

Annex H

Assessment of Impacts on Additional Approved Dwelling (DNVGL)

BIALA WIND FARM

Addendum to Noise and Shadow Flicker Impact Assessments for Additional Identified Dwelling

Environmental Resources Management Australia Pty Ltd

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Proposal 170223-PP-01, Rev. A

Objective:
Biala Wind Farm noise and shadow flicker impact assessment at house DA18

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1 EXECUTIVE SUMMARY

This technical note was prepared in response to a request from Environmental Resources Management Australia Pty Ltd ("the Client" or "ERM") to assist with environmental impact assessments for the Biala Wind Farm ("BWF") in New South Wales, on behalf of Newtricity who is developing the wind farm. The work reported here has been prepared as a variation to proposal 170223/PP/01 Issue A draft, dated 22nd August 2013 and is subject to the terms and conditions contained therein.

Garrad Hassan Pacific Pty Ltd, now trading as DNV GL ("DNV GL"), has been asked by the Client to assess the environmental impact of the BWF at a dwelling ("DA18") that was subject of a Development Application (DA) on 29 May 2015 and approved by Upper Lachlan Shire Council (Council) on 17 June 2015. Newtricity was made aware of the approval for this dwelling following lodgement of the EIS with the NSW Department of Planning and Environment (DPE), therefore assessment of impacts on the dwelling was not included in the EIS. This technical note assesses the environmental impact of the BWF at DA18, specifically wind farm noise and shadow flicker, and is supplied as an addendum to the previous impact assessment reports by DNV GL that are included in the publicly exhibited EIS for the BWF.

DNV GL has previously assessed the wind farm noise and shadow flicker in reports submitted as part of the BWF EIS [1, 2]. The wind farm characteristics, applicable assessment requirements, assessment methodology, modelling inputs, assumptions, caveats and limitations contained in these reports also apply to the assessment reported in this technical note, unless otherwise stated.

Based on the assessment reported here, it is predicted that the Biala Wind Farm will comply with the required wind farm operational noise limits at house DA18.

As part of the shadow flicker assessment, it is necessary to make an assumption regarding the maximum length of a shadow cast by a wind turbine that is likely to cause annoyance due to shadow flicker. As discussed in [2] DNV GL has assumed a maximum shadow length equivalent to the more conservative of two available recommendations for this limit [7, 8], and as a result a maximum rotor shadow length of 1500 m has been used.

Based on the modelling approach described in [2], which includes the above assumption regarding maximum rotor shadow length, DNV GL predicts a shadow flicker duration of 0 hours per annum at dwelling DA18.

2 SITE DESCRIPTION

The location of house DA18 is contained in Lot 103, DP1174962 and was derived by DNV GL from documents supplied by ERM [3]. House DA18 is located more than 2 km to the southeast of proposed turbine locations.

The location given for DA18 in the supplied information was, however, approximate. DNV GL has therefore estimated the coordinates of the proposed dwelling based on the supplied information as follows:

House ID	Easting ¹ (m)	Northing ¹ (m)	Type	Status	Distance to nearest turbine (m)
DA18	715847	6166184	DA house location	Non-Stakeholder	2119

Notes: 1. Coordinate system is UTM Zone 55H, WGS84 datum

Table 2.1 Approximate coordinates of House DA18 in the vicinity of the Biala Wind Farm.

The houses neighbouring the wind farm (as well as property cadastral lines and turbine exclusion buffers around the houses) are presented in Figure 2.1 below.

