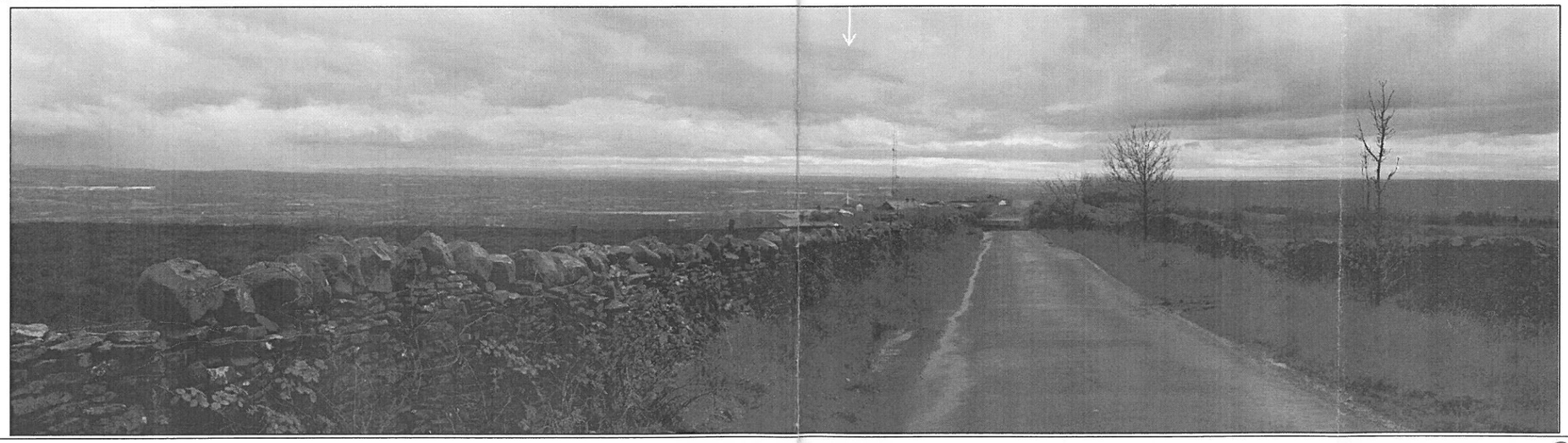


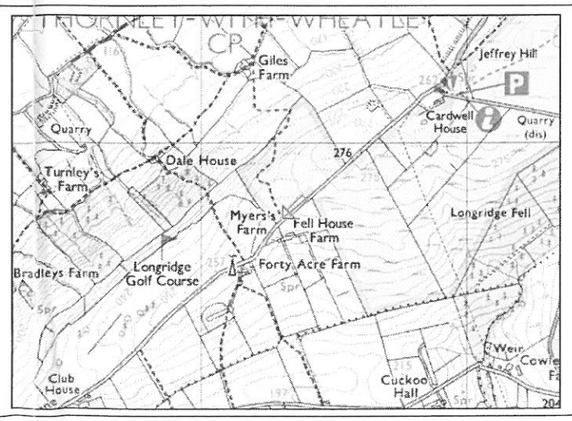
Horizon line and wireframe from Viewpoint 1 showing turbine obscured by the agricultural barn



Photomontage from NGR 363411, 439803 on Higher Road at Viewpoint 1b showing turbine visible above farm buildings

aardvark
environment matters

Viewpoint Location:	363302, 439716
View Direction:	221 degrees
Camera Elevation:	1.55m
Distance to Proposed Turbine:	1,567m
Hub height; rotor diameter; top tip height	24.8m ; 19.2m; 34.5m



320121021P

Viewpoints 1 and 1b:

Top: AoNB boundary footpath stile at Fell House and Myers Farms

Bottom: AoNB – Higher Road above Fell House Farm

Hills Farm Wind Turbine
Landscape & Visual Impact Assessment
Single Turbine Photomontages
(WindPro v2.8)

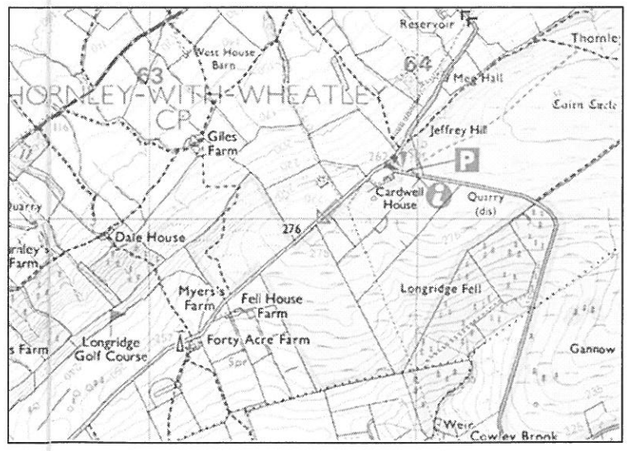


320121021P

Photomontage from Viewpoint 1b

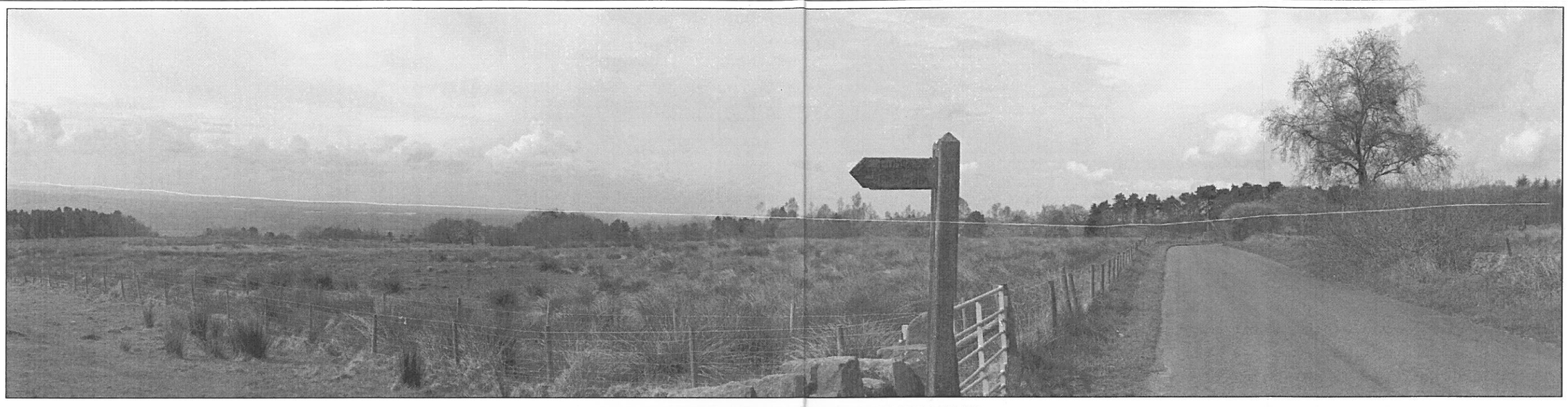
aardvark
environment matters

Viewpoint Location:	363411, 439803
View Direction:	223 degrees
Camera Elevation:	1.55m
Distance to Proposed Turbine:	2, 048m
Hub height; rotor diameter; top tip height	24.8m ; 19.2m; 34.5m



Viewpoint 1b:
AoNB – Higher Road above Fell House Farm

Hills Farm Wind Turbine
Landscape & Visual Impact Assessment
Cumulative turbine Photomontages
(WindPro v2.8)



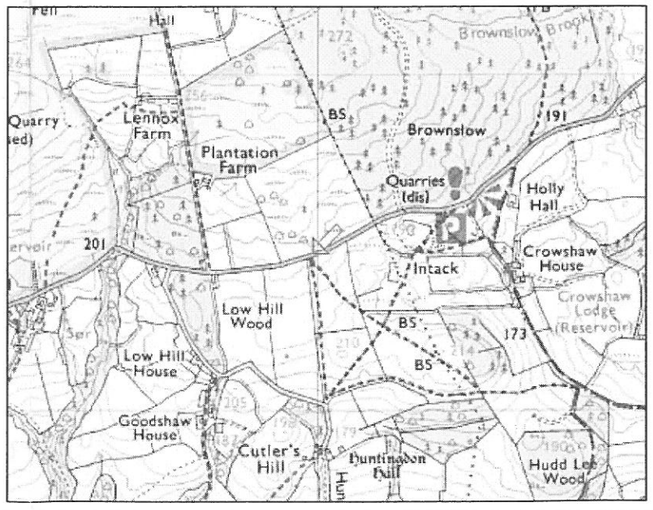


320121021P

Horizon line and wire frame from Viewpoint 2, including zoomed, extracted image showing proposed turbine obscured by the plantation.

aardvark
environment matters

Viewpoint Location:	365974, 439462
View Direction:	256 degrees
Camera Elevation:	1.55m
Distance to Proposed Turbine:	3,830m
Hub height; rotor diameter; top tip height	24.8m ; 19.2m; 34.5m



