

- 9.59. The displacement zone does not impinge on the Coir' an Eoin SSSI. There are ongoing studies to investigate whether golden plovers breeding on the SSSI use the proposed development site. In the meantime, it is assumed that there will be no displacement impacts on golden plover breeding in the SSSI.

#### **Snow Bunting**

- 9.60. Effects on snow buntings are likely to involve small numbers of birds during the non-breeding period. The magnitude of this impact is considered to be **negligible**.

#### **Collision**

- 9.61. Collision is considered most likely in the case of highly aerial species (golden eagle and peregrine). The level of collision will depend on the extent to which birds are displaced and the ability of birds to detect and manoeuvre around rotating turbine blades. Birds that collide with a turbine are likely to be killed or fatally injured. This may in turn affect the productivity of bird populations.
- 9.62. The extent to which birds are able to avoid collision with wind turbines has not yet been adequately quantified. The indications from studies so far (reviewed by Crockford 1992, Benner et al 1993, Winkelman 1994) are that collisions are rare events and occur mainly at sites where there are unusual concentrations of birds and turbines, or where the behaviour of the birds concerned leads to high-risk situations. Examples include migration flyways, other situations where large numbers of birds may be flying at night or in poor visibility (e.g. tidal feeding movements), areas where the food resource is exceptional, "wind wall" turbine layouts, and the use of lattice towers by perching birds. None of these situations apply to Gordonbush.

#### **Golden Eagle, Peregrine**

- 9.63. Only six observations were made of golden eagles flying over the site during over 70 hours observation (see **Appendix 9.1**). Peregrines were recorded only once. It would be expected that both species display a high degree of awareness and avoidance of the operational turbines. In view of the low levels of usage of the site, and their flying characteristics and aptitudes, it is predicted that the magnitude of collision impacts in respect of golden eagle and peregrine is **low**.

#### **Golden Plover, Snow Bunting**

- 9.64. Unlike foraging raptors, golden plover and snow bunting do not spend prolonged periods of time flying at turbine rotor height. Hence, it is predicted that the probability of golden plover or snow bunting colliding with a turbine is **low**.

#### **Future situation without the scheme**

- 9.65. If it is assumed that the existing land management of the site is continued, few site-specific changes in bird populations are predicted during the medium to long term (up to 25 years). Trends that are likely to affect bird populations more generally are summarised in **Table 9.6**.

**Table 9.6. Population trends for species occurring at Gordonbush. Details are shown for breeding species of moderately high, high or very high nature conservation importance.**

Species	Population trend
Golden Eagle	Following historical decline (due to persecution), then recovery after First World War (Holloway 1996), the Scottish golden eagle population is currently stable (Dennis et al 1984, Watson et al 1989, Gibbons et al 1993).
Golden plover	The population trend is poorly understood, although there has been a marked contraction in the species' range between 1968-72 and 1988-91 (Gibbons et al 1993). Declines have been evident in some areas due to forest re-establishment.

#### **Significance of Effects**

- 9.66. Effects are evaluated in accordance with paragraph 9.27. For each potential effect identified, significance is determined by taking account of the predicted spatial and temporal impact magnitude(s) and the nature conservation importance of the affected species. Where appropriate, significance is moderated according to the trends in the species' population.

#### **Golden Eagle**

- 9.67. Impact magnitude is considered to be low during the short and longer terms. The nature conservation importance of golden eagle is considered to be high. At most, one breeding pair could be affected. The significance of likely effects is judged to be **moderately low**.

#### **Peregrine**

- 9.68. Impact magnitude is considered to be low during the short and longer terms. The nature conservation importance of peregrine is considered to be moderately high. There are no breeding pairs close to the proposed development. The significance of likely effects is judged to be **low**.

#### **Golden plover**

- 9.69. Impact magnitude is considered to be very high during the short-term and high during the medium and long term. The nature conservation importance of golden plover is considered to be moderately high. It is estimated that approximately 25 breeding pairs are likely to be affected in the short-term and 15 pairs in the medium to long term. The short-term losses represent, at most, 0.6% of the regional golden plover population (see 9.33). Pending the results of further studies it is assumed that no golden plover breeding within the Coir' an Eoin SSSI /Caithness and Sutherland Peatlands SPA will be affected. Overall, the significance of likely effects is judged to be **moderately high**.

#### **Snow bunting**

- 9.70. Impact magnitude is considered to be negligible during the short-term and longer terms. The nature conservation importance of snow bunting is considered to be moderately high. There are no breeding pairs likely to be affected by the proposed development. The significance of likely effects is judged to be **very low**.

## MITIGATION

- 9.71. No practical mitigation measures with respect to golden plover have been identified and as a result, the residual effects would remain the same.

## SUMMARY AND CONCLUSIONS

- 9.72. The development is likely to have a significant adverse effect on golden plover, based on conservative assumptions. However, pending the results of ongoing studies, it is considered unlikely that the development will adversely affect the integrity of the Coir' an Eoin SSSI or Caithness and Sutherland Peatlands SPA.
- 9.73. No other significant effects are anticipated.

## REFERENCES

Benner, J.H.B., Berkhuizen, J.C., de Graaf, R.J. and Postma, A.D. (1993). *Impact of wind turbines on birdlife*. Report no. 9247. Consultants on Energy and the Environment, Rotterdam, The Netherlands.

Cramp, S. and Simmons, K.E.L. (1983). *Handbook of the Birds of Europe, the Middle East and North Africa: the birds of the Western Palearctic*. Volume III (Waders to Gulls). Oxford University Press, Oxford.

Crockford, N.J. (1992). A review of the possible impacts of wind farms on birds and other wildlife. *JNCC report no. 27*. JNCC, Peterborough.

Dennis, R.H., Ellis, P.M., Broad, R.A. and Langslow, D.R. (1984). The status of the Golden Eagle in Britain. *British Birds* 77: 592-607.

Gill, J.P., Townsley, M. and Mudge, G.P. (1996). Review of the impacts of wind farms and other aerial structures upon birds. *SNH Review* 21: 68pp.

Gibbons, D.W., Reid, J.B. and Chapman, R.A. (1993). *The New Atlas of Breeding Birds in Britain and Ireland: 1988-91*. Poyser, Berkhamsted.

Gregory, R.D., Wilkinson, N.I., Noble, D.G., Robinson, J.A., Brown, A.F., Hughes, J., Procter, D.A., Gibbons, D.W. and Galbraith, C.A. (2002). The population status of birds in the United Kingdom, Channel Islands and Isle of Man: an analysis of conservation concern 2002-2007. *British Birds* 95: 410-450.

Holloway, S. (1996). *The Historical Atlas of Breeding Birds in Britain and Ireland 1875-1900*. Poyser, London.

Leddy, K.L., Higgins, K.F and Naugle, D.E. (1999). Effects of wind turbines on upland nesting birds in conservation reserve program grasslands. *Wilson Bull.* 111(1): 100-104.

Percival, S.M. 1998. Birds and Turbines: managing potential planning issues. *Proc. of the 20th BWEA Conference 1998*: pp 345-350.

Phillips, J.F. (1994). *The effects of a wind farm on the upland breeding bird communities of Bryn Tytli, mid-Wales: 1993-4*. Unpublished report for National Windpower.

Ratcliffe, D.A. (1976). Observations on the breeding of the Golden Plover in Great Britain. *Bird Study* 23: 63-116.

Ratcliffe, D.A. (1990). *Bird Life of Mountain and Upland*. Cambridge University Press, Cambridge.

Regini, K. (2000). *Guidelines for ecological evaluation and impact assessment*. *Ecology and Environmental Management*. In *Practice*, 29 (September), pp. 1, 3-7. Winchester, Institute of Ecology and Environmental Management.

SERAD 2000 Birds and Habitats Directives. Nature Conservation: Implementation in Scotland of EC Directives on the conservation of natural habitats and of wild flora and fauna and the conservation of wild birds. Scottish Executive Rural Affairs Dept., Edinburgh.

Shepherd, K.B. (2001). *Hare Hill Windfarm, New Cumnock, Ayrshire: Breeding bird monitoring 2001*. Report to Scottish Power plc, Glasgow.

Shepherd, K.B. (2002). *Hare Hill Windfarm, New Cumnock, Ayrshire: Breeding bird monitoring 2002*. Report to Scottish Power plc, Glasgow.

Shepherd, K.B., Batchelor, P.K., Hulka, S., Stirling, J.P., Watson, D. & Whitfield, P. (1995). *A survey of moorland breeding birds on the Isle of Lewis, Outer Hebrides, Scotland in 1995*. RASD Commissioned Research Report, Scottish Natural Heritage.

Shepherd, K.B. and Whitfield, D.P. (1996). *A survey of moorland breeding birds on the Isle of Lewis, Outer Hebrides, Scotland in 1996*. RASD Commissioned Research Report, Scottish Natural Heritage.

SNH (2000). *Natural Heritage Zones*. Scottish Natural Heritage, Battleby.

Stone, B.H., Sears, J., Cranswick, P.A., Gregory, R.D., Gibbons, D.W., Rehfish, M.M., Aebischer, N.J. and Reid, J.B. (1997). Population estimates of birds in Britain and in the United Kingdom. *British Birds* 90: 1-22.

Stroud, D.A., Reed, T.M., Pienkowski, M.W. and Lindsay, R.A. (1987). *Birds, Bogs and Forestry: the peatlands of Caithness and Sutherland*. Nature Conservancy Council, Peterborough.

Vauk, G. (1990). Biological and ecological study of the effects of construction and operation of wind power sites. *Jahrgang/Sonderheft*, Endbericht. Norddeutsche Naturschutzakademie, Germany.

Watson, A., Payne, S. and Rae, R. (1989). Golden Eagles *Aquila chrysaetos*; land-use and food in northeast Scotland. *Ibis* 131: 336-348.

Williams, I. and Young, A.J. (1997). *Trannon Moor ornithological studies*. RSPB report to: Powys County Council, Powys.

Winkelmann, J.E. (1994). Bird/wind turbine investigations in Europe. *Proc. of the National Avian Wind Power Planning Meeting*, Denver, Colorado: pp 43-48.

Young, A.J. (1999). *Trannon Moor Ornithological Survey*. Unpublished report, RSPB Wales.

## 10. NOISE

### INTRODUCTION

- 10.1. This Chapter assesses the potential noise effects of the proposed Gordonbush windfarm. Noise is defined as sound that is unwanted by the recipient in any given situation.
- 10.2. The scope of the assessment includes operational noise from rotating turbines, and construction noise from construction plant, borrow pit activities, and construction traffic. The area considered is therefore the site and its immediate environs, and parts of the access track which are sensitive to noise.
- 10.3. Vibration effects are not considered since, due to the nature of the windfarm operations and the large distances between the windfarm and its nearest neighbours, these will be insignificant.
- 10.4. This chapter relates to the Traffic, Transport and Access Chapter (Chapter 12), in terms of traffic noise.
- 10.5. This part of the assessment has been undertaken by Hoare Lea Acoustics (HLA). A fuller description of relevant experience is provided in **Appendix I.1**.

### POTENTIAL SIGNIFICANT EFFECTS

- 10.6. Wind turbines may emit two types of noise. Firstly aerodynamic noise, which is a natural sounding noise produced by the movement of the rotating blades through the air; and secondly mechanical noise, which may emanate from gearboxes and generators. There has been rapid progress in reducing both aerodynamic and mechanical noise from wind turbines, and new designs are much quieter than those of a few years ago. Mechanical noise in particular is negligible from modern turbine designs. Aerodynamic noise is usually only perceived when the wind speeds are fairly low. In higher winds, it is generally masked by the normal sound of wind blowing through trees and around buildings.
- 10.7. In contrast with the operational noise from the windfarm, noise associated with construction activities is of a transient nature and its potential impact is therefore assessed differently. Examples of construction related activities that may create audible noise at closely located properties include the winning of stone from borrow pits, the use of mobile and fixed construction plant on site for the preparation of access tracks and the construction of the turbines themselves, vehicular traffic movements both on-site and also accessing the site, and all other construction processes.
- 10.8. **Table 10.1** identifies potential noise effects of the windfarm. Potential effects are those which could result from the construction and operation of a windfarm, according to the project, site and receptor characteristics and their interactions, and their inclusion in **Table 10.1** does not imply that they will occur, or be significant at Gordonbush. The assessment is based upon an assessment of the potential effects, in order to identify predicted effects.

**Table 10.1 Summary of Potential Effects on Noise and Vibration**

- Construction noise including: borrow pit activities; construction plant, and traffic;
- Aerodynamic and mechanical noise from operational turbines.

### CONSULTATION

- 10.9. The potential noise impact of the windfarm is subsequently shown to be insignificant when assessed in accordance with acknowledged standard noise impact assessment procedures. No specific issues were raised during the scoping process. It has therefore been unnecessary to enter into detailed technical consultation with local authorities or other parties.

