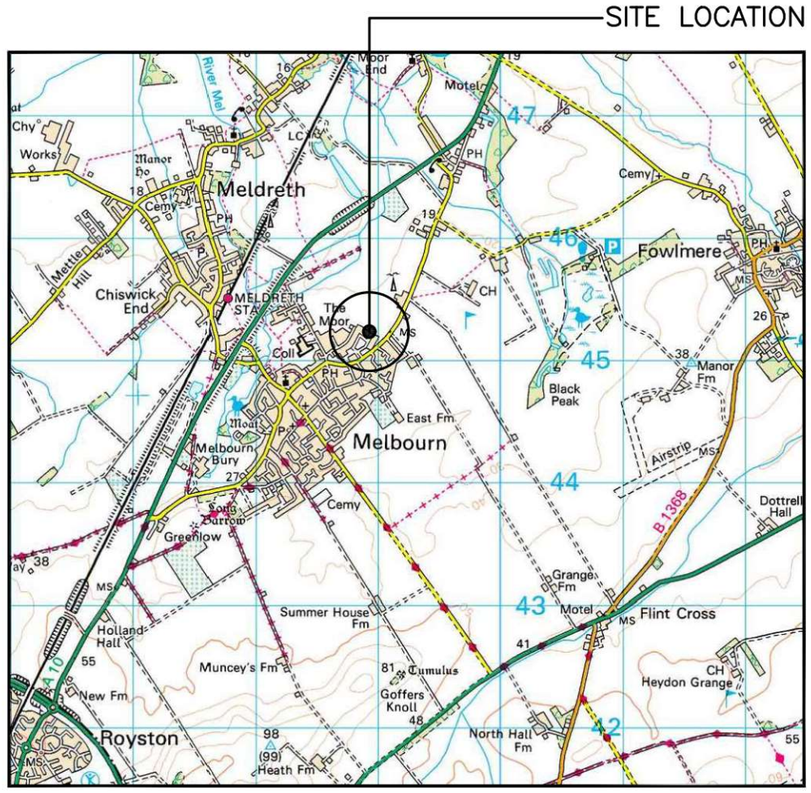
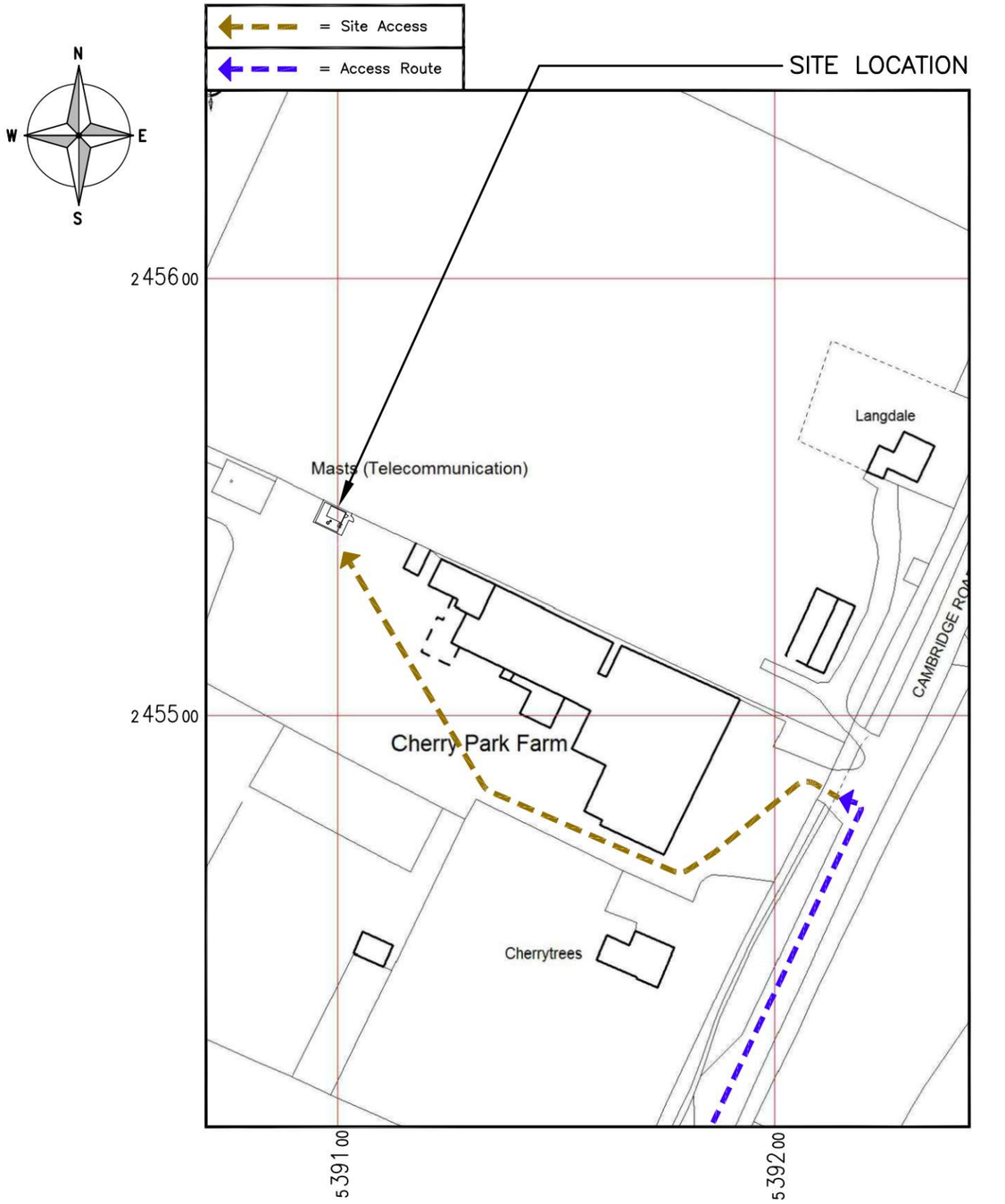


0 1km 2km
Scale

SITE LOCATION
(Scale 1:50000)
Ordnance Survey map extract
based upon Landranger map series
with the permission of the controller of
Her Majesty's Stationery Office
Licence No. 0100023487
Crown copyright.

SITE PHOTOGRAPH

These drawings comply with VMO2 Standard ICNIRP guidelines,
Designed in accordance with Cornerstone documents: SDN0007 & SDN0008



DETAILED SITE LOCATION
(Scale 1:1250)
Based upon Ordnance Survey map extract
with the permission of the Controller of
Her Majesty's Stationery Office.
Crown copyright.
Licence No. 100020449

50 0 50 100 150

ORIGINAL SCALE AT A3 – 1:1250 ALL DIMENSIONS IN METRES

ALL DIMENSIONS ARE IN mm UNLESS NOTED OTHERWISE

N.G.R	E: 539096 N: 245542

DIRECTIONS TO SITE:
TRAVELLING EAST M62. AT JUNCTION 32A, EXIT ONTO A1(M). CONTINUE ONTO A1. CONTINUE ONTO A1(M) (SIGNS FOR RED HOUSE/THE SOUTH/M18/M1). CONTINUE ONTO A1. CONTINUE ONTO A1 (M) (SIGNS FOR LONDON) . CONTINUE ONTO A14 . CONTINUE ONTO M11 (SIGNS FOR LONDON). AT JUNCTION 11, TAKE THE A1309 EXIT TO A10/CAMBRIDGE(SOUTH)/ROYSTON. AT THE ROUNDABOUT, TAKE THE 3RD EXIT ONTO CAMBRIDGE ROAD/A10. CONTINUE TO FOLLOW A10. TURN LEFT ONTO CAMBRIDGE ROAD

