

Telecommunications Impact Assessment

Cliffe Hill Farm

Caddick Group Limited

March 2026



ADMINISTRATION PAGE

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Issue	Date	Detail of Changes
1	08 January 2026	Initial issue
2	23 January 2026	Additional stakeholder responses and assessment of infrastructure
3	03 February 2026	Minor revision
4	06 March 2026	Confirmation of agreement with Maxxwave Limited

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EXECUTIVE SUMMARY

Report Purpose

Pager Power has been commissioned to investigate the potential impact of a proposed building development upon wireless telecommunications infrastructure (point-to-point links) in the surrounding area. The proposed development is located at Cliffe Hill Farm, at J22 of the M1, Leicestershire.

The proposed development will introduce new structures that could interact with wireless telecommunications infrastructure and cause interference. This report presents the results of stakeholder consultation and an impact assessment of any identified telecommunications infrastructure.

Assessment Results

Arqiva, the Joint Radio Company, Mobile Broadcast Network Limited, MLL Telecom, Virgin Media, Vodafone and Cellnex Telcom all confirmed they have no objections with the proposed development.

Pager Power is awaiting a response from Severn Trent Water.

British Telecom (BT)

BT identified a telecommunications link in the area but did not raise an objection. 3D analysis of the telecommunications link path undertaken for completeness shows that the proposed development is clear of the exclusion zone. No impacts upon the telecommunications link are predicted.

Maxxwave Limited

Maxxwave Limited identified three Very High Frequency (VHF) telecommunications links and nomadic mobile services provided in the area.

Assessment of diffraction and reflection effects in relation to the telecommunications links cannot conclusively rule out interference; however, it is deemed unlikely given the existing infringement of the link exclusion zone and the low likelihood that all criteria for reflection effects to occur would be met.

Similarly, interference to the mobile services in close proximity to the proposed development cannot be entirely ruled out. This is because the resilience of the services in the area may be reduced if services are only provided by a single mast, despite radio services being designed to work in dynamic and built-up environments and there is not predicted to be existing interference from other obstructions in the area.

Mitigation Agreement

Maxxwave Limited has requested pre-emptive mitigation to ensure that no impacts are experienced to their services. The applicant and Maxxwave Limited have therefore entered into an agreement to re-route the potentially impacted links via an alternate transmitter.



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ABOUT PAGER POWER

Pager Power is a specialist technical consultancy based in the United Kingdom and has been providing independent expertise on planning issues for solar, wind, and building developments for over 20 years.

Established in 1997, the company initially specialised in assessing the impact of wind turbines on radar systems. Pager Power has since expanded into a multidisciplinary technical planning consultancy that offers a comprehensive range of services and has supported renewable and building projects in more than 60 countries.

Pager Power's core competencies now include:

- Aviation and Radar;
- Daylight, Sunlight and Overshadowing;
- Glint and Glare;
- Shadow Flicker;
- Telecommunications.

Using proprietary modelling software, each study is tailored to the individual project, ensuring that results are relevant, defensible, and aligned with current national and international standards. The company also provides planning support and stakeholder consultation across all service areas, helping clients to understand constraints, explore potential mitigation options, and forge a path forward for their projects.

Pager Power's work helps our clients identify potential risks, inform project design, and support the decision-making process, and can provide support at any stage of a project, from initial feasibility through to completion. Pager Power's assessments – recognised for their objectivity, accuracy, and technical integrity – are designed to withstand legal scrutiny and trusted by developers and stakeholders alike.

1 INTRODUCTION

1.1 Introduction

Pager Power has been commissioned to investigate the potential impact of a proposed building development upon wireless telecommunications infrastructure (point-to-point links) in the surrounding area. The proposed development is located at Cliffe Hill Farm, at J22 of the M1, Leicestershire.

The proposed development will introduce new structures that could interact with wireless telecommunications infrastructure and cause interference. This report presents the results of stakeholder consultation and an impact assessment of any identified telecommunications infrastructure.

