APPENDIX 1

ANGUS COUNCIL'S SUBMISSION RESPECT OF NON- DETERMINATION

APPLICATION NUMBER – 15/00415/FULL

APPLICANT- BOLSHAN RENEWABLES LIMITED

PROPOSAL & ADDRESS – ERECTION OF WIND TURBINE OF 55.6 TO HUB HEIGHT AND 79.6 TO BLADE TIP AND ANCILLARY DEVELOPMENT AT FIELD 750M NORTH WEST OF BOLSHAN FARM, BOLSHAN, ARBROATH

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TaylorE

From: ThomsonSD
Sent: 06 July 2015 14:20
To: TaylorE
Cc: WrightJ
Subject: FW: 15/00415/Full Bolshan WInd Turbine
Attachments: Bolshan Turbine.doc

Follow Up Flag: Follow up
Flag Status: Flagged

From: HendersonA
Sent: 06 July 2015 12:12
To: WrightJ
Cc: ThomsonSD
Subject: 15/00415/Full Bolshan WInd Turbine

James,

With regards to the above application, I would advise that the supporting information has been examined as well as a site visit having been made. Accordingly I would offer that this Department has no objections to the development save for the attached conditions.

Regards
Alex.

Alex. Henderson. Environmental Health Officer (Part Time)
Angus Council, Communities Department, Dewar House, 12 Hill Terrace, Arbroath, DD11 1AH.
Telephone 01241 435600

1. The rating level of noise immissions from the combined effects of the wind turbines (including the application of any tonal penalty) when determined in accordance with the attached Guidance Notes (to this condition), shall not exceed at any property lawfully existing at the date of this planning permission, L_{A90} 35dB (A) 10min level at wind speeds up to 10m/s as 10m height

2. Prior to the commencement of development the make and model of the turbine selected for use in the development shall be submitted for the written approval of the Planning Authority.

3. In the event that any turbine other than the candidate turbine is to be installed, a detailed noise assessment, including where necessary a cumulative assessment taking into account any existing wind turbine developments approved prior to the date of this permission, demonstrating that the noise limits specified by this permission shall not be exceeded shall be submitted for the written approval of the Planning Authority.

4. The wind farm operator shall continuously log power production, wind speed and wind direction, all in accordance with Guidance Note 1(d). This data shall be retained for a period of not less than 24 months. The wind farm operator shall provide this information in the format set out in Guidance Note 1(e) to the Local Planning Authority on its request, within 14 days of receipt in writing of such a request.

5. No electricity shall be exported until the wind farm operator has submitted to the Local Planning Authority for written approval a list of proposed independent consultants who may undertake noise compliance measurements in accordance with this permission. Amendments to the list of approved consultants shall be made only with the prior written approval of the Local Planning Authority.

6. Within 21 days from receipt of a written request from the Local Planning Authority following a complaint to it from an occupant of a dwelling alleging noise disturbance at that dwelling, the wind farm operator shall, at its expense, employ a consultant approved by the Local Planning Authority to assess the level of noise immissions from the wind farm at the complainant's property in accordance with the procedures described in the attached Guidance Notes. The written request from the Local Planning Authority shall set out at least the date, time and location that the complaint relates to and any identified atmospheric conditions, including wind direction, and include a statement as to whether, in the opinion of the Local Planning Authority, the noise giving rise to the complaint contains or is likely to contain a tonal component.

7. The assessment of the rating level of noise immissions shall be undertaken in accordance with an assessment protocol that shall previously have been submitted to and approved in writing by the Local Planning Authority. The protocol shall include the proposed measurement location identified in accordance with the Guidance Notes where measurements for compliance checking purposes shall be undertaken, whether noise giving rise to the complaint contains or is likely to contain a tonal component, and also the range of meteorological and operational conditions (which shall include the range of wind speeds, wind directions, power generation and times of day) to determine the assessment of rating level of noise immissions. The proposed range of conditions shall be those which prevailed during times when the complainant alleges there was disturbance due to noise, having regard to the written request by the Local Planning Authority to investigate a complaint, and such others as the independent consultant considers likely to result in a breach of the noise limits.

8. Where a dwelling to which a complaint is related is not listed in the tables attached to these conditions, the wind farm operator shall submit to the Local Planning Authority for written approval proposed noise limits to be adopted at the complainant's dwelling for compliance checking purposes. The proposed noise limits are to be those limits selected from the Tables specified for a listed location which the independent consultant considers as being likely to experience the most similar background noise environment to that experienced at the complainant's dwelling. The rating level of noise immissions resulting from the combined effects of the wind turbines when determined in accordance with the attached Guidance Notes shall not exceed the noise limits approved in writing by the Local Planning Authority for the complainant's dwelling.

9. The wind farm operator shall provide to the Local Planning Authority the independent consultant's assessment of the rating level of noise immissions undertaken in accordance with the Guidance Notes within 2 months of the date of the written request of the Local Planning Authority for compliance measurements to be undertaken, unless the time limit is extended in writing by the Local Planning Authority. The assessment shall include all data collected for the purposes of undertaking the compliance measurements, such data to be provided in the format set out in Guidance Note 1(e) of the Guidance Notes. The instrumentation used to undertake the measurements shall be calibrated in accordance with Guidance Note 1(a) and certificates of calibration shall be submitted to the Local Planning Authority with the independent consultant's assessment of the rating level of noise immissions.

10. Where a further assessment of the rating level of noise immissions from the wind farm is required pursuant to Guidance Note 4(c), the wind farm operator shall submit a copy of the further assessment within 21 days of submission of the independent consultant's assessment pursuant to condition 8 above unless the time limit has been extended in writing by the Local Planning Authority.

11. In the event that noise emissions from the wind turbine exceed the levels set by this permission, operation of the turbine shall cease until measures to reduce noise levels to comply with this permission are implemented. Should such measures fail to achieve compliance with the noise levels set by this permission the operation of the turbine shall cease until otherwise approved in writing by the planning authority.

12. In the event of a pollution incident or interruption to supply, caused by the wind farm development, affecting or likely to affect any private water supply, the wind farm operator shall provide an immediate temporary supply to those affected until permanent mitigation can be

effected to the satisfaction of the Planning Authority. Any replacement supply shall be of a quality to meet the private water supplies (Scotland) Regulations 1992 or any other appropriate Regulation in force at the time. In any case a permanent replacement supply or mitigation measures shall be provided no later than one month after the supply is first affected.

13. Noise associated with construction operations including the movement of materials, plant and equipment shall not exceed the noise limits shown in table A below for the times shown. At all other times noise associated with construction operations shall be inaudible at any sensitive receptor. For the avoidance of doubt sensitive receptors includes all residential properties, hospitals, schools and office buildings.

Table A: Construction Noise limits

Day	Time	Average Period (t)	Noise limit
Monday-Friday	0700-0800	1 hour	55 dBA Leq
Monday-Friday	0800-1800	10 hour	65 dBA Leq
Monday-Friday	1800-1900	1 hour	55 dBA Leq
Saturday	0700-0800	1 hour	55 dBA Leq
Saturday	0800-1800	10 hour	65 dBA Leq
Saturday	1800-1900	1 hour	55 dBA Leq
Sunday	0800-1800	10 hour	55 dBA Leq

Guidance Notes for Noise Conditions

These notes are to be read with and form part of the noise condition. They further explain the condition and specify the methods to be employed in the assessment of complaints about noise immissions from the wind farm. The rating level at each integer wind speed is the arithmetic sum of the wind farm noise level as determined from the best-fit curve described in Guidance Note 2 of these Guidance Notes and any tonal penalty applied in accordance with Guidance Note 3. Reference to ETSU-R-97 refers to the publication entitled "The Assessment and Rating of Noise from Wind Farms" (1997) published by the Energy Technology Support Unit (ETSU) for the Department of Trade and Industry (DTI).

Guidance Note 1

(a) Values of the LA90,10 minute noise statistic should be measured at the complainant's property, using a sound level meter of EN 60651/BS EN 60804 Type 1, or BS EN 61672 Class 1 quality (or the equivalent UK adopted standard in force at the time of the measurements) set to measure using the fast time weighted response as specified in BS EN 60651/BS EN 60804 or BS EN 61672-1 (or the equivalent UK adopted standard in force at the time of the measurements). This should be calibrated in accordance with the procedure specified in BS 4142: 1997 (or the equivalent UK adopted standard in force at the time of the measurements). Measurements shall be undertaken in such a manner to enable a tonal penalty to be applied in accordance with Guidance Note 3.

(b) The microphone should be mounted at 1.2 – 1.5 metres above ground level, fitted with a two-layer windshield or suitable equivalent approved in writing by the Local Planning Authority, and placed outside the complainant's dwelling. Measurements should be made in "free field" conditions. To achieve this, the microphone should be placed at least 3.5 metres away from the building facade or any reflecting surface except the ground at the approved measurement location. In the event that the consent of the complainant for access to his or her property to undertake compliance measurements is withheld, the wind farm operator shall submit for the written approval of the Local Planning Authority details of the proposed

alternative representative measurement location prior to the commencement of measurements and the measurements shall be undertaken at the approved alternative representative measurement location.

(c) The LA90,10 minute measurements should be synchronised with measurements of the 10-minute arithmetic mean wind and operational data logged in accordance with Guidance Note 1(d), including the power generation data from the turbine control systems of the wind farm.

(d) To enable compliance with the conditions to be evaluated, the wind farm operator shall continuously log arithmetic mean wind speed in metres per second and wind direction in degrees from north at hub height for each turbine and arithmetic mean power generated by each turbine, all in successive 10-minute periods. Unless an alternative procedure is previously agreed in writing with the Planning Authority, this hub height wind speed, averaged across all operating wind turbines, shall be used as the basis for the analysis. All 10 minute arithmetic average mean wind speed data measured at hub height shall be 'standardised' to a reference height of 10 metres as described in ETSU-R-97 at page 120 using a reference roughness length of 0.05 metres . It is this standardised 10 metre height wind speed data, which is correlated with the noise measurements determined as valid in accordance with Guidance Note 2, such correlation to be undertaken in the manner described in Guidance Note 2. All 10-minute periods shall commence on the hour and in 10- minute increments thereafter.

(e) Data provided to the Local Planning Authority in accordance with the noise condition shall be provided in comma separated values in electronic format.

(f) A data logging rain gauge shall be installed in the course of the assessment of the levels of noise immissions. The gauge shall record over successive 10-minute periods synchronised with the periods of data recorded in accordance with Note 1(d).

Guidance Note 2

(a) The noise measurements shall be made so as to provide not less than 20 valid data points as defined in Guidance Note 2 (b)

(b) Valid data points are those measured in the conditions specified in the agreed written assessment protocol, but excluding any periods of rainfall measured in the vicinity of the sound level meter. Rainfall shall be assessed by use of a rain gauge that shall log the occurrence of rainfall in each 10 minute period concurrent with the measurement periods set out in Guidance Note 1. In specifying such conditions the Local Planning Authority shall have regard to those conditions which prevailed during times when the complainant alleges there was disturbance due to noise or which are considered likely to result in a breach of the limits.

(c) For those data points considered valid in accordance with Guidance Note 2(b), values of the LA90,10 minute noise measurements and corresponding values of the 10- minute wind speed, as derived from the standardised ten metre height wind speed averaged across all operating wind turbines using the procedure specified in Guidance Note 1(d), shall be plotted on an XY chart with noise level on the Y-axis and the standardised mean wind speed on the X-axis. A least squares, "best fit" curve of an order deemed appropriate by the independent consultant (but which may not be higher than a fourth order) should be fitted to the data points and define the wind farm noise level at each integer speed.

Guidance Note 3

(a) Where, in accordance with the approved assessment protocol, noise immissions at the location or locations where compliance measurements are being undertaken contain or are likely to contain a tonal component, a tonal penalty is to be calculated and applied using the following rating procedure.

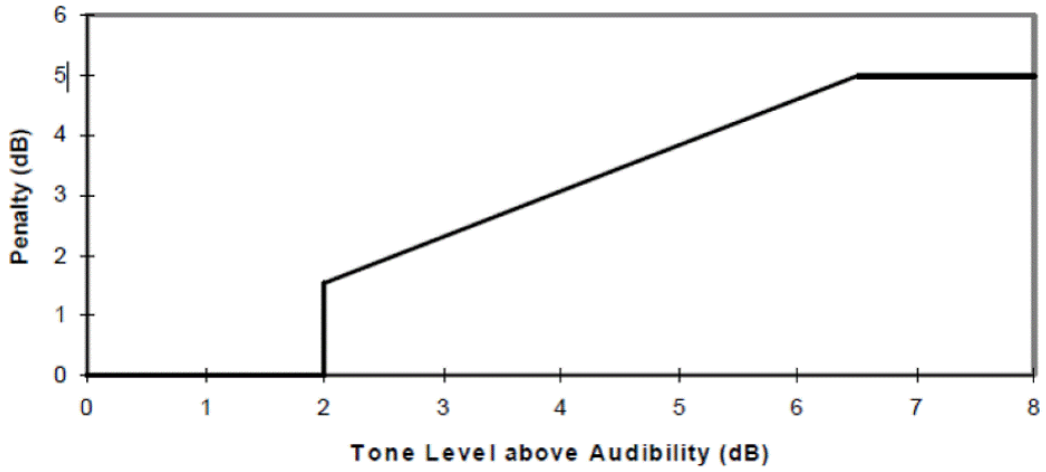
(b) For each 10 minute interval for which LA90,10 minute data have been determined as valid in accordance with Guidance Note 2 a tonal assessment shall be performed on noise immissions during 2 minutes of each 10 minute period. The 2 minute periods should be spaced at 10 minute intervals provided that uninterrupted uncorrupted data are available ("the standard procedure"). Where uncorrupted data are not available, the first available uninterrupted clean 2 minute period out of the affected overall 10 minute period shall be selected. Any such deviations from the standard procedure, as described in Section 2.1 on pages 104-109 of ETSU-R-97, shall be reported.

(c) For each of the 2 minute samples the tone level above or below audibility shall be calculated by comparison with the audibility criterion given in Section 2.1 on pages 104-109 of ETSU-R-97.

(d) The tone level above audibility shall be plotted against wind speed for each of the 2 minute samples. Samples for which the tones were below the audibility criterion or no tone was identified, a value of zero audibility shall be used.

(e) A least squares "best fit" linear regression line shall then be performed to establish the average tone level above audibility for each integer wind speed derived from the value of the "best fit" line at each integer wind speed. If there is no apparent trend with wind speed then a simple arithmetic mean shall be used. This process shall be repeated for each integer wind speed for which there is an assessment of overall levels in Guidance Note 2.

(f) The tonal penalty is derived from the margin above audibility of the tone according to the figure below.



Guidance Note 4

(a) If a tonal penalty is to be applied in accordance with Guidance Note 3 the rating level of the turbine noise at each wind speed is the arithmetic sum of the measured noise level as determined from the best fit curve described in Guidance Note 2 and the penalty for tonal noise as derived in accordance with Guidance Note 3 at each integer wind speed within the range specified by the agreed written assessment protocol.

(b) If no tonal penalty is to be applied then the rating level of the turbine noise at each wind speed is equal to the measured noise level as determined from the best fit curve described in Guidance Note 2.

(c) In the event that the rating level is above the limit(s) set out in the Tables attached to the noise conditions or the noise limits for a complainant's dwelling, the independent consultant shall undertake a further assessment of the rating level to correct for background noise so that the rating level relates to wind turbine noise immission only.

(d) The wind farm operator shall ensure that all the wind turbines in the development are turned off for such period as the independent consultant requires to undertake the further assessment. The further assessment shall be undertaken in accordance with the following steps:

(e). Repeating the steps in Guidance Note 2, with the wind farm switched off, and determining the background noise (L3) at each integer wind speed within the range requested by the Local Planning Authority in its written request and the approved protocol.

(f) The wind farm noise (L1) at this speed shall then be calculated as follows where L2 is the measured level with turbines running but without the addition of any tonal penalty:

$$L_1 = 10 \log\left[10^{L_2/10} - 10^{L_3/10}\right]$$

(g) The rating level shall be re-calculated by adding arithmetically the tonal penalty (if any is applied in accordance with Note 3) to the derived wind farm noise L1 at that integer wind speed.

(h) If the rating level after adjustment for background noise contribution and adjustment for tonal penalty (if required in accordance with note 3 above) at any integer wind speed lies at or below the values set out in the Tables attached to the conditions or at or below the noise limits approved by the Local Planning Authority for a complainant's dwelling then no further action is necessary. If

the rating level at any integer wind speed exceeds the values set out in the Tables attached to the conditions or the noise limits approved by the Local Planning Authority for a complainant's dwelling then the development fails to comply with the conditions.

15/00415/FULL Field 750M North West Of Bolshan Farm Bolshan Arbroath
Erection of Wind Turbine of 55.6 to hub height and 79.6 to blade tip and Ancillary Development
Evaluation and comments on Landscape and Visual Effects - Angus Environment & Development Plan - Planning Advice- Landscape Officer 28 May 2015

1.0 Summary

Issues are highlighted pertaining to landscape character impacts, visual amenity impacts, cumulative in combination and succession impacts and major issue with regard to residential effects.

1.2 Landscape character effects

The application site sits within landscape character area LCT13 Dipslope farmland subtype (vi) Rossie Moor of the SNH regional Tayside Lowland and is close to the confluence of two other LCT15 Inland Loch Basins / Coast and LCT12 Low Moorland Hills subtype (ii) and within 5km of LCT10 Broad Valley Lowland plus the adjacent LCT subtype (iv) Letham, Lunan Water and Arbroath Valleys.

The Rossie Moor subtype of the Dipslope Farmland is more elevated and open than the other subareas and is characterised by gently rolling landform of large fields with minimal boundary features and isolated farms. Its proximity to the coastal geographic area makes it more sensitive than the rest of the Dipslope LCT. The adjacent Lowland Loch Basin is an enclosed tidal low lying farmland with tidal basin enclosed from the north and south interspersed with areas of woodland and hedgerow trees.

Capacity: At publication SLCAWEA indicates in Figure 6.1c that subarea (iv) has a low capacity for wind energy up to 80m size and in Figure 6.1c that the south west of subtype (vi) had a wind energy typology of "*a landscape of no turbines"* and in figure 6.3 it proposed that it had capacity to be a "*landscape with occasional WTs (50-<80m)"* but with separation distance of 5-10km. In figure 6.4 it is indicated part of a swathe of land with "*limited underlying capacity"*. The proposal would be within 4.2km of Rosse School WT, 5km of Pickerton Farm Wt 4.6m from Dubton and 3m of Waulkmill from suggesting it does not fully heed the siting parameters for the LCT subtype. The perceptual sense as one moves through this part of the Dipslope Farmland is that wind turbines are becoming frequent potentially exceeding the target capacity of 'occasional' to form a landscape with wind turbines'.

Aspects of the LCT which contribute to its character and value include various conservation designations which protect various habitats:

SSSI Rossi Moor, Whiting Ness -Ethie Haven, Duns Dish
RAMSAR Montrose Basin also SSSI SPA
SAC South Esk

Effects of proposal: The proposal is for a medium/ large scale turbine. The site is located on the lower northern slope of a small hill, Wuddy Law

which forms the western edge of the Rossie Moor landform, south of the South Esk River valley. The turbine would be located in an exposed location above the River South Esk valley and the Broad valley Lowlands. The surrounding landscape is dominated by areas of plantation woodland to the northwest while to the southwest lies Friockheim. Farms around the site are defined by large sheds lending a utilitarian feel.

The turbine would be in scale with the surrounding landform however it would tower above existing landscape features such as trees and built structures from which it would not be sufficiently distanced. The landscape effects would be similar to those of the existing turbine at Pickerton therefore it would not introduce new landscape effects into the locality. However the turbine would add a second very noticeable vertical feature within the local surroundings and potential increase discordance already between the various types of existing turbines.

1.3 Landscape Designation Effects (scoped out)

The site and its study area are of sufficient distance from national landscape designations for them to be scoped out. Other environmental designations and classifications contribute to the landscape character as outlined above.

1.4 Visual Effects

Review of applicant assessment: The submission does not follow current visualisation guidance. The viewpoints submitted are satisfactory for their distances though there should have been a simpler and obvious numbering. I would have expected viewpoints out to ZTV study area of 20km. The selection should have included for visibility from significant local hills and adopted core routes. Eight out of ten viewpoints were from the road network within 5km; one from a low hill and one from a public off road position.
Sensitivity magnitude of effects and significance were downplayed though it is agreed that overall the significance would likely not be significant.

Description of pattern of visibility: The ZTV gives a good indication of the extent of visibility esp. for mid point for their stated distances indicating potential widespread visibility to 1km and extensive to 2km. The site lies on the lower shallow slopes of Wuddy Law, a squat low hill, NW outlier of Rossie Moor. Views are open and panoramic in all directions and there would be wide range of visibility from the local road network, trails, local hills and core paths. There is only partial visibility to the immediate east due to forestry and the topography of Rossie Moor and to the northwest due to extensive forestry. Extensive uninterrupted views are possible from the southwest to 10km and from northwest to 20km from the Highland foothills LCT5 –Menmuir Hills which define the boundary fault and Pentland Hill (LCT3 highland summits and plateaux).

Description of effects: The turbine would be a prominent feature above the skyline from the local road network, especially the A933 northbound toward Friockheim, parts of A934, unclassified minor road U472 off the A934 and beyond.

Summation:
The proposed scheme increases the presence of WTs in the Dipslope Farmland. While the magnitude would be major for a couple of viewpoints, the overall magnitude would be low to medium.

1.5 Residential Effects

The LVIA lists the 8 properties within 1km of the proposed turbine though the actual analysis was rather slight. There were no detailed descriptions of the likely effect and no actual visualisation or photomontages.

The nearest would be Bolshan Cottage at approx 626m almost 8 times the turbine height. While field boundary trees would partially screen the turbine there would be visibility of the upper portion. The hub and rotor would likely dominate the immediate skyline reducing the sense of remoteness. Ardmhor Cottage @ 652m would have a similar experience while Viewbank, 770m has not visual connection. Trees would likely partially occlude the turbine from Bolshan farm, Ashview and Doonbye. Teuchat Hillock Steading would have partially occluded views. Teuchat Hillock views would be occluded by the adj. Steading. At just over a kilometre, Smithy Cottage, Smithyfield and Muirside Cottage would have filtered views through a more open treeline. Views from Burnside, 969m, 937m just under a kilometre away, would be fairly uninterrupted.

1.6 Cumulative Landscape Character effects

This area of the Rossie Moor is already indicated[1] as under pressure for development and where further wind energy development, may exceed the acceptable cumulative capacity of the landscape.

The proposal will intensify the landscape character effects of this type of development for the area. There are likely to be in combination in succession and sequential effects. However there is limited intervisibility so the cumulative landscape effects would be low when considering the landscape context.

Capacity: This subarea in particular is characterized by rising rolling landform with widespread visibility and the backdrop of the highland hills to the north-west and Rossie Moor to the East. The area has an establishing pattern of medium and small to medium turbines. These may increase discordance.

1.7 Cumulative Visual Effects

There are some instances of cumulative in combination, in succession and sequential visual effects in relation to Pickerton, Dubton and Waulkmill.

The proposal will intensify the in succession and sequential visual effects of this type of development for the area and form a visual link to the

[1] *Strategic Landscape Capacity Assessment for Wind Energy in Angus, SNH & Angus Council, Ironside Farrar, Edinburgh March 2014.*

expanding area indicated in figure 6.4 of SLCAWEA as a 'red hatch zone' – 4 Letham to Firth Muir of Boysack, southwest of Friockheim where 'cumulative impact limits development'. The development will be visible from the south and western side of Rossie Moor, Dunnichen and Dunbarrow .These effects are likely to be low-moderate.

Capacity: The proposal will add to the effects of this type of development in an area already influenced by a mixed of rural industrial farming and infrastructure facilities and give rise to cumulative landscape and visual effect of low significance and which give rise to landscape typology approaching the envisaged wind energy capacity for the receiving landscape, i.e. that of 'a landscape with wind turbines'.

2.0 Conclusion

The overall landscape sensitivity of this area is moderate to high due to the predominantly agricultural nature which accords with the LCT description. The proposal would result in a modest increase in the presence of wind turbines within the landscape type. On its own this would not be an issue however this particular turbine would yield significant impacts for a number of dwellings due to its proximity and size.

The cumulative effect would be low and will not lead to significant adverse impacts. Notwithstanding the effects would give rise to visual relationships with other WE developments where two or more can be seen in combination or in succession this will increase discordance in regard to design and height.

The receiving landscape has capacity to accommodate the proposed type, scale or nature of change. However the remaining issue is the impact on Bolshan Cottage and Burnside.

CaneyV

From: GUNN, Nicola <Nicola.GUNN@nats.co.uk> on behalf of NATS Safeguarding <NATSSafeguarding@nats.co.uk>
Sent: 22 May 2015 14:06
To: PLNProcessing
Subject: Your Ref: 15/00415/FULL (Our Ref: SG21270)

The proposed development has been examined from a technical safeguarding aspect and does not conflict with our safeguarding criteria. Accordingly, NATS (En Route) Public Limited Company ("NERL") has no safeguarding objection to the proposal.

However, please be aware that this response applies specifically to the above consultation and only reflects the position of NATS (that is responsible for the management of en route air traffic) based on the information supplied at the time of this application. This letter does not provide any indication of the position of any other party, whether they be an airport, airspace user or otherwise. It remains your responsibility to ensure that all the appropriate consultees are properly consulted.

If any changes are proposed to the information supplied to NATS in regard to this application which become the basis of a revised, amended or further application for approval, then as a statutory consultee NERL requires that it be further consulted on any such changes prior to any planning permission or any consent being granted.

Yours faithfully,

Nicola Gunn
Technical Administrator
On behalf of NERL Safeguarding Office

Defence Infrastructure Organisation

Miss Rachel Evans
Assistant Safeguarding Officer
Ministry of Defence
Safeguarding – Wind Energy
Kingston Road
Sutton Coldfield
West Midlands B75 7RL
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Telephone [MOD]: +44 (0)121 311 2195
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E-mail: DIOODC-IPSSG3a@mod.uk

Your Reference: 15/00415/FULL

Our Reference: DIO/SUT/43/10/1/18476

Mr James Wright
Angus Council
County Buildings
Market Street
Forfar
DD8 3LG

1st June 2015

Dear Mr Wright

Please quote in any correspondence: 18476

Site Name: Field 750m North West of Bolshan Farm

Proposal: Erection of 1 Wind Turbine

Planning Application Number: 15/00415/FULL

Site Address: Bolshan, Arbroath

Thank you for consulting the Ministry of Defence (MOD) on the above Planning Application in your communication dated 15th May 2015.

I am writing to tell you that the MOD has no objection to the proposal.

The application is for 1 turbine at 79.6 metres to blade tip. This has been assessed using the grid references below as submitted in the planning application or in the developers' or your pro-forma.

Turbine	100km Square letter	Easting	Northing
1	NO	61507	52652

In the interests of air safety the MOD will request that the development should be fitted with aviation safety lighting. The MOD requests that the turbine is fitted with 25 candela omni-directional red lighting or infrared lighting with an optimised flash pattern of 60 flashes per minute of 200ms to 500ms duration at the highest practicable point.

The principal safeguarding concern of the MOD with respect to the development of wind turbines relates to their potential to create a physical obstruction to air traffic movements and cause interference to Air Traffic Control and Air Defence radar installations.

Defence Infrastructure Organisation Safeguarding wishes to be consulted and notified of the progression of planning applications and submissions relating to this proposal to verify that it will not adversely affect defence interests.

If planning permission is granted we would like to be advised of the following prior to commencement of construction;

- the date construction starts and ends;
- the maximum height of construction equipment;
- the latitude and longitude of every turbine.

This information is vital as it will be plotted on flying charts to make sure that military aircraft avoid this area.

If the application is altered in any way we must be consulted again as even the slightest change could unacceptably affect us.

I hope this adequately explains our position on the matter. If you require further information or would like to discuss this matter further please do not hesitate to contact me.

Further information about the effects of wind turbines on MOD interests can be obtained from the following websites:

MOD: https://www.gov.uk/government/publications/wind-farms-ministry-of-defence-safeguarding

Yours sincerely

Miss Rachel Evans
Assistant Safeguarding Officer – Wind Energy
Defence Infrastructure Organisation

SAFEGUARDING SOLUTIONS TO DEFENCE NEEDS

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
All of nature for all of Scotland
Nàdar air fad airson Alba air fad

Year of Natural Scotland 2013

James Wright
Communities, Planning & Places
Angus Council
County Buildings
Market Street
FORFAR
DD8 3LG

24 October 2013
Our ref: CNS/REN/WF/ANGUS
Your ref: 13/00887/FULL

Dear Mr Wright

Town and Country Planning (Scotland) Act 1997
Erection of single wind turbine 50m to hub, 77m to blade tip
Land south of agricultural storage shed, Bolshan Farm, Bolshan, Arbroath

Thank you for your email of 7 October 2013 requesting comments from Scottish Natural Heritage (SNH) on the above application.

Our Advice

There are natural heritage interests of international importance at this site, but in our view, these will not be adversely affected by the proposal.

Appraisal
Montrose Basin SPA

Bolshan Farm lies approximately 8km from Montrose Basin Site of Special Scientific Interest (SSSI), Montrose Basin Ramsar Site and Montrose Basin Special Protection Area (SPA). The SPA is notified for its wintering bird population, including greylag and pink-footed geese.

- Please see www.snh.gov.uk/docs/A423286.pdf for a summary of the legislative requirements for European sites.
- Further details for designated sites in proximity to the proposed development, including qualifying / notified features and conservation objectives for this and other designated sites can be found on SiteLink at: http://www.snh.gov.uk/publications-dataand-research/snhi-information-service/sitelink/
- As the proposal is within 20km of the SPA there is potential connectivity. www.snh.gov.uk/docs/A675474.pdf

Wildfowl and Wetlands Trust (WWT) data held by SNH indicate feeding records for geese in the 1km ^{2} surrounding Bolshan Farm as well as squares to the south, east and south east.

There is the potential for geese to collide with the turbine while flying between the roost site and feeding grounds. Geese may also be displaced from foraging in this area.

In our view, this proposal is likely to have a significant effect on the qualifying interests of this site. As a consequence Angus Council is required to carry out an appropriate assessment in view of the site's conservation objectives for its qualifying interests.

To help you do this we would further advise that, in our view, based on the appraisal carried out to date, the proposal will not adversely affect the integrity of the site.

The appraisal we carried out considered the impact of the proposals on the following factors: Collision mortality, displacement and barrier effects. In the absence of site specific goose survey we used generic data, which indicate very low collision mortality. There are alternative foraging opportunities in the surrounding area and a single turbine is unlikely to displace geese from accessing these areas.

You may wish to carry out further appraisal before completing the appropriate assessment.

Any concerns about potential impacts to Montrose Basin SSSI and Ramsar site are fully addressed as part of the consideration of the SPA.

Concluding remarks

In accordance with our Service Level Statement for Planning and Development, we are content that Angus Council identifies any other natural heritage issues and addresses these without further reference to SNH.

To assist with your assessment we refer you to our guidance on small scale wind farms http://www.snh.gov.uk/docs/A669283.pdf

Yours sincerely

Fiona Mutch
Operations Officer
Tayside & Grampian
fiona.mutch@snh.gov.uk

CaneyV

From: Windfarms <Windfarms.Windfarms@caa.co.uk>
Sent: 20 May 2015 11:38
To: CaneyV
Subject: RE: Consultation for Field 750M North West Of Bolshan Farm Bolshan Arbroath - 15/00415/FULL

Dear Sir/Madam

Request for Comment under the Town and Country Planning Act 1990 and the Town and Country Planning (Scotland) Act 1997

There is currently a high demand for CAA comment on wind turbine applications which can exceed the capacity of the available resource to respond to requests within the timescales required by Local Planning Authorities. The CAA has no responsibilities for safeguarding sites other than its own property, and a consultation by a Council is taken as a request for clarification of procedural matters. Councils are reminded of their obligations to consult in accordance with ODPM/DfT Circular 1/2003 or Scottish Government Circular 2/2003, and in particular to consult with NATS and the Ministry of Defence as well as any aerodromes listed in Annex 3 of the above documents, taking note of appropriate guidance and policy documentation. Should the Council be minded to grant consent to an application despite an objection from one of the bodies listed in the circular, then the requisite notifications should be made.

Whilst the CAA recommends all aerodrome operators/license holders develop associated safeguarding maps and lodge such maps with local planning authorities, the CAA additionally encourages councils/planning authorities to undertake relevant consultation with known local aerodromes regardless of status or the existence of any aerodrome/council safeguarding agreement, including local emergency service Air Support Units (e.g. Police Helicopter or Air Ambulance). Such units may operate in the area of concern and could be affected by the introduction of tall obstacles. For example Police helicopters are permitted to operate down to 75 feet and will routinely follow main roads and motorways during their operations. Both the Police and Air Ambulance may need to land anywhere but will also have specifically designated landing sites.

There is an international civil aviation requirement for all structures of 300 feet (91.4 metres)* or more to be charted on aeronautical charts. However, on behalf of other non-regulatory aviation stakeholders, in the interest of Aviation Safety, the CAA requests that any feature/structure 70 feet in height, or greater, above ground level is notified to the Defence Geographic Centre (mail to dvof@mod.uk), including the location(s), height(s)* and lighting status of the feature/structure, the estimated and actual dates of construction and the maximum height of any construction equipment to be used, at least 6 weeks prior to the start of construction, to allow for the appropriate notification to the relevant aviation communities.

Any structure of 150 metres* or more must be lit in accordance with the Air Navigation Order and should be appropriately marked. Although if an aviation stakeholder (including the MOD) made a request for lighting it is highly likely that the CAA would support such a request, particularly if the request falls under Section 47 of the Aviation Act.

Cumulative effects of turbines may lead to unacceptable impacts in certain geographic areas.

The Ministry of Defence will advise on all matters affecting military aviation.

Should the Council still have a specific query about a particular aspect of this application the CAA will help in the clarification of aviation matters and regulatory requirements. Site operators remain responsible for providing expert testimony as to any impact on their operations and the lack of a statement of objection or support from the CAA should not be taken to mean that there are no aviation issues, or that a comment from an operator lacks weight.

The CAA Policy and Guidance on Wind Turbines is contained in the CAP 764, which can be obtained from the CAA Website at the following address: CAP 764 Version 5. In addition, the CAA, through the Airspace and Safety Initiative Windfarm Working Group, have published the following Guidance for Planning Authorities.

Yours Faithfully

Mark

Mark Deakin
Squadron Leader (RAF)

Surveillance and Spectrum Management
Safety and Airspace Regulation Group
Civil Aviation Authority
45-59 Kingsway London WC2B 6TE
Tel: 020 7453 6534 Fax: 020 7453 6565
mark.deakin@caa.co.uk

*The effective height of a wind turbine is the maximum height to blade tip.

From: CaneyV [mailto:CaneyV@angus.gov.uk]
Sent: 15 May 2015 08:37
To: NATSsafeguarding@nats.co.uk; aphillips@hial.co.uk; TAYSIDE_GRAMPIAN@SNH.GOV.UK; Windfarms; esro@rspb.org.uk; spectrum.LicensingEnquiries@ofcom.org.uk; Windfarms@Atkinsglobal. Com (windfarms@atkinsglobal.com); windfarms@jrc.co.uk; archaeology@aberdeenshire.gov.uk; HS.consultationsangus@scotland.gsi.gov.uk
Subject: Consultation for Field 750M North West Of Bolshan Farm Bolshan Arbroath - 15/00415/FULL

Regards,
Veronica.

Veronica Caney
Clerical Officer (Development Control)
Angus Council
Planning & Place
County Buildings
Market Street
Forfar.
DD8 3LG
Tel : 01307 473242

CaneyV

From: Spectrum Licensing <Spectrum.Licensing@ofcom.org.uk>
Sent: 23 May 2015 04:28
To: CaneyV
Cc: windfarms@atkinsglobal.com; windfarms@jrc.co.uk
Subject: RE: Consultation for Field 750M North West Of Bolshan Farm Bolshan Arbroath - 15/00415/FULL
Attachments: ufm3.rtf

FIXED LINK REPORT FOR WINDFARM CO-ORDINATION AREA:

Dear Sir/Madam

Search Radius 0m at Centre NGR NO6158652521. Search in

Links	*Company*	*Contact*

NO LINKS FOUND

These details are provided to Ofcom by Fixed Link operators at the time of their licence application and cannot verified by Ofcom for accuracy or currency and Ofcom makes no guarantees for the currency or accuracy of information or that they are error free. As such, Ofcom cannot accept liability for any inaccuracies or omissions in the data provided, or its currency however so arising. The information is provided without any representation or endorsement made and without warranty of any kind, whether express or implied, including but not limited to the implied warranties of satisfactory quality, fitness for a particular purpose, non-infringement, compatibility, security and accuracy.

Our response to your co-ordination request is only in respect of microwave fixed links managed and assigned by Ofcom within the bands and frequency ranges specified in the table below. The analysis identifies all fixed links with either one link leg in the coordination range or those which intercept with the coordination range. The coordination range is a circle centred on your provided national grid reference. We add an additional 500 metres to the coordination range that you request. Therefore if you have specified 500 metres the coordination range will be 1km.

If you should need further information regarding link deployments and their operation then you will need to contact the fixed link operator(s) identified in the table above directly.

Additional coordination is also necessary with the band managers for the water, electricity and utilities industries which operate in the frequency ranges 457-458 MHz paired with 463-464 MHz band. You should contact both the following:

- Atkins Ltd at windfarms@atkinsglobal.com.
- Joint Radio Company (JRC) at windfarms@jrc.co.uk. Additionally, you can call the JRC Wind Farm Team on 020 7706 5197.

For self coordinated links operating in the 64-66GHz, 71-76GHz and 81-86GHz bands a list of current links can be found at: http://www.ofcom.org.uk/radiocomms/ifi/licensing/classes/fixed/

Regarding assessment with respect to TV reception, the BBC has an online tool available on their website: http://www.bbc.co.uk/reception/info/windfarm_tool.shtml . Ofcom do not forward enquiries to the BBC.

Please note other organisations may require coordination with regard to your request. More information regarding windfarm planning is available on the British Wind Energy Association website www.bwea.com .

Table of assessed fixed links bands and frequency ranges

Band (GHz)	Frequency Range (MHz)
1.4/1.5	1350 -1375 1450 -1452 1492 -1530
1.6	1672 – 1690
1.7	1764 – 1900
2	1900 – 2690
4	3600 – 4200
6	5925 – 7110
7.5	7425 – 7900
11	10700 – 11700
13	12750 – 13250
14	14250 – 14620
15	14650 – 15350
18	17300 – 19700
22	22000 – 23600
25	24500 – 26500
28	27500 – 29500
38	37000 – 39500
50	49200 – 50200
55	55780 – 57000

Regards

From: CaneyV [mailto:CaneyV@angus.gov.uk]
Sent: 15 May 2015 08:37
To: NATSsafeguarding@nats.co.uk; aphillips@hial.co.uk; TAYSIDE_GRAMPIAN@SNH.GOV.UK; windfarms@caa.co.uk; esro@rspb.org.uk; Spectrum Licensing; Windfarms@Atkinsglobal. Com (windfarms@atkinsglobal.com); windfarms@jrc.co.uk; archaeology@aberdeenshire.gov.uk; HS.consultationsangus@scotland.gsi.gov.uk
Subject: Consultation for Field 750M North West Of Bolshan Farm Bolshan Arbroath - 15/00415/FULL

Regards,
Veronica.

Veronica Caney
Clerical Officer (Development Control)
Angus Council
Planning & Place
County Buildings
Market Street
Forfar.
DD8 3LG
Tel : 01307 473242

CaneyV

From: Windfarms <windfarms@atkinsglobal.com>
Sent: 15 May 2015 09:14
To: PLNProcessing
Cc: windfarms-radiotelemetry@scottishwater.co.uk
Subject: WF 30254- 15/00415/FULL - 750M North West Of Bolshan Farm Bolshan Arbroath - NO 61586 52521

Dear Sirs,

I am responding to an email of 15-05-2015, regarding the above named proposed development.

The above application has now been examined in relation to UHF Radio Scanning Telemetry communications used by our Client in that region and we are happy to inform you that we have **NO OBJECTION** to your proposal.

Please note that this is not in relation to any Microwave Links operated by Scottish Water

Atkins Limited is responsible for providing Wind Farm/Turbine support services to TAUWI.

Atkins Limited is responsible for providing Wind Farm/Turbine support services to the Telecommunications Association of the UK Water Industry. Web: www.tauwi.co.uk
Windfarm Support
ATKINS
The official engineering design services provider
for the London 2012 Olympic and Paralympic Games
Web: www.atkinsglobal.com/communications

CaneyV

From: Windfarms <windfarms@atkinsglobal.com>
Sent: 25 May 2015 12:59
To: PLNProcessing
Cc: windfarms-radiotelemetry@scottishwater.co.uk
Subject: WF 30254 - 15/00415/FULL - 750M North West Of Bolshan Farm Bolshan Arbroath - NO 61586 52521

Dear Sirs,

I am responding to an email of 23-05-2015, regarding the above named proposed development.

The above application has now been examined in relation to UHF Radio Scanning Telemetry communications used by our Client in that region and we are happy to inform you that we have **NO OBJECTION** to your proposal.

Please note that this is not in relation to any Microwave Links operated by Scottish Water

Atkins Limited is responsible for providing Wind Farm/Turbine support services to TAUWI.

Atkins Limited is responsible for providing Wind Farm/Turbine support services to the Telecommunications Association of the UK Water Industry. Web: www.tauwi.co.uk
Windfarm Support
ATKINS
The official engineering design services provider
for the London 2012 Olympic and Paralympic Games
Web: www.atkinsglobal.com/communications

CaneyV

From: Windfarms Team <windfarms.team@jrc.co.uk>
Sent: 15 May 2015 11:40
To: PLNProcessing
Subject: Planning Ref: 15/00415/FULL -- Bolshan Farm, Brechin, Angus -- Proposed Wind Turbine

Dear Sir/Madam,

Planning Ref: 15/00415/FULL

Name/Location: Bolshan Farm

Turbine at NGR/IGR: 361507 752652

Hub Height: 56m Rotor Radius: 24m

(defaults used if not specified on application)

Cleared with respect to radio link infrastructure operated by:-

Local Electricity Utility and Scotia Gas Networks

JRC analyses proposals for wind farms etc. on behalf of the UK Fuel & Power Industry and the Water Industry in north-west England. This is to assess their potential to interfere with radio systems operated by utility companies in support of their regulatory operational requirements.

In the case of this proposed wind energy development, JRC does not foresee any potential problems based on known interference scenarios and the data you have provided. However, if any details of the wind farm change, particularly the disposition or scale of any turbine(s), it will be necessary to re-evaluate the proposal.

In making this judgement, JRC has used its best endeavours with the available data, although we recognise that there may be effects which are as yet unknown or inadequately predicted.JRC cannot therefore be held liable if subsequently problems arise that we have not predicted.

It should be noted that this clearance pertains only to the date of its issue. As the use of the spectrum is dynamic, the use of the band is changing on an ongoing basis and consequently, developers are advised to seek re-coordination prior to considering any design changes.

Regards

Wind Farm Team

The Joint Radio Company Limited
Dean Bradley House,
52 Horseferry Road,
LONDON SW1P 2AF
United Kingdom

TEL: +44 20 7706 5199

<windfarms@jrc.co.uk>

HISTORIC SCOTLAND
ALBA AOSMHOR

Sent by e-mail: PLNProcessing@angus.gov.uk

Planning & Transport Division
Angus Council
County Buildings
Market Street
FORFAR
DD8 3LG

Longmore House
Salisbury Place
Edinburgh
EH9 1SH

Direct Line: 0131 668 8688
Switchboard: 0131 668 8600
Hazel.Johnson2@scotland.gsi.gov.uk

Our ref: AMH/6317/10
Our Case ID: 201500903

20 May 2015

Dear Sirs

Town And Country Planning (Development Management Procedure) (Scotland) Regulations 2013
Field 750M North West Of Bolshan Farm Bolshan Arbroath - Erection of Wind Turbine (55.6m to hub height and 79.6m to blade tip) and Ancillary Development

Thank you for your consultation which we received on 15 May.

You have consulted us because you believe the development may affect:

- **Hatton Mill,enclosure 300m WNW of**

We have considered your consultation, and we consider the proposals do not raise issues of national significance, so we can confirm that we do not object.

Please note though, that our comments relate to the application as currently proposed, an amended scheme may require a fresh consultation with us.

If you require any further information, please contact me.

Yours faithfully

HAZEL JOHNSON
Heritage Management Officer, East

ANGUS COUNCIL

COMMUNITIES
PLANNING

CONSULTATION SHEET

PLANNING APPLICATION NO	**15/00415/FULL**

Tick boxes as appropriate

ROADS	No Objection		
	Interest	√	(Comments to follow within 14 days)
	Date	18 05 15	

PLEASE DO NOT TAKE AWAY THE LAST SET OF PLANS WHERE POSSIBLE COPIES WILL BE PROVIDED ON REQUEST

ELECTRONIC SUBMISSION DRAWINGS TO BE VIEWED VIA IDOX

Memorandum

Communities
(Roads)

TO: HEAD OF PLANNING & PLACE

FROM: HEAD OF TECHNICAL & PROPERTY SERVICES

YOUR REF:

OUR REF: GH/AG/CM TD1.3

DATE: 22 May 2015

SUBJECT: **PLANNING APPLICATION REF. NO. 15/00415/FULL – PROPOSED ERECTION OF WIND TURBINE, INCLUDING ASSOCIATED ACCESS TRACK, FOUNDATION, HARDSTANDING, AND SUBSTATION FOR BOLSHAN RENEWABLES LTD**

I refer to the above planning application.

The site is located on the north side of the U471, Glasterlaw-Bolshan road. Access to the site will be taken from this road.

The National Roads Development Guide, adopted by the Council as its road standards, is relative to the consideration of the application and the following comments take due cognisance of that document.

I have considered the application in terms of the traffic likely to be generated by it, and its impact on the public road network. As a result, I do not object to the application but would recommend that any consent granted shall be subject to the following condition:

1 That, prior to the commencement of development, a Traffic Management Plan shall be submitted for the written approval of the Planning Authority. Thereafter, the development shall be undertaken in accordance with the approved plan. The Traffic Management Plan shall consider arrangements for the following:

(i) agreement with the Roads Authority on the routing for abnormal loads;

(ii) the type and volume of vehicles to be utilised in the delivery to the site of construction materials [and turbine components] associated with the construction [and erection of the wind turbines];

(iii) assessment of the suitability of the proposed routes, including bridge capacities, to accommodate the type and volume of traffic to be generated by the development. The assessment shall include details of swept path analyses and include DVD video route surveys;

(iv) any proposed accommodation works / mitigating measures affecting the public roads in order to allow for delivery loads, including carriageway widening, junction alterations, associated drainage works, protection to public utilities, temporary or permanent traffic management signing, and temporary relocation or removal of other items of street furniture;

(v) the restriction of delivery traffic to agreed routes;

(vi) the timing of construction traffic to minimise impacts on local communities, particularly at school start and finish times, during refuse collection, at weekends and during community events;

(vii) a code of conduct for HGV drivers to allow for queuing traffic to pass;

(viii) liaison with the roads authority regarding winter maintenance;

(ix) contingency procedures, including names and telephone numbers of persons responsible, for dealing with vehicle breakdowns;

(x) a dust and dirt management strategy, including sheeting and wheel cleaning prior to departure from the site;

(xi) the location, design, erection and maintenance of warning/information signs for the duration of the works at site accesses and crossovers on private haul roads or tracks used by construction traffic and pedestrians, cyclists or equestrians;

(xii) contingencies for unobstructed access for emergency services;

(xiii) co-ordination with other major commercial users of the public roads on the agreed routes in the vicinity of the site;

(xiv) traffic management, in the vicinity of temporary construction compounds;

(xv) the provision of data from traffic counters, installed at locations and at intervals to be agreed with the Roads Authority, at the applicant's expense;

(xvi) arrangements for the monitoring, reviewing and reporting on the implementation of the approved plan; and

(xvii) procedures for dealing with non-compliance with the approved plan.

Reason: in the interests of road safety and to ensure the free flow of traffic for the convenience of road users and to ensure that any works required to the local road network to facilitate the development are undertaken in a timely manner.

I trust the above comments are of assistance but should you have any queries, please contact Adrian Gwynne on extension 3393.

p.p.

Comments for Planning Application 15/00415/FULL

Application Summary

Application Number: 15/00415/FULL
Address: Field 750M North West Of Bolshan Farm Bolshan Arbroath
Proposal: Erection of Wind Turbine of 55.6 to hub height and 79.6 to Blade Tip and Ancillary Development
Case Officer: James Wright

Customer Details

Name: Mrs Susan Elliott
Address: Heatherbank Union Street Friockheim

Comment Details

Commenter Type: Member of Public
Stance: Customer made comments in support of the Planning Application
Comment Reasons:
Comment:I am writing to express support for the proposed wind turbine at Bolshan Farm. I would like the planning committee to consider the following points when determining this planning application.
The National Planning Policy Framework, published in March 2012, sets out the following opportunity for local planning authorities:
'planning plays a key role in helping shape places to secure radical reductions in greenhouse gas emissions, minimising vulnerability and providing resilience to the impacts of climate change, and supporting the delivery of renewable and low carbon energy and associated infrastructure. This is central to the economic, social and environmental dimensions of sustainable development.' (para 93)
I support this application on the basis that it will provide a much needed source of renewable energy and will make a valuable contribution to cutting greenhouse gas emissions, as the national planning policy framework sets out:
'When determining planning application, local planning authorities should: Not require applicants for energy development to demonstrate the overall need for renewable or low carbon energy and also recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions'
This project goes on to deliver diversification in the farming industry in the local Angus area which is a must these days to allow local farms to not only survive but to thrive, which in turn, assists other businesses in the area also. This is extremely important to the local community.
I strongly believe that this turbine will not in any way detract from the surroundings rather it will enhance the area. I am happy with their appearance and am sure that it will not have a significant impact on terms of noise.
I ask that you look favourably at this application.

Comments for Planning Application 15/00415/FULL

Application Summary
Application Number: 15/00415/FULL
Address: Field 750M North West Of Bolshan Farm Bolshan Arbroath
Proposal: Erection of Wind Turbine of 55.6 to hub height and 79.6 to Blade Tip and Ancillary Development
Case Officer: James Wright

Customer Details
Name: Miss Pauline Robinson
Address: Doonbye Bolshan Arbroath

Comment Details
Commenter Type: Member of Public
Stance: Customer objects to the Planning Application
Comment Reasons:
Comment:I strongly object to the proposed windturbine for the following reasons:
i) SCALE - a turbine of this size would not fit into the landscape, and visual effects would be significant and adverse.

ii) PROXIMITY TO RESIDENCES - I believe there would be significant impact on the residential amenity of adjacent properties. I note that in Environmental Report (Part I) the applicant believes that a noise survey is unnecessary. Surely this is not the case?

iii) IMPACT ON WILDLIFE - the surrounding area is used extensively by geese for grazing, and the turbine would be on the flight path used by thousands of geese to and from the Montrose Basin . Swans are also regular visitors to the area.
The protected mammals survey referred to in the environmental report is that of a previous application and as such is now two years out of date and for a different location.

Surely a much less visually intrusive solution would be the installation of solar panels on the extensive roof areas at the farm and a solar array on some of the available land?

Comments for Planning Application 15/00415/FULL

Application Summary
Application Number: 15/00415/FULL
Address: Field 750M North West Of Bolshan Farm Bolshan Arbroath
Proposal: Erection of Wind Turbine of 55.6 to hub height and 79.6 to Blade Tip and Ancillary Development
Case Officer: James Wright

Customer Details
Name: Mr Martin Brown
Address: Rossie Young People's Trust Rossie Montrose

Comment Details
Commenter Type: Miscellaneous
Stance: Customer objects to the Planning Application
Comment Reasons:
Comment:On behalf of Rossie Young People's Trust, I am writing to object to this proposal.

Planning precedent for this case can be drawn from the recent nearby application refused by the Council to land adjacent to Rossie Moor (application ref. 15/00013/FULL). The officer's report refusing that application provides more than sufficient reasons to refuse this application, mindful that the sites are in such close proximity to each other.

Note should be made of the refused application for turbines of 34 metres to hub height and 51 metres to blade tip, compared to this application for a turbine with a far greater size of 79 metres just to hub height. Both scale, flicker and noise factors would make this development unacceptable. The proximity to residences is significantly within the recommended Scottish Planning Framework guidelines.

Note should also be made of the SNH Guidelines 'Siting and Design of Wind Farms in the Landscape', referred to in other objections, which concur with the Planning Framework guidelines, but provide clear guidelines for acceptable aspect, siting, and scale, none of which are met within this application.

Comments for Planning Application 15/00415/FULL

Application Summary

Application Number: 15/00415/FULL
Address: Field 750M North West Of Bolshan Farm Bolshan Arbroath
Proposal: Erection of Wind Turbine of 55.6 to hub height and 79.6 to Blade Tip and Ancillary Development
Case Officer: James Wright

Customer Details

Name: Mr Michael Morison
Address: Friock Mains Farm By Arbroath

Comment Details

Commenter Type: Member of Public
Stance: Customer made comments in support of the Planning Application
Comment Reasons:
Comment:I refer to the above mentioned Planning Application and would like to submit my support for this project.
This application has been very well prepared and the site has been carefully selected to have as little adverse affect on the surrounding area and population. The turbine is far enough away from any dwelling so noise will not be an issue and after studying the plans, the visual impact will be minimal.
Wind turbines produce clean, renewable energy which must be supported to meet our green energy requirements. This application will safeguard the future of this local family farm and it is a good example of an ever increasing need to diversify.
I fully support this application and recommend it for approval.

Comments for Planning Application 15/00415/FULL

Application Summary

Application Number: 15/00415/FULL
Address: Field 750M North West Of Bolshan Farm Bolshan Arbroath
Proposal: Erection of Wind Turbine of 55.6 to hub height and 79.6 to Blade Tip and Ancillary Development
Case Officer: James Wright

Customer Details

Name: Mr Albert Chassar
Address: Crossroads Cottage Kinnell Arbroath

Comment Details

Commenter Type: Member of Public
Stance: Customer made comments in support of the Planning Application
Comment Reasons:
Comment:My wife Margaret and I both strongly support this application which is within the views of our property.
We do not feel the application will have a detrimental effect on the local landscape in any way and would like to point out that the existing turbines in the area have blended in well and indeed provide welcome reference points to many people in the area. We do not think noise will be a problem as the turbine will be situated far enough away from any housing and it is not an area of high population density.
It is important in this day and age that local councils and indeed businesses such as this are at the forefront of allowing and investing in this type of clean renewable energy.
We in our county are fortunate that our landscape is not blighted by coal, gas or nuclear monstrosities with the health issues associated with these types of energy generation, and we should be mindfull that as our dependency on energy increases so does the chances of something like this appearing in our locality.
Farming in this country has come under tremendous financial pressures in recent years and developments like this can only be good for the rural economy as well as helping to reduce the huge carbon footprint of running cold storage for certain crops.
This can only be ultimately good for everyone in the long run.

Comments for Planning Application 15/00415/FULL

Application Summary
Application Number: 15/00415/FULL
Address: Field 750M North West Of Bolshan Farm Bolshan Arbroath
Proposal: Erection of Wind Turbine of 55.6 to hub height and 79.6 to Blade Tip and Ancillary Development
Case Officer: James Wright

Customer Details
Name: Mr Derek Strachan
Address: Doonbye Bolshan Arbroath

Comment Details
Commenter Type: Member of Public
Stance: Customer objects to the Planning Application
Comment Reasons:
Comment:
I strenuously object to this 3rd application for the erection of a proposed wind turbine at this location. As previously stated it would greatly impact on our health and well-being irrespective of moving the proposed site from W to NW of the nearest property. The height of this turbine has been increased from the previous application to 79.6m and the blade size decreased. This will change the noise characteristics which will potentially increase the health implications as the nearest property is still only 650m from the turbine.

I believe the Scottish Planning Framework recommends a separation of 2Km.

The increase in speed of the smaller turbine blades will also increase the risk to the swan and goose population that regularly flies from the fields in the south and settles at the lake 630m NW of the proposed turbine site.

The installation of this extremely large turbine will significantly impact on this landscape, particularly from the south looking towards Bolshan Hill. The intangible benefits of our local amenity will also be seriously compromised.

Artists paint this landscape looking North West from the road at Bolshan Hill to the Angus Glens. This construction would be directly in line with this view and completely ruin a stunning vista for both locals and visitors to enjoy.

It will at best reduce the value of all property surrounding this construction but more likely make property in the near vicinity unsaleable.

A more detailed objection will be added to this following a study of the all the applicants supporting documentation.

Comments for Planning Application 15/00415/FULL

Application Summary
Application Number: 15/00415/FULL
Address: Field 750M North West Of Bolshan Farm Bolshan Arbroath
Proposal: Erection of Wind Turbine of 55.6 to hub height and 79.6 to Blade Tip and Ancillary Development
Case Officer: James Wright

Customer Details
Name: Mrs Caron Smith
Address: Fallaw Cottage Inverkeilor Arbroath

Comment Details
Commenter Type: Member of Public
Stance: Customer made comments in support of the Planning Application
Comment Reasons:
Comment:As a young person living and working in this area, I am in full support of this application. Looking forward to the future it is clear that we need to change the way in which we power this country. Wind energy is clean, renewable and has less impact on the environment and the landscape compared to fossil fuels and nuclear power.

As a country we take farming for granted and do not realise how important farming is to the future of this country. In order for a family run farm to stay afloat in today's financial climate it has to diversify and become more economical viable. By allowing this wind turbine to be erected at Bolshan it will help to ensure the financial future of this farm.

This application has been well thought through with great detail gone into how it will affect the local area and the people who surround it. Having gone and visited a wind farm myself, I don't believe that the noise is an issue with very little noise being produced. Although it would be highly visible, I do not have an objection with it being there.

Comments for Planning Application 15/00415/FULL

Application Summary

Application Number: 15/00415/FULL
Address: Field 750M North West Of Bolshan Farm Bolshan Arbroath
Proposal: Erection of Wind Turbine of 55.6 to hub height and 79.6 to Blade Tip and Ancillary Development
Case Officer: James Wright

Customer Details

Name: Ms Virginia Fraser
Address: The Small House, West Mains Of Rossie, Montrose, Angus DD10 9TP

Comment Details

Commenter Type: Member of Public
Stance: Customer objects to the Planning Application
Comment Reasons:
Comment:Supporters of wind power should be reminded of the serious limitations and dubious economics of wind power. The energy produced is unpredictable, unreliable, and cannot be stored, so conventional generators are required as back-up.
A case may be made for wind turbines in specific locations such as farms or factories where the purpose is to reduce energy costs and unwanted emissions, but the scale of the installation should be matched to need and should not be a source of additional income for landowners and developers, subsidised by consumers and taxpayers, to the detriment of the landscape and the environment.
Because they are moving wind turbines cannot be ignored, they cannot fade into even the most forgiving background; the eye is always drawn to them. In this location the proposed structure would completely dominate the gentle landscape which surrounds it, and it could be a distraction to drivers on the nearby A934 (which I frequently use).
I strongly object to this application and hope that it will be refused.

Comments for Planning Application 15/00415/FULL

Application Summary

Application Number: 15/00415/FULL
Address: Field 750M North West Of Bolshan Farm Bolshan Arbroath
Proposal: Erection of Wind Turbine of 55.6 to hub height and 79.6 to Blade Tip and Ancillary Development
Case Officer: James Wright

Customer Details

Name: Mr Craig Wilson
Address: Muirside cottage Muirside of Kinnell Arbroath

Comment Details

Commenter Type: Member of Public
Stance: Customer objects to the Planning Application
Comment Reasons:
Comment:I strongly object to the proposed wind turbine. Due to the size, constant noise and visual impact on the countryside.

Comments for Planning Application 15/00415/FULL

Application Summary

Application Number: 15/00415/FULL
Address: Field 750M North West Of Bolshan Farm Bolshan Arbroath
Proposal: Erection of Wind Turbine of 55.6 to hub height and 79.6 to Blade Tip and Ancillary Development
Case Officer: James Wright

Customer Details

Name: Mr Gavin Keen
Address: Not Available

Comment Details

Commenter Type: Member of Public
Stance: Customer made comments in support of the Planning Application
Comment Reasons:
Comment:I strongly support this application. I believe that a wind turbine would enhance the local environment. I am a great supporter of renewable energy and believe that we should be investing in wind power as a resource for the future. In my opinion Bolshan is an ideal location for a wind turbine.

Comments for Planning Application 15/00415/FULL

Application Summary
Application Number: 15/00415/FULL
Address: Field 750M North West Of Bolshan Farm Bolshan Arbroath
Proposal: Erection of Wind Turbine of 55.6 to hub height and 79.6 to Blade Tip and Ancillary Development
Case Officer: James Wright

Customer Details
Name: Miss Jane Anne Mackie
Address: Ardmhor Cottage Bolshan Friockheim

Comment Details
Commenter Type: Member of Public
Stance: Customer made comments in support of the Planning Application
Comment Reasons:
Comment:As the owner of one of the properties closest to this proposed wind turbine I am writing to express support for the proposed wind turbine at Bolshan. I would like to state that I believe that this wind turbine will in no way detract from their surroundings, rather it will enhance the area. I am happy with their appearance and I am sure that they will have no significant impact in terms of noise.

We also support this application on the basis that it will provide a much needed source of renewable energy which the councils planning policy supports. Now and in the future we need to welcome the efforts made to produce renewal energy.

The planning application has carefully considered and addressed all relevant points and I have no concerns regarding health and well being of surrounding properties and do not believe that it will affect the value or saleability of local properties, including my own.

Comments for Planning Application 15/00415/FULL

Application Summary

Application Number: 15/00415/FULL
Address: Field 750M North West Of Bolshan Farm Bolshan Arbroath
Proposal: Erection of Wind Turbine of 55.6 to hub height and 79.6 to Blade Tip and Ancillary Development
Case Officer: James Wright

Customer Details

Name: Ms Jo Woolley
Address: Mountboy by Montrose

Comment Details

Commenter Type: Member of Public
Stance: Customer objects to the Planning Application
Comment Reasons:
Comment:I object to this application. The proposed turbine is hideously, industrially tall, and with no mitigating cover would have an extremely negative impact upon the landscape - immediate and distant. I believe the application should be turned down.

Comments for Planning Application 15/00415/FULL

Application Summary

Application Number: 15/00415/FULL
Address: Field 750M North West Of Bolshan Farm Bolshan Arbroath
Proposal: Erection of Wind Turbine of 55.6 to hub height and 79.6 to Blade Tip and Ancillary Development
Case Officer: James Wright

Customer Details

Name: Mrs mhairi wilson
Address: muirside cottage muirside of kinnell near froickheim

Comment Details

Commenter Type: Member of Public
Stance: Customer objects to the Planning Application
Comment Reasons:
Comment:I strongly object to the proposed wind turbine as I think the noise would be unbearable , and the visual impact would be significant and adverse.
We cant open our windows on a hot summer night as it is as the farmer has lorry engines pumping water 24/7 at the back of my house, now a massive wind turbine not a stones throw away at the front of my house is just too much , why does the farmer not opt for solar or position the turbine well away from local houses.
What about the impact on wildlife ,geese , bats , swans , and large birds of prey ?

Comments for Planning Application 15/00415/FULL

Application Summary

Application Number: 15/00415/FULL
Address: Field 750M North West Of Bolshan Farm Bolshan Arbroath
Proposal: Erection of Wind Turbine of 55.6 to hub height and 79.6 to blade tip and Ancillary Development
Case Officer: James Wright

Customer Details

Name: Mr James Smith
Address: Smiddy Cottage Easter Braikie Arbroath

Comment Details

Commenter Type: Member of Public
Stance: Customer objects to the Planning Application
Comment Reasons:
Comment:My reason for objecting to this application is in relation to the height of the turbine. 80 metres is very tall structure to be erected in open countryside with no mitigating landscape features. This will dominate the landscape for miles around.
Surely 50 metre to blade tip height is a sufficiently large turbine to provide an income for the land owner. This would reduce the impact on others residing close by.
It seems the focus on wind development is now moving to offshore and we need to be careful we do not ruin the Angus countryside as south Aberdeenshire have done. Smaller reasonably sized individual turbines, grey in colour can be absorbed into the background landscape but structures of this size in my opinion cannot

Comments for Planning Application 15/00415/FULL

Application Summary

Application Number: 15/00415/FULL
Address: Field 750M North West Of Bolshan Farm Bolshan Arbroath
Proposal: Erection of Wind Turbine of 55.6 to hub height and 79.6 to Blade Tip and Ancillary Development
Case Officer: James Wright

Customer Details

Name: Mrs Diane Smith
Address: Not Available

Comment Details

Commenter Type: Member of Public
Stance: Customer made comments in support of the Planning Application
Comment Reasons:
Comment:As a young person living in a world where issues regarding sustainability are pertinent, I strongly support this application. I have looked at this application in great detail and truly believe that this application for a single wind turbine does in fact meet the principles of sustainable development which is part of Angus Council's vision. This wind turbine will allow a source of renewable energy which does not contribute greenhouse gases such as CO2 and it is, indeed, sustainable for the future. In no way will this turbine compromise the ability of future generations to meet their needs as it is well documented that wind turbines only take up a very small plot of land and therefore crop output and food production from this area will not be reduced. In a study published in the journal 'Energy and Environmental Science' wind power was ranked as the best alternative energy source when considering the impact on land, wildlife, human health, climate change and energy security.
National agendas support the development of sources such as wind power as the UK has both a renewable energy target and laws requiring cuts in carbon emissions which are driving climate change.
I know the area in which this turbine is planned very well and I do not believe that it will detract in any way from the landscape. Many people find the turbines to be majestic man-made wonders, and I am one of those people.
Economically there is much to be gained from this development as wind energy can help to diversify the economies of rural communities and add to the tax base. For consumers it helps to provide price stability and reduces our dependence on foreign fossil fuel imports which will help to control spikes in electricity costs.

Comments for Planning Application 15/00415/FULL

Application Summary
Application Number: 15/00415/FULL
Address: Field 750M North West Of Bolshan Farm Bolshan Arbroath
Proposal: Erection of Wind Turbine of 55.6 to hub height and 79.6 to Blade Tip and Ancillary Development
Case Officer: James Wright

Customer Details
Name: Mr MARK CESSFORD
Address: JACKS WALK LITTLE KINNELL BY ARBROATH

Comment Details
Commenter Type: Member of Public
Stance: Customer made comments in support of the Planning Application
Comment Reasons:
Comment:I would like to comment on this application. My business is heavily dependant on fossil fuel based energy. As a next door neighbour, I am excited to discover that there has been an application for a wind turbine on our doorstep. In my business travels across the U.K., I find the sight of wind turbines "very relaxing" and have never considered that there is any excessive noise coming from wind turbines. Developments like this help the local economy during development, create a sustainable energy supply for businesses who invest in them and ultimately allow for council / government targets on renewable energy to be achieved.

I look forward to hearing how this application progresses, but I certainly believe that I am not alone in looking forward to the day that this turbine might be switched on.

Regards,

Mark J Cessford

Letter received from Brian Meldrum Soutar, New House, Chapelton, Arbroath, DD11 4RT, dated 6 June 2015, reads as follows:-

> "I write in support for the Bolshan wind turbine.
>
> In my mind the development will have little effect on the surrounding landscape as I know the area where the turbine would be situated well which is open farmland. The noise levels if any would be insignificant as the nearest properties are a distance away.
>
> I have read the planning application which addresses all relevant points and time has been spent well on the preparation.
>
> I am in full favour of this application as I believe the rural economy must be allowed to diversify."

Letter 15/00415/FULL (Brian M Soutar)

Comments for Planning Application 15/00415/FULL

Application Summary

Application Number: 15/00415/FULL

Address: Field 750M North West Of Bolshan Farm Bolshan Arbroath

Proposal: Erection of Wind Turbine of 55.6 to hub height and 79.6 to blade tip and Ancillary Development

Case Officer: James Wright

Customer Details

Name: Miss Constanza Dessain

Address: Lawton House Inverkeilor Angus

Comment Details

Commenter Type: Member of Public

Stance: Customer objects to the Planning Application

Comment Reasons:

Comment:I object strongly

Comments for Planning Application 15/00415/FULL

Application Summary
Application Number: 15/00415/FULL
Address: Field 750M North West Of Bolshan Farm Bolshan Arbroath
Proposal: Erection of Wind Turbine of 55.6 to hub height and 79.6 to Blade Tip and Ancillary Development
Case Officer: James Wright

Customer Details
Name: Mr Robert Hill
Address: Strathella Steading Brechin

Comment Details
Commenter Type: Member of Public
Stance: Customer objects to the Planning Application
Comment Reasons:
Comment:Wind turbines are controversial. Allowing repeated applications for the same site firstly castes doubt on the industrial and economic evidence for any turbine in that location but more importantly puts a permanent blight on the surrounding houses in terms of amenity and value. This habit of repeat applications does not appear to be prevalent in other areas of planning so why should it be happening with wind turbines which by their nature attract strong comments for and against.

In this particular application the location is frequently flown over by skeins of geese from Montrose Basin. A wind turbine of the height proposed in the present application could result in numerous deaths and I cannot help wondering if the applicant has included the collection of numerous of very large birds in his application.

Comments for Planning Application 15/00415/FULL

Application Summary
Application Number: 15/00415/FULL
Address: Field 750M North West Of Bolshan Farm Bolshan Arbroath
Proposal: Erection of Wind Turbine of 55.6 to hub height and 79.6 to blade tip and Ancillary Development
Case Officer: James Wright

Customer Details
Name: Mr Simon Dessain
Address: Lawton House Arbroath

Comment Details
Commenter Type: Miscellaneous
Stance: Customer objects to the Planning Application
Comment Reasons:
Comment:I am a local resident. This application is not supported locally. it is an inappropriate intrusion into the landscape.

The area is suffering from significant cumulative impact.

As you summit the road from Redford heading towards Friockheim there is an substantial, existing burden of visual intrusion into the landscape looking out over the landscape and this application will add materially to the blight.

The zone of visual impact is highly significant and the area and scenery of the environs are prized by the Council under their plan for their tourism amenity.

I believe that this application should be refused.

Comments for Planning Application 15/00415/FULL

Application Summary
Application Number: 15/00415/FULL
Address: Field 750M North West Of Bolshan Farm Bolshan Arbroath
Proposal: Erection of Wind Turbine of 55.6 to hub height and 79.6 to Blade Tip and Ancillary Development
Case Officer: James Wright

Customer Details
Name: Mr michael pagan
Address: smithyfield house muirside of kinnell by arbroath

Comment Details
Commenter Type: Member of Public
Stance: Customer objects to the Planning Application
Comment Reasons:
Comment:I strongly object to the proposed wind turbine for the following reasons.

Proximity to Residences for noise, our property is only 750 meters from the proposed turbine, and thought 2km was the recommended distance from property, very worried about the size and the noise

Visual impact

Impact on wild life

Comments for Planning Application 15/00415/FULL

Application Summary

Application Number: 15/00415/FULL
Address: Field 750M North West Of Bolshan Farm Bolshan Arbroath
Proposal: Erection of Wind Turbine of 55.6 to hub height and 79.6 to Blade Tip and Ancillary Development
Case Officer: James Wright

Customer Details

Name: Mrs Irene Pagan
Address: Smithyfield House Muirside of Kinnell by Arbroath

Comment Details

Commenter Type: Member of Public
Stance: Customer objects to the Planning Application
Comment Reasons:
Comment:I am strongly objecting to the close proximity to the surrounding properties, my property is only 750 metres away from the proposed turbine and I feel that noise will be an issue.
I don't understand why the farmer can't go for solar energy(no noise or visual impact)

Comments for Planning Application 15/00415/FULL

Application Summary
Application Number: 15/00415/FULL
Address: Field 750M North West Of Bolshan Farm Bolshan Arbroath
Proposal: Erection of Wind Turbine of 55.6 to hub height and 79.6 to Blade Tip and Ancillary Development
Case Officer: James Wright

Customer Details
Name: Mr Derrick Robertson
Address: 42 Charleton Place Montrose

Comment Details
Commenter Type: Member of Public
Stance: Customer made comments in support of the Planning Application
Comment Reasons:
Comment:I am writing to express my support for the aforementioned Wind Turbine,my work as an Agronomist covers this area and I strongly believe that this Wind Turbine will not detract from the surroundings and enjoyment of this area,I also observe it will be a suitable distance from residential properties,thus no noise pollution will occur.

Farmers are constantly under scrutiny from out with and should be helped in producing clean renewable energy,which has positive results for everyone,we do live on an island so surely the more we can make of our natural resources the better for generations to come.