NOTES:

REV	MODIFICATION	BY	CH	DATE
A	Issued for Approval	DP	SD	12.05.23

CLARKE telecom
Unit E, Madison Place, Northampton Road,
Manchester, M40 5AG
Tel: 0161 785 4500
Fax: 0161 785 4501
Web: www.clarke-telecom.com

cornerstone

Cell Name	Opt.
MELBOURN	–

Cell ID No

CORNERSTONE	VF	VMO2
110973_22	N/A	70896

Site Address / Contact Details

CHERRY PARK FARM IND. EST.
CAMBRIDGE ROAD
MELBOURN
HERTFORDSHIRE
SG8 6EY

Drawing Title: SITE LOCATION MAPS

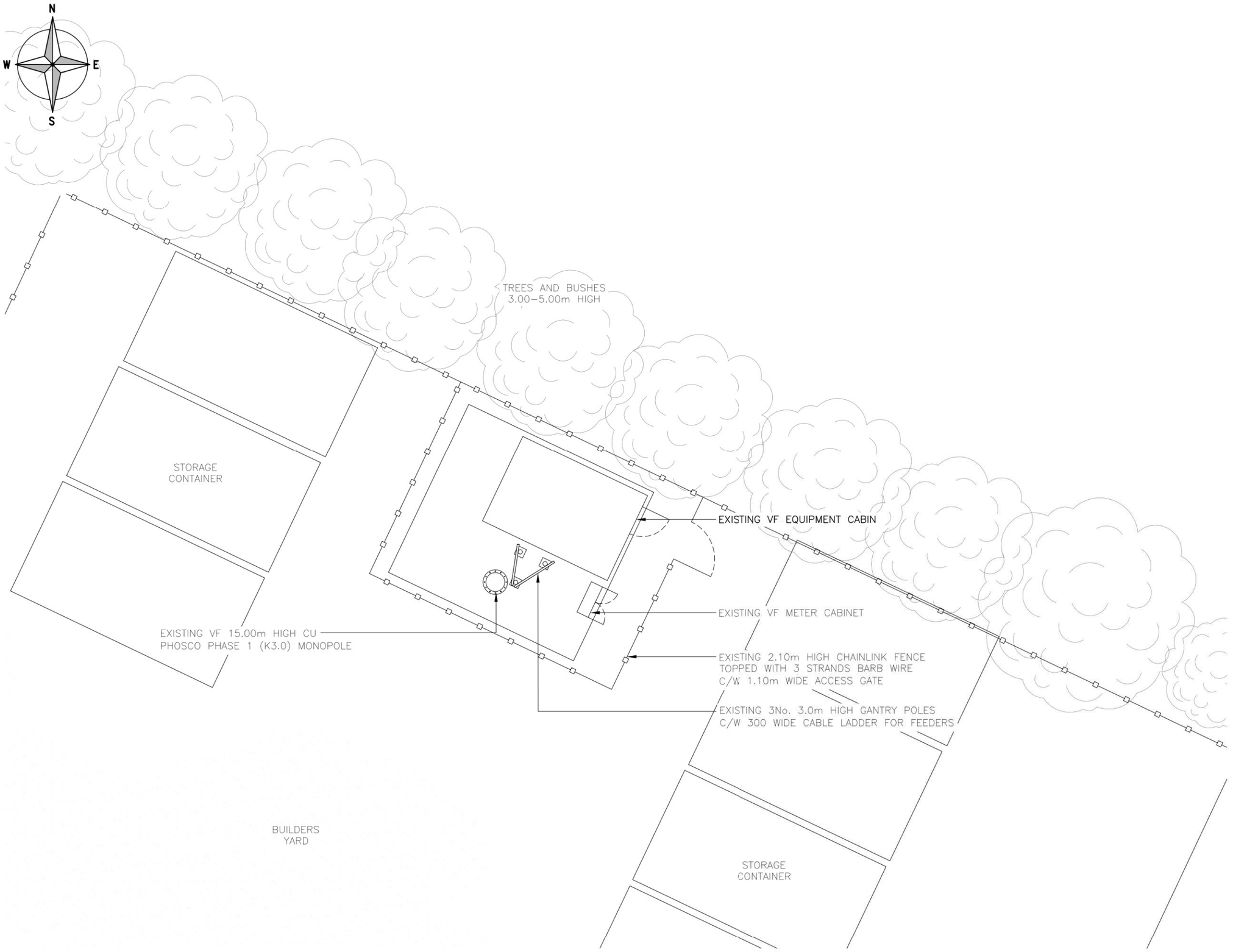
Purpose of issue: PLANNING — Dwg Rev: A

Drawing Number: 100

Surveyed By: SSH — Original Sheet Size: A3 — Pack Issue: A

Drawn:	Date:	Checked:	Date:
DP	03.05.23	SD	12.05.23

SDNT0005 Version 1.3



EXISTING SITE PLAN

(1:100) 5000 0 5000 10000

ORIGINAL SCALE AT A3 – 1:100

ALL DIMENSIONS IN MILLIMETRES

ALL DIMENSIONS ARE IN mm UNLESS NOTED OTHERWISE

N.G.R E: 539096 N: 245542

NOTES:

REV	MODIFICATION	BY	CH	DATE
A	Issued for Approval	DP	SD	12.05.23

CLARKE telecom
Unit E, Madison Place, Northampton Road,
Manchester, M40 5AG
Tel: 0161 785 4500
Fax: 0161 785 4501
Web: www.clarke-telecom.com

