

Telecommunications Impact Assessment

RSK Environment Limited

Hollandmey Renewable Energy Development

27 October 2021



PLANNING SOLUTIONS FOR:

- Solar
- Telecoms
- Railways
- Defence
- Buildings
- Wind
- Airports
- Radar
- Mitigation

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ADMINISTRATION PAGE

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Issue	Date	Detail of Changes
1	15 June 2020	Initial issue (10008A)
2	17 June 2020	Additional link operator responses
3	28 October 2020	Assessment of finalised layout
4	27 August 2021	Assessment of updated T8 location (10008G)
5	27 October 2021	Updated redline boundary

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EXECUTIVE SUMMARY

Report Overview

Pager Power has been commissioned to investigate the potential impact a proposed wind development located in northern Scotland, UK, upon wireless communications infrastructure (point-to-point links) in the surrounding area.

The proposed wind development comprises 10 wind turbines with a maximum tip height of 149.9 metres above ground level (agl) and a rotor diameter of 132 metres.

Overall Results

Arqiva, Atkins Global, and Ericsson have confirmed that they do not operate any communication links in the surrounding area and therefore have no concerns with the proposed development.

BT, Telefonica, and Vodafone identified telecommunication links that cross the site; however, the analysis has shown that none of the turbines infringe the exclusion zones, and no impacts are therefore predicted. This was also confirmed through consultation with the link operators.

The JRC raised an initial objection to the proposed development but did not provide specific link details. After undertaking further analysis, the proposed development was cleared with respect to radio link infrastructure. The JRC has therefore removed their objection.

Airwave is a company that safeguards fixed communication links for the emergency services and does not provide link details due to confidentiality reasons. They do offer their own assessment for developments, which is commercially available pre-planning or automatically undertaken where necessary following submission.

Mitigation

None of the surrounding communications links are affected by the proposed development and therefore no mitigation requirement has been identified.

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ABOUT PAGER POWER

Pager Power is a dedicated consultancy company based in Suffolk, UK. The company has undertaken projects in 51 countries within Europe, Africa, America, Asia and Australasia.

The company comprises a team of experts to provide technical expertise and guidance on a range of planning issues for large and small developments.

Pager Power was established in 1997. Initially the company focus was on modelling the impact of wind turbines on radar systems. Over the years, the company has expanded into numerous fields including:

- Renewable energy projects.
- Building developments.
- Aviation and telecommunication systems.

Pager Power prides itself on providing comprehensive, understandable, and accurate assessments of complex issues in line with national and international standards. This is underpinned by its custom software, longstanding relationships with stakeholders and active role in conferences and research efforts around the world.

Pager Power's assessments withstand legal scrutiny and the company can provide support for a project at any stage.

1 BACKGROUND

1.1 Introduction

Pager Power has been commissioned to investigate the potential impact a proposed wind development located in northern Scotland, UK, upon wireless communications infrastructure (point-to-point links) in the surrounding area.

The proposed wind development comprises 10 wind turbines with a maximum tip height of 149.9 metres above ground level (agl) and a rotor diameter of 132 metres.

In detail, this report contains:

- Site description;
- Ofcom and stakeholder consultation to identify relevant:
 - Microwave links;
 - UHF Telemetry links.
- Technical analysis including:
 - Exclusion zone calculations (Ofcom-recommended methodology);
- Overall conclusions.

2 PROPOSED WIND DEVELOPMENT DETAILS

2.1 Proposed Development Location

The location and application boundary of the proposed development is shown in Figure 1¹ below.

