	2,0	1,0	90,0	"Green house mode"	3,0
G	361 494	7 002 345	171,7	2,0	2,0	1,0	90,0	"Green house mode"	3,0
H	361 730	6 998 471	171,0	2,0	2,0	1,0	90,0	"Green house mode"	3,0

Calculation Results

Shadow receptor

No.	Shadow, worst case Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow, expected values Shadow hours per year [h/year]
A	0:00	0	0:00	0:00
B	0:00	0	0:00	0:00
C	28:22	64	0:35	3:02
D	4:14	27	0:13	1:07
E	0:00	0	0:00	0:00
F	0:00	0	0:00	0:00

To be continued on next page...

SHADOW - Main Result

Calculation: Alajärvi Suolasalmenharju Välkemallinnus 19062023

...continued from previous page

No.	Shadow, worst case: Shadow hours per year [h/year]	Shadow, worst case: Shadow days per year [days/year]	Shadow, worst case: Max shadow hours per day [h/day]	Shadow, expected values: Shadow hours per year [h/year]
G	0:00	0	0:00	0:00
H	0:00	0	0:00	0:00

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	VESTAS V162-7.2 7200 240.0 !O! hub: 180,0 m (TOT: 300,0 m) (1)	0:00	0:00
2	VESTAS V162-7.2 7200 240.0 !O! hub: 180,0 m (TOT: 300,0 m) (2)	0:00	0:00
3	VESTAS V162-7.2 7200 240.0 !O! hub: 180,0 m (TOT: 300,0 m) (3)	0:00	0:00
4	VESTAS V162-7.2 7200 240.0 !O! hub: 180,0 m (TOT: 300,0 m) (4)	0:00	0:00
5	VESTAS V162-7.2 7200 240.0 !O! hub: 180,0 m (TOT: 300,0 m) (5)	0:00	0:00
6	VESTAS V162-7.2 7200 240.0 !O! hub: 180,0 m (TOT: 300,0 m) (6)	4:14	1:07
7	VESTAS V162-7.2 7200 240.0 !O! hub: 180,0 m (TOT: 300,0 m) (7)	0:00	0:00
8	VESTAS V162-7.2 7200 240.0 !O! hub: 180,0 m (TOT: 300,0 m) (8)	0:00	0:00
9	VESTAS V162-7.2 7200 240.0 !O! hub: 180,0 m (TOT: 300,0 m) (9)	28:22	3:02

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

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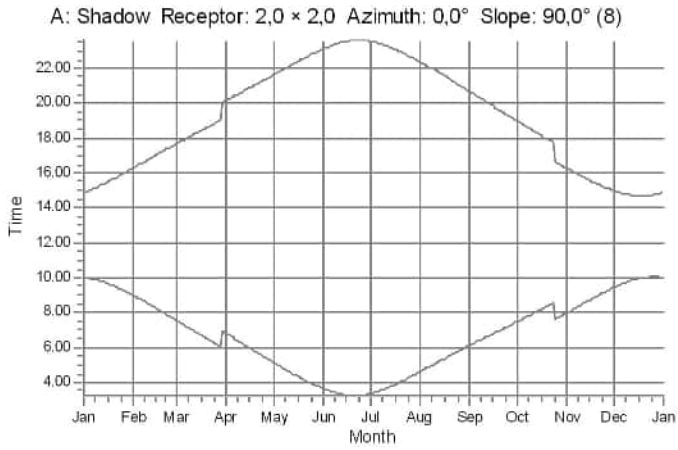
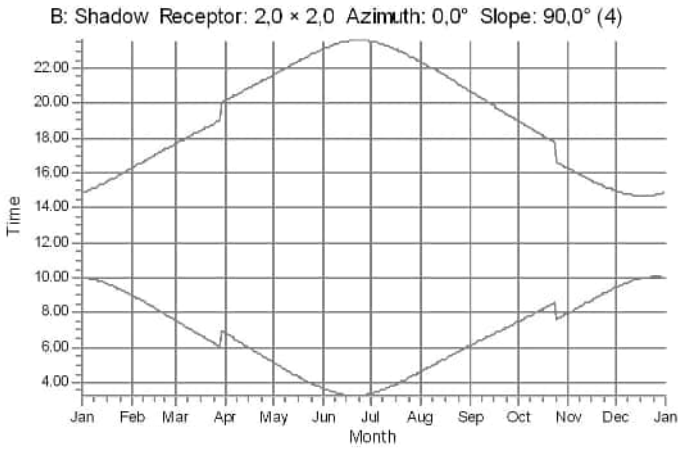
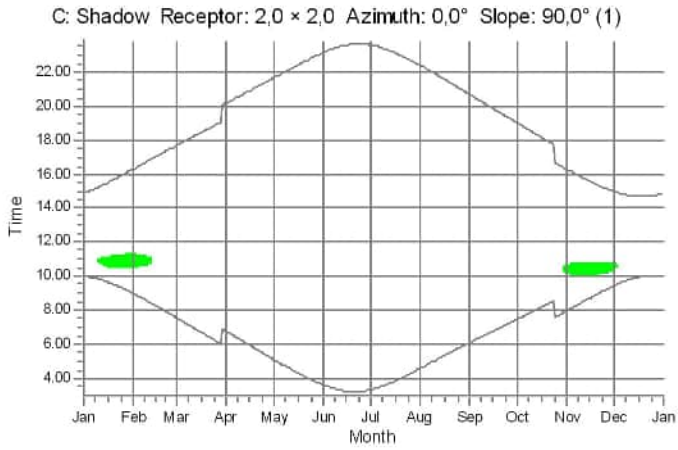
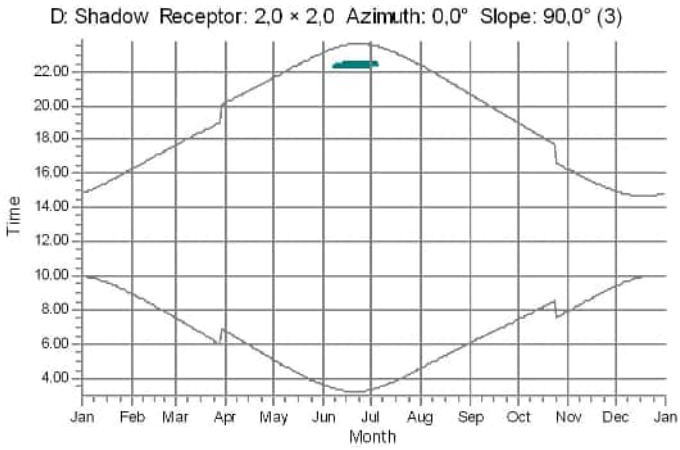
SHADOW - Calendar, graphical

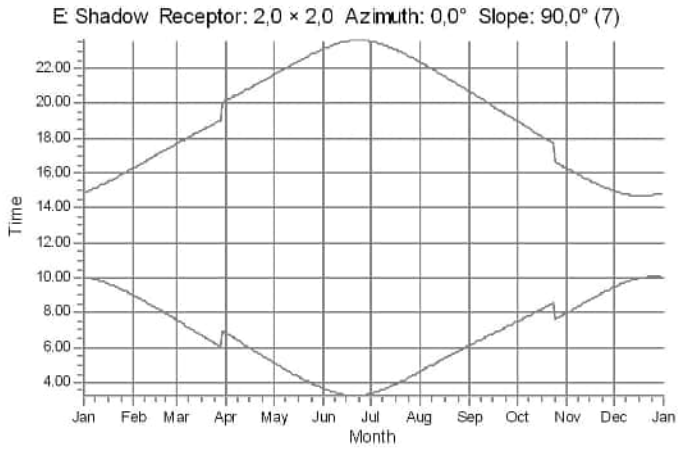
Calculation: Alajärvi Suolasalmenharju Välkemallinnus 19062023

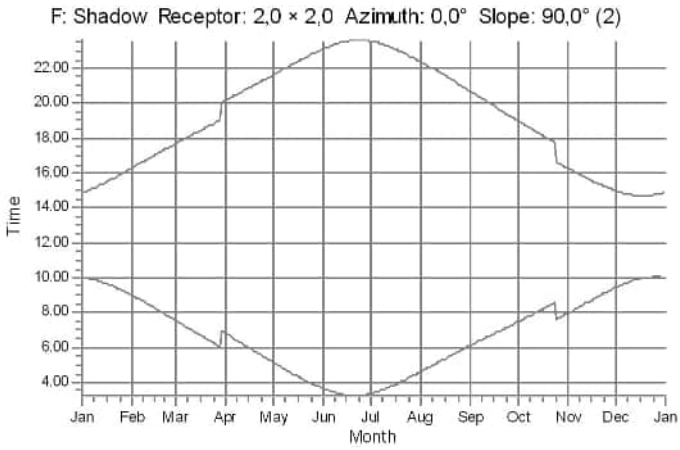












WTGs

6: VESTAS V162-7.2 7200 240.0 !O! hub: 180,0 m (TOT: 300,0 m) (6)

9: VESTAS V162-7.2 7200 240.0 !O! hub: 180,0 m (TOT: 300,0 m) (9)