1.2 Proposed Development Masterplan

The proposed development masterplan¹ is shown in Figure 1 below.



Figure 1 *Proposed development masterplan*

¹ Source: 24473-UMC-ZZZZ-ZZ-DR-A-0601-C03-Proposed Masterplan (cropped)

The proposed development masterplan represented on aerial imagery is shown in Figure 2 below.



Figure 2 Proposed development masterplan represented on aerial imagery

1.3 Unit Heights

The proposed unit heights are as follows:

- Unit 01 – Ridge 18.5m, U/S Eaves 16.3m;
- Unit 02 – Ridge 18.5m, U/S Eaves 16.3m;
- Unit 03 – Ridge 15.5m, U/S Eaves 13.3m;
- Unit 04 – Ridge 15.5m, U/S Eaves 13.3m;
- Unit 05 – Ridge 15.5m, U/S Eaves 13.3m;
- Unit 06 – Ridge 10.5m, U/S Eaves 8.5m.

2 CONSULTATION

2.1 Overview

Pager Power has consulted wireless link operators to establish the most up to date wireless link network in the vicinity of the proposed development. Consultation was undertaken directly with the most prevalent operators² in order to obtain link details.

Consultation was also undertaken directly with Maxxwave Limited based on the lodged objection that identified concerns.

2.2 Consultation Overview

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

Link Operator	Summary
Arqiva	17/12/2025 – PP link request sent 18/12/2025 – Response received No objection
Atkins / Severn Trent Water	17/12/2025 – PP link request sent 23/12/2025 – Request forwarded to Severn Trent Water. Awaiting response
British Telecom (BT)	17/12/2025 – PP link request sent 07/01/2026 – Follow up sent 15/01/2026 – Response received Telecommunications link in close proximity identified but no objection raised Identified telecommunications link assessed in Section 3.3 for completeness
Joint Radio Company (JRC)	17/12/2025 – PP link request sent 05/01/2026 – Response received. No objection

² Based on Pager Power's experience and contacts database.

Link Operator	Summary
Maxxwave Limited	11/12/2025 – PP initial contact made requesting NDA 16/12/2025 – Follow up sent 17/12/2025 – Maxxwave asked if PP had a standard NDA, PP confirmed it would need to be provided one from Maxxwave 23/12/2025 – Follow up sent 05/01/2026 – Follow up sent 14/01/2026 – Response received Three telecommunications links and three nomadic mobile services identified Identified infrastructure assessed in Sections 3.4 and 4
Mobile Broadcast Newtork Limited (MBNL) ³	17/12/2025 – PP link request sent 22/12/2025 – Response received No objection
MLL Telecom	17/12/2025 – PP link request sent 17/12/2025 – Response received No objection
Virgin Media O2	17/12/2025 – PP link request sent 17/12/2025 – Response received No objection
Vodafone	17/12/2025 – PP link request sent 17/12/2025 – Response received No objection
Cellnex Telecom	17/12/2025 – PP link request sent 19/12/2025 – Masterplan requested, sent by PP 03/03/2026 – Response received No objection

Table 1 *Telecommunications stakeholder consultation*

2.3 Summary of Stakeholder Consultation

Arqiva, the JRC, MBNL, MLL Telecom, Virgin Media, Vodafone and Cellnex Telecom all confirmed they have no objections with the proposed development.

Pager Power is awaiting a response from Severn Trent Water.

³ A joint venture between Everything Everywhere (EE) and Three.



3 TELECOMMUNICATIONS LINK TECHNICAL ASSESSMENT

3.1 Methodology

Wireless communication links are used to transmit information between two antennae via radio waves within a particular frequency band.

Obstructions sited between two 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 in not directly between the antennae but close to the link boresight⁴.

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.

3.1.1 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.

3.1.2 Diffraction

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 boresight. 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

⁴ This is the straight line between the two antennae.



exclusion zone. Pager Power considers 60% of the First Fresnel zone⁵ when considering the effect of a static obstruction upon telecommunications links⁶.

