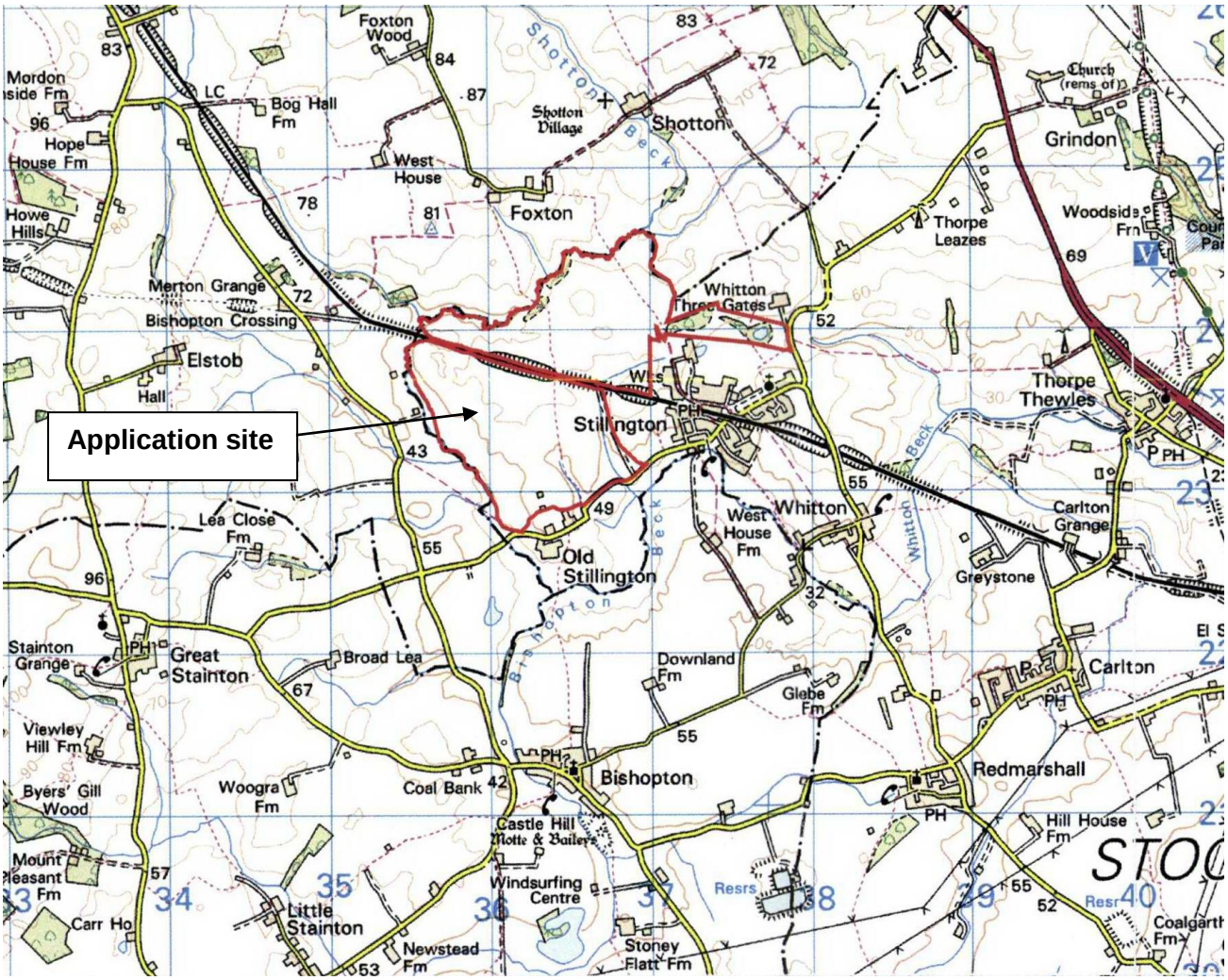
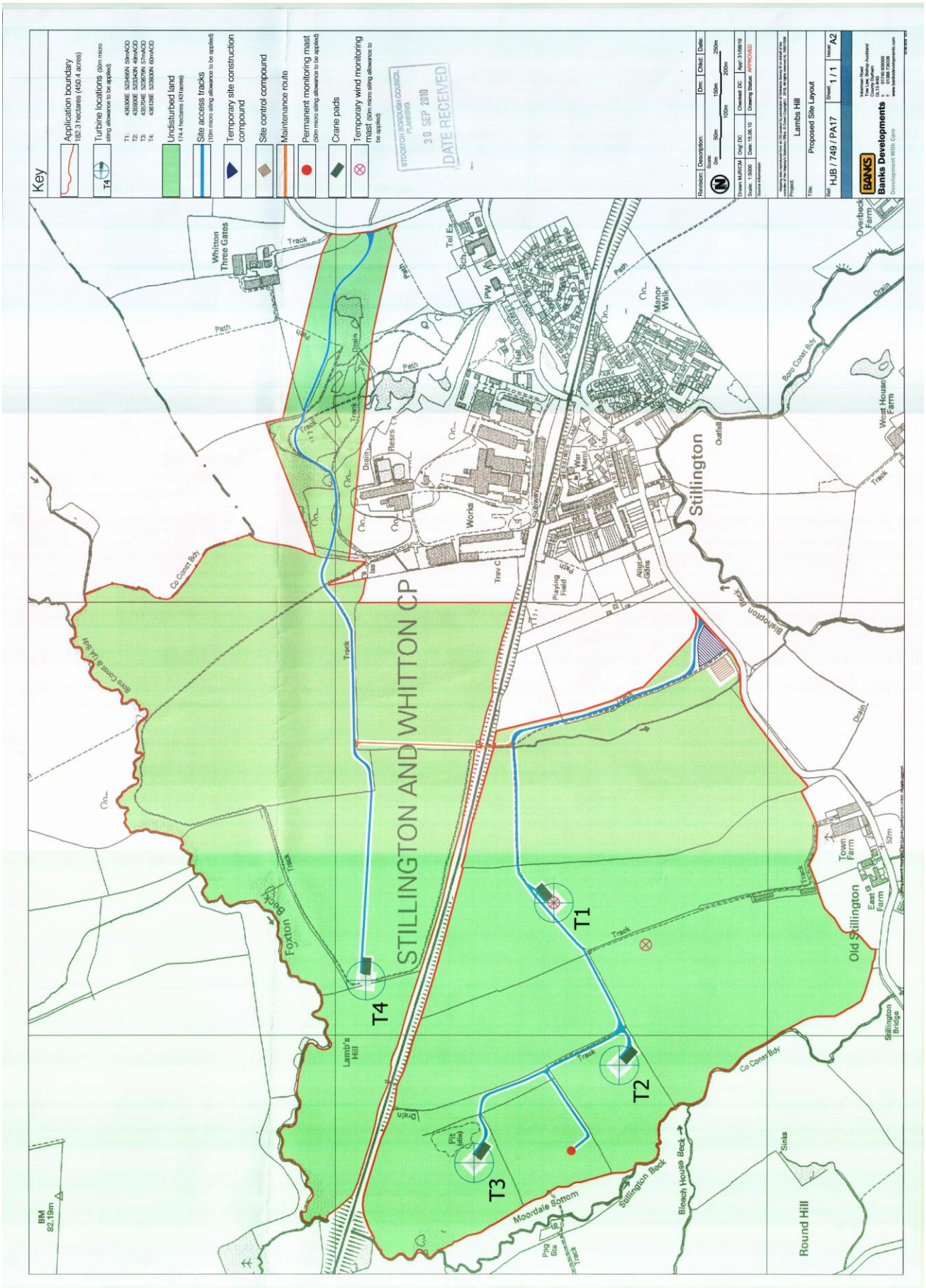
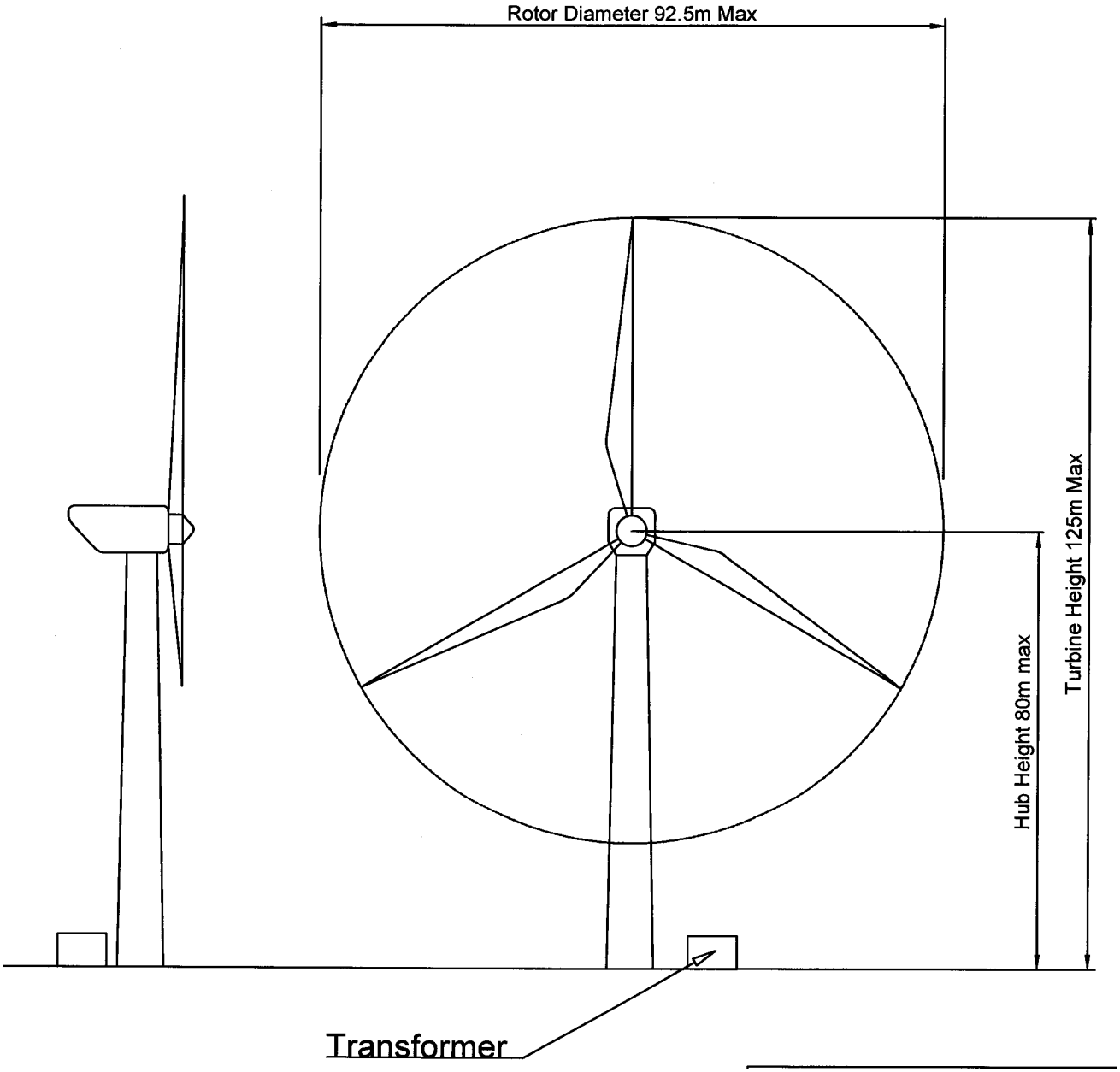
12/1762/VARY – Lambs Hill Wind Farm
Appendix reference 1
Site location plan