cornerstone

Cell Name	Opt.
MELBOURN	–

Cell ID No

CORNERSTONE	VF	VMO2
110973_22	N/A	70896

Site Address / Contact Details

CHERRY PARK FARM IND. EST.
CAMBRIDGE ROAD
MELBOURN
HERTFORDSHIRE
SG8 6EY

Drawing Title: EXISTING SITE PLAN

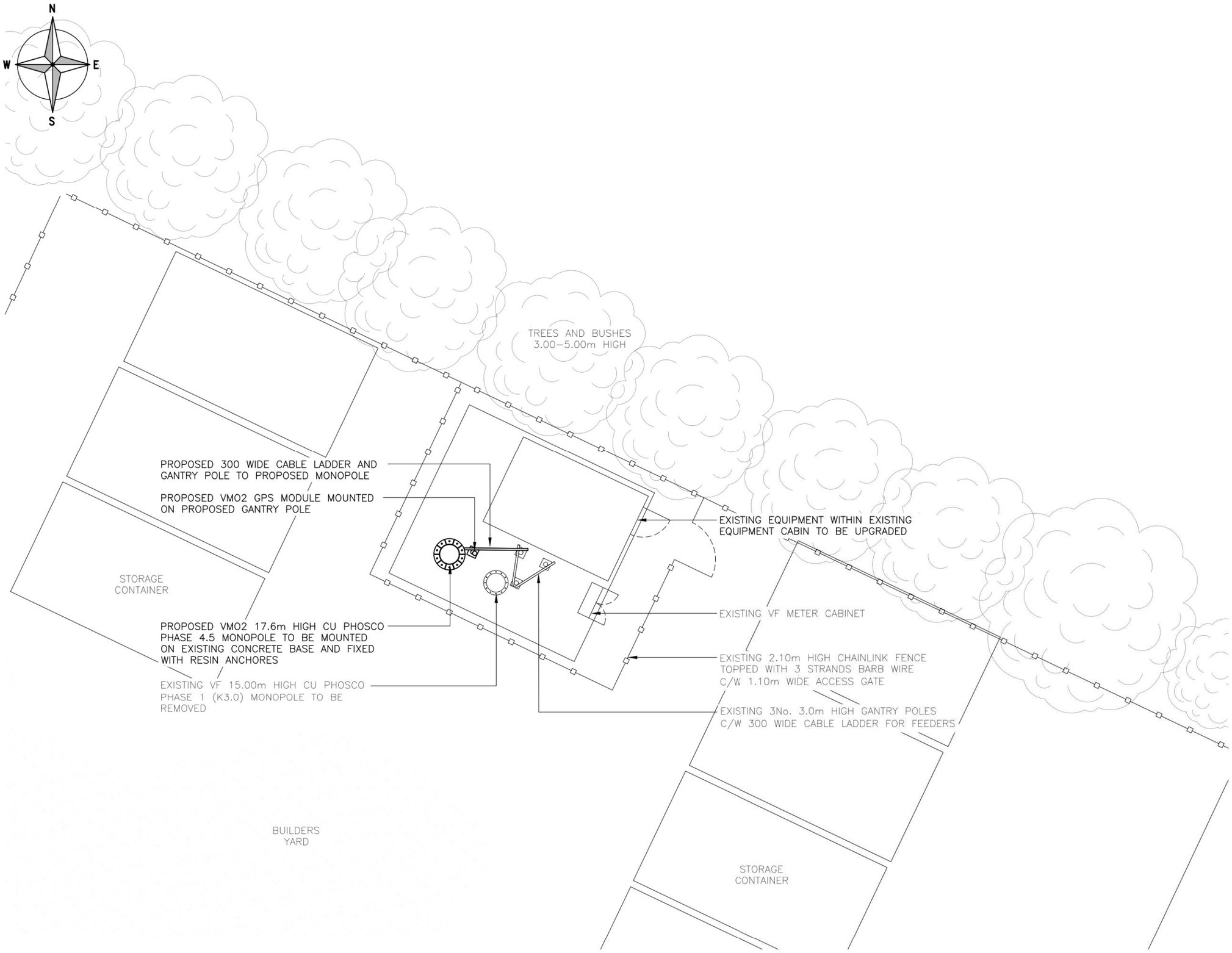
Purpose of issue: PLANNING — Dwg Rev: A

Drawing Number: 200

Surveyed By: SSH — Original Sheet Size: A3 — Pack Issue: A

Drawn:	Date:	Checked:	Date:
DP	03.05.23	SD	12.05.23

SDNT0005 Version 1.3



PROPOSED SITE PLAN

(1:100)

5000 0 5000 10000

ORIGINAL SCALE AT A3 – 1:100

ALL DIMENSIONS IN MILLIMETRES

These drawings comply with VMO2 Standard ICNIRP guidelines,
Designed in accordance with Cornerstone documents: SDN0007 & SDN0008

ALL DIMENSIONS ARE IN mm UNLESS NOTED OTHERWISE

N.G.R	E: 539096 N: 245542

NOTES:

REV	MODIFICATION	BY	CH	DATE
A	Issued for Approval	DP	SD	12.05.23

CLARKE telecom
Unit E, Madison Place, Northampton Road,
Manchester, M40 5AG
Tel: 0161 785 4500
Fax: 0161 785 4501
Web: www.clarke-telecom.com

cornerstone

Cell Name	Opt.
MELBOURN	–

Cell ID No

CORNERSTONE	VF	VMO2
110973_22	N/A	70896

Site Address / Contact Details

CHERRY PARK FARM IND. EST.
CAMBRIDGE ROAD
MELBOURN
HERTFORDSHIRE
SG8 6EY

Drawing Title: PROPOSED SITE PLAN

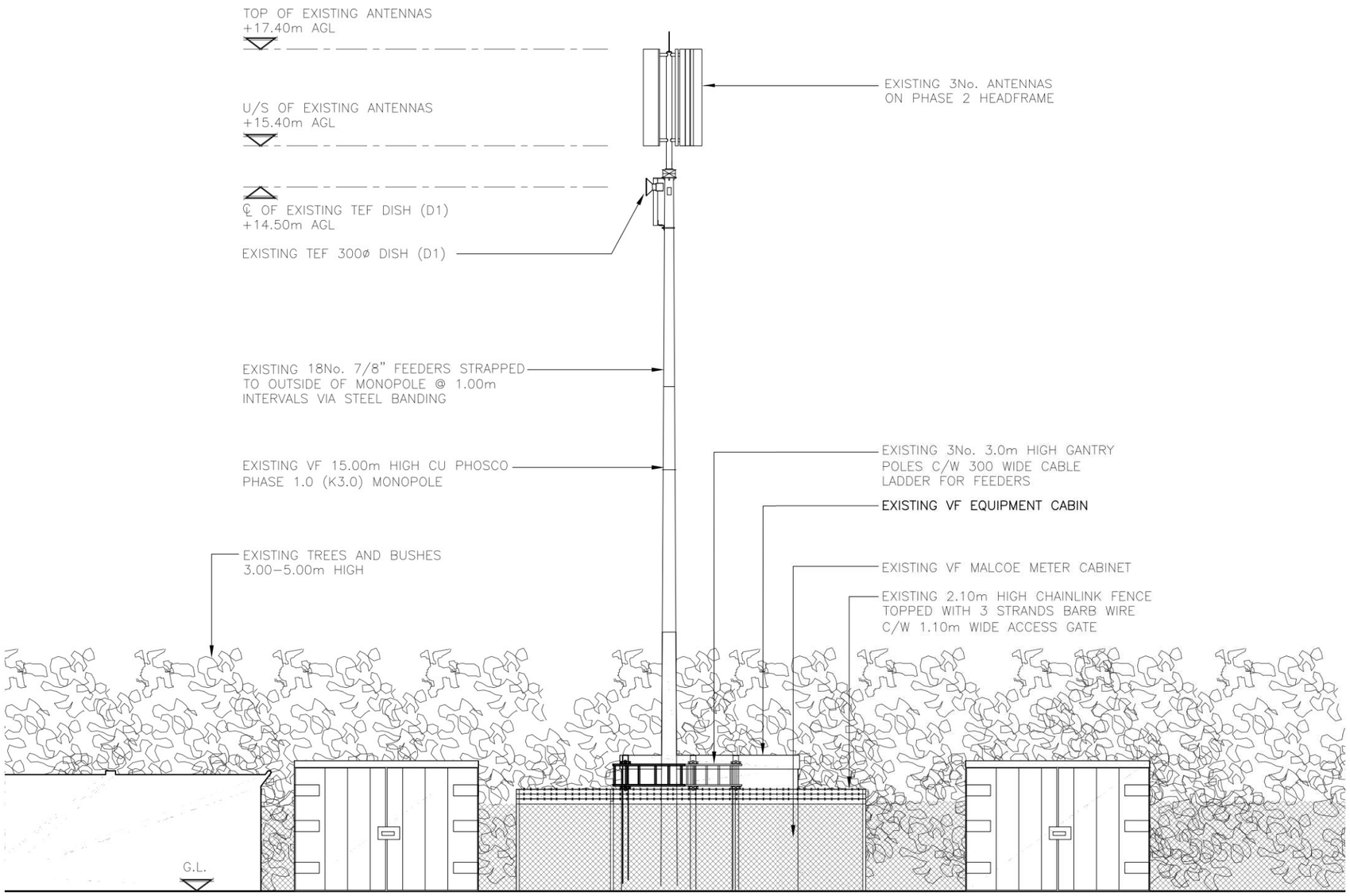
Purpose of issue: PLANNING — Dwg Rev: A

Drawing Number: 201

Surveyed By: SSH — Original Sheet Size: A3 — Pack Issue: A

Drawn:	Date:	Checked:	Date:
DP	03.05.23	SD	12.05.23

SDNT0005 Version 1.3



EXISTING SOUTH WEST ELEVATION

(1:100)