3.1.3 Reflections – VHF and UHF Links

Obstructions can affect Very High Frequency (VHF) and Ultra High Frequency (UHF) links by reflecting the signal between transmitter and receiver. This is not a significant concern for microwave links because they are highly directional.

3.2 Identified Telecommunication Links

Table 2 below summarises the identified telecommunications links.

Operator	Type	Link ID / Ref	Frequency	A End ⁷	B End
BT	Microwave	0395152/1	18.5 GHz	448543E 312549N	440280E 297073N
Maxxwave Limited	VHF	Markfield > Manchester	Confidential		
	VHF	Markfield > Derby			
	VHF / Microwave	Markfield > Bardon Hill			

Table 2 Identified telecommunications links

3.3 BT 0395152/1

Figure 3 on the following page shows the BT 0395152/1 link exclusion zone chart showing the microwave link relative to the proposed development. The exclusion zone is represented by the green lines⁸, each marking an edge of the exclusion zone. Any building (blue outlined areas) located between the lines would infringe the zone in two dimensions.

The figures shows that Unit 01 infringes the link exclusion zone in two dimensions, therefore 3D calculations have been undertaken in the following section to determine the potential impact.

⁵ 0.6th Fresnel zone for JRC links

⁶ Manning, T. (1999), Microwave Radio Transmission Design Guide, Artech House Books

⁷ Airwave have not provided any link end information, the information used within the assessment has been extrapolated from the Ofcom database.