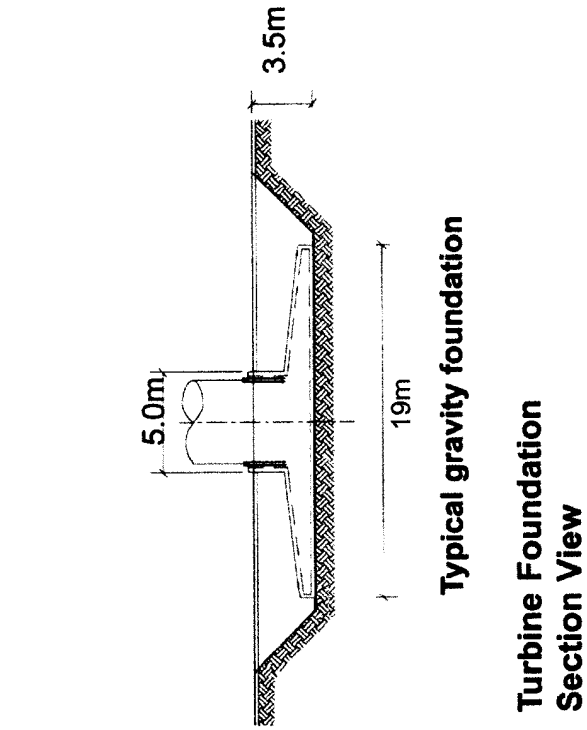
12/1762/VARY – Lambs Hill Wind Farm
Appendix reference 2
Site Layout Plan



12/1762/VARY – Lambs Hill Wind Farm
Appendix reference 3
Typical Turbine Detail

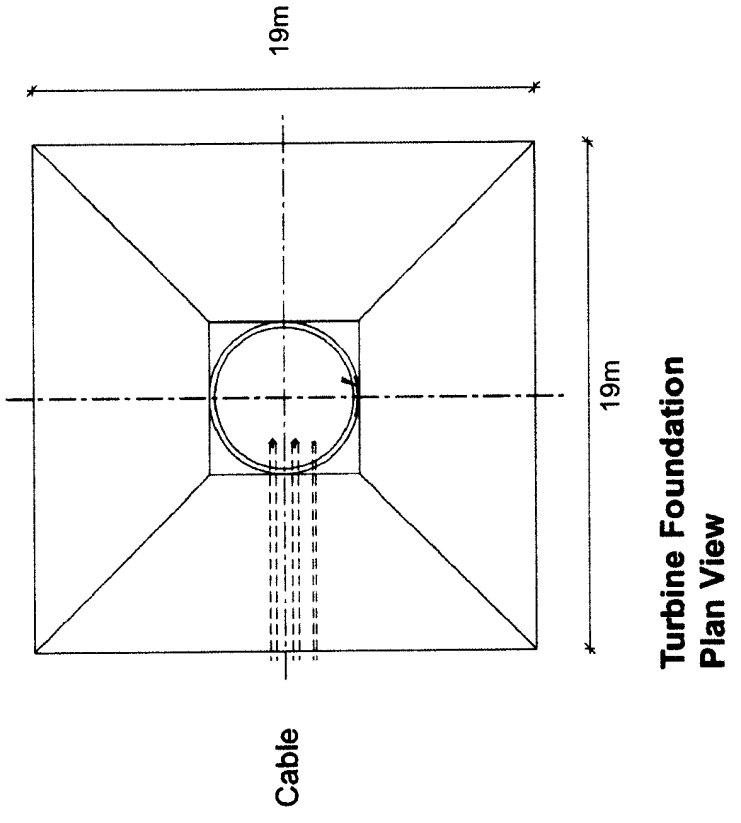


12/1762/VARY – Lambs Hill Wind Farm
Appendix reference 4
Typical Turbine Foundation Detail

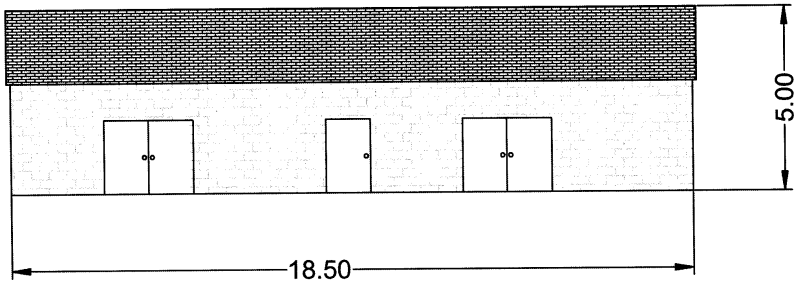


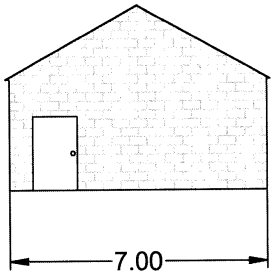
Typical gravity foundation

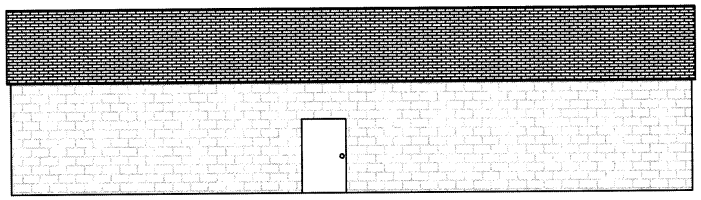
Turbine Foundation
Section View

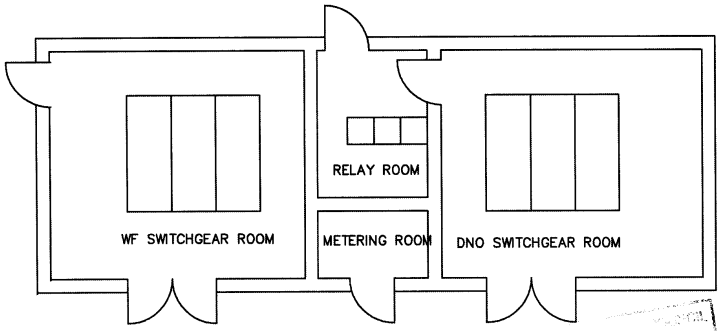


Turbine Foundation
Plan View









Approximately 18.5m x 7m x 5m in height
External material to be agreed with local planning authority

Revision:	Description:	Drn:	Chkd:	Date:

Drawn: SH	Checked: EK	App': 17/09/10
Scale: 1:125 Date: 01/07/10	Drawing Status: APPROVED	

Source information:

Project: Lambs Hill

Title: Typical Control Building Design

Drawing number: HJB / 749 / PA20 Rev: . Issue: A3

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Banks Developments
Development With Care

