Appendix B:
Additional Supporting Information

Registered Address:
Cornerstone Telecommunications, Infrastructure Limited,
Hive 2, 1530 Arlington Business Park, Theale, Berkshire, RG7 4SA.
Registered in England & Wales No. 08087551.
VAT No. GB142 8555 06

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General Background Information for Telecommunications Development.

England

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Introduction.

Cornerstone is the UK's leading mobile infrastructure services company. We acquire, manage, and own over 20,000 sites and are committed to enabling best in class mobile connectivity for over half of all the country's mobile customers. We oversee works on behalf of telecommunications providers and wherever possible aim to:

- Promote shared infrastructure;
- Maximise opportunities to consolidate the number of base stations;
- Significantly reduce the environmental impact of network development.

This document is designed to provide general background information on the development of UK mobile telecommunications networks.

It has been prepared for inclusion with planning applications and supports network development proposals with general information.

Background

Over 30 years ago under the Telecommunications Act 1984, a licence was granted to mobile network operators. The licence was to provide wireless (or mobile) phone services utilising unused radio frequencies adjacent to those transmitted for over 50 years by the television industry.

With the wireless technology being new and the number of potential customers unknown, several tall masts were used to provide basic radio coverage to the main populated areas.

As the way we use our phones and other technologies have changed over the past 30 years, where we locate masts is crucial.

Due to the increased data transfer necessary for the latest telecommunication services, locations of base stations must be where the local demand exists.

Digital networks.



2G

2G digital networks developed in the early 1990s.

This digital technology is also known as GSM (Global System for Mobile Communications), which is the common European operating standard. This technology enabled phones to interconnect to other networks throughout Europe and internationally.



3G

In 2000, the 'Third Generation' mobile telecommunications service was launched, known as 3G or UMTS.

In addition to voice services, this allowed broadband access to the internet for mobile phones and laptop computer data card users.



4G

2013 saw the launch of 4G services on the network.

This technology allows for ultra-fast speeds when browsing the internet, streaming videos or sending emails. It also enables faster downloads.

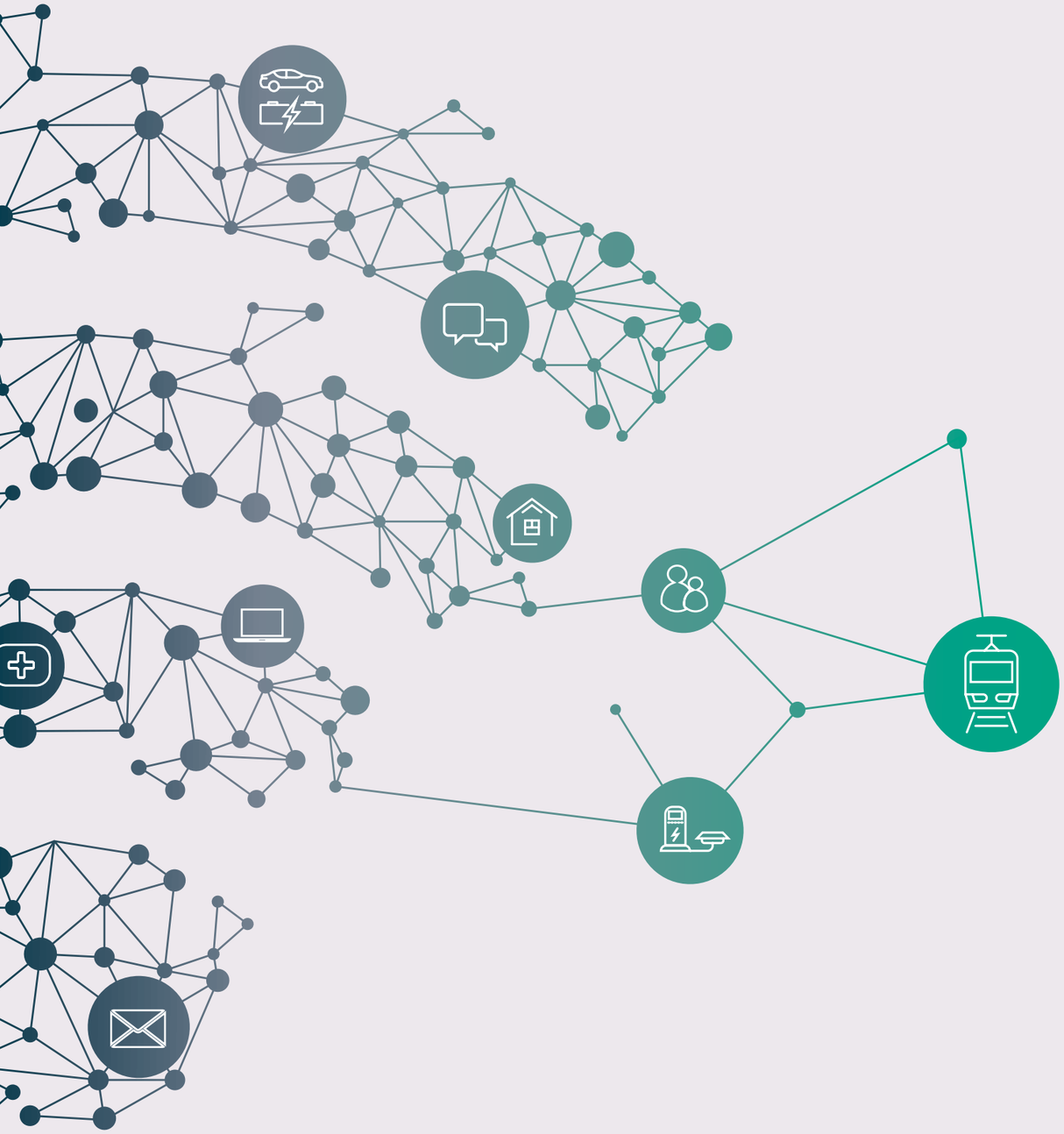


5G

2019 saw the introduction of 5G services, with the Government's ambition for the UK to become a world leader in this technology.

