

Television Baseline Survey Report

East Didsbury

Dandara

December 2021

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ADMINISTRATION PAGE

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Issue	Date	Detail of Changes
1	14 th December 2021	Initial issue
2	19 th January 2022	Second issue – updated proposed development definition

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EXECUTIVE SUMMARY

Report Purpose

Pager Power has been commissioned to investigate the potential impact of a proposed building development upon terrestrial television reception in the surrounding area (see Section 1). The proposed development consists of 6 storey residential building (Use Class C3) comprising 75 new homes together with ground floor flexible community space, car parking, cycle parking as well as landscaping, highways and other associated works. The address of the proposed development is Tesco Car Park, Parrs Wood Lane, East Didsbury, Manchester M20 5NP.

The proposed development will introduce a new structure into an already built-up environment and therefore this could interact with terrestrial television signals and cause some interference. The proposed development will have a height of circa 20m above ground level (agl).

Results

- The proposed development is within the coverage area for the Winter Hill television transmitter.
- Any interference would be due to shadowing effects i.e. the weakening of the transmitted signal due to the physical presence of the building.
- A site survey was undertaken on 13th December 2021 to confirm the relevant transmitter and record the signal quality.
- Terrestrial coverage is variable in the proposed development shadow zone. Overall, at 4 out of the 5 locations assessed the signal varies from good to very good quality for main multiplexes and of good quality for local multiplexes. At the remaining location the signal quality was low for both main and local multiplexes, however this was due to obstructions near the surveyed location blocking the signal.
- Where signal quality is low is due mainly to the presence of existing building blocking the signal.
- It is unlikely that there will be any noticeable effects at those location where the signal strength was of good quality.

Mitigation

The most likely options, if a mitigation requirement transpires, would be:

- Replacement of receiving aerial with a more directional or higher gain aerial.
- Replacement of terrestrial reception equipment with satellite reception equipment or cable.

Recommendation

Any reported television interference after construction has begun should be investigated by means of a reception measurement.

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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 of a proposed building development upon terrestrial television reception in the surrounding area. The proposed development consists of 6 storey residential building (Use Class C3) comprising 75 new homes together with ground floor flexible community space, car parking, cycle parking as well as landscaping, highways and other associated works. The address of the proposed development is Tesco Car Park, Parrs Wood Lane, East Didsbury, Manchester M20 5NP.

The proposed development will introduce a new structure into an already built-up environment and therefore this could interact with terrestrial television signals and cause some interference that needs to be mitigated. The proposed development will have a height of circa 25m above ground level (agl). The interference zones have been modelled in accordance with Ofcom guidance (see section 3) and a baseline reception survey has been undertaken within potentially affected areas (see sections 4 and 5).

1.2 Proposed Development Details

The proposed development is shown in Figure 1¹ below.

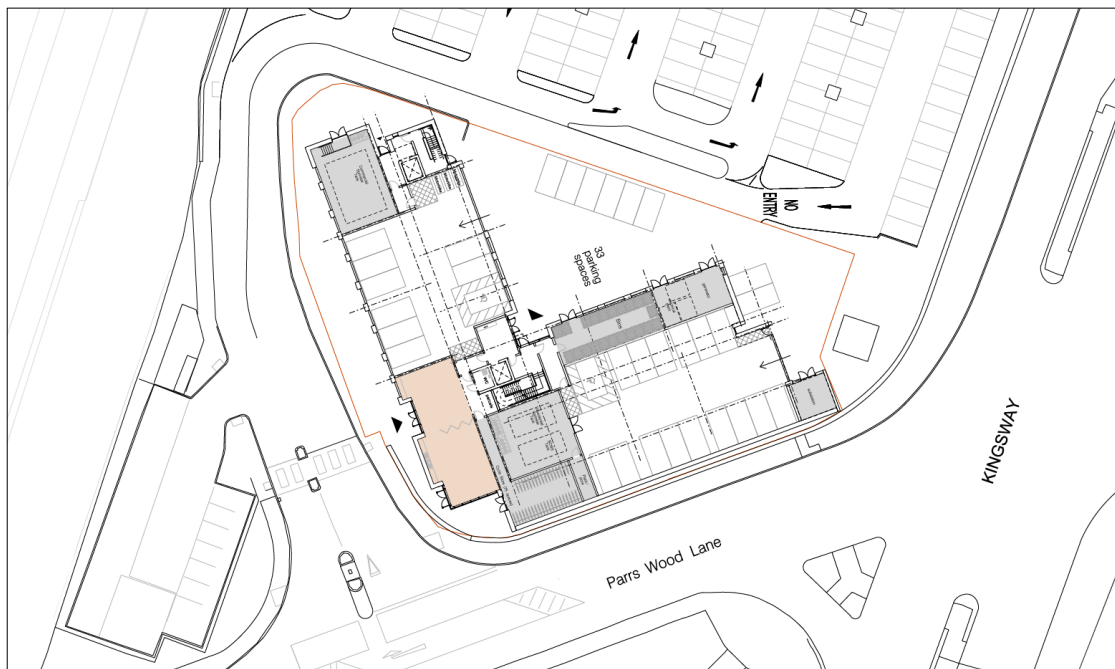


Figure 1 – Proposed development

¹ Ground Floor Plan, Didsbury, Parrs Wood, Hodder+partners, Date: 11/2021, Drawing No.: L(--)-000, cropped

The extrapolated development footprint overlaid on an aerial image is shown in Figure 2 below².