Inkerman Road
Tow Law, Bishop Auckland
County Durham
DL13 4HG
t: 01740 658500
f: 01388 738336
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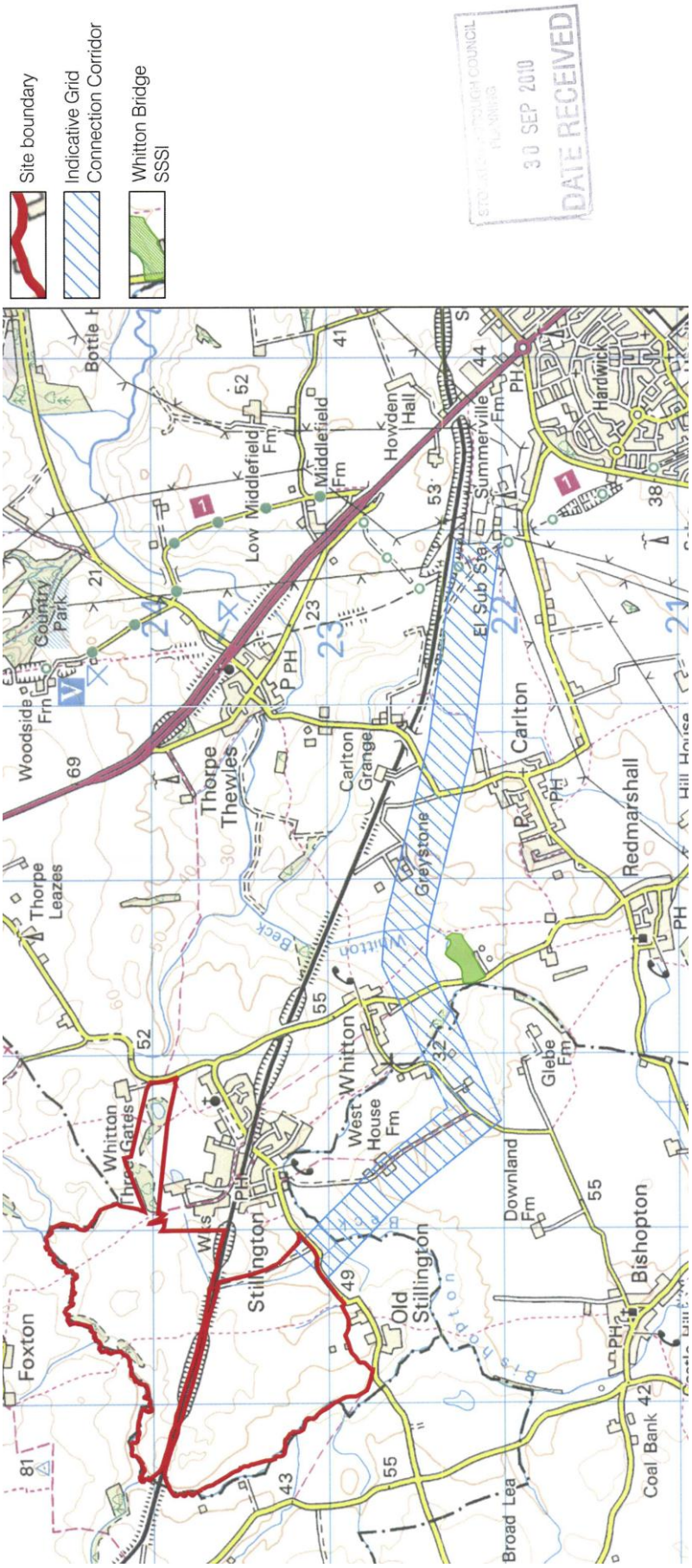
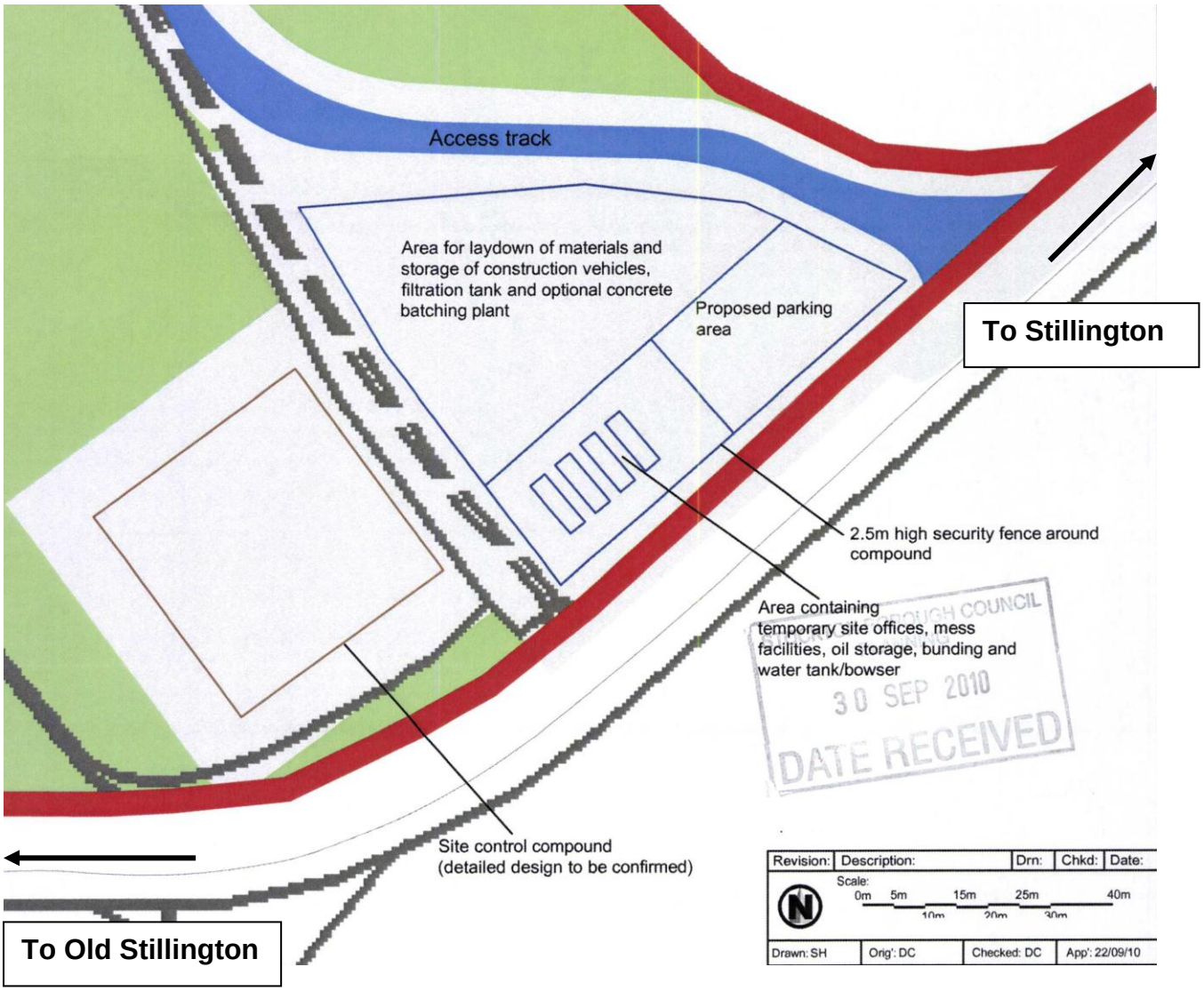
12/1762/VARY – Lambs Hill Wind Farm
Appendix reference 5
Typical Control Building

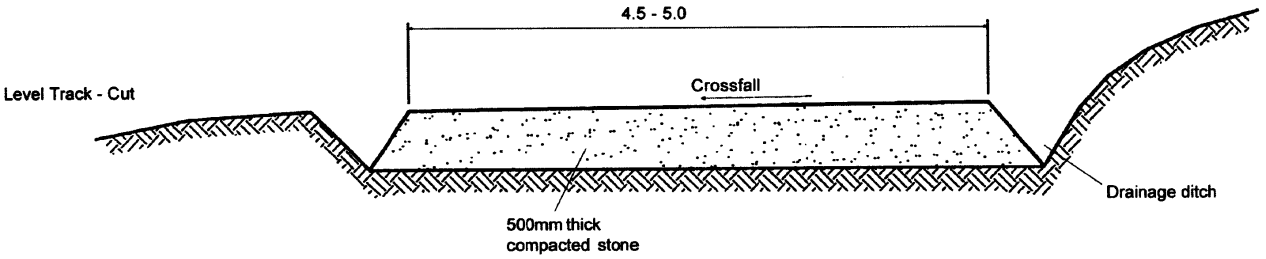
12/1762/VARY – Lambs Hill Wind Farm
Appendix reference 6
Possible grid connection corridor

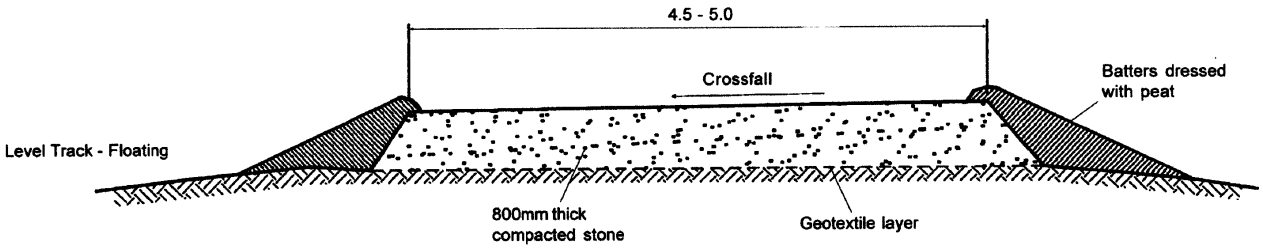


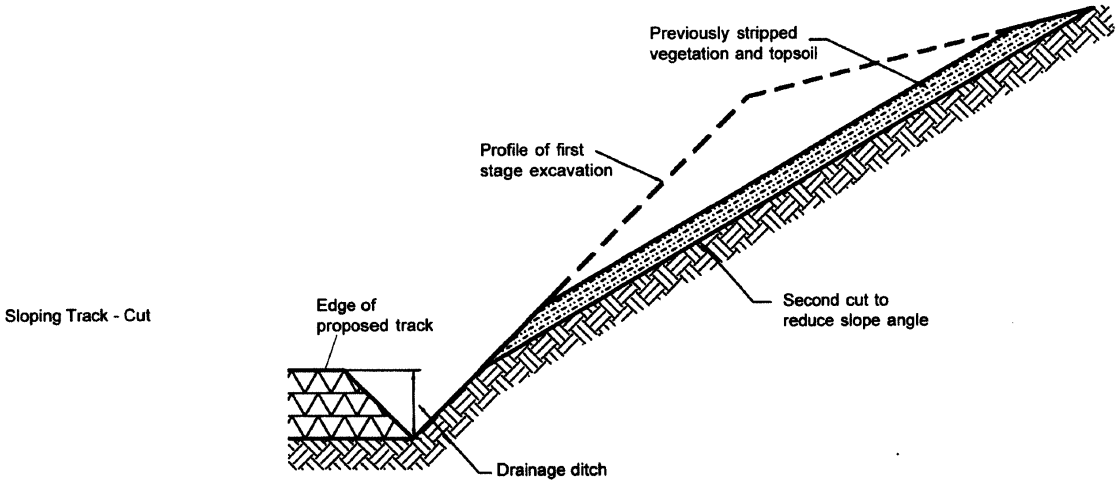
12/1762/VARY – Lambs Hill Wind Farm
Appendix reference 7
Indicative Lay down and Construction Compound Area



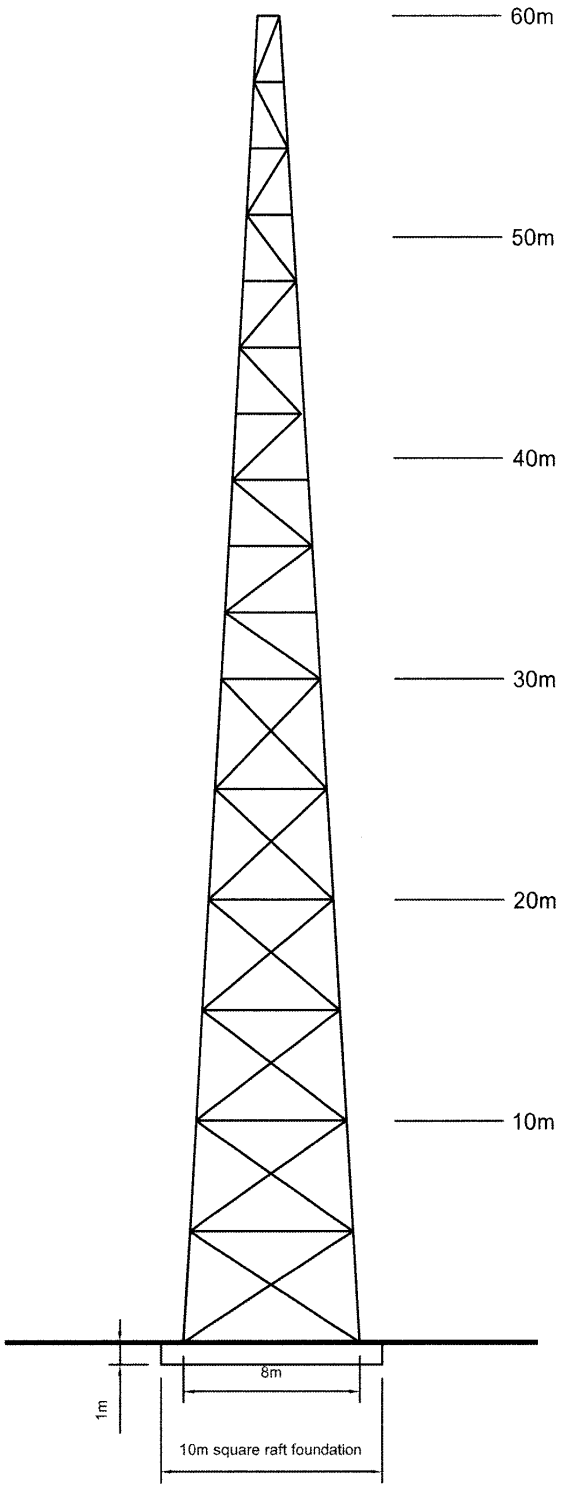
12/1762/VARY – Lambs Hill Wind Farm
Appendix reference 8
Cross sections of typical internal tracks