5000 0 5000 10000

ORIGINAL SCALE AT A3 – 1:100

ALL DIMENSIONS IN MILLIMETRES

ALL DIMENSIONS ARE IN mm UNLESS NOTED OTHERWISE

N.G.R	E: 539096 N: 245542

NOTES:

REV	MODIFICATION	BY	CH	DATE
A	Issued for Approval	DP	SD	12.05.23

CLARKE telecom
Unit E, Madison Place, Northampton Road,
Manchester, M40 5AG
Tel: 0161 785 4500
Fax: 0161 785 4501
Web: www.clarke-telecom.com

cornerstone

Cell Name	Opt.
MELBOURN	–

Cell ID No

CORNERSTONE	VF	VMO2
110973_22	N/A	70896

Site Address / Contact Details

CHERRY PARK FARM IND. EST.
CAMBRIDGE ROAD
MELBOURN
HERTFORDSHIRE
SG8 6EY

Drawing Title: EXISTING SITE ELEVATION

Purpose of issue: PLANNING

Dwg Rev: A

Drawing Number: 300

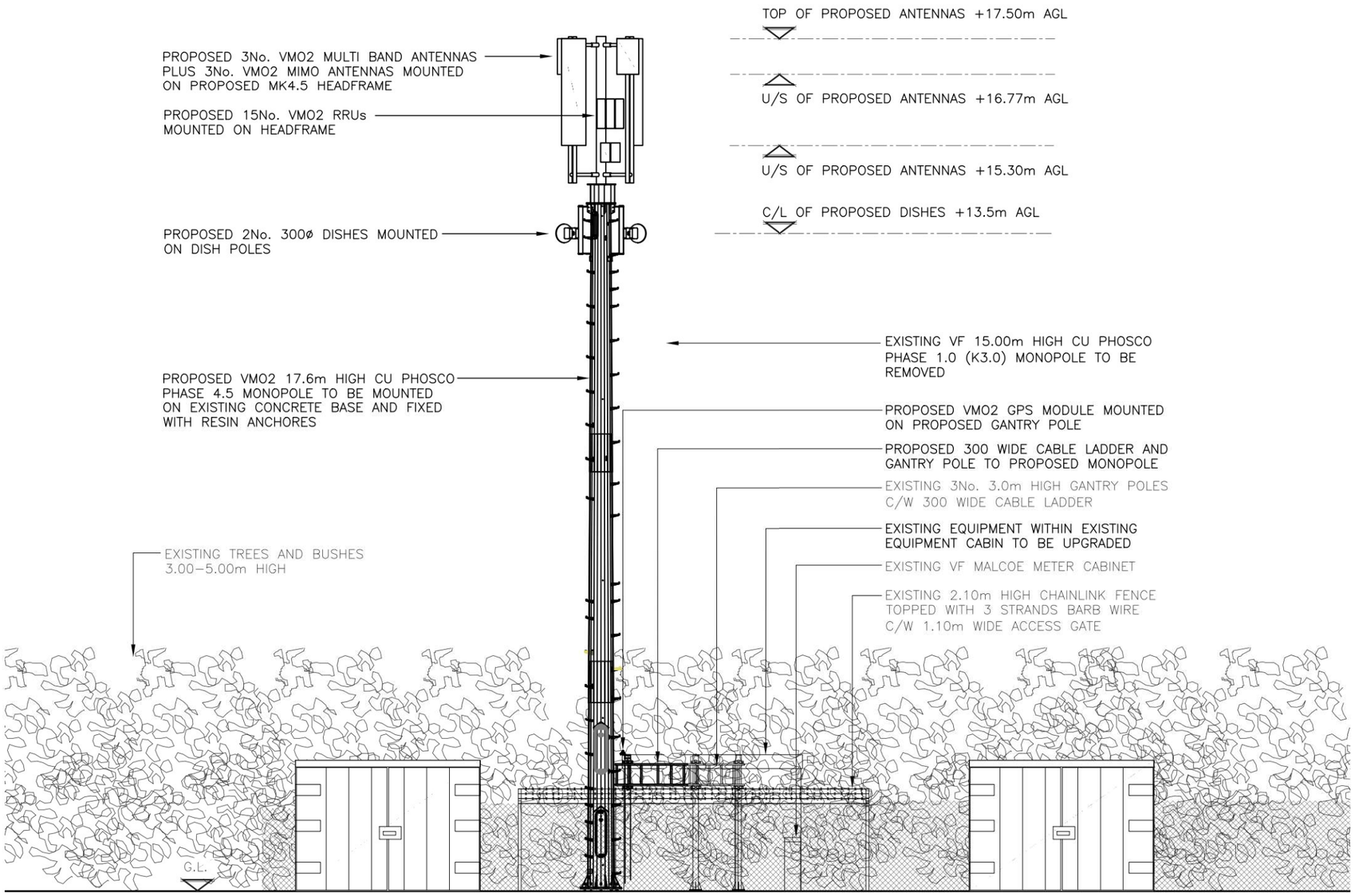
Surveyed By: SSH

Original Sheet Size: A3

Pack Issue: A

Drawn:	Date:	Checked:	Date:
DP	03.05.23	SD	12.05.23

SDNT0005 Version 1.3



PROPOSED SOUTH WEST ELEVATION

(1:100)

5000 0 5000 10000

ORIGINAL SCALE AT A3 – 1:100

ALL DIMENSIONS IN MILLIMETRES

These drawings comply with VMO2 Standard ICNIRP guidelines,
Designed in accordance with Cornerstone documents: SDN0007 & SDN0008

ALL DIMENSIONS ARE IN mm UNLESS NOTED OTHERWISE

N.G.R	E: 539096 N: 245542

NOTES:

REV	MODIFICATION	BY	CH	DATE
A	Issued for Approval	DP	SD	12.05.23

CLARKE telecom
Unit E, Madison Place, Northampton Road, Manchester, M40 5AG
Tel: 0161 785 4500
Fax: 0161 785 4501
Web: www.clarke-telecom.com

cornerstone

Cell Name	Opt.
MELBOURN	–

Cell ID No

CORNERSTONE	VF	VMO2
110973_22	N/A	70896

Site Address / Contact Details

CHERRY PARK FARM IND. EST.
CAMBRIDGE ROAD
MELBOURN
HERTFORDSHIRE
SG8 6EY

Drawing Title: PROPOSED SITE ELEVATION

Purpose of issue: PLANNING — Dwg Rev: A

Drawing Number: 301

Surveyed By: SSH — Original Sheet Size: A3 — Pack Issue: A

Drawn:	Date:	Checked:	Date:
DP	03.05.23	SD	12.05.23

SDNT0005 Version 1.3

Cornerstone Community Information Sheet

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.