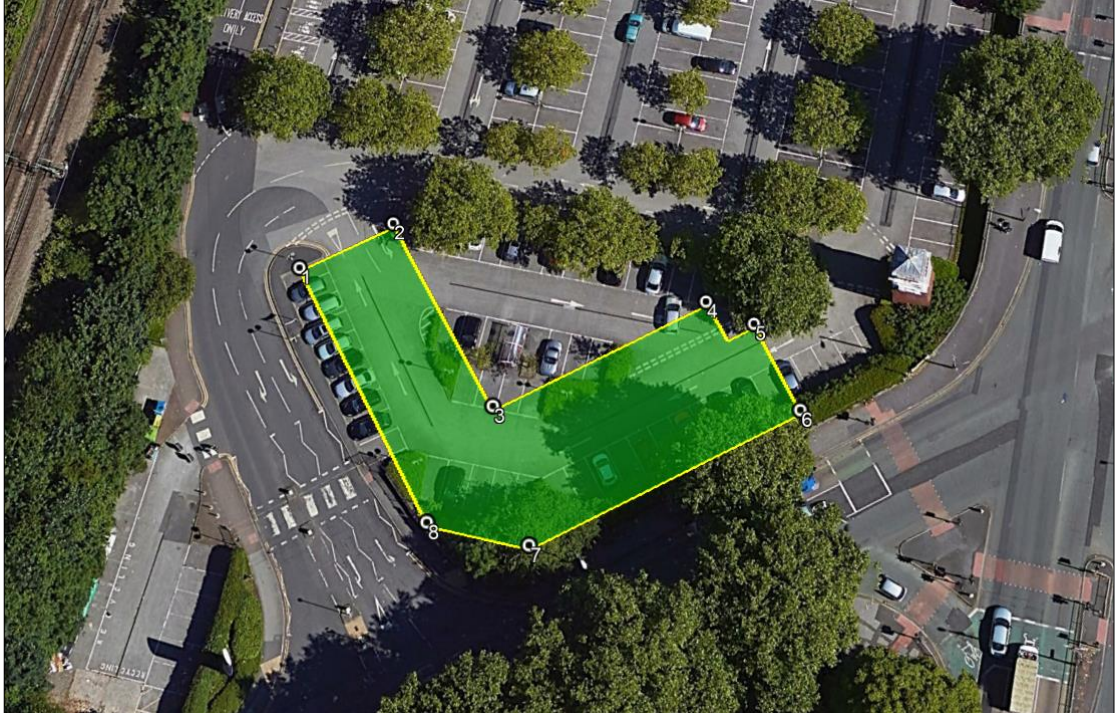


Figure 2 – Proposed development footprint – aerial image

1.3 Proposed Development Assessment Data

Coordinate data used for the assessment has been extrapolated from the project plans. The assessed coordinates are presented in Table 1 below. The entire proposed development footprint has been assessed at the maximum elevation as this is the most conservative approach. The proposed development will have a height of circa 20m above ground level (agl).

ID	Longitude (°)	Latitude (°)	ID	Longitude (°)	Latitude (°)
1	-2.22054	53.41107	5	-2.21982	53.41096
2	-2.22038	53.41110	6	-2.21977	53.41087
3	-2.22025	53.41091	7	-2.22021	53.41077
4	-2.21989	53.41098	8	-2.22036	53.41081

Table 1 – Building footprint points assessed within the redline site boundary

² Copyright © 2021 Google.

Figure 3 below³ indicates the scale of the proposed development in the context of the neighbouring buildings.



Figure 3 – Proposed development location and nearby environment

The location of the proposed development relative to Manchester city centre is shown in Figure 4⁴ below.



Figure 4 – Map showing location of proposed development

³ Copyright © 2021 Google.

⁴ Copyright © 2021 Google.

2 TELEVISION TRANSMITTER DETAILS

2.1 Relevant Transmitter

The Winter Hill transmitter predominantly serves the area around the development⁵. Digital television services are broadcast via Ultra High Frequency (UHF) signals.