Comments for Planning Application 15/00415/FULL

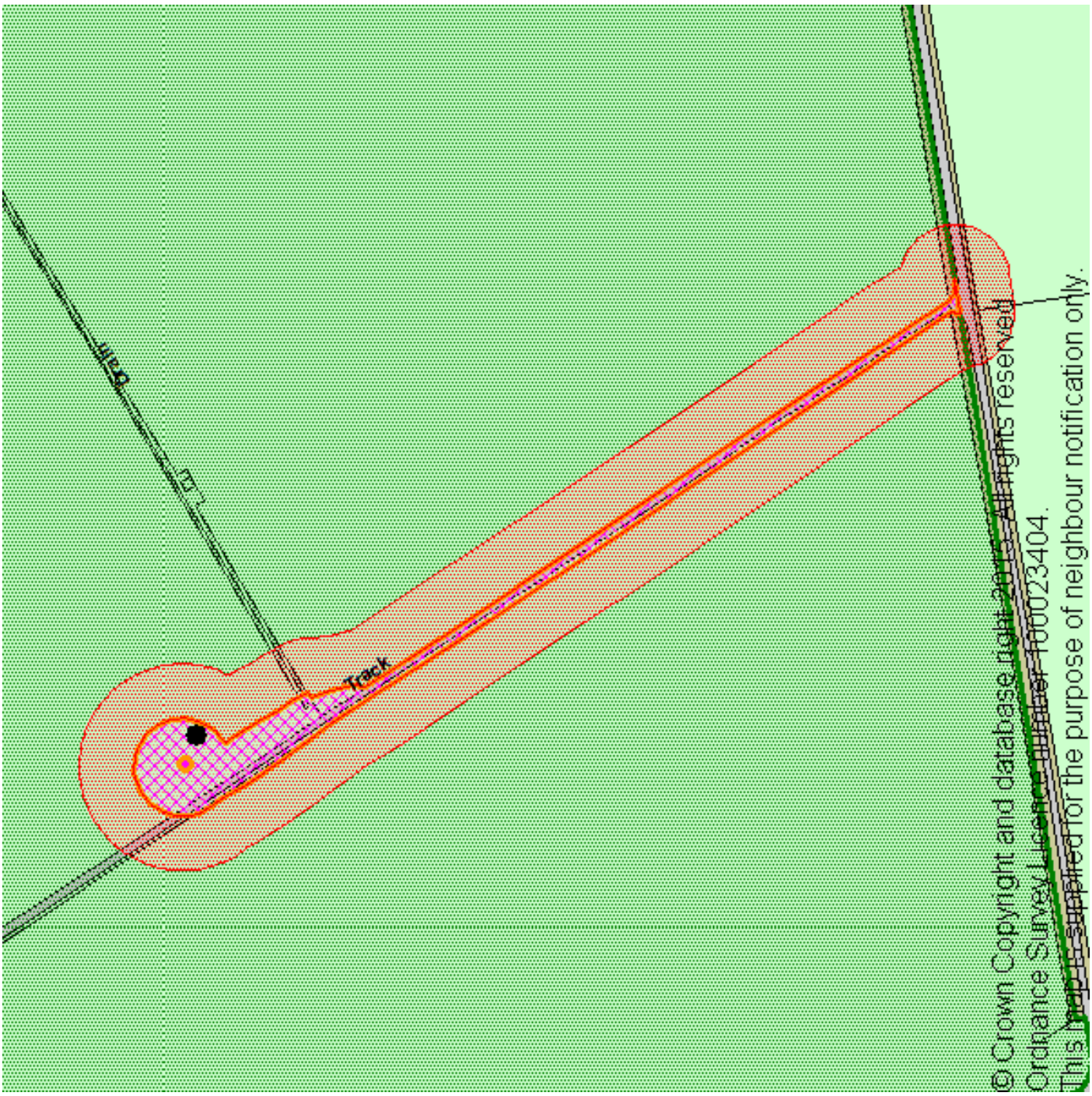
Application Summary
Application Number: 15/00415/FULL
Address: Field 750M North West Of Bolshan Farm Bolshan Arbroath
Proposal: Erection of Wind Turbine of 55.6 to hub height and 79.6 to Blade Tip and Ancillary Development
Case Officer: James Wright

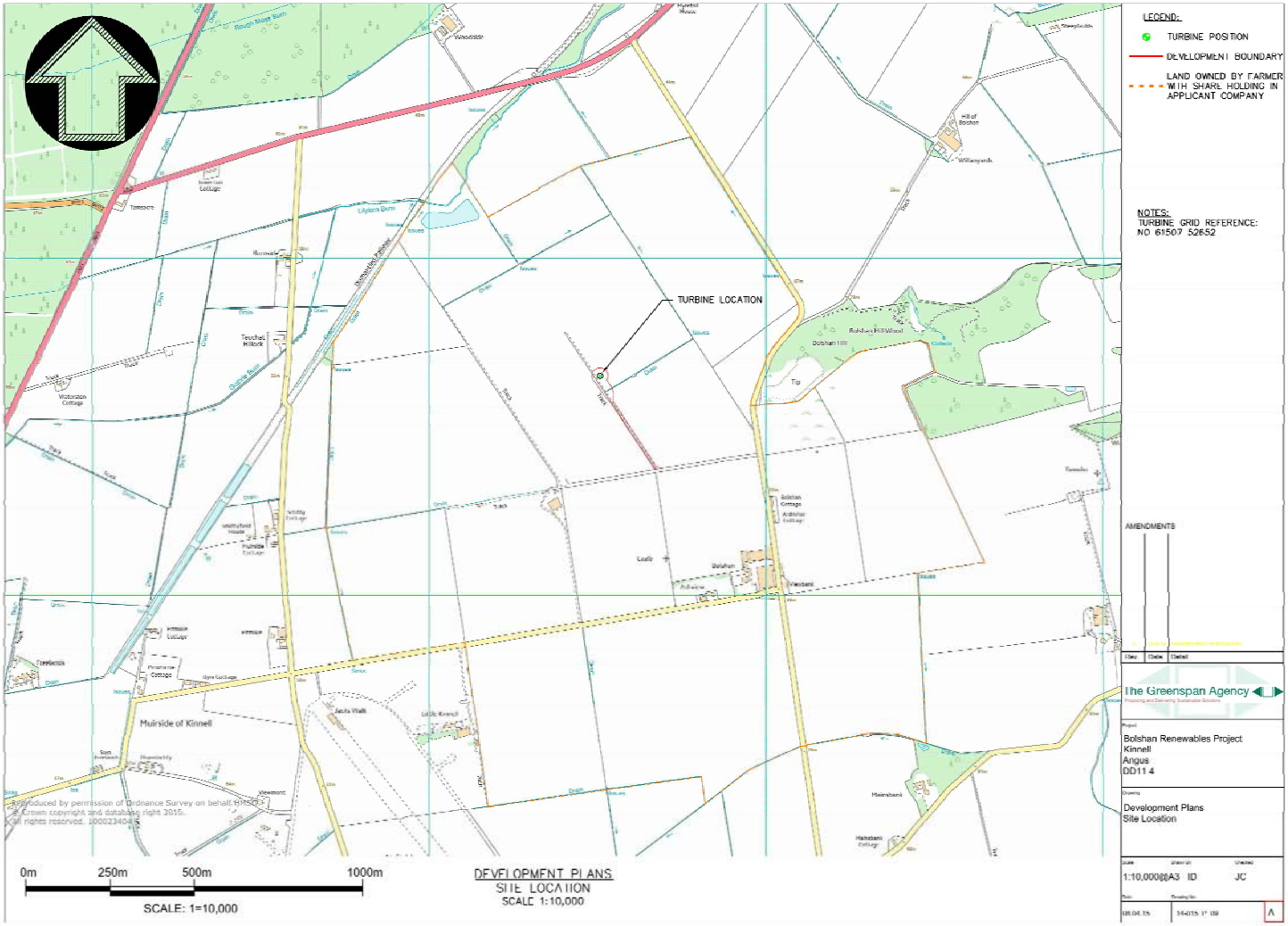
Customer Details
Name: Mr James Patrick Main
Address: Craigengower Church Road, Luthermuir Laurencekirk

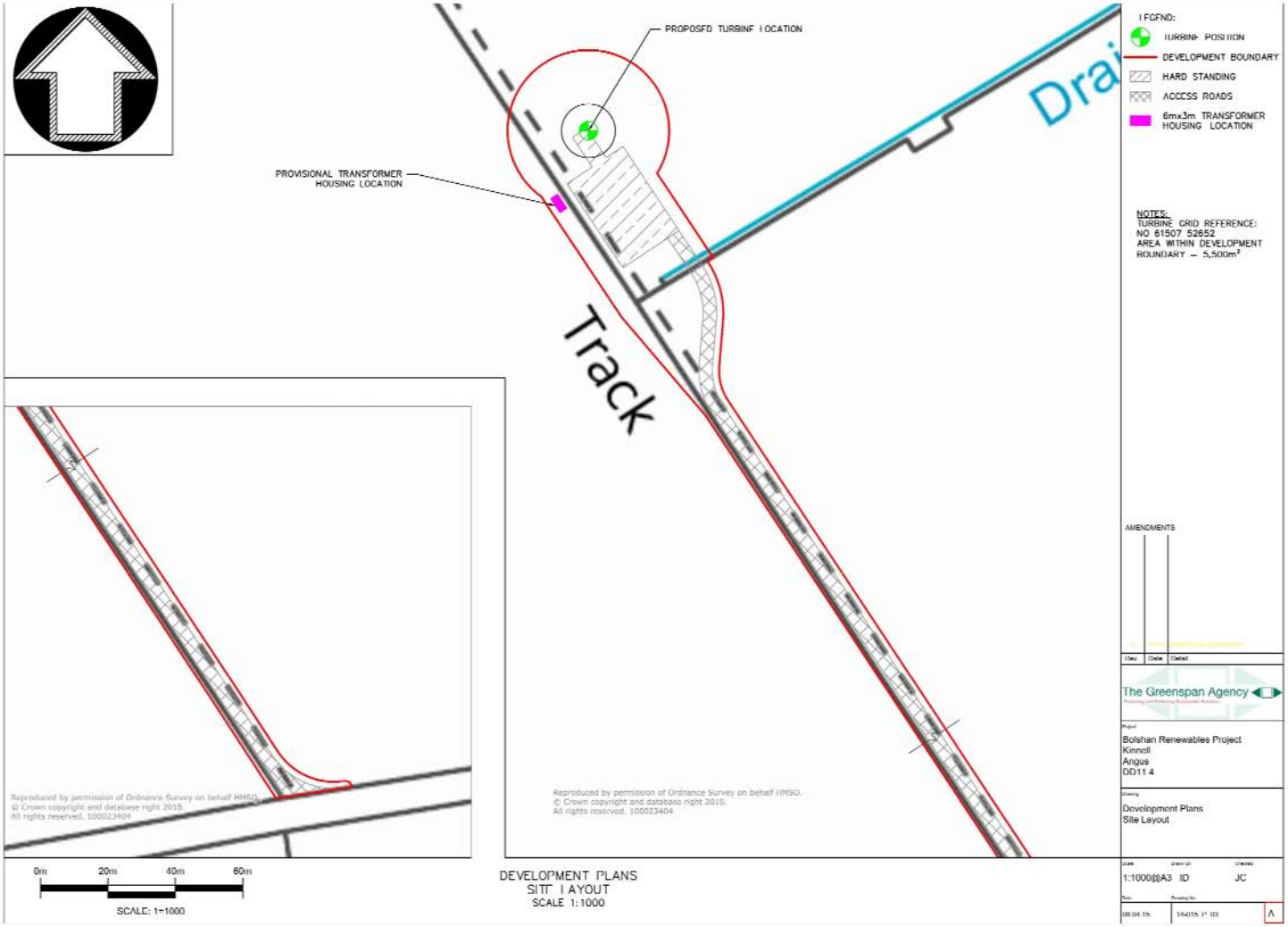
Comment Details
Commenter Type: Member of Public
Stance: Customer made comments in support of the Planning Application
Comment Reasons:
Comment:I advise farmers on various matters all to do with finance (not wind turbines) in the North East of Scotland and see the vast costs of running cooling stores for potatoes and grain driers to provide the public with good food supplies. Surely by making full use of the free wind which there is plenty of on this site, makes it an ideal situation for the production of power for the future, with minimal impact on the local community. I have a wind turbine this size within hundreds of yards of my house and apart from seeing it we are never aware of it at all.

I think the long term benefits from these should be looked at closely as wherelse is the power to come from and at what cost.

I therefore support this application and see no reason why each farming unit that uses heavy amounts of power do not have their own wind turbine.


Track
© Crown Copyright and database right 2013. All rights reserved
Ordnance Survey Licence number 100023404.
This map is supplied for the purpose of neighbour notification only.


LEGEND:
TURBINE POSITION
DEVELOPMENT BOUNDARY
LAND OWNED BY FARMER WITH SHARE HOLDING IN APPLICANT COMPANY
NOTES:
TURBINE GRID REFERENCE: NO 61507 52652
TURBINE LOCATION
AMENDMENTS
The Greenspan Agency
Bolshan Renewables Project
Kinnell
Angus
DD11 4
Development Plans
Site Location
1:10,000@A3
ID
JC
Muirside of Kinnell
0m
250m
500m
1000m
SCALE: 1=10,000
DEVELOPMENT PLANS
SITE LOCATION
SCALE 1:10,000


PROPOSED TURBINE LOCATION
PROVISIONAL TRANSFORMER HOUSING LOCATION
Track
Drai
LEGEND:
TURBINE POSITION
DEVELOPMENT BOUNDARY
HARD STANDING
ACCESS ROADS
6mx3m TRANSFORMER HOUSING LOCATION
NOTES:
TURBINE GRID REFERENCE:
NO 61507 52652
AREA WITHIN DEVELOPMENT BOUNDARY – 5,500m²
AMENDMENTS
The Greenspan Agency
Bolshan Renewables Project
Kinnell
Angus
DD11 4
Development Plans
Site Layout
1:1000@A3 ID
JC
0m 20m 40m 60m
SCALE: 1=1000
DEVELOPMENT PLANS
SITE LAYOUT
SCALE 1:1000
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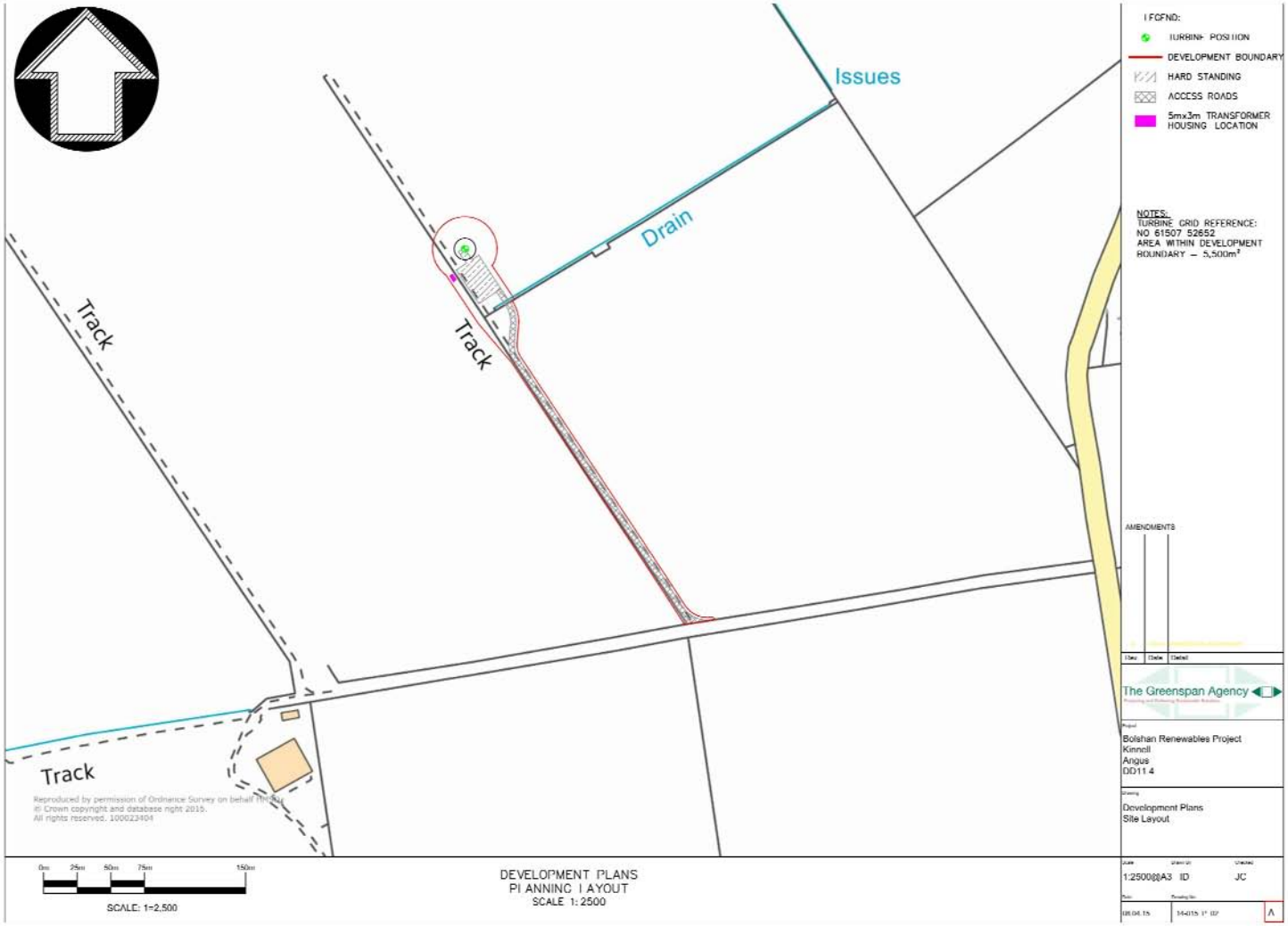

Issues
Drain
Track
Track
Track
LEGEND:
TURBINE POSITION
DEVELOPMENT BOUNDARY
HARD STANDING
ACCESS ROADS
5mx3m TRANSFORMER HOUSING LOCATION
NOTES:
TURBINE GRID REFERENCE:
NO 61507 52652
AREA WITHIN DEVELOPMENT BOUNDARY – 5,500m²
AMENDMENTS
The Greenspan Agency
Bolshan Renewables Project
Kinnell
Angus
DD11 4
Development Plans
Site Layout
1:2500@A3 ID
JC
SCALE: 1=2,500
DEVELOPMENT PLANS
PLANNING LAYOUT
SCALE 1: 2500

AMENDMENTS

Rev.	Date	Detail

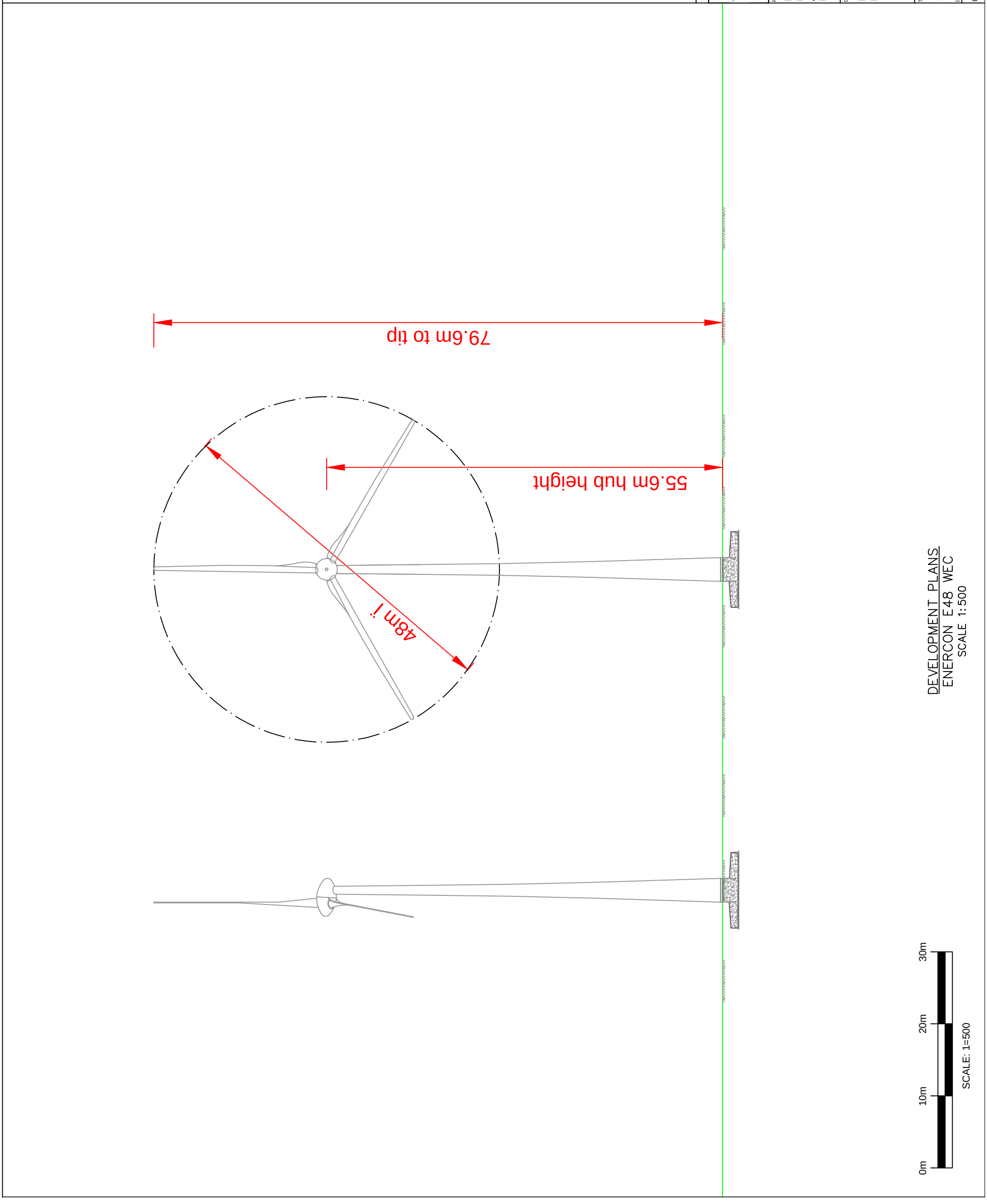
The Greenspan Agency
Proposing and Delivering Sustainable Solutions

Project
Bolshan Renewables Project
Kinnell
Angus
DD11 4

Drawing
Development Plans
Enercon E48 Turbine Elevation

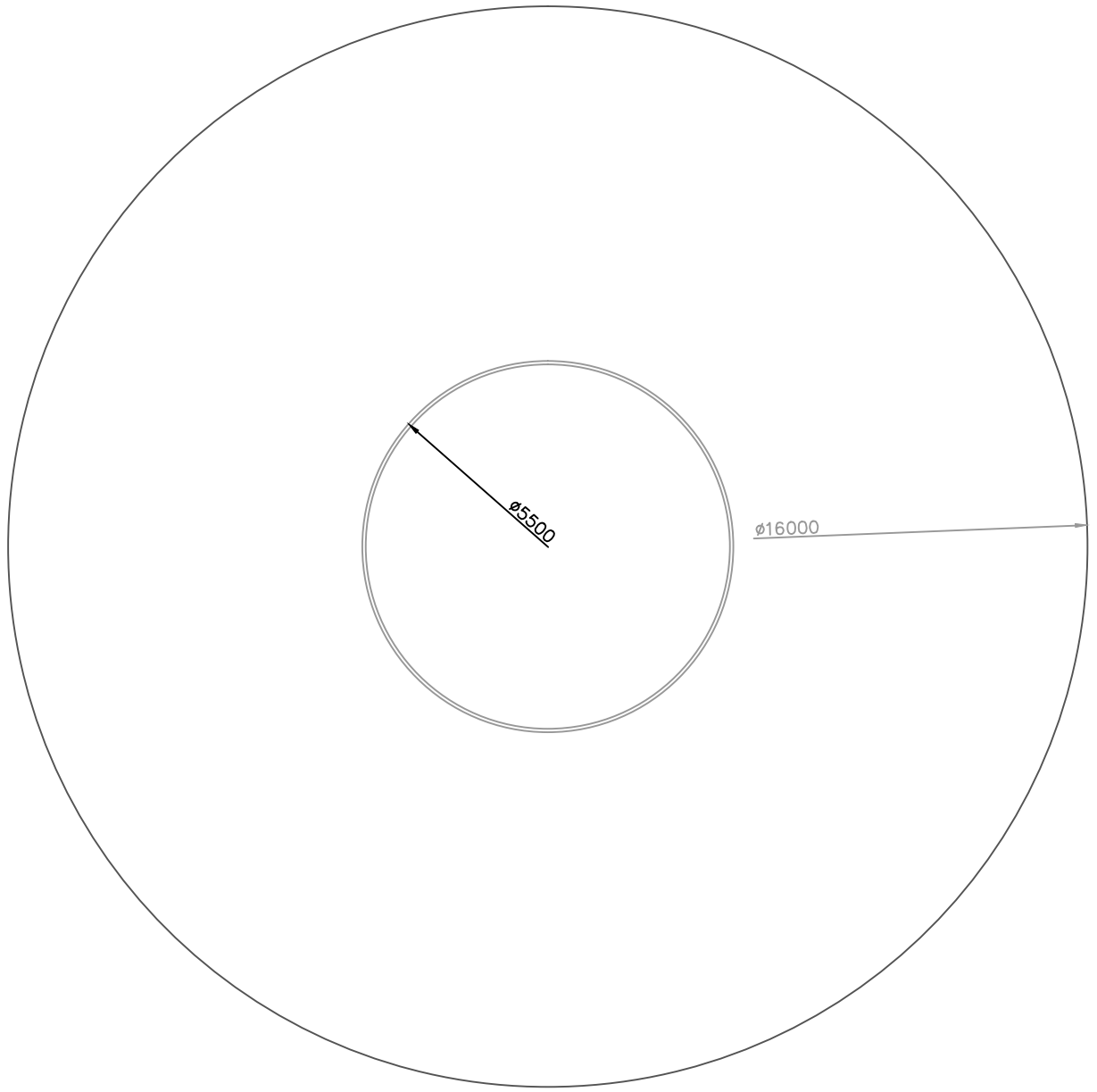
Scale	Drawn By	Checked
1:500@A3	ID	JC

Date	Drawing No	
07.04.15	14-015_P_05	0



DEVELOPMENT PLANS
ENERCON E48 WEC
SCALE 1:500

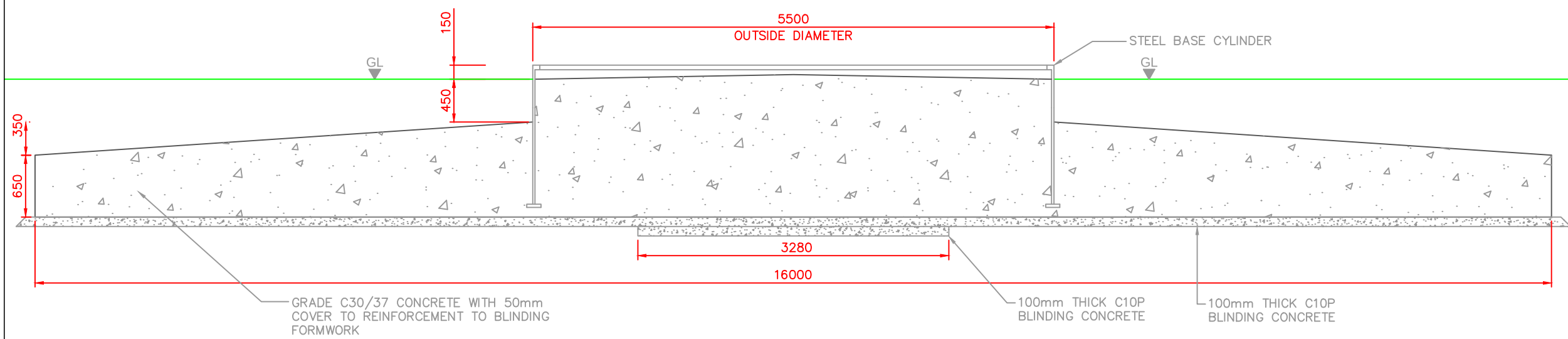
0m 10m 20m 30m
SCALE: 1=500



0m 3m 5m

SCALE = 1:100

DEVELOPMENT PLANS
TYPICAL WEC FOUNDATION PLAN
SCALE 1:100



0m 1m 3m 5m

SCALE = 1:50

DEVELOPMENT PLANS
TYPICAL WEC FOUNDATION ELEVATION
SCALE 1:50

CONCRETE NOTES:

DUE CONSIDERATION SHALL BE GIVEN TO DURABILITY AND PROPER WORKMANSHIP IN PLANNING OF THE CONCRETE WORKS. BEFORE WORKS COMMENCE THE CONTRACTOR SHALL DELIVER FOR APPROVAL A PLANNING PROGRAMME FOR CONCRETE PRODUCTION INCLUDING STOCKS OF AGGREGATES AND REINFORCEMENT, EQUIPMENT FOR MIXING AND PLACING, VEHICLES FOR TRANSPORT OF CONCRETE, MANPOWER, E.T.C.

THE CONCRETE SHALL BE MIXED AND PLACED IN ACCORDANCE WITH THE FOLLOWING:-

CODE OF PRACTICE:- BS 8110
ENVIRONMENT:- MODERATE
CONCRETE STRENGTH:- C30/37
AGGREGATE:- dmax=20mm
COVER:- 50mm TO FORMWORK AND SUB-BASE CONCRETE
100mm TO SOIL

CONCRETE JOINT NOTE:

IF ANY CONCRETE JOINTS ARE REQUIRED THE FOLLOWING SHALL BE PROVIDED:-

CLEANING THE SURFACE UNTIL IT IS DUSTFREE, SOAK WITH WATER AND APPLY AN ADHESIVE CONCRETE SIKA-TOP121 OR SIKA MONO TOP 610. THE ADHESIVE CONCRETE SHALL BE THOROUGHLY WORKED IN AND HAVE 1-2mm DEPTH. THE CONCRETE SHALL BE PLACED BETWEEN 15 AND 45 MINUTES AFTER ADHESIVE CONCRETE IS APPLIED.

AFTER STRIKING OF FORMWORK THE JOINT SHALL BE PROTECTED WITH A CONCRETE COATING SUCH AS VANDEX.

GENERAL NOTE:

ALL DIMENSIONS IN mm.

MINIMUM COVER TO REINFORCEMENT = 50mm

CONCRETE TO BE GRADE C30/37 TO BS 8500-1.

ALL WORKS CARRIED OUT IN STRICT ACCORDANCE WITH TURBINE MANUFACTURERS REQUIREMENTS AND SPECIFICATIONS.

MINIMUM DEPTH OF SOIL COVER MATERIAL OVER FOUNDATION TO BE AS SHOWN. WELL COMPACTED GRANULAR MATERIAL FROM EXCAVATION TO BE USED AND DRESSED WITH TOPSOIL. MINIMUM AVERAGE DENSITY OF COMPACTED BACKFILL TO BE 18.8 kN/m¡.

ALL CONCRETE SHALL BE WELL CONSOLIDATED BY USE OF IMMERSION VIBRATORS.

ALL CONCRETE SURFACES SHALL BE MAINTAINED IN A MOIST CONDITION AND BE PROTECTED AGAINST THE RAIN AND RAPID TEMPERATURE CHANGES AS SOON AS POSSIBLE AND FOR AT LEAST 8 DAYS.

GROUND SURFACE AT TURBINE LOCATION ASSUMED TO BE FLAT - TOPOGRAPHICAL SURVEY TO BE CARRIED OUT PRIOR TO FINALISATION OF FOUNDATION DESIGNS.

ALL PROVISION FOR DUCTING, CABLING, E.T.C. BY OTHERS.

CONTRACTOR TO ALLOW FOR CHAIRS AT 1 No. PER m2.

AMENDMENTS

Rev.	Date	Detail

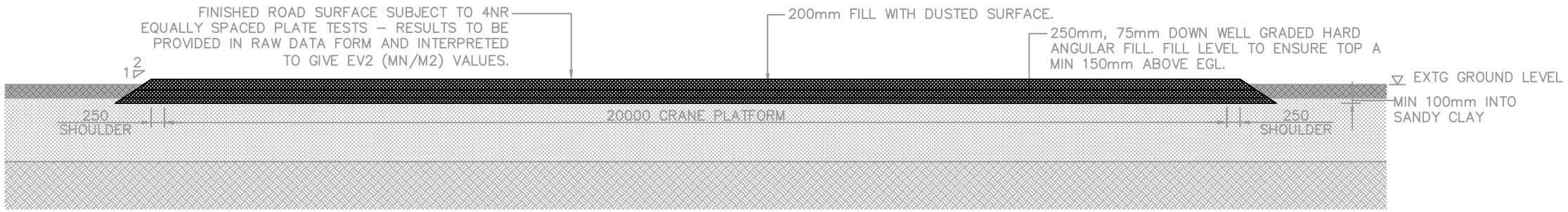
The Greenspan Agency
Proposing and Delivering Sustainable Solutions

Project
Bolshan Renewables Project
Kinnell
Angus
DD11 4

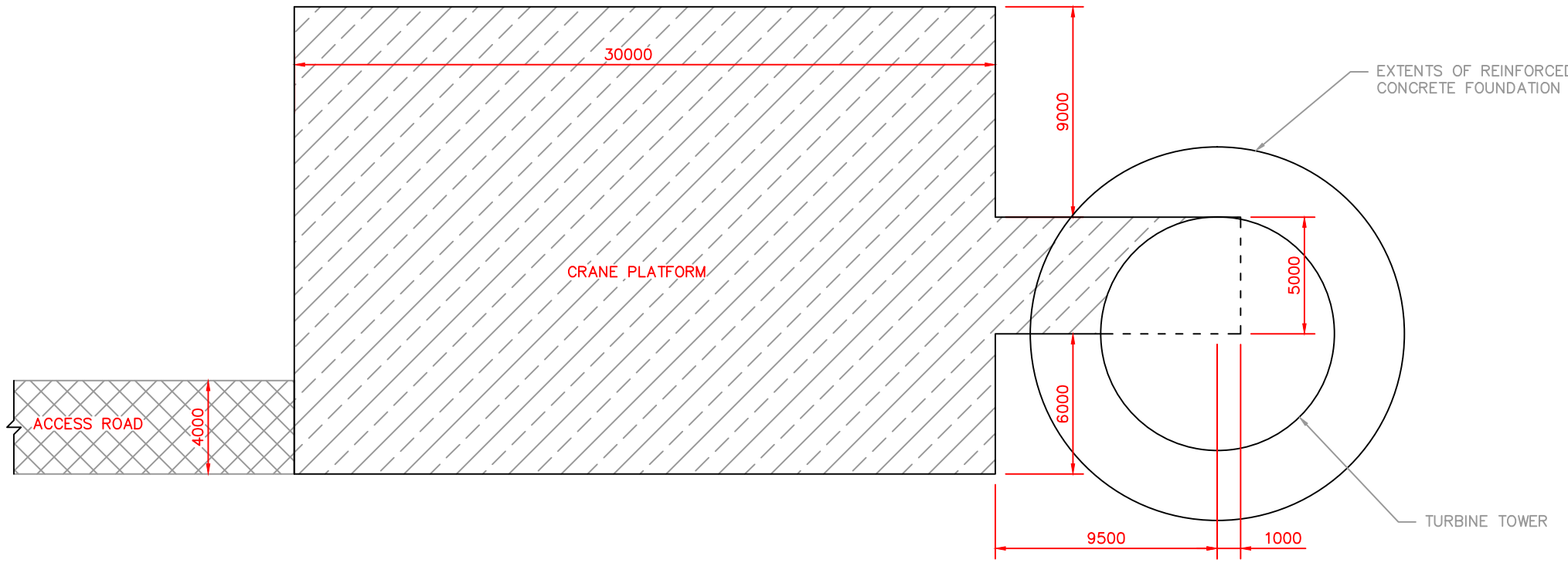
Drawing
Development Plans
Typical WEC Foundation
Plan & Elevation

Scale	Drawn By	Checked
As Shown	ID	JC

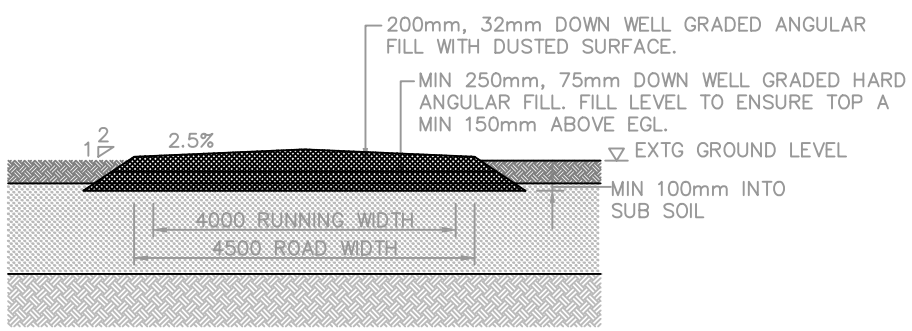
Date	Drawing No	
08.04.15	14-015_P_07	0



DEVELOPMENT PLANS
TYPICAL HARDSTANDING ELEVATION
SCALE 1:100



DEVELOPMENT PLANS
TYPICAL HARDSTANDING PLAN
SCALE 1:250



DEVELOPMENT PLANS
TYPICAL ACCESS ROAD DETAIL
SCALE 1:100

AMENDMENTS

Rev.	Date	Detail

The Greenspan Agency
Proposing and Delivering Sustainable Solutions

Project
Bolshan Renewables Project
Kinnell
Angus
DD11 4

Drawing
Development Plans
Typical Access Road & Hardstanding Details

Scale	Drawn By	Checked
As Shown	ID	JC

Date	Drawing No	
08.04.15	14-015_P_08	0

AMENDMENTS

Rev.	Date	Detail

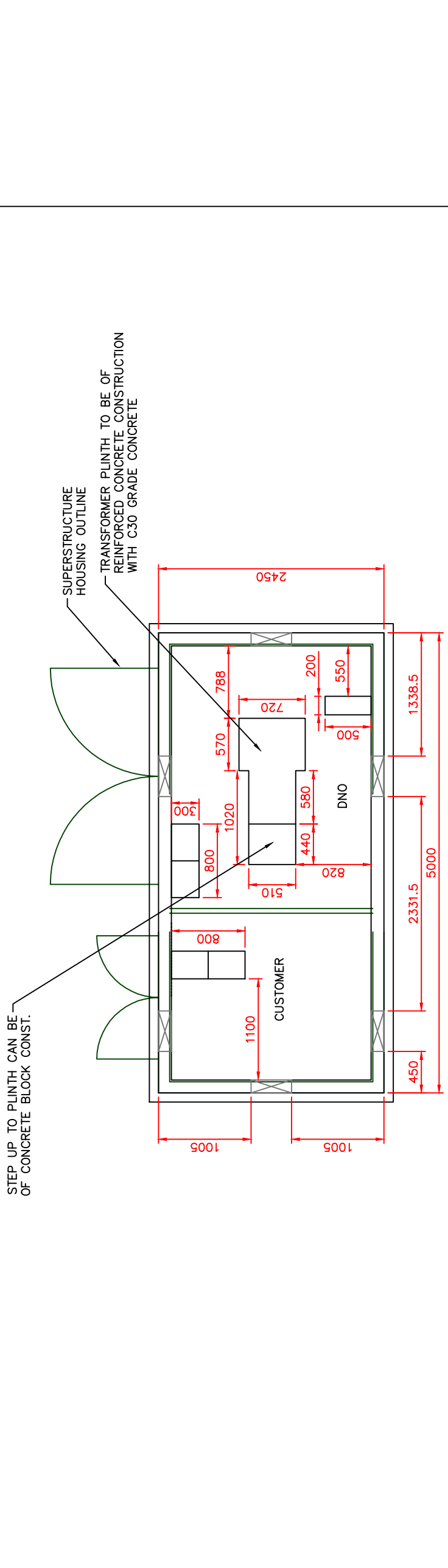
The Greenspan Agency
Proposing and Delivering Sustainable Solutions

Project
Bolshan Renewables Project
Kinnell
Angus
DD11 4

Drawing
Development Plans
Typical Transformer Substation

Scale	Drawn By	Checked
1:50@A3	ID	JC

Date	Drawing No	
08.04.15	14-015_P_06	0



DEVELOPMENT PLANS
TYPICAL TRANSFORMER SUBSTATION
SCALE 1:50


06/01/2015


06/01/2015


06/01/2015


06/01/2015


06/01/2015


06/01/2015

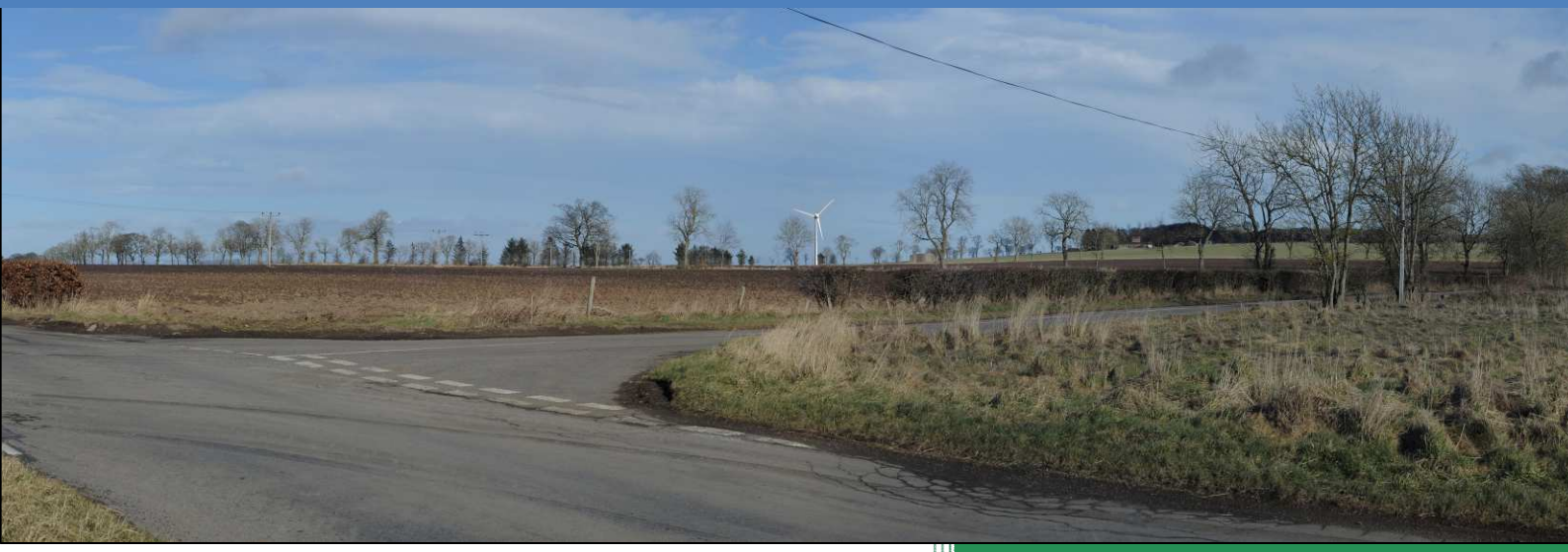

06/01/2015


06/01/2015

The Greenspan Agency

Bolshan Renewables Project

ER Volume I: Environmental Report



This document has been prepared on behalf of the applicant, Bolshan Renewables Limited, by The Greenspan Agency Ltd

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Preface

This Environmental Report seeks to assess the planning and environmental effects of the Bolshan Renewables Project. This report is not a formal 'Environmental Statement' for the purposes of the Planning EIA Regulations (the Environmental Impact Assessment (Scotland) Regulations 2011).

The Bolshan Renewables Project planning application comprises two separate volumes of the environmental report, together with the required application forms and drawings:

- ER Volume I: Environmental Report
- ER Volume II: Landscape and Visual Impact Assessment Figures
- Planning Application Forms and Drawings

The information provided in the above suite of information should be sufficient for the determination of the planning application.

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1. Outline Description of the Proposal

1.1. The Applicant

Bolshan Renewables Limited is a joint venture between the farm owner, Messrs W B Smith & Sons Limited, and Greenspan Energy Limited.

The Smith family have been farming at Bolshan since 1945. The business at Bolshan Farm focuses exclusively on arable farming. The applicant is seeking to diversify the business and sees renewable energy as a sustainable, environmentally sound opportunity which utilises the area's excellent wind resources.

The Greenspan Agency and the Greenspan group of companies are renewable energy developers and consultants. Together with developing their own wind and solar projects, The Greenspan Agency acts as a consultancy advising landowners and farmers in the development of anaerobic digestion, solar, wind, and hydro renewable energy projects from inception to operation.

1.2. The Proposed Development

Planning permission is sought for one wind turbine up to 79.6 metres tip height, with associated access, foundations, and hardstandings on land north of the Bolshan farm buildings, around 3km north-east of Friockheim, Angus. The proposed development is henceforth referred to as the 'Bolshan Renewables Project'.

The exact model of wind turbine would be confirmed at the time of order; however the assessment of environmental effects presented here has been based on the preferred Enercon E48 turbine model with a 55 metre hub height and a rotor diameter of 48 metres. Any variation from this turbine model would be agreed with the planning authority but the maximum tip height would not exceed 79.6 metres.

The proposed development will be an important farm diversification project, helping to secure business viability at Bolshan farm and allow investment in the local area. The electricity generated by the turbine would be exported to the National Grid, making an important contribution to the Scottish and UK Governments' climate change targets. The project would enable the farming business to be more environmentally conscious and to do its part to safeguard the natural environment and help mitigate climate change.

1.3. The Site

The proposed wind turbine would be located at the following grid reference:

361507 752652
(aka NO 61507 52652)

A first consideration of the site shows that it has the following attributes:

- The site is well exposed to the prevailing south-westerly winds. According to DECC's NOABL wind speed calculation model, the site has a strong average speed of approximately 7.8m/s at 45m above ground level. A wind turbine would harvest the wind at this location very effectively;
- The site does not support any sites of international, national or local importance within its boundaries;
- The site does not lie within a designated landscape;
- A grid connection has been agreed with Scottish and Southern Energy;
- The development offers farm diversification opportunities to the applicant, without affecting the current farming practices on-site;
- There is suitable access to the site by the trunk road system and adjacent roads.

The following page shows the proposed site layout plan.

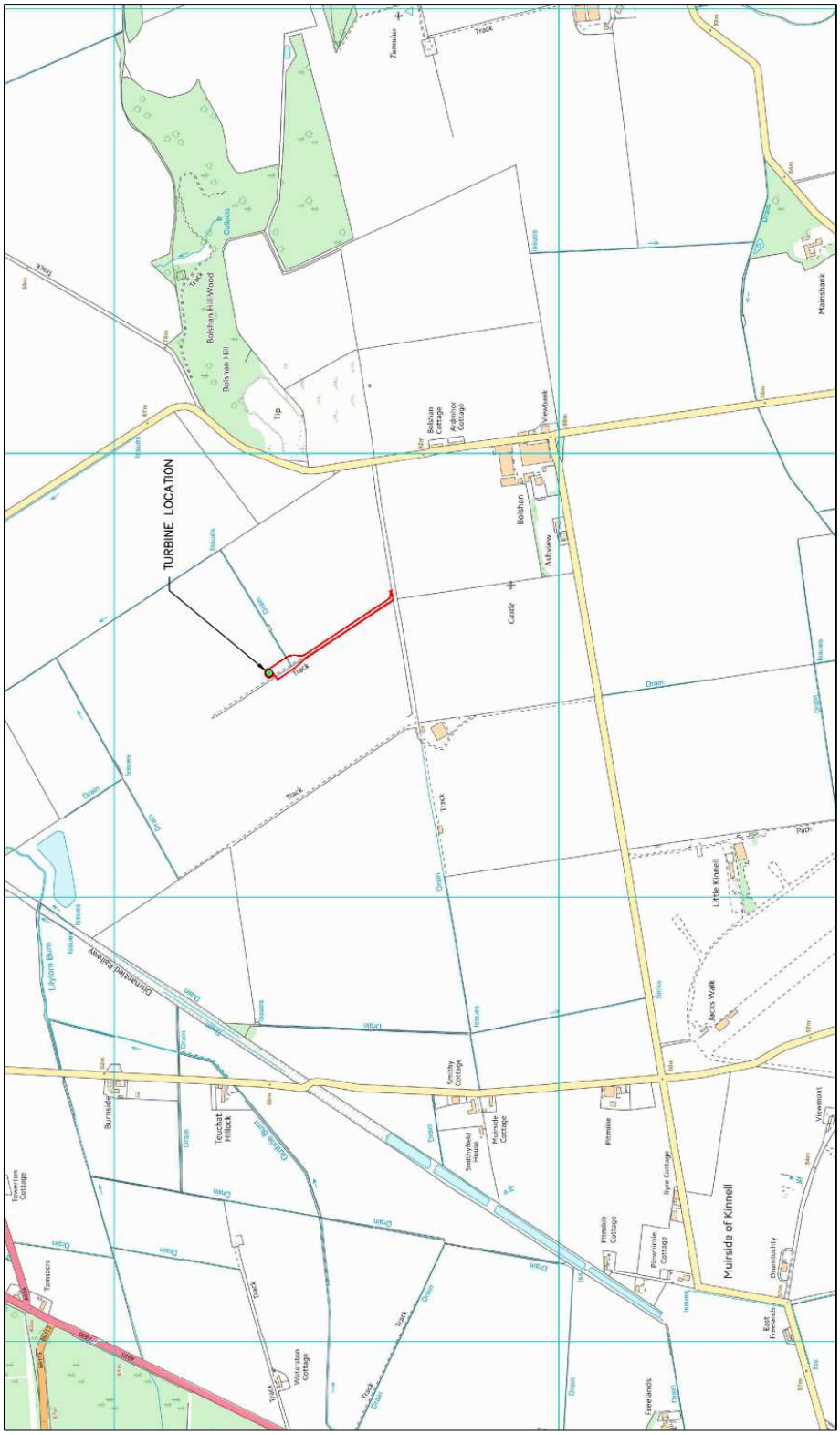


Figure 1: Bolshan Location Plan
(A detailed version of this plan with scale and key has been submitted as a separate drawing with this planning application)

1.4. Turbine Details

The Enercon E48 turbine model and manufacturer is widely considered to be the most efficient and reliable currently available. It will maximise production from the site and minimise maintenance downtime. Technical details of the E48 are shown on the next page Figure 3). The colour of the turbines would be agreed with Angus Council; however it is typically light grey/off-white with a semi-matt finish to attenuate visibility.

Figure 2: An operational E48 wind turbine at a Greenspan Agency project in Aberdeenshire. Enercon turbines are recognisable by their elegant streamlined shape which compares favourably with other wind turbine designs.

The turbine rotors would rotate upwind of the prevailing wind direction and the speed of rotation would be controlled by the nacelle yawing so that the rotor faces into the wind, whilst feathering the blades. Above maximum permissible wind speeds the turbines would shut down automatically and a brake would be applied.

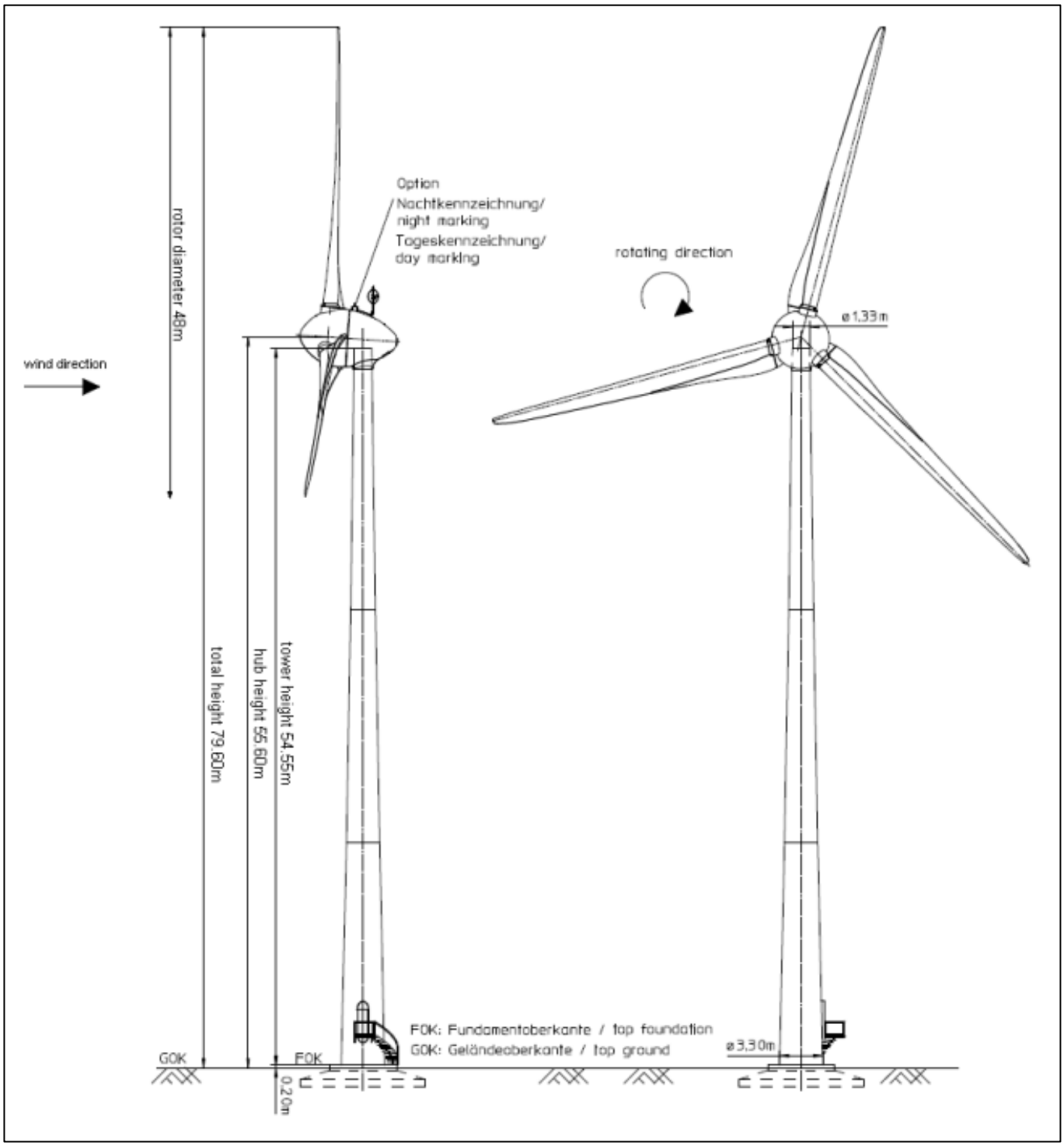
N.B. All of the environmental assessments submitted within this report have been carried out using the specifications of the Enercon E48 wind turbine.

1.5. Wind Resource

The site potentially has an excellent wind resource. The Department of Energy and Climate Change's wind yield estimation tool predicts an average wind speed of 7.8m/s at 45m above ground level. This figure indicates that a load factor of around 30% is likely for a wind turbine in this location.

Boasting an estimated 25% of the total European wind resource, Scotland is ideally suited to exploit this natural attribute in order to ensure energy security, boost the Scottish economy, create employment and increase energy exports to neighbouring countries. The Enercon E48 turbine is suitable for the sort of higher wind speed classes expected at this site. This will ensure that the turbine operates effectively in the high wind speed conditions found in this area and will also deliver a firmer output than many similar projects.

Figure 3: Technical Elevations of the Enercon E48 wind turbine [1].



[1] Enercon Technical Description E-48. VI-Technical Description E48 Rev001ger-eng.doc

2. Summary of Report Findings

The detailed assessment set out in this environmental report has identified the following key findings. A similar account of key findings with explicit reference to relevant planning policies is given in the 'Planning Assessment' section of the 'Planning Statement' chapter of this report.

Landscape Suitability

The adopted Angus Local Plan Review sets out that the 'lowland and hills' geographic area in which the turbine is proposed is the best suited in Angus for wind turbine development. In addition: two key items of supplementary guidance point to the acceptability of the Dipslope Farmland landscape character type, and the Rossie Moor sub-area, in which the site is located, as being suitable locations for a wind turbine of this scale.

To summarise, there is a very clear consensus within the following documents that the chosen site is in one of the best parts of Angus for a wind turbine of the scale proposed:

- Angus Local Plan Review (in particular pages 94-97)
- Angus Council, *'Implementation Guide for Renewable Energy Proposals'* (June 2012) (in particular, page 48)
- Ironside Farrar for Angus Council, *'Strategic Landscape Capacity Assessment for Wind Energy in Angus'* (2014) (in particular page 67)

The planning system in Scotland is 'plan led' and the applicant has designed the proposal to accord with the development plan and the guidance listed above so that the policy vision set out by Angus Council can be delivered.

Impacts on Amenity and Distances to Dwellings

The project will provide substantial separation distances to nearby dwellings. These distances will be in excess of those provided at comparable projects nearby (please refer to '*Table 2: Separation distances to closest dwellings for comparable nearby projects'* in the following section of this report for further details). These large separation distances ensure easy compliance with noise limits and reduce visual amenity effects upon nearby dwellings and their settings.
When considered together with the aesthetically pleasing turbine design chosen (details given elsewhere in this report) it is clear that the siting and appearance of the turbine has been chosen to minimise impacts on amenity.

Improvements over Previous Wind Turbine Proposal at Bolshan Farm

A previous planning application for a wind turbine on the farm, with a different turbine position (application 13/00887/FULL) was withdrawn in January 2014. This application was handled by a different agent. Subsequently pre-application discussions with the planning authority were entered into during summer 2014 by the previous agent. The understanding acquired during this process helped The Greenspan Agency design the current scheme. The new turbine position and turbine design offer the following key benefits over the previous application:

- A turbine with more balanced proportions giving a more aesthetically pleasing design
- Increased separation distances to the nearest dwelling
- Significantly shallower viewing angle gradients to the top of the turbine from the nearest dwelling
- The turbine is no-longer on the ridgeline
- Separation from the Kinnell airfield second world war historic site and its extended component parts
- Less disturbance of vegetation and buildings with potential ecological value.
- Greater separation distance to Braikie Castle, with no views of the turbine expected from the castle.
- The new turbine position is over 2km from the nearest settlement as allocated in the local plan (Kinnell) and as such complies with spatial guidance set out in the SPP and emerging Local Development Plan.

Further discussion of the previous project and the design process is given in the 'Design Stage and Early Planning Work' chapter of this report, below.

Turbine and Generation

The 79.6m turbine is expected to provide clean energy sufficient to power the equivalent of at least 424 domestic homes (based on Ofgem average annual domestic electricity consumption of 3.3MWh per household [2)]. The 2011 census data shows that there were 425 households in Friockheim. Therefore, the electricity produced by the wind turbine at Bolshan could provide for all domestic users in a settlement the size of Friockheim. This is a substantial environmental benefit.

Carbon Payback

The carbon dioxide generated in the turbine's manufacture and construction will be paid back in around 6 months and the carbon footprint of electricity generated using wind is 215 times less than that of conventional coal powered generation.

Need for Renewables

There is a scientific consensus that the increase in greenhouse gases in the atmosphere is causing global average temperatures to rise. This has wide-spread adverse effects including those on habitats, landscapes, the historic environment, sea levels and human populations. The proposed development will help address these problems.

Historic Environment

There will be no direct effects on historic sites or known archaeological remains. Any indirect effects that may be caused are considered to be acceptable. In particular, a historic site close to the previously applied for turbine position will be avoided, and views from the nearest Scheduled Ancient Monument (Braikie Castle) are expected to be entirely screened.

Social and Economic Benefits

Locally owned renewable projects offer very important economic benefits. The proposed turbine constitutes a valuable rural diversification project and will enhance the viability of other activities undertaken at Bolshan Farm.

Ecology

The ecological assessment has found that there will be negligible impact on birds, mammals, and designated sites.

Noise

All noise levels at nearby properties will be within ETSU guidelines. Given the ample separation distances to nearby dwellings no background noise survey was required and the suitability of the site in noise terms can be very clearly demonstrated using a 'simple limits' approach.

Microwave and Radar

The proposed turbine is not expected to interfere with microwave communications links or aviation radar.

Effectiveness of Wind Energy

Concerns over the intermittency of wind energy are poorly grounded and distributed generation is an effective way of generating electricity.

Energy Security

Finite energy sources, by their very nature, do not last. In order to secure energy supply into the future, the use of renewable energy must increase.

Planning Assessment

The proposal has been found to be in accordance with the development plan and as such should receive planning permission.

[2]https://www.ofgem.gov.uk/publications-and-updates/typical-domestic-consumption-values-gas-and-electricity

3. Design Stage and Early Planning Work

3.1 Previous Application

A planning application for a wind turbine at Bolshan Farm was originally submitted in September 2013 (Application Ref: 13/00887/FULL). This turbine was at a different location to the one now proposed and the turbine model also differed. The turbine has now moved 422m to the north-east (see below). The previous application was withdrawn in January 2014. The Greenspan Agency was not the agent for that planning application and the applicant was 'Messrs G & W Smith'. The Smith family, who own Bolshan Farm, are still involved in the project, but now as part of a joint venture with Greenspan Energy Limited.

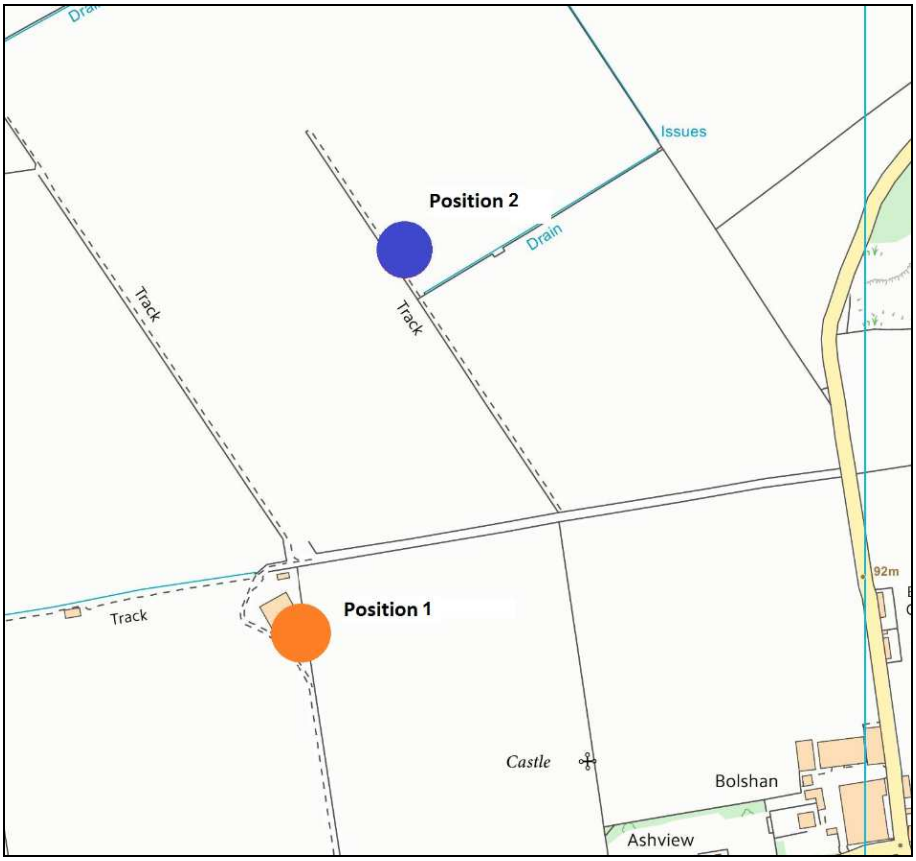


Figure 4: Original and New Turbine Positions
The turbine position for application 13/00887/FULL is shown by the annotation 'position 1'.
The new turbine position applied for under the current application is annotated 'position 2'.

While the precise details of the consultation responses received by the Council can only be understood by reference to the original responses, the following summary can be given of the responses received by the Council in respect of the earlier planning application.

Table 1: Summary of Consultee Responses to Previous Wind turbine Planning Application (13/00887/FULL)

Consultee	Response Date	Response
Ofcom	08/10/2013	No Objection
Atkins Global	09/10/2013	No Objection
JRC	10/10/2013	No Objection
Environmental Health Officer, Angus Council	11/10/2013	No Objection
NATS	23/10/2013	No Objection
Transport Planning, Angus Council	23/10/2013	No Objection
Scottish Water	23/10/2013	No Objection
SNH	24/10/2013	No Objection

The consultations responses for the previous application summarised above are very encouraging and point to Bolshan Farm being a very good site for wind turbine development.

The planning application now prepared builds upon information gathered during a pre-application consultation carried out during June 2014 by the previous agent, A. Craig. Feedback was provided by the Council's Countryside Officer and from the Case Officer (James Wright) to the agent within an email dated 30 June 2014. In this email the prospect of the turbine being reduced to 61m in height was discussed, together with some other landscape considerations. Key points made by Mr Wright in this email which the new project responds to include:

1. Reducing the turbine tip would result in a turbine design with a large rotor and short tower which would not have pleasing proportions.

2. The turbine position within 500m of the nearest dwelling was a concern

3. The ridgeline location was not favoured by the planning officer and countryside officer

4. The low height of the turbine blade above the ground (9m) as the blade rotated would lead to unfavourable comparisons with the scale of nearby trees.

In respect of points 1-4 the new turbine proposal provides the following benefits over the previous design:

1. The proportions of the turbine are more favourable. The proposed Enercon E48 uses a 48m blade diameter and a 55m tower. This provides a balanced turbine with aesthetically pleasing proportions. The proposed turbine model is also known for its elegant curved profile (please refer to photo of turbine on preceding pages).

2. The new turbine position provides greater separation distances to nearby dwellings (623m instead of 478m[3], giving a 145m increase in separation distance to the nearest dwelling). The new separation distance is significantly in excess of the 500m distance mentioned by the planning officer in his email of 30 June 2014. The elevation of the turbine base has also dropped from 78m AOD to 65m AOD, a change of 13m. These factors combine to reduce the visual impact of the turbine on nearby dwellings. The gradient of the view to the top of the turbine now proposed is much less steep than the previous viewing angle. That is, the new turbine tip is at a gradient of 1 in 12 from the nearest dwelling, while the previous application as originally proposed with a 77m turbine has a 1 in 6.6 gradient, reduced to 1 in 8.5 when the revised tip height of 61m was suggested. Please refer to the 'Nearby Dwellings' section of the Landscape and Visual Impact Assessment Chapter of this report for further details and illustrations.

3. The turbine has been moved down from the ridgeline.

[3] The distance to the nearest property at Doonbye was stated as 495.6 in the original noise assessment carried out by the previous agent but has been measured at 478m to the nearest façade by The Greenspan Agency using goreferenced 1:10,000 OS map data.

4. With the new turbine model the turbine blade will be 31m from the ground at its lowest point. This avoids the comparison with trees in the area. There are also fewer trees adjacent to the new turbine position.

Other planning benefits of the new turbine position include:

5. Separation from the Kinnell airfield second world war historic site and its extended component parts

6. Less disturbance of vegetation and buildings with potential ecological value.

7. Even lower noise levels at nearby dwellings.

8. Greater separation distance to Braikie Castle.

9. The new turbine position is over 2km from the nearest settlement as allocated in the local plan (Kinnell) and as such complies with spatial guidance set out in the SPP and emerging Local Development Plan.

The Greenspan Agency typically carries out extensive pre-application consultation with consultees and the planning authority prior to the submission of a planning application. However, in this case, because of the extent of useful information gathered during the application process for the previous project, it was not thought necessary to re-enter detailed pre-application consultation.

3.2 Comparison with Similar Projects Nearby

The distances between the proposed turbine and the nearest dwellings at this site compare very favourably with other comparable projects in the local area:

Table 2: Separation distances to closest dwellings for comparable nearby projects
(listed by increasing separation distance)

Project	***App Ref***	***Closest Dwelling***	***Planning status***	***Decision Date***	***Turbine Height to tip (m)***	***Distance from Bolshan turbine***
Hatton, Kinnell	12/00732/FULL	410	Refused	May 2013	77	2.3
Bolshan (withdrawn application)	13/00887/FULL	495	Withdrawn		77	0.4
Renmure	12/00632/FULL	558	Refused	June 2013 Nov 2013 (LRB)	77	3.7
Pickerton Farm, Guthrie	12/00365/FULL 11/00940/FULL	601	Approved	Oct 2012	77 (previous withdrawn app was for 86.5m)	5.0
Bolshan (new application)	**No reference number yet**	**623**	**-**	**-**	**79**	**0**
Stracathro (Greenspan)	12/00808/FULL	626	Approved	Jan 2013	79	11.6

The Greenspan Agency has sought to provide large separation distances to dwellings for the new Bolshan turbine application. The distance to the nearest property for the new Bolshan application would be almost identical to the distance for the Stracathro Greenspan Agency project which is operating successfully elsewhere in Angus and has the largest separation distances listed above.

In summary, although a modest (2.5metre) increase in turbine tip is now proposed, compared with the original 77m tip suggested in the original application, the new turbine location, preferable turbine design, and large separation distances to nearby dwellings, means that key visual and landscape effects are lessened and other significant planning improvements can be made.

4. The Need for Renewable Energy

Four key arguments in support of the Bolshan Renewables Project are presented here. Firstly, the need to combat climate change; secondly, the long term requirement to derive energy from a perpetually renewable source in a way that ensures security of energy supply in the future; thirdly, the need to improve the environmental and financial sustainability of the farming business. Finally, a case for wind energy is also presented.

4.1. Climate Change

The global climate is changing as a result of human activities. The UN's Intergovernmental Panel on Climate Change (IPCC) published *'the most comprehensive and up-to-date reports on the subject'*[4] in their key landmark publication 'Climate Change 2007: Synthesis Report', the IPCC stated that there is "unequivocal"[5] evidence that the earth's temperature is warming, and that Greenhouse gas concentrations are now much higher than pre-industrial levels. They concluded with a high degree of certainty that the two are connected:

> *"Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic GHG [greenhouse gas] concentrations"*[6].

The IPCC report mentions many impacts of climate change. The following are of particular relevance to the UK:

- Extremes in weather, bringing increased frequency of damaging incidents such as severe storms and drought.
- Rising sea levels as a result of melting ice caps and flooding of many coastal areas.
- Acidification of the seas and resultant impacts on sea life.

The Working Group contribution to the IPCC's Fifth Assessment Report (AR5) considered new evidence of climate change to build on AR4. Their findings 'Climate Change 2013 The Physical Science Basis' were released in September 2013[7]. A key finding of the report is that global warming is likely to surpass the previously recognised danger threshold of a 2C average increase in temperature.

> *"Human influence has been detected in warming of the atmosphere and the ocean, in changes in the global water cycle, in reductions in snow and ice, in global mean sea level rise, and in changes in some climate extremes. This evidence for human influence has grown since AR4. It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century.*
>
> *"Continued emissions of greenhouse gases will cause further warming and changes in all components of the climate system. Limiting climate change will require substantial and sustained reductions of greenhouse gas emissions."*

[4] IPCC, 2007: *Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland.

[5] Summary for Policy Makers, Page 2. IPCC, 2007: *Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland.

[6] Summary for Policy Makers, Page 4. IPCC, 2007: *Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland.

[7] Intergovernment Panel on Climate Change (2013) *Climate Change 2013: The Physical Science Basis* [Online] Available: http://www.ipcc.ch/report/ar5/wg1/#.Uk59g9IkEUU

In addition, Scottish Natural Heritage mentions the following problems associated with climate change on their website[8]:

- Eradication of some species and the introduction of others which may become problem invasive species.
- Loss of Habitats, "Climate change is the single greatest threat to Scotland's habitats"
- Changes to soil formation and the ability of soils to support ecosystems. Coupled with changing land use practices this *"will have impacts on the character of Scotland's landscapes"*.
- Changes to the climate will effect 'dynamic environments' reliant on the interaction of flooding and deposition with knock-on effects for habitat quality.

In 2009 Scottish Natural Heritage published *'Climate Change and the Natural Heritage SNH's Approach and Action Plan*'. The document states:

> *"SNH views climate change as the most serious threat over coming decades to Scotland's natural heritage." (Page 1)*

In addition to impacts on the natural world, the human cost of climate change is already being felt. The Global Humanitarian Forum have calculated the number of fatalities already attributable to climate change in their 2009 publication *'Climate Change - The Anatomy of a Silent Crisis'.* The report concludes that "About 315,000 deaths per year" were attributable to climate change in the period 2004-2008[9].

It is clear from current national renewable energy policy that the Scottish Government is committed to tackling climate change. This is demonstrated by the passing of the Climate Change (Scotland) Act, 2009; the publication of the National Planning Framework for Scotland (NPF2), 2009; and the Scottish Climate Change Programme.

Part 1 of the Climate Change (Scotland) Act 2009 creates the statutory framework for greenhouse gas emissions reductions in Scotland by setting an interim 42% reduction target for 2020, with the power for this to be varied based on expert advice, and an 80% reduction target for 2050. To help ensure the delivery of these targets, this part of the Act also requires that the Scottish Ministers set annual targets, in secondary legislation, for Scottish emissions from 2010 to 2050.

The move to clean renewable energy is absolutely necessary if climate change is to be controlled and the proposed wind turbine forming the Bolshan Renewables Project are exactly the type of energy generation required.

4.2. Sustainable Development and Energy Security

Finite Hydrocarbon Fuels

Non-renewable electricity generation from Coal or Gas fired power stations relies on finite resources that cannot be replenished and will ultimately be exhausted. This has consequences for securing energy supply, and results in economic impacts such as rising oil prices due to the changing relationship between supply and demand.

