CANARY WHARF
GROUP PLC

NQ.PA.25

# North Quay
# Radio and TV Interference Assessment

Hoare Lea
July 2020

# Overview

Canary Wharf (North Quay) Ltd (“the Applicant”) are submitting applications for Outline Planning Permission (“OPP”) and Listed Building Consent (“LBC”) to enable the redevelopment of the North Quay site, Aspen Way, London (“the Site”).

Two separate applications are being submitted as follows:

- Application NQ.1: Outline Planning Application (all matters reserved) (“OPA”) - Application for the mixed-use redevelopment of the Site comprising demolition of existing buildings and structures and the erection of buildings comprising business floorspace, hotel/serviced apartments, residential, co-living, student housing, retail, community and leisure and sui generis uses with associated infrastructure, parking and servicing space, public realm, highways and access works; and
- Application NQ.2: Listed Building Consent Application (“LBCA”) - To stabilise listed quay wall and any associated/necessary remedial works as well as demolition of the false quay in connection with Application NQ.1.

Together the development proposed under Applications NQ.1 and NQ.2 are referred to as the “Proposed Development”.

At the time of making the OPA, the Applicant is unable to determine exactly how much of the Proposed Development is likely to come forward in which land use. For this reason, the description of development provides the Applicant with flexibility as to the uses that could be undertaken on the Site.

However, in order to ensure that the level of flexibility is appropriately restricted, the OPA seeks approval for three Control Documents which describe the principal components of the Proposed Development, define the parameters for the Proposed Development (the "Specified Parameters") and control how the Proposed Development will come forward in future. They provide the parameters, design principles and controls that will guide future reserved matters applications (“RMAs”). These Control Documents are – (1) the Development Specification; (2) the Parameter Plans; and (3) the Design Guidelines:

- The Development Specification sets out the type and quantity of development that could be provided across the Site (including setting a maximum floorspace across the Site);
- The Parameter Plans set the parameters associated with the scale, layout, access and circulation and distribution of uses classes and public space for the Proposed Development. They also establish the Development Zones and Development Plots across the Site; and
- The Design Guidelines set the design principles and controls for future development.

Together, these documents set out the information required to allow the impacts of the Proposed Development to be identified with sufficient certainty as future RMAs will be required to demonstrate compliance with the Specified Parameters and controls in these Control Documents.

This report (NQ.PA.25) forms part of the supporting documentation prepared for the OPA. It outlines the findings of a radio and television interference study undertaken to assess the potential impact of the Proposed Development on the reception of radio and terrestrial/satellite television signals, in the areas surrounding the Site.

## Site Description

The North Quay site ("the Site") is located in the north of the Isle of Dogs, within the administrative boundary of the London Borough of Tower Hamlets (the "LBTH"), at Canary Wharf. It is bounded by Canary Wharf Crossrail Station to the south, Aspen Way (A1261) to the north, Hertsmere Road to the west and Billingsgate Market to the east. The West India Quay Docklands Light Railway ("DLR") station and Delta Junction are located on the western side of the Site and the Site also incorporates parts of North Dock, Upper Bank Street and Aspen Way.

The Site is 3.28 hectares (ha) in area. Currently the Site comprises mostly cleared land, being previously used as a construction laydown site for the Canary Wharf Crossrail Station. There are some temporary uses currently on site, including the LBTH Employment and Training Services, WorkPath and advertising structures.

A Grade I Listed brick dock wall (Banana Wall) exists below the surface of part of the Site, which originally formed the dockside until it was extended over to the south.

Existing access to the Site for vehicles is from Upper Bank Street to the east and Hertsmere Road to the west, which both link to Aspen Way. The Site is not currently accessible to the public, however pedestrian routes are located on each side of the Site (Aspen Way, Hertsmere Road, Upper Bank Street, and the western part of the dockside to the south). The Aspen Way footbridge which leads to Poplar also lands on the southern side of Aspen Way.

The Site is highly accessible by public transport. The West India Quay DLR station is located on the Site, the Poplar DLR station is accessed directly from the Aspen Way Footbridge, the Canary Wharf Crossrail Station is located immediately to the south of the Site, beyond which are the Canary Wharf underground and DLR stations. The Site's PTAL varies from 5 ('very good') to 6a ('excellent'), with improved PTAL closer to Upper Bank Street. The score is expected to improve to 6a across the entire Site by 2021 owing to the planned opening of the Crossrail Station.

Beyond the Site, 1 West India Quay (the Marriot Hotel (107m AOD) and residential building (41m AOD)) are located to the west, adjacent to the DLR tracks. Beyond these, along Hertsmere Road is a cinema, museum, shops, restaurants and other leisure facilities, forming part of the West India Quay Centre.

Billingsgate Market is located to the east of the Site, on the opposite side of Upper Bank Street. Billingsgate Market is identified as a Site Allocation (4.2: Billingsgate Market) for redevelopment in LB Tower Hamlet's Local Plan.

To the north of the Site on the other side of Aspen Way are the Tower Hamlets College and The Workhouse leisure facility. They comprise part of a Site Allocation (4.1: Aspen Way) for redevelopment in the LBTH Local Plan. In close proximity to these there are lower rise residential properties (some with shops beneath them) as well as the Poplar Recreation Ground.

Beyond the Crossrail station and Crossrail Place to the south of the Site is the Canary Wharf commercial area, with the buildings closest to the Proposed Development including the HSBC (200m AOD), Bank of America and One Canada Square buildings (235m AOD).

## Listed Building Works

Towards the south of the Site, the edge of the dock is defined by a quay wall known as the Banana Wall. The brickwork has a profile and counterfort buttresses, on a gravel bed. The Banana Wall was constructed between 1800-1802 and was Listed Grade I in 1983.

The Proposed Development will span over the Banana Wall with piles on either side of the wall providing support to the new structures. The new structures will leave a void or compressible material above to avoid permanent loading of the wall. The adjacent existing false quay deck will be removed. The excavation of the basement may require stabilisation works to be undertaken to ensure there are no impacts to the Banana Wall. Remedial works to the Banana Wall will also be undertaken if required.

# Contents

# Executive Summary

Hoare Lea has been commissioned to undertake a radio and television interference study to assess the potential impact of the proposed North Quay (”Proposed Development”) on the reception of radio and terrestrial/satellite television signals, in the areas surrounding the development site (“the Site”).

The findings of the assessment are outlined below:

- Terrestrial television signal shadowing created by the buildings (Development Plots) in the Proposed Development could be significant. However, due to the effects of diffraction, it is envisaged that only properties in the immediate section of the shadow zone could be affected. With the implementation of mitigation measures, the impact of terrestrial television signal shadowing would likely not be significant.
- Satellite television signal shadowing created by the Development Plots in the Proposed Development would likely be significant and affect existing residential properties under the shadow zone. With the implementation of mitigation measures, the impact of satellite television signal shadowing would likely not be significant.
- The Proposed Development would likely have no significant effect on the reception of Frequency Modulated (FM) broadcast and Digital Audio Broadcasting (DAB) radio.
- Temporary structures like cranes and scaffolding used during the construction phase would give rise to signal shadowing. Signal reception, especially for satellite television, may be affected. Any interference effects will be temporary and change over time.

In the event that the Proposed Development is deemed to be adversely affecting the reception of terrestrial and satellite television signals and is confirmed by pre and post-construction reception surveys, the following mitigation measures or combination of measures are recommended:

- Where possible, relocate affected terrestrial television aerials to positions outside reception shadow zones.
- Replace existing aerials in affected properties with amplified extra high-gain types.
- Where significant terrestrial television signal loss has occurred, affected properties would need to be connected to the Freesat satellite television service.
- Where possible, relocate affected satellite dishes to positions outside reception shadow zones or mount dishes at greater heights.
- Where it is not possible to relocate satellite dishes or mount them at greater heights, affected properties would need to be connected to Internet Protocol Television (IPTV) services or cable television services (provided this is readily available by the time the Proposed Development is being constructed or when it’s completed – Virgin Media is expanding its cable television network in east London and is currently available in parts of the Isle of Dogs.

# 1. Introduction

## Purpose of This Report

1.1 The development of tall buildings can interfere with the reception of radio and television signals.

1.2 The Applicant has commissioned Hoare Lea to carry out a study to assess the potential impact of the Proposed Development on the reception of radio and terrestrial/satellite television signals, in the areas surrounding the Site.

1.3 Information published by the British Broadcasting Corporation (BBC), Office of Communications (Ofcom) and Digital UK has been used in the assessment.

1.4 Mitigation measures will be implemented in the event that the Proposed Development adversely affects the reception of radio and television signals in the surrounding areas in order to reduce any adverse effects.

## Background

### General

1.5 The Applicant is submitting an Outline Planning Application ("OPA") and an associated Listed Building Consent ("LBC") application to enable the redevelopment of the Site.

1.6 The main application (Application NQ.1) is an OPA (all matters reserved) for the mixed-use redevelopment of the Site comprising demolition of existing buildings and structures and the erection of buildings comprising business floorspace, hotel/serviced apartments, residential, co-living, student housing, retail, community and leisure and sui generis uses with associated infrastructure, parking and servicing space, public realm, highways and access works.

1.7 The application for LBC (Application NQ.2) is for the stabilisation of the listed quay wall and any associated/necessary remedial works as well as demolition of the false quay in connection with Application NQ.1.

1.8 Due to the maximum heights of the high-rise buildings proposed in Application NQ.1, the reception of radio and television signals in the surrounding area may be affected.

**Historical Legal Context**

1.9 In *Hunter and Others v Canary Wharf Ltd* [1997] UKHL 14; [1997] AC 655; [1997] 2 All ER 426; [1997] 2 WLR 684; [1997] 2 FLR 342; [1997] Fam Law 601, the effect of interference with television reception by proposed tall buildings was considered, and whether an action in private nuisance was available for interference.

1.10 The case concerned the construction of the 250m high, steel-clad, Canary Wharf Tower (One Canada Square), in an area designated as an Enterprise Zone created a television reception 'shadow' on properties in the area, affecting television signal reception. The plaintiffs therefore sued over television interference, claiming compensation for loss of amenity and wasted licence fees.

1.11 In a majority decision, the House of Lords ruled that as a general rule, a man is entitled to build on his own land, though this right is subject to planning controls. Moreover, a man's right to build on his land is not restricted by the fact that the presence of the building may of itself interfere with his neighbour's enjoyment of his land.

1.12 It was ruled that *''no action lay in private nuisance for interference with television caused by the mere presence of a building. That a building may have such an effect has to be accepted. If a large building is proposed in an area, it will usually be open to local people or the planning authority to raise the possibility of television interference at the stage of the application for planning permission.'' (Hunter and Others v Canary Wharf Ltd, 1997).*

1.13 Moreover the Canary Wharf area had been designated an Enterprise Zone with the effect that planning permission was deemed to have been granted for any form of development; no application for permission had to be made.