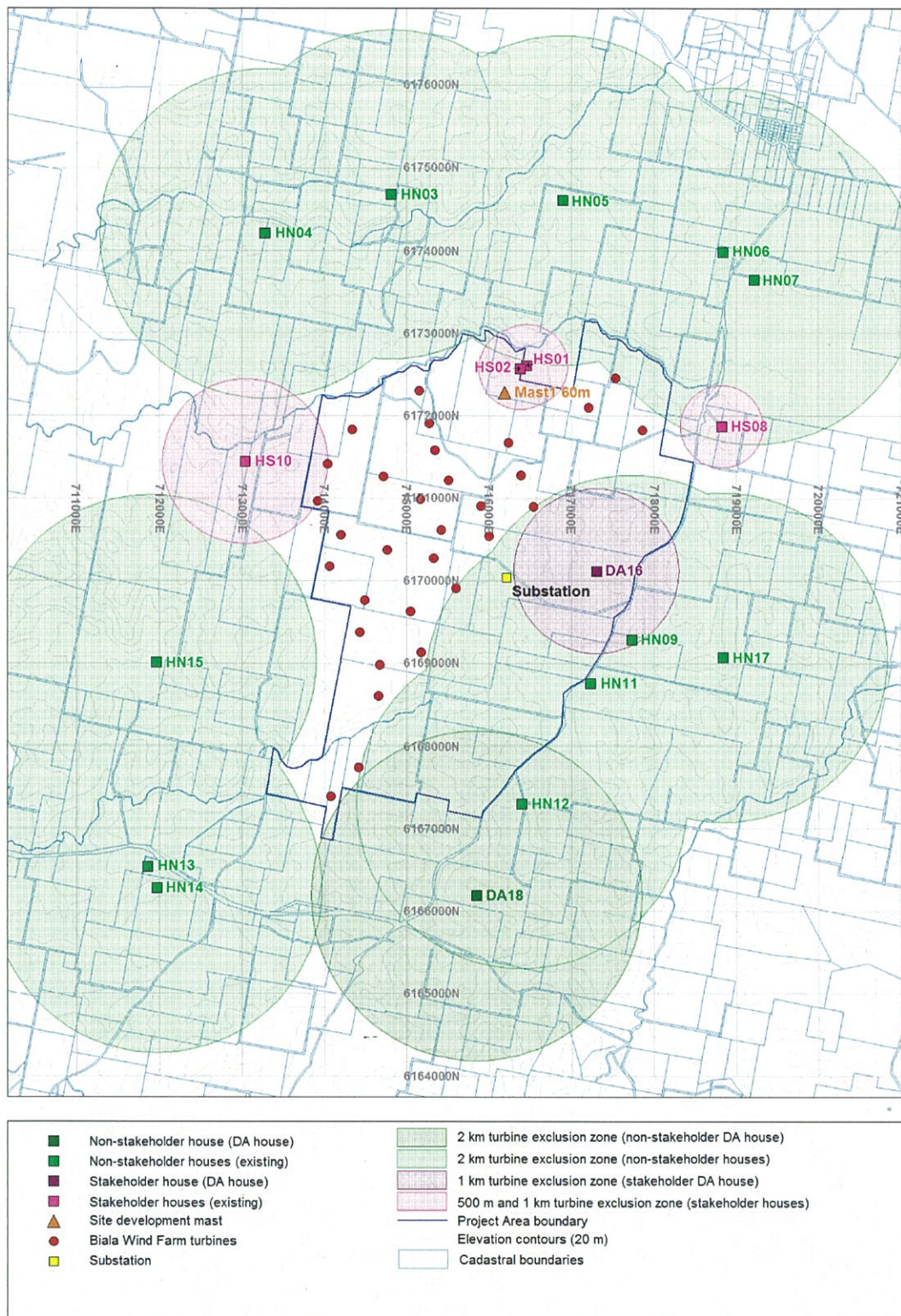


Figure 2.1 Site layout and neighbouring houses.

3 WIND FARM NOISE PREDICTIONS

DNV GL has assessed the wind farm noise at house DA18 according to project requirements and the results are summarised in Table 3.1 to Table 3.3 and Figure 3.1 to Figure 3.3 below.