5G Connectivity will ensure that everyone benefits from early advantages of its potential and that the UK creates a world-leading digital economy that works for all.

What is 5G?



5G is the new generation of wireless technology that will deliver reliable and faster networks of the future, changing how we understand wireless connectivity.

The technology will see us all move from something we experience through personal devices to an integrated infrastructure across buildings, transport and utilities. The new technology will provide enormous benefits for citizens, businesses and urban regions alike.

5G will also offer a new level of underlying connectivity to transform services and create new digital ecosystems.

The economic benefit

- Businesses offering online services can extend their products to a broader audience
- Local areas and businesses can benefit from tourists and visitors as hotels, attractions, and restaurants can be booked online from anywhere in the world
- Business owners and services like doctors can provide a faster and more cost effective service by offering both online appointments and ordering
- Digital connectivity facilitates economic growth, something which the Government is keen to progress and promote

The social benefit

- Mobile communications can help people to stay in touch wherever and whenever, which can help improve social well-being
- Contacting emergency services is easier, especially in remote areas
- Using a mobile wherever you go can provide better personal security
- Having access to social networking sites and applications can keep people entertained with their lifestyles and interests
- Mobile connectivity helps promote smarter and productive ways of working. For example, working from home can help minimise commuting which can provide better work and home life balance
- Access to personal information 24/7, e.g. bank accounts, can offer efficiency and convenience

5G is the next generation of mobile connectivity, providing us with a new level of experience. It will offer immense opportunities, given the faster and more reliable connectivity that it will provide.

We will experience new technologies that will help us become more efficient and save costs as an individual or business.

What can we expect from 5G?

- Driverless vehicles – this will give drivers autonomy to do other things while driving
- Advanced healthcare facilities – performing surgeries remotely will be made possible, along with freeing up more GP time through better online facilities
- Enhanced Virtual and Augmented reality (AR) – used in gaming and entertainment already, with 5G, live interactions will be taken to the next level
- Greater Internet of Things (IoT) transformation – with better connected devices, the IoT will enable us to control devices more independently
- Cutting-edge agricultural operations – operating farming machinery and tools remotely will promote smart agriculture, saving time and increasing productivity for farmers

We need to continue to work together to enable the opportunities that mobile technology brings to all of us.

Planning policies.

Planning policy guidance on telecommunications

The revised National Planning Policy Framework (NPPF), published in December 2024, supports high-quality communications infrastructure and recognises it as a strategic priority.

Within paragraph 119 it states that:

"Advanced, high-quality and reliable communications infrastructure is essential for economic growth and social well-being. Planning policies and decisions should support the expansion of electronic communications networks, including next-generation mobile technology (such as 5G) and full-fibre broadband connections."

The NPPF goes on to state within Paragraph 123 that:

"Local planning authorities must determine applications on planning grounds only. They should not seek to prevent competition between different operators, question the need for an electronic communications system, or set health safeguards different from the International Commission guidelines for public exposure."

Section 6 of the revised NPPF relates to:

"Building a Strong, Competitive Economy' and refers specifically to 'Digital Infrastructure."

Paragraph 85 states:

"Significant weight should be placed on the need to support economic growth and productivity. This is particularly important where Britain can be a global leader in driving innovation."

Paragraph 86 highlights that Local Development Plans should include policies that facilitate development to meet the needs of a modern economy, including identifying suitable locations for uses such as digital infrastructure. It goes on to confirm that Planning Policies should:

"Set out a clear economic vision and strategy which positively and proactively encourages sustainable economic growth, having regard to the national industrial strategy and any relevant Local Industrial Strategies and other local policies for economic development and regeneration."

And that they should:

"Seek to address potential barriers to investment, such as inadequate infrastructure, services or housing, or a poor environment."

Paragraph 87 states:

"Planning policies and decisions should recognise and address the specific locational requirements of different sectors. This includes making provision for: (a) clusters or networks of knowledge and data-driven, creative or high technology industries, and for new, expanded or upgraded facilities and infrastructure that are needed to support the growth of these industries." And (c) "The expansion or modernisation of other industries of local, regional or national importance to support economic growth and resilience."

Site/Mast sharing

Cornerstone actively encourages and supports site-sharing for both commercial and environmental reasons. All operators are required to explore site-sharing opportunities under the terms of their licences. Cornerstone has implemented many measures to identify and maximise site-sharing opportunities.

Consultation & legal case.

Consultation

Cornerstone is committed to carrying out appropriate consultations with Local Planning Authorities, stakeholders and the public.

The Code of Practice for Wireless Network Development in England (March 2022) gives guidance on the factors that operators should consider when determining what consultation is required, as each development is different.

These factors are equally applicable for Local Planning Authorities who carry out their own consultation once the application has been submitted.