Many of the remaining fossil fuel reserves such as deepwater oil wells, tar sands and gas shale have a higher economic cost associated with them. However, the cost of developing these finite reserves can be measured not only in high economic terms, but in severe environmental consequences as well, as demonstrated by the recent *Deepwater Horizon* oil disaster.

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[8] Scottish Natural Heritage, (2015) *Effects on nature and landscapes* [Online] Available: http://www.snh.gov.uk/climate-change/impacts-in-scotland/effects/species/
http://www.snh.gov.uk/climate-change/impacts-in-scotland/effects/habitats/
http://www.snh.gov.uk/climate-change/impacts-in-scotland/effects/geology-soil-and-landscapes/

[9] Global Humanitarian Forum (2009), 'Human Impact Report, Climate Change – The Anatomy of a Silent Crisis' [Online] Available: http://www.eird.org/publicaciones/humanimpactreport.pdf, page 11.

Having been self-sufficient in gas as recently as 8 years ago the UK now imports 40% of its gas requirements[10]. This makes us vulnerable to international markets for this finite commodity.

Changing the Energy Supply Mix

Compared to the rest of the UK, Scotland has made good progress towards increasing the percentage of our electricity produced from renewable sources. Renewable sources delivered 44.4% of gross electricity consumption in 2013 – up from 38.8% in 2012[11]. However electricity generation is but one part of total energy use. Results published in 2015 suggest energy use per sector was as follows: "55% heat; 24% transport; and 21% electricity" Scottish Government 2015[12]. To illustrate the scale of the challenge: If around 40% of electricity is from renewables, we are only 10% of the way to 100% decarbonised energy use in Scotland.

As transport and heat generation are made more sustainable, electricity will need to step in and make a greater contribution to powering these sectors. Even with efficiency savings, the use of electricity is expected to grow, as the UK government have recently explained: *"even as we improve energy efficiency, demand for electricity may need to double by 2050 – as decarbonisation of the economy means that electricity provides more of our heating and transport needs"*[13]

Given the above, it is clear that the shift to renewables is a pressing and significant issue and the process has only just begun. Overall as a country, a move towards a low carbon economy is essential, with less focus on the dwindling supplies of native fossil fuels or the ever more expensive and insecure imported fuels. To fulfil this, a focus on sustainable, long term, renewable energy supplies that are produced in the UK is crucial. As wind energy is one of the few viable renewable energy sources currently available, this will necessitate an increase in wind turbine developments, both onshore and offshore.

The proposed Bolshan Renewables Project will export electricity for distribution through the national grid. This contributes to the nation's energy security and does so in a clean and sustainable way which reduces the environmental impact of energy generation.

4.3. Sustainability of the farming business

The development of a wind turbine at Bolshan would lead to an additional sustainable source of income for the farming business. A farming business is susceptible to many external factors such as weather conditions, market prices, exchange rates and operational costs. This has prompted the exploration of alternative sources of income for the farming business. The proposed wind turbine will provide a source of additional income over the 25 years of expected operation. The proposed wind turbine will provide an income stream that is separate from the aforementioned factors and demonstrates best practice in diversification. The turbine will have a minimal footprint, and allow for the continuation of current farming operations.

The main objectives of the proposed diversification are as follows:

- To increase direct business revenue and thus support the continued viability of the existing farming business;
- To promote the use of renewable energy generation in the area and contribute towards achieving national and regional renewable energy targets;
- To improve marketability of food produce to suppliers through improved environmental sustainability;
- To support existing employment;
- To provide renewable energy to indirectly offset current electricity demand;

[10] International Energy Agency (2011) *'Gas Emergency Policy: Where Do IEA Countries Stand?*' Paris: IEA, page 5.
[11] Scottish Government (2015) *Energy in Scotland*[Online] Available: http://www.gov.scot/Topics/Statistics/Browse/Business/Energy/EIS2015
[12] Scottish Government (2008) '*Making Scotland a Leader in Green Energy*', Edinburgh: Scottish Government, page 19.
[13] Department of Energy and Climate Change (2010) '*Consultation on Electricity Market Reform',* London: DECC, page 4.

- To reduce the overall carbon footprint of the farm through offsetting energy usage; and
- To spread the farmer's risk into a non-agricultural sector.

4.4. National Renewable Energy Policy Response

The Scottish Government has adapted policy in response to the challenges of climate change and the need for a sustainable renewable energy supply.

It is clear from current national renewable energy policy that the Scottish Government is committed to tackling climate change, moving towards a zero-waste Scotland, and increasing the use of renewable energy. This is demonstrated by the passing of the Climate Change (Scotland) Act, 2009; the publication of the National Planning Framework for Scotland (NPF2), 2009; and the Scottish Climate Change Programme. Scotland has now set ambitious targets for the percentage of electricity that must come from renewable sources, announcing increases in November 2007, September 2010 and May 2011.

Part 1 of the Climate Change (Scotland) Act 2009 creates the statutory framework for greenhouse gas emissions reductions in Scotland by setting an interim 42 per cent reduction target for 2020, with the power for this to be varied based on expert advice, and an 80 per cent reduction target for 2050. To help ensure the delivery of these targets, this part of the Act also requires that the Scottish Ministers set annual targets, in secondary legislation, for Scottish emissions from 2010 to 2050.

The Scottish Government is committed to promoting the increased use of renewable energy sources. This commitment recognises renewables' potential to support economic growth.

The renewable energy industry provides new opportunities to enhance our manufacturing capacity and to provide new employment, not least in remote and rural areas. This Government has set clear targets for renewable electricity. The Government wants renewable sources to generate the equivalent of 100 per cent of Scotland's gross annual electricity consumption by 2020[14]. Similarly, a target has been set for renewables sources to provide the equivalent of 11 per cent of Scotland's heat demand by 2020.

> *"The Scottish Ministers are fully committed to increasing the amount of electricity generated from renewable energy sources. This commitment recognises the ability of renewable energy to contribute to secure and diverse energy supplies; tackle the causes of climate change; and its potential to support economic growth. The Executive's strategy for renewable energy is set out in Securing a Renewable Future: Scotland's Renewable Energy[15]."*

The approved 2012 TAYplan aims to contribute towards greater regional energy self-sufficiency. It suggests that the issue is no longer whether renewable energy infrastructure is needed, but instead helping to ensure it is delivered in the right places. Well-sited proposals such as the Bolshan Renewables Project will be necessary if this aim is to be achieved.

4.5. Wind Energy

Onshore wind energy is, and will continue to be, a major contributor towards meeting our renewable energy targets. Although wind energy cannot meet Scotland's full renewable commitment alone (especially as this commitment increases in the future), it is the most technologically mature and proven form of renewable energy generation. Locally owned developments are a perfect example of how to harness renewable energy, whilst providing economic and employment benefits to the local area.

[14] Scottish Government (2011) *2020 Routemap for Renewable Energy in Scotland*, Edinburgh: Scottish Government

[15] Securing a Renewable Future: Scotland's Renewable Energy, Ross Finnie MSP, The Scottish Executive.

Distributed Generation

Small wind developments enable the harnessing of Scotland's considerable wind resource, whilst providing minimal noise and visual disturbance. This form of decentralised energy generation allows energy to be used close to where it is generated, utilising the existing distribution network and minimising transmission losses.

This approach minimises the need for large sections of new high voltage electricity pylons, which would transport the power large distances to the hubs, which are generally a requirement for large power stations.

Intermittency Facts

Opponents of wind power often quote 'intermittency' as a major drawback of this technology. Despite the variability of wind conditions at wind farm sites, turbines in Scotland typically have a capacity factor in the order of 30% and generate electricity for at least 80% of the time, in a year of average winds. In this regard, wind turbine developments should be described as 'variable' generators of electricity. Several facts regarding the variability of wind power and its impact on the UK electricity distribution system are provided below. These points are discussed in greater detail by the National Grid (2009)[16], BWEA (2009)[17] and Pöyry (2009). UK electricity networks are designed to cope with generation outages or 'shocks', such as the sudden loss of large thermal power stations and with uncertainties in consumer demand.

All types of electricity generation require backup, not just wind. For example during the winter of 2008/09, at the time of peak demand, the metered wind electricity production was about 18% of its rated output. However, about 5000 MW of nuclear output was unavailable for various reasons – nearly 50% of the total. All electricity consumers were kept online during this event because a common pool of backup capacity (operational reserve) is always available for such a crisis.

It is extremely unlikely that 1000 MW of dispersed wind will disappear instantaneously across the whole country. As wind capacity increases, the increased geographical spread reduces the variability of generation, and so sudden changes in wind output across the whole country do not occur. This is known as "aggregation", which evens out all of the UK's wind generation fluctuations to a manageable average, with lower standard deviations. The National Grid already uses this aggregation tool every day for balancing energy supply and demand, so the addition of wind generation to the supply network will have no effect on distribution management practice.

The amount of operational reserve does not have to grow significantly to accommodate wind power. Modelling carried out by Pöyry Energy Consulting[18], the leading advisor to Europe's energy markets, showed that power response requirements did not appear to grow significantly in the British market due to wind capacity increase. The majority of increase in response requirements was due to accounting for the commissioning of new nuclear power stations, which are prone to unexpected faults and will raise operational reserve requirements. Pöyry concluded that the necessary increase in reserve capacity for accommodating wind and nuclear energy "do not appear to be critical issues for the British market."

The cost to the consumer of integrating the variable generation of wind farms is likely to be only 1% on annual domestic bills. The cost of creating extra reserves for wind power providing 20% of electricity consumption is unlikely to be no more than £1.20/MWh on electricity bills (a little over 1% on domestic bills). With 40% of electricity provided by wind, the corresponding figure would be £2.8/MWh. If wind provides 22% of electricity by 2020 (as Government modelling suggests), variability costs would increase the domestic electricity by about 2%.

The decommissioning of old nuclear facilities and the construction and integration of new ones, as well as disposing of dangerous spent nuclear fuel cells, has a much greater likelihood of being more costly to the average domestic consumer. The current estimate is that clean-up costs across the UK will be in excess of £115 billion spread over the next 120 years or so. In reality, taking account of numerous uncertainties, the range is likely to be somewhere between £90 billion and £220 billion[19]. For wind energy the current estimate is £120 million based on typical values of £15K per MW installed to cover the cost of breaking out foundations to c. 1m below ground level, some track reinstatement and removal of cables and

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[16] *National Grid (2009) Operating the system beyond 2020 [Online] Available:* http://www.nationalgrid.com/NR/rdonlyres/32879A26-D6F2-4D82-9441-40FB2B0E2E0C/39517/Operatingin2020Consulation1.pdf

[17] *British Wind Energy Association (2009) Managing Variability [Online] Available:* http://assets.wwf.org.uk/downloads/managing_variability_report.pdf

[18] *Intermittency – How wind variability could shape British and Irish energy markets. July 2009.* http://www.ilexenergy.com/pages/Documents/Reports/Renewables/Intermittency%20Public%20Report%202_0.pdf

[19] *Nuclear Provision – explain the cost of cleaning up Britain's nuclear legacy. Nuclear Decommission Authority. February 2015*

substations. The dismantling of the turbines is assumed to be paid for by the monies recovered from onward sale or scrap value of the components[20].

Carbon Footprint

The Parliamentary Office of Science and Technology (2006)[21] researched the carbon footprints of all electricity generators, accounting not only for their operation but also for their extraction, construction, maintenance and decommissioning. They found that the electricity generated from wind energy has one of the lowest carbon footprints. As with other low carbon technologies, nearly all the emissions occur during the manufacturing and construction phases, arising from the production of steel for the tower, concrete for the foundations and epoxy/fibreglass for the rotor blades. These account for 98% of the total life-cycle CO_2 emissions. Emissions generated during operation of wind turbines arise from routine maintenance inspection trips. This includes lubricants and transport.

Life cycle assessment shows that the carbon footprint of onshore wind is 4.64 g CO_2eq/kWh. The emissions generated by conventional coal combustion systems are >1,000 g CO_2eq/kWh, *at least 215 times greater.* The average wind turbine in Scotland will pay back the energy used in its manufacture within six months, and over its lifetime a wind turbine will produce over 49 times more energy than was used in its manufacture. Wind energy not only achieves carbon payback within a few months of installation but does so from a fuel that is free and inexhaustible. It is estimated that the Bolshan Renewables Project will avoid 906 metric tons of CO_2 eq emissions each year[22].

4.6. Generation in terms of 'Households Equivalent'

The 79.6m turbine is expected to provide clean energy sufficient to power the equivalent of approximately 424 domestic homes (based on Ofgem average annual domestic electricity consumption of 3.3MWh[23] per household). 2011 census data shows that there were 425 households in Friockheim. The electricity produced by the wind turbine at Bolshan could provide for a settlement the size of Friockheim. This is a substantial environmental benefit.

[20] *Research and guidance on restoration and decommissioning of onshore wind farms. Scottish natural Heritage Commissioned Report No. 591*

[21] *Parliamentary Office of Science and Technology (2006) Carbon footprint of electricity generation Issue 268.*

[22] *http://www.epa.gov/cleanenergy/energy-resources/calculator.html#results*

[23] https://www.ofgem.gov.uk/publications-and-updates/typical-domestic-consumption-values-gas-and-electricity

5. Social and Economic Assessment

5.1 Locally Owned Renewable Energy & Rural Diversification

As a joint venture with the farm owners, rather than a land rental agreement, this project will have a particular economic benefit to the local area.

Substantial revenues from the turbine are likely to be spent improving and enhancing the farm. This safeguards and increases local employment, and provides knock on benefits through orders for construction, equipment and many other services. The multiplier effect then comes into play, as the wages of those employed by the farm, or anyone who provides equipment or services as a result of the development, are spent in local shops and the myriad of other businesses in the area. Due to this, the benefit of the revenue spreads out within the immediate area, significantly enhancing the local economy and encouraging local jobs.

Compelling evidence of the economic importance of locally owned wind power has been demonstrated in *'The economic benefits of on-farm wind energy clusters in Aberdeenshire'* (2010) published by SAC Consulting. Even though this study was based in Aberdeenshire, its conclusions are also applicable to Angus. Its findings are outlined in the paragraph quoted below:

> *"On farm wind power generation represents a major opportunity to support rural incomes and employment in Aberdeenshire. These benefits are greatest where projects are locally owned and managed. Expected reductions in agricultural support under CAP reform represent a serious threat to the long term viability of farms and rural businesses in Aberdeenshire. Locally developed wind power projects offer the potential to support incomes and jobs in rural Aberdeenshire for decades to come."*

The Scottish Government's *'2020 Routemap for Renewable Energy in Scotland'* (July 2011), presents several targets in order to help Scotland meet the Government's overarching target of renewable energy generation equivalent to 100% of demand. The document highlights the importance of locally owned projects and announces a target of *"500 MW community and locally owned renewable energy by 2020"*[24].

According to the National Farmers Union, the UK's rural economy is worth £300 billion and supports 5.5 million people[25].

5.2 Public Perception

In 2003 the Scottish Executive commissioned MORI Scotland to conduct survey research among people living close to Scotland's operational wind farms[26]. A total of 1,810 adults were interviewed and all respondents lived within a 20km zone of all operational wind farms that had 9 or more turbines. The survey found high levels of acceptance and overwhelming support for wind power. The vast majority of people living within 5km of the turbines felt the turbines had had a positive effect (45% were for turbines, compared to 6% against, with the rest not responding or having no definite opinion). The results of this survey match that of an earlier Scottish Executive survey 'Public attitudes to the Environment in Scotland 2002' which found that the Scottish public would prefer the majority of their electricity to come from renewables, and rated wind power as the cleanest source of renewables.

More recent evidence shows that prevailing public perception of wind turbines remains positive. For example, a poll published by YouGov (http://today.yougov.co.uk), on behalf of Scottish Renewables, suggested that people are becoming increasingly supportive of wind farms as they become more common across the country. Poll fieldwork was carried out between 31 August and 2 September 2010, with a representative sample size of 1001 Scottish adults (aged 18+). More than three-quarters of all Scots supported the development of wind farms and 78% of those surveyed agreed that "wind farms are necessary so that we can produce renewable energy to help us meet current future energy needs in Scotland" –

[24] Scottish Government (2011) '*2020 Routemap for Renewable Energy in Scotland*', Edinburgh: Scottish Government, page 4.
[25] National Farmers Union (2009) '*Why Farming Matters More Than Ever*', Warwickshire: National Farmers' Union
[26] MORI Scotland (2003) '*A study examining the attitudes of people living close to windfarms in Scotland*' [Online] Available: http://www.scotland.gov.uk/Publications/2003/08/18050/25619

up from the 73% for this statement five years before. On 13 December 2011 a poll commissioned by the Sunday Times and carried out by YouGov shows 56% of public support for the expansion of wind energy, with only 19% against.[27]

Another poll by YouGov, on behalf of Scottish Renewables, published in 2013[28] sampled the opinion of 1,003 Scottish adults and asked 'to what extent do you agree or disagree with the following statement. "I support the continuing development of wind power as part of a mix of renewable and conventional forms of electricity generation"'. 64% of the responses agreed with this statement – this was actually higher in North East Scotland where 73% agreed with the statement. The Department of Energy & Climate change have published similar findings[29] indicating that 64% of 2,110 households surveyed support onshore wind development.

These findings do suggest that there is strong support for onshore wind development in Scotland, despite the frequent misgivings given by a vocal minority of opponents. The majority of people clearly understand the need for more renewable energy to tackle climate change and realise the social, economic and environmental benefits that these technologies can provide.

5.3 Construction Phase Benefits

The construction of the proposal would represent a large investment in the local area. The installed cost of two wind turbines of the model proposed is approximately £1,200,000. Of this sum, over £200,000 may be typically spent in the locality of the project, with a range of contracts being placed with electrical and civil engineering companies. The applicant wishes local contractors to benefit from as much of this as possible.

Smaller distributed generation projects, such as the proposed turbine, often provide more local benefits during construction because they are of a manageable scale for local contractors.

[27] Sunday Times (2011) *YouGov poll commissioned by the Sunday Times* [Online] Available: http://cdn.yougov.com/cumulus_uploads/document/gm4jg0973n/Sunday%20Times%20Results%20111125%20VI%20and%20Trackers.pdf

[28] YouGov/ Scottish Renewables (2013) *Survey Report* [Online] Available: http://d25d2506sfb94s.cloudfront.net/cumulus_uploads/document/vj66wakgzm/YG-Scottish-Renewables-Archive-results-260213-renewable-energy.pdf

[29] Department of Energy and Climate Change (2014) *Public attitudes tracking survey: wave 8* [Online] Available: https://www.gov.uk/government/publications/public-attitudes-tracking-survey-wave-8

6. Planning Statement

6.1. Introduction

This planning statement has been prepared by The Greenspan Agency to accompany a planning application for one wind turbine (79.6m to blade tip) plus associated hardstanding, foundation and service track on land at Bolshan Farm, Angus.

The applicant (Bolshan Renewables Limited) and the agent (The Greenspan Agency) have worked from the outset to design a development proposal which accords with the development plan and is acceptable given all material considerations.

The planning application must be determined in accordance with the statutory planning process and relevant policy. This chapter sets out the relevant planning policies before assessing whether the proposal should receive planning permission. It is split into the following sections:

- Legislative Framework
- Planning History and Current Uses
- Pre-application Consultations
- Relevant Planning Policy
- Planning Assessment
- Conclusions

Having considered relevant planning policy, other material considerations, and the findings set out elsewhere in the Environmental Report, this Planning Statement concludes that the proposal should be granted planning permission.

6.2. Legislative Framework

Planning etc. (Scotland) Act 2006

The 2006 planning act places 'sustainable development' at the heart of the planning system as the overriding aim planning authorities and the Scottish Government should have when preparing their respective Development Plans and National Planning Framework. For the purposes of this section of the act 'sustainable development' is defined in the Scottish Planning Policy document and this is expanded upon in the 'national policy' section of this planning statement.

Climate Change Legislation

The Climate Change (Scotland) Act 2009 sets targets for the reduction in CO_2 and other greenhouse gases (GHGs). The aim is to reduce CO_2 emissions by 80% by 2050, and by 42% by 2020, and to meet interim targets in the run-up to these dates. The legislation sets similarly ambitious targets for other GHGs. These targets are emphasised within the planning system by reference to them throughout the SPP document (Scottish Government, June 2014). Paragraph 19 of the SPP for example notes that "*planning can support the transformational change required to meet emission reduction targets and influence climate change. Planning can also influence people's choices to reduce the environmental impacts of consumption and production, particularly through energy efficiency and the reduction of waste*"[30].

Hierarchy of Development Regulations

The proposal is for a 'local development' in the terms set out in 'The Town and Country Planning (Hierarchy of Developments) (Scotland) Regulations 2009'.

Section 4 of the schedule attached to the regulations states that an electricity generating station, the capacity of which is 20MW or greater, is a 'major' development. As this is a development proposal seeking permission for 0.5MW of generation this would be classed as a 'local' development.

[30] Page 7, Scottish Government (2014) *Scottish Planning Policy* [Online] Available: http://www.scotland.gov.uk/Resource/0045/00453827.pdf

6.3. Planning History & Current Uses

The site is currently in agricultural use.

Original Turbine Application at Bolshan Farm (13/00887/FULL)

This planning application was submitted in September 2013. A turbine up to 77metres to tip was proposed at a site 422m south-west of the turbine position now proposed. Further details are given in the 'Design Stage and Early Planning Work' chapter of this report. A number of improvements in planning terms are noted in that chapter and are reflected in the planning assessment later in this planning statement.

6.4. Pre-application Consultations

Please refer to the discussion of the previous application earlier in this report for a summary of consultation responses to the original turbine planning application.

6.5. Relevant Planning Policy

Development Plan

Strategic Development Plan

Approved Strategic Development Plan

The approved strategic development plan is the Tayplan (approved June 2012).

The vision for the strategic development plan area is given on page 6 of the Tayplan document. Both economic and environmental sustainability are featured in this statement and placed at the centre of the development plan by their inclusion in it.

> *"By 2032 the TAYplan region will be sustainable, more attractive, competitive and vibrant without creating an unacceptable burden on our planet"*

The Tayplan describes itself as *'A long term plan for Scotland's susTAYnable region',* with sustainability placed at the heart of policy.

Page 18 introduces the policy on renewable energy: *"This Plan seeks to reduce resource consumption through provision of energy and waste/resource management infrastructure … This requires us to use less energy and to generate more power and heat from renewable sources…"*

The key objectives set out on page 6 of the Tayplan include the statement: *"Promote prosperous and sustainable rural communities".*

Emerging Strategic Development Plan

A consultation on the proposed Strategic Development Plan is anticipated later in 2015.

Local Plan

Adopted

The current local plan is the 'Angus Local Plan Review', Adopted 2009.

Vision, Aims & Development Strategy

The aims of the Angus Local Plan Review are set out on page 6 of the document. 'Sustainable development' is stated as the core principle tying together all of these aims. The aims 'are based on broad themes of sustainable development which underpin the strategy and policies of this Plan' – p6.

Policies

The key local plan policies for the determination of planning applications for wind energy developments are ER34 and ER35, which merit being set out in full here:

> ***Policy ER34: Renewable Energy Developments***
> *Proposals for all forms of renewable energy development will be supported in principle and will be assessed against the following criteria:*
>
> *a) the siting and appearance of apparatus have been chosen to minimise the impact on amenity, while respecting operational efficiency;*
> *b) there will be no unacceptable adverse landscape and visual impacts having regard to landscape character, setting within the immediate and wider landscape, and sensitive viewpoints;*
> *c) the development will have no unacceptable detrimental effect on any sites designated for natural heritage, scientific, historic or archaeological reasons;*
> *d) no unacceptable environmental effects of transmission lines, within and beyond the site; and*
> *e) access for construction and maintenance traffic can be achieved without compromising road safety or causing unacceptable permanent and significant change to the environment and landscape.*
>
> ***Policy ER35: Wind Energy Development***
> *Wind energy developments must meet the requirements of Policy ER34 and also demonstrate:*
>
> *a) the reasons for site selection;*
> *b) that no wind turbines will cause unacceptable interference to birds, especially those that have statutory protection and are susceptible to disturbance, displacement or collision;*
> *c) there is no unacceptable detrimental effect on residential amenity, existing land uses or road safety by reason of shadow flicker, noise or reflected light;*
> *d) that no wind turbines will interfere with authorised aircraft activity;*
> *e) that no electromagnetic disturbance is likely to be caused by the proposal to any existing transmitting or receiving system, or (where such disturbances may be caused) that measures will be taken to minimise or remedy any such interference;*
> *f) that the proposal must be capable of co-existing with other existing or permitted wind energy developments in terms of cumulative impact particularly on visual amenity and landscape, including impacts from development in neighbouring local authority areas;*
> *g) a realistic means of achieving the removal of any apparatus when redundant and the restoration of the site are proposed.*

ER34 and ER35 are comprehensive policies. Other policies which could be relevant to this proposal largely expand upon issues already dealt with by one of the many sections of ER34 and ER35. Some of these other policies with relevance to matters considered in ER34 and ER35 include:

- Policy S6: Development Principles (and accompanying schedule)
- Policy ER1 : Natura 2000 and Ramsar Sites Policy ER2 : National Nature Reserves and Sites of Special Scientific Interest
- Policy ER16: Development Affecting the Setting of a Listed Building

Other local plan policies of some relevance to the proposal include:

- Policy SC19: Rural Employment (although the title of this policy highlights development that directly results in employment in rural areas, the policy also deals with the diversification of existing rural businesses).

Pages 94 – 97 of the Angus Local Plan Review (Adopted 2009) discuss requirements for the siting of wind energy developments and set out a landscape policy for wind turbines based on SNH landscape character areas and three different geographical areas within Angus. The Bolshan site is placed within geographic area number 2, 'Lowland and Hills'. This is the preferred location for wind energy development within Angus.

Material Considerations

Supplementary Planning Guidance

The following documents are discussed in more detail under the 'planning assessment' sub-heading below

- Angus Council, *'Implementation Guide for Renewable Energy Proposals'* (June 2012)
- Ironside Farrar for Angus Council, *'Strategic Landscape Capacity Assessment for Wind Energy in Angus'* (2014)

National Policy

The latest Scottish Planning Policy (SPP) was published in June 2014.

National planning policy in Scotland is driven by the following overarching vision:

> "*We live in a Scotland with a growing, low-carbon economy with progressively narrowing disparities in well-being and opportunity. It is growth that can be achieved whilst reducing emissions and which respects the quality of environment, place and life which makes our country so special. It is growth which increases solidarity – reducing inequalities between our regions. We live in sustainable, well-designed places and homes which meet our needs. We enjoy excellent transport and digital connections, internally and with the rest of the world.*"[31]

The planning system is outcomes led and has accordingly set four planning outcomes to achieve this vision. These are outlined within Table 3 below.

Table 3: Scottish Planning Outcomes[32]

Outcome No.	Outcome Name	Description
1	A successful, sustainable place	Supporting sustainable economic growth and regeneration, and the creation of well-designed, sustainable places.
2	A low carbon place	Reducing our carbon emissions and adapting to climate change
3	A natural, resilient place	Helping to protect and enhance our natural and cultural assets, and facilitating their sustainable use
4	A connected place	Supporting better transport and digital connectivity.

These outcomes set the tone and content of both the Scottish Planning Policy, and the National Planning Framework 3, which provides a framework for spatial development in Scotland.

Many aspects of these documents are relevant to the Bolshan Renewables Project; in particular outcomes 1, 2 and the overarching principle of sustainability. These are discussed below.

<u>Sustainability</u>

Sections 3E and 3D of the Planning Etc (Scotland) Act 2006 place a duty upon Scottish Ministers and Local Planning Authorities to prepare the national planning framework and development plans with the objective of contributing to

[31] Page 6, Scottish Government (2014) Scottish Planning Policy [Online] Available: http://www.scotland.gov.uk/Resource/0045/00453827.pdf
[32] Page 6-7, ibid

'sustainable development'. 'Sustainability' is now an overarching principle policy of the SPP. As such, and in line with the aforementioned requirement, there is now a "presumption in favour of development that contributes to sustainable development"[33]. According to the policy this means that "the planning system should support economically, environmentally and socially sustainable places by enabling development that balances the costs and benefits of a proposal over the longer term"[34]. A number of principles are set out within the policy to guide these decisions. This list includes, amongst others, supporting climate change mitigation.

Outcome 2: A Low Carbon Place

The National Planning Framework commits to taking action to help "generate the equivalent of 100% of Scotland's gross annual electricity consumption from renewable sources by 2020, with an interim target of 50% by 2015"[35], to deliver "500MW of community and locally-owned renewable energy"[36] and to achieve the ambitious climate change targets; the Climate Change (Scotland) Act 2009 sets a target of reducing greenhouse gas emissions by at least 80% by 2050, with an interim target of reducing emissions by at least 42% by 2020. The SPP notes that "efficient supply of low carbon and low cost heat and generation of heat and electricity from renewable energy course are vital to reducing greenhouse gas emissions and can create significant opportunities for communities".

Subject Policy: Heat and Electricity

In line with the above, the subject policy on Heat and Electricity of the SPP reiterates that planning should "support the transformational change to a low carbon economy, consistent with national objectives and targets"[37]; this includes an "equivalent of 100% of electricity demand from renewable sources by 2020"[38]. To deliver this emphasis is placed on ensuring development plans achieve "an area's full potential for electricity and heat from renewable sources". The SPP goes on to set out guidance on the preparation of local planning policy for wind energy developments, including the adoption of a spatial framework for onshore wind farms, and a set of considerations development management departments should include when assessing proposals for energy infrastructure. This list includes the scale of contribution to renewable energy generation targets, effect on greenhouse gas emissions, net economic benefit and cumulative impact. The latter is defined as including "existing developments of the kind proposed, those which have permission, and valid applications which have not been determined. The weight attached to undetermined applications should reflect their position in the application process"[39].

Outcome 1: A successful, sustainable place

Rural diversification remains a key theme underpinning Planning Outcome 1. The SPP for example notes that planning "has an important role in promoting strong, resilient and inclusive communities". This is reflected in the aspiration that planning should "encourage rural development that supports prosperous and sustainable communities and businesses whilst protecting and enhancing environmental quality"[40]. Additionally, the National Planning Framework makes a link between this and renewable energy developments. This states that "local and community ownership and small-scale generation can have a lasting impact on rural Scotland, building business and community resilience and providing alternative sources of income"[41]

Subject Policy: Promoting Rural Development

There is a subject policy on rural development linked with Planning Outcome 1 with the SPP. This reflects the importance planning has in rural areas and indicates that plans should set out a strategy which:

[33] Page 9, ibid
[34] ibid
[35] Page 68, Scottish Government (2014) National Planning Framework 3 [Online] Available: http://www.scotland.gov.uk/Resource/0045/00453683.pdf
[36] ibid
[37] Page 36, Scottish Government (2014) Scottish Planning Policy [Online] Available: http://www.scotland.gov.uk/Resource/0045/00453827.pdf
[38] Ibid
[39] Page 71, Ibid
[40] Page 21, Ibid
[41] Page 34, Scottish Government (2014) National Planning Framework 3 [Online] Available: http://www.scotland.gov.uk/Resource/0045/00453683.pdf

- "Reflects the development pressures, environmental assets, and economic needs of the area, reflecting the overarching aim of supporting **diversification and growth of the rural economy**";
- Promotes economic activity and diversification, including, where appropriate, sustainable development linked to tourism and leisure, forestry, farm and croft diversification and aquaculture, nature conservation, and **renewable energy developments**, while ensuring that the distinctive character of the area, the service function of small towns and natural and cultural heritage are protected and enhanced"[42].

A number of other points are made in relation to promoting rural development in spatial strategies relating to housing leisure and transport. Additionally, this states that development on prime agricultural land should not be permitted unless it is essential. Where the land is being used "for the generation of energy from a renewable source"[43] is an example given of an essential use.

Subject Policy: Onshore Wind

The SPP requires the preparation of spatial frameworks for onshore wind development but the Angus Local Plan Review, the 2014 capacity assessment, and the implementation guide (details above) pre-date the specific approach set out in the June 2014 SPP. However, reference to the spatial frameworks methodology table on page 39 of the SPP and to the previous documents above suggests that the turbine is within a 'group 3' area which is most suitable for wind turbine development. Specifically, it is not within any of the following:

- National Parks
- National Scenic Areas
- World Heritage Sites
- Natura 2000 and Ramsar
- SSSI
- National Nature Reserves
- Gardens and Designed Landscapes
- Historic Battlefields
- Areas of wild land identified by SNH
- Carbon rich soils, deep peat or priority peatland.
- Within 2km of an allocated settlement.

With reference to the final point on the list above, the image below has been prepared which shows a 2km buffer (red line) from the edge of Kinnell's settlement boundary, as specified in the adopted local plan (Kinnell being the nearest allocated settlement). The image shows that the turbine position now applied for is out-with this area, while the previous turbine position (application 13/00887/FULL) was within 2km of the settlement. This is yet another point on which the revised application improves upon the previous one.

[42] Page 22, Scottish Government (2014) Scottish Planning Policy [Online] Available: http://www.scotland.gov.uk/Resource/0045/00453827.pdf
[43] Ibid.

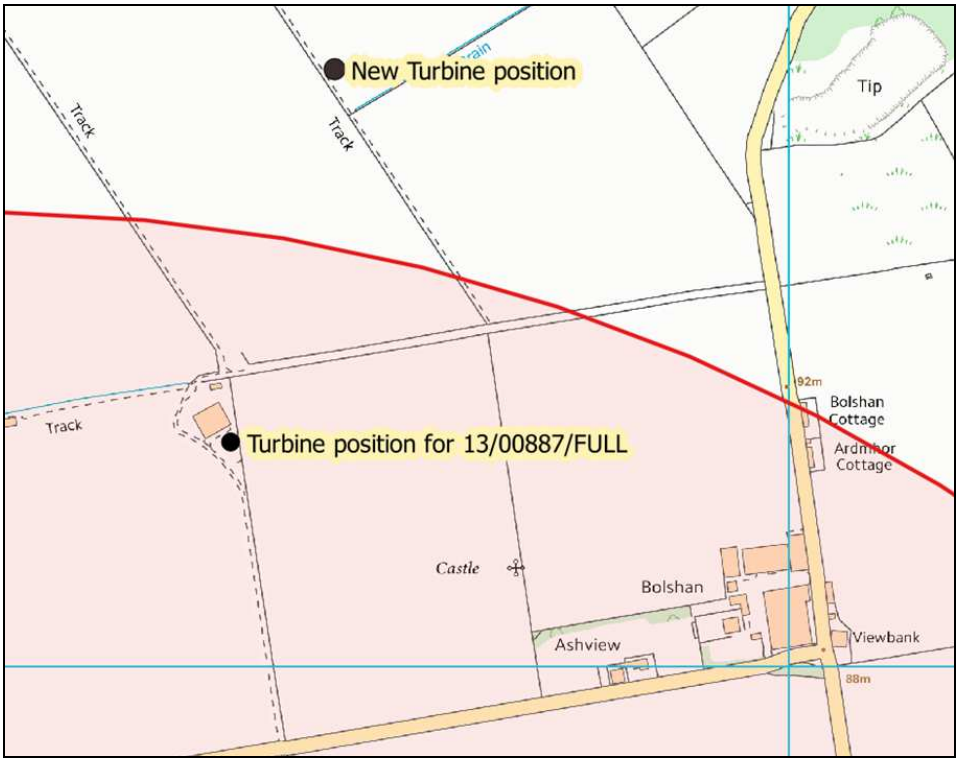

Figure 5: 2km buffer from Kinnell settlement boundary.

Scottish Government Planning Advice

Scottish Government's Planning Advice for onshore wind turbines was last amended on 28 May 2014. The 'onshore wind turbines' advice sheet provides information on local authority policy preparation, technical matters, and development management for wind turbine applications.

6.6. Planning Assessment

Section 25 of the Town and Country Planning (Scotland) Act 1997 as amended by the 2006 act confirms the primacy of the development plan and sets out that:

> *"Where, in making any determination under the planning Acts, regard is to be had to the development plan, the determination is, unless material considerations indicate otherwise—*
>
> *(a) to be made in accordance with that plan"*

This planning assessment first considers whether the proposal is in accordance with the development plan, then considers relevant material considerations.

Development Plan

Angus Local Plan Review, Policy ER34 : Renewable Energy Developments

The following assessment considers each of the criteria in this key policy in turn. Please refer to the policy which is quoted above:

Criterion (a)

The siting and appearance of this wind turbine have been chosen to minimise the impact on amenity this has been set out throughout this document. In particular, the turbine is within an appropriate landscape character area and sub-area, and the turbine is an elegant and well-designed model located a sufficient distance from neighbouring properties.

Criterion (b)
A detailed and complete Landscape and Visual Impact Assessment (LVIA) has been presented within this environmental report. It concludes that there is an overwhelming consensus within local planning policy and guidance that the location chosen is appropriate for a wind turbine of the size proposed. Detailed assessment set out in the LVIA using photomontages and other figures further supports this conclusion. Landscape character, landscape setting, and sensitive viewpoints have each been considered in the LVIA.

Criterion (c)
Effects on natural heritage have been considered in detail within the Ecological Impact Assessment chapter of this Environmental Report. No significant adverse effects were identified. The Historic Environment chapter has explained that the effects on historic sites and their settings will be very limited.

Criterion (d)
Cables linking the development to the network will be buried to reduce visual impact.

Criterion (e)
The access road for this turbine will be relatively short (approximately 290m of upgraded tracks) and have a similar appearance to many farm tracks in the area. The movement of construction traffic will be carried out in accordance with a construction method statement as required under the Construction Design Management Regulations. Further details can be found within the Transport and Delivery Assessment Chapter of this Environmental Report.

Given the above, it can be concluded that the proposed wind turbine at Bolshan project accords with policy ER34.

Angus Local Plan Review, Policy ER35: Wind Energy Development

Criterion (a)
The benefits of the chosen site have been set out throughout this environmental report. In particular, please refer to the sub-heading 'the site' within chapter 1, 'Outline Description of the Proposal', and to chapter 3 'Design Stage and Early Planning Work'.

Criterion (b)
The ecological impact assessment chapter of this report has set out that no unacceptable interference with birds is expected.

Criterion (c)
The siting and appearance of the turbine has been chosen to minimise impacts on amenity.
Shadow flicker and noise have been modelled and assessed in detail within the 'environmental health' chapter of this report. No properties are within the modelled shadow flicker zone out to 10 rotor diameters (480m) and the likelihood of annoyance is very negligible. Noise has been found to be within the required basic fixed limit of 35dB (31.4dB is the highest noise level predicted at a nearby property) because the separation distances to this turbine position are exceptionally large. No background noise assessment or 'margin over background' noise limit was required as part of the noise assessment.
Further details of the separation distances and a comparison with similar projects in Angus is set out in the 'Design Stage and Early Planning Work' chapter of this environmental report where a table of similar projects is presented under the sub-heading 'Comparison with Similar Projects Nearby'. A table showing distances to nearby dwellings from the proposed turbine is given in the noise assessment. These sections of this report clarify that the development now proposed enjoys very substantial separation distances to the nearest dwellings and underscores that criterion (c) can be complied with.

Criterion (d)
The turbine is thought to be below the radar ceiling for radar installations within the region and this has been set out in detail within the 'Aviation and Radar' sub-section of the Electromagnetic Interference chapter of this environmental report.

Criterion (e)
Microwave link operators were consulted about the previous Bolshan wind turbine planning application 13/00887/FULL. Neither of those consulted (Ofcom, Atkins Global, and JRC) objected to the proposal and their responses are expected to

indicate that the new turbine position will also be acceptable. For further details please refer to the 'Design Stage and Early Planning Work' chapter of this report, and to the Microwave and UHF link Interference sub-section of the 'Electromagnetic Interference' chapter.

Criterion (f)
Cumulative effects have been considered in detail within this environmental report. In particular, cumulative noise effects, and cumulative effects on the landscape, visual environment, and historic environment will be acceptable. There are no relevant effects across local authority boundaries.

Criterion (g)
Restoration of wind energy development sites is relatively straightforward. The turbine can be removed. The footprint of the development is small. The crane-pad is required during the lifetime of the project for servicing and this means that it is available to assist with the decommissioning.

Other Local Plan Policies

Policy SC19: Rural Employment supports *'proposals that assist diversification of an existing rural business'*. For the farm owners, the primary objective of erecting the Bolshan turbine is to diversify the existing farm business and to create an additional revenue stream that will allow re-investment into the existing business. Locally owned 'farm scale' renewables projects represent a substantial opportunity for rural Angus.

Schedule 1 to which Policy S6: Development Principles refers, and Policy ER30: Agricultural Land, support the protection of existing agricultural activities, and prime quality agricultural land respectively. The area around the turbine position can continue to be used for agriculture. The position has been deliberately maintained near to an existing field boundary to minimise loss of agricultural ground. According to the relevant land capability for agriculture map the majority of the site is not within the 'prime quality' land classifications of 1, 2, or 3.1, although the turbine position is close to the boundary between the class 3.1 and 3.2 land. The whole length of the access track would be formed from the upgrading of an existing track rather than building a new one.

As noted above, *'Sustainable development'* is stated as the core principle tying together all the aims of the Angus Local Plan Review set out in the right-hand column on page 6 of the local plan. **It is not possible to have sustainable development without renewable energy. By definition the use of finite energy sources cannot be sustained**. For this reason if Angus is to become more sustainable, more energy must be generated from renewable sources. Renewable energy projects such as the Bolshan wind turbine will be necessary to attain that aim.

Structure Plan

The Bolshan wind turbine will help meet the TayPlan's objectives of creating a more sustainable region in both economic and environmental terms.

Having considered the development plan above, it is now necessary to consider relevant material considerations.

Material Considerations

Sustainable Development, Climate Change, and Renewable Energy

As a renewable energy proposal, the Bolshan Renewables Project embodies the principles of sustainable development and seeks to contribute to the adaptation of Scotland's energy generation infrastructure to the post fossil-fuel age.

The proposal will help Scotland to meet the ambitious targets for cutting greenhouse gas emissions set out in the Climate Change (Scotland) Act 2009 and re-iterated with the SPP and NPF3 documents. It will also support the principle of 'sustainable development' which is placed at the heart of the planning system by sections 3D and 3E of the Planning etc. (Scotland) Act 2006 and SPP.

The proposal is in accordance with the SPP's policies in support of onshore wind; this report has addressed the considerations mentioned in paragraph 169 of the SPP relating to the determination of wind energy applications. Similarly, the cumulative assessment within the Landscape and Visual Impact Assessment has considered "existing developments of

a kind proposed, those which have permission, and valid applications which have not been determined"[44], as stipulated by the SPP.

Landscape, Natural Heritage & the Historic Environment

The proposal will accord with SPP policies in respect of landscape character, Natural Environment and the Historic Environment. Detailed assessments have been set out in the relevant chapters of the report and in the discussion above of development plan policies.

Rural and Economic Development

The proposal will provide additional income as part of a farm diversification project.
The Greenspan Agency strongly supports local construction companies and has a track record of ensuring such companies build projects they are involved in, helping secure much-needed jobs in a sector which is currently under particular pressure in the difficult economic climate.

Scottish Government Planning Advice – Onshore Wind Turbines

This document has been considered in detail. A thorough account of all the topics raised in this advice sheet has been provided, and the assessment has followed the methodologies it recommends.

Progress Toward 2020 Targets

The '2020 Routemap for Renewable Energy in Scotland' published in July 2011 (updated 2013) is not specifically presented as a planning document but a link to it is provided on the Scottish Government's planning for renewable energy webpage[45]. With reference to the target of generating 100% of Scotland's electricity demand from renewable sources by 2020 it states *'The successful delivery of the capacity required to deliver the equivalent of 100% of Scottish electricity consumption will demand a significant and sustained improvement over the deployment levels seen historically'.* More recently Audit Scotland reported similar findings. It issued a report in September 2013[46] stating that the rate of deployment of renewable electricity generation would need to increase in order to avoid a significant shortfall of 3,100MW of installed capacity by 2020 relative to targets.

Supplementary Planning Guidance

Implementation Guide for Renewable Energy Proposals

Angus Council's *'Implementation Guide for Renewable Energy Proposals'* (June 2012) expands upon policies ER34 and ER35 of the Angus Local Plan Review (adopted 2009).

The implementation guide sets out many of the issues relevant to the determination of a wind energy application and recommends the scope of supporting information that should be provided.

The document explains the importance of renewable energy and sets out the latest government target of generating the equivalent of 100% of Scotland's electricity use from renewable sources by 2020.

The importance of renewable energy within national planning policy and the development plan is highlighted. Page 13 states: *'The Development Plan is supportive of renewable energy in principle'.*

The landscape policy set out in pages 94 to 97 of the Angus Local Plan Review is expanded upon in the *'Implementation Guide for Renewable Energy Proposals'.* Page 48 of the implementation guide explains that turbines of around 80m in height are likely to be considered appropriate within the Dipslope Farmland landscape character area in which the Bolshan turbine is located.

Strategic Landscape Capacity Study

The latest version of the '*Strategic Landscape Capacity Assessment for Wind Energy in Angus'* known to be available is dated March 2014. It was prepared by Ironside Farrar (henceforth 'the 2014 capacity assessment').

[44] Page 71, Scottish Government (2014) Scottish Planning Policy [Online] Available: http://www.scotland.gov.uk/Resource/0045/00453827.pdf
[45] Scottish Government (2013) *Renewable Energy* [Online] Available: http://www.gov.scot/Topics/Business-Industry/Energy
[46] Audit Scotland (2013) *Renewable Energy* [Online] Available: http://www.audit-scotland.gov.uk/media/article.php?id=246

This document divides the 'dipslope farmland' landscape character type into landscape character sub-areas. The proposed Bolshan turbine is located within the Rossie Moor sub-area[47]. A red mark has been placed on the map below to show the proposed turbine location. The map base was originally taken from page 13 of the 2014 capacity assessment.

Figure 6: Landscape Character Sub-Areas. Area (vi) is the Rossie Moor sub-area.

The table on page 67 of the 2014 capacity assessment explains that Rossie Moor has some 'medium' remaining capacity for Medium/Large wind turbines, which it defines as those between 50 and 80m in height.

Consensus on Landscape Suitability

It has been explained in the preceding section that two key items of supplementary guidance point to the acceptability of this location for a wind turbine of the scale proposed.

It was also noted above that the adopted Angus Local Plan Review sets out that the 'lowland and hills' geographic area in which the turbine is located is the best suited in Angus for wind turbine development.

To summarise, there is a very clear consensus within the following documents that the chosen site is in a location suited to a wind turbine of the scale proposed, provided other policy tests are met:

- Angus Local Plan Review (pages 94-97)
- Angus Council*, 'Implementation Guide for Renewable Energy Proposals'* (June 2012)
- Ironside Farrar for angus Council*, 'Strategic Landscape Capacity Assessment for Wind Energy in Angus'* (2014)

The applicant has designed the proposal to assist with delivering the policy goals and locational guidance set out in these documents.

[47] Refer to page 63 of the 'Strategic Landscape Capacity Assessment for Wind Energy in Angus', Ironside Farrar, 2014. This part of the capacity assessment introduces the Rossie Moor area and provides a map.

6.7. Conclusions, Planning Statement

The Bolshan Renewables Project accords with the Development Plan and other material considerations. In particular the criteria in policy ER34: Renewable Energy Developments and ER35: Wind Energy Development can be complied with.

The siting and appearance of the turbine has been chosen to minimise impacts on amenity. When measured against comparable projects for which planning permission has been sought in Angus, this proposal offers some of the largest separation distances between the turbine and the nearest properties. In particular this assists with visual and noise amenity issues and compliance with policy tests ER34 (a), ER35(c).

There is a very clear consensus between the adopted local plan, the relevant 'implementation guide' and the latest 'capacity study' (full details above) that the chosen site is in a location suited to a wind turbine of the scale proposed.

From the very earliest stages of the development process the applicant, and their agent, have sought to design a development that fully accords with planning policy. The result is a proposal which is in accordance with the development plan and should be granted planning permission.

7. Ecological Impact Assessment (EcIA)

7.1 Introduction

This chapter considers the potential effects of the proposed wind turbine on the nature conservation interests on and around the position of the proposed turbine at the Bolshan Renewables Project. The survey work for the project was carried out by experienced consultant zoologist Dr Susan M. Swift and was also used to inform the ecological impact assessment for the previous planning application (13/00887/FULL). The previous ecological impact assessment is provided as an appendix to this chapter. It should be understood that the turbine locations are different so although there are findings from the original assessment that are still relevant, there are differences too.

The new turbine position is considered to have less ecological value because of the absence of abandoned buildings (something that typified the original turbine position) and less trees.

The original and new turbine positions are shown on a map in chapter 3 of this report.

7.2 Scoping Assessment

In preparation for the following ecological assessments, the Scottish Natural Heritage (SNH) document "Assessing the impact of small-scale wind energy proposals on the natural heritage" (SNH, June 2014) formed the principal guidance. This document applies to any wind energy development of three or fewer turbines and is therefore appropriate for the Bolshan Renewables Project.

Wind energy projects have the potential to have some impact on the natural heritage. The guide recommends that the four key issues are considered in respect of small scale kind development. These are:

- *"Landscape*
- *Protected Areas*
- *Habitats and Species"*[48]

Landscape is covered within chapter 8 of this report. The impact on protected areas, habitats, and species are considered within this section under separate sub-headings. The effects of construction on natural heritage is also given attention within this chapter.

SNH were consulted on an earlier iteration of the project (response dated 24 October 2013, ref 13/00887/FULL). SNH's response stated that:

> '*There are natural heritage interests of international importance at this site [in the surrounding area], but in our view, these will not be adversely affected by the proposal.*'

7.3 Protected Areas

A wind turbine proposal does not have to be in a designated site to have an effect on the habitats or species for which it is designated. Therefore, a detailed desk-based search was carried out to locate all those protected sites found within 20 km of the development in accordance with SNH guidance which states:

> *"we recommend that the developer check for all protected areas within a 20km radius of the proposal"*[49]

Sites classified as Special Protection Areas (SPA) under the Birds Directive and designated as Special Areas of Conservation (SAC) under the Habitats Directive form an EU-wide network of internationally protected areas known as Natura 2000.

[48] Page 3, "Assessing the impact of small-scale wind energy proposals on the natural heritage" (SNH, June 2014)
[49] Page 5, "Assessing the impact of small-scale wind energy proposals on the natural heritage" (SNH, June 2014)

Ramsar sites are wetlands designated under the Ramsar Convention on Wetlands of International Importance, especially as waterfowl habitat. National designations include National Scenic Areas (NSA), Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR) and National Parks. Local designations include Local Nature Reserves (LNR) and Local Nature Conservation Sites.

Table 4: All designated sites within 20 km of the Bolshan Renewables Project that are protected for their ecological interests

International Designations	**Classification**	**Distance from Bolshan Renewables Project**
River South Esk	SAC (*EU Habitats Directive)*	2 km N
Montrose Basin	SPA, SSSI, Ramsar	7.4 km NE
National Designations	**Classification**	**Distance from Bolshan Renewables Project**
Rossie Moor	SSSI	2.8 km NE
Whiting Ness – Ethie Haven	SSSI	8.5 km SE
Dun's Dish	SSSI	8.6 km N
St Cyrus and Kinnaber Links	SSSI	14 km NE

Table 4 shows every designated site within 20 km of the proposed turbine which has been afforded protection for its biological interests. Several other sites of national importance are found within a 20 km radius of the turbine but these are protected for their floral, geological or geomorphological interests and are therefore very unlikely to be directly affected by the development.

7.4 Habitats and Species

A survey was carried out for bats, nesting birds, and other protected species. This survey covered the derelict buildings, trees, and tracks in the area near the proposed turbine site.

The relevant guidance states:

> *"We advise that the developer collates relevant information on other protected habitats and species, and presents a preliminary assessment of the potential impacts (including any proposed further survey requirements and/or mitigation) to the planning authority. This should include a desk study and a reconnaissance visit to the development site by a competent consultant.*
>
> *A basic assessment will require:*
>
> - *a brief description of the site, its context, and the habitats and species present;*
> - *identification of the presence of any protected species, description of any potential impacts and any required mitigation.*
>
> *The need for further assessment should be determined by the planning authority following the submission of the initial appraisal."*[50]

Habitats Desktop Assessment

Introduction

The proposed wind turbine is located approximately 7.5 km south of Brechin, Angus. The site is situated amongst similar agricultural terrain, typical of the rural Angus district. Results from a search through all available SNH records revealed that the Bolshan Renewables Project land boundary does not fall within any regional or nationally important protected sites.

[50] Page 6, "Assessing the impact of small-scale wind energy proposals on the natural heritage" (SNH, June 2014)

A desktop assessment was carried out to identify and record any habitats, species and features of botanical, ecological and geological importance within the vicinity of the development area.

Legislation and Policy Guidance

Legislation exists to protect habitats and floral species from destruction, degradation and loss as a result of development activities and include:

- The Conservation (Natural Habitats, & C.) Regulations 1994[51]
- Wildlife & Countryside Act 1981 (as amended)[52]
- The Nature Conservation (Scotland) Act 2004[53]

Methodology

Desk Study

A search to check for existing habitat surveys and important flora records of the site was undertaken. Studies of Ordnance Survey maps, National Biodiversity Network database, MAGIC database[54] and publicly available internet based satellite imagery also aided familiarity with habitat features of the site.

Results

Desktop Study

Results from the desk-based search revealed that the site is located within a rural farmland locality. Contour information revealed an undulating topography. Dominant habitats present over the site comprise of arable fields and improved grassland.

Results from searches undertaken of the MAGIC and NBN databases revealed that the site does not fall within any regionally, nationally or locally important protected designation. The River South Esk SAC, via the Pow Burn, is located 2 km to the north of the site.

Satellite imagery of the site was also sourced using 2015 Google Imagery © to help aid identification of habitats, features and boundaries.

[51] Full details of The Conservation (Natural Habitats, & c.) Regulations 1994 can be viewed at: *http://www.jncc.gov.uk/page-1379*

[52] Full details of the Wildlife and Countryside Act (1981) can be viewed at: http://www.jncc.gov.uk/page-3614#download

[53] Full details of the Nature Conservation (Scotland) Act 2004 can be viewed at: http://www.opsi.gov.uk/legislation/scotland/acts2004/asp_20040006_en_1

[54] Multi Agency Geographic Information for The Countryside http://www.magic.gov.uk/website/magic

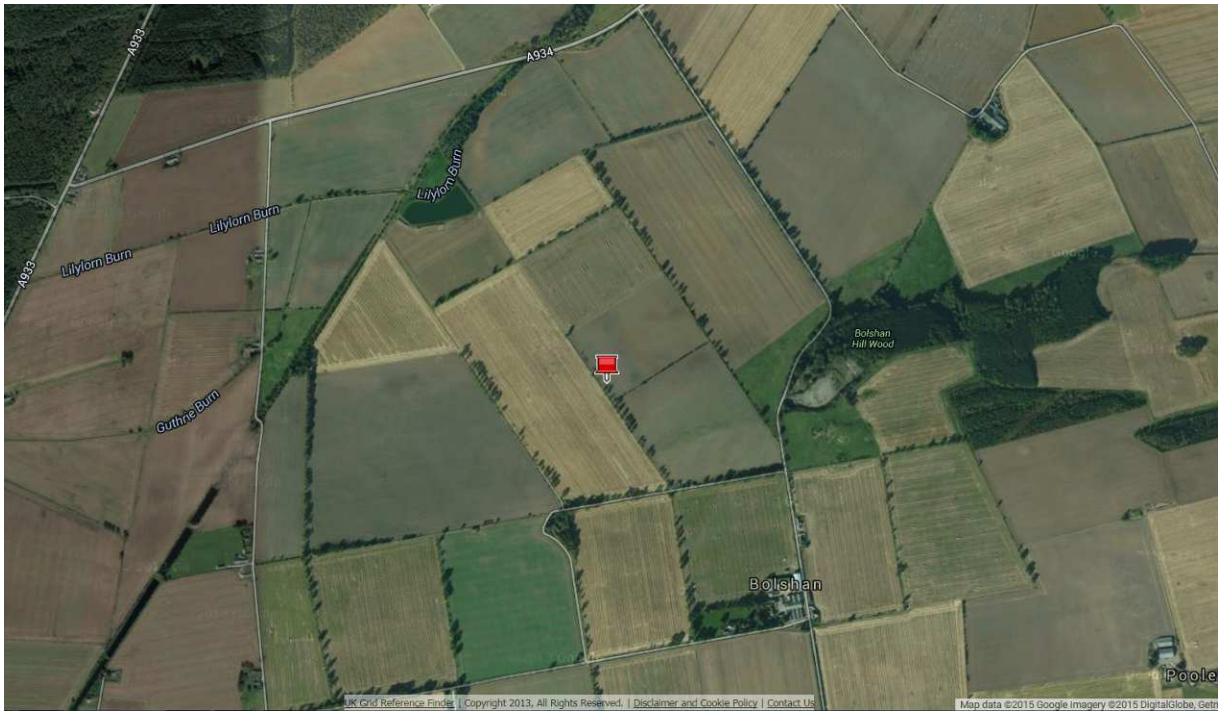

Figure 7: Satellite Image of Habitats (Source Map data © 2015 Google Imagery© 2015 Digital Globe, Getmapping Plc)

Desk-based Habitats Assessment Summary

The site is made up of improved grasslands and arable fields. No nationally or internationally protected habitats were identified during the desktop survey of the site. Botanically, the turbine and ancillary infrastructure is located on a site of low sensitivity.

The River South Esk SAC is found in the nearby area (2km). Given the nature of the development it is not anticipated that this will be affected.

The construction footprint for the proposed turbine and access track is over arable fields (see Figure 7 above). Construction activities on the arable farmland are likely to be of low impact to the habitat given these habitats are themselves formed by disturbance. The development may potentially pose impacts to habitats present through construction activities including civil works, vehicular movements and pollutants. These can be considered to be generic impacts which are typically associated with a development of this nature. During construction activities, vigilance and care would be taken by on-site contractors to minimise potential disturbance and degradation of habitats and associated flora and fauna present on site.

There are three trees near the hardstanding location, thought to be maple, horse chestnut, or oak. These are 7-10 meters in height. These would need to be removed during the construction phase. Each tree that is removed would be replaced with 3 native deciduous trees at other locations on the farm, in keeping with the pattern of tree-lined tracks and roads within the local area. This could be controlled by a condition added to the planning consent.

Figure 8: Trees Near the Turbine Position.
A row of three trees near the turbine position that would be removed to provide sufficient working space at the hardstanding. Any tree removed would be replaced by 3 native deciduous trees, as discussed above.

Protected Mammals Site Survey

Dr. Susan Swift undertook a survey for Bats, Bat Roosts, and other protected species at the site of the previous turbine position applied for under application 13/00887/FULL. The survey aimed to identify and record presence of any species, and associated suitable habitat features of ecological importance, within the development area.

The main mammals that may potentially inhabit a site of this nature were anticipated to be bats, however signs for any other protected mammals were also searched for. A search to check for existing protected mammal records present within a 10 km square of the site was undertaken. The source for this desk-based research was the National Biodiversity Network database.

In addition, studies of 1:25:000 Ordnance Survey mapping and publicly available internet based satellite imagery also aided familiarity with habitat features that may provide suitability for protected species within the site development area.

Badgers

Introduction

Badgers and their setts are fully protected from the results of lawful human activities, including the development of wind farms. A sett is defined as “any structure or place which displays signs of current use by a badger” (Protection of Badgers Act 1992). Setts can be classified into four types. The main sett is the largest within the badger’s social group’s or clan’s

territory (Kruuk, 1989)[55]. There is only one main sett for each clan of badgers. It has a number of entrances, used and disused, with active spoil heaps and well used paths radiating from it. It is in continual use.

Annex setts are usually found within 150 m of the main sett. They have well used entrances. Paths connect the annex setts to the main sett. Annex setts may not be in use all of the time.

Subsidiary setts have no obvious path connecting them to the main sett. They can have several entrances but are not always in use.

Outlier setts have only one to two entrances with small spoil heaps. They are rarely in use.

All setts should be treated as being in use during development as they may be used by the badgers. The main legislation referring to badgers is the Protection of Badgers Act 1992. Under this act, it is an offence to:

- Wilfully or attempt to kill, injure or take a badger;
- Use badger tongs in the course of killing, taking or attempting to kill a badger;
- Dig for a badger;
- Cruelly ill-treat a badger;
- Possess a dead badger or any part of a badger;
- Sell or offer for sale or control any live badger;
- Mark, tag or ring a badger;
- Interfere with a badger sett by:
    - damaging a sett or part thereof;
    - destroying a sett;
    - obstructing access to a sett;
    - causing a dog to enter a sett;
    - disturbing a badger while occupying a sett.

The act carries penalties of up to six months imprisonment or a fine of up to £5,000, or both. The fine can relate to individual badgers and has the potential to be substantial. The act also allows for the forfeiture of any badger or skin and of any weapon or article used. Dogs can be destroyed or disposed of, and the owner can be disqualified from having custody of a dog.

Other legislation includes the Wildlife and Countryside Act 1981 where Badgers are listed on Schedule 6. This prohibits methods of taking and killing wild animals. The Protection of Animals Act 1911 protects badgers from cruelty.

Under the Protection of Badgers Act 1992, licences can be issued to interfere with badger setts to allow development to take place. In Scotland, these are issued by SNH. Licences to prevent serious damage to property are issued by the Scottish Executive Rural Affairs Department (SERAD). It is recommended that local staff of SNH or SERAD are consulted before a licence is applied for.

Methodology

In addition to the desk study, a field survey to investigate the status of badgers around the proposed wind turbine development location was carried out. Habitat types (i.e. agricultural fields, boundaries, woodland, scrub etc.) were searched around the site.

Results

The desk-based survey revealed that there are known records of badger in the 10 km square surrounding the proposed turbine.

However, during the field survey no evidence of activity of badgers (Meles meles) was found around the proposed Bolshan turbine.

[55] Kruuk, H. (1989) *'The Social Badger: Ecology and Behaviour of a group-living Carnivore'*, Oxford University Press, Oxford

Conclusion

The desk-based search has confirmed there are known records of badger activity in the wider area however, the survey identified no indication of badger presence within the vicinity of the proposed development site.

Additionally, the proposed development location is in fields well away from any possible badger setts habitat and will only represent a low loss of foraging area. The works would not constitute a risk to badgers as long as the appropriate mitigation is implemented as outlined below.

Mitigation

If evidence of badgers is detected at the site at any point during in the lifetime of the development, as a result of territories expanding or new territories becoming established, standard mitigation measures will be taken to ensure compliance with the Protection of Badgers Act 1992 and the Wildlife and Countryside Act 1981.

The field survey found no evidence of badgers around the proposed turbine site, But badgers are known to be in the general area and given they are also understood to range widely, and expand territories to occupy adjacent land if it is vacant and of suitable habitat, the following mitigation is proposed during all stages of the wind development project:

- All contractors should be made aware of badgers and their legal protection;
- All personnel should be made aware that badgers may exist close to the site and are at risk from vehicles and on-site speed restrictions should be put in place for all vehicles, including construction, maintenance and visitors to the site;
- All trenches dug during construction and exposed open pipes should be covered at the end of each working day to ensure no risk to badgers, otters or any other wildlife that may have the potential to be trapped; and
- Ramps should be located within the trenches or pits that can't be covered to allow an exit for any mammal that has gone into a trench or pit.

Bats

Introduction

Bats of all species in Britain and their roosts are protected under the Conservation (Natural Habitats, &c) Amendment (Scotland) Regulations 2007. Following recent changes to legislation in Scotland under this law it is illegal intentionally or recklessly to kill or injure a bat, to disturb a roosting bat or to damage, destroy or obstruct access to any bat roost. This applies to both summer and winter roosts, which may be in different structures. Any action which is likely to disturb or damage a bat roost requires a license from the Scottish Government.

Bats and their roosts are legally protected by domestic and international legislation: Wildlife and Countryside Act 1981 as amended by the Nature Conservation (Scotland) Act 2004, and by the Conservation (Natural Habitats) Regulations 1994. The purpose of the legislation is to maintain and restore protected species to a situation where their populations are thriving, and there is sufficient habitat to ensure this will continue.

The most relevant SNH guidance on bats for large wind turbines, such as that proposed at the Bolshan Renewables Project, is Natural England Technical Information Note TIN059 'Bats and single large wind turbines: Joint Agencies interim guidance'.

In mainland Europe and North America, evidence of bat collisions has led to growing concern about the siting and operation of wind turbines. The most serious incidents have involved bat species that fly very high and for long journeys, particularly species on long distance migrations. In mainland Europe, noctules, common pipistrelles and Nathusius' pipistrelles are most frequently recorded as turbine casualties.

There are five species of bat known to be resident in north-east Scotland. These are two species of pipistrelles, commonly referred to as the 55 kHz or soprano pipistrelle (*Pipistrellus pygmaeus*), and the 45 kHz or common pipistrelle (*Pipistrellus pipistrellus*). Also present are brown long-eared bats (*Plecotus auritus*), Natterer's bat (*Myotis nattereri*) and Daubenton's bat *(Myotis daubentonii*). Common pipistrelle bats have been removed from the priority species list in the UKBAP

(Biodiversity Information and Reporting Group, 2007)[56] as the population within the UK has increased to over 2 million (Bat Conservation Trust, 2006; Battersby (ed., 2005)[57] [58]. The two species of pipistrelle are believed to be at medium risk of collision with turbines. These are both aerial feeders which can exploit open spaces. It is believed that the threat to the populations of both species is low (Natural England, 2009)[59]. The other three species are at low risk with a low threat to their populations.

Most bat species in the UK are unlikely to come into contact with the turbine blades during their normal movements. To the best of current knowledge, common pipistrelles do not migrate at high altitude and rarely fly at heights that intersect with the blades (Natural England, 2009)[59].

Methodology

A desk-based data search was carried out to find out whether any records are held of bat species sightings activity near the development site. Sources included The National Biodiversity Network and The Bat Conservation Trust. Further desk-based assessment has been completed to identify features that may be suitable for commuting and foraging bats. 1:20,000 and 1:25,000 scale Ordnance Survey map data and remote sensing satellite imagery (sourced using 2015 Google Imagery ©) was used to aid identification of habitats, features and boundaries that may potentially be attractive for bat activity.

The site was visited and surveyed in May 2013. A daylight survey, and a dusk activity survey were carried out. In the daylight, buildings and trees surrounding the turbine site were checked for potential roost sites and access holes. An ultra-sonic bat detector was used during the dusk survey to assess the presence/absence of roosts, and assess bat activity.

Results

Data Review

NBN Gateway revealed that the following bat species were recorded within the 10 km^2 around the development site.

- Brown long-eared bats (*Plecotus auritus*)
- Soprano pipistrelle (*Pipistrellus pygmaeus)*
- Daubenton's Bat (*Myotis* Daubentonii)

These species are considered to be at low and medium risk of turbine development by Natural England (TIN059).

Survey

The great majority of habitat within the vicinity of the site is arable fields which are not favoured bat foraging habitat.

No roosting bats or signs of bats were found anywhere in or around the buildings or trees near the site of the turbine. The area around the turbine was used as foraging habitat by *pipistrelles* in very small numbers. Single bats commuted to the site from roosts elsewhere and foraged around the trees and buildings for a short amount of time before moving on.

Bats are known to use linear features as commuting pathways and for foraging. There are some linear features in the vicinity of the development site, for example woodland edge. The woodland feature nearest to the turbine is 300 m distant.

The majority of the study area is barren arable fields that are not favorable foraging habitat for bats. Various areas of woodland are present in the vicinity of the proposed turbine site that would be expected to have foraging bats.

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[56] Biodiversity Information and Reporting Group (2007) *"Report on species and habitat review" UK biodiversity Partnership*, Peterborough: JNCC.

[57] Bat Conservation Trust (2006) *The State of UK's Bats, summary report from the national Bat Monitoring Programme*, London: Bat Conservation Trust

[58] Battersby, J. (2005) *UK Mammals: Species Status and Population Trends*, Peterborough: JNCC Tracking Mammals Partnership

[59] Natural England (2009), *Natural England Technical Information Note TIN051: Bats and onshore wind turbines (Interim Guidance)* [Online] Available: http://publications.naturalengland.org.uk/publication/35010

Conclusions Bats

The desk top study has found that there are known records of bats within a 10 km^2 around the development site. The habitat around the proposed turbine location is a mixture of improved grasslands and arable fields; which is not favoured by bats for foraging. There is woodland within the vicinity of the development site however this, at is closest point, is 300m distant from the position of turbine.

The overall lack of roost and foraging potential in the vicinity of the proposed turbine position means that any potential effects are likely to be negligible. Bolshan Renewables Project is unlikely to have a significant effect on local bat populations.

Ornithology

Introduction

The following section describes and evaluates the current ornithological interest associated with the Bolshan Renewables Project and the surrounding area. Additionally, this section provides an assessment of the predicted effects on this interest. The most important issues relating to birds and the proposed wind farm are as follows:

- The effects of direct habitat loss due to land uptake by the wind turbine base, tracks and ancillary structures.
- The effects of indirect habitat loss, which may occur as a consequence of construction work, or due to the proximity of the wind turbine to nests, feeding sites or migration paths.
- The effects of collision with rotating turbine blades, which is considered to be of particular relevance for sites located in areas known to support raptors or large populations of wildfowl.

Methodology

A desk-based study was carried out to check for the presence of all international, national and local designated sites within 20 km of the site, according to the recommendation given by SNH[60]. See table above.

The Angus Council planning register was also checked as part of the cumulative assessment for this EcIA. Consultations by SNH and the Royal Society for the Protection of Birds for other wind turbine developments were considered.

A Bird Sensitivity Map published by RSPB[61] which aids the location of onshore wind turbine development in Scotland was consulted. This map is based on bird species of conservation concern and Special Protection Areas (SPA) and indicates where wind turbines are more likely to conflict with bird sensitivities.

Dr Susan Swift carried out a site survey to assess the importance of the immediate area around the previous turbine position for barn owls and other nesting birds on 28th May 2013.

Results

Designations

Table 4 (above) shows every designated ecological site within 20 km of the proposed turbine. Several other sites of national importance are found but these are protected for their floral, geological or geomorphological interests and are therefore very unlikely to be affected by the development.

Of the international designations listed only Montrose Basin lists geese or other migratory wildfowl as a qualifying species. As noted below, SNH have acknowledged when consulted on the previous application 13/008887 that 'The proposal will not adversely affect the integrity of the site'[62]. They also stated:

> *The appraisal we carried out considered the impact of the proposals on the following factors: Collision mortality, displacement and barrier effects. In the absence of site specific goose survey we used generic data, which indicate*

[60] Page 5, "Assessing the impact of small-scale wind energy proposals on the natural heritage" (SNH, June 2014)
[61] Bright, J.A, *et al* (2006) Bird Sensitivity Map to provide locational guidance for onshore wind farms in Scotland, RSBP Research Report No 20, accessed on 31/03/2015 from http://waww.rspb.org.uk/forprofessionals/policy/windfarms/locationalguidance/scottish.aspx
[62] Page 2, SNH response to application 13/00887/FULL, dated 24 October 2013, authored by Fiona Mutch

very low collision mortality. There are alternative foraging opportunities in the surrounding area and a single turbine is unlikely to displace geese from accessing these areas.[63]

There is also one SAC – River South Esk, which is protected under the EU Habitats Directive – no birds are included as a qualifying interest but these sites have been acknowledged as they possess international status.

Montrose Basin SPA, SSSI, Ramsar

SPA Citation:

This site, an internationally important wetland, qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species: It provides a winter roost for an average of:

- 1,080 Greylag Geese (*Anser anser*) at least 1% of the wintering Iceland/UK/Ireland population;
- 4,500 Knot (*Calidris cantus*) at least 1.3% of the wintering Northeastern Canada/Greenland/Iceland/Northwestern Europe population;
- 31,600 Pink footed Geese (*Anser brachyrhynchus*) representing at least 14.1% of the wintering Eastern Greenland/Iceland/UK population; and
- 2,260 Redshank (*Tringa tetanus*) representing at least 1.5% of the wintering Eastern Atlantic - wintering population.

The site also qualifies under Article 4.2 of the Directive (79/409/EEC) because it regularly supports at least 20,000 waterfowl. Over winter, the area regularly supports 54,900 individual waterfowl.

SSSI Citation:

"Montrose Basin is a large, almost circular, estuarine basin on the River South Esk immediately west of Montrose in which there are extensive mudflats at low tide. Montrose Basin consists of a mosaic of saltmarsh, mudflat and transition fen habitat together with arable and pasture land, which is used annually by thousands of migrating and over-wintering birds for feeding and roosting. A section of Montrose Basin at Maryton is a key site for the illustration of post-glacial sea level fluctuations."

River South Esk SAC

SAC Citation:

"The River South Esk is a designated Special Area of Conservation (SAC) for Atlantic salmon and freshwater pearl mussels under the European directive commonly known as the 'Habitats Directive'. Thus it forms part of a network of SACs across Europe. The network of sites is known as Natura 2000."