In the absence of background noise measurements at location DA18, it has been assumed that the wind farm noise limits derived for the nearest house location where background noise measurements were carried out (HN12), are also representative of location DA18. It should be noted that as noise predictions at DA18 do not exceed the lower base noise limit of 35 dB until wind speeds of at least 10 m/s, and are no more than 1 to 2 dB above the lower limit for higher wind speeds, it is unlikely that the compliance assessment at DA18 will be sensitive to the selection of assumed background noise levels.

Based on these results, it is predicted that the Biala Wind Farm will comply with the required noise limits at house DA18, for equivalent wind farm characteristics, assessment methodologies, modelling inputs, assumptions, caveats and limitations as those specified in the previous noise assessment [1].

As a further check, the wind farm noise for the BWF was also assessed at points on the northern boundary of Lot 103, DP1174962 and these noise predictions were also below the compliance limits.

House ID	Period	Noise compliance limits (dBA)																	
		Hub height wind speed (m/s)																	
		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DA18	24 Hour	35	35	37	39	40	42	43	45	46	48	51	53	55	55	55	55	55	55
	Day	35	35	37	39	41	43	45	46	48	49	52	54	55	55	55	55	55	55
	Night	35	35	36	38	39	40	42	43	45	47	50	53	55	55	55	55	55	55

Table 3.1 Wind farm noise compliance limits at House DA18.

House ID	Period	Wind farm noise predictions (dBA)																	
		Hub height wind speed (m/s)																	
		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DA18	24 Hour	20	26	28	30	32	34	35	36	36	36	37	37	37	37	37	37	37	36
	Day	20	26	28	30	32	34	35	36	36	36	37	37	37	37	37	37	37	36
	Night	20	26	28	30	32	34	35	36	36	36	37	37	37	37	37	37	37	36

Table 3.2 Wind farm noise predictions at House DA18.

House ID	Period	Wind farm noise compliance level (dBA)																	
		Hub height wind speed (m/s)																	
		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DA18	24 Hour	-15	-9	-8	-9	-9	-8	-8	-9	-10	-12	-14	-17	-18	-18	-18	-18	-18	-19
	Day	-15	-9	-8	-10	-10	-9	-9	-10	-11	-13	-15	-18	-18	-18	-18	-18	-18	-19
	Night	-15	-9	-8	-8	-7	-6	-6	-7	-9	-11	-13	-16	-18	-18	-18	-18	-18	-19

Table 3.3 Wind farm noise compliance margin at House DA18.

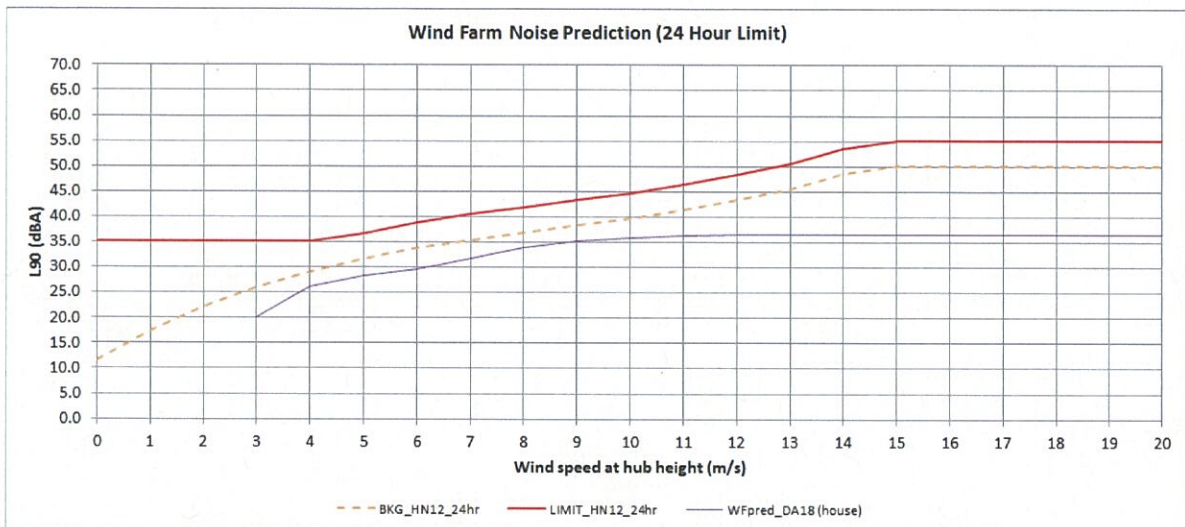


Figure 3.1 Wind farm noise compared to limit for house DA18 (24 Hour).

