

6

Skuggberäkningar

SHADOW - Main Result

Calculation: LAK_V162 (worst case)

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) [BORLANGE]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,76 2,86 3,88 5,64 9,16 8,08 7,55 5,65 4,80 3,10 1,88 1,43

Operational hours are calculated from WTGs in calculation and wind distribution:
wpd6

Operational time
N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
827 878 678 519 260 310 686 1548 1246 701 560 497 8611
Idle start wind speed: Cut in wind speed from power curve

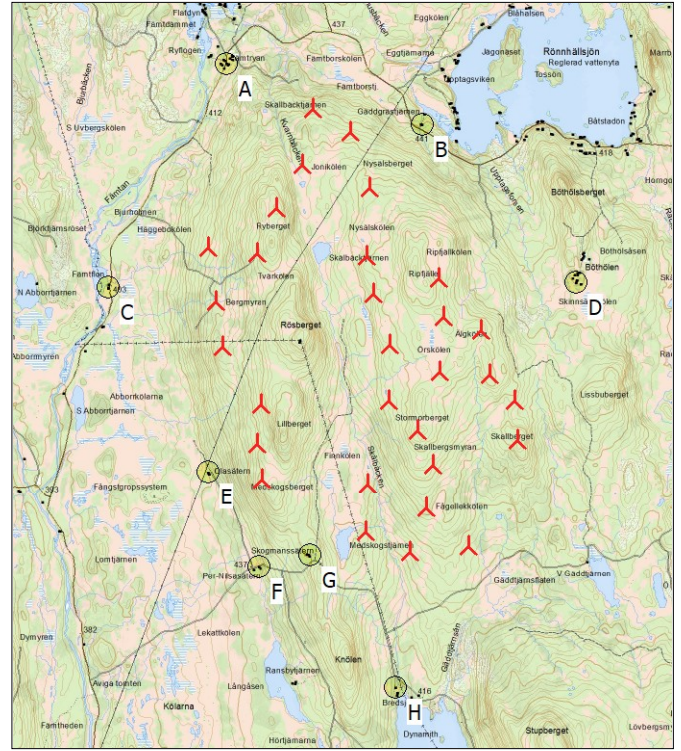
A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

Height contours used: GSD2 & GSD50
Obstacles used in calculation
Eye height for map: 1,5 m
Grid resolution: 1,0 m

All coordinates are in Swedish UTM 33-SWREF99 (SE)

WTGs

	Easting	Northing	Z [m]	Row data/Description	WTG type			Shadow data			
					Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]
1	403246	6729596	494,3	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
2	403335	6729004	515,6	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
3	406747	6729213	562,6	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
4	403788	6730230	545,7	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
5	405014	6731830	487,7	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
6	403145	6730315	474,8	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
7	406253	6729397	570,0	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
8	406203	6728667	563,4	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
9	406862	6728639	556,6	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
10	405226	6726552	471,5	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
11	406114	6727441	529,4	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
12	406582	6726360	462,5	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
13	407232	6727775	538,8	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
14	405913	6727894	566,6	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
15	406188	6729907	572,1	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
16	405242	6730191	544,3	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
17	405280	6731103	531,1	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
18	404041	6730832	565,5	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
19	404528	6732142	474,4	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
20	405537	6729027	545,1	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
21	406029	6726871	503,3	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
22	405812	6726289	457,3	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
23	405248	6727187	474,3	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
24	404380	6731409	505,4	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
25	407195	6728297	517,2	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
26	405529	6728291	531,6	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
27	403843	6728237	540,3	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
28	403786	6727719	521,1	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
29	403849	6727255	528,0	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1
30	405320	6729706	534,5	VESTAS V162 5600 162.0 !O! hub:...Yes	VESTAS	V162-5600	5600	162,0	162,0	1993	12,1



Scale 1:100 000
New WTG (red windmill icon)
Shadow receptor (yellow sun icon)

SHADOW - Main Result

Calculation: LAK_V162 (worst case)

Shadow receptor-Input

No.	Name	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode
				[m]	[m]	[m]	[m]	[°]	
A	Fämtryan	403381	6732744	419,2	5,0	5,0	0,0	0,0	"Green house mode"
B	Rönnhällsjön	405971	6731938	424,2	5,0	5,0	0,0	0,0	"Green house mode"
C	Abborrkölarna N längs väg	401820	6729791	403,0	5,0	5,0	0,0	0,0	"Green house mode"
D	Böthölen	408009	6729858	502,5	5,0	5,0	0,0	0,0	"Green house mode"
E	Olasättern	403137	6727346	425,8	5,0	5,0	0,0	0,0	"Green house mode"
F	Per-Nilsasättern	403815	6726095	441,0	5,0	5,0	0,0	0,0	"Green house mode"
G	Skogmanssättern	404484	6726240	500,0	5,0	5,0	0,0	0,0	"Green house mode"
H	Bredsjön	405620	6724506	416,4	5,0	5,0	0,0	0,0	"Green house mode"

Calculation Results

Shadow receptor

No.	Name	Shadow, worst case			Shadow, expected values	
		Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]	
A	Fämtryan	27:42	81	0:29	4:43	
B	Rönnhällsjön	78:42	173	1:01	16:50	
C	Abborrkölarna N längs väg	42:12	126	0:28	10:04	
D	Böthölen	54:24	174	0:35	11:09	
E	Olasättern	53:48	82	0:51	11:51	
F	Per-Nilsasättern	33:13	99	0:27	9:18	
G	Skogmanssättern	90:54	149	0:50	24:49	
H	Bredsjön	0:00	0	0:00	0:00	