1.14 For these and other legal reasons, the plaintiff's case was dismissed. This court case has meant that the development of large/tall buildings which can cause radio and television reception difficulties has become a matter of interest to planning authorities, viewers, broadcasters and developers. It has become a requirement for new developments to carry out radio and television interference studies to assess the potential effects of the developments on radio and television signal reception and to mitigate any disrupted signal reception.

**Policy Context**

***National Policy – National Planning Policy Framework (February 2019) ("NPPF")***

1.15 With reference to local planning authorities, the NPPF states that *"They should ensure that: …… they have considered the possibility of the construction of new buildings or other structures interfering with broadcast and electronic communications services."* (NPPF, 2019, paragraph 114b)

***Regional Policy – The London Plan: The Spatial Development Strategy for London Consolidated with Alterations since 2011 (March 2016) ("The London Plan")***

1.16 Overall planning policy in London is set out in the Greater London Authority's (GLA) London Plan. The London Plan states that *"tall buildings should not affect their surroundings adversely in terms of ……telecommunication interference."* (The London Plan, 2016, Policy 7.7 Location and Design of Tall and Large Buildings)

***Regional Policy – The Draft London Plan: Intend to Publish version (December 2019) ("Draft London Plan")***

1.17 The Mayor of London is currently preparing a new London Plan which when adopted will replace the current London Plan.

1.18 The Draft London Plan states that states that *"…… buildings, including their construction, should not interfere with …… telecommunication ……"* (Draft London Plan, 2019, Policy D9 Tall Buildings)

***Local Policy – LB Tower Hamlets Local Plan 2031: Managing growth and sharing the benefits (Adopted January 2020) ("Local Plan")***

1.19 The Local Plan states *"Developments with tall buildings must demonstrate how they will: ……not interfere to an unacceptable degree with telecommunications, television and radio transmission networks……"* (Local Plan, 2020, Policy D.DH6 Tall Buildings)

**The Site**

1.20 The 3.28-hectare Site (central Ordnance Survey (OS) ref. TQ 37632 80540) is bounded by Canary Wharf Crossrail Station to the south, Aspen Way (A1261) to the north, Hertsmere Road to the west and Billingsgate Market to the east. The West India Quay Docklands Light Railway (DLR) station and Delta Junction are located on the western side of the Site and the Site also incorporates parts of North Dock.

1.21 The existing buildings in the immediate area of the Site are a mix of low to high-rise buildings. The Canary Wharf tall buildings cluster is located to the south and the 35-storey 1 West India Quay building (Marriott Hotel) to the west. Areas north of the Site are predominantly populated by a mix of low to medium-rise residential properties.

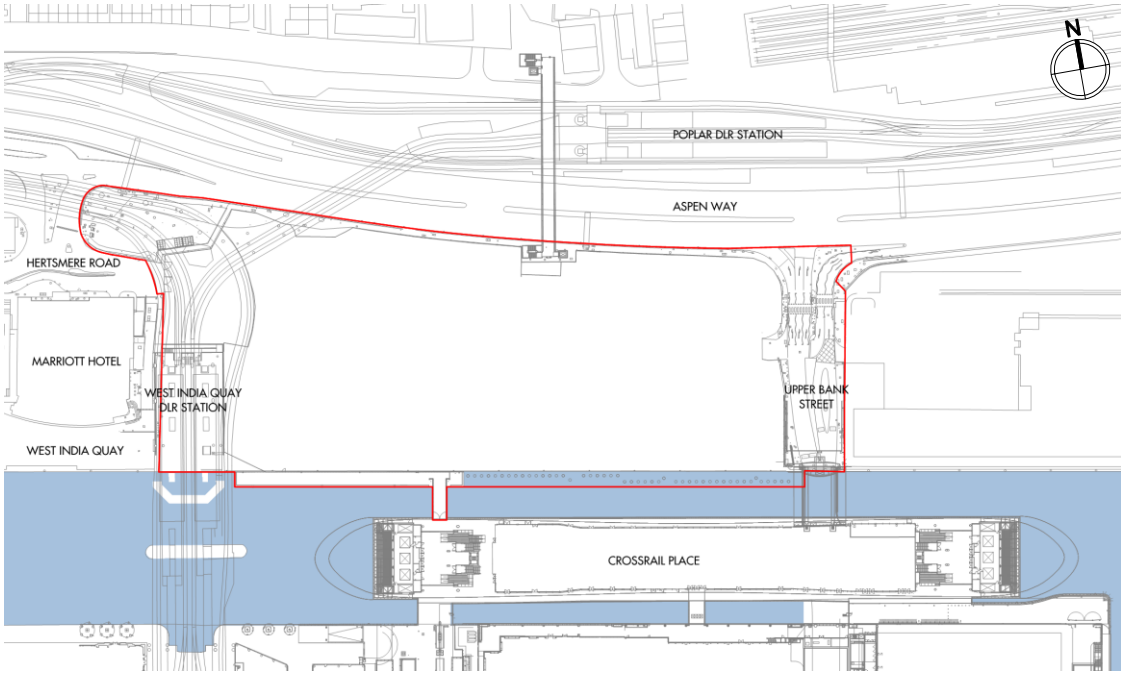


**Figure 1: Location of the Site**

## The Proposed Development

### Outline Planning Application

1.22 Application for outline planning permission (all matters reserved) for the redevelopment of the North Quay site for mixed use comprising:

- Demolition of existing buildings and structures;
- Erection of buildings and construction of basements;
- The following uses:
    - Business floorspace (B1)
    - Hotel/Serviced Apartments (C1)
    - Residential (C3)
    - Co-Living (C4/Sui Generis)
    - Student Housing (Sui Generis)
    - Retail (A1-A5)
    - Community and Leisure (D1 and D2)
    - Other Sui Generis Uses;
- Associated infrastructure, including a new deck over part of the existing dock;
- Creation of streets, open spaces, hard and soft landscaping and public realm;
- Creation of new vehicular accesses and associated works to Aspen Way, Upper Bank Street, Hertsmere Road and underneath Delta Junction;
- Connections to the Aspen Way Footbridge and Crossrail Place (Canary Wharf Crossrail Station);
- Car, motorcycle, bicycle parking spaces, servicing;

- Utilities including energy centres and electricity substation(s); and
- Other minor works incidental to the proposed development.

**Listed Building Consent Application**

1.23 Stabilisation of listed quay wall and associated/remedial works as well as demolition/removal of the false quay in connection with the erection of mixed-use development.

1.24 The Proposed Development will comprise buildings (Development Plots), including tall buildings – the maximum height of each of the Development Plots is given in Figure 2 below. The maximum height parameters are overlain by the Design Guidelines which further control the maximum heights by requiring certain buildings to be 20m lower where other buildings are built out at the maximum parameter. Therefore, there would not be an instance where all maximum heights (i.e. the Jelly Mould) could be built out.

| DEVELOPMENT PLOT | MAXIMUM HEIGHT (m) AOD |
|---|---|
| NQ.A1 | 150.00 |
| NQ.A2 | 25.00 |
| NQ.A3 | 150.00 |
| NQ.A4 | 225.00 |
| NQ.A5 | 37.00 |
| NQ.B1 | 180.00 |
| NQ.C1 | 25.00 |
| NQ.D1 | 190.00 |
| NQ.D2 | 150.00 |
| NQ.D3 | 85.00 |
| NQ.D4 | 190.00 |
| NQ.E1 | 8.00 |
| NQ.F1 | 8.00 |
| NQ.F2 | 25.00 |
| NQ.F3 | 8.00 |
| NQ.G1 | 8.00 |
| NQ.H1 | 12.00 |
| NQ.H2 | 25.00 |

**Figure 2: Development Plots and their Maximum Heights**

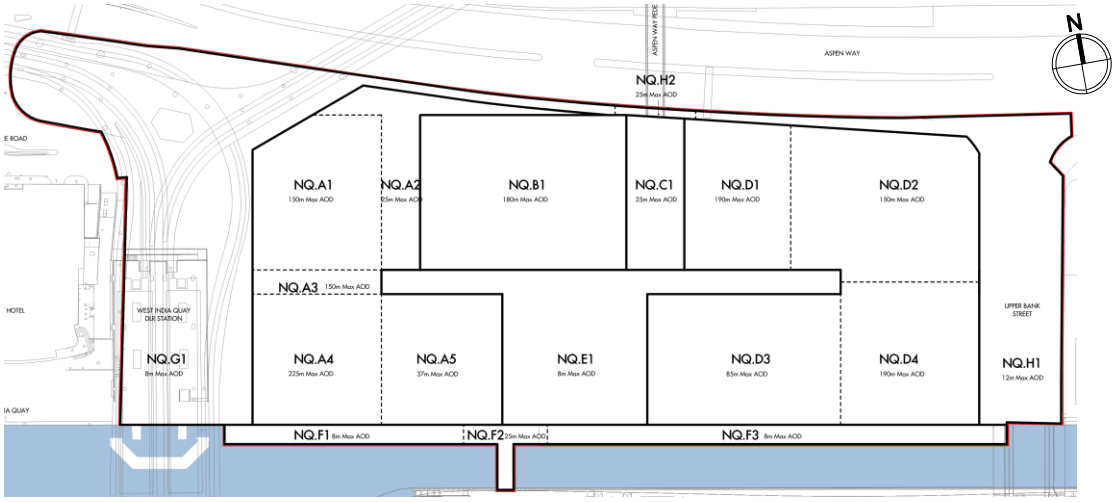


**Figure 3: Parameter Plan of the Proposed Development showing Development Plots**

# 2. Analysis

## Signal Reception Interference Mechanisms

### Shadowing

2.1 Broadcast radio and terrestrial and satellite television signals are transmitted at radio frequencies, ranging from hundreds of kilohertz (kHz) to thousands of megahertz (MHz). At the high frequencies in which the signals operate, the corresponding wavelengths of the signals are several hundred times smaller than the length of tall buildings or other structures with sizeable massing and elevation. The relative difference between the sizes of large structures/buildings and signal wavelengths means that the structures act as obstructions in the paths of the signals being transmitted. In simple terms, signals transmitted at high frequencies travel as electromagnetic waves and can be considered as travelling in straight lines, like rays of light.

2.2 This ability of high frequency signals to travel almost in straight lines has the disadvantage that large structures with sizeable elevations, can cause reception problems to broadcast links and television reception.

2.3 The main mechanisms that create these reception problems are when the obstructing structure creates a reception ‘shadow’ by obstructing the transmitted signal from reaching other properties within the shadow or causes ‘reflection’ whereby the structure reflects incident signals onto surrounding properties.