### POLICY CONTEXT

- 10.10. General guidance and policy concerning noise associated with new developments in Scotland is presented in the following documents:
- Circular 10/1999 *Planning and Noise*<sup>i</sup>;
  - Planning Advice Note (PAN) 56: *Planning and Noise*<sup>ii</sup>;
- 10.11. Paragraph 34 of PAN56 refers to noise from windfarms, stating:
- 'Good acoustical design and siting of turbines is essential to ensure there is no significant increase in ambient noise levels as they affect the environment and any nearby noise-sensitive property.'*
- 10.12. Specific advice about windfarms, with reference to the potential impact of noise, is included in:
- National Planning Policy Guideline (NPPG)6: *Renewable Energy*<sup>iii</sup>;
  - Planning Advice Note (PAN) 45: *Renewable Energy Technologies* (revised 2002)<sup>iv</sup>.
- 10.13. Paragraphs A27 to A37 in Annex A of PAN45 present a discussion of the broad issues surrounding the assessment of noise from windfarms. This discussion concludes that the use of BS4142:1997, which is traditionally used for the assessment of industrial noise affecting residential areas, is generally inappropriate for windfarms, and that assessments should be undertaken by reference to the nature and character of the area, with the concluding statement:
- 'Experience has shown that there is unlikely to be a significant noise problem for any noise sensitive property situated further than 350-400 metres from the nearest turbine. Lesser separation distances may be acceptable depending on the turbines used and the specific conditions at a site.'*
- 10.14. Advice about the impact of noise from construction and quarrying activities is included in:
- NPPG 4: *Land for Mineral Working*<sup>v</sup>;
  - BS5228:1997: *Noise and Vibration Control on Construction and Open Sites*<sup>vi</sup>.
- 10.15. Over recent years many windfarms have been constructed within the UK and a better understanding has been gained into what constitutes an acceptable level of noise from these types of development. As a result of this increased understanding, a methodology for assessing the impact of noise from windfarms has been formulated by the Department of

Trade and Industry. This methodology was developed by a noise working group (NWG) that comprised a cross section of interested persons including, amongst others, environmental health officers, windfarm operators and independent acoustic experts. The outcome recommendations are presented in the DTI Noise Working Group report “*The Assessment and Rating of Noise from Windfarms*”<sup>vii</sup>.

10.16. The methodological approach published in the report of the Noise Working Group is recommended in NPPG6 as the appropriate good practice that should be adopted in the assessment of wind turbine noise impact in Scotland.

10.17. The basic aim of the Noise Working Group in arriving at the recommendations contained within the report was, in accordance with relevant Scottish policy advice <sup>iii</sup> the intention to provide:

*‘Indicative noise levels thought to offer a reasonable degree of protection to windfarm neighbours, without placing unreasonable restrictions on windfarm development or adding unduly to the costs and administrative burdens on windfarm developers or local authorities.’*

10.18. The DTI Noise Working Group report makes it clear from the outset that any noise restrictions placed on a windfarm must balance the environmental impact of the windfarm against the national and global benefits that would arise through the development of renewable energy sources.

*‘The planning system must therefore seek to control the environmental impacts from a windfarm whilst at the same time recognising the national and global benefits that would arise through the development of renewable energy sources and not be so severe that windfarm development is unduly stifled.’*

## ASSESSMENT APPROACH

### Windfarm Construction Noise Impact Assessment

10.19. The analysis of construction noise impact is undertaken in accordance with BS5228 <sup>vi</sup>. This Standard contains a number of methodologies for undertaking the prediction of construction noise levels, using as the starting point tabulated noise output data for typical items of plant. These methodologies include for the calculation of construction traffic noise along access tracks and haul routes and also for construction activities at fixed locations, such as around the bases of turbines in the case of a windfarm or those in the immediate vicinity of a borrow pit in cases where stone is being won on site.

### Windfarm Operational Noise Impact Assessment

10.20. The DTI Noise Working Group recommendations, as presented in report ETSU-R-97<sup>vii</sup>, now provide a robust basis for assessing the noise implications of a windfarm and have become the accepted standard for such developments within the UK. This methodology has therefore been adopted for the present assessment.

10.21. In accordance with best practice <sup>iii</sup>, the operational noise impact assessment is undertaken by adopting the ETSU-R-97 <sup>vii</sup> methodology. In its comprehensive form, where there is a possibility of noise sensitive properties being significantly affected, this consists of the following stages:

- specify the type and noise emission characteristics of the wind turbines;

- specify the number and locations of the wind turbines;
- identify the locations of the nearest, or most noise sensitive, neighbours;
- measure the background noise levels as a function of site wind speed at the nearest neighbours;
- determine the quiet daytime and night-time criterion curves from the measured background noise levels at the nearest neighbours;
- calculate the noise immission levels due to the operation of the wind turbines as a function of site wind speed at the nearest neighbours;
- compare the calculated windfarm noise immission levels with the derived criterion curves and assess in the light of planning requirements.

10.22. Notwithstanding the foregoing ‘detailed’ assessment methodology, the DTI Noise Working Group Report additionally offers a ‘simplified’ assessment procedure that may be used under certain conditions. The NWG report advises that, if it can be demonstrated the noise immission levels at all noise sensitive receptor locations due to the operation of the wind farm do not exceed 35dB(A) at all wind speeds up to 12 metres per second, then this fact alone is considered to offer adequate protection to the amenity of residents and no further steps are necessary to measure the background noise level and to undertake the comparison between measured background noise levels and calculated windfarm noise immission levels.

10.23. During the scoping process a preliminary turbine noise assessment was undertaken. This assessment predicted that noise levels at the nearest noise sensitive properties would be considerably less than 35dB(A) due to the large minimum separation distances between the turbines and these properties. Therefore, in the case of the Gordonbush proposal, it is appropriate to adopt the ‘simplified’ methodology just described.

## EXISTING SITUATION

### General Context

10.24. Traffic on the A9 trunk road is the primary artificial noise source in the study area. Other sources include light local traffic and agriculture related activities. For these reasons the noise environment in the area can be described as being of largely rural nature, with naturally occurring noise generated by the interaction of the wind with trees and buildings increasingly becoming the dominant source of ambient noise as wind speeds increase.

10.25. The nearest inhabited property to the windfarm is at Ascoile, just over 4 km from the closest located turbine. There is also an uninhabited bothy at Craggie 3.8 km from the nearest turbine. There are also inhabited properties adjacent to the main construction traffic access routes, particularly along the A9 in Golspie and Brora.

### Field Assessment

10.26. On the basis of the calculated windfarm noise immission levels (reported subsequently) it has not been necessary to undertake measurements of the baseline noise levels in the vicinity of the windfarm as the predicted windfarm noise immission levels do not exceed 35dB(A) at any property at wind speeds up to 12 metres per second.

## ASSESSMENT OF POTENTIAL EFFECTS

### Windfarm Construction Noise

#### Assumptions

- 10.27. It has been assumed that the plant presented in the inventory included in the Transport Statement (**Appendix 12.1**) will be operating on the site. The plant will operate along the track routes during track construction, at borrow pit locations, and at sub-station, anemometer and turbine locations during foundation formation and turbine erection.
- 10.28. Typically, construction equipment are based on diesel engines which have more low frequency (63Hz to 250 Hz) noise content than domestic equipment. Plant sound power levels will typically range from  $L_{WA}$  100dB to  $L_{WA}$  120dB depending on type and operation mode. The items of plant are unlikely to operate at full load duty for more than 30% to 40% of the time they are in operation.
- 10.29. The stone extraction works is likely to involve drilling plant can be inherently noisy in operation, plus the use of excavating, screening and crushing plant. Such operations may be continuous throughout the working day. Typical noise levels of such plant are up to approximately  $L_{WA}$  120dB, making these item of plant amongst the noisiest likely to be employed in the construction of the windfarm. However, the plant is to be sited such that the potential impact of noise is minimised on the neighbours to the windfarm, the closest of which is, in any case, located around 4km away from the nearest turbine. In addition to excavating, drilling and crushing, depending on the characteristics there may also be a requirement to blast in some areas. The use of blasting should only occur around once a week over a period of approximately 7 months, and would only be undertaken at times that have been agreed in advance as being acceptable (often recommended as being between 10:00 to 16:00 Monday to Friday and 10:00 to 12:00 Saturdays). Planning advice concerning blasting activities is presented in Planning Advice Note PAN 50: Annex D: *Control of Blasting at Surface Mineral Workings*<sup>x</sup>. PAN 50 states that air overpressures of up to 130dB due to blasting activity are safe and are perceived as being such by those exposed to them. Due to the large distances between any blasting activities and the nearest residential properties, air overpressures will be well below the 130dB limit referred to in PAN 50. Also, the expected infrequent occurrence of blasts will render their impact as being of only minor significance.
- 10.30. Delivery vehicles generate noise levels in the order of  $L_{WA}$  108dB when in motion. However, these vehicles usually pass a reception point quite quickly thereby minimising their noise impact. When stationary or moving slowly they will ordinarily be in idle or at least a lower load condition which significantly lowers their noise output to the environment.
- 10.31. Details of vehicular activities associated with the construction of the windfarm are presented in **Chapters 6 and 12**.

#### Choice of Construction Noise Propagation Model

- 10.32. There are many methods available to predict noise propagation in the environment. For construction noise a defined method of prediction is contained in BS5228 (1997) *Noise and Vibration Control and Construction and Open Sites*<sup>vi</sup>. This document forms the basis for the majority of construction works assessments throughout the United Kingdom. The prediction method allows for assessment of:
- distance attenuation;

- defined working areas;
- power on-times;
- working average noise levels;
- screening.

- 10.33. In our opinion there is a tolerance for error of  $\pm 5$ dB(A) inherent in the methods of BS5228, and therefore the accuracy of information used to calculate the resultant levels should reflect this tolerance. Noise levels given for plant operations in BS5228 are based on site-measured activity and can be relied upon as the most appropriate starting point in propagation calculations.
- 10.34. The BS5228:1997 prediction model used is the static plant sound power level method, with the exception of the calculation of noise levels associated with vehicular movements onto and off the site. The size of the proposed site, together with the large minimum separation distances between the site and the closest located residences, allows the prediction model to assume a single location for each turbine work area for all plant. This is instead of calculating all the possible movements of vehicles in the vicinity of the turbine being constructed which, in any case, can not be precisely specified at this stage. Adopting this approach results in calculated noise levels within the overall accuracy of the prediction methodology.

#### Predicted Windfarm Construction Noise Immission Levels

- 10.35. An assessment has been undertaken utilising the noisiest items of plant it is anticipated will be used during the construction of the windfarm. Based on published typical sound power levels of 120dB(A) for stone crushing plant, and also accounting for a 4km separation distance between the plant and the nearest noise sensitive receptor, the plant will produce a noise level at the nearest receptor location of less than 40dB(A). Such a change would be considered negligible. Higher noise levels may be experienced when upgrading the access track which runs by the residential property at Ascoile. However, unlike the stone crushing activities which may last for extended periods during the construction of the windfarm, albeit at much greater distances from residential properties, access track upgrading will necessarily be completed in a short space of time at the start of the construction programme. The potential impact of access track upgrading will therefore be negligible.
- 10.36. In addition to the calculation of noise from static plant, calculations have also been undertaken of vehicle movements onto and off the site where vehicles pass closest to residential properties. In particular there are inhabited properties adjacent to the main construction access routes in Golspie and Brora.
- 10.37. It is presently estimated that during the peak periods of site activity there could be a total of 382 to 544 HGV movements over a month period (depending on aggregate or concrete option implemented respectively), or around an average of 16 to 23 HGVs per day. This number of HGV movements is calculated to result in  $L_{Aeq,10hr}$  noise levels of approximately 50dB(A) and 55dB(A) at the worst affected properties. At residences lying along the A9 this noise level will result in a negligible impact over and above the existing traffic noise. Along the minor roads leading to the windfarm site there are fewer residences to be affected. This factor, coupled with the necessarily much lower vehicle speeds along these minor roads, means that any noise impact will only be minor and temporary as individual vehicles pass by the residences. Impact from the movement of individual vehicles from where they turn off

the public road onto the windfarm site will be further limited through management measures, including the strict imposition of site speed limits.

### Windfarm Operational Noise

#### Assumptions

- 10.38. The operational noise assessment is based upon the noise specifications of the Vestas V80 2MW –105dB turbine, sited as in **Figure 6.1**. This turbine is a variable speed machine with a rotor diameter of 80m and a hub height of between 60m and 100m. A hub height of 67m has been selected for the present exercise. Due to its variable speed operation the sound power level of the Vestas V80 machine varies considerably with wind speed and is considerably quieter at the lower wind speeds.
- 10.39. The relevant acoustic details associated with the generic turbine selected for the assessment are summarised in **Tables 10.2 and 10.3**. This information has been extracted from the manufacturer’s data presented in reference <sup>viii</sup>.

**Table 10.2: Summary details of the sound power output of the candidate VESTAS V80-2MW-105dB wind turbine** <sup>(viii)</sup>

THIRD OCTAVE BAND Hz	A-WEIGHTED SOUND POWER LEVEL dB(A)
31.5	76.3
63	83.3
125	91.2
250	97.9
500	100.2
1000	98.8
2000	97.5
4000	92.4
8000	75.5
<b>OVERALL</b>	<b>105.1</b>

**Table 10.3: Octave band spectrum for the candidate VESTAS V80-2MW-105dB wind turbine under reference wind speed conditions ( $v_{10} = 8 \text{ ms}^{-1}$ )** <sup>(viii)</sup>

Wind speed at 10m height	3	4	5	6	7	8	9	10	11	12
Sound power level, L <sub>WA</sub>	90.0	93.5	99.1	102.6	104.2	105.1	105.7	106.0	107.2	107.9

#### Nearest Residential Neighbours

- 10.40. **Table 10.4** lists the coordinate locations of the nearest residential neighbours to the proposed windfarm site, together with the minimum distances from each of the selected properties to the nearest turbine. This is also illustrated in **Figure 10.1**. Note that the list also includes two uninhabited properties, namely the Village Hall at Kildonan and the bothy at Craggie.