Legal case

The following legal case may be helpful:

Harrogate case November 2004

The Court of Appeal gave a judgement that Government Planning Guidance in PPG8 (now replaced by the NPPF) is perfectly clear in relation to compliance with the Health and Safety standards for mobile phone base stations.

The Court of Appeal and the High Court both upheld Government policy in response to a planning inspector's decision that departed from that policy and failed to give adequate reasons for doing so.

Bardsey case January 2005

The Court of Appeal confirmed that the permitted development regime for mobile phone base stations is compliant with the Human Rights Act. This was a case in which a local planning authority failed to comply with its obligations to act within the 56 day period provided under the permitted development regulations.

Further information.

We trust that this document answers your main queries regarding our planned installation.

The enclosed site-specific details will identify any alternative discounted options and reasons why they were rejected and how the proposed site complies with national and local planning policies.

The Local Government Ombudsman's Special Report on Telecommunication Masts gives some positive recommendations and advice to Local Planning Authorities in determining prior approval applications.

The Digital Connectivity Portal provides guidance for local authorities and network providers on improving connectivity across the UK. Produced by DCMS, it promotes closer co-operation between network providers and local authorities, and offers guidance on effective policies and processes to facilitate deployment of digital networks.

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Electromagnetic Fields". This report concluded that there is no convincing evidence that mobile phone technologies cause adverse effects on human health.

The World Health Organisation (WHO) noted that "A large number of studies have been performed over the last two decades to assess whether mobile phones pose a potential health risk. To date, no adverse health effects have been established as being caused by mobile phone use" WHO factsheet 193: Electromagnetic fields and public health: mobile telephones, 2014.

In 2019 Public Health England (PHE) noted that "Exposure to radio waves is not new and health-related research has been conducted on this topic over several decades. In particular, a large amount of new scientific evidence has emerged since the year 2000 through dedicated national and international research programmes" https://www.gov.uk/government/publications/5g-technologies-radio-waves-and-health/5g-technologies-radio-waves-and-health

ICNIRP GUIDELINES

The radiofrequency public exposure limits for EMF fields were developed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) http://www.icnirp.org following evaluation of all the peer-reviewed scientific literature, including thermal and non-thermal effects. ICNIRP is a non-governmental organisation formally recognised by WHO. Established biological and health effects have been used as the basis for the ICNIRP exposure restrictions. These guidelines have been adopted for use in the European Union and the UK.

In 2017 ICNIRP reaffirmed that their safety guidelines provide protection against all known health effects of radiofrequency signals.

COMPLIANCE WITH INTERNATIONAL EXPOSURE GUIDELINES

All Cornerstone installations are designed and constructed in compliance with the precautionary ICNIRP public exposure guidelines as adopted in EU Council Recommendation of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz). These guidelines have been set following a thorough review of the science and take into consideration both thermal and non-thermal effects. They protect all members of the public 24 hours a day. In addition, precautionary measures have been taken into account when setting relevant guideline limits for the public (i.e. in the UK a safety factor of 50 times is applied to the public exposure guideline).

When measured, field strengths are many times lower than the precautionary ICNIRP general public guidelines.

An ICNIRP certificate is provided with every planning application and this verifies that the mobile phone base station, when operational, will meet the precautionary ICNIRP guidelines. We also provide further documentation to clarify that the ICNIRP certificate addresses emissions from all mobile phone network operators' equipment at the proposed site.

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Further Information:

World Health Organisation EMF Project
http://www.who.int/peh-emf/en/

International Commission on Non-Ionizing Radiation Protection (ICNIRP)
http://www.icnirp.org/

Public Health England (formally HPA)
https://www.gov.uk/government/collections/electromagnetic-fields

Or contact:

Community, Cornerstone
The Hive 2, 1530 Arlington Business Park, Theale, Berks, RG7 4SA
Email: community@cornerstone.network

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5G Masts & Health

5G is a generation leap in mobile technology with multiple benefits. However, with new technology, it is understandable that people wish to seek reassurance as to its safety and how it works.

This guide provides an explanation of 5G and the equipment behind it, including the antennae and the masts, to ensure that there is no cause for concern in regard to health.