⁸ Appearing as a single line in the figure due to the size of the exclusion zone

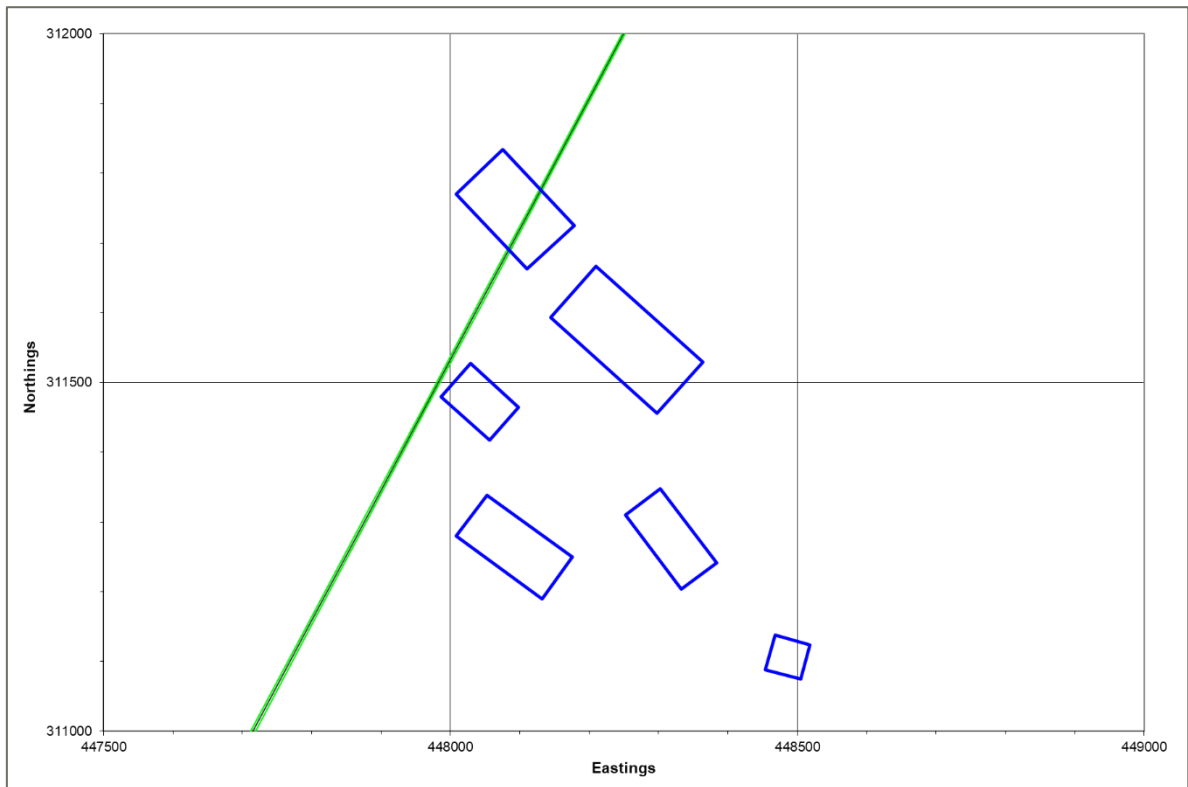


Figure 3 BT 0395152/1 exclusion zone chart

3.3.1 3D Analysis

The 3D exclusion zone is defined by also considering the maximum building relative to the link boresight altitude. Figure 4 below shows the side-on 3D exclusion zone (green outlined circle) relative to Unit 01 (blue outlined area).

The figure shows that Unit 01 is 24m vertically clear of the exclusion zone and therefore no impacts to the telecommunications link are predicted.

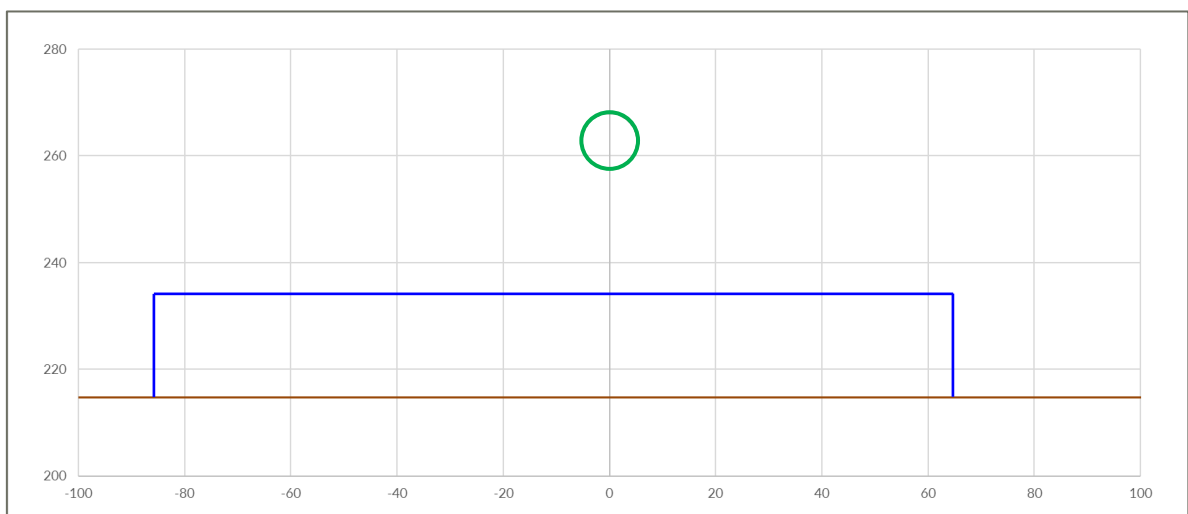


Figure 4 BT 0395152/1 3D exclusion zone relative to Unit 01

3.4 Maxxwave Limited

The Maxxwave Limited link information is confidential and has not been included in this report. However, the exclusion zone chart produced by Pager Power showed that Unit 04 infringes the Markfield > Manchester link exclusion zone, and Unit 01 infringes the Markfield > Derby, in two dimensions. The Markfield > Bardon Hill link exclusion zone is clear in two dimensions and therefore diffraction losses are not predicted.

Therefore, 3D calculations have been undertaken in the following section for the Markfield > Manchester and Markfield > Derby links to determine the potential diffraction impacts.

3.4.1 Markfield > Manchester 3D Analysis

Figure 5 below shows the side-on 3D exclusion zone (red outlined circle) relative to Unit 04 (blue outlined area).