**Table 10.4 Distances between the closest located properties and the nearest turbines**

PROPERTY LOCATION	OS EASTING	OS NORTHING	NEAREST TURBINE	DISTANCE, m
Ascoile	282500	911300	17	4047
Gordonbush	284500	909600	29	4137
Oldtown	285200	908900	29	4796
Kildonan Station	290200	921700	3	6341
Village Hall, Kildonan	290400	921800	3	6536
Kildonan	290700	921200	3	6239
Bothy, Craggie	287300	920200	3	3837

#### Choice of Windfarm Noise Propagation Model

- 10.41. Whilst there are several noise propagation models available, here the ISO 9613-2 model <sup>ix</sup> has been used to calculate the noise immission levels at the selected nearest residential neighbours<sup>1</sup>. This model has been identified as most appropriate for use in predicting far-field noise radiation from wind turbines in such rural sites<sup>2</sup>. The model takes account of:
- Geometric divergence;
  - Air absorption;
  - Reflecting obstacles;
  - Screening;
  - Vegetation; and
  - Ground reflections.
- 10.42. Whilst it is impossible to specify exact error bands on noise predictions, the ISO 9613-2 model was found to be the best available, both in flat and complex terrain. This model, like all the others, tends to over-estimate the noise at nearby dwellings. The overriding conclusion of the work undertaken as part of an EC research study was that the ISO 9613-2 algorithm tended to predict noise levels that would generally occur under downwind propagation conditions. The probability of non-exceedence of the levels predicted by the ISO 9613-2

<sup>1</sup> Noise levels arising from the operation of the proposed windfarm have been calculated using the ISO 9613-2 algorithm option in the Cadna commercial noise propagation software. The software package uses as its acoustic input data the octave band sound power output of the turbines and calculates, on an octave band basis, attenuation due to geometric spreading, atmospheric absorption, ground effects and barriers. Barrier effects include screening due to topographical features. To generate the ground cross sections between each turbine and each dwelling necessary for reliable propagation modelling, ground contours at 5m intervals for the area of interest have been generated from OS digital terrain data.

<sup>2</sup> The ISO 9613-2 algorithm has been chosen as being the most robust prediction method based on the findings of a recent joint European Commission research project into windfarm noise propagation over large distances. The title of the research project was “Development of a windfarm Noise Prediction Model”, JOULE project JOR3-CT95-0051. The project partners of this work included two independent, ISO9001 accredited acoustic consultancies, including Hoare Lea Acoustics.

algorithm was around 85%. The other important outcome of the research was to clearly demonstrate that under upwind propagation conditions between a given receiver and the windfarm the noise imission level at that receiver will be as much as 10dB(A) to 15dB(A) lower than the level predicted using the ISO 9613-2 algorithm.

- 10.43. For the purposes of the present assessment, all noise level predictions for both day and night have been undertaken using a receiver height of 4.0m above local ground level. This equates roughly to first floor window level.

**Predicted Windfarm Operational Noise Imission Levels**

- 10.44. **Table 10.5** shows the predicted noise imission levels,  $L_p$ , at each of the selected assessment locations for each 10m height wind speed from 2ms<sup>-1</sup> to 12ms<sup>-1</sup> inclusive. All windfarm noise imission levels in this report are presented in terms of the  $L_{A90,T}$  noise indicator in accordance with the recommendations of the NWG Report. The  $L_{A90,T}$  is the most commonly used measurement index for the assessment of the impact of environmental noise against the existing level of ‘background’ noise.

**Table 10.5: Windfarm noise imission levels at each of the selected assessment locations calculated in terms of the dB(A)  $L_{A90,T}$  noise levels at 4.0m height as a function of 10m height wind speed.**

PROPERTY LOCATION	WIND SPEED AT REFERENCE 10m HEIGHT ( $v_{10}$ ), ms <sup>-1</sup>									
	3	4	5	6	7	8	9	10	11	12
Ascoile	4.2	7.7	13.3	16.8	18.4	19.3	19.9	20.2	21.4	22.1
Gordonbush	3.1	6.6	12.2	15.7	17.3	18.2	18.8	19.1	20.3	21.0
Oldtown	1.5	5.0	10.6	14.1	15.7	16.6	17.2	17.5	18.7	19.4
Kildonan Station	-2.1	1.4	7.0	10.5	12.1	13.0	13.6	13.9	15.1	15.8
Village Hall, Kildonan	-2.7	0.8	6.4	9.9	11.5	12.4	13.0	13.3	14.5	15.2
Kildonan	-1.7	1.8	7.4	10.9	12.5	13.4	14.0	14.3	15.5	16.2
Bothy, Craggie	5.5	9.0	14.6	18.1	19.7	20.6	21.2	21.5	22.7	23.4

**EVALUATION OF NOISE EFFECTS**

**Windfarm Construction Noise**

- 10.45. The calculated noise levels arising from the construction of the on-site access tracks, winning stone from on-site borrow pits, the excavation and pouring of the turbine footings and the erection of the turbines themselves indicates that these activities are very unlikely to result in any significant noise effect, with daily averaged noise levels of typically less than 40dB(A) being predicted. This is due mainly to the large minimum separation distances between the construction activities and the closest located residences.
- 10.46. The calculated noise levels due to construction traffic movements onto and off the site is expected to be of only **minor** significance, producing indicative daily averaged noise levels of less than 55dB(A) at the worst affected properties. Noise imissions associated with individual vehicles passing by residential properties lying close to the site access tracks will be

controlled through management measures including strictly imposed site speed limits which have a major effect on vehicle noise outputs.

**Windfarm Operational Noise**

- 10.47. The results of Table 10.5 indicate that at all properties and at all wind speeds up to 12ms<sup>-1</sup> the calculated windfarm noise imission levels lie at least 10dB(A) below the NWG criterion of 35dB(A) for using the ‘simplified’ assessment procedure <sup>(vii)</sup>. It is therefore concluded that the location and layout of the windfarm, coupled with the choice of turbine, will result in the adequate protection to the amenity of even the closest located residents and windfarm operational noise effect will therefore be insignificant. This is largely due to the relatively large distances between the nearest residences and the closest located turbines of almost 4 km, which compares with the guideline distance of 350m to 400m recommended in PAN45 at which ‘there is unlikely to be a significant noise problem for any noise sensitive property’.

**MITIGATION**

- 10.48. Although there are not predicted to be any significant noise effects during construction, best practice will be adopted during the construction of the windfarm, in particular by:
- using suitable specification requirements in works contracts;
  - encouraging the use of noise suppressed construction equipment through management instructions;
  - strict imposition of vehicle handling management measures, including adherence to site speed limits where vehicles pass close by residential properties;
  - reducing the number of heavy vehicle journeys onto site by winning stone on site.

**SUMMARY AND CONCLUSIONS**

- 10.49. The acoustical effect of the operation of the proposed Gordonbush windfarm on the local environment has been assessed in accordance with the latest guidance on windfarm noise assessment as issued in the DTI publication ‘The Assessment and Rating of Noise from Windfarms’. The assessment has also accounted for other appropriate relevant standards and guidelines, including:
- Planning Advice Note (PAN) 56: *Planning and Noise*
  - Planning Advice Note (PAN) 45: *Renewable Energy Technologies*
- 10.50. The assessment has been undertaken of the noise impact at seven properties representative of the closest located properties to the site, although in the present context even the closest located inhabited property is in excess of 4 km from the nearest turbine.
- 10.51. The DTI Noise Working Group in their report ETSU-R-97 (now adopted as the recommended best practice for windfarm noise impact assessment in Scottish Planning Policy guidance) propose that, if it can be shown that the wind farm noise imission levels at all properties at all wind speeds up to 12ms<sup>-1</sup> do not exceed 35dB(A), then this fact in itself will offer adequate protection to the inhabitants of those properties.
- 10.52. Calculations of noise imission levels resulting from the operation of the proposed Gordonbush windfarm indicate that, even at the closest located property, the noise levels lie

greater than 10dB(A) below the NWG recommended lower limit of 35dB(A), even at wind speeds of 12ms<sup>-1</sup>. It is therefore concluded that the operation of the windfarm will have an **insignificant** effect on the noise amenity presently enjoyed by those residents of properties lying closest to the site.

10.53. The potential effect of noise generated through the construction of the windfarm, including associated open quarrying activity, has also been addressed. This noise effect has been initially assessed with reference to the guidance given in:

- National Planning Policy Guideline (NPPG)4 *Land for Mineral Working* <sup>(v)</sup>
- Planning Advice Note (PAN)56 *Planning and Noise* <sup>(ii)</sup>
- BS5228:1997 *Noise and Vibration Control on Construction and Open Sites* <sup>(vi)</sup>.

10.54. Formation of access tracks and general construction of the windfarm are unlikely to have any significant adverse noise and vibration effects. Vehicular access from local roads may have a minor effect to residential properties lying close to the access points to the site. However, this potential adverse effect will be managed through the imposition of good practice techniques, the management procedures for which will be agreed with the Local Authority in advance of commencing the works.

10.55. **Table 10.6** below summarises the potential effects, mitigation and residual effects of the windfarm in relation to noise:

**Table 10.6 Summary of the Effects of the Windfarm on Noise**

Effect	Significance	Mitigation	Residual Effect
Noise from construction activities	Insignificant	N/A	Insignificant
Noise from construction traffic accessing site	Minor, properties adjacent to local roads only away from the A9 main road	Management of timing, vehicle handling, speed	Minor
Noise from operational turbines.	Insignificant	N/A	Insignificant

## REFERENCES

- <sup>i</sup> Circular 10/1999, *Planning and Noise*, The Scottish Office, 1999
- <sup>ii</sup> Planning Advice Note PAN 56, *Planning and Noise*, The Scottish Office, 1999
- <sup>iii</sup> National Planning Policy Guideline NPPG6, *Renewable Energy*, The Scottish Office, 2002
- <sup>iv</sup> Planning Advice Note PAN 45: *Renewable Energy Technologies*, The Scottish Office, 1999
- <sup>v</sup> National Planning Policy Guideline NPPG4: *Land for Mineral Working*, The Scottish Office, 1994
- <sup>vi</sup> BS5228:1997: *Noise and Vibration Control on Construction and Open Sites*
- <sup>vii</sup> The Working Group on Noise from Wind Turbines: *The Assessment and Rating of Noise from Windfarms*, ETSU Report ETSU-R-97, 1996
- <sup>viii</sup> General Specification V80 – 2.0 MW Optispeed Wind Turbine, Vestas Ref: 944406.R8 (5b), 30<sup>th</sup> July 2001
- <sup>ix</sup> *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*, International Standards Organisation, ISO 9613-2, 1996
- <sup>x</sup> *Planning Advice Note PAN 50: Annex D: Control of Blasting at Surface Mineral Workings*, The Scottish Office, 2000



# GORDONBUSH WINDFARM

Scottish and Southern Energy

## Nearest Neighbour Locations

- ⊕ Turbine Location
- Substation
- Construction Compound
- ⊠ Permanent Anemometer Masts
- Borrow Pit
- Access Track

Property Location	Distance (m)	Nearest Turbine
A. Ascoile	4,047	17
B. Gordonbush	4,317	29
C. Oldtown	4,796	29
D. Kildonan Station	6,341	3
E. Village Hall, Kildonan	6,536	3
F. Kildonan	6,239	3
G. Bothy, Craggie	3,837	3

Scale 1:60,000

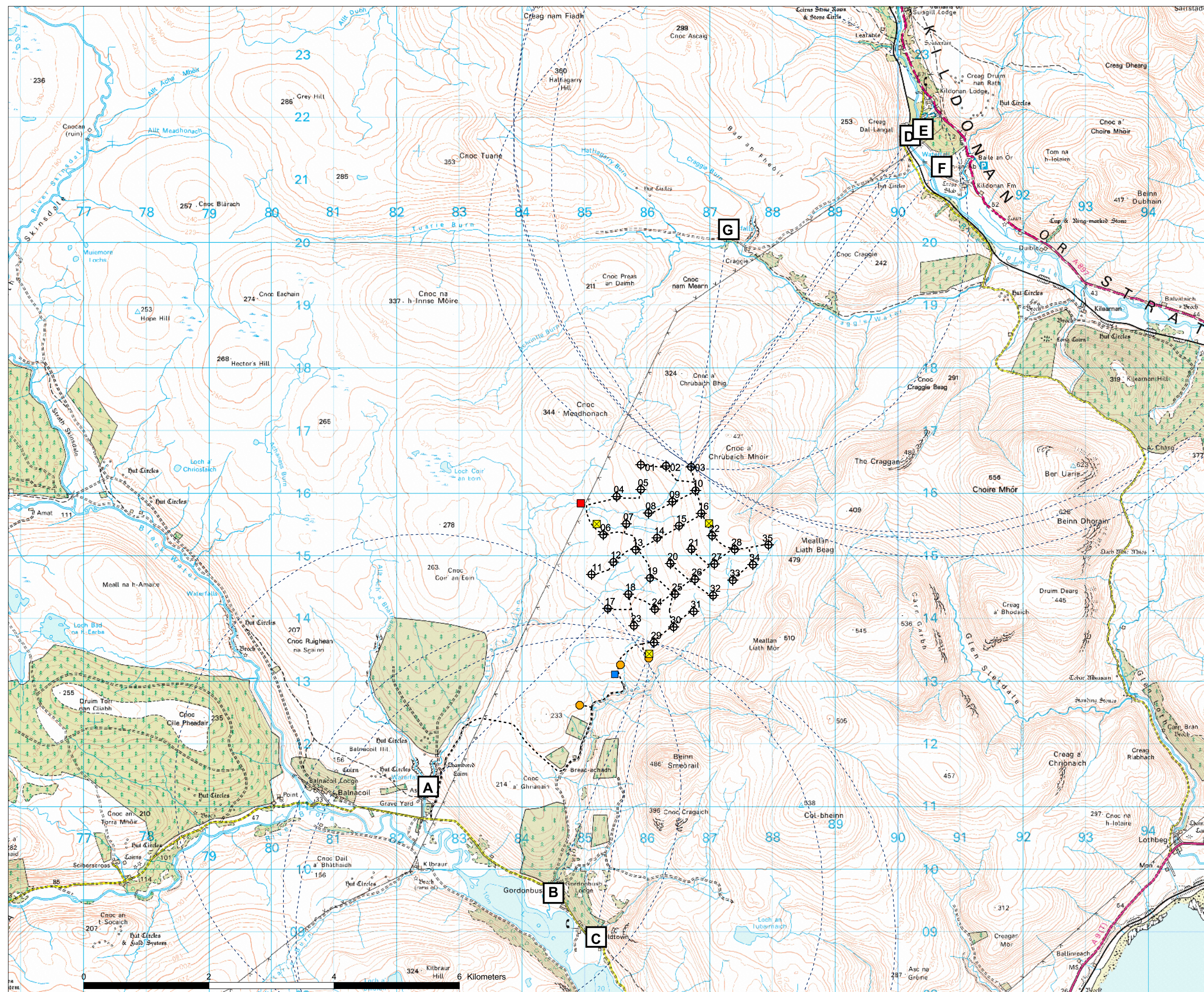


Figure 10.1

# 11. ARCHAEOLOGY AND CULTURAL HERITAGE

## INTRODUCTION

- 11.1. This chapter assesses the effects of the development on features of archaeological interest within the study area. This includes the existing archaeological remains and sites of interest, and the broader aspects of cultural heritage such as built heritage resources affected by the development. This includes consideration of the development in relation to known archaeological remains, including any Scheduled Ancient Monuments (SAMs) and their settings, and listed buildings affected by the development. The assessment includes an evaluation of known archaeology on and around the site and consideration of its potential importance. It describes the potential effects on these resources, and their potential significance. It also considers the potential for unforeseen archaeological remains on the site which could be affected by the development. An archaeological avoidance and mitigation strategy is also provided.
- 11.2. Elements of the development which have been taken into account to inform the assessment include the siting of the wind turbines and the formation of access tracks, borrow pits, control building / substation and the monitoring masts, and modification of the junction off the A9 at Brora. The study area for the assessment focuses on the site itself and considers its immediate environs. A 20 metre corridor around the development components formed the focus for the site based assessment.
- 11.3. The Chapter also considers cultural heritage and should be read in conjunction with the chapter on landscape and visual effects (**Chapter 7**). As well as linking with the Landscape and Visual Effects Assessment, this part of the assessment also relates to the recreation and tourism chapter.
- 11.4. This part of the assessment has been undertaken by Stuart Farrell (**Appendix I.1**).