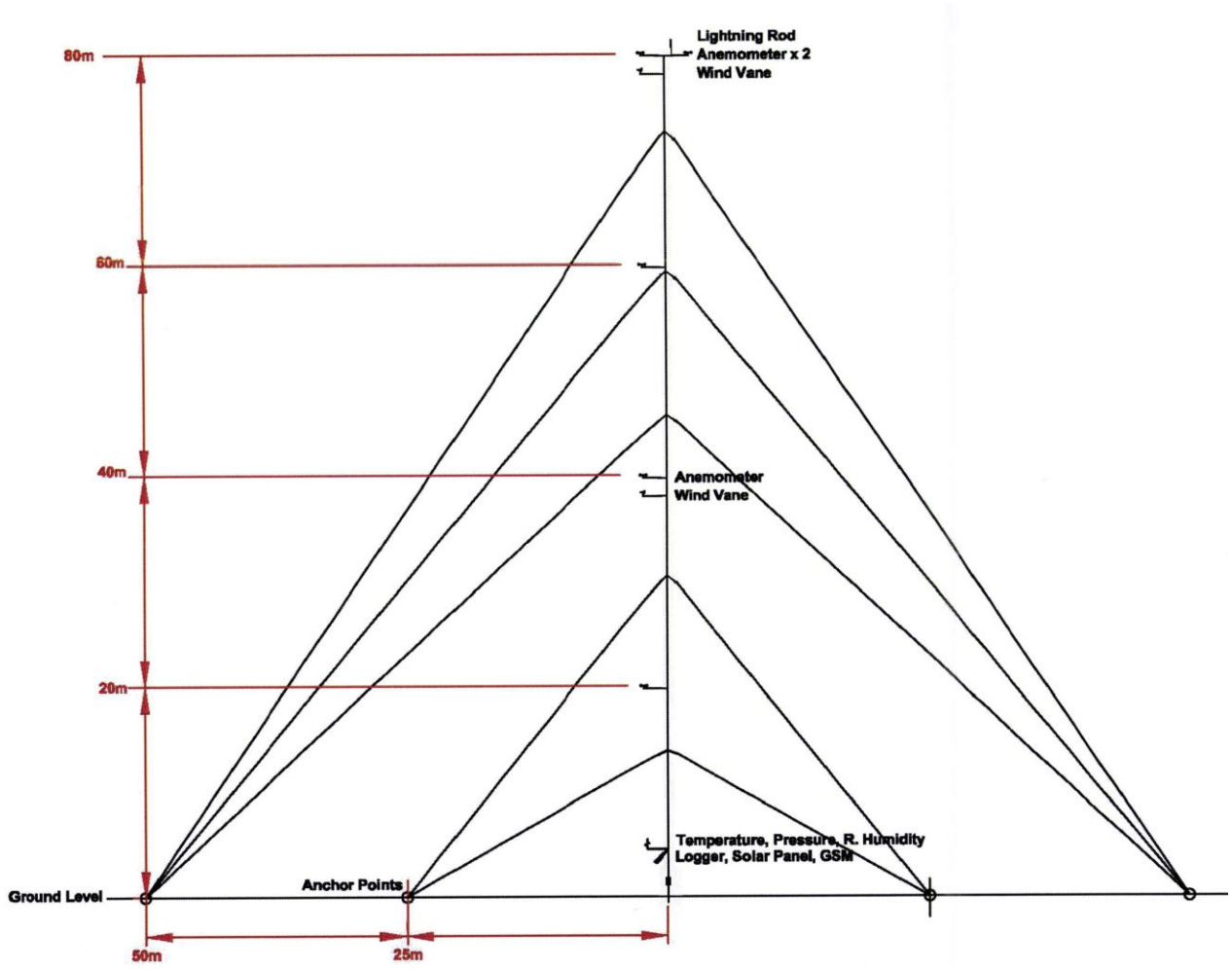




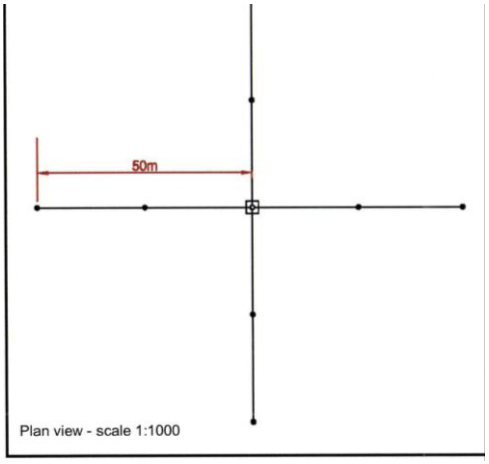
12/1762/VARY – Lambs Hill Wind Farm
Appendix reference 9
Typical 60m Met Mast



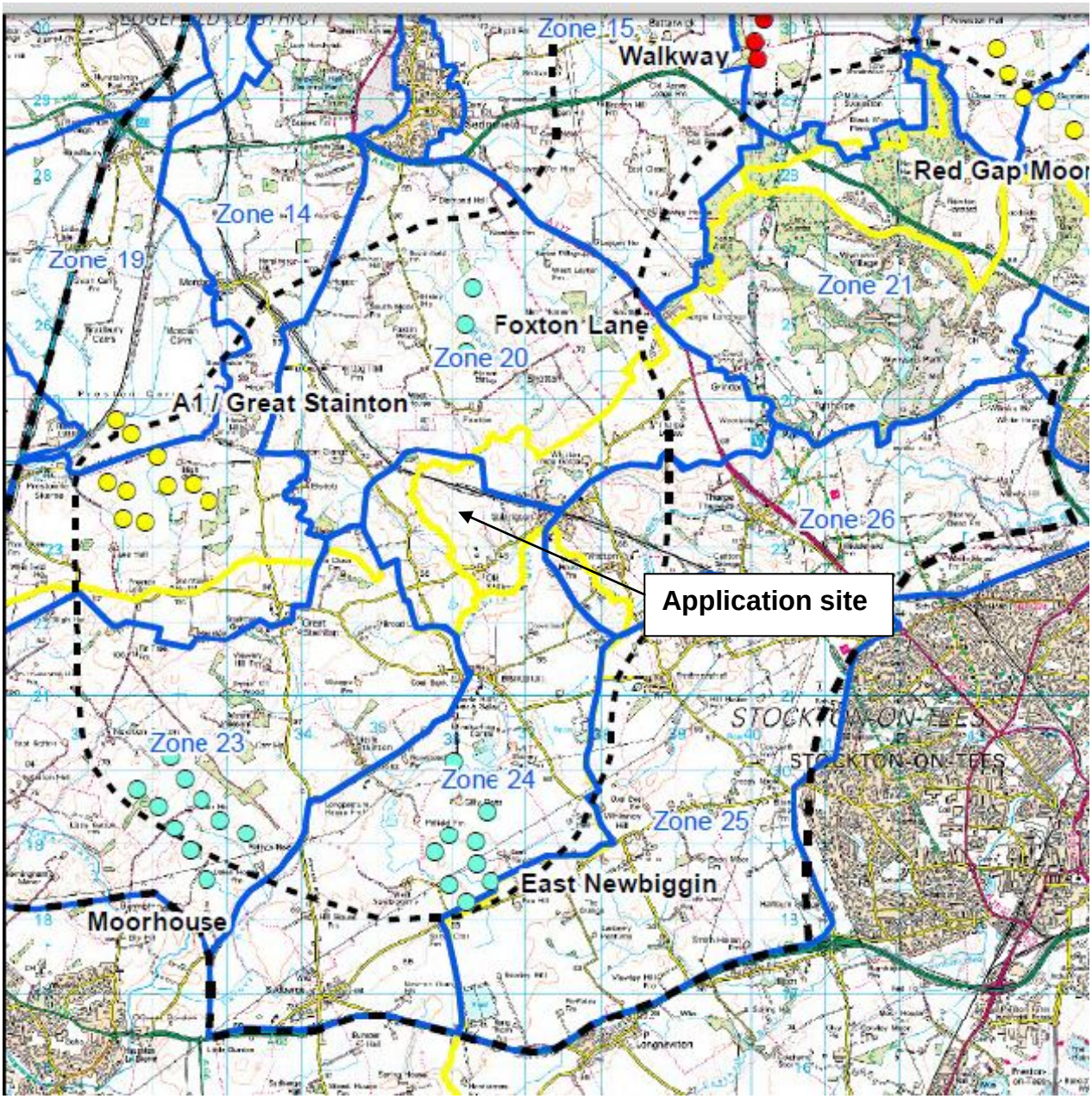
12/1762/VARY – Lambs Hill Wind Farm
Appendix reference 10
Typical 80m mast



Typical 80m Meteorological Mast Arrangement



12/1762/VARY – Lambs Hill Wind Farm
Appendix reference 11
Wind Farm Development and Landscape Capacity studies – East Durham and Tees Plain Addendum. Zoning Map and associated text.



