

Project:

Windpark Lingewaard

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Licensed user:

Winvast B.V.

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NL-3984 MK Odijk

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R.L.M. de Coö / info@winvast.nl

Calculated:

28-6-2013 23:31/2.9.207



SHADOW - Main Result

Calculation: Shadow 5xN117-2.4MW-140m Noord

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) [BOCHOLT]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,64	3,01	3,53	5,65	7,16	6,01	6,70	6,24	4,57	3,38	2,03	1,16

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

Site data 12 sectors; Radius: 20.000 m (1)

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
565	549	657	533	482	517	748	1.371	1.297	738	501	399	8.358

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

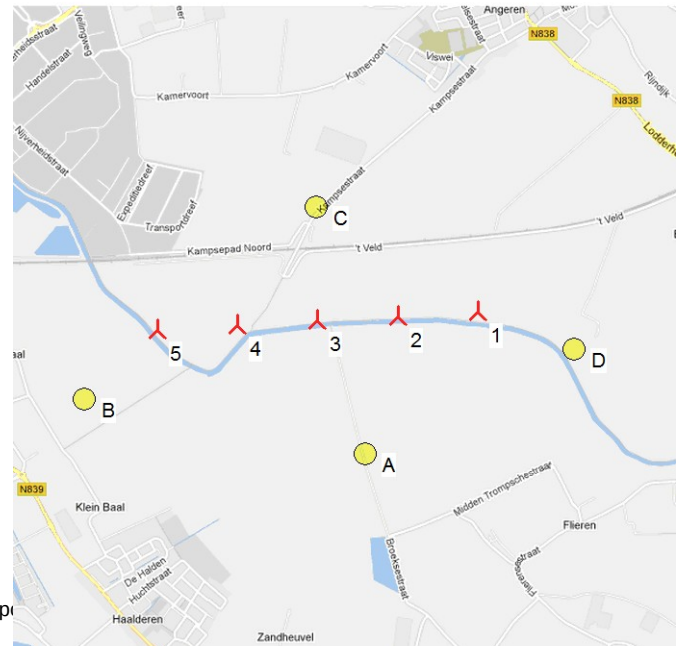
window. The ZVI calculation is based on the following assumptions:

Height contours used: Height Contours: CONTOURLINE_ONLINEDATA_0.wp

Obstacles not used in calculation

Eye height: 1,5 m

Grid resolution: 10,0 m



New WTG

Scale 1:40.000

Shadow receptor

WTGs

	Dutch Stereo-RD/NAP 2000				WTG type				Shadow data			
	East	North	Z	Row	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Calculation distance	RPM
	[m]								[m]	[m]	[m]	[RPM]
1	194.014	434.844	10,0	266,7°, 425,0 m	Yes	NORDEX	N117-2.400	2.400	116,8	140,6	1.486	11,8
2	193.590	434.816	10,0		Yes	NORDEX	N117-2.400	2.400	116,8	140,6	1.486	11,8
3	193.166	434.789	10,0		Yes	NORDEX	N117-2.400	2.400	116,8	140,6	1.486	11,8
4	192.742	434.762	10,0		Yes	NORDEX	N117-2.400	2.400	116,8	140,6	1.486	11,8
5	192.318	434.734	10,0		Yes	NORDEX	N117-2.400	2.400	116,8	140,6	1.486	11,8

Shadow receptor-Input

No.	Dutch Stereo-RD/NAP 2000				Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
	East	North	Z	Width					
	[m]	[m]	[m]	[m]	[m]	[m]	[°]	[°]	
A	193.425	434.083	10,0	8,0	5,0	1,0	0,0	90,0	"Green house mode"
B	191.932	434.364	10,0	8,0	5,0	1,0	0,0	90,0	"Green house mode"
C	193.157	435.388	10,0	8,0	5,0	1,0	0,0	90,0	"Green house mode"
D	194.529	434.651	10,0	8,0	5,0	1,0	0,0	90,0	"Green house mode"

Calculation Results

Shadow receptor

Shadow, expected values

No. Shadow hours

per year

[h/year]

A	4:05
B	13:13
C	22:45
D	19:27

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SHADOW - Main Result

Calculation: Shadow 5xN117-2.4MW-140m Noord

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

No.	Name	Worst case [h/year]	Expected [h/year]
1	5*NORDEX N117 2400 116.8 !O! hub: 140,6 m (TOT: 199,0 m) dist: 425 m (3,6 RD) angle: 267° (13)	81:32	16:28
2	5*NORDEX N117 2400 116.8 !O! hub: 140,6 m (TOT: 199,0 m) dist: 425 m (3,6 RD) angle: 267° (13)	73:50	11:03
3	5*NORDEX N117 2400 116.8 !O! hub: 140,6 m (TOT: 199,0 m) dist: 425 m (3,6 RD) angle: 267° (13)	62:05	9:32
4	5*NORDEX N117 2400 116.8 !O! hub: 140,6 m (TOT: 199,0 m) dist: 425 m (3,6 RD) angle: 267° (13)	89:57	16:04
5	5*NORDEX N117 2400 116.8 !O! hub: 140,6 m (TOT: 199,0 m) dist: 425 m (3,6 RD) angle: 267° (13)	35:53	6:35

