

Glenvernoch Wind Farm

Environmental Impact Assessment Report Volume I Chapter 13: Infrastructure and Human Health

October 2024

CONTENTS

13 INFRASTRUCTURE AND HUMAN HEALTH	13-1
Introduction	13-1
Legislation, Policy and Guidance	13-1
Planning Policy	13-2
Consultation.....	13-3
Assessment Methodology and Significance Criteria	13-3
Baseline Conditions.....	13-4
Identification and Key Evaluation of Impacts.....	13-7
Cumulative Effects and Interaction of Effects	13-9
Mitigation Measures.....	13-9
Residual Effects.....	13-11
Summary	13-11

TABLES

Table 13.1: Summary of Relevant Consultation Undertaken to Date
Table 13.2: Summary of Relevant Aviation Interests
Table 13.3: Potential Shadow Flicker Receptors
Table 13.4: Potential Levels of Shadow Flicker

FIGURES

Figure 13.1: Potential Shadow Flicker Receptors

APPENDICES

Appendix 13.1: Wind Farm Aviation Lighting Design for Glenvernoch Wind Farm

13 INFRASTRUCTURE AND HUMAN HEALTH

Introduction

- 13.1 This chapter considers the likely significant effects of the Proposed Development upon infrastructure and human health interests of the Site and wider environment. Infrastructure interests include the following:
- Safety
 - Telecommunications
 - Aviation
 - Television reception
 - Buried and above ground infrastructure
 - Shadow flicker
- 13.2 Prior to assessing the likely significant effects, this chapter summarises the relevant legislative and policy background, the methods used to determine potential significant effects and the baseline conditions currently present on the Site. The potential significant effects associated with the Proposed Development are then established by comparison to the baseline conditions, along with proposed mitigation measures and the subsequent anticipated residual effects.
- 13.3 This chapter is not intended to be read as a standalone assessment and reference should be made to the initial chapters of this EIA Report (Chapters 1 – 5).
- 13.4 This chapter has been prepared by Energiekontor UK Ltd, an established wind developer with a wide range of experience of the various infrastructure and human health considerations discussed in this chapter.

Legislation, Policy and Guidance

- 13.5 The relevant set of reference documentation is set out below:

Safety

- British Standard BS 61400-1:2004
- Energy Review: HSE Expert Report (2006), Health and Safety Executive
- Wind Turbines and Horses – Guidance for Planners and Developers (2014), British Horse Society

Aviation

- Civil Aviation Publication (CAP) CAP 168 Licensing of Aerodromes, July 2013;
- CAP 764 Civil Aviation Authority (CAA) Policy and Guidance on Wind Turbines Version 5, June 2013;
- CAP 670 ATS Safety Requirements Version 3, June 2013;
- CAP 774 UK Flight Information Services;
- CAP 738 Safeguarding of Aerodromes;
- CAP 793 Safe Operating Practices at Unlicensed Aerodromes, July 2010;
- CAP 493 Safe Operating Practices at Unlicensed Aerodromes;
- CAP 660 Parachuting;
- Military Aviation Authority Traffic Management (3000 series) Instructions;
- Military Aviation Authority Manual of Aerodrome Design and Safeguarding;
- Military Aviation Authority Low Flying Manual;
- Low Flying Operations Squadron Wind Farm Assessment Criteria (Briefing Document 20071128 U TTA WF 2009/2011/2013);
- UK Military Aeronautical Information Publication (MIL AIP);
- UK Aeronautical Information Publications (AIP);
- CAA 1:250,000 and 1:500,000 VFR Charts; and
- Joint Ministry of Defence (MoD)/CAA Wind Farm Interim Guidelines

Television Reception

- Tall Structures and their Impact on Broadcast and other Wireless Services (2009), Ofcom

Buried and Above Ground Infrastructure

- Separation between Wind Turbines and Overhead Lines, Principles of Good Practice (2012), Energy Networks Association

Shadow Flicker

- Update of UK Shadow Flicker Evidence Base (2011), DECC

Planning Policy

13.6 Planning policy at the national and local level and its relevance to environmental design and assessment is discussed in Chapter 5. A summary of planning policy relevant to this chapter is summarised below:

- The National Planning Framework 4;
- Scottish Government web-based Advice on onshore wind turbines; and
- Relevant policies from the Local Development Plan.