Moorhouse wind farm (Zone 23)

The proposed Moorhouse wind farm (referred to as wind farm or site B in the scenario assessment) comprises 10 turbines which are all located within Zone 23. The main study identified that the largest wind farm typology potentially acceptable in Zone 23 was small medium small, i.e. development of "between 7.5-18 MW or 4-6 turbines approx." Overall the level of development proposed in this location exceeds the capacity of the landscape identified in the main study. However, the extent to which a development of the scale proposed would exceed the capacity of the local landscape, and the significance of that in the context of the policy environment at the time the application is determined, can only be fully resolved through a detailed investigation of the landscape and visual impacts of the individual scheme which is beyond the scope of this study. In terms of overall visibility within 15km Zone 23 was ranked 25th out of 27 Zones (where 1 was best and 27 worst). Zone 23 performed in the bottom 50% in terms of effects on settlements within 10km, in the top 50% in terms of effects on settlements with 2km and in the bottom 50% in terms of effects on roads up to 5km. Overall Zone 23 was ranked as 22nd out of 27. In the main study Zone 23 was identified as having some suitability for (further) wind farm development, based on a high level review of the availability of technically unconstrained land and cumulative visibility issues. All of the turbines associated with the proposed

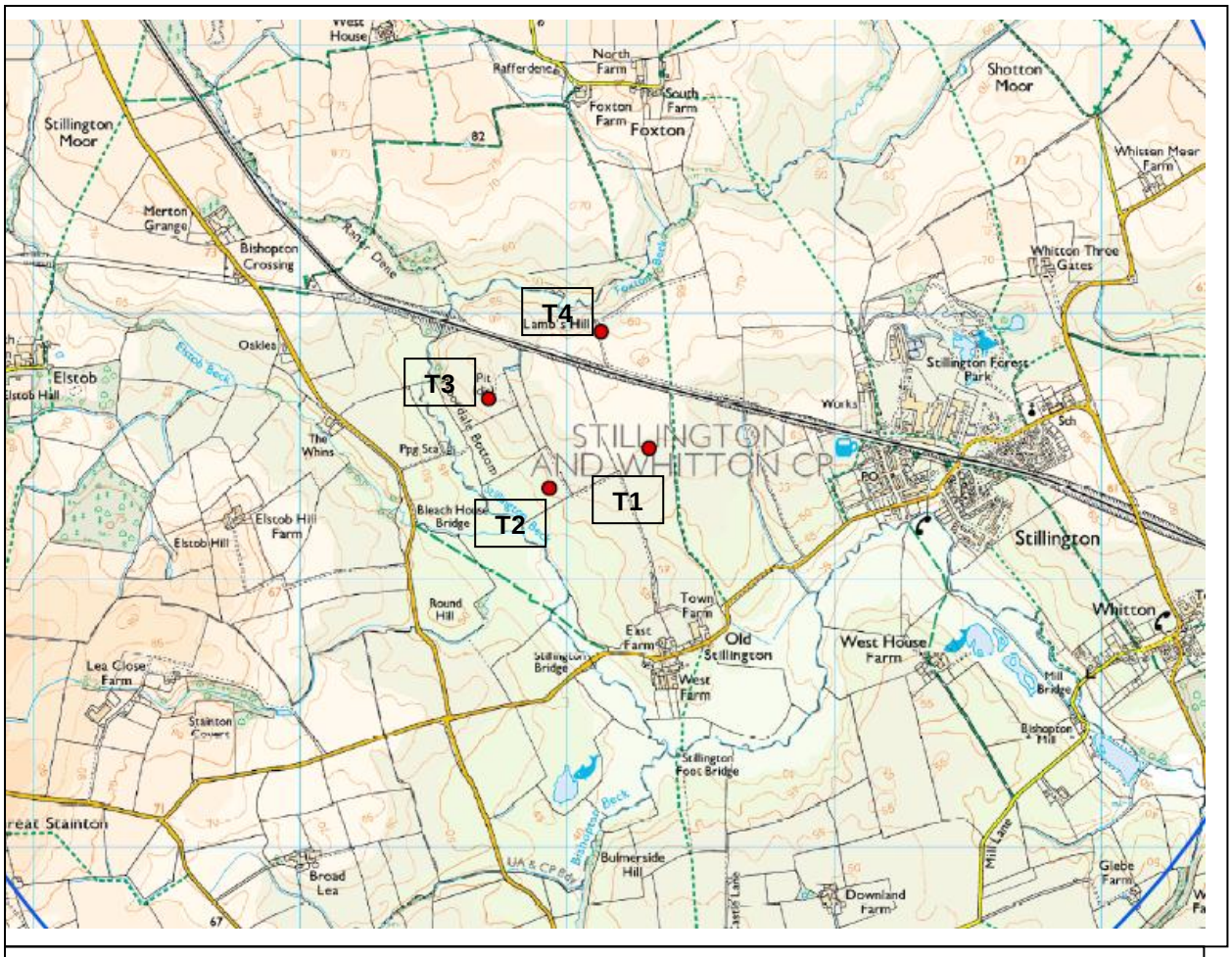
Moorhouse development apart from two are located within the "Least impact" area identified in the main study.

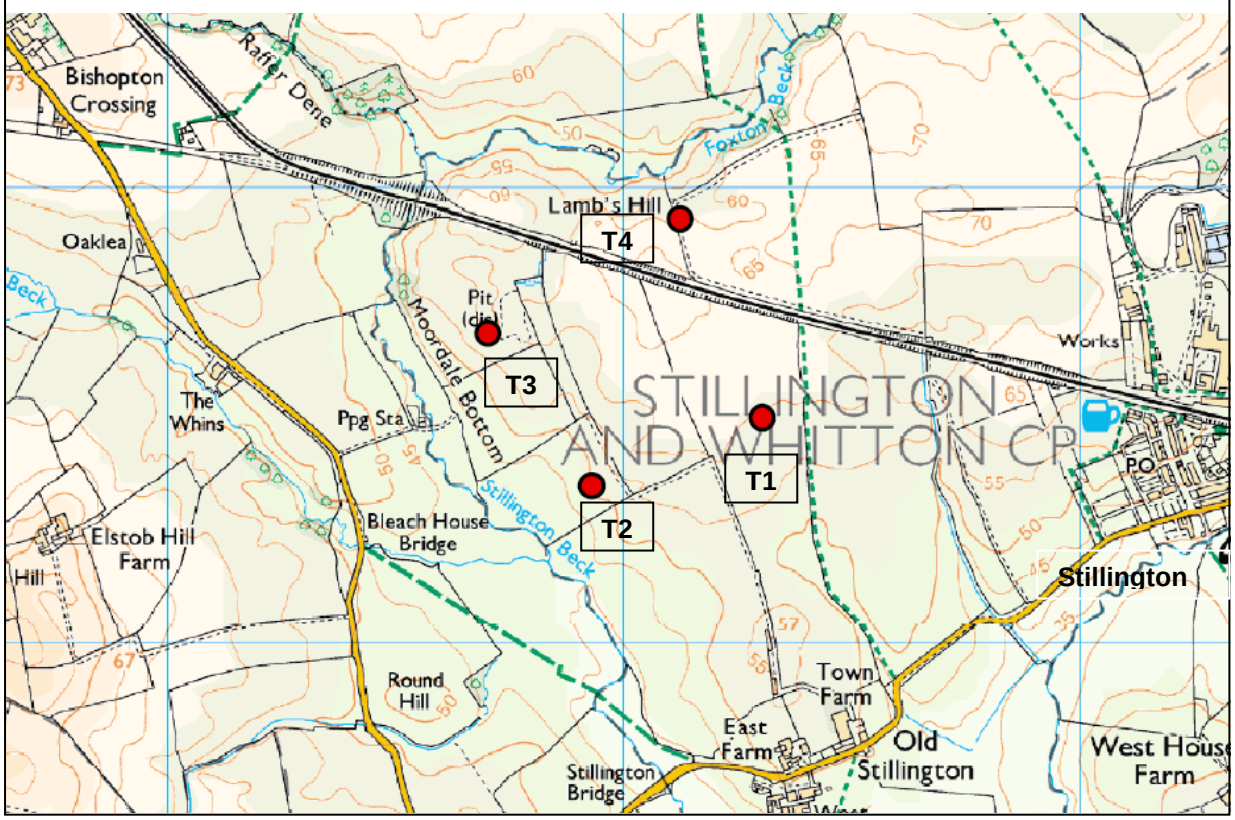
East Newbiggin wind farm (Zone 24)
The proposed East Newbiggin wind farm (referred to as wind farm or site C in the scenario assessment) comprises 9 turbines which are all located within Zone 24. The main study identified that the largest wind farm typology potentially acceptable in Zone 24 was small medium small, i.e. development of "between 7.5-18 MW or 4-6 turbines approx." Overall the level of development proposed in this location exceeds the capacity of the landscape identified in the main study. However, the extent to which a development of the scale proposed would exceed the capacity of the local landscape, and the significance of that in the context of the policy environment at the time the application is determined, can only be fully resolved through a detailed investigation of the landscape and visual impacts of the individual scheme which is beyond the scope of this study.

Foxton Lane wind farm (Zone 20)
The proposed Foxton wind farm (referred to as wind farm or site D in the scenario assessment) comprises 3 turbines which are all located within Zone 20. The main study identified that the largest wind farm typology potentially acceptable in Zone 20 was medium small, i.e. development of "between 7.5-25 MW or 4-9 turbines approx." The level of development proposed in this location is below the capacity of the landscape identified in the main study. In terms of overall visibility within 15km Zone 20 was ranked 22nd = out of 27 Zones (where 1 was best and 27 worst). Zone 20 performed in the bottom 50% in terms of effects on settlements within 10km, but in the top 25% in terms of effects on settlements with 2km and in the top 50% in terms of effects on roads up to 5km. Overall Zone 20 was ranked as 10th out of 27. In the main study Zone 20 was identified as having some suitability for (further) wind farm development, based on a high level review of the availability of technically unconstrained land and cumulative visibility issues. The proposed Foxton Lane wind farm is located entirely within the "Least impact" area identified in the main study.