The figure shows that Unit 04 is located within the exclusion zone. It also shows that the exclusion zone area that is free of obstacles at this location will reduce from approximately 60% to approximately 40%, meaning there is still a sizable amount of the exclusion is free obstacles. It is predicted to be infringed just as significantly by the terrain behind the proposed development that raises to 225m north of the M1.

Therefore, whilst diffraction effects due to the proposed development cannot be ruled out, they are not predicted to significantly change the signal strength relative to the baseline case.

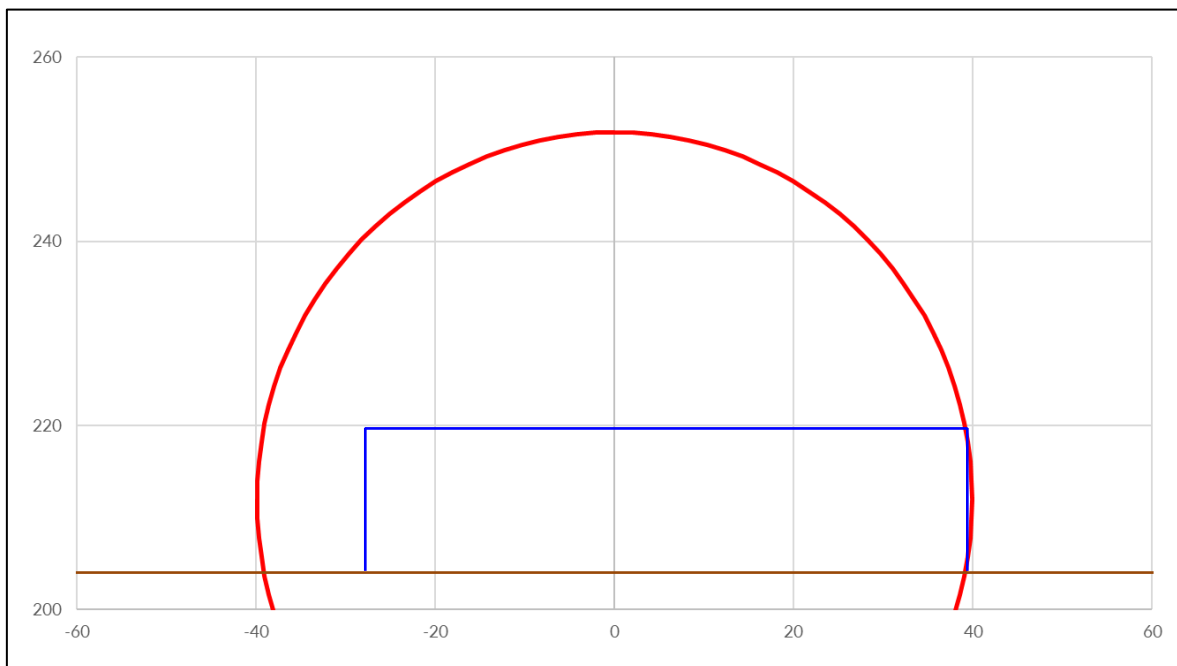


Figure 5 Markfield > Manchester exclusion zone relative to Unit 04

3.4.2 Markfield > Derby 3D Analysis

Figure 6 below shows the side-on 3D exclusion zone (green outlined circle) relative to Unit 01 (blue outlined area). The figure shows that Unit 01 is 0.7m clear of the exclusion zone and most of the exclusion zone will be infringed by the terrain.

Therefore, diffraction effects due to the proposed development are predicted to be limited.