Cornerstone, Hive 2
1530 Arlington Business Park
Theale, Berkshire, RG7 4SA

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

In 2020 the ICNIRP updated their safety guidelines, Dr Eric van Rongen stated 'When we revised the guidelines, 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…However, 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'.

https://www.icnirp.org/cms/upload/presentations/ICNIRP_Media_Release_110320.pdf

For further information please contact:

Community, Cornerstone

The Hive 2, 1530 Arlington Business Park, Theale, Berks, RG7 4SA

Tel. 01753 564306, community@cornerstone.network

General Background Information for Telecommunications Development.

England

cornerstone

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.

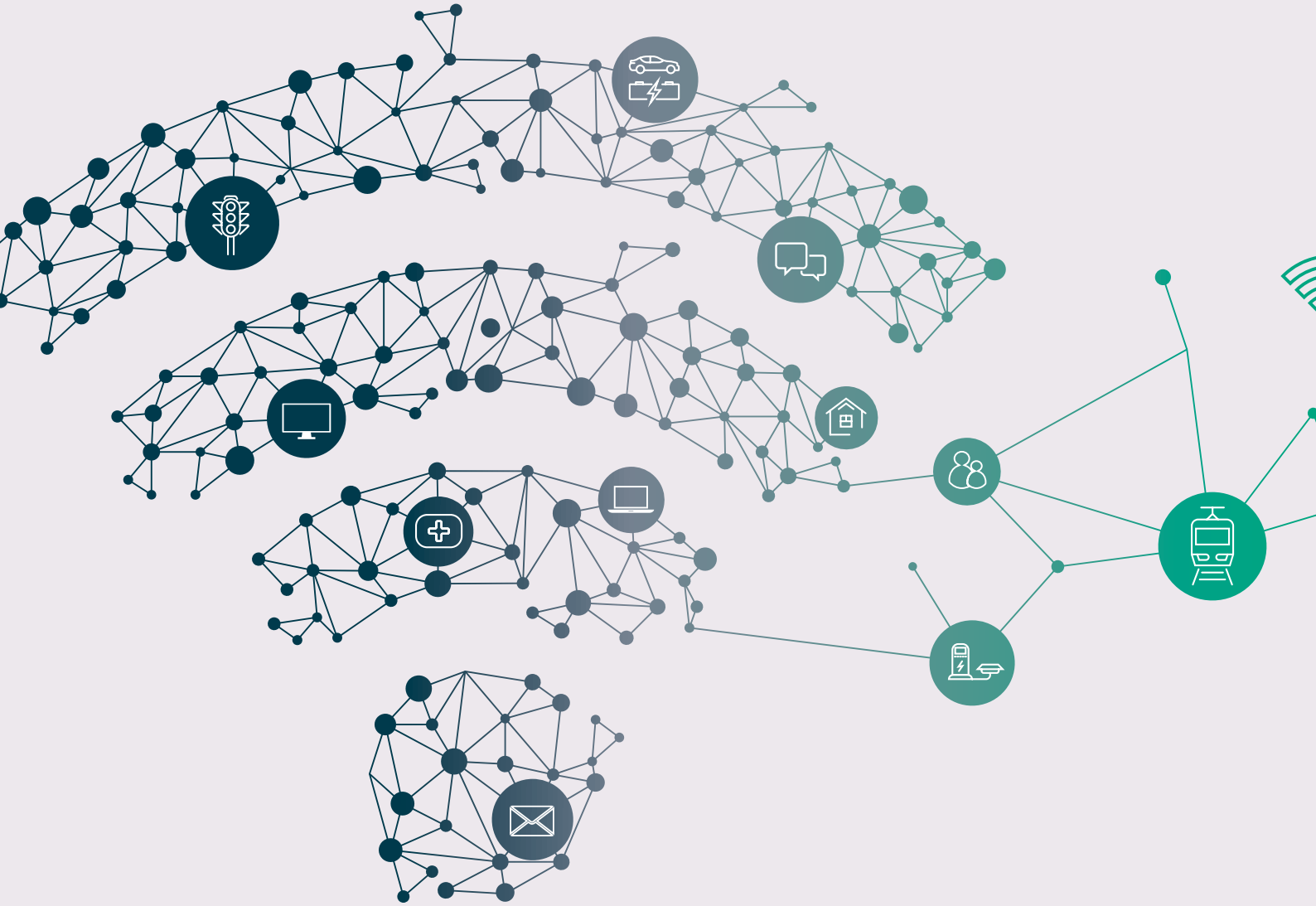
This technology allows for ultra-fast speeds when browsing the internet, streaming videos or sending emails. It also enables faster downloads.

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 benefits of 5G.

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
- 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 on 20th July 2021, supports high-quality communications infrastructure and recognises it as a strategic priority.

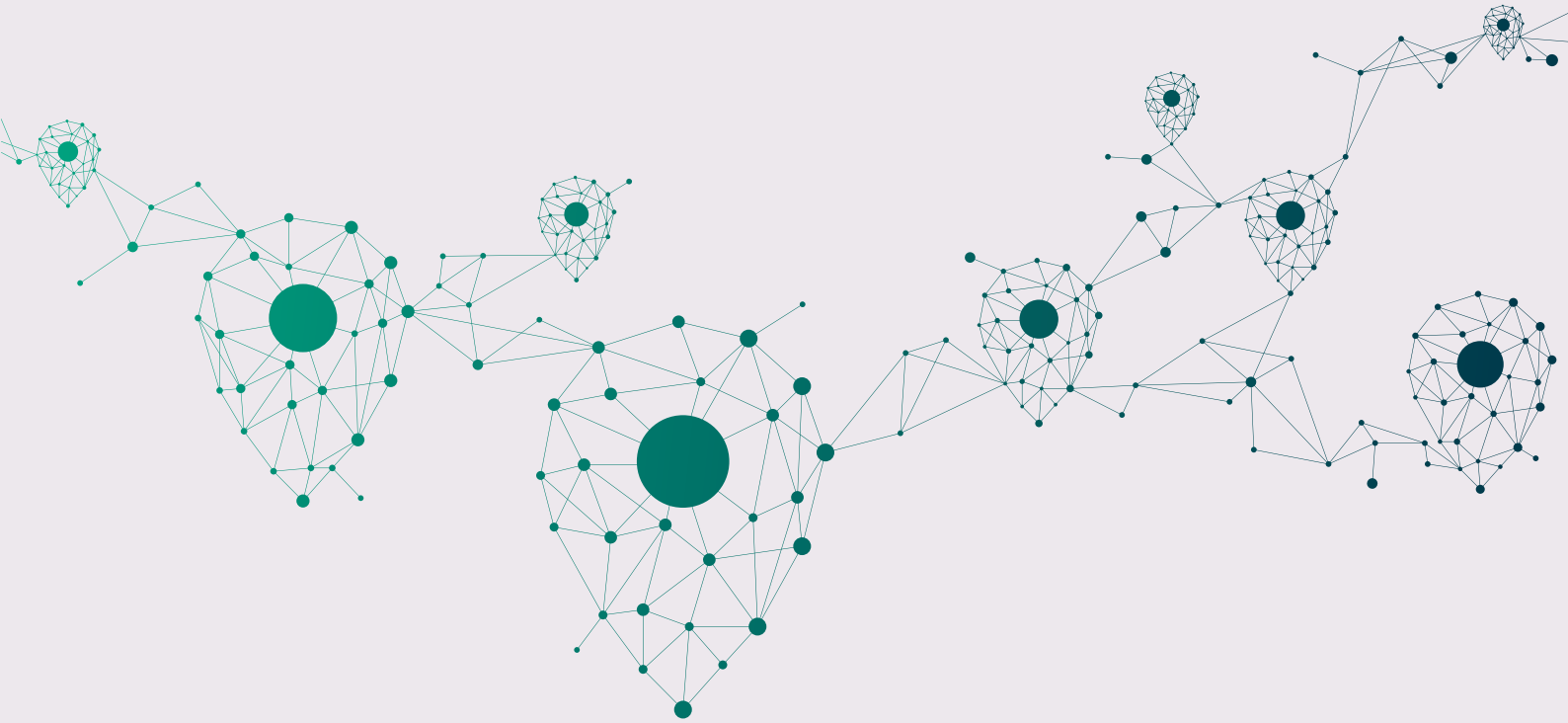
Within paragraph 114 it states that:

"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 118 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."