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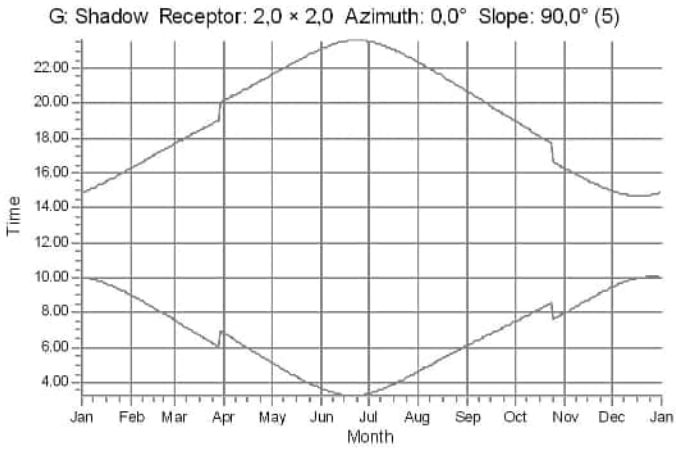
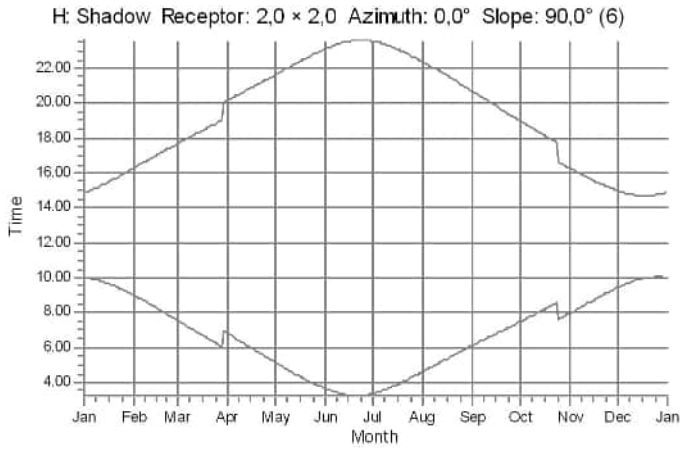
FI-00240 Helsinki

Juho Ali-Tolppa / juho.ali-tolppa@sweco.fi
Calculated:
19.6.2023 9.39/3.6.361

SHADOW - Calendar, graphical

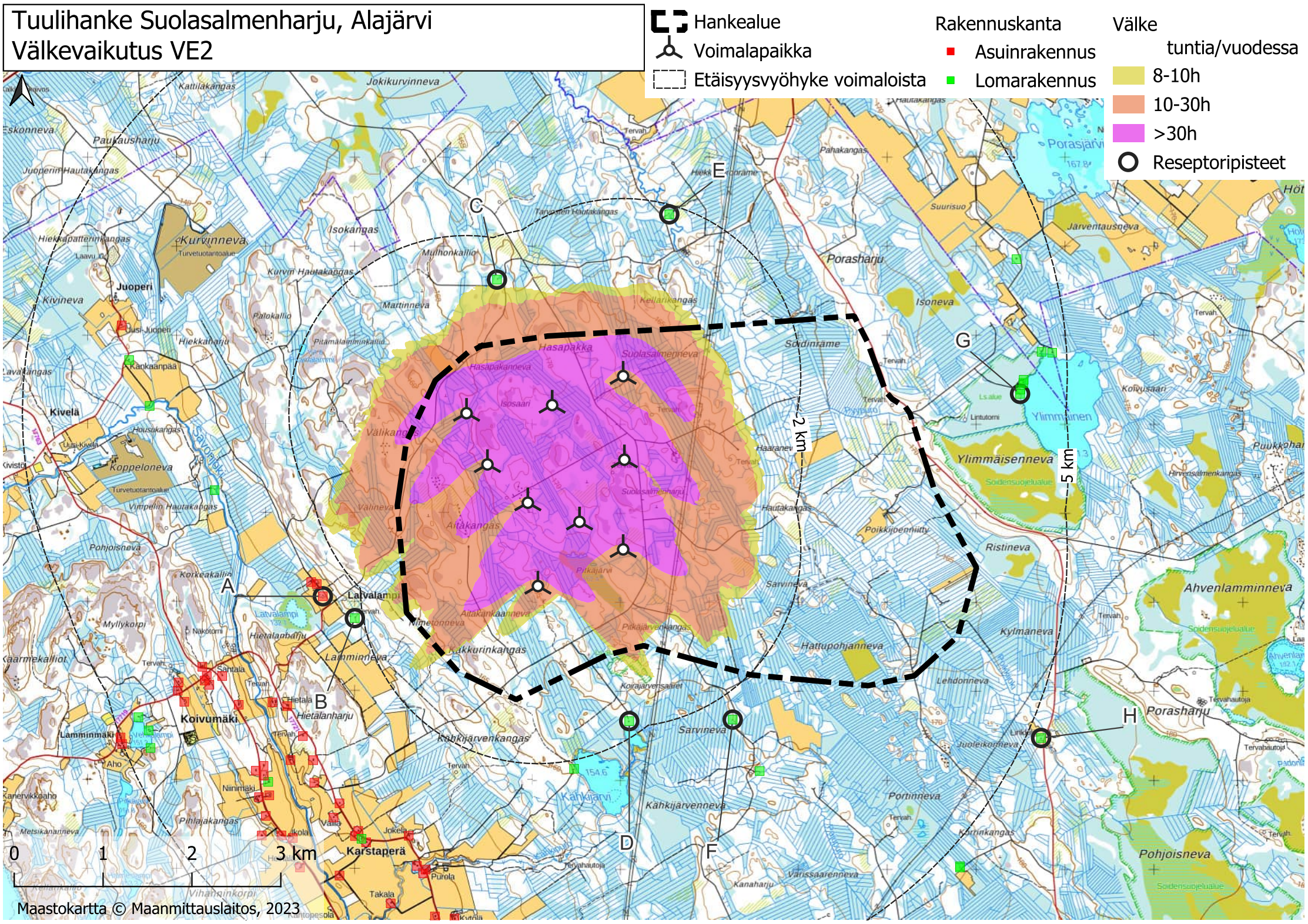
Calculation: Alajärvi Suolasalmenharju Välkemallinnus 19062023





WTGs

Tuulihanke Suolasalmenharju, Alajärvi
Välkevaikutus VE2



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Juho Ali-Tolppa / juho.ali-tolppa@sweco.fi

Calculated:
28.2.2024 11.11/3.6.377

SHADOW - Main Result

Calculation: Alajärvi Suolasalmenharju Välkemallinnus VE2 28022024

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) []

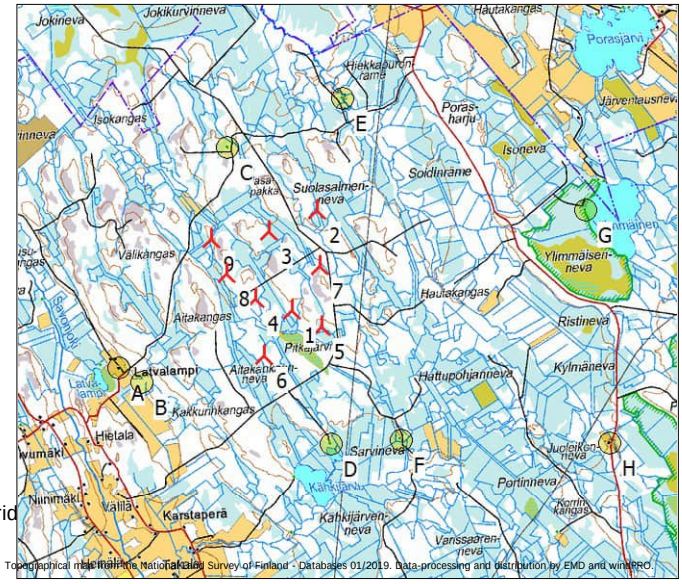
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,97	2,54	4,68	6,30	8,61	9,20	8,65	6,68	4,67	2,58	1,03	0,55

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
574	377	337	340	552	645	806	1 231	1 191	921	619	585	8 178

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Elevation Grid Data Object: Suolasalmenharju_EMDGrid
Receptor grid resolution: 1,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



WTGs

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
1	356 535	7 000 904	167,9	VESTAS V162-7.2 7200 180.0 !O! h...	Yes	VESTAS	V162-7.2-7 200	7 200	180,0	180,0	2 036	9,5
2	357 026	7 002 544	164,8	VESTAS V162-7.2 7200 180.0 !O! h...	Yes	VESTAS	V162-7.2-7 200	7 200	180,0	180,0	2 036	9,5
3	356 227	7 002 219	171,2	VESTAS V162-7.2 7200 180.0 !O! h...	Yes	VESTAS	V162-7.2-7 200	7 200	180,0	180,0	2 036	9,5
4	355 953	7 001 119	168,2	VESTAS V162-7.2 7200 180.0 !O! h...	Yes	VESTAS	V162-7.2-7 200	7 200	180,0	180,0	2 036	9,5
5	357 026	7 000 594	169,8	VESTAS V162-7.2 7200 180.0 !O! h...	Yes	VESTAS	V162-7.2-7 200	7 200	180,0	180,0	2 036	9,5
6	356 066	7 000 181	167,9	VESTAS V162-7.2 7200 180.0 !O! h...	Yes	VESTAS	V162-7.2-7 200	7 200	180,0	180,0	2 036	9,5
7	357 040	7 001 604	175,5	VESTAS V162-7.2 7200 180.0 !O! h...	Yes	VESTAS	V162-7.2-7 200	7 200	180,0	180,0	2 036	9,5
8	355 498	7 001 550	163,8	VESTAS V162-7.2 7200 180.0 !O! h...	Yes	VESTAS	V162-7.2-7 200	7 200	180,0	180,0	2 036	9,5
9	355 263	7 002 127	160,4	VESTAS V162-7.2 7200 180.0 !O! h...	Yes	VESTAS	V162-7.2-7 200	7 200	180,0	180,0	2 036	9,5

Shadow receptor-Input

No.	East	North	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
A	353 645	7 000 066	138,2	2,0	2,0	1,0	90,0	"Green house mode"	3,0
B	354 006	6 999 820	140,2	2,0	2,0	1,0	90,0	"Green house mode"	3,0
C	355 606	7 003 632	161,7	2,0	2,0	1,0	90,0	"Green house mode"	3,0
D	357 094	6 998 661	156,3	2,0	2,0	1,0	90,0	"Green house mode"	3,0
E	357 545	7 004 366	153,6	2,0	2,0	1,0	90,0	"Green house mode"	3,0
F	358 259	6 998 677	160,4	2,0	2,0	1,0	90,0	"Green house mode"	3,0
G	361 494	7 002 345	171,7	2,0	2,0	1,0	90,0	"Green house mode"	3,0
H	361 730	6 998 471	171,0	2,0	2,0	1,0	90,0	"Green house mode"	3,0

Calculation Results

Shadow receptor

No.	Shadow, worst case Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow, expected values Shadow hours per year [h/year]
A	0:00	0	0:00	0:00
B	0:00	0	0:00	0:00
C	53:18	122	0:52	6:03
D	0:00	0	0:00	0:00
E	17:55	60	0:24	1:40
F	0:00	0	0:00	0:00

To be continued on next page...