5G & Radio Waves

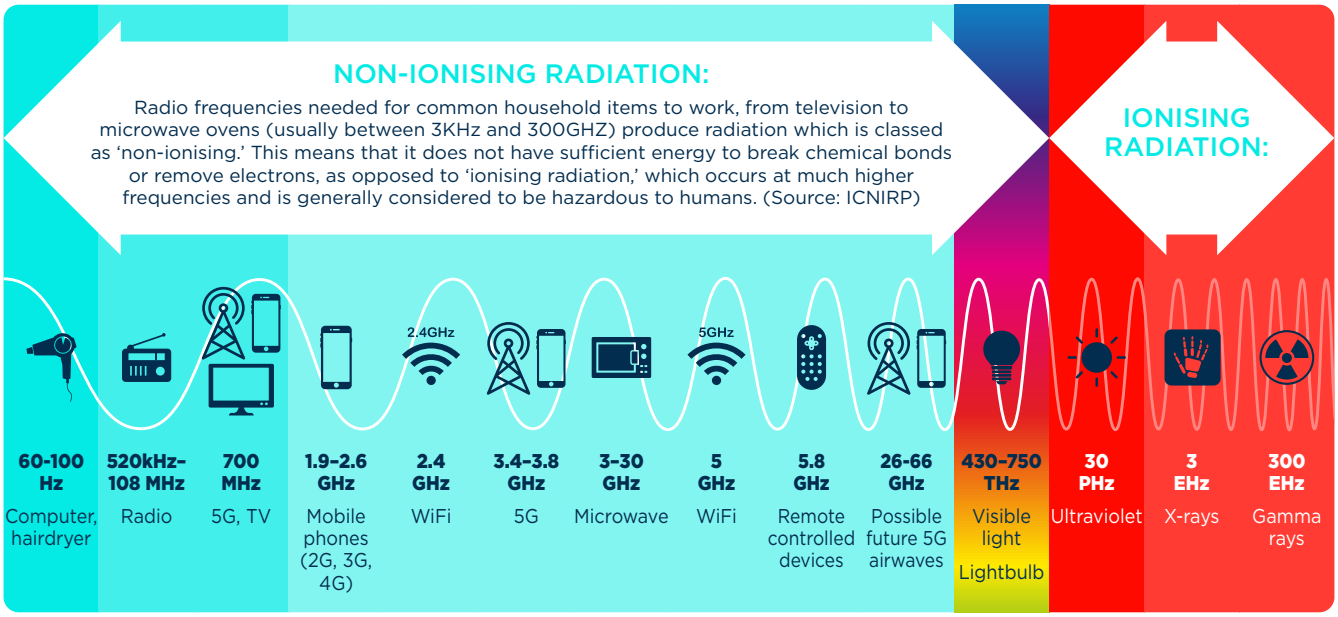
5G is broadcast using radio waves, which are a type of radiation in what is commonly referred to as the 'electromagnetic spectrum.' Sometimes the word 'radiation' scares people, because it is an invisible thing and something many people do not understand, or easily confuse with 'radioactivity.'

Radiation is simply the release of energy, just like the light from the sun or heat from our bodies. Most radiation is considered harmless, or in scientific terms, non-ionising when used within guidelines. It is part of our everyday lives, without us even realising it. Radio waves are used by your TV, radio and remote control.

5G uses a specific frequency of radio waves, just like 4G and before that 3G. The exposure to these radio waves is very low and crucially, many times lower than public safety guidelines dictate.

All frequencies that are currently and will in future be used for 5G fall within the part of the electromagnetic spectrum that includes radiation which is classed as non-ionising. This means that these radio waves do not carry enough energy to directly damage cells. This is different from 'ionising' radiation, which is generally considered to be hazardous to humans and includes gamma (nuclear) radiation as well as x-rays, which occur at the higher frequency end of the electromagnetic spectrum.

- Ofcom



5G Masts & Health

Research into the safety of 5G and mobile phone signals

Research into the safety of radio waves has been conducted for more than 80 years, across the UK and around the world. The strong consensus of scientific opinion and public health agencies, such as the World Health Organisation (WHO), is that no dangers to health have been established from exposure to the low-level radio signals used for mobile communications, including 5G, when used within guidelines.

Strict safety guidelines

All mobile operators must ensure that their radio base stations (also known as masts) are designed and built so that the public are not exposed to radiofrequency fields above the strict safety guidelines which govern and limit public exposure to electromagnetic fields. In fact, base stations operate at low levels, emitting levels of radio waves many times lower than the guidelines.

The International Commission on Non-Ionising Radiation Protection (ICNIRP) is the universally recognised non-governmental organisation that governs the safety levels of electromagnetic field or radio wave exposure and is accepted by the World Health Organisation (WHO). The guidelines, updated in 2020, monitor frequencies up to 300GHz, anything below this threshold is considered to not cause adverse health effects and is therefore safe for the public. 5G radio waves fall well within this category, operating at 700MHz and between 3.4GHz 3.6GHz.

Testing of 5G masts

In fact, the UK's telecoms regulator Ofcom carried out tests at 5G-enabled mobile masts across the country. The highest emission levels (e.g. radiation) recorded at mobile phone masts were consistently well within the strict safety guidelines that monitor radiation levels.

Further Information

As the world depends more and more on mobile connectivity and we are consuming more data, existing networks are becoming congested. 5G has the capacity to handle this and future demand, as it will offer much faster data and upload speeds, allow more devices to access the mobile internet at the same time, and significantly reduce the amount of time it takes to send information from one point to another.

The rollout of 5G is not just about the benefits to each individual mobile phone user but the wider societal benefits of providing connectivity to all, such as the emergency services, local businesses and the provision of council services; the capability of 5G can transform, and ultimately help save lives.

For more information on 5G and health, and to learn about the wider benefits of 5G visit **www.mobileuk.org.uk/5G-and-health**

For further information from external sources regarding 5G and health, the following links may be helpful:

World Health Organization (WHO) - Radiation: 5G mobile networks and health: **https://www.who.int/news-room/q-a-detail/radiation-5g-mobile-networks-and-health**

BBC - Does 5G post health risks?: **https://www.bbc.co.uk/news/world-europe-48616174**

Which? - Is 5G safe?: **https://www.which.co.uk/news/2020/06/is-5g-safe-everything-you-need-to-know-on-the-5g-powered-future/**

BBC Click - Testing the Safety of 5G: **https://www.youtube.com/watch?v=k2t1dUCyE0I&feature=youtu.be**

Cancer Research UK - Do mobile phones cause cancer?: **https://www.cancerresearchuk.org/about-cancer/causes-of-cancer/cancer-myths/do-mobile-phones-cause-cancer**



The public benefit of

mobile connectivity.