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.

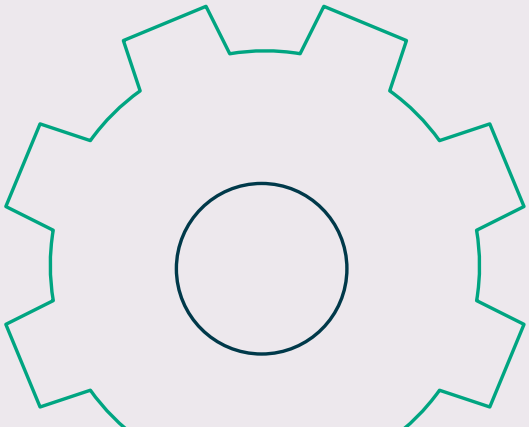
Further information.

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.



For further information or to contact Cornerstone, please visit **www.cornerstone.network**

or write to us at:

Hive 2, 1530 Arlington Business Park, Theale,
Berkshire, RG7 4SA.

cornerstone

cornerstone

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

Cornerstone, Hive 2
1530 Arlington Business Park
Theale, Berkshire, RG7 4SA

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

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

Community, Cornerstone

The Hive 2, 1530 Arlington Business Park, Theale, Berks, RG7 4SA

Tel. 01753 564306, community@ctil.co.uk

The Institution of Engineering and Technology

Allaying health concerns regarding 5G and exposure to radio waves

An IET guide for policy makers and local planning authorities
2nd edition

theiet.org/5G-health

Contents

Allaying health concerns regarding 5G and exposure to radio waves is published by the Institution of Engineering and Technology.

Please note that the views expressed in this publication are not necessarily those of the IET. It is not intended to be a guidance note with a specified set of recommendations or actions but rather seeks to add understanding and debate around the topic.

The Institution of Engineering and Technology

The Institution of Engineering and Technology (IET) is working to engineer a better world. We inspire, inform and influence the global engineering community, supporting technology innovation to meet the needs of society. The Institution of Engineering and Technology is registered as a Charity in England and Wales (no. 211014) and Scotland (no. SC038698).

About this guide

This Institution of Engineering and Technology Guide aims to give policy makers and Local Planning Authorities a better understanding of what 5G is, and what it is not, as it affects the concerns that have been expressed about exposure to radio waves.

The document is intended as a brief overview and references for further reading are provided in the footnotes.

Prof Will Stewart FREng, FInstP, FIET, FOSA
Chairman of the IET Digital Communications Policy Panel

Prof Stephen Temple CBE FREng CEng FIET
IET Guide Lead Editor

The IET Digital Panel would welcome any comments you may have on the contents/ your ideas for future digital publications. Please get in touch via **sep@theiet.org**.

Foreword

There has been an "infodemic" of misleading and false information circulating in the media about 5G and alleged health effects. Some of it is pure fantasy, but there have also been sincere concerns expressed by some people, including scientists, who are not up to date with how 5G has evolved in the UK.

The second edition of the IET Guide "Allaying health concerns regarding 5G and exposure to radio waves" provides a bridge to understanding how the 5G technology being implemented and the frequencies being used affect radio wave exposure, compared to the earlier mobile technologies that everyone is very familiar with.

The Guide is also helpful in another respect. It brings together, in one publication, an explanation of the overall rigorous radio exposure safety framework for public mobile services, embracing both the mobile networks and smartphones. The conclusion that 5G is as safe as 4G, 3G and Global System for Mobile communication (GSM) is not a political soundbite, but a conclusion drawn from an objective detailed examination, by independent professional engineers, who belong to institutions committed to the very highest professional standards.

Professor Danielle George
IET Deputy President

Introduction

What is 5G?

5G is the next evolution in mobile technology that will provide the underlying wireless infrastructure to cope with the relentless rise in data consumption[1] and support many new applications. This includes everything from connected cars and virtual and augmented reality through to the foundations for emerging smart city and Internet of Things (IoT) technologies. It delivers this through the use of revolutionary new hardware like beam forming antennas and innovative new radio coding software at its core.

Features of 5G

Faster download speeds

It is expected that 5G will provide Gb/s data speeds. This would mean things that currently take minutes to download would only take seconds. Even more important will be the ability to support higher download speeds for many more concurrent users in the same place. This will lead to a more predictable and consistent performance.

Lower latency

5G can support significantly lower latency, where appropriate, meaning very little lag, or buffering. This could enable mobile applications that simply aren't possible today, such as multiplayer gaming, factory automation and other tasks that demand quick responses.

Greater capacity

5G will also have vastly greater capacity, allowing networks to better cope with not only the rapidly increasing data demands of customers today, but also the growth of high-demand applications being planned in the future.

[1] Ofcom "*Enabling 5G in the UK*" https://www.ofcom.org.uk/__data/assets/pdf_file/0022/111883/enabling-5g-uk.pdf.

Key observations

The 5G technology itself, ***in so far as it affects radio wave exposure***, is very similar to 4G and in terms of its pulsed signals, the same as Global System for Mobile communication (GSM), Digital Enhanced Cordless Telecommunications (DECT) phones and a version of 4G.

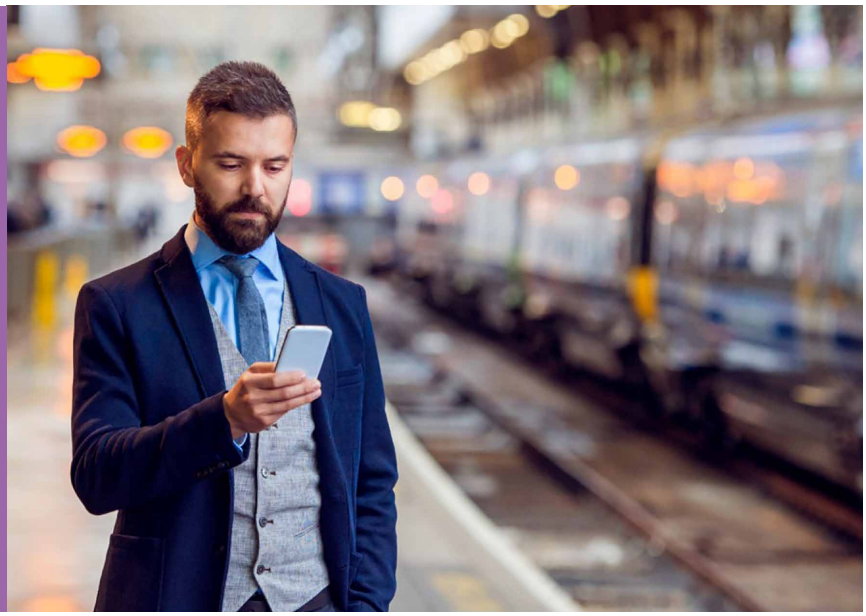
As there has been no dispensation for 5G safety standards, it will have to meet the same safety standards as 4G, 3G and GSM, meaning ***5G will be just as safe as 4G, 3G and GSM***.