Consultation

- 13.7 In accordance with policy guidance the organisations listed in Table 14.1 have been consulted to establish the relevant baseline conditions.

Table 13.1: Summary of Relevant Consultation Undertaken to Date

Body	Consultation Outcome Summary
Safety	
Dumfries and Galloway Council	Details of any Core Paths or other public rights of way in the vicinity of the Site.
Telecommunications	
JRC	Details of any telecommunication links passing in the vicinity of the Site.
BT	Details of any telecommunication links passing in the vicinity of the Site.
Aviation	
Ministry of Defence (MoD)	Consultation on proposed turbine coordinates.
National Air Traffic Services (NATS)	Consultation on proposed turbine coordinates and mitigation measures.
Buried and Above Ground Infrastructure	
Linesearch	Details provided of any pipeline infrastructure crossing the Site.

Assessment Methodology and Significance Criteria

- 13.8 In order to predict and quantify the impacts that would result from the Proposed Development on infrastructure and human health, this assessment has considered:

- **Baseline conditions** – a review of existing information in relation to existing public rights of way, telecommunication links, aviation, television reception and existing infrastructure on the Site and local area.
- **Significance of the effects and impacts** – an assessment of the impact of the Proposed Development against the baseline conditions and assessment of the cumulative impact of the Proposed Development with any other existing, consented or proposed wind turbine development in the area.
- **Mitigation measures** – details of the proposed mitigation measures to be incorporated into the Proposed Development that would be implemented to avoid any significant impacts.
- **Residual effects** – an assessment of any residual effects following the implementation of mitigation measures.
- **Summary of Assessment**

Baseline Conditions

Safety

- 13.9 Details of any Rights of Way, including Core Paths within the local area have been obtained from Ordnance Survey mapping and Dumfries and Galloway Council (DGC). Core Path 504 (Southern Upland Way) is located immediately west and north of the Site, forming a small part of the north western site boundary. In the northernmost corner of the site, Core Path 504 encroaches the site boundary at Bargrennan before crossing the River Cree to the east.
- 13.10 The Land Reform (Scotland) Act 2016 also provides members of the public with rights of access (sometimes referred to as 'right to roam') over the Site, provided that they behave responsibly.

Telecommunications

- 13.11 As confirmed by relevant operators, there are no existing telecommunications links currently crossing the site. No adverse effects on telecommunication links are therefore anticipated and this issue is not considered further.

Aviation

- 13.12 CAP 764 sets out that the criteria for assessing the impacts on various types of airfield include:
- Airfield with a surveillance radar – 30 km;
 - Non radar licensed aerodrome with a runway of more than 1,100 m – 17 km;
 - Non radar licensed aerodrome with a runway of less than 1,100 m – 5 km;
 - Licensed aerodromes where the turbines would be located within airspace coincidental with any published Instrument Flight Procedure (IFP);
 - Unlicensed aerodromes with runways of more than 800 m – 4 km;
 - Unlicensed aerodromes with runways of less than 800 m – 3 km;
 - Gliding sites – 10 km; and
 - Other aviation activity such as parachute sites and microlight sites within 3 km – in such instances developers are referred to appropriate organisations.
- 13.13 In accordance with CAP 764, Table 13.2 below sets out details of all relevant aviation interests in the area along with their distance from the Site.

Table 13.2: Summary of Relevant Aviation Interests

Aviation Interest	Distance from Nearest Turbine
MoD Airfields	
MoD West Freugh Range	27.5km
NATS	
There are none within the relevant distance criteria set out in CAP 764	-

Aviation Interest	Distance from Nearest Turbine
Civil Aerodromes, Unlicensed Aerodromes and Other Aviation Sites	
There are none within the relevant distance criteria set out in CAP 764	-

Television Reception

- 13.14 Given the topography of the area it is likely that the majority of receivers will be positioned towards the Caldbeck Transmitter in Cumbria. Given the distance between the transmitters and the Site and the strength of the digital signal transmitted, it is not anticipated that the quality of television signal would be significantly affected within these potential shadow zones. This issue is not considered further.