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The evolution of **mobile connectivity.**

The demand for faster and improved mobile connectivity continues to grow. Most of us rely on having mobile phones and devices 24/7, which provides us with many benefits.

Since the launch of 2G in 1991, the mobile generation is firmly established. Not only has it provided a way to communicate with each other and exchange information, but it has given individuals and businesses an innovative platform to do much more. Over the years, we have seen 3G and 4G, and now we have been introduced to 5G. The differences between the generations have provided us with higher speed, better connection, and many more advanced features on our mobiles. Now with 5G, we can expect to experience an even more extensive range of telecommunication services.



1G

Mobile voice only



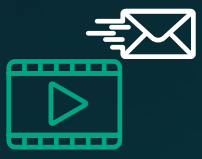
2G

Calls and texts



3G

Data services



4G

High-speed internet access



5G

Faster connection, enhanced data services



Connecting you to what matters.

Access to a reliable mobile network has become a necessity for many of us. Some of the key benefits it provides us with are:

- Connecting with family, friends, and colleagues at any time around the world
- Giving the ability to manage our personal information 24/7
- Keeping us always entertained and informed with the latest news
- Creating more productive and cost efficiencies for businesses

The economic benefit

- Businesses offering online services can extend their products to a broader audience
- Local areas and businesses can benefit from tourists and visitors as hotels, attractions, and restaurants can be booked online from anywhere in the world
- Business owners and services like doctors can provide a faster and more cost-effective service by offering both online appointments and ordering
- Digital connectivity facilitates economic growth, something which the Government is keen to progress and promote

The social benefit

- Mobile communications can help people to stay in touch wherever and whenever, which can help improve social wellbeing
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What can we expect from 5G?

- Driverless vehicles – this will give drivers autonomy to do other things while driving
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- Enhanced Virtual and Augmented reality (AR) – used in gaming and entertainment already, with 5G, live interactions will be taken to the next level
- Greater Internet of Things (IoT) transformation – with better connected devices, the IoT will enable us to control devices more independently
- Cutting-edge agricultural operations – operating farming machinery and tools remotely will promote smart agriculture, saving time and increasing productivity for farmers

These are just some highlights of how the public benefits from mobile phones and what 5G will offer. But what's also essential is reliable mobile coverage and connectivity. Without this, we are at risk of not being able to use our phones or maximise it's potential if we experience poor coverage or no signal.



What do we need to enable mobile connectivity in the UK?

To maintain and improve mobile connectivity, it is crucial to recognise that this is only possible with the continuous deployment of mobile infrastructure throughout the UK. Mobile infrastructure (or masts as you might know them) can be placed on rooftops, greenfield sites, and street-works.

As the UK's leading mobile infrastructure services company, Cornerstone works with landowners, institutions, and public authorities to place mobile equipment on sites to enable telecom operators to deliver mobile services to the public.

With more advanced technology now available, placing mobile infrastructure has become even more necessary. To achieve this is a collaborative effort between telecoms, the legal & property industry, and landowners, and requires everyone to work together.

Recognising this, the Government introduced an updated version of the Electronic Communications Code (ECC) in December 2017, to help support the roll-out of mobile infrastructure. Ofcom also issued an ECC Code of Practice to help guide operators and landlords with site dealings and negotiations. Since the introduction of the new ECC, many landlords have been agreeing leases using the Code principles. This has helped operators and landlords, guiding them through the process and ultimately playing a key role in enabling mobile connectivity.

Working together

The future for digital connectivity in the UK lies in many of our hands. The telecom operators are constantly developing new technologies to provide better mobile services to the public in rural and urban areas. However, landlords play a crucial part in building the network too, allowing mobile infrastructure to be placed on their site. Without infrastructure, providing a mobile network to the public isn't possible, which would affect all of us as individuals and businesses.

We need to continue to work together to enable the opportunities that mobile technology brings to all of us.

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RADIO PLANNING AND PROPAGATION (V.4 November 2019)
An introduction to how radio networks are planned and the limitations associated with the technology

When planning cellular telecommunications networks engineers use specialist software to predict, with a high degree of confidence, the behaviour of cellular transmissions. This then enables the operator to calculate how many cell sites are needed to provide the level of coverage and capacity required by their customers.

Radio signals at the frequencies used for cellular radio propagate in a manner that is broadly similar to light. Generally anything that casts a shadow to light will attenuate radio waves. The strength of radio signals detected at a receiving device naturally reduces the further away it is from the transmitter. In general, the attenuation (or decay) in signal power is affected by a number of variables. The main factors are:

- signal frequency (attenuation increases with frequency),
- distance (from the transmitter),
- terrain (such as hills),
- clutter (such as buildings, foliage, vehicles, and water) and
- atmospheric conditions (such as rain).

A reduction in the strength of the radio signal increases the likelihood of dropped calls and reduced data rates for internet browsing, for example.

Clutter

Any physical object obstructing the propagation of radio signals causes a reduction in the signal strength reaching a customer's device. A common term for these objects is 'clutter'. The more obvious examples are buildings and geographical terrain such as hills and trees.

Buildings cause a varying amount of signal reduction depending on their height, construction, thickness of walls, number of windows etc. Glass causes a lower reduction in signal than brick/concrete walls.

Customers will inadvertently be aware of this by finding that sometimes they need to go near windows, a higher floor of a building or even outside in order to achieve a stronger signal for their mobile devices.