Viewpoint 2:

AoNB boundary along Old Clitheroe Road above Huntingdon Hall

Hills Farm Wind Turbine

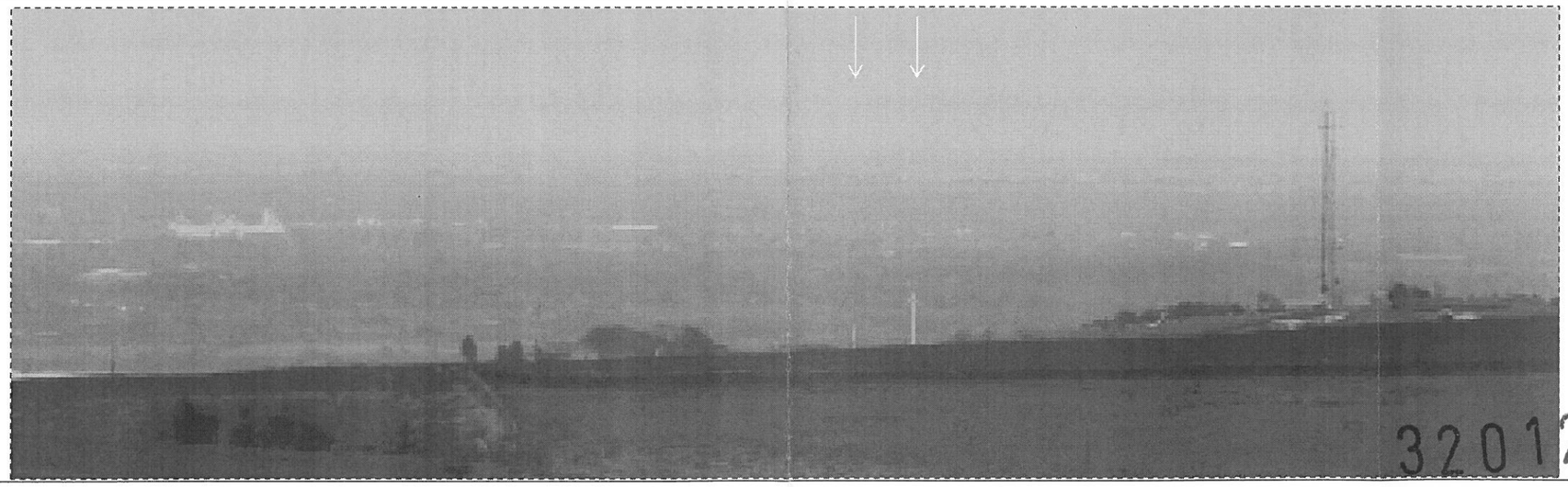
Landscape & Visual Impact Assessment

Single Turbine Photomontages

(WindPro v2.8)



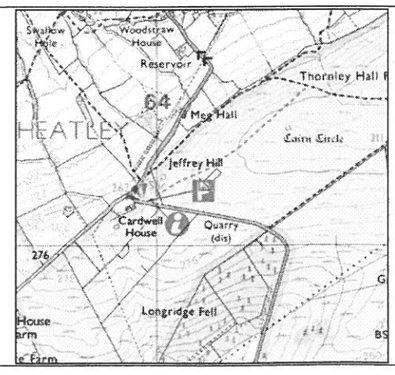
Photomontage of proposed Hills Farm and Dilworth Brows turbines from Viewpoint 3



Zoomed, extracted image from above photomontage

aardvark
environment matters

Viewpoint Location:	364153, 440219
View Direction:	228 degrees
Camera Elevation:	1.55m
Distance to Proposed Turbine:	2,532m
Hub height; rotor diameter; top tip height	24.8m ; 19.2m; 34.5m

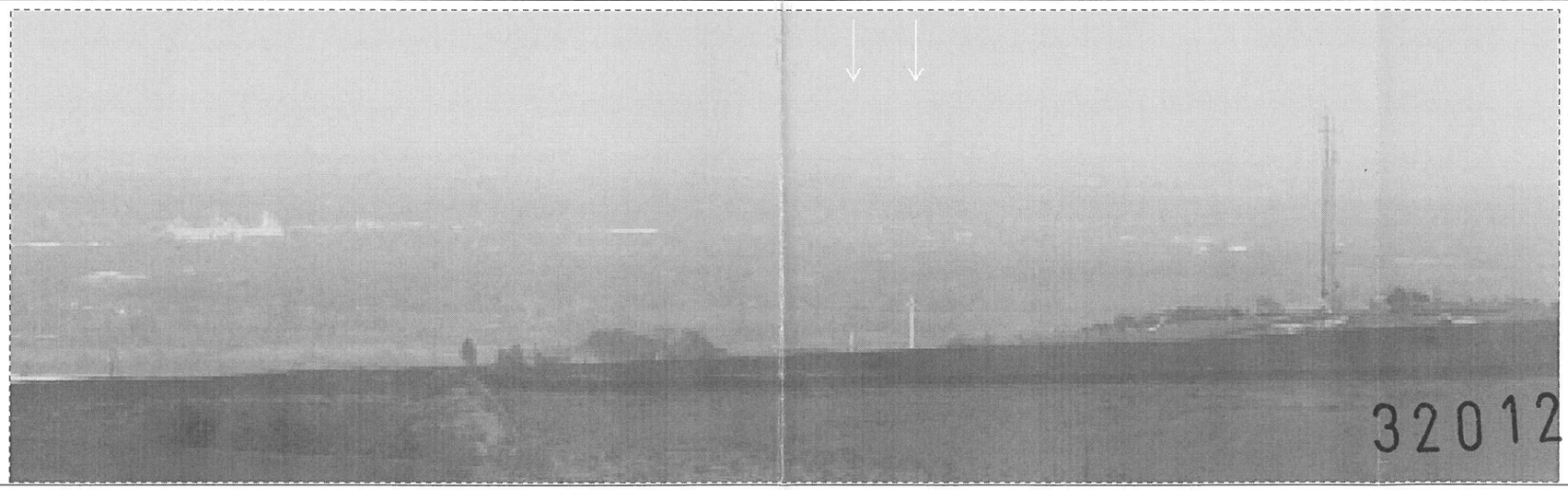


Viewpoint 3:
Longridge Fell
above Jeffrey Hill layby

Hills Farm Wind Turbine
Landscape & Visual Impact Assessment
Cumulative Turbines Photomontages
(WindPro v2.8)



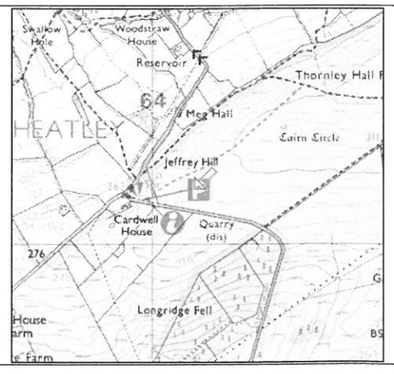
Photomontage of proposed Hills Farm and Dilworth Brows turbines from Viewpoint 3



Zoomed, extracted image from above photomontage

aardvark
environment matters

Viewpoint Location:	364153, 440219
View Direction:	228 degrees
Camera Elevation:	1.55m
Distance to Proposed Turbine:	2,532m
Hub height; rotor diameter; top tip height	24.8m ; 19.2m; 34.5m

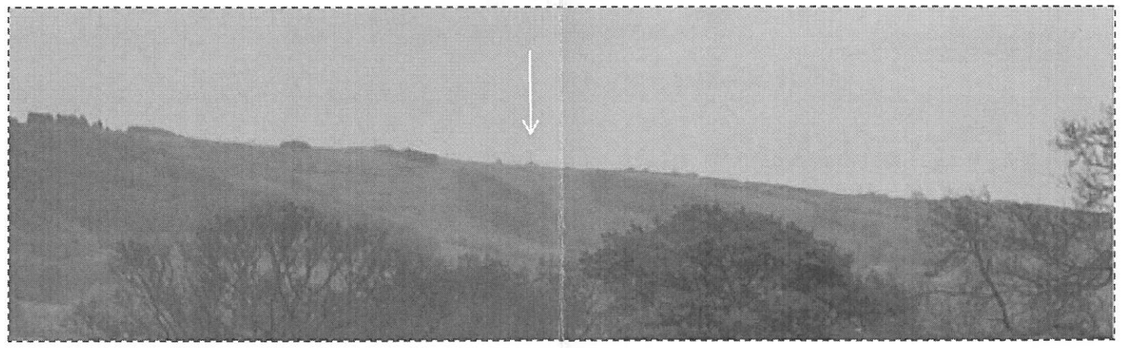


Viewpoint 3:
Longridge Fell
above Jeffrey Hill layby

Hills Farm Wind Turbine
Landscape & Visual Impact Assessment
Cumulative Turbines Photomontages
(WindPro v2.8)