2.2 Winter Hill Main Transmitter

Winter Hill is one of the UK's main television transmitters located approximately 31km north-west of the development.

Digital television services are broadcast, details are presented in Table 2 and Table 3.

	Public (PSB)			Commercial (COM)		
Service	BBC A	Digital 3&4	BBC B	SDN	Arqiva A	Arqiva B
Channel	32	34	35	29	31	37
Power	100 kilo-Watts (kW)					

Table 2 – Winter Hill main transmissions (main multiplexes)

Service	LTVmux (Manchester)	Glmux	COM 7
Channel	24	27	55
Power	2 kW	1 kW	25.7 kW

Table 3 – Winter Hill transmissions (local multiplexes)

⁵ Based on coverage maps and Digital UK information.

3 BUILDINGS AND TELEVISION INTERFERENCE

3.1 Technical Overview

3.1.1 Television

Terrestrial television services are provided by means of UHF radio waves which propagate from transmitters to receiving aerials which then relay the signal to a television set.

The quality of the image and sound on a television set is dependent on both the strength of the signal received directly from the transmitter (carrier signal) and the strength of any interference signals from other sources.

To achieve good quality reception an aerial must receive a strong carrier signal but weak interference signals.

3.1.2 Interference mechanisms

There are two ways that buildings can cause interference to television reception, these are described below.

3.2 Obstruction of the Signal

This is caused by the building physically blocking the transmitted television signal, reducing the strength of the carrier signal in the shadow of the building. In the case of Sutton Coldfield transmissions, this would affect residences to the south southwest of the proposed development. Specifically:

- The highest losses (greatest interference) will be located immediately behind the building.
- Losses near the edge of the shadow zone will be less significant due to diffraction effects (bending of the signal).

3.2.1 Television

The Ofcom document states that:

"In general, there will be three 'zones' behind the structure:

Zone A - close behind the structure (typically a few tens of metres) there may be a large reduction in signal level with a possible complete loss of reception

Zone B - further away (typically a few hundred metres) the signal reduction is less severe and the shadow will be smaller as diffraction effects partially fill in the shadow. Depending on the size of the structure, some locations could still lose reception completely

Zone C - some distance away (1-5km) the shadow will effectively have disappeared."

The zones mentioned are illustrated in Figure 5 below⁶, taken from Section 3.2 of an Ofcom paper⁷ regarding the impact of buildings on broadcast signals.