Generally, the higher the signal frequency the more it will be impacted by clutter.

Tree Clutter

The effects of trees on signal degradation can be significant. Signal absorption and shadowing effects vary according to vegetation and density, and are caused by the main tree trunk, branches, and leaves.

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Cell sites located in or near trees will have signals significantly reduced. As a result, a number of extra sites may need to be built locally in order to counter-effect this.

Signal variation throughout the seasons is also a practical concern. Leaves on trees in the spring and summer can cause shadowing and reduce radio voice quality and increase the number of dropped calls.

As a result, the bottom of an antenna should a) be above the top level of the trees, b) allow greater height due to the antenna downtilt at build or for future requirements and c) allow some room for future growth of the trees.

When a cell site utilises point-to-point microwave dishes to communicate with other cell sites in the network any obstruction between these dishes will result in failed line of sight communications. As a result, dishes need to be placed above the top level of the trees.

Propagation Models

In essence these are mathematical formulae used to characterise radio wave propagation, in order to determine the signal strength at a receiving device.

Coverage Planning Tools

Radio planning engineers plan cellular networks using highly sophisticated computer programs that incorporate propagation models. Armed with data on cell site location, cell site configuration, maps, terrain etc. they are used to *predict* areas of coverage deficiency (so called 'coverage holes'), new site requirements and configurations.

Network Changes

Over time the topography and clutter in an area may change. For example, building developments, housing and tree growth can all change. As the signals received from local phone masts can degrade, as they are dependent on these factors. These reasons along with increased usage of mobile devices, customer complaints, network consolidation (mast sharing) and new technologies (5G) require a re-evaluation of a network operator's telecommunications infrastructure.

Mast sharing can result in some masts no longer being needed. As a result, they are decommissioned and physically removed. Mast sharing will however sometimes result in the need for a taller more substantial structure.

Technical surveys undertaken for reasons above may highlight that antenna height increases are required – this is more likely for sites with low antenna heights around 15m AGL, particularly street furniture sites. More details on these reasons below.

While thus far this document is generic to mobile telephony masts it should be noted that each mast has to be dealt with on a case-by-case basis.

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Site Height increases

There are a number of reasons why an operator may request a height increase on existing structures. The main ones are described below.

Maintaining existing coverage
The antennas inside, for example, street furniture sites are generally of 2 physical build designs – 'Single Stack' and 'Dual Stack'. The former describes when the set of antennas are all at the same height. The latter describes a site with 2 sets of antennas one above the other.

The 'Dual Stack' is by far the preferred option. This is due to a number of factors including greater flexibility & control for different technologies and providing optimum service performance to customers.
Site upgrades such as network consolidation between Vodafone and Telefonica and/ or new 5G technologies facilitate a Single Stack structure being upgraded to a Dual Stack structure. In a straight swap scenario at equal height the new lower aperture antennas would be lower than they were originally - resulting in significantly reduced coverage. To ensure existing coverage is maintained the whole structure needs to be increased in height.

Clutter changes

A more extreme example is when the local clutter or tree lines have changed, or are such that the mobile signals are blocked, resulting in lower quality calls and downloads for mobile device users. To provide sufficient services to customers height increases on existing masts or additional new masts are required. The former is the preferred option in many cases.

5G Technologies

5G New Radio technologies operate in higher frequency bands than older technologies. Since it operates at higher frequencies where attenuation of the radio signal is naturally higher, and the effects of clutter are greater it will normally require a higher structure to achieve the same coverage footprint. Furthermore, unlike traditional technologies 5G uses adaptive beamforming technologies to increase capacity and data speeds to the user. For effective beamforming the antenna will normally need to be mounted higher than conventional antennas. These factors drive a require for an increase in antenna height in 5G

International Commission on Non-Ionizing Radiation Protection (ICNIRP) Compliance
The addition of new technologies and mast sharing affects ICNIRP compliance, one of the health and safety requirements for a cell site, a higher minimum mast height is required in some cases.

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Cornerstone Community Information Sheet

5G Services

As 5G technology is deployed across the country more and more services will become available and our lifestyles, economy and even the way we commute will be transformed. Additional base stations and upgrades to existing ones will be needed to meet this demand and improve the quality of service.

Practical uses of 5G

Two areas where these benefits are becoming evident are education and health,

The relationship between 5G and education is evolving at a massive rate with educators exploring the relevance of Virtual Reality (VR) technologies for education and training. Crucially, VR can support remote learning, allowing students a presence in the classroom even when working elsewhere.

5G's ability to deliver real-time information (low latency), ultra-fast speeds (critical for high-definition images and video), increased capacity and heightened security will also allow learning on the job, thanks to technologies such as Augmented Reality (AR) goggles, which can give engineers real-time instructions on how to fix a machine on a production line, for example.

Health care is undergoing a rapid transformation, patients across the country are now becoming accustomed to relying on remote healthcare services such as virtual GP appointments, and ordering online deliveries of essential medical supplies.

5G will prove critical in providing the infrastructure required to deliver remote health services over the next decade. 5G's fast and secure services will be fundamental in scaling the patient benefits of remote healthcare and keeping medical records protected and private. Trials have shown that connecting ambulance crews to expert resources using 5G allows paramedics to work with doctors and conduct specialist procedures in real time whilst on the road.