Buried and Above Ground Infrastructure

- 13.15 A Linesearch enquiry has been undertaken which shows that there is no buried or above ground infrastructure crossing the Site. No adverse effects are anticipated in relation to buried and above ground infrastructure and this issue is not considered further.

Shadow Flicker

- 13.16 Shadow flicker as an issue has been around for as long as wind farms have been in development. The phenomenon is well understood and well-established industry software, developed and updated over decades, is able to predict potential effects in fine detail. The information is fed into the programming of wind turbines through shadow flicker modules – offered by all modern turbine manufacturers – to automatically shut down the turbines when shadow flicker could occur at a receptor. The majority of effects tend to be within 10 rotor diameters from turbines and in the Applicant's experience, that is the distance within which issues occur. Complaints can and do occur outside this zone, however such cases are rare and can quickly be addressed by adjusting the shadow flicker modules to automatically shut down at the relevant property. The Applicant has an operations team in Scotland who are committed to preventing the occurrence of shadow flicker and can quickly and easily make any required adjustments to the operation of wind farms if any complaints do arise.
- 13.17 The 2011 Parsons Brinckerhoff study *Update of UK Shadow Flicker Evidence Base* sets out the following recommendations for assessing shadow flicker:
- A study area of 130 degrees north of turbine positions is considered appropriate for assessing shadow flicker effects;
 - There is unlikely to be a significant effect at distances greater than 10 rotor diameters; and
 - The frequency of rotational speed of modern wind turbines are unlikely to cause any health effects and nuisance.
- 13.18 Based on these parameters, a study area was established to identify properties with potential susceptibility to shadow flicker effects. A baseline was established through a desk study using 1:10,000 scale ordnance survey mapping and OS Landform Profile terrain

mapping. The candidate wind turbine modelled in the assessment had a rotor diameter of 170m, giving a study area of 1,700m from each turbine 130 degrees either side of north (the zone of potential shadow flicker). There are 11 properties within this study area and two properties that sit just outside the study area, but have also been included within the assessment. Table 13.3 lists these properties and their distance to the nearest turbine.

Table 13.3 Potential Shadow Flicker Receptors

Property	Distance to nearest turbine
Knockville	619m
Clachaneasy	1310m
Glenvernoch	1470m
Glenruther	1548m
Brigton Farm	1300m
Old Larg House	1170m
Larg Farm	1192m
Shepherds Cottage	1234m
Glenvernoch Cottage	1569m
Glenhapple	1336m
Cordorcan	1218m
Beoch	2185m
Glenruther Lodge	2517m

Identification and Key Evaluation of Impacts

Safety

Technical Safety Issues

- 13.19 Modern wind turbines are designed and manufactured to withstand the most extreme weather conditions which arise in the United Kingdom in terms of wind speeds, turbulence and temperature. The structural parts of the turbines and all aspects relating to the foundations and associated infrastructure would be designed to survive the worst weather conditions that could be anticipated and would meet the relevant structural safety legislation.
- 13.20 Turbine control and monitoring systems operate with several levels of redundancy to protect the plant from damage. In the case of faults arising, including situations where the speed of the blades or power production exceeds set parameters, or loss of grid connection, turbines shut down automatically through the installation of failsafe braking mechanisms. In addition, turbines are fitted with vibration sensors so that, if in the unlikely event a blade is damaged or significantly ices, the turbines would automatically shut down.
- 13.21 The Health and Safety Executive (HSE) prepared an expert report in 2006 which examined the potential risks relating to health and safety at work that might arise from some specific energy development. This report 'The 2006: Energy Review: HSE Expert Report' states:
- "The planning process also has an important role to play in helping identify and address health and safety issues prior to development and construction, such as turbine location".*
- 13.22 It also states:
- "Full consideration of issues such as turbine location relative to other structures, highways and areas where public have access will help ensure the continued safe development and reputation of the wind industry. The application of sensible risk assessment as an integral part of the planning process should help to identify risks and highlight any measures required to reduce them to an acceptable level".*
- 13.23 Several British Standards (including BS61400-1:2004) were identified within the HSE report that apply to wind turbine generators and their safety requirements. These standards specify requirements for safety of onshore wind turbine generator systems irrespective of location or environment, including design, installation, maintenance and operation under specified environmental conditions. They also cover all subsystems, including control and protection mechanisms, internal electrical systems, support structures, foundations and the electrical interconnection equipment. The standards are concerned with quality assurance during design and manufacture and also with the adequacy of the assembly, installation, maintenance and operational procedures.