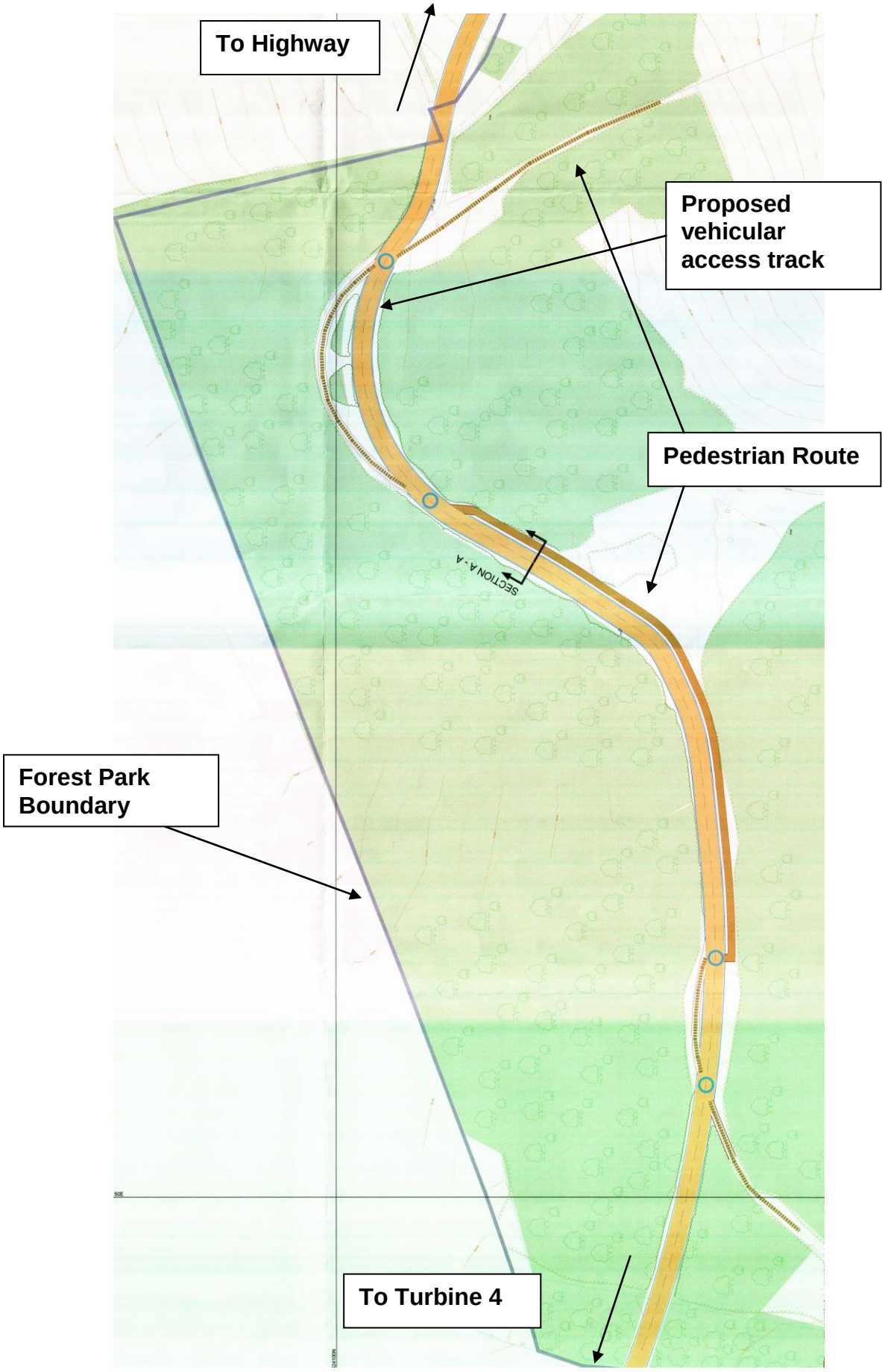
Extracts from Page 11 of the Association of North East Councils document 'Wind Farm Development and Landscape Capacity Studies – East Durham and Tees Plain Addendum Oct 2009.

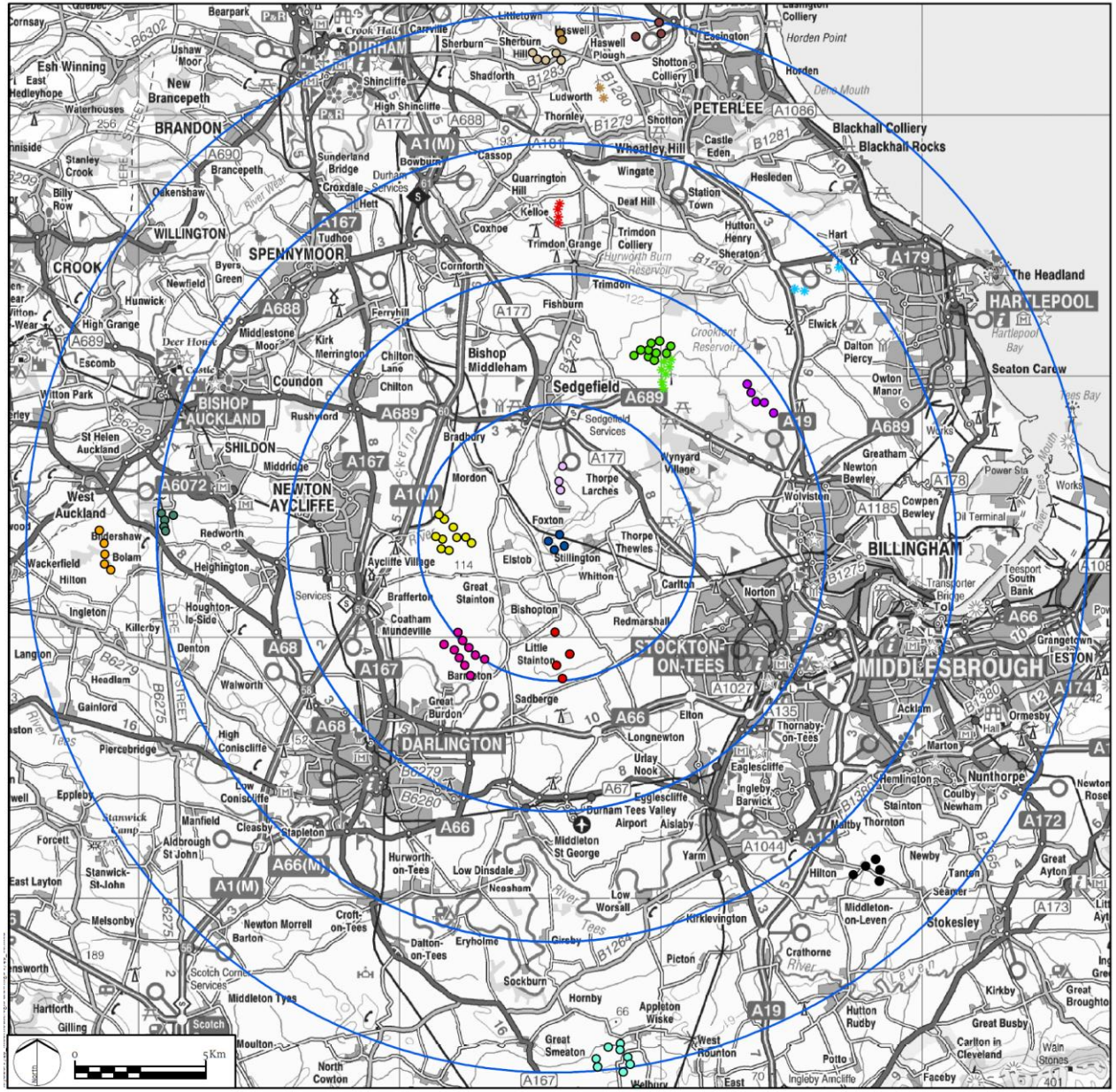
12/1762/VARY – Lambs Hill Wind Farm
Appendix reference 12
Extract taken from ES appendix ref 6.1. Proximity to Public Rights of Way





12/1762/VARY – Lambs Hill Wind Farm
Appendix reference 13
Access Track Route Through Forest Park





LEGEND

- Lambs Hill turbine locations
- Foxton Lane

LEGEND

Distance from turbines (5,10, 15, 20km)

:d in cumulative assessment

- Butterwick
- Hare Hill
- Haswell Moor
- High Haswell
- High Volts
- Ingram Grange
- Junction House
- Newbiggin
- Red Gap Moor
- Royal Oak
- Seamer
- Teesdale
- Trimdon Grange
- Walkway
- A1
- Foxton Lane
- Moor House

Note - existing wind farms shown as asterisk symbols, all others either approved or in planning

REV. DESCRIPTION APP. DATE

BANKS
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Development With Care

LDĀDESIGN

PROJECT TITLE
LAMBS HILL WIND FARM

DRAWING TITLE
Figure 6.10 - Cumulative Study - Sites included

ISSUED BY	Peterborough T 01733 310471		
DWG.NO	2899P_10		
DATE	16 August 2010	DRAWN	CM
SCALE@A3	1:200,000	CHECKED	MFI
STATUS	FINAL	APPROVED	MFI

No dimensions are to be scaled from this drawing.
All dimensions are to be checked on site.
Area measurements for indicative purposes only.

Sources: data supplied Durham County Council

12/1762/VARY – Lambs Hill Wind Farm
Appendix reference 14
Map showing cumulative turbine locations

12/1762/VARY – Lambs Hill Wind Farm
Appendix reference 15
Heavy goods Vehicle Routing Plan

2.2 NOISE

Objective Twenty - To ensure that noise emissions are controlled to acceptable levels during the operation of the Lambs Hill Wind Farm.

ACTIONS

Compliance Monitoring

The wind farm has been designed to comply with noise limits contained in ETSU-R-97, The Assessment and Rating of Noise from Wind Farms. The following monitoring measures will confirm that the wind farm is operating within the predicted limits inline with ETSU.

a) Within the first six months after the wind farm is commissioned, a continuous noise survey set to an agreed methodology will be conducted to monitor the noise levels from the wind farm at or adjacent to locations agreed with the Environmental Health Officer (subject to permission from the various householders).

Noise monitoring

b) The results will be compared with the predicted noise levels and also limits set using ETSU to confirm that the wind farm is functioning in accordance with limits agreed with the LPA as displayed in tables 1 and 2.

Table 1: Between 23:00 and 07:00 hours (Noise Level in dB $L_{A90, 10min}$):

Location (easting, northing grid co-ordinates)	Wind speed (m/s) at 10m height measured within the site averaged over 10m minute periods											
	1	2	3	4	5	6	7	8	9	10	11	12
Foxton (436313,524722)	43	43	43	43	43	43	43	43	46	49	52	55
Stillington (437099,523425)	43	43	43	43	43	43	43	43	43	44	47	49
Old Stillington (436392,522789)	43	43	43	43	43	43	43	47	49	52	53	53
The Whins (435168,523576)	43	43	43	43	43	43	43	43	43	46	48	50
Moor House Farm (435082,524082)	43	43	43	43	43	43	43	44	47	50	53	54
Foxton Farm (435993,524794)	43	43	43	43	43	43	43	43	43	44	47	50

Table 2: At all other times (Noise Level in dB LA90, 10min):

Location (easting, northing grid co-ordinates)	Wind speed (m/s) at 10m height measured within the site averaged over 10m minute periods											
	1	2	3	4	5	6	7	8	9	10	11	12
Foxton (436313,524722)	35	35	35	37	38	40	43	45	47	50	52	54
Stillington (437099,523425)	35	35	35	36	37	38	40	42	44	46	49	52
Old Stillington (436392,522789)	35	35	35	37	39	42	45	48	51	54	56	58
The Whins (435168,523576)	36	37	37	39	40	41	43	44	46	47	48	49
Moor House Farm (435082,524082)	35	35	35	35	37	39	42	45	47	48	49	49
Foxton Farm (435993,524794)	35	35	35	35	36	37	39	41	43	45	48	50

Note:

The geographical coordinate references set out in these Tables are provided for the purpose of identifying the general location of dwellings to which a given set of noise limits applies.

c) Within 6 weeks of completion, the findings of the compliance monitoring will be submitted in written form to the LPA.

d) If it is determined that noise attributable to the wind farm results in the exceedance of the limits as stated in condition 40 and duplicated in tables 1 and 2 at any of the agreed monitoring locations, the applicant will submit measures to be agreed with the LPA within 2 weeks (unless otherwise agreed in writing with the LPA) to reduce noise from the wind farm to within the agreed limits.