There are no "higher frequency" (mmWaves) commercial 5G mobile antennas ***deployed anywhere in the UK*** and none are currently planned (due to high cost of coverage).

Reducing exposure to radio waves in the future requires more base stations ***in order to drive down both*** smartphone and base station power levels.

Electromagnetic Field (EMF) exposure guidelines developed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP)

The first element of the cellular mobile radio wave exposure safety framework are the international recommended guidelines set by the ICNIRP at levels to ensure no harm[2].



The most recent set of ICNIRP guidelines were published on the 11th March 2020, following a comprehensive assessment of peer-reviewed scientific literature over two decades, covering both thermal and non-thermal effects. The guidelines are designed to ensure that all people are not exposed to electromagnetic radiation at radio frequencies[3] in a way that would have any adverse effect on the body, such as excessive heating. No evidence for cancer, infertility or other health effects[4] has been found at the exposure levels recommended in the guidelines.

The reference exposure level for bands below 6 GHz (i.e. all the frequencies currently used in the UK for GSM, 3G, 4G & 5G) has not been changed in the revised guidelines. They have been calculated by reference to specific absorption rate (SAR)[5] and incorporate a substantial margin of safety.

For bands above 6 GHz, where the body does not really absorb the Radio Frequency (RF), the guidelines are set by reference to Power Density (PD)[6], and again incorporating a substantial margin of safety.

[2] https://www.icnirp.org/en/frequencies/radiofrequency/index.html. https://www.icnirp.org/cms/upload/publications/ICNIRPrfgdl2020.pdf.

[3] The radiofrequency ranges are in the non-ionising part of the Electromagnetic Spectrum (30Hz to 300GHz), well below, for example, the visible light portion of the Electromagnetic Spectrum (c.430-740THz).

[4] Other health effects mentioned include absurd theories linking 5G to Coronavirus.

[5] **SAR** is defined as the power absorbed per mass of tissue and has units of watts per kilogram (W/kg). SAR is usually averaged either over the whole body or over a small sample volume (typically 1g or 10g of tissue).

[6] **Power density** is the amount of power per unit area (Watts/M2).

Compliance with ICNIRP guidelines for 5G mobile broadband networks

The second element of the cellular mobile radio wave exposure safety framework is *compliance* of base stations with ICNIRP recommended limits.

Ofcom intends to introduce a new condition in spectrum licences that will require licensees to ensure that all Electric and Magnetic Fields (EMF) emissions from radio equipment in excess of 10 watts (effective isotropic radiated power) complies with the relevant levels for general public exposure from the ICNIRP Guidelines. It will ensure Ofcom is in a position to take appropriate enforcement action in the event of non-compliance with the ICNIRP Guidelines.

Ofcom has already carried out their own independent measurements on some deployed 5G base stations and verified their compliance with the guidelines[7].

As part of the process for obtaining planning consent for new 4G/5G sites and upgrades, each operator will continue to confirm compliance with ICNIRP guidelines[8].

[7] See https://www.comsoc.org/publications/ctn/truth-out-there-examining-science-around-5g-paranoia.
[8] See https://www.ofcom.org.uk/manage-your-licence/radiocommunication-licences/mobile-wirelessbroadband/exposure-electro-magnetic-fields.

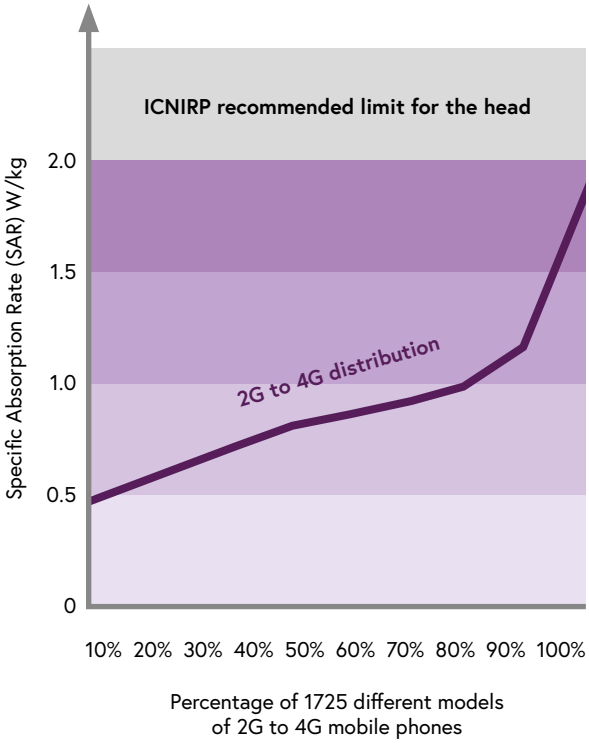
Compliance with ICNIRP guidelines for 5G smartphones and consumer choice

The third element of the cellular mobile radio wave exposure safety framework are the recommended limits for smartphones and other mobile devices.

A manufacturer, by adding a CE marking, is declaring, on its own responsibility, conformity with all of the legal requirements to achieve CE marking, including compliance with ICNIRP guidelines.

The illustration below indicates the distribution of Specific Absorption Rate (SAR) values for the head with GSM, 3G and 4G mobile technology generations based upon a very large sample of 1725 different models from 14 different manufacturers over a number of years.

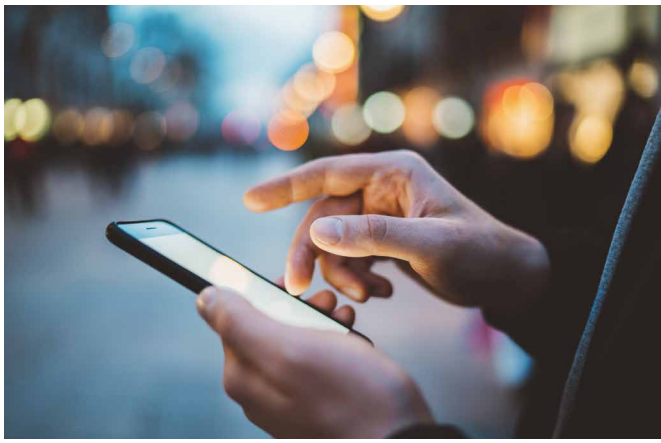
Specific Absorption Rate (SAR) values for the head with GSM, 3G and 4G mobile technology



The result shows almost 80% of all models in this very large sample had SAR values under 50% of the recommended limit. Data has been gathered on a number of 5G smartphones on sale in the UK. All the values were compliant and comparable to the earlier generations of smartphones. The frequencies built into the UK 5G smartphones were all below 6 GHz.

In recent years, SAR information for some phones has not always been easy for consumers to locate. SAR information should be included in publicly available technical specifications of all smartphones in order to facilitate consumer choice.

Finally, "handsfree working" is now standard on all smartphones. This offers consumers the discretion for further reducing RF exposure.