2.4 In an area behind a structure, the radio/television transmitter is effectively screened from the viewer and the strength of the signal from the transmitter to a viewer in the ‘shadow’ zone is reduced, as shown in Figure 4.

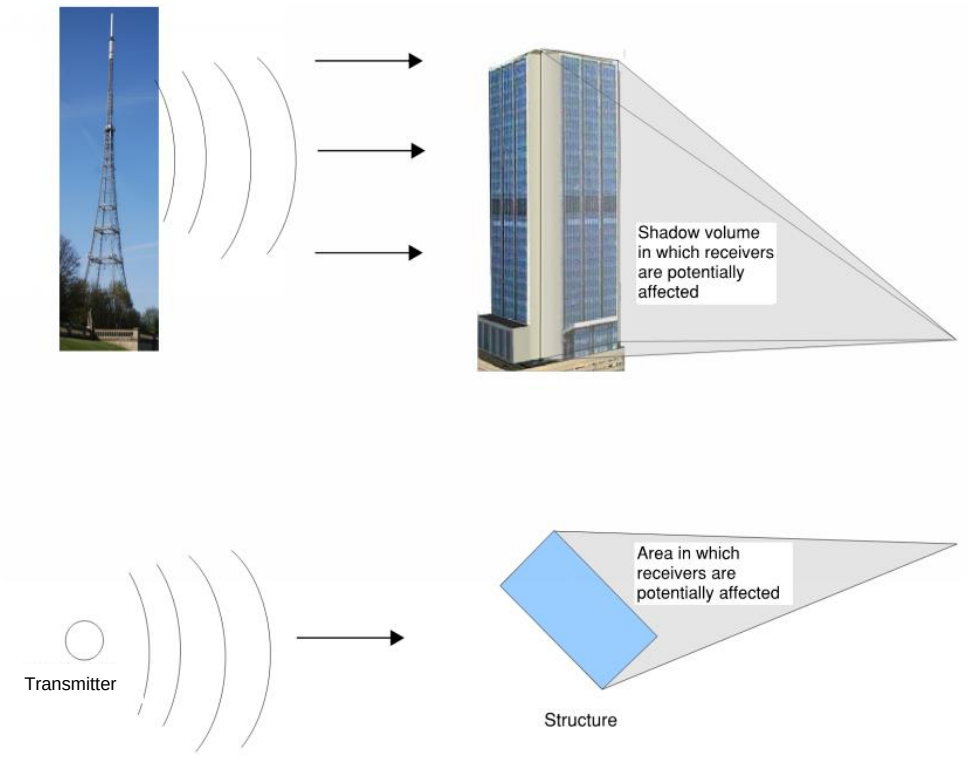


**Figure 4: Terrestrial Radio/Television Signal Shadowing Effects**

2.5 The ‘shadow’ area can be considered to be divided into the following sub-areas:-

- In the region where an optical view of the transmitter is lost, the reduction in signal strength is dependent on the design and composition of the obstructing structure. Most brick and concrete buildings can significantly reduce signal strength in the ‘shadow’ area, and can in some cases, allow no signal through.
- Diffraction at the edges of the structure can effectively reduce the effects of a ‘shadow’. In general, the effect of diffraction is that the signal appears to bend around the sides of the structure and is able to reduce the size of the ‘shadow’ area.
- Further from the structure, a complex multiple of reflections and diffraction, caused by structures in the locality, may result in the ‘shadow’ area becoming almost non-existent.

2.6 Satellite television reception problems occur when a structure creates a reception ‘shadow’ by obstructing the line-of-sight path between satellite dishes and geostationary satellites above the horizon, preventing the transmitted satellite television signal from reaching satellite dishes on surrounding properties, as shown in Figure 5.

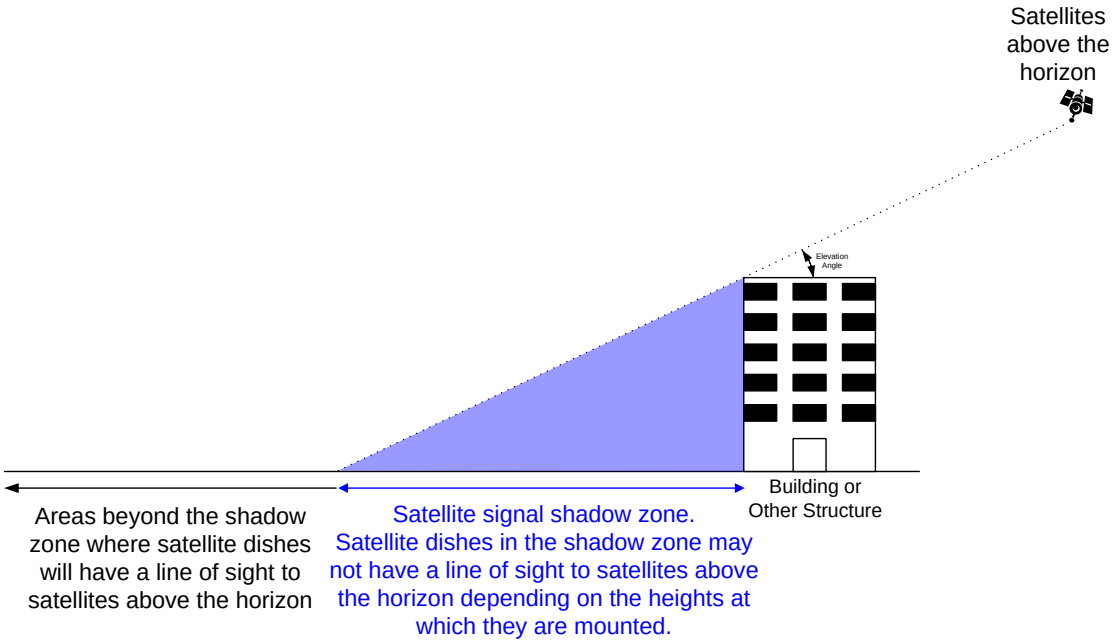


**Figure 5: Satellite Television Signal Shadowing Effects**

### Reflections

2.7 Radio frequency signals can be reflected from a structure and can result in a receiver, receiving two or more signals from the same source.

2.8 Figure 6 shows the potential interference mechanism produced by ‘reflection’ or ‘scattering’ of the incident signal; this type of interference is caused by the combination of a direct signal which travels distance (D1) to the viewer and a signal reflected from the structure which travels a slightly further distance (D2 + D3).

2.9 Even though signals travel at the speed of light, the different path lengths can mean that one signal arrives at a significant delay relative to the other; this can result in a second image appearing on the viewer’s screen, displaced from the other. This type of interference to television reception is known as ‘ghosting’ or ‘delayed image’.

2.10 The extent of the zone and the interference within the zone is dependent on the relative strengths of the direct and reflected signals. The greater the relative strength of the reflected signal, and the longer the delay, the more subjectively intrusive the problem becomes.

2.11 Conducting surfaces, such as flat polished metallic structures, metal impregnated glass and such like materials tend to reflect a high proportion of radio signals. The proportion of the incident signal reflected off structures would therefore be dependent on the materials used to clad the exterior of the structures.

2.12 The point at which the reflected (unwanted) signal is 5% of the direct signal corresponds to a difference of 26dB; this separation is used as the planning protection ratio for delayed images resulting from ghosting.

2.13 Analogue television signals are particularly susceptible to reflection interference; by contrast, digital television signals are largely unaffected by signal reflections.

2.14 The switchover from analogue to digital terrestrial television (DTT) in the UK has meant that signal reflection is no longer an issue to be considered for television transmissions.

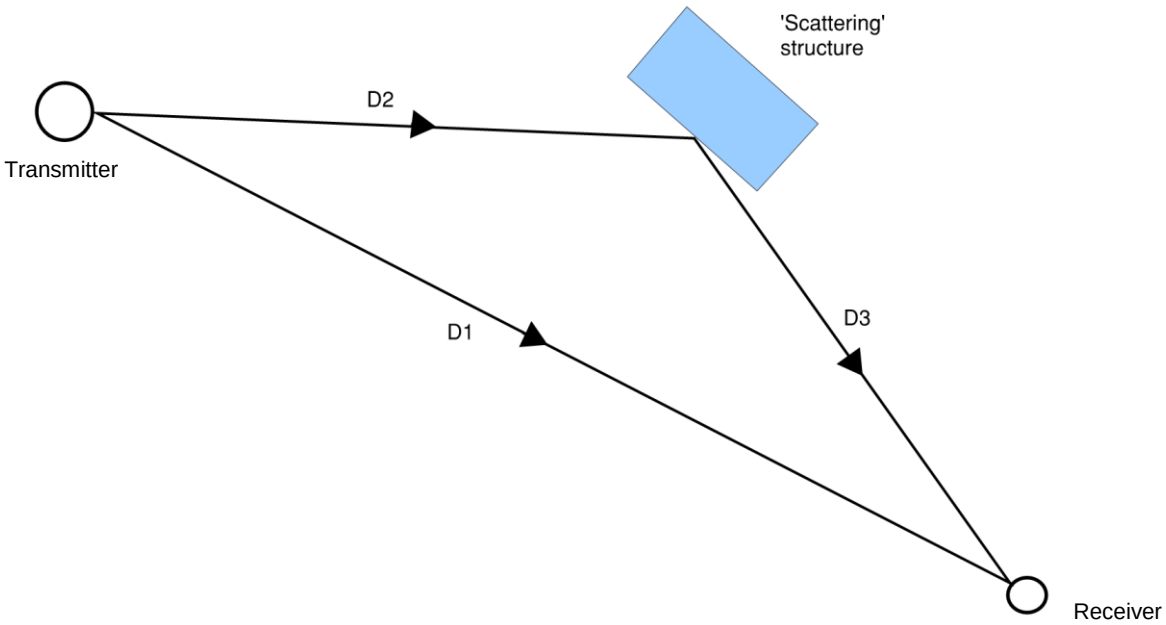


**Figure 6: Signal Reflection Effects**

## Signal Coverage at the Site

2.15 The Site and surrounding areas predominantly receive radio and television signals from the following sources:-

### Broadcast Radio

2.16 Broadcast radio, mainly transmitted at Very High Frequency (VHF) in Band II between 87.5 MHz and 108 MHz as Frequency Modulated (FM) signals, from a network of radio transmitters including the Crystal Palace transmitter.

### Digital Audio Broadcasting (DAB) Radio

2.17 DAB transmitted at VHF in Band III between 218 MHz and 240 MHz, from a network of radio transmitters including the Crystal Palace transmitter.

**Terrestrial Television**

2.18 Digital television signals transmitted at UHF (Ultra High Frequency) in Band IV and V between 470 MHz and 758 MHz from the Crystal Palace transmitter (OS ref. TQ 33940 71220), from a bearing of 202° from the north. Transmissions from the Crystal Palace transmitter include nine TV multiplexes and it transmits the entire range of digital terrestrial television (DTT) channels/services available.