## POTENTIAL SIGNIFICANT EFFECTS

- 11.5. **Table 11.1** identifies potential effects on archaeology. Potential effects are those which could result from the construction and operation of a windfarm, according to the project, site and receptor characteristics and their interactions, and their inclusion in **Table 11.1** does not imply that they will occur, or be significant at Gordonbush. The archaeology and cultural heritage assessment is based upon an assessment of the potential effects, in order to identify predicted effects.

**Table 11.1 Potential Significant Effects on Archaeology**

<ul style="list-style-type: none"> <li>• physical damage to sites or remains (partial or total removal);</li> <li>• severance of features, particularly linear features (e.g. field boundaries);</li> <li>• visual intrusion on any listed buildings, archaeological or historic sites or features, affecting their setting;</li> <li>• other indirect effects, for example those caused by disturbance from vibration, dewatering or changes in hydrology.</li> </ul>
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## CONSULTATION

- 11.6. The following relevant consultation responses were received and used to inform the archaeological assessment for the Gordonbush windfarm:

**Table 11.2 Summary of Consultation Responses relating to Archaeological Effects of the Development**

Consultee	Summary of Comments
Scottish Executive Enterprise and Lifelong Learning Consents and Emergency Planning Unit	Notes that the assessment should address effects on known and unknown archaeological sites, and that views to and from monuments within the ZVI should be considered as advised by Historic Scotland.  Recommends that the Landscape and Visual Assessment identifies any possible changes to the setting of historic monuments and designed landscapes.
Historic Scotland	Notes that the windfarm area does not include any scheduled ancient monuments, and provides details of two sites in the vicinity of the area.  Advises that the setting of SAMs and designed landscape within the ZVI requires to be taken into account as part of the assessment – including views of and from monuments  Provides an outline of relevant national policy and guidance which should be used to inform the assessment.
Highland Council	Note the potential for unrecorded sites of archaeological interest which could be affected by the development.  Suggest that a qualified archaeologist undertakes a walkover survey in order to identify features of archaeological interest (brief for the survey provided).  Recommend that survey results are submitted to the Council's Archaeology Unit to allow for further advice to be provided.
Clyne Heritage Society	Identified the need to take into account impacts on several additional resources. Highlighted the importance of taking into account effects arising from the access track and route from the A9 to the site.

## POLICY CONTEXT

- 11.7. The following policies provide a framework within which the archaeological assessment has been undertaken:
- NPPG5 *Archaeology and Planning* states that the preservation of ancient monuments and their setting is a material consideration in determining proposals for development. The NPPG provides guidance on determining applications of development which could have effects on sites, and scope for mitigation where necessary and appropriate.

- NPPG18 *Planning and the Historic Environment* considers wider issues associated with the historic environment, stating that planning authorities should ensure that planning applications are accompanied by information about the historical, architectural, environmental and archaeological significance of the site affected by proposals, so the effects of proposals can be fully evaluated.
- PAN42 *The Planning Process and Scheduled Ancient Monuments* focuses on development control and its role in safeguarding archaeological resources. It defines where remains should be preserved in situ, and where it may be appropriate to excavate and record them.
- Policy G6 of the *Highland Structure Plan* aims to promote and conserve archaeological features. Policy BC1 provides a further focus, emphasising the importance of preservation and recording sites where this is not possible.
- Paragraph 1.57 of the *South and East Sutherland Local Plan* notes the importance of cultural heritage features including listed buildings and archaeological features. Scheduled Ancient Monuments and Designed Landscapes are identified as being of national significance, with a high degree of protection being attached to them. Locally important archaeological sites are also identified in the plan, with paragraph 1.57 (c) stating that development proposals must have regard for such sites.

## ASSESSMENT APPROACH

### Overview

- 11.8. The key objectives of the assessment approach were to:
- evaluate known and potential archaeology and cultural heritage resources on and around the proposed site and to evaluate its importance;
  - describe what the potential impacts might be on these resources;
  - assess and describe the effects of the windfarm and its associated infrastructure on the known archaeological remains and to evaluate their significance;
  - formulate an appropriate avoidance and mitigation strategy.
- 11.9. These objectives were achieved through establishing the baseline and subsequently defining the potential effects of the development components on the current situation.

### Baseline Assessment

- 11.10. The baseline was established through a combination of desk study and field survey work. The work was undertaken following the Institute of Field Archaeologists Standards and Guidance.<sup>1</sup>

### Desk Study

- 11.11. The desk based assessment comprised:
- background research, focusing on references listed at the end of this Chapter;

- an examination of existing and aerial photographic coverage held at the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS);
- a search of the National Monuments Record for Scotland (NMRS) held at RCAHMS, which contains information on all known archaeological sites in Scotland, often cross referenced to other material such as early photographs;
- a search of the Highland Council's Sites and Monuments Record, Inverness;
- cartographic evidence held in the National Library of Scotland Map Room, Edinburgh;
- Highland Council Archives, Inverness and Inverness Library. The former also held other pertinent records, especially lists of estate papers that were used to inform the history of the Gordonbush Estate (see references at the end of the Chapter).

### Field Survey

- 11.12. An archaeologist undertook a thorough walkover survey of the area that would potentially be affected by the windfarm proposals. Any archaeological features encountered during the survey were mapped using a GPS handset and plotted onto OS Maps enlarged to 1:5000 scale. A photographic record and written description were also made. The survey report is provided as **Appendix 11.1**.

### Evaluation method

- 11.13. The evaluation of effects considered the proposed development and construction process, and operation of the windfarm in relation to the identified baseline conditions. The proportion of the site or feature affected, the integrity of site or features and the nature, potential and perceived heritage value of the site or feature were taken into account in the analysis of effects. The sensitivity of the receptors has been informed by the level of designation which each site has been afforded.

### Significance Criteria

- 11.14. Significance of effects on archaeology was identified through evaluation of the magnitude of impacts in combinations with sensitivity of the feature.
- 11.15. **Table 11.3** below summarises the magnitude criteria which were used for the assessment of impacts on archaeology. These criteria have been developed on the basis of professional judgement, informed by planning policy and other relevant guidance.

**Table 11.3 Criteria for Assessing Magnitude of Impacts on Archaeology**

Impact Magnitude	Definition
Major	Total loss or major alteration to key elements or features of the pre-development conditions, such that its post-development character or composition would be fundamentally changed.
Moderate	Loss or alteration of one of the key elements or features of the pre-development conditions such that its post-development character would be partially changed.
Minor	Slight alteration from pre-development conditions.
Negligible	Very slight or no change from pre-development conditions.

11.16. The sensitivity of the archaeological resource as a receptor of impacts depends on factors such as the condition of the site and the perceived heritage value/importance of the site. The sensitivity of sites can be graded according to its significance in policy terms as set out in NPPG5. These levels of sensitivity are defined in **Table 11.4**.

**Table 11.4: Criteria for Assessing Sensitivity**

Sensitivity	Scale
High	Sites of <i>National</i> policy importance
Moderate	Sites of <i>Regional</i> policy importance
Low	Sites of <i>Local</i> policy importance
Unknown	Other sites – archaeological sites of <i>unknown</i> policy importance

11.17. The sensitivity of the receiving environment, together with the magnitude of the impact, define the significance of the effect (**Table 11.5**).

**Table 11.5: Significance Criteria**

Effect significance	Sensitivity of receiving environment			
	Unknown	Low	Moderate	High
<b>Impact magnitude</b>				
<b>Major</b>	Unknown	Moderate	Major	Major
<b>Moderate</b>	Unknown	Minor	Moderate	Major
<b>Minor</b>	Unknown	Minor	Minor	Moderate
<b>Negligible</b>	Negligible	Negligible	Negligible	Negligible

11.18. This form of evaluation of significance criteria excludes the concept of ‘setting’. Because setting is largely a visual concept, issues of the setting of SAMs would normally be considered as part of the Landscape and Visual Assessment. This is discussed in more detail below.

## EXISTING SITUATION

### General Context

11.19. The Gordonbush Estate was formerly part of the sheep farm of Kilcalmkill, having been bought by the Duke of Sutherland from Joseph Gordon in 1812 (Adam, 1972). The name Gordonbush first appears in the County Valuation Rolls in 1884. The Gordon Family farmed Kilcalmkill as part of the Carrol Estate and papers belonging to them show charters dating back to 1553. Accounts and crop records are included in these papers.

11.20. The majority of archaeological sites in the vicinity of the development relate to a post-medieval agricultural landscape in the form of small farms with buildings, enclosures and sheepfolds, being later replaced by a larger sheep farm. The known archaeology of the area of the proposed windfarm is limited to a number of sites along the existing estate tracks, in the form of a number of small farmsteads, prehistoric sites including a cairn and possible hut circles. The small number of surviving prehistoric sites possible reflects the extent of the land that has been improved.

### Designations

11.21. There are no listed buildings, conservation areas or designed landscapes on or immediately adjacent to site. However, the Former Clyne Parish School in Brora adjacent to the proposed access road connecting the A9 with the site, is listed as a category C(S) listed building. The listing relates to the school itself as well as its boundary wall. The School dates from the 1870s and was built by the Sutherland Estate. In use as a school until 1903, the building is currently derelict.

11.22. There are no Scheduled Ancient Monuments on the site itself, although the wider area around the site is known to include archaeological remains which have designated status. As noted in the Scoping Response by Historic Scotland, this includes a Cairn on Balnacoil Hill, and a Tumulus near Ascoilebeg. The potential effect on the setting of these sites is considered in **Chapter 7**.

### Previous studies / data

11.23. A literature search was undertaken to identify published data. Only one site in the vicinity of the proposed windfarm (the chambered cairn at Allt a’ Mhuilinn) has seen any previous archaeological field survey, having been undertaken by Henshall in 1963 and later revised and re-planned by Henshall and Ritchie (1995). The overall area has undergone very little archaeological study, possibly due to its limited archaeological potential.

### Desk assessment

#### Maps and Aerial Photographs

11.24. The available Ordnance Survey Maps were consulted for information concerning the archaeological and historical development of the area. By the time of publication of the first edition of the Ordnance Survey Maps of Sutherland (25 inches to the mile) in 1879, the pattern of the landscape had changed significantly to resemble that of today, with most ground being marked as moorland. Comparison of recent maps with those of the first edition of the Ordnance Survey shows little additional information. Some alteration to the farmsteads in their abandonment forms the main feature marked on the various editions consulted.

11.25. A study of aerial photographs held by RCAHMS in Edinburgh was of limited benefit, with only partial coverage for 1946 and the later coverage (1989) was limited as a result of its scale.

#### Highland Council Archives

11.26. Archive sources in Inverness Library provided further information on the archaeology and history of the proposed development area.

11.27. A list of the Sutherland Estate Papers held in the National Library form three large accessions (313, 10225 and 10853). These are very extensive and would require further more detailed study to extract information with regards to the history of Gordonbush. This would be of general interest, but is not of direct relevance to the current assessment. However, some history of the estate is available from the County Valuation Rolls and Sutherland Estate Management (Adam, 1972).