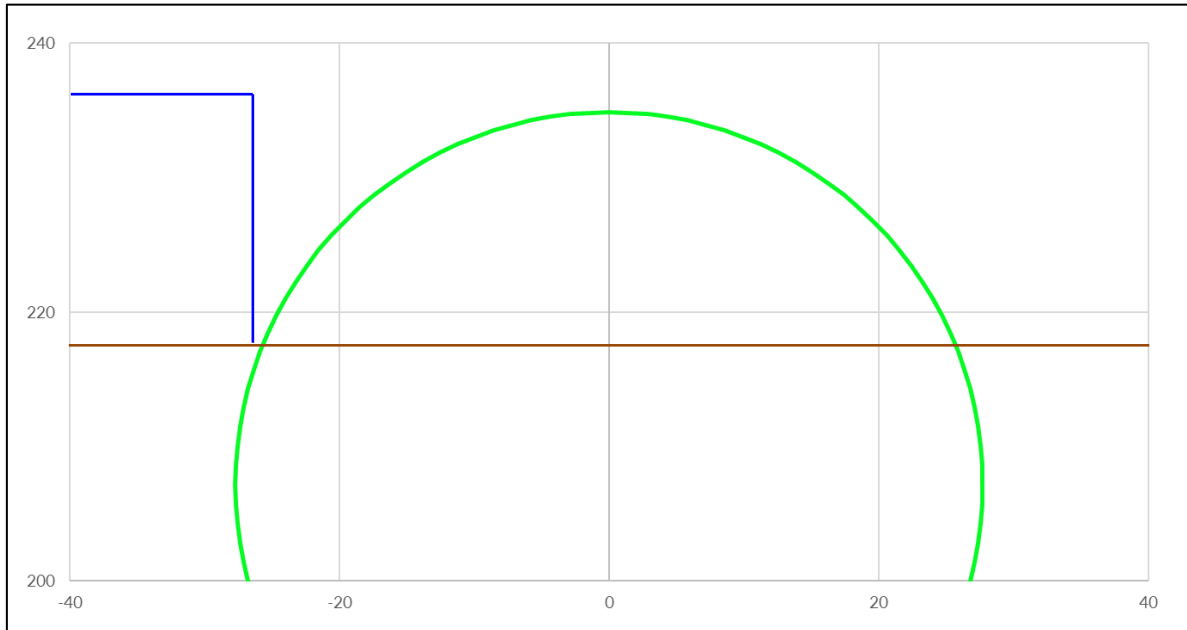


Figure 6 *Markfield > Derby exclusion zone relative to Unit 01*

3.4.3 Reflections

The proposed development will introduce multiple large flat reflectors (facades) into the environment that are capable of reflecting the VHF signals. Interference due to reflections are most likely when:

- The receiving aerial is unobstructed by existing obstacles.
- The reflected signal path via the proposed development is unobstructed.
- The angle between the reflected signal via the proposed development and the direct signal is small.

In practice, it is unlikely that all of the above criteria would be met for the proposed development. This is because the proposed development are understood to below radio line-of-sight to the receiving aerials, meaning the signal path via the proposed development will be obstructed.

Nevertheless, the presence of the large flat facades close to the link path can increase the chance that reflections can occur.

3.5 Conclusions

The proposed development is clear of the BT 0395152/1 link exclusion zone. No impacts to the link are predicted.

The proposed development will introduce a physical obstacle and large reflectors into the environment that is likely to interact with the Maxxwave Limited links. The diffraction and reflection effects are not predicted to be result in interference, though this cannot be entirely ruled out.

It is therefore recommended that a process is devised to investigate and alleviate disruption to Maxxwave Limited radio services as a result of the proposed development. This is presented in Section 5.

4 RADIO SERVICES ASSESSMENT

4.1 Overview

Radio services are also received from fixed transmitters, much like terrestrial television signals. However, radio services are typically available from numerous transmitters, particularly in a dense urban environment. Services can be digital or analogue.

The quality of the received signal is dependent on its strength and the level of interference, although radio services are typically more robust to interference than television signals.

4.2 Interference

There is less specific guidance for radio interference within Ofcom guidance compared to television interference. However, the following information is given:

Although reports of new structures causing problems to radio reception are rare, the possibility of difficulties cannot be ruled out entirely. Broadcast radio (FM, AM and DAB digital radio) are transmitted on lower frequencies than those used by terrestrial TV signals. Lower frequency signals tend to pass through obstructions more easily than the higher frequency TV signals, and diffraction effects also become more significant at lower frequencies. Both these factors will tend to lessen the impact of new structures on radio reception.