2.19 The Poplar relay transmitter (OS ref. TQ 38200 81200) is located to the north-east of the Site and provides localised coverage to properties in the Poplar area. Its transmissions include only three TV multiplexes and it transmits only DTT channels/services from the public service broadcasters.

**Satellite Television**

2.20 Satellite television signals are transmitted at Super High Frequency (SHF) in the gigahertz (GHz) bands between 10.7 and 12.75 GHz. These frequencies are converted by the satellite dish's low-noise block downconverter (LNB) to the satellite intermediate frequency (IF) range of 950 MHz to 2150 MHz for feeding to the radio frequency (RF) input of the satellite receiver.

2.21 The vast majority of UK viewers receive satellite television signals from the Astra satellites in geostationary orbit above the equator which are located at a longitude of 28.2°E. To receive services (Sky and Freesat) from these Astra satellites, satellite dishes in the UK are oriented in a south-south-easterly direction and are required to point upwards at an angle of between 17° and 26°.

2.22 The elevation angle of the satellite dish is dependent on the latitude of the receiving site – an elevation angle of between 24° and 26° is required in the south of England, decreasing the further north the receiving site is located. An elevation angle of about 17° is required in the northernmost parts of Scotland.

2.23 At the latitude of the Site, an elevation angle of 25.4° is required by satellite dishes located on existing properties in the surrounding area to maintain a 'line of sight' to the Astra satellites in geostationary orbit.

## Assessment of Interference

2.24 This assessment has analysed the potential effects of the Proposed Development on the reception of radio and television signals in areas surrounding the Site. The actual interference effects will be confirmed by pre and post-construction reception surveys which will be secured via planning conditions.

2.25 The assessment has been based on the massing, siting and maximum heights of the Development Plots on the Site. The assessment is based on the maximum build-out (i.e. the Jelly

Mould) and not the Indicative Scheme, therefore the assessment shows an absolute worst case and the impact of the completed Proposed Development would actually be less given that the full parameters would never be built out.

**Shadowing Effects on Digital Terrestrial Television**

***Construction Phase***

2.26 An inspection of the Site and surrounding areas indicated that most television aerials on properties were directed towards the main transmitter at Crystal Palace. The construction of the Development Plots proposed for the Site, would likely give rise to the shadowing of signals from Crystal Palace, the extent of which will be dependent on the stage of construction of the Development Plots. The lengths of the signal shadows cast by the Development Plots will increase as their heights increase.

2.27 The analysis of shadowing from the Development Plots during the construction phase and the mitigation measures that may need to be implemented will be the same as during the operational phase. It is considered that the effects of shadowing would gradually increase throughout the construction period as massing is erected, to align with the potential effects identified for the completed Proposed Development. It is therefore considered that the completed Proposed Development represents the worst-case assessment in terms of shadowing effects. Refer to the *Operational Phase* section below.

2.28 The shadowing of terrestrial television signals by temporary structures such as cranes and scaffolding is difficult to assess and mitigate as the positions of these structures and their interference effects will change over time. Any likely mitigation measures would also have to be done to suit the short-term interference effects caused by these temporary structures. However, signal shadowing by these temporary structures, is not envisaged to be significant as the structures would not have suitably large/flat surface areas to effectively block terrestrial television signals broadcast in the megahertz frequency range and significantly attenuate the signal levels reaching aerials on buildings outside the Proposed Development.

***Operational Phase***

2.29 An inspection of the Site and surrounding areas indicated that most television aerials on properties were directed towards the main transmitter at Crystal Palace. The Proposed Development would likely obstruct signals from the Crystal Palace transmitter. The assessment of shadowing from the Crystal Palace transmitter has indicated the completed Proposed Development would likely create shadowing to the north-east of the Site towards Epping.

2.30 The following approximate worst-case shadow lengths would be created:

| DEVELOPMENT PLOT | MAXIMUM HEIGHT (m) AOD | SHADOW LENGTH (km) | FARTHEST EXTENT OF SHADOW |
|---|---|---|---|
| NQ.A1 | 150.00 | 8.79 | Nightingale Lane, Wanstead |
| NQ.A2 | 25.00 | 0.85 | Chrisp Street, Poplar |
| NQ.A3 | 150.00 | 8.77 | Grosvenor Road, Wanstead |
| NQ.A4 | 225.00 | 23.38 | St John's Road, Epping |
| NQ.A5 | 37.00 | 1.30 | Zetland Street, Poplar |
| NQ.B1 | 180.00 | 12.81 | Snakes Lane East, Woodford Green |
| NQ.C1 | 25.00 | 0.85 | Hay Currie Street, Poplar |
| NQ.D1 | 190.00 | 14.58 | Roding Lane, Chigwell |
| NQ.D2 | 150.00 | 8.82 | Grove Park, Wanstead |
| NQ.D3 | 85.00 | 3.61 | Dawn Crescent, Stratford |
| NQ.D4 | 190.00 | 14.53 | Roding Lane, Chigwell |
| NQ.E1 | 8.00 | 0.26 | Castor Lane, Poplar |
| NQ.F1 | 8.00 | 0.25 | Castor Lane, Poplar |
| NQ.F2 | 25.00 | 0.84 | Chrisp Street, Poplar |
| NQ.F3 | 8.00 | 0.26 | Castor Lane, Poplar |
| NQ.G1 | 8.00 | 0.25 | Poplar High Street, Poplar |
| NQ.H1 | 12.00 | 0.40 | Cottage Street, Poplar |
| NQ.H2 | 25.00 | 0.85 | Hay Currie Street, Poplar |

**Figure 7: Theoretical Terrestrial Television Signal Shadow Lengths**

2.31 It is important to note that the assessment of the shadow lengths has ignored the effects of signal diffraction around the Development Plots, which when taken into consideration would decrease the length and severity of the signal shadows created. It is envisaged that a distance of between 500m – 1km away from the Site would be sufficient for diffraction effects to reduce the severity of signal reduction. The first 3km of the potential shadow zones are illustrated in Figure 8.

2.32 Aerials in the shadow zones could experience signal attenuation especially for properties in the Poplar area in the immediate section of the shadow zones.

2.33 The impact of the shadowing of signals from the Crystal Palace transmitter could be significant as it is the only transmitter broadcasting the entire range of DTT services to the Site and surrounding areas – mitigation measures would therefore need to be implemented. Potential mitigation measures that could be implemented to reduce this impact are set out in the Section below.

2.34 Aerials at affected properties under the Crystal Palace shadow zones may need to be relocated outside the shadow zones (in cases where buildings are not fully within the shadow zones) or upgraded to amplified extra high-gain types to compensate for reduced signal levels. However, aerial upgrades will not suffice where considerable signal attenuation has occurred and in such cases, the affected properties would need to be connected to the Freesat satellite television service.

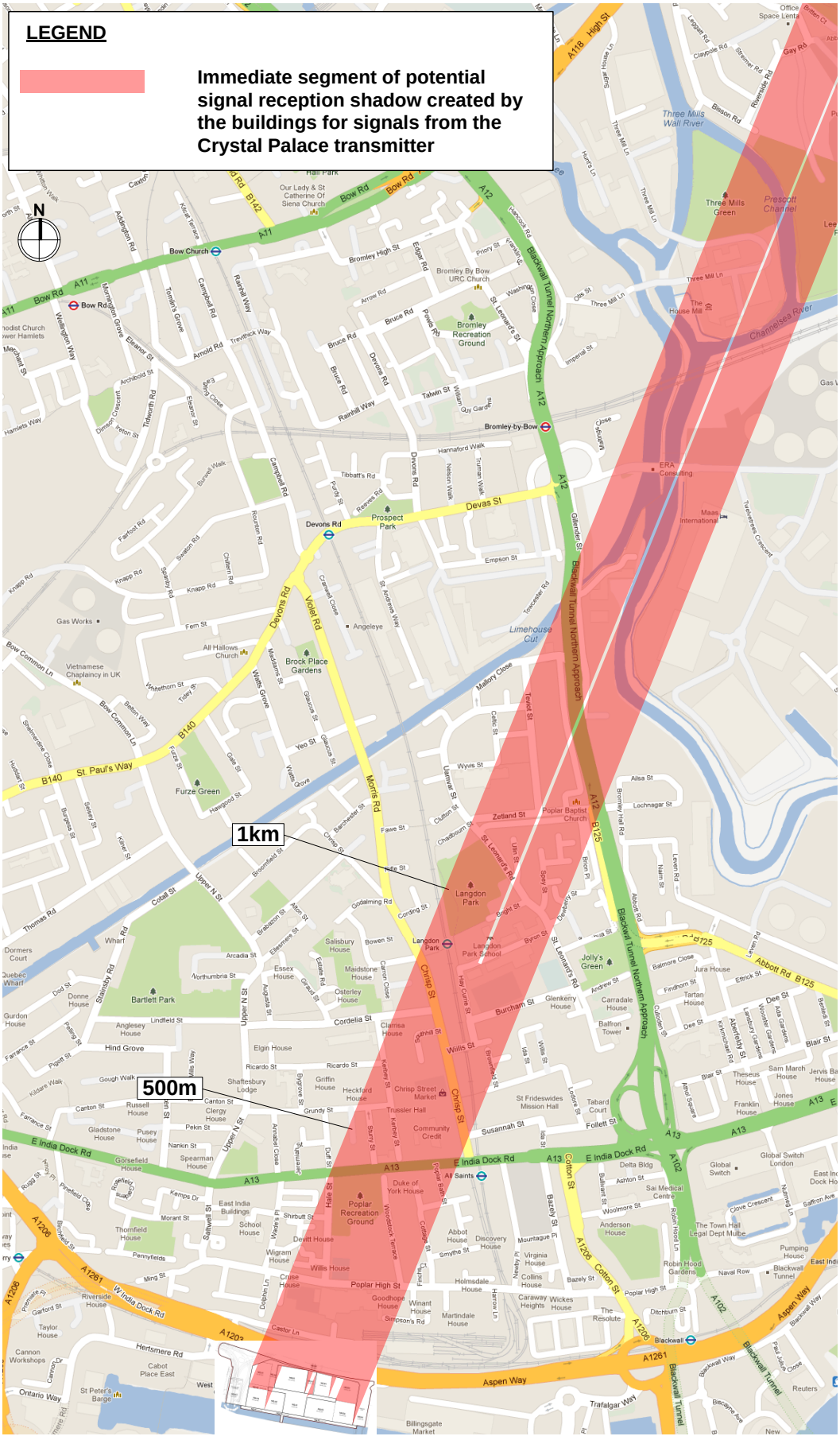


**Figure 8: First 3km of the Theoretical Terrestrial Television Shadow Zones**

2.35 To the south and south-west of the Site, there are existing and proposed high-rise schemes in and around the Canary Wharf estate which should be taken into consideration to ensure that signal shadowing caused by these other schemes is not attributed to the Development Plots in the Proposed Development.