**National Monuments Record (Scotland) and Highland Council Sites and Monuments Record**

11.28. The following sites (**Table 11.6**) were identified from the National Monuments Record (Scotland) and Highland Council Sites and Monuments Record (Inverness) on Gordonbush Estate:

**Table 11.6 Archaeological sites identified during the desk assessment**

	Name	NMRS	HSMR	Grid Ref	Type	Comments
1	Breac-achadh	NC81SW 46	NC81SW 61	NC 847/115	Township, sheepfold	Noted in HSMR and NMRS of 'the township of Breac-achadh comprises of 1 roofed, 2 unroofed and 2 unroofed circular structures, one of which is a sheepfold and a field system are depicted on the 1 <sup>st</sup> edition OS map of 1879 sheet 88. 1 roofed, 3 unroofed buildings, 2 of which are L-shaped and have 2 compartments, a field system and a possible head dyke are shown on OS map of 1963.
2	Breac-achadh	n/a	NC81SW 49	NC 848/116	Depopulation	No information on HSMR database. Likely to be same site as above.
3	Breac-achadh	n/a	n/a	NC 84818/11806	Buildings	Group of 2 buildings to the N in area of Breac-achadh that do not appear on 1 <sup>st</sup> edition OS but do appear on 2 <sup>nd</sup> edition OS of 1907.
4	Allt Smeorail	n/a	n/a	NC 85099/12195	Buildings, sheepfold	2 square buildings and a circular sheepfold marked but not named on latest OS map. Sheepfold is marked and named on 1 <sup>st</sup> edition OS of 1879 and unchanged on 2 <sup>nd</sup> edition OS of 1907. Sheepfold is located at NC 85101/12260.
5	Ristocky	NC81SE 5	NC81SE 6	NC 8514/1252	Building	Noted in HSMR and NMRS of 'an unroofed building is depicted on 1 <sup>st</sup> edition OS map of 1879 sheet 88 and on OS map of 1963'. Marked on latest OS map as an irregular shaped square.
6	Ristocky	NC81SE 2	NC81SE 2 & 14	NC 852/126	Farmstead	Noted in HSMR and NMRS of 'farmstead of an unroofed building and enclosure is depicted on 1 <sup>st</sup> edition OS of 1879 sheet 88. 1 unroofed building and 2 enclosures are depicted on OS map of 1963'.
7	Badan	NC81SE 1	NC81SE 3 & 10	NC 8560/1282	Farmstead	No information available on HSMR database. Noted in NMRS of 'a farmstead of an unroofed building and an enclosure is depicted on the 1 <sup>st</sup> edition OS map of 1879 sheet 88. Three unroofed buildings and 2 enclosures are shown on the OS map of 1963'.
8	Cnoc a' Ghnanain	n/a	n/a	NC 83606/12031 (centred)	Grouse butts	9 grouse butts aligned NW-SE is marked on the latest OS map. Not marked on the 1 <sup>st</sup> or 2 <sup>nd</sup> edition OS maps.
9	Loch Mhuilinn	NC81SW 31	n/a	NC 83196/12325	Hut circle	Hut circle marked on latest OS map. Not recorded in HSMR database. Noted in NMRS of 'a hut circle measuring 13.5m SSW-NNE by 13m within, slight wall spread to 2m. The structure is peat obscured with no stones visible. The entrance is in the SSW. There are no traces of contemporary cultivation in the area. OS 5/1/1976.
10	Allt a' Mhuilinn	NC81SW 19	NC81SW 19	NC 8275/1150	Chambered Cairn	Noted in 1909 to be excavated partly but standing 6ft high (RCAHMS, 1911) with some of the stones later being used for a nearby dam (Davidson, 1948). Noted by the OS of 1964 and 1975 as to be as described by Henshall (1963) who visited in 1957 but now reduced to ground level and 19m in diameter. More recently a detailed survey and description has been undertaken in 1993 (see Henshall and Ritchie, 1995, 82-83).
11	Allt a'	NC81SW	NC81SW 20	NC	Clearance	Recorded by Davidson (1948) as a stone circle.

	Name	NMRS	HSMR	Grid Ref	Type	Comments
	Mhuilinn	W 20		8280/1140	cairns, hut circles	Noted by OS in 1964 of further 3 enclosures being identified. Revised in 1975 by the OS that 'structures form 4 hut circles of a-d with huts a-c oval varying in size from about 12m x 11m to 8m x 8m internally, the longer axis being through the entrance in the S. d, the best preserved is the "stone circle" noted by Davidson, measuring 10.8m internally with a wall 1.3m thick entrance to S. Hut c is in poor condition obscured to the E by a land-slip. Apart from 3 or 4 scattered clearance cairns no sign of field system in vicinity, though system occurs up the hill to the E.
12	Ascoile	n/a	n/a	NC 82583/11040	Sheepfold	Circular enclosure marked on 1 <sup>st</sup> edition OS of 1879 and as sheepfold on 2 <sup>nd</sup> edition OS map of 1907 but not marked on latest OS map.
13	Ascoilbeg	NC81SW 7	NC81SW 7	NC 829/107	Deserted Settlement	Noted in HSMR and NMRS of 'Marked on Roy's military map of 1747 as Koylbeg of a group of 6 buildings with arable beside river. Noted by OS in 1964 of footings and remains up to 0.4m in height of at least 12 buildings ranging in sizes from 7.5m by 4m to 37m by 4.5m, together with enclosures.
14	Allt Ghimner	n/a	n/a	NC 86602/15604 (centred)	Grouse butts	8 grouse butts aligned NE-SW is marked on the latest OS map. Not marked on the 1 <sup>st</sup> or 2 <sup>nd</sup> edition OS maps.
15	Allt Ghimner	n/a	n/a	NC 86729/14521 (centred)	Grouse butts	11 grouse butts aligned NNW-SSE is marked on the latest OS map. Not marked on the 1 <sup>st</sup> or 2 <sup>nd</sup> edition OS maps.
16	Ruidhean	NC81SW 47	NC81SW 62	NC 847/108	Farmstead (possible)	Noted in HSMR and NMRS of 'what may be a farmstead, comprising 1 unroofed building and an unroofed structure, which may be an enclosure is depicted on the 1 <sup>st</sup> edition OS map of 1879 sheet 88. Not shown on OS map of 1963.

## Field Assessment

11.29. Seventeen sites were identified during the field survey work, including those identified in the desk assessment, and two additional unrecorded sites. **Table 11.7** below sets out the findings in relation to each of these sites.

**Table 11.7 Archaeological Field Survey Findings**

	Name	Type	Findings
1	Breac-achadh	Township, sheepfold	A number of dykes visible and a number of structures, including: <b>A:</b> sheepfold at NC84796/11788 about 15m in diameter (not very discernable due to reeds) wall spread to 2m and up to 1m high, possibly robbed out for site 3. <b>B:</b> rectangular structure aligned to N-S 7m x 3m and up to 1.5 high <b>C:</b> sheepfold at NC 84848/11658 14m NS x 12m EW possible entrance to E with walls spread to 1.5m and up to 0.3m high, covered in bracken <b>D:</b> enclosure, possible at NC 84769/11616 U shaped 10m x 7m N-S with walls spread to 1m and up to 1m high. No wall at SE. <b>E:</b> clearance cairn at NC 84769/11606 spread to 5m x 10m <b>F:</b> farm at NC 84695/11568 longhouse aligned E-W of 2 compartments with enclosure to S forming L shaped structure with larger enclosing wall to N, possibly garden. House is 4.5m x 20m being divided at 10m with walls 0.5m thick and up to 1.2m high. Enclosure to S is 7m <sup>2</sup> with walls 0.4m thick and up to 1.2m high with cow-gate to W and drain to E. Enclosing wall on north side is 27m NS by 22m EW. <b>G:</b> clearance cairn at NC 84790/11516 5m x 4m and up to 1m high <b>H:</b> clearance cairn at NC 84808/11497 2m NS x 6m EW and spread to 3m and up to 1m high.
2	Breac-achadh	Depopulation	As site 1.
3	Breac-achadh	Buildings	Ruined house constructed of dressed stone and south facing. Has lean-to porch to front with brick built addition to E and lean-to rubble built structure to the NW. 3 six pained skylights to roof, cast iron drains and 2 fireplaces in each gable room and central staircase to room in attic. House is 5m x 12m in plan, with addition to E of 2m x 2.5m, to N of 5m x 3m and porch to S of 2m x 2m. No trace of 2 <sup>nd</sup> building as depicted in OS map of 1907.
4	Allt Smeorail	Buildings, sheepfold	Site is very heavily covered in bracken, no trace was made of the buildings in the vicinity of the sheepfold (information from keeper that they are visible as footings only when bracken dies off). Sheepfold is 14m in diameter with walls 1m wide at base and tapering to 0.5m at top with walls up to 1.3m in height. Entrance to W.
5	Ristocky	Building	Site is heavy with bracken but discernable as not to be a house but an enclosure 8m x 9m with wall spread to 1m and up to 0.25, high. Wall only in an L shape with burn to north side and steep drop to E.
6	Ristocky	Farmstead	Site is heavily covered with bracken. Only a semi-circular arc of wall is visible where a fire has removed bracken. Arc is spread to 1.2m and 14m in length.
7	Badan	Farmstead	Site heavily covered with bracken. House at NC 85588/12807 is just visible aligned to NNW-SSE measuring 4.5m x 9m with walls 0.5m wide and up to 0.5 m high. Entrance to NE and partly covered with heather. Adjoining house to SE is an L shaped structure (not easily discernible due to bracken) measuring 8m x .45, with extension 5m x 3m with walls 0.5m high and 0.5m wide. Other structures depicted on OS maps not discernible due to bracken.
8	Cnoc a' Ghnanain	Grouse butts	A number of butts visible all built of turf. One at NC83746/11925 is 4m <sup>2</sup> with walls 0.5m thick and up to 0.6m high with entrance to NW.
9	Loch Mhuilinn	Hut circle	Site visit shows that this is possibly not a hut circle but natural as entrance to SE is 5m wide. Appears to be more a product of erosion, as opposed to a man made structure.
10	Allt a' Mhuilinn	Chambered Cairn	Remains of chamber are visible in heather as planned by Henshall and Ritchie. The hut circle marked on the latest edition OS map located to the NW of this site was not located during the walkover survey.
11	Allt a' Mhuilinn	Clearance cairns, hut circles	Walkover survey not undertaken as site lies beyond area potentially affected by the development.
12	Ascoile	Sheepfold	No trace of a structure identified at this location – may have been removed.

	Name	Type	Findings
13	Ascoilbeg	Deserted Settlement	Traces of structures revealed in an area of bracken, although the site is outwith the survey area. No sites close to the main road or access track.
14	Allt Ghimner	Grouse butts	Turf built semi-circular structures up to 1m high and 1.3m wide, all appear modern in date. Currently not much heather in vicinity.
15	Allt Ghimner	Grouse butts	Turf built semi-circular structures up to 1m high and 1.3m wide, all appear modern in date. Currently not much heather in vicinity.
16	Ruidhean	Farmstead (possible)	Site visit reveals site to be heavily covered with bracken (to waist height). Site not discernible apart from traces of walls.
17	Allt a' Mhuilinn (NC 82791/115588)	Cairn	Small cairn revealed during walkover survey of 4.5m diameter and up to 2.5m in height. Possible kerbstones to the south edge.
18	Allt a' Mhuilinn (NC 82756/11523)	Structure	Site revealed during the walkover survey of a circular structure 5m in diameter with walls 0.7m high and 0.3m thick in area of bracken. Function is unknown.

11.30. Sites 3, 4, 8, 12, 14, 15, 17 and 18 are not recorded in the Highland Sites and Monuments Record or the National Monuments Record of Scotland, Edinburgh.

### Unknown Sites

11.31. Given that few new sites have been recorded during the present field survey, it is highly unlikely that other sites, which are not visible as surface remains, exist in the area. However, without invasive surveys, any unknown resources will remain undiscovered. The proposed mitigation measures includes maintaining a watching brief during construction of the windfarm (see paragraphs 11.44 and 11.45 below). This would allow for any currently unknown remains affected by the development to be identified.

### Future Situation without the Scheme

11.32. Should the scheme not be developed, no major change in the existing archaeological remains is likely to occur.

### Summary – Sensitive Receptors

11.33. As shown in **Figure 11.1**, known archaeological remains are located close to the access track and within the turbine area. In addition, further remains were discovered at several locations on and around the development site. Although there are no SAMs on the site, national policy and guidance emphasises the need to take into account the effects of development on both designated and undesignated sites, as well as known and unknown remains. The sites identified above would therefore be sensitive to any direct effects arising from the construction and operation of the windfarm. Due to the lack of designated status, the sensitivity of the sites is considered to be of **low** significance. The former Clyne Parish School is a category C(S) listed building, with its designation relating to the way in which it provides an example of an estate property (having been built by the Sutherland estate).

## ASSESSMENT OF POTENTIAL EFFECTS

### Project Assumptions

11.34. The assessment has been undertaken on the basis of the layout shown in **Figure 6.1** being constructed. Construction methods including proposed numbers and types of vehicle movements, would be as defined in **Chapter 6**. As with the ecology chapter, it has been

assumed that the new lengths of track will have a working width of 15m (5m width with 5 metres on each side for drainage, and reinstated cable trenches and track batters).

### Construction effects

#### Physical damage to sites or remains

- 11.35. **Figure 11.1** illustrates that some of the sites are close to the access track. It is possible that some physical damage to sites or remains (partial or total removal) of could arise during the construction period. These impacts could range from negligible to major depending on the sites. Given that the value of the sites is essentially local, they are considered to be of low sensitivity and this effect would therefore be of **negligible to moderate** significance. However, damage should be avoided during construction using the mitigation methods set out below.
- 11.36. As a result of proposed changes to the road connecting the A9 with the site, the boundary wall at the Old School House in Clyne will be removed and subsequently reassembled after the turbine components have been delivered. The building is Category C(S) listed. This applies to “*Buildings of local importance, lesser examples of any period, style or building type, as originally constructed or altered; and simple, traditional buildings which group well with others in categories A and B or are part of a planned group such as an estate or an industrial complex.*”<sup>vi</sup> Historic Scotland’s Policy on Listed Buildings and Conservation areas states that objects within the curtilage of a listed building are included within the designation and therefore subject to the same level of control. The boundary wall is also specifically referred to as being included within the listing. As a result, the need for listed building consent for this part of the development will be discussed further with the Highland Council.
- 11.37. The building has been listed as a result of its local significance and as a result is considered to be of moderate sensitivity. The impact of the development would be the temporary removal of the boundary wall, followed by reinstatement, resulting in minor change. As a result, the effect of the proposed development is predicted to be of **minor** significance in relation to the listed building.

#### Severance of Features

- 11.38. No severance of known features, particularly linear features (e.g. field boundaries) is predicted.