Photomontage of proposed Hills Farm Turbine from Viewpoint 4

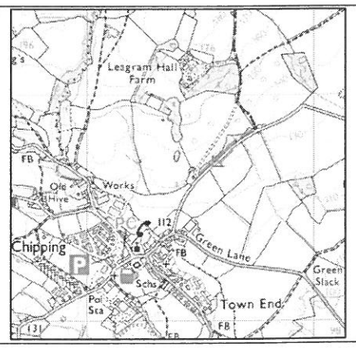


320121021P

Zoomed, extracted image from above photomontage – highlighting the uppermost blade of the proposed turbine

aardvark
environment matters

Viewpoint Location:	**362538.78, 443671.34**
View Direction:	**182.65 degrees**
Camera Elevation:	**1.55m**
Distance to Proposed Turbine:	**5,133m**
Hub height; rotor diameter; top tip height	**24.8m ; 19.2m; 34.5m**



Viewpoint 4
East of Chipping

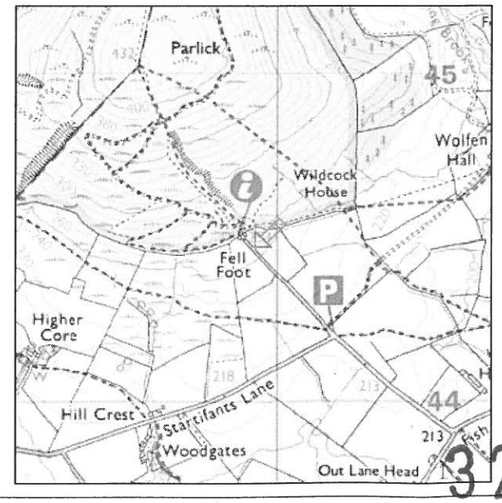
Hills Farm Wind Turbine
Landscape & Visual Impact Assessment
Single Turbine Photomontages
(WindPro v2.8)



Photomontage of proposed Hills Farm turbine from Viewpoint 5, including zoomed, extracted image from the photomontage. (WindPro rendering setting: heavily clouded, normal light conditions – as per the actual weather conditions).

aardvark
environment matters

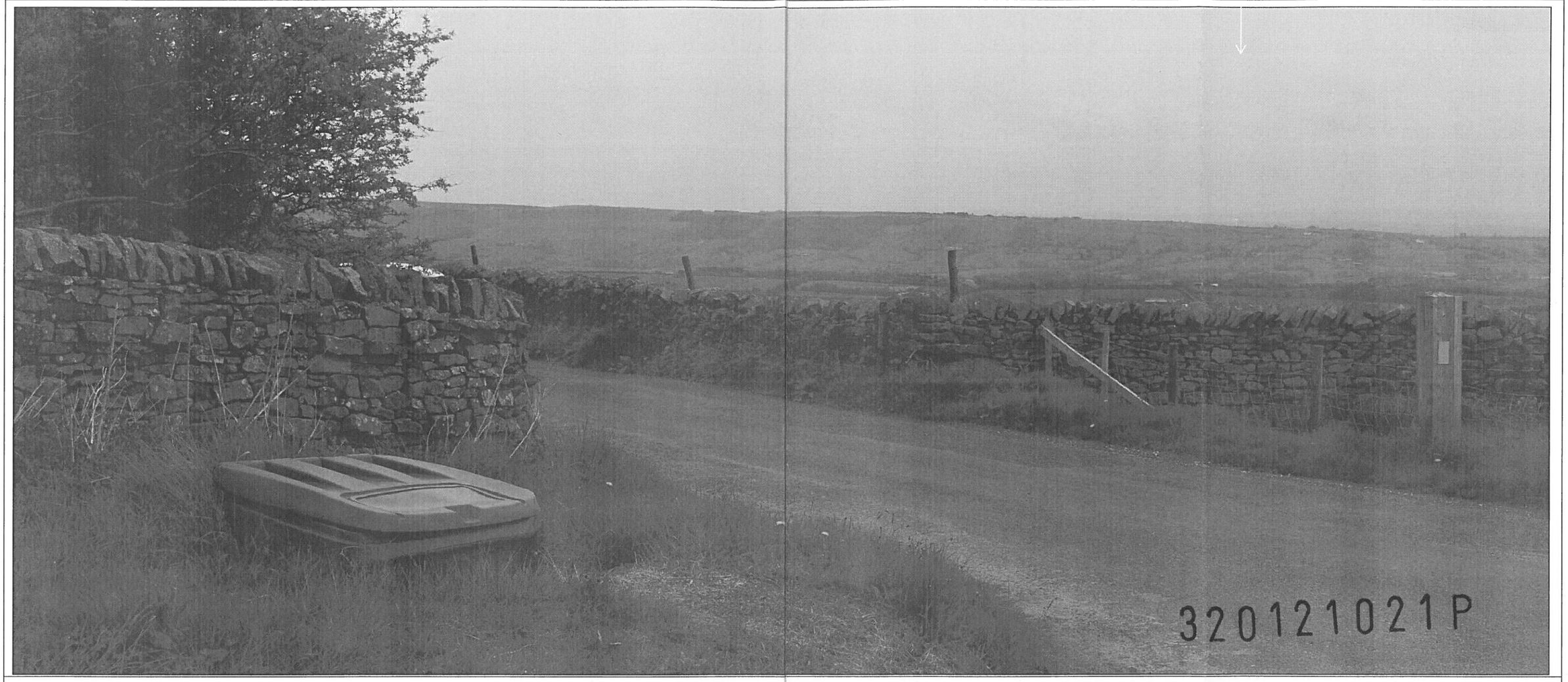
Viewpoint Location:	**359928, 444473**
View Direction:	**158 degrees**
Camera Elevation:	**1.55m**
Distance to Proposed Turbine:	**6,374m**
Hub height; rotor diameter; top tip height	**24.8m ; 19.2m; 34.5m**



Viewpoint 5
Fell Foot

Hills Farm Wind Turbine
Landscape & Visual Impact Assessment
Single Turbine Photomontages
(WindPro v2.8)

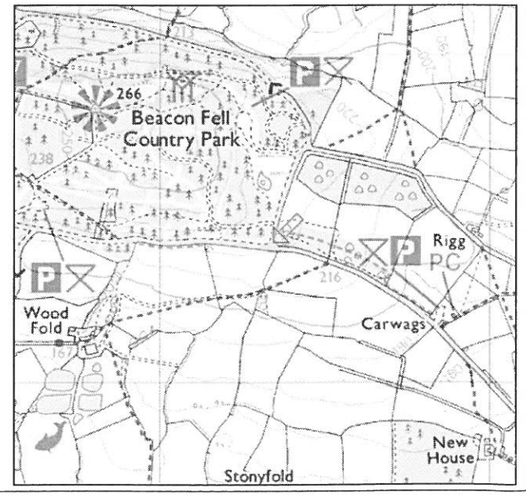
3/2012/1021/P



Photomontage of the proposed Hills Farm turbine from Viewpoint 6 (WindPro rendering setting: heavily clouded, normal light conditions – as per the actual weather conditions).

aardvark environment matters

Viewpoint Location:	357337, 442413
View Direction:	128 degrees
Camera Elevation:	1.55m
Distance to Proposed Turbine:	6,256m
Hub height; rotor diameter; top tip height	24.8m ; 19.2m; 34.5m



Viewpoint 6

Beacon Hill Country Park exit junction

Hills Farm Wind Turbine

Landscape & Visual Impact Assessment

Single turbine photomontages

(WindPro v2.8)

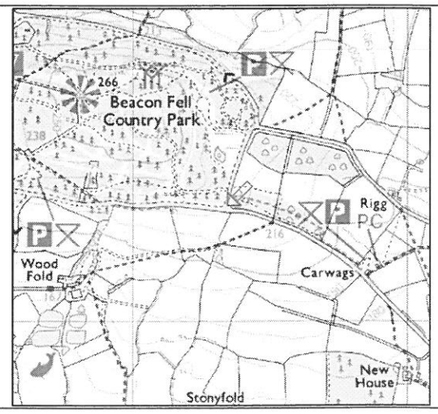


320121021P

Photomontage of proposed Hills Farm and Dilworth Brows turbines from Viewpoint 6 – with zoomed, extracted image from photomontage. (WindPro rendering setting: heavily clouded, normal light conditions – as per the actual weather conditions).

aardvark environment matters

Viewpoint Location:	**357337, 442413**
View Direction:	**128 degrees**
Camera Elevation:	**1.55m**
Distance to Proposed Turbine:	**6,256m**
Hub height; rotor diameter; top tip height	**24.8m ; 19.2m; 34.5m**