Strong signal reflections will reduce the quality of FM reception leading to fluttering noises or sound distortion. In contrast, the signal format used for DAB digital radio is designed to offer high levels of robustness in difficult conditions and it is not materially affected by reflections. FM and DAB reception can be affected where a structure blocks signals and both may cease to function if signals are reduced below a certain threshold.

It is Pager Power's experience that reported interference to radio services is significantly less common than reported interference to television services. Potential impacts on radio service have nevertheless been considered within the analysis.

4.3 Nomadic Mobile Services

The radio mast operated by Maxxwave Limited is understood to provide nomadic mobile services which typically involve a device that changes locations but remains stationary while in use. This means they can be used temporarily or intermittently at different locations.

The specific uses in this case are unknown; however, they are often used for emergency response, temporary events, mobile council services, or for construction projects.

4.4 Interference Area

Though there is not a specific distance at which interference is likely, it is Pager Power's experience that interference is most likely within a few hundred metres of a proposed development. Potential interference area out to a maximum of 300m from the proposed development has therefore been deemed appropriate in this case, and is shown in Figure 7 below.



Figure 7 Radio services potential interference area

4.5 Analysis

Radio interference due to new building developments is a rare phenomenon. This is based on Pager Power's industry experience as well as the Ofcom guidance (see Section 4.2). This is primarily because radio services are designed to operate in a dynamic environment through the use of multiple transmitters. However, in the case of Maxxwave Limited services, it is expected that there are no additional masts that provides the services for the area.

Interference is most likely to materialise if the signal strength is already diminished by existing obstructions in the environment (e.g. in a city centre), and a small increase in interference would cause the signal strength to below minimum levels. Considering that the area around the proposed development is not a built-up environment, it is not predicted that the presence

of the proposed development will result in a reduction in signal strength and noticeable interference.

4.6 Conclusions

Overall, on the basis that radio services are designed to work in dynamic and built-up environments, noticeable impacts on radio coverage are not predicted to materialise. The buildings will however represent obstacles in the environment, and the services are predicted to be less resilient if reliant on a single radio mast. Some interference in close proximity to the proposed development cannot be entirely ruled out.

Although this analysis does not predicted interference to the radio services, Maxxwave Limited has requested pre-emptive mitigation to ensure that no impacts are experienced, particularly the emergency services communications. The applicant and Maxxwave Limited have therefore entered into an agreement to re-route the potentially impacted links via an alternate transmitter.

5 OVERALL CONCLUSIONS

5.1 Assessment Results

Arqiva, the JRC, MBNL, MLL Telecom, Virgin Media, Vodafone and Cellnex Telcom all confirmed they have no objections with the proposed development.

Pager Power is awaiting a response from Severn Trent Water.

5.1.1 BT

BT identified a telecommunications link in the area but did not raise an objection. 3D analysis of the telecommunications link path undertaken for completeness shows that the proposed development is clear of the exclusion zone. No impacts upon the telecommunications link are predicted.

5.1.2 Maxxwave Limited

Maxxwave Limited identified three VHF telecommunications links and nomadic mobile services provided in the area.

Assessment of diffraction and reflection effects in relation to the telecommunications links cannot conclusively rule out interference; however, it is deemed unlikely given the existing infringement of the link exclusion zone and the low likelihood that all criteria for reflection effects to occur would be met.

Similarly, interference to the mobile services in close proximity to the proposed development cannot be entirely ruled out. This is because the resilience of the services in the area may be reduced if services are only provided by a single mast, despite radio services being designed to work in dynamic and built-up environments and there is not predicted to be existing interference from other obstructions in the area.

5.2 Mitigation Agreement

Maxxwave Limited has requested pre-emptive mitigation to ensure that no impacts are experienced to their services. The applicant and Maxxwave Limited have therefore entered into an agreement to re-route the potentially impacted links via an alternate transmitter.



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