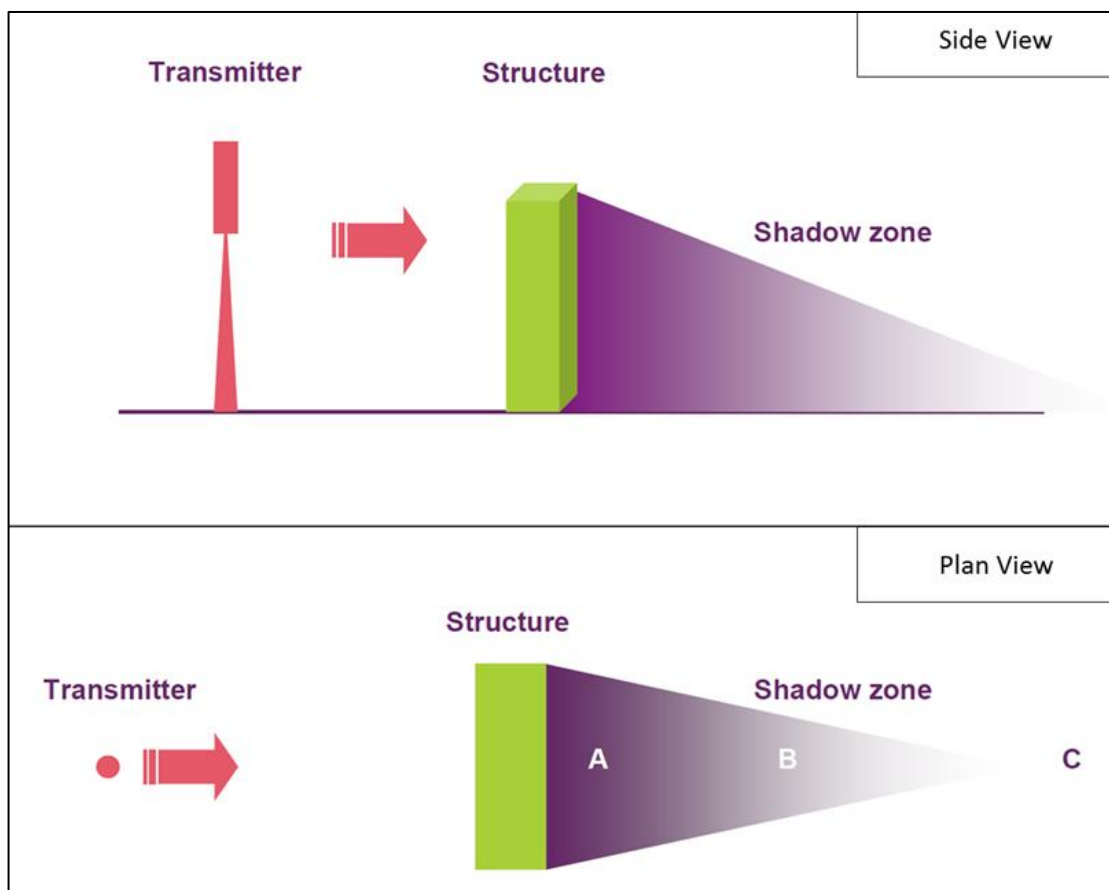


Figure 5 – Diffraction loss zones

3.2.2 Reflection of the Signal – Television

For large developments with straight edges, the transmitted signal can be reflected by the building itself. This causes an effect known as ‘multipath interference’ whereby the signal is received twice by an aerial at different times. The direct signal arrives first because it has a shorter distance to travel.

⁶ Source: Ofcom (2009): Tall Structures and their impact on broadcast and other wireless services.

⁷ Reference as above.

Figure 6 below (taken from Section 3.3 of the Ofcom document referenced above) illustrates this effect.