- 13.24 The HSE report recognises that wind turbines are frequently located on land open to the public, so account needs to be taken of hazards such as whole or partial blade failure, falling ice, fire and lightning. The report also acknowledges that the history of the industry indicates that the likelihood of occurrence of incidents from these hazards is low.
- 13.25 Properly designed and maintained wind turbines are a safe technology. The very few accidents that have occurred involving injury to humans have been caused by failure to observe manufacturers' and operators' instructions for the operation of machines. There has been no record of injury to a member of the public.

Public Access Considerations

- 13.26 In terms of public access safety considerations, given the safety features and safety record of wind turbines, coupled with the separation distances provided between the wind turbines and rights of way, **no potentially significant effects** are predicted in relation to wind farm safety. However, given the access rights across the Site afforded by the Land Reform (Scotland) Act 2016 and the presence of Core Path 504 (Southern Upland Way) on the northwest boundary, and partially crossing the site in the northernmost corner, it would be prudent to put mitigation measures in place during the construction phase to address any safety issues in relation to members of the public exercising their 'right to roam' or taking access across the Core Path. These measures are discussed in the *Mitigation* section below.

Telecommunications

- 13.27 Relevant operators have been consulted by the Applicant and details of the link paths passing in close proximity to the proposed wind turbines have been provided by the relevant link operators. As there are no links in the vicinity of the Site **no potentially significant effects** are predicted.

Aviation

MoD

- 13.28 It is necessary to take into account the aviation and air defence activities of the MoD in the area. The types of issues that need to be addressed include:
- MoD airfields, both radar and non-radar equipped;
 - MoD Air Defence radars;
 - MoD low flying; and
 - Meteorological Radars.
- 13.29 In relation to airfields, radar line of sight modelling has been undertaken which demonstrates the proposed wind turbines would not be visible to any MoD airfields. **No potentially significant effects** are therefore predicted in relation to MoD airfields.
- 13.30 In relation to Air Defence radars, radar line of sight modelling has been undertaken which demonstrates the proposed wind turbines would not be visible to any MoD Air Defence

radars. **No potentially significant effects** are therefore predicted in relation to MoD Air Defence radars.

- 13.31 In relation to Meteorological Radars, the Met Office safeguards its network of radars using a European methodology known as OPERA. In general they will object to any turbine within 5km in line of sight and will examine the impact of any turbines within 20km. There are no radars which would be affected by the Proposed Development and **no potentially significant effects** are predicted.
- 13.32 The impact of wind turbine development on military low flying is assessed by the Low Flying Operations Squadron (LFOS). The site falls within Tactical Training Area 20T (TTA 20T), an area within which fixed wing aircraft may operate as low as 100 feet above ground level to conduct low level flight training. The MOD was consulted and they have requested that a condition is attached to the consent which states that as a minimum the MOD require the development to be fitted with MOD accredited aviation safety lighting in accordance with the Air Navigation Order 2016.
- 13.33 The Applicant accepts the condition required by the MOD, and in doing so there are **no potentially significant effects** predicted in relation to MoD low flying operations.

NATS

- 13.34 It is necessary to take into account the possible effects of wind turbines upon the NATS radar system – a network of primary and secondary radars and navigation facilities around the country.
- 13.35 NATS have been consulted by the Applicant and they confirmed the development does not conflict with their safeguarding criteria. The site also falls outwith the relevant distance criteria for assessment of possible effects on primary and secondary radars and navigation facilities as set out in CAP 764. No **potentially significant effects** are therefore predicted.