Operational Controls

Once it has been confirmed that the wind farm is operating within the limits set out in tables 1 and 2 the malfunction shut down mechanism and maintenance of the turbines will ensure that these noise limits are not exceeded due to malfunction.

Operational Noise Complaints Procedure

Objective Twenty One - To ensure that any complaints and incidents that occur related to the site in regards to noise of all types/characteristics including amplitude modulation are reported, investigated and appropriate action taken by following the complaint and notifiable incident procedures.

In the event that a complaint relating to noise is received by the Local Planning Authority or the operator in relation to the Lambs Hill Wind Farm, the procedure set down below will be enacted:

- The LPA and or the operator to assess the substance of the complaint:
- The LPA to notify the operator in writing of receipt of complaint and the operator to likewise inform the LPA within two working days of receipt of a complaint (or sooner if possible)
- The operator to carry out an initial investigation of the circumstances of the complaint and provide the LPA with a report within two working days identifying;

  a) What action was taken to identify the problem
  b) Whether a problem was identified and the nature of the problem
  c) The next stage of investigation
  d) Any action taken to prevent the problem from reoccurring.

- If the initial investigation is inconclusive an investigation will commence immediately following the submission of the initial investigation report to the LPA (unless otherwise agreed with the LPA in writing) and include (but will not be limited to) the following elements as necessary and will be conducted by a member of the Institute of Acoustics (IOA) who holds the IOA Diploma in Acoustics and Noise Control:
  - Use of sound level meter with calibrated audio recording equipment;
  - Interview with complainants;
  - Use of complaint log sheets (sample appended at appendix A);
  - Noise level monitoring in accordance with a methodology previously agreed in writing with the LPA ;
  - Logging of prevailing weather and operational data (for correlation with noise monitoring and complaint log data).
  - The operator will provide the LPA with fortnightly updates on progress of the investigation.

- Within 28 working days following the initial investigation unless otherwise agreed with the LPA in writing, a noise complaint investigation report will be provided to the LPA by the operator. This report will include results of the assessment, recommendations for mitigation actions and also full evidence or investigations as requested by the LPA.

- If deemed required in agreement with the LPA, which will not be unreasonably withheld proceed in the appointment of an independent and appropriately qualified consultant (at the operator's expense), to undertake an assessment of the operation of the wind farm to include the elements referred to above within 2 weeks of submission of a complaints investigation report to the LPA (unless otherwise agreed with the LPA in writing) for a period of no greater than two months (unless agreed in writing with the LPA). The report

produced by the independent and appropriately qualified consultant will be submitted to the LPA within 2 weeks of completion of the assessment, unless otherwise agreed in writing with the LPA.

Noise Complaint Resolution

Where the above investigation(s) demonstrates either that the rated output of the wind farm is in excess of the noise limits set out in tables 1 and 2 or the wind farm is producing unacceptable levels of noise of any types / characteristics including amplitude modulation (as defined in accordance with the agreed current best practice at the time of investigation and in agreement with the LPA), then a mitigation strategy designed to solve the noise problem either at or before the time of its occurrence shall be implemented to the satisfaction of the LPA that effectively mitigates any such breaches.

This mitigation strategy will be provided by the operator for the LPAs approval within two weeks of receipt of the noise complaint investigation report and will include a timescale for implementation of mitigation measures.

Where the above investigation demonstrates that the agreed levels have not been exceeded, the findings of the report will be logged by the LPA and the complainant advised accordingly.

Where mitigation action is required this will be carried out by the operator and the investigation continued to ensure that the mitigation actions are effective.

Further monitoring and investigation will be carried out by the operator to demonstrate any mitigation actions effectiveness.

A report will be produced by the operator within 1 month of mitigation actions being implemented and provided to the LPA to demonstrate effectiveness of actions.

If the mitigation actions are found to be ineffective as per the findings of the above report provided to the LPA to demonstrate effectiveness of actions, then further measures will be applied and examined for effectiveness.

From this a second further report to demonstrate effectiveness of actions will be provided within 1 month of the first report being submitted to the LPA (unless otherwise agreed with the LPA in writing).

This process will be repeated until either the complaint removes complaint or mitigation action is demonstrated by the operator to be effective.

Relevant Legislation

Under the Environmental Protection Act (EPA) 1990 levels of noise that are prejudicial to health or interfering with an individual's right to use or enjoy their property is a Statutory Nuisance therefore 'Best Practicable Means' (BPM) should be taken to prevent/abate any noise nuisance, this includes all types and characteristics of noise resulting from the operation of the wind farm.

.

12/1762/VARY – Lambs Hill Wind Farm
Appendix reference 17

There is no Appendix. 17

Appendix Reference 18
APPEAL DECISION EXTRACTS RELEVANT TO AMPLITUDE MODULATION .
(All dealt with at Inquiry)

Appendix: Ref 18a. Frodsham Case

Inquiry considered by the Inspectorate on behalf of the Secretary of State for Energy and Climate Change.
Decision date: 4th July 2012.
Scheme – Wind farm in 2 clusters, cluster 1 = 13 turbines, cluster 2 = 6 turbines. 125m to blade tip. Max. blade diameter 90m, 3 blade rotors.

General noise matters were accepted by the Inspector as having being dealt with in regard to AM, para. 590 is most relevant;

File Ref: DPI/A0655/11/13
Frodsham Canal Deposit Grounds

590. There remain concerns amongst local people in relation to excess amplitude modulation (EAM) or blade swish, which is often described as a thumping sound. The reasons for EAM are not fully understood. However, the phenomenon is not common, the majority of wind farms seeming to avoid its effects, though there are a few well publicised cases of difficulty. EAM can occur with single turbines or clusters and the range of variables which might contribute towards it is large. Though residents fear its occurrence here I have no evidence which suggests that there are particular conditions at this site, or that the configuration of the wind farm here, would be likely to cause the production of EAM. It would be unreasonable to deny consent on the basis of an unsubstantiated fear of such an effect, and it should be borne in mind that statutory nuisance procedures have proved capable of dealing with any difficulties in other cases.

Appendix: Ref 18b. Haselbech, Kelmarsh Case.
Inquiry considered by the Inspectorate on behalf of the Secretary of State for Communities and Local Government.
Decision date: 19th December 2011.
Scheme – Wind farm containing 7 turbines, max. 126.5m to blade tip.

Appeal Ref: APP/Y2810/A/11/2154375
Land to the South of the A14 and North of Haselbech, Kelmarsh

94. However, it is acknowledged that there is no evidence to suggest that excess amplitude modulation will occur as a result of the proposal and there is no established method of accurately forecasting whether the phenomenon will occur or not. Against that background, SKWF points to Planning Policy Statement 23: *Planning and Pollution Control* (PPS23) and the advice in paragraph 6 that the precautionary principle should be invoked when: there is good reason to believe that harmful effects may occur; and the level of scientific uncertainty is such that the risk cannot be assessed with sufficient confidence to inform decision-making. That may be correct in terms of the areas that PPS23 is intended to address but PPS23 paragraph 1 is very clear that noise is covered by Planning Policy Guidance: *Planning and Noise* (PPG24). Moreover, PPS22 makes it clear in paragraph 22 that ETSU-R-97 is to be used to assess and rate noise from wind energy development. Neither of these documents suggest that conditions to address excess amplitude modulation are necessary. I recognise that PPS22 and ETSU-R-97 (and for that matter PPS23) predate more recent thinking on the issue of amplitude modulation but the Government has not seen fit to alter their advice in PPS22. Against that overall background, I see no good reason to apply the precautionary principle and attach conditions to address the possibility of excess amplitude modulation. In the light of Government guidance, such conditions would not meet the test of necessity set out in Circular 11/95.

Appendix: Ref 18c. Kirkharle, Northumberland.
Decision Date 4th November 2011.
8 Wind Turbines, 125m to tip.

Appeal Ref: APP/P2935/A/10/2136112
Land to the east of Bavington Hill Head Farm and land to the west of Northside Farm, near Kirkharle, Northumberland, NE19 2AY

Whether an 'excess amplitude modulation' condition should be imposed

106. Turning to the matter of excess amplitude modulation and whether the imposition of such a condition on any approval would be appropriate, much is made of the Den Brook appeal decision and the later consideration of Hulme in the Court of Appeal. The paper by MAS Environmental, offers observations on the interpretation of the Den Brook amplitude modulation condition, and also provides a critique of the expert noise evidence presented by the appellant. However, it could not be tested and it therefore merits limited weight.

107. The crucial point emerging is that the Court of Appeal found that the Inspector in the Den Brook case had set out his explanation for imposing the condition in question. However, the phenomenon of excess amplitude modulation is difficult to predict and quantify; there is no consensus amongst experts; the Council favours the route of Statutory Nuisance rather than the imposition of a condition; and the decisions of the Secretary of State, which post-date Den Brook and Hulme, do not apply such conditions.

108. There is no evidence to demonstrate that the proposed wind farm would result in excess amplitude modulation with consequential adverse effects on the living conditions of local residents. Indeed, the AECOM Report[14] explains that *'there is to date (despite research by numerous investigators over the last 20 years[15]) no universally accepted explanation as to the causes of AM or means to predict its occurrence'*.

109. Moreover, it comes to the conclusion, drawing on the Salford University Study[16], that *'it appears clear that whatever the actual number of occurrences of AM, it only occurs at a minority of wind farm sites for some of the time'*. Imposition of a condition, merely as a precaution and without demonstrable evidence, would therefore fail the test of necessity.

110. The AECOM Report, in the knowledge of the Den Brook decision and the imposition of the AM condition[17], explains that the method therein, *'may provide a starting point ……, although it does not represent a validated method of assessing the significance of any impact or effect on amenity ……'* . Without common understanding and an agreed methodology, there must be some considerable doubt about the validity of an excess amplitude modulation condition on the grounds of enforceability and precision.

111. In addition, the measure of duplication with Statutory Nuisance legislation, and the very telling lack of support from the local planning authority for an excess amplitude modulation condition, could render a condition to be unreasonable.

Interim conclusions on the noise issue

112. Although a considerable number of additional noise-related points were raised by KREF it was conceded that none amounted to a justifiable reason to refuse planning permission. I see no reason to disagree as many of the concerns would be subsumed by the imposition of a condition setting specific noise limits.

113. On the matters of substance, I conclude that a condition on any approval limiting the day time absolute level to 37dB(A) would strike the right balance; the cumulative impact of Kirkharle, taking account of the small turbine at Cocklaw Walls, would not have a materially damaging effect on local living conditions; and there is no basis to impose an excess amplitude modulation condition.