#### Indirect Construction Effects

- 11.39. Further potential effects arising from the development would be indirect, occurring as a result of the vehicular access to the site during the construction period which could cause damage as a result of vibration. This could result in settlement or compaction of ‘ground’ features immediately adjacent to the track. The main sites potentially affected by vibration are most likely to be those within the 15m area. The potentially affected sites are:

1. Breac-achadh Township (NC 847/115)
5. Ristocky Building (NC 8514/1252)
6. Ristocky Farmstead (NC 852/126)
7. Badan Farmstead (NC 8560/1282)

9. Loch Mhuilinn Hut Circle (NC 83196/12325)

- 11.40. The track will be routed around these sites to avoid direct impacts, but they may be subject to vibration.
- 11.41. These have only partial remains visible above ground level and, with the exception of part of the township at Breac-achadh (which is up to 1.5m high), their height tends to be limited to around 0.5m high or less. As detailed previously, the track will be resited where required to avoid direct impacts on sites in the vicinity of the track, and it can therefore be concluded that these sites will be in the vicinity of the track (within a 5m strip on either side). However, it is considered very unlikely that they would be adversely affected by ongoing vibration as a result of their characteristics, and owing to the temporary nature of vehicular use during the construction period. Given the local value of the sites affected (low sensitivity) and the negligible magnitude of change which would result from traffic vibration which occurs during the construction period, the significance of this effect is considered to be **negligible**.

### Ongoing and Operational Effects

- 11.42. In terms of visual intrusion on any listed buildings, archaeological or historic sites or features, affecting their setting during operation, two different types of site have been taken into account. The setting of archaeological sites 1- 12 and 18 is potentially affected by upgrading of the existing access track or construction of the new access track. Overall the visual relationship of these remains with the surrounding landscape will not be changed. As a result, the effect of the development on locally important sites identified in **Table 11.7** has been assessed as being of **negligible** significance.
- 11.43. Archaeological sites 14 and 15 (grouse butts) currently located on open moorland will, if the development proceeds, be surrounded by turbines and tracks. Given the low value of these remains the effect of this is considered to be **negligible**.
- 11.44. As defined in **Chapter 7**, there would be no significant effect on the Scheduled Ancient Monuments in the vicinity of the site. As a result it is anticipated that the windfarm would have a **negligible** effect on the setting of SAMs within the study area.

### MITIGATION AND MONITORING

- 11.45. To ensure that known sites are not disturbed, those close to working areas will be fenced off to prevent accidental damage. A construction method statement which includes more detailed routing for the access tracks and contractor requirements will be provided.
- 11.46. Although no significant effects are predicted, based on available information, the possibility exists that further sites may be unrecorded and may be disturbed during construction. A watching brief will be undertaken during any excavation works associated with enhancement of the existing access track.

### Residual Effects

- 11.47. Following mitigation the effects arising would be negligible. The main change would result from the fencing off of remains close to the development area and rerouting of the track to avoid damage (partial or total) of remains.

## SUMMARY AND CONCLUSIONS

11.48. **Table 11.8** below summarises the predicted effects, mitigation and residual effects of the windfarm in relation to archaeology.

**Table 11.8 Summary of the Effects of the Windfarm on Archaeology**

Potential Effect	Significance	Mitigation	Residual Effect
<b>Construction Effects</b>			
Physical damage to sites or remains (partial or total removal) on the site and listed buildings (Former Clyne Parish School)	Negligible - Moderate	Watching brief during construction to ensure contractors pay regard to known sites and to allow unknown remains to be identified and recorded.  Sites to be fenced off prior to construction.  Micrositing of access track to avoid remains.	Negligible
Severance of features, particularly linear features e.g. field boundaries;	Negligible	N/A	Negligible
Indirect impacts arising from vibration from site traffic at Sites 7 and 9	Negligible	N/A	Negligible
<b>Operational Effects</b>			
Visual intrusion on the setting of on-site archaeology.	Negligible	N/A	Negligible
Visual intrusion on the setting of Scheduled Ancient Monuments in the vicinity of the site.	Negligible	N/A	Negligible



## REFERENCES

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<sup>i</sup> Institute of Field Archaeologists (IFA), (1999) *By-laws, Standards and Policy Statements of the Institute of Field Archaeologists*, IFA: Reading.

<sup>ii</sup> Historic Scotland (1998) *Memorandum of Guidance on Listed Buildings and Conservation Areas*, HMSO: Edinburgh.

Adam, R J (1972) *Papers on Sutherland Estate Management 1802-16*. 2 volumes. Scottish History Society. T & A Constable Ltd.

*County Valuation Rolls for Sutherland 1874 – 1915*.

Davidson, J M (1948) *A Miscellany of Antiquities in Easter Ross and Sutherland*, Proceedings of the Society of Antiquaries of Scotland 1945-6, 80, 25-33.

Henshall, A S (1963) *The Chambered Tombs of Scotland*, Volume I. Edinburgh University Press.

Henshall, A S & Ritchie, J N G (1995) *The Chambered Cairns of Sutherland : An Inventory of the Structures and their Contents*. Edinburgh University Press.

*Highland Sites and Monuments Record* database entries for NC81SW & NC81SE.

IFA (1999) *By-laws, Standards and Policy Statements of the Institute of Field Archaeologists*. Reading.

*National Monuments Record of Scotland* CANMORE database entries for NC81SW & NC81SE.

*Ordnance Survey Name Book Sutherland – Clyne* book 26, pages 71,75,76 & 79.

RCAHMS (1911) *Royal Commission on the Ancient and Historical Monuments of Scotland: Inventory of Monuments in Sutherland*. HMSO. Edinburgh.

### OS Maps Consulted

Sutherland Edition of 1879 (surveyed 1871) 6 inch to a mile sheets 88 and 97.

Sutherland Edition of 1907 (revised 1904) 6 inch to a mile sheets 88 and 97.

NC81SW OS map sheet of 1969 1:10,560.

NC81SE OS map sheet of 1963 1:10,560.

### Aerial Photographs Consulted

RAF RAF/CPE/Scot/UK 180 1136-1142 (gap) then 1202-1199, 1473-1478, 4133-4137

Flown 8-10-1946, 1:10,000

RAF RAF/CPE/UK 297 3197-3196 (end of run for CPE/180 – no cover for rest)

Flown 18-9-1947, 1:10,000

# GORDONBUSH WINDFARM

Scottish and Southern Energy

## Known Archaeological Remains

- ⊕ Turbine Location
- Construction Compound
- Substation
- Borrow Pits
- ⊠ Permanent Anemometer Masts
- Access Track
  
- Archeological Sites
  1. Township, Sheepfold
  2. Township, Sheepfold
  3. Buildings
  4. Buildings, Sheepfold
  5. Building
  6. Farmstead
  7. Farmstead
  8. Grouse Butts
  9. Hut Circle
  10. Chambered Cairn
  11. Clearance Cairns, Hut Circles
  12. Sheepfold
  13. Deserted Settlement
  14. Grouse Butts
  15. Grouse Butts
  16. Farmstead (Possible)
  17. Cairn
  18. Structure

Scale 1:35,000

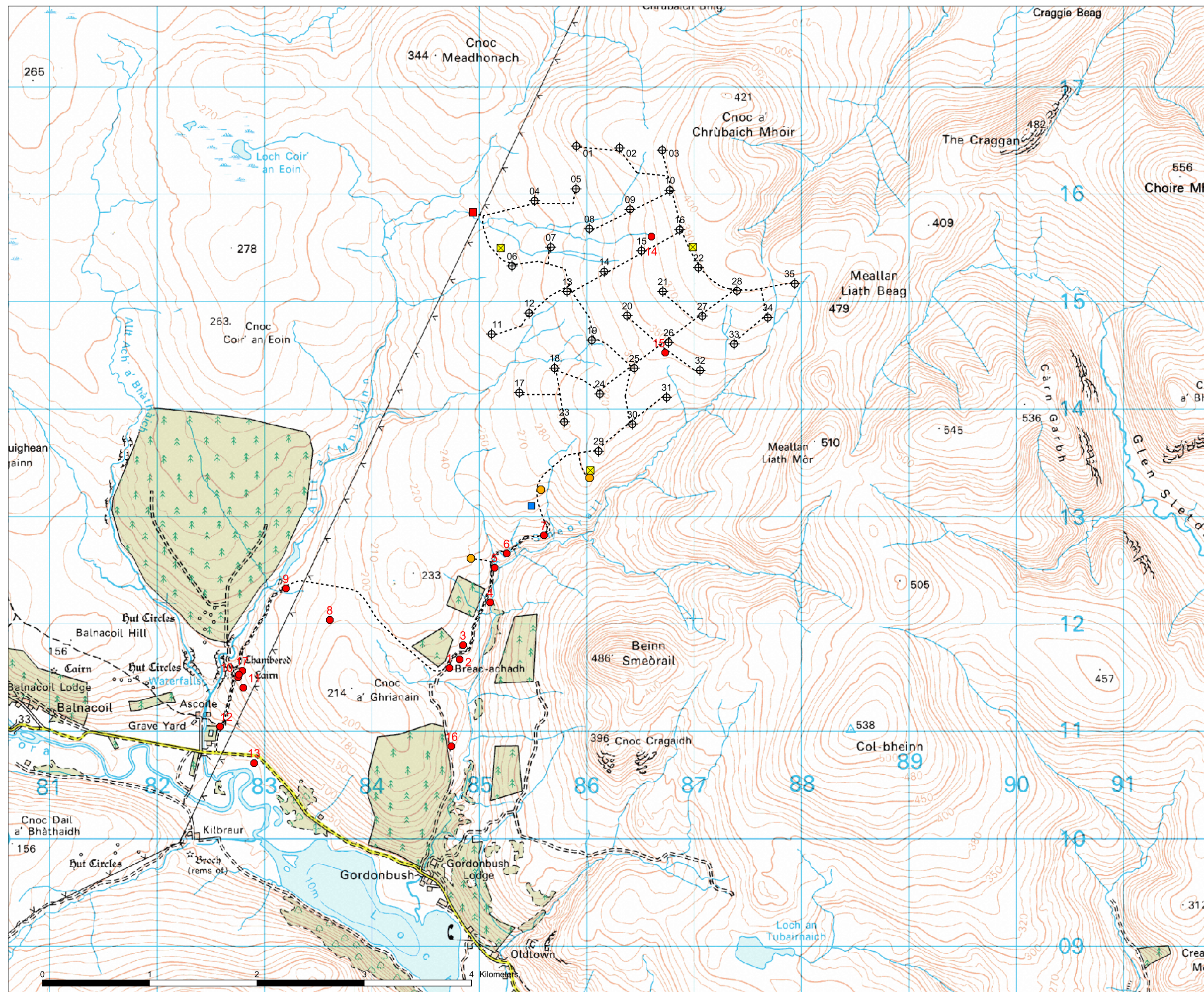


Figure 11.1

## 12. TRAFFIC, TRANSPORTATION AND ACCESS

### INTRODUCTION

- 12.1. This chapter presents the assessment of traffic, transportation and access impacts and effects associated with the proposed windfarm development. It addresses the traffic generated during both the construction and operational phases, discusses the proposed access route and proposes where necessary measures to minimise disruption to the local road network.
- 12.2. The associated issues of noise and air quality are discussed in more detail in **Chapters 10** and **15** respectively.
- 12.3. **Appendix 12.1** is a Transport Statement, which provides more detail on construction traffic and traffic management.
- 12.4. This part of the assessment has been undertaken by Arupscotland. A fuller description of the company's relevant experience is provided in **Appendix 1.1**.

### POTENTIAL SIGNIFICANT EFFECTS

- 12.5. **Table 12.1** identifies potential effects on traffic, transportation and access. Potential effects are those which could result from the construction and operation of a windfarm, according to the project, site and receptor characteristics and their interactions, and their inclusion in **Table 12.1** does not imply that they will occur, or be significant at Gordonbush. The transport assessment is based upon an assessment of the potential effects, in order to identify predicted effects.

**Table 12.1 Summary of Potential Effects on Traffic, Transportation and Access**

- Change to traffic volumes and flows during construction and operation;
- Changes in traffic composition, predominantly HGVs during construction;
- Landtake associated with junction improvements and new access track;
- Improvements to local roads;
- Abnormal wear to roads.

## CONSULTATION

- 12.6. **Table 12.2** summarises relevant responses to the consultation on traffic, transportation and access

**Table 12.2 Consultation Summary**

Consultee	Summary of Comments
Scottish Executive Development Department (RNMMMD)	The Development Department commented that the 'impact on the trunk road network is unlikely to be significant'
Scottish Executive Planning	The Planning Department had no objections on the scheme and highlighted two guidance documents, namely, <i>NPPG 17 Transport and Planning</i> <sup>(i)</sup> and the <i>Guide to Transport Assessment and Development Proposals in Scotland</i> <sup>(ii)</sup>
Scottish Executive Consents and Emergency Planning Unit	Consents and Emergency Planning commented that 'A comprehensive Transport Assessment on how the site is to be accessed together with a full Construction Method Statement giving details of route, period of activity, plant and vehicular movement should be included in the Environmental Statement. The scope of the Transport Assessment should be agreed with Highland Council's Transport and Infrastructure Department'
Highland Council	Highland Council has indicated that they would require an agreement under section 96 of <i>The Roads (Scotland) Act 1984</i> <sup>(x)</sup> in relation to road maintenance.
BEAR Scotland	BEAR Scotland indicated that the general concept of the development appears to be acceptable. The preferred option of routing traffic through Brora and turning left at the Old Schoolhouse is agreeable to the Scottish Executive. They stipulated the use of the Design Manual for Roads and Bridges, Volume 6, TD/41/95 Junction Layout 6 for the design of the junction leading from the A9(T). They also advised that they would not expect abnormal wear and tear of the A9(T).

- 12.7. The following sources of information were used to inform the assessment:
- The Scottish Executive provided data on existing traffic flows on the local trunk road (A9);
  - Highland Council & BEAR Scotland provided information on the local road network.

