

Craiginmoddie Wind Farm

Environmental Impact Assessment Report Chapter 14: Infrastructure and Human Health

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14 INFRASTRUCTURE AND HUMAN HEALTH

Introduction

- 14.1 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
- 14.2 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.
- 14.3 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).
- 14.4 This chapter has been prepared by Energiekontor UK Ltd with specialist initial input in relation to aviation considerations from Commander John Taylor of Wind Power Aviation Consultants Ltd, formerly of the Royal Navy. Energiekontor UK Ltd is 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

- 14.5 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

14.6 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 3;
- Scottish Planning Policy;
- Scottish Government web-based Advice on onshore wind turbines; and
- Relevant policies from the Local Development Plan.

Consultation

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

Table 14.1: Summary of Relevant Consultation Undertaken to Date

Body	Consultation Outcome Summary
Safety	
South Ayrshire Council	Details of any Core Paths or other public rights of way in the vicinity of the Site.
Telecommunications	
Ofcom	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

- 14.8 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

- 14.9 Details of any Rights of Way, including Core Paths within the local area have been obtained from Ordnance Survey mapping and South Ayrshire Council (SAC). There are no Core Paths within the proposed wind farm site itself, however, Core Paths SA1, SA46

and SA42 do coincide with parts of the access routes that would be used by construction traffic. The Sustrans National Route 7 also runs along Core Path SA1 to the east of the Site.

- 14.10 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

- 14.11 As confirmed by consultation with Ofcom, 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

- 14.12 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.
- 14.13 In accordance with CAP 764, Table 14.2 below sets out details of all relevant aviation interests in the area along with their distance from the Site.

Table 14.2: Summary of Relevant Aviation Interests

Aviation Interest	Distance from Nearest Turbine
MoD Airfields	
There are none within the relevant distance criteria set out in CAP 764	-
NATS	
Lowther Hill radar	57 km
Civil Aerodromes, Unlicensed Aerodromes and Other Aviation Sites	
Glasgow Prestwick Airport	25 km

Television Reception

- 14.14 Given the topography of the area it is likely that the majority of receivers will be positioned either towards the Darvel Transmitter. 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

- 14.15 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

- 14.16 The 2011 Parsons Brinckerhoff study *Update of UK Shadow Flicker Evidence Base* sets out the following conclusions:

- 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.

- 14.17 The baseline was established through a desk study using:

- 1:10,000 scale Ordnance Survey Mapping; and
- OS Landform Profile terrain mapping.

- 14.18 The mapping was used to identify properties with potential susceptibility to shadow flicker. The candidate wind turbines modelled in the assessment has a proposed rotor diameter of 155 m. The area around each turbine location within a distance of ten rotor diameters (1,550 m) and 130 degrees either side of north (the zone of potential shadow flicker) was mapped. There is one property within this potential flicker zone with a further three properties just outside of the zone as illustrated on Figure 14.1. For the purposes of undertaking a comprehensive assessment these additional properties have been included in the shadow flicker assessment.

Identification and Key Evaluation of Impacts

Safety

Technical Safety Issues

- 14.19 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.

14.20 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, in the unlikely event a blade is damaged or significantly iced, the turbines would automatically shut down.

14.21 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".

14.22 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".

14.23 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.

14.24 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.

14.25 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

14.26 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 the Core Paths and Sustrans cycle route on the construction access routes, 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 Paths and Sustrans route. These measures are discussed in the *Mitigation* section below.

Aviation

Glasgow Prestwick Airport

- 14.27 Glasgow Prestwick Airport is located approximately 25km north of the Proposed Development. Radar line of sight modelling has been undertaken for the Proposed Development which indicates that the proposed turbines are likely to be visible to the radar at the airport. This would generate clutter on the radar screen at the airport, potentially impairing the operations of air traffic controllers. This would lead to a **potentially significant effect**. Mitigation measures are discussed below.

MoD

- 14.28 The types of issues that need to be addressed in respect of the MoD include:
- MoD airfields, both radar and non-radar equipped;
 - MoD Air Defence radars; and
 - Meteorological Radars.
- 14.29 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.
- 14.30 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.
- 14.31 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.

NATS

- 14.32 The NATS radar at Lowther Hill has coverage in the area of the Site. Radar line of sight modelling has been undertaken for the Proposed Development which indicates that the proposed turbines are likely to be visible to this radar. This would generate clutter on the radar screen at Lowther Hill, potentially impairing the operations of air traffic controllers. This would lead to a **potentially significant effect**. Mitigation measures are discussed below.

Shadow Flicker

- 14.33 Table 14.3 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 14.3: Potential levels of shadow flicker

Property	Theoretical Maximum Hours per Annum*	Likely Hours per Annum Assuming 30% Sunshine*
Doughty	50 hours	15 hours
Delamford	21 hours	6 hours
Dobbingstone	34 hours	10 hours
Glenalla	7 hours	2 hours

* Figures have been rounded to the nearest whole hour

- 14.34 The levels of shadow flicker reported in Table 14.3 are considered to be worst case as they do not take into account any intervening screening by vegetation or local landform. That notwithstanding and in the context of the guidance discussed above, the levels of likely predicted shadow flicker are at a low level such that **no potentially significant effects** are predicted to occur in relation to shadow flicker.

Cumulative Effects and Interaction of Effects

- 14.35 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

- 14.36 Mitigation measures are proposed specifically to address the potential adverse effects of the Proposed Development in relation to aviation as set out below. Mitigation measures are also set out in relation to safety issues.

Safety

- 14.37 Given the presence of Core Paths and the Sustrans route on the construction traffic routes, 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.
- 14.38 It is proposed to erect suitable temporary signage on the Site and the off-site construction routes 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. SAC's Countryside Access Team would be consulted over any such temporary proposals during the construction and decommissioning phases, and a Construction Traffic Management Plan would be put in place with SAC to manage the safety issues around construction traffic off-site.
- 14.39 It is also proposed to include some enhancement measures to improve opportunities for recreational access in the area. In particular, the Site offers the opportunity to link up a number of existing recreational opportunities in the area as illustrated on Figure 14.2, in particular Core Path SA46 to the west of the Site and Core Path SA1 to the east of the Site. This link would establish a number of circular walks in the area, for example a 25km circular walk could be undertaken from Dailly by following the SA42, SA46, the tracks associated with the Proposed Development, the SA1, the SA43 and finally the SA42. A 29km circular walk could be undertaken from Barr by following the SA51, the SA46, the tracks associated with the Proposed Development, the SA1, and finally the SA52. Similarly from Crosshill a 30km circular walk could be undertaken by following the SA1, the tracks associated with the Proposed Development, the SA46, the SA42, the SA41 the SA43 and finally back along the SA1. These circular walks are illustrated on Figures 14.3-14.5.

Aviation

- 14.40 The Applicant will enter into discussions with NATS to provide appropriate mitigation for the potentially significant effects on the radar at Lowther Hill. It is likely that these discussions will be concluded during consideration of the application. A suitably worded planning condition could be attached to the grant of any consent to ensure that the required mitigation is delivered as agreed.
- 14.41 The Proposed Development may interfere with the current radar operations at Glasgow Prestwick Airport (GPA) which may lead to an adverse effect upon the operation of air traffic controllers at GPA. Such impacts are not uncommon for wind energy proposals and the Applicant will engage with GPA to establish suitable mitigation arrangements for the Proposed Development. It is likely that these discussions will be concluded during consideration of the application for consent. A suitably worded planning condition could be attached to the grant of any consent to ensure that the required mitigation is delivered as agreed.

Residual Effects

- 14.42 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

- 14.43 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.