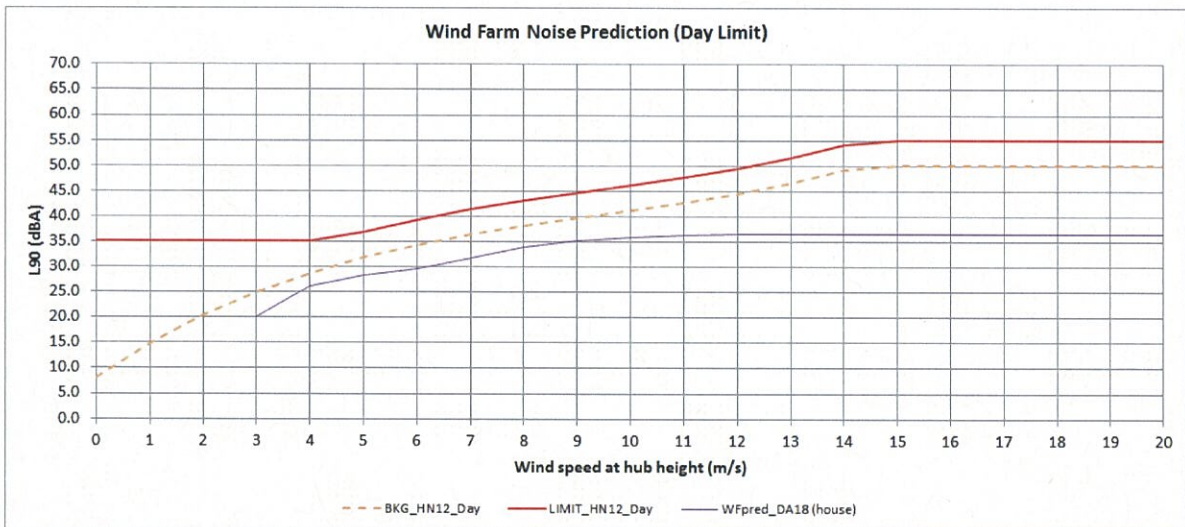


Figure 3.2 Wind farm noise compared to limit for house DA18 (Day).