Exposure level reductions from new masts and small cells

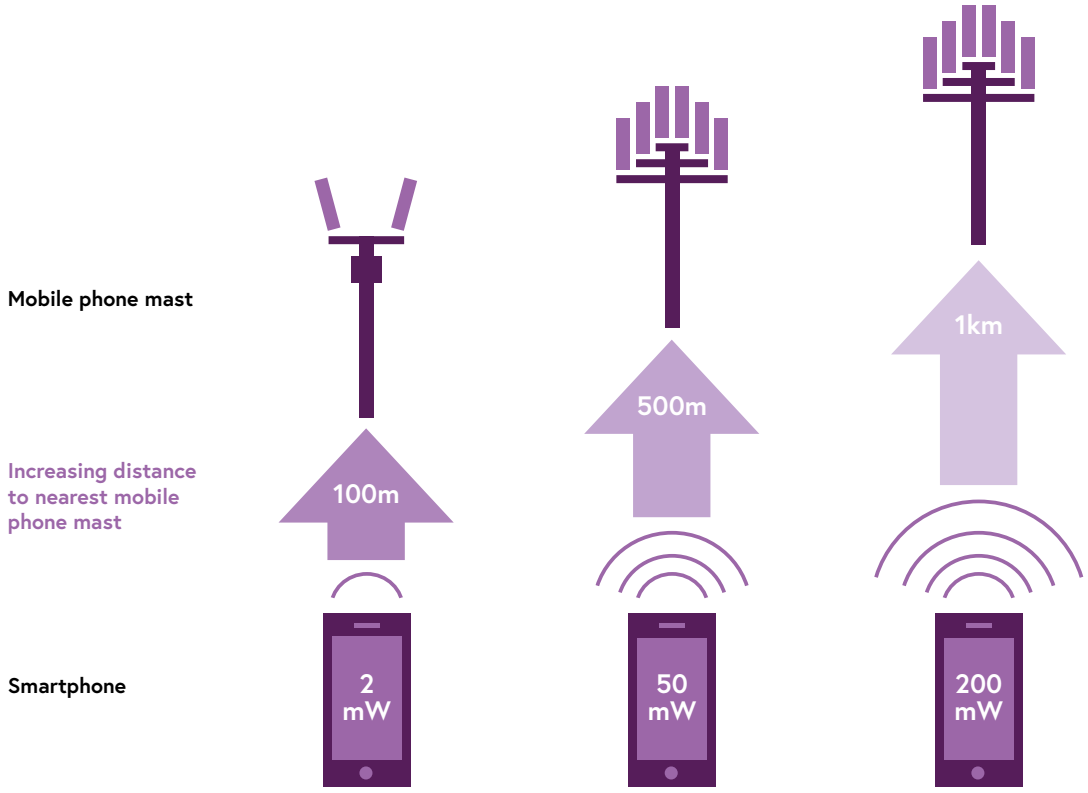
Small cells (micro-cells or pico-cells) are physically smaller antenna systems designed to work over a very short range to ease network congestion or fill in gaps in coverage.

Some people have expressed concern that a large number of 5G cells may increase a person's exposure to radio waves. However, that is not the way cellular mobile networks work. Every time a new mast or small cell is added, the distance the signal has to travel reduces. Therefore, from the laws of physics, the power needed at the smartphone and base station for a reliable connection is much less. Using the lowest practical power level is essential to prevent users located in different cells from disrupting each other's connections. It also saves the user's smartphone battery life.

For many people, their smartphone will be by far the nearest source of radio wave energy to them. As a result, more masts or 5G small cells will lead to a reduction in the overall radio wave signal strength an individual smartphone user is exposed to.

At the moment, there are relatively few small cells in use in the UK and though their numbers are likely to increase over time, we don't expect a mass rollout of them any time soon.

Illustrating how more base stations reduce smartphone powers and hence RF exposure[9]



[9] The numbers are purely illustrative and the actual powers will be determined by many factors including, importantly, the physical distance but also the urban topology between the network antenna and the smartphone.

The most widely used 5G band in the UK will be 3.6GHz

The UK and Europe proposed the use of three bands for 5G[10]. These were termed the 5G pioneer bands and each had a different purpose.

700MHz

This band is to secure pervasive national coverage. It's likely to be deployed from the traditional tall mobile phone masts. Only modest data capacity can be supported.

3.6GHz (3.4-3.8GHz)

The 3.6GHz band sits between the current WiFi bands at 2.4GHz and 5GHz that are already widely deployed in homes, offices and public places. 3.6GHz is the 'sweet spot' for achieving the best capacity over the largest areas for the lowest cost and has wide international support. The mass deployment of small low power base stations in towns and cities will most likely use this band[11].

26GHz

This high frequency (mmWaves) supports the largest capacity but at the highest cost of coverage. There are no 26 GHz (mmWaves) commercial 5G mobile antenna being deployed anywhere in the UK and none are currently planned.

Research engineers see a potential for 26GHz to be used for a data capacity lift in the limited number of locations where the 3.6 GHz frequency maxes out over the next 10 years (less than 3% of the UK[13]). Another use may be as a low power advanced manufacturing broadband access point (industry 4.0). Such examples of relatively short distance applications only need relatively low power levels.

Beam forming antennas

For the past 20 years mobile operators have typically used three or four sectored antennas, so as not to waste radio energy in directions where it's not needed. New beam forming antennas (sometimes referred to as Massive (complexity) Multiple input Multiple output antenna) make the transmission much more efficient, with the equivalent of 40, much smaller sectors, but still able to deliver the same power to a user standing at the edge of the cell's coverage area but wasting less energy to achieve this[12].

[10] European Commission Radio Spectrum Policy Group's "*Strategic Roadmap towards 5G in Europe*" https://rspg-spectrum.eu/wp-content/uploads/2013/05/RPSG16-032-Opinion_5G.pdf and IET "*5G Networks for Policy Makers*" report https://www.theiet.org/media/1166/5g-report.pdf.

[11] Ofcom "*Enabling 5G in the UK*" March 2018 paragraph 1.13 https://www.ofcom.org.uk/__data/assets/pdf_file/0022/111883/enabling-5g-uk.pdf.

[12] IEEE Spectrum "*5G Bytes: Massive MIMO Explained*" https://spectrum.ieee.org/video/telecom/wireless/5gbytes-massive-mimo-explained.

[13] techUK "*UK SPF publish principles for the release of 26 GHz 5G pioneer band*" https://www.techuk.org/insights/reports/item/15915-uk-spf-publish-principles-for-the-release-of-26-ghz-5g-pioneer-band.

Conclusion

5G is just as safe as 4G, 3G and GSM

This document has aimed to set out the reality around concerns regarding radio wave exposure, mobile coverage and 5G.

Small 5G base stations in our towns and cities will allow improved network coverage. They will reduce radio wave exposure to individual smartphone users and improve local 5G capacity for all manner of useful bandwidth-hungry applications. A good 5G fibre base local broadband infrastructure will be important to local communities over the coming decades in view of the ever-increasing amounts of data being consumed by the general public.

The Institution of Engineering and Technology

Our offices

London, UK
T +44 (0)20 7344 8460
E faradaycentre@ietvenues.co.uk

Stevenage, UK
T +44 (0)1438 313311
E postmaster@theiet.org

Beijing, China
T +86 10 6566 4687
E china@theiet.org
W theiet.org.cn

Hong Kong
T +852 2521 2140
E adminap@theiet.org

Bangalore, India
T +91 80 4089 2222
E india@theiet.in
W theiet.in

New Jersey, USA
T +1 (732) 321 5575
E ietusa@theiet.org

@TheIET theiet.org

E6D20002/Digital/0720