SHADOW - Main Result

Calculation: Alajärvi Suolasalmenharju Välkemallinnus VE2 28022024

...continued from previous page

No.	Shadow, worst case: Shadow hours per year [h/year]	Shadow, worst case: Shadow days per year [days/year]	Shadow, worst case: Max shadow hours per day [h/day]	Shadow, expected values: Shadow hours per year [h/year]
G	0:00	0	0:00	0:00
H	0:00	0	0:00	0:00

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	VESTAS V162-7.2 7200 180.0 !O! hub: 180,0 m (TOT: 270,0 m) (337)	0:00	0:00
2	VESTAS V162-7.2 7200 180.0 !O! hub: 180,0 m (TOT: 270,0 m) (338)	27:39	3:13
3	VESTAS V162-7.2 7200 180.0 !O! hub: 180,0 m (TOT: 270,0 m) (339)	17:52	2:00
4	VESTAS V162-7.2 7200 180.0 !O! hub: 180,0 m (TOT: 270,0 m) (340)	0:00	0:00
5	VESTAS V162-7.2 7200 180.0 !O! hub: 180,0 m (TOT: 270,0 m) (341)	0:00	0:00
6	VESTAS V162-7.2 7200 180.0 !O! hub: 180,0 m (TOT: 270,0 m) (342)	0:00	0:00
7	VESTAS V162-7.2 7200 180.0 !O! hub: 180,0 m (TOT: 270,0 m) (343)	0:00	0:00
8	VESTAS V162-7.2 7200 180.0 !O! hub: 180,0 m (TOT: 270,0 m) (344)	0:00	0:00
9	VESTAS V162-7.2 7200 180.0 !O! hub: 180,0 m (TOT: 270,0 m) (345)	25:42	2:26

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

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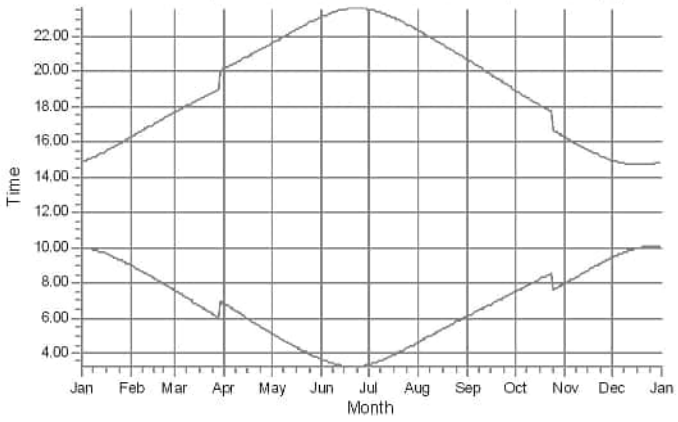
Calculated:
28.2.2024 11.11/3.6.377

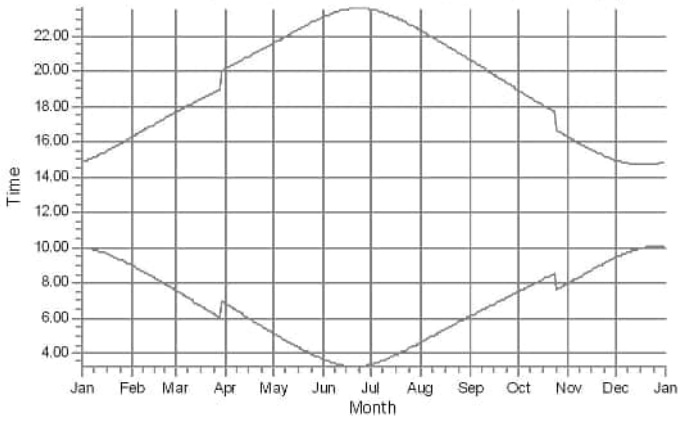
SHADOW - Calendar, graphical

Calculation: Alajärvi Suolasalmenharju Välkemallinnus VE2 28022024

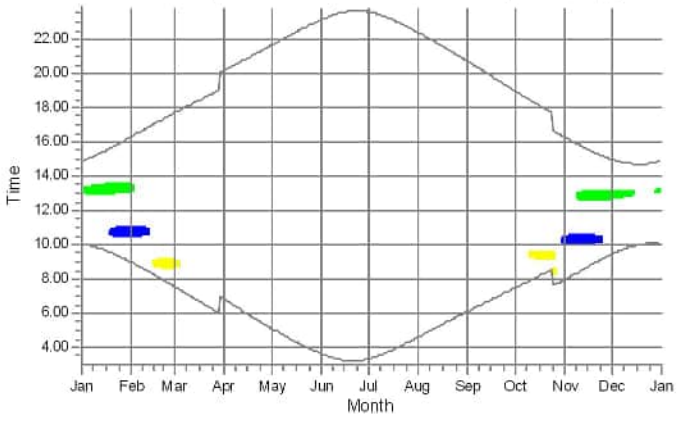
A: Shadow Receptor: 2,0 × 2,0 Azimuth: 0,0° Slope: 90,0° (8)



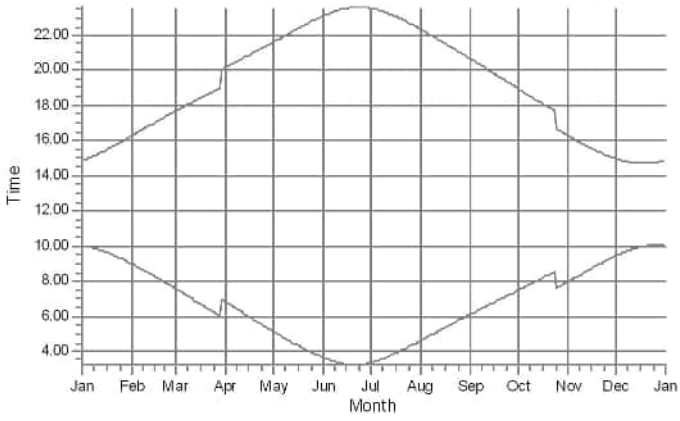
B: Shadow Receptor: 2,0 × 2,0 Azimuth: 0,0° Slope: 90,0° (4)



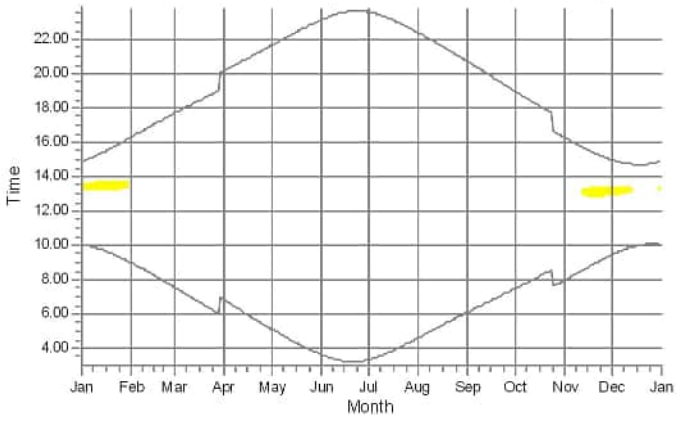
C: Shadow Receptor: 2,0 × 2,0 Azimuth: 0,0° Slope: 90,0° (1)



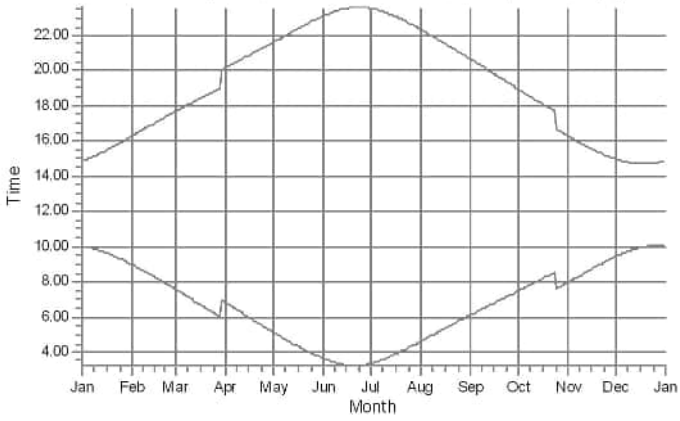
D: Shadow Receptor: 2,0 × 2,0 Azimuth: 0,0° Slope: 90,0° (3)



E: Shadow Receptor: 2,0 × 2,0 Azimuth: 0,0° Slope: 90,0° (7)



F: Shadow Receptor: 2,0 × 2,0 Azimuth: 0,0° Slope: 90,0° (2)