Cumulative Effects and Interaction of Effects

- 13.36 There is no potential for significant cumulative effects in relation to human health, telecommunications, buried infrastructure, aviation, television reception or shadow flicker when considered alongside other proposed developments in the local area.

Mitigation Measures

- 13.37 The following mitigation measures are set out in relation to safety issues:

Safety

- 13.38 Given that Core Path 504 (Southern Upland Way) crosses a small part of the site in the northernmost corner and forms a small section of the northwest site boundary, and more generally that members of the public are able to exercise their 'right to roam' across the Site by virtue of the Land Reform (Scotland) Act 2016, it is considered prudent to put appropriate measures in place to protect members of the public from incident during the construction and decommissioning phases.

- 13.39 It is proposed to erect suitable temporary signage on the Site during the construction and decommissioning phases to advise members of the public of the areas in which construction activities would be taking place and the risks involved. This would allow members of the public to avoid any potentially dangerous areas. Temporary fencing could also be erected as necessary during the construction and decommissioning phases. DGC's Countryside Access Team would be consulted over any such temporary proposals during the construction and decommissioning phases.

Shadow Flicker

- 13.40 The Applicant would operate a shadow flicker protocol that would automatically shut turbines down at times when shadow flicker could potentially occur. The protocol would also set out how the Applicant will respond to any shadow flicker complaints should they arise during the operation of the Proposed Development.
- 13.41 Table 13.4 details the predicted levels of shadow flicker at each of the potential receptor locations within the shadow flicker zone. The table details the maximum duration of effects which could theoretically occur throughout the year assuming the sun is always shining, together with the predicted likely number of hours of shadow flicker per annum (assuming 30% per annum bright sunshine).

Table 13.4 Potential Levels of Shadow Flicker

Property	Theoretical Maximum Hours per Annum*	Likely Hours per Annum Assuming 30% Sunshine*
Knockville	245 hours	74 hours
Clachaneasy	56 hours	17 hours
Glenvernoch	0 hours	0 hours
Glenruther	10 hours	3 hours
Brigton Farm	50 hours	15 hours
Old Larg House	70 hours	21 hours
Larg Farm	79 hours	24 hours
Old Shepherds Cottage	92 hours	28 hours

Glenvernoch Cottage	0 hours	0 hours
Glenhapple	29 hours	9 hours
Cordorcan	94 hours	28 hours
Beoch	0 hours	0 hours
Glenruther Lodge	4 hours	1 hour

*Figures have been rounded to the nearest whole hour

- 13.42 The levels of shadow flicker reported in table 13.4 are considered to be worst case as they do not take into account any intervening screening by vegetation or local landform. Notwithstanding that, and in the context of guidance discussed above which sets a guideline of not more than 30 hours of shadow flicker per year for dwellings, the levels of likely predicted shadow flicker at the majority of properties are at a low level such that **no potentially significant effects** are predicted to occur in relation to shadow flicker.
- 13.43 The property at Knockville exceeds the guideline of 30 hours per year, and so mitigation measures will need to be implemented here. This would best be achieved through a shadow flicker protocol, secured via planning condition, requiring the programming of the wind turbines to automatically shut down at times when flicker effects could occur. This would ensure that any potential effects are minimised or removed entirely.
- 13.44 Whilst no significant effects are predicted in relation to shadow flicker at the other 10 properties within the shadow flicker zone, in the event that reports or complaints of shadow flicker are received by the Applicant or Dumfries and Galloway Council, and an appropriate investigation confirms the occurrence, then appropriate measures would be used to mitigate the re-occurrence. Again, this could be secured through a planning condition.

Residual Effects

- 13.45 Following implementation of any necessary mitigation it is considered that there would be no significant effects on infrastructure on human health as a result of the Proposed Development.

Summary

- 13.46 Consideration has been given to the potential for significant effects on infrastructure and human health. Following implementation of any necessary mitigation it is considered that there would be **no potentially significant effects** on infrastructure or safety arising as a result

of the Proposed Development or in combination with any other existing, consented or proposed wind turbine developments in the local area.