Rossie Moor SSSI

SSSI Citation:

"Rossie Moor is located just over 6 km south-west of Montrose. It sits on a gently undulating plateau of relatively low lying hill ground which separates the flood plain of the River South Esk from that of the Lunan Water. It is important for its extensive areas of lowland heath and valley fen, together with associated insect communities, in particular water beetles and flies."

Whiting Ness – Ethie Haven SSSI

SSSI Citation:

"Whiting Ness to Ethie Haven SSSI is situated on the Angus coastline, stretching about 11 km in length from Victoria Park, on the edge of Arbroath, to almost as far as north as Lunan Bay. The site is geologically important for its exposures of Upper Old Red Sandstone and Ethie Lavas. It is also the longest continuous stretch of sea cliffs

[63] Mutch, F. (2013) Letter to Angus Council re Bolshan Turbine App 13/00887/FULL. Scottish Natural Heritage. Aberdeen

and rocky shore in Angus and supports nationally important numbers of nesting seabirds and over-wintering waders, a wide range of coastal grassland and coastal cliff communities and the small blue butterfly Cupido minimus, a Scottish rarity."

Dun's Dish SSSI

SSSI Citation:

"Dun's Dish SSSI is situated 4 km north west of Montrose Basin. It is important for its eutrophic (nutrient–rich) open water and fen plant communities and the breeding birds these habitats support.

The swamps and fens are species-rich and mark the transition from open water to drier land. Species typical of this community type include marsh marigold Caltha palustris, bottle sedge Carex rostrata, marsh willow-herb Epilobium palustre, marsh-bedstraw Galium palustre, marsh cinquefoil Potentilla palustris, and lesser spearwort Ranunculus flammula, as well as several species of plants which are very local in Angus: for example, lesser tussock-sedge Carex diandra, marsh ragwort Senecio aquaticus, and blue water-speedwell Veronica anagallis-aquatica.

The site supports a high diversity and number of breeding wildfowl which include mute swan, shelduck (the only inland colony in Angus), teal, pintail, shoveler, tufted duck and redshank. The site has also held the largest colony of common terns in Angus, nesting on the small islands in the loch."

St Cyrus and Kinnaber Links SSSI

SSSI Citation:

"St Cyrus and Kinnaber Links SSSI is located on the east coast of Scotland, on either side of the mouth and estuary of the River North Esk, about 5 km north of Montrose. The varied site consists of sand dunes, shingle, foreshore, river estuary, saltmarsh and cliffs composed of basalts and andesites of Old Red Sandstone age. The cliffs have weathered to produce a moderately base-rich soil, and for the north-east of Scotland the site enjoys relatively long hours of sunshine.

The breeding bird assemblage, about 60 regular breeding species, includes fulmar, shelduck, eider, curlew, redshank, ringed plover, oystercatcher, sedge warbler, grasshopper warbler, wheatear, stonechat, whinchat, kestrel, buzzard, sparrowhawk and peregrine".

Cumulative Assessment

It is possible that if many wind farms were operating in the local area there could be an increased risk of collision as individual birds strove to avoid each farm, or a number of individuals could be displaced from potentially large areas. The area surrounding the proposed turbine does support other wind farm developments. Development in a 5 km radius of the site is shown in the table below (Table 5). There are a number of wind developments within the vicinity of the site which are either already approved by Angus Council or currently pending consideration. The developments are primarily small to medium scale comprising mostly of single turbines.

The Bolshan turbine will occupy only 48 m of airspace (should the turbine blades be aligned perpendicular to the direction of a flight path). It is anticipated that any migrating and foraging bird species should be able to successfully navigate around the proposed turbine position without undue risk of collision with other developments or having to extend their flying distances. Therefore, the cumulative impact of the Bolshan Renewables Project on flight activity is likely to be negligible.

Table 5: Cumulative ornithological information for nearby wind developments

Application Number	Site Name	Distance to site (km)	Status	Turbine	Assessment	SNH	RSPB
07/01632/FUL	Montreathmont	2.7	Refused	11 x 126 m	Bird Surveys, Protected Species Surveys, Vegetation Survey and desktop assessment	Objects to the Proposal based on adverse landscape and visual impacts, and insufficient information regarding greylag geese and pink footed geese	N/A
07/00050/FUL	Mountboy	3.9	Refused	3 x 105 m	Desk Studies and Field Studies	Objects to the Proposal based on adverse effects on Rossie Moor	N/A
12/00365/FULL	Pickerton	5.0	Permitted	1 x 77 m	Desk Studies and Field Studies	No comment	N/A
12/00632/FULL	Renmure Farm	3.7	Refused	1 x 77 m	Desk Studies and Field Studies	N/A	N/A
12/00732/FULL	Hatton Mill Farm	2.3	Refused	1 x 77 m	Desk Studies and Field Studies	N/A	N/A
13/01069/EIAL	Rossie School	4.1	Withdrawn	3 x 80 m	Desk Studies and Field Studies	Object as further information is needed regarding effect on Rossie Mooor	N/A
14/00606/FULL	Dubton Farm	4.6	Pending	1 x 77 m	Desk Studies and Field Studies	N/A	N/A
13/00722/FULL	Waulkmill Quarry	3.1	Permitted	1 x 46 m	Desk study	No adverse effects on the integrity of the site	N/A
10/01093/FULL	Heughhead	2.9	Refused	1 x 19.9 m	N/A	N/A	N/A
11/00143/FULL	Heughhead Farm	2.9	Permitted	1 x 21 m	N/A	N/A	N/A
15/00013/FULL	Rossie School	4.1	Pending	1 x 51 m	Desk Studies and Field Studies	Natural heritage interests of international and national importance close to the site will not be adversely affected by the proposal	N/A

Bird Sensitivity Map

The proposed wind turbine falls within an area of low sensitivity in the RSPB Bird Sensitivity Map[64], which means that it is unlikely to be classed as sensitive to bird species.

Owls and nesting birds.

During the site survey on 28th May 2013 one tawny owl was recorded flying inside one of the buildings before dusk. There was no sign of a nest, and only one bird was present. Four swallows were observed foraging over the wheat fields east of the site, and one swallows' nest was recorded in the smallest of the buildings surveyed. Two chaffinches were recorded and are probably nesting in a tree or bush near the site.

Assessment of Effects

Construction Effects

Wind turbine construction is likely to last approximately 5 months. The actual turbine erection may take only a day to be completed and the impact of any other civil work such as the construction of ancillary structures, access tracks etc may be comparable in scale to activities typically carried out on agricultural land. Construction activities may temporarily displace some birds using the site and surrounding areas. The level of impact will depend on:

1. the timing of potentially disturbing activities;
2. the degree of displacement (spatially and temporally);
3. the size, suitability and proximity of habitats available for displaced birds to occupy; and
4. the capacity of alternative habitats to accommodate birds.

Disturbance during construction is generally short-term and can be readily mitigated by avoiding sensitive areas and by timing construction outside certain periods where sensitive species are present. Construction usually takes place when the weather is expected to be clement, so the migration periods will likely be avoided for this reason also. Construction impacts will be greatest on species that are intolerant of noise and other sources of disturbance.

Given the low sensitivity and numbers of the species recorded at the site the magnitude of the impact from construction is considered to be negligible.

Operational Effects

A number of studies have investigated the effect of displacement by wind farms on wintering wildfowl. A detailed Danish study conducted in an area where power lines, wind breaks, roads and settlements were all present found pink-footed geese avoided utilising areas within approximately 100 m of single rows of turbines, and 200 m of a larger wind farm (Larsen & Madsen, 2000)[65]. This study concluded that wind farms caused disturbance to pink-footed geese comparable in magnitude to hedgerows and farm buildings. A study into the displacement of white-fronted geese in Rheiderland, Germany found lower post construction densities of white-fronted geese within 600 m of turbines (Kruckenberg & Jaene, 1999)[66], which is generally accepted to be the maximum reliably recorded distance that any bird species has been affected by wind farms (Drewitt & Langston, 2006)[67].

Another scenario in which wind turbines could have a displacement impact is by affecting usual flight lines. A number of studies have shown that a wind farm can result in the alteration of flight-lines of some species. Where wildfowl do fly through wind farms, evidence suggests that they avoid flying close to turbines, hence reducing the risk of collision. For example, the only detectable effect reported from studies at Tunø Knob Offshore Wind Farm was that eider avoided flying

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[64] *Bright, J.A, et al (2006) Bird Sensitivity Map to provide locational guidance for onshore wind farms in Scotland, RSBP Research Report No 20, accessed on 31/03/2015 from http://waww.rspb.org.uk/forprofessionals/policy/windfarms/locationalguidance/scottish.aspx*

[65] *Larsen, J. K. & Madsen, J. (2000) Effects of wind turbines and other physical elements on field utilization by Pink-footed Geese [Anser brachyrhynchus]: A landscape perspective, Landscape Ecology **15**: p755-764.*

[66] *Kruckenberg, H. & Jaene, J. (1999) Zum Einfluss eines Windparks uaf Verteilung weidender Bläßgänse im Rheiderland [Landkreis Leer, Niedersachsen], Natur und Landschaft **74**: p420-427.*

[67] *Drewitt, A. L. & Langston, R. H. W. (2006) Assessing the impacts of wind farms on birds, Ibis **148**: p29-42.*

and landing within 100 m of turbines (Guillemette *et al*, 1998 and 1999)[68] [69]. A further study at the same wind farm (Tulp *et al*, 1999)[70] reported that both common scoter and eider flew through the area at night, maintaining a greater distance from turbines in conditions of poor visibility, with fewer flights within 1.5 km of turbines being recorded during darkness. These results were consistent with a study of flight behaviour of pochard and tufted duck at Lely in the Netherlands (Dirksen *et al*, 1998)[71]. Therefore, in an offshore situation at least, birds can be displaced from their usual flight paths by wind farms. This might make a foraging area less attractive due to the increased flight time and energy required to reach it from a roost site. However, given that the Bolshan Renewables Project only consists of one turbine it is unlikely that any birds would have to deviate far from their usual course and, considering greylag geese or pink footed geese (for example) may forage up to 20 km from their roosts, the impact would be negligible.

SNH (2010)[72] sets out that both the British Trust for Ornithology and Patterson (2006)[73] have concluded that *"wind farms appear to cause very few collisions of geese in United States, UK and Europe. The limited data from operational wind farms in [the] UK support this view and, and while it is still too soon to be certain, the BTO [British Trust for Ornithology] view that such events are rare is entirely consistent with all the currently available field-based evidence. In Europe, with thousands of wind turbines and large wintering populations of Arctic breeding geese, only about 9 goose casualties have been recorded – 6 barnacle geese, 1 greylag goose, 1 bean goose and 1 bean/white-fronted goose (Hötker et al, 2005[74])".*[75]

In a review of the impacts of wind farms on upland raptors, Madders & Whitfield (2006)[76] concluded that displacement appears to be negligible. Given the amount of habitat available and the relatively small area from which raptors may be displaced, the impact of displacement on any species would be negligible.

One SPA was found within 20 km of Bolshan Renewables Project. Table 6 below lists this SPA, the distance to site, the qualifying features, and the foraging range of these species as noted within the SNH guidance 'Assessing Connectivity with Special Protection Areas'[77].

Table 6: SPA within 20 km of the Bolshan Renewables Project, qualifying features and foraging ranges

Designation	Distance to Bolshan	Qualifying Feature (birds)	Foraging Range
Montrose Basin	7.4 km NE	Greylag goose	15-20 km
		Pink-footed Goose	15 -20 km
		Redshank	Forage in tidal areas (*not included in SNH guidance*)
		Knot	Forage in tidal areas (*not included in SNH guidance*)

[68] *Guillemette, M., Larsen, J. & Clausager, I. (1998) Impact assessment of an offshore wind-park on sea-ducks, NERI Technical Report No. 27, 63pp.*

[69] *Guillemette, M., Larsen, J. & Clausager, I. (1999) Assessing the impact of the Tunø Knob wind park on sea ducks: the influences of food resources, NERI Technical Report No. 263, 21pp.*

[70] *Tulp, I., Schekkerman, H., Larsen, J. K., van der Wilden, J., van de Haterd, R. J. W., van Horssen, P., Dirksen, S., Spaans, A. L. (1999) Nocturnal flight activity of sea ducks near the wind farm Tunø Knob in the Kattegat, IBN-DLO Report No. 99.30.*

[71] *Dirksen, S., Spaans, A. L. & van der Winden, J. (1998) Nocturnal collision risks with wind turbines in tidal and semi-offshore areas. In: Wind Energy and Landscape. Proc. 2nd European and African Conference on Wind Engineering, 1997, p99-108.*

[72] *Scottish Natural Heritage (2010) Use of avoidance rates in the SNH wind farm collision risk model.*

[73] *Patterson, I. J. (2006) Geese and wind farms in Scotland. Report for SNH*

[74] *Hötker, H., Thomsen, K.-M. & H. Jeromin (2006) Impacts on biodiversity of exploitation of renewable energy sources: the example of birds and bats - facts, gaps in knowledge, demands for further research, and ornithological guidelines for the development of renewable energy exploitation. Michael-Otto-Institut im NABU, Bergenhusen.*

[75] *Page 6, Scottish Natural Heritage (2010) Use of avoidance rates in the SNH wind farm collision risk model*

[76] *Madders, M. & Whitfield, D. P. (2006) Upland raptors and the assessment of wind farm impacts. Ibis **148**: p43-56.*

[77] *Scottish Natural Heritage (2012) Assessing Connectivity with Special Protection Areas [Online] Available: http://www.snh.gov.uk/docs/A675474.pdf*

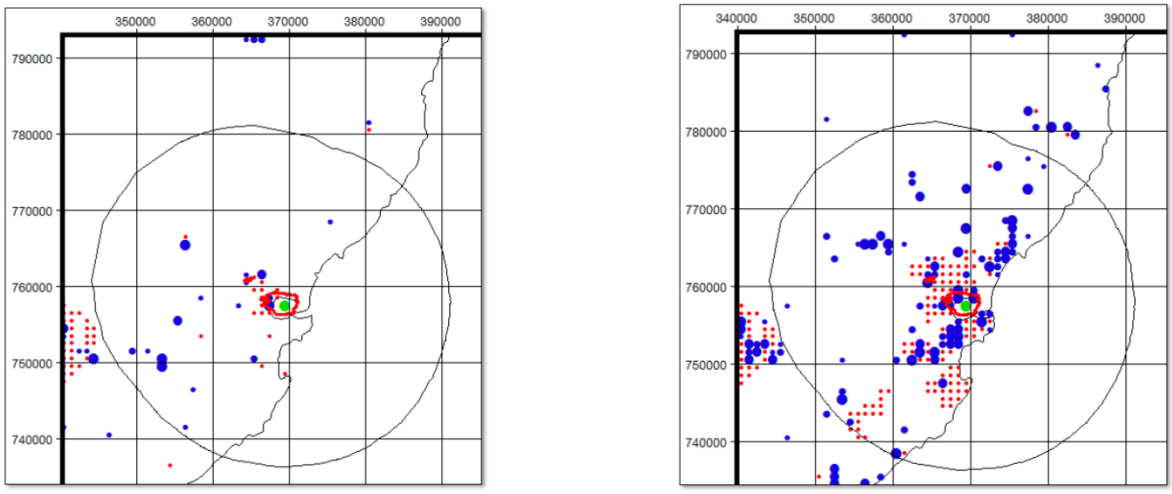

Figure 9: Feeding distribution (1986/87 to 2011/12 – all records) of Greylag Geese (left) and Pink Footed Geese (right) in relation to the Montrose Basin SPA[78]

Figure 9 shows the feeding distribution of greylag geese and pink footed geese around Montrose Basin. The geese feed around the proposed turbine site. However, SNH have said in their response to the previous turbine application: "*the appraisal we carried out considered the impact of the proposals on the following factors: Collision mortality, displacement and barrier effects. In the absence of site specific goose survey we used generic data, which indicate very low collision mortality. There are alternative foraging opportunities in the surrounding area and a single turbine is unlikely to displace geese from accessing these areas*"[79]. As already noted SNH have advised that "*There are natural heritage interests of international importance at this site, but in our view, these will not be adversely affected by the proposal*" [80]

There will be no adverse impacts upon sites of international, national or local importance. Therefore, it is fair to conclude that the magnitude of impact for all bird species during operation is likely to be negligible.

Decommissioning Effects

Turbine removal may cause disturbance to birds breeding and foraging within the site. However, the level of impact would be considerably lower than in the construction phase, as there would not need to be any preparatory works, simply the dismantling by crane and removal of the turbine for recycling elsewhere, which can be completed in a couple of days. This very short period would result in a negligible level of impact.

[78] *Mitchell, C. (2012) Mapping the distribution of feeding Pink-footed and Iceland Greylag Geese in Scotland. A report for the Wildfowl and Wetlands Trust.*

[79] *Page 2, SNH response to application 13/00887/FULL, dated 24 October 2013, authored by Fiona Mutch*

[80] *Page 1, SNH response to application 13/00887/FULL, dated 24 October 2013, authored by Fiona Mutch*

7.5 Conclusions: Ecology Impact Assessment

- The habitat within the development area is either improved grassland or arable habitat types. There are no plants of national or local importance (UKBAP or LBAP). Botanically, the area is of low sensitivity with a limited flora.

- The proposed wind turbine is likely to have negligible impacts on badgers. No badger setts were found on-site. Suitable mitigation and best practice will be included in the Construction Method Statement to ensure that badgers are properly protected during the construction phase.

- The bat survey found that there are no roosting bats and no signs of bats anywhere in or around buildings or trees on the site of the proposed wind turbine. The area around the turbine site was used as foraging habitat in very small numbers. Because of these small numbers, and extensive alternative habitat available locally, the significance of impact on populations locally will be very low. Pipistrelles are adaptive in their foraging habits and if deterred by the turbine, will use alternative sites in the area. It has been concluded that the development is unlikely to have a significant effect on local bat populations.

- The impact on designated species is considered to be negligible. There is one SPA within a 20 km distance. There are alternative foraging opportunities in the surrounding area, and a single turbine is unlikely to displace geese from accessing these areas.

- Cumulative effects have been studied as part of the EcIA. It is concluded that any effects caused by the introduction of the Bolshan Renewables Project, in the context of current wind development proposals in the area, is likely to be negligible.

Ecological Impact Assessment, Appendix 1: Ecological Survey Report

Taken from Previous Planning Application (13/00887/FULL). Deals with a different turbine position.

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SNH Bat Licence Number 15094

SURVEY FOR BATS, BAT ROOSTS AND OTHER PROTECTED SPECIES AT SITE OF PROPOSED WIND TURBINE, BOLSHAN FARM, FRIOCKHAM

Report to Alex Craig, Architectural Consultant / R & G Smith

by
Dr Susan M. Swift

May 2013

1.0 Introduction and Background

Planning permission is sought to install a single wind turbine on a site at Bolshan Farm near Friockham (**O.S grid reference NO 614 522**). Because there are several derelict buildings on the site and also trees round the buildings and along farm tracks leading to and from it, it was considered advisable to carry out a survey for bats, nesting birds and other protected species as part of the Planning application. This is in view of the known propensity for bats and owls to roost in farm buildings and because of the nesting/feeding opportunities provided by trees and bushes. The current survey was therefore commissioned by Alex Craig on behalf of the owners and carried out by Dr Sue Swift on 28th May 2013. It aimed to identify any bat roosts in buildings on the site or in trees surrounding them, to assess the importance of the site for bats in the area and to recommend measures to mitigate possible harmful effects on bats of the proposed turbine. It also aimed to assess the importance of the site for barn owls and other nesting birds and for protected species such as red squirrels.

2.0 The Conservation Status of Bats

Bats of all species in Scotland and their roosts are protected under the Conservation (Natural Habitats, &c) Amendment (Scotland) Regulations 2007. Under this law it is illegal intentionally or recklessly to kill or injure a bat, to disturb a roosting bat or to damage, destroy or obstruct access to any bat roost. This applies to both summer and winter roosts, which may be in different structures. Any action which is likely to

disturb or damage a bat roost requires a development licence from Scottish Natural Heritage.

3.0 Site Description

The site is located 500m north-west of Bolshan Farm steadings and is surrounded on all sides by arable fields. It is accessed via two hard core tracks through the fields. There are open fields on all sides, with tree lines along the field edges and along the tracks. Some of these are mature (mainly oaks and beech) and they are interspersed with younger trees (sycamore and poplar). The nearest water bodies are the River Lunan Water 2.5km to the south and Balgavies Loch 7km west. The east edge of Montreathmont Forest, a large area of coniferous forest with areas of deciduous trees, is 2km west of the site. There are no other areas of woodland within 3-4km. The nearest buildings are at Bolshan Farm (houses and farm buildings).

There are five buildings on the site, all of the same age and construction. Dating from the Second World War, when they were associated with a nearby airfield, they have not been maintained since and are currently used for storing hay and agricultural implements. All are of single skin brick construction with asbestos sheet roofs and no roof spaces. Some of the roofs have originally been board lined, but much of the boarding has rotted, leaving the asbestos sheets exposed. One of the buildings, originally a grain drier, is 12m high, but the rest are single storey and there are no dark roof voids or lofts. Trees around the buildings are mainly immature poplar, ash and sycamore, with two large Norway spruce in the NW corner. These, together, with trees along the access tracks leading south and east from the site, provide shelter for flying insects and also potential nest sites for birds.

4.0 Biology of Bats - Aspects Relevant to the Survey

4.1 Bat species

Nine species occur in Scotland, of which five are regularly found in Angus:-

Pipistrelles. Two very similar species, 45kHz pipistrelles (*Pipistrellus pipistrellus)* and 55kHz pipistrelles (*Pipistrellus pygmaeus)*, are both common and widespread in Scotland. Both may occur in rural or built-up areas and their summer and winter roost sites are usually in man-made structures such as bridges and buildings. While summer maternity colonies of females and young are usually in heated houses, small groups of males sometimes roost in crevices in cooler buildings. Foraging habitat is tree lines, woodland edges and riparian vegetation, and pipistrelles are the only species which commonly exploit small, isolated patches of habitat in open farmland..

The brown long-eared bat, *Plecotus auritus,* is also usually found in houses, particularly in rural and wooded areas. Although much less common than pipistrelles, it is frequently associated with old buildings containing large attics. Although associated with farm buildings, long-eared bats rely heavily on woodland as foraging habitat and tend to avoid areas with open fields.

Daubenton's bat, *Myotis daubentonii*, is strongly associated with water and almost always roosts within 50m of lochs or rivers. Roosts are usually in trees overhanging the water, and buildings are rarely used. They were considered unlikely to be present at this site.

Natterer's bat, *Myotis nattereri*, typically roosts in rural areas, in barns, steadings and large old houses.However, it is uncommon in Angus and prefers wooded habitat..

entrances, staining around holes or a dark streak running down the trunk. Not all tree roosts will show these signs, so any trees containing holes or cavities are normally considered to be potential roosts and should be subjected to climbing or dusk/dawn surveys.

5.0 Method

5.1 Daylight survey

5.1.1 Buildings. A search was made of the exterior of all building for signs of bats, using binoculars to search high areas. Any droppings adhering to walls, wall tops or roofs, or accumulated at wall bases, were recorded, as was staining on brickwork. A search was made for potential roost sites or access holes, in order to plan the dusk survey. A thorough search was then made of the inside of all buildings for roosting bats or signs of bat occupation.

5.1.2 Trees. All trees on the site, plus those along the tracks within 30m of the site boundaries, were first assessed for their suitability for bat roosting on the basis of trunk diameter at 1m height – any trees with a diameter of less than about 0.3m are very unlikely to offer sufficient shelter. Any suitable for bats were then checked for signs of bats and for holes and cavities usable by bats as roost sites. Binoculars were used to check high areas.

5.2 Dusk activity survey

A dusk survey was carried out to confirm the presence/absence of roosts and assess bat activity on the site. It lasted for two hours, from 15 minutes before sunset (21.20 hours B.S.T.), using an ultrasonic bat detector (Pettersson D240X) to detect bats. Bats were identified in flight, using the detector in time expansion mode to record their orientation calls. The calls were stored on a tape recorder (Sony Professional) and later downloaded to a computer and analysed using wave analysis software (Batsound; Pettersson, Sweden). This allowed accurate identification to be made to species level. A count was made of bats detected, and the time, direction of flight and behaviour of all bats was recorded. The emergence survey was carried out from outside the buildings, although checks were also made inside each every 10 minutes; this was to detect any bats flying inside. Following the emergence survey, a continuous transect was wallked around the site to record foraging bats.

5.3 Local bat records

The SNH database was checked for bat records in the Friockham and Forfar areas. Other sources of information were Tayside Bat Group records and the author's own records of data accumulated from research projects and surveys carried out over twenty years.

6.0 Findings of the Survey

6.1 Daylight survey

6.1.1 Buildings. No roosting bats and no signs of bats were found in any of the buildings on the site. With single-skin, unclad brick walls, they contained no potential roost sites behind cladding, and the asbestos roofs had no sarking. The high building (granary) had no roof lining and the rest were low (wall top height around 2.5-3m), offering little in the way of roost potential. In these low buildings, although there was a space between the lining boards and the roofs, most of these boards had rotted away, leaving large, draughty spaces and much of the roofs exposed. The remaining spaces

between boards and roofs were generally unsuitable for bat roosts, offering insufficient shelter or concealment for use by bats. No bat droppings or staining were found in any of the buildings.

6.1.2 Trees. Trees around the buildings included sycamore, poplar and ash. Many of these were self-seeded saplings, and none had trunk diameter at 1m height of more than 0.25m. None contained holes or cavities usable by bats as roost sites, and no signs of bats were found. The only larger trees were two Norway spruce in the NW corner of the site (trunk diametere 0.35m, crown height 15m) and neither of these had deep holes or cavities. Thus, although the trees on the site would provide shelter for flying insects and thus provide foraging habitat for bats, there were no potential roost sites in trees. The access tracks leading to the site had a number of mature trees along them, mainly oak and beech, in particular two large beeches along the track leading east from the site; I understand these trees will not be affected by the proposed development. No signs of bats were found in these trees, but they did contain potential roost sites and should be re-surveyed if, in future, they need to be removed.

6.2 Dusk emergence survey

No bats emerged from anywhere in or around the buildings during the dusk survey. No bats flew inside the buildings, no pre-emergence bat noise was detected and no flying bats were detected until at least 20 minutes after the expected time of emergence; this confirmed that no bats roosted on the site. Similarly, there was no bat activity around any of the trees on the site until later in the evening. There was therefore no indication any bats roosted in trees or buildings on the site.

6.3 Bat foraging

Three individual bats foraged on the site during the dusk survey. All were pipistrelles, one 55kHz and two 45kHz. The first bat, a 55kHz pipistrelle, was first detected at 22.16 (36 minutes after sunset and 20-25 minutes after pipistrelles could be expected to emerge from roosts). It approached the site from the east, commuting along the east track, and foraged for 5 minutes over the corner of a wheat field and over the tree line along the track, before leaving and not returning. A second bat, a 45kHz pipistrelle, was detected five minutes later over the NE corner of the site. Feeding buzzes were detected as it foraged on a beat in this area. The third bat, another 45kHz pipistrelle, arrived on the site at 22.45 along the south track and foraged over the high building and the tree line along the track for ten minutes. No other bats were recorded, and no bats other than pipistrelles were detected.

6.4 Weather conditions

Weather on the night of the survey was suitable for bat activity. The following conditions were recorded:-

Ambient temperature at 21.15 = 13°C, at 23.00 = 8°C. Overhead conditions clear (cloud cover 0/8), light NE breeze. Flying insects were recorded on the site.

6.5 Local bat records

The following records of bats are known within 5km of Bolshan Farm:-

Pipistrelles. There are a number of records of both 45 and 55kHz pipistrelles locally, including a maternity roost of 55kHz pipistrelles in Friockham, a report of pipistrelles at Kinnell, numerous foraging records of pipistrelles in and around Montreathmont Forest and a 45kHz roost in Guthrie.

Brown long-eared bats. A maternity colony of this species is recorded in a roost at Farnell, and another at Arrat's Mill (6.5km).
Daubenton's bats have not been recorded within 5km, but there is a large colony at Balgavies Loch (10km), and also foraging records on the Lunan Water.

6.6 Owls and Nesting birds

One tawny owl was recorded flying inside one of the buildings before dusk. There was no sign of a nest, and only one bird was present. Unlike barn owls, tawny owls more commonly nest in tree holes, although single birds use buildings for shelter. Four swallows were observed foraging over the wheat field east of the site, and one swallows' nest was recorded in the smallest of the buildings; this was not currently occupied, but swallows are nesting late this year and they could yet return to it. A pair of chaffinches was recorded and are probably nesting in a tree or bush on the site.

6.7 Other Protected Species

No signs were found of red squirrels, and the site was not considered suitable for them, being too isolated from extensive coniferous woodland. It was too far from water to be relevant for otters and not relevant for other protected species.

7.0 Conclusions

7.1 No roosting bats and no signs of bats were found anywhere in or around buildings or trees on the site of the proposed wind turbine. I could find no evidence bats roosted on the site.
7.2 In view of the above, no licences in respect of bats will be needed before work begins.
7.3 The area around the turbine site was used as foraging habitat by pipistrelles (45 and 55kHz sprecies) in very small numbers. Single bats commuted to the site from roosts elsewhere and foraged around the trees and buildings for short periods of time before moving on.
7.4. A single tawny owl roosted in the buildings. There was no sign of a nest. Swallows foraged on the site and have nested in the buildings in the past. A pair of chaffinches nested on the site.
7.5 No protected species other than bats and nesting birds were present.

8.0 Impact assessment

Since no bat roosts were identified in buildings or trees, no roosts will be lost. The effects of single wind turbines on bat foraging habitats are not currently clear, since the technology is relatively new and research is continuing. So far, no mass deaths of bats such as are known from large wind farm sites in Europe and the USA have been reported in Britain. At large sites in these countries, many of the bat deaths have been shown to be caused by barotrauma – bats drown in their own blood when they fly into massive air pressure changes around moving turbine blades. Microturbines and single farm turbines do not have this effect, but sometimes cause bats to avoid previously used habitats. In this case, because the number of bats using the site for foraging is very low and there is extensive alternative habitat available locally, the significance of impact on populations locally will be very low. Pipistrelles are adaptive in their foraging habits and, if deterred by the turbine, will use alternative sites in the area. The birds on the site are unlikely to be affected by the proposed installation.

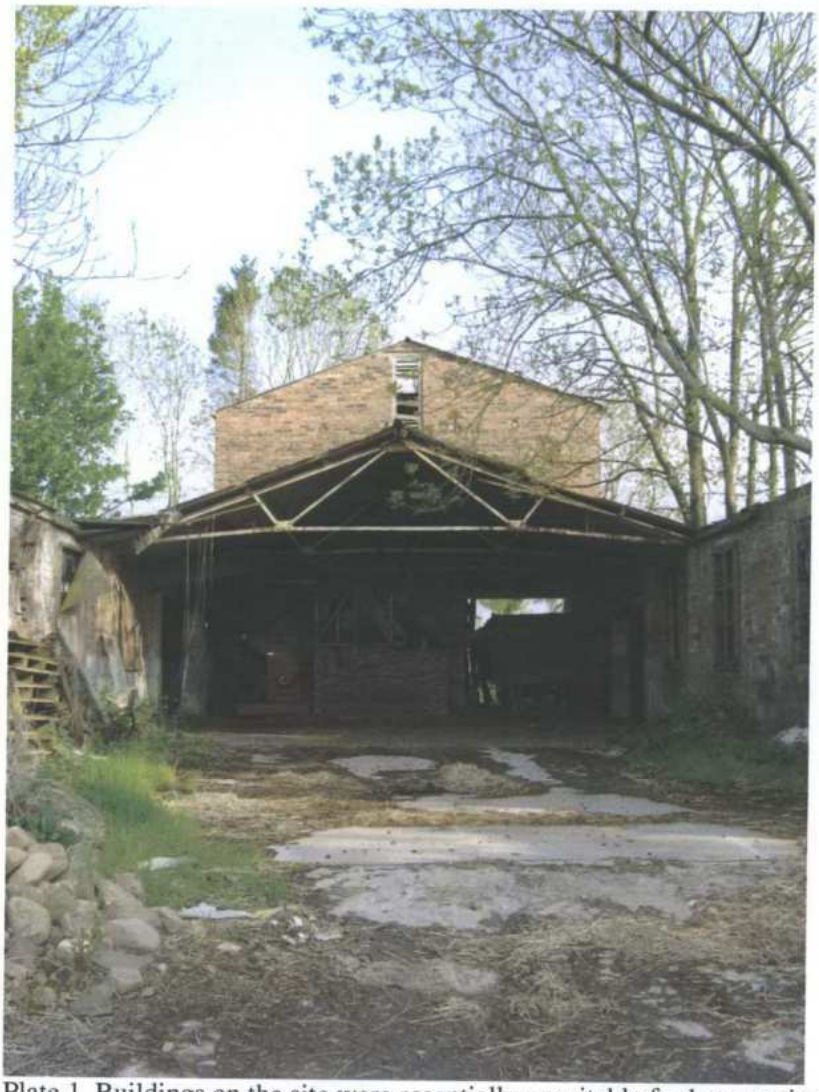

Plate 1. Buildings on the site were essentially unsuitable for bat roosting. The high ganary had no roof lining and no wall cladding and thus no potential roost sites. Other buildings were low, in very poor condition and with very few suitable roost sites. Trees were mainly small, with no cavities usable by bats.

8. Landscape and Visual Impact Assessment

8.1 Introduction

This Landscape and Visual Impact Assessment (LVIA) considers the potential effects that the proposed Bolshan Farm Renewables Project would have on the landscape and visual resource around the development site. This LVIA focuses on a defined study area with the aim of arriving at an assessment of the 'significance' of the effects on that study area. This LVIA should be read together with the volume of figures *'Bolshan Farm Renewables Project, Landscape and Visual Impact Assessment (LVIA) Figures (April 2015)',* provided with this Environmental Report.

The assessment presented here uses established landscape and visual impact assessment methodology which relies upon a systematic analysis of verifiable facts about the landscape, the proposal, and those who would observe it. The methodology applied is set out in the appendix to this chapter.

This LVIA concludes that the Bolshan Farm Renewables Project is acceptable in terms of its effect on the landscape and visual environment, that the design of the proposal has been carefully considered, and the location is appropriate. Photomontages and other images, together with the written assessment demonstrate how this conclusion has been reached

8.2 Policy and Regulatory Context

LVIA Approach

This LVIA has been prepared in accordance with the relevant policy, and guidance documents; some of which are detailed in the list below. This framework of documents gives the impetus for the LVIA, legitimacy to the methodology applied, and ensures the methodology is consistent with studies completed for other wind energy proposals.

Guidance and Research

- *'Visual Representation of Windfarms.',* Scottish Natural Heritage (Dec 2014).
- '*Assessing the impact of small-scale wind energy proposals on the natural heritage.*', Scottish Natural Heritage (June, 2014).
- *'Onshore Wind Turbines',* Online Planning Advice, Scottish Government (revised 28 May, 2014).
- *'Strategic Landscape Capacity Assessment for Wind Energy in Angus',* Prepared for SNH by Ironside Farrar (March 2014).
- *'Guidelines for Landscape and Visual Impact Assessment*' published by the Institute of Environmental Management and Assessment and the Landscape Institute (3rd edition, 2013). Referred to as 'the GLVIA'.
- *'Implementation Guide for Renewable Energy Proposals'*, Angus Council (approved June 2012)
- *'Assessing the Cumulative Impact of Onshore Wind Energy Developments',* Scottish Natural Heritage, (March 2012*).*
- *'Photography and Photomontage in Landscape and Visual Impact Assessment, Landscape Institute Advice Note 01/11'*, Landscape Institute (2011).
- *'Siting and Designing Windfarms in the Landscape, Version 1',* Scottish Natural Heritage (Dec 2009).

Policy

- Scottish Planning Policy (23 June, 2014)
- TAYplan – Strategic Development Plan (Approved June 2012)
- Angus Local Plan Review (Adopted 2009)

8.3 Terminology

In accordance with the GLVIA Guidance, this report has been prepared using the terminology commonly employed in the presentation of an LVIA. This ensures that the LVIA is accessible to other practitioners in the field and the assessment is comparable to that undertaken in other LVIA. Where possible, plain English has been used to make the assessment more comprehensible to all readers, and to avoid introducing opaque or ambiguous concepts that make the assessment more difficult to read.

'Significance'

'Significance' within this LVIA is stated as being along a scale ranging from 'negligible' to 'high' significance and is derived by combining 'sensitivity' and 'magnitude' ratings.

For the purposes of this LVIA the various thresholds of 'significance' mentioned in the methodology given should not be confused with 'significant effects on the environment' as stated in the EIA regulations. Nor should a particular level of 'significance' be considered to indicate acceptability or otherwise of the proposal under a particular development plan policy. Such an assessment requires a more rounded consideration of the proposal.

'Effect' and 'Impact'

The terms 'effect' and 'impact' have been used interchangeably, for instance when discussing 'landscape impact', 'landscape effects', 'visual impacts', and 'visual effects'. Interchanging between the two arises because assessments such as this are generally called 'Landscape and Visual Impact Assessments', but the term 'impact' is pejorative. Hence the more neutral 'effect' is more commonly used in the analysis and this is common LVIA practice.

8.4 Aesthetic Judgements and Public Opinion

The assessment presented in this LVIA is designed to avoid subjective judgements on the aesthetic value of the wind turbine. However it must be recognised that the experience someone has when viewing a landscape is deeply influenced by the subjective ideas they bring to that experience. For example the person's values, ideals, and concept of what makes a rural landscape worthy of aesthetic appreciation, will all shape their experience of viewing the proposed wind energy development. Some people may appreciate wind turbines as signs of admirable sustainable ideals; others may not share this point of view. Conclusions as to the significance of effect on a landscape or viewpoint should not be interpreted as positive or negative aesthetic judgements. This applies both when there is a low significance of impact, and when impact is high. Because of such issues it is difficult, or perhaps impossible, to judge wind turbines simply in visual and landscape terms, without informing these judgements with an awareness of the need for such developments.

An independent survey, carried out by MORI on behalf of Cardiff University[81], found that members of the public are generally supportive of wind farms within 5 miles of their homes: *'most respondents (73%) would tend to support or strongly support the building of a new wind farm within 5 miles of their home'*[82], interestingly this survey also asked respondents whether they would support new coal or nuclear generation within 5 miles of their home, to which they were overwhelmingly more negative. A more recent poll, conducted by YouGov, on behalf of Scottish Renewables, sampled the opinion of 1,008 Scottish adults. This survey asked 'to what extent do you agree or disagree with the following statement. "I support the continuing development of wind power as part of a mix of renewable and conventional forms of electricity generation"'. 71% of the responses agreed with this statement[83], which is an increase of 7% on the 2013 result. While wind turbines can be locally contentious, the application for the Hunterston coal fuelled power station which was eventually withdrawn in 2012 received 20,000 objections. The public are far more supportive of renewable energy and understand its benefits. This support feeds through into judgements about the acceptability of landscape change.

[81] '*Public Perceptions of Climate Change and Energy Futures in Britain',* Spence et al, Cardiff University, March 2010.

[82] Spence, A., Venables, D., Pidgeon, N., Poortinga, W. and Demski, C. (2010) *'Public Perceptions of Climate Change and Energy Futures in Britain, Summary Findings of a Survey Conducted from January to March 2010',* Cardiff: School of Psychology.

[83] Article and Poll results can be accessed via: http://www.scottishrenewables.com/news/number-scots-backing-wind-power-increases/

8.5 Landscape Effects of Climate Change

It is important to understand that climate change will alter the landscape, just as measures to mitigate climate change will too.

SNH, reporting the findings of research they commissioned into the effects of climate change on Scottish landscapes state the following on their website:

> *"Climate change could result in extensive landscape change across Scotland."*

The research report[84] mentions the following direct changes that may be caused by climate change:

- Coastal flooding and loss of low lying areas
- River flooding and erosion
- Habitats and species moving north
- Changing snowfall pattern
- Changes to agricultural practices and crops

While photomontages are provided with this LVIA to show the change caused by the construction of wind turbines, photomontages are also being used elsewhere to highlight how landscapes might be altered as a direct result of climate change[85].

Changes to the landscape caused by the construction and operation of renewable energy systems can be weighed against the likely landscape effects of climate change. Globally and in the longer term, there is a choice between landscapes in which renewable energy is generated, or landscapes altered by climate change. Both outcomes will result in changes to the landscape.

8.6 Site Selection at Feasibility Stage

The actual desirable separation distance between dwellings and wind turbines will be dependent on a range of factors including the size and number of wind turbines, topography, safety issues, noise, shadow flicker and shadow throw. The separation distances to nearby dwellings are the first consideration when any turbine layout is designed by The Greenspan Agency. This ensures that visual amenity is considered from the very earliest stages of site design and feasibility.

8.7 Previous Wind Turbine Designs at Bolshan

A detailed account of how a previous planning application for a wind turbine at Bolshan Farm (13/00887/FULL) has informed the design now put forward is given in Chapter 3 of this report. Also set out in that Chapter are details of how the views of the Council's Countryside Officer, and planning officer James Wright, have been taken into account. Mr Wright set out these views in an email to the previous agent A. Craig dated 30 June 2014. In that email he discusses a previous design iteration, with a different turbine position. To summarise, landscape and visual benefits of the new turbine position and turbine design which have a direct bearing on matters raised in that email are as follows:

- The proportions of the turbine are more favourable. The proposed Enercon E48 uses a 48m blade diameter and a 55m tower. This provides a balanced turbine with aesthetically pleasing proportions. The proposed turbine model is also known for its elegant curved profile (please refer to the turbine photo in Figure 2) and the elevation drawings provided separately with this planning application.

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[84] Land Use Consultants (2010) *An assessment of the impacts of climate change on Scottish landscapes and their contribution to quality of life: Phase 1 - Interim report*. Scottish Natural Heritage Commissioned Report No. 343.

[85] Stephen R.J. Sheppard, '*Landscape visualisation and climate change: the potential for influencing perceptions and behaviour'*, Environmental Science & Policy 8 (2005) 637–654.

- The new turbine position provides greater separation distances to nearby dwellings (623m instead of 478m[86], giving a 145m increase in separation distance to the nearest dwelling). The new separation distance is significantly in excess of the 500m distance mentioned by the planning officer in his email of 30 June 2014.
- The turbine has been moved down from the ridgeline.
- With the new turbine model the turbine blade will be 31m from the ground at its lowest point. This avoids the comparison with trees in the area. There are also fewer trees adjacent to the new turbine position.

Please refer to the full discussion in Chapter 3 of this report for further details.

8.8 Description of the Proposed Development and Mitigation

Detailed specifications for the proposal are given in the remainder of this Environmental Report. However it is important to give an account here with particular emphasis on the visible elements of the proposal and how landscape and visual impact has been mitigated through the design process.

Turbine design and site layout have been carefully considered to minimise landscape and visual impacts while delivering clean energy.

Turbine

The wind turbine would be the most visible part of the proposal. Planning permission is sought for one turbine located at grid reference NO 61507 52652. It would have a 55.6 metre hub height, a rotor diameter of 48 metres and a tip height of 79.6m. The tower will be solid and taper slightly, getting narrower with height. The turbine would be painted off-white and matt paint would be used to reduce the reflection of sunlight. The colour of the turbines would accord with the design advice commonly given in council supplementary guidance.

Although wind turbines are tall structures, they are also slender and may present less surface area to the viewer than large agricultural buildings or groups of houses commonly found in the landscape in Angus.

The height and movement of the wind turbine means it is the most important aspect of the proposal in visual terms (when compared with other supporting infrastructure such as the access track). This LVIA focuses on the predicted landscape and visual effects of the wind turbine. Statements given about the landscape and visual impact of the proposal should be read as references to the turbine, rather than the supporting infrastructure, unless specified otherwise.

Other Infrastructure

Some supporting infrastructure will be needed, including the following:

- The access track, which will be formed from the upgrading of an existing track and will be around 290m in length, will run across relatively flat ground and will not be widely visible from outwith the site. Access tracks for wind turbines have a greater visual impact if they are lengthy, or if they climb or traverse steep elevated slopes. There should be no problems of this nature at this site.
- The turbine foundation will not be visible after construction as it will be covered with excavated material.

Mitigation Through Design

Mitigation of landscape and visual impact is not possible after construction and during the operation of this type of development, so the design process has been the principle means by which the potential landscape and visual effects of the proposal have been mitigated.

[86] The distance to the nearest property at Doonbye was stated as 495.6 in the original noise assessment carried out by the previous agent but has been measured at 478m to the nearest façade by The Greenspan Agency using goreferenced 1:10,000 OS map data.

Turbine Size

Wind turbines tend to be large structures fundamentally because of the low density of air and the large area from which it is necessary to harness the wind. The turbine model being considered would have a tip height of 79.6m and a rated capacity of 500kW. This allows a meaningful amount of clean renewable energy to be produced while making the project viable in terms of balancing the financial benefits and required capital expenditure, taking into account the goal of diversifying farm income.

Turbines of 93m (for example, at Tealing Airfield, near Dundee) and 125m are commonly found in large wind energy developments throughout Scotland. Relatively speaking the Bolshan Farm turbine is modest in size, providing a compromise appropriate to the landscape and visual setting.

Turbine Model

The intended turbine model is specifically suited to the higher wind speeds found at this site. It delivers a great deal of power generation for the swept area of its blades. This is an important point because it means that progress can be made towards Scottish Government renewable energy generation targets which are re-iterated in the Angus Local Plan Review while minimising cumulative effects. Page 93 states that "major investment in commercial renewable energy production and distribution capacity throughout Scotland" is required to meet Scotland's renewable energy targets. More wind turbines will be needed in total if windy sites like Bolshan Farm are not utilised.

Duration of Effects

The lifespan of the project is 25 years. After this time the turbine is expected to be removed and the site re-instated. The only remaining part of the development would be the underground turbine foundation.

8.9 Defining the Study Area

The radii used to define the study area for this LVIA were based on SNH guidance and recent experience of consultee requirements for other similar developments. **A core radius of 20km has been used to define the study area for this LVIA**. This corresponds with the radius recommended for turbines of the relevant size in SNH's guidance 'Assessing the impact of small-scale wind energy proposals on the natural heritage', (June 2014).

8.10 Landscape Assessment

This landscape assessment considers the likely effects on the landscape caused by the Bolshan Farm Renewables Project.

Local Development Plan

Pages 94 – 97 of the Angus Local Plan Review (Adopted 2009) discuss requirements for the siting of wind energy developments and set out a landscape policy for wind turbines based on SNH landscape character areas and three different geographical areas within Angus. The Bolshan site is placed within geographic area number 2, 'Lowland and Hills'. According to the Local Plan Review this is the preferred location for wind energy development within Angus. When combined with the suitability of the area identified in the relevant capacity assessment, and Angus Council's Implementation Guide for Renewable Energy (fully detailed below) this points to an overwhelming consensus within the development plan, and documents which are material considerations, that this is a one of the most appropriate locations in Angus for a wind turbine of the scale proposed.

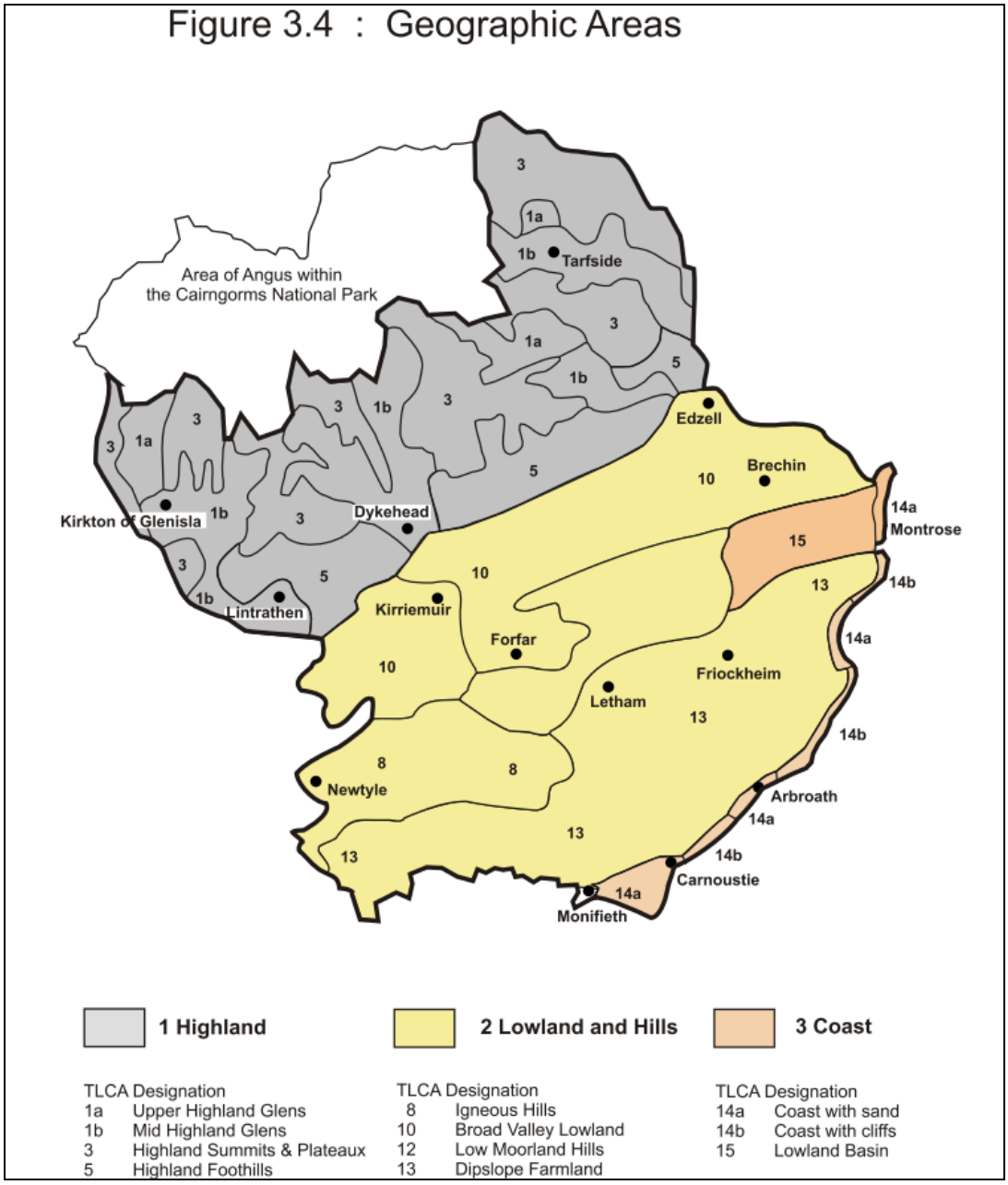


Figure 10 - Figure 3.4, page 95 'Angus Local Plan Review'

Site and Immediate Surroundings

The turbine base would be located at an elevation of 65m, on the lower eastern slopes of Wuddy Law, a low hill which rises to 132m. From a distance the hill is a gentle and low topographic feature from most directions.

Roads encircle Wuddy Law at around 75 to 105 metres elevation, isolating the hill itself. The area within these roads measures approximately 3.9km north to south-west and 2.7km north-west to south-east; an area of around 538 hectares.

The site is currently in use as an agricultural field. Aside from the agricultural land use, there are no notable landscape features within the application red-line boundary.

The scale of the agricultural land-use pattern and the abundance of space, provide an immediate landscape setting that is able to accommodate the proposed turbine.

Nearest properties

Sufficient separation distances are provided to the nearest properties. This abundance of space was key to the site's selection. Further details are given in the visual assessment below.

Study Area

The majority of the core landscape assessment study area, which extends to 20km, is within Angus Council's administrative boundary. The far north-east of the 20km area is within Aberdeenshire. Landscape character varies, and many landscape character areas have been identified by SNH within this 20km radius. According to the policy documents informing this study as noted in Section 8.2, the Dipslope Farmland character type in which the turbine is proposed is considered an appropriate land-area for wind energy development.

Zone of Theoretical Visibility Diagrams

The Zone of Theoretical Visibility diagrams (ZTVs) presented in Figures A1 to A5 of the volume of LVIA figures are key tools for understanding the magnitude of landscape effects and are referred to throughout this section. These ZTVs are produced by combining an Ordnance Survey digital terrain model with specifications for a turbine of 79.6m tip height, the resulting maps are then generated automatically by industry standard computer software and reveal areas from which the development is visible in theory.

The ZTVs presented here differentiate between complete and partial views of the turbine. Please refer to the text on the figures.

ZTVs are informative but tend to over-state the landscape impacts of wind energy developments. The ZTVs presented here have been adapted to take into account screening from large blocks of trees but do not show screening from buildings, hedgerows, or other smaller wooded areas, which are present extensively throughout the surrounding landscape. In addition, they assume perfectly clear visibility. Also, the presence of a myriad of other features (hills, roads, buildings, forests, vehicles etc) is played down. Many of these other features will be much closer to a receptor, or more fundamental to the experience of the landscape, but are not themselves represented in the ZTV. **Because of these factors, the ZTVs are likely to overstate the visibility and impact of the proposed wind turbine.**

Baseline Study

In preparing this LVIA an understanding of landscape character was acquired through desk-based research and field trips.

Zones for Landscape Assessment

It was necessary to break down the study area in order to carry out the landscape assessment and help understand the range and type of landscapes within 20km of Bolshan Farm. The study area is covered by two Scottish Natural Heritage landscape character assessments:

- No 122, 'Tayside Landscape Character Assessment', prepared by Land Use Consultants for SNH (1999).
- No 102, 'South and Central Aberdeenshire: Landscape Character Assessment', prepared by Environmental Resources Management for SNH (1998).

SNH Landscape Character Types beyond 10km, although included in the original scoping study area, have been excluded from subsequent more detailed assessment. One turbine of the size proposed would be very unlikely to have any notable landscape impacts on Landscape Character Types outwith a 10km radius.

Table 7 lists the Landscape Character Types within a 10km radius as defined in landscape character area assessment 'No 122, 'Tayside Landscape Character Assessment', prepared by Land Use Consultants for SNH (1999).

The table identifies those types which will clearly experience effects of a very negligible magnitude which can be excluded from the assessment without being considered in further detail. In this way the table helps select those Landscape Character Types for which a more detailed assessment will be presented.

The Landscape Character Types referred to are shown in the following figures included within the separate volume of LVIA figures:

- A4 – Scottish Natural Heritage Landscape Character Types, Zone of Theoretical Visibility, 10km Radius
- A5 – Index Map, Scottish Natural Heritage Landscape Character Types

The boundaries of each Landscape Character Type are specified in SNH shapefile GIS data which has been used to create these figures.

The Cairngorms National Park lies outwith the 20km study area.

There are no National Scenic Areas within 20km of the proposed turbine location.

Assessment of Sensitivity, Magnitude and Significance of Effect

The following pages assess the impact on the SNH Character Types noted above as meriting more detailed landscape assessment. In carrying out this assessment reference has been made to site visits, photographs, field notes, the relevant SNH landscape character assessments and ZTV Figures A1 to A5. The methodology set out in LVIA Appendix 1: LVIA Methodology (included at the bottom of this chapter), and the criteria set out in the tables in that appendix, have been used to determine levels of sensitivity and magnitude. For the reasons given in above, a 10km radius is focused upon.

In some instances a range of different magnitude, sensitivity or significance ratings may have been thought appropriate, with the word 'to' inserted in between. For instance a landscape Character Type may experience a 'High to Medium' impact because different parts of the area are closer or further from the proposal.

In other instances a magnitude, sensitivity or significance may be judged to be between two different ratings. This is represented by the insertion of an oblique between the two ratings, e.g. 'High/Medium'.

Table 7: SNH landscape Character Types within 10km

Landscape Character Type as numbered on Figure A5	*SNH Landscape Character Type*	*SNH Regional Character Area*	*Distance from Bolshan Farm Turbine at closest point (km)*	*Distance from Bolshan Farm Turbine at furthest point (km)*	*Impacts of negligible magnitude indicated on Figures A4 and A5 – No further assessment required*	*Selected for further assessment? See landscape assessment tables below.*
1	**Dipslope Farmland**	**Tayside Lowlands**	Turbine within this zone	Extends beyond 10 km radius.		✓
2	**Lowland Basins**	**Tayside Lowlands**	0.18	Extends beyond 10 km radius.		✓
3	**Low Moorland Hills**	**Tayside Lowlands**	0.62	Extends beyond 10 km radius.		✓
4	**Broad Valley Lowland**	**Tayside Lowlands**	6.35	Extends beyond 10 km radius.	✓	
5	**Coast with Sand**	**Tayside Lowlands**	6.91	Extends beyond 10 km radius.	✓	

Landscape Assessment Tables

Scottish Natural Heritage Landscape Character Assessment Zones

Table 8: Landscape Assessment. SNH Landscape Character Type: Dipslope Farmland

Number on Figure A5: 1
Distance from turbine at closest point: Turbine within this zone

Assessment of landscape sensitivity:

Description

This is an extensive area which lies between the steep slopes of the Lowland Loch Basin, the Low Moorland Hills and the coastal landscape areas.
Land use is predominantly agricultural with a network of generally small-scale roads. The larger roads A933, A92 and A90 run through the area connecting settlements nearer the coast.
The slopes range in height from 50m near the coastal strip to 180m in the north-west.
The landscape character is relatively coherent and balanced without degradation.
The Ironside Farrar Capacity Study[87] defines a landscape character sub-area within the Dipslope Farmland as the 'Rossie Moor' sub-area and the wind turbine is located within this sub-area. The landscape is heavily managed and not natural. It is intensively farmed with areas of low woodland interspersed throughout, field sizes range from medium to large.

Assessment

The Angus Council Renewables Implementation Guide[88] concludes that the Dipslope Farmland landscape character type is *'considered to have scope for turbines circa 80m in height'*[89].
The Rossie Moor sub-area has been identified as less sensitive to wind energy developments and the Ironside Farrar Capacity Study states: *"Due to its openness and productive farmland character the sub-area would be less sensitive to wind energy developments"* [90] The detailed table on page 67 of that document also explains that there is 'medium capacity' for turbines up to just-under 80m in height within the Rossie Moor sub-area in which the proposed turbine is located[91].
There is therefore a consensus that this one of the best areas in Angus for a turbine of the size proposed.
There is a variety of land uses, agriculture, forestry, roads, farm buildings, settlements etc. This variety would prevent wind turbine development from standing out as an isolated feature.

Landscape sensitivity is considered to be: Medium/Low

Assessment of magnitude:

This is a large character type. Around half of the area within the 10km radius is highlighted in ZTV Figure A4 with more substantial highlighting on the ZTV figure shown south-west of Friockheim and areas surrounding the A933.
It is worth noting that ZTV figures typically over-represent the importance of a wind turbine in the landscape. Experience of operational turbines has shown that the turbine's presence within the landscape diminishes quickly with distance. As distance increases, not only does the turbine take up less of an observer's field of view, but the landscape within which it is set effectively expands and the turbine is situated amongst a broad range of sizable landscape features.
In this case it also should be noted that the turbine is among the smallest 'commercial' sized turbines available, with just a 48m diameter.

Magnitude of change to this landscape character area caused by the turbine is considered to be:
High to Medium, between 0 and 0.5km from the turbine,
Medium to Low, 0.5-1.5km
Negligible to None, 1.5km - edge of landscape character type or where the turbine cannot be seen.

Significance of landscape effect:
High to Medium, between 0 and 0.5km from the turbine,
Medium to Low, 0.5-1.5km
Negligible to None, 1.5km - edge of landscape character type or where the turbine cannot be seen.
Note that this is a large landscape character type and the effect on it as a whole is expected to be very negligible.

[87] '*Strategic Landscape Capacity Assessment for Wind Energy in Angus*.' Prepared for SNH by Ironside Farrar, March 2014.
[88] *'Implementation Guide for Renewable Energy Proposals'*, Angus Council (approved June 2012)
[89] Page 48, *'Implementation Guide for Renewable Energy Proposals'*, Angus Council (approved June 2012)
[90] Page17 '*Strategic Landscape Capacity Assessment for Wind Energy in Angus*.' Prepared for SNH by Ironside Farrar, March 2014
[91] Page 67 '*Strategic Landscape Capacity Assessment for Wind Energy in Angus*.' Prepared for SNH by Ironside Farrar, March 2014

Table 9: Landscape Assessment. SNH Landscape Character Type: Lowland Basins

Number on Figure A5: 2 **Distance from turbine at closest point:** 0.18
Assessment of landscape sensitivity: **Description** *"The overall impression is of a very broad, shallow basin within which, particularly at the eastern end, water and sky, together with the enclosing hills are the dominant landscape element."*[92] The most prominent features of the area of character type which is within the 10km study radius is the Montrose Basin (a designated SSSI). This is an estuary enclosed by harder volcanic rocks to the north and south and cut off from the sea by the spit of land where Montrose is located. Proximity to the coast has resulted in the mudflats surrounding the basin being significant in terms of nature conservation interest. Land use of the character type is a mix of agriculture and conservation in the form of Kinnaird Deer Park located to the west of the area. The roads A935 and A934 run through the area connecting Montrose to neighbouring settlements, most of the smaller settlements in the character type are located along these roads. The part of this landscape character type closest to the proposed wind turbine differs markedly in character from the Montrose Basin, which is the character type's key feature, and is around 8km away. **Assessment** The sensitivity of the area is not uniform and the key sensitive landscape features, such as the coast and the Montrose Basin are about 12 and 8km respectively from the proposed turbine at Bolshan Farm. **Landscape sensitivity is considered to be:** Medium/Low, rising to High/Medium near the Montrose Basin.
Assessment of magnitude: Within 10km of the turbine perhaps around a third of the landscape character area within the study area would experience frequent views of the turbine, according to the ZTV figure A4. Montrose Basin, which is more sensitive, is not expected to be significantly impacted due to screening from large areas of woodland and the terrain. Areas highlighted in ZTV Figure 4 as experiencing views of the turbine tower are expected to occur largely occur within 0 - 2.5km and between 7.5km and 10km. **Magnitude of change to this landscape character area caused by the turbine is considered to be:** High to Medium, between 0.18 and 0.5km from the turbine Medium to Low, 0.5-1.5km Negligible to None, 1.5km - edge of landscape character type or where the turbine cannot be seen.
Significance of landscape effect: High to Medium, between 0.18 and 0.5km from the turbine, Medium to Low, 0.5-1.5km Negligible to None, 1.5km - edge of landscape character type or where the turbine cannot be seen.

[92] Page236, '*No 122 Tayside landscape character assessment*', prepared by Land Use Consultants for SNH (1999).

Table 10: Landscape Assessment. SNH Landscape Character Type: Low Moorland Hills

Number on Figure A5: 3 **Distance from turbine at closest point:** 0.62
Assessment of landscape sensitivity: **Description** The Low Moorland Hills character type can be defined as a series of "ridge-like hills with sharply defined northern edge and gentler eastern slopes" rising from 200 to 250 metres above sea level.[93] The prominent features of the character type are the continuous area around Montreathmont Moor overlooking Forfar and the smoother, isolated hills such as Dunnichen Hill and Fothringham Hill, only the Montreathmont Moor feature is within the 10km study area. Settlements within the character type take form of scattered farmsteads rather than any village having been established. The designated SSSI 'Rescobie and Balgavies Lochs' partially lies within the 10km radius study area on the far west outer reaches. **Assessment** The Montreathmont Moor, although being an elevated area of upland is extensively covered by coniferous woodland and as such the minor network of roads and paths within this area are not expected to have views of the proposed turbine. Generally, the agricultural practices range from arable to grazing highlighting the poorer soil quality found in the area. Telecommunication masts and pylons are also a common sight throughout the area. The Angus Council Implementation Guide for Renewable Energy[94] sets out that this area is considered appropriate for some wind turbines up to 80m in height, dependent upon site specifics: "Considered to have scope for turbines circa 80m in height which do not disrupt the principle ridgelines or adversely affect the setting of important landscape features …"[95] **Landscape sensitivity is considered to be:** Medium/Low
Assessment of magnitude: The turbine is not in this area and there will be no direct effect on this landscape. Less than half of the character area within the 10km study radius is highlighted in ZTV Figure 4, most of the highlighted areas which are expected to see at least the tower of the turbine lie between 2.5km and 5km. At this distance the turbine would not play an invasive role in the experience of landscape. **Magnitude of change to this landscape character area caused by the turbine is considered to be:** Medium to Low, 0.62-1.5km Negligible to None, 1.5km - edge of landscape character type or where the turbine cannot be seen.
Significance of landscape effect: Medium to Low from 0.62km to around 1.5km Negligible or less from around 1.5km, falling to none towards the edge of landscape character area or where the turbine cannot be seen.

[93] Page211 '*No 122 Tayside landscape character assessment'*, prepared by Land Use Consultants for SNH (1999).
[94] '*Implementation Guide for Renewable Energy Proposals'*, Angus Council (approved June 2012)
[95] Page 48, '*Implementation Guide for Renewable Energy Proposals'*, Angus Council (approved June 2012)

Landscape Assessment Summary

The following tables present a complete summary of the findings of the above landscape assessment for the 20km study area.

Table 11: Landscape Assessment Summary

Landscape Character Type Number on Figure A5	*SNH Landscape Character Type*	*Distance from Bolshan Farm turbine at closest point (km)*	*Detailed Assessment Required and carried out in tables above?*	*Significance of Landscape Effects*
1	Dipslope Farmland	Turbine within this zone	✓	High to Medium, 0 - 0.5km Medium to Low, 0.5-1.5km Negligible to None, 1.5km - edge of landscape character type or where the turbine cannot be seen.
2	Lowland Basins	0.18	✓	High/Medium 0.18km - 0.5km Medium/Low 0.5km - 1.5km Negligible to none from around 1.5km, falling to none towards the edge of landscape character area or where the turbine cannot be seen.
3	Low Moorland Hills	0.62	✓	Medium to Low 0.62km - 1.5km Negligible or less from around 1.5km, falling to none towards the edge of landscape character area or where the turbine cannot be seen
4	Broad Valley Lowland	6.35	×	Very Negligible
5	Coast with Sand	6.91	×	Very Negligible
n/a	Assorted landscape character types	Beyond 10km	×	All Landscape Character Types beyond 10km from the proposed turbine were assessed as experiencing effects of negligible significance or no effect at all.

Landscape Assessment Conclusions

The scale of the agricultural land-use pattern and the abundance of space, provide an immediate landscape setting that is able to accommodate the proposed turbine. The area of the lower slopes of Wuddy Law hill provides a coherent and spacious setting for the wind turbine.

The site is not within a designated landscape. There are no National Scenic Areas or National Parks within the 20km study area.

The Angus Council Renewables Implementation Guide[96] concludes that the 'Dipslope Farmland' landscape character type in which the proposed turbine is located is *'considered to have scope for turbines circa 80m in height'*[97].
The Ironside Farrar Capacity Study identifies sub-areas within the 'Dipslope Farmland'. According to this capacity study the proposed turbine is within the Rossie Moor sub-area which has been identified as less sensitive to wind energy developments. The Ironside Farrar Capacity Study states: *"Due to its openness and productive farmland character the sub-area would be less sensitive to wind energy developments"* [98] The detailed table on page 67 of this document also explains that there is 'medium capacity' for turbines up to just-under 80m in height within the Rossie Moor sub-area in which the proposed turbine is located[99].
There is therefore a consensus within relevant planning guidance documents that this one of the best areas in Angus for a turbine of the size proposed. The findings of the above landscape assessment also support this conclusion.

8.11 Visual Assessment

Landscape impact assessment and visual impact assessment are closely related, with visual impact assessment being a subset of landscape impact assessment[100]. Generally accepted practice for wind turbine analysis divides the two and focuses on the assessment of specific views in the 'visual' assessment through the production of photomontages.

The main section of this visual assessment involves the presentation and methodical assessment of photomontages showing how the Bolshan Farm turbine would look from 10 different viewpoints.

Viewpoint Selection

The viewpoints chosen for assessment were selected based on those used for the photomontage assessment of the previous turbine application for this site (13/00887/FULL). Subsequent review of these locations, supported by analysis of preliminary ZTVs, lead to the choice of viewpoints as specified in Table 12. The resulting list of viewpoints provide a clear understanding of the turbine's appearance and allow an informed analysis of the effects of the proposed development upon some of the most relevant visual receptors. Further photomontages can be provided for the planning authority upon request should they be required.

[96] *'Implementation Guide for Renewable Energy Proposals'*, Angus Council (approved June 2012)

[97] Page 48, *'Implementation Guide for Renewable Energy Proposals'*, Angus Council (approved June 2012)

[98] Page17 '*Strategic Landscape Capacity Assessment for Wind Energy in Angus*.' Prepared for SNH by Ironside Farrar, March 2014

[99] Page 67 '*Strategic Landscape Capacity Assessment for Wind Energy in Angus*.' Prepared for SNH by Ironside Farrar, March 2014

[100] Paragraph 1.3 of '*Visual Assessment of Windfarms: Best Practice*', University of Newcastle (2002), Scottish Natural Heritage Commissioned Report.

Figures B2 to B11 within the volume of LVIA figures which accompanies this Environmental Report (dated April 2015) contain photomontages and wireframes illustrating how the proposed development could appear once built. Figure B1 shows where the viewpoints are located and a list summarising the viewpoints is presented in the table below.

Table 12: Viewpoints for Visual Assessment

Figure Number	*Viewpoint*	*Distance from proposed turbine (m)*
B2	Junction on A934	977
B3	Pitmikie Crossroads	1,292
B4	A933/A934 Junction	1,526
B5	Wuddy Law Trig Point	1,537
B6	Kinnell Church	2,449
B7	Edge of Farnell	2,873
B8	Edge of Friockheim	3,314
B9	A933/B961 Legaston Junction	4,961
B10	A933 near Colliston Mill Cottage	6,932
B11	Layby on A935	8,332

Photomontages

It should be noted that although the photomontages have been prepared with great attention to detail, using advanced computer software and high quality photography, there are limitations to the images created. The images should be seen as tools for understanding how the view may change, rather than an exact replication of the experience of viewing the finished development from the specified viewpoint.

The computer program used takes into account the turbine model (exact hub height and blade length), the distance of the turbine from the viewpoint, the location of the viewpoint, topographical data, the position and brightness of the sun and other factors. Some factors, such as the size of the turbine within the view, are generated automatically by the program. Some other factors, such as how the photograph is aligned with the rendered turbine, must be done manually in a considered and methodical way. It should be noted that the experience of viewing a proposal once built is not easy to replicate on photomontages created prior to construction.

The key SNH documents providing guidance on creating photomontages is 'Visual Representation of Windfarms, Good Practice Guidance' (July 2014). But 'Assessing the impact of small-scale wind energy proposals on the natural heritage' (Version 2, June 2014) is also relevant here. The former document provides very extensive prescriptive guidance for photomontage figures but makes clear in paragraphs 6 and 7 that the standards set out there are a requirement only for EIA projects. The small-scale wind energy guidance explains on page 2 that 'small scale' wind includes proposals for up to 3 turbines, "even when the turbines themselves might be quite large"[101]. As such the requirements of the guidance for 'small-scale' schemes applies to this non-EIA project for one wind turbine, and the more exacting requirements set out in 'Visual Representation of Windfarms, Good Practice Guidance' do not.

This LVIA has taken a balanced approach informed by the SNH guidance, The Greenspan Agency's own experience of preparing many such assessments and the LVIA methodologies as used by other consultancies accompanying assessments for wind energy developments.

For this project a 68 degree included angle (field of view) has been used for all photomontages. 68 degree photomontages allow the viewer to appreciate the context of the rendered turbine and give a good balance between wider views (which make the turbine look smaller while placing it within the wider context) and narrower views (which make the turbine look bigger but remove the context). Maintaining a consistent 68 degree field of view throughout the LVIA simplifies the reader's task of interpreting the images.

The panoramic photos used for the background image were originally composed of several images taken with a Nikon D700 digital SLR camera with a full frame sensor. The images were then digitally stitched together to create panoramas

[101] SNH *'Assessing the impact of small-scale wind energy proposals on the natural heritage'*, Version 2, June 2014.

with a 68 degree field of view. The photomontages presented for this LVIA ought to be viewed at a distance of 340mm when printed at A3 size, replicating a 68 degree field of view.

Turbine Visibility

When the photos were taken the exact position of the viewpoint was chosen to maximise views of the turbine. Several photosets were taken from slightly different positions, with the clearest views of the turbine presented in the final figures. Picking viewpoints with clear views of the turbine can give a biased impression of how visible the turbine would be from locations within the study area. It is important to understand that screening from topography, vegetation, buildings etc. will usually obscure views of the turbine if an individual is to face in the direction of the turbine when at a random location within the 20km study area.

Visual Assessment Tables

The visual assessment tables below deal with each of the viewpoints in turn. The tables present an assessment of sensitivity, magnitude, and significance of effect; these are derived using the methodology set out in the Methodology appendix and the end of this LVIA. The **magnitude** of change to the view is combined with its **sensitivity** using the matrix in the appendix. In this way a conclusion as to the overall level of effect and the **'significance'** of this effect is derived.