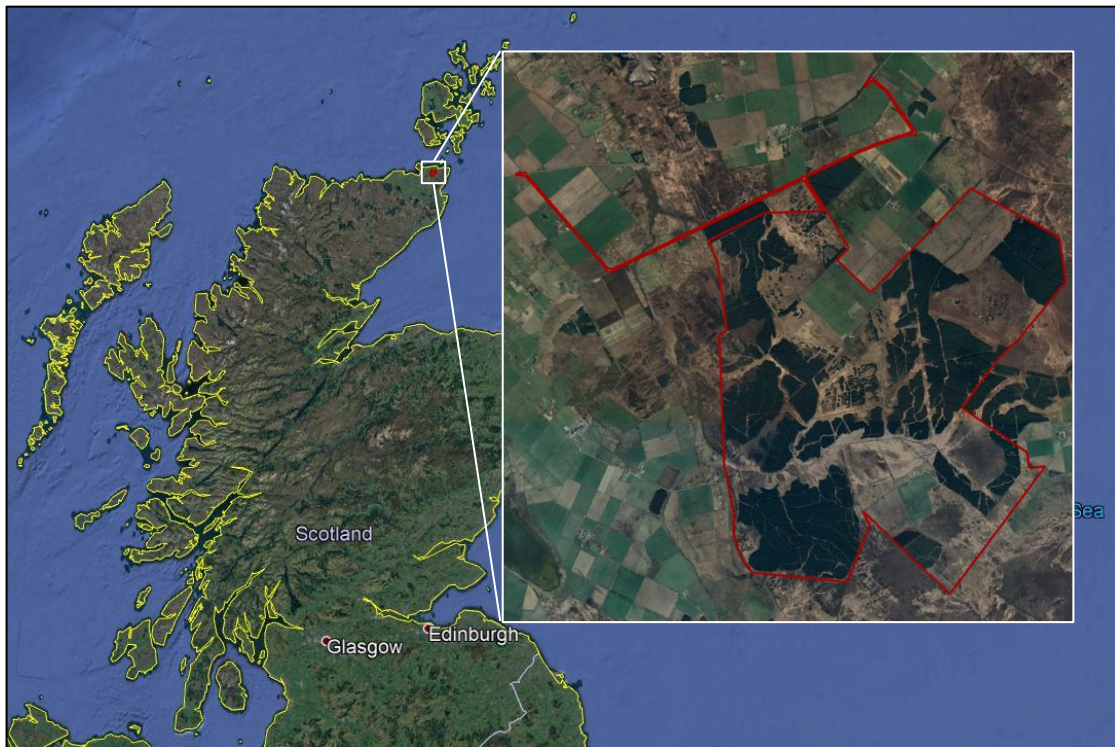


Figure 1 Proposed development location

¹ Source: Copyright © 2021 Google.

2.2 Proposed Development Layout

The locations of the proposed wind turbines are shown in Figure 2² below. The wind turbine coordinate and height details are presented in Appendix A.



Figure 2 Proposed development layout

² Source: Copyright © 2021 Google.

3 TELECOMMUNICATIONS CONSULTATION SUMMARY

3.1 Process

Historically, Ofcom has provided on request a list of parties that operate licensed fixed links within a given search radius of a defined location. Since 2018, this process was under review following GDPR requirements and has not been formally restarted³. Therefore, consultation was undertaken directly with the most prevalent operators⁴ in order to obtain link details. At the time of writing, no further information from Ofcom has been made available.

Airwave is a company that safeguards fixed communication links for the emergency services and does not provide link details due to confidentiality reasons. An Airwave assessment has not been progressed at this stage but is automatically undertaken where necessary following submission.

3.2 Consultation Overview

Table 1 below presents a summary of the consultation to date.

Party	Summary
Arqiva	No telecommunication links in the vicinity and therefore no objections to the proposed development.
Atkins	No telecommunication links in the vicinity and therefore no objections to the proposed development.
BT	Confirmed that the proposed development will not have an impact upon their infrastructure.
Ericsson	No telecommunication links in the vicinity and therefore no objections to the proposed development.
Joint Radio Company (JRC)	The JRC has confirmed through their own internal analysis that the proposed development has been cleared with respect to radio link infrastructure operated by the local electricity utility. No objection.
Telefonica	Confirmed that the proposed development will not have an impact upon their infrastructure.
Vodafone	Confirmed that the proposed development will not have an impact upon their infrastructure.

Table 1 *Telecommunications stakeholder consultation*

³ To Pager Power's knowledge.

⁴ Based on Pager Power's experience and contacts database.

4 TECHNICAL ASSESSMENT

4.1 Methodology

Microwave and UHF⁵ wireless communication links are used to transmit information between two antennae via radio waves within a particular frequency band.

The exclusion zones associated with the identified links have been calculated based on the telecommunications data provided. Further 2-dimensional clearance calculations have then been undertaken to determine the extent of any clearance or infringement of the proposed development. The following subsections present an overview of the interference mechanisms and methodology.

4.1.1 Fresnel Zones

A Fresnel Zone takes the form of an ellipsoid surrounding a link path and represents the area in which obstructions should not be sited in order to avoid diffraction losses. The width of the zone at any point along the link path is determined by the Fresnel Zone number, the frequency of the link and the distance from each link end. The width of the zone is maximal at the midpoint of the link path.

4.1.2 Diffraction – Microwave and UHF Links

Obstructions such as building developments which are sited in between two microwave link antennae can partially block the radio signal passing between them, thereby reducing the functionality of the link. This can occur even if the obstruction is not directly between the antennae but close to the link boresight⁶. This kind of blocking is called 'diffraction'.

There are various approaches to safeguarding microwave links against from obstruction via building developments. The most common approaches are:

1. Implementation of a fixed stand-off distance around the link boresight;
2. Safeguarding the relevant Fresnel Zone (discussed below).