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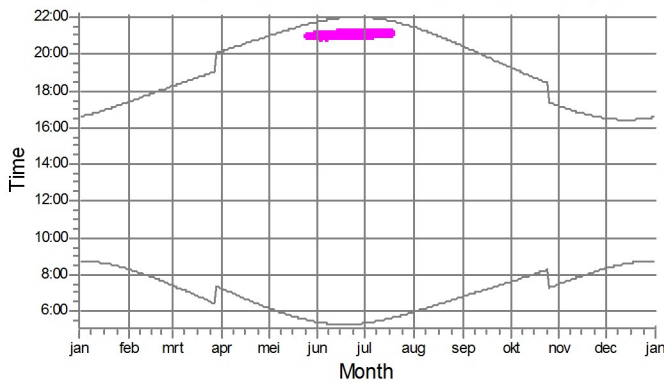
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Calculated:

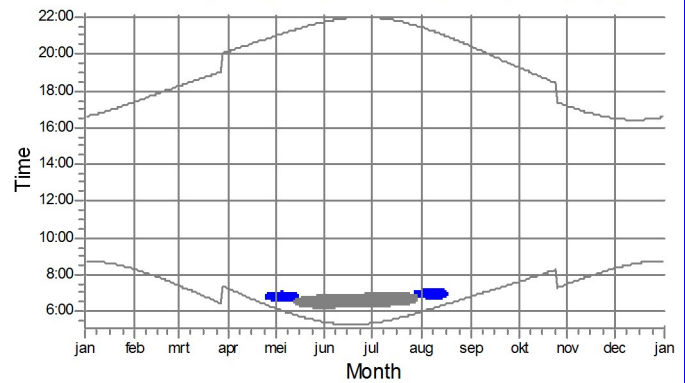
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**SHADOW - Calendar, graphical****Calculation:** Shadow 5xN117-2.4MW-140m Noord

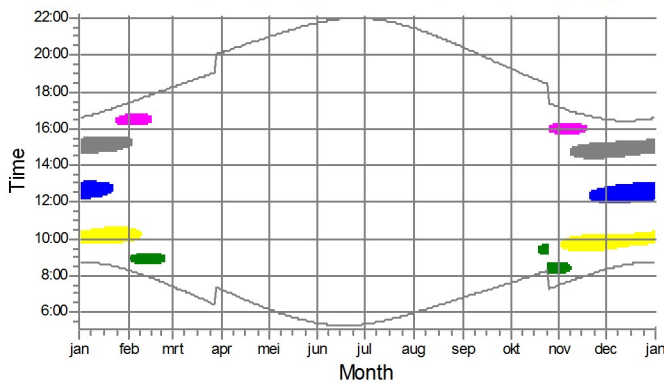
A: Shadow Receptor: 8,0 × 5,0 Azimuth: 0,0° Slope: 90,0° (1)



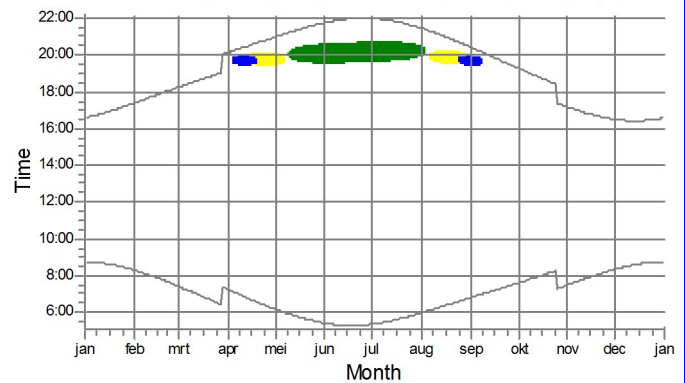
B: Shadow Receptor: 8,0 × 5,0 Azimuth: 0,0° Slope: 90,0° (2)



C: Shadow Receptor: 8,0 × 5,0 Azimuth: 0,0° Slope: 90,0° (3)



D: Shadow Receptor: 8,0 × 5,0 Azimuth: 0,0° Slope: 90,0° (4)