Table 13: Visual Assessment, Junction on A934

Photomontage Figure Number: B2 **Distance to Bolshan Farm Turbine:** 977m
Reason for Selection: Nearest 'A934' road junction expected to have a clear view of the turbine providing an indicative view from local road network.
Assessment of sensitivity: With reference to Table 34: Criteria for Assessing Visual Sensitivity 'road users' are usually considered receptors of 'low' sensitivity. It should be noted that Figure 11 (below) provides a more indicative view of the junction and surrounding vegetation. Subsequent analysis and photomontage composition revealed that from this position the turbine site would be obscured by the tree in the foreground. As this assessment aims to provide a 'worst case scenario', with a clear view of the turbine, the alternative position was selected for viewpoint assessment. This viewpoint helps illustrate the gently sloping character of the agricultural landscape surrounding the proposed turbine. Deciduous trees grow along the boundaries of these fields, this can be seen in Figure 11 and has been considered in the assessment of magnitude below. The view is not especially well composed or exciting, but is pleasant none-the-less. **The sensitivity of this viewpoint is considered to be:** Medium/Low
Assessment of magnitude: Due to its proximity, the turbine is prominent in this view. The lines of trees found along field boundaries provide intermittent screening for road users restricts views toward the turbine. The view as demonstrated in Figure B2 would be experienced very fleetingly by road users through spaces in the trees. Visual composition would be changed; however the turbine does not obstruct an existing view within the landscape. The agricultural fields have a more immediate relevance to the character of the view, but the wind turbine is certainly a clearly visible and interesting addition. **Magnitude of change to the existing view is considered to be:** High/Medium
Significance of effect: High/Medium

Figure 11 - Alternative view towards Turbine Site from Junction on A934

Table 14: Visual Assessment, Pitmikie Crossroads

Photomontage Figure Number: B3 **Distance to Bolshan Farm Turbine:** 1292m
Reason for Selection: Shows the turbine from a nearby junction along the minor road network surrounding the turbine site and connecting residential properties. This figure gives some impression of the effect experienced around some of the nearest dwellings that are not owned by the applicant.
Assessment of sensitivity: The flatter nature of the landscape can be observed from this viewpoint, populated by rows of deciduous trees that can be found along field boundaries and around nearby dwellings (typically defined as visually sensitive receptors). Road users are given as receptors of 'low' in Table 34: Criteria for Assessing Visual Sensitivity. The view is of little interest in itself. It is not, for example, a magnificent hilltop panorama, but instead has a more familiar and simple rural agrarian appeal. **The sensitivity of this viewpoint is considered to be:** High/Medium
Assessment of magnitude: The following phrase from the 'Medium' category set out in Table 35: Criteria for Assessing Magnitude of Visual Effects below, appears apt, "the composition of the view has been added to but is generally intact". In addition, the following phrase from the 'Low' category set out in Table 35 below, also appears relevant, "the composition of the view is subtly amended". **Magnitude of change to the existing view is considered to be:** Medium/Low
Significance of effect: Medium/Low

Table 15: Visual Assessment, A933/A934 Junction

Photomontage Figure Number: B4 **Distance to Bolshan Farm Turbine:** 1526m
Reason for Selection: This viewpoint is useful for understanding the view as can be expected from the junction connecting the main roads A934 and A933 and the area around the residential properties located beside this junction.
Assessment of sensitivity: This junction is a busy one and therefore the view as indicated by Figure B4 will be experienced by a significant number of road users. Tall structures such as pylons and trees can be observed in the foreground emphasising the general busy and developed nature of the viewpoint. The hills and slopes of the landscape can also be observed in the background of the image. In this case the main receptors of the view would be the three residential properties in the foreground and road users. **The sensitivity of this viewpoint is considered to be:** High/Medium
Assessment of magnitude: The residential property located towards the north side of the image has partial screening from vegetation, whereas the more southern dwelling and the eastern property located closer to the turbine have clearer views. Given the proximity to the main roads and the sloping terrain on which the turbine is located, the turbine development will not dominate or control the view. **Magnitude of change to the existing view is considered to be:** Medium/Low
Significance of effect: Medium

Table 16: Visual Assessment, Wuddy Law Trig Point

Photomontage Figure Number: B5 **Distance to Bolshan Farm Turbine:** 1537m
Reason for Selection: This is an **e**levated viewpoint presenting panoramic view of the landscape surrounding the development site.
Assessment of sensitivity: The viewpoint is within an agricultural field. There is a track to this point but it is not an obvious route for recreational walking. Uplands can be observed in the far distance of the image adding to the attractiveness of the view. Visual receptors within this context are occasional recreational users. **The sensitivity of this viewpoint is considered to be:** Medium
Assessment of magnitude: The hub and blades of the Bolshan Farm turbine can be seen but a significant proportion of the turbine is largely obscured by the terrain. From certain points on this hill the turbine will be further obscured by Bolshan Hill Wood. There is a noticeable change to the view as observed from this point however the turbine occupies a small area of the landscape in view and an expansive panoramic view is still clearly visible, around and beyond the turbine. **Magnitude of change to the existing view is considered to be:** Low
Significance of effect: Low

Table 17: Visual Assessment, Kinnell Church

Photomontage Figure Number: B6 **Distance to Bolshan Farm Turbine:** 2449m
Reason for Selection: Church located in one of the closest settlements.
Assessment of sensitivity: The church itself is in a state of disrepair as can be seen in Figure 12 and is no-longer in use for services. This view is representative of the general setting of the village. **The sensitivity of this viewpoint is considered to be:** Medium
Assessment of magnitude: The proposed turbine is not visible and there is no effect on the view. **Magnitude of change to the existing view is considered to be:** None
Significance of effect: None

Figure 12 - Image of Kinnell Church

Table 18: Visual Assessment, Edge of Farnell

Photomontage Figure Number: B7 **Distance to Bolshan Farm Turbine:** 2873m
Reason for Selection: Nearby settlement from which there may be some views of the turbine.
Assessment of sensitivity: The view itself is not exceptional or of particular value. The viewpoint is located just off the main road entering the settlement providing a view which would commonly be seen by road users. **The sensitivity of this viewpoint is considered to be:** Medium/Low
Assessment of magnitude: The turbine is a less prominent feature in the view than the electricity pylons in the foreground, and appears to be of a similar scale to the trees on the right of the image. ZTV Figure B7 indicates that the hub and blades of the Bolshan Farm turbine would be visible from the edge of the settlement. "The composition of the view is altered but at an almost imperceptible level", as mentioned in the 'negligible' section of Table 35: Criteria for Assessing Magnitude of Visual Effects. Due to the distance between viewpoint and turbine location, and the natural cover the terrain provides, the development not a prominent or distinctive feature within the landscape. **Magnitude of change to the existing view is considered to be:** Negligible
Significance of effect: Negligible

Table 19: Visual Assessment, Edge of Friockheim

Photomontage Figure Number: B8 **Distance to Bolshan Farm Turbine:** 3314m
Reason for Selection: To show a view from one of the closest towns.
Assessment of sensitivity: The viewpoint is located on the main road leading into the town and is also approximately 150m east of the local school. Please note that the majority of the settlement does not have such open views toward the turbine and the school is behind a row of trees to the left of the image. The landscape as observed from this direction is generally flat with little screening from natural contours. Some of the lower hills can be seen in the background behind the turbine. **The sensitivity of this viewpoint is considered to be:** Medium/High
Assessment of magnitude: Figure B8 indicates that the majority of the turbine will be visible from this location. Although the majority of the turbine will likely be visible from this viewpoint it is located over 3km away from the settlement. As such the development itself occupies a very small area in the viewer's perspective and does not encroach upon the general composition of the landscape. **Magnitude of change to the existing view is considered to be:** Low/negligible
Significance of effect: Low

Table 20: Visual Assessment, A933 / B961 Legaston Junction

Photomontage Figure Number: B9 **Distance to Bolshan Farm Turbine:** 4961m
Reason for Selection: View from a main transport providing an indicative view of the turbine as can be expected approximately 4.5 – 5km from the site.
Assessment of sensitivity: This section of A933 is very busy and views from this location would be observable by a large number of road users. However, many drivers will not be looking in the direction shown on this viewpoint. Speeds are high on this stretch of the road so passengers will only see this view for a short period. The landscape in the foreground appears flat and continuous with views of mountainous region in the far distance and smaller hills to the right of the image. This viewpoint provides an indication of the view as can be expected from the dwellings located behind the camera outwith the field of view. **The sensitivity of this viewpoint is considered to be:** Medium/High
Assessment of magnitude: The tower, hub and blades of the turbine are in view however at this distance it has little effect on the composition or enjoyment of the view. **Magnitude of change to the existing view is considered to be:** Negligible.
Significance of effect: Low/Negligible.

Table 21: Visual Assessment, A933 near Colliston Mill Cottage

Photomontage Figure Number: B10 **Distance to Bolshan Farm Turbine:** 6932m
Reason for Selection: This viewpoint is helpful for understanding how the turbine will be viewed from locations expected to have a view of the Bolshan Farm turbine at a distance of 6.5 – 7km.
Assessment of sensitivity: Further along the busy A933, reasonably extensive views can be obtained from this location. The dwelling Colliston Mill Cottage is located to the left of the image outwith field of view, this viewpoint therefore provides an indicative perspective for nearby properties. **The sensitivity of this viewpoint is considered to be:** Medium/High
Assessment of magnitude: The turbine is visible, but at such distances it has little effect on the composition or enjoyment of the view. It is not highly discernible in the landscape. **Magnitude of change to the existing view is considered to be:** Negligible
Significance of effect: Low/Negligible

Table 22: Visual Assessment, Layby on A935

Photomontage Figure Number: B11 **Distance to Bolshan Farm Turbine:** 8332m
Reason for Selection: This viewpoint is helpful for providing an indicative view of the turbine from over 8km.
Assessment of sensitivity: The area surrounding the viewpoint itself is not an important one in terms of visual receptors, nor is the view particularly valued. A number of road users can expect to experience this view as the layby is located on a main road. **The sensitivity of this viewpoint is considered to be:** Low/Negligible
Assessment of magnitude: The turbine is unlikely to be distinguishable unless weather conditions are particularly clear, the observer is stationary and is specifically searching for the turbine. **Magnitude of change to the existing view is considered to be:** Negligible
Significance of effect: Negligible

Photomontage Assessment Summary

The following table presents a summary of the more detailed visual assessment tables above.

Table 23: Viewpoints for Visual Assessment

Figure number	***Viewpoint***	***Distance from Turbine (m)***	***Significance of Effect***
B2	Junction on A934	977	High/Medium
B3	Pitmikie Crossroads	1,292	Medium/Low
B4	A933/A934 Junction	1,526	Medium
B5	Wuddy Law Trig Point	1,537	Low
B6	Kinnell Church	2,449	None
B7	Edge of Farnell	2,873	Negligible
B8	Edge of Friockheim	3,314	Low
B9	A933/B961 Legaston Junction	4,961	Low/Negligible
B10	A933 near Colliston Mill Cottage	6,932	Low/Negligible
B11	Layby on A935	8,332	Negligible

Nearest Dwellings

Full photomontage assessment from each dwelling would be needed for accurate conclusions to be drawn on the issue of visual impact. This would require access in and around each dwelling in question. However, the following observations can be made regarding the effect on neighbouring dwellings.

There is no right to a view in planning law, but the question of 'residential amenity' is nonetheless a relevant one. The matter of residential amenity is also raised in the Angus Council 'Implementation Guide for Renewable Energy Proposals' (2012).

Of the eight dwellings within a kilometre of the proposed turbine location, only Bolshan Farm has financial involvement. The separation distances are set out clearly within the table below. A map of these dwellings is provided within the Environmental Health chapter of this Environmental Report.

Table 24: Nearest Dwellings

Dwelling	***Distance to Bolshan Farm Turbine from Dwelling (m)***	***Financial Involvement?***
Bolshan Cottage	623	No
Ardmhor Cottage	659	No
Doonbye	722	No
Ashview	722	No
Bolshan Farm	733	Yes
Viewbank	820	No
Teuchat Hillock	936	No
Burnside	979	No

The nearest non-financially-involved property, Bolshan Cottage, is over half a kilometre from the proposed turbine. The dwelling is situated on a rising slope with the façade and principle windows facing west, the change in turbine position now means that site is no longer in direct line of sight from Bolshan Cottage. The garden is on the east side of the dwelling and therefore does not have direct line of site to the development. ZTV Figure A3 suggests that this dwelling will have a clear view of the turbine however trees located between the turbine site and the property may provide partial screening (See Figure 13).

Figure 13: Googlemap© view towards proposed turbine site from
Bolshan Cottage. The turbine would sit behind the trees in the mid-ground and may be partially visible.

Reduction in Perceived Height of Turbine from Nearest Dwelling

The proposed turbine site is situated 422m north/north-east of the turbine position previously submitted (13/00887/FULL) and some of the benefits of this site include a less dominating view of the turbine from nearby properties. Table 25 summarises the height and elevation changes (AOD) between the previous application, a proposal discussed in summer 2014 with the planning authority (see discussion in chapter 3 above), and the turbine now proposed.

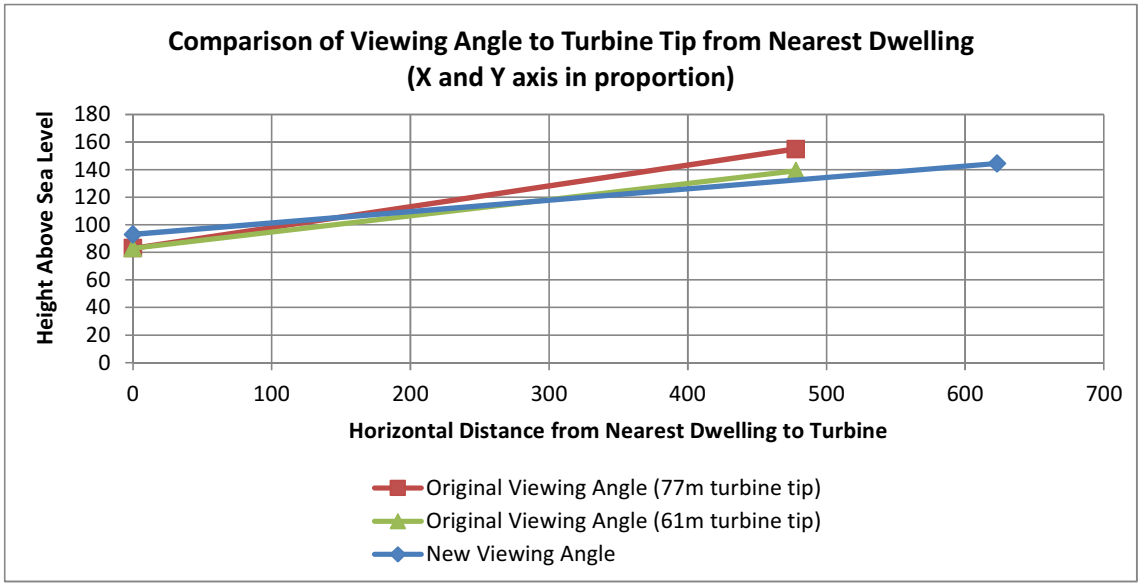
Table 25: Summary of changes in turbine size and elevations

Turbine Application	Proposed Turbine Grid Reference	Tip Height (m)	Turbine Base Elevation AOD (m)[102]	Turbine Tip Elevation AOD (m)	Approximate distance to 'nearest dwelling'	Nearest Dwelling Elevation (AOD)[103]	Viewing Gradient to Turbine Tip from Nearest Property
13/00887/FULL	361394, 752245	77	78	155	478 (Doonbye)	83	1 in 6.6
Turbine discussed with planning authority summer 2014.	361394, 752245	61	78	139	478 (Doonbye)	83	1 in 8.5
The Greenspan Agency Project now proposed	361507, 752652	79.6	65	144	621 (Bolshan Cottage)	93	1 in 12.1

The distance between the turbine and the nearest dwelling has now increased, and the elevation of the turbine base has decreased. Taking this information into account, the gradient of the viewing angle to the tip of the turbine from the nearest dwelling can be calculated. This provides an indication of how overbearing (or not) the turbine will appear from the nearest property. This data is displayed in Figure 14.

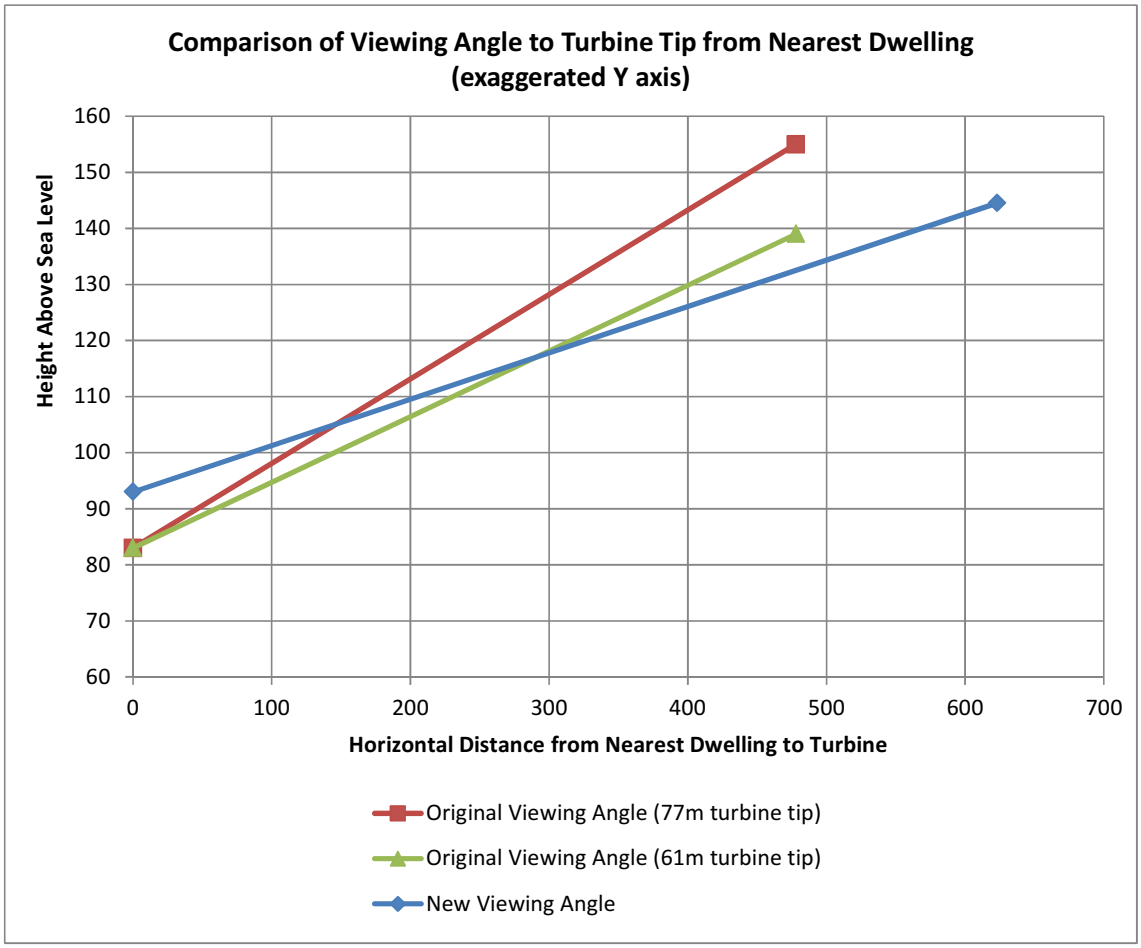
[102] Elevations taken from Ordnance Survey digital terrain data.
[103] Elevations taken from Ordnance Survey digital terrain data.

Figure 14: Comparison of Viewing Angle to Turbine Tip from Nearest Dwelling



The graph below (Figure 15) shows the same data as the graph above, but on an exaggerated Y-axis to better display the significant reduction in viewing angle provided by the turbine position now proposed even though the turbine height has increased slightly. This is likely to have the effect of reducing the perceived height of the turbine as the gradient of the viewing angle falls to 1 in 12.1 (see table above for details). The site chosen for this proposal is well suited to maximise electricity generation whilst protecting the visual amenity of local dwellings.

Figure 15: Comparison of Viewing Angle to Turbine Tip from Nearest Dwelling (exaggerated Y axis)



To summarise the above analysis, the change in turbine position allows the perceived scale of the turbine from the nearest dwelling to be diminished by a significant reduction in the gradient of the viewing angle to the turbine tip.

Although views from within or around several properties will be affected to some extent, the planning process must control the use of land to serve the public interest and a case can be made that the benefit of providing clean electricity equivalent to the needs of several hundred houses far outweighs the change to the view caused by a wind turbine around a half a kilometre away from only a few houses.

Transport Routes

Roads typically experience 'sequential' views where changing impressions of the turbine are seen from one viewpoint after another[104].

6 of the 10 viewpoints assessed using photomontages were taken from transport routes. This gives a clear impression of the turbine's appearance from the local road network.

The nearest road is the unclassified one to the east of the turbine position and passes around 475m from the turbine at its closest point. The A934 comes to within 1km. Both routes will afford road-users views of the turbine but neither comes close enough for the turbine to appear overbearing.

The visual assessment has discussed the relationship between the surrounding road network, particularly along the A934 and A933 roads. Photomontage Figure B2 in particular shows the view with greatest magnitude of effect on the A934. The overall significance of the effect on this viewpoint was rated as 'high/medium' in the assessment above within this LVIA.

Sections of the A932 and A935 have been highlighted in ZTV Figure A2 so views of the turbine can be expected at certain points along these routes. At the closest point to the project the A932 is approximately 4.1km away and the A935 approximately 6.5km away. Views along these routes will be infrequent and owing to these distances and road speeds, the turbine will not be a discernible feature within the landscape. Photomontage Figures B2 and B4 & B11 reveal that the effect of this turbine on these trunk routes will be negligible.

Given what has been learned from the photomontages and the ZTV diagrams it can be concluded that although the turbine will be visible from the local road network, trunk roads will not be greatly affected, and the closest roads are a suitable distance from it.

Visual Assessment Conclusions

Photomontages have been presented for 10 viewpoints. The methodology applied to derive assessments of the 'significance' of the turbine's effect upon these viewpoints is clearly detailed in the Appendix to this chapter. All of these viewpoints are within 10km of the proposed turbine, the inner half of the 20km study area. Despite this, 7 of the viewpoints were assessed as experiencing effects below 'low' significance.

As is usual for an assessment of this kind, viewpoints closer to the turbine were found to experience a greater level of effect. This does not point to an unacceptable level of change in the visual environment but is instead inevitable when LVIA methodology is fairly and consistently applied and does not suggest that the proposal is unacceptable overall.

It can be concluded that the photomontage assessment reveals a visual environment that is suited to the introduction of the proposed turbine.

The nearest dwellings have been considered and separation distances were found to be sufficient to avoid visual intrusion. The topography and surrounding landscape of the site will assist in reducing the effect on the nearest property not owned by the applicant.

[104] Page 10 'Cumulative Effect of Wind Farms, Version 2, Scottish Natural Heritage (2005)

Views from the local road network have been clearly illustrated in the photomontage assessment. Although some roads will offer clear view of the turbine, generally the visual experience from local roads will not be greatly affected.

Importantly, the change in turbine position allows the perceived scale of the turbine from the nearest dwelling to be diminished by a significant reduction in the gradient of the viewing angle to the turbine tip.

The findings of the visual assessment indicate that the proposal is well designed, in a suitable location, and of an appropriate scale.

8.12 Cumulative Assessment

This section of the LVIA provides information on other wind energy developments within the region and considers whether the environmental impact of the Bolshan Farm wind turbine would be acceptable in landscape and visual terms given these cumulative effects.

As with the assessment of the single wind turbine above, the cumulative assessment is divided into two parts which chiefly rely on different diagrammatical tools:

> **Cumulative Landscape Assessment:** considers landscape effects by using Zone of Theoretical Visibility (ZTV) diagrams which show the relationship between Bolshan Farm and other wind energy developments.
>
> **Cumulative Visual Assessment:** uses cumulative photomontages and wireframes that give an impression of how a viewpoint would change if consented and proposed turbines were erected.

Operational, Consented and Valid Planning Applications

What to Include

The level of cumulative impact clearly varies depending on the number of projects in planning and the number of consented projects that are actually built. In accordance with relevant planning policy, guidance (particularly SNH's 'Assessing The Cumulative Impact Of Onshore Wind Energy Developments' March 2012), and The Greenspan Agency's experience of preparing such assessments, the scope for assessing cumulative impacts considers operational turbines, consented turbines, and turbines in planning.[105]

How this Affects the Assessment

There are many possible eventualities, and at the time of an application's submission there is much uncertainty as to what the development pattern will be by the time the application is determined. **For completeness and simplicity the assessments presented here assume that all consented developments are built, and that all planned turbines are also eventually consented and built.** However, it is likely that some planned schemes eventually do not obtain planning permission, or their planning permission lapses without the development being implemented. Where these developments are relevant to the cumulative assessment, the changed circumstances should be taken into account at the time of the application's determination.

Study Focus

SNH's guidance *'Assessing the Cumulative Impact of Onshore Wind Energy Developments',* March 2012, states:

> *"The focus should be on the key cumulative effects which are likely to influence decision making, rather than an assessment of every potential cumulative effect."*[106]

[105] Page15 'Assessing The Cumulative Impact Of Onshore Wind Energy Developments'. Scottish Natural Heritage, March 2012

[106] *Ibid*.

Cumulative Studies, Difficulties and Limitations

When assessing cumulative impact it should be borne in mind that such an assessment can be difficult to carry out. It is difficult to judge when a ceiling for the amount of wind energy generation in a region has been reached, and thresholds are not quantified. The Angus Council 'Implementation Guide for Renewable Energy Proposals' acknowledges this and notes that "there is not a direct correlation between the number of wind energy proposals and the degree of impact".[107] The difficulties found in landscape and visual impact assessment in general are reflected in cumulative assessments, although the effects are more complex.

A cumulative study will usually have to consider a diverse landscape with several wind energy projects, and it can be challenging to decide which figures to produce and to base the assessment upon. Each figure can also be produced in many different ways.

Interpretation and Understanding of Cumulative Effects

Following on from the discussion above titled 'Aesthetic Judgements and Public Opinion' it is worth discussing the values, ideas and thoughts behind our understanding and interpretation of cumulative effects. Those who support the introduction of turbines into the landscape are likely to understand the following points:

1. The emergence of several wind energy developments Angus and throughout the north-east of Scotland will be seen by some as a sign that society is taking a positive (and ultimately inevitable) step forward towards a more sustainable future.

2. The existing agricultural character of much of the landscape can be reinforced by the presence of locally owned wind turbines which benefit traditional local agribusiness enormously. These turbines have a very obvious connection to the region's agricultural heritage and can be seen as emblematic of a new way of exploiting the region's natural resources for the sustainable economic benefit of local communities. In the case of the Bolshan Farm turbine, an additional revenue stream will be provided to an existing farm, helping to diversify the rural economy.

Such an interpretation of wind turbine developments will not be shared by all, and those who do not understand the benefits are more likely to consider the turbines unacceptable in aesthetic terms. Setting aside these issues, this section of the environmental report can attempt to provide information on the number and location of wind energy developments, an assessment of the sensitivity of the landscape, the magnitude of change in that landscape and the overall significance of cumulative effects.

[107] Page 7 'Implementation Guide for Renewable Energy Proposals' Angus Local Plan Review, 2009

Figure C1: Cumulative Turbines Map, 10 km Radius

Figure C1: Cumulative Turbines Map, 10 km Radius shows all wind turbines within a 5km radius and all turbines with a tip height over 30m between the 5km and 10km radii. The table below shows all the developments shown on figure C1.

The landscape assessment above for the Bolshan Farm turbine in isolation concluded that landscape effects of a magnitude greater than 'low' would be limited to an area within 1.5km of the proposed turbine. Given this, the radii applied for the preparation of figure C1 were considered sufficient to identify all relevant cumulative landscape effects. An area of 314km^2 is covered by the 10km radius on figure C1.

Table 26 - Turbines shown on figure C1 within 10km of Bolshan Farm

Site Name	*Number of Turbines*	*Turbine Height to Tip (m)*	*Status*	*Distance from turbine (km)*	*Total Installed Capacity (MW)*
Heughhead Farm	1	21	Consented	2.9	0.015
Waulkmill Quarry	1	46	Consented	3.1	0.25
Land West of Rossie School	2	51	Planning	4.1	0.8
Dubton Farm	1	77	Planning	4.6	0.5
Pickerton	1	77	Operational	5.0	0.5
East Drums	1	67	Consented	5.3	0.5
Newton Of Boysack	1	49	Planning	6.0	0.1
Janeston Farm	1	47.5	Planning	6.0	0.05
Old Montrose Farm, Montrose	1	39	Operational	6.7	0.08
East Mains Of Colliston Farm	1	49	Planning	6.9	0.1
North Mains of Cononsyth	1	66.7	Operational	7.4	0.33
Parkconnon Farm	1	41.5	Consented	7.6	0.225
Arrat Farm	2	46.5	Operational	7.7	0.5
Newton of Idvies Farm	1	47	Operational	8.7	0.1
East Pitforthie Farm	1	47	Operational	8.9	0.1
Ethie Barns Farm	1	45	Planning	9.1	0.225
Crofts Farm	2	79.6	Planning	9.2	1.5
Whitefield of Dun Farm	1	67	Consented	9.8	0.5

Cumulative Landscape Assessment

Study Radius

In deciding the radius for detailed cumulative landscape impact assessment the following two points were noted:

1. The landscape assessment above for the Bolshan Farm turbine in isolation concluded that landscape effects of a magnitude greater than 'low' would be limited to an area within 1.5km of the proposed turbine. This suggested that areas more than a few kilometres from the turbine were unlikely to experience cumulative landscape effects in which the Bolshan Farm turbine played a substantial role.
2. The visual assessment had shown that the significance of visual impact would not exceed 'low' other than at the closest three viewpoints, the furthest of which was 1.5km away. Again, this suggests that the principle role of the Bolshan Farm turbine in cumulative impacts would be limited to an area within a few kilometres.

Given the above, the cumulative landscape assessment will focus on the three landscape character areas closest to the proposal, and those parts of these landscape character areas within 5km of the Bolshan Farm turbine. It will consider the effect on these areas caused by those wind energy developments within this 5km radius.

ZTV Preparation

Specifying a 5km radius for the cumulative landscape assessment allows more meaningful and informative cumulative zone of theoretical visibility figures to be produced.

The Greenspan Agency have studied many other applications submitted around Scotland and have found that in their opinion the cumulative ZTVs tend to be difficult to present coherently, and their usefulness is sometimes limited. The approach taken here seeks to present the most relevant information in a way that can assist with the determination of the planning application, but is only one of many possible approaches.
Further cumulative ZTVs (or any other landscape and visual information) can be provided to the Council upon request.

Figure numbers C2 to C4, indicate areas within the landscape which would theoretically experience cumulative views of the Bolshan Farm proposal together with the other renewable energy developments being considered. The colour of the highlighted areas show where the turbine hub, or more, of the Bolshan Farm turbine, and at least one other turbine hub from the featured developments are theoretically visible from the same location.

Turbine hub was used to ensure that very partial views of the wind turbines were not included since these would have limited relevance to cumulative effects. Note once again however, this is one of many ways of approaching such an assessment and every aim has been made to provide the most relevant information for the planning authority and consultees.

Cumulative Landscape Assessment Tables

The following tables include an assessment of the cumulative ZTVs (Figures C2 to C4).

The following table in the methodology Appendix attached to this landscape and visual impact assessment give criteria for assessing the magnitude of landscape effects and can be applied to this cumulative assessment:

- Table 33: Criteria for Assessing Magnitude of Landscape Effects

This forms the basis of judgements as to the magnitude of an effect given in the tables below.

As discussed in the landscape assessment above, the ZTV diagrams are a useful tool but tend to over-state the landscape significance of the turbines being assessed. The presence of other landscape features is played down and the level of screening from trees and buildings etc. is not fully represented.

Table 27: Cumulative Landscape Assessment, ZTV Figure C2

Developments on this figure:

Name	***Spec'***	***Status***	***Distance to Bolshan Farm Turbine (km)***
Land West of Rossie School	2 x 51m, 1.6MW	Planning	4.1
Dubton Farm	1 x 77m, 0.5MW	Planning	4.6

Sensitivity

As explained above, this cumulative assessment focuses on the 3 landscape character types closest to the proposed turbine. These were assessed in Table 8 and Table 9 as having the following sensitivities to wind energy development.
Dipslope Farmland, Medium/Low sensitivity.
Lowland Basins, Medium/Low, sensitivity[108].
Low Moorland Hills, Medium/Low sensitivity.

Assessment of Magnitude

- Dubton Farm is within the Low Moorland Hills Landscape Character Type, the Land West of Rossie School development is within the Dipslope Landscape Character Type.
- The Bolshan Farm and Dubton Farm turbines are of similar sizes whereas the two turbines at Land West of Rossie School are approximately 20m lower.
- The similar heights of the turbines at Bolshan Farm and Dubton Farm result in the cumulative intervisibility of these two projects being the greatest but less than 20% of the ZTV study area is highlighted.
- The greatest cumulative impact occurs within the Dipslope Farmland character type which is of medium/low sensitivity and as noted previously, a character type suited to turbines of the proposed size.
- The cumulative intervisibility of Bolshan Farm and Land West of Rossie School is does not have a high percentage of cover on the ZTV, less than 10%. Most areas of which occur in the Lowland Basins and Low Moorland Hills which range from High to Low sensitivity.
- Cumulative intervisibility of all three projects is limited to areas of higher terrain and as such, views are less likely to be experienced often.

Significance of cumulative landscape effects, Fig.C2

Given the space between projects, areas where the magnitude of effect from these developments is greater than 'low' are unlikely to overlap and the projects do not combine to create cumulative effects. Because of this, the cumulative effects are little different from the non-cumulative effects.

[108] Note that the 'Lowland Basins' was found to have a higher sensitivity nearer the Montrose basin but this is beyond the radius of this ZTV.

Table 28: Cumulative Landscape Assessment, ZTV Figure C3

Developments on this figure:

Name	*Spec'*	*Status*	*Distance to Bolshan Farm Proposal from closest turbine (km)*
Heughhead Farm	1 x 21m, 0.015MW	Consented	2.9km
Waulkmill Quarry	1 x 46m, 0.25MW	Consented	3.1km

Sensitivity

As explained above, this cumulative assessment focuses on the 3 landscape character types closest to the proposed turbine. These were assessed in Table 8 and Table 9 as having the following sensitivities to wind energy development.

Dipslope Farmland, Medium/Low sensitivity.

Lowland Basins, Medium/Low, sensitivity[109].

Low Moorland Hills, Medium/Low sensitivity.

Assessment of Magnitude

- Both the Heughhead Farm and Waulkmill Quarry developments are within the same Landscape Character Type, Dipslope Farmland.
- These developments are on a smaller scale than what is proposed at Bolshan Farm. The magnitude of the landscape effects caused by cumulative intervisibility of the three developments are therefore lessened.
- The greatest area of cumulative intervisibility of the three developments occurs within the Dipslope Farmland character type which, as stated previously, has capacity for wind energy development.
- Areas experiencing views of the Bolshan Farm turbine and only the Heughhead Farm or Waulkmill Quarry developments cover less than 10% of the map combined.
- It is estimated that highlighted areas of intervisibility affect less than half of area within 5km of the Bolshan Farm turbine.

Significance of cumulative landscape effects, Fig.C3

In common with the findings in the table above.

Given the space between projects, areas where the magnitude of effect from these dwellings is greater than 'low' are unlikely to overlap and the projects do not combine to create notable cumulative effects. Because of this, the cumulative effects are little different from the non-cumulative effects.

Table 29: Cumulative Landscape Assessment, ZTV Figure C4

Developments on this figure:

Name	*Spec'*	*Status*	*Distance to Bolshan Farm proposal from closest turbine (km)*
Pickerton	1 x 77m tip, 0.5MW	Operational	5km

Sensitivity

As explained above, this cumulative assessment focuses on the 3 landscape character types closest to the proposed turbine. These were assessed in Table 8 and Table 9 as having the following sensitivities to wind energy development.

Dipslope Farmland, Medium/Low sensitivity.

Lowland Basins, Medium/Low, sensitivity[110].

Low Moorland Hills, Medium/Low sensitivity.

Assessment of Magnitude

- The Pickerton turbine operates within the Low Moorland Hills landscape character type and is of a comparable size to the proposed Bolshan Farm turbine.
- Less than 35% of the ZTV highlights areas of possible intervisibility of both turbines.
- The majority of cumulative impact occurs within the Dipslope Farmland landscape character type which as stated in the Tayside

[109] Note that the 'Lowland Basins' was found to have a higher sensitivity nearer the Montrose basin but this is beyond the radius of this ZTV.

[110] Note that the 'Lowland Basins' was found to have a higher sensitivity nearer the Montrose basin but this is beyond the radius of this ZTV.

Landscape Character Assessment (1999), has capacity for turbines of the height proposed at Bolshan Farm.
Significance of cumulative landscape effects, Fig.C4 The Bolshan Farm turbine would not have landscape effects that would notably interact with this development, which is 5km away from Bolshan Farm.

Total Combined Cumulative Effects

The above tables consider just one or two developments, together with the Bolshan Farm turbine at any one time. It is unlikely that all planned developments will be consented and built along-side the Bolshan Farm turbine but if this were to happen the total combined cumulative landscape effects would be greater than the effects noted in the tables above.

18 developments are operational, consented or proposed within a 10km radius of the Bolshan Farm Turbine. However, only 5 of these occur within a 5km radius of the Bolshan Farm Turbine. This is an area of 78.5km^2, accounting for Bolshan Farm these developments can be distributed throughout the area giving just over 13km^2 of land space for each turbine. This suggests that while wind turbines could become an increasingly frequent sight within the landscape there would be a very significant amount of space, protecting the underlying character of the landscape.

Conclusions, Cumulative Landscape Assessment

The relevance of the Bolshan Farm turbine to overall cumulative impacts would be limited due to the size of the turbine and the fact that only one turbine is proposed. Beginning with a survey out to 10km, an area of 5km radius has been focused on in the cumulative ZTV figures.

The cumulative ZTV figures have revealed a complex pattern of cumulative effects on the landscape. The Dipslope Farmland, Lowland Basins and Low Moorland Hills were the focus of this cumulative assessment because it was in these areas that the landscape effect of the Bolshan Farm turbine was found to be relevant in the preceding single turbine landscape assessment.

The above tables concentrate on one or two developments at a time and their relationship with the Bolshan Farm turbine. This makes for more coherent ZTV figures but of course does not show all turbines together at the same time. If all planned and consented turbines were eventually built the presence of wind energy developments in the landscape would be more noticeable.

If all planned projects were built the total combined cumulative effects would mean that wind turbines would become an increasingly frequent sight within the landscape, but these turbines would be set in a substantial amount of space, allowing the underlying character of the landscape to dominate.

With reference to criterion (f) within local development plan policy ER35 it has been demonstrated in the above cumulative landscape assessment that this criterion has been met.

Cumulative Visual Assessment

This cumulative visual assessment presents and assesses two cumulative photomontages which show how selected views would be altered if all proposed and consented turbines were built and added to the view alongside existing turbines and the Bolshan Farm turbine.

Selection of Viewpoints

Two viewpoints were chosen to give an understanding of how the Bolshan Farm turbine would sit alongside other developments, one from the north/north-east of the site facing south and another from the south/south-west of the site facing north/north-east.

These cumulative viewpoints address views 'in combination' as mentioned on page 44 of the Angus Council 'Implementation Guide for Renewable Energy Proposals', "where two or more features are seen together at the same time from the same place, in the same (arc of) view where their visual effects are combined".

Note that the same direction of view and field of view has been used as in the visual assessment. This ensures that the LVIA photomontages are consistent throughout, making the process of assessing them simpler for the reader. However, turbines that are just to one side of the field of view may not be included. Again it is important to acknowledge that with so many variables and options, there is no one correct approach to cumulative assessment, but the photomontages presented here certainly provide information of use for decision makers.

Preparation of Cumulative Photomontages

The same attention to detail applied to photomontage Figures B2 to B11 was applied to the cumulative figures. Care was taken to use the correct turbine geometry and coordinates for each development so that accurate photomontages and wireframes could be produced.

The criteria for assessing the magnitude of visual effects was again based on the scale of high, medium, low, negligible, very negligible or no effect. The criteria for each level of magnitude is set out in the methodology appendix to this LVIA.

If turbine developments appeared on 'Figure C1: Cumulative Turbines Map, 10km Radius' then these have been included within the cumulative photomontages. Figure C1 included all wind turbines within a 5km radius and all turbines with a tip height over 30m between the 5km and 10km radii. Those consented developments superseded by a more recent design on the same site were not included.

Table 30: Cumulative Visual Assessment, Junction on A934

Figure Number: C5 **Distance to Proposed Bolshan Farm Turbine:** 977m
The sensitivity of this viewpoint is considered to be: Medium (as assessed in Table 13: Visual Assessment, Junction on A934)
Reasoned assessment of magnitude: The effect of the Bolshan Farm turbine in isolation was assessed as having a 'high/medium' magnitude effect in Table 13: Visual Assessment, Junction on A934. As all other turbines can be reasonably said to have an effect of negligible magnitude as the majority are hidden by terrain. The following statement from the 'medium' category in Table 35: Criteria for Assessing Magnitude of Visual Effects can be said to describe the magnitude of the effects shown in the photomontage: 'The turbine is noticeable and distinct, but is perceived as one of several features in the view rather than dominating it'. Given this the cumulative change to the view can be said to be of medium magnitude. **The magnitude of cumulative effect, taking into account the role of the Bolshan Farm turbine in the view, and all planned, consented, and operating turbines, is considered to be:** Low
Significance of cumulative effect: Low

Table 31: Cumulative Visual Assessment, Edge of Friockheim

Figure Number: C6 **Distance to Proposed Bolshan Farm Turbine:** 3314m
The sensitivity of this viewpoint is considered to be: Medium/High (as assessed in Table 17: Visual Assessment, Table 19).
Reasoned assessment of magnitude: The topographic model used to create the photomontage reveals that half of the developments would be hidden by the landform. Others are hidden behind vegetation. The Bolshan Farm Turbine is the only one which can be seen, the singular effects of which are low magnitude. **The magnitude of cumulative effect, taking into account the role of the Bolshan Farm turbine in the view, and all planned, consented, and operating turbines, is considered to be:** Low/Negligible.
Significance of cumulative effect: Low

Cumulative Visual Assessment Summary and Conclusions

Two cumulative photomontages and wireframes have been prepared and assessed, showing views in different directions.

Of all the other developments considered, none appear to have a particular cumulative visual relationship with the Bolshan Farm turbine. With the additional of the Bolshan Farm Turbine, both viewpoints selected for cumulative assessment appear relatively unaltered when taking into account projects which are operational, consented and in planning. The natural topography of the surrounding landscape and the distances which separate the developments results in a very low cumulative impact overall.

Although just two cumulative photomontages have been presented, tentative findings for wider cumulative visual effects from other viewpoints can be made. Cumulative visual effects are likely to alter the visual environment in this area with turbines becoming an identifiable feature of some views. However many of these views are expected to contain enough space and other visual features for their composition and quality to be maintained.

8.13 Conclusions, Landscape and Visual Impact Assessment

Conclusions have been given at the end of each section above, a more concise overview is presented here.

Aims and Methodology

- The methodology which has been applied is set out clearly in the LVIA Appendix. The reasoning behind each step of the assessment has been explained. The conclusions stated here follow from the evidence presented.

Design

- Turbine design and site layout have been carefully considered to minimise landscape and visual impacts while delivering clean energy.

Landscape Assessment

- The site is not within a designated landscape.
- The scale of the agricultural land-use pattern and the abundance of space, provide an immediate landscape setting that is able to accommodate the proposed turbine.
- The turbine would sit in an area of landscape which has been identified in the Angus Council as suitable for wind energy developments "circa 80m in height"[111]. Also, the landscape character sub-area in which the turbine will be located has been identified by consultants working on behalf of Angus Council as having capacity for turbines of the height proposed[112]. There is a consensus that this is one of the best parts of Angus for this scale of wind turbine development.

Visual Assessment

- It can be concluded that the photomontage assessment reveals a visual environment that is suited to the introduction of the proposed turbine.
- The findings of the visual assessment indicate that the proposal is well designed, in a suitable location, and of an appropriate scale.
- The gradient of the view to the top of the turbine from the nearest dwellings will be much shallower than for the turbine position proposed in application 13/00887/FULL. The new design will have a greatly reduced visual effect on nearby dwellings and improved separation distances.

Cumulative Assessment

- If all planned and consented projects were built the total combined cumulative effects would mean that wind turbines would become an increasingly frequent sight within the landscape. But these turbines would be set in a substantial amount of space (an average of 13km^2 for each turbine within 5km of the Bolshan turbine). This abundance of space would preserve the underlying character of the landscape.
- Cumulative visual effects will have a very limited impact on the views assessed in the cumulative photomontages and the views contain enough space and other visual features for their composition and quality to be maintained.

Relevant Planning Policy

- The conclusions of this LVIA have shown that the proposal would accord with landscape and visual requirements set out in policies ER34 and ER35 of the adopted Angus Local Plan Review.

[111] Page 48, *'Implementation Guide for Renewable Energy Proposals'*, Angus Council (approved June 2012)
[112] Page 67 '*Strategic Landscape Capacity Assessment for Wind Energy in Angus*.' Prepared for SNH by Ironside Farrar, March 2014.

LVIA Appendix 1: Landscape and Visual Impact Assessment Methodology

This appendix sets out the methodology applied in the above landscape and visual impact assessment.

Sources

The methodology used has been adapted from the 'Guidelines for Landscape and Visual Impact Assessment', published by the Institute of Environmental Management and Assessment (IEMA) and the Landscape Institute (LI) (3rd edition, 2013) (henceforth 'the GLVIA').

Angus Council do not prescribe a LVIA methodology which defines specific levels of 'sensitivity' 'magnitude' and a matrix for deriving significance. Therefore, this LVIA is also informed by specific methodologies prescribed by other Councils, by the Greenspan Agency's experience of preparing many such assessments, and by an awareness of the methodology used by other consultancies in LVIAs that accompany planning applications for wind energy developments. The documents listed in the 'Policy and Regulatory Context' section (above) have also been taken into account.

The GLVIA considers LVIA for all kinds of development, not only wind energy proposals. The emphasis throughout the GLVIA is on non-prescriptive and non-specific guidance and the need for authors of LVIAs to set out their methods clearly.

> *"The guidance concentrates on principles while also seeking to steer specific approaches where there is a general consensus on methods and techniques. It is not intended to be prescriptive... It is always the primary responsibility of any landscape professional carrying out an assessment to ensure that the approach and methodology adopted are appropriate to the particular circumstances."* (paragraph 1.20)

Certain fundamentals of LVIA which are discussed in the GLVIA are consistently found within LVIAs for wind energy developments; this LVIA incorporates these fundamental elements and is compatible with the GLVIA.

The GLVIA makes reference to the terms 'sensitivity' and 'magnitude' as 'nature of receptor' and 'nature of effect' respectively[113] however these terms are still noted within the flowchart found on page 39 (Figure 16) describing the methodology for assessing the significance of effects. The terms 'sensitivity' and 'magnitude' are consistently found in LVIAs for wind energy developments and various council's supplementary guidance. For clarity and compatibility, this LVIA uses the terms 'sensitivity' and 'magnitude'.

[113] Page 37, '*Guidelines for Landscape and Visual Impact Assessment*', published by the Institute of Environmental Management and Assessment (IEMA) and the Landscape Institute (LI) (3rd edition, 2013)

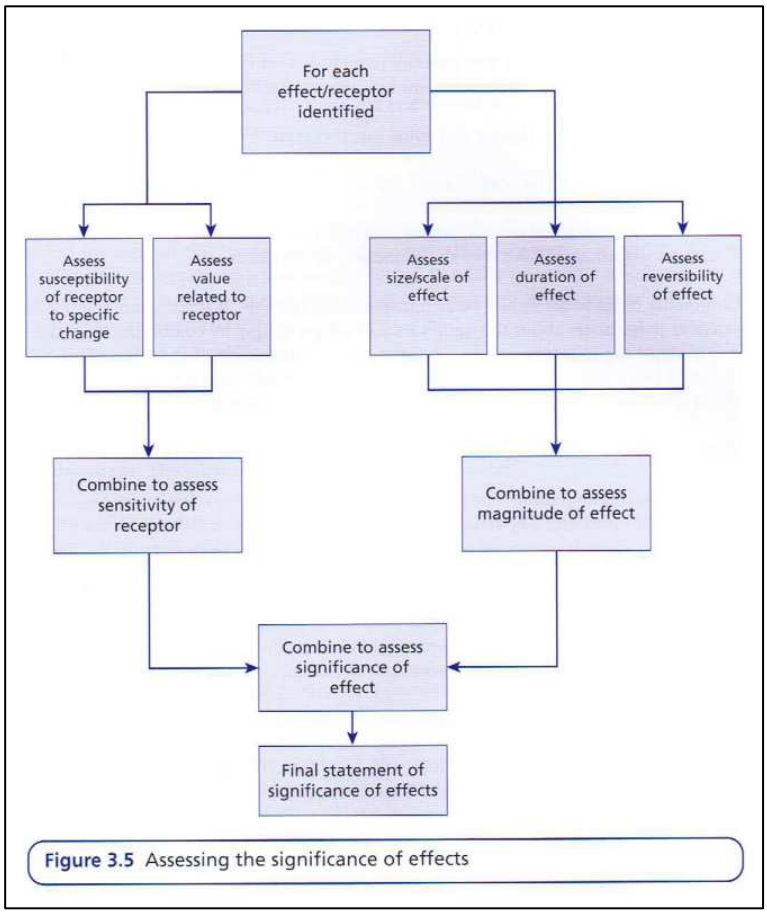


Figure 16: Flowchart figure of 'assessing the significance of effects' as found on Page 39 of the GLVIA

Landscape Assessment Methodology

To assess the effect of the proposal on the landscape the following methodology was applied.

Landscape Sensitivity

Pages 70 to 73 of the GLVIA focus more specifically on the landscape baseline assessment but the understanding of this assessment will feed into judgements about sensitivity.

It is important to consider the following in determining landscape sensitivity:

1. Landscape character
2. Landscape scale
3. Landscape condition
4. Landscape coherence and quality
5. Existing prevalence of discordant or intrusive features
6. Importance of landscape at local, national or international level

Table 32 has been adapted from the GLVIA which does not prescribe levels of sensitivity but discusses several examples. The thresholds set out here have also been chosen to be comparable with standards set in other LVIAs for wind energy projects. The table reiterates the same themes within each row to aid comparison between rows and clarity of assessment.

Table 32: Criteria for Assessing Landscape Sensitivity to Change

Sensitivity	***Criteria*** *(not all of which must be satisfied)*
High	• Landscape of very high quality (e.g. largely intact, coherent and balanced). • A highly valued landscape considered to be of substantial scenic value. • Small-scale landscapes with fine detail. • The introduction of discordant elements or new types of development would have notable effects on character, value and quality. • Distinctive or scarce landscape features. • Designated Landscapes of National Significance.
Medium	• Landscape of reasonable quality and has a reasonably coherent structure. • Locally valued and of some scenic value. • Medium scale landscapes. • The introduction of some discordant elements or new types of development could be accepted without notable change to character, value or quality. • Some distinctive landscape features and also many familiar features. • Designated landscapes of local significance.
Low	• Landscape of poor or degraded quality, incoherent and confused land use. • Not locally valued and of little scenic value. • Large expansive landscapes. • New features or types of development are unlikely to change the character of the area (other than for the better). • Very few distinctive or valued features. • No designated landscapes.

Magnitude of Landscape Effects

In discussing the assessment of the magnitude of landscape effects, the GLVIA states:

> *"Each effect on landscape receptors needs to be assessed in terms of its size or scale, the geographical extent od the area influenced, and its duration and reversibility."* (paragraph 5.48)

As with sensitivity of landscape and visual effects, discussed above, there is no prescribed methodology in the GLVIA, or list of thresholds for categorising magnitude, and certainly none specific to wind energy development. However, LVIA practice for wind energy development is now a well-developed discipline and certain matters are generally considered in determining the magnitude of landscape impacts. These are listed below:

1. To what extent is the proposal visible from the landscape character area?
2. What is the distance from the landscape character area to the proposal and how does this affect the scale of the turbine in views from the landscape area?
3. The permanence of the change to the landscape and the possibility of its reversal.
4. The frequency of sequential views of the turbine for members of the public moving through the area.

In particular, the above list borrows from the following sources:

a) Appendix 6 and Paragraphs 7.18 to 7.23 of 'Guidelines for Landscape and Visual Impact Assessment' published by the Institute of Environmental Management and Assessment and the Landscape Institute (2nd edition, 2002).
b) Relevant 'Summary advice on good practice' as can be found in 'Guidelines for Landscape and Visual Impact Assessment' published by the Institute of Environmental Management and Assessment and the Landscape Institute (3rd edition, 2013).

c) Best practice for LVIAs carried out for other wind energy developments

Table 33, defines the categories of magnitude of landscape impact used in this LVIA and takes into consideration points 1-4 above, and references a - c. There is no duplication of the topics considered in the criteria used for sensitivity in Table 32. Again similar themes are developed in each row of the table.

Table 33: Criteria for Assessing Magnitude of Landscape Effects

Magnitude	***Criteria*** *(not all of which must be satisfied)*
High	• A Large proportion of the landscape will have views of the proposal, causing widespread indirect change to the landscape setting • The character of the landscape will be substantially altered. • Large areas will be physically altered by the development, causing direct change to the landscape. • The turbines are within or directly adjacent to the landscape area. • The change will be permanent. • Key routes through the area will experience sequential views at many points.
Medium	• A notable proportion of the landscape will have views of the proposal, causing indirect change to the landscape setting. • The character of the landscape will be partly effected. • A small area may be physically altered by the development, causing a minor direct change to the landscape. • The turbines are not within the landscape area. • Most changes will be reversible. • Key routes through the area will experience sequential views at several points.
Low	• Some points in the landscape will theoretically have views of the proposal, but the development will have a muted effect. • The character of the landscape will be slightly amended. • None of the area will be physically altered by the development, and there will be no direct change to the landscape. • The turbines are not within the landscape area. (as above) • Most changes will be reversible (as above) • Key routes through the area will experience sequential views at a few points but the proposal will be a subtle addition to these views.
Negligible	• A minimal number of points within the landscape will theoretically have views of the proposal but this will usually be confined to a small number of high points. • The character of the landscape will remain almost entirely un-altered. • None of the area will be physically altered by the development, and there will be no direct change to the landscape (as above) • The turbines are not within the landscape area and are such a distance from it that they are usually difficult to see. • All changes will be indirect and reversible. • Key routes are very unlikely to experience views of the proposal.
None	• The proposal cannot be seen from the landscape area.

Visual Assessment Methodology

Assessing Visual Sensitivity

As with determining landscape sensitivity, visual sensitivity thresholds are not prescribed in the GLVIA. However, paragraphs 3.22 and 6.13 – 6.15 of the GLVIA discuss the matters to consider. Table 34 makes clear the criteria applied in this LVIA. Again this is based on the GLVIA but must be interpreted from it rather than copied directly. And again, similar themes are developed in each row of the table.

Table 34: Criteria for Assessing Visual Sensitivity

Sensitivity	***Criteria*** *(not all of which must be satisfied)*
High	• The view is of good quality, scenic value, or is well valued by the public. • The view is a viewpoint that invites attention. • The view is distinctive • The view is valued regionally or nationally. • There are few intrusive features and the composition of the view is coherent and feels 'composed'. • The view is visible by sensitive visual receptors
Medium	• The view is of reasonable quality, scenic value or is appreciated by some members of the public. • The view is not identifiable as a viewpoint but can be appreciated as such. • The view contains some local character but is not particularly distinctive. • The view is valued locally. • The view is relatively coherent but contains discordant elements and does not appear 'composed'. • The view is visible by less sensitive visual receptors such as the passing public and those engaged in active or other recreation which is not focused on the landscape or view.
Low	• The view is unattractive, of little or no scenic value, and is either not appreciated or is disliked by members of the public. • The view is not identifiable as a viewpoint or appreciated as such. • The view is not distinctive in a positive way. • The view is not valued locally. • The view contains a number of discordant or intrusive elements. • The view is visible by visual receptors considered to be of low sensitivity (e.g. occasional passing members of the public, road users, or those at work)

Magnitude of Visual Impacts

Once the sensitivity of a view has been assessed it is necessary to assess the magnitude of the effect upon that view. The assessment of magnitude is carried out with careful consideration of the photomontages for each view and reference to the criteria in Table 35 below.

Once again the GLVIA is not prescriptive, but thresholds of magnitude must be defined for the clarity of the assessment presented in this LVIA.

The following references are of particular relevance.

- Paragraph 6.27 of *'Guidelines for Landscape and Visual Impact Assessment'* published by the Institute of Environmental Management and Assessment and the Landscape Institute (3rd edition, 2013).
- Paragraph 7.36 (quoted below) and Appendix 6 of *'Guidelines for Landscape and Visual Impact Assessment'* published by the Institute of Environmental Management and Assessment and the Landscape Institute (2nd edition, 2002).
- Paragraphs 7.6 and 7.7, and Table 18 of *'Visual Assessment of Windfarms Best Practice'*, University of Newcastle (2002), Scottish Natural Heritage Commissioned Report.

Paragraph 7.36 of the GLVIA states the following:

"In the evaluation of the effects on views and the visual amenity of the identified receptors, the magnitude or scale of the visual change is described by reference to:

- *The scale of change in the view with respect to the loss or addition of features in the view and changes in its composition including the proportion of the view occupied by the proposed development;*
- *The degree of contrast or integration of any new features or changes in the landscape with the existing or remaining landscape elements and characteristics in terms of form, scale and mass, line, height, colour and texture;*
- *The duration and nature of the effect, whether temporary or permanent, intermittent or continuous, etc.;*
- *The angle of view in relation to the main activity of the receptor* [for instance are the turbines directly in line with key views available to the receptor, or are seen obliquely to the key view];
- *The distance of the viewpoint from the proposed development;*
- *The extent of the area over which the changes would be visible."*

The list above is not aimed exclusively at wind turbine development but can be adapted to create the following scale in Table 35.

Table 35: Criteria for Assessing Magnitude of Visual Effects

Magnitude	**Criteria** (not all of which must be satisfied)
High	• The turbine(s) dominates the view. • The composition of the view is fundamentally altered. • The viewpoint is in very close proximity to the turbine(s).
Medium	• The turbine(s) is noticeable and distinct, but is perceived as one of several features in the view rather than dominating it. • The composition of the view has been added to but is generally intact. • The turbine(s) is in the medium distance.
Low	• The turbine does not attract attention but can be seen, it is a minor element in the view. • The composition of the view is subtly amended. • The turbine(s) is a considerable distance away.
Negligible	• The turbine(s) can be seen, but may be difficult to identify unless the viewer knows where it is. • The composition of the view is altered but at an almost imperceptible level • The turbine(s) is very distant
None	• The turbine(s) is not visible

Matrix for Deriving 'Significance' of Effects

Once the above criteria have been used to determine 'sensitivity' and 'magnitude' these must be combined to arrive at a judgement of the 'significance' of the landscape or visual effect. Table 36, below provides a matrix for this which gives transparency to the process.

Table 36: Matrix for combining 'magnitude' of effect and 'sensitivity' used to derive overall 'significance' of effect.

		Sensitivity		
		High	**Medium**	**Low**
Magnitude	**High**	High	High	Medium
	Medium	High	Medium	Low
	Low	Medium	Low	Negligible
	Negligible	Low	Negligible	Negligible
	None	No Effect	No Effect	No Effect

In addition to the table above, the criteria used to determine magnitude when a single wind energy development is considered have been taken into account, as have the approaches to assessment mentioned in the Scottish Natural Heritage document '*Assessing the Cumulative Impact of Onshore Wind Energy Developments',* (March 2012).

Combining Values between Categories

Applying the above table can be more complex when magnitude or sensitivity is assessed as between two values, for example as 'medium/low'. This can be done by applying the matrix twice, once for each term used. For example. Combining medium / low sensitivity with medium / high magnitude would give 4 results which can then be 'averaged':

Medium sensitivity combined with medium magnitude = medium
Medium sensitivity combined with magnitude high = high
Low sensitivity combined with magnitude medium = low
Low sensitivity combined with magnitude high = medium
This would give an overall significance of 'medium', with the 'high' and 'low' results cancelling each other out.

Cumulative Assessment Methodology

When considering cumulative effects the sensitivity and magnitude criteria as applied to determine the sensitivity of landscapes and viewpoints for single developments continues to be applied. These criteria have been specified in the tables above.

9. Historic Environment

9.1 Introduction

This chapter focuses on the effect the Bolshan Renewables Project could have on the historic environment. It catalogues the nearby architectural and archaeological heritage and assesses the likely impact of the proposal on the following:

- Listed Buildings
- Scheduled Ancient Monuments
- Sites listed in the National Monuments Record of Scotland
- Sites listed in the Local Sites and Monuments Record
- Gardens and Designed Landscapes
- Conservation Areas

This assessment considers one 79.6m Enercon E48 wind turbine located at grid reference 361507, 752652.

The following documents, among others, have been used to inform the assessment carried out in this chapter:

- *'Scottish Historic Environment Policy'* (SHEP), Historic Scotland (2011).
- *'Managing Change in the Historic Environment – Setting',* Historic Scotland, October 2010.
- Angus Council's Planning Guidance, *'Implementation Guide for Renewable Energy Proposals'* (June 2012).
- *'Planning Advice Note 2/2011: Planning and Archaeology',* Scottish Government, July 2011.
- *'Seeing the History in the View',* English Heritage, May 2011

The following policies in the adopted 2009 Angus Local Plan Review are particularly relevant to the historic environment:

- Policy ER12 : Development Affecting Conservation Areas
- Policy ER16 : Development Affecting the Setting of a Listed Building
- Policy ER18 : Archaeological Sites of National Importance
- Policy ER19 : Archaeological Sites of Local Importance
- Policy ER20 : Historic Gardens and Designed Landscapes
- Policy ER34 : Renewable Energy Developments

In addition, Policy 3 – Managing TAYplan's Assets in the adopted TAYplan Strategic Development Plan (June 2012) is particularly relevant to the historic environment.

The process of compiling this chapter has shown that the proposed wind turbine will be in accordance with the above local plan policies, and will not have an adverse effect on the historic environment.

9.2 Climate Change and the Historic Environment

It is worth noting that climate change is a threat to the historic environment and that the proposed development would help address this threat. Historic Scotland understands the importance of tackling climate change. Their website contains the following statements:

> *"Climate change is one of the most serious and defining issues of our time"*
>
> *"Historic Scotland aims to be recognised nationally and internationally as a world-class innovative institution at the forefront of making the historic built environment a key element in achieving emissions reduction targets, creating sustainable economic, social and environmental opportunities, and playing its part in the transfer to a low carbon economy."*

> *"We are already seeing the negative impacts on the global economy, environments, and social structures. However, studies show it's not too late to make a difference by making more sustainable choices we can keep Climate Change at bay and help reduce and even prevent terrible consequences…"*[114]

Any small effect this proposal may have on the historic environment should be measured against the need to protect the historic environment by addressing climate change.

9.3 Designations and Legislation

Statutory Designations

Historic Scotland's policy document, SHEP, explains the classification of architectural and archaeological heritage sites. Scheduled Ancient Monuments (SAMs) are scheduled under the Ancient Monuments and Archaeological Areas Act 1979 and are of national importance. Listed buildings are listed under the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997, and are described in the act as being those buildings considered to be of 'special architectural or historic interest'. There are 3 categories of listed building; A, B, and C(s).

Conservation areas are also designated under the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997 and are described in section 61 of the act as "areas of special architectural or historic interest the character or appearance of which it is desirable to preserve or enhance".

All provisions and regulations attached to the Historic Environment (Amendment) (Scotland) Act 2011 came into force on the 1st of December, 2011. This Bill was brought in to improve the management and protection of Scotland's Historic Environment by addressing weaknesses identified in the aforementioned Ancient Monuments and Archaeological Areas Act 1979 and the Planning (Listed Buildings and Conversation Areas) (Scotland) Act 1997.

Gardens and Designed Landscapes (GDLs) are designated on behalf of the Scottish Ministers by Historic Scotland. The Historic Environment (Amendment) (Scotland) Act 2011 (henceforth 'The 2011 Act') placed GDLs on a statutory footing. The relevant section of the act came into force on 30th June 2011. Designated Gardens and Designed Landscapes are selected for their national importance. Section 11 of the 2011 Act explains that a GDL is defined as "a grounds which have been laid out for artistic effect".

The Historic Environment Scotland Act 2014 (The Bill received royal assent on 9th December 2014) establishes Historic Environment Scotland (HES) as a new Non Departmental Public Body (NDPB) which will take over the functions of Historic Scotland and Royal Commission on Ancient and Historical Monuments in Scotland (RCAHMS). It is proposed the regulations will come into force on 1st October 2015.

Non-Statutory Designations

Archaeological and historic sites of lesser importance are recorded on Angus Council's Sites and Monuments Record and the National Monuments Record of Scotland.

[114] *http://www.historic-scotland.gov.uk/index/heritage/climatechange/climatechangeourrole.htm*

9.4 Desk-based Study

The initial stage in carrying out this assessment was a desk-based survey of historic sites in the area. The sites were identified through the online Pastmap system and cross-checked with data from Angus Sites and Monuments Records (SMR), The Royal Commission on the Ancient and Historical Monuments of Scotland, and Historic Scotland.

The results of this research are presented in the 'Gazetteer of Historic Sites' at the end of this chapter. The distances to each historic site, taken approximately from the base of the proposed turbine are calculated. Some notable findings of the desk based research were as follows:

Overall Pattern of Historic Sites

Historic sites are scattered across the surrounding countryside. Within 5 km of the proposed turbine location, sites of varying significance were identified, from nationally significant Scheduled Ancient Monuments to records of small archaeological finds.

Development Site

The current land use of the site is arable farming. No direct impacts on historic artefacts, sites, or buildings, are anticipated, and no known historic sites are expected to be physically disturbed by the construction of the wind turbine or any related civil works. Impacts on the historic environment caused by this development are therefore reduced to potential indirect impacts on setting.

Setting and Temporary Planning Permissions

Because there are no direct impacts on historic assets within the site boundary, the remainder of this assessment is concerned with effects on the 'setting' of historic assets. It is therefore worth considering what the term 'setting' means in this context. Historic Scotland provide the following definition in '*Managing Change in the Historic Environment – Setting*' (October 2010):

> *"Setting should be thought of as the way in which the surroundings of a historic asset or place contribute to how it is experienced, understood and appreciated."*

Planning permission for a wind turbine at Bolshan is sought for a period of 25 years, after which the turbine will be decommissioned. Any further turbine development would need planning approval. Impacts on setting are reversible and 25 years is a short period in the lifetime of the historic assets considered here.

Scheduled Ancient Monuments

There are 16 scheduled ancient monuments (SAMs) within 5 km of Bolshan. Of the 16 SAMs, all except Kinnells Mill cairn, Cairn Knap, Braikie Castle and Kinnaird Castle are represented by crop marks. Crop marks appear when plant growth is affected by sub-surface archaeological features, and are often only visible from a higher vantage point. The importance of these sites lies below ground, where important archaeological features can be uncovered and studied. All of the sites are located in agricultural land and their setting will have been affected by both modern and traditional farming practises. The indirect visual effect caused by a single turbine at Bolshan would not confuse the setting of these SAMs. Therefore, the impact on SAMs represent by crop marks is deemed to be slight and has not been assessed any further.

Kinnells Mill cairn and Cairn Knap are both represented by a turf covered stony mound. Kinnells Mill cairn is situated in the corner of a private garden, while Cairn Knap is in a field surrounded by a modern wall. Online satellite imagery, source using Google Maps ™ shows that the view of the turbine from two sites, Kinnells Mill cairn and Cairn Knap, will be screened by intervening tree cover and buildings too localised to be included in the exclusion zones specified in the ZTV run-data. Kinnaird Castle is out of the ZTV, so the setting is not considered to be negatively affected by the proposed turbine. ZTV diagrams are included within the volume of Landscape and Visual Impact Assessment Figures provided with this Environmental Report. These figures help to understand how visible the turbine is expected to be from various locations within the landscape surrounding the Bolshan turbine. The ZTV diagrams are a useful tool but not completely accurate down the smallest detail, as they do not take into account screening from buildings, single trees, or small groups of trees. This means the ZTV figures usually over-estimate how visible the turbine will be. As such, visibility at these SAMs is highly likely to be less than the ZTV suggests and these sites have not been assessed any further.

The following notable SAM was identified 2.2 km from the turbine: **Braikie Castle (Index number: 166)** The Historic Scotland record online describes the site as follows: *The monument is the remains of Braikie Castle, a late 16th-century*

tower house. The tower is L-shaped in plan with four storeys and a garret. It survives to wall-head height and fragments of the roof timbers and slate tiles survive on the N and NW side"

The effect of the Bolshan turbine on Braikie Castle has been further assessed later in this chapter due to its significance and the wide views it enjoys toward the surrounding countryside. It is interesting to note that during the consultation for application 12/00732 which was for a proposed turbine of similar height, and in principle view 1.2 km south west from the Castle, Historic Scotland had no objections as the impact of the development on the setting of the castle was not of a magnitude as to raise issues of national significance.

The previous planning application for a wind turbine at Bolshan (Ref 13/00887/FULL) was closer to the Castle. Previously the turbine was proposed 1960m from the Castle, but the new turbine position has extended this distance to 2210m and taken the turbine lower behind intervening topography. This is one of several benefits of the new turbine position.

Listed Buildings

There are a large number of listed buildings surrounding Bolshan. Within 3 km there are 15 listed buildings all of which are within the ZTV of the turbine. The closest of these is located about 1.1 km from the turbine: C listed Muirside of Kinnell, Old Schoolhouse. This building is south facing, and has no windows facing the turbine direction. Trees and a hedgerow in the field between the building and the turbine will provide screening. 1.2 km from the turbine is the B listed building Willanyards (HB Number 12326, Grid Ref 362521 753334), located within the ZTV of the turbine. This building is screened by vegetation to the south west of the building so the impact is considered to be negligible. Little Fithie farmhouse is situated 2.2 km to the North West from the turbine. It is screened by vegetation, and the impacts will be further mitigated by distance from the turbine location. Former Kinnell Parish Church (HB Number 51307, Grid Ref 360880, 750277) a C listed building is located 2.5 km from the turbine. This building will be screened by other buildings and vegetation so the impact is also considered to be negligible. There is a group of 5 B listed buildings at Kinnell within the ZTV. These range from 2.5 to 2.7 km from the turbine site. These buildings are mostly incorporated into a working farm environment, so it is considered they would not be negatively impacted by the turbine. These buildings have not been assessed any further. There is a group of 4 B listed buildings at Farnell, and the Farnell Castle (A Listed) which are 2.9 – 3 km from the proposed turbine site. These are all screened by vegetation, so will not be directly impacted.

The nearest A listed building is Braikie Castle which is also a scheduled ancient monument, and has been further assessed later in this chapter.

Non-Statutory Sites

Seven non-statutory recorded sites were identified within a 1 km radius of the site (refer to appendix 1 for details). None of these sites are recorded as being of 'regional significance' on Angus SMR.

The non-statutory site, Kinnell Airfield (NO65SW0049), consists of the remains of a World War II airfield and three associated camps. The proposed turbine is located about 900 m from the airfield. The site condition is described as 'incomplete'. All that remains of the three accommodation camps is a combined three hut structure and a detached hut. The previous planning application for a wind turbine at Bolshan (Ref 13/00887/FULL), which was designed by another consultant, was within the area of these accommodation camps. Removal of some of the historic buildings would have been likely if it were to be built. The new turbine position, 422m to the north-east of the previous position, has no such conflict with the historic environment. This is one of several benefits of the new turbine position.

Three other non–statutory sites are located where the current Bolshan farm buildings are situated. The two Willanyards records, are locations where axe heads were discovered. Teuchat Hillock is a small farmstead situated about 900 m from the proposed turbine site.

No further assessment of impacts on the settings of these minor non- statutory sites was deemed necessary.

Conservation Areas

There are two conservation areas within 10 km of the proposed turbine. Brechin Town Centre, and Brechin St Ninian's Square are both 7.7 km to the north of the site. The ZTV shows that the turbine is not visible from any of these areas. It is unlikely therefore that there will be any effect on the setting of these Conservation Areas by the Bolshan Renewables Project and no further assessment was deemed necessary.

Gardens and Designed Landscapes

There are seven garden and designed landscapes (GDLs) within 10 km of the Bolshan Renewables Project. The closest of these, Kinnaird Castle is located 4.8 km to the north east of the turbine. The ZTV indicates the hub of the turbine may be seen from Kinnaird Castle gardens. The impact of the turbine on the setting of the castle gardens will be mitigated by the fact that the castle lies within 1300 acres of walled parkland. House of Pitmuies, is located 5.6 km south west of the site, while Guthrie Castle is 5.7 km to the south west of the site. Both of these gardens are expected to be well screened from the turbine by walls surrounding the gardens and tall vegetation. Brechin Castle is 7.1 km to the North West, and Dunninald and Craig House are 8.9 km, and 9.4 km north east from the turbine respectively. They all lie out with the ZTV. House of Dun is 9.0 km in the north east direction is partially in the ZTV. The overall effect of the turbine on the setting of any of these sites will be further mitigated by distance. As such, it is expected to be extremely negligible and no further assessment of GDLs was deemed necessary.