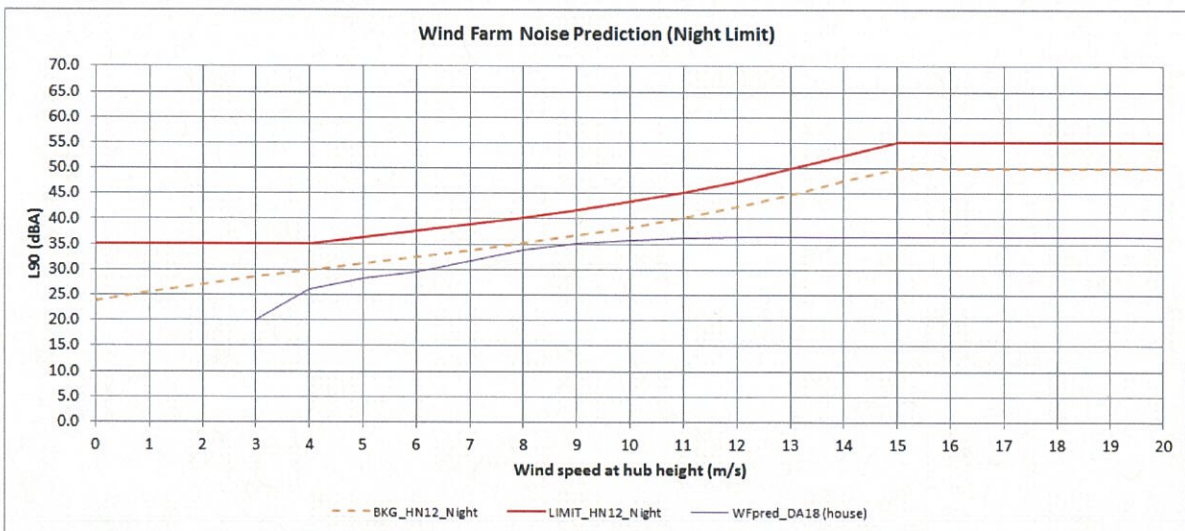


Figure 3.3 Wind farm noise compared to limit for house DA18 (Night).

4 SHADOW FLICKER

DNV GL has assessed the shadow flicker and blade glint at house DA18 using equivalent wind farm characteristics, assessment methodologies, modelling inputs, assumptions, caveats and limitations as those specified in the previous shadow flicker and blade glint assessment [2].

As part of the shadow flicker assessment, it is necessary to make an assumption regarding the maximum length of a shadow cast by a wind turbine that is likely to cause annoyance due to shadow flicker. The SEARs [5] and Draft NSW Guidelines [6] do not provide any guidance on this parameter. The UK wind industry considers that 10 rotor diameters is appropriate [7], while the EPHC Draft National Wind Farm Development Guidelines [8] suggest a distance equivalent to 265 maximum blade chords as an appropriate limit.

Newtricity has nominated a turbine with a hub height of 110 m and a rotor diameter of 150 m for this study [4]. DNV GL has therefore assumed a maximum shadow length equivalent to the more conservative of the two approaches described above, and in this case, a maximum rotor shadow length of 10 rotor diameters or 1500 m has been used. Under the EPHC Draft National Wind Farm Development Guidelines, this will be conservative for any turbine with a maximum blade chord of less than approximately 5.7 m.

Based on the modelling approach described in [2], which includes the above assumption regarding maximum rotor shadow length, DNV GL predicts a shadow flicker duration of 0 hours per annum at dwelling DA18. The location of DA18 is shown in Figure 3.4 and Figure 3.5 below.

Blade glint involves the reflection of light from a turbine blade, and can be seen by an observer as a periodic flash of light coming from the wind turbine. Blade glint is not generally a problem for modern turbines provided non-reflective coatings are used for the surface of the blades.