Appendix: Ref 18d. Langford Bedfordshire,
10 turbines, 110m to blade tip.
Decision Date: 19th January 2012

Appeal Ref: APP/P0240/A/11/2150950
Land to the north of Edworth Road, Langford, Bedfordshire (GR Easting 520500, Northing 241000)

Amplitude Modulation

55. Amplitude Modulation (AM) or "blade swish" is an aspect of the aerodynamic noise from wind turbines that can be particularly noticeable or insistent but which is still not fully understood. ETSU recognises the phenomenon and the recommended noise levels are set to take account of it. The Council are concerned that there is a particular risk of Excess Amplitude Modulation at Langford and that if the appeal proposal were approved it should be controlled by condition.

56. However, although the Council's acoustic witness contended that there was general acceptance that EAM occurred at 10-16% of wind farms nationally, no cogent evidence was advanced to support that figure. A study by the University of Salford in 2007 [17] considered that AM could be a factor in 4 of the 133 wind farms then operational in the UK and a possible factor in another 8. It concluded that the incidence of AM in the UK was low. Even taking account of the Council's acoustics witness' criticism that the study may have underestimated the incidence of the phenomenon, and his assessments at certain wind farm sites, there is no real challenge to that conclusion. Importantly too the Government have seen no reason to change advice in PPS22 on using the ETSU methodology in response to the Salford report[18].

57. Nor is there any evident reason why the appeal site should be particularly prone to EAM. Although it was suggested that it was likely to be common in flat eastern parts of the country and could be exacerbated by wind shear and linear layout or particular spacing of turbines, these assertions were not supported by evidence. And although the proposed layout does indeed include two separate lines of three turbines this does not appear to me to really constitute a linear layout in any real sense.

58. As I am not convinced that there is a real possibility of EAM at the site I consider that the Council's suggested condition to control it does not pass the test of necessity in Circular 11/95. If there is no clear need for it it cannot be justified on a precautionary basis or because to impose it would "cause no harm"; nor do parallels drawn with the Den Brook case[19] advance the argument appreciably. I also have doubts as to whether such a condition would meet the Circular tests of enforceability and precision in that, despite what the Council's acoustics witness said about being able to identify EAM and distinguish it from other noise, this would appear to depend so heavily upon individual judgement as to render the approach unsafe.

Appendix: Ref 18e. Woolley Hill, Huntingdon,
4 no. 3 blade turbines, 130.5m to blade tip.
Decision Date: 23rd March 2012

Appeal Ref: APP/H0520/A/11/2158702
Land east of Whitleather Lodge, Woolley Hill, Ellington, Huntingdon, Cambridgeshire, PE28 0UD[3]

(e) Noise

133. A common strand amongst objections is the effects of noise from the proposed wind farm and the adequacy of the noise predictions. The Environmental Statement concludes *'The proposed wind farm therefore complies with the relevant guidance on wind farm noise[17] and the impact on the amenity of all nearby properties would be regarded as negligible'*. The Council concur; and in the absence of any convincing technical evidence to the contrary, I agree.

134. I return to the need to secure restrictions on maximum noise levels, based on those predicted, in my consideration of conditions.

183. A further matter arises in relation to the consideration of imposing a condition to provide a remedy for any excess amplitude modulation or noise that might occur over and above the normal level of blade swish noise. It is common knowledge that there have been instances at some wind farms of reported noise characteristics which could not be attributed to normal blade swish. Although Government sponsored research[19] suggested a relatively low incidence of occurrences (evident in 4 and possibly another 8 sites out of a total of 133) these findings were based on descriptions of noise characteristics and later re-interpretation of the data has suggested that the incidence might be as high as 25%.

184. Whilst several potential causes have been identified, and despite the study undertaken by Salford University, there remains no consensus as to the trigger for excess amplitude modulation and research is continuing. Moreover, there appears to be a greater likelihood of occurrences at night, inside dwellings, associated with sleep disturbance; but investigation within buildings is very limited.

185. In this regard, the once favoured theory that turbines in a linear pattern might be more susceptible, as a result of successive turbines operating in disturbed air, has been discredited as excess amplitude modulation has been observed with a single turbine. Other variables are likely to include:- wind direction; topography; distance from dwellings; and background noise levels, with the experience potentially more apparent in areas of low background noise, which is not the case in the locality of the appeal site.

186. The recognised guidance for wind farm noise assessment is ETSU-R-97 which accepts a certain level of increased noise at residential properties. It also anticipates an element of amplitude modulation which is widely claimed to be no longer adequate for modern, much larger, wind turbines. However, it remains as current guidance, endorsed by Government, and there is nothing of material weight to supplement it or to replace it.

187. *Circular 11/95: The Use of Conditions in Planning Permissions* indicates that *'…… a condition ought not to be imposed unless there is a definite need for it'*. As the likelihood of excess amplitude modulation manifesting itself cannot be predicted, and there is nothing to suggest that Woolley Hill would be particularly prone, or even likely, to such tendencies, the imposition of a condition cannot be claimed to be necessary in the sense of mitigating foreseeable impacts. Similarly, asking the question *'whether planning permission would have to be refused if the condition were not to be imposed'* the answer would be *'no'* as there would be no evidence of demonstrable harm.

188. The Circular acknowledges that in some cases a condition is clearly unnecessary but in others *'the lack of need may be less obvious and it may help to ask whether it would be considered expedient to enforce against a breach'*. Here, if a condition were to be imposed and if its terms were to be breached with resultant harm to the living conditions of one or more local residents, the answer is likely to be *'yes'*.

189. The Circular goes on to advise that *'conditions should be tailored to tackle specific problems ……'*. In this regard the 'specific problem' would relate to the interference with residential amenity beyond a defined acceptable level. However, with so little understanding of excess amplitude modulation, any condition set would be somewhat arbitrary, particularly as the trigger for alleged non-compliance would be the subjective response of an individual.

190. A further test of necessity is whether the condition would duplicate the effect of other controls, notably through the action of statutory nuisance. Whilst this might provide a remedy, it operates in a different regime to land use planning considerations based on a 'reasonable user' test and the defence of 'best practicable means'. It is further complicated by the current limited state of knowledge on excess amplitude modulation; any potential action is likely to be complex and drawn-out; and the penalties available to the court are limited to fines.

191. Drawing this together, ETSU-R-97 takes account of amplitude modulation in noise levels and research in 2007 saw nothing of sufficient consequence to cause this to be changed. However, excess amplitude modulation has been known to occur with no apparent commonality or accepted cause; impacts are potentially serious; and the ability to secure a remedy within defined limits is a reasonable expectation in terms of protecting residential amenity.

192. Whether or not an excess amplitude modulation condition would be necessary or precautionary is a matter of fine balance as the possibility of occurrence, or absence, cannot be gauged. In this particular case, the clamour for a condition is largely based on the experience of limited, largely unexplained, problems elsewhere; the doubts cast on the Salford study; and the example of Den Brook[20] where an Inspector imposed two conditions relating to *'greater than expected amplitude modulation immissions'*. The shortcomings of the statutory nuisance process are also a factor.

193. However, none of these aspects, compounded by the lack of understanding on excess amplitude modulation, provide good reason for the imposition of a condition as a matter of routine or precaution. To my mind, on the basis of the evidence before me, the test of necessity has not been fully met.

194. Continuing to assess whether a condition could be framed to be precise, enforceable and reasonable, the condition preferred by the Council and by WHAG is based on the conditions imposed in the Den Brook appeal. The effect would be to restrict amplitude modulation to no more than 3dB occurring within a 2 second period; and subject to other provisos. In this regard the condition would set a precise level.

195. However, the point at issue is the ability to detect and measure amplitude modulation from other noise; and with background noise levels above or close to predicted turbine noise levels, detecting a 3dB variable might be an indeterminate or inexact task. Although accompanying supplementary audio recordings could be of benefit, the often intermittent nature of excess amplitude modulation would be a further complicating factor.

196. Moreover, even with a measurement of apparent excess amplitude modulation, the preceding process would have followed from a subjective complaint and a complex test. Added to this, whilst ETSU-R-97 makes an allowance of 3dB when measured close to a wind turbine it explains that this would be expected to decrease further away. Nonetheless, it is admitted that an increase in the modulation depth has been perceived at remote locations affected by reflection; and that the modulation depth might be as much as ± 6dB(A).

197. The authors of ETSU-R-97 acknowledged that there was insufficient data available, at that time, to formulate an accurate measurement for blade swish where it occurs; and indicated that it was envisaged that further research would be required to enable proper measurement and assessment to be devised.

198. Despite the considerable passage of time since the publication of ETSU-R-97 the acoustic industry is no further forward with excess amplitude modulation; other than a growing awareness and a recent programme of work designed to establish a better and properly objective assessment process.

199. All these factors, bearing on the inexact allowance of 3dB in ETSU-R-97, which is not necessarily coincidental with excess amplitude modulation, subjective reaction, the technicalities of measurement, and an admission of needing a fully fit for purpose methodology, point to material drawbacks in imposing the condition sought by the Council and by WHAG.

200. Although the Renewable Energy Foundation, in a published information note on the Den Brook conditions, which includes a dataset indicating a breach of the maximum level, claims that the conditions could be employed in a transparent and objective manner, its views do not fully overcome the reservations that I have expressed.

201. As to the alternative excess amplitude modulation condition proposed by the appellant, setting out a series of detailed time-related steps, this would also require subjective assessment without defined parameters and it would be imprecise.

202. Overall, without an agreed robust methodology for measuring excess amplitude modulation, based on convincing research, it would be unreasonable to impose a condition on such an uncertain basis.

203. In conclusion, despite the findings of the Inspector in the Den Brook case, the evidence presented to me does not provide convincing justification that an excess amplitude modulation condition would be necessary. In addition, such a condition, if imposed, would be unreasonable given the current limited knowledge and understanding of excess amplitude modulation and a lack of consensus beyond the guidance of ETSU-R-97.

Appendix: Ref 18f. Spring Farm Ridge, Greatworth and Helmdon,
5 turbines, 125m to blade tip.
Decision Date: 12th July 2012

Appeal Ref: APP/Z2830/A/11/2165035
Spring Farm Ridge, land to the north of Welsh Lane between Greatworth and Helmdon

70. Amplitude Modulation (AM), sometimes referred to as blade swish or thump, is a phenomenon, the occurrence and effect of which are difficult to predict. Nevertheless, the recommended maximum noise levels in ETSU-R-97 take account of character of noise that is described as blade swish. The Salford University Report Research into Aerodynamic Modulation of Wind Turbine Noise concludes that AM was not generally a factor in noise complaints. There was no conclusive evidence that excess AM would occur, therefore possible excess AM does not carry much weight in my determination of this appeal. However, maximum noise levels could be controlled by condition.