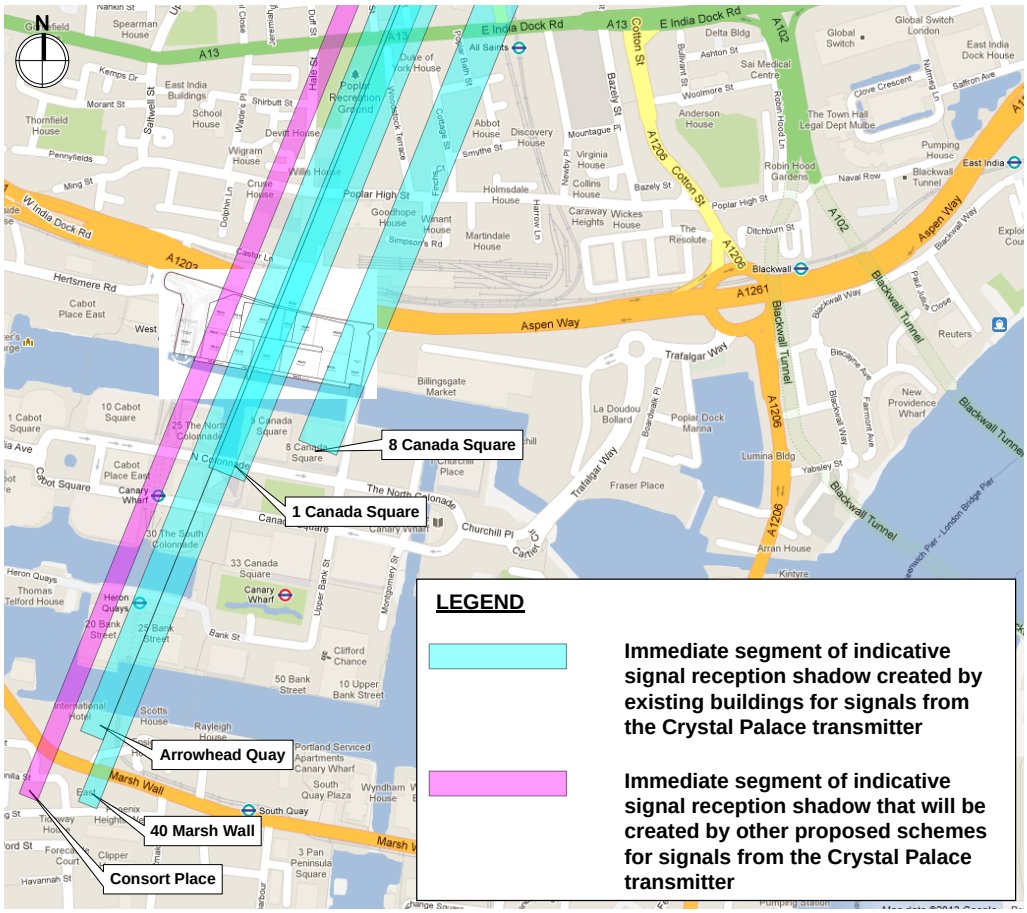


**Figure 9: Indicative Theoretical Terrestrial Television Shadow Zones cast by other Tall Buildings in the area**

2.36 Existing high-rise schemes Arrowhead Quay, 40 Marsh Wall and the Canary Wharf tall buildings cluster will already be creating signal shadowing in the same direction and area to that which will be created by the Development Plots in the Proposed Development. Therefore, some areas in the Proposed Development's shadow zone may already be experiencing reduced signal levels.

2.37 Similarly, signal shadowing in the same direction and area as the Proposed Development would be created by the proposed Consort Place high-rise scheme (planning reference number: PA/15/02671/A1). The mixed-use scheme which is in the early stages of construction will comprise two towers standing at 217.50m AOD and 124.15m AOD.

2.38 The construction of the Proposed Development will not affect current Crystal Palace signal levels in the areas already shadowed by Arrowhead Quay, 40 Marsh Wall and the high-rise buildings in Canary Wharf.

2.39 The overall impact of signal shadowing by the Proposed Development, for signals from Crystal Palace, could be significant. However, with the implementation of the appropriate mitigation measures, the impact of shadowing on digital terrestrial television would likely have no significant residual effect in both the short-term and long-term.

2.40 Any potential shadowing of signals from the Poplar relay transmitter will not be significant as the theoretical shadow zone for Poplar signals will fall in areas south-west of the Proposed Development – these areas are outside the Poplar transmitter's main coverage area. Aerials in these areas were observed to be directed towards the Crystal Palace transmitter and Crystal Palace signal transmissions in areas south-west of the Site will not likely be affected by the Proposed Development.

**Shadowing Effects on Satellite Television**

***Construction Phase***

2.41 The construction of the Development Plots proposed for the Site would likely give rise to satellite television signal shadowing to the north-west of the Site, the extent of which will be dependent on the stage of construction of the Development Plots. The lengths of the signal shadows cast by the Development Plots will increase as their heights increase.

2.42 The analysis of shadowing from the Development Plots during the construction phase and the mitigation measures that may need to be implemented will be the same as during the operational phase. Refer to the *Operational Phase* section below.

2.43 Although tall structures like cranes and scaffolding, etc. used during the construction of the Proposed Development do not have very large/flat surface areas, the SHF range at which satellite television signals are broadcast mean that such structures may obstruct satellite television signals to existing properties to the north-west of the Proposed Development.

2.44 The shadowing of satellite television signals by temporary structures such as cranes is difficult to assess and mitigate as the positions of cranes' jibs and their subsequent interference effects will change continuously. Affected satellite dishes will need to be suitably relocated to ensure the 'line of sight' to the Astra satellites is not obscured by temporary structures on the Site. Alternatively, affected properties may need to be connected to IPTV services on a temporary basis.

2.45 Cable television services are not currently available in areas within the potential reception shadow zone, but Virgin Media is expanding its network in east London and is already available in parts of the Isle of Dogs, so cable television services could potentially be available by the time construction of the Proposed Development has commenced. Connecting affected properties to cable television services on a temporary basis may therefore be a suitable mitigation measure.

***Operational Phase***

2.46 Unlike terrestrial television and broadcast radio transmissions, satellite television signals are broadcast in the SHF range and are less susceptible to signal diffraction effects so obstructing structures create more severe signal shadows. However, as satellite signals are transmitted from above the horizon, shadow lengths are usually shorter, meaning signal disruption will only typically occur in areas local to the obstructing structure. In addition, depending on the mounting height of satellite dishes within a satellite television signal shadow, signal reception could still occur.

2.47 Low-rise buildings are at a greater risk of signal shadowing due to the lower heights at which satellite dishes will be mounted on these buildings.

2.48 An inspection of the Site and surrounding areas revealed that existing Sky/Freesat satellite dishes are oriented in a south-south-easterly direction. The location of the Site and the general orientation of existing satellite dishes in a south-south-easterly direction, indicate that the Proposed Development, when completed, could obstruct the 'line of sight' between existing satellite dishes and Astra satellites in geostationary orbit, in an area to the north-west of the completed Proposed Development.

2.49 The assessment has estimated that the following approximate shadow lengths would be created:

| DEVELOPMENT PLOT | MAXIMUM HEIGHT (m) AGL | SHADOW LENGTH (m) | FARTHEST EXTENT OF SHADOW |
|---|---|---|---|
| NQ.A1 | 143.80 | 302.84 | Saltwell Street, Poplar |
| NQ.A2 | 18.80 | 39.59 | Aspen Way, Poplar |
| NQ.A3 | 143.80 | 302.84 | Ming Street, Poplar |
| NQ.A4 | 218.80 | 460.79 | Rosefield Gardens, Poplar |
| NQ.A5 | 30.80 | 64.86 | Rail track within planning application boundary |
| NQ.B1 | 173.80 | 366.02 | Morant Street, Poplar |
| NQ.C1 | 18.80 | 39.59 | Aspen Way, Poplar |
| NQ.D1 | 183.80 | 387.08 | Morant Street, Poplar |
| NQ.D2 | 143.80 | 302.84 | Wade's Place, Poplar |
| NQ.D3 | 78.80 | 165.95 | Castor Lane, Poplar |
| NQ.D4 | 183.80 | 387.08 | Poplar High Street, Poplar |
| NQ.E1 | 1.80 | 3.79 | Within the Site |
| NQ.F1 | 1.80 | 3.79 | Within the Site |
| NQ.F2 | 18.80 | 39.59 | Within the Site |
| NQ.F3 | 1.80 | 3.79 | Within the Site |
| NQ.G1 | 1.80 | 3.79 | Rail track within planning application boundary |
| NQ.H1 | 5.8 | 12.21 | Aspen Way, Poplar |
| NQ.H2 | 18.80 | 39.59 | Aspen Way, Poplar |
| The above ground level (AGL) heights of the Development Plots have been calculated by subtracting their maximum AOD heights from the AOD ground height of the Site. | | | |

**Figure 10: Satellite Television Signal Shadow Lengths**

2.50 The potential shadow zones (created by the completed Proposed Development for satellite signals broadcast from an orbital longitude of 28.2°E above the equator) is illustrated in Figure 11.

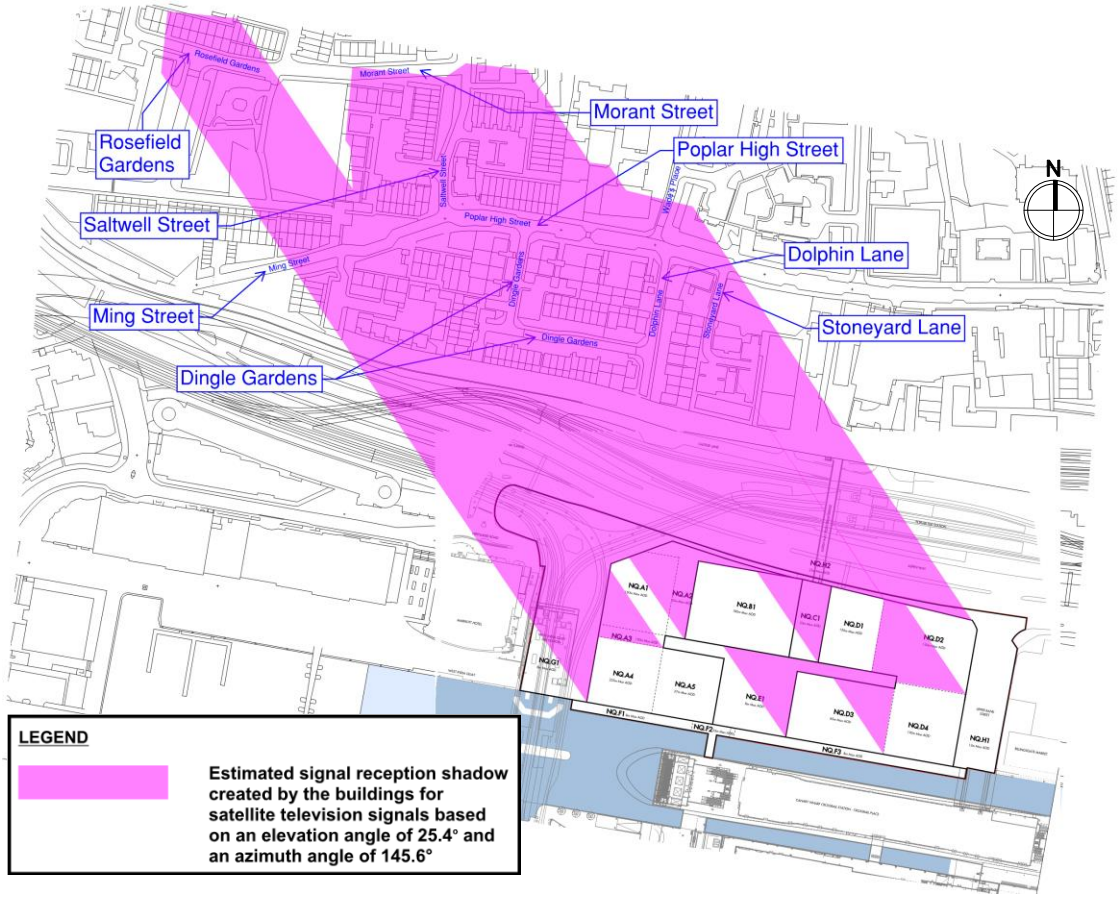


**Figure 11: Satellite Television Shadow Zones**

2.51 As shown in Figure 11, the shadow zones fall on low to medium-rise residential properties on Dingle Gardens, Dolphin Lane, Stoneyard Lane, Ming Street, Poplar High Street, Saltwell Street, Rosefield Gardens and Morant Street. Satellite television reception at most of these properties will likely be adversely affected.

2.52 Figures 12 – 19 illustrate the minimum dish mounting heights which satellite dishes within the shadow zones must be mounted at to ensure a line of sight to the Astra satellites is maintained. The dish mounting heights are dependent on how far a satellite dish is located from the Development Plots in the Proposed Development.

2.53 Under the shadow zones, in order to ensure signal reception is maintained, the minimum mounting heights of satellite dishes on properties would range from 5.69m to 115.79m AGL approximately. The affected properties are low to medium-rise so it would not be feasible to achieve the required minimum dish mounting heights in most cases. Mitigation measures would therefore need to be implemented – affected properties would need to be connected to IPTV services.

2.54 Cable television services are not currently available in areas within the potential reception shadow zone, but Virgin Media is expanding its network in east London and is already available in parts of the Isle of Dogs, so cable television services could potentially be available by the time the Proposed Development is complete. Connecting affected properties to cable television services may therefore be a suitable mitigation measure.