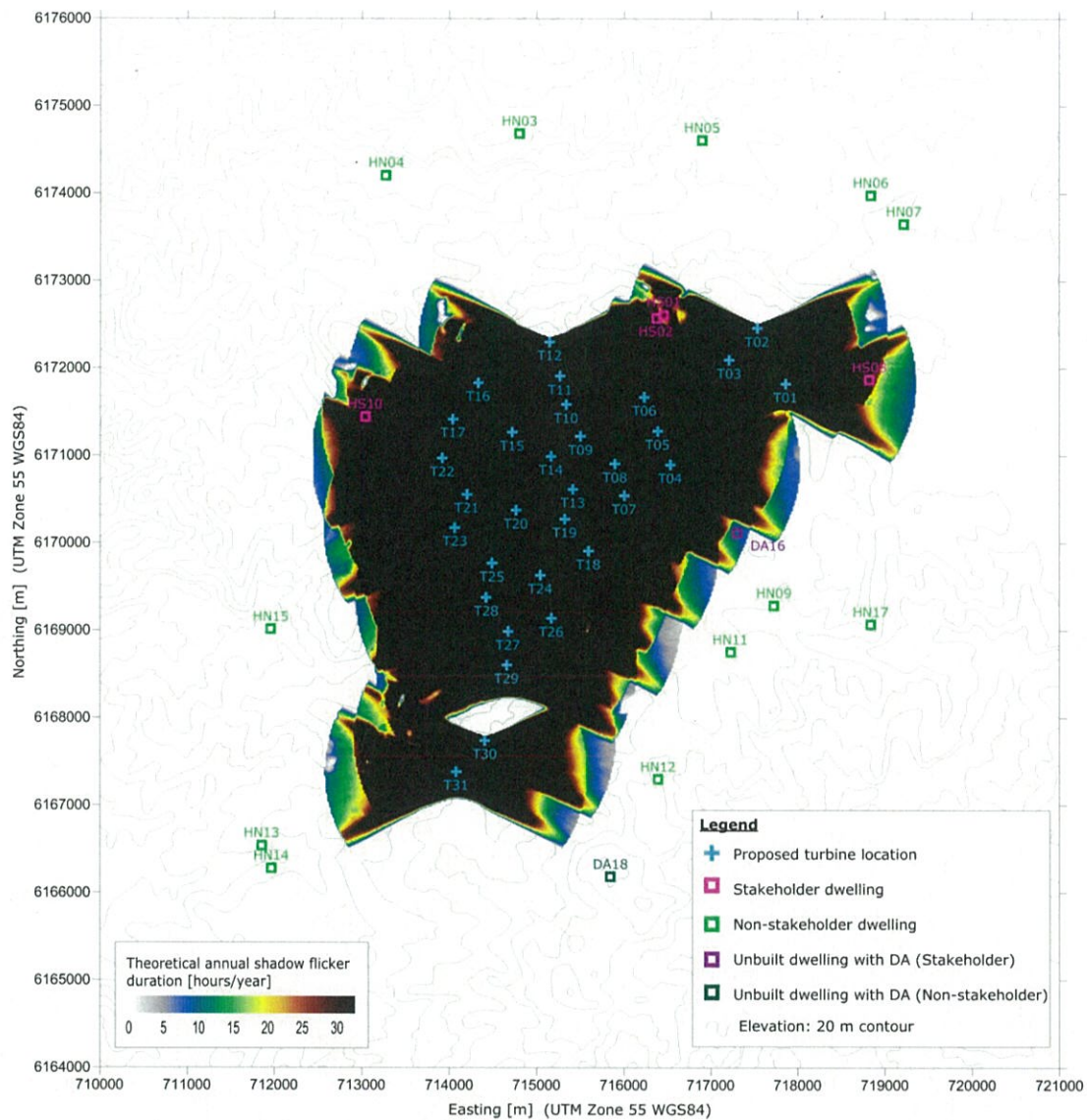


Figure 3.4 Map of the proposed Biala Wind Farm with turbines, dwelling locations and theoretical annual shadow flicker duration at 2 m above ground level.