9.5 Viewpoint Assessment

Given the results of the desk based survey and detailed ZTV analysis, it was considered useful to carry out further analysis of the effect the turbine would have on the A listed building and SAM; Braikie Castle.

At an earlier iteration of the project (planning application 13/00887/FULL) Historic Scotland were consulted regarding the possible impact of the proposed turbine on the surrounding area. At that time the turbine was located 1984m from centre of the castle tower and was about 422m south-west of the current proposed turbine location (Grid reference 361394, 752245) which is 2210m from the castle tower. Historic Scotland responded by saying that they have no objection in principle to a wind turbine development in this location but would wish to see a photomontage showing views to and from Braikie Castle.

When the current planning application was prepared a site visit was carried out with the intention of taking photos for the photomontage assessment. However the landowner where Braikie Castle is located objected to photographs being taken from his property. A wireframe assessment will be presented instead. As is shown below, the findings are such that a photomontage was not entirely necessary.

Wireframe Assessment

A 'wireframe' image combines ordnance survey terrain data with the turbine coordinates and dimensions to accurately show a 'bare land' view of the turbine. Wireframes do not have the colour and detail of photomontages, but wireframes are the basic starting point for full photomontages and are a useful tool.

The details of the Historic Site - Braikie Castle, the subject of the Wireframe Assessment are shown in Table 37.

Table 37: Site to be Assessed Using Wireframes

Historic Site	*Classification*	*Grid Ref*	*Distance From Turbine (km)*	*Reason for Selection*
Braikie Castle	'A' listed building Scheduled ancient monument Gardens and Designed Landscapes	362846, 750893	2.2 km	Significant site within ZTV

Methodology for Viewpoint Assessment

As in the landscape and visual impact assessment section of this Environmental Report, indirect visual impacts have been assessed by choosing a receptor (in this case the architectural or archaeological heritage site) and then arriving at a judgement of the **'significance'** of the effect on this receptor by combining assessments of its **'sensitivity'** and of the **'magnitude'** of the effects it is subjected to.

It is important that the methodology used is transparent. Full details of the criteria for 'sensitivity' and 'magnitude' are given in Appendix 2 of this chapter.

The following matrix has been applied in order to derive the 'significance' of impacts by combining sensitivity and magnitude ratings.

Table 38: Matrix for combining 'magnitude' of effect and 'sensitivity' used to derive overall 'significance' of effect.

		Sensitivity		
		High	Medium	Low
Magnitude	High	High	High	Medium
	Medium	High	Medium	Low
	Low	Medium	Low	Negligible or Positive
	Negligible	Low	Negligible or Positive	Negligible or Positive

The following page shows two wireframe images, one of which shows how only the turbine tip is expected to be visible from Braickie Castle, with the viewing position being an eye-level 2m from the ground adjacent to the tower.

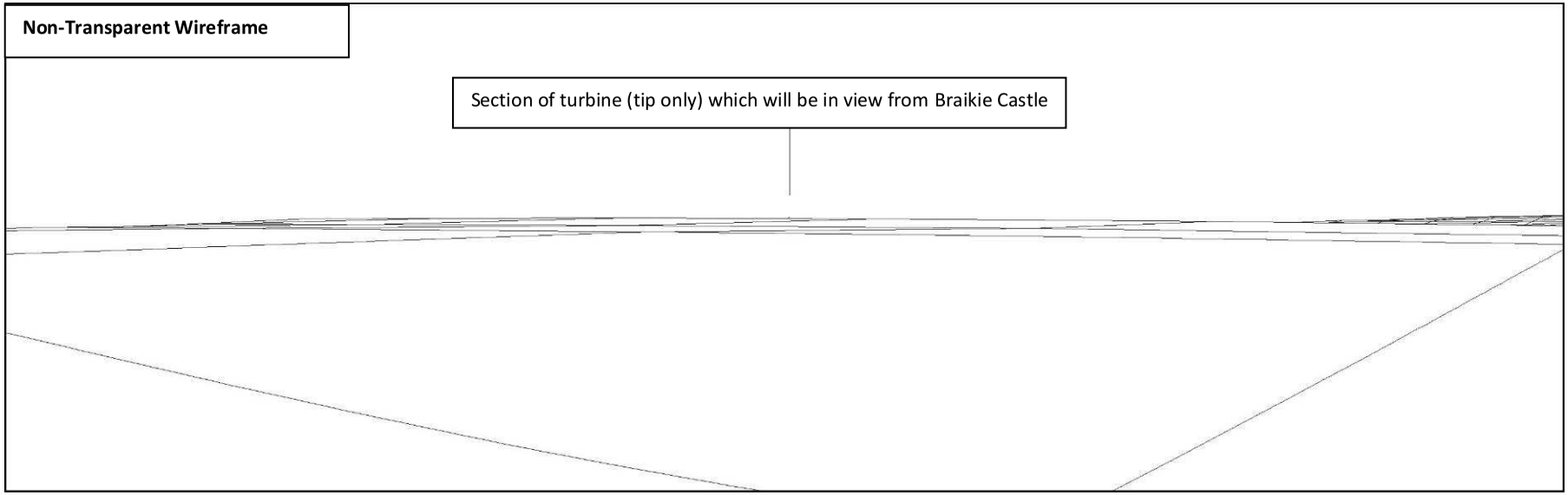


Figure 17: Wireframe from Braikie Castle (GR NO 62853, 50894), 68deg field of view.

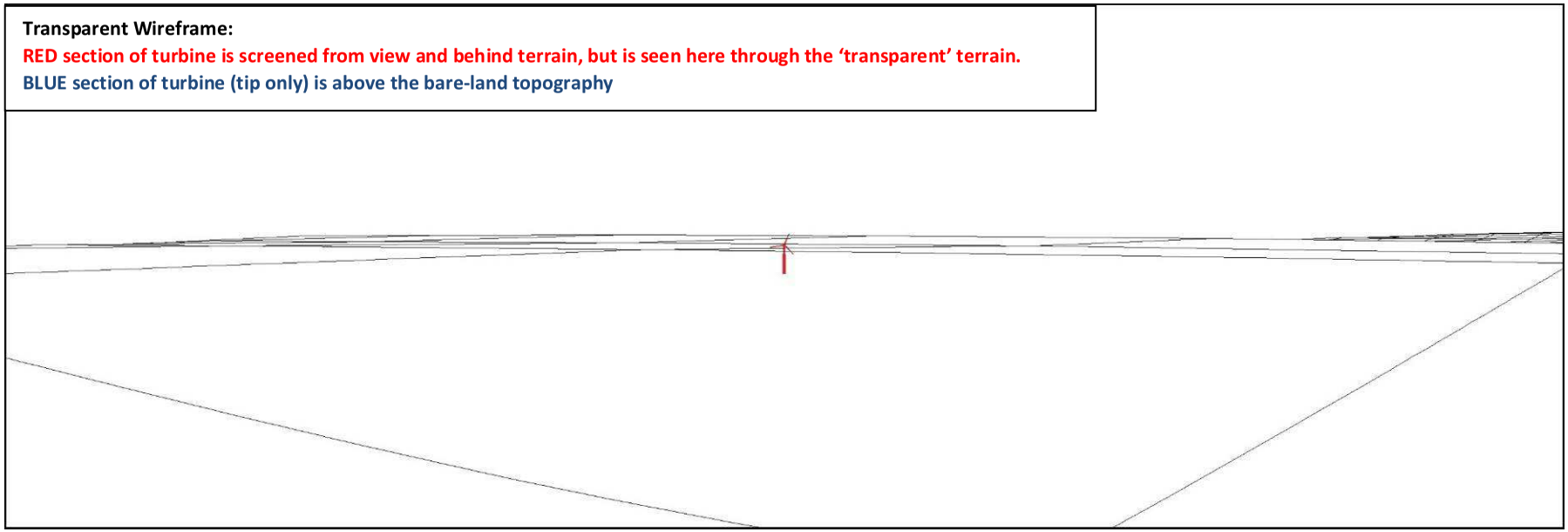
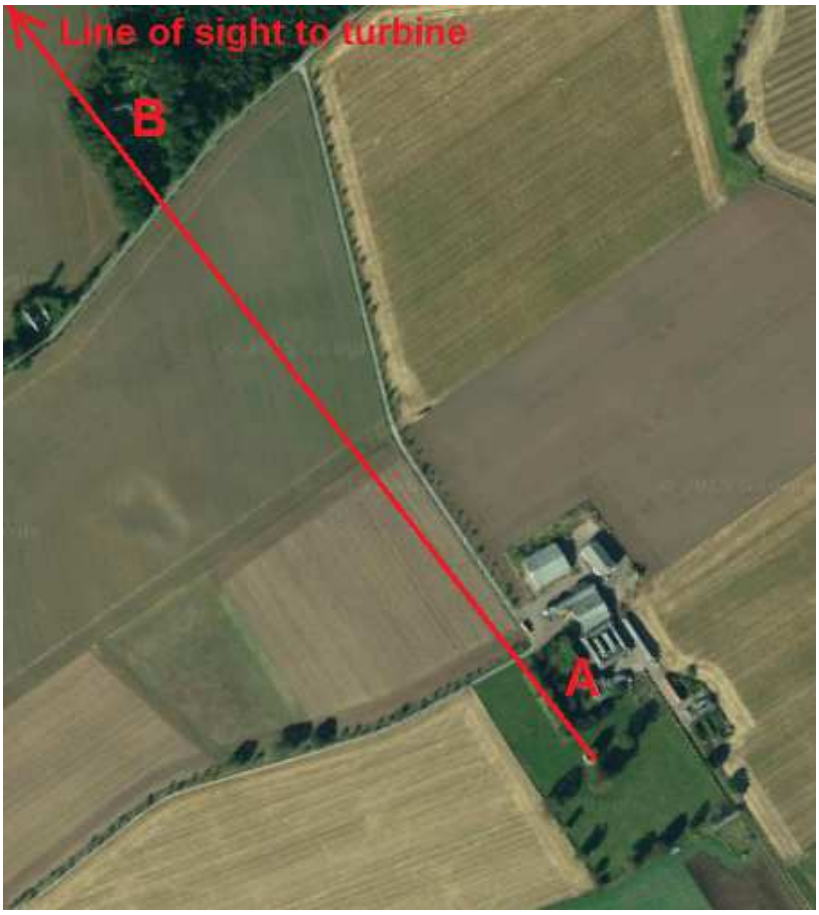


Figure 18: Transparent Wireframe from Braikie Castle (GR NO 62853, 50894), 68deg field of view.

In addition to the wireframes the following aerial photo below helps develop an understanding of the visual impact on the setting of the Castle and the extensive screening from topography and trees. The line-of-sight from the castle tower to the turbine has been added to the aerial photo using a red line. It is thought that the very small part of the turbine that may be visible above the bare-ground horizon, as shown in the wireframes, would be obscured by the trees at points 'A' and 'B'.



Assessment Table

The table below contains an assessment of the effect of the turbine on the setting of Braikie Castle.

Table 39: Wireframe Assessment, Braikie Castle

Site Type: Scheduled Ancient Monument, A Listed Building, Garden and Designed Landscape Figure 17 & Figure 18 **Distance to turbine from viewpoint:** 2.2 km **Grid reference for viewpoint:** 362853, 750894 **Notes on Viewpoint Position:** The viewing position is an eye-level 2m above the ground adjacent to the tower.
Assessment of Sensitivity: With reference to Table 46 Category A and B listed buildings are categorised as being of 'high' sensitivity. **Sensitivity:** High
Assessment of Magnitude: The methodology for assessing magnitude (see Table 47) refers to direct and indirect impacts together with noise impacts and the impact of ancillary development. There will be no direct impacts on Braikie Castle, the turbine will not be at all audible from this distance, and no ancillary development (such as access tracks or electrical equipment) will be visible from this distance. These factors significantly reduce the magnitude of the impact. The wireframe shows that the turbine would be screened behind the hill with only the tip of the turbine theoretically visible from Braikie Castle, however in reality this would be concealed by vegetation. Beyond Braikie Castle, the setting is already altered by a more modern rural landscape, with large farm buildings and a farm yards in the close vicinity. While the turbine may be a slightly visible addition to the landscape, it is a modern diversification of a local farming business. Historic Scotland's document; 'Managing Change in the Historic Environment – Setting' (October 2010) describes and examines setting. When defining setting, Historic Scotland state that it comprises of a combination of "modern changes", as well as surviving "original setting (and) subsequent development". Some very negligible effects on the setting of the castle cannot be ruled out. These negligible effects may be possible when views from elsewhere which contain both the castle and the turbine are considered, or when views from within the immediate setting of the turbine are considered, particularly in the western part of the grassed field in which the turbine sits. These views are not represented by the wireframe image or the line of sight indicated above and so are not the focus of the assessment set out in this table, but they have been noted below. The setting of the site is already altered by the modern landscape, and the site is located next to a public road. With reference to the definition of 'negligible' given in Table 47, the turbine would be "an introduction of elements that could be visible but not intrusive in views". Therefore, the magnitude of change to the view is deemed to be negligible. **The magnitude of effect on setting is considered to be:** • **None** (from the wireframe viewpoint position) • **Negligible** (possible from some other locations)
Significance of Effect: With reference to the matrix presented in Table 38, the significance of the effect on Braikie Castle would be**.** • **None** (no effect from the viewpoint assessed in the wireframe) • **Low** (possible from some other locations)

9.6 Cumulative Assessment

The assessment for the Bolshan turbine has considered the proposed turbine in isolation and excluded the effect of all other wind energy developments in the area. Figures C1 to C6 within the volume of LVIA figures show other permitted, and proposed wind energy developments in the area surrounding Bolshan.

It is possible that some other turbine developments in the local area may have a significant impact on the historic environment, but a complete assessment of these developments cannot be provided here. It would be inaccurate to somehow attribute the effects of another wind energy development to the Bolshan Renewables Project.

The assessment for the proposed turbine has found that it is expected to have only a very negligible impact on the historic environment. Therefore, it can be concluded that any cumulative impacts on the historic environment within the local area could only be attributed to the Bolshan Renewables Project to a very negligible degree. This development represents a good opportunity for generating renewable energy in the area whilst avoiding an adverse cumulative impact on the historic environment.

9.7 Conclusions, Historic Environment

Historic sites have been thoroughly identified and catalogued through a desk based study. The assessment has been carried out with reference to the relevant guidance and through the application of a transparent methodology.

The planning consent sought would last 25 years, this is a short period in the history of this area and the granting of planning permission will not result in a permanent effect on the settings of historic sites.

The nearest scheduled ancient monument is over 2 km away and the nearest listed building is over 1 km away. Within 10 km there are seven garden and designed landscape and three conservation areas. None of these sites are expected to have any more than a partial view of the turbine from parts of the site. Any effects on the settings of the historic assets will be notably mitigated by distance, and in most cases, intervening tree cover and other obstructions.

The wireframe assessment found that no views of the turbine are expected to be possible from the immediate surroundings of Braikie Castle, but it could be possible that some effects of 'low' significance could be experienced from views which include both the castle and the turbine, and from the western most extent of the field in which the castle is set.

Generally, no adverse impacts on the historic environment were identified through the desk based study and wireframe analysis. This suggests that in terms of mitigating effects on the historic environment the proposed site is a suitable site for wind energy development and the design of the development is appropriate.

It is concluded that the historic environment will not be adversely affected by the proposed turbine, and that the development is therefore considered to be in accordance with the Angus Local Plan Review policies which safeguard the historic environment.

Historic Environment Appendix 1: Gazetteer of Historic Sites

All distances are measured from the proposed turbine position (361507, 752652). Each table has been organised in order of distance to the turbine.

Table 40: Scheduled Ancient Monuments within 5 km

Scheduled Ancient Monument	*Index Number*	*Easting*	*Northing*	*Distance to turbine (km)*
Braikie Castle	166	362851	750893	2.2
Hatton Mill, enclosure 300 m WNW of	6317	361076	750217	2.5
Kinnells Mill, cairn	6312	360485	750190	2.7
Invergighty Cottage, barrow cemetery N of Boysack	5985	362080	749583	3.1
Balneaves Cottage, cursus and settlement 200 m SE of	6041	360647	749565	3.2
Boysack, barrow cemetery 500 m NW of	5984	361798	749400	3.3
Douglasmuir, ring ditch, enclosure and pits 500 m NW of	5983	360837	749274	3.4
Milton of Guthrie, cursus NE of	6282	359052	750017	3.6
Boysack, enclosures, ring ditches and souterrains	5986	361954	748910	3.8
Pitmuies Mill Farm, ring ditch 250 m NW of	6091	358564	749941	4.0
Cairn Knap, cairn	6093	359318	749013	4.2
Chapelton, settlement 750 m NW of	5987	362134	748437	4.5
Friock Mains, pit alignment 270 m WNW of	6092	358520	749336	4.0
Damside Cottages, settlement 400 m E of	6090	358089	749588	4.6
Damside Cottages, souterrain 250 m E of	6089	357916	749622	4.7
Kinnaird Castle, enclosure 300 m WNW of	6398	357765	749412	4.9

Table 41: Listed Buildings within 3 km.

Listed Building	*HB Number*	*Category*	*Easting*	*Northing*	*Distance to turbine (km)*
Muirside Of Kinnell, Old Schoolhouse	12324	C	360536	752191	1.1
Willanyards	12326	B	362521	753334	1.2
Braikie Castle	12325	A	362846	750893	2.2
Little Fithie, Farmhouse	11504	C	362342	754738	2.2
Former Kinnell Parish Church Graveyard Including Gatepiers, Gates And Enclosure Walls	51307	C	360880	750277	2.5
Kinnell Mill & Granary, Gatepiers	12322	B	360668	750181	2.6
Kinnells Mill Cottages	12323	B	360650	750184	2.6
Kinnells Mill And Granary	12323	B	360563	750197	2.6
Kinnells Farmhouse	12321	B	360513	750173	2.7
Kinnell Bridge	13815	B	360605	750098	2.7
Farnell Castle, Dovecot	11502	B	362524	755387	2.9
Farnell Castle	11501	A	362429	755488	3.0
Farnell, Glebe House, Sundial	11499	B	362690	755390	3.0
Farnell, Glebe House	11498	B	362685	755401	3.0
Farnell, Glebe House, Gatepiers	11500	B	362663	755415	3.0

Table 42: Non Statutory Sites within 1 km

Site Name	*Angus SMR Reference*	*Significance*	*Easting*	*Northing*	*Distance to turbine (m)*
Bolshan (site of a castle)	NO65SW0006	Standard	361704	752107	580
Willanyards	NO65SW0039	Standard	361995	753005	602
Bolshan Windmill	NO65SW0036	Standard	361942	752070	727
Kinnell Airfield	NO65SW0049	Standard	360955	751439	802
Bolshan (site of a chapel)	NO65SW0009	Standard	362001	751999	819
Teuchat Hillock	NO65SW0068	Standard	360549	752749	963
Willanyards 2	NO65SW0066	Standard	362304	753197	966

Table 43: Conservation Areas within 10 km

Conservation Area	***Distance to turbine from nearest edge (km)***
Brechin Town Centre	7.7
Brechin St Ninian's Square	7.7

Table 44: Gardens and Designated Landscapes within 10 km

Garden and Designed Landscape	***Easting***	***Northing***	***Distance to turbine (km)***
Kinnaird Castle	362757	757291	4.8
House Of Pitmuies	356628	749826	5.6
Guthrie Castle	356239	750485	5.7
Brechin Castle	359250	759345	7.1
Dunninald	370216	754237	8.9
House Of Dun	366907	759873	9.0
Craig House	370230	756197	9.4

Historic Environment Appendix 2: Assessment Methodology

Initially a desk-based study was completed using Historic Scotland's available GIS databases. All A and B Listed Buildings and Scheduled Monuments within a 5 km radius were identified (see Table 40 and Table 41). In addition, a search of C Listed Buildings within 3 km of the proposed turbine location was undertaken.
The assessment[115] focuses mainly on the visual impact on these sites; the matrix used to assess the overall impact is detailed in Table 45 below.

Table 45: Overall impact assessment matrix

		Sensitivity		
		High	Medium	Low
Magnitude	High	High	High	Medium
	Medium	High	Medium	Low
	Low	Medium	Low	Negligible or Positive
	Negligible	Low	Negligible or Positive	Negligible or Positive

The guidelines in Table 46 and Table 46 below are used to determine the sensitivity and magnitude of the potential impact on the cultural heritage receptors.

Table 46: Summary of the criteria used in this study to assess the relative sensitivity of an historic receptor

Sensitivity	***Definition***
High	Category A and B listed building
	Scheduled Ancient Monument
	Non-statutory List of sites likely to be of national importance
	Designed Gardens and Landscapes
Medium	Category C(S) listed building
	Archaeological sites on the Sites and Monuments record (of regional and local importance)
	Conservation Areas
Low	Archaeological sites of lesser importance
	Non-Inventory Gardens and Designed Landscapes

Table 47: Criteria for assessing magnitude of impact upon historic receptors.

Magnitude	*Definition*
High	Any number of wind turbines and/or ancillary development that would result in: • the removal or partial removal of key features, areas or evidence important to the historic character and integrity of the site, which could result in the substantial loss of physical integrity; and/or • a substantial obstruction of existing view by the addition of uncharacteristic elements dominating the view, significantly altering the quality of the setting or the visual amenity of the site both to and from. Where the mechanical or aerodynamic noise from any number of wind turbines (or from other neighbouring wind energy developments) that are likely to detract from site amenity of a popular built or cultural heritage site managed as a visitor attraction adjacent to a wind energy development.
Medium	Any number of wind turbines and/or ancillary development that would result in: • the removal of one or more key features, parts of the designated site, or evidence at the secondary or peripheral level, but are not features fundamental to its historic character and integrity; and/or • a partial obstruction of existing view by the addition of uncharacteristic elements which, although not affecting the key visual and physical relationships, could be an important feature in the views, and significantly alter the quality of the setting or visual amenity of the site both to and from. Where the noise intrusion (mechanical or aerodynamic) from any number of wind turbines (or from other

[115] Based on the following report: University of Newcastle (2002) Visual Assessment of Windfarms Best Practice. Scottish Natural Heritage Commissioned Report F01AA303A.

	neighbouring wind energy developments) may detract from the amenity of a built or cultural heritage site adjacent to a wind energy development.
Low	Any number of wind turbines or ancillary developments that may result in: • a partial removal/minor loss, and/or alteration to one or more peripheral and/or secondary elements/features, but not significantly affecting the historic integrity of the site or affect the key features of the site; and/or • an introduction of elements that could be intrusive in views, and could alter to a small degree the quality of the setting or visual amenity of the site both to and from. Where the noise intrusion (mechanical or aerodynamic) from any number of wind turbines (or from other neighbouring wind energy developments) is unlikely to detract from the amenity of a built or cultural heritage site adjacent to a wind energy development.
Negligible	Any number of wind turbines or ancillary developments that may result in: • a relatively small removal, and/or alteration to small, peripheral and/or unimportant elements/features, but not affect the historic integrity of the site or the quality of the surviving evidence; and/or • an introduction of elements that could be visible but not intrusive in views, and the overall quality of the setting or visual amenity of the site would not be affected both to and from. Where the noise intrusion (mechanical or aerodynamic) from any number of wind turbines (or from other neighbouring wind energy developments) would not have any noticeable effect on the amenity of a built or cultural heritage site adjacent to a wind energy development.

10. Hydrology

10.1 Introduction

This chapter presents an assessment of the likely impacts on surface and groundwater hydrology of the development. It includes a characterisation of the existing water environment, against which any effects are evaluated. It also outlines mitigation measures that are likely to be required during the construction and operation of the Bolshan Renewables Project. It is taken that the life-span of the development is 25 years.

Understanding surface and groundwater environments is critically important to designing a successful project. Surface water includes watercourses, water bodies and runoff. Groundwater includes all water stored in permeable underground strata (or aquifers). In any construction project it is important to understand both where and how they relate to each other so that the project can be designed to minimise the risk of pollution or any other impact. Surface water provides important water resources for potable and other supply, amenity, aesthetic value, conservation and ecological environments and importantly, recharge to groundwater systems.

Key pollution concerns for surface water from the proposed project are:

- Sediment erosion and contaminated silty runoff during construction.
- Chemical spill from activities such as refuelling of construction vehicles;
- Contaminated ground water from any dewatering activities; and
- Modification or destruction of habitats.

Groundwater provides essential base flow to rivers and wetland areas, often supporting important ecological systems. Key pollution concerns for groundwater are:

- Chemical spill from activities such as refuelling of construction vehicles; and
- Creation of new pollution pathways through, for example, excavation or piling.

The methodology of this assessment is based on the collection of data and information from published material as well as consultations with statutory bodies, principally SEPA, Angus Council, as well as the land owner's own knowledge of the site. Although hydrological issues are likely to be relatively minor at this site, the risk of pollution of watercourses, groundwater bodies and, most importantly, private water sources within or near the site needs to be assessed and appropriately mitigated where necessary.

10.2 Legislation, Policy and Guidance

The assessment has been undertaken primarily using a qualitative assessment based on professional judgement, statutory, general, national and local guidance. This chapter represents the majority of the national guidance that has been used for this assessment.

The statutory development plan for the proposed development is the Angus Local Plan Review (LPR) 2009. The LPR contains the following policies which make provisions for wind turbine developments, water management and the prevention of flooding:

- Policy ER34: Renewable Energy Developments
- Policy ER35: Wind Energy Development
- Policy ER24: Surface Water Disposal
- Policy ER25: Water Resource Protection
- Policy ER27: Flood Risk - Consultation
- Policy ER28: Flood Risk Assessment

In addition to the LPR guidance described above, there is a range of environmental legislation relevant to the life-cycle of this development, including:

- The Water Environment (Controlled Activities) (Scotland) Regulations 2011
- PAN 61 Planning and Sustainable Urban Drainage Systems
- PAN 79 Water and Drainage

The remainder of the chapter discusses the likely impacts of the wind turbine development on surface and groundwater hydrology.

10.3 Sources of Information

This assessment has been undertaken primarily using a qualitative assessment based on general, national and local guidance as follows:

Table 48: Sources of information for hydrology assessment

Topic	Source of Information
Climate	
Rainfall	Met Office - http://www.metoffice.gov.uk/public/weather/climate
Runoff	UK Hydrometric Register (NERC) 2008
Surface waters	SEPA - http://map.sepa.org.uk/floodmap/map.htm
Water Quality	SEPA
River flows	SEPA UK Hydrometric Register (NERC) 2008
Groundwater	
Aquifer Productivity	BGS – UK Hydrogeology Viewer http://mapapps.bgs.ac.uk/hydrogeologymap/hydromap.html
Bedrock Aquifer Productivity	BSG – Bedrock Aquifer Productivity Map for Scotland http://nora.nerc.ac.uk/504764/1/CR-04-047N_SEPA%20Aq%20productivity.pdf
Groundwater vulnerability	BGS – Groundwater Vulnerability (Scotland) GIS dataset http://nora.nerc.ac.uk/17084/1/OR11064.pdf
Geology	BGS – Onshore Geoindex http://mapapps2.bgs.ac.uk/geoindex/home.html
Solid and Drift Geology	BGS – Geology of Britain (Web based GIS) http://mapapps.bgs.ac.uk/geologyofbritain/home.html
Water Resource Use	
Groundwater and Surface Water Abstractions	Angus Council and SEPA
Pollution of groundwater	
Pollution prevention	SEPA Policy No.19: Groundwater Protection Policy for Scotland. SEPA Pollution Prevention Guidance Notes (PPG): o PPG 1: General guide to the prevention of water pollution; o PPG 2: Above Ground Oil Storage Tanks; o PPG 5: Works in, near of liable to affect watercourses; o PPG 6: Working at construction and demolition sites; o PPG 21: Pollution incident response planning.

10.4 Hydrogeology

Bedrock Geology

In assessing wind energy developments, the underlying geology is an important factor. The BGS Geology of Britain (Web based GIS, 1:50 000 scale geology) indicates that the geology at the site is Dundee Flagstone Formation, which comprises of medium- to coarse-grained, cross-bedded sandstones and substantial, distinctive, flaggy sandstones interbedded with minor siltstones and mudstones, interdigitated with the Ochil Volcanic Formation. The surrounding area consists of the Montrose Volcanic formation which contains a mixture of Andesite, basaltic andesite, other andesitic rocks, volcaniclastic conglomerate and sandstone.

Superficial deposits

The BGS Geology of Britain (Web based GIS, 1:50 000 scale geology) indicates that the superficial deposits within the immediate area and within 1 km radius for the immediate area consists of Till, Devensian found to be consistent with Diamicton sediment. There are no important geological resources that may potentially be impacted by the proposal.

Hydrology

The closest Climate Station to the proposed turbine site is Forfar No3 Climate Station (NO 43307 54968), situated 18.3 km to the North West. Table 49 shows the Annual Average Monthly rainfall for the period 1981 – 2010 at this site[116].

Table 49: Annual Average Monthly rainfall (1981 -2010) - Forfar No3 Climate Station

Month	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Rainfall (mm)	80.2	49.3	63.7	48.7	51.5	62.1	57.5	67.4	66.6	97.2	78.1	68.6	791.0

The closest flow gauging station to the site is maintained on Lunan Water (NO 65466 49433), ~ 5 km south east of the site. The UK Hydrometric Register (2008) records the following station statistics:

Table 50: Kirkton Mill (Lunan Water) Flow Gauging Records

Station Number	13005
Catchment Area	124 km^2
Period of Record	1981-2013
Mean Flow	1.706 $m^3 s^{-1}$
Q95	0.195 $m^3 s^{-1}$
Q10	3.805 $m^3 s^{-1}$
Baseflow Index	0.52

The mean flow is the average flow, weighted to account for the different number of days per month of the daily mean monthly flows for the period of the monitoring record. The 10 percentile and 95 percentile flows are river flows that were equalled or exceeded for 10 and 95 per cent of the monitoring record. They provide measures of a catchment response to rainfall (flashiness) and dry weather flow characteristics respectively.

The base flow index was developed by the Institute of Hydrology (now CEH Wallingford) during the Low Flow Study project to help assess low flow characteristics of rivers in the UK. The index is considered to provide a measure of the proportion of river runoff that derives from stored sources – the more permeable the rock, drift and soil material of a catchment the higher the baseflow and the more sustained the river flow during periods of little rainfall. Typically rivers draining impervious catchments have baseflow indices of 0.15 – 0.35. A highly permeable catchment may have index score of more than 0.9 and reflects a high component of groundwater flow to the river discharge.

[116] http://www.metoffice.gov.uk/public/weather/climate/gfjfmqukv

Ground Water Conditions/Geology

The Water Framework Directive (WFD) has a wide range of objectives, one of them being to measure the effect of human activity on Scotland's groundwater. Scotland's groundwater is a valuable resource providing a source for thousands of properties, farms, and other buildings, plus the provision of the general public water supply. Throughout the year groundwater springs feed many terrestrial ecosystems. In the summer months, groundwater helps to maintain river flows via baseflow discharge. Natural deterioration of groundwater quality rarely occurs and deterioration is often associated with human activity.

Groundwater Vulnerability

In its simplest form groundwater vulnerability can be defined as: "The tendency and likelihood for general contaminants to reach the water-table after introduction at the ground surface"[117]

Interpretation of the aquifer and vulnerability maps

The movement and concentrations of contaminants in the subsurface is an important element in the source-pathway-receptor risk assessment process and has been defined on a national-scale through aerial reconnaissance and the development of Aquifer and Vulnerability Maps. Vulnerability maps provide a regional screening tool that enables areas of comparatively higher risk to be identified and to help scope the amount of detailed site investigation required at a particular site. The maps represent simplifications of the complex processes involved in subsurface contaminant transport. Their features are described in detail in the aquifer and vulnerability subsections below. SEPA has simplified the features into horizontal and vertical pathways as follows:

Horizontal Pathway (represented by the Aquifer Map), and Vertical Pathway (represented by the Vulnerability Map).

Horizontal Pathway (Aquifer Maps)

Aquifers in Scotland have been classified according to their productivity and groundwater flow mechanisms, the key features of which are described in the table below. The table is sourced from 'GIS of aquifer productivity in Scotland: Explanatory notes" (2004).

[117] O Dochartaigh, B.E.; Ball, D.F.; MacDonald, A.M.; Lilly, A.; Fitzsimons, V.; del Rio, M.; Auton, C.A.. 2005 Mapping groundwater vulnerability in Scotland: a new approach for the Water Framework Directive. Scottish Journal of Geology, 41 (1). 21-30. 10.1144/sjg41010021

Table 51: Aquifer Productivity

	Aquifer productivity				
Flow mechanism	**Very High (VH)**	**High (H)**	**Moderate (M)**	**Low (L)**	**Very Low (VL)**
Intergranular (I)	**IVH** Attenuation of certain contaminants can occur within the aquifer itself. Additional protection is provided by strata overlying the aquifer.	**IH** Attenuation of certain contaminants can occur within the aquifer itself. Additional protection is provided by strata overlying the aquifer.	**IM** Attenuation of certain contaminants can occur within the aquifer itself. Additional protection is provided by strata overlying the aquifer.	**IL** Attenuation of certain contaminants can occur within the aquifer itself. Additional protection is provided by strata overlying the aquifer.	**IVL**
Dominantly Intergranular (DI)	**DIVH** Attenuation of certain contaminants can occur within the aquifer itself. Additional protection is provided by strata overlying the aquifer.	**DIH** Attenuation of certain contaminants can occur within the aquifer itself. Additional protection is provided by strata overlying the aquifer.	**DIM** Classification not applicable in Scotland.	**DIL** Classification not applicable in Scotland.	**DIVL** Classification not applicable in Scotland.
Intergranular and Fracture Flow (the latter is dominant) **(IF)**	**IFVH** Dilution within the aquifer itself can reduce contaminant concentrations in certain situations. Most protection is provided by strata overlying the aquifer.	**IFH** Dilution within the aquifer itself can reduce contaminant concentrations in certain situations. Most protection is provided by strata overlying the aquifer.	**IFM** Dilution within the aquifer itself can reduce contaminant concentrations in certain situations. Most protection is provided by strata overlying the aquifer.	**IFL** Protection will generally only be provided by strata overlying the aquifer.	**IFVL** Classification not applicable in Scotland.
Fracture Flow (F)	**FVH** Classification not applicable in Scotland.	**FH** Classification not applicable in Scotland.	**FM** Dilution within the aquifer itself can reduce contaminant concentrations in certain situations. Most protection is provided by strata overlying the aquifer.	**FL** Protection will generally only be provided by strata overlying the aquifer.	**FVL** Protection will generally only be provided by strata overlying the aquifer.

As well as assessing aquifer productivity, the maps can be used to assess contaminant activity in the subsurface. The 'type' of aquifer will often determine the rate of flow (and therefore the rate of contaminant movement) and the capacity for attenuation. Aquifers with fracture/intergranular flow tend to provide a relatively higher level of attenuation. The rate of flow tends to be slower relative to flow in highly fractured aquifers.

The SEPA map of superficial aquifers indicates a classification for the area surrounding the site as an aquifer of moderate productivity with small amounts of groundwater in near surface weathered zone and secondary fractures. Preliminary assessment of the SEPA map of bedrock aquifers indicates the Bolshan Renewables Project is located upon the Arbuthnott-Garvock Group and has an IFM classification (intergranular/fractured flow mechanism with moderate aquifer productivity).

Vertical Pathway (Vulnerability Map)

Table 52 below presents vulnerability definitions for potentially polluting surface activities (taken from the WFD28 project). Whilst Aquifer Maps represent how groundwater (and hence contaminants are dissolved in groundwater) moves in the aquifer itself, the Vulnerability Map represents the strata overlying a given aquifer. This vulnerability map will be influenced by three key factors:

1. The thickness and permeability of the overlying strata influences the movement of contaminants from surface sources of contamination to the underlying aquifer;

2. Thick, low permeability strata (e.g. thick clays) tend to provide more attenuation capacity than thin, highly permeable deposits (e.g. thin, sandy strata);

3. For intergranular aquifers, the depth to the water table is also important, with deeper unsaturated zones allowing more contaminant attenuation.

The Vulnerability Map is divided into 5 main vulnerability classes:

Table 52: Vertical Pathway Vulnerability Classes

Vulnerability category	Description	Frequency of activity	Travel time
5	Vulnerable to most water pollutants with rapid impact in many scenarios.	Vulnerable to individual events	Rapid
4	Vulnerable to those pollutants not readily adsorbed or transformed.		
3	Vulnerable to some pollutants with many significantly attenuated.		
2	Vulnerable to some pollutants, but only when continuously discharged/leached.		
1	Only vulnerable to conservative pollutants in the long-term when continuously and widely discarded and leached.	Vulnerable only to persistent activity	Very slow

Class 4 is further subdivided in a scale from 4a to 4d, where 4a is classified at a higher vulnerability than 4d.

Aquifer and Vulnerability Maps should be used in combination when undertaking a risk assessment of groundwater in Scotland, since contaminant migration is influenced by both vertical (Vulnerability Map) and horizontal (Aquifer Map) pathways.

The Bolshan Project site itself and the majority of the land within a 250 m radius of the site can be classified as Vulnerability Class 2.

Water Quality

SEPA Water Bodies Data Sheet[118] states that the nearest sampled water body, the Pow Burn, is located on Lunan/Pow bedrock. SEPA has classified this water body as having an overall status of bad with medium confidence in 2008. The quality of the groundwater has been classified as poor with high confidence and the quantity of groundwater has been classified as poor with medium confidence in 2008.

Abstractions

SEPA have published *'Land Use Planning System SEPA Guidance Note 4, Planning Advice on Windfarm Developments'* (05 May 2014). Page 14 of this document refers to a buffer distance of 250 m between private water supplies (PWS) and turbine foundations. Information from Angus Council concerning private water supplies (PWS) shows there are no PWS abstraction points within the immediate 250 m buffer from the proposed turbine position. There was one PWS identified at Willanyards about 1.5 km north east from the proposed turbine.

Potential Impacts

The potential impact on water quantity from the development is minimal, so the mitigation measures focus on preventing water pollution. The major potential risk to the water environment is from erosion of exposed ground and consequent suspended solid pollution during construction. There is also a smaller risk from chemical pollution from, for example, oil, or

[118] SEPA (n.d.) *RBMP Water body information sheet for water body 5802 in North East Scotland* [Online] Available: http://www.sepa.org.uk/water/river_basin_planning/waterbody_data_sheets.aspx

[i118] British Geological Survey *A GIS of aquifer productivity in Scotland: Explanatory Notes* (2004) [Online]. Groundwater Systems and Water Quality Programme Commissioned Report. Available: http://nora.nerc.ac.uk

fuel spills and concrete. The criteria used in the assessment is a qualitative risk assessment methodology, in which the probability of an impact occurring and the magnitude of the impact, if it were to occur, are considered. This approach allows effort to be focused on reducing risk where the greatest benefit may result.

A summary of the potential impacts and effects that the main features of the development could have on the hydrological environment are presented in the table below.

Table 53: Unmitigated Potential Impacts

Stage of Development	Activity	Potential Impacts	Potential Effects (Direct and Indirect)
Construction	• soil stripping • accidental spillages of fuel etc • maintenance and operation of vehicles • use of non-sewage mains connected facilities • construction of and upgrading of roads • discharge of water	• soil erosion/sediment loading • change to the runoff regime • deterioration in surface and groundwater quality • impede groundwater flow • alteration of watercourses	• detrimental effects/ significant changes to habitats and designated sites • detrimental effects on aquatic flora and fauna and modification of substrates • detrimental effects on private water supplies • detrimental effects on groundwater abstractions • detrimental effects on ecological interests • increased flood risk
Operation	• use of roads • increased areas of hardstanding • Operation of heavy plant	• change in runoff regime as a result of increased impermeable surface area • contamination hazard • deterioration in surface and groundwater quality • alteration of watercourses • soil erosion/sediment loading	• detrimental effects/ significant changes to habitats and designated sites • detrimental effects on private water supplies • detrimental effects on groundwater abstractions • detrimental effects on ecological interests • increased flood risk
Reinstatement	• removal of structures • re-vegetation	• change to the runoff regime • alteration of saturation levels • deterioration in surface and groundwater quality	• detrimental effects on private water supplies • detrimental effects on groundwater abstractions • detrimental effects on ecological interests

10.5 Mitigation

Special Area of Conservation

The River South Esk and some of the surrounding tributaries have been designated as a Special Area of Conservation (SAC). A SAC is an area that has been adopted by the European Commission and formally designated by the government of each member country within whose territory the site lies. The SAC site boundary encompasses Pow Burn, a tributary of the South Esk, which runs to the north east of the site. The shortest distance between the SAC boundary and the development site boundary is 2 km. Careful consideration must be given to pollution prevention. The following section outlines the relevant measures required to protect this SAC and the site's hydrology generally.

General Pollution Prevention Measures

There are a number of general pollution prevention measures that would be employed to ensure that both ground and surface waters are not contaminated at any stage of the development. The development will be designed, constructed, operated and decommissioned in line with relevant Pollution Prevention Guidelines (PPG) and other codes of best practice. These will be detailed in the Construction Environmental Management Document (CEMD) and issued to all operatives that enter the site.

Construction Phase

These potential impacts require mitigation and as such will be set out within a CEMD. This will be provided post-consent and will set out how the development will be constructed, and the additional mitigation commitments. These additional commitments would include both specific mitigation measures as well as proposals for monitoring and emergency procedures. Such emergency procedures would include a site-specific Pollution Incident Response Plan in order to prevent and mitigate damage to the environment caused by accidents such as spillages and fires.

All of the specified environmental mitigation measures that would be required for the development would be clearly stated at the tendering stage of the construction process and all appointed sub-contractors working on the site would be made aware of the site specific concerns and the environmental mitigation measures that would be required.

The following measures will be stated within the CEMD in order to mitigate the impact on hydrology from work on the access road, hard standing and construction of the foundation:

- During construction of the track, drainage will be controlled by placing excavated soils on the uphill slopes with lateral drainage ditches on the downhill slopes where necessary to avoid silt washing into controlled waters.
- Access road will be constructed using "free draining" granular material and would be suitably profiled to reduce surface water flows.
- Should surface water treatment be required during construction, it will be carried out in accordance with CIRIA guidance for site works. Any temporary SUDS will be kept separate from the existing field drain network to avoid any potentially contaminated runoff from the new infrastructures to be discharged into the local water courses. If this is not practical then drains will be installed along the length of the tracks which will then feed in to a soak away via a silt trap.
- On-site activities during construction of the development will require the use of some heavy machinery. During these activities there will be a need to bring small quantities of oil and greases and other materials on to the site. The CEMD will take into account all pollution prevention guidance documents. Operational best practice procedures will continue to be adopted and this will mitigate the potential pollution risks during the construction of the development.

Essential mitigation measures relevant to controlling erosion and runoff from the access road construction are described in SEPA's pollution prevention guidance and include the following:

- Scheduling construction activities to minimise the area and period of time that soil will be exposed, particularly during winter periods.
- Installation of cut-off drains around the working areas to intercept uncontaminated surface runoff and divert it around the works.
- Minimise the stockpiling of materials and locating essential stockpiles as far away as possible from watercourses.
- Reinstatement of excavated material and the re-vegetation of the site as soon as possible following completion.

The mitigation measures noted above will be built into the tendering process so that all contractors are obliged to follow the agreed methods of pollution control. Appropriate clauses will be incorporated within contractual documents to ensure that appropriate measures are taken. The site induction for contractors will include a specific section on environmental risks, including water pollution from construction activity. Where oils and diesel are stored on site for refuelling or maintenance, these operations will be carried out in designated areas of hard standing located at least 20 m from the nearest watercourse or drain. Standard methods will be adopted within these designated areas that minimise the risk of spillage. Contingency plans will also be in place for dealing with any spillage that may occur. A groundwater management scheme will be required to be undertaken by the contractor to monitor groundwater conditions during construction.

Given the short duration of construction, the potential impact from the proposed development is considered minimal.

Operational Phase

The ongoing risk of pollution on the site after construction is considered to be very low. The proposed mitigation for the construction of the access roads will continue to function through the life of the project. Only routine maintenance is envisaged to be required for the roads and all such maintenance will generally be carried out in summer months when the tracks are dry. There will be a few on-site activities during operation of the wind turbine relating to regular maintenance or repair of the turbine. During these activities there will be a need to bring small quantities of oil and greases and other materials on to the site. Operational best practice procedures will continue to be adopted.

Decommissioning Phase

The activities during decommissioning are broadly similar to those during construction, however, the level of activity will be less as some of the roads and sub-surface elements will be left in place. It is envisaged that detailed method statements, in compliance with relevant current legislation, will be drawn up prior to decommissioning. However, similar mitigation methods to those employed during construction are likely to be appropriate.

In addition, the various elements of the proposed development, such as the site tracks and turbine foundations, have been designed so as to mitigate all of the potential impacts. Such mitigation designs have been based upon, or developed from, best practice guidance as well as other sources.

10.6 Conclusions, Hydrology

This impact assessment has taken account of geological, surface water and groundwater features and conditions at and near to the proposed turbine. It has highlighted a number of potential impacts on site hydrology and hydrogeology; primarily during construction, but potentially also during the operation of the turbine. These impacts are associated with a range of activities, including soil removal and construction of the foundations, access tracks and hardstandings. The most serious potential impacts are associated with sediment-laden runoff from exposed ground entering watercourses and spillage of chemicals infiltrating to controlled waters.

Surface water and groundwater will most likely flow westwards towards Pow Burn. The road and hardstanding will be constructed using free draining materials ensuring and surface water will continue to run in its natural flow direction.

It has been shown that deployment of mitigation measures in accordance with best practice guidance reduces the identified potential hazards to acceptable levels. This report demonstrates that the proposed development complies with the requirements of relevant policies and guidance.

11. Flood Risk

11.1 Introduction

It is recognised that one of the implications of climate change is an increased flood risk in some parts of the country[119]. The Scottish Government have stated that "planning can play an important part in reducing the vulnerability of existing and future development to flooding"[120]. As a result the Scottish Planning Policy now promotes:

- A precautionary approach to flood risk;
- Flood avoidance;
- Flood reduction; and
- Avoidance of increased surface water flooding through SUDs.

In line with this, developers are advised to "take into account flood risk and the ability of future occupiers to insure development before committing themselves to a site or project, as applicants and occupiers have ultimate responsibility for safeguarding their property"[121]. This chapter therefore considers the implications of the Bolshan Renewables Project on flood risk.

This assessment has been carried out in accordance with the following policies and guidance:

Scottish Government (2014) Scottish Planning Policy
Scottish Environment Protection Agency (2012) Land Use Planning System SEPA Guidance Note 4
Scottish Environment Protection Agency (2012) Land Use Vulnerability Guidance

The Scottish Environment Protection Agency (SEPA) have a duty under the Environment Act 1995 "to provide, on request by an authority, flood risk advice based on the information" they hold. SEPA are therefore a key agency to the planning process with regard to assessing the implications of flood risk of a proposed development. It is noted by SEPA that wind turbines, "due to their small footprint….. do not usually create or increase flooding to nearby receptors in their local vicinity"[122] although it is recognised that these issues do "occasionally arise in relation to wind-farms in relation to the location of infrastructure such as substations or access tracks"[123].

This assessment contains written information on the flood potential of the site and measures to mitigate its effects.

11.2 Scottish Planning Policy: Managing Flood Risk and Drainage (June 2014)

Outcome 3 of the Scottish Planning Policy includes policy on Managing Flood Risk and Drainage. This policy states that "the planning system should prevent development which would have a significant probability of being affected by flooding or would increase the probability of flooding elsewhere"[124]. To deliver this it is expected that planning authorities "have regard to the probability of flooding from all sources and take flood risk into account when preparing development plans and determining planning applications"[125].

Accordingly, a flood risk framework has been developed as a basis for planning decision making in relation to flood risk. This appeared within Scottish Planning Policy 7: Planning and Flooding, the first consolidated Scottish Planning Policy and has recently been revised within the new Scottish Planning Policy.

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[119] Page 57, Scottish Government (2014) Scottish Planning Policy [Online] Available: http://www.scotland.gov.uk/Resource/0045/00453827.pdf
[120] ibid
[121] Page 58, ibid.
[122] Page 13, Scottish Environment Protection Agency (2012) Land Use Planning System SEP Guidance Note 8, SEPA: Stirling.
[123] Page 7, ibid.
[124] Page 57, Scottish Government (2014) *Scottish Planning Policy* [Online] Available: http://www.scotland.gov.uk/Resource/0045/00453827.pdf
[125] Page 58, ibid

This flood risk framework has been replicated in Table 54 below. This framework has been used to appraise and categorise flood risk at the Bolshan Renewables Project site. It is noted that wind turbines are described by the Scottish Planning Policy and SEPA's Land Use Vulnerability Guidance as essential infrastructure. Additionally, the SPP notes that in applying the flood risk framework the following should also be taken into account:

- The characteristics of the site;
- The design and use of the proposed development;
- The size of the area likely to flood;
- Depth of flood water, likely flow rate and path, and rate of rise and duration;
- The vulnerability and risk of wave action for coastal sites;
- Committed and existing flood protection methods: extent, standard and maintenance regime;
- The effects of climate change, including an allowance for freeboard;
- Surface water run-off from adjoining land;
- Culverted watercourses, drains and field drainage;
- Cumulative effects, especially the loss of storage capacity;
- Cross-boundary effects and the need for consultation with adjacent authorities;
- Effects of flood on access including by emergency services; and
- Effects of flood on proposed open spaces including gardens

Table 54: Flooding Risk Framework (Taken from the Scottish Planning Policy June 2014)

RISK FRAMEWORK **Little or No Risk** – annual probability of coastal or watercourse flooding is less than 0.1% (1:1000 years) • No constraints due to coastal or watercourse flooding.
Low to Medium Risk – annual probability of coastal or watercourse flooding is between 0.1% and 0.5% (1:1000 to 1:200 years) • Suitable for most development. A flood risk assessment may be required at the upper end of the probability range (i.e. close to 0.5%), and for essential infrastructure and the most vulnerable uses. Water resistant materials and construction may be required. • Generally not suitable for civil infrastructure. Where civil infrastructure must be located in these areas or is being substantially extended, it should be designed to be capable of remaining operational and accessible during extreme flood events.
Medium to High Risk – annual probability of coastal or watercourse flooding is greater than 0.5% (1:200 years) • May be suitable for: o residential, institutional, commercial and industrial development within built-up areas provided flood protection measures to the appropriate standard already exist and are maintained, are under construction, or are a planned measure in a current flood risk management plan; o essential infrastructure within built-up areas, designed and constructed to remain operational during floods and not impede water flow; o some recreational, sport, amenity and nature conservation uses, provided appropriate evacuation procedures are in place; and o job-related accommodation, e.g. for caretakers or operational staff. • Generally not suitable for: o civil infrastructure and the most vulnerable uses; o additional development in undeveloped and sparsely developed areas, unless a location is essential for operational reasons, e.g. for navigation and water-based recreation, agriculture, transport or utilities infrastructure (which should be designed and constructed to be operational during floods and not impede water flow), and an alternative, lower risk location is not available; and o new caravan and camping sites. • Where built development is permitted, measures to protect against or manage flood risk will be required and any loss of flood storage capacity mitigated to achieve a neutral or better outcome. • Water-resistant materials and construction should be used where appropriate. Elevated buildings on structures such as stilts are unlikely to be acceptable.

11.3 Site Description

The proposed development is on the land at Bolshan Farm, Arbroath DD11 4UH. The site is ~3.0 km north east of Friockheim and at an elevation of ~60 m AOD. The National Grid Reference is NO 61507 52652. See the Location Plan provided with this planning application for a clear indication of the Bolshan Renewables Project site location.

11.4 Source of Flooding

A useful high level tool to appraise the likelihood of flooding for a particular area in Scotland is SEPA's Flood Risk Management Map[126]. This online tool illustrates areas of land with a high likelihood (1:10 or 0.1% chance of happening in any one year) medium likelihood (1:200 or a 0.5% chance of happening in one year) and low likelihood (1:1000 or 0.1% chance of happening in one year) of pluvial, fluvial and coastal flooding. Although developed from various sources of data this is an indicative tool helpful in screening the necessity for further flood risk appraisals; it does not for example account for any flood protection measures which may have been installed to help reduce likelihood of flooding.

Analysis of the SEPA flood risk map (Figure 19) indicates that the area surrounding the site is not at risk of fluvial, pluvial or coastal flooding. For example, the nearest area that is susceptible to river flooding is adjacent to the Guthrie Burn ~870 m west of the development. The Guthrie Burn is a tributary of the Lilylorn and Pow Burns which flow north east ~7.7 km to the River South Esk. The risk of surface water flooding in the surrounding area is negligible. There are no recorded surface water build ups identified on the turbine site due to the slope of the land, however surface run off may require mitigation.

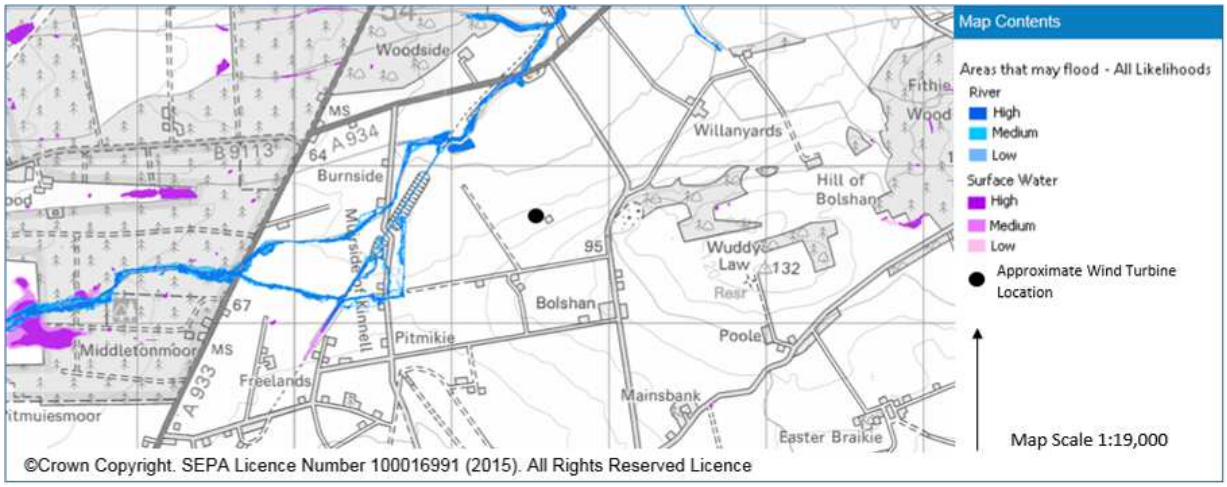

Figure 19: SEPA Flood Risk Map

11.5 Increased impermeable surfaces

There will be a requirement to construct 1,853 m^2 of new access road and hardstanding using free draining granular material. There are no requirements to construct any of the roads and hardstandings with impermeable materials.

As the new roads and hardstandings are constructed using free draining granular material and the ground is relatively flat with no cross-slope, it is proposed to construct the site roads and hardstandings with no artificial drainage. Surface water will simply filter through the roads and hardstandings into the underlying soils.

The concrete foundation of the turbine will be approximately 201 m^2 and be buried approximately 1 m below existing ground level. Rainfall will seep through the free draining granular hardstanding into the ground below. The foundation has a sloped surface to allow any rain water which falls onto it, to flow to the outer edges of the foundation and dissipate into the surrounding soils.

[126] SEPA (n.d.) *Flood Risk Management Map* [Online] Available: http://map.sepa.org.uk/floodmap/map.htm

11.6 Culverts and Bridges

The end of a minor artificial field drain will need to be culverted in order to access the turbine location. No Controlled Activities Regulations (CAR) license is expected to be required from SEPA for this work because it involves an engineering activity on a 'land drainage works that do not affect a natural watercourse'[127] and the watercourse is a minor one, since it does not appear on a 1:50,000 scale ordnance survey map[128].

11.7 Impact of flooding on the proposed development

The flood map (Figure 19) shows that the turbine, road and hardstanding are out with the areas indicated by SEPA at low, medium or high likelihood of fluvial, pluvial or coast flooding.

The proposed development is located on sloping land at an elevation of ~60 m AOD (considerably higher than the estimated flood level). It is highly unlikely flood waters would ever reach the site.

11.8 Conclusions, Flood Risk

The proposed development is shown by SEPA Flood Risk Management Map as being out with areas subject to fluvial, pluvial or coastal flooding; this indicates that the site can therefore be considered at minimal or no risk of flooding. The roads and hardstandings have been positioned and designed to ensure they are not affected by or contribute to the risk of flooding.

The end of a minor artificial field drain will need to be culverted in order to access the turbine location. No CAR licence is thought to be required.

In order to mitigate the potential for surface run off, the road and hardstanding will be constructed using free draining granular material, which will allow any surface water to filter through to the ground below. As such there is no need for attenuation or treatment. The additional impermeable surface from the construction of the foundation is very small and as such the increased surface water run-off is considered to be low.

The proposed development is therefore considered to be at no risk of flooding and will not create a risk of flooding on the surrounding area.

[127] Page 30, A Practical Guide [to] The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended), SEPA, version 7.2, March 2015.

[128] Page 30, A Practical Guide [to] The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended), SEPA, version 7.2, March 2015.

12. Transport and Delivery Assessment

This transport and delivery assessment describes the frequency of deliveries for all aspects of the proposed project. A detailed transport assessment of the abnormal loads will be carried out for the project following a successful application.

12.1 Operational verses Construction Traffic

Wind turbine developments produce very minimal operational transport impacts, particularly when compared with almost any other type of development proposal for which planning application could be sought. This positive aspect of wind turbine development should be acknowledged. A single wind turbine of the type proposed may require a visit every two months for routine maintenance and checks. Because transport impacts are so negligible during the operational phase, this transport assessment focuses on the construction phase.

12.2 Sourcing of Materials

The materials with the greatest volume will come from the delivery of aggregate and concrete. The supplier of these materials will be subject to competitive tender and this will only be confirmed by the successful civil engineering contractor. In practice, however, the nearest quarry to the site is generally the most competitive. In this case, three quarries are within 25km of the site.

Clark William Cotside Quarry, Barry, Carnoustie, DD7 7RR	Denfind Stone Ltd. Denfind Farm House, Monikie, Dundee, DD5 3PZ	Breedon Aggregates, Ethiebeation Quarry, DD5 3RB

Estimates of traffic generations associated with the construction phase of the project have been derived from first-principles, based on assumptions made with regard to the following activities. It is estimated that the construction of the wind turbine will take place over a 4 month period. Construction traffic generation relates to the following construction activities:

- Delivery of road stone for construction of access tracks and crane pads;
- Disposal of excavated material;
- Ready-mix concrete delivered to the site for construction of the turbine bases;
- Formwork and reinforcing steel delivered to the site for construction of the turbine bases; and
- Delivery of the turbine equipment.

12.3 Access Tracks and Crane Pads

The road stone for the construction of the access tracks and hardstandings will be sourced from local quarries. Based on 1,200m^2 of new access track and 652.5m^2 of crane hardstandings, it is estimated that 833m^3 of imported stone will be required (1852.5m^2 x 0.45m). Assuming a density of 2.2t/m^3, this equates to 1,834 tonnes of stone. Given that the load capacity of an HGV is 20 tonnes, **92 loads** of road stone will be required.

12.4 Delivery of concrete

The design of the wind turbine foundation is calculated to require 176m^3 of concrete plus 9m^3 for the blinding, giving a total concrete quantity of 185m^3. Assuming a load capacity of 6m^3 per HGV, **31 loads** would be required. Technical constraints require the concrete for an individual turbine to be delivered and poured in one day to prevent cold joints in

the mass structure. This creates a short but disproportionate impact and has therefore been considered separately from the impact of the other traffic movements.

12.5 Disposal of Excavated Material

The main access road will be constructed along an existing field access and pastoral agricultural land so there will be a requirement for excavations for this section. The crane hardstanding will also be newly constructed on the land adjacent to the upgraded access track with the formation level being the underside of the topsoil. The quantity of excavated material to be disposed of off site is the displaced quantity of earth from the foundation. This quantity is therefore calculated to be 185m^3. Assuming a density of 1.8t/m^3, this equates to 333 tonnes of surplus material. Given that the load capacity of an HGV is 20 tonnes, **17 loads** will be required to be removed from site.

12.6 Formwork and Reinforcing Steel

Formwork and reinforcing steel is required for the concrete bases. The turbine will require two deliveries of steel and 1 of formwork. Based on this a total of **3 loads** will be required for the formwork and reinforcing steel.

12.7 Turbine Delivery

There will be **7 deliveries** required for the turbine equipment (one for nacelle, one for the blades, two for the tower, one for the blade hub, and two for generator/controller etc.).

12.8 Estimate of Total Deliveries

Table 55 shows the traffic generations estimate for the Bolshan Farm turbine.

Table 55: Traffic Generations

Activity	Total Loads
Delivery of Road Stone (inc craneage areas)	92
Delivery of Cabling	1
Delivery of Concrete	31
Disposal of Excavated Material	17
Delivery of Formwork and Reinforcing Steel	3
Delivery of Turbine	7
Total (excluding concrete)	120
Total (including concrete)	151

It is predicted that the construction period of the proposed development will be approximately 4 months. Table 56 shows the total trips distributed according to that work programme.

Table 56: Trips Per Month

Activity	Month				
	1	2	3	4	Total
Road Stone	60	32			**92**
Delivery of Cable			1		**1**
Delivery of Concrete			31		**31**
Disposal of Material			17		**17**
Reinforcing Steel			3		**3**
Turbine Delivery				7	**7**
Total Trips (excluding concrete for turbines)	60	32	21	7	**120**
Total Trips (including concrete for turbines)	60	32	52	7	**151**

Table 56 shows the total daily trips by month for all construction activities, based on an average of 4½ weeks per month and an average five working days per week (rounded down to an average of 22 working days per month). This table illustrates that the maximum traffic impact associated with the construction of the proposed wind farm (excluding

concrete deliveries) are predicted to occur in the first 2 months of the construction programme. During these months, an average of 2 trips (excluding concrete deliveries) is predicted to be generated on each working day.

After the first 2 months, an average of less than 1 delivery per working day is predicted to be generated (excluding concrete deliveries).

To avoid cold joints in the foundation, concrete deliveries are restricted by the pouring method to one pour per working day. As a result, there will be 31 deliveries of concrete on one day in month 3.

12.9 Conclusions, Transport and Delivery Assessment

A positive aspect of wind turbine development is that transport impacts while the turbine is operational are very negligible. A visit every two months is expected for this turbine.

The source of the aggregate, concrete, sand, reinforcement and cabling is not known at this stage. The majority of the traffic to and from site will be involved with the supply of concrete and aggregate. The most likely places this material is to be sourced from are Cotside Quarry, Denfind Stone Ltd or Ethiebeation Quarry.

The total number of deliveries to the site (excluding concrete) is anticipated to be 120 trips over the 4 month construction period. Based on 22 working days per month, this equates to an average of less than 1 delivery per working day over the 4 month construction period. However, the actual frequency is greater during the first 2 months of construction when 2 deliveries per day occur. This results in a frequency of 1 delivery per working day over the second 2 months of construction (excluding concrete).

To avoid cold joints, the turbine foundation must be completed on the same day it was started. Therefore there will be 1 day in month 3 when a disproportionately high volume of traffic will occur. On this day there will be 31 deliveries of concrete brought to site.

It can be concluded that the vehicle movements associated with the proposed project will have little impact on the surrounding area.

The abnormal loads brought to the site will cause minor disruption on the day of delivery, but will be subject to a traffic management plan, approved by Angus Council Roads & Transportation Department.

13. Construction Method Statement

13.1 Introduction

The following chapter describes the construction process and the mitigation measures incorporated to ensure that all risks are minimised. The construction method statement will form the body of this chapter and it will detail the construction process along with the risk assessments of all activities for personnel on site and the surrounding environment. The site specific details regarding the design and construction of the site will be described and the general construction details will be listed in the method statements. A full list of the method statements and risk assessments will be provided post-consent together with an Environmental Management Plan.

Access to the turbine will be via the upgraded existing access track. A new section of track will be required off this to reach the turbine location and accommodate the delivery vehicles. The total length access track will be 290m, all of which would be upgraded existing track. The hardstanding area used for erecting the turbine will be circa 652m^2, designed and constructed in line with the turbine supplier's specifications. Over one third of the total area used for erecting the turbine will be dressed back and returned to the previous condition of the ground following commissioning.

The chapter describes how the works will be carried out, including any mitigation measures, associated with the following aspects of construction:

1. Access road construction
2. Crane hardstanding
3. Turbine Foundation
4. Drainage installation

Work on the development will initially involve the stripping of the topsoil and construction of the access road. This will be followed by the construction of the hardstanding around 3 - 4 weeks after the site start. As the hardstanding progresses we would expect to commence on the foundation works.

13.2 Access Road Construction

The setting out of the site tracks has been based upon site visits, study of aerial photography and discussions with the land owner. The development will partially utilise an existing track; this minimises the amount of additional track required to facilitate the development of the site. The track will be constructed in close proximity to the field boundaries in order to save space on actively worked agricultural land. Whilst the exact type of road construction method will be dependent on the outcome of ground investigation works, the overall road design takes into account the following features and constraints:

- Tracks are routed to avoid sensitive ecological, archaeological and hydrological features, and avoiding the crossing of any drainage channels where possible. The track length is kept to a minimum to reduce environmental impact, construction time and material quantities;
- The topography of the area means that the site is gently sloping. There are no excessive gradients which could affect delivery vehicles and as such construction plant is able to move safely round the site;
- A minimum width of 4m has been specified.
- The principles of the track drainage system have been designed to comply with Sustainable Drainage System (SUDS) requirements in order to minimise any potential impacts to on-site and offsite hydrology.

The road will be constructed in accordance with the designs drawn by experienced design consultants using the specifications supplied by the turbine supplier.

The road will have a running width of 4000mm but the depth and level of stone required will only be determined after a site investigation has been undertaken. Any stripped superficial deposits will be removed and stored in a designated area on site to be used to redress the sides of the road after construction.

13.3 Crane Hardstanding

The wind turbine requires an area of hardstanding to be built adjacent to the turbine foundation. This provides a stable base on which to lay down turbine components ready for assembly and erection, and to site the two cranes necessary to lift the three tower sections, nacelle and rotor into place. The crane hardstanding will be left in place following construction in order to allow for the use of similar plant should major components need replacing during the operation of the wind turbine. These could also be utilised during decommissioning at the end of the wind turbines life. The total area of hardstanding at the turbine location, including the turbine foundations and the crane pad will be approximately 826.5m^2. Approximately one third of this area will be dressed back with topsoil and landscaped into the surrounding area upon completion of turbine erection.

It is anticipated that one team will carry out turbine erection, using two road-going cranes (one of approximately 100 tonne capacity and one of 500 tonne capacity). The erection contractor would determine the actual cranes used, together with the exact programme and number of teams on site.

The lay down areas will accommodate all components ready for assembly and erection and provide a firm base for cranes used to erect the turbine.

The turbine erection platform will initially be formed to allow construction plant access and storage close to the turbine base. All efforts will be made to minimise the ground disturbance and footprint of the excavation. Excavations will be left open for as short a duration as possible. Vegetation will be stripped and a proportion carefully stored locally for re-use in surface restoration around the platform margin and along the access road verges.

Ground conditions for the hardstanding will be similar to those for the access road and the design of the hardstanding will be similar to that of the access road.

13.4 Turbine Foundations

The turbine will be installed on a circular foundation, comprising both stone and reinforced concrete. These typically measure ø 16.0m in plan with concrete depth of approximately 1.5m, and a stone overlay of circa 1m. The volume of concrete will be approximately 176.35m^3 and will incorporate around 26 tonnes of steel reinforcement. The final choice of foundation design will be based on the most efficient use of materials, water table and local ground conditions.

Three foundation scenarios may be considered, depending on the results of detailed ground investigation work that would take place should the site be granted planning permission.

Type 1: Where rock-head or suitable bearing is relatively shallow (<2m), the wind turbine foundations will bear directly onto rock.
Type 2: Where rock-head or suitable bearing is between 2-5m depth, the existing overburden will be excavated and replaced with suitable load-bearing material imported from local quarries
Type 3: Where rock-head or suitable bearing is greater than 5m depth, a piled solution will be considered.

The setting of the foundation base has been based upon site visits, the study of aerial photography and discussions with the land owners. The foundation design will depend on the results from detailed ground investigation. Based on the information gathered to date it is expected that the depth to bedrock will be shallow and the construction will be of Type 1 or 2. It is proposed to agree the methodologies for this with the determining authority prior to construction.

The designed foundations will be built into the ground in line with turbine supplier's specifications.

Prior to excavation of the turbine foundation the drainage will be assessed with a view to installing mitigation measures for the duration of the works in this location. As with the description of the hardstanding above, all efforts will be made to minimise the ground disturbance and footprint of the excavation and excavations will be left open for as short duration as possible.

Any overburden that is removed during the excavation will be stored separately to be used in the restoration of the site once the foundation is in place and set. All surplus materials will then be removed from site.

The correct construction method for the turbine foundation is set out in the relevant 'method statement' to be produced during the construction phase.

13.5 Drainage Installation

The sections of the access track where drainage will be most important are the steep sections. This is because water can quickly accumulate during a heavy rainfall and begin running down the track and as a result of this there may be some water accumulation at the site entrance. This water can, for example, pick up particulate matter from the recently constructed track and potentially transport sediment laden water into local watercourses.

To mitigate the risks of run-off water containing excess sediment entering local watercourses, the access road and hardstanding will be constructed using "free draining" granular material and would be suitably profiled to reduce surface water flows. If drainage is required during the construction phase temporary cut-off trenches will be formed along the sides of the access road to catch any sediment laden run-off. This will then be allowed to filter naturally back into the ground through the grass and soil. Any temporary drainage will be backfilled when the access road has been completed.

The final section of the works where settlement run-off will need to be considered is from the works associated with the turbine foundation and the crane hard standing pad. To prevent sediment laden water running straight into the field and watercourses, a drainage ditch will be installed along the edge of the hard standing, which will filter the water and let it naturally drain back into the ground.

All sediment traps will require maintenance and emptying at regular intervals.

14. Electromagnetic Interference

Due to its size and behaviour, there is a possibility that a wind turbine could have an adverse effect on electromagnetic signals within the immediate area. The previous application (13-00887-FULL) was for a turbine approximately 422m away from the proposed position. It received several consultation responses and contained a detailed radar assessment with the aim of identifying specific airwave links or radar that may be negatively affected by the introduction of the proposed turbine. Although not in the identical location given the typical scope of assessments, it is assumed conclusions relating to radar/microwave links for the previous turbine position will be indicative of those for the new position.

Notwithstanding, all statutory consultees will be contacted in relation to the proposed turbine to ensure there have been no changes and it does not pose an issue to safeguarding.

An aviation proforma has been completed and is included with this planning application. The proforma may be distributed by the Planning Service to aviation consultees.

14.1 Aviation and Radar

In certain circumstances, wind turbines have been known to cause interference to aviation radar, in a way that can affect the ability of the radar to track aircraft as they pass behind or in front of the turbine location. The previous application received a response from NERL which indicated they would have no objection to the proposal.

A radar risk assessment was also submitted for the previous planning application, and was carried out by Pager Power. This consulted a database of UK civil and military radar, licensed/unlicensed aerodromes and radio navigation aids.

It identified Leuchars PSR, Leuchars PAR (both 34.4km) and Perwinnes Radar (68.6km) as being potential aviation issues. Further line of sight analysis was used to ensure the proposed turbine would not be in line of site of any radar. Taking into account the differences in tip height and height above sea level between the previous and proposed turbines, the radar line of site would pass approximately 62m, 70m and 551m respectively above the turbine now proposed.

This gives a good indication that the proposed turbine will not cause interference to aviation radar in the area.

14.2 Microwave and UHF link Interference

Microwave data links are used by many organisations to support infrastructure and transmit critical information along paths which have unimpeded line of sight between two transmitting/receiving stations. Wind turbines with blades that would pass through the link centreline or the interference zone known as the 2nd Fresnel Radius may cause unacceptable interference to the link.

13-00887-FULL received no objection from Ofcom, JRC or Atkins. The Ofcom response indicates a typical search radius of 500m, given that the proposed turbine position will be developed around 422m away, it is anticipated that these parties will continue to have no objection to this new application.

14.3 TV signal

No response had been received from Arqiva, who are responsible for providing the BBC and ITV's transmission network and ensuring the integrity of re-broadcast links with the last application.

No adverse effects are anticipated to be caused by this development however, in order to protect nearby residents a condition can be attached to the decision notice which requires, upon the receipt of a complaint, a TV and radio reception impact survey to be submitted and approved by the planning authority. Suitable mitigation measures can then be implemented at the developer's expense to ensure that the issue is fully rectified.

15. Environmental Health

15.1 Noise

Executive Summary

This application seeks planning consent for the erection of a single turbine of 79.6m to turbine tip on land north west of Bolshan Farm.

The aim of this chapter is to assess whether the proposed wind turbine would meet the prescribed noise levels detailed within ETSU-R-97[129] which is the assessment method adopted by Angus Council for the assessment and rating of wind turbine noise. This involves demonstrating compliance with noise limits based on a fixed limit or a margin over background noise whilst taking into account cumulative noise from neighbouring wind energy developments.