### POLICY CONTEXT

- 12.8. The assessment has been undertaken within the following policy context:

- *NPPG 6 Renewable Energy Developments*<sup>i</sup>, which highlights planning issues including construction traffic.
- *NPPG 17 Transport and Planning*<sup>ii</sup>, which presents guidance on transportation and infrastructure issues for developments.
- *PAN 45 Renewable Energy Technologies*<sup>iii</sup>, which provide guidance on issues relating to windfarms, including proximity to roads.
- *Highland Structure Plan*<sup>iv</sup> Policy E2 – Wind Energy Developments states that: ‘Wind energy developments will be supported provided that impacts are not shown to be significantly detrimental. In addition to the General Strategic Policies, wind energy proposals will be assessed in respect of: roads, bridges and traffic’.
- *South and East Sutherland Local Plan*<sup>v</sup> states that: ‘Economic activity in South and East Sutherland relies heavily on the quality of road access to and from the south. The need to reduce the environmental impact of road traffic, move towards more energy efficient patterns of development and reduce the need to travel are key components of a sustainable development strategy.’

## ASSESSMENT APPROACH

### Overview

- 12.9. The evaluation includes a review of construction traffic generated by the scheme and of effects on access during and post construction. The assessment has been based on a set of assumptions, as the contractor would determine the exact details of how construction would proceed (see paragraph 12.26).
- 12.10. The Institution of Highway and Transportation specify that a formal Traffic Impact Assessment (TIA) is not required for a development generating an increase in traffic during peak hour of less than 5% in a congested or sensitive location, or less than 10% in an un-congested location<sup>vi</sup>. In addition a TIA is normally not required for temporary construction works and the threshold is therefore only used as a guide parameter in this circumstance.
- 12.11. The evaluation of traffic effects has been determined by:
- Consultation with Highland Council, BEAR Scotland and the Scottish Executive;
  - Desk Study;
  - Field Survey of construction access.
- 12.12. Each of the elements is described below.

### Baseline Assessment

- 12.13. The desk study identified:
- Existing road network conditions;
  - Details of traffic flows and type ;
  - Transportation and access constraints;

- Identification of sensitive receptors in the form of communities and transport routes likely to be affected.

12.14. A preliminary site visit was made on the 12<sup>th</sup> June 2002 to examine access routes in more detail and verify desk based analysis. It included an inspection of two possible access routes and notes taken on the condition and dimensions of the existing track alongside Loch Brora, which would be used for access to the site.

12.15. As traffic data was available for the A9 (T), no traffic count was undertaken on the field visit.

### Evaluation method

12.16. The assessment considers both the construction and operational phases of the development. It assesses the significance of the increase in traffic flows and alterations to the traffic composition on the local network, against current data.

### Significance Criteria

12.17. Significance criteria have not been adopted for the assessment of traffic effects. However, the assessment focuses on the routes likely to be affected by the proposed scheme. Qualitative assessments have been undertaken of the effects noted, and a professional judgement made as to whether the residual effects are considered to be of significance.

## EXISTING SITUATION

### General Context

- 12.18. The nearest main road is the A9 (T), located approximately 12 km south east of the proposed site running along the coastline in a generally north east – south west direction, passing through the villages of Golspie and Brora. In the vicinity of the proposed windfarm area there are two roads leading inland from the A9(T), which converge approximately 3km to the west of Brora. The C6 Strath Brora road / A9(T) junction is in the centre of Brora, adjacent to the river Brora. The Clynelish Distillery Road leaves the A9(T) approximately 1.5 km further north. Both junctions were inspected during the preliminary site visit. It was noted that sections of the Clynelish Distillery Road, prior to its convergence with the C6 Strath Brora road are of floating construction.
- 12.19. West of the point where these roads join, the C6 Strath Brora road leads inland along the eastern shore of Loch Brora through Gordonbush and Ascoile, connecting inland with the A839 in Strath Fleet approximately 19km to the south west of the windfarm site.
- 12.20. There is currently no public vehicular access to the proposed windfarm site. Access to the site is available at two points from the C6 Strath Brora road, an estate track leading up Allt a’ Mhuilinn which currently extends for approx 2km in a north easterly direction and a second estate track leading up from Gordonbush in a northerly direction along Allt Smeorail for approximately 3.5km.

### Designations

12.21. There are no statutory designations regarding traffic, transportation and access in the vicinity of the windfarm.

### Previous Studies / Data

- 12.22. Statistics were supplied from the Scottish Executive for the A9 (T) Golspie to Brora automatic traffic counter. Using 7 day hourly flow data, recorded for 430 days between 6<sup>th</sup> Sept 2000 and 7<sup>th</sup> July 2002 the average total daily flow (two-way movements) was calculated as 3872 vehicle. The counter is only volumetric but a manual count statistic provided by the Scottish Executive indicated that 9% of this is HGVs.
- 12.23. There may be some seasonal variation on the A9 (T), specifically higher traffic flows in the summer months due to tourist related traffic as it is the main route north along the coastline.

### Summary – Sensitive Receptors

- 12.24. The surrounding land use is predominantly agricultural land, woodland / forestry and open moorland with groups of houses at Ascoile, Gordonbush Lodge and Farm, Oldtown, Killin, Brora and Golspie. These are all key receptors to changes in traffic volume and composition.

### Future situation without the scheme

- 12.25. Without the windfarm scheme, the existing traffic flows on the A9(T) are likely to increase in accordance with local traffic growth.

## ASSESSMENT OF POTENTIAL EFFECTS

### Project Assumptions

- 12.26. A Traffic Management Plan will be produced for the construction phase of the development, as proposed in the Traffic Statement. This would ensure that the appointed contractor had systematic guidelines to manage the traffic and transport issues. It would take into account consultation feedback from the Scottish Executive, Highland Council and BEAR Scotland.
- 12.27. The plan would cover the issues relating to vehicle movements, namely:
- traffic control measures for the delivery of the abnormal loads (turbine towers, blades, nacelle units and hubs ). This will involve notifying police and may require Temporary Traffic Regulation Orders (TTRO) and / or Special Type General Order which would need to be confirmed with the Scottish Executive and Highland Council;
  - dedicated access route for construction vehicles in order to limit disruption;
  - coordination with police to organise the escorting of all abnormal loads from Invergordon port to the site, with the possible exception of the hubs;
  - phasing for the abnormal loads;
  - use of special abnormal cargo route in Invergordon;
  - use of passing places to allow traffic to clear;
  - encouraging multi-occupancy of transport vehicles.

### Construction Effects

- 12.28. A 10 month programme has been assumed in the following assessment. Total vehicle movements for each activity are summarised in **Table 12.3**.
- 12.29. Note that one trip is equal to two vehicle movements accounting for delivery and return journeys. A six day working week has been assumed equating to 26 days per month, and a construction staff vehicle occupancy rate of 2. In practice use of minibuses will result in a lower number of vehicles.
- 12.30. Two options are being presented for the mobilisation of concrete.
- Option 1: Ready Mix Concrete Trucks;
  - Option 2: Concrete Batching.
- 12.31. The civil contractor will be responsible for deciding whether to bring bulk ready mixed concrete to the site, or to use a batching plant on site and haul aggregates and cement. However, a batching plant is the most likely option. Further details are presented in the accompanying Transport Statement (**Appendix 12.1**). Both options have been taken into account for the purposes of the assessment.

### Access

- 12.32. Three routes were considered when identifying access and transportation to the site. The Transport Statement outlines the different options and explains the proposed access routes.
- 12.33. **Figure 6.10** shows the proposed access route.

**Table 12.3 Summary of predicted construction traffic**

Item being transported	Type of vehicle	Vehicle movements	
		Loaded delivery	Empty return
	<b>HGVs</b>		
Preconstruction delivery Including construction plant, equipment and site offices.	HGV / Low Loader	65	65
Construction plant fuel	Fuel Truck	30	30
Waste disposal	Tankers / skip collection	40	40
<i>Turbines</i>			
Towers	HGV abnormal load	105	105
Nacelle units	HGV abnormal load	35	35
Blades	HGV abnormal load	105	105
Hub	HGV abnormal load	35	35
Cranes + ballast	HGV abnormal load	10	n.a.
<i>Turbine Foundations</i>			
Option 1: Ready mix concrete	Ready Mix Concrete Trucks	1309	1309
Option 2: Concrete batching – cement, aggregates	HGV	964	964
Steel reinforcement	HGV	35	35
<i>Grid substation and Cable Works</i>			
Cabling	HGV	13	13
Cabling sand	HGV	386	386
Substation	HGV	10	10
Transformer	HGV abnormal load	1	1
Miscellaneous	HGV	50	50
Option 1 TOTAL OVER CONSTRUCTION PERIOD Ready Mix Concrete Trucks		4448 HGV's	
Option 2 TOTAL OVER CONSTRUCTION PERIOD Concrete Batching		3758 HGV's	
<b>Non HGV's (Car or Minibus)</b>			
Total Construction personnel		8684	

**Access Tracks and Site Tracks**

- 12.34. An estimated 100,000m<sup>3</sup> of stone will be required for various purposes, primarily track construction. Whilst some of this will be obtained from, for example, foundation excavation, it will be sourced from on site borrow pits, rather than importing stone on the public roads system. Therefore this will not create additional traffic on the public road system.
- 12.35. **Table 12.4** indicates how construction traffic may be phased in relation to site activities over the construction programme. Two-way vehicle movements are shown.

**Table 12.4 Outline construction programme and vehicle estimates**

Month	1	2	3	4	5	6	7	8	9	10	Total vehicle movements (two-way)
<b>HGV's</b>											
Construction Plant	60		10		10	10	10	10	10	10	130
(Option 1) Concrete			655	654	655	654					2618
(Option 2) Cement , Aggregates	321	321	321	321	321	323					1928
Cabling sand						256	260	256			772
Turbines						140	140	140	140		560
Other	36	36	36	36	37	39	37	37	37	37	366
Tracks	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	
Foundations		◆	◆	◆	◆	◆	◆	◆	◆	◆	
Control Building						◆	◆	◆	◆	◆	
Cabling						◆	◆	◆	◆	◆	
Turbine Erection						◆	◆	◆	◆	◆	
Commissioning									◆	◆	
Average No of Working Days	26	26	26	26	26	26	26	26	26	26	
Daily Average on A9(T)	3872	3872.0	3872.0	3872.0	3872.0	3872.0	3872.0	3872.0	3872.0	3872.0	
<b>Non HGV's</b>											
Cars/Minibuses (Site Personnel)	780	780	1300	1300	1300	1300	676	676	364	208	8684
Total Per Day - Average	30	30	50	50	50	50	26	26	14	8	33
<b>% increase on A9(T) non HGV's</b>	0.77%	0.77%	1.29%	1.29%	1.29%	1.29%	0.67%	0.67%	0.36%	0.21%	<b>0.86%</b>
<b>Ready Mix Concrete Option</b>											
Total HGV's	96	36	701	690	702	1099	447	443	187	47	4448
Total HGV's Per Day - Average	4	1	27	27	27	42	17	17	7	2	17
<b>% increase of HGV's on A9(T)</b>	0.10%	0.04%	0.70%	0.69%	0.70%	1.09%	0.44%	0.44%	0.19%	0.05%	<b>0.44%</b>
<b>Total % increase on A9(T) – HGV's &amp; Non HGV's</b>	0.87%	0.81%	1.99%	1.98%	1.99%	2.38%	1.12%	1.11%	0.55%	0.25%	<b>1.30%</b>
<b>Concrete Batching Option</b>											
Total HGV's	417	357	367	357	368	768	447	443	187	47	3758
Total HGV's Per Day – Average	16	14	14	14	14	30	17	17	7	2	14
<b>% increase of HGV's on A9(T)</b>	0.41%	0.35%	0.36%	0.35%	0.37%	0.76%	0.44%	0.44%	0.19%	0.05%	<b>0.37%</b>
<b>Total % increase on A9(T) – HGV's &amp; Non HGV's</b>	1.19%	1.13%	1.66%	1.65%	1.66%	2.05%	1.12%	1.11%	0.55%	0.25%	<b>1.24%</b>

**Change to Traffic Volumes and Flows**

12.36. As highlighted in **Table 12.4** the highest percentage increase on the A9(T) is 2.38 % for the concrete option and 2.05 % for the aggregate option. Both these levels are well within the Traffic Impact Assessment (TIA) criteria that specify that a formal TIA is not required for a development generating an increase in traffic during peak hour of less than 5% in a congested or sensitive location, or less than 10% in an un-congested location. The effect is therefore **minor**. Monitoring of the traffic from the windfarm during construction works is not proposed due to the small percentage increase in traffic.

**Changes in Traffic Composition**

12.37. Transportation of the abnormal loads are likely to cause some delay to the traffic along the route over a short time period. This will occur through month 6 to 9 of the construction programme. The nature and extent of these delays will be dependent on the timing of the vehicle movements. Manual traffic control may be required to allow slow moving construction vehicles safe entry onto the A9 (T). Given the traffic increase throughout construction is not considered to be significant and the temporary nature of the disruption, the significance of the effect is judged to be **minor**.

**Improvements to Local Roads**

12.38. Route improvements will be required to accommodate the abnormal loads.

12.39. It is not possible to fully define the final improvements required as this will be proposed by the turbine supplier and haulage contractor and agreed with Highland Council. However, the following measures may be required:

- opening up of the junction of the A9 / Clynelish Distillery road at the Old School House;
- removal of humps on the C6 Strath Brora road;
- localised widening;
- creation of new passing places;
- localised tree removal;
- temporary removal of bridge parapets;
- reinforcement of the Clynelish Distillery road at Clynelish Moss;
- replacement of Nam Bam culverts;
- widening of the approach to Oldtown Bridge and possible temporary removal of bridge parapets;
- straighten approach to Gordonbush Bridge.

12.40. The Transport Statement contains further details of the route improvements.

12.41. Although there will be some temporary disruptive effect to road users when the work is being carried out, the road users will benefit from the improvements, in particular the provision of additional passing places, so the effect is deemed as **minor** beneficial.