Health concerns

Various international assessments have concluded that below the International Commission on Non-Ionizing Radiation (ICNIRP) Guidelines there is no evidence of adverse health effects for wireless networks (including 5G).

In January 2019 the Finnish Radiation and Nuclear Safety Authority (STUK) concluded that:

In the light of current information, exposure to radio frequency radiation from base stations will not rise to a significant level with the introduction of the 5G network. From the point of view of exposure to radio frequency radiation, the new base stations do not differ significantly from the base stations of existing mobile communication technologies (2G, 3G, 4G).' https://www.stuk.fi/aiheet/matkapuhelimet-ja-tukiasemat/matkapuhelinverkko/5g-verkon-sateilyturvallisuus

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In the UK Ofcom, the regulator for the communications services, undertook measurements of electromagnetic fields (EMFs) around 5G base stations. In 2020 they noted: "In all cases, the measured EMF levels from 5G-enabled mobile phone base stations are at small fractions of the levels identified in the ICNIRP Guidelines" https://www.ofcom.org.uk/__data/assets/pdf_file/0015/190005/emf-test-summary.pdf

In Norway the Norwegian Radiation and Nuclear Safety Authority (DSA), noted:

'The overall research shows that the radiation from wireless technology is not hazardous to health, as long as the levels are below the recommended limit values. This is the prevailing view among researchers in many countries today, and it is supported by the EU Scientific Committee. We have used cell phones and radio transmitters for decades and much research has been done on how this affects our health. Risk factors of importance to public health have not been found. With the knowledge we have today, there is no need to worry that 5G is hazardous to health.' January 2019 https://www.dsa.no/temaartikler/94565/5g-teknologi-og-straaling

In the light of concerns about 5G signals from some members of the public the UK Health Security Agency (UKHSA) commented in 2019:

"It is possible that there may be a small increase in overall exposure to radio waves when 5G is added to an existing network or in a new area. However, the overall exposure is expected to remain low relative to guidelines and, as such, there should be no consequences for public health" https://www.gov.uk/government/publications/5g-technologies-radio-waves-and-health/5g-technologies-radio-waves-and-health.

In 2020 the ICNIRP updated their safety guidelines to include further restrictions for frequencies used for 5G services. ICNIRP Chairman, Dr Eric van Rongen stated 'the new guidelines provide better and more detailed exposure guidance in particular for the higher frequency range, above 6 GHz, which is of importance to 5G and future technologies using these higher frequencies. The most important thing for people to remember is that 5G technologies will not be able to cause harm when these new guidelines are adhered to.' https://www.icnirp.org/cms/upload/presentations/ICNIRP_Media_Release_110320.pdf.

In 2020 the World Health Organisation commented on 5G stating: "Provided that the overall exposure remains below international guidelines, no consequences for public health are anticipated" https://www.who.int/news-room/q-a-detail/5g-mobile-networks-and-health.

In common with all mobile phone base stations, Cornerstone sites with 5G technology will be checked and certified for ICNIRP compliance.

For further information please contact

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Health Summary

Radio base stations and handsets use electromagnetic fields (EMFs) to transfer information and make communication possible with mobile phones and devices. EMFs are used for television and radio transmissions, by the police, fire and ambulance services, by taxi firms and public utilities. EMFs are also used for a wide range of personal and commercial equipment from electronic car keys, WiFi equipment and baby monitoring devices to shop security tag systems. They are also produced by household electrical appliances like the fridges, vacuum cleaners or electric shavers.

The UK Health Security Agency (UKHSA) have noted that "Exposure to radio waves is not new and health-related research has been conducted on this topic over several decades. In particular, a large amount of new scientific evidence has emerged since the year 2000 through dedicated national and international research programmes" https://www.gov.uk/government/publications/5g-technologies-radio-wavesand-health/5g-technologies-radio-waves-and-health. After a thorough review of the available scientific findings, the World Health Organisation reported: 'To date, the only health effect from RF fields identified in scientific reviews has been related to an increase in body temperature (> 1 °C) from exposure at very high field intensity found only in certain industrial facilities, such as RF heaters. The levels of RF exposure from base stations and wireless networks are so low that the temperature increases are insignificant and do not affect human health" World Health Organisation, Fact Sheet 304, Base stations and wireless technologies, 2006. In addition, the WHO notes that "Based on a recent in-depth review of the scientific literature, the WHO concluded that current evidence does not confirm the existence of any health consequences from exposure to low level electromagnetic fields". http://www.who.int/pehemf/about/WhatisEMF/en/index1.html. In 2020 the World Health Organisation published information on 5G commenting that: "Provided that the overall exposure remains below international guidelines, no consequences for public health are anticipated" https://www.who.int/news-room/q-a-detail/5g-mobile-networks-and-health.

The Advisory Group on Non-ionising Radiation (AGNIR) summarised that "although a substantial amount of research has been conducted in this area, there is no convincing evidence that RF field exposure below guideline levels causes health effects in adults or children." "Health Effects from Radiofrequency Electromagnetic Fields – RCE 20", 2012

In 2019 the UK Health Security Agency noted: "It is possible that there may be a small increase in overall exposure to radio waves when 5G is added to an existing network or in a new area. However, the overall exposure is expected to remain low relative to guidelines and, as such, there should be no consequences for public health" https://www.gov.uk/government/publications/5g-technologies-radio-waves-andhealth/5g-technologies-radio-waves-and-health.