WTGs

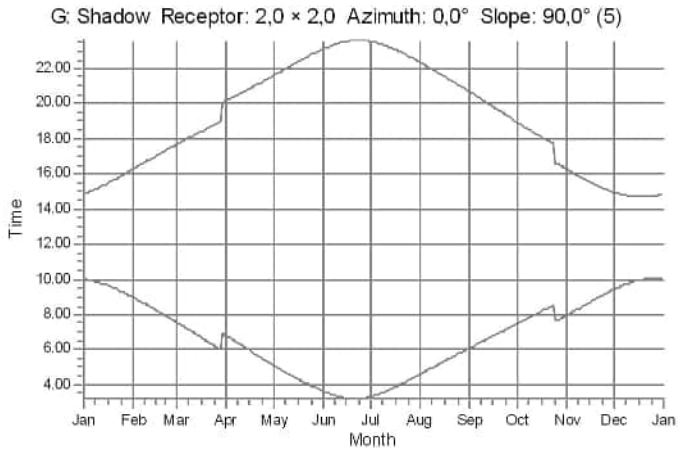
2: VESTAS V162-7.2 7200 180.0 !O! hub: 180,0 m (TOT: 270,0 m) (338)

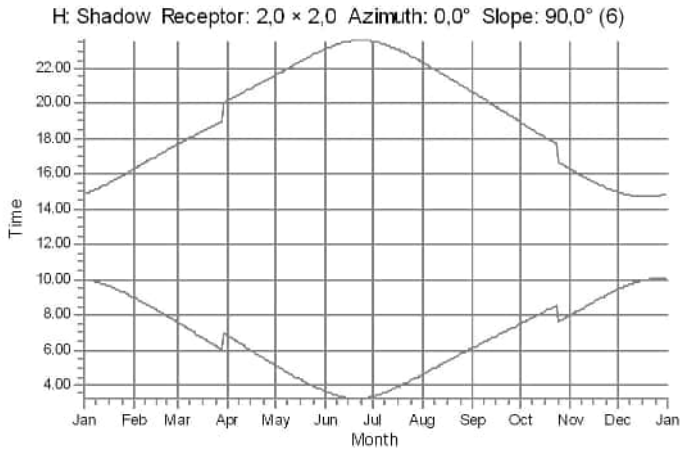
3: VESTAS V162-7.2 7200 180.0 !O! hub: 180,0 m (TOT: 270,0 m) (339)

9: VESTAS V162-7.2 7200 180.0 !O! hub: 180,0 m (TOT: 270,0 m) (345)

SHADOW - Calendar, graphical

Calculation: Alajärvi Suolasalmenharju Välkemallinnus VE2 28022024

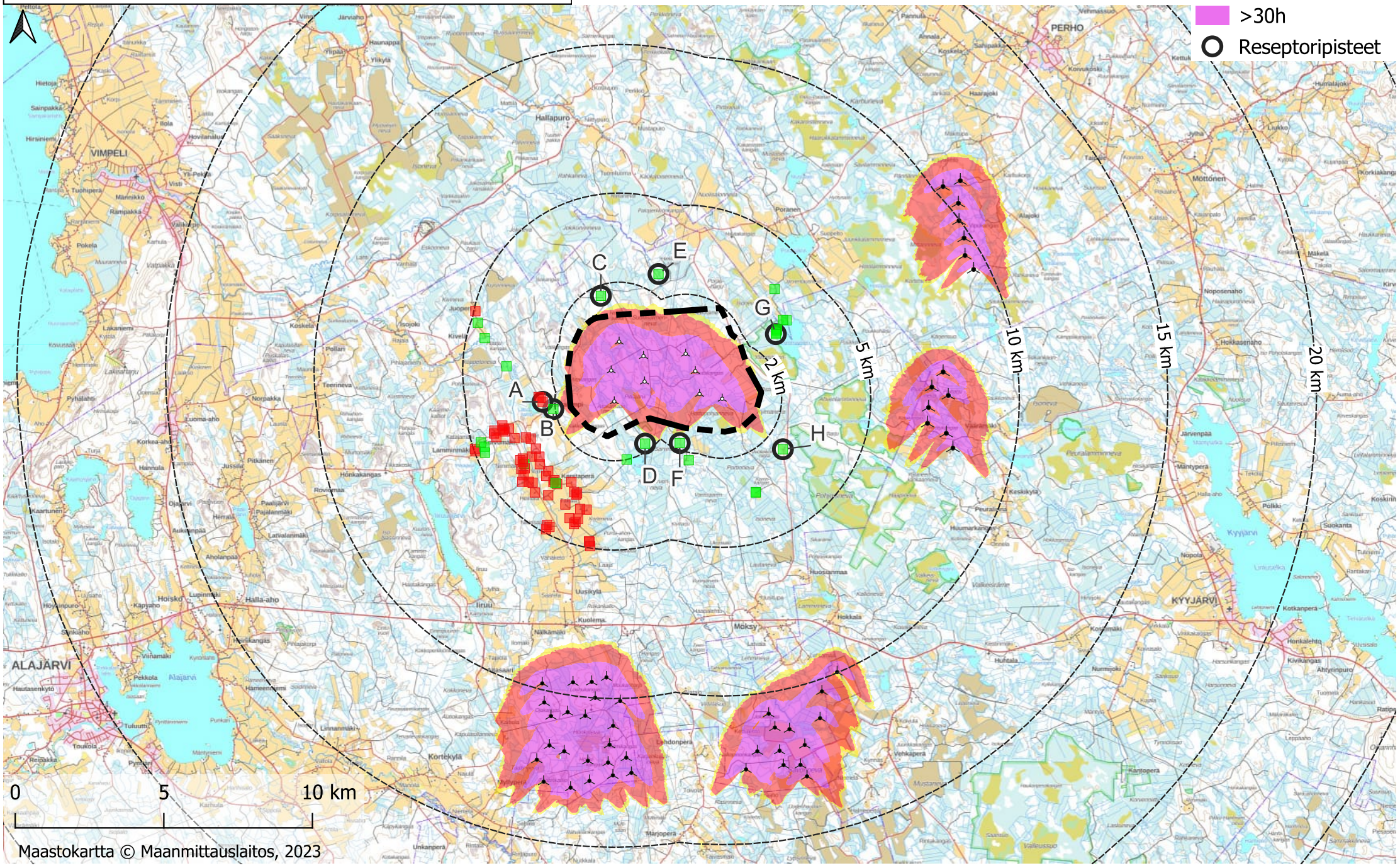




WTGs

LIITE 2. Välkkeen yhteisvaikutusmallinnuksen mallinnustulosteita

Tuulihanke Suolasalmenharju, Alajärvi
Välkevaikutus VE1
Yhteisvaikutus



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Calculated:
2.8.2023 12.46/3.6.366

SHADOW - Main Result

Calculation: Alajärvi Suolasalmenharju Välkkeen yhteisvaikutusmallinnus 02082023

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) []

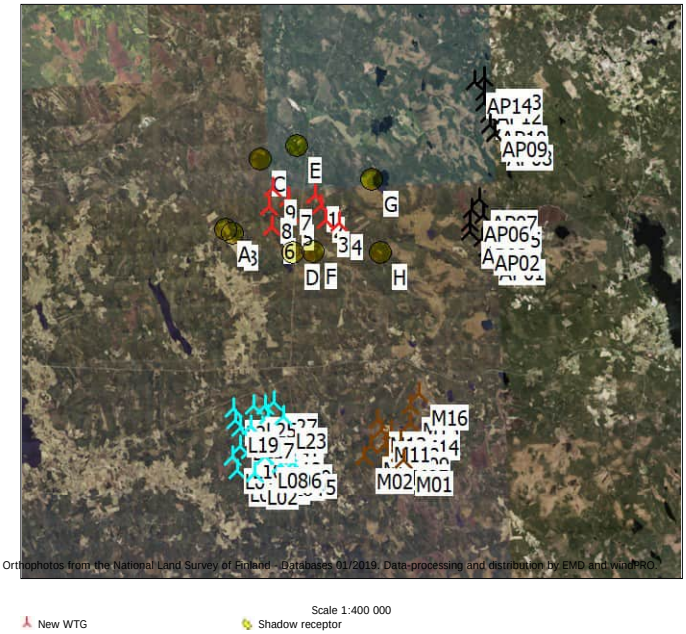
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,97	2,54	4,68	6,30	8,61	9,20	8,65	6,68	4,67	2,58	1,03	0,55

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
574	377	337	340	552	645	806	1 231	1 191	921	619	585	8 178

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Korkeus_40km*40km
Receptor grid resolution: 1,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



WTGs

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
1	358 459	7 001 683	165,2	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	240,0	180,0	2 036	9,5
2	358 785	7 001 098	171,2	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	240,0	180,0	2 036	9,5
3	358 926	7 000 329	165,9	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	240,0	180,0	2 036	9,5
4	359 689	7 000 167	163,3	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	240,0	180,0	2 036	9,5
5	357 076	7 000 746	171,2	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	240,0	180,0	2 036	9,5
6	356 056	7 000 079	165,1	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	240,0	180,0	2 036	9,5
7	357 040	7 001 604	175,5	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	240,0	180,0	2 036	9,5
8	355 953	7 001 119	168,2	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	240,0	180,0	2 036	9,5
9	356 219	7 002 089	171,8	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	240,0	180,0	2 036	9,5
AP01	367 452	6 998 511	171,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP02	367 229	6 999 008	177,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP03	366 597	6 999 343	185,6	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP04	366 633	6 999 876	175,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP05	367 296	7 000 281	180,1	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP06	366 743	7 000 559	181,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP07	367 123	7 001 069	178,6	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP08	368 149	7 004 519	185,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP09	367 859	7 004 990	189,7	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP10	367 827	7 005 574	185,6	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP11	367 658	7 006 158	183,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP12	367 637	7 006 747	182,8	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP13	367 702	7 007 505	178,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP14	367 119	7 007 309	180,2	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
L01	353 679	6 987 286	150,6	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	0,0
L02	354 585	6 987 085	163,1	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	0,0
L03	355 219	6 987 313	162,1	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	0,0
L04	356 009	6 987 498	164,1	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	0,0
L05	356 634	6 987 584	169,8	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	0,0
L06	355 849	6 987 929	169,3	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	0,0
L07	353 449	6 988 027	134,2	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	0,0
L08	355 168	6 987 987	163,3	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	0,0
L09	356 460	6 988 096	172,2	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	0,0
L10	353 875	6 988 505	145,5	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	0,0
L11	354 371	6 988 310	149,2	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	0,0
L12	355 897	6 988 530	166,4	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	0,0
L15	356 017	6 989 168	168,1	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	0,0
L16	353 926	6 989 492	160,2	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	0,0

To be continued on next page...