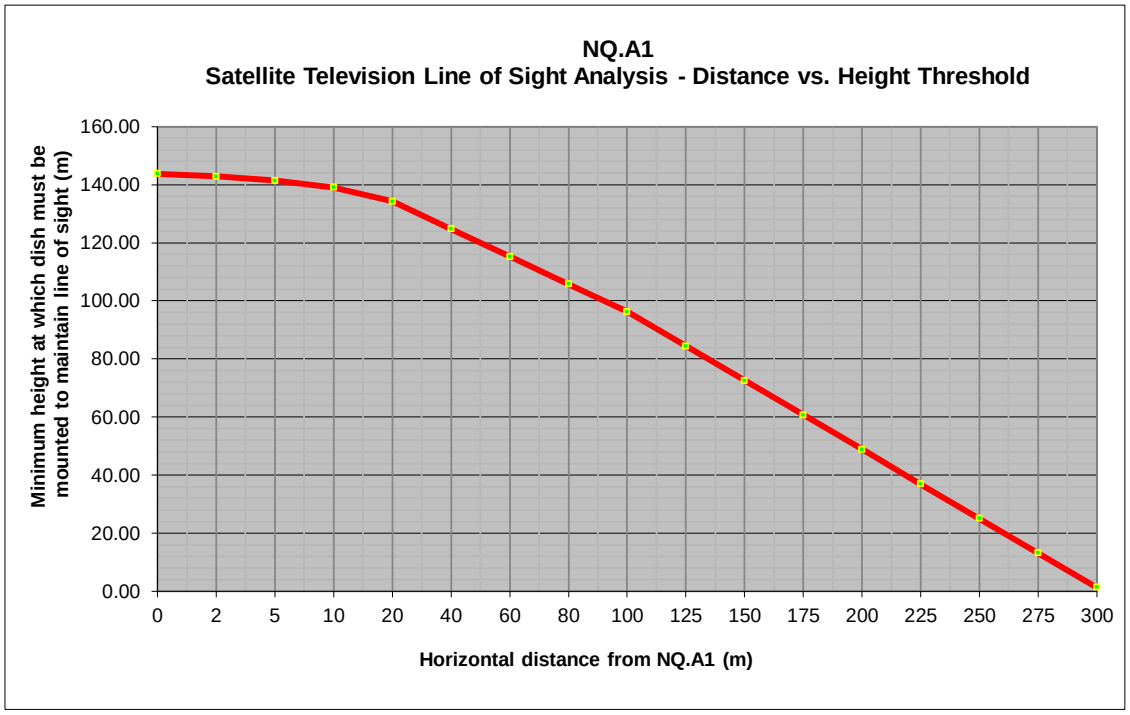


**Figure 12: Minimum Dish Mounting Heights in NQ.A1 Satellite Television Shadow Zone**

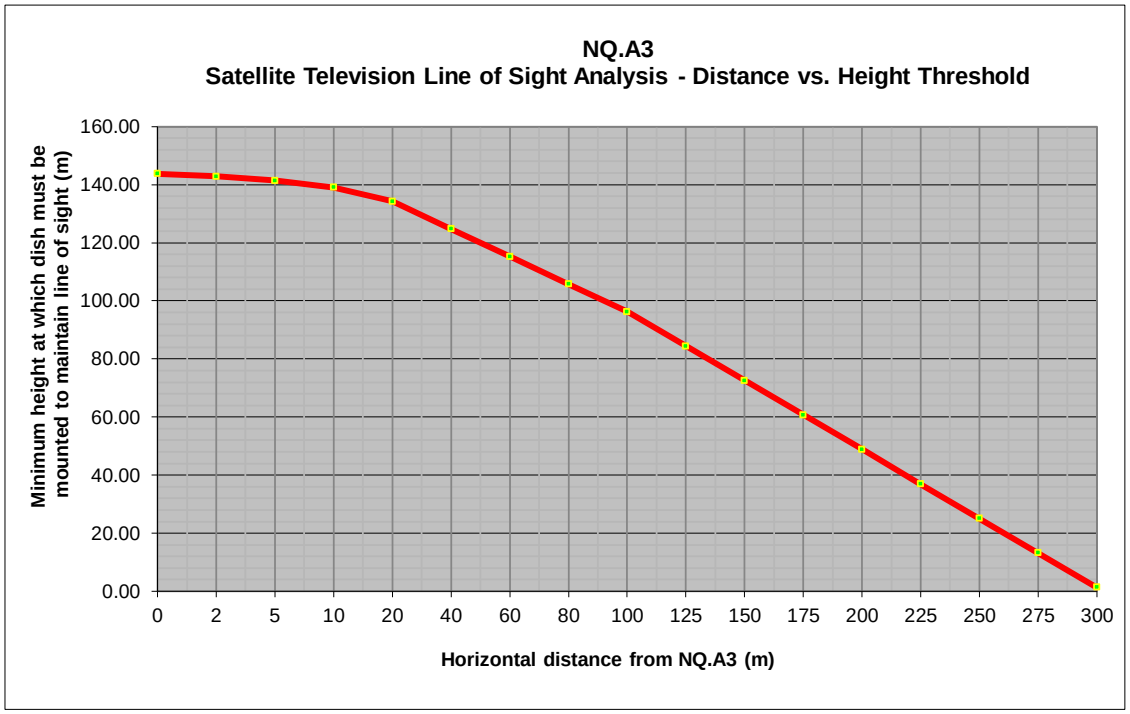


**Figure 13: Minimum Dish Mounting Heights in NQ.A3 Satellite Television Shadow Zone**

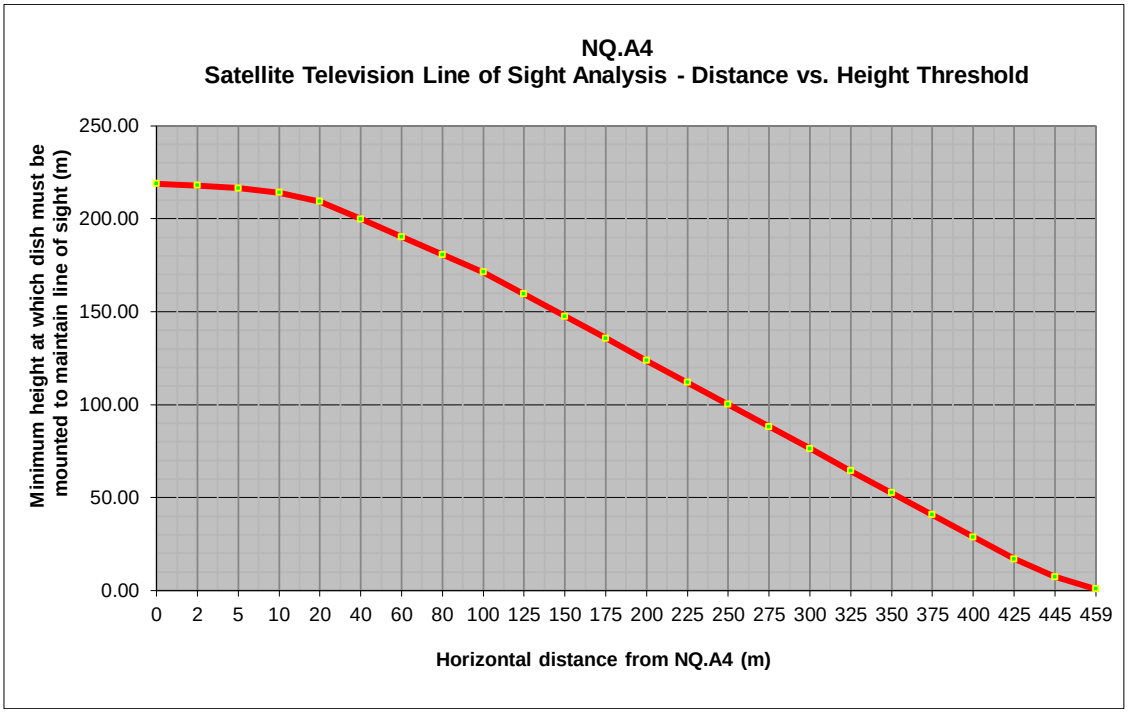


**Figure 14: Minimum Dish Mounting Heights in NQ.A4 Satellite Television Shadow Zone**

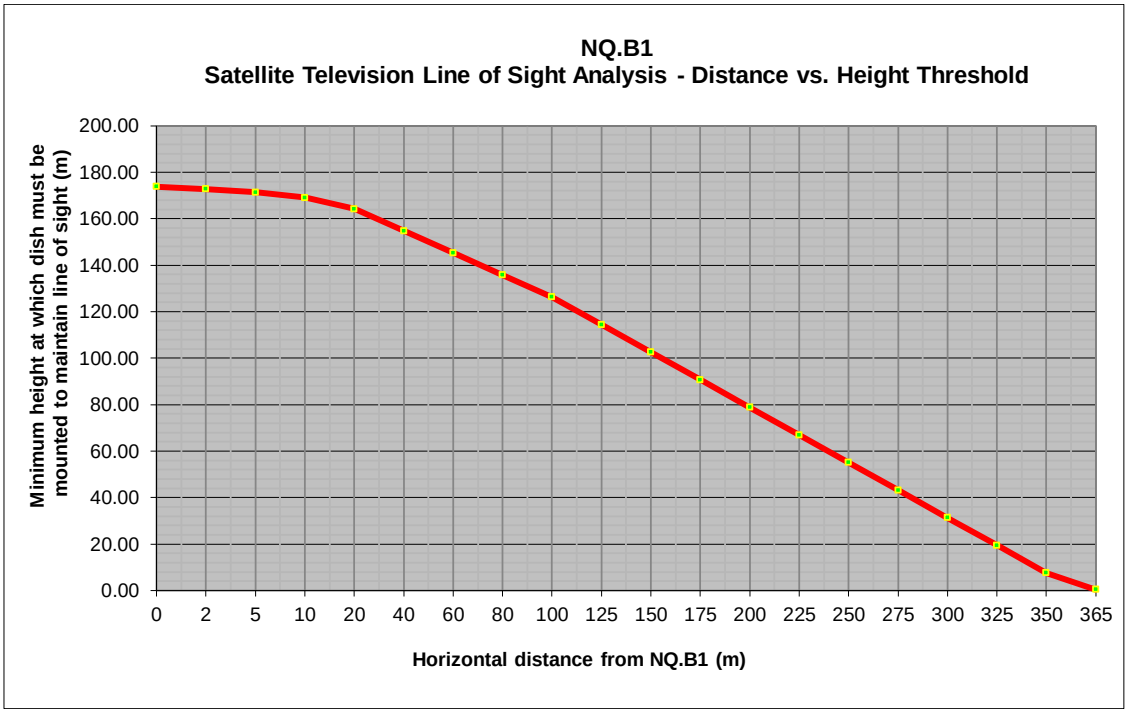


**Figure 15: Minimum Dish Mounting Heights in NQ.B1 Satellite Television Shadow Zone**

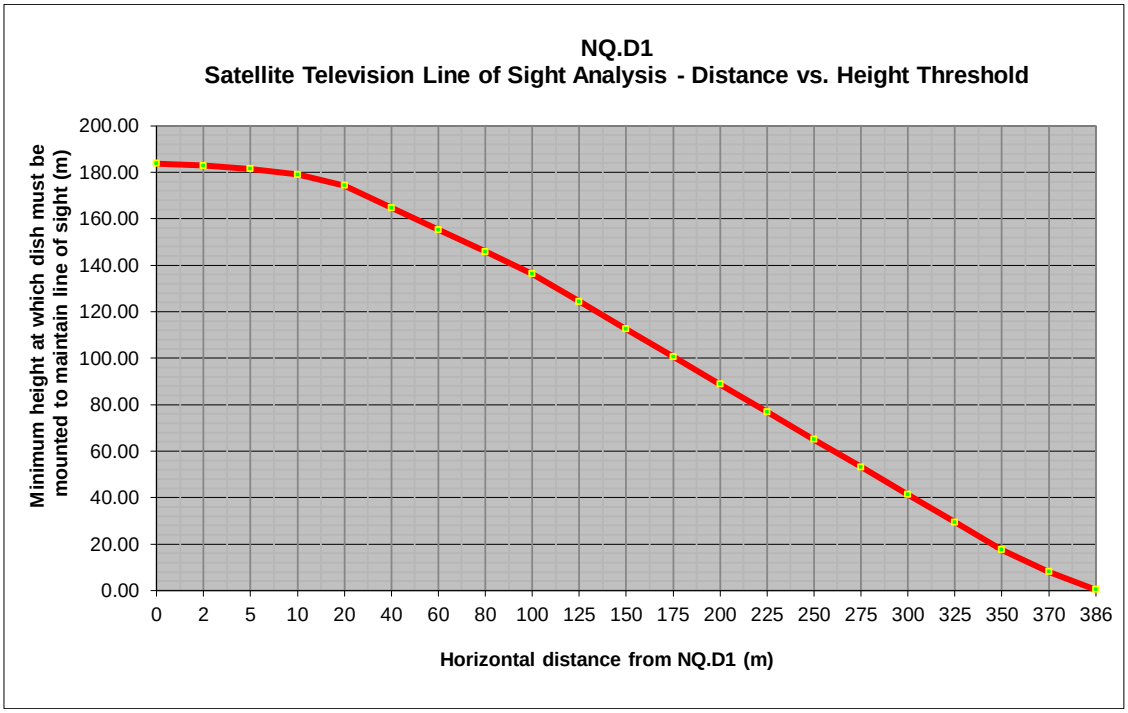


**Figure 16: Minimum Dish Mounting Heights in NQ.D1 Satellite Television Shadow Zone**

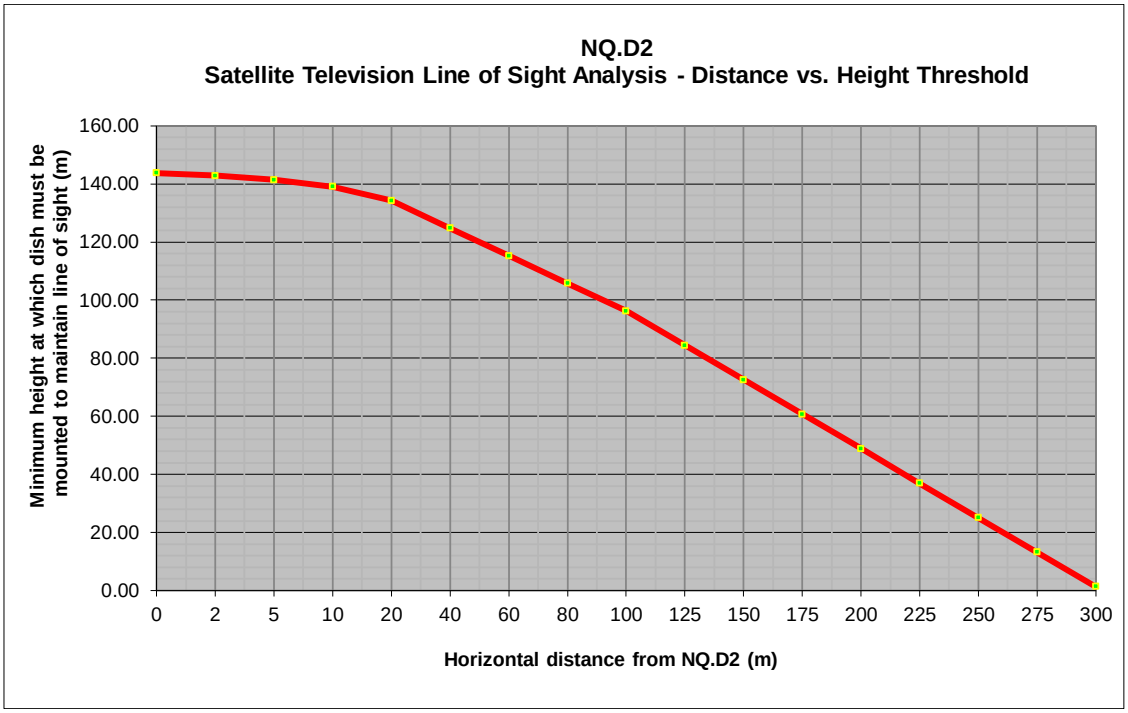


**Figure 17: Minimum Dish Mounting Heights in NQ.D2 Satellite Television Shadow Zone**

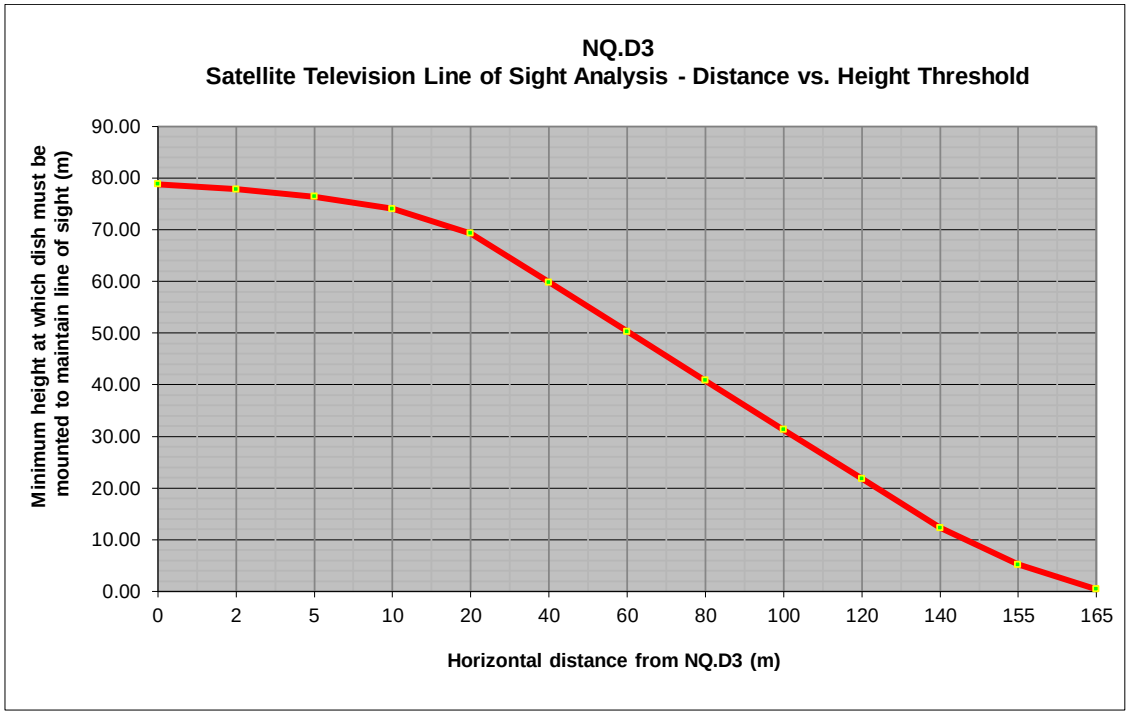


**Figure 18: Minimum Dish Mounting Heights in NQ.D3 Satellite Television Shadow Zone**

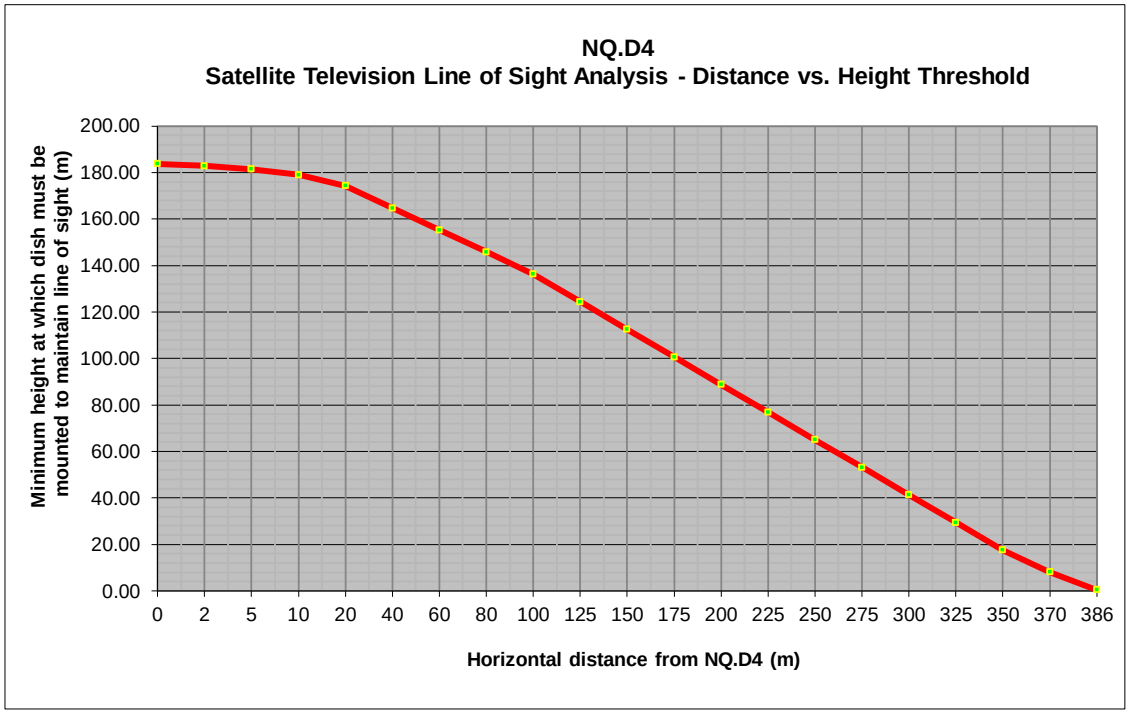


**Figure 19: Minimum Dish Mounting Heights in NQ.D4 Satellite Television Shadow Zone**

2.55 Where satellite television reception is disrupted and affected satellite dishes cannot be relocated outside the shadow zone (in cases where buildings are not fully within the shadow zone) or it is not possible to achieve the minimum dish mounting heights, affected properties would need to be connected to IPTV services or to cable television services if it is available by the time the Proposed Development is complete.

2.56 The overall impact of satellite television signal shadowing by the Proposed Development would likely be significant. However, with the implementation of the appropriate mitigation measures, especially if cable television services are available, the effects of any signal shadowing would not be significant in both the short-term and long-term.

**FM Broadcast and DAB Radio**

2.57 FM broadcast radio is transmitted at frequencies between 87.5 MHz and 108 MHz, a much lower frequency band than that for television signals. At these low frequencies, radio signals do not strictly travel in straight lines and the effect of diffraction is significant, with the result that it is less necessary for a receiver to have a 'line of sight' to the transmitter. Medium and long wave radio frequencies are much lower than that of FM radio and signals can be significantly diffracted, resulting in these signals being able to get around most obstructions.

2.58 The wide diffraction angles of these signals means that shadowing is substantially reduced and becomes practically non-existent.

2.59 Similarly, DAB radio signals broadcast at frequencies between 218 MHz and 240 MHz are subject to significant diffraction effects and are less susceptible to shadowing. It is possible for DAB signal shadowing to result in significant signal attenuation, but such instances are rare.

2.60 The assessment indicates that the construction and operational phases of the Proposed Development would likely not cause any significant interference to the reception of FM broadcast and DAB radio signals.

**Reflection Effects**

2.61 In the UK, terrestrial television, DAB radio and satellite television from the Astra satellites are broadcast as digital transmissions which are largely unaffected by signal reflections.

2.62 Signal reflection is virtually absent from FM broadcast radio signals and 'ghosting' is therefore not an issue.

2.63 The assessment indicates that in relation to reflection effects, the construction and operational phases of the Proposed Development would likely have a negligible effect on the reception of terrestrial and satellite television signals, FM broadcast and DAB radio signals.

# 3. Conclusions

3.1 The assessment of the construction and operational effects of the Proposed Development on radio and television reception is as follows:

## Impacts during the Construction Phase

- The unfinished or finished Development Plots on the Site would likely cast a terrestrial television reception shadow over existing properties to the north-east of the Site and signal reception could be affected. Mitigation measures may need to be implemented. It is not envisaged that signal levels will be significantly affected in areas already shadowed by the existing high-rise schemes Arrowhead Quay, 40 Marsh Wall and the Canary Wharf tall buildings cluster.
- The unfinished or finished Development Plots on the Site would likely cast a satellite television reception shadow over existing residential properties to the north-west of the Site and signal reception would likely be affected. Mitigation measures would need to be implemented.
- Tall structures like cranes and scaffolding would likely give rise to satellite television shadowing and this may affect properties to the north-west of the Site. Signal shadowing by temporary structures like cranes, scaffolding etc. is difficult to assess and mitigate as the positions of these structures and their interference effects will change over time. Any likely mitigation measures like the relocation of satellite dishes would also have to be done to suit the short-term interference effects caused by these temporary structures.