Radio base stations are designed to comply with the stringent, precautionary public exposure guidelines set out by ICNIRP (International Commission on Non-Ionizing Radiation Protection). These guidelines have been developed following a thorough review of the science including both thermal and non-thermal effects. UK radio base station installations have been surveyed by independent bodies and found to be hundreds and sometimes thousands of times below these guidelines.

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In 2020 ICNIRP updated their safety guidelines noting that: 'we looked at the adequacy of the ones we published in 1998. We found that the previous ones were conservative in most cases, and they'd still provide adequate protection for current technologies'
https://www.icnirp.org/cms/upload/presentations/ICNIRP_Media_Release_110320.pdf

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Safety Guidelines on electromagnetic fields from antennas

Radio frequency fields are a type of electromagnetic field. Virtually everyone in the modern world is exposed to electromagnetic fields generated by man-made sources. These include TV and radio transmissions, communications by the emergency services, medical and factory equipment, electronic car keys, baby-listening devices, WiFi and any household appliance that uses electricity.

Various regulations and guidelines apply to the construction and operation of radio base stations, including those that serve to protect health and safety.

All installations are designed to comply with the precautionary International Commission on Non-Ionizing Radiation Protection (ICNIRP) public exposure guidelines as adopted in a European Union recommendation. The UK Government and the UK Health Security Agency support this view.

Mobile phone base stations are generally composed of a cabin or cabinet, which houses the electrical equipment that generates the radio signal, a supporting structure such as a tower or pole and a set of antennas. Only the antennas emit radio waves. As one moves away from the antenna, the strength of the radio wave falls off very rapidly and as the strength decreases, so does the radiofrequency exposure level. Closer to the antennas, there is an area, or volume, where it is possible that ICNIRP guidelines for the public may be exceeded. This is known as the ICNIRP Public Zone and measures are taken, in the form of antenna positioning, signage and physical barriers, to prevent inadvertent access to this area by the public.

The extent of the zone will vary from site to site and is dependent on power input, distribution of the radiofrequency fields and the frequency range.

Clear signage at mobile phone operator sites will indicate restrictions on access and these restrictions should always be observed. The signage provides the relevant contact details for further advice.

How the guidelines are established

Many countries have adopted international guidelines suggested by ICNIRP. These guidelines, which have the formal backing of the World Health Organisation, were developed following a thorough review of the science and took into consideration **both thermal and non-thermal effects**. They are designed to protect all sectors of the population, 24 hours a day, wherever they are in relation to a radio base station. The guidelines are made up of two parts: the first is based on established and proven science; the second part incorporates a safety factor. In this way, the guidelines come with a built-in precautionary element.

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Cornerstone Community Information Sheet

How it Works

An introduction to how a network of mobile phone base stations operate.

Mobile phone base stations are needed in areas where people work and live to ensure that they can access digital services, keep in contact with friends, family and work colleagues as well as new connectivity solutions such as Internet of Things. Without ongoing improvements to connectivity which includes measures such as upgrading existing base stations, areas will become digital black spots where lack of connectivity prevents economic development, hinders local services and frustrates efforts to keep vulnerable members of the community healthy and safe.

Base stations are made up of three main elements. The cabin which contains the equipment used to generate the radio signal. A supporting structure such as a mast which holds the antennas in the air and the antennas themselves. Only the antennas emit radio signals.

Many other everyday items also use radio signals to send and receive information, such as television and radio broadcasting equipment and two-way radio communications.

Base stations are connected to each other and telephone exchanges by cables or wireless technology, such as microwave dishes, to create a network. The area each base station covers is called a cell.

Each cell overlaps with its neighbouring cells to create a continuous network. The size and shape of each cell is determined by the features of the surrounding area, such as buildings, trees and hills, which can block signals. When people travel between cells, the signal is transferred between base stations without a break in service. However, each base station can cover a certain area only and can only handle a limited number of calls at once. As mobile phones and devices become more popular more base stations are needed to ensure continuous coverage.

All UK mobile phone base stations are designed to comply with the stringent International Commission on Non-Ionizing Radiation Protection (ICNIRP) General Public Exposure guidelines recommended by the UK government and the European Union. These guidelines also have the formal backing of the World Health Organisation.

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Coverage and Capacity

Mobile phone base stations are needed in areas where people work and live to ensure that they can access digital services, keep in contact with friends, family and work colleagues as well as new connectivity solutions such as Internet of Things. Without ongoing improvements to connectivity which includes measures such as upgrading existing base stations, areas will become digital black spots where lack of connectivity prevents economic development, hinders local services and frustrates efforts to keep vulnerable members of the community healthy and safe.

Individual base stations can only handle a certain number of calls or data downloads. If the number of calls or data requests exceeds the base stations capability then local network users will experience a reduction in data download speeds and reduced call quality. We call areas without good coverage 'blackspots' and all mobile phone networks suffer from them. You can experience them wherever you are, even in cities with lots of base stations. Mobile network operators monitor call quality so they are aware of any necessary improvements.

To keep up with growing demand we need to upgrade existing base stations or build new base stations. Upgrading a site will increase the capacity of a base station. Capacity is the maximum data or calls that can be processed by a base station. An upgrade can be done in a number of ways, often by redeveloping the site to enable an increase in the number of technologies, or increasing the number or height of the antennas.

However, even after these upgrades, in some busy areas the demand for services can still exceed the capacity of the local base station. In this situation we may need to look into developing a new base station, resulting in improved service for our customers.

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