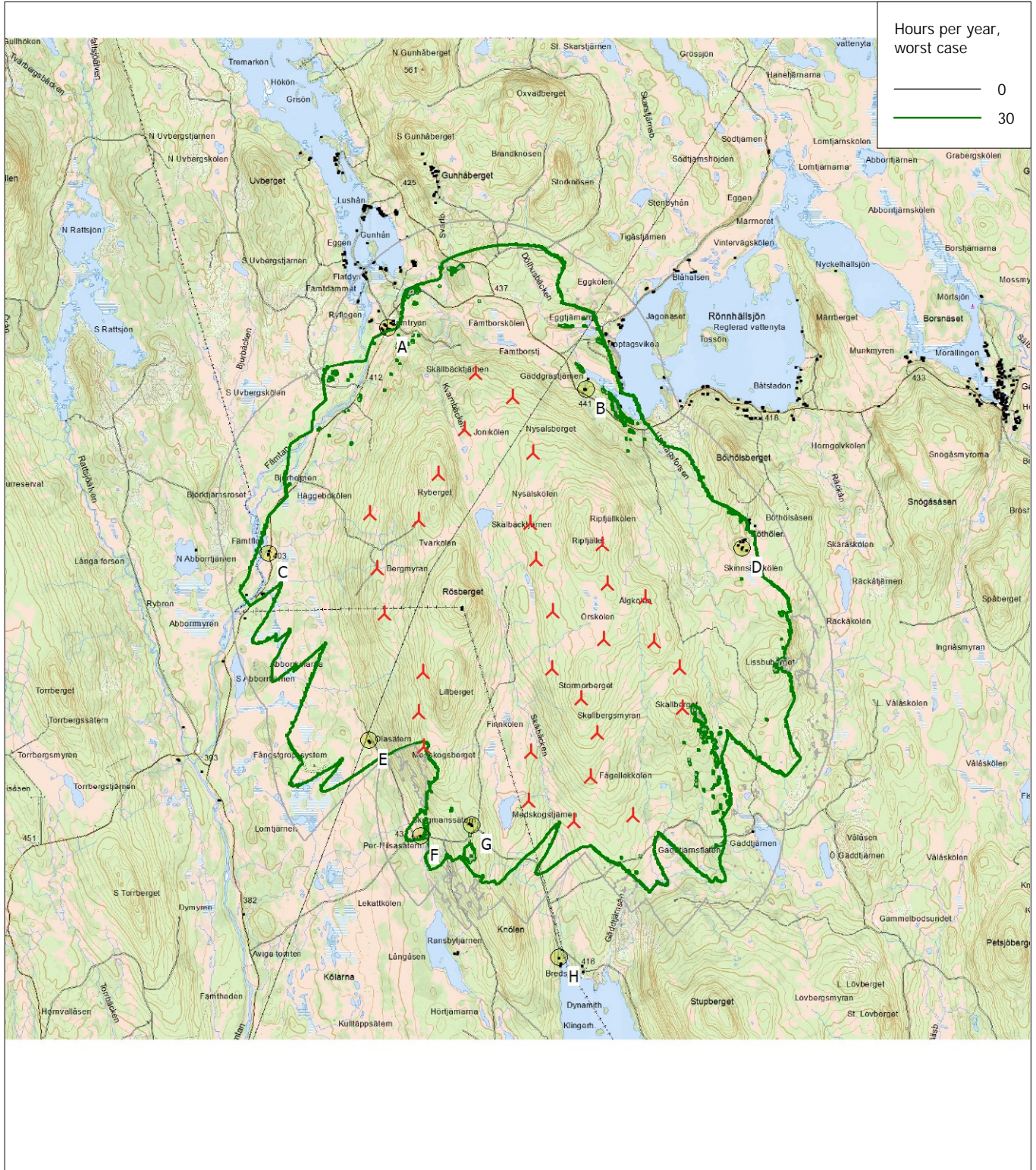
Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1747)	11:36	2:16
2	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1748)	8:02	1:21
3	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1749)	11:52	2:29
4	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1750)	0:00	0:00
5	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1751)	33:01	6:45
6	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1752)	22:34	6:33
7	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1753)	7:10	1:27
8	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1754)	0:00	0:00
9	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1755)	10:37	2:13
10	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1756)	83:28	23:24
11	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1757)	0:00	0:00
12	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1758)	0:00	0:00
13	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1759)	0:00	0:00
14	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1760)	0:00	0:00
15	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1761)	7:25	1:32
16	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1762)	11:11	2:09
17	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1763)	20:34	4:38
18	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1764)	0:00	0:00
19	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1765)	26:34	4:52
20	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1766)	0:00	0:00
21	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1767)	12:25	3:25
22	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1768)	12:15	2:35
23	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1769)	17:57	5:20
24	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1770)	19:05	3:32
25	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1771)	17:20	3:17
26	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1772)	0:00	0:00
27	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1773)	0:00	0:00
28	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1774)	0:00	0:00
29	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1775)	53:48	11:51
30	VESTAS V162 5600 162.0 !O! hub: 162,0 m (TOT: 243,0 m) (1776)	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.

SHADOW - Map

Calculation: LAK_V162 (worst case)



Map: Bitmap map: RIPF_grundkartan2.jpg , Print scale 1:75 000, Map center Swedish UTM 33-SWREF99 (SE) East: 405 080 North: 6 729 340
 ▲ New WTG ● Shadow receptor

Flicker map level: GSD2 & GSD50