Department of Planning and Environment

dpie.nsw.gov.au

NSW Telecommunications Facilities Guideline, Including Broadband

October 2022

Acknowledgement of Country

The Department of Planning and Environment acknowledges that it stands on Aboriginal land. We acknowledge the Traditional Custodians of the land and we show our respect for Elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

Published by NSW Department of Planning and Environment

dpie.nsw.gov.au

NSW Telecommunications Facilities Guideline, Including Broadband

First published: October 2022

Department reference number: DOC22/872711

TMP-MC-R-WC-V1.2

Contents

Introduction

1.1 Purpose

The NSW Telecommunications Facilities Guideline Including Broadband supports the roll out of broadband in NSW and aims to ensure that both wireline and wireless telecommunications infrastructure, including for broadband, can be provided in an efficient and cost effective manner to meet community needs for telecommunications services.

The Guideline explains the state-wide planning provisions and development controls for telecommunication facilities in NSW, as outlined in *State Environmental Planning Policy (Transport and Infrastructure) 2021* (Transport and Infrastructure SEPP). These provisions relate to telecommunications facilities that are:

- exempt development
- complying development
- development permitted without consent
- development permitted with consent.

We also cover principles for the design, siting, construction and operation of telecommunications facilities, which aim to minimise the impacts of facilities and acknowledge the Commonwealth Telecommunications (Low-impact Facilities) Determination 2018 (Determination). Made under the Telecommunications Act 1997 (Telco Act), the Determination is in force nationally and provides for low-impact telecommunication facilities that are not subject to NSW planning laws.

1.2 Definitions

Telecommunications facilities provide for transmission of voice, data, image, graphic and video information between or among points by wire, cable, optical fibre, microwave, radio, satellite or similar facilities. This guideline draws from the Transport and Infrastructure SEPP's definition of a telecommunications facility as:

- any part of the infrastructure of a telecommunications network
- any line, cable, optical fibre, fibre access node, interconnect point, equipment, apparatus, tower, mast, antenna, dish, tunnel, duct, hole, pit, pole, or other structure in connection with a telecommunications network
- any other thing used in or in connection with a telecommunications network.

Broadband describes the speed and capacity at which a telecommunications service is provided. As combination of the words 'broad' and 'bandwidth', it is a generic term that covers many different high capacity telecommunication circuits including two-way, always-on internet connections. Broadband offers the opportunity to access the Internet and to obtain high volume data, at fast speeds.

Broadband is provided in Australia via:

- copper telephone lines (e.g. ADSL and VDSL)
- wireless systems (e.g. mobile broadband, WiFi, WiMax, satellite)
- hybrid fibre-coaxial (HFC)
- fibre systems including fibre-to-the-node (FTTN) and fibre-to-the-premises (FTTP).

These digital delivery methods produce fast broadband and include services such as voice, video, TV including internet protocol television (IPTV), data and text on a range of platforms.

2 Approval pathways

This section of the Guideline relates to both Commonwealth legislation and the NSW planning system. It should be read in conjunction with relevant Commonwealth telecommunications legislation and Transport and Infrastructure SEPP.

If there is any inconsistency between Commonwealth laws and the laws of a state or territory, Commonwealth legislation prevails.

2.1 Commonwealth legislation

The Telco Act and the *Radiocommunications Act 1992* regulate the provision of telecommunications and radiocommunications services throughout Australia. Organisations that hold a Carrier license under the Telco Act are bound by the operational provisions of the Telco Act and the *Telecommunications Code of Practice 2021* (Code of Practice).

The Determination lists a number of 'low-impact' facilities that the Australian Government continues to regulate and that are exempt from state and territory laws including the Transport and Infrastructure SEPP. These facilities are also exempt from the principles outlined in the next chapter of this Guideline.

However, approvals may be required under NSW legislation such as:

- *Biodiversity Conservation Act 2016*
- *Coastal Management Act 2016*
- *Crown Land Management Act 2016*
- *Fisheries Management Act 1994*
- *Forestry Act 1916*
- *Heritage Act 1977*
- *Local Land Services Act 2013*
- *Mine Subsidence Compensation Act 1961*
- *Mining Act 1992*
- *National Parks and Wildlife Act 1974*
- *Protection of the Environment Operations Act 1997*
- *Roads Act 1993*
- *Rural Fires Act 1997*
- *Water Management Act 2000.*

There can be supplementary codes in addition to the Code of Practice. The Communications Alliance Ltd Industry Code C564:2020 *Mobile Phone Base Station Deployment* (Industry Code) applies to Carriers intending to install or operate fixed radiocommunications infrastructure to supply Public

Mobile Telecommunications Services. The Industry Code supplements the existing requirements already imposed on Carriers by requiring them to consult with local community and adopt a precautionary approach in planning, installing and operating Mobile Phone Radiocommunications Infrastructure.

