

PlanMER Gemeente Emmen

Slagschaduwstudie Windenergie



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2.0	HLS	19/05/2015	Draft – minor changes due to improved wind statistic, updated maps, calculation reports and counts; added calculation reports & maps for phase II;
3.0	ARN	11/06/2015	Small changes after meeting with municipality

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1 Inleiding en samenvatting

De gemeente Emmen heeft een aantal locaties aangewezen om mogelijk windturbines te plaatsen. Een onderdeel van de planm.e.r. is een slagschaduwstudie. Hierbij wordt per locatie en alternatief het aantal gevoelige objecten binnen de invloedssfeer van het windpark bepaald. Voor het plaatsen van een windturbine is een melding in het kader van het Activiteitenbesluit milieubeheer¹ noodzakelijk. In het Activiteitenbesluit zijn de toegestane grenswaarden voor slagschaduw bepaald. Dit onderzoek zal duidelijkheid brengen over het aantal objecten waarvoor deze grenswaarde overschreden wordt.

Slagschaduw is de schaduw van de windturbine op de ondergrond of achtergrond. Deze slagschaduw draait met de zon mee en reikt bij zonsopgang en -ondergang in de winter het verst. Als slagschaduw op het raam van een woning valt kan dat als hinderlijk worden ervaren. Vooral de wisseling tussen wel en geen schaduw kan als ergerlijk worden ervaren.

Om de aanpak van de planm.e.r. te faciliteren is er in twee stappen gewerkt.

Stap1: Voor de negen locaties, afkomstig van de belemmeringenkaart Emmen, is de slagschaduwhinder bepaald

Stap2: Voor de zeven gecombineerde locaties, de alternatieven, is de slagschaduwhinder bepaald

De onderbouwing van het tot stand komen van de gecombineerde alternatieven is te lezen in het planMER.

De negen locaties en de zeven gecombineerde alternatieven hebben de volgende naamgeving:

	Locatie	Alternatief
1	Pottendijk	Woon- en leef-omgeving 3MW
2	De Vennen	Landschap 3MW
3	Groenedijk	Opbrengst 5MW
4	Zwartenberger-weg	Spreiding 3MW
5	Berkenrode	Spreiding 5MW
6	Noordersloot	Concentratie 3MW
7	N34	Concentratie 5MW
8	Tuinbouwgebied Klazienaveen	
9	Veenschapsweg	

In het kader van dit onderzoek wordt uitgegaan van 2 generieke windturbine typen van 3MW en 5MW. De windturbines hebben een maximale omwentelingsnelheid van 13 toeren resp. 14.3 toeren

¹ Activiteitenbesluit milieubeheer <http://wetten.overheid.nl/BWBR0022762>

per minuut. Het maximale aantal bladpassages is daardoor 39 per minuut resp. 42.9 per minuut, dit komt overeen met een frequentie van 0.65 Hz resp. 0.72 Hz¹.

Uit de analyse blijkt dat er zich rondom de opstellingen gebouwen bevinden waarop wettelijke slag-schaduwbeperkingen gelden. De berekeningen met de huidige aannames laten zien dat het aantal objecten waarvoor overschrijding plaatsvindt van de limiet 5 uur en 40 minuten per jaar, per opstelling verschilt. In onderstaande tabellen zijn de opstelling en het betreffende aantal objecten genoemd. Binnen deze limiet ligt bij een aantal opstellingen ook objecten met bouwrecht voor woningen. Deze aantallen zijn tussen haakjes weergegeven. Terugregeling van de windturbines voor slag-schaduw kan een oplossing bieden om toch aan de normstelling te voldoen.

Aantal schaduw gevoelige objecten in Stap1 (zie ook hoofdstuk 4):

	Locatie	3MW	5MW
1	Pottendijk	26 (3)	46 (4)
2	De Vennen	18	-
3	Groenedijk	5	18
4	Zwartenbergerweg	10	21
5	Berkenrode	5	-
6	Noordersloot	8	-
7	N34	5	23
8	Tuinbouwgebied Klazienaveen	28 (1)	-
9	Veenschapsweg	1	90

Aantal schaduw gevoelige objecten in Stap2 (zie ook hoofdstuk 5):

	Alternatief	Aantal woningen
1	Woon- en leefomgeving 3MW	14 (2)
2	Landschap 3MW	48 (1)
3	Opbrengst 5MW	45 (4)
4	Spreiding 3MW	64 (1)
5	Spreiding 5MW	139
6	Concentratie 3MW	12 (3)
7	Concentratie 5MW	48 (1)

¹ Uit onderzoek is gebleken dat mensen vooral last hebben van het afwisselen van schaduw en licht bij een hogere frequentie, tussen de 2,5 en 14 Hz [Agentschap NL (2012), <http://www.windenergie.nl/>]

2 Uitgangspunten

2.1 Locatie en type windturbines

Het uitgangspunt voor de schaduwberekeningen is dat de gemeente Emmen een aantal locaties heeft aangewezen om mogelijk windturbines te plaatsen. Voor deze locaties zijn mogelijke opstellingen bepaald voor twee generieke windturbintypes. Het onderzoek zal uitwijzen wat het aantal gevoelige objecten is per opstelling en per locatie, voor welke de in het Activiteitenbesluit genoemde slagschaduw- grenswaarden mogelijk worden overschreden.

Voor de berekeningen wordt uitgegaan van generieke windturbines. De parameters van deze zijn weergegeven in Tabel 1.

Tabel 1. Windturbine parameters

Vermogen	Ashoogte	Tiphoogte	Rotordiameter
3 MW	100 meter	150 meter	101 meter
5 MW	130 meter	194 meter	128 meter

2.2 Normstelling

In art. 3.14 van Activiteitenbesluit milieubeheer¹ zijn voorschriften opgenomen voor slagschaduw ten gevolge van windturbines:

Bij het inwerking hebben van een windturbine worden ten behoeve van het voorkomen of beperken van slagschaduw en lichtschildering de bij ministeriële regeling te stellen maatregelen toegepast.

De in de ministeriële regeling² genoemde maatregelen zijn als volgt:

- (Art. 3.12) Een automatische stilstandvoorziening is vereist indien:
 - slagschaduw optreedt ter plaatse van gevoelige objecten³ voor zover de afstand⁴ tussen de windturbine en de gevoelige objecten minder dan 12 maal de rotordiameter bedraagt en
 - gemiddeld meer dan 17 dagen per jaar gedurende meer dan 20 minuten per dag slagschaduw kan optreden en
 - voor zover zich in de door de slagschaduw getroffen uitwendige scheidingsconstructie van geluidgevoelige gebouwen of woonwagens ramen bevinden.

¹ Activiteitenbesluit milieubeheer

<http://wetten.overheid.nl/BWBR0022762>

² Regeling algemene regels voor inrichtingen milieubeheer, afkorting Rarim (Ministerie Infrastructuur en Milieu)

<http://wetten.overheid.nl/BWBR0022830>

³ **Gevoelig objecten** (definitie Barim): Gevoelige gebouwen plus gevoelige terreinen

- **Gevoelige gebouwen:** woningen en gebouwen die op grond van [artikel 1 van de Wet geluidhinder](#) worden aangemerkt als andere geluidgevoelige gebouwen (bijvoorbeeld scholen), met uitzondering van die gebouwen behorende bij de betreffende inrichting
- **Gevoelige terreinen:** terreinen die op grond van [artikel 1 van de Wet geluidhinder](#) worden aangemerkt als geluidgevoelige terreinen, met uitzondering van die terreinen behorende bij de betreffende inrichting

⁴ De afstand geldt van een punt op ashoogte van de windturbine tot de gevel van het geluidgevoelige object.

- (Art 3.13) Ten behoeve van het voorkomen of beperken van slagschaduw en lichtschildering wordt lichtschildering bij het in werking hebben van een windturbine zoveel mogelijk voorkomen of beperkt door toepassing van niet reflecterende materialen of coatinglagen op de betreffende onderdelen. Het meten van reflectiewaarden vindt plaats overeenkomstig NEN-EN-ISO 2813 of een daaraan ten minste gelijkwaardige meetmethode.

Op basis van de regelgeving wordt in dit rapport het criterium aangehouden dat windturbines niet meer dan 5 uur en 40 minuten per jaar slagschaduw veroorzaken ter plaatse van een gevoelig object.

2.3 Schaduwgevoelige objecten

Op basis van BAG data zijn gevoelige objecten geïdentificeerd in de gemeente Emmen.

In het gebied rondom de opstellingen bevinden zich gebouwen en percelen met bouwrecht waarop wettelijke slagschaduwbeperkingen gelden.

3 Modelling slagschaduw

De berekeningen voor slagschaduw zijn uitgevoerd met het softwarepakket WindPro. Het gebruikte model houdt er rekening mee dat de bladen van de windturbines niet altijd draaien. Bij te lage windsnelheden (beneden de cut-in) is er te weinig energie en bij hele hoge windsnelheden (boven de cut-out) worden de windturbines automatisch stilgezet vanwege de veiligheid. Daarnaast schijnt de zon niet altijd en wordt het gemiddeld aantal zonuren meegenomen gebaseerd op klimaatgegevens. Onderstaande tabel geeft de cut-in en cut-out windsnelheden per windturbine type weer.

Tabel 2: Cut-in en cut-out windsnelheid

Vermogen	Cut-in (m/s)	Cut-out (m/s)
3 MW	3	25
5 MW	4	25

3.1 Modelparameters

3.1.1 Windklimaat

De lokale windsnelheidsverdeling bepaalt het aantal operationele uren van de windturbines en dient daarom meegenomen te worden in de berekeningen. De windrichting bepaalt de oriëntatie van de windturbinerotor en de distributie van de windrichting wordt daarom ook meegenomen in het schaduwmodel.

Het lokale windklimaat is gebaseerd op de windstatistiek van nabij gelegen KNMI stations: Heino, Leeuwaarden en Markenesse. De weging van de stations is gebaseerd op ervaring van Ecofys, zoals bijvoorbeeld met projecten in de nabije omgeving en referentie meetdata op ashoogte. Ecofys komt uit op een weging van 20% voor Heino, 40% voor Leeuwaarden en 40% voor Markenesse.

De KNMI datasets die gebruikt worden in de berekeningen bestaan uit 10 jaar data, gemeten op 10 meter boven de grond over een periode van 2000 tot 2009. KNMI is verantwoordelijk voor de kwaliteit en de consistentie van de data en geeft documentatie op de website (www.knmi.nl).

3.1.2 Zonuren

De aanwezigheid van wolken of mist vermindert het aantal zonuren per jaar. Dit effect wordt meegenomen in het model door het klimatologisch gemiddeld aantal zonuren van het KNMI station De Bilt te gebruiken. Zonuren worden vervolgens genormaliseerd door het aantal gemiddelde zonuren per maand te delen door het theoretisch maximum aantal zonuren (als de zon de hele maand gedurende de dag schijnt).

Tabel 3: Genormaliseerde zonuren voor De Bilt

Maand		Maand	
Januari	0.20	Juli	0.39
Februari	0.28	Augustus	0.42
Maart	0.31	September	0.35
April	0.38	Oktober	0.32
Mei	0.42	November	0.23
Juni	0.37	December	0.18

4 Resultaten Stap 1

Op basis van de uitgangspunten uit hoofdstuk 2 en de modelparameters uit hoofdstuk 3 zijn de contouren berekend waarbinnen jaarlijks meer dan 5 uur en 40 minuten slagschaduw optreedt. In de figuren 2 t/m 15 zijn de resultaten weergegeven. (Zie ook Bijlage 2). In tabel 4 is het aantal objecten per locatie en opstelling weergegeven waarbij overschrijding plaats vindt (van de limiet 5 uur en 40 minuten per jaar) (Zie ook bijlage 1 en 2).

Binnen deze limiet ligt bij een aantal opstellingen ook objecten met bouwrecht voor woningen. Deze aantallen zijn tussen haakjes weergegeven¹.

Tabel 4: Effectbeoordeling slagschaduw

	Locatie	3MW	5MW
1	Pottendijk	26 (3)	46 (4)
2	De Vennen	18	-
3	Groenedijk	5	18
4	Zwartenbergerweg	10	21
5	Berkenrode	5	-
6	Noordersloot	8	-
7	N34	5	23
8	Tuinbouwgebied Klazienaveen	28 (1)	-
9	Veenschapsweg	1	90

Uit de tabel kan worden opgemaakt dat bij de 3 MW opstelling in het gebied Veenschapsweg het minste aantal objecten binnen de 5uur en 40 minuten contour liggen. Bij de 5 MW opstellingen is het de opstelling in het gebied Groenedijk dat het geringst aantal door slagschaduw belemmerde objecten telt.

Uitgaande van de huidige opstellingen liggen bij elke opstelling objecten binnen de 5 uur en 40 minuten contour.

¹ De gemeente Emmen heeft aangegeven dat een bouwrecht in locatie Pottendijk inmiddels woning is. Dit heeft geen effect op de resultaten aangezien zowel de woningen als bouwrecht meegenomen wordt in de beoordeling

5 Resultaten Stap 2

Op basis van de uitgangspunten uit hoofdstuk 2 en de modelparameters uit hoofdstuk 3 zijn de contouren berekend waarbinnen jaarlijks meer dan 5 uur en 40 minuten slagschaduw optreedt. In Bijlage 4 zijn kaarten met de resultaten weergegeven). In onderstaande tabel is het aantal objecten per locatie en opstelling weergegeven waarbij overschrijding plaats vindt (van de limiet 5 uur en 40 minuten per jaar) (Zie ook bijlage 3 en 4).

Binnen deze limiet ligt bij een aantal opstellingen ook objecten met bouwrecht voor woningen. Deze aantallen zijn tussen haakjes weergegeven.

Tabel 5: Effectbeoordeling slagschaduw

	Alternatief	Aantal woningen
1	Woon- en leefomgeving 3MW	14 (2)
2	Landschap 3MW	48 (1)
3	Opbrengst 5MW	45 (4)
4	Spreiding 3MW	64 (1)
5	Spreiding 5MW	139
6	Concentratie 3MW	12 (3)
7	Concentratie 5MW	48 (1)

Uit de tabel kan worden opgemaakt dat bij het alternatief "Concentratie 3 MW" het minste aantal objecten binnen de 5uur en 40 minuten contour liggen en "Woon- en leefomgeving" slechts 1 woning/bouwrecht extra heeft.

Bij de 5 MW alternatieven zijn "Opbrengst 5MW en Concentratie 5MW" gelijk¹. Het alternatief "Spreiding 5MW" ligt er een stuk boven. Uitgaande van de huidige opstellingen liggen bij elke opstelling objecten binnen de 5 uur en 40 minuten contour.

¹ Woningen en bouwrecht worden samen genomen

6 Conclusies

Er liggen voor elke locatie en elk alternatief (zie ook onderstaande tabellen) woningen binnen de in het activiteitenbesluit genoemde afstand van 12 maal de rotordiameter vanaf de windturbine. Uit de slagschaduwberekeningen blijkt dat voor meerdere omliggende woningen een overschrijding plaatsvindt van de 5 uur en 40 minuten per jaar limiet.

Voor de negen locaties heeft de locatie Veenschapsweg (3MW) het minste aantal objecten binnen de 5uur en 40 minuten contour liggen. Bij de 5 MW locaties is het de opstelling in het gebied Groenedijk dat het geringst aantal belemmerde objecten telt.

Voor de 7 alternatieven heeft alternatief "Concentratie 3 MW" het minste aantal objecten binnen de 5uur en 40 minuten contour liggen en heeft "Woon- en leefomgeving" slechts 1 woning/bouwrecht extra.

Bij de 5 MW alternatieven zijn "Opbrengst 5MW en Concentratie 5MW" gelijk. Het alternatief "Spreiding 5MW" ligt er een stuk boven.

Terugregeling van de windturbines voor slagschaduw kan een oplossing bieden om toch aan de normstelling te voldoen.

Bijlage 1 Invoergegevens en resultaten slag- schaduwberekening – Stap 1

Pottendijk, 3MW

WindPRO version 2.9.285 Sep 2014

Project: WIENL15411_9 locaties WRA_20150429_HLS	Printed Page: 17/05/2015 06:15 / 1 Licensee user: Ecofys Netherlands BV Kanaalweg 15-G NL-3526 KL Utrecht +31 (0)30 662 33 00 Helen Pater / h.saehr@ecofys.com Calculated: 16/05/2015 23:42/2.9.285
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SHADOW - Main Result

Calculation: Pottendijk 3MW - Emmen WRA wind

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

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.w
 Obstacles not used in calculation
 Eye height: 1.5 m
 Grid resolution: 10.0 m



WTGs

	Dutch Stereo-RD/NAP 2000			Row data/Description	WTG type			Shadow data			
	East	North	Z		Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]
1	260,640	538,723	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
2	259,747	537,705	10.6	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
3	259,980	537,293	11.2	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
4	260,930	538,388	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
5	261,235	538,631	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
6	260,999	537,933	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
7	261,342	538,150	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
8	261,704	538,381	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
9	262,053	538,611	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
10	262,397	538,832	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
11	262,739	539,051	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
12	263,102	539,269	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
13	263,450	539,473	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
14	263,995	539,859	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
15	264,336	540,075	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
16	261,127	537,482	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
17	261,438	537,720	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
18	261,786	537,920	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
19	262,117	538,142	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
20	262,452	538,355	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
21	262,781	538,575	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
22	263,121	538,791	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
23	263,450	538,991	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
24	264,264	539,522	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
25	264,594	539,749	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
26	262,166	537,721	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
27	262,536	537,957	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
28	262,890	538,170	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
29	263,240	538,390	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
30	263,579	538,614	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
31	263,176	537,917	10.0	ECOTECNIA 3000 3000 100.0 !O!... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3

WindPRO is developed by EMD International A/S, Niels Jernesvej 10, DK-9220 Aalborg Ø, Tel. +45 96 35 44 44, Fax +45 96 35 44 46, e-mail: windpro@emd.dk

Pottendijk, 5MW

WindPRO version 2.9.285 Sep 2014

Project: WIENL15411_9 locaties WRA_20150429_HLS	Printed Page: 17/05/2015 06:20 / 1 Licensee user: Ecofys Netherlands BV Kanaalweg 15-G NL-3526 KL Utrecht +31 (0)30 662 33 00 Helen Pater / h.saehr@ecofys.com Calculated: 17/05/2015 00:34/2.9.285
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 Please look in WTG table

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.w
 Obstacles not used in calculation
 Eye height: 1.5 m
 Grid resolution: 10.0 m



WTGs	Dutch Stereo-RD/NAP 2000				Row data/Description	WTG type			Shadow data					
	East	North	Z	[m]		Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM	
1	260,015	537,265	10.8	GAMESA G128 5000	128.0	!O!	hub: ... Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
2	260,005	537,856	10.0	GAMESA G128 5000	128.0	!O!	hub: ... Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
3	260,781	538,882	10.0	GAMESA G128 5000	128.0	!O!	hub: ... Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
4	260,888	538,328	10.0	GAMESA G128 5000	128.0	!O!	hub: ... Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
5	261,374	538,607	10.0	GAMESA G128 5000	128.0	!O!	hub: ... Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
6	260,978	537,805	10.0	GAMESA G128 5000	128.0	!O!	hub: ... Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
7	261,484	538,055	10.0	GAMESA G128 5000	128.0	!O!	hub: ... Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
8	261,970	538,353	10.0	GAMESA G128 5000	128.0	!O!	hub: ... Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
9	262,465	538,622	10.0	GAMESA G128 5000	128.0	!O!	hub: ... Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
10	262,951	538,922	10.0	GAMESA G128 5000	128.0	!O!	hub: ... Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
11	263,444	539,216	10.0	GAMESA G128 5000	128.0	!O!	hub: ... Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
12	263,870	539,779	10.0	GAMESA G128 5000	128.0	!O!	hub: ... Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
13	264,348	540,086	10.0	GAMESA G128 5000	128.0	!O!	hub: ... Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
14	261,430	537,515	10.0	GAMESA G128 5000	128.0	!O!	hub: ... Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
15	261,988	537,785	10.0	GAMESA G128 5000	128.0	!O!	hub: ... Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
16	262,494	538,039	10.0	GAMESA G128 5000	128.0	!O!	hub: ... Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
17	263,003	538,312	10.0	GAMESA G128 5000	128.0	!O!	hub: ... Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
18	263,485	538,626	10.0	GAMESA G128 5000	128.0	!O!	hub: ... Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
19	264,375	539,522	10.0	GAMESA G128 5000	128.0	!O!	hub: ... Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0

WindPRO is developed by EMD International A/S, Niels Jernesvej 10, DK-9220 Aalborg Ø, Tel. +45 96 35 44 44, Fax +45 96 35 44 46, e-mail: windpro@emd.dk

De Vennen, 3MW

WindPRO version 2.9.285 Sep 2014

Project: WIENL15411_9 locaties WRA_20150429_HLS	Printed Page: 17/05/2015 06:14 / 1 Licensed user: Ecofys Netherlands BV Kanaalweg 15-G NL-3526 KL Utrecht +31 (0)30 662 33 00 Helen Pater / h.sæhr@ecofys.com Calculated: 16/05/2015 23:05/2.9.285
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SHADOW - Main Result

Calculation: De Vennen 3MW - Emmen WRA wind

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

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.w
 Obstacles not used in calculation
 Eye height: 1.5 m
 Grid resolution: 10.0 m



▲ New WTG

Scale 1:20,000

Dutch Stereo-RD/NAP 2000				WTG type				Shadow data			
East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM
		[m]									
1	267,828	540,473	10.0 ECOTECNIA 3000 3000 100.0 !O! ... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3	
2	267,754	540,867	10.0 ECOTECNIA 3000 3000 100.0 !O! ... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3	
3	267,781	540,068	10.0 ECOTECNIA 3000 3000 100.0 !O! ... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3	
4	268,056	540,195	10.0 ECOTECNIA 3000 3000 100.0 !O! ... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3	
5	268,041	540,736	10.0 ECOTECNIA 3000 3000 100.0 !O! ... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3	

WindPRO is developed by EMD International A/S, Niels Jernesvej 10, DK-9220 Aalborg Ø, Tel. +45 96 35 44 44, Fax +45 96 35 44 46, e-mail: windpro@emd.dk

Groenedijk, 3MW

WindPRO version 2.9.285 Sep 2014

Project: WIENL15411_9 locaties WRA_20150429_HLS	Printed Page: 17/05/2015 06:16 / 1 Licensee user: Ecofys Netherlands BV Kanaalweg 15-G NL-3526 KL Utrecht +31 (0)30 662 33 00 Helen Pater / h.sæhr@ecofys.com Calculated: 16/05/2015 23:49/2.9.285
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SHADOW - Main Result

Calculation: Groenedijk 3MW - Emmen WRA wind

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

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.w
 Obstacles not used in calculation
 Eye height: 1.5 m
 Grid resolution: 10.0 m



	Dutch Stereo-RD/NAP 2000			Row data/Description	WTG type			Shadow data				
	East	North	Z [m]		Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM
1	261,899	535,186	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
2	261,897	534,763	14.7	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
3	261,920	534,358	17.1	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
4	262,300	534,774	12.2	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
5	262,323	534,369	14.3	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
6	262,701	534,786	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
7	262,724	534,381	10.7	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
8	263,125	534,392	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
9	263,574	534,588	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
10	263,781	534,971	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3

WindPRO is developed by EMD International A/S, Niels Jernesvej 10, DK-9220 Aalborg Ø, Tel. +45 96 35 44 44, Fax +45 96 35 44 46, e-mail: windpro@emd.dk

Groenedijk, 5MW

WindPRO version 2.9.285 Sep 2014

Project: WIENL15411_9 locaties WRA_20150429_HLS	Printed Page: 17/05/2015 06:21 / 1 Licensee user: Ecofys Netherlands BV Kanaalweg 15-G NL-3526 KL Utrecht +31 (0)30 662 33 00 Helen Pater / h.saehr@ecofys.com Calculated: 17/05/2015 00:40/2.9.285
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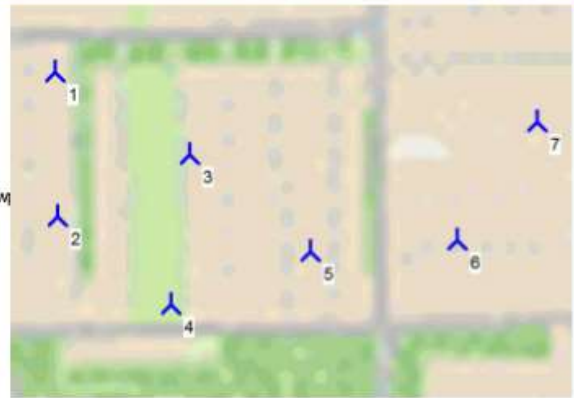
SHADOW - Main Result

Calculation: Groenedijk 5MW - Emmen WRA wind

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

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.w
 Obstacles not used in calculation
 Eye height: 1.5 m
 Grid resolution: 10.0 m



Dutch Stereo-RD/NAP 2000				WTG type				Shadow data			
East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM
1	261,898	535,167	10.0 GAMESA G128 5000 128.0 !O! hub: 1...	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
2	261,919	534,600	15.6 GAMESA G128 5000 128.0 !O! hub: 1...	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
3	262,433	534,854	10.6 GAMESA G128 5000 128.0 !O! hub: 1...	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
4	262,373	534,266	14.4 GAMESA G128 5000 128.0 !O! hub: 1...	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
5	262,917	534,486	10.0 GAMESA G128 5000 128.0 !O! hub: 1...	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
6	263,493	534,542	10.0 GAMESA G128 5000 128.0 !O! hub: 1...	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
7	263,797	535,013	10.0 GAMESA G128 5000 128.0 !O! hub: 1...	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0

WindPRO is developed by EMD International A/S, Niels Jernesvej 10, DK-9220 Aalborg Ø, Tel. +45 96 35 44 44, Fax +45 96 35 44 46, e-mail: windpro@emd.dk

Zwartenbergerweg, 3MW

WindPRO version 2.9.285 Sep 2014

Project: WIENL15411_9 locaties WRA_20150429_HLS	Printed Page: 17/05/2015 06:17 / 1 Licensed user: Ecofys Netherlands BV Kanaalweg 15-G NL-3526 KL Utrecht +31 (0)30 662 33 00 Helen Pater / h.sæhr@ecofys.com Calculated: 16/05/2015 23:56/2.9.285
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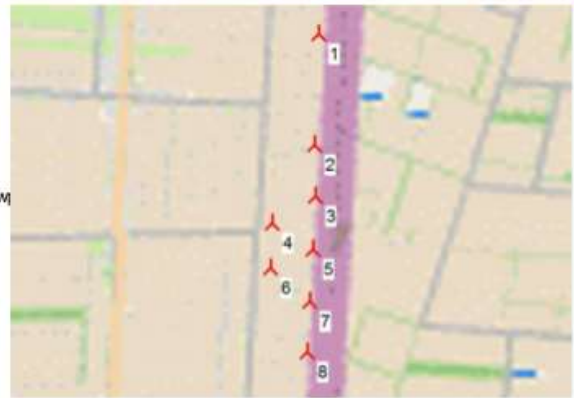
SHADOW - Main Result

Calculation: Zwartenbergerweg 3MW - Emmen WRA wind

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

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.w
 Obstacles not used in calculation
 Eye height: 1.5 m
 Grid resolution: 10.0 m



	Dutch Stereo-RD/NAP 2000			Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
	East	North	Z [m]		Valid	Manufact.	Type-generator				Calculation distance [m]	RPM [RPM]
1	268,410	535,966	11.5	ECOTECNIA 3000 3000 100.0 !O! ... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3	
2	268,396	535,093	12.7	ECOTECNIA 3000 3000 100.0 !O! ... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3	
3	268,417	534,693	13.2	ECOTECNIA 3000 3000 100.0 !O! ... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3	
4	268,077	534,474	13.2	ECOTECNIA 3000 3000 100.0 !O! ... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3	
5	268,404	534,277	13.8	ECOTECNIA 3000 3000 100.0 !O! ... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3	
6	268,073	534,120	13.7	ECOTECNIA 3000 3000 100.0 !O! ... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3	
7	268,391	533,870	14.3	ECOTECNIA 3000 3000 100.0 !O! ... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3	
8	268,380	533,468	14.8	ECOTECNIA 3000 3000 100.0 !O! ... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3	

WindPRO is developed by EMD International A/S, Niels Jernesvej 10, DK-9220 Aalborg Ø, Tel. +45 96 35 44 44, Fax +45 96 35 44 46, e-mail: windpro@emd.dk

Zwartenbergerweg, 5MW

WindPRO version 2.9.285 Sep 2014

Project: WIENL15411_9 locaties WRA_20150429_HLS	Printed Page: 17/05/2015 06:22 / 1 Licensed user: Ecofys Netherlands BV Kanaalweg 15-G NL-3526 KL Utrecht +31 (0)30 662 33 00 Helen Pater / h.sæhr@ecofys.com Calculated: 17/05/2015 06:09/2.9.285
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SHADOW - Main Result

Calculation: Zwartenbergerweg 5MW

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

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.w
 Obstacles not used in calculation
 Eye height: 1.5 m
 Grid resolution: 10.0 m



New WTG

Scale 1:75,000

Dutch Stereo-RD/NAP 2000				WTG type				Shadow data			
East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM
1	268,410	535,966	11.5 GAMESA G128 5000 128.0 !O! hub: 1...	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
2	268,339	534,708	13.1 GAMESA G128 5000 128.0 !O! hub: 1...	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
3	267,973	534,223	13.5 GAMESA G128 5000 128.0 !O! hub: 1...	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
4	268,347	533,750	14.4 GAMESA G128 5000 128.0 !O! hub: 1...	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
5	268,328	533,172	15.2 GAMESA G128 5000 128.0 !O! hub: 1...	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0

WindPRO is developed by EMD International A/S, Niels Jernesvej 10, DK-9220 Aalborg Ø, Tel. +45 96 35 44 44, Fax +45 96 35 44 46, e-mail: windpro@emd.dk

Berkenrode, 3MW

WindPRO version 2.9.285 Sep 2014

Project: WIENL15411_9 locaties WRA_20150429_HLS	Printed Page: 17/05/2015 06:17 / 1 Licensed user: Ecofys Netherlands BV Kanaalweg 15-G NL-3526 KL Utrecht +31 (0)30 662 33 00 Helen Pater / h.sæhr@ecofys.com Calculated: 17/05/2015 00:01/2.9.285
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SHADOW - Main Result

Calculation: Berkenrode 3MW - Emmen WRA wind

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

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.w
 Obstacles not used in calculation
 Eye height: 1.5 m
 Grid resolution: 10.0 m



New WTG

WTGs	Dutch Stereo-RD/NAP 2000				WTG type				Shadow data			
	East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM
1	265,212	533,268	14.2	ECOTECNIA 3000 3000 100.0 !O! ... No	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
2	265,265	532,826	15.5	ECOTECNIA 3000 3000 100.0 !O! ... No	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
3	265,590	533,376	13.6	ECOTECNIA 3000 3000 100.0 !O! ... No	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
4	265,569	533,022	14.7	ECOTECNIA 3000 3000 100.0 !O! ... No	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
5	265,528	532,664	15.8	ECOTECNIA 3000 3000 100.0 !O! ... No	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3

WindPRO is developed by EMD International A/S, Niels Jernesvej 10, DK-9220 Aalborg Ø, Tel. +45 96 35 44 44, Fax +45 96 35 44 46, e-mail: windpro@emd.dk

Noordersloot, 3MW

WindPRO version 2.9.285 Sep 2014

Project: WIENL15411_9 locaties WRA_20150429_HLS	Printed Page: 17/05/2015 06:18 / 1 Licensed user: Ecofys Netherlands BV Kanaalweg 15-G NL-3526 KL Utrecht +31 (0)30 662 33 00 Helen Pater / h.sæhr@ecofys.com Calculated: 17/05/2015 00:06/2.9.285
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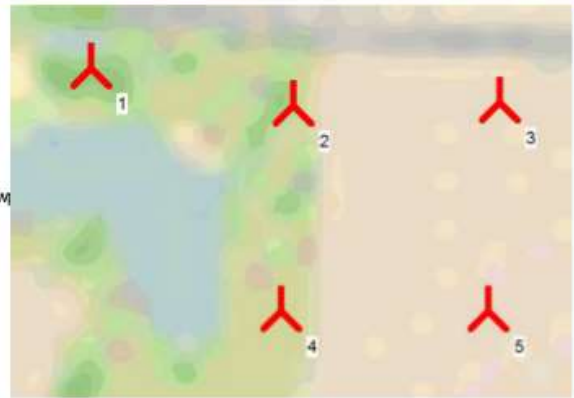
SHADOW - Main Result

Calculation: Noordersloot 3MW - Emmen WRA wind

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

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.w
 Obstacles not used in calculation
 Eye height: 1.5 m
 Grid resolution: 10.0 m



Dutch Stereo-RD/NAP 2000				WTG type				Shadow data			
East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM
1	260,995	523,434	20.0 ECOTECNIA 3000 3000 100.0 !O! ... No	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
2	261,394	523,369	20.0 ECOTECNIA 3000 3000 100.0 !O! ... No	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
3	261,801	523,384	20.0 ECOTECNIA 3000 3000 100.0 !O! ... No	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
4	261,378	522,966	20.0 ECOTECNIA 3000 3000 100.0 !O! ... No	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
5	261,787	522,975	20.0 ECOTECNIA 3000 3000 100.0 !O! ... No	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3

WindPRO is developed by EMD International A/S, Niels Jernesvej 10, DK-9220 Aalborg Ø, Tel. +45 96 35 44 44, Fax +45 96 35 44 46, e-mail: windpro@emd.dk

N34, 3MW

WindPRO version 2.9.285 Sep 2014

Project: WIENL15411_9 locaties WRA_20150429_HLS	Printed Page: 17/05/2015 06:18 / 1 Licensed user: Ecofys Netherlands BV Kanaalweg 15-G NL-3526 KL Utrecht +31 (0)30 662 33 00 Helen Pater / h.sæhr@ecofys.com Calculated: 17/05/2015 00:11/2 9.285
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SHADOW - Main Result

Calculation: N34 3MW - Emmen WRA wind

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

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.w
 Obstacles not used in calculation
 Eye height: 1.5 m
 Grid resolution: 10.0 m



WTGs	Dutch Stereo-RD/NAP 2000			Row data/Description	WTG type			Shadow data			
	East	North	Z		Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]
1	253,299	533,380	20.0	ECOTECNIA 3000 3000 100.0 !O! ... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
2	253,189	532,997	20.0	ECOTECNIA 3000 3000 100.0 !O! ... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
3	253,168	532,585	20.0	ECOTECNIA 3000 3000 100.0 !O! ... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
4	253,761	533,883	20.0	ECOTECNIA 3000 3000 100.0 !O! ... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
5	253,708	533,540	20.0	ECOTECNIA 3000 3000 100.0 !O! ... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
6	253,634	533,194	20.0	ECOTECNIA 3000 3000 100.0 !O! ... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
7	254,055	533,333	20.0	ECOTECNIA 3000 3000 100.0 !O! ... No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3

WindPRO is developed by EMD International A/S, Niels Jernesvej 10, DK-9220 Aalborg Ø, Tel. +45 96 35 44 44, Fax +45 96 35 44 46, e-mail: windpro@emd.dk

N34, 5MW

WindPRO version 2.9.285 Sep 2014

Project: WIENL15411_9 locaties WRA_20150429_HLS	Printed/Date: 17/05/2015 06:22 / 1
	Licensee user: Ecofys Netherlands BV Kanaalweg 15-G NL-3526 KL Utrecht +31 (0)30 662 33 00 Helen Pater / h.sæhr@ecofys.com
	Calculated: 17/05/2015 02:20/2.9.285

SHADOW - Main Result

Calculation: N34 5MW - Emmen WRA wind

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

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.w
 Obstacles not used in calculation
 Eye height: 1.5 m
 Grid resolution: 10.0 m



New WTG

Dutch Stereo-RD/NAP 2000				WTG type				Shadow data			
East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM
		[m]									
1	253,997	533,445	20.0 GAMESA G128 5000 128.0 !O! hub: 1...	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
2	253,105	533,146	20.0 GAMESA G128 5000 128.0 !O! hub: 1...	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
3	253,761	533,877	20.0 GAMESA G128 5000 128.0 !O! hub: 1...	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
4	253,622	533,184	20.0 GAMESA G128 5000 128.0 !O! hub: 1...	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
5	253,132	532,572	20.0 GAMESA G128 5000 128.0 !O! hub: 1...	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0

WindPRO is developed by EMD International A/S, Niels Jernesvej 10, DK-9220 Aalborg Ø, Tel. +45 96 35 44 44, Fax +45 96 35 44 46, e-mail: windpro@emd.dk

Tuinbouwgebied Klazienaveen, 3MW

WindPRO version 2.9.285 Sep 2014

<p>Project: WIENL15411_9 locaties WRA_20150429_HLS</p>	<p>Printed/Date: 17/05/2015 06:19 / 1</p> <p>Licensed user: Ecofys Netherlands BV Kanaalweg 15-G NL-3526 KL Utrecht +31 (0)30 662 33 00 Helen Pater / h.saehr@ecofys.com</p> <p>Calculated: 17/05/2015 00:16/2.9.285</p>
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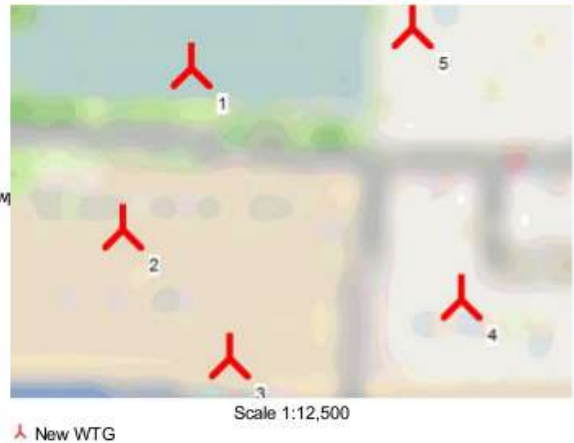
SHADOW - Main Result

Calculation: Klazienaveen 3MW - Emmen WRA wind

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

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.w
Obstacles not used in calculation
Eye height: 1.5 m
Grid resolution: 10.0 m



WTGs

	Dutch Stereo-RD/NAP 2000				WTG type				Shadow data			
	East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM
1	265,157	529,196	20.0	ECOTECNIA 3000 3000 100.0 !O! ... No	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
2	265,029	528,876	20.0	ECOTECNIA 3000 3000 100.0 !O! ... No	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
3	265,245	528,629	20.0	ECOTECNIA 3000 3000 100.0 !O! ... No	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
4	265,699	528,753	20.0	ECOTECNIA 3000 3000 100.0 !O! ... No	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
5	265,591	529,284	20.0	ECOTECNIA 3000 3000 100.0 !O! ... No	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3

WindPRO is developed by EMD International A/S, Niels Jernesvej 10, DK-9220 Aalborg Ø, Tel. +45 96 35 44 44, Fax +45 96 35 44 46, e-mail: windpro@emd.dk

Veenschapsweg, 3MW

WindPRO version 2.9.285 Sep 2014

Project: WIENL15411_9 locaties WRA_20150429_HLS	Printed Page: 17/05/2015 06:20 / 1 Licensee user: Ecofys Netherlands BV Kanaalweg 15-G NL-3526 KL Utrecht +31 (0)30 662 33 00 Helen Pater / h.sæhr@ecofys.com Calculated: 17/05/2015 00:24/2.9.285
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SHADOW - Main Result

Calculation: LOFAR 3MW - Emmen WRA wind

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

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.w
 Obstacles not used in calculation
 Eye height: 1.5 m
 Grid resolution: 10.0 m



	Dutch Stereo-RD/NAP 2000				Row data/Description	WTG type				Shadow data		
	East	North	Z	[m]		Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]
1	260,677	520,779	15.4	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
2	260,375	521,046	15.1	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
3	260,012	521,215	14.8	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
4	259,633	521,382	13.2	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
5	259,337	521,631	12.3	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
6	259,047	521,840	11.3	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
7	258,987	521,480	10.1	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
8	258,554	521,871	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
9	258,532	521,102	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
10	258,319	521,452	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
11	257,974	521,678	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
12	257,632	521,888	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3

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Project:
WIENL15411_9 locaties WRA_20150429_HLS

Printed/Date:
17/05/2015 06:23 / 1
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+31 (0)30 662 33 00
Helen Pater / h.sæhr@ecofys.com
Calculated:
17/05/2015 02:26/2.9.285

SHADOW - Main Result

Calculation: LOFAR 5MW - Emmen WRA wind

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

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.w
Obstacles not used in calculation
Eye height: 1.5 m
Grid resolution: 10.0 m



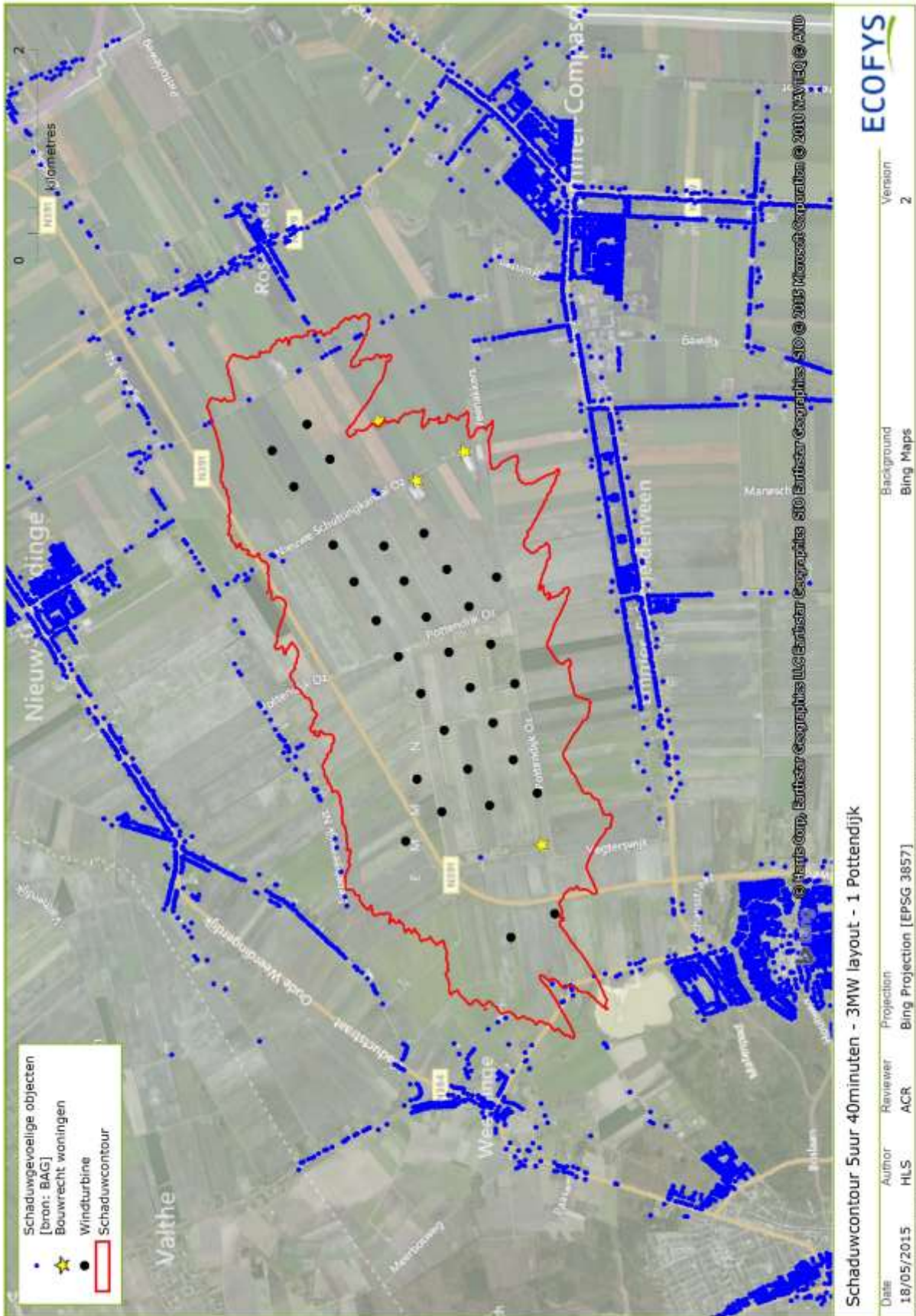
▲ New WTG

WTGs

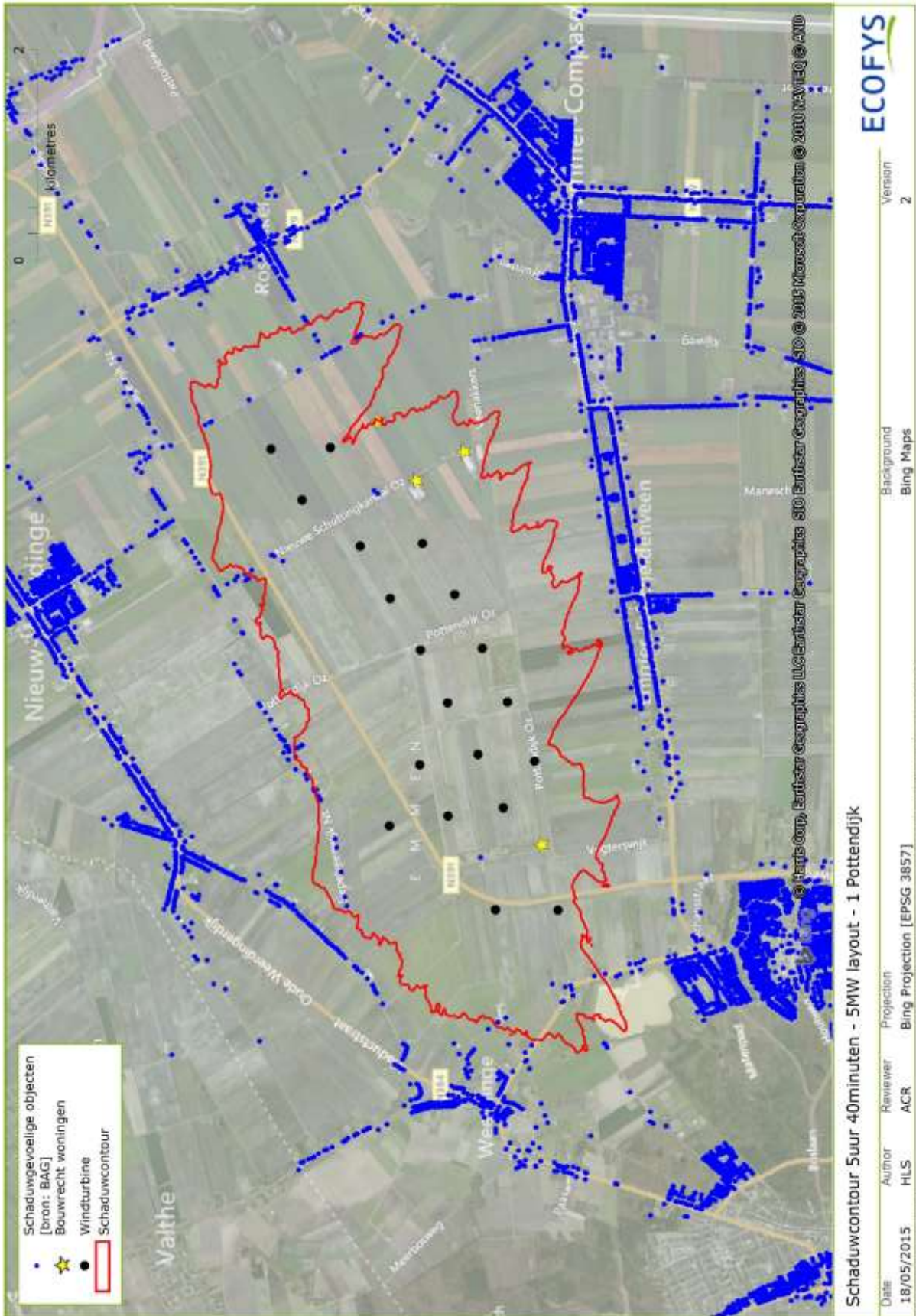
Dutch Stereo-RD/NAP 2000				WTG type				Shadow data			
East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM
		[m]									
1	258,411	521,273	10.0 GAMESA G128 5000 128.0 !O! hub: 1...	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
2	257,550	521,913	10.0 GAMESA G128 5000 128.0 !O! hub: 1...	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
3	259,080	521,570	10.8 GAMESA G128 5000 128.0 !O! hub: 1...	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
4	258,046	521,696	10.0 GAMESA G128 5000 128.0 !O! hub: 1...	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
5	258,575	521,831	10.0 GAMESA G128 5000 128.0 !O! hub: 1...	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
6	259,569	521,274	12.6 GAMESA G128 5000 128.0 !O! hub: 1...	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
7	260,087	521,026	14.6 GAMESA G128 5000 128.0 !O! hub: 1...	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
8	260,577	520,730	14.9 GAMESA G128 5000 128.0 !O! hub: 1...	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0

Bijlage 2 Schaduwcontouren – Stap 1

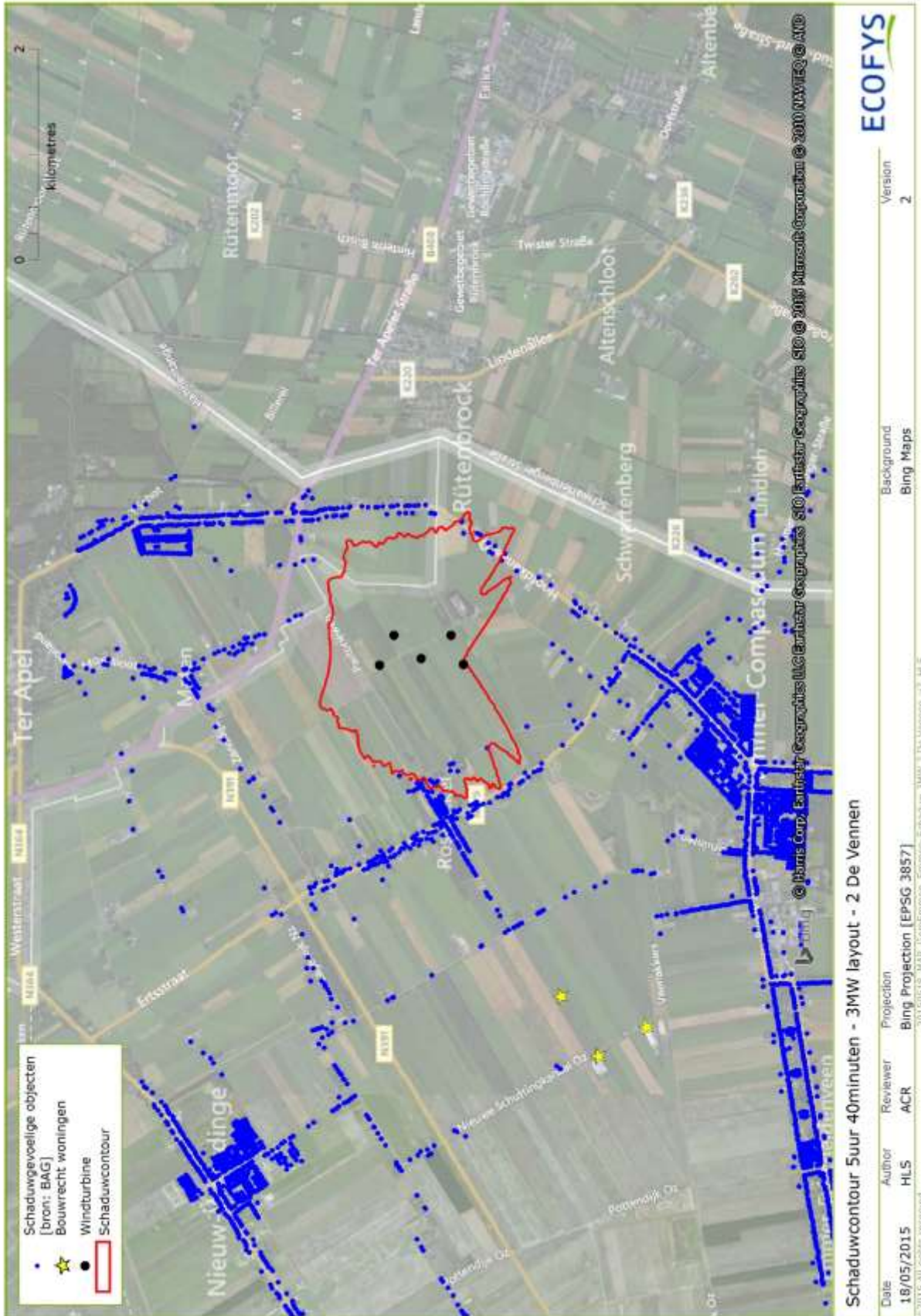
Pottendijk, 3MW



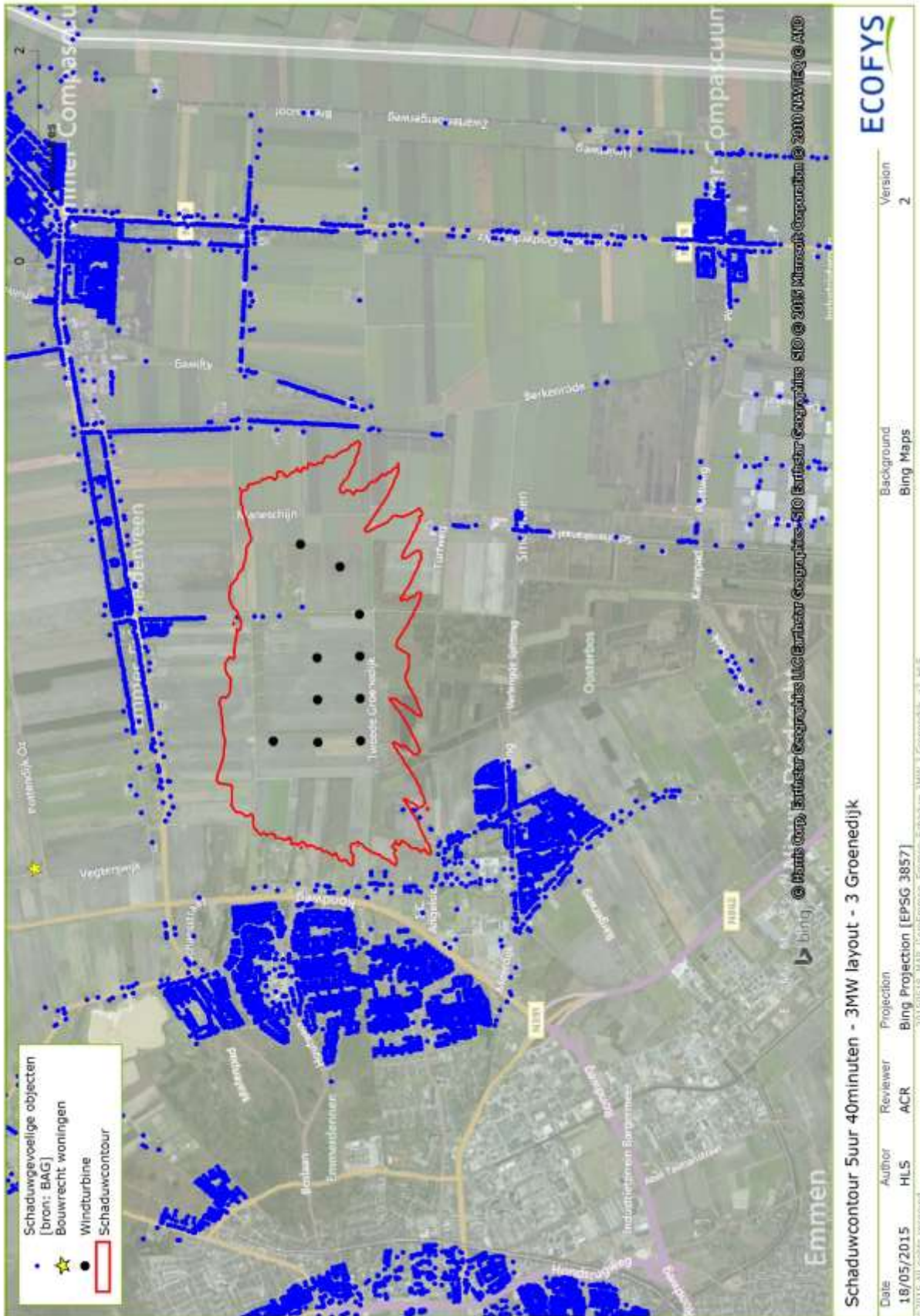
Pottendijk, 5MW



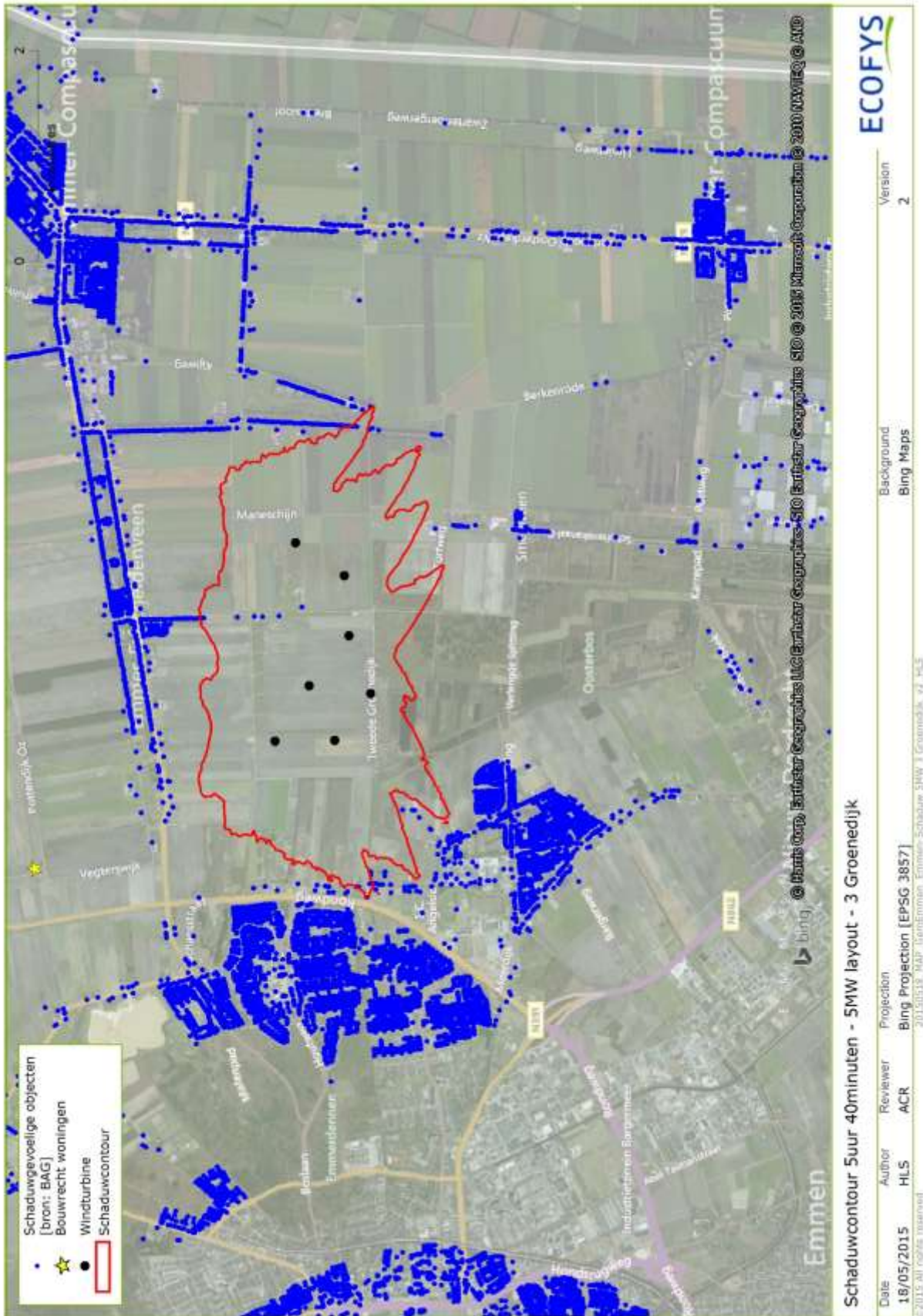
De Vennen, 3MW



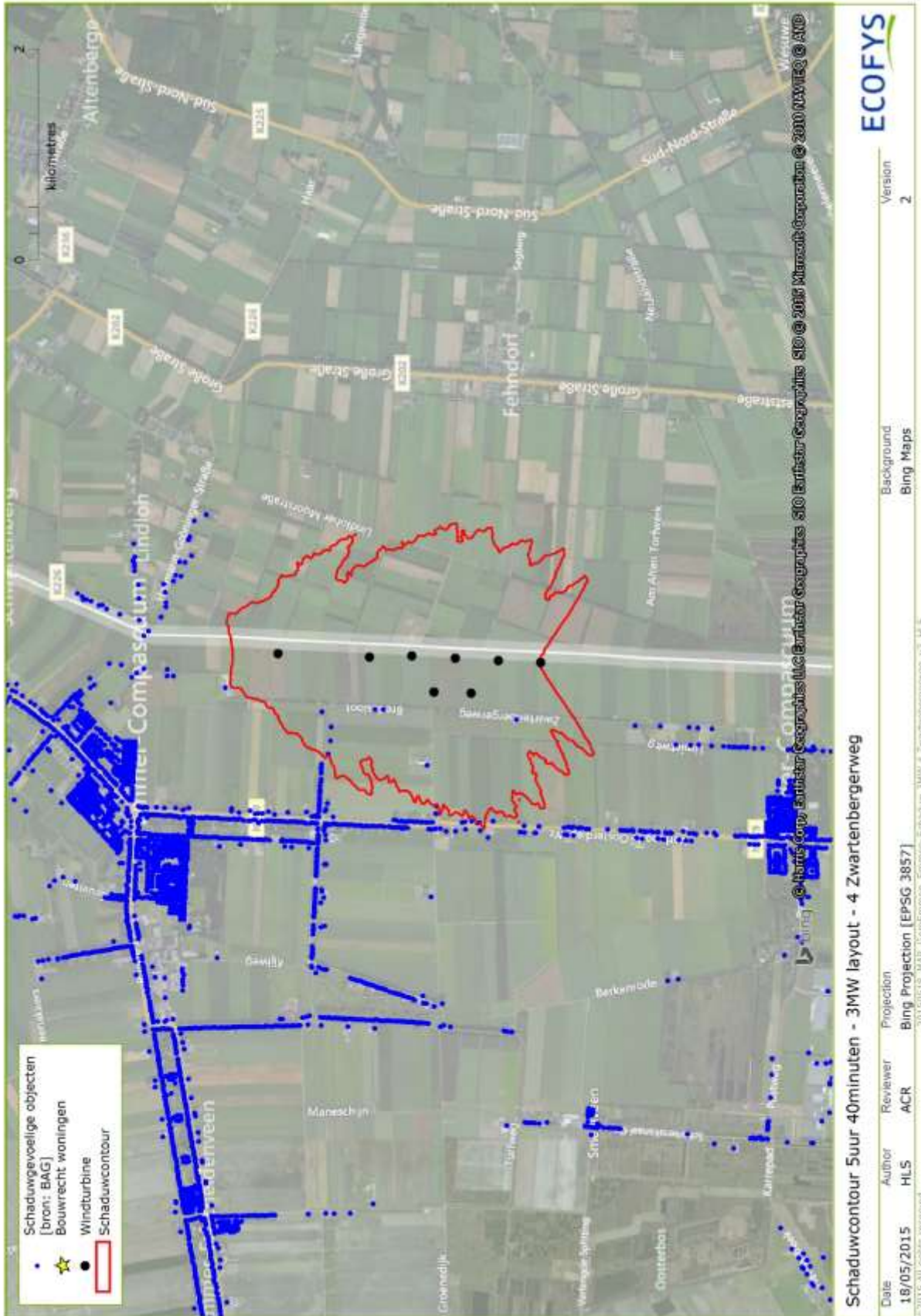
Groenedijk, 3MW



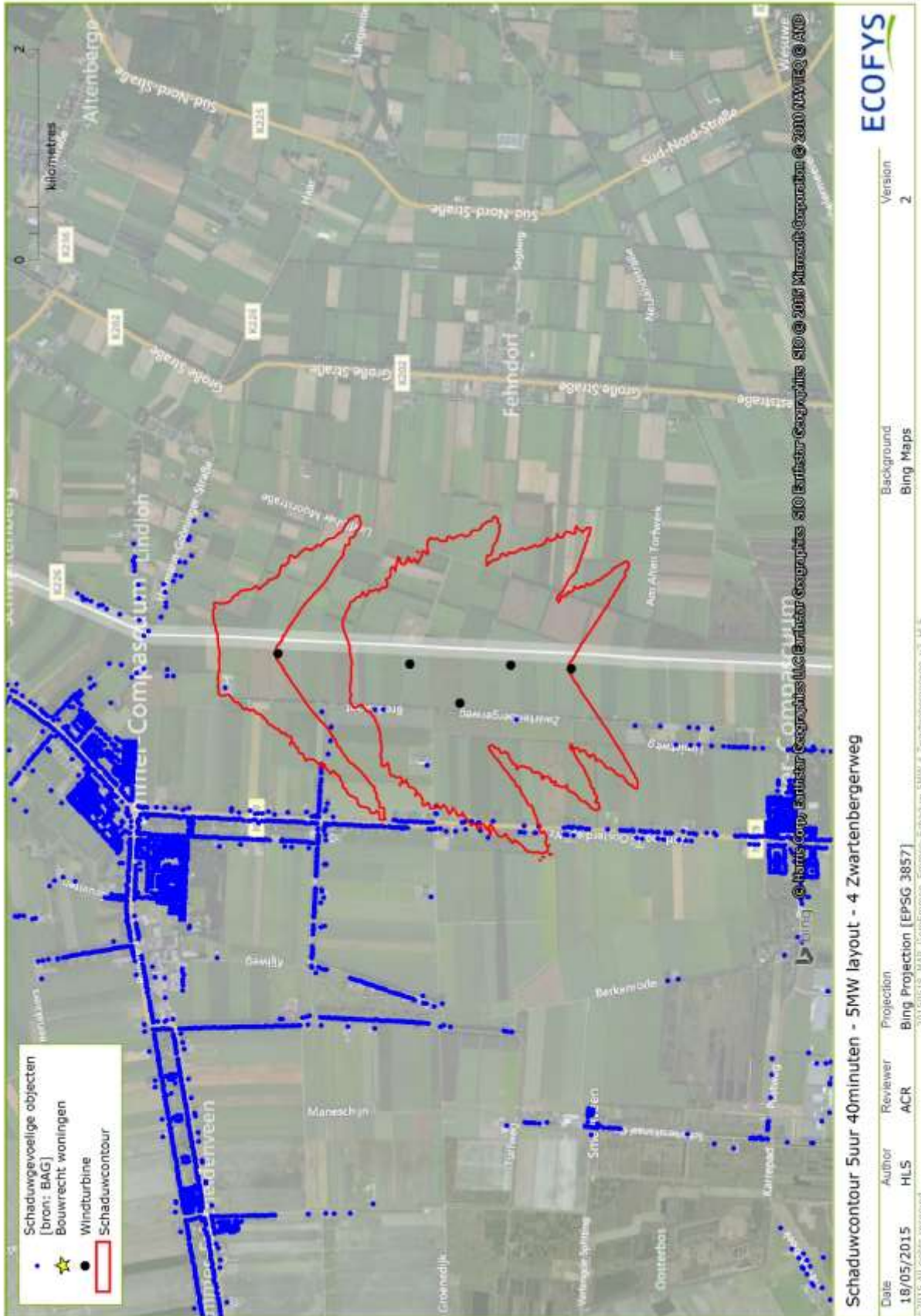
Groenedijk, 5MW



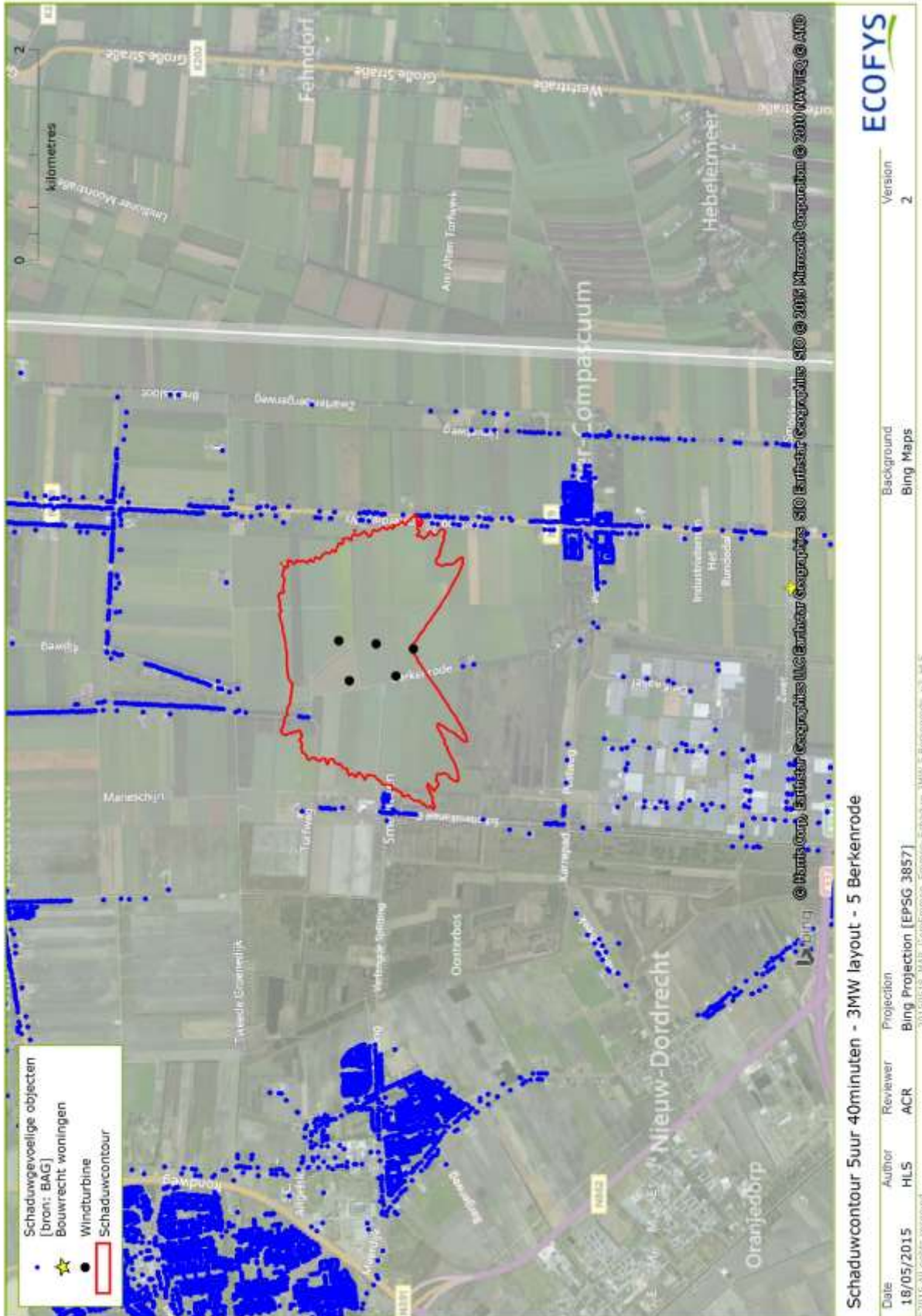
Zwartenbergerweg, 3MW



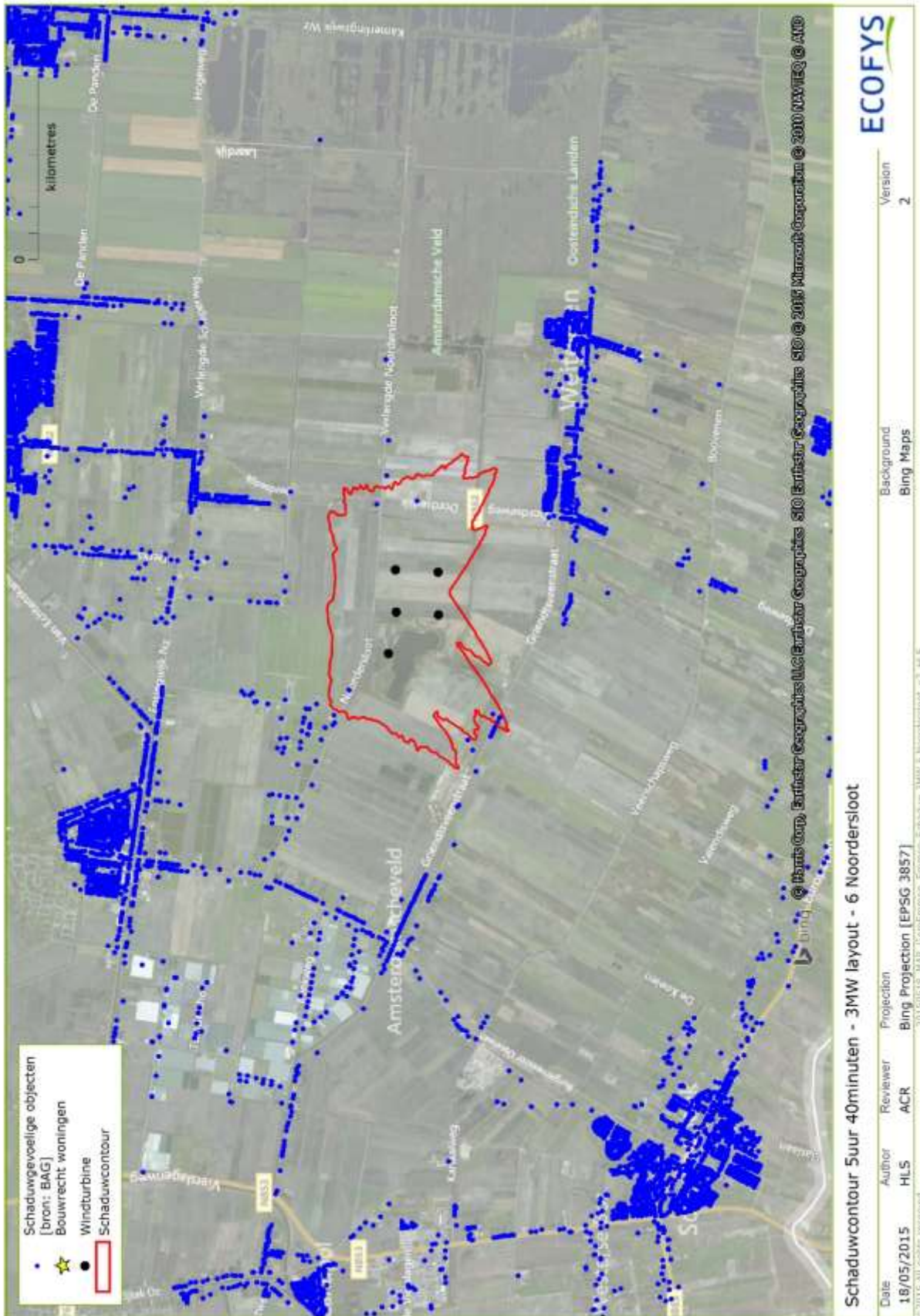
Zwartenbergerweg, 5MW



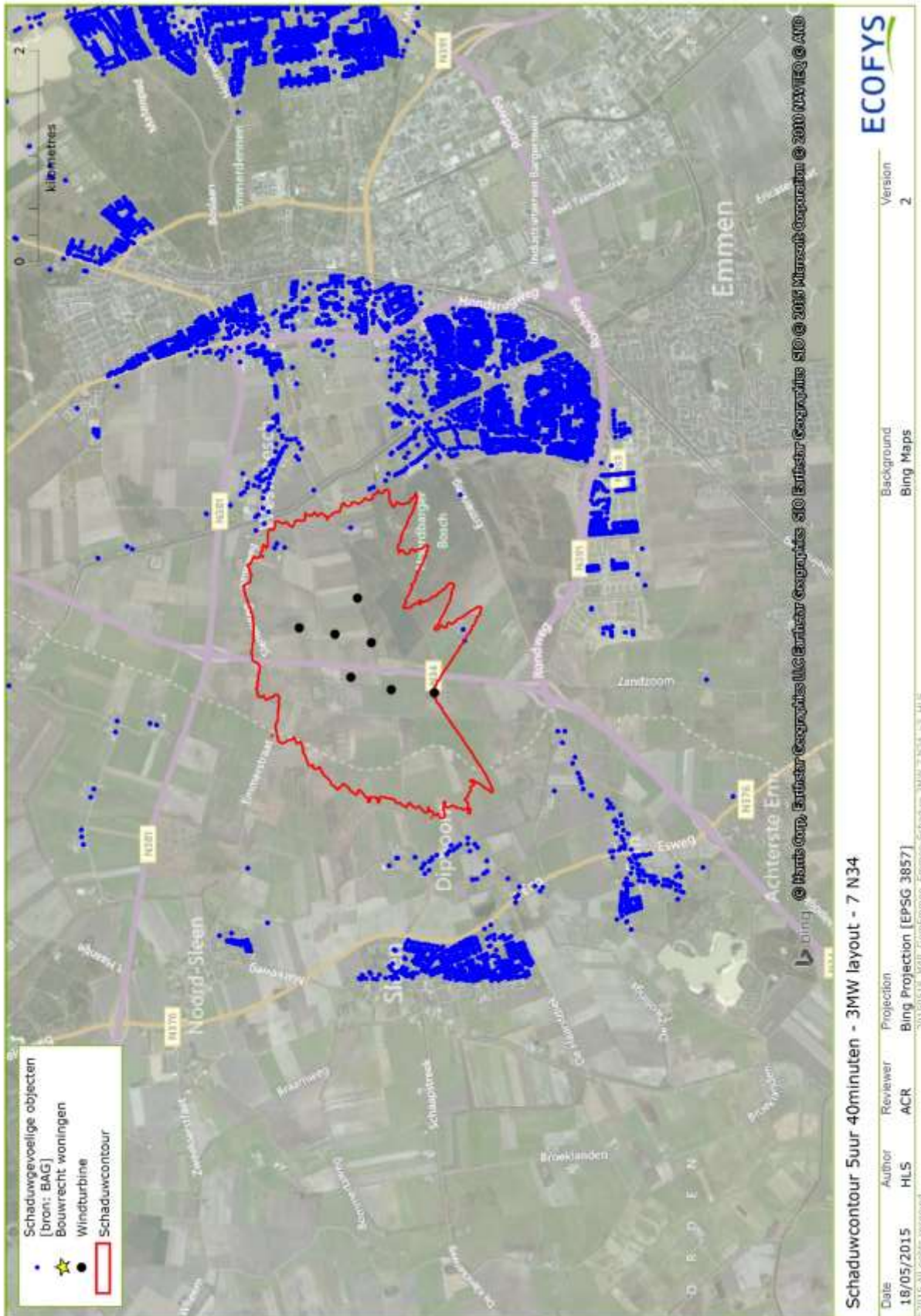
Berkenrode, 3MW



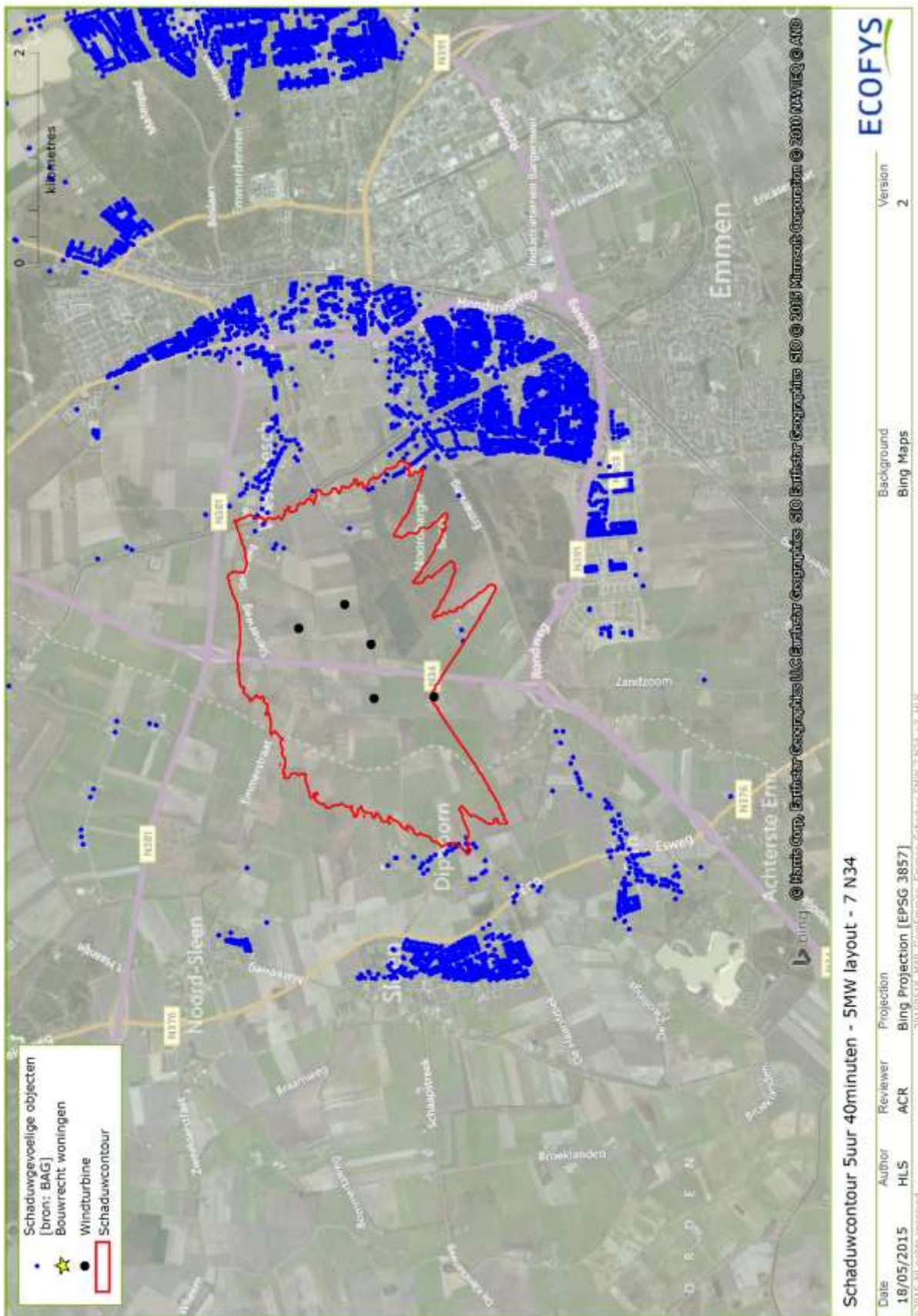
Noordersloot, 3MW



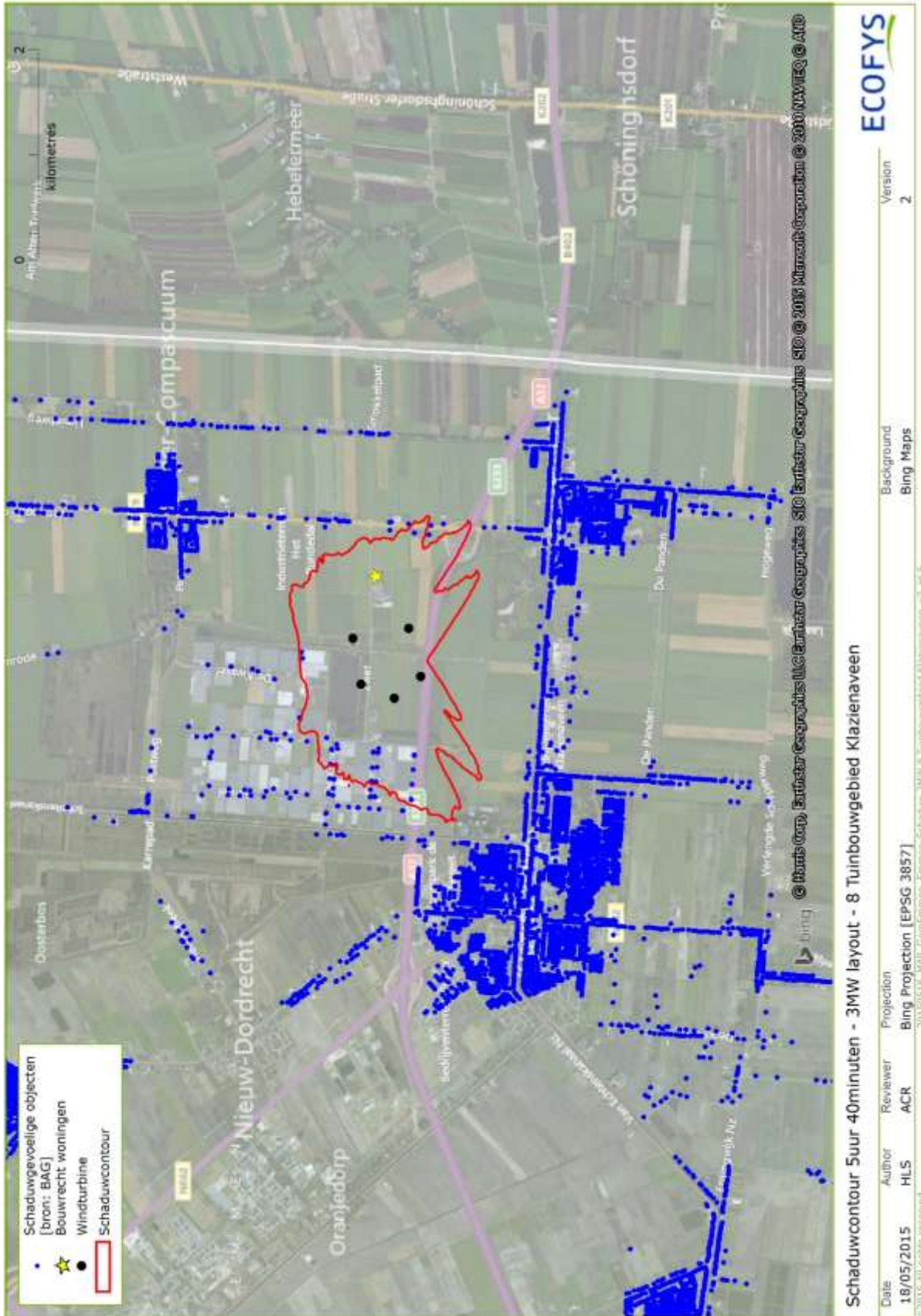
N34, 3MW



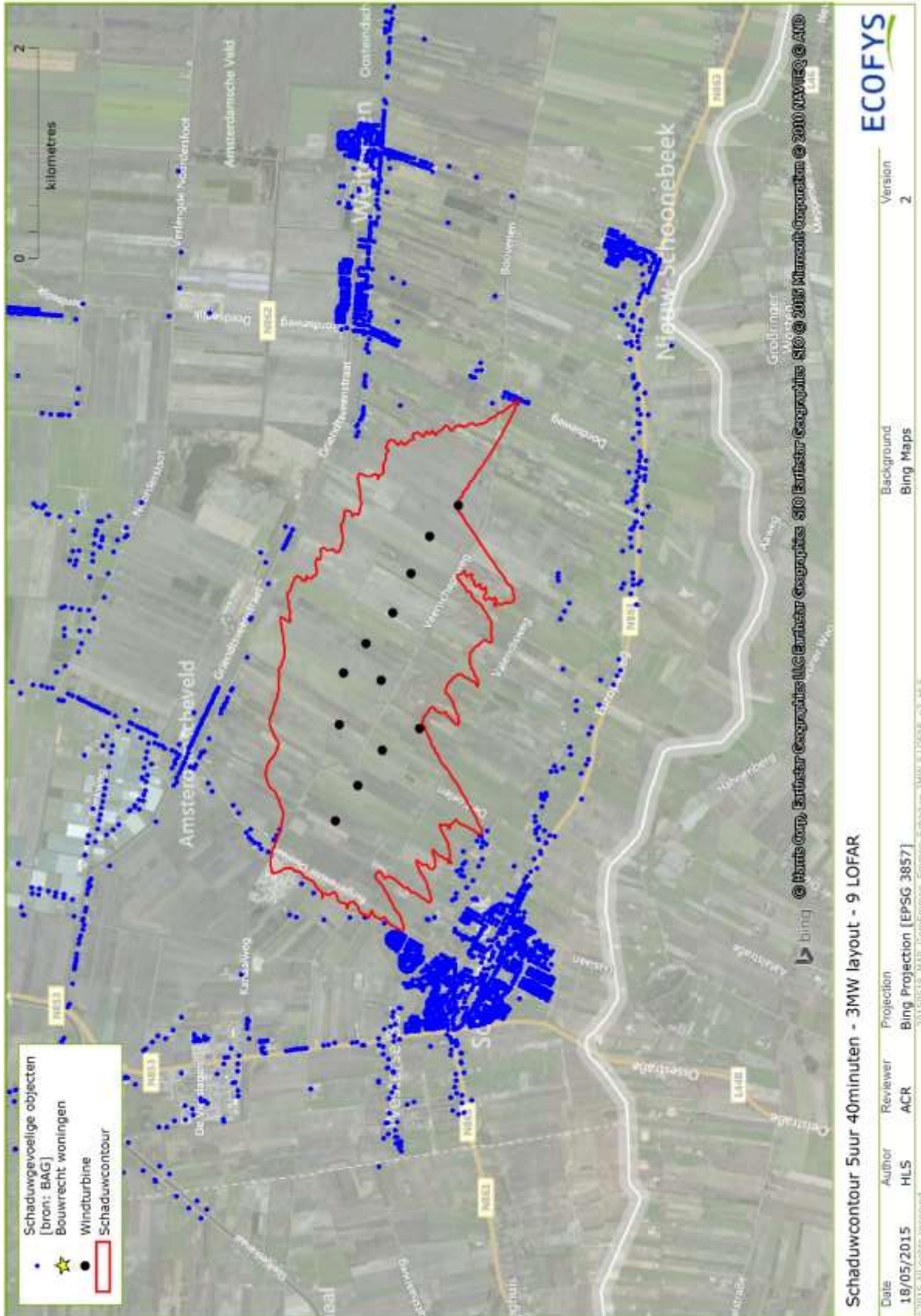
N34, 5MW



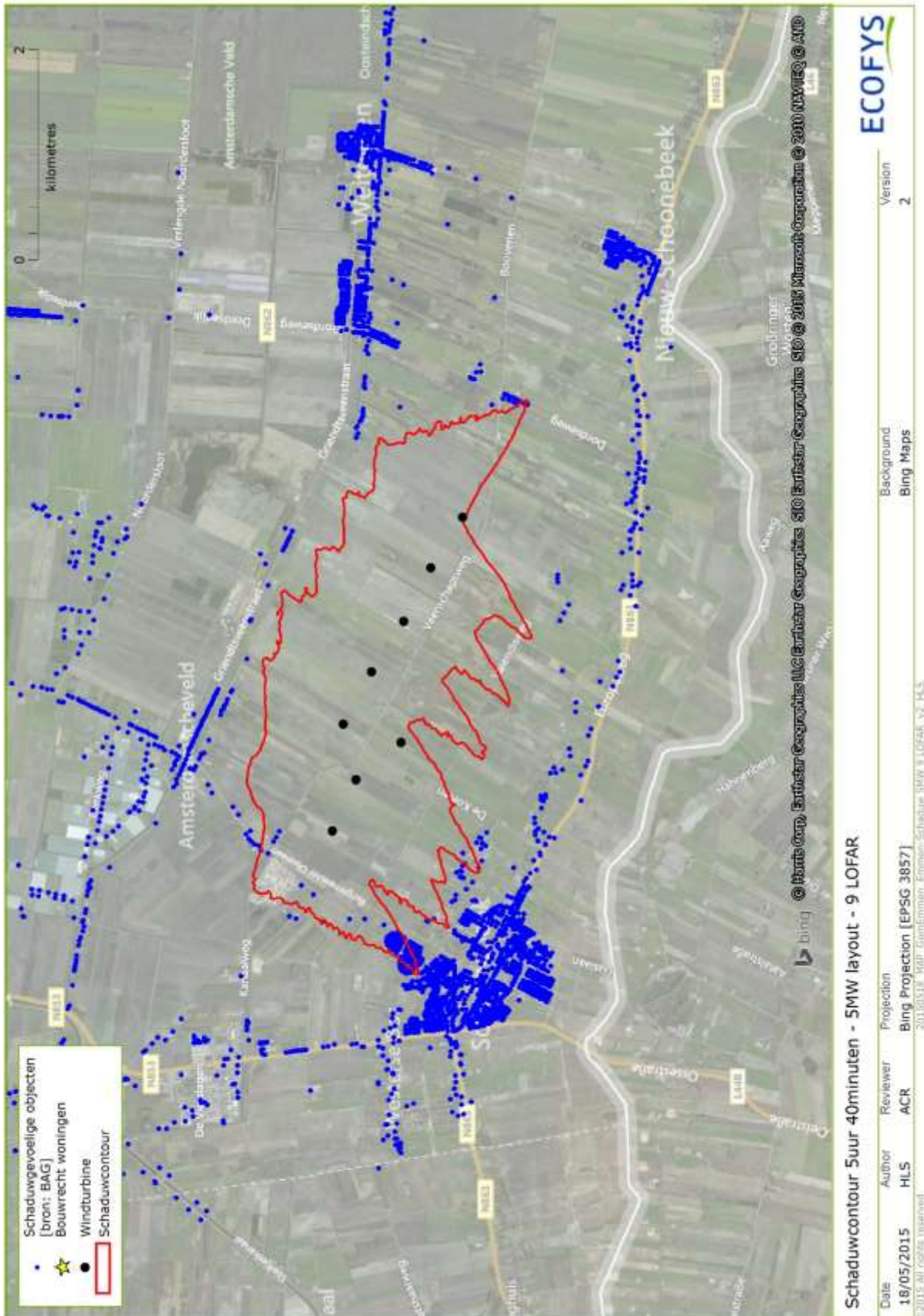
Tuinbouwgebied Klazienaveen, 3MW



Veenschapsweg, 3MW



Veenschapsweg, 5MW



Bijlage 3 Invoergegevens en resultaten slag- schaduwberekening – Stap 2

Combinatie Woon- en leefomgeving 3MW

Project: WIENL15411_9 locaties WRA_20150429_HLS

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 Calculated: 16/05/2015 23:25/2.9.285

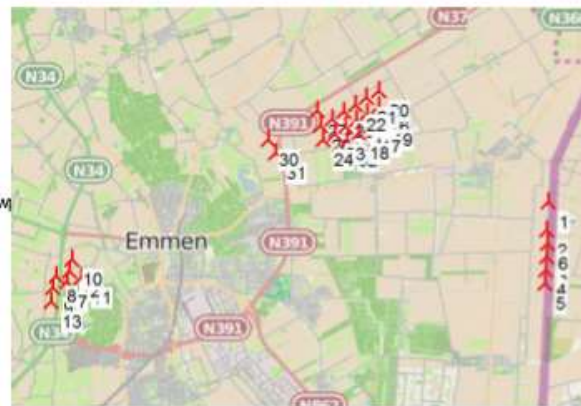
SHADOW - Main Result

Calculation: Combi Woon- en Leefomgeving 3MW - Emmen WRA wind

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

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.w
 Obstacles not used in calculation
 Eye height: 1.5 m
 Grid resolution: 10.0 m



New WTG

WTGs

No	Dutch Stereo-RD/NAP 2000			Row data/Description	WTG type			Shadow data				
	East	North	Z		Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM
			[m]									
1	268,410	535,966	11.5	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
2	268,396	535,093	12.7	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
3	268,404	534,277	13.8	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
4	268,391	533,870	14.3	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
5	268,380	533,468	14.8	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
6	268,417	534,693	13.2	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
7	253,634	533,194	20.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
8	253,299	533,380	20.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
9	253,189	532,997	20.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
10	253,761	533,883	20.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
11	254,055	533,333	20.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
12	253,708	533,540	20.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
13	253,168	532,585	20.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
14	262,452	538,355	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
15	262,781	538,575	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
16	263,121	538,791	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
17	262,890	538,170	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
18	262,536	537,957	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
19	263,240	538,390	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
20	263,102	539,269	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
21	262,739	539,051	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
22	262,397	538,832	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
23	261,786	537,920	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
24	261,438	537,720	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
25	262,117	538,142	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
26	261,342	538,150	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
27	261,235	538,631	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
28	261,704	538,381	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
29	262,053	538,611	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
30	259,747	537,705	10.6	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
31	259,980	537,293	11.2	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
32	262,166	537,721	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3

Combinatie Landschap 3MW

WindPRO version 2.9.285 Sep 2014

Project: WIENL15411_9 locaties WRA_20150429_HLS	Printed Page: 17/05/2015 06:24 / 1
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	Calculated: 17/05/2015 02:48/2.9.285

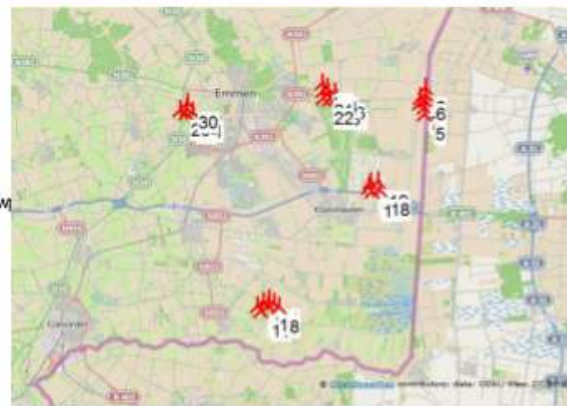
SHADOW - Main Result

Calculation: Combi Landschap 3MW - Emmen WRA wind

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

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.w
 Obstacles not used in calculation
 Eye height: 1.5 m
 Grid resolution: 10.0 m



New WTG

WTGs

Dutch Stereo-RD/NAP 2000				WTG type			Shadow data				
East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM
		[m]									
1	268,077	534,474	13.2 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
2	268,396	535,093	12.7 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
3	268,404	534,277	13.8 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
4	268,391	533,870	14.3 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
5	268,380	533,468	14.8 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
6	268,417	534,693	13.2 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
7	268,073	534,120	13.7 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
8	259,633	521,382	13.2 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
9	259,337	521,631	12.3 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
10	258,686	521,694	10.0 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
11	259,047	521,840	11.3 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
12	258,305	521,424	10.0 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
13	258,532	521,102	10.0 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
14	258,987	521,480	10.1 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
15	265,157	529,196	20.0 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
16	265,029	528,876	20.0 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
17	265,245	528,629	20.0 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
18	265,699	528,753	20.0 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
19	265,591	529,284	20.0 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
20	262,040	535,221	10.0 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
21	262,064	534,753	13.4 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
22	262,084	534,304	16.1 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
23	262,491	534,242	13.3 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
24	262,339	534,972	10.8 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
25	262,422	534,607	12.1 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
26	262,797	534,620	10.0 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
27	262,906	534,264	10.2 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
28	253,634	533,194	20.0 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
29	253,299	533,380	20.0 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
30	253,761	533,883	20.0 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
31	254,055	533,333	20.0 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
32	253,708	533,540	20.0 ECOTEENIA 3000 3000 100.0 !O!...	No	ECOTEENIA	3000-3,000	3,000	100.0	100.0	2,500	14.3

WindPRO is developed by EMD International A/S, Niels Jernesvej 10, DK-9220 Aalborg Ø, Tel. +45 96 35 44 44, Fax +45 96 35 44 46, e-mail: windpro@emd.dk

Combinatie Opbrennst 5MW

WindPRO version 2.9.285 Sep 2014

Project: WIENL15411_9 locaties WRA_20150429_HLS

Printed Page: 17/05/2015 06:25 / 1
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 Calculated: 17/05/2015 03:01/2.9.285

SHADOW - Main Result

Calculation: Combi Opbrennst 5MW - Emmen WRA wind

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

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.w
 Obstacles not used in calculation
 Eye height: 1.5 m
 Grid resolution: 10.0 m



WTGs

Dutch Stereo-RD/NAP 2000	WTG type			Shadow data							
	East	North	Z	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM
			[m]								
1	260,978	537,805	10.0	GAMESA	G128-5000	128.0	5,000	128.0	130.0	2,500	12.0
2	261,484	538,055	10.0	GAMESA	G128-5000	128.0	5,000	128.0	130.0	2,500	12.0
3	261,970	538,353	10.0	GAMESA	G128-5000	128.0	5,000	128.0	130.0	2,500	12.0
4	262,465	538,622	10.0	GAMESA	G128-5000	128.0	5,000	128.0	130.0	2,500	12.0
5	262,951	538,922	10.0	GAMESA	G128-5000	128.0	5,000	128.0	130.0	2,500	12.0
6	263,444	539,216	10.0	GAMESA	G128-5000	128.0	5,000	128.0	130.0	2,500	12.0
7	263,870	539,779	10.0	GAMESA	G128-5000	128.0	5,000	128.0	130.0	2,500	12.0
8	264,348	540,086	10.0	GAMESA	G128-5000	128.0	5,000	128.0	130.0	2,500	12.0
9	261,427	537,520	10.0	GAMESA	G128-5000	128.0	5,000	128.0	130.0	2,500	12.0
10	261,988	537,785	10.0	GAMESA	G128-5000	128.0	5,000	128.0	130.0	2,500	12.0
11	262,494	538,039	10.0	GAMESA	G128-5000	128.0	5,000	128.0	130.0	2,500	12.0
12	263,003	538,312	10.0	GAMESA	G128-5000	128.0	5,000	128.0	130.0	2,500	12.0
13	263,485	538,626	10.0	GAMESA	G128-5000	128.0	5,000	128.0	130.0	2,500	12.0
14	264,375	539,522	10.0	GAMESA	G128-5000	128.0	5,000	128.0	130.0	2,500	12.0
15	268,328	533,172	15.2	GAMESA	G128-5000	128.0	5,000	128.0	130.0	2,500	12.0
16	267,973	534,223	13.5	GAMESA	G128-5000	128.0	5,000	128.0	130.0	2,500	12.0
17	268,347	533,750	14.4	GAMESA	G128-5000	128.0	5,000	128.0	130.0	2,500	12.0
18	268,410	535,966	11.5	GAMESA	G128-5000	128.0	5,000	128.0	130.0	2,500	12.0
19	268,339	534,708	13.1	GAMESA	G128-5000	128.0	5,000	128.0	130.0	2,500	12.0

WindPRO is developed by EMD International A/S, Niels Jernesvej 10, DK-9220 Aalborg Ø, Tel. +45 96 35 44 44, Fax +45 96 35 44 46, e-mail: windpro@emd.dk

Combinatie Spreiding 3MW

WindPRO version 2.9.285 Sep 2014

Project: WIENL15411_9 locaties WRA_20150429_HLS

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 Helen Pater / h.sae@ecofys.com
 Calculated: 17/05/2015 03:25/2.9.285

SHADOW - Main Result

Calculation: Combi Spreiding 3MW - Emmen WRA wind

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

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.w
 Obstacles not used in calculation
 Eye height: 1.5 m
 Grid resolution: 10.0 m



WTGs

WTG ID	Dutch Stereo-RD/NAP 2000			Row data/Description	WTG type			Shadow data				
	East	North	Z		Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM
1	261,801	523,384	20.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
2	261,394	523,369	20.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
3	261,378	522,966	20.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
4	260,995	523,434	20.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
5	261,787	522,975	20.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
6	268,410	535,966	11.5	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
7	268,396	535,093	12.7	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
8	268,404	534,277	13.8	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
9	268,391	533,870	14.3	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
10	268,380	533,468	14.8	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
11	268,417	534,693	13.2	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
12	253,634	533,194	20.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
13	253,299	533,380	20.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
14	253,189	532,997	20.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
15	253,708	533,540	20.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
16	253,168	532,585	20.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
17	267,828	540,473	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
18	267,754	540,867	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
19	267,781	540,068	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
20	268,056	540,195	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
21	268,041	540,736	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
22	265,157	529,196	20.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
23	265,029	528,876	20.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
24	265,245	528,629	20.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
25	265,699	528,753	20.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
26	265,591	529,284	20.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
27	262,118	535,178	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
28	262,300	534,774	12.2	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
29	262,323	534,369	14.3	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
30	262,701	534,786	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
31	262,724	534,381	10.7	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
32	263,125	534,392	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3

WindPRO is developed by EMD International A/S, Niels Jernesvej 10, DK-9220 Aalborg Ø, Tel. +45 96 35 44 44, Fax +45 96 35 44 46, e-mail: windpro@emd.dk

Combinatie Spreiding 5MW

WindPRO version 2.9.285 Sep 2014.

Project: WIENL15411_9 locaties WRA_20150429_HLS	Printed Page: 17/05/2015 06:26 / 1 Licensed user: Ecofys Netherlands BV Kanaalweg 15-G NL-3526 KL Utrecht +31 (0)30 662 33 00 Helen.Pater / h.saeher@ecofys.com Calculated: 17/05/2015 03:41/2.9.285
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SHADOW - Main Result

Calculation: Combi Spreiding 5MW - Emmen WRA wind

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

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.w
 Obstacles not used in calculation
 Eye height: 1.5 m
 Grid resolution: 10.0 m



▲ New WTG

WTGs

Dutch Stereo-RD/NAP 2000	WTG type				Shadow data							
	East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM
			[m]									
1	268,328	533,172	15.2	GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
2	267,973	534,223	13.5	GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
3	268,347	533,750	14.4	GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
4	268,410	535,966	11.5	GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
5	268,339	534,708	13.1	GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
6	260,781	538,882	10.0	GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
7	261,374	538,607	10.0	GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
8	261,970	538,353	10.0	GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
9	262,498	538,179	10.0	GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
10	263,112	538,099	10.0	GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
11	258,411	521,273	10.0	GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
12	257,550	521,913	10.0	GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
13	258,046	521,696	10.0	GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
14	258,575	521,831	10.0	GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
15	259,080	521,570	10.8	GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
16	253,997	533,445	20.0	GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
17	253,105	533,146	20.0	GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
18	253,761	533,877	20.0	GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
19	253,622	533,184	20.0	GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
20	253,132	532,572	20.0	GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0

WindPRO is developed by EMD International A/S, Niels Jernesvej 10, DK-9220 Aalborg Ø, Tel. +45 96 35 44 44, Fax +45 96 35 44 46, e-mail: windpro@emd.dk

Combinatie Concentratie 3MW

WindPRO version 2.9.285 Sep 2014

Project:
WIENL15411_9 locaties WRA_20150429_HLS

Printed Page:
17/05/2015 06:27 / 1
Licensed user:
Ecofys Netherlands BV
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Helen Pater / h.sae@ecofys.com
Calculated:
17/05/2015 03:58/2.9.285

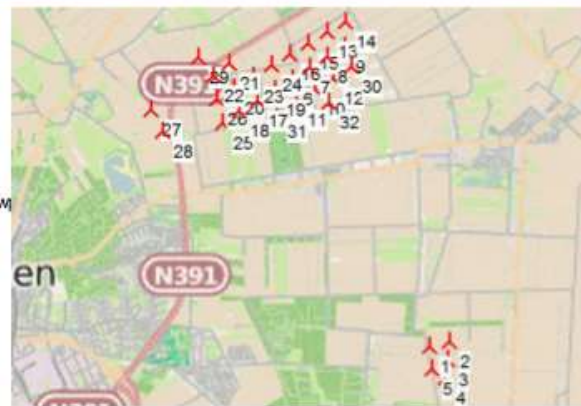
SHADOW - Main Result

Calculation: Combi Concentratie 3MW - Emmen WRA wind

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

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.w
Obstacles not used in calculation
Eye height: 1.5 m
Grid resolution: 10.0 m



New WTG

WTGs

WTG ID	Dutch Stereo-RD/NAP 2000			Row data/Description	WTG type			Shadow data				
	East	North	Z		Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM
1	265,212	533,268	14.2	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
2	265,590	533,376	13.6	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
3	265,569	533,022	14.7	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
4	265,528	532,664	15.8	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
5	265,265	532,826	15.5	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
6	262,452	538,355	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
7	262,781	538,575	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
8	263,121	538,791	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
9	263,450	538,991	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
10	262,890	538,170	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
11	262,536	537,957	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
12	263,240	538,390	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
13	263,102	539,269	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
14	263,450	539,473	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
15	262,739	539,051	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
16	262,397	538,832	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
17	261,786	537,920	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
18	261,438	537,720	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
19	262,117	538,142	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
20	261,342	538,150	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
21	261,235	538,631	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
22	260,930	538,388	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
23	261,704	538,381	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
24	262,053	538,611	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
25	261,127	537,482	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
26	260,999	537,933	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
27	259,747	537,705	10.6	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
28	259,980	537,293	11.2	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
29	260,640	538,723	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
30	263,579	538,614	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
31	262,166	537,721	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3
32	263,176	537,917	10.0	ECOTECNIA 3000 3000 100.0 !O!...	No	ECOTECNIA	3000-3,000	3,000	100.0	100.0	2,500	14.3

Combinatie Concentratie 3MW

WindPRO version 2.9.285 Sep 2014

Project: WIENL15411_9 locaties WRA_20150429_HLS	Printed Page: 20/05/2015 10:09 / 1 Licensee user: Ecofys Netherlands BV Kanaalweg 15-G NL-3526 KL Utrecht +31 (0)30 662 33 00 Helen Pater / h.sae@ecofys.com Calculated: 20/05/2015 10:01/2.9.285
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SHADOW - Main Result

Calculation: Combi Concentratie 5MW - Emmen WRA wind

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

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.w
 Obstacles not used in calculation
 Eye height: 1.5 m
 Grid resolution: 10.0 m



▲ New WTG

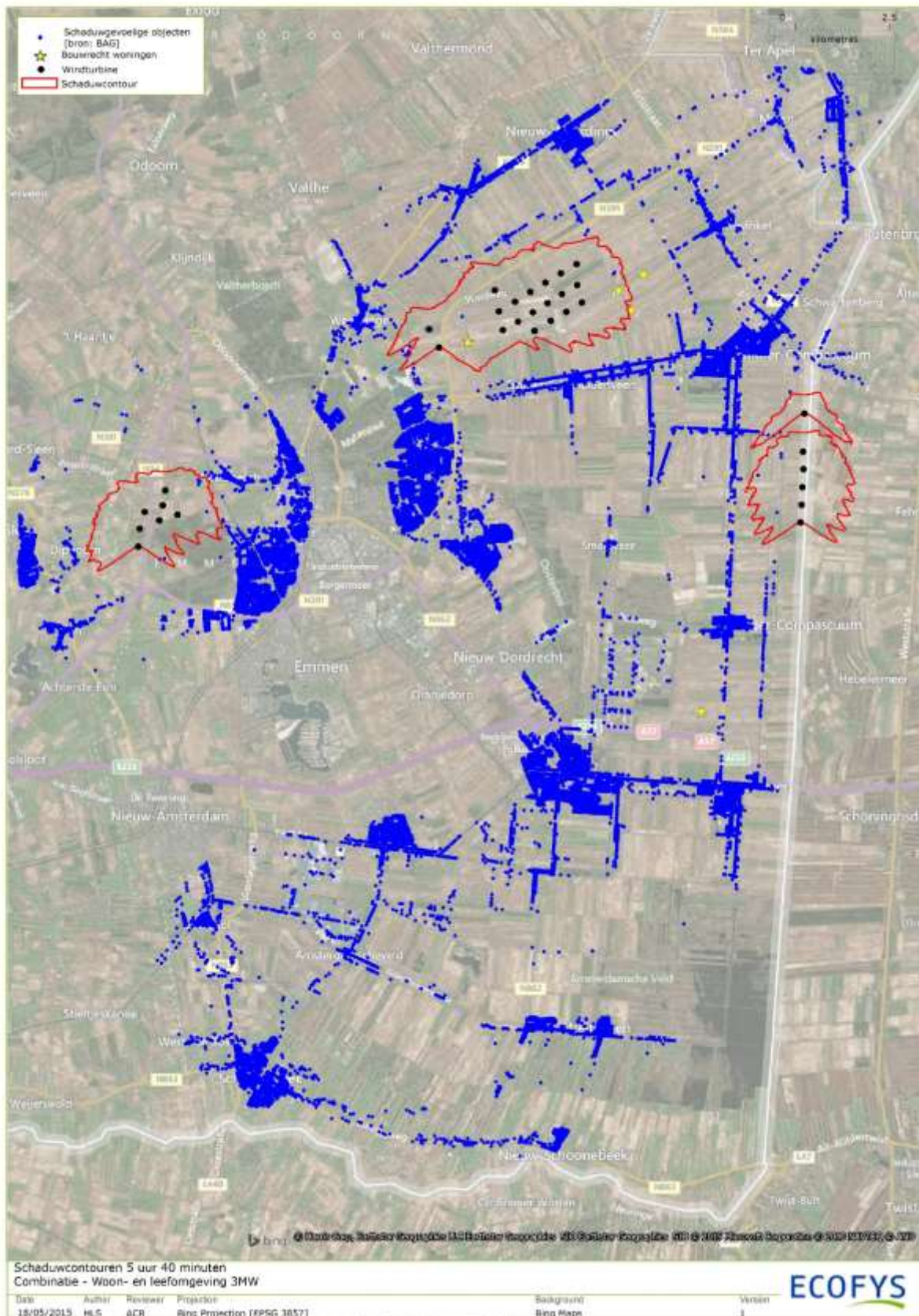
WTGs

Dutch Stereo-RD/NAP 2000				WTG type				Shadow data			
East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM
		[m]									[RPM]
1	260,888	538,328	10.0 GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
2	260,781	538,882	10.0 GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
3	260,015	537,265	10.9 GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
4	260,005	537,856	10.0 GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
5	261,374	538,607	10.0 GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
6	260,978	537,805	10.0 GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
7	261,484	538,055	10.0 GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
8	261,970	538,353	10.0 GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
9	262,465	538,622	10.0 GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
10	262,951	538,922	10.0 GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
11	263,444	539,216	10.0 GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
12	263,870	539,779	10.0 GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
13	264,348	540,086	10.0 GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
14	261,430	537,515	10.0 GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
15	261,988	537,785	10.0 GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
16	262,494	538,039	10.0 GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
17	263,003	538,312	10.0 GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
18	263,485	538,626	10.0 GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0
19	264,375	539,522	10.0 GAMESA G128 5000 128.0 !O! hub: ... Yes	Yes	GAMESA	G128-5,000	5,000	128.0	130.0	2,500	12.0

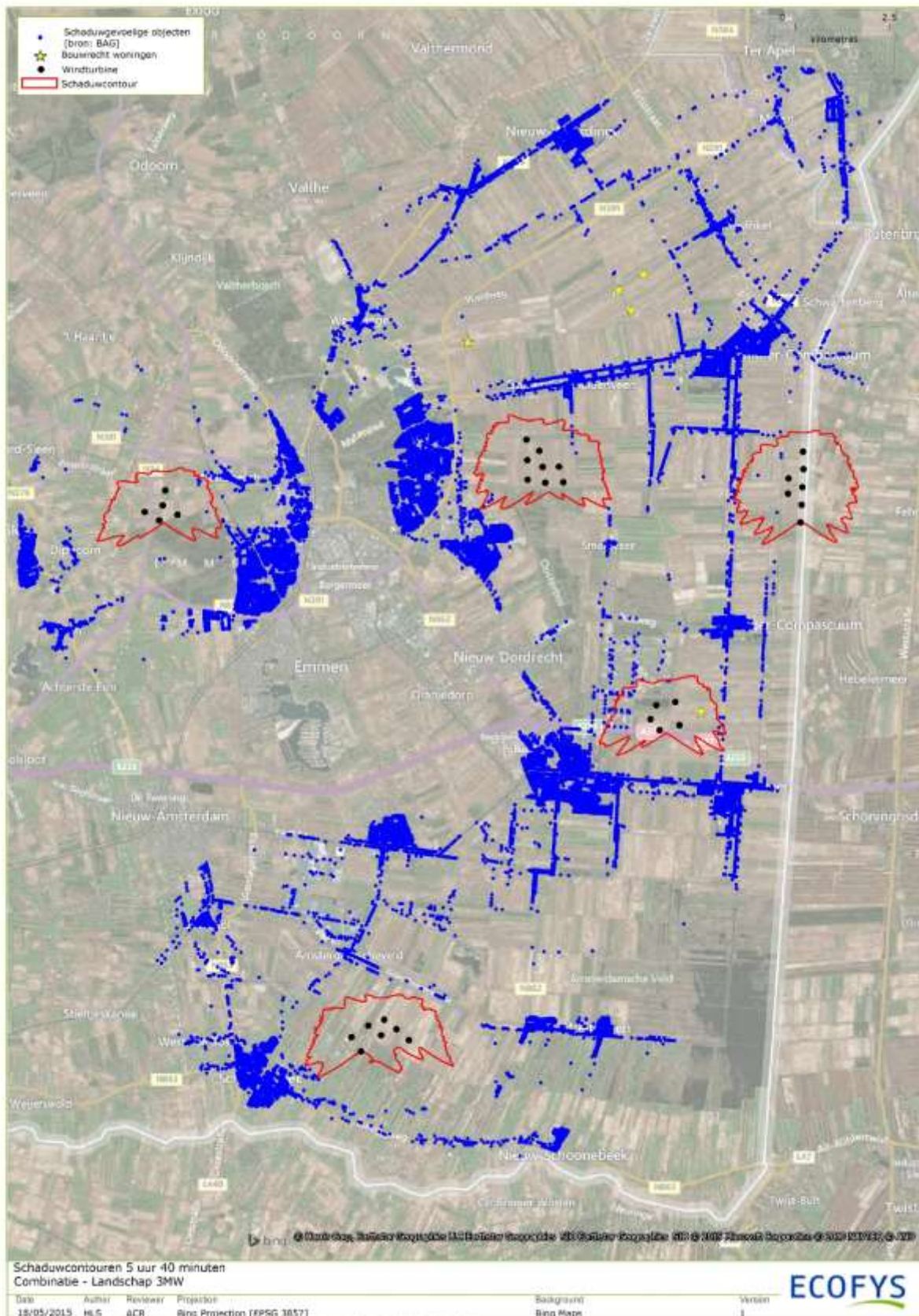
WindPRO is developed by EMD International A/S, Niels Jernesvej 10, DK-9220 Aalborg Ø, Tel. +45 96 35 44 44, Fax +45 96 35 44 46, e-mail: windpro@emd.dk