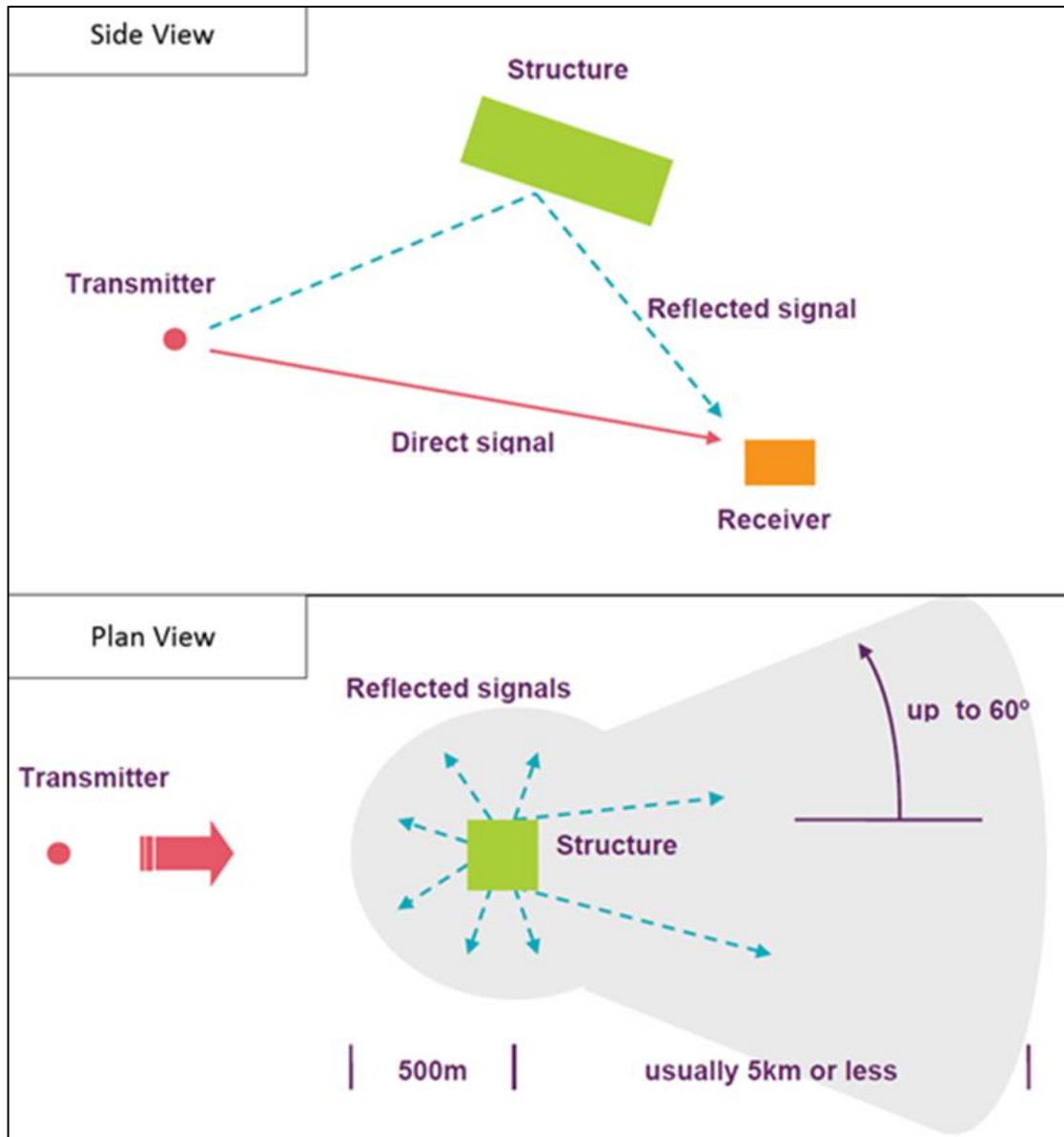


Figure 6 – Reflection zones

In practice, it is considered highly unlikely that reflections will have an effect for receivers in front of the building or on either side when viewed from the location of the transmitter. For digital transmissions in particular, it is unlikely that issues will occur if the angle between the direct signal and the reflected signal is more than 30 degrees⁸.

The reflection zone has been constructed in accordance with the Ofcom approach, however the angle considered is 30 degrees rather than 60 degrees. This is in order to represent a more realistic scenario for digital transmissions.

Reflection issues are most likely to cause a noticeable impact if:

- The direct signal from transmitter to receiver is weak (e.g. obstructed by terrain or buildings).
- The reflected signal from the building is strong (e.g. clear radio line of sight from the transmitter to the building and the building to the receiver).

The worst-case scenario is for both of the above conditions to be satisfied. The best-case scenario is for neither of the above conditions to be satisfied.

⁸ This is known to be the angle that Arqiva considers when safeguarding its Television Re-Broadcast Links with regard to reflections from wind turbines – whilst wind turbines cause issues that are different to buildings this particular issue is similar for the two.

4 TECHNICAL ASSESSMENT

4.1 Potential Interference Areas

Figure 7 below shows the potential interference areas associated with the proposed development.