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2.8.2023 12.46/3.6.366

SHADOW - Main Result

Calculation: Alajärvi Suolasalmenharju Välkkeen yhteisvaikutusmallinnus 02082023

...continued from previous page

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
L17	354 487	6 989 627	161,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	0,0
L18	355 081	6 989 503	158,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	0,0
L19	353 699	6 989 952	155,4	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	0,0
L22	355 415	6 990 109	167,1	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	0,0
L23	356 257	6 989 999	165,4	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	0,0
L24	353 633	6 990 594	147,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	0,0
L25	354 667	6 990 629	148,8	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	0,0
L26	355 297	6 990 644	162,9	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	0,0
L27	355 792	6 990 794	161,1	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	0,0
M01	362 542	6 987 466	193,6	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	0,0
M02	360 490	6 987 699	202,5	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	0,0
M04	361 752	6 987 845	190,4	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	0,0
M05	362 323	6 987 853	188,1	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	0,0
M07	360 871	6 988 310	191,7	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	0,0
M08	361 618	6 988 328	192,9	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	0,0
M09	362 466	6 988 521	184,9	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	0,0
M11	361 462	6 989 109	186,8	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	0,0
M12	361 952	6 989 053	184,0	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	0,0
M13	361 253	6 989 574	191,1	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	0,0
M14	362 982	6 989 422	185,4	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	0,0
M15	363 044	6 990 324	184,8	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	0,0
M16	363 556	6 990 972	185,2	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	0,0

Shadow receptor-Input

No.	East	North	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
A	353 645	7 000 066	138,2	2,0	2,0	1,0	90,0	"Green house mode"	3,0
B	354 006	6 999 820	140,2	2,0	2,0	1,0	90,0	"Green house mode"	3,0
C	355 606	7 003 632	161,7	2,0	2,0	1,0	90,0	"Green house mode"	3,0
D	357 094	6 998 661	156,3	2,0	2,0	1,0	90,0	"Green house mode"	3,0
E	357 545	7 004 366	153,6	2,0	2,0	1,0	90,0	"Green house mode"	3,0
F	358 259	6 998 677	160,4	2,0	2,0	1,0	90,0	"Green house mode"	3,0
G	361 494	7 002 345	171,7	2,0	2,0	1,0	90,0	"Green house mode"	3,0
H	361 730	6 998 471	171,0	2,0	2,0	1,0	90,0	"Green house mode"	3,0

Calculation Results

Shadow receptor

No.	Shadow, worst case Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow, expected values Shadow hours per year [h/year]
A	0:00	0	0:00	0:00
B	0:00	0	0:00	0:00
C	28:22	64	0:35	3:02
D	4:14	27	0:13	1:07
E	0:00	0	0:00	0:00
F	0:00	0	0:00	0:00
G	0:00	0	0:00	0:00
H	0:00	0	0:00	0:00

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	VESTAS V162-7.2 7200 240.0 !O! hub: 180,0 m (TOT: 300,0 m) (1)	0:00	0:00
2	VESTAS V162-7.2 7200 240.0 !O! hub: 180,0 m (TOT: 300,0 m) (2)	0:00	0:00
3	VESTAS V162-7.2 7200 240.0 !O! hub: 180,0 m (TOT: 300,0 m) (3)	0:00	0:00
4	VESTAS V162-7.2 7200 240.0 !O! hub: 180,0 m (TOT: 300,0 m) (4)	0:00	0:00
5	VESTAS V162-7.2 7200 240.0 !O! hub: 180,0 m (TOT: 300,0 m) (5)	0:00	0:00
6	VESTAS V162-7.2 7200 240.0 !O! hub: 180,0 m (TOT: 300,0 m) (6)	4:14	1:07

To be continued on next page...

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2.8.2023 12.46/3.6.366

SHADOW - Main Result

Calculation: Alajärvi Suolasalmenharju Välkkeen yhteisvaikutusmallinnus 02082023

...continued from previous page

No.	Name	Worst case [h/year]	Expected [h/year]
7	VESTAS V162-7.2 7200 240.0 !O! hub: 180,0 m (TOT: 300,0 m) (7)	0:00	0:00
8	VESTAS V162-7.2 7200 240.0 !O! hub: 180,0 m (TOT: 300,0 m) (8)	0:00	0:00
9	VESTAS V162-7.2 7200 240.0 !O! hub: 180,0 m (TOT: 300,0 m) (9)	28:22	3:02
AP01	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (255)	0:00	0:00
AP02	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (256)	0:00	0:00
AP03	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (257)	0:00	0:00
AP04	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (258)	0:00	0:00
AP05	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (259)	0:00	0:00
AP06	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (260)	0:00	0:00
AP07	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (261)	0:00	0:00
AP08	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (248)	0:00	0:00
AP09	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (249)	0:00	0:00
AP10	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (250)	0:00	0:00
AP11	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (251)	0:00	0:00
AP12	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (252)	0:00	0:00
AP13	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (253)	0:00	0:00
AP14	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (254)	0:00	0:00
L01	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (46)	0:00	0:00
L02	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (47)	0:00	0:00
L03	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (49)	0:00	0:00
L04	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (48)	0:00	0:00
L05	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (50)	0:00	0:00
L06	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (51)	0:00	0:00
L07	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (52)	0:00	0:00
L08	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (53)	0:00	0:00
L09	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (54)	0:00	0:00
L10	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (55)	0:00	0:00
L11	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (56)	0:00	0:00
L12	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (57)	0:00	0:00
L15	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (58)	0:00	0:00
L16	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (61)	0:00	0:00
L17	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (60)	0:00	0:00
L18	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (59)	0:00	0:00
L19	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (62)	0:00	0:00
L22	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (67)	0:00	0:00
L23	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (68)	0:00	0:00
L24	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (63)	0:00	0:00
L25	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (64)	0:00	0:00
L26	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (65)	0:00	0:00
L27	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (66)	0:00	0:00
M01	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (33)	0:00	0:00
M02	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (36)	0:00	0:00
M04	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (35)	0:00	0:00
M05	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (34)	0:00	0:00
M07	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (37)	0:00	0:00
M08	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (38)	0:00	0:00
M09	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (39)	0:00	0:00
M11	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (41)	0:00	0:00
M12	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (42)	0:00	0:00
M13	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (40)	0:00	0:00
M14	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (44)	0:00	0:00
M15	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (43)	0:00	0:00
M16	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (45)	0:00	0:00

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

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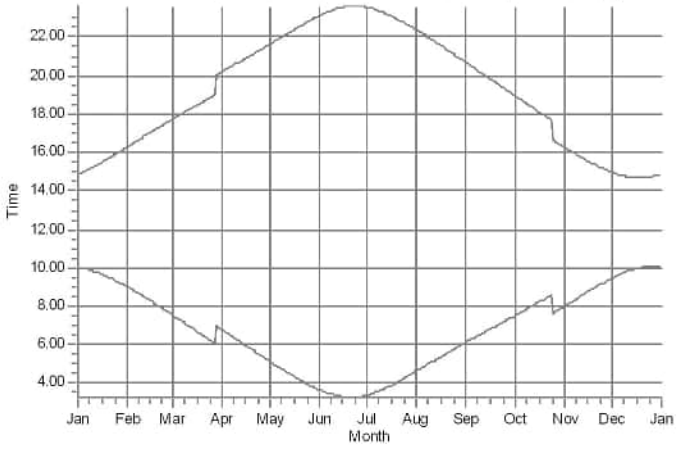
Calculated:
2.8.2023 12.46/3.6.366