The first approach is used by many operators who request a set buffer distance. Set stand offs are occasionally conservative and produce a large exclusion zone distance. The second approach is to assess an obstruction on a case-by-case basis to calculate the most accurate exclusion zone. Pager Power considers the Second Fresnel zone when assessing the effect of a wind turbine upon microwave links and the 0.6th Fresnel zone when assessing UHF links⁷.

⁵ Ultra-High Frequency

⁶ This is the straight line between the two antennae.

⁷ Manning, T. (1999), Microwave Radio Transmission Design Guide, Artech House Books

4.1.3 Reflections – UHF Links

Obstructions can affect UHF links by reflecting the signal between transmitter and receiver. This is not a significant concern for microwave links because they are highly directional. Reflection effects are unlikely to be significant because the link paths are already operating in a built-up area surrounded by many buildings. Diffraction effects are likely to be the most significant concern.

4.2 Identified Telecommunications Links

Operator	Link ID / Ref	Frequency / Buffer Distance	A End	B End
BT	6000349	100m	334372E 945602N	328000E 992580N
	6000351			
	6000353			
	6000355			
	6000357			
	6000359			
	6000361 6000363			
Joint Radio Company (JRC)	JESHCS1 to JESHCO18	460 MHz	The JRC does not provide specific link details.	
Telefonica	1125009/1	15 GHz	332360E 970226N	317499E 965641N
	1119919/1	7.5 GHz	332360E 970226N	334400E 945600N
Vodafone	0950728/1	38 GHz	332360E 970226N	325400E 970900N
	0951034/1	15 GHz	332360E 970226N	317499E 965641N
	0950749/1	38 GHz	335540E 963430N	332360E 970226N

Table 2 Identified telecommunications links

4.3 Telecommunications Link Exclusion Zone Chart

Figure 3 below shows the telecommunications link exclusion zone chart for the identified links⁸. Each exclusion zone is represented by two lines, each marking an edge of the exclusion zone⁹. Any turbine(s) located between the lines would infringe the zone in two dimensions.