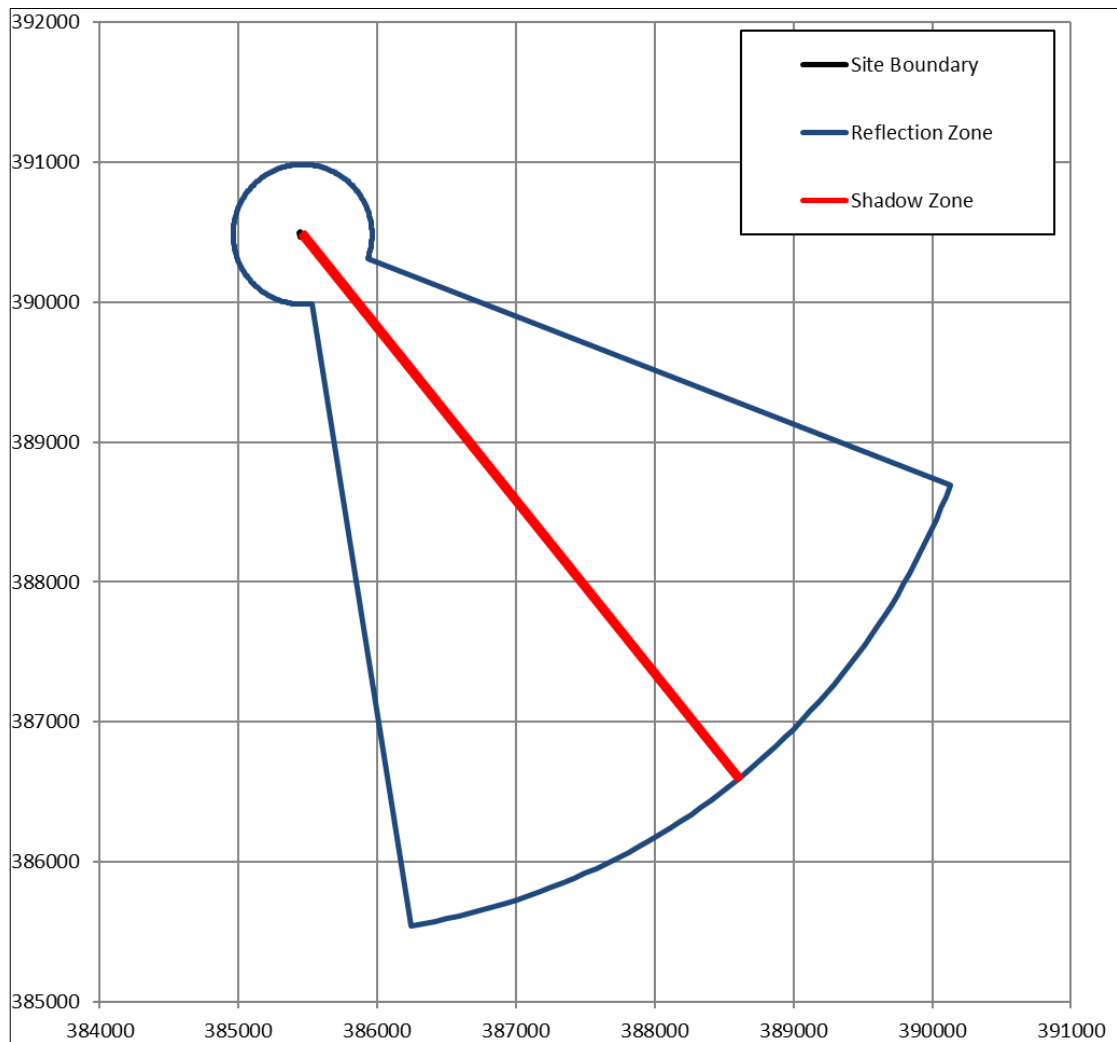


Figure 7 – Interference areas

The interference zones have been defined based on the geometry of the potential interference zones as set out in the previous section. Both zones extend to a distance of 5km beyond the proposed development location in accordance with the Ofcom guidance.

In the case of the shadow zone, this has been modelled as having straight sides in order to be conservative. In actuality, due to diffraction effects, the zone would have a more triangular shape as shown in Figure 5 in the previous section.

Figure 8 below⁹ shows the interference zones overlaid onto an aerial image of the area.



Figure 8 – Interference zones map

4.2 Potential Diffraction Issues

It can be seen that the shadow zone passes over sports and grass fields, woods and urban areas that contain dwellings. Areas closest to the proposed development at the highest risk of experiencing television interference. However, fewer buildings are located within the first kilometre from the proposed development. These buildings are mainly commercial buildings or offices. No dwelling is located within the first kilometre. The first urban area within the building shadow is located at circa 1.9km from the proposed development.

⁹ Copyright 2021 © Google, Landsat / Copernicus.

4.3 Potential Reflection Issues

Reflection effects are most likely if the transmitter does not have direct radio line of sight to the receiving aerial. Based on bare-earth terrain, the Sutton Coldfield transmitter has coverage below ten metres for the majority of the reflection zone.

For interference to occur due to reflections, the following criteria would need to be met:

- The receiving aerial would be already obstructed by a building or other existing obstacle.
- The reflected signal path via the proposed development would have to be relatively unobstructed.
- The angle between the reflected signal via the proposed development and the direct signal would have to be small.

In practice it is unlikely that all of the above criteria would be met. In many cases where the direct path is obstructed, the reflected path would also be obstructed. The difference in angle between the direct and reflected paths is small for a confined region. Reflection effects are rarely seen in practice for buildings and digital television transmissions. Impacts due to reflections are considered unlikely.

5 TELEVISION SURVEY

5.1 Overview

The purpose of a baseline survey is to establish current television signal strength and quality in the area. The baseline survey serves three purposes these are:

1. It confirms which transmitter is serving most homes in the areas surveyed;
2. It provides an indicator regarding the likelihood of interference. If current signals are of good quality, minor degradation is less likely to have a noticeable effect; and
3. It allows a 'before and after' comparison to be made in the event that a complaint is received.

The purpose of a post-construction survey is as follows:

1. To establish the reception quality post-construction;
2. To determine the variation to television signal strength and quality from baseline to post-construction;
3. To determine whether significant interference (reported or otherwise) is occurring and to identify the specific development to which the interference is attributable.

A baseline television reception survey was undertaken for the proposed development on 13th December 2021.

Survey measurements were taken using Pager Power's custom survey vehicle with a wideband UHF aerial extended to a height of 10 metres above ground level. This was connected to television analyser to record the signal strength and stability.

The strength of the recorded signals is categorised in accordance with Table 4 below.

Average Signal Strength (dB)	Subjective Signal Strength Definition
<35	Low
35-45	Moderate
45-55	Good
55+	Very Good

Table 4 – Television signal strength categories

5.2 Survey Locations

Figure 9 below¹⁰ shows the survey locations overlaid onto aerial photography. The blue icons show the locations chosen for the pre-construction survey.



Figure 9 – Survey locations

¹⁰ Copyright 2021 © Google, Landsat / Copernicus.

5.3 Survey Results

Table 5 below summarises the survey results. Full survey results are shown in Appendix A. Survey photographs are shown in Appendix B. Mitigation options are discussed in Section 6.

Location	Average Measured Signal Strength (dB)	Remarks	High Level Conclusion
1	Main TV MUX: 61.0 (Very Good) Local TV MUX: 45.2 (Good)	No aerial was visible from this survey location. All six main and three local multiplexes had good video and audio. This location was not on the shadow ¹¹ ; however, it will be affected by reflections.	This location is within 25 metres of the proposed development. It is highly likely that the signal will be weakened by the proposed development due to reflections. However, no dwellings are in this area. No perceivable effects are predicted in practice.
2	Main TV MUX: 34.0 (Low) Local TV MUX: 27.3 (Low)	No aerial was visible from this survey location. Only three main multiplexes had good video and audio. None of the local multiplexes was received. This was probably due to a building blocking the signal.	This location is within 230 metres of the proposed development boundary. It is highly likely that the signal will be weakened by the proposed development. However, no dwellings are in this area. No perceivable effects are predicted in practice.
3	Baseline: Main TV MUX: 47.2 (Good) Local TV MUX: 30.7 (Low)	Multiple aerials observed at this location with the majority pointing towards Winter Hill. All six main and all three local multiplexes had good video and audio.	This location is approximately 1,930m from the proposed development boundary. Signal losses at this range are likely to be minimal. Interference is unlikely.

¹¹ This location was marginally outside the shadow zone due to safety and access limitations, it is however an indicative measurement for the first section of the shadow region

Location	Average Measured Signal Strength (dB)	Remarks	High Level Conclusion
4	Baseline: Main TV MUX: 62.8 (Very Good) Local TV MUX: 45.7 (Good)	Multiple aerials observed at this location all pointing towards Winter Hill. All six main and all three local multiplexes had good video and audio. Two in three local multiplexes were not received at this location.	This location is more than 2,650m from the proposed development boundary. Signal losses at this range are likely to be minimal. Interference is unlikely.
5	Baseline: Main TV MUX: 64.7 (Very Good) Local TV MUX: 47.8 (Good)	Multiple aerials observed at this location all pointing towards Winter Hill. All six main and all three local multiplexes had good video and audio. Two in three local multiplexes were not received at this location.	This location is more than 3,850m from the proposed development boundary. Signal losses at this range are likely to be minimal. Interference is unlikely.

Table 5 – Baseline survey results

6 MITIGATION

6.1 Mitigation Requirement

If an adverse effect on television services occurs and is attributable to the proposed development, mitigation may be required.

The most effective form of mitigation is dependent on the specific impact. Common options are shown below.

Mitigation options for television include:

- Replacement of receiving aerial with a more directional or higher gain aerial.
- Repositioning the receiving aerial so that the received signal is stronger.
- Directing the receiving aerial to an alternative transmitter that covers the area and retuning the television accordingly.
- Upgrading antenna cabling and connections.
- Installation of signal amplifiers.
- Development of a bespoke local solution using a receiving aerial some distance from the dwelling.
- A combination of the above.
- Replacing terrestrial reception equipment with satellite reception equipment or cable.

6.2 Recommended Options

If interference were to occur for a small number of dwellings it is likely that installation of satellite television receiver would be the most suitable option. If effects are experienced for dwellings with poor quality or low receiving aerials, the best option may be to upgrade and/or elevate the existing aerial. It is also possible that the television services could be supplied by an alternate transmitter in the surrounding area.

6.3 Recommended Process

It is possible that no adverse effects will occur due to the current reception quality in the surrounding area and the scarcity of residential receptors at a low height in the immediate shadow zone. It is therefore recommended to investigate any reports of interference in order to determine whether these are attributable to the proposed development. If this is found to be the case, mitigation can be applied.

There is no reason to install pre-emptive mitigation.

7 CONCLUSIONS

7.1 Findings

- The proposed development is within the coverage area for the Winter Hill television transmitter.
- Any interference would be due to shadowing effects i.e. the weakening of the transmitted signal due to the physical presence of the building.
- A site survey was undertaken on 13th December 2021 to confirm the relevant transmitter and record the signal quality.
- Terrestrial coverage is variable in the proposed development shadow zone. Overall, at 4 out of the 5 locations assessed the signal varies from good to very good quality for main multiplexes and of good quality for local multiplexes. At the remaining location the signal quality was low for both main and local multiplexes, however this was due to obstructions near the surveyed location blocking the signal.
- Where signal quality is low is due mainly to the presence of existing building blocking the signal.
- It is unlikely that there will be any noticeable effects at those location where the signal strength was of good quality.

7.2 Mitigation

The most likely options, if a mitigation requirement transpires, would be:

- Replacement of receiving aerial with a more directional or higher gain aerial.
- Replacement of terrestrial reception equipment with satellite reception equipment or cable.