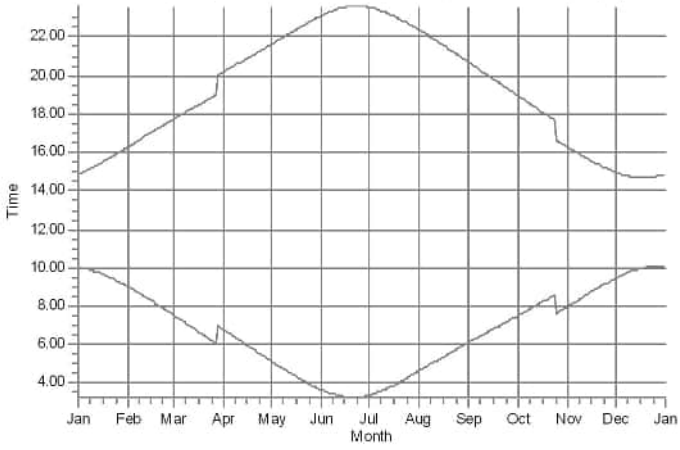
SHADOW - Calendar, graphical

Calculation: Alajärvi Suolasalmenharju Välkkeen yhteisvaikutusmallinnus 02082023

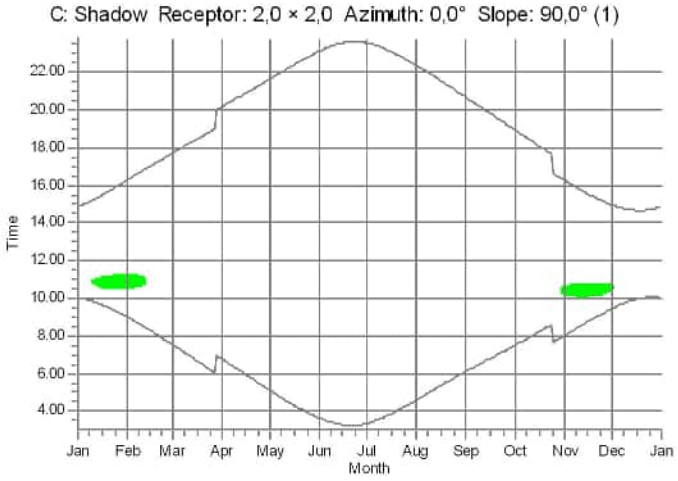
A: Shadow Receptor: 2,0 × 2,0 Azimuth: 0,0° Slope: 90,0° (8)



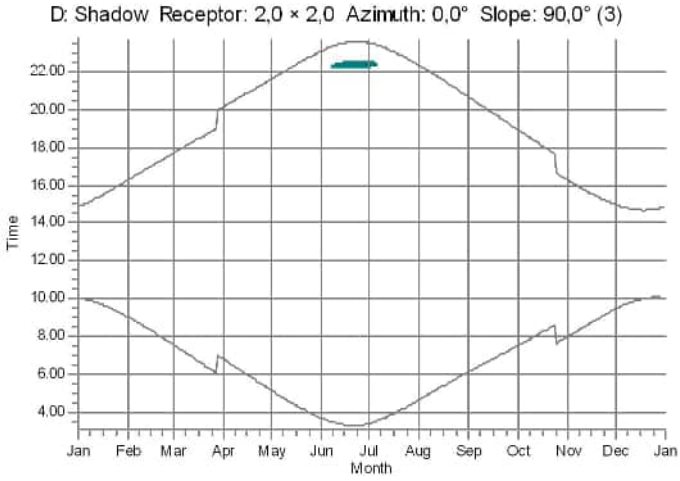
B: Shadow Receptor: 2,0 × 2,0 Azimuth: 0,0° Slope: 90,0° (4)



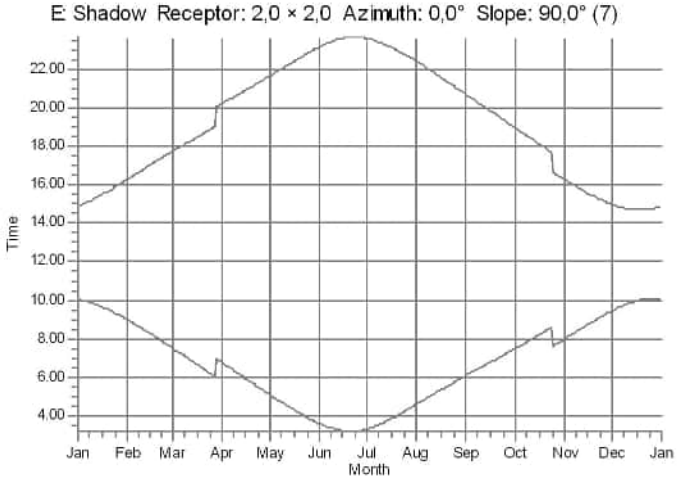
C: Shadow Receptor: 2,0 × 2,0 Azimuth: 0,0° Slope: 90,0° (1)



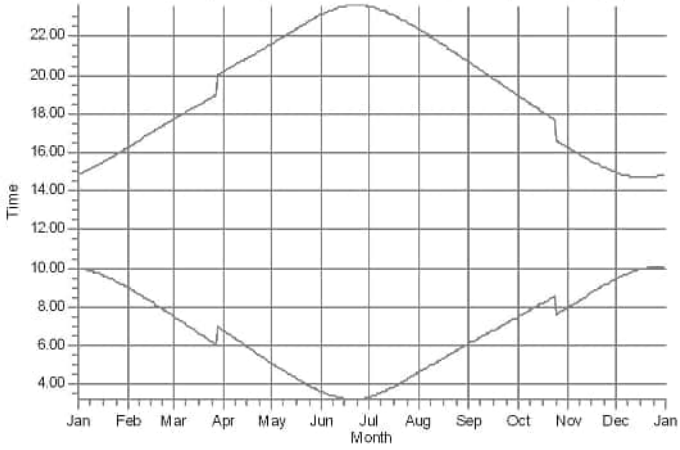
D: Shadow Receptor: 2,0 × 2,0 Azimuth: 0,0° Slope: 90,0° (3)



E: Shadow Receptor: 2,0 × 2,0 Azimuth: 0,0° Slope: 90,0° (7)



F: Shadow Receptor: 2,0 × 2,0 Azimuth: 0,0° Slope: 90,0° (2)



WTGs

6: VESTAS V162-7.2 7200 240.0 IOI hub: 180,0 m (TOT: 300,0 m) (6)

9: VESTAS V162-7.2 7200 240.0 IOI hub: 180,0 m (TOT: 300,0 m) (9)

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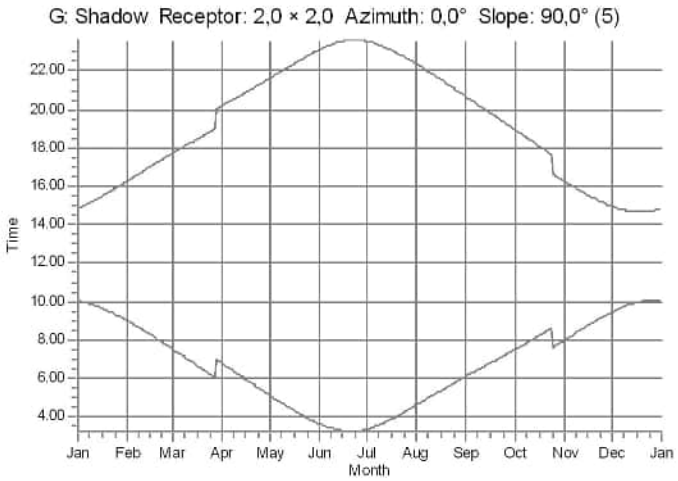
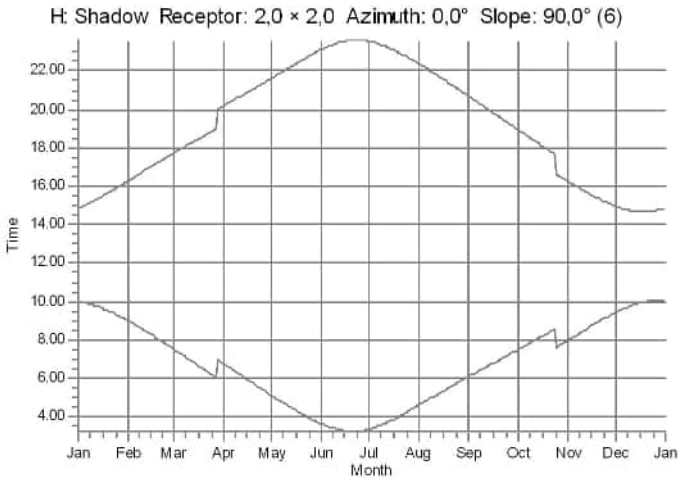
SHADOW - Calendar, graphical