Viewpoint 6
Beacon Hill Country Park exit junction

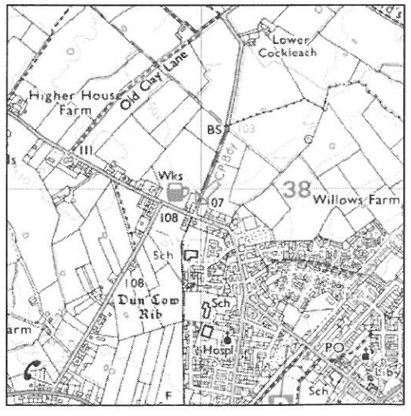
Hills Farm Wind Turbine
Landscape & Visual Impact Assessment
Cumulative turbine Photomontages
(WindPro v2.8)



Photomontage of the proposed Hills Farm turbine from Viewpoint 7

aardvark
environment matters

Viewpoint Location:	359985, 437970
View Direction:	75 degrees
Camera Elevation:	3m
Distance to Proposed Turbine:	2,346m
Hub height; rotor diameter; top tip height	24.8m ; 19.2m; 34.5m



Viewpoint 7
Alston Arms garden

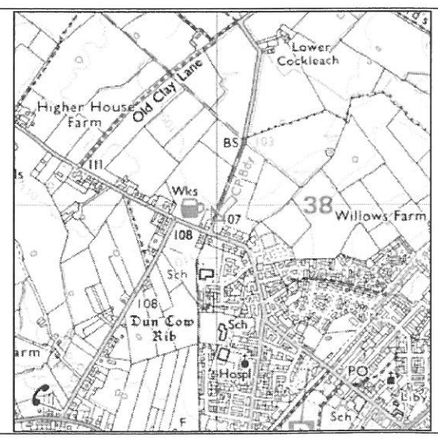
Hills Farm Wind Turbine
Landscape & Visual Impact Assessment
Single turbine photomontages
(WindPro v2.8)



Photomontage of proposed Hills Farm and Dilworth Brows turbines from Viewpoint 7, including zoomed, extracted image from photomontage.

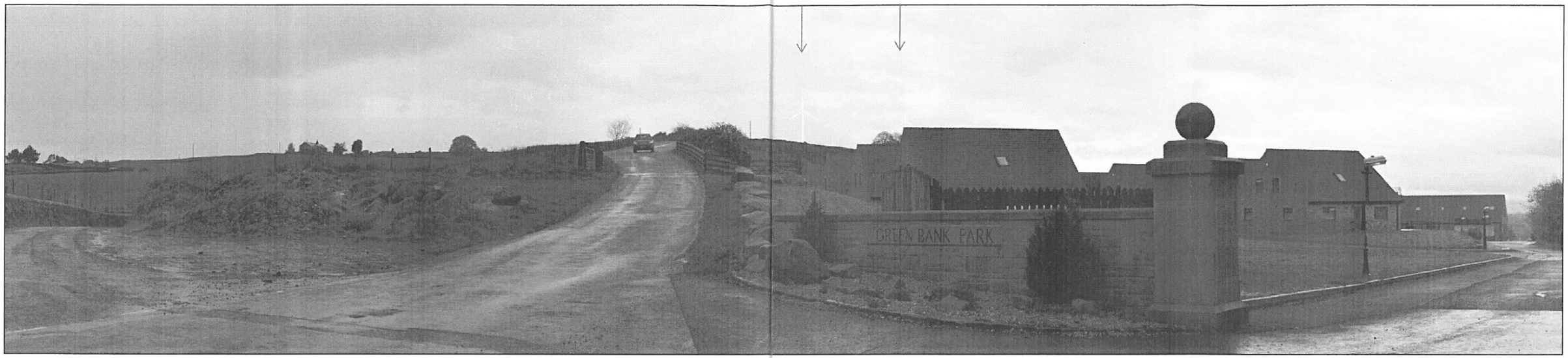
aardvark
environment matters

Viewpoint Location:	359985, 437970
View Direction:	75 degrees
Camera Elevation:	3m
Distance to Proposed Turbine:	2,346m
Hub height; rotor diameter; top tip height	24.8m ; 19.2m; 34.5m



Viewpoint 7
Alston Arms garden

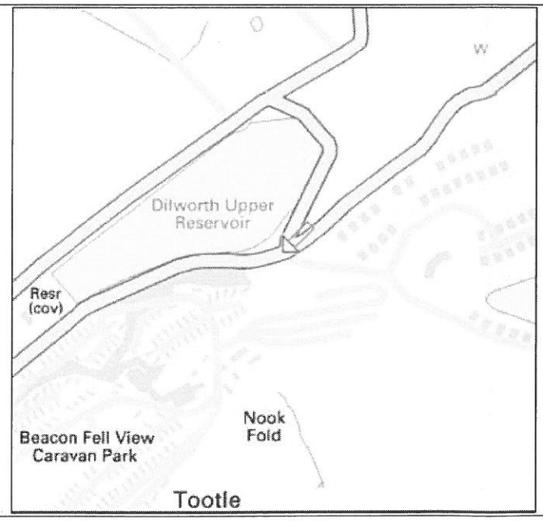
Hills Farm Wind Turbine
Landscape & Visual Impact Assessment
Cumulative turbine Photomontages
(WindPro v2.8)



Photomontage of proposed Hills Farm and Dilworth Brows turbines from Viewpoint 8

aardvark
environment matters

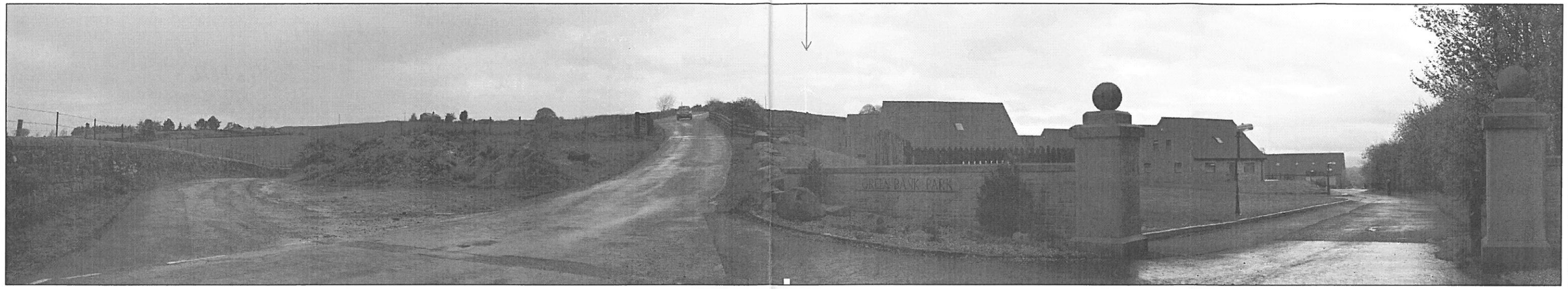
Viewpoint Location:	**361745, 438260**
View Direction:	**60 degrees**
Camera Elevation:	**1.55m**
Distance to Proposed Turbine:	**584m**
Hub height; rotor diameter; top tip height	**24.8m ; 19.2m; 34.5m**



Viewpoint 8
Green Bank Park entrance,
Old Clitheroe Road

Hills Farm Wind Turbine
Landscape & Visual Impact Assessment
Cumulative turbine Photomontages
(WindPro v2.8)

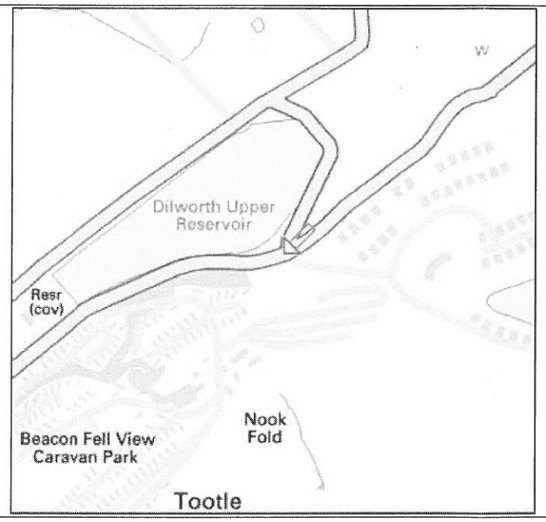
3201210 21P



Photomontage of proposed Hills Farm turbine from Viewpoint 8

aardvark
environment matters

Viewpoint Location:	361745, 438260
View Direction:	60 degrees
Camera Elevation:	1.55m
Distance to Proposed Turbine:	584m
Hub height; rotor diameter; top tip height	24.8m ; 19.2m; 34.5m



Viewpoint 8
Green Bank Park entrance,
Old Clitheroe Road

Hills Farm Wind Turbine
Landscape & Visual Impact Assessment
Single turbine photomontages
(WindPro v2.8)

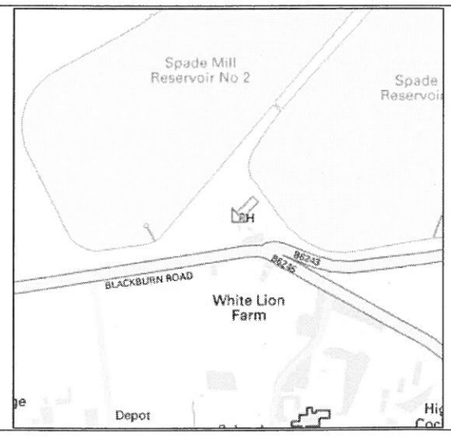
3201210 21P



Photomontage of proposed Hills Farm and Dilworth Brows turbines from Viewpoint 9

aardvark
environment matters

Viewpoint Location:	361795, 437336
View Direction:	20 degrees
Camera Elevation:	1.55m
Distance to Proposed Turbine:	1,303m
Hub height; rotor diameter; top tip height	24.8m ; 19.2m; 34.5m



Viewpoint 9
Corporation Arms garden

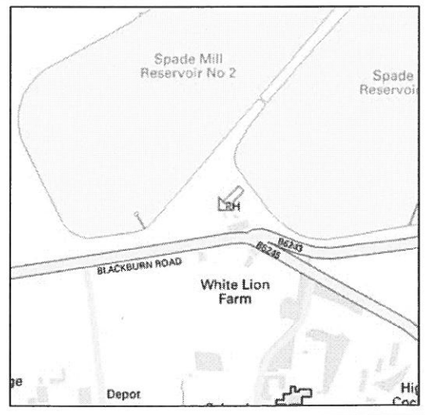
Hills Farm Wind Turbine
Landscape & Visual Impact Assessment
Cumulative turbine Photomontages
(WindPro v2.8)



Photomontage of proposed Hills Farm turbine from Viewpoint 9

aardvark
environment matters

Viewpoint Location:	361795, 437336
View Direction:	20 degrees
Camera Elevation:	1.55m
Distance to Proposed Turbine:	1,303m
Hub height; rotor diameter; top tip height	24.8m ; 19.2m; 34.5m



Viewpoint 9
Corporation Arms garden

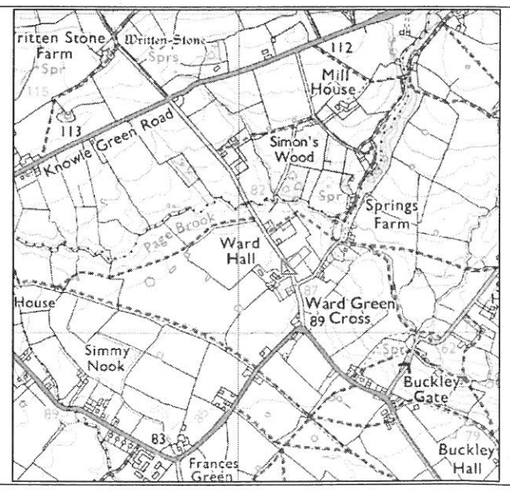
Hills Farm Wind Turbine
Landscape & Visual Impact Assessment
Single turbine Photomontages
(WindPro v2.8)



Horizon line and wireframe of the proposed Hills Farm and Dilworth Brows turbines from Viewpoint 10 – from this viewpoint the proposed Dilworth Brows turbine would be screened by the tree.

aardvark
environment matters

Viewpoint Location:	363125, 437187
View Direction:	327 degrees
Camera Elevation:	1.55m
Distance to Proposed Turbine:	1,620m
Hub height; rotor diameter; top tip height	24.8m ; 19.2m; 34.5m



Viewpoint 10
Beacon Reach Education Centre, Ward Green Lane

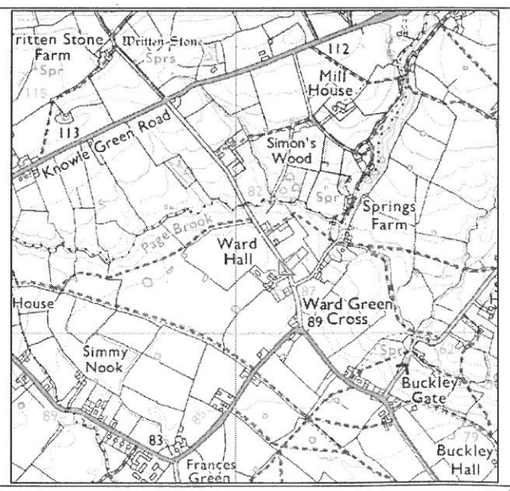
Hills Farm Wind Turbine
Landscape & Visual Impact Assessment
Cumulative Turbines Photomontages
(WindPro v2.8)



Photomontage of proposed Hills Farm turbine from Viewpoint 10

aardvark
environment matters

Viewpoint Location:	363125, 437187
View Direction:	327 degrees
Camera Elevation:	1.55m
Distance to Proposed Turbine:	1,620m
Hub height; rotor diameter; top tip height	24.8m ; 19.2m; 34.5m



Viewpoint 10
Beacon Reach Education Centre, Ward Green Lane

Hills Farm Wind Turbine
Landscape & Visual Impact Assessment
Single Turbine Photomontages
(WindPro v2.8)

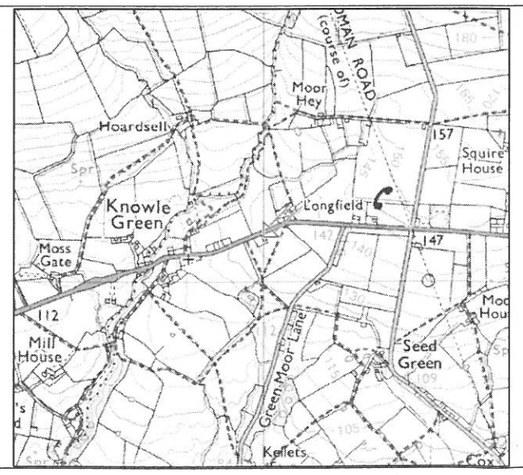


Photomontage of proposed Hills Farm turbine from Viewpoint 11

320121021P

aardvark
environment matters

Viewpoint Location:	363992, 438142
View Direction:	283 degrees
Camera Elevation:	155.m
Distance to Proposed Turbine:	1,783m
Hub height; rotor diameter; top tip height	24.8m ; 19.2m; 34.5m



Viewpoint 11
Knowle Green Village Hall

Hills Farm Wind Turbine
Landscape & Visual Impact Assessment
Single Turbine Photomontages
(WindPro v2.8)

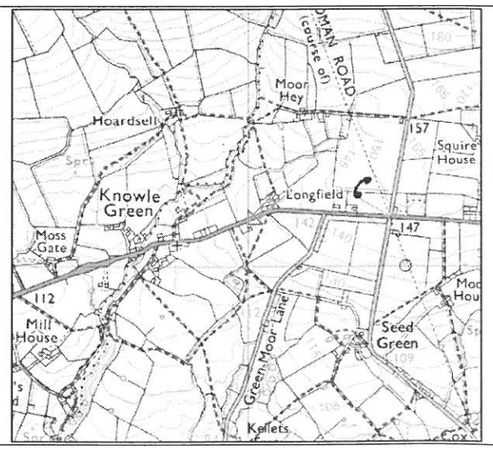


Photomontage of proposed Hills Farm and Dilworth Brows turbines from Viewpoint 11

3201210 21P

aardvark
environment matters

Viewpoint Location:	363992, 438142
View Direction:	283 degrees
Camera Elevation:	155.m
Distance to Proposed Turbine:	1,783m
Hub height; rotor diameter; top tip height	24.8m ; 19.2m; 34.5m



Viewpoint 11
Knowle Green Village Hall

Hills Farm Wind Turbine
Landscape & Visual Impact Assessment
Cumulative turbine Photomontages
(WindPro v2.8)

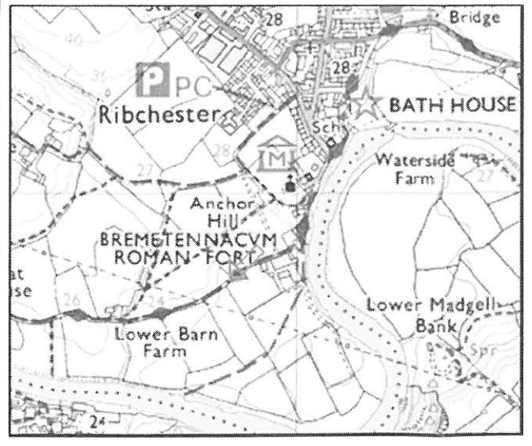


Photomontage of the proposed Hills Farm turbine from Viewpoint 12

320121021P

aardvark
environment matters

Viewpoint Location:	364824, 434776
View Direction:	326 degrees
Camera Elevation:	1.55m
Distance to Proposed Turbine:	4,571m
Hub height; rotor diameter; top tip height	24.8m ; 19.2m; 34.5m



Viewpoint 12
Ribble Valley Way,
South-West of Ribchester

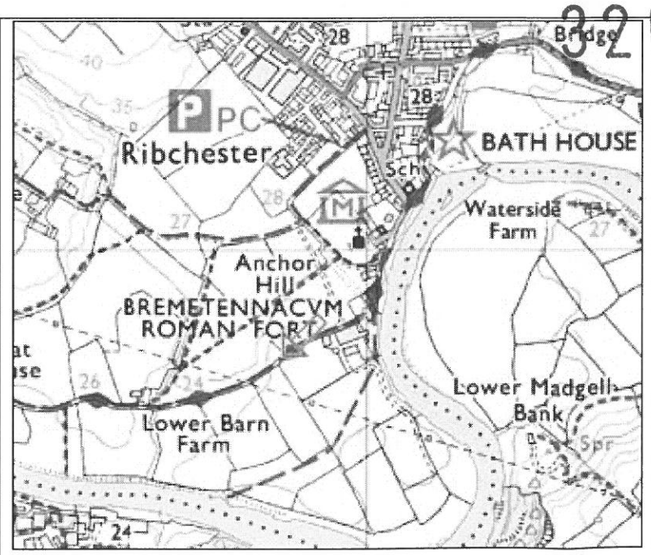
Hills Farm Wind Turbine
Landscape & Visual Impact Assessment
Single Turbine Photomontages
(WindPro v2.8)



Photomontage of proposed Hills Farm and Dilworth Brows turbines from Viewpoint 12

aardvark
environment matters

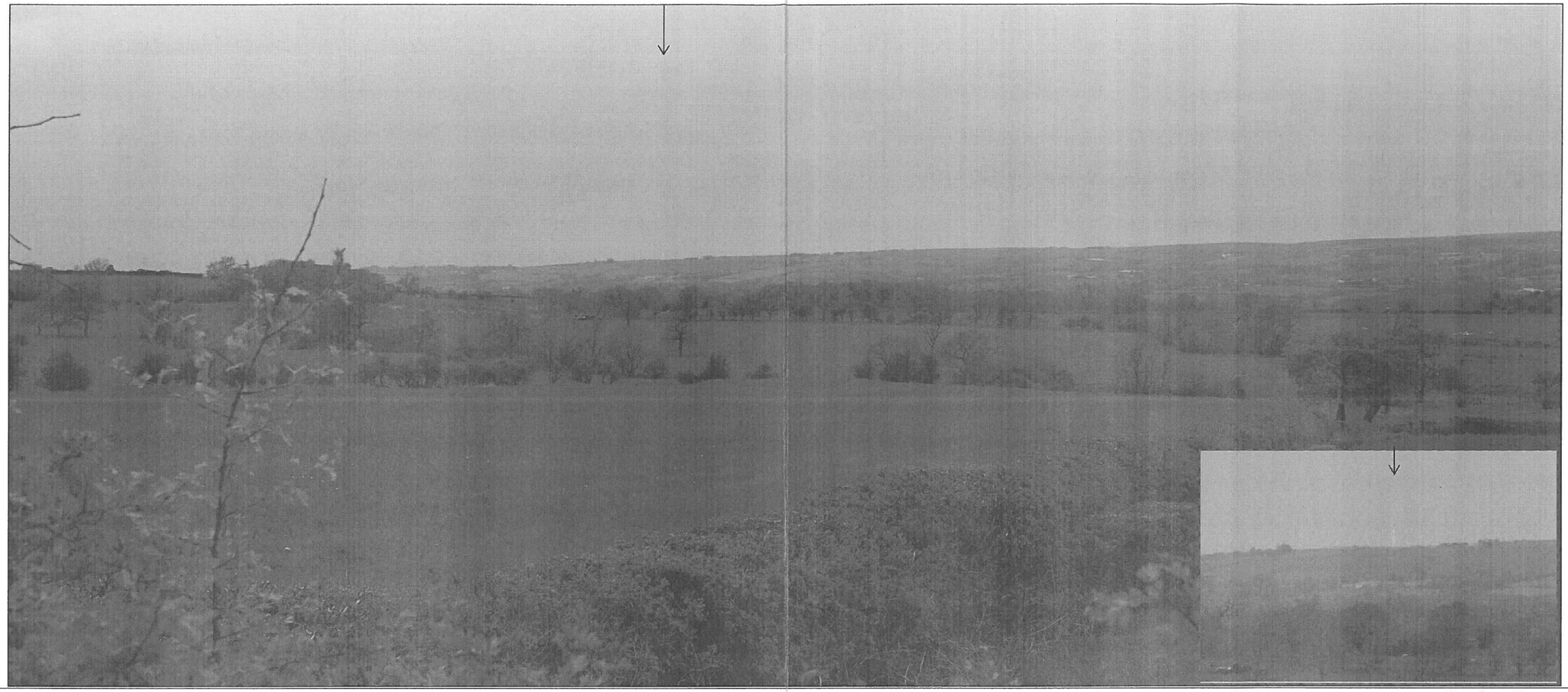
Viewpoint Location:	364824, 434776
View Direction:	326 degrees
Camera Elevation:	1.55m
Distance to Proposed Turbine:	4,571m
Hub height; rotor diameter; top tip height	24.8m ; 19.2m; 34.5m



3201210 21P

Viewpoint 12
Ribble Valley Way,
South-West of Ribchester

Hills Farm Wind Turbine
Landscape & Visual Impact Assessment
Cumulative turbine Photomontages
(WindPro v2.8)

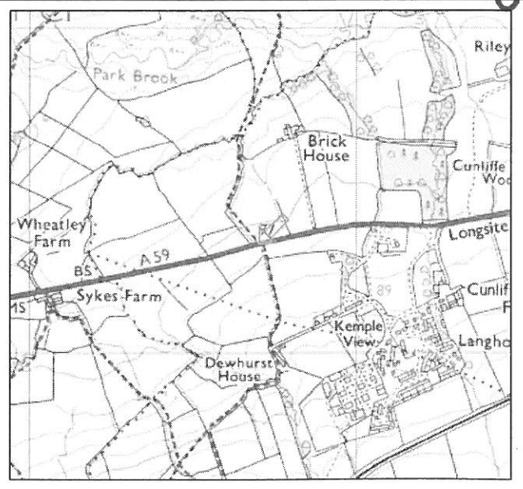


Photomontage of the proposed Hills Farm turbine from Viewpoint 13, with zoomed, extracted image from the photomontage.

320121021P

aardvark environment matters

Viewpoint Location:	368694, 434337
View Direction:	303 degrees
Camera Elevation:	1.55m
Distance to Proposed Turbine:	7,694m
Hub height; rotor diameter; top tip height	24.8m ; 19.2m; 34.5m



Viewpoint 13
A59 East of Copster Green

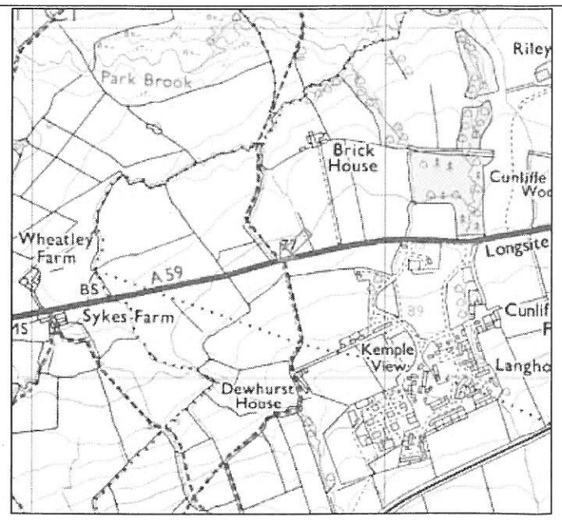
Hills Farm Wind Turbine
Landscape & Visual Impact Assessment
Single turbine Photomontages
(WindPro v2.8)



Photomontage of proposed Hills Farm and Dilworth Brows turbines from Viewpoint 13, with zoomed, extracted image from the photomontage.

aardvark
environment matters

Viewpoint Location:	368694, 434337
View Direction:	303 degrees
Camera Elevation:	1.55m
Distance to Proposed Turbine:	7,694m
Hub height; rotor diameter; top tip height	24.8m ; 19.2m; 34.5m



Viewpoint 13
A59 East of Copster Green

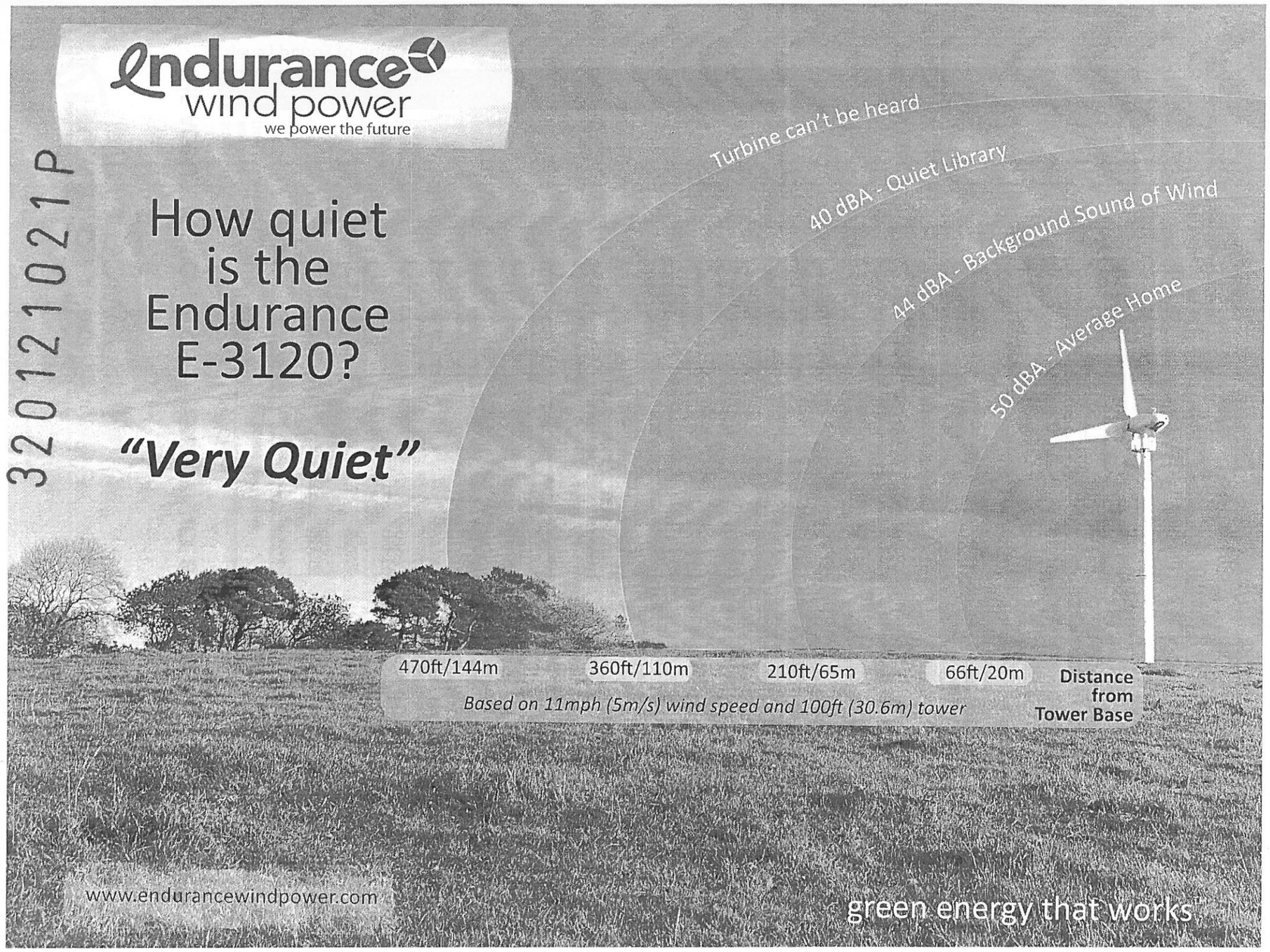
Hills Farm Wind Turbine
Landscape & Visual Impact Assessment
Cumulative turbine Photomontages
(WindPro v2.8)

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How quiet is the Endurance E-3120?

"Very Quiet"

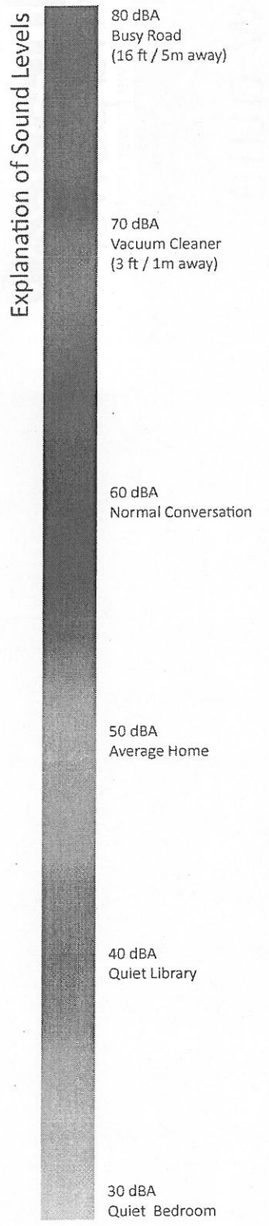


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THE ACOUSTIC PROFILE OF THE ENDURANCE E-3120 50 kW WIND TURBINE



E-3120 Sound Level Chart

Distance from tower base		Sound level (dBA)	
ft	m	11 mph wind (5 m/s)	22 mph wind (10 m/s)
33	10	51.0	53.7
66	20	49.9	52.6
98	30	48.5	51.2
131	40	47.1	49.8
164	50	45.8	48.5
197	60	44.5	47.3
230	70	43.5	46.2
262	80	42.5	45.2
295	90	41.6	44.3
328	100	40.7	43.4
394	120	39.3	42.0
459	140	38.0	Inaudible
525	160	Inaudible	Inaudible

Key Sound Data

	11 mph wind (5 m/s)	22 mph wind (10m/s)
Background wind noise level	43.8 dBA	47.0 dBA
Distance at which turbine matches background noise	220 ft (67m)	200 ft (62 m)
Distance at which the turbine is inaudible	470 ft (144m)	440 ft (135m)
35 dBA distance	660 ft (200 m)	900 ft (273 m)
Acoustic power level at turbine	92.1 dBA	94.8 dBA

Common Sound Levels

Sound	Approximate Sound Level
Busy road, 16ft (5m) away	80 dBA
Vacuum cleaner at 3ft (1m)	70 dBA
Normal conversation	60 dBA
Average home	50 dBA
Quiet library	40 dBA
Quiet bedroom at night	30 dBA

How Quiet is the Endurance E-3120?
The numbers show that the E-3120 is extremely quiet, but the experiences and testimonials of neighbours and owners are even more impressive. Quiet operation was the essential characteristic that Montana State University required for their wind turbine to maintain the learning environment on their campus. Prior to installation, they were assured by two other turbine owners- a farmer in Cornwall, England and the Sault College of Applied Arts and Technology- that the E-3120 was a "very quiet" wind turbine. "Very quiet" were the same words used to describe the E-3120 by Montana State University's neighbours after it was installed.

Sound Measurement and Perception
Sound levels are measured above on the decibel scale, with an "A" weighting to account for how the ear perceives sound (dBA). A one decibel difference is perceptible, and a 10 decibel increase is usually perceived as twice as loud.

Measuring Wind Turbine Acoustics
Acoustic data has been collected and analyzed per IEC standard 61400-11: *Wind turbine generator systems - acoustic noise measurement techniques.* All data is based on the E-3120-1 three-phase wind turbine at a 100ft (30.6m) hub height. The E-3120-2 single phase turbine has a different acoustic profile. All wind speeds are at turbine hub height.

The turbine sound does not have irritating tones, and is not considered tonal per IEC 61400-11.

AWEA Sound Rating - 48.1 dBA
The American Wind Energy Association (AWEA) sound rating is 48.1 dBA – which is the sound level that is not exceeded 95% of the time in a 5 m/s average annual wind, 173ft (52.6m) from the tower base. This is per the conditions defined in the AWEA *Small Wind Turbine Performance and Safety Standard.*

AWEA BUSINESS MEMBER | canwea | renewableUK Member 2010

ENDURANCE E3120 WIND TURBINE
GENERALISED NOISE PREDICTIONS
Hayes McKenzie Partnership Ltd
Seth Roberts, 26th July 2011
Reference: HM2438_1_SJR

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Summary

1. The Hayes McKenzie Partnership Ltd. has been asked by The Green Company Ltd. to carry out generalised noise predictions for the Endurance E3120 wind turbine in order to assess it's suitability for possible installation sites.

2. This note presents the noise prediction methodology and results.

Methodology

3. The wind turbine noise predictions were carried out based on the latest best practice advice; *Prediction and Assessment of Noise from Wind Turbine Noise* published in the Institute of Acoustics, Acoustics Bulletin magazine, using measured noise data, a ground factor of G=0.5 and a 2 dB allowance for measurement uncertainty.

4. The source noise data, supplied by the manufacturer and octave band data is shown at Table 1 and Table 2 below.

Table 1 – Endurance E3120 50kW Wind Turbine Apparent Sound Power Level Data

Wind Speed at 10m Height (m/s)	Sound Power Level(dB L_{WAeq})
3	87.1
4	87.3
5	87.6
6	88.1
7	89.0
8	90.6
9	92.4
10	94.3
11	95.4
12	94.9

Table 2 – Endurance E3120 50kW Wind Turbine Octave Band Noise Data at 8 m/s

Octave Band Centre Frequency (Hz)	Overall	63	125	250	500	1k	2k	4k	8k
Octave Band Sound Power Level (dB(A))	91.8	70.3	78.7	83.7	82.6	83.9	86.8	84.5	71.5

Results

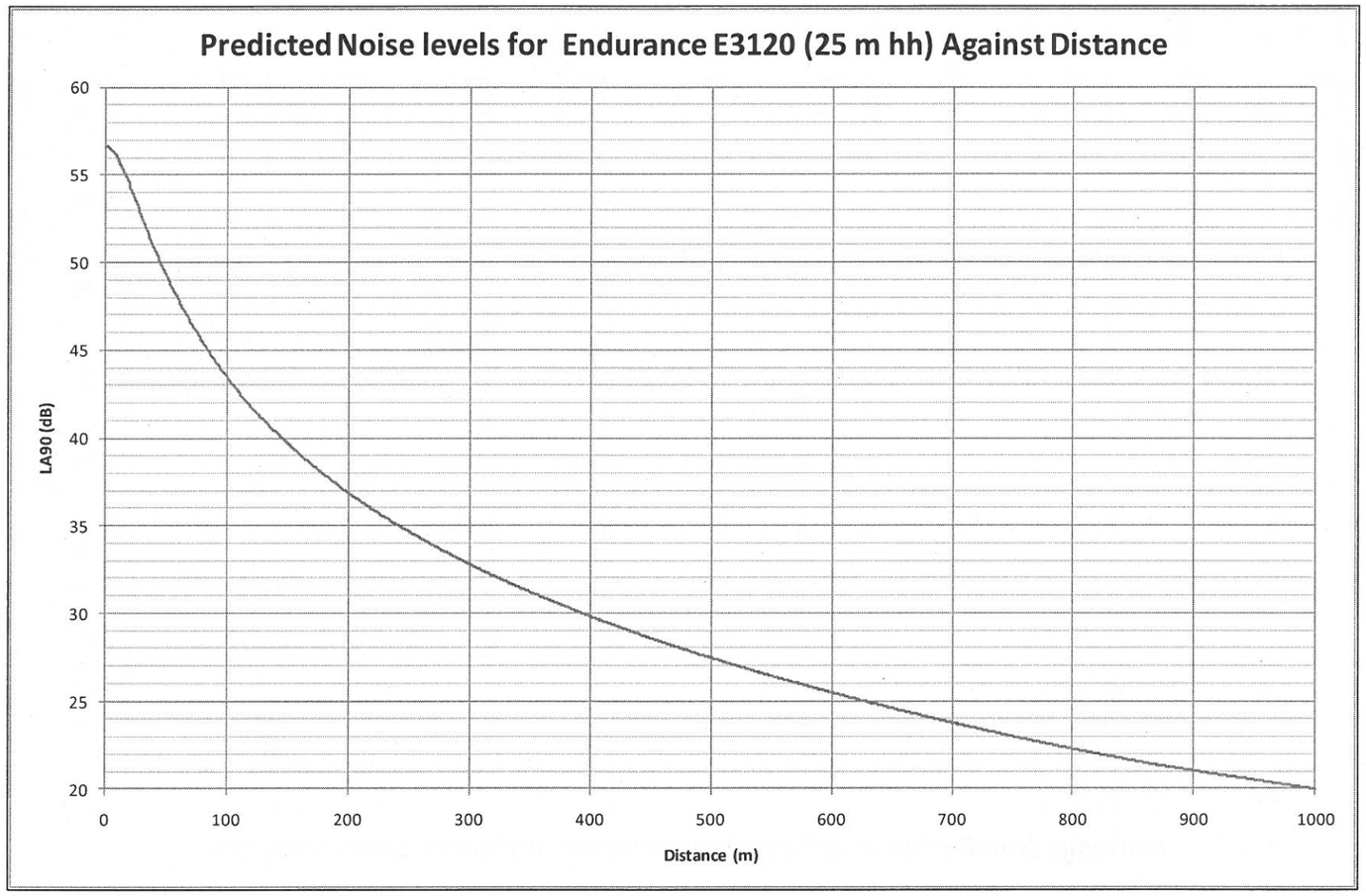
5. The results of the predictions, which assume downwind propagation and hub heights of both 25 m and 37 m, are shown in the form of graphs of noise against distance at Figure 1, for a wind speed of 10m/s. Note that for wind speeds lower than 10m/s, and for wind directions other than downwind noise propagation, wind turbine noise levels will be lower.

Assessment

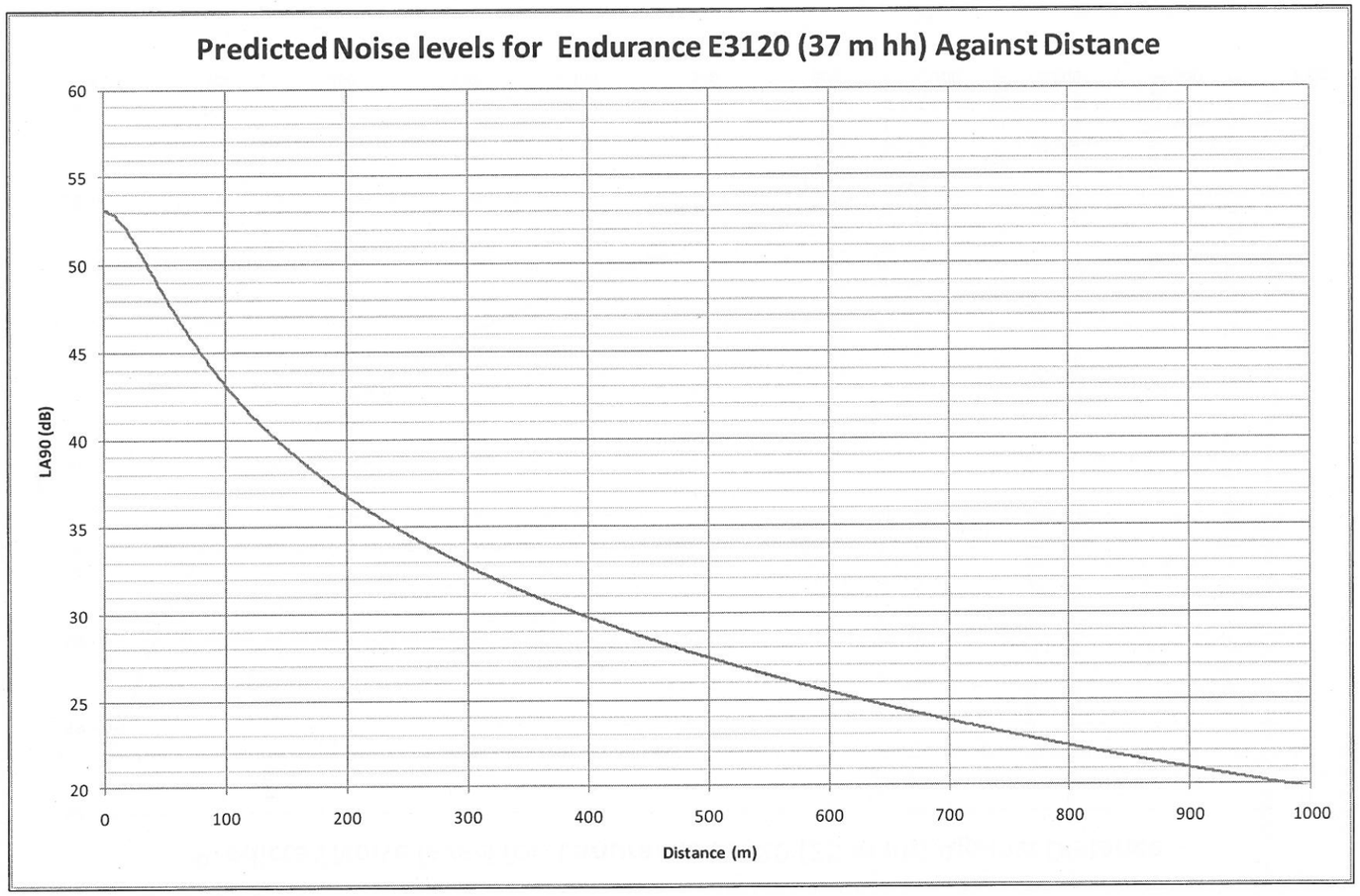
6. The results of the predictions show that the 35dB L_{A90} simplified noise limit described in ETSU-R-97, *The Assessment and Rating of Noise from Wind Farms*, is met for any property at a distance greater than 250m to the site.

7. Other separation distances of significance are the distances beyond which the predicted noise level is below 30 dBL_{A90}, 40 dBL_{A90}, 43 dBL_{A90} and 45 dB L_{A90}. These distances are 400m, 150m, 110m and 85m respectively.

Figure 1 – Predicted Noise levels for an Endurance E3120 Wind Turbine at 10m/s



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Predicted Noise levels for Endurance E3120 (37 m hh) Against Distance
LA90 (dB)
60
55
50
45
40
35
30
25
20
0
100
200
300
400
500
600
700
800
900
1000
Distance (m)