**WTGs**

- | | |
|---|---|
|  | 1: 5*NORDEX N117 2400 116.8 !O! hub: 140,6 m (TOT: 199,0 m) dist: 425 m (3,6 RD) angle: 267° (13) |
|  | 2: 5*NORDEX N117 2400 116.8 !O! hub: 140,6 m (TOT: 199,0 m) dist: 425 m (3,6 RD) angle: 267° (13) |
|  | 3: 5*NORDEX N117 2400 116.8 !O! hub: 140,6 m (TOT: 199,0 m) dist: 425 m (3,6 RD) angle: 267° (13) |
|  | 4: 5*NORDEX N117 2400 116.8 !O! hub: 140,6 m (TOT: 199,0 m) dist: 425 m (3,6 RD) angle: 267° (13) |
|  | 5: 5*NORDEX N117 2400 116.8 !O! hub: 140,6 m (TOT: 199,0 m) dist: 425 m (3,6 RD) angle: 267° (13) |

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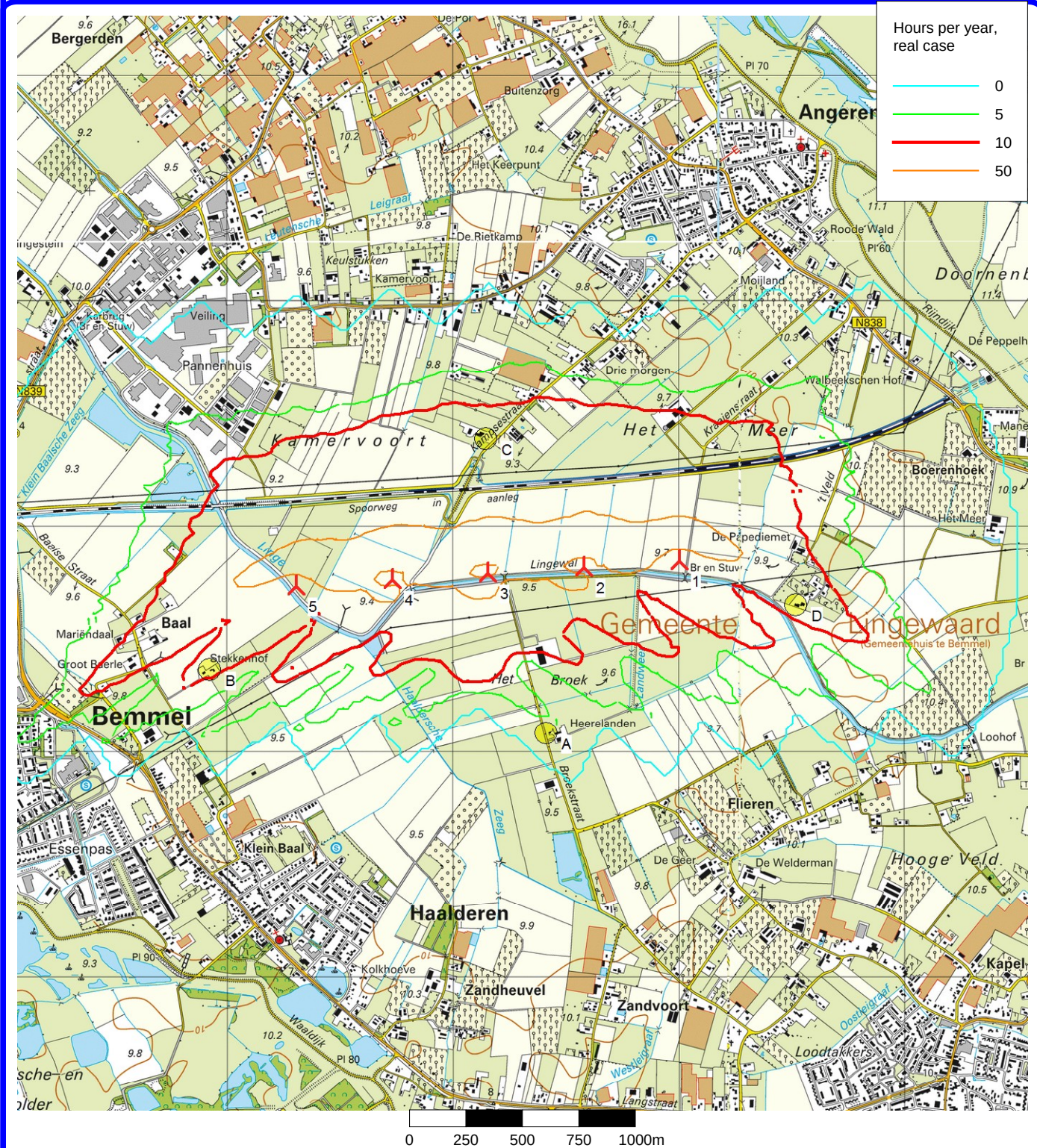
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SHADOW - Map

Calculation: Shadow 5xN117-2.4MW-140m Noord



New WTG

Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_ONLINEDATA_0.wpo (1)