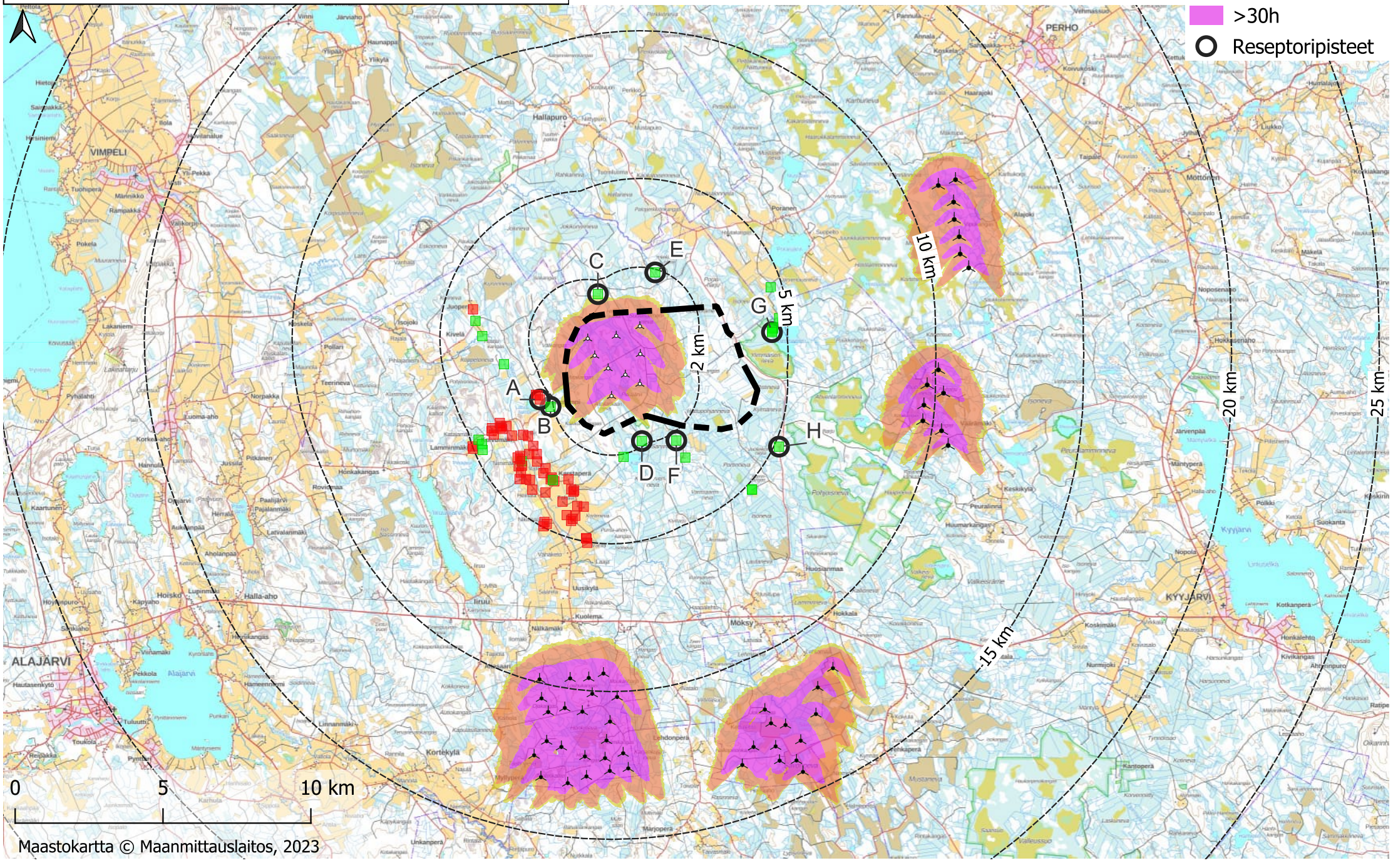
Calculation: Alajärvi Suolasalmenharju Välkkeen yhteisvaikutusmallinnus 02082023





WTGs

Tuulihanke Suolasalmenharju, Alajärvi
Välkevaikutus VE2
Yhteisvaikutus



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Calculated:
10.4.2024 15.04/3.6.377

SHADOW - Main Result

Calculation: Alajärvi Suolasalmenharju VE2 Välkeyhteisvaikutusmallinnus 10042024

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) []

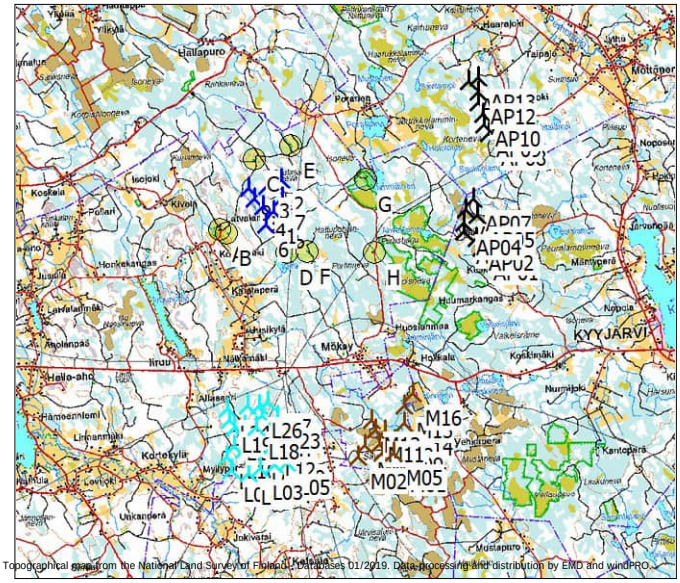
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,97	2,54	4,68	6,30	8,61	9,20	8,65	6,68	4,67	2,58	1,03	0,55

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
574	377	337	340	552	645	806	1 231	1 191	921	619	585	8 178

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Korkeus_40km*40km
Receptor grid resolution: 1,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



WTGs

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
1	356 535	7 000 904	167,9	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	180,0	180,0	2 036	9,5
2	357 026	7 002 544	164,8	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	180,0	180,0	2 036	9,5
3	356 227	7 002 219	171,2	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	180,0	180,0	2 036	9,5
4	355 953	7 001 119	168,2	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	180,0	180,0	2 036	9,5
5	357 026	7 000 594	169,8	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	180,0	180,0	2 036	9,5
6	356 066	7 000 181	167,9	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	180,0	180,0	2 036	9,5
7	357 040	7 001 604	175,5	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	180,0	180,0	2 036	9,5
8	355 498	7 001 550	163,8	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	180,0	180,0	2 036	9,5
9	355 263	7 002 127	160,4	VESTAS V162-7.2 720...	Yes	VESTAS	V162-7.2-7 200	7 200	180,0	180,0	2 036	9,5
AP01	367 452	6 998 511	171,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP02	367 229	6 999 008	177,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP03	366 597	6 999 343	185,6	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP04	366 633	6 999 876	175,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP05	367 296	7 000 281	180,1	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP06	366 743	7 000 559	181,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP07	367 123	7 001 069	178,6	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP08	368 149	7 004 519	185,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP09	367 859	7 004 990	189,7	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP10	367 827	7 005 574	185,6	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP11	367 658	7 006 158	183,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP12	367 637	7 006 747	182,8	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP13	367 702	7 007 505	178,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
AP14	367 119	7 007 309	180,2	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-155-6 600	6 600	155,0	162,5	2 003	9,3
L01	353 679	6 987 286	150,6	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	-
L02	354 585	6 987 085	163,1	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	-
L03	355 219	6 987 313	162,1	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	-
L04	356 009	6 987 498	164,1	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	-
L05	356 634	6 987 584	169,8	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	-
L06	355 849	6 987 929	169,3	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	-
L07	353 449	6 988 027	134,2	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	-
L08	355 168	6 987 987	163,3	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	-
L09	356 460	6 988 096	172,2	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	-
L10	353 875	6 988 505	145,5	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	-
L11	354 371	6 988 310	149,2	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	-
L12	355 897	6 988 530	166,4	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	-
L15	356 017	6 989 168	168,1	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	-
L16	353 926	6 989 492	160,2	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	-

To be continued on next page...

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Calculated:
10.4.2024 15.04/3.6.377

SHADOW - Main Result

Calculation: Alajärvi Suolasalmenharju VE2 Välkeyhteisvaikutusmallinnus 10042024

...continued from previous page

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
L17	354 487	6 989 627	161,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	-
L18	355 081	6 989 503	158,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	-
L19	353 699	6 989 952	155,4	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	-
L22	355 415	6 990 109	167,1	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	-
L23	356 257	6 989 999	165,4	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	-
L24	353 633	6 990 594	147,0	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	-
L25	354 667	6 990 629	148,8	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	-
L26	355 297	6 990 644	162,9	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	-
L27	355 792	6 990 794	161,1	VESTAS V162-6.2 620...	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	139,0	2 039	-
M01	362 542	6 987 466	193,6	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	-
M02	360 490	6 987 699	202,5	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	-
M04	361 752	6 987 845	190,4	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	-
M05	362 323	6 987 853	188,1	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	-
M07	360 871	6 988 310	191,7	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	-
M08	361 618	6 988 328	192,9	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	-
M09	362 466	6 988 521	184,9	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	-
M11	361 462	6 989 109	186,8	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	-
M12	361 952	6 989 053	184,0	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	-
M13	361 253	6 989 574	191,1	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	-
M14	362 982	6 989 422	185,4	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	-
M15	363 044	6 990 324	184,8	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	-
M16	363 556	6 990 972	185,2	VESTAS V162-6.0 600...	Yes	VESTAS	V162-6.0-6 000	6 000	162,0	139,0	2 039	-

Shadow receptor-Input

No.	East	North	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
A	353 645	7 000 066	138,2	2,0	2,0	1,0	90,0	"Green house mode"	3,0
B	354 006	6 999 820	140,2	2,0	2,0	1,0	90,0	"Green house mode"	3,0
C	355 606	7 003 632	161,7	2,0	2,0	1,0	90,0	"Green house mode"	3,0
D	357 094	6 998 661	156,3	2,0	2,0	1,0	90,0	"Green house mode"	3,0
E	357 545	7 004 366	153,6	2,0	2,0	1,0	90,0	"Green house mode"	3,0
F	358 259	6 998 677	160,4	2,0	2,0	1,0	90,0	"Green house mode"	3,0
G	361 494	7 002 345	171,7	2,0	2,0	1,0	90,0	"Green house mode"	3,0
H	361 730	6 998 471	171,0	2,0	2,0	1,0	90,0	"Green house mode"	3,0

Calculation Results

Shadow receptor

No.	Shadow, worst case Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow, expected values Shadow hours per year [h/year]
A	0:00	0	0:00	0:00
B	0:00	0	0:00	0:00
C	53:18	122	0:52	6:03
D	0:00	0	0:00	0:00
E	17:55	60	0:24	1:40
F	0:00	0	0:00	0:00
G	0:00	0	0:00	0:00
H	0:00	0	0:00	0:00

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	VESTAS V162-7.2 7200 180.0 !O! hub: 180,0 m (TOT: 270,0 m) (337)	0:00	0:00
2	VESTAS V162-7.2 7200 180.0 !O! hub: 180,0 m (TOT: 270,0 m) (338)	27:39	3:13
3	VESTAS V162-7.2 7200 180.0 !O! hub: 180,0 m (TOT: 270,0 m) (339)	17:52	2:00
4	VESTAS V162-7.2 7200 180.0 !O! hub: 180,0 m (TOT: 270,0 m) (340)	0:00	0:00
5	VESTAS V162-7.2 7200 180.0 !O! hub: 180,0 m (TOT: 270,0 m) (341)	0:00	0:00
6	VESTAS V162-7.2 7200 180.0 !O! hub: 180,0 m (TOT: 270,0 m) (342)	0:00	0:00

To be continued on next page...