- In relation to signal shadowing, the construction phase of the Proposed Development would likely have no significant effect on the reception of FM broadcast and DAB radio.
- In relation to signal reflection, the construction phase of the Proposed Development would likely have a negligible effect on the reception of terrestrial and satellite television, FM broadcast and DAB radio.

## Operational Impacts of the Completed Proposed Development

- Terrestrial television signal shadowing created by the Development Plots in the completed Proposed Development could be significant. However, due to the effects of diffraction, it is envisaged that only properties in the immediate section of the shadow zone could be affected. It is not envisaged that signal levels will be significantly affected in areas already shadowed by the existing high-rise schemes Arrowhead Quay, 40 Marsh Wall and the Canary Wharf tall buildings cluster. With the implementation of mitigation measures, the impact of terrestrial television signal shadowing would likely not be significant.
- Satellite television signal shadowing created by the Development Plots in the completed Proposed Development would likely be significant and affect existing residential properties under the shadow zone. With the implementation of mitigation measures, the impact of satellite television signal shadowing would likely not be significant.

- In relation to signal shadowing, the completed Proposed Development would likely have no significant effect on the reception of FM broadcast and DAB radio.
- In relation to signal reflection, the completed Proposed Development would likely have a negligible effect on the reception of terrestrial and satellite television, FM broadcast and DAB radio.

# 4. Mitigation Measures

4.1 The assessment has indicated that the construction and operational phases of the Proposed Development would likely create a terrestrial television signal shadow to the north-east of the Site towards Epping. Terrestrial television reception may be adversely affected.

4.2 In the event that the Proposed Development is deemed to be adversely affecting the reception of terrestrial television signals and this is confirmed by pre and post-construction reception surveys which would be secured via planning conditions or s106 planning obligations, the following mitigation measures or a combination of measures may be considered:

- Where a property is only partly covered by the signal shadow, relocate affected aerials to appropriate positions elsewhere upon the property, outside of the signal shadow.
- Replace existing aerials in the affected properties with amplified extra high-gain types. The aerial upgrade work would have to be undertaken by a registered installer with CAI (Confederation of Aerial Industries) or RDI (Registered Digital Installers) accreditation. Any system components used would be CAI benchmarked as the CAI's benchmarking scheme ensures that the cables and aerials have passed minimum requirements for DTT reception.
- Where significant signal loss has occurred, affected properties would need to be connected to the Freesat satellite television service.

4.3 The assessment has also indicated that the construction and operational phases of the Proposed Development would likely give rise to satellite television signal shadowing to the north-west of the Site. Satellite television reception would likely be adversely affected.

4.4 In the event that the Proposed Development is deemed to be adversely affecting the reception of satellite television signals and this is confirmed by a reception survey, the following mitigation measures or a combination of measures may be considered:

- Where a property is only partly covered by the signal shadow, relocate affected satellite dishes to appropriate positions elsewhere upon the property, outside of the signal shadow to ensure the 'line of sight' to the Astra satellites is not obscured.

- Relocate affected satellite dishes to an appropriate height to ensure the ‘line of sight’ to the Astra satellites is not obscured.
- Where satellite dish relocation is not possible, affected properties would need to be connected to IPTV services or to cable television services if it is available by the time the Proposed Development is complete.

# Appendix 1 - Abbreviations

| | |
|---|---|
| AGL | Above Ground Level |
| AOD | Above Ordnance Datum |
| BBC | British Broadcasting Corporation |
| CAI | Confederation of Aerial Industries |
| DAB | Digital Audio Broadcasting |
| DLR | Docklands Light Railway |
| DTT | Digital Terrestrial Television |
| FM | Frequency Modulated |
| GLA | Greater London Authority |
| IPTV | Internet Protocol Television |
| IF | Intermediate Frequency |
| LBC | Listed Building Consent |
| LBTH | London Borough of Tower Hamlets |
| LNB | Low-Noise Block Downconverter |
| NPPF | National Planning Policy Framework |
| Ofcom | Office of Communications |
| OPA | Outline Planning Application |
| OPP | Outline Planning Permission |
| OS | Ordnance Survey |
| RDI | Registered Digital Installers |
| RMA | Reserved Matters Application |
| RF | Radio Frequency |
| SHF | Super High Frequency |
| VHF | Very High Frequency |