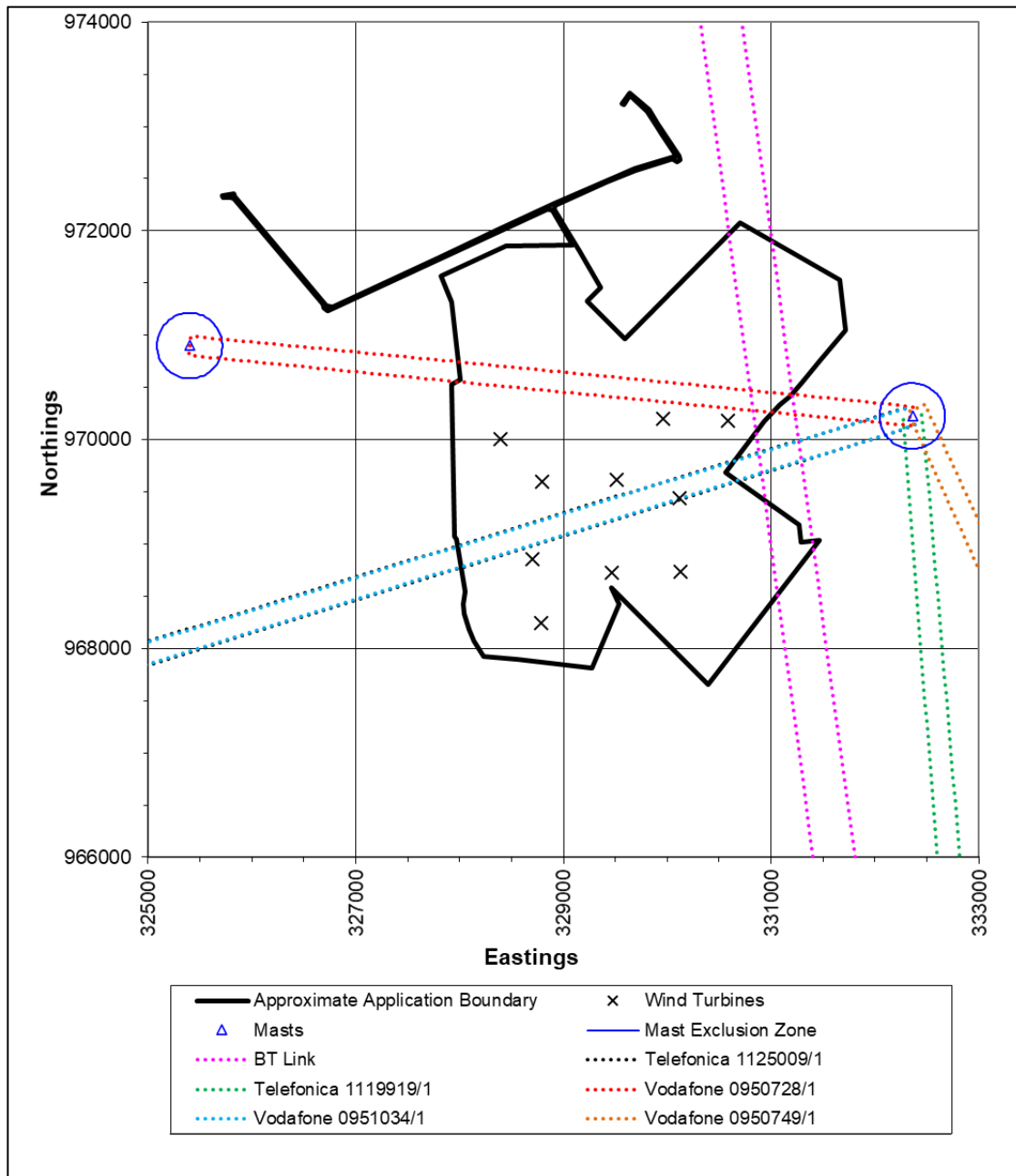


Figure 3 Telecommunications link exclusion zone chart

⁸ The JRC does not provide specific link details and were therefore not plotted.

⁹ The Vodafone 0951034/1 and Telefonica 1125009/1 links occupy the same path.

4.4 Technical Assessment

The exclusion zone chart shows that a turbine (T8) is located close to the Telefonica 1125009/1 and Vodafone 0951034/1 communication link exclusion zones. 2-dimensional clearance calculations have therefore been undertaken for these communications links to determine the extent of any clearance or infringement of the turbine.

4.4.1 Telefonica

The clearance calculations for the Telefonica 1125009/1 communications link is shown in Figure 4 below.

The analysis shows that T8 is clear of the Telefonica link exclusion zone by 8.2m and therefore no impacts are predicted. This conclusion was confirmed through consultation with Telefonica.

Link Type	Microwave			
Link Description	Telefonica 1125009/1			
	A End	Z End		
Easting	332360	317499	Turbine Distance from A End (km)	2.4
Northing	970226	965641	Turbine Distance from Z End (km)	13.2
Frequency GHz (e.g. 13)	7.5		Link Length (km)	15.6
Turbine	8		Second Fresnel Zone Radius [B] (m)	12.7
Turbine Easting	330120		Turbine Distance from Link Path [C] (m)	86.9
Turbine Northing	969444		Clearance between Tip and Zone [D] (m)	8.2
Turbine Rotor Diameter [A]	132			
Calculation Reference	A6		Additional Clearance [E] (m)	0
			Remaining Clearance Tip - Zone [F] (m)	8.2

Figure 4 Telefonica link clearance calculations

4.4.2 Vodafone

The clearance calculations for the Vodafone 0951034/1 communications link is shown in Figure 5 below.

The analysis shows that T8 is clear of the Vodafone link exclusion zone by 11.9m and therefore no impacts are predicted. This conclusion was confirmed through consultation with Vodafone.

Link Type	Microwave			
Link Description	Vodafone 0951034/1			
	A End	Z End		
Easting	332360	317499	Turbine Distance from A End (km)	2.4
Northing	970226	965641	Turbine Distance from Z End (km)	13.2
Frequency GHz (e.g. 13)	15		Link Length (km)	15.6
Turbine	8		Second Fresnel Zone Radius [B] (m)	9.0
Turbine Easting	330120		Turbine Distance from Link Path [C] (m)	86.9
Turbine Northing	969444		Clearance between Tip and Zone [D] (m)	11.9
Turbine Rotor Diameter [A]	132			
Calculation Reference	A6		Additional Clearance [E] (m)	0
			Remaining Clearance Tip - Zone [F] (m)	11.9

Figure 5 Vodafone link clearance calculations

5 CONCLUSIONS

5.1 Overall Results

Arqiva, Atkins Global, and Ericsson have confirmed that they do not operate any communication links in the surrounding area and therefore have no concerns with the proposed development.

BT, Telefonica, and Vodafone identified telecommunication links that cross the site; however, the analysis has shown that none of the turbines infringe the exclusion zones, and no impacts are therefore predicted. This was also confirmed through consultation with the link operators.

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5.2 Mitigation

None of the surrounding communications links are affected by the proposed development and therefore no mitigation requirement has been identified.

APPENDIX A – WIND TURBINE DETAILS

Wind Turbine Details

ID	Easting	Northing	Rotor Diameter (m)	Tip Height (m agl)
T1	328397	970004	132	149.9
T2	328796	969598		
T3	328700	968860		
T4	328781	968240		
T5	329515	969620		
T6	329467	968729		
T7	329963	970204		
T8	330120	969444		
T9	330129	968731		
T10	330588	970185		

Wind turbine details



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