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10.4.2024 15.04/3.6.377

SHADOW - Main Result

Calculation: Alajärvi Suolasalmenharju VE2 Välkeyhteisvaikutusmallinnus 10042024

...continued from previous page

No.	Name	Worst case [h/year]	Expected [h/year]
7	VESTAS V162-7.2 7200 180.0 !O! hub: 180,0 m (TOT: 270,0 m) (343)	0:00	0:00
8	VESTAS V162-7.2 7200 180.0 !O! hub: 180,0 m (TOT: 270,0 m) (344)	0:00	0:00
9	VESTAS V162-7.2 7200 180.0 !O! hub: 180,0 m (TOT: 270,0 m) (345)	25:42	2:26
AP01	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (353)	0:00	0:00
AP02	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (354)	0:00	0:00
AP03	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (355)	0:00	0:00
AP04	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (356)	0:00	0:00
AP05	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (357)	0:00	0:00
AP06	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (358)	0:00	0:00
AP07	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (359)	0:00	0:00
AP08	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (346)	0:00	0:00
AP09	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (347)	0:00	0:00
AP10	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (348)	0:00	0:00
AP11	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (349)	0:00	0:00
AP12	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (350)	0:00	0:00
AP13	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (351)	0:00	0:00
AP14	Siemens Gamesa SG 6.0-155 6600 155.0 !O! hub: 162,5 m (TOT: 240,0 m) (352)	0:00	0:00
L01	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (46)	0:00	0:00
L02	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (47)	0:00	0:00
L03	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (49)	0:00	0:00
L04	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (48)	0:00	0:00
L05	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (50)	0:00	0:00
L06	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (51)	0:00	0:00
L07	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (52)	0:00	0:00
L08	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (53)	0:00	0:00
L09	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (54)	0:00	0:00
L10	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (55)	0:00	0:00
L11	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (56)	0:00	0:00
L12	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (57)	0:00	0:00
L15	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (58)	0:00	0:00
L16	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (61)	0:00	0:00
L17	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (60)	0:00	0:00
L18	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (59)	0:00	0:00
L19	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (62)	0:00	0:00
L22	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (67)	0:00	0:00
L23	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (68)	0:00	0:00
L24	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (63)	0:00	0:00
L25	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (64)	0:00	0:00
L26	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (65)	0:00	0:00
L27	VESTAS V162-6.2 6200 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (66)	0:00	0:00
M01	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (360)	0:00	0:00
M02	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (363)	0:00	0:00
M04	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (362)	0:00	0:00
M05	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (361)	0:00	0:00
M07	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (364)	0:00	0:00
M08	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (365)	0:00	0:00
M09	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (366)	0:00	0:00
M11	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (368)	0:00	0:00
M12	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (369)	0:00	0:00
M13	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (367)	0:00	0:00
M14	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (371)	0:00	0:00
M15	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (370)	0:00	0:00
M16	VESTAS V162-6.0 6000 162.0 !O! hub: 139,0 m (TOT: 220,0 m) (372)	0:00	0:00

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

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SHADOW - Calendar, graphical

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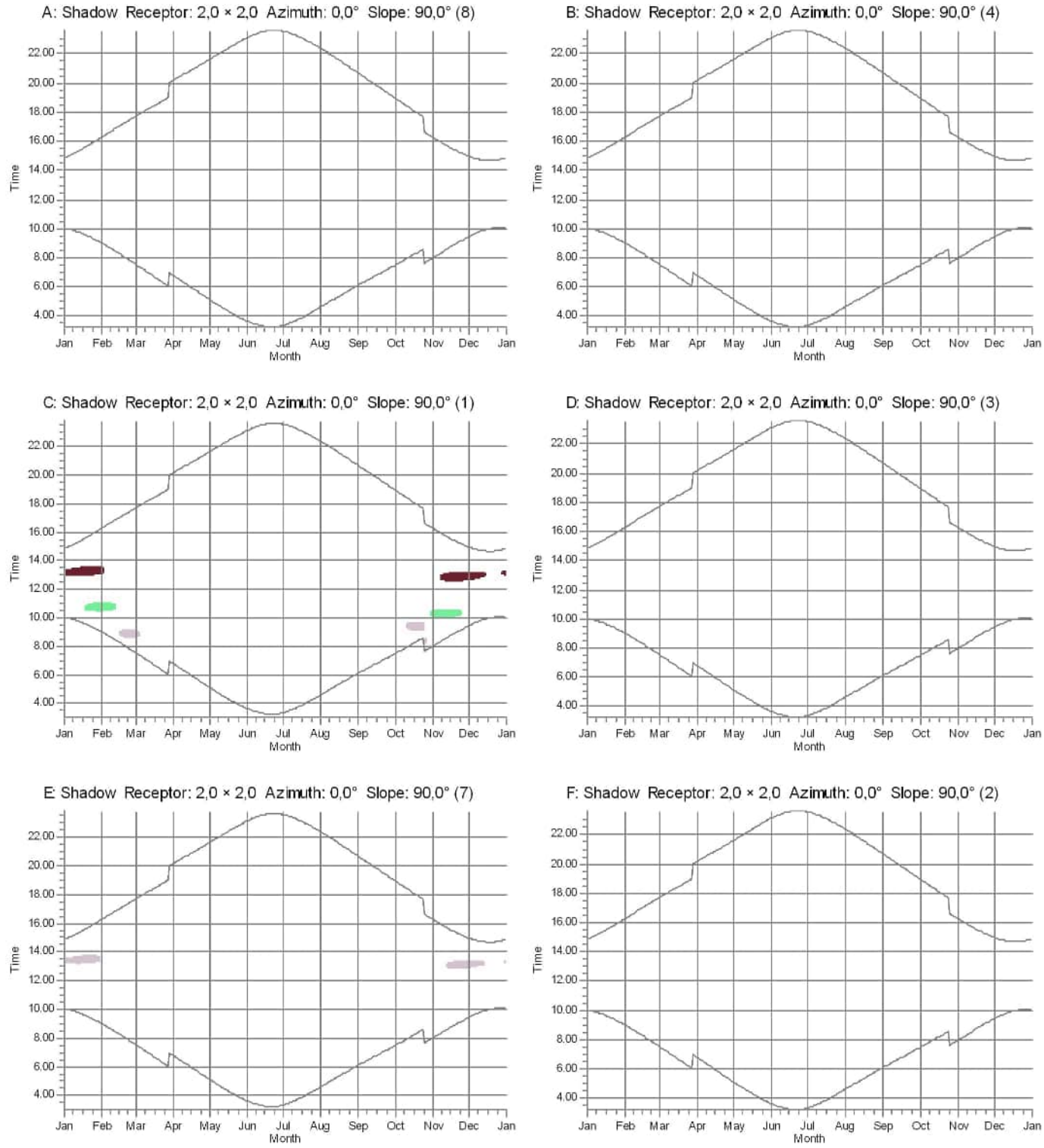

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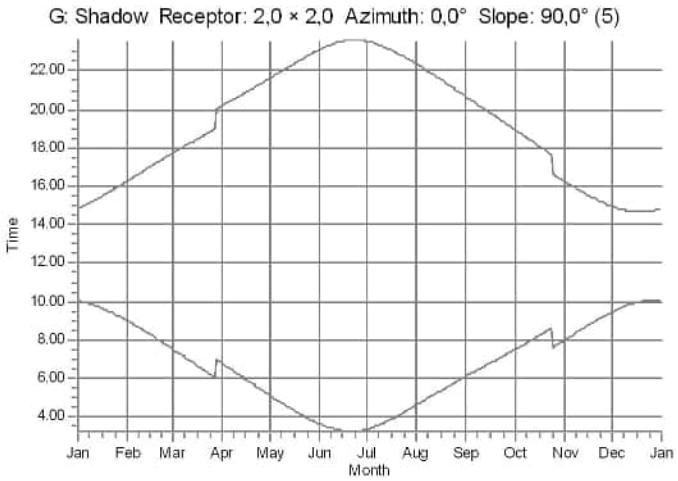
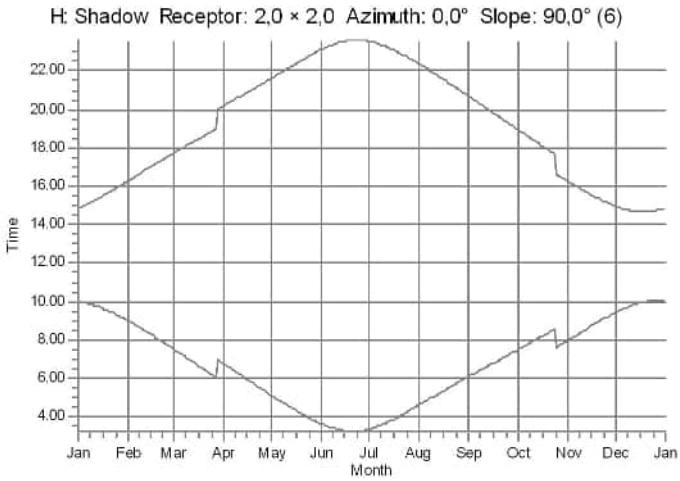
SHADOW - Calendar, graphical

Calculation: Alajärvi Suolasalmenharju VE2 Välkeyhteisvaikutusmallinnus 10042024





WTGs