Bijlage 4 Schaduwcontouren – Stap 2

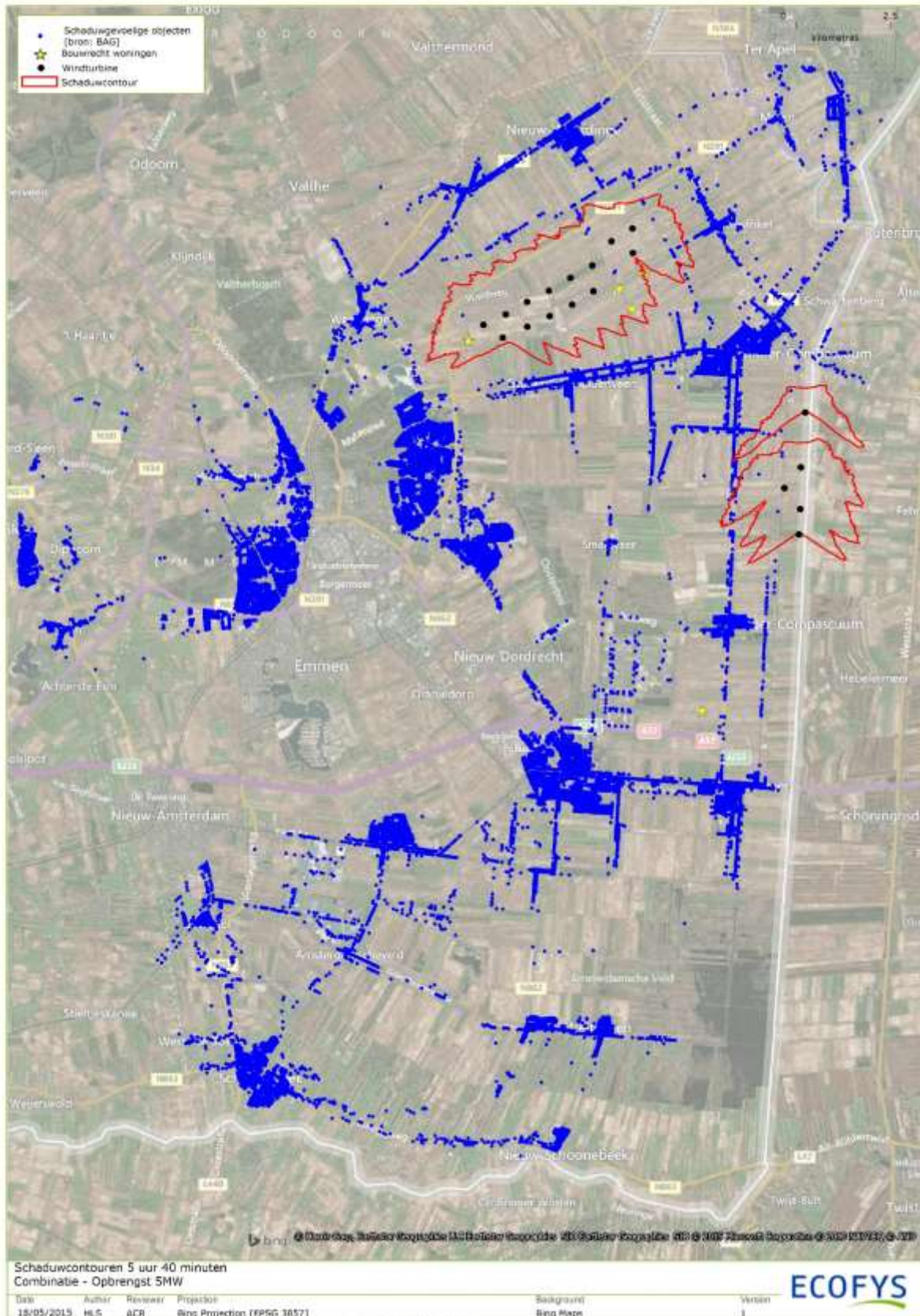
Combinatie Woon- en Leefomgeving 3MW



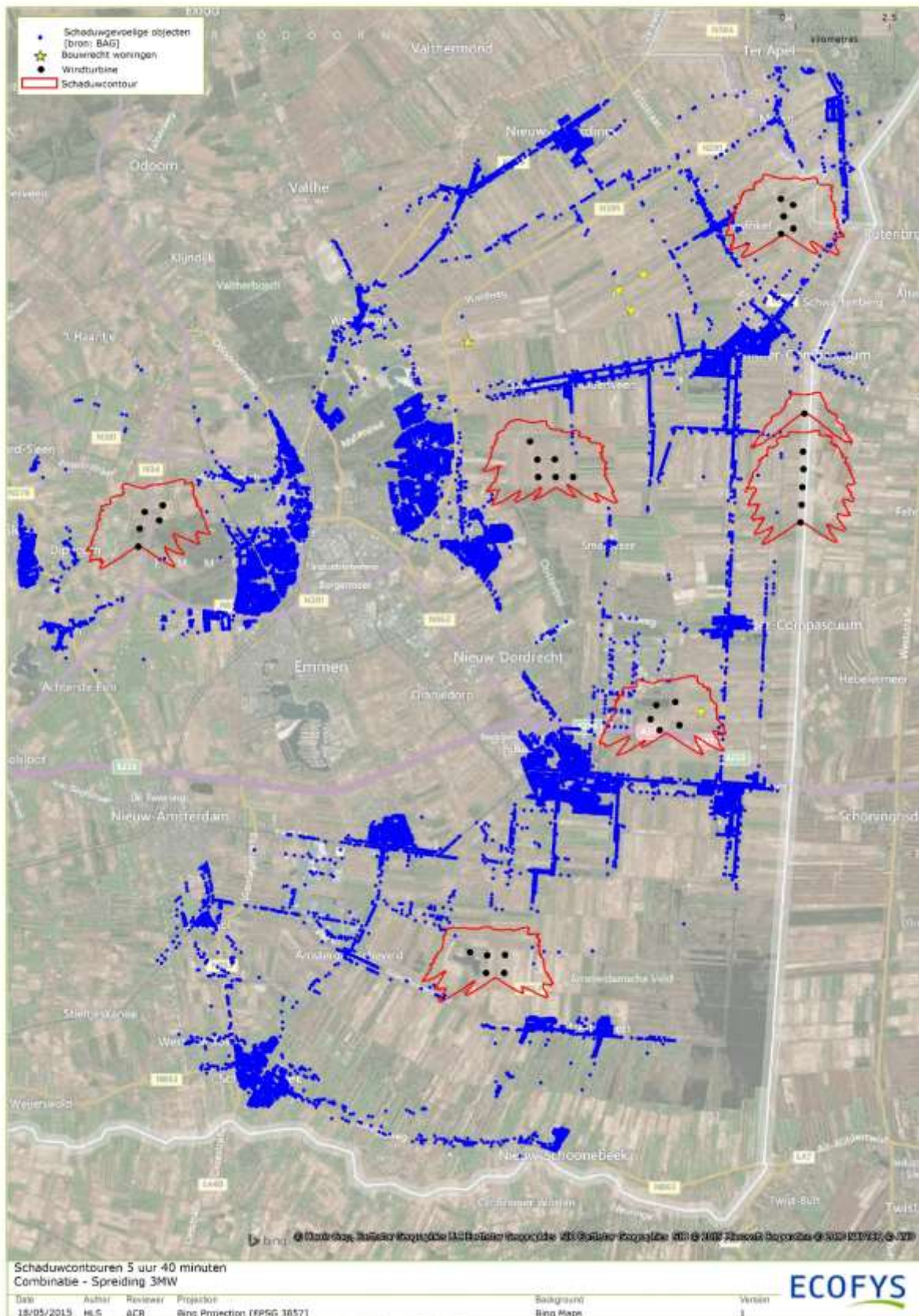
Combinatie Landschap 3MW



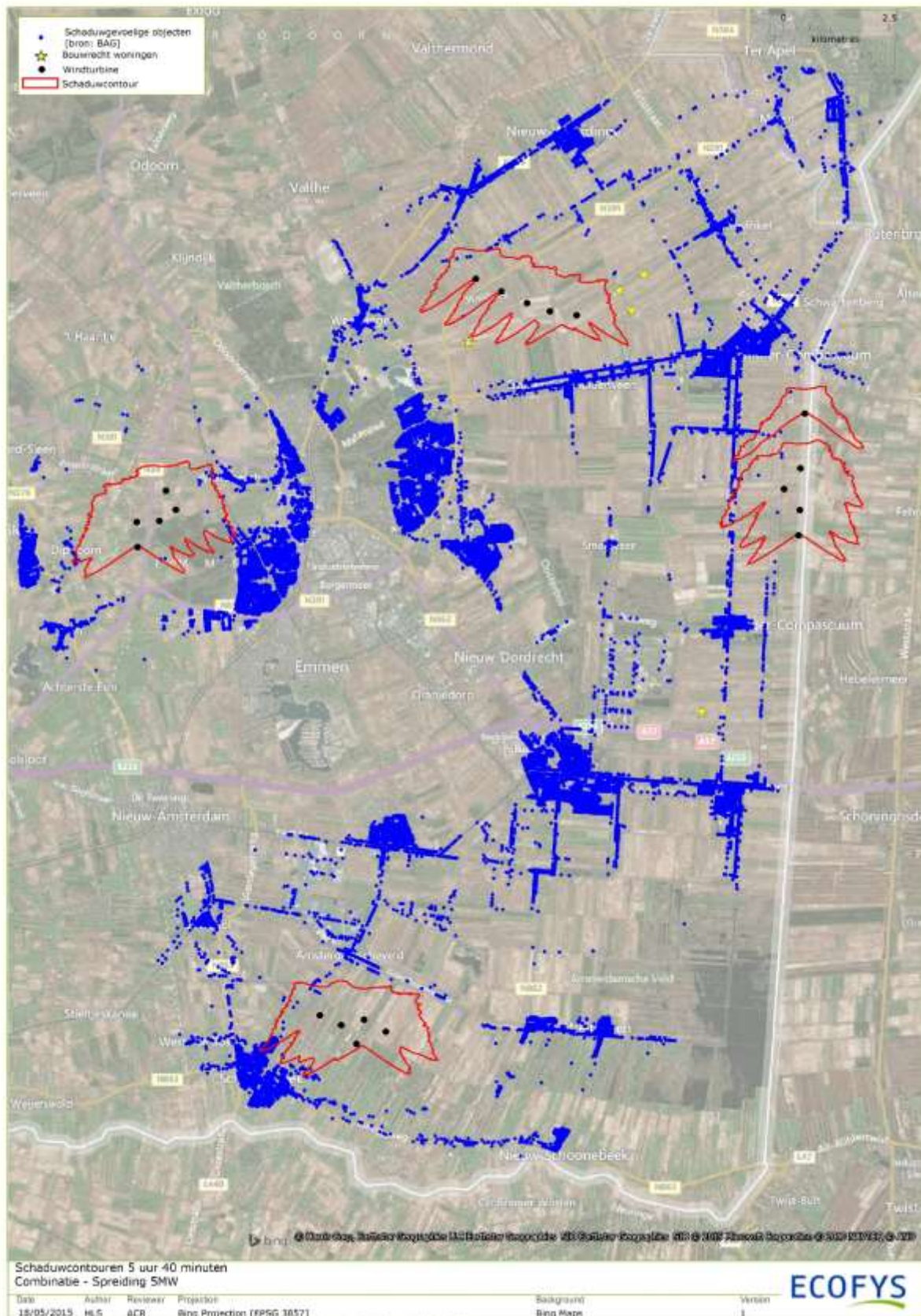
Combinatie Opbrengst 5MW



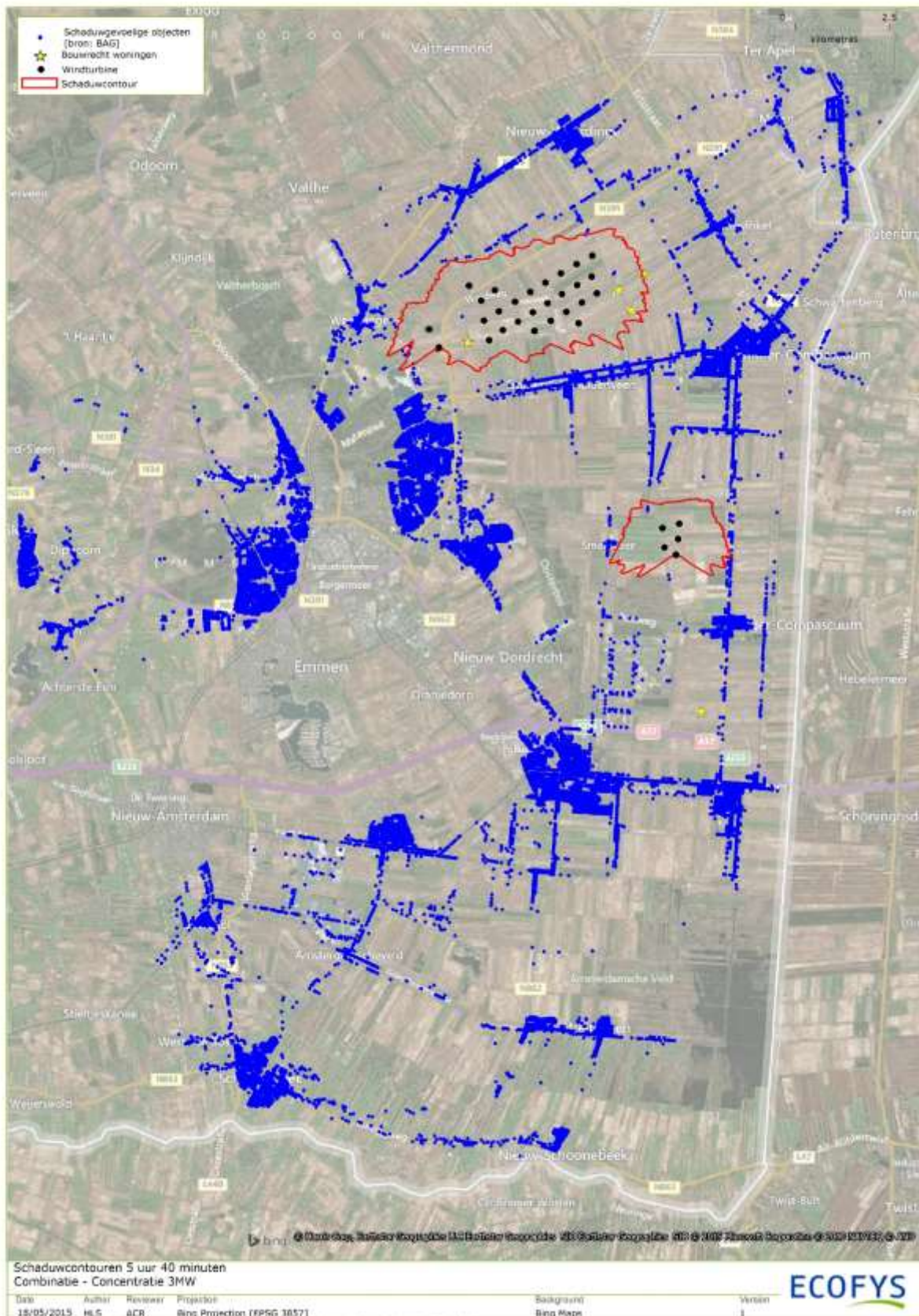
Combinatie Spreiding 3MW



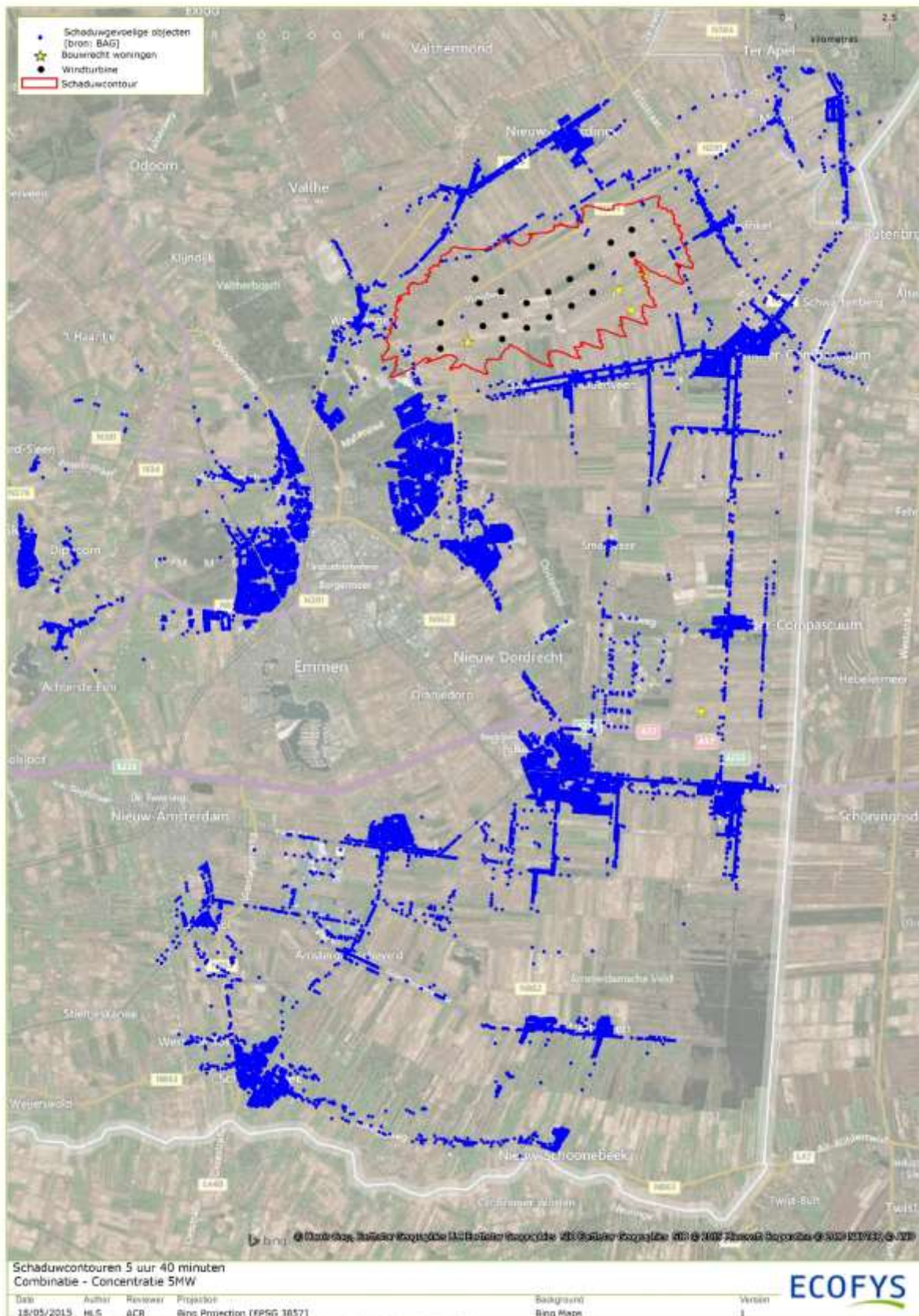
Combinatie Spreiding 5MW



Combinatie Concentratie 3MW



Combinatie Concentratie 3MW



ECOFYS



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