### Landtake associated with junction improvements and new access track

12.42. As per the route improvements outlined above, land will be required for each of the following:

- junction at Clynesh Distillery road
- realignment of the road at the approach to Oldtown
- localised widening on the 12km approach to the site
- creation of new passing places
- new access track totalling approximately 19km

12.43. Overall, the land required for these improvements is less than 10ha and given that road users will benefit from the improvements, the effect is deemed as **negligible**.

### Abnormal wear to roads

12.44. Highland Council have indicated that they would require an agreement under section 96 of *The Roads (Scotland) Act 1984<sup>vii</sup>*. In essence, this agreement provides for a developer to cover the cost of abnormal wear and tear on roads not designed for that purpose. This would relate to the C6 Strath Brora road and the Clynesh Distillery road west of Brora. The details of this agreement would be agreed subsequent to planning permission but the requirement to enter such an agreement may form a planning condition.

12.45. In relation to the A9(T), BEAR Scotland indicated that they would not expect the development to result in abnormal wear and tear to the A9(T), and therefore a section 96 agreement would not be required.

12.46. With a section 96 agreement in place to act as a control measure to ensure that the condition of minor roads is maintained, there will be no adverse effects.

### Ongoing and Operational Effects

#### Change to traffic volumes and flows during operation

12.47. Access to the site for operational maintenance will be taken from the A9(T) on either the C6 Strath Brora road or the Clynesh Distillery Road depending on the vehicle origin. It has been estimated that this would amount to 2 vehicle movements per day, totalling 730 per year.

12.48. This would comprise vehicles for routine maintenance of turbines, sub station and access tracks. The predominant vehicle type would be the size of a transit van / landrover.

12.49. The traffic generated during the operation of the windfarm will be significantly less than that during the construction stage. The operational traffic will not increase the existing traffic flow or composition significantly on the C6 Strath Brora road or the A9(T) therefore the effect has been assessed to be **negligible**.

### MITIGATION

12.50. With a section 96 agreement in place to ensure that the roads are maintained in a suitable condition at the developer's expense, and a traffic management plan in place, no additional specific mitigation measures are required.

## SUMMARY AND CONCLUSIONS

12.51. **Table 12.5** below summarises the predicted effects, mitigation and residual effects of the windfarm in relation to traffic, transportation and access.

**Table 12.5 Summary of the Effects of the Windfarm on Traffic, Transportation and Access**

Potential Effect	Effect Significance	Mitigation	Residual Effect
Increased vehicle movements on local roads during construction	Minor	No mitigation measures required, as environmental controls form part of the construction strategy	Minor
Changes in traffic composition, predominantly HGVs during construction	Minor	No mitigation measures required, as environmental controls form part of the construction strategy	Minor
Change to traffic volumes and flows during operation	Negligible	No mitigation measures required, as environmental controls form part of construction strategy	Negligible
Improvements to local roads	Minor (positive)	None required	Minor (positive)
Landtake associated with junction improvements and new access track	Negligible	None required	Negligible
Abnormal wear to roads	None	With the section 96 agreement and traffic management plan in place, no specific mitigation measures are required.	None



## REFERENCES

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- <sup>i</sup> Scottish Executive, Revised (2000), National Planning Policy Guidelines (NPPG) 6 *Renewable Energy Developments*
- <sup>ii</sup> Scottish Executive, (1999), National Planning Policy Guidelines (NPPG) 17, *Transport and Planning*
- <sup>iii</sup> Scottish Executive, (Revised 2002), Planning Advice Note (PAN) 45, *Renewable Energy Technologies*
- <sup>iv</sup> Highland Council, 2001, *Highland Structure Plan*
- <sup>v</sup> Highland Council, (2000), *South and East Sutherland Local Plan*
- <sup>vi</sup> Institute of Environmental Assessment' *Guidelines for the Environmental Assessment of Road Traffic*.
- <sup>vii</sup> The Roads (Scotland) Act 1984



## 13. TELECOMMUNICATIONS AND AVIATION

### INTRODUCTION

- 13.1. This chapter considers the potential impacts and subsequent effects on telecommunications and aviation from the proposed windfarm scheme.
- 13.2. Telecommunications includes:
- television transmission;
  - radio transmission;
  - mobile phone networks; and
  - other private wireless communication systems.
- 13.3. Aviation includes:
- civil and military airspace;
  - civil and military air traffic control systems; and
  - military radar.
- 13.4. The wind turbines themselves are the only element of the development which is relevant to the assessment.
- 13.5. Due to the nature of telecommunications and aviation, a study area was not predefined. Rather, consultation was undertaken with relevant operators and agencies who determined their own study areas as appropriate to their own operations.
- 13.6. This part of the assessment has been undertaken by Arupscotland. A fuller description of the company's relevant experience is provided in **Appendix I.I**.

### POTENTIAL SIGNIFICANT EFFECTS

- 13.7. **Table 13.1** identifies potential effects on telecommunications and aviation. Potential effects are those which could result from the construction and operation of a windfarm, according to the project, site and receptor characteristics and their interactions, and their inclusion in **Table 13.1** does not imply that they will occur, or be significant at Gordonbush. The assessment of effects on telecommunications and aviation is based upon an assessment of the potential effects, in order to identify predicted effects.

**Table 13.1 Summary of Potential Effects on Telecommunications and Aviation**

- interference with point to point transmission links operated by telecommunication service providers in the area;
- interference with military and civilian aviation radar / communication systems;
- interference with the reception of terrestrial TV at residences in the surrounding area;
- interference with the reception of radio services at residences in the surrounding area
- disruption to aircraft activity in the area

### CONSULTATION

- 13.8. **Table 13.2** summarises relevant responses to the consultation on Telecommunications and Aviation.

**Table 13.2 Consultation Responses Relating to Telecommunications and Aviation**

Consultee	Summary of Comments
<b>Public mobile communications network operators</b>	
O2 (UK)	O2 had no comment to make and are confident the proposed windfarm will not affect current or future operations
T-Mobile UK	T-Mobile did not provide a response
Vodafone Ltd	Vodafone checked their records and do not have any services in the area
Orange	Orange commented that the proposed windfarm is some distance from any of their installations and as a result Network Planners confirmed no impact on the existing network
<b>Public fixed communications network operators</b>	
Cable & Wireless	Cable & Wireless have no objections to the development proceeding.
British Telecommunications plc	BT plc did not provide a response
<b>Aviation</b>	
Civil Aviation Authority (CAA)	The CAA commented that there is no significant aeronautical radio stations within 30km of the proposed site.
National Air Traffic Services (NATS)	NATS found that the development does not conflict with their safeguarding criteria and therefore had no objections.
Defence Estates (agency of the Ministry of Defence)	The Defence Estates had no objections to the windfarm or monitoring masts but specified that certain information should be passed to them should the development go ahead, namely: date of commencement and completion of construction; height above ground level of tallest structure; maximum extension height of any construction equipment; position of masts in latitude and longitude; if the site will be lit.

Consultee	Summary of Comments
Highlands and Islands Airports Ltd (Includes Inverness Airport Authority)	Highlands and Islands Airports Ltd commented that the proposed development will have no effect upon operations at either Inverness or Wick airports.
<b>Maritime Traffic Control</b>	
Maritime and Coastguard Agency	The Maritime and Coastguard Agency had no objections to the development
<b>Local Emergency Services</b>	
Scottish Executive Communication & Information Services	There were no concerns with respect to radio coverage for the emergency services.
<b>Public radio and television broadcasters</b>	
BBC	The BBC commented that the development should not have a detrimental effect upon national or local BBC Radio reception. In terms of TV, the BBC advised that the proposed development is located within an area assigned to the ITC who have watching brief to protect TV services in the area. NTL acts on their behalf for some of these matters.
National Transcommunications Ltd. (NTL) (on behalf of the Independent Television Commission (ITC))	It is predicted that no RBL (Rebroadcast Link) or SHF (Super High Frequency) links should be affected by the windfarm. With regard to domestic reception, advised that in this isolated part of Scotland, it is very difficult to know precisely which transmitter homes are using. However, it is expected that homes are receiving their TV signals from Rosemarkie main transmitter (NH762623) in the south or from Rumster Forest to the north east (ND197385). Not expected to be any problems. Homes close to the development, where a high level of reflected signals could be received, may experience reception problems irrespective of the direction. However, there appears to be no dwellings nearby therefore problems close to the site are not expected. If viewers were affected by the development, the broadcaster/viewers would look to the developer to rectify any problems caused. Because of the very small risk of potential problems, if approached by the Planning authority for views, ntl would be obliged to enjoin the council to enter an agreement with the developer, for instance under section 75 of the town and country planning (Scotland) act 1997 or similar binding agreement to meet the cost of investigating and rectifying any problem that does occur.
Radio Communications Agency	No knowledge of any links that may be affected by the proposal.

13.9. In summary, the following key findings emerged from the consultation process:

- **Public mobile communications network operators:** No objections from Vodafone, Orange, O2. T-mobile did not provide an official response.
- **Public fixed communications network operators:** No objections from Cable & Wireless. BT plc did not provide a response.
- **Air traffic control:** No objections from Civil Aviation Authority, National Air Traffic Services, Defence Estates, Highlands and Islands Airports Ltd or Inverness Airport Authority.
- **Maritime Traffic Control:** No objections from the Maritime and Coastguard Agency
- **Local Emergency Services:** No objections from the Scottish Executive Communication & Information Services
- **Public radio and television broadcasters:** No objections from the BBC with regards to radio. No objections from NTL with regards to TV reception (includes BBC and NTL).

## POLICY CONTEXT

13.10. The assessment has been undertaken within the following policy context:

- NPPG 6 *Renewable Energy Developments*<sup>(i)</sup>, which highlights planning issues including electro-magnetic fields generated, consideration of airfield flight paths and military aircraft flying areas and telecommunications, including TV reception.
- PAN 45 *Renewable Energy Technologies*<sup>ii</sup>, which provide guidance on issues relating to windfarms, including electro-magnetic interference.
- PAN 62 *Radio Telecommunications*<sup>iii</sup>, which provides guidance on all aspects of radio telecommunications.
- Highland Structure Plan<sup>iv</sup> Policy E2 Wind Energy Development states: 'Wind energy developments will be supported provided that impacts are not shown to be significantly detrimental. In addition to the General Strategic Policies, wind energy proposals will be assessed in respect of: electro-magnetic interference ; aircraft flightpaths / MOD operations.'

## ASSESSMENT APPROACH

### Overview

13.11. The assessment has been carried out as a desk study. Standard guidance and professional judgement were used in the assessment. A field survey was not conducted.

### Baseline Assessment

13.12. The study covered:

- Preliminary identification of telecommunications, broadcast television and radio signal transmission in the area around the windfarm;
- Investigation into aviation activity in the area.

- A review of scoping responses and further consultation with telecommunications and broadcast television operators, maintainers of their transmission networks and relevant aviation parties.

### **Evaluation Method**

13.13. The evaluation involved:

- Consideration of consultation responses
- Particular regard to the position of the turbine site relative to the main sources of transmission
- For this assessment, given the results of the consultation exercise, it was not considered necessary to undertake any detailed technical evaluations such as analysis of geometry or materials properties of the turbines.

### **Significance criteria**

13.14. Particular significance criteria for the assessment of telecommunications have not been adopted. The assessment identifies communities or systems that are likely to be impacted by the proposed scheme and the likelihood of disruption.

## **EXISTING SITUATION**

### **Designations**

13.15. The proposed development site is located outwith the MOD Tactical Training Area LFA 14(T), which extends over much of northern Scotland, and is located west of the 275,000 volt overhead line adjacent to the windfarm site.

### **Previous studies / data**

13.16. The Site finder website, operated by the Radiocommunications Agency (RA) has a register of Mobile Phone Base Stations. This can be used as an initial check for potential stations prior to consultation with the relevant operator.

13.17. Outwith this, consultees carry out their own checks and research for the area in question.

### **Desk assessment**

#### **Telecommunications**

13.18. According to the consultation responses and research of the area, the site does not have any live or planned mobile phone masts. Similarly, no microwave radio links are present.

13.19. There are no significant aeronautical radio stations within 30km of the proposed site and there is no conflict with the safeguarding criteria of the civilian airfields at Inverness and Wick, and the military airfields at Lossiemouth and Kinloss.

#### **Radio**

13.20. The site and surrounding area has radio reception.

#### **Television**

13.21. The proposed windfarm is located within an area assigned to the ITC. It is expected that homes are receiving their domestic reception of broadcast television from either Rosemarkie main transmitter (NH762623) in the south or from Rumster Forest to the north east (ND197385).

#### **Airfields**

13.22. The site is remote from the civilian airfields at Inverness and Wick, and the military airfields at Lossiemouth and Kinloss.

### **Summary – Sensitive Receptors**

13.23. With respect to TV and radio users, the nearest occupied property to the turbine area is Gordonbush Lodge, approximately 4km to the south west. Other properties and settlements in this area are Ascoile, Oldtown, Killin and Brora.

### **Future situation without the scheme**

13.24. Without the windfarm scheme, there will no be related risk to existing telecommunication links, radio/ television transmissions and aviation.

## **ASSESSMENT OF POTENTIAL EFFECTS**

### **Ongoing and Operational Effects**

#### **Telecommunications Interference:**

13.25. The consultation has indicated that there will be no effect from the windfarm on:

- mobile telephone operators;
- fixed communication operators;
- maritime and coastguard agency service;
- military or civil aviation radar systems
- emergency services telecommunications.

#### **Radio Interference**

13.26. It has been concluded that the windfarm will have no detrimental effect on local or national radio reception. The BBC has indicated this is the case for their radio reception.

#### **Television Interference**

13.27. With regard to domestic TV reception, NTL have responded to the consultation by stating that they do not anticipate there to be any problems. However, homes close to the development, where a high level of reflected signals could be received, may experience reception problems irrespective of the direction. NTL state that there appears to be no dwellings nearby, and therefore problems close to the site are not expected.