It was found that, at wind speeds up to 10m/s (at 10m height), the predicted wind turbine noise level was inside the noise limits as prescribed within ETSU-R-97 at all times. The proposed turbine would not therefore expose properties to excessive noise or a risk of loss of amenity. This planning application is in accordance with relevant planning policies which aim to control wind turbine noise.

Should planning permission ultimately be granted for this application, a condition can be attached to the planning consent which refers to either a single fixed limit or a table of fixed limits defining noise levels based on predicted levels which cannot be exceeded at specific properties and wind speeds. Reference can also be made to those properties with a financial interest in the project, with differing limits applying to those with a financial involvement and those without.

[129] '*The Assessment and Rating of Noise from Wind Farms*', ETSU-R-97 for DTI, 1996 (henceforth referred to as 'ETSU-R-97').

Introduction

This report accompanies an application which seeks planning consent for the erection of a single wind turbine of 79.6m tip height on land west of Bolshan Farm, Bolshan, Arbroath; the preferred turbine model is an Enercon E48 which will be operating in '500kW' mode.

This report presents an assessment of the potential operational noise impact of the Bolshan Farm turbine on the nearest noise sensitive dwellings.

Development Summary

Turbine Model:	Enercon E48
Hub Height:	55.6m
Tip Height:	79.6m
Capacity:	500kW
Location (NGR):	361507, 752652
Altitude:	65m AOD

Site Description

The area in general consists primarily of farmland with scattered dwellings and agricultural buildings. The general noise environment in the surrounding area could be characterised as having 'natural' or 'rural' sources; such as vegetation and bird call. Other noise sources in the area include intermittent local road vehicles and agricultural noise.

Relevant Guidance and Policy

This assessment takes into account the following guidance and policy documents:

***'The Assessment and Rating of Noise from Wind Farms'*, ETSU for DTI, 1996 (henceforth referred to as 'ETSU-R-97').** This document sets appropriate standards for noise emissions from wind turbine developments. The document is now relatively out-dated but is supported as the basis for wind turbine noise control through the planning system by The Scottish Government and the Department for Energy and Climate Change.

Angus Council 'Implementation Guide for Renewable Energy Proposals' June 2012. This document provides guidance relating to the submission of wind turbine noise assessments in Angus. It covers topics such as the assessment criteria to be used, information on background noise measurements and also prediction of wind turbine noise levels.

Institute of Acoustics '*A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise*' May 2013. This guide presents current good practice in the application of the ETSU-R-97 assessment methodology, reflecting the original principles within, as well as the results of research carried out and experience gained since ETSU-R-97 was published. It aims to build a common framework for turbine noise assessment for acoustic consultants, local planning authorities, developers and the general public.

Noise limits

This assessment compares the proposed development against the following noise limits:

35dB $L_{A90,10\ min}$ $L_{A90,10\ min}$ at all times for wind speeds up to and including 10 m/s.

If the occupiers of the affected dwelling have a financial involvement in the wind turbine project, the limit is increased to:

40dB $L_{A90,10\ min}$ at all times for wind speeds up to and including 10 m/s.

Noise Sensitive Receptors

There are several neighbouring properties located in the surrounding area. A total of thirteen properties have been included in this assessment. These properties are in closest proximity to the turbine and are seen as being most susceptible to noise. All properties considered in the assessment are shown in Table 57 below.

Table 57: Dwellings Included in Noise Assessment

Dwelling	Easting	Northing	Elevation (m)	Distance from Source to Receiver (m)	Financial Involvement
Bolshan Cottage	362013	752287	93	623	No
Ardmhor Cottage	362020	752238	93	659	No
Doonbye	361807	751995	83	722	No
Ashview	361830	752006	84	722	No
Bolshan Farm	361928	752051	88	733	Yes
Viewbank	362046	752033	89	820	No
Teuchat Hillock	360576	752751	56	936	No
Burnside	360587	752987	54	979	No
Smithy Cottage	360551	752225	62	1047	No
Smithyfield House	360545	752190	62	1067	No
Muirside Cottage	360552	752156	63	1076	No

Cumulative Wind Turbine Developments

Neighbouring proposed and consented wind turbine developments surrounding the Bolshan turbine have been established. It was found that the nearest development at Waulkmill Quarry (13/00722/FULL) for a single 45.9m turbine is approximately 3km away and as a result its cumulative noise impact would be insignificant at those noise sensitive receptors surrounding the Bolshan Farm turbine.

Noise Predictions

Turbine Source Noise Data

Noise data for the Enercon E48 was obtained from the manufacturers warranted data sheet containing the sound power level of the turbine in 500kW mode[130]. This specifies a peak sound power level of 100.0 dB(A) for the turbine at 10m/s standardised to 10m height. To obtain the warranted levels, an additional +1dB uncertainty has been applied to achieve a maximum level of 101.0 dB(A) as stated in Enercon's sound power level warranty document[131].

Table 58: Enercon E48 500kW Sound Power Levels standardised to 10m Height Wind Speeds (55m Hub height)

Wind Speed (m/s) at 10m reference height	4	5	6	7	8	9	10
Specification Sound Power Level, dB(A) L_W	89.2	93.6	97.8	99.4	100.0	100.0	100.0
Additional Uncertainty, Uc	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Warranted Sound Power Level, dB(A) L_W	90.2	94.6	98.8	100.4	101.0	101.0	101.0

Octave banded data was obtained from an extract of a test report for Enercon carried out by DAR for the Enercon E48 in accordance with IEC 61400-11[132]. A summary of the data used at 10m/s is shown in Table 59 below. This is then scaled to match the warranted sound power level stated by Enercon in accordance with IOA Supplementary Guidance Note 3, paragraph 4.1.3. All data sheets referenced to the Enercon E48 are included in Appendix 3 of this report.

Table 59: Summary of Enercon E48 Octave Banded Sound Power Levels (10m/s)

Frequency (Hz)	63	125	250	500	1000	2000	4000	8000
Sound Power Level, L_{WA}	78.6	84.4	93.3	96.8	97.9	92.7	87.6	84.6

Noise Propagation Model

Wind turbine noise was modelled at nearby receptors in accordance with ISO 9613-2 *'Acoustics – Attenuation of Sound during Propagation Outdoors'*, the modelling tool used was ReSoft WindFarm. This model accounts for the attenuation due to geometric spreading, atmospheric attenuation, barrier attenuation, and ground effects.

The results obtained from such a model are highly reliant upon the inputs, as a result the Institute of Acoustics published a document in May 2013 entitled *'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise'* (henceforth IOA GPG) which aimed to help develop a consensus and common method when applying the parameters used in such models. The following model parameters were chosen in accordance with the IOA GPG:

[130] Enercon, *'Sound Power Level of the Enercon E-48 Operational Mode 500kW (SIAS-04-SPL E48 OM 500kW Rev1_1-eng-eng)'*. March 2012.
[131] Enercon, *'Sound Power Level Warranty for Enercon Wind Energy Converters (Sound Power Level Warranty_Rev006.1_eng.eng)'*, October 2014.
[132] DAR, *'Exctract of test report WICO 439SEC04/07 regarding noise emission of wind turbine (WT) type Enercon E-48 (Mode I), hub height 56m'* January 2006.

Table 60: ISO 9613 Propagation Input Parameters

Parameter	Input							
Spreading Model	Octave							
Attenuation Model	ISO 9613							
Ground Attenuation Porosity Factor	Source			Middle			Receiver	
	0.5			0.5			0.5	
Receiver Height	4m							
Temperature	10°c							
Humidity	70%							
Attenuation Coefficients (db/m)	63	125	250	500	1k	2k	4k	8k
	0.0001	0.0004	0.001	0.00193	0.00366	0.0097	0.0328	0.117
Reference Height	10m							

It should be noted that all predictions based on this model are assumed to be under downwind conditions (from source to receiver). This is seen as representing the 'worst case' noise conditions as in reality the receptors would not generally be downwind of the turbine at all times. Noise emissions under upwind conditions have been found in practice to be up to 10-15dB(A) lower than those predicted.

The topography in the area surrounding the turbine was also examined to ascertain whether additional factors to account for reflections due to valley effects would be necessary. It was found that the source to receiver paths exhibited primarily flat or gradually sloping ground and would not meet the criteria in the IOA GPG to trigger an additional +3dB increase to predicted levels.

Results – Simple Limit

Table 61 shows the predicted cumulative noise levels at each of the selected assessment locations, the levels shown are the peak levels predicted at 10m/s standardised to 10m height wind speed which relate to the maximum sound power level of the Enercon E48. Also shown is the margin which indicates the difference between the predicted value and the noise limit, positive values indicate that the predicted noise level is below the limit.

The number of receptor locations chosen is deemed to be represented of those most likely to be affected by noise from the proposed development. All predictions are based on warranted turbine sound power levels and are inclusive of a 2dB(A) subtraction to convert from L_{eq} to L_{90} noise levels in accordance with ETSU-R-97 and the IOA Good Practice Guide. All noise levels are predicted at a distance of 15m from the dwellings façade in the direction of the proposed turbine, this assumes an amenity area around the property where the occupant can enjoy use of their garden whilst being protected against disturbance.

For non-financially involved properties, the noise limit has been set at 35dB(A) which is the lowest fixed daytime limit that can be applied under ETSU-R-97 and is relevant at wind speeds up to and including 10m/s standardised to 10m height. Financially involved properties have had their limit set at 40dB(A) which is applicable where there is a valid financial interest in the project.

Table 61: Predicted Wind Turbine Noise Levels (dB, L_{A90}) at Nearest Noise Sensitive Receptors

Dwelling	Easting	Northing	Distance from Source to Receiver (m)	Noise Limit (dB, L_{A90})	Predicted Noise Level (dB, L_{A90})	Margin (dB, L_{A90})
Bolshan Cottage	362013	752287	623	35	31.4	3.6
Ardmhor Cottage	362020	752238	659	35	30.8	4.2
Doonbye	361807	751995	722	35	29.9	5.1
Ashview	361830	752006	722	35	29.9	5.1
Bolshan Farm	361928	752051	733	40	29.7	10.3
Viewbank	362046	752033	820	35	28.5	6.5
Teuchat Hillock	360576	752751	936	35	27.0	8.0
Burnside	360587	752987	979	35	26.5	8.5
Smithy Cottage	360551	752225	1047	35	25.8	9.2
Smithyfield House	360545	752190	1067	35	25.6	9.4
Muirside Cottage	360552	752156	1076	35	25.5	9.5

The assessment shows that the predicted noise levels from the proposed turbine are below the simplified ETSU-R-97 noise limits at all of the noise assessment locations listed in Table 61.

Conclusions, Noise

The Greenspan Agency has undertaken an assessment of the likely noise impact of the operation of a single Enercon E48 turbine located on land north west of Bolshan Farm. The assessment has been undertaken using a combination of fixed limits based on ETSU-R-97 and acoustic modelling of the noise emissions from the proposed turbine to predict operational noise levels at the closest noise sensitive receptors. It has been demonstrated that noise levels from the proposed turbine will not exceed the relevant noise limits at nearby properties at any time.

15.2 Shadow Flicker Assessment

Introduction

The objective of this chapter is to identify, and where possible quantify, the likely effects of shadow flicker arising from the proposed Bolshan Farm turbine. It quantifies the geographical area over which shadow flicker could occur, sets out the timing and duration of these impacts and identifies potential mitigation measures.

> "*Under certain combinations of geographical position, time of day and time of year, the sun may pass behind the rotor and cast a shadow over neighbouring properties. When the blades rotate, the shadow flicks on and off; the effect is known as "shadow flicker". It occurs only within buildings where the flicker appears through a narrow window opening. The seasonal duration of this effect can be calculated from the geometry of the machine and the latitude of the potential site*."[133]

The frequency of flicker is relevant in determining whether or not shadow flicker can cause health effects in human beings. The 2007 report 'Onshore Wind Energy Planning Conditions'[134] sets out guidance on the potential health effects from shadow flicker. Within the report, the National Society for Epilepsy advises that only 3.5% of the 1 in 200 people in the UK who have epilepsy suffer from photosensitive epilepsy, which is generally triggered by frequencies between 2.5 and 30Hz.

The turbine considered for this application, an Enercon E48 which has a maximum rotating speed of 32rpm, would result in a flicker frequency of 1.6Hz; well below levels which may cause adverse health effects for sufferers of photosensitive epilepsy.

The 2014 Onshore Wind Turbines Online Planning Advice[135] states that significant shadow flicker may only occur within distances of up to ten rotor diameters of the proposed turbine. With increasing distance between a wind turbine and any potential shadow flicker receptor, the intensity of the shadows cast by the blades, and therefore the intensity of the flickering is diminished. Shadows cast close to the turbine will be focused and distinct, gradually decreasing towards the edge of the shadow flicker zone.

Further guidance can be found in Companion Guide to PPS22 (2004)[136]. This recommends that it is only necessary to assess properties for shadow flicker within 130 degrees either side of north, relative to the turbine. Latitudes in the UK mean that turbines cannot cast long shadows on their southern side.

The nature and likelihood of shadow flicker can vary depending on the following factors;

- Direction of the receptor relative to the turbine,
- Distance from the turbine,
- Turbine hub-height and rotor diameter,
- Time of day/year,
- Cloud cover,
- Prevailing wind direction.

Methodology

As mentioned above, a general rule is that shadow flicker is likely to cause significant effects only within 10 times the rotor diameter from the nearest turbine. Any properties located out with this distance should not experience significant impacts.

---

[133] "*Planning Advice Note on Onshore Wind Turbines", last updated May 2014. http://www.gov.scot/Resource/0045/00451413.pdf .*

[134] *"Onshore Wind Energy Planning Conditions Guidance Note",* Department for Business, Enterprise and Regulatory Reform. October 2007.

[135] *"Planning Advice Note on Onshore Wind Turbines", last updated May 2014. http://www.gov.scot/Resource/0045/00451413.pdf .*

[136] *"Planning for Renewable Energy: A Companion Guide to PPS22".* Published16 December 2004 for the Office of the Deputy Prime Minister.

The Bolshan Farm turbine will have a rotor diameter of 48m, as a result, any properties located more than 480m from the turbine will not be assessed.

The shadow flicker package within Resoft WindFarm was used to calculate the amount of shadow flicker that properties in the locality may experience. The software models the path of the sun throughout an entire year to identify when and where shadows from the moving blades will be cast. This can give specific dates, times and the duration of any shadow flicker effects at nearby residential properties.

This form of computer based modelling makes a number of assumptions that mean the assessment can be considered a worst case scenario in regards to shadow flicker, these assumptions are detailed below:

- There are no trees or landscape features between the turbine and any affected properties,
- There is no cloud cover;
- The turbine is always orientated towards each property providing the maximum opportunity for shadow flicker to occur,
- There is always sufficient wind to cause the turbine blades to rotate,
- Someone is assumed to be in all properties at all times in order to experience the full duration of any shadow flicker effects.

The shadow flicker map on the following page (Figure 20) shows the maximum hours of shadow flicker that were calculated for the area around the Bolshan Farm turbine.

Conclusions, Shadow Flicker

Shadow flicker has been examined for the turbine proposed at Bolshan Farm. As there are no properties located within the 480m potential shadow flicker zone, no impact or effect on amenity is predicted during the operational phase of the project. The nearest property of Bolshan Cottage (623m) is located well outside the shadow flicker zone giving a comfortable buffer zone and further reducing any likelihood of impact or annoyance.

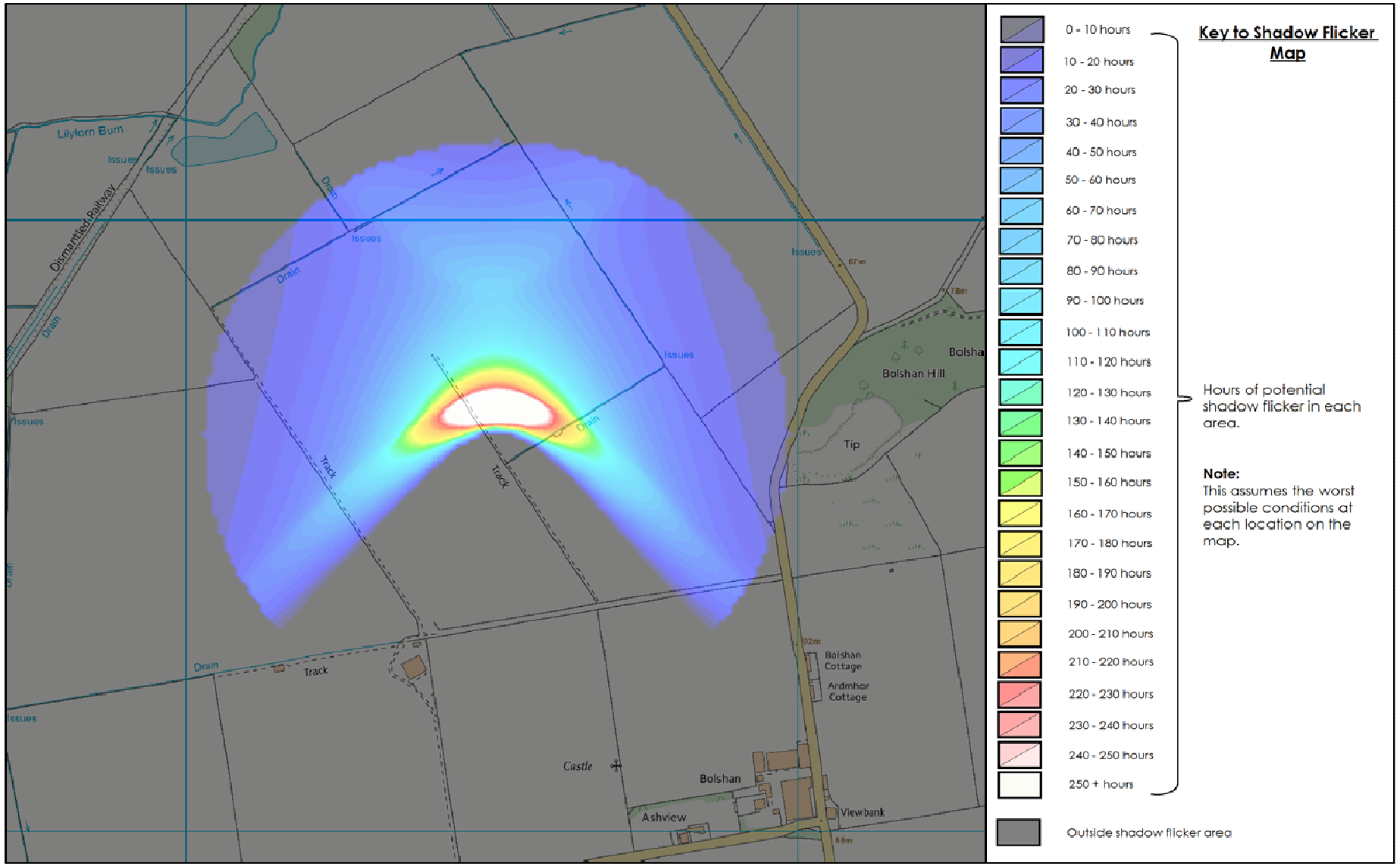

Figure 20: Bolshan Farm Shadow Flicker Map

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15.3 Vibration

In 2005, researchers from Keele University investigated the effects of vibration resulting from wind farms on the operation of a seismic array installed at Eskdalemuir in Scotland, one of the most sensitive ground-borne vibration detection stations in the world. The results from this study are often misinterpreted in that if infrasonic vibrations from wind farms can be measured, then they must consequently have some potential effect on humans. The authors have subsequently explained that[137]:

> *"The levels of vibration from wind turbines are so small that only the most sophisticated instrumentation and data processing can reveal their presence, and they are almost impossible to detect".*

They then go on to add context to the measured results:

> *"Vibrations at this level and in this frequency range will be available from all kinds of sources such as traffic and background noise – they are not confined to wind turbines. To put the level of vibration into context, they are ground vibrations with amplitudes of about one millionth of a millimetre. There is no possibility of humans sensing the vibration and absolutely no risk to human health".*

It may therefore be concluded that vibration associated with modern wind turbines is not a source which will result in levels that may be detrimental to the health of a wind farm neighbour.

15.4 Ice Throw

As with any structure, wind turbines can accumulate ice under certain conditions, such as ambient temperatures near freezing combined with high relative humidity, freezing rain, or sleet. Normal operation of the turbine can then cause ice to be shed, resulting in safety concerns that must be considered during project development and operation.

The accumulation of ice is highly dependent on local weather conditions and the turbine's operational state. Any ice accumulated may be shed from the turbine due to both gravity and the mechanical forces of the rotating blades. An increase in ambient temperature, wind, or solar radiation may cause sheets or fragments of ice to loosen and fall, making the area directly under the rotor subject to the greatest risk[138].

The Enercon E48 is fitted with sensors that detect loading imbalances on the rotor blades that are associated with icing. Appropriate signage will also be introduced in the vicinity of the development for the protection of site personnel and the public.

Additionally, there are several scenarios which would result in turbine deactivation in the event of icing:

- Detection of ice by nacelle-mounted ice sensor.
- Detection of rotor imbalance caused by blade ice formation by a shaft vibration sensor.
- Anemometer icing that leads to a measured wind speed below cut-in.

In conclusion, it is considered any safety concerns due to ice throw have been sufficiently mitigated and any risk to the public is negligible.

[137] 'Wind farm noise', P. Styles, letter by Prof P Styles and S Toon printed in The Scotsman, August 2005.
[138] *'Wind Turbine Icing and Public Safety – a Quantifiable Risk?'*,Colin Morgan and Ervin Bossanyi of Garrad Hassan, 1996.

15.5 Blade Loss

Another potential public safety concern is the possibility of a rotor blade detaching and being thrown from the nacelle. These are extremely rare occurrences but have usually been the result of design defects during manufacturing, poor maintenance, wind gusts that exceed the maximum design load of the engineered turbine structure, or lightning strikes. Technological improvements and safety standards during turbine design, manufacture and installation as well as more frequent maintenance have made these occurrences all the less likely.

Modern turbines are certified according to international engineering standards[139]. Testing facilities in the US and Europe employ these standards to test blade integrity and their ability to withstand different levels of hurricane strength wind and fatigue, among other criteria. Braking systems, pitch controls, sensors and speed regulators on wind turbines have greatly reduced the risk of blade throw.

The Enercon E48 turbine proposed for this project automatically shuts down at wind speeds of between 28-34 m/s (62-76 mph). They also cease operation if significant vibrations or rotor blade stress is detected by the turbine blade monitoring system. As a result the risk of blade failure is minimal. The nearest property is deemed to be of sufficient distance (623m) from the turbine that in the unlikely event of blade loss or fragment, it will not pose any risk to public safety.

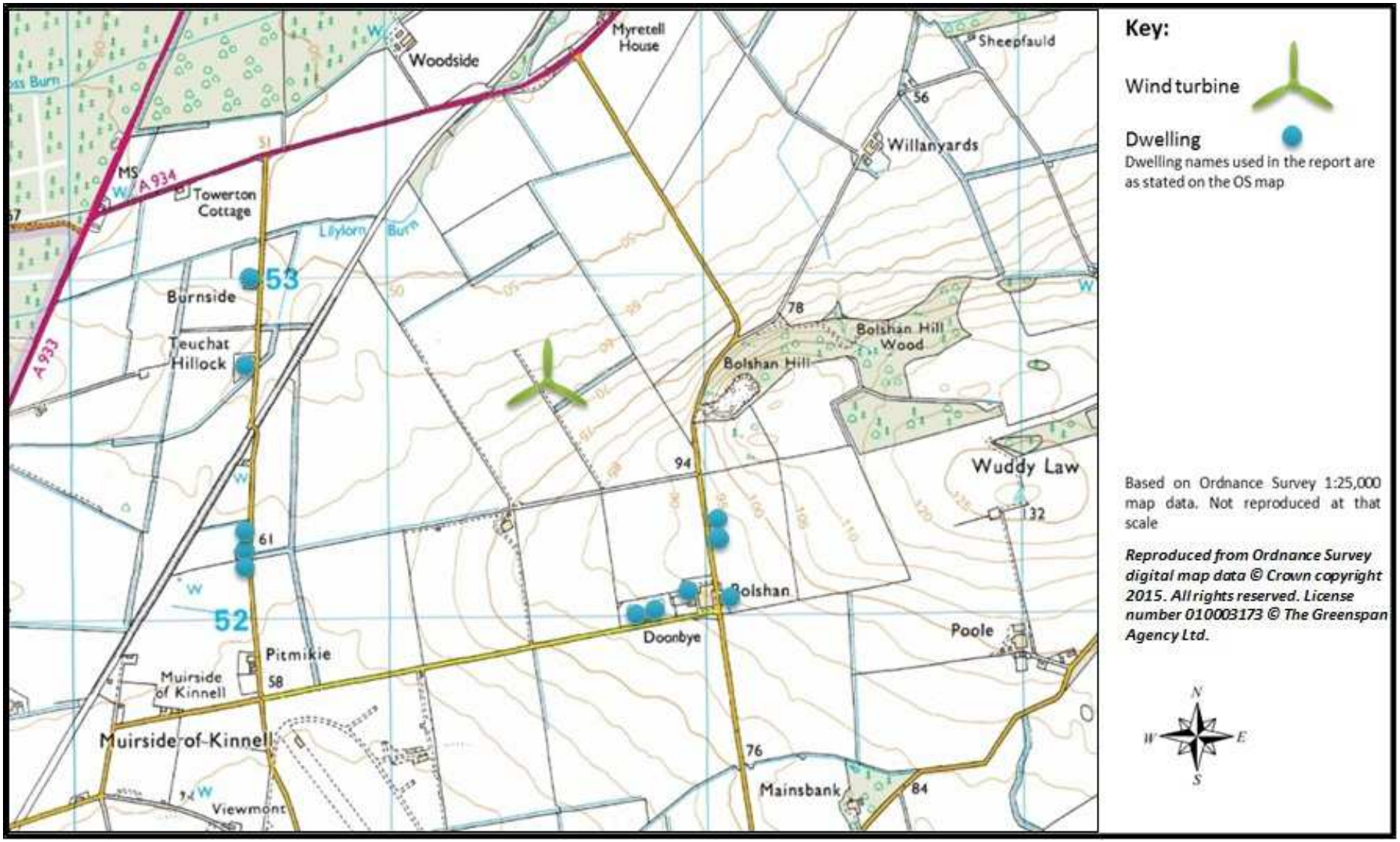
Environmental Health, Appendix 1 – Map of Nearest Dwellings

(Next page) Location plan of Bolshan Farm wind turbine and nearest dwellings.

Environmental Health, Appendix 2 – Wind Turbine Manufacturer Data Sheets

(Following pages) Manufacturer data sheets confirming the warranted turbine sound power level for a 500kW mode E48 and octave banded test datasheets.

[139] *'IEC 61400 - Wind Turbines'*. International Electrotechnical Commission. 2005.


Key:
Wind turbine
Dwelling
Dwelling names used in the report are as stated on the OS map
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N
E
S
W
Woodside
Myretell House
Sheepfauld
Willanyards
Towerton Cottage
Burnside
Teuchat Hillock
Bolshan Hill
Bolshan Hill Wood
Wuddy Law
Bolshan
Doonbye
Poole
Pitmikie
Muirside of Kinnell
Muirside-of-Kinnell
Viewmont
Mainsbank
A933
A934
53
52
61
58
94
78
76
84
56
51
32

245

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Sound Power Level

of the

ENERCON E-48

Operational Mode 500 kW

(Data Sheet)

Imprint

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Glossary

WEC	means an ENERCON wind energy converter.
WECs	means more than one ENERCON wind energy converter.

Document information:		© Copyright ENERCON GmbH. All rights reserved.	
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Translator /date:		Revisor	Sro / 02.2012

ENERCON ENERGY FOR THE WORLD	Sound Power Level E-48	Page 2 of 3

Sound Power Level of the E-48 with 500 kW reduced power

hub height / V_s in 10 m height	50 m	55 m	60 m	65 m	76 m
4 m/s	89.0 dB(A)	89.2 dB(A)	89.4 dB(A)	89.5 dB(A)	89.9 dB(A)
5 m/s	93.3 dB(A)	93.6 dB(A)	93.9 dB(A)	94.2 dB(A)	94.7 dB(A)
6 m/s	97.5 dB(A)	97.8 dB(A)	98.1 dB(A)	98.3 dB(A)	98.8 dB(A)
7 m/s	99.2 dB(A)	99.4 dB(A)	99.5 dB(A)	99.7 dB(A)	100.0 dB(A)
8 m/s	100.0 dB(A)	100.0 dB(A)	100.0 dB(A)	100.0 dB(A)	100.0 dB(A)
9 m/s	100.0 dB(A)	100.0 dB(A)	100.0 dB(A)	100.0 dB(A)	100.0 dB(A)
10 m/s	100.0 dB(A)	100.0 dB(A)	100.0 dB(A)	100.0 dB(A)	100.0 dB(A)
95% reduced power					

Measured value at 500 kW reduced Power					***99,4 dB(A)*** *MBBM M69130/1*

in relation to wind speed at hub height									
wind speed at hub height [m/s]	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Sound Power Level [dB(A)]	95.1	97.9	99.5	99.8	100.0	100.0	100.0	100.0	100.0

1. The relation between the sound power level and the standardized wind speed v_S in 10 m height as shown above is valid on the premise of a logarithmic wind profile with a roughness length of 0.05 m. The relation between the sound power level and the wind speed at hub height applies for all hub heights. During the sound measurements the wind speeds are derived from the power output and the power curve of the WEC.
2. A tonal audibility of $\Delta L_{a,k}$ < 2 dB can be expected over the whole operational range (valid in the near vicinity of the turbine according to IEC 61 400 -11 ed. 2).
3. The sound power level values given in the table are valid for the **Operational Mode 500 kW** (defined via the rotational speed range of 16 – 28 rpm). The respective power curve is the calculated power curve E-48 dated November 2009 (Rev. 2.x).

Document information:			
Author/Revisor / date:	Sro / 02.2012	Documentname	SIAS-04-SPL E48 OM 500kW Rev1_1-eng-eng.doc
Approved / date:	RWo / 03.2012	Revision / date:	1.1 / 02.2012
Translator /date:		Revisor	Sro / 02.2012

4. The values displayed in the tables above are based on official and internal measurements of the sound power level. If available the official measured values are given in this document as a reference (in italic print). The extracts of the official measurements can be made available upon request. The values given in the measurement extracts do not replace the values given in this document. All measurements have been carried out according to the recommended German and international standards and guidelines as defined in the measurement reports, respectively.
5. Due to the typical measurement uncertainties, if the sound power level is measured according to one of the accepted methods the measured values can differ from the values shown in this document in the range of +/- 1 dB.

   Accepted measurement methods are:

   a) IEC 61400-11 ed. 2 („Wind turbine generator systems – Part 11: Acoustic noise measurement techniques; Second edition"), and

   b) the FGW-Guidelines („Technische Richtlinie für Windenergieanlagen – Teil 1: Bestimmung der Schallemissionswerte", published by the association "Fördergesellschaft für Windenergie e.V.", 18th revision).

   If the difference between total noise and background noise during a measurement is less than 6 dB a higher uncertainty must be considered.
6. For noise-sensitive sites it is possible to operate the E-48 with reduced rotational speed and reduced rated power during night time. The sound power levels resulting from such operational mode can be provided in a separate document upon request.
7. The sound power level of a wind turbine depends on several factors such as but not limited to regular maintenance and day-to-day operation in compliance with the manufacturer's operating instructions. Therefore, this data sheet can not, and is not intended to, constitute an express or implied warranty towards the customer that the E-48 WEC will meet the exact sound power level values as shown in this document at any project specific site.

Document information:			
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Approved / date:	RWo / 03.2012	Revision / date:	1.1 / 02.2012
Translator /date:		Revisor	Sro / 02.2012

Extract III of test report

Master Information „Noise“, according to “Wind turbine generator systems - Part 11: Acoustic noise measurement techniques.”

IEC 61400-11 ED. 2 from 2002 (published by: Central Office of the IEC, Geneva, Switzerland)

Extract of test report WICO 439SEC04/07 regarding noise emission of wind turbine (WT) type ENERCON E-48 (Mode I), hub height 56 m

General			Technical specifications (manufacturer)	
Manufacturer:	ENERCON GmbH		Rated power (generator):	800 kW
	Dreekamp 5		Rotor diameter:	48,0 m
	D-26605 AURICH		Hub height above ground:	56 m
Serial number:	48087		Kon. Stahlrohr	Tubular steel tower
WT-location:	WP Holtriem	RW 25.95.228	Pitch	pitch/stall/active-stall
		HW 59.42.988		
Complementations of rotor (manufacturer)			**Complementations of gear and generator (manufacturer)**	
Manufacturer of rotor blades	ENERCON GmbH		Manufacturer of gear:	No
Type of blades:	E48/1		Type of gear:	No
Pitch angle:	variabel		Manufacturer of generator:	ENERCON GmbH
Number of blades	3		Type of generator:	E-48
Rated speed(s)/speed range:	16 – 29,5 rpm (Mode I)		Rated speed(s):	16 – 29,5 rpm (Mode I)

Report power curve: calculated power curve, date: 31.08.2004

	Reference		Noise emission parameter	Remarks
	Standardized wind speed at 10 m above ground	Electric power		
Sound power level L_{WA}	*5 ms^{-1}*	*162 kW*	*93.1* dB(A)*	*(1)*
	6 ms^{-1}	276 kW	96.9 dB(A)	
	7 ms^{-1}	441 kW	99.8 dB(A)	
	8 ms^{-1}	619 kW	101.2 dB(A)	
	9 ms^{-1}	740 kW	101.8 dB(A)	
	9.3 ms^{-1}	*760 kW*	*101,8 dB(A)*	*(2)*
	10 ms^{-1}	794 kW	102.1 dB(A)	(3), (4)
Tonal components ΔL_a (near proximity)	*5 ms^{-1}*	*162 kW*	No tone	*(1)*
	6 ms^{-1}	276 kW	No tone	
	7 ms^{-1}	441 kW	No tone	
	8 ms^{-1}	619 kW	No tone	
	9 ms^{-1}	740 kW	No tone	
	9.3 ms^{-1}	*760 kW*	*No tone*	*(2)*
	10 ms^{-1}	794 kW	No tone	(3), (4)

One third octave sound power level at reference point v_{10} = 5 m/s [dB(A)]												
Frequency	50	63	80	100	125	160	200	250	315	400	500	630
L_{WA}	66.7	70.3	72.0	73.6	77.1	76.1	78.4	83.3	84.7	83.7	83.3	83.5
L_{WA}	74.9			80.6			87.6			88.3		
Frequency	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
L_{WA}	81.7	81.1	80.5	78.3	77.6	75.7	74.3	73.9	72.2	71.5	70.0	66.5
L_{WA}	85.9			82.1			78.3			74.6		

One third octave sound power level at reference point v_{10} = 6 m/s [dB(A)]												
Frequency	50	63	80	100	125	160	200	250	315	400	500	630
L_{WA}	70.8	73.3	76.0	76.7	77.9	78.8	79.7	85.2	86.9	86.5	86.5	88.1
L_{WA}	78.6			82.7			89.6			91.9		
Frequency	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
L_{WA}	87.4	87.2	86.0	83.1	81.5	80.0	78.5	78.1	77.2	76.4	74.0	72.0
L_{WA}	91.7			86.5			82.7			79.3		

Deutscher Akkreditierungs Rat DAR

DAP-PL-2756.00

According to DIN EN ISO 17025 by the DAP German Accreditation System for Testing Ltd. accredited testing laboratory. The accreditation is valid for test methods listed in the document.

One third octave sound power level at reference point v_{10} = 7 m/s [dB(A)]												
Frequency	50	63	80	100	125	160	200	250	315	400	500	630
L_{WA}	72.2	75.6	78.8	80.0	80.4	82.4	83.8	88.7	90.7	90.2	90.0	91.0
L_{WA}		81.1			85.8			93.3			95.2	
Frequency	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
L_{WA}	89.7	89.2	87.4	85.0	83.6	82.1	81.2	81.1	80.2	79.7	78.7	75.8
L_{WA}		93.6			88.5			85.6			83.1	

One third octave sound power level at reference point v_{10} = 8 m/s [dB(A)]												
Frequency	50	63	80	100	125	160	200	250	315	400	500	630
L_{WA}	69.9	74.1	77.1	78.8	81.5	82.1	84.2	90.3	92.5	91.8	91.7	92.7
L_{WA}		79.4			85.8			94.9			96.9	
Frequency	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
L_{WA}	91.5	90.7	88.9	85.8	83.7	81.9	80.7	81.4	80.4	79.5	79.0	77.1
L_{WA}		95.3			88.9			85.6			83.4	

One third octave sound power level at reference point v_{10} = 9 m/s [dB(A)]												
Frequency	50	63	80	100	125	160	200	250	315	400	500	630
L_{WA}	71.6	74.3	76.9	79.2	82.4	84.0	86.4	91.3	93.3	92.4	92.1	92.9
L_{WA}		79.6			87.1			95.9			97.3	
Frequency	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
L_{WA}	91.2	90.3	88.5	86.0	84.8	84.1	83.7	84.2	83.7	83.5	82.3	79.9
L_{WA}		94.9			89.8			88.6			86.9	

One third octave sound power level at reference point v_{10} = 10 m/s [dB(A)]												
Frequency	50	63	80	100	125	160	200	250	315	400	500	630
L_{WA}	69.9	73.9	75.9	77.4	80.2	80.7	83.4	88.3	91.0	90.8	91.5	93.4
L_{WA}		78.6			84.4			93.3			96.8	
Frequency	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
L_{WA}	93.2	93.6	92.6	89.9	87.4	85.0	83.2	83.3	82.0	81.1	79.9	77.8
L_{WA}		97.9			92.7			87.6			84.6	

(1) Because of the signal to noise ratio laying in between 3 dB to 6 dB the sound pressure level was corrected with 1.3 dB.
(2) Sound power level at 95% of the rated power.
(3) Wind speed at the maximum sound pressure level minute measured at the hub height of 75.6 m was 9.6 ms^{-1}.
(4) One value was measured in the wind bin of 10 ms^{-1}.

This extract of test report is valid only in connection with the enclosed „Manufacturer's certificate" from 2004-08-31.

This declaration does not replace above-mentioned report.

measured by: WIND-consult GmbH
Reuterstraße 9
D-18211 Bargeshagen

- pdf - document was signed electronically -

date: 2006-01-24

Dipl.-Ing. A. Petersen Dipl.-Ing. W. Wilke

Deutscher Akkreditierungs Rat
DAP-PL-2756.00
According to DIN EN ISO 17025 by the DAP German Accreditation System for Testing Ltd. accredited testing laboratory.
The accreditation is valid for test methods listed in the document.

Bolshan Renewables Project

Environmental Report Volume II

Landscape and Visual Impact Assessment (LVIA) Figures

251

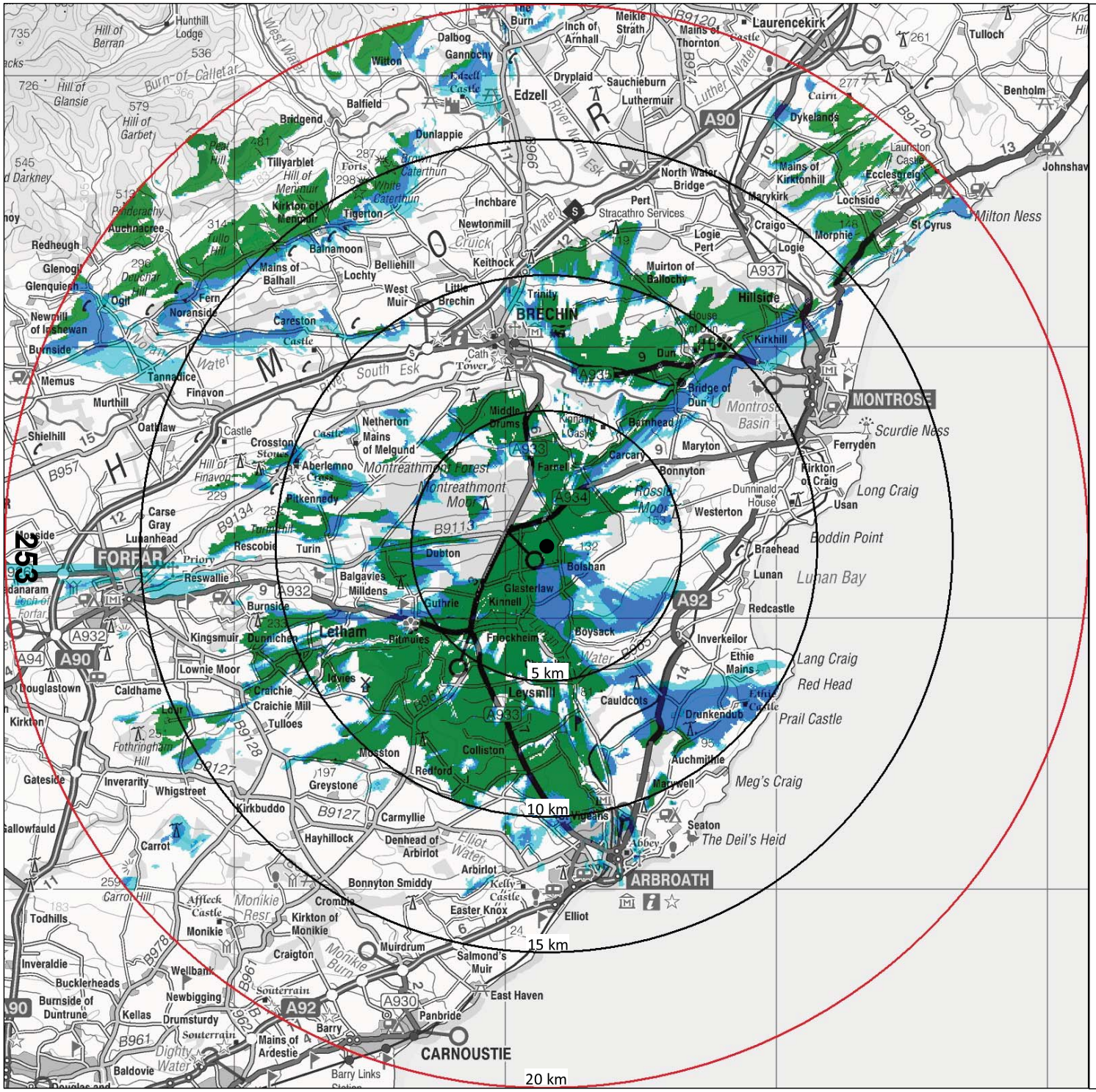
Compiled by Jack Cook, MRTPI, Victoria Scruton MA (*Hons*), MSc and Sarah Hunt BEM, MApplSc

April 2015

AC40

Bolshan Renewables Project, LVIA Figures
April 2015

Table of Contents



Project Name:

Bolshan Renewables Project

Document Title:

Zone of Theoretical Visibility, 20km Radius

Scale:

1: 181,094 @ A3

Key:

- **Bolshan Farm Turbine Position**
- **79.6m Turbine Tip Visible (but not hub)**
- **55.6m Turbine Hub Visible (but not tower mid-point)**
- **27.8m Tower Mid-Point Visible (at least)**
- **20km Radius**

Turbine grid reference: 361507, 752652

Client:

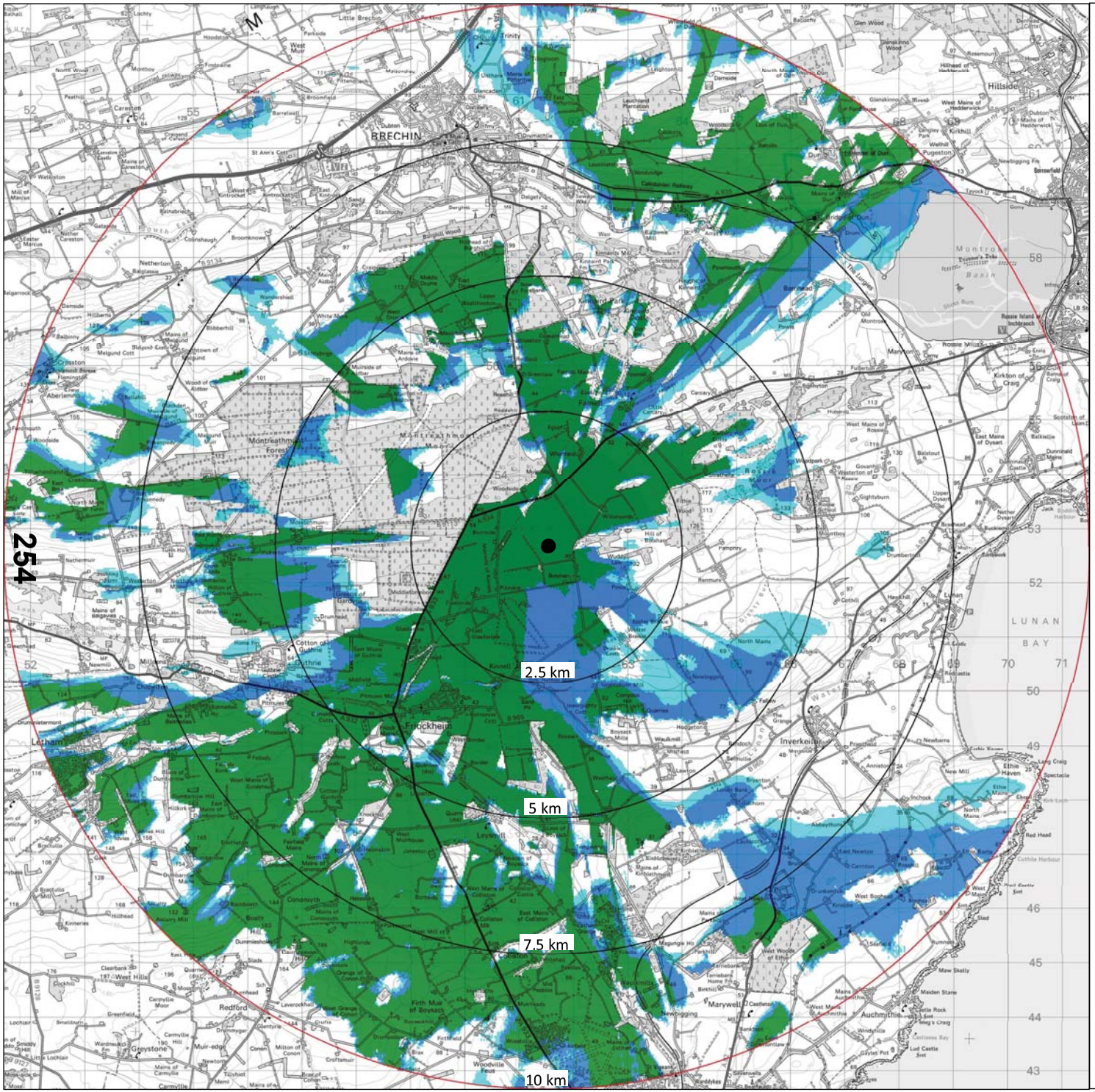
Bolshan Renewables Limited

Drawing By:

The Greenspan Agency

Figure No.:	**GBF/14-015/Fig.A1**
Version No.:	**1.1**
Produced by:	**VS**
Checked By:	**MB**
Date Last Amended:	**29.04.2015**

AC40



Project Name:

Bolshan Renewables Project

Document Title:

Zone of Theoretical Visibility, 10km Radius

Scale:

1: 72,438 @ A3

Key:

- **Bolshan Farm Turbine Position**
- **79.6m Turbine Tip Visible (but not hub)**
- **55.6m Turbine Hub Visible (but not tower mid-point)**
- **27.8m Tower Mid-Point Visible (at least)**
- **10km Radius**

Turbine grid reference: 361507, 752652

Client:

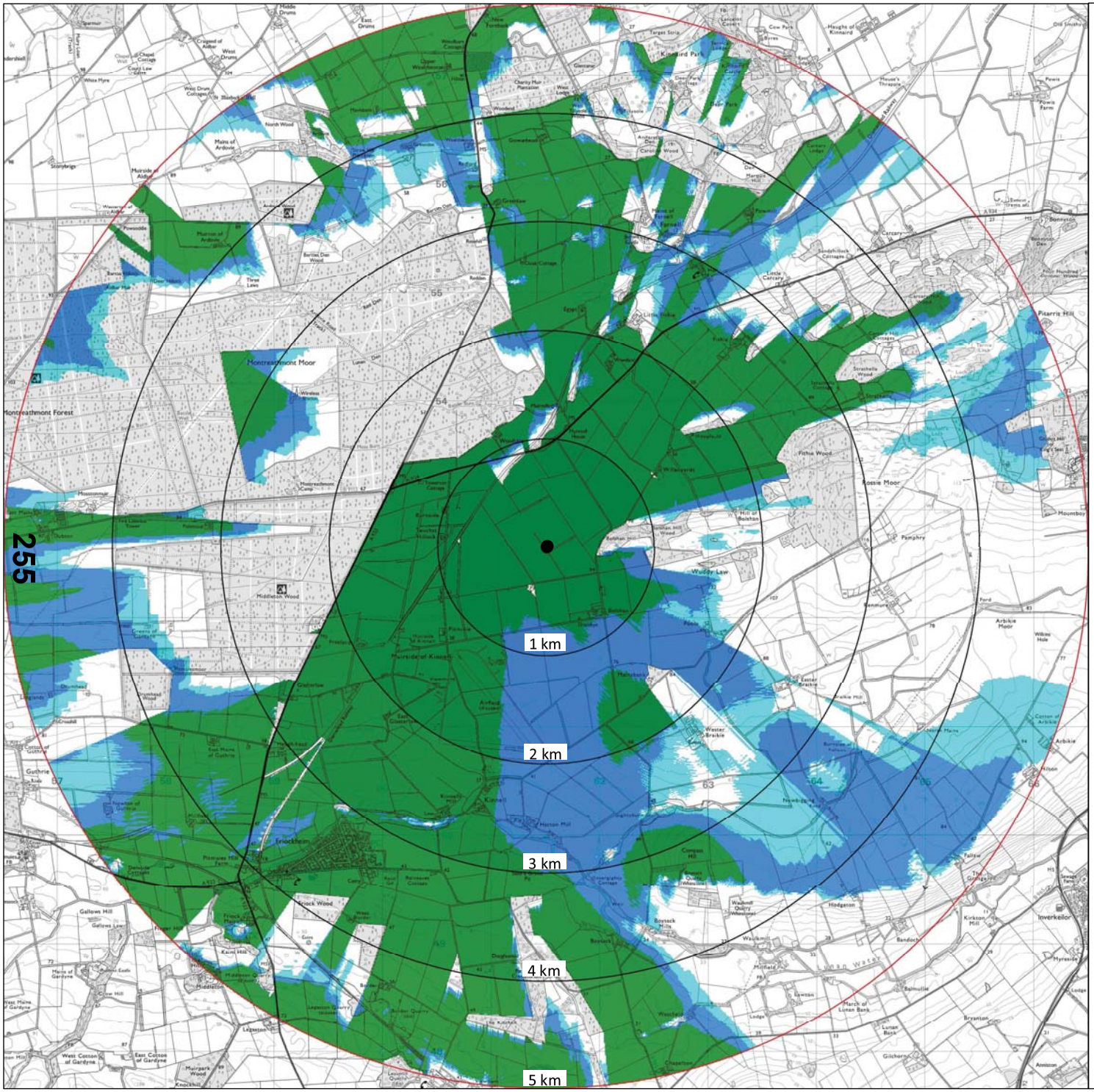
Bolshan Renewables Limited

Drawing By:

The Greenspan Agency

Figure No.:	**GBF/14-015/Fig.A2**
Version No.:	**1.0**
Produced by:	**VS**
Checked By:	**MB**
Date Last Amended:	**29.04.2015**

AC40



Project Name:

Bolshan Renewables Project

Document Title:

Zone of Theoretical Visibility, 5km Radius

Scale:

1: 36,232 @ A3

Key:

- **Bolshan Farm Turbine Position**
- **79.6m Turbine Tip Visible (but not hub)**
- **55.6m Turbine Hub Visible (but not tower mid-point)**
- **27.8m Tower Mid-Point Visible (at least)**
- **5km Radius**

Turbine grid reference: 361507, 752652

N
W E
S

Client:

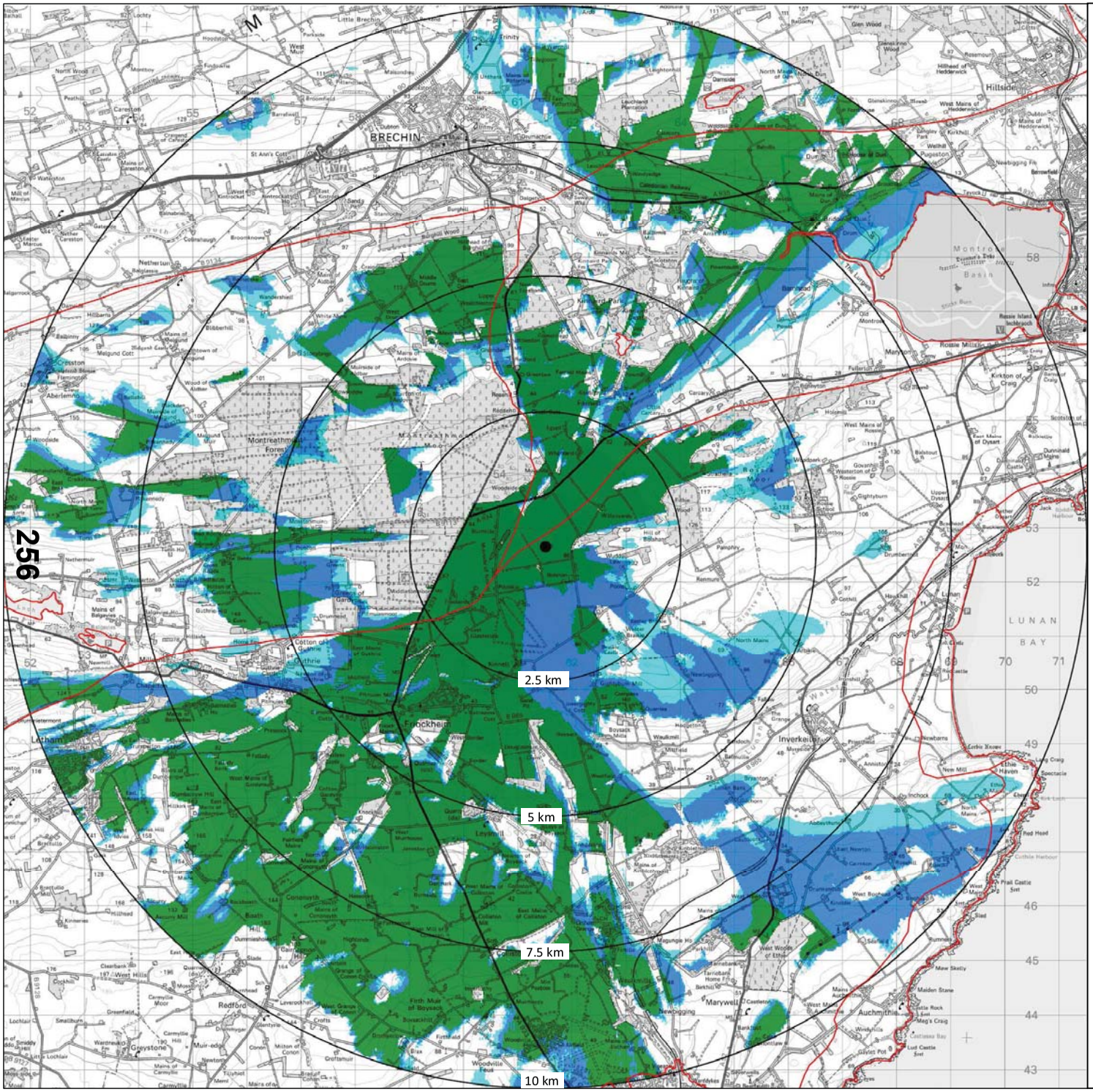
Bolshan Renewables Limited

Drawing By:

The Greenspan Agency

Figure No.:	**GBF/14-015/Fig.A3**
Version No.:	**1.0**
Produced by:	**VS**
Checked By:	**JC**
Date Last Amended:	**29.04.2015**

AC40



Project Name:

Bolshan Renewables Project

Title:

Scottish Natural Heritage Landscape Character Types

Zone of Theoretical Visibility, 10km Radius

Scale:

1: 72,202 @ A3

Key:

- **Bolshan Farm Turbine Position**
- **79.6m Turbine Tip Visible (but not hub)**
- **55.6m Turbine Hub Visible (but not tower mid-point)**
- **27.8m Tower Mid-Point Visible (at least)**
- **10 km Radius**
- **SNH Landscape Character Type Boundaries**

Turbine grid reference: 361507 752652

N
W E
S

Client:

Bolshan Renewables Limited

Drawing By:

The Greenspan Agency

Figure No.:	**GBF/14-015/Fig.A4**
Version No.:	**1.0**
Produced by:	**VS**
Checked By:	**MB**
Date Last Amended:	**29.04.2015**

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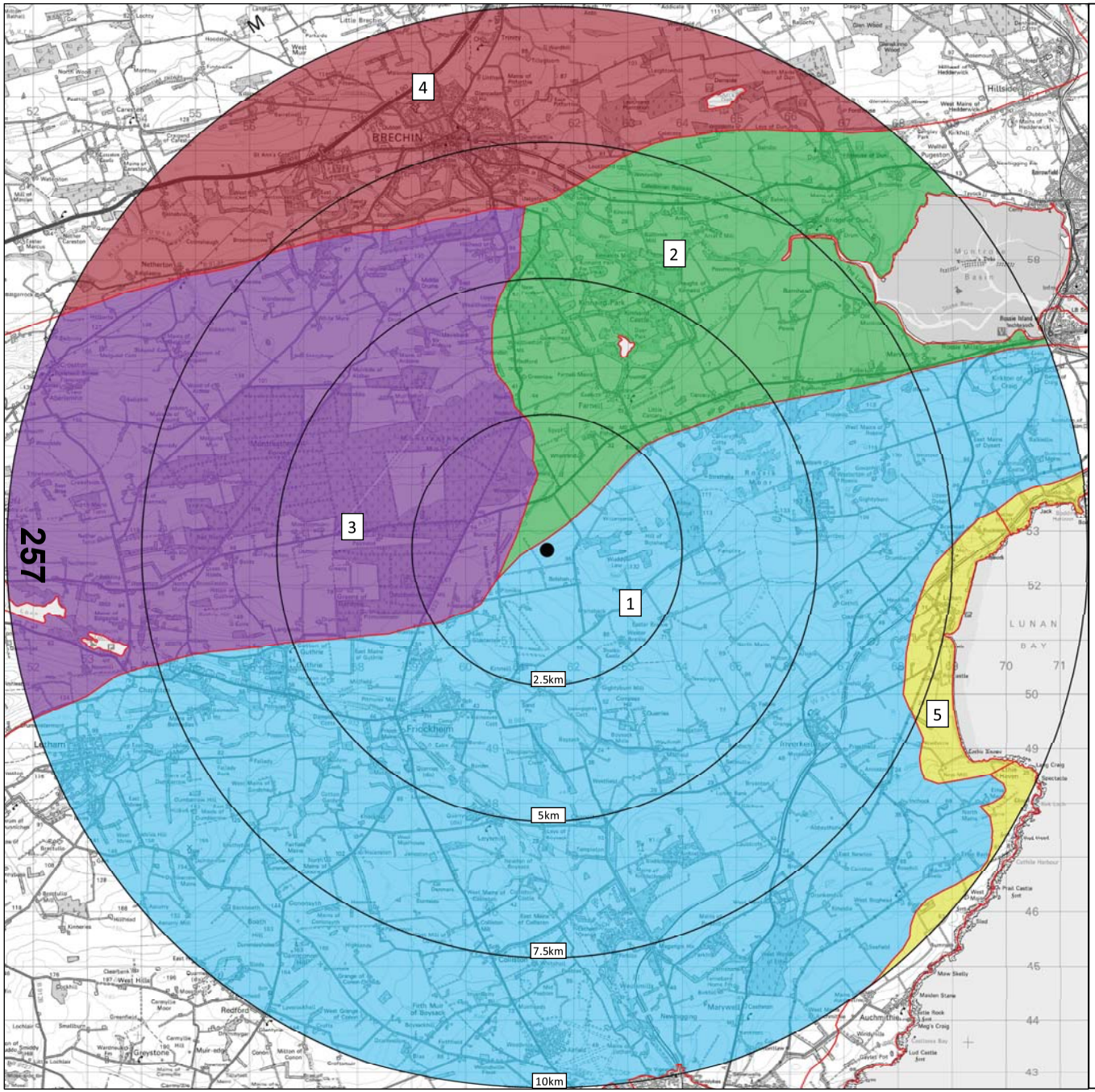


Key:

- Bolshan Farm Turbine
- 10km Radius
- SNH Landscape Character Type Boundary

Landscape Character Types as defined in the 'Tayside Landscape Character Assessment', prepared by Land Use Consultants for SNH (1999). (Numbered in order of distance from Bolshan Farm Turbine position.)

1. Dipslope Farmland
2. Lowland Basins
3. Low Moorland Hills
4. Broad Valley Lowland
5. Coast with Sand

Project Name:
Bolshan Renewables Project

Title:
Index Map, Scottish Natural Heritage Landscape Character Types

Specification:
Scottish Natural Heritage Landscape Character Types within 10km radius.

Scale:
1: 79,555 @ A3

Turbine grid reference: 361507 752652

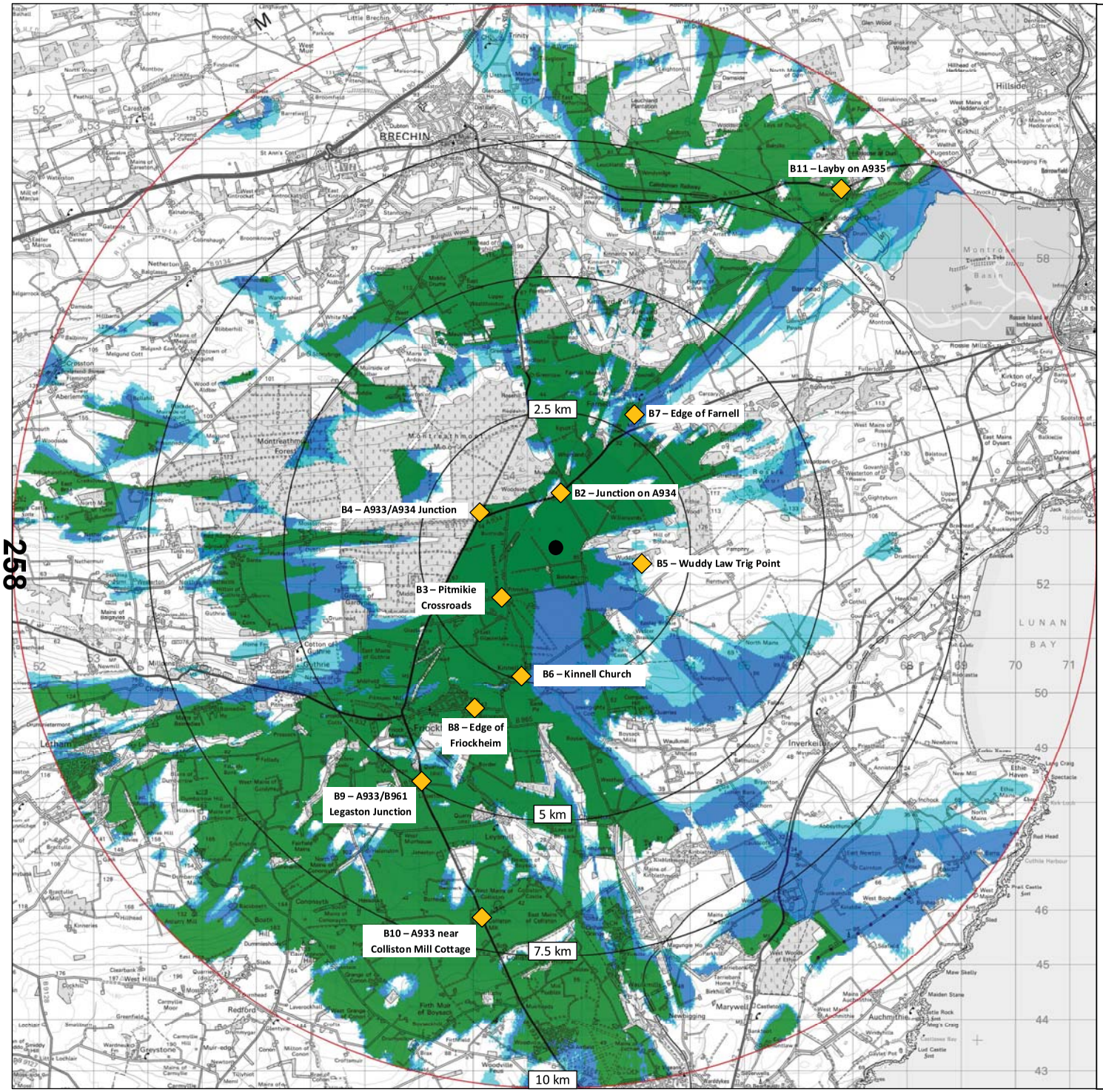
N
W E
S

Client:
Bolshan Renewables Limited

Drawing By:
The Greenspan Agency

Figure No.:	**GBF/14-015/Fig.A5**
Version No.:	**1.0**
Produced by:	**VS**
Checked By:	**MB**
Date:	**29.04.2015**

AC40



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Project Name:

Bolshan Renewables Project

Document Title:

Map of Viewpoints: Shown on 10km ZTV diagram

Scale:

1:73,019 @ A3

Key:

- **Bolshan Farm Proposed Turbine Position**
- **79.6m Turbine Tip Visible (but not hub)**
- **55.6m Turbine Hub Visible (but not tower mid-point)**
- **27.8m Tower Mid-Point Visible (at least)**
- **Radius Markers**
- **10km Radius**
- **Viewpoint Locations with Photomontage Figure Names and Numbers.**

Turbine grid reference: 361507, 752652

N W E S

Client:

Bolshan Renewables Limited

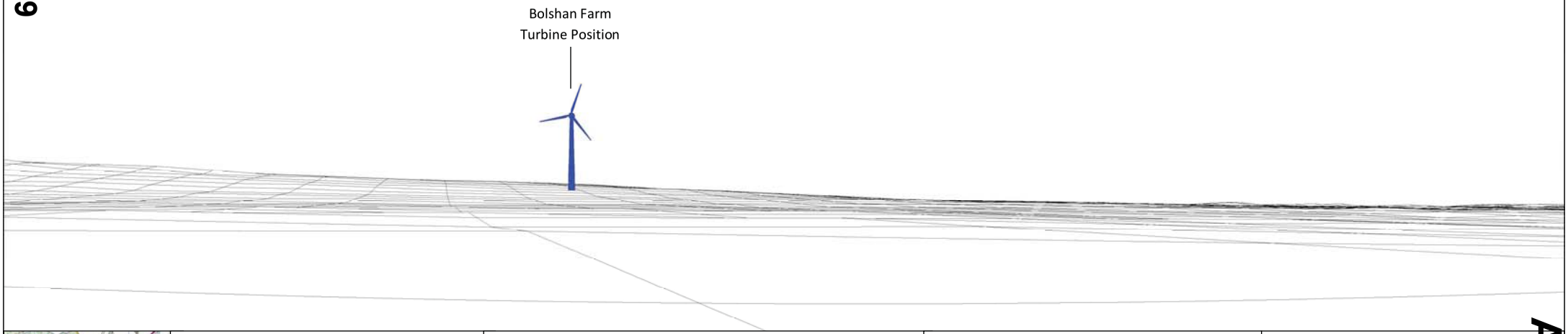
Drawing By:

The Greenspan Agency

Figure No.:	**GBF/14-015/Fig.B1**
Version No.:	**1.1**
Produced by:	**VS**
Checked By:	**MB**
Date Last Amended:	**29.04.2015**

AC40

259



Viewpoint Grid Reference: 361605 753625
Distance to proposed turbine: 977m
Viewing direction: S 195°
Viewpoint elevation: 41m
Field of View: 68°
Camera Model: Nikon D700
Focal Length: 50mm
Camera Height: 1.5m
Date and time of photo: 24.02.2015 13:51

Junction on A934
Photomontage and Wireframe

Bolshan Renewables Project

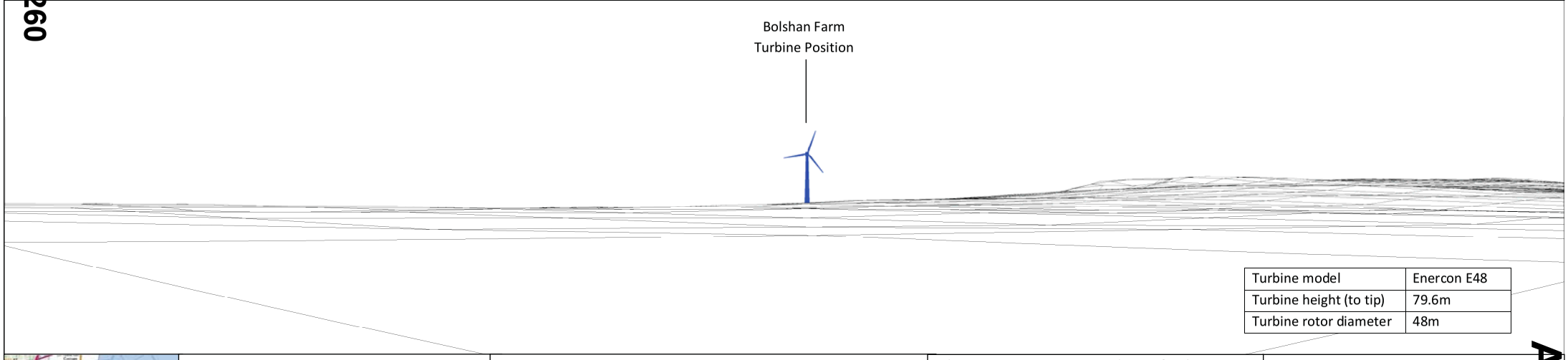
The Greenspan Agency

This is a composite image made up of at least 3 No. 50mm photographs joined together horizontally to form an overall field of view which is wider than that seen in detail by the human eye. For correct perspective viewing, this image must be viewed at an exact distance of 340mm with **one eye**, whilst curving the image in an **exact arc** of 68 degrees. This image should only be assessed within the landscape from the same viewpoint.