APPENDIX A – DETAILED SURVEY RESULTS

Location 1

Coordinates: Lon: -2.22263, Lat: 53.48517					
Channel	Service	Signal Strength ¹² (dBμV)	BER ¹³	Picture	Audio
24	LTVmux	44.0+-0.1	1*10 ⁻⁸	Fine	Fine
27	Glmax	39.1+-0.1	1*10 ⁻⁸	Fine	Fine
29	SDN	59.9+-0.1	1*10 ⁻⁸	Fine	Fine
31	Arq A	61.5+-0.1	1*10 ⁻⁸	Fine	Fine
32	BBC A	62.0+-0.1	1*10 ⁻⁸	Fine	Fine
34	D3+4	60.6+-0.1	1*10 ⁻⁸	Fine	Fine
35	BBC B	60.6+-0.2	1*10 ⁻⁸	Fine	Fine
37	Arq B	61.6+-0.1	1*10 ⁻⁸	Fine	Fine
55	COM7	52.6+-0.1	1*10 ⁻⁸	Fine	Fine

Notes: No aerials observed

¹² +/- followed by a number represents the approximate signal fluctuation.

¹³ E = 1 x10 to the power of the following number e.g. -8.

Location 2

Coordinates: Lon: -2.22159, Lat: 53.48448					
Channel	Service	Signal Strength (dBμV)	BER	Picture	Audio
24	LTVmux	27.0+-0.1			
27	Glmax	26.5+-0.1			
29	SDN	36.1+-0.1	2.5×10^{-3}	Fine	Fine
31	Arq A	36.3+-0.1	3.5×10^{-3}	Fine	Fine
32	BBC A	31.8+-0.1			
34	D3+4	35.5+-0.1	1×10^{-4}	Fine	Fine
35-	BBC B	33.5+-0.1			
37	Arq B	30.9+-0.2			
55	COM7	28.3+-0.1			

Notes: No aerials observed, large building on the way

Location 3

Coordinates: Lon: -2.21903, Lat: 53.48342					
Channel	Service	Signal Strength (dBμV)	BER	Picture	Audio
24	LTVmux	32.6+-0.1	1*10 ⁻⁷	Fine	Fine
27	Glmax	27.3+-0.1			
29	SDN	51.8+-0.1	1*10 ⁻⁸	Fine	Fine
31	Arq A	49.4+-0.1	1*10 ⁻⁸	Fine	Fine
32	BBC A	46.3+-0.1	1*10 ⁻⁸	Fine	Fine
34	D3+4	47.9+-0.1	1*10 ⁻⁸	Fine	Fine
35-	BBC B	40.8+-0.1	1*10 ⁻⁸	Fine	Fine
37	Arq B	46.7+-0.1	1*10 ⁻⁸	Fine	Fine
55	COM7	32.2+-0.1			

Notes: Multiple HP UHF aerial directed towards the Winter Hill transmitter was observed.
Multiple satellite dishes were observed.

Location 4

Coordinates: Lon: -2.21561, Lat: 53.48172					
Channel	Service	Signal Strength (dBμV)	BER	Picture	Audio
24	LTVmux	46.4+-0.1	1*10 ⁻⁸	Fine	Fine
27	Glmax	35.5+-0.1	2.3*10 ⁻⁸	Fine	Fine
29	SDN	61.2+-0.1	1*10 ⁻⁸	Fine	Fine
31	Arq A	62.6+-0.1	1*10 ⁻⁸	Fine	Fine
32	BBC A	62.5+-0.1	1*10 ⁻⁸	Fine	Fine
34	D3+4	63.0+-0.1	1*10 ⁻⁸	Fine	Fine
35-	BBC B	62.7+-0.1	1*10 ⁻⁸	Fine	Fine
37	Arq B	64.6+-0.1	1*10 ⁻⁸	Fine	Fine
55	COM7	55.2+-0.1	1*10 ⁻⁸	Fine	Fine

Notes: Multiple HP UHF aerial directed towards the Winter Hill transmitter was observed.
Multiple satellite dishes were observed.

Location 5

Coordinates: Lon: -2.20826, Lat: 53.47847					
Channel	Service	Signal Strength (dBμV)	BER	Picture	Audio
24	LTVmux	51.5+-0.1	1*10 ⁻⁷	Fine	Fine
27	Glmax	34.9+-0.1	2.5*10 ⁻³	Fine	Fine
29	SDN	64.4+-0.1	1*10 ⁻⁸	Fine	Fine
31	Arq A	64.1+-0.1	1*10 ⁻⁸	Fine	Fine
32	BBC A	64.7+-0.1	1*10 ⁻⁸	Fine	Fine
34	D3+4	64.6+-0.1	1*10 ⁻⁸	Fine	Fine
35-	BBC B	64.5+-0.1	1*10 ⁻⁸	Fine	Fine
37	Arq B	66.1+-0.1	1*10 ⁻⁸	Fine	Fine
55	COM7	57.1+-0.1	1*10 ⁻⁸	Fine	Fine

Notes: Multiple HP UHF aerial directed towards the Winter Hill transmitter was observed.
Multiple satellite dishes were observed.

APPENDIX B – SURVEY PHOTOGRAPHS

Location 1



Location 2



Location 3



Location 4



Location 5





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