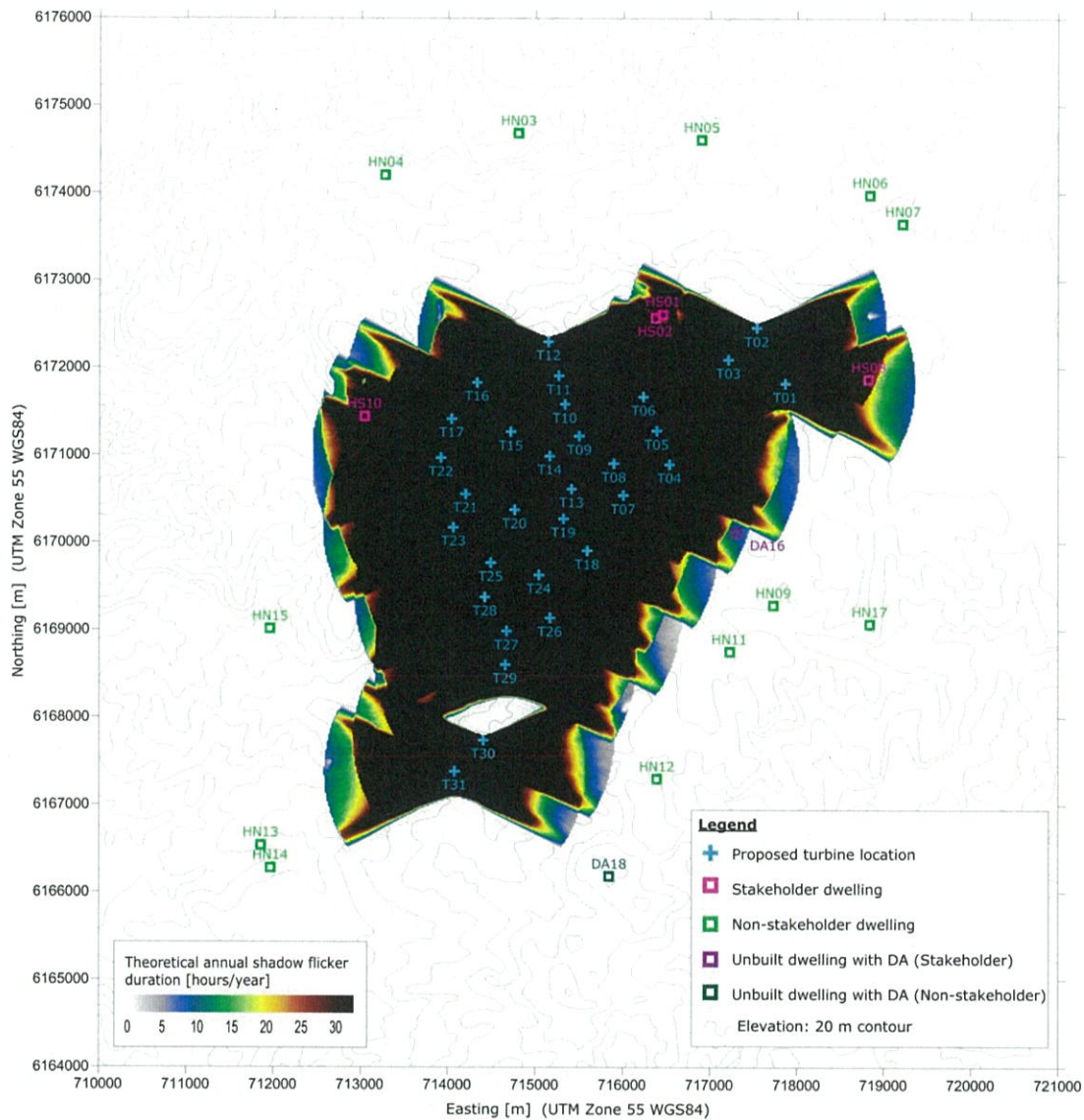


Figure 3.5 Map of the proposed Biala Wind Farm with turbines, dwelling locations and theoretical annual shadow flicker duration at 6 m above ground level.



5 REFERENCES

- 1 "Biala Wind Farm Project – Wind Farm Noise Impact Assessment", DNV GL Report 170223-AUME-R-01-D, 5 June 2015.
- 2 "Biala Wind Farm – Shadow Flicker and Blade Glint Assessment", DNV GL Report 170223-AUME-R-02-E, 10 July 2015.
- 3 Email from Claire Burnes (ERM) to Trenton Gilbert (DNV GL), 23 November 2015.
- 4 Email from Annmaree Lavery (Newtricity) to Trenton Gilbert (DNV GL), 14 December 2014.
- 5 "Secretary's Environmental Assessment Requirements", SEARs for Biala Wind Farm - Application Number SSD 13_6039, NSW Department of Planning and Infrastructure, 19 May 2015.
- 6 "Draft NSW Planning Guidelines Wind Farms", NSW Department of Planning and Infrastructure, December 2011.
- 7 "Planning for Renewable Energy – A Companion Guide to PPS22", Office of the Deputy Prime Minister, UK, 2004.
- 8 "National Wind Farm Development Guidelines – Public Consultation Draft", Environmental Protection and Heritage Council (EPHC), Jul 2010.