Figure No.:	**GBF/14-015/Fig.B2**
Version No.:	**1.0**
Produced by:	**VS**
Approved By:	**MB**
Date:	**20.04.2015**

AC40

260



Turbine model	Enercon E48
Turbine height (to tip)	79.6m
Turbine rotor diameter	48m

Viewpoint Grid Reference: 360590 751741
Distance to proposed turbine: 1292m
Viewing direction: NE 44.2°
Viewpoint elevation: 56m
Field of View: 68°
Camera Model: Nikon D700
Focal Length: 50mm
Camera Height: 1.5m
Date and time of photo: 24.02.2015 14:14

Pitmikie Crossroads
Photomontage and Wireframe

Bolshan Renewables Project

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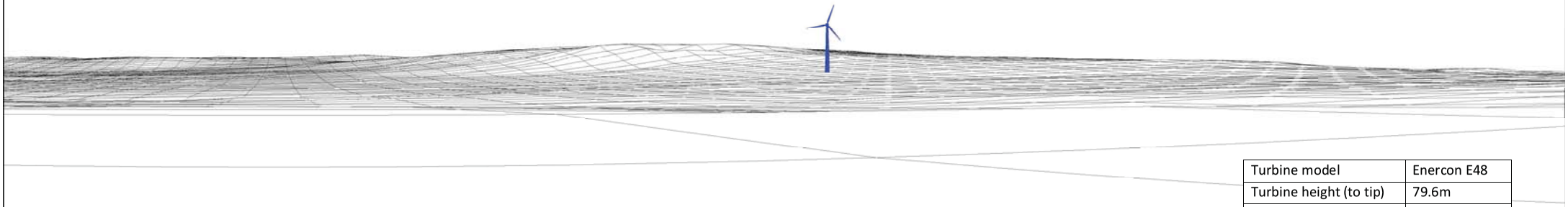
Figure No.:	**GBF/14-015/Fig.B3**
Version No.:	**1.0**
Produced by:	**VS**
Approved By:	**JC**
Date:	**20.04.2015**

261

Bolshan Farm
Turbine Position



Turbine model	Enercon E48
Turbine height (to tip)	79.6m
Turbine rotor diameter	48m

Viewpoint Grid Reference: 360111 753269
Distance to proposed turbine: 1526m
Viewing direction: E SE 112°
Viewpoint elevation: 61m
Field of View: 68°
Camera Model: Nikon D700
Focal Length: 50mm
Camera Height: 1.5m
Date and time of photo: 19.03.2015 16:38

A933/A934 Junction
Photomontage and Wireframe

Bolshan Renewables Project

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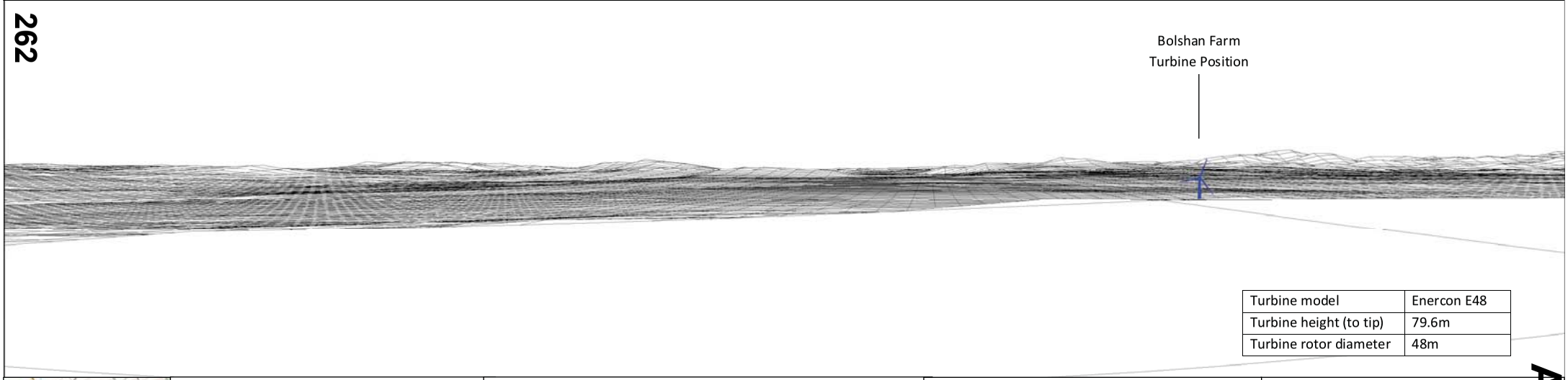
Figure No.:	**GBF/14-015/Fig.B4**
Version No.:	**1.0**
Produced by:	**VS**
Approved By:	**MB**
Date:	**20.04.2015**

262



Turbine model	Enercon E48
Turbine height (to tip)	79.6m
Turbine rotor diameter	48m

Viewpoint Grid Reference: 363012 752339
Distance to proposed turbine: 1537m
Viewing direction: W 263.7°
Viewpoint elevation: 130m
Field of View: 68°
Camera Model: Nikon D700
Focal Length: 50mm
Camera Height: 1.5m
Date and time of photo: 24.02.2015 13.10

Wuddy Law Trig Point
Photomontage and Wireframe

Bolshan Renewables Project

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AC40

Figure No.:	**GBF/14-015/Fig.B5**
Version No.:	**1.0**
Produced by:	**VS**
Approved By:	**MB**
Date:	**20.04.2015**

263

Bolshan Farm Turbine Position
(*Behind vegetation and terrain.*)

Turbine model	Enercon E48
Turbine height (to tip)	79.6m
Turbine rotor diameter	48m

Viewpoint Grid Reference: 360864 750288
Distance to proposed turbine: 2449m
Viewing direction: N 13°
Viewpoint elevation: 35m
Field of View: 68°
Camera Model: Nikon D700
Focal Length: 50mm
Camera Height: 1.5m
Date and time of photo: 24.02.2015 15:19

Kinnell Church
Photomontage and Wireframe

Bolshan Renewables Project

The Greenspan Agency

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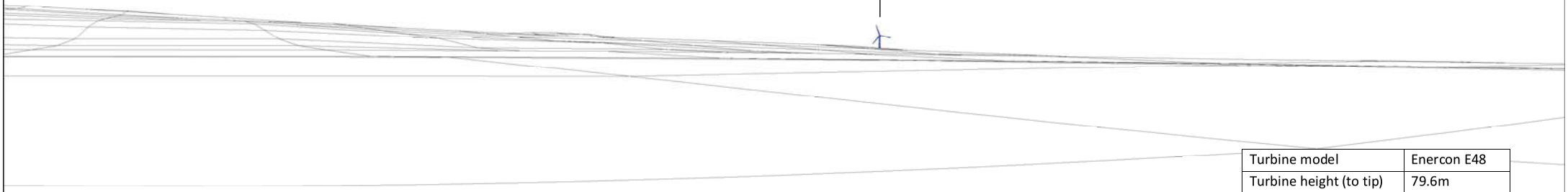
AC40

Figure No.:	**GBF/14-015/Fig.B6**
Version No.:	**1.0**
Produced by:	**VS**
Approved By:	**MB**
Date:	**20.04.2015**

264

Bolshan Farm
Turbine Position



Turbine model	Enercon E48
Turbine height (to tip)	79.6m
Turbine rotor diameter	48m

Viewpoint Grid Reference: 362976 755122
Distance to proposed turbine: 2873m
Viewing direction: S SW 206.6°
Viewpoint elevation: 20m
Field of View: 68°
Camera Model: Nikon D700
Focal Length: 50mm
Camera Height: 1.5m
Date and time of photo: 24.02.2015 17:41

Edge of Farnell
Photomontage and Wireframe

Bolshan Renewables Project

The Greenspan Agency

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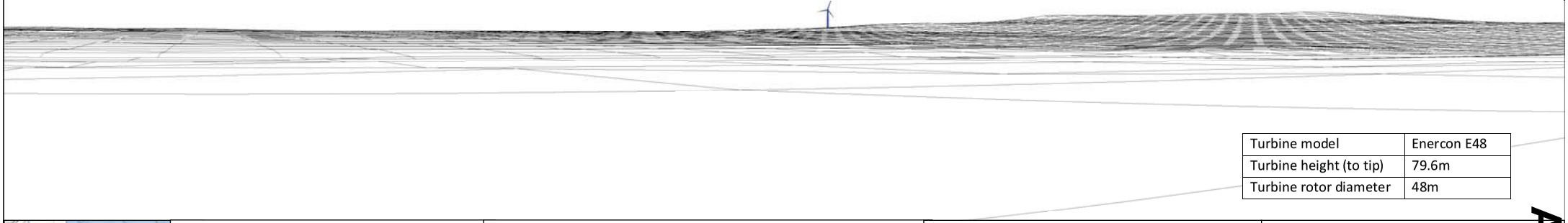
Figure No.:	**GBF/14-015/Fig.B7**
Version No.:	**1.1**
Produced by:	**VS**
Approved By:	**MB**
Date:	**29.04.2015**

AC40

265

Bolshan Farm
Turbine Position



Turbine model	Enercon E48
Turbine height (to tip)	79.6m
Turbine rotor diameter	48m

Viewpoint Grid Reference: 360024 749688
Distance to proposed turbine: 3314m
Viewing direction: N NE 24.7°
Viewpoint elevation: 44m
Field of View: 68°
Camera Model: Nikon D700
Focal Length: 50mm
Camera Height: 1.5m
Date and time of photo: 19.03.2015 15:51

Edge of Friockheim
Photomontage and Wireframe

Bolshan Renewables Project

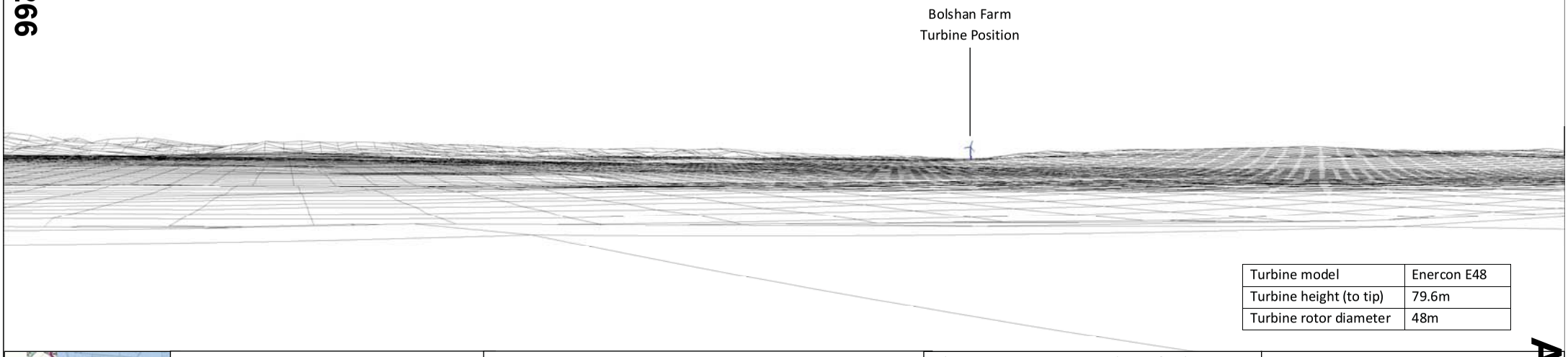
The Greenspan Agency

This is a composite image made up of at least 3 No. 50mm photographs joined together horizontally to form an overall field of view which is wider than that seen in detail by the human eye. For correct perspective viewing, this image must be viewed at an exact distance of 340mm with **one eye**, whilst curving the image in an **exact arc** of 68 degrees. This image should only be assessed within the landscape from the same viewpoint.

AC40

Figure No.:	**GBF/14-015/Fig.B8**
Version No.:	**1.0**
Produced by:	**VS**
Approved By:	**MB**
Date:	**17.04.2015**

266



Turbine model	Enercon E48
Turbine height (to tip)	79.6m
Turbine rotor diameter	48m

AC40

Viewpoint Grid Reference: 359040 748347
Distance to proposed turbine: 4961m
Viewing direction: N NE 21.7°
Viewpoint elevation: 71m
Field of View: 68°
Camera Model: Nikon D700
Focal Length: 50mm
Camera Height: 1.5m
Date and time of photo: 24.02.2015 16:16

A933 / B961 Legaston Junction
Photomontage and Wireframe

Bolshan Renewables Project

The Greenspan Agency

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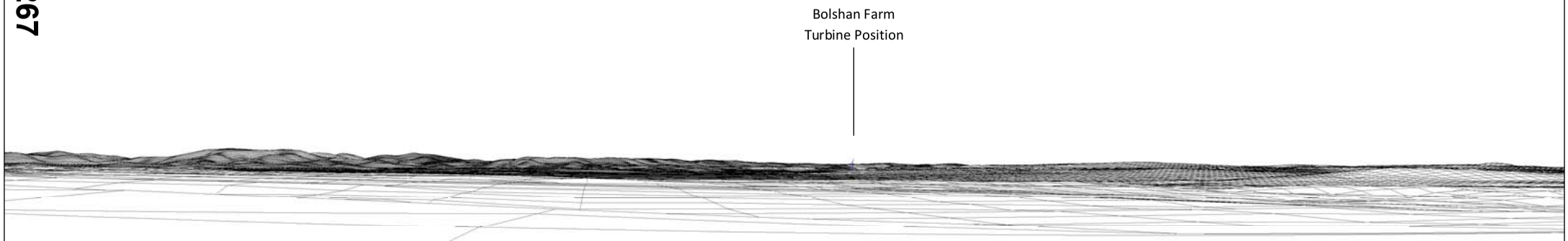
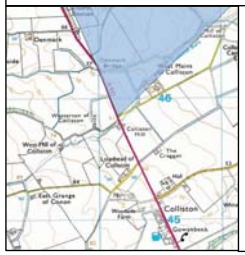
Figure No.:	**GBF/14-015/Fig.B9**
Version No.:	**1.0**
Produced by:	**VS**
Approved By:	**MB**
Date:	**20.04.2015**

267



Turbine model	Enercon E48
Turbine height (to tip)	79.6m
Turbine rotor diameter	48m



Viewpoint Grid Reference: 360154 745853
Distance to proposed turbine: 6932m
Viewing direction: N NE 8.3°
Viewpoint elevation: 60m
Field of View: 68°
Camera Model: Nikon D700
Focal Length: 50mm
Camera Height: 1.5m
Date and time of photo: 24.02.2015 16:53

A933 near Colliston Mill Cottage
Photomontage and Wireframe

Bolshan Renewables Project

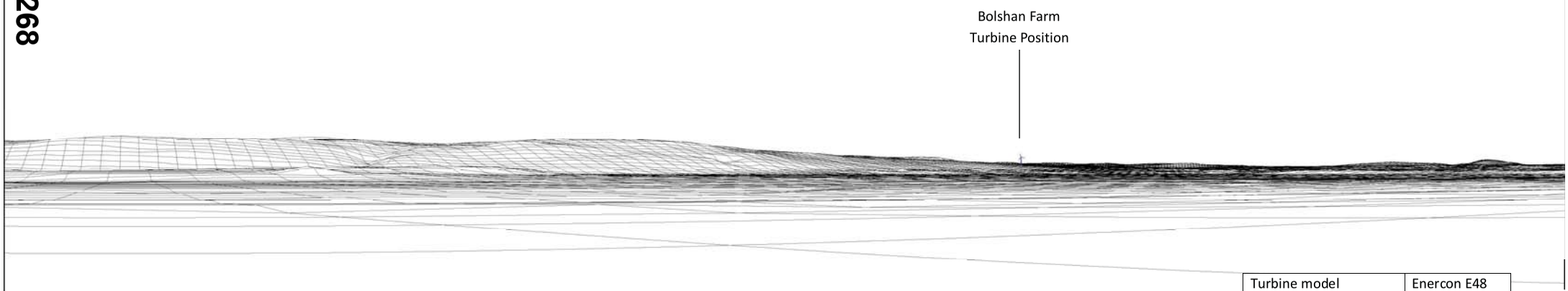
The Greenspan Agency

This is a composite image made up of at least 3 No. 50mm photographs joined together horizontally to form an overall field of view which is wider than that seen in detail by the human eye. For correct perspective viewing, this image must be viewed at an exact distance of 340mm with **one eye**, whilst curving the image in an **exact arc** of 68 degrees. This image should only be assessed within the landscape from the same viewpoint.

Figure No.:	**GBF/14-015/Fig.B10**
Version No.:	**1.0**
Produced by:	**VS**
Approved By:	**MB**
Date:	**20.04.2015**

AC40

268



Turbine model	Enercon E48
Turbine height (to tip)	79.6m
Turbine rotor diameter	48m

Viewpoint Grid Reference: 366724 759149
Distance to proposed turbine: 8332m
Viewing direction: S SW 208.5°
Viewpoint elevation: 60m
Field of View: 68°
Camera Model: Nikon D700
Focal Length: 50mm
Camera Height: 1.5m
Date and time of photo: 24.02.2015 18:03

Layby on A935
Photomontage and Wireframe

Bolshan Renewables Project

The Greenspan Agency

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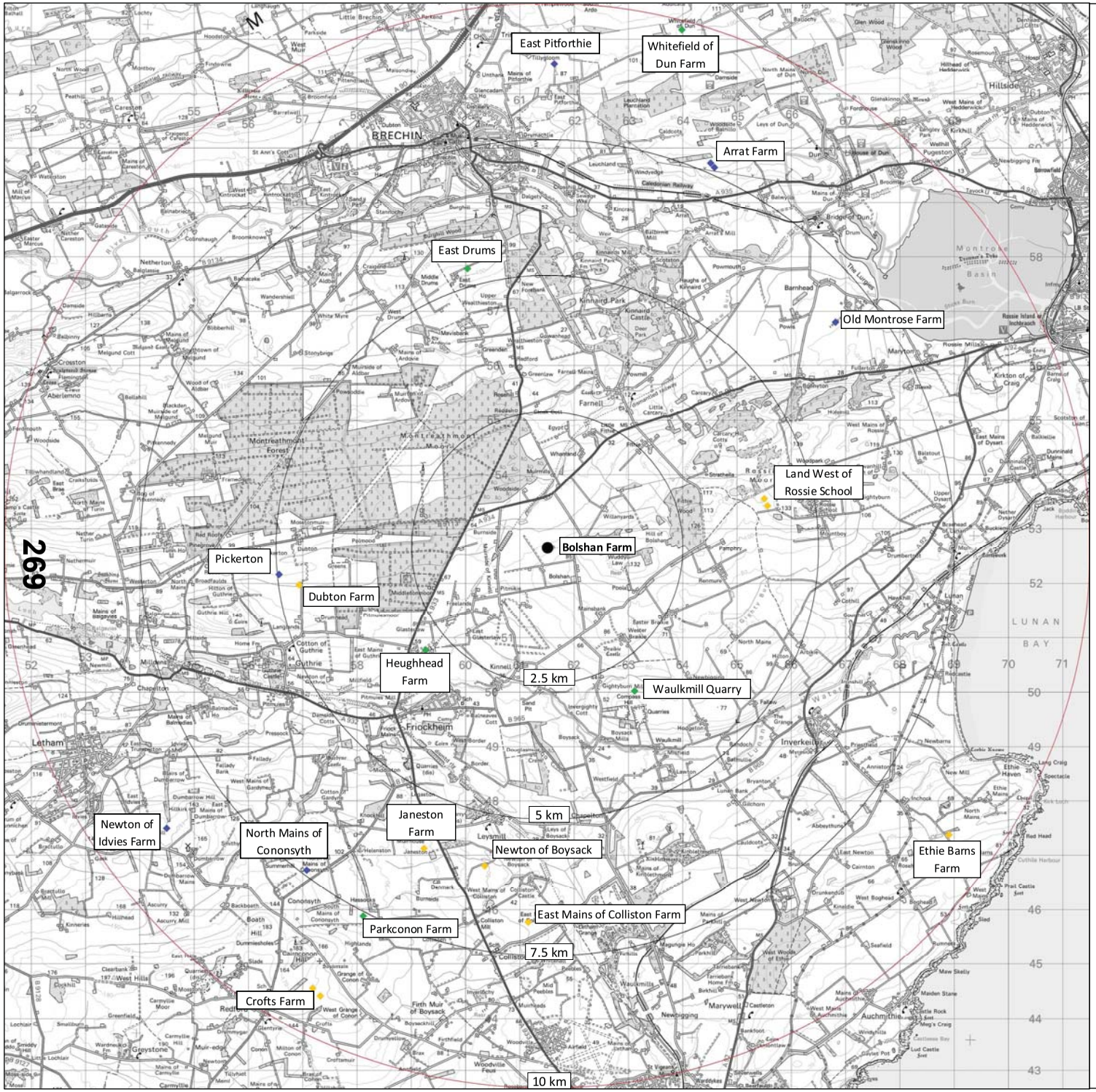
Figure No.:	**GBF/14-015/Fig.B11**
Version No.:	**1.0**
Produced by:	**VS**
Approved By:	**MB**
Date:	**20.04.2015**

AC40



Project Name:

Bolshan Renewables Project

Title:

Cumulative Turbines Map, 10 km Radius

Scale:

1: 71,891 @ A3

Key:

- **Proposed Bolshan Farm Turbine Position**
- **10km Radius**
- **Operational Turbines**
- **Consented Turbine Applications**
- **Planning Applications (Validated)**

Turbine grid reference: 361507 752652

0 – 5km turbines of all heights shown
5 – 10km turbines of greater than 30m tip height shown

Client:

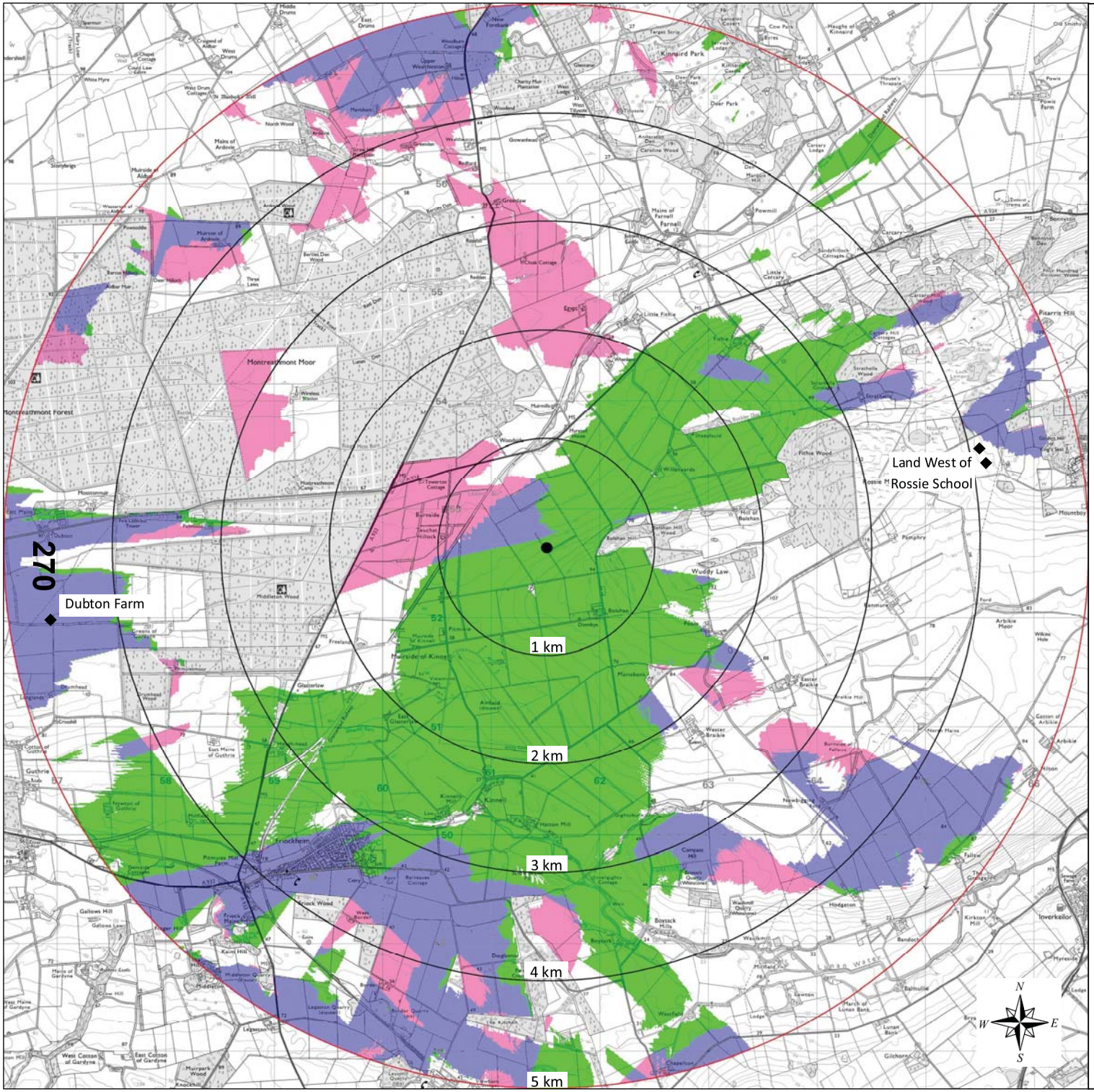
Bolshan Renewables Limited

Drawing By:

The Greenspan Agency

Figure No.:	**GBF/14-015/Fig.C1**
Version No.:	**1.1**
Produced by:	**VS**
Checked By:	**MB**
Date Last Amended:	**29.04.2015**

AC40



Project Name:
Bolshan Renewables Project

Document Title:
Cumulative ZTV, Bolshan Farm, Land West of Rossie School and Dubton Farm.

Specification:

- 1:25 000 map used
- The ZTV has been calculated out 5km to demonstrate the relevant effects of the Bolshan Farm project together with the projects in planning at Rossie School and Dubton Farm.
- Green areas show locations from which the turbines at Bolshan Farm and Dubton Farm (14/00606/FULL) are theoretically visible at hub height.
- Pink areas show locations from which the turbines at Bolshan Farm and Land West of Rossie School (15/00013/FULL) are theoretically visible at hub height.
- Purple areas show locations from which at least one turbine from all three developments is theoretically visible at hub height.
- Exclusion zones have been applied for substantial areas of tree cover. Screening from smaller features such as single trees, hedgerows, or buildings is not taken into account.

Scale:
1: 35,549 @ A3

Key:

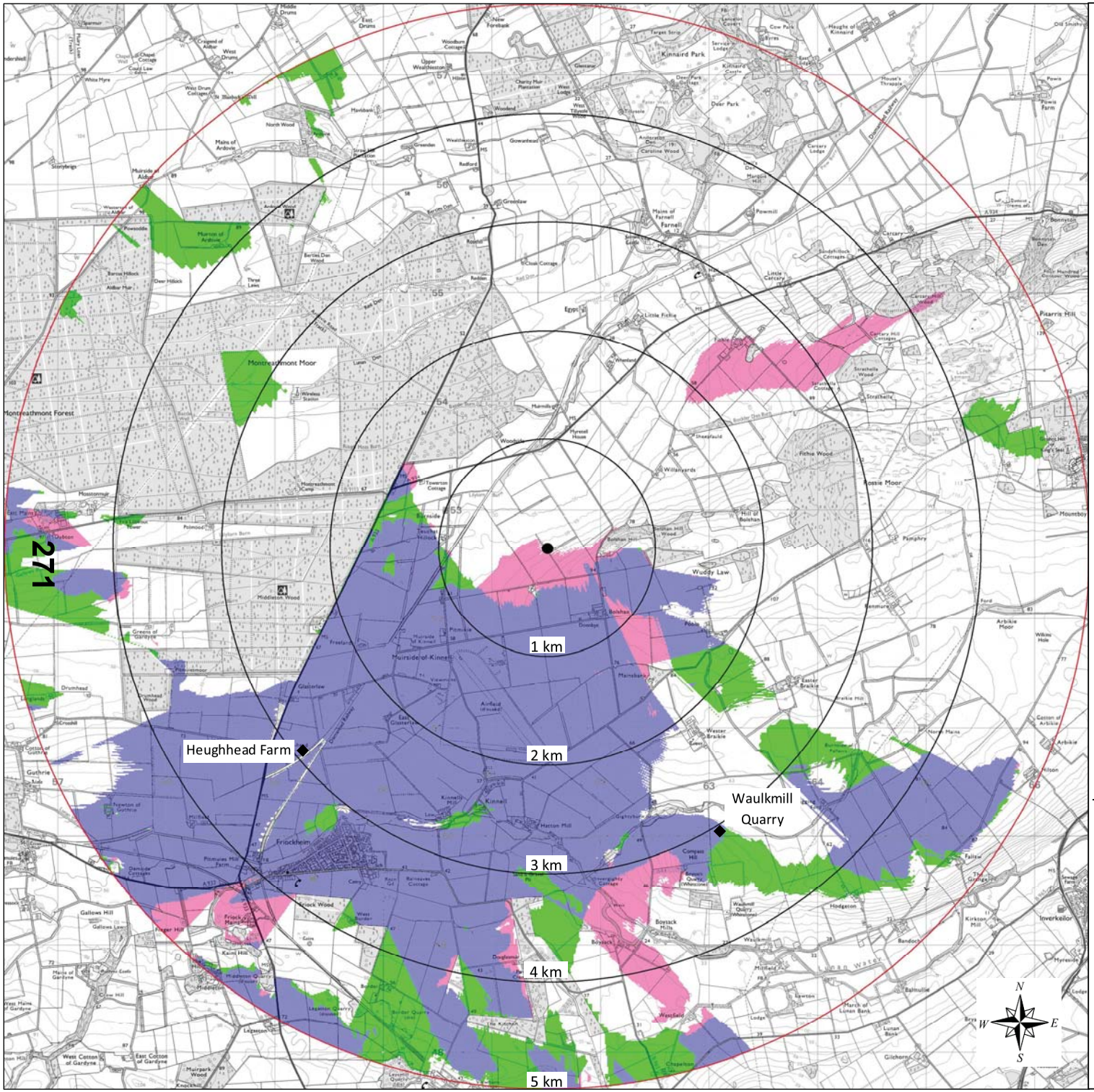
- **Bolshan Farm Turbine Position (Grid reference: 361507, 752652)**
- Theoretical cumulative intervisibility of both the Bolshan Farm turbine and the Dubton Farm turbine at hub height.
- Theoretical cumulative intervisibility (at hub height) of the Bolshan Farm turbine and at least one turbine at Land West of Rossie School.
- Theoretical cumulative intervisibility (at hub height) of at least one turbine from all three developments at Bolshan Farm, Dubton Farm and Land West of Rossie School.
- 5km Radius

Client:
Bolshan Renewables Limited

Drawing By:
The Greenspan Agency

Figure No.:	**GBF/14-015/Fig.C2**
Version No.:	**1.1**
Produced by:	**VS**
Checked By:	**JC**
Date:	**29.04.2015**

AC40



Project Name:
Bolshan Renewables Project

Document Title:
Cumulative ZTV, Bolshan Farm, Heughhead Farm and Waulkmill Quarry.

Specification:

- 1:25 000 map used
- The ZTV has been calculated out 5km to demonstrate the relevant effects of the Bolshan Farm project together with the consented projects at Waulkmill Quarry and Heughhead Farm.
- Green areas show locations from which the turbines at Bolshan Farm and Waulkmill Quarry (13/00722/FULL) are theoretically visible at hub height.
- Pink areas show locations from which the turbines at Bolshan Farm and Heughhead Farm (11/00143/FULL) are theoretically visible at hub height.
- Purple areas show locations from which the turbine hub of all three developments is theoretically visible at hub height.
- Exclusion zones have been applied for substantial areas of tree cover. Screening from smaller features such as single trees, hedgerows, or buildings is not taken into account.

Scale:
1: 35,562 @ A3

Key:

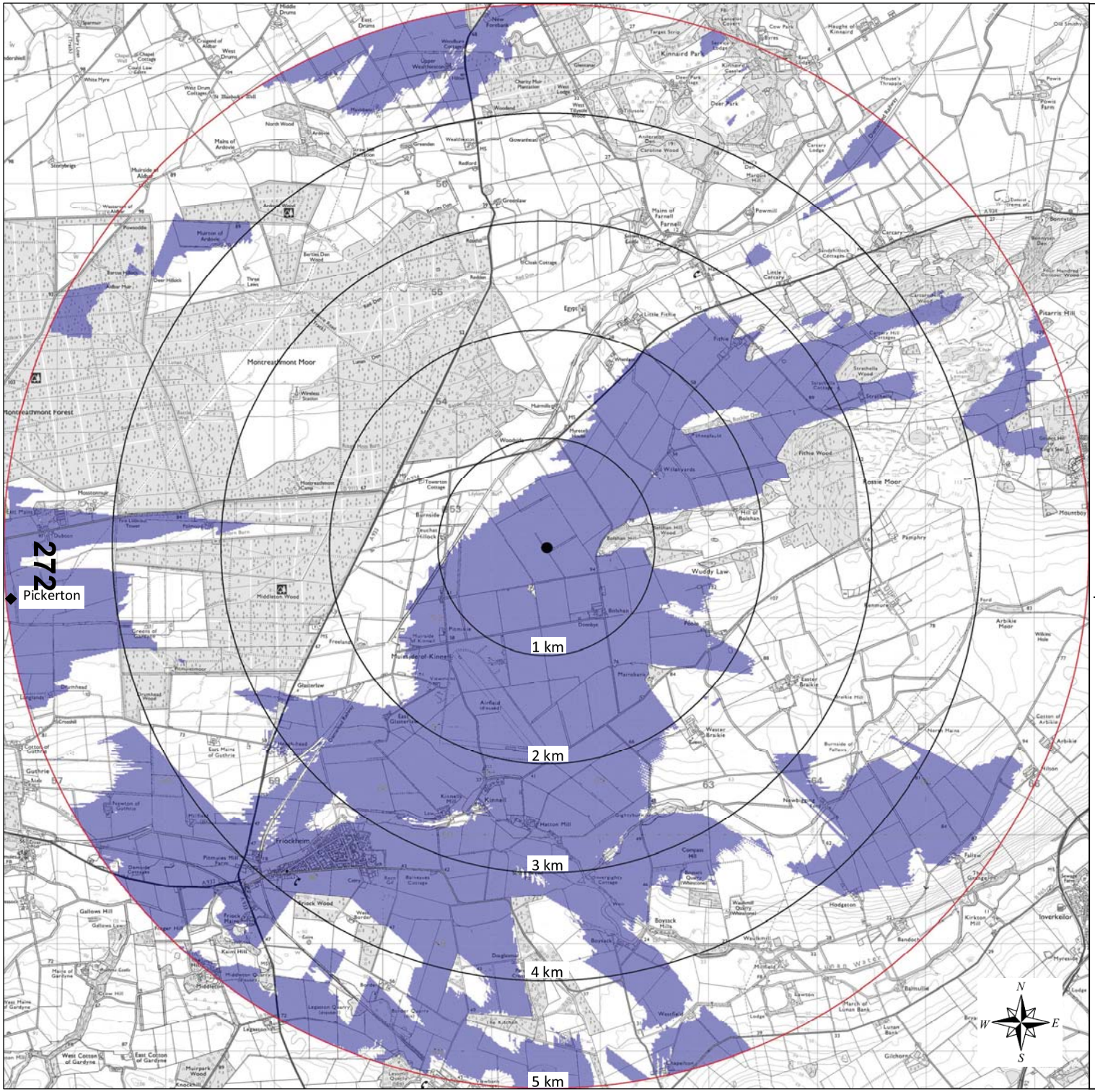
- **Bolshan Farm Turbine Position (Grid reference: 361507, 752652)**
- Theoretical cumulative intervisibility of both the Bolshan Farm turbine and the Waulkmill Quarry turbine at hub height.
- Theoretical cumulative intervisibility of the Bolshan Farm turbine and the Heughhead Farm turbine at hub height.
- Theoretical cumulative intervisibility (at hub height) of all three developments at Bolshan Farm, Heughead Farm and Waulkmill Quarry.
- 5km Radius

Client:
Bolshan Renewables Limited

Drawing By:
The Greenspan Agency

Figure No.:	**GBF/14-015/Fig.C3**
Version No.:	**1.1**
Produced by:	**VS**
Checked By:	**JC**
Date:	**29.04.2015**

AC40



Project Name:
Bolshan Farm Renewables Project

Document Title:
Cumulative ZTV, Bolshan Farm & Pickerton.

Specification:

- 1:25 000 map used
- The ZTV has been calculated out to 5km to demonstrate the relevant effects of the Bolshan Farm project together with the operational turbine at Pickerton (12/00365/FULL).
- Purple areas show locations from which the turbine hubs of both developments are theoretically visible.
- Exclusion zones have been applied for substantial areas of tree cover. Screening from smaller features such as single trees, hedgerows, or buildings is not taken into account.

Scale:
1: 35,549 @ A3

Key:

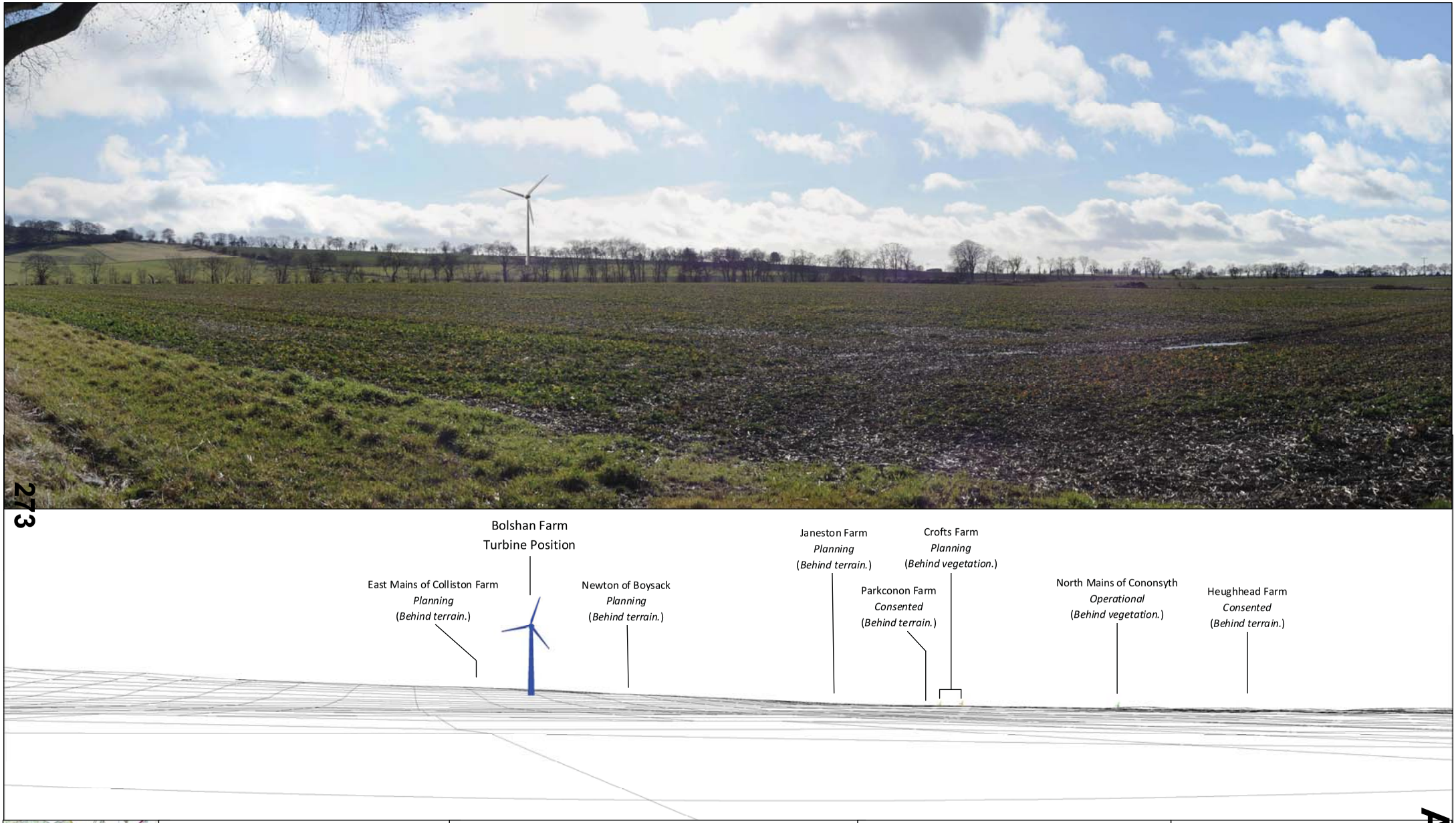
- **Bolshan Farm Turbine Position (Grid reference: 361507, 752652)**
- Theoretical cumulative intervisibility of the turbines at Bolshan Farm and Pickerton at hub height.
- 5km Radius

Client:
Bolshan Renewables Limited

Drawing By:
The Greenspan Agency

Figure No.:	**GBF/14-015/Fig.C4**
Version No.:	**1.0**
Produced by:	**VS**
Checked By:	**JC**
Date:	**29.04.2015**

AC40



273

AC40

Viewpoint Grid Reference: 361605 753625
Distance to proposed turbine: 977m
Viewing direction: S 195°
Viewpoint elevation: 41m
Field of View: 68°
Camera Model: Nikon D700
Focal Length: 50mm
Camera Height: 1.5m
Date and time of photo: 24.02.2015 13:51

Junction on A934
Cumulative Photomontage and Wireframe

Bolshan Renewables Project

The Greenspan Agency

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Figure No.:	**GBF/14-015/Fig.C5**
Version No.:	**1.1**
Produced by:	**VS**
Approved By:	**JC**
Date:	**30.04.2015**

Viewpoint Grid Reference: 360024 749688
Distance to proposed turbine: 3314m
Viewing direction: N NE 24.7°
Viewpoint elevation: 44m
Field of View: 68°
Camera Model: Nikon D700
Focal Length: 50mm
Camera Height: 1.5m
Date and time of photo: 19.03.2015 15:51

Edge of Friockheim
Cumulative Photomontage and Wireframe

Bolshan Renewables Project

The Greenspan Agency

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Figure No.:	**GBF/14-015/Fig.C6**
Version No.:	**1.1**
Produced by:	**VS**
Approved By:	**JC**
Date:	**29.04.2015**

AC40

Civil Aviation & Ministry of Defence Safeguarding

NOTICE TO WIND FARM DEVELOPERS
Please submit a completed application form for all new or revised onshore and offshore wind farm plans. This form has been compiled in consultation with the British Wind Energy Association. Its purpose is to standardise the information provided and to expedite the assessment of your proposed wind farm development. Assessment is made against air safety and defence interests, through evaluation of the possible effects on air traffic systems, defence systems and low flying needs.

NOTICE TO PLANNING AUTHORITIES
This form has been compiled with the assistance of the Civil Aviation Authority (CAA), the Ministry of Defence (MOD), the National Air Traffic Service (NATS) and the British Wind Energy Association (BWEA), to assist in the processing and assessment of wind farm applications. It is important that copies of this form are forwarded within the planning consultation process. This will help these organisations trace their records of any earlier consultations, as well as provide them with the relevant information for their assessments.

WHAT TO DO WITH THIS FORM
Please provide as much detail as possible by **filling in the shaded areas.** If the specific turbine and/or exact positions have yet to be established then fill in the likely turbine size (hub height, rotor diameter) and boundary points as a minimum. On completion send copies to both the following addresses.

Safeguarding
Defence Estates
Blakemore Drive
Sutton Coldfield
B75 7RL

Directorate of Airspace Policy
K6 Gate 3
CAA House
45-49 Kingsway
London, WC2B 6TE

It is important that a copy of this form is retained for inclusion with subsequent planning applications at the same site. If no application has been made prior to a planning application, please include a completed form in your planning application.

Wind Farm Name:	
Bolshan Renewables Project	
Developers reference	14-015
Application identification No.	TBA
Related/previous applications (at or near this site): Provide reference names or numbers.	Site address: Land at Bolshan Farm, Friockheim, Arbroath, DD11 4UH. Grid reference: NO 61394 52245 Planning Reference: 13-00887-FULL Decision: Withdrawn

Developer Information

Company name:	Bolshan Renewables Ltd
Address:	c/o Agent, The Greenspan Agency Ltd
Contact:	Jack Cook The Greenspan Agency Ltd 6 Castle Street Edinburgh EH2 3AT
Telephone:	0131 290 2262
Facsimile:	n/a
e-mail:	jack@greenspanenergy.com

Relevant Wind Turbine Details

Wind turbine manufacturer:	Enercon		
Wind turbine model:	E48		
Wind farm generation capacity (MW)	0.5	**Number of turbines**	**1**
Blade manufacturer	Enercon		
Number of blades	3		
Rotor diameter	48	Meters	
Rotation speed (or range)	16 - 32	Rpm	
Blade material including lightning conductors	Glass-reinforced epoxy with copper conductor		
Wind turbine hub height	55.6	Metres	
Tower design (* delete as required)	Tubular		
Tower base diameter/dimensions	3.3 approx	Metres	
Tower top diameter/dimensions	1.332 approx	Metres	

Comments
Please refer to “Related/previous applications” statement.

Turbine Locations

Please provide as much information as you can. The position and height above sea level of every machine if available, the site boundary if not. The height above sea level is the above ordinance datum (AOD) used to specify all heights on OS maps

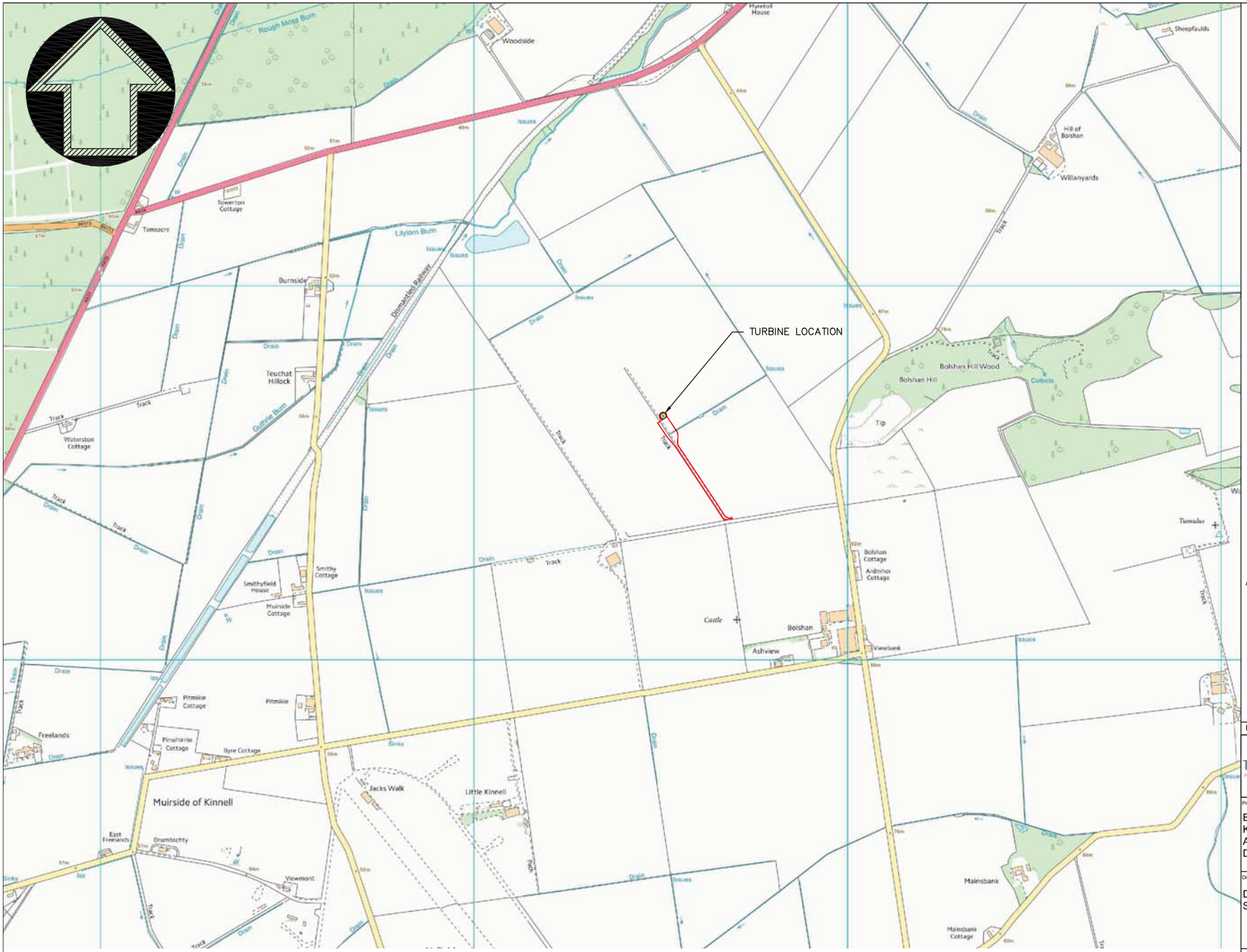
An Ordinance Survey (OS) map, or maritime chart, should be submitted with this pro-forma, showing locations of proposed turbine/turbines or scheme boundaries. Please number the turbines or boundary points on the map, to correlate with the information provided below.

Copy this page as necessary to account for all turbines or boundary points

Wind farm Name & Address:	**Bolshan Farm** **Land at Bolshan Farm, Arbroath, Angus, DD11 4UH**

Turbine Location (see attached map)									
Turbine:	**1**		**Height** AOD (m)			**65m approx**			
Grid Reference					100 km square letter(s) identifier			**NO**	
Easting (10 m)	**6**	**1**	**5**	**0**	Northing (10 m)	**5**	**2**	**6**	**5**
	Degrees				Minutes			Seconds	
Latitude									
Longitude									

Full 12-fig NGR of wind turbine is NO 61507 52652 (see accompanying plan)



278

DEVELOPMENT PLANS
SITE LOCATION
SCALE 1:10,000

LEGEND:

TURBINE POSITION

DEVELOPMENT BOUNDARY

NOTES:
TURBINE GRID REFERENCE:
NO 61507 52652

AMENDMENTS

Rev.	Date	Detail

The Greenspan Agency
Proposing and Delivering Sustainable Solutions

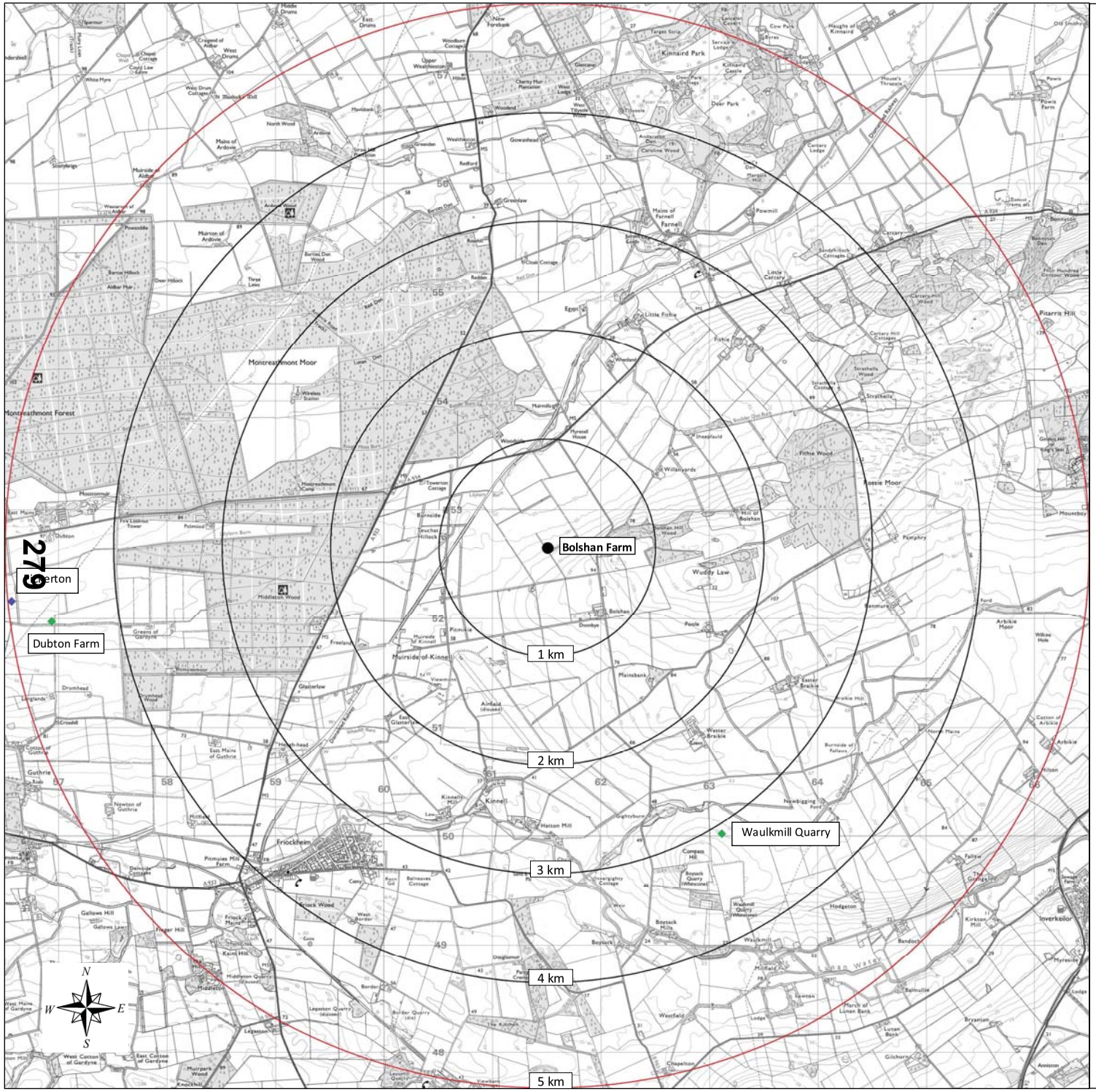
Project
Bolshan Renewables Project
Kinnell
Angus
DD11 4

Drawing
Development Plans
Site Location

Scale	Drawn By	Checked
1:10,000@A3	ID	JC

Date	Drawing No
08.04.15	14-015_P_10

AC41



Project Name:

Bolshan Renewables Project

Title:

Cumulative Turbines Map, 5 km Radius

Turbines of All Heights Shown

Note: This figure supersedes the information presented within a 5km radius in Figure C1 submitted under application 15/00415/FULL.

Scale:

1: 35,958 @ A3

Key:

- **Proposed Bolshan Farm Turbine Position**
  Grid reference: 361507, 752652
- **5 km Radius**
- **Operational Turbines**
- **Consented Turbine Applications**

Site Name	Tip Height (m)	Application Reference	Distance from Bolshan Farm Turbine (km)
Waulkmill Quarry	45.9	13/00722/FULL	3.1
Dubton Farm	77	14/00606/FULL	4.6
Pickerton	77	12/00365/FULL	5.0

Client:

Bolshan Renewables Limited

Drawing By:

The Greenspan Agency

Figure No.:	**GBF/14-015/Fig.C7**
Version No.:	**1.1**
Produced by:	**VS**
Checked By:	**JC**
Date Last Amended:	**25.06.2015**

AC42

Project Name:

Bolshan Renewables Project

Title:

Principle Viewing Direction Through Key Windows from Selected Properties

Scale:

1: 7,830 @ A4

Key:

- **Proposed Bolshan Farm Turbine Position Grid reference: 361507, 752652**
- **Principal viewing direction from Burnside**
- **Principal viewing direction from Bolshan Cottage**

Client:

Bolshan Renewables Limited

Drawing By:

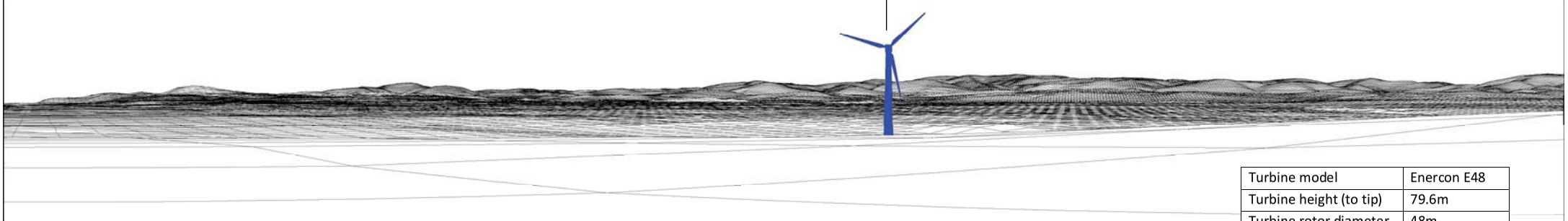
The Greenspan Agency

Figure No.:	**GBF/14-015/Fig.**
Version No.:	**1.0**
Produced by:	**VS**
Checked By:	**JC**
Date Last Amended:	**25.06.2015**

AC43

283

Bolshan Farm Turbine Position
(*Partially obscured by terrain and vegetation.*)



Turbine model	Enercon E48
Turbine height (to tip)	79.6m
Turbine rotor diameter	48m

Viewpoint Grid Reference: 362006 752274
Distance to proposed turbine: 626m
Viewing direction: 302.6°
Viewpoint elevation: 93m
Field of View: 68°
Camera Model: Nikon D700
Focal Length: 50mm
Camera Height: 1.5m
Date and time of photo: 24.06.2015 09:55

View Adjacent to Bolshan Cottage
Photomontage and Wireframe

Bolshan Renewables Project

The Greenspan Agency

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AC44

Figure No.:	**GBF/14-015/Fig.B12**
Version No.:	**1.1**
Produced by:	**VS**
Approved By:	**JC**
Date:	**25.06.2015**

The Greenspan Agency

Document Ref: 14-015/JC/L007

The Greenspan Agency
6 Castle Street
Edinburgh
EH2 3AT

26 June 2015

James Wright
Planning Officer
Angus Council, Planning & Place
County Buildings, Market Street
Forfar, DD8 3LG

By email

Dear James,

Discussion of Landscape Officer's Response to Application

15/00415/FULL, Wind Turbine, Bolshan Farm.

I write further to receiving the comments made on the above application by Landscape Officer Nola O'Donnell.

The Greenspan Agency notes that Nola's response is not an 'objection' to the application and we are encouraged by this. We are also of the view that there are many positive points in favour of the project raised by Nola's comments. In addition Nola has highlighted her concerns about the landscape and visual impact of the project where she has considered them relevant.
In this letter I would like to comment on a few points raised by Nola with the aim of encouraging a clear understanding of the project ahead of the application's determination. Where The Greenspan Agency has already set out relevant matters in the Environmental Report and accompanying Landscape and Visual Impact Assessment (LVIA) Figures submitted with the planning application, I have referred to those documents to avoid duplication.

I have used the same sub-headings as The Landscape Officer to engage with her points as clearly as possible through reference to the matters she has raised under those headings.

Landscape Character Effects
The Landscape Officer has referred to the turbine position being close to the boundaries of other landscape character types and areas.
The abruptness with which actual landscape character changes across such boundaries will vary. Some such boundaries are marked on the ground by clear changes; such as a lowland plain meeting the highland boundary fault and rising highlands, or a clear boundary marker such as a river. In other cases the boundary marks a more gradual change. In the case of the 2.5km radius around the Bolshan turbine, in which the Dipslope Farmland converges with the neighbouring Lowland Basins and Low Moorland Hills landscape character types, the change is gradual and boundaries are not readily observed on the ground. Many of the characteristics of the Rossie Moor landscape character area are visible within the first 2 km or so of these adjacent landscape types. This points to the suitability of the site for wind turbine development since it is situated in a landscape character area and character

type within which there is a policy consensus[1] that turbines of this scale are suitable, and not close to a significantly different manifestation of landscape character features indicative of other areas.

The Landscape Officer states, *"Its [the 'Rossie Moor Landscape Character Area's] proximity to the coastal geographic area makes it more sensitive than the rest of the Dipslope LCT"*. However, it is not clear to me that this is stated within the SLCAWEA[2], I have not been able to identify this point within the SLCAWEA and indeed the Rossie Moor Landscape Character Area is in many instances considered one of the more suitable areas of the Dipslope farmland for wind turbine development. This is most clearly set out by the blue dots in the tables on pages 64 to 67 of the SLCAWEA.

The landscape officer has listed several wind turbine projects within 5km. Due to changing circumstances some of these projects are now less relevant than before and an update of the cumulative picture is needed. With this letter I have provided an updated cumulative map to replace the information on figure C1 within the 5 km radius, this is numbered 'Figure C7'. I have not included any project for which a planning application may have been submitted after the Bolshan application because it will be incumbent on those projects to demonstrate that their cumulative effects are acceptable given the outcome of the Bolshan turbine application. Table 1 shows the changes between figures C1 and C7:

Table 1: Changes between figure C1 and C7

	Figure C1	***Figure C7***
Heughhead, 11/00143/FULL	Consented	Permission expired, no sign of initiation of development, removed from figure.
Dubton, 14/00606/FULL	Planning Application	Consented
Rossie School, 15/00013/FULL	Planning Application	Refused, no indication of appeal to LRB, removed from figure.

Given these changes it is clear that cumulative effects are less than those perhaps feared by the landscape officer when she listed the projects she has referred to in her response (although I note that she ultimately concludes toward the end of her response that *"The cumulative effect would be low and will not lead to significant adverse impacts"*).

The landscape officer refers to *"potential increase [sic] discordance already between the various types of existing turbines"*. I do not expect such discordance to occur, for the following reasons:

1. The turbine will be sufficiently distant from other turbines to avoid easy size comparisons.
2. The turbine is broadly similar in size to others within 5 km.
3. Almost all landscape features (for example, trees, houses, fields, hills etc.) differ in size from others of their type. Fears that wind turbines will cause discordance if they are not identically sized are therefore often misplaced.

[1] Please refer to page 5 of this letter for justification of the 'policy consensus' point.

[2] In this letter 'SLCAWEA' refers to the 'Strategic Landscape Capacity Assessment for Wind Energy in Angus', produced by Ironside Farrar for Angus Council, March 2014.

Visual Effects

The landscape officer states: "*The submission does not follow current visualisation guidance"*. However, it is not made clear how this conclusion has been arrived at. I disagree with the Landscape Officer's statement on this matter. The photomontages submitted with the application have been prepared with integrity, professionalism, and attention to detail. Page 73 of the 'Environmental Report' submitted with the planning application contains a lengthy discussion of the challenges of preparing wind turbine photomontages and sets out how the relevant SNH guidance was applied.

The landscape officer also states: *"there should have been a simpler and obvious numbering"*. This appears to be a reference to the photomontages, which are numbered in order of distance. The Greenspan Agency have prepared a large number of similar reports and found that ordering photomontage figures by the viewpoint's distance from the turbine position is an approach that lends order to the assessment and has relevance to the magnitude of visual effects, which, all things being equal, will diminish with increasing distance.

The landscape officer discusses the ZTV figures. While ZTV's are a useful tool they do tend to over-emphasise the significance of a proposed development within the landscape. These matters have been discussed further on page 65 of the 'Environmental Report' submitted with this planning application. One example of the limitations of ZTV's can be shown by contrasting the photomontage figure submitted with this letter which shows a view from Bolshan Cottage, which reveals significant tree screening which is not included on ZTV figure A3, submitted with the planning application.

Residential Effects

In this section of her response the Landscape Officer comments on several of the nearest properties. Where her concerns over residential amenity lie is most clearly stated later, in the 'conclusions' section of her response where she states *'the remaining issue is the impact on Bolshan Cottage and Burnside'.* Discussion of each of these properties follows below:

Bolshan Cottage

This letter is accompanied by a new photomontage (figure B12), showing a view from close to the front (western) façade of Bolshan Cottage. This is the closest dwelling to the turbine.

The photomontage confirms the considerable screening from trees, although this would be partially reduced in winter. The view shown is also at such an angle that it is likely to be difficult to view from inside the property. The photomontage also reveals how the height of the turbine is diminished by the falling topography. Further discussion of how the topography, combined with distance, creates a low viewing gradient toward the top of the turbine from Bolshan Cottage is given on pages 82 and 83 of the Environmental Report submitted with the planning application (please note that the key discussion of nearest dwellings is set out across pages 81, 82, 83 and 84).

I also note that a letter of support has been received from the resident of Ardmhor Cottage, which is next-door to Bolshan Cottage and the second-closest property to the proposed turbine.

Burnside

This dwelling is 979m from the turbine position[3]. This distance considerably mitigates the magnitude of visual effects and is 12.3 times the tip-height of the turbine[4]. The viewpoint shown in photomontage figure B2 – Junction

[3] I note that the landscape officer has stated two different distances with reference to this property: *"Views from Burnside, 969m, 937m just under a kilometre away"*, I am unsure what is meant by this. We have checked the 979m distance stated in our report once again and are happy with its accuracy. It is taken from the turbine position to the nearest part of the dwelling façade, measured using GIS on a 1:10,000 scale OS base.

on A934, which was submitted with the planning application, is 977m from the turbine, 2m closer than Burnside. Reference to this photomontage gives a good impression of the scale of the turbine in views from such distances. The separation distance to Burnside is large when compared with distances to dwellings at other wind turbine projects[5].

Principle Views From Bolshan Cottage and Burnside

A figure titled 'Principle Viewing Direction Through Key Windows from Selected Properties' has been provided with this letter. It shows the viewing direction from what appear to be the key windows in the main façade of both Bolshan Cottage and Burnside. This shows that the proposed turbine would be very peripheral to views through these key windows.

The previous planning application for a wind turbine at the farm (13/00887/FULL) proposed a turbine which was directly in-front of Bolshan Cottage. The turbine has now been deliberately moved to avoid this.

It is worth noting that there is no 'right to a view' in planning law or policy. Planning must manage the use of the land in the public interest and the benefit of providing for the electricity needs of 424 dwellings (by coincidence this almost exactly matches the 425 dwellings in Friockheim[6]) and the very real environmental benefits of this wind turbine, could be said to outweigh any adverse visual impacts on nearby residences, particularly given the mitigating factors discussed above.

Cumulative Landscape Character Effects

The landscape officer states: *'This area of the Rossie Moor [Landscape Character Area] is already indicated as under pressure for development and where further wind energy development, may exceed the acceptable cumulative capacity of the landscape'*. The landscape officer references the SLCAWEA but does not give a page reference. I have not been able to find a statement that this landscape character area is indicated as under pressure from wind turbine development or an indication that any further development beyond those consented would exceed landscape capacity. However, I do note that at the time the SLCAWEA was published (March 2014) it stated *'Current consents and applications would not exceed capacity'* (bottom-right of table on page 67).

Further to the update to the cumulative information which I have set out above (see table 1 and Figure C7 in particular) this leaves 3 turbines, in addition to the Bolshan turbine, within the 5km radius. If the Bolshan turbine was consented and built there would be 4 wind turbines within an area of 78.5 km^2. This is a small number and it is my conclusion that this does not suggest adverse cumulative effects.

Cumulative Visual Effects

I note that the landscape officer concludes that the development would <u>not</u> exceed the capacity of the landscape to accommodate wind turbine development, but instead states the proposed Bolshan turbine will, *"give rise to cumulative landscape and visual effect of low significance"*.

Matters Not Covered

Some landscape and visual matters which I consider significant, and which were set out in the Environmental Report, have not been commented upon by the Landscape Officer, and I do think it is useful to quickly recall some of these here. For example, the improvements over the previous application for a wind turbine at Bolshan Farm (13/00887/FULL) are covered in the Environmental Report submitted with the planning application (pages 11, 13,

[4] 979 / 79.6 = 12.298

[5] Page 15 of the Environmental Report submitted with the application contains a table which substantiates this claim.

[6] See page 21 of the Environmental Report submitted with the planning application for further details.

14, 15 in particular). Similarly, no support has been given for the fact that the turbine position allows greater separation distances to the nearest dwellings when compared with several applications in Angus for comparably sized turbines (p15 of the Environmental Report).
I also think that the clear consensus within policy and guidance that the site is within a landscape character area and type which is suited to wind turbines of the size proposed is important but is not commented upon in the Landscape Officer's response. This matter is set out in the bullet points on p11 of the Environmental Report in particular.

Summary
The Greenspan Agency are encouraged by many of the comments made by the Landscape Officer. But I have sought to challenge some of the other points she has made.
The Landscape officer concludes *'the remaining issue is the impact on Bolshan Cottage and Burnside',* the photomontage we have provided from Bolshan Cottage and the figure showing analysis of the key viewing directions from these properties, combined with the 979m (12.3 times turbine tip-height distance) to Burnside surely reveals that these impacts are in fact acceptable and that there is no remaining landscape and visual consideration which should be used to form a reason for refusal.

Thank you for considering this letter. The Greenspan Agency and resident Farmer Ralph Smith hope to move forward to deliver an environmentally and economically sustainable wind turbine at Bolshan Farm.

Kind regards,

Jack Cook, MRTPI

Planner

jack@greenspanenergy.com

0131 290 2262

From: Jack Cook
Sent:7 Jul 2015 14:09:16 +0100
To: WrightJ
Cc: Martyn Bentley
Subject:15/00415/FULL, Wind Turbine, Bolshan

James,

Thank you for setting out your initial position and I hope you will be able to re-consider as you write up the detail of your report.

Comparison with Hatton Mill - 12/00732/FULL

Nearby Landscape Features

You have expressed concerns regarding the proximity of Wuddy Law Hill, and suggested that this is comparable with the Compass Law hill in the case of the refused Hatton Mill turbine.

I have summarised the relevant heights and distances below, which helps explain that the proposed Bolshan turbine is both further from the neighbouring landscape high-point and overtops it by far less.

	Turbine base elevation above sea level (m)	Nearest Hill	Elevation of highest point of nearby hill named on left (m)	Turbine height, base to tip (m)	Amount b turbine ti be higher nearby hi
Hatton Mill Turbine, 77m to tip, 1.25km to top of compass hill	42	Compass Hill	85	77	
Bolshan Turbine, 79.6m to tip, 1.52km to top of Wuddy Law	65	Wuddy Law	132	79.6	

In addition, while all landscapes are important at a local level it is not the case that Wuddy Law is an iconic or ☐key feature☐ in the landscape, and nor is it protected in any written planning policy.

Photomontages B3, B4 and B9 submitted with the current Bolshan planning application give a clear indication of the relationship between the turbine and the gently rising shoulder of Wuddy Law. The landscape officer has already stated that ☐the turbine would be in scale with the surrounding landform☐, which is positive and concurs with our own study. We question the fairness of making such a direct comparison with the Hatton Mill site, which relates to its receiving landscape in a less sympathetic fashion.

There is also a need for wind turbines to emerge from the landscape to a certain extent in order to make good use of the available wind. Sites with a higher elevation will usually have a better wind resource and renewable energy potential. Nevertheless, we have sought to reduce the elevation of the Bolshan turbine in response to your service□s feedback on the previous application, and are disappointed that this has not been acknowledged.

Proximity to Dwellings

As set out on page 15 of the Environmental Report submitted with the Bolshan turbine application, our project is far further from nearby dwellings than the Hatton Mill proposal was. The relevant distances to the nearest properties being: 410m between the Hatton Mill turbine and the nearest dwelling, and 623m from the Bolshan turbine to Bolshan Cottage. In addition the effects on Bolshan Cottage have been discussed at length within our submission of 26 June and we have demonstrated that these effects will be acceptable using new figures which unfortunately were not available to the landscape officer when she authored her response.

Sequential Cumulative Effects

We are surprised that you have referred to sequential cumulative effects as a possible reason for refusal. The likelihood of such effects was not identified during our cumulative research and we have recently updated our cumulative information (on 26 June) to show that the cumulative picture is even sparser than previously thought. The landscape officer has concluded: *□The cumulative effect would be low and will not lead to significant adverse impacts□.*

Planning Policy Consensus

The Greenspan Agency eliminate around 3 out of 4 wind turbine sites at the planning feasibility stage, we have proceeded at Bolshan because we think we can help deliver the planning policy vision set out by the Council. I have referred previously to a consensus within policy and guidance that this is an appropriate location for a wind turbine of this scale and listed key references on page 11 of the submitted Environmental Report. I have expanded on these references below:

- Angus Local Plan Review (2009)

The turbine is within the □lowland and hills□ geographic area which is preferred for wind turbine development when compared with the □coast□ and □highland□ areas (pages 94-97).

- Angus Council, □*Implementation Guide for Renewable Energy Proposals*□ (June 2012)

  The □dipslope farmland□ landscape character type in which the project is located is □Considered to have scope for turbines circa 80m in height□ (page 48)

- Ironside Farrar for Angus Council, □*Strategic Landscape Capacity Assessment for Wind Energy in Angus*□ (2014)

  The □Rossie Moor□ landscape character area in which the project is located is stated as having □medium□ remaining landscape capacity for medium to large turbines of 50-<80m in height. (page 67)

Given the many other benefits of this project (summarised in particular on pages 11 and 12 of the submitted Environmental Report) the site chosen and the turbine design proposed are as good as possible within the Dipslope farmland. As such the application must surely be received positively.

Public Records

I ask that the landscape officer□s response is uploaded onto the public application record together with the information I submitted on the 26th June and this email so that this information is available to the LRB should it be needed.

Thank you for considering this email. I respectfully ask that you re-consider the matters raised in your email below as we contend the project has clearly demonstrated compliance with the requirements of the development plan.

Jack Cook, MRTPI

0131 290 2262

www.greenspanenergy.com

From: WrightJ [mailto:WrightJ@angus.gov.uk]
Sent: 03 July 2015 11:46
To: Jack Cook
Subject: RE: Discussion of Landscape Officer's Response: 15/00415/FULL, Wind Turbine, Bolshan

Mr Cook,

I refer to the above application and your e-mail below.

I have reviewed your proposals and had some further discussions.

There are a number of concerns regarding your proposals and I have summarised these below.

As indicated in the landscape officers comments, it is acknowledged that there are a number of residential properties which are close to the turbine that would experience adverse visual impacts and there are concerns in this regard. Having had regard to other decisions in the immediate area there are a number of other concerns which had been raised and have now been reviewed.

A previous application at Hatton Mill (12/00732/FULL refers) for a 77 m high turbine was refused and dismissed by the Local Review Board. As well as similar impacts on housing, concern was raised that as the proposed turbine was 77m to blade tip and located at a height of 40m AOD that it would dominate the local landscape in respect of vertical scale and as such not be in accordance with SNH guidance. Particular concern was raised in terms of the impacts on landscape features such as Compas Hill and Wuddy Law.

The current application has similarities with the Hatton Mill refused turbine in a number of ways and it is actually located closer to Wuddy Law and on a contour of what appears to be about 65m AOD (Hatton turbine approximately 40m AOD). On this basis there are similar concerns with the proposed turbine.

In addition to this the proposal is located on the primary route between Forfar and Montrose and the location of other turbines along this route would create a sequential cumulative visual effect on that route and other road networks in the immediate area.

In summary, this Division has concerns regarding the proposed turbine and it is likely that this application will receive a recommendation for refusal on this basis. Should you wish to withdraw the current application I would be grateful if you could indicate this by response to this e-mail.

It may be the case that a turbine of less than 50m in height might significantly reduce some impacts. However the acceptability of any reduction in height would need to be fully considered as part of a further application in any event.

I trust this clarifies our position on this.

Regards

James

From: Jack Cook [mailto:jack@greenspanenergy.com]
Sent: 26 June 2015 15:38
To: WrightJ
Subject: Discussion of Landscape Officer's Response: 15/00415/FULL, Wind Turbine, Bolshan

Dear James,

Further to the comments provided by your Landscape Officer, I would be grateful if you could consider the attached letter and the figures to which it refers.

You have stated on the phone that you consider residential effects to be a key consideration. These are discussed under the 'Residential Effects' sub-heading on pages 3 and 4 of the attached letter.

Thanks for your time on this matter.

Regards,

Jack Cook, MRTPI

Environmental Planner

0131 290 2262

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