Any development permissible under the Determination must demonstrate compliance with the *Standard for Limiting Exposure to Radiofrequency Fields – 100 kHz to 300 GHz (Rev. 1)* (2021) (RPS S-1) produced by the Australian Radiation and Protection Authority (ARPANSA) and regulated by the Australian Communications and Media Authority (ACMA).

The Transport and Infrastructure SEPP applies to telecommunications facilities that are not exempt under the Telco Act or are not 'low-impact' facilities under the Determination. Compliance with RPS S-1 is also required.

2.2 NSW planning system

Under the NSW planning system, development may be development that does not require consent, development that needs consent or development that is prohibited.

The Transport and Infrastructure SEPP prescribes planning approval pathways, development standards and matters for consideration for the development of infrastructure. It provides for 4 planning pathways for telecommunications facilities:

- development permitted without consent
- development permitted with consent
- exempt development
- complying development.

Development permitted without consent is where a proponent does not need to obtain a development consent. Instead, they will need to assess the environmental impacts of the activity through an assessment referred to as a review of environmental factors under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Part 5 relates to infrastructure and environmental impact assessment. Under Part 5, Division 5.1 applies to development by a public authority or that requires approval from a public authority. It requires an assessment of the likely environmental impacts of a proposal and measures required to mitigate any adverse impacts. If an environmental impact assessment is required, the authority responsible for the legislation would become a determining authority under Part 5 of the EP&A Act. A review of environmental factors (REF) is prepared and provided to any determining authority.

This includes telecommunications facilities classified as 'development without consent' in the Transport and Infrastructure SEPP, unless the proposal is state significant infrastructure under Division 5.2 of the EP&A Act. The types of facilities are listed in Chapter 2 Division 21 of the Transport and Infrastructure SEPP, together with any notification or consultation requirements.

Development that needs consent includes the development application (DA) process, whereby approval is usually required from the relevant council, unless the proposal is state significant

development under Part 4 Division 4.1 of the EP&A Act. It also includes complying development, which requires a complying development certificate (CDC) from a council or private certifier.

The Transport and Infrastructure SEPP makes telecommunications and other communications facilities permissible on all land across NSW, irrespective of zoning. The consent authority must consider the principles contained in this Guideline. The Transport and Infrastructure SEPP prevails if there is inconsistency with a local environmental plan (LEP).

The range of telecommunications facilities that are either **exempt or complying development** in the Transport and Infrastructure SEPP must meet both specific development standards and the general requirements for exempt and complying development.

Exempt development may be carried out without the need to submit a DA and no approval is required. Complying development can be determined by a council or by an accredited certifier. It requires compliance with specific prescribed conditions, and a complying development certificate is to be issued prior to the works commencing.

Refer to the latest version of the Transport and Infrastructure SEPP for the most current list of telecommunications facilities and their specified planning pathway.

Figure 1 Panel antenna on existing high voltage tower

2.2.1 Initial assessment steps

Before you begin, check the latest Determination and most recent Transport and Infrastructure SEPP.

Follow these steps to determine the type of planning approval required (see Figure 2).

Step 1

Only Carriers need to follow this step to determine whether the proposed facility or upgrade to a facility is contained in the Determination or is otherwise exempt from NSW planning law.

If the proposed works are in the Determination, laws or principles of the NSW planning system do not apply, although as noted under 2.1, other State licences or approvals may be required. The Carrier does not need to follow the rest of these steps.

If the proposal is not included in the Determination, Carriers should proceed to the next steps.

Step 2

Check if the proposed telecommunication facility is a permissible use on the proposed site in the relevant LEP and/or the Transport and Infrastructure SEPP. If not, talk to the council or find another site.

Step 3

If the proposed works are a permissible use yet not authorised under Commonwealth law, it may correspond with one of the facilities listed under Section 2.144 and 2.145 and Schedule 4 of the Transport and Infrastructure SEPP. If that is the case, it may be exempt or complying development.

Step 4

If the proposed works meet the relevant sections and listed standards for exempt development in the Transport and Infrastructure SEPP, approval is not required. However, notification will be required as set out in Section 2.144 in the Transport and Infrastructure SEPP prior to works being undertaken.

Step 5

If the proposed works do not meet those sections and standards, check if they meet provisions of:

- Section 1.17A of the *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008*
- Sections 2.23, and 2.145, and the prescribed standards for complying development in Schedule 4, Part 2, Column 2 of the Transport and Infrastructure SEPP.

If they do, a CDC is required alongside the Section 2.145 notification requirements to certify that the development complies with the Transport and Infrastructure SEPP. Note that Sections 2.23 and 2.145 also contain applicable conditions.

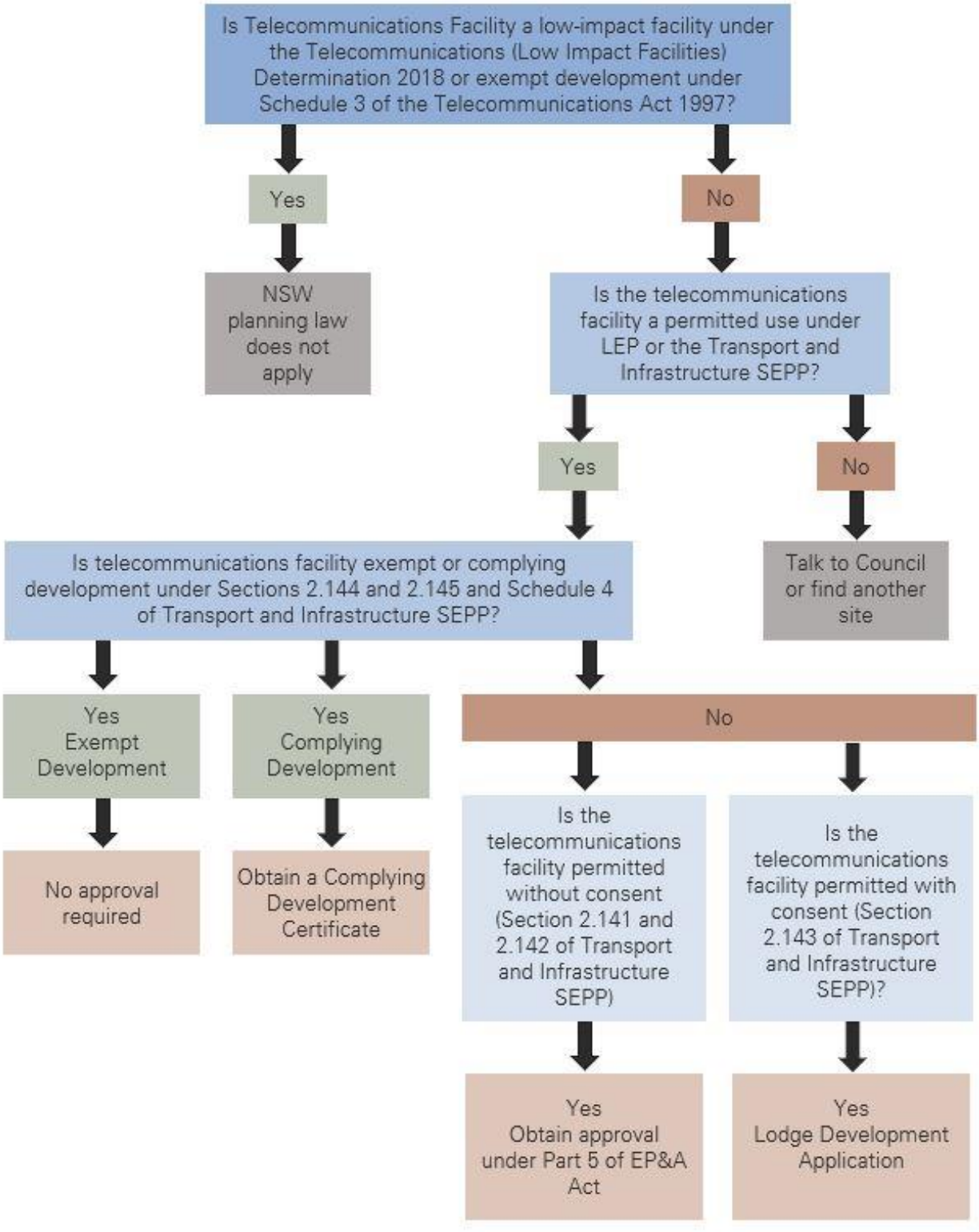

Figure 2 Steps to determine the required approval

Step 6

If the works do not meet these provisions, they may be permitted without consent under Sections 2.141 and 2.142 of the Transport and Infrastructure SEPP. This requires an environmental impact

assessment under Part 5 of the EP&A Act and the determining authority is to consider the principles in this Guideline.

Step 7

If the proposed works are not applicable under Part 5, they may be permitted with consent under Section 2.143 of the Transport and Infrastructure SEPP. This would follow the DA process and the consent authority must consider the principles in this Guideline.

2.3 Other planning issues

2.3.1 Applicable zones

Requirements relating to telecommunications facilities apply to all local land use zones. In some instances, the Transport and Infrastructure SEPP may specify a requirement that relates only to a specific zone(s).

The zone types are defined in the *Standard Instrument - Principal Local Environmental Plan*.

2.3.2 Development applications

Consent authorities considering DAs must refer to the Transport and Infrastructure SEPP, the principles in this Guideline, and relevant Commonwealth legislation. If approved, conditions of consent may be applied – see Appendix B for an example set.

2.3.3 Consultation

The Mobile Phone Base Station Deployment Code applies to both exempt development and complying development that requires fixed radiocommunications infrastructure to supply public mobile telecommunications services. Refer to the notification and consultation sections of the Code, and Appendix E of this Guideline.

Development not for Public Mobile Telecommunications Services should be subject to notification processes, as required for development without consent, exempt development and complying development in Sections 2.141, 2.144 and 2.145 of the Transport and Infrastructure SEPP.

There are also additional requirements for CDCs and DAs to be accompanied by a statement signed by the owner of the land that the owner consents to the application.

3 Principles

3.1 Background

Development with consent and development without consent under the Transport and Infrastructure SEPP, that relates to the site selection, design, construction and operation of telecommunication facilities in NSW, should be consistent with the principles in this chapter. This will ensure a more efficient and consistent planning and decision-making process.

Some of these principles relate to health and electromagnetic energy (EME) exposure. These principles have their origins in the regulatory and scientific framework for wireless telecommunications facilities, outlined in Appendix F.

Principle 1: Design and site telecommunications facilities to minimise visual impact.

a. As far as practical, integrate a telecommunications facility that is mounted on an existing building or structure with the design and appearance of the building or structure.
b. Minimise the visual impact of telecommunications facilities, reduce visual clutter (particularly on tops of buildings) and ensure physical dimensions (including support mounts) are sympathetic to the scale and height of the building to which it is to be attached and to adjacent buildings.
c. If a telecommunications facility protrudes from a building or structure and is predominantly seen against the sky, either match the prevailing colour of the host building or structure or use a neutral colour such as pale grey.
d. Where possible and practical, screen or house ancillary facilities using the same colour as the prevailing background and consider using existing vegetation or new landscaping.
e. Locate and design a telecommunications facility in a way that responds to its setting (rural, residential, industrial or commercial).
f. Site and design a telecommunications facility located on or adjacent to a listed heritage item or within a heritage conservation area with external colours, finishes and scale sympathetic to the heritage item or conservation area.
g. Locate telecommunications facilities to minimise or avoid obstructing significant views of a heritage item or place, a landmark, a streetscape, vista or a panorama, whether viewed from public or private land.
h. Consult with relevant council when proposing pruning, lopping or removing any tree or vegetation. Obtain a tree preservation order, permit or development consent if required.
i. Remove redundant telecommunications facilities and restore the site to the condition it was in prior to the facility's construction.
j. Remove redundant components of existing facilities after upgrades.
k. Where possible, consolidate telecommunications facilities to reduce visual clutter and work with other users on co-location sites to minimise cumulative visual impact.

l. Accord with all relevant industry design guides when siting and designing telecommunications facilities.

m. Assess potential visual impact in alternative site assessments.

Principle 2: Co-locate telecommunications facilities wherever practical

a. As far as practical, locate telecommunications lines underground or within an existing underground conduit or duct.

b. Where practical, co-locate or attach overhead lines, antennas and ancillary telecommunications facilities to existing buildings, public utility structures, poles, towers or other radiocommunications equipment to minimise clutter.

c. Consider extending an existing tower as a practical co-location solution to new towers.

d. Demonstrate that co-location is not practicable1 if choosing not to co-locate a facility.

e. If choosing to co-locate, design, install and operate a telecommunications facility so that resultant cumulative levels of radio frequency emissions are within the maximum human exposure levels set out in RPS S-1.

Principle 3: Meet health standards for exposure to radio emissions

a. Design, install and operate a telecommunications facility so that maximum human exposure levels to radiofrequency emissions comply with RPS S-1 (see Appendix C).

b. Using the format required by ARPANSA, report on predicted levels of EME surrounding any development covered by the Industry Code C564:2020 Mobile Phone Base Station Deployment, and how the development will comply with ACMA safety limits and RPS S-1.

Principle 4: Minimise disturbance and risk, and maximise compliance

a. Ensure the siting and height of a telecommunications facility complies with the of the Commonwealth Civil Aviation Regulations 1998 and Airports (Protection of Airspace) Regulations 1996. Avoid penetrating any obstacle limitation surface (OLS) shown on a relevant OLS plan for an aerodrome or airport (as reported to the Civil Aviation Safety Authority) within 30 km of the proposed development.

b. Ensure no adverse radio frequency interference with any airport, port or Commonwealth defence navigational or communications equipment, including the Morundah Communication Facility, Riverina.

c. Carry out the telecommunications facility and ancillary facilities in accordance with any manufacturer's installation specifications.

d. Protect the structural integrity of any building or structure on which a telecommunications facility is erected.

e. Erect the telecommunications facility wholly within the boundaries of a property as approved by the relevant landowner.

[1] Co-location is 'not practicable' if no existing tower or other suitable telecommunications facility can provide equivalent site technical specifications including requirements for coverage, radio traffic capacity and call quality.

f. Ensure all construction of a telecommunications facility accords with *Managing Urban Stormwater: Soils and Construction – Volume 1* (Landcom 2004), or its replacement.

g. Mitigate obstruction or risks to pedestrians or vehicles caused by the location of the facility, construction activity or materials used in construction.

h. Where practical, carry out work at times that minimise disruption to adjoining properties and public access and restrict hours of work to 7.00am and 5.00pm, Mondays to Saturdays, with no work on Sundays and public holidays.

i. Employ traffic control measures during construction in accordance with Australian Standard AS1742.3-2002 Manual of uniform traffic control devices – Part 3: Traffic control devices for works on roads.

j. Guard open trenching in accordance with Australian Standard Section 93.080 – Road Engineering AS1165 – 1982 – Traffic hazard warning lamps.

k. Minimise disturbance to flora and fauna and restore land to a condition similar to its condition before the work was carried out.

l. Identify any potential impacts on threatened species and communities in consultation with relevant authorities and avoid disturbance to identified species and communities where possible.

m. Identify the likelihood of harming an Aboriginal place and/or Aboriginal object and obtain approval from the Department of Premier and Cabinet if the impact is likely, or Aboriginal objects are found.

n. Reinstate, at your expense, street furniture, paving or other facilities removed or damaged during construction to at least the same condition as that prior to installation.

Principle 5: Undertake an alternative site assessment for new mobile phone base stations

a. Include adequate numbers of alternative sites in the alternative site assessment as a demonstration of good faith.

b. In addition to the new site selection matters in Section 4 of the Industry Code C564:2020 Mobile Phone Base Station Deployment:

- only include sites that meet coverage objectives, and that have been confirmed as available, with an owner agreeable to having the facility on their land
- if the preferred site is a site owned by the Carrier, undertake a full assessment of the site
- indicate the weight placed on selection criteria
- undertake an assessment of each site before any site is dismissed.

Figure 3 Panel antenna on street light pole

4 Telecommunication facility types

4.1 Mobile telecommunications base stations

Mobile multimedia devices send and receive radiofrequency waves to and from the nearest base station. Mobile telecommunication networks have a cellular design to maximise the limited RF spectrum and enable the handover of calls from one cell to another when the user is moving. These network cells overlap to limit gaps in coverage. If the base stations are too far apart, call quality may be impacted.

A base station includes above-ground housing that houses the transceiver and transmission equipment; a tower, monopole or support mount that provides the necessary height to give required coverage; and antennas.

The type of antenna required depends on the shape and range of the coverage area and available mounting locations. An omnidirectional antenna provides 360 degrees of signal propagation – one example of this type is the NSW Public Safety Network, which provides radio communications for emergency services organisations and other state agencies.

The coverage area of each base station depends on:

- **The height of the antenna above the ground.** A mobile device needs to connect a base station, which means its radio signal to the base station needs to be as uninterrupted as possible. As hills, trees and buildings can impinge on this connection, base stations need to be located to maximise coverage.
- **Radiofrequency.** The frequency band in which the network operates can affect base station size – normally the higher the radiofrequency (as in 4G or 5G) the shorter the distance the signal travels.

The largest coverage areas are in sparsely populated rural areas and the smallest in urban areas. In addition, the base station area in a 5G network will often be smaller than those required for previous generation networks.

An increase in demand requires additional base stations as each can only support a limited number of calls simultaneously.

Mobile telecommunication networks include different types of base station or installation as described below.

4.1.1 Macrocell base station

Macrocell base stations are the main infrastructure of a mobile telecommunications network. Antennas for macrocells are usually mounted on monopoles, towers or masts, or on high-voltage pylons, rooftops and other structures, but may be within a building. They are positioned high enough to not be obstructed by surrounding buildings and terrain.

Omnidirectional antennas and radiocommunication dishes can be part of a macrocell base station.

Macrocell base stations usually use directional antenna and, to cover all directions, at least 3 120-degree angled macrocell antennas.

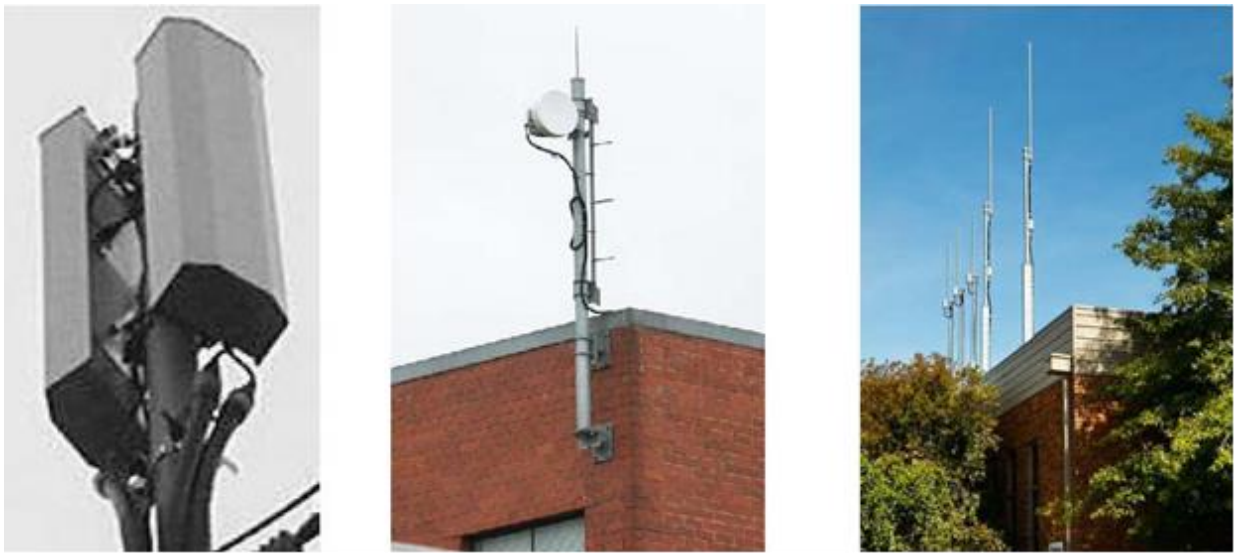

Figure 4 Examples of macrocell base stations

The monopole macrocell base station below has above-ground housing at the base connected to the antennas, accommodating a number of Carriers. Macrocell base stations directional antennas are around 2.8 m long and can be placed on existing or new towers, rooftops or sides of buildings or structures.

Figure 5 Macrocell base station antennas co-located on an existing high voltage tower

4.1.2 Microcells

Microcells or small-cells comprise one or two antennas and associated equipment units that supplement the mobile network by providing localised additional coverage and/or call capacity.

The antennas for microcells are mounted externally at street level and are smaller than those in macrocell base stations. The antennas are attached to an existing pole or other street furniture and the equipment unit may be mounted on the pole or structure or on the ground.

Microcells provide coverage for a small area and are often found at intersections and in heavy pedestrian traffic areas and have a range of a few hundred metres.

Microcell installations, typically, do not use radiocommunication dishes as the installation is linked into the telecommunication network via cable or optical fibre.

Figure 6 Microcells attached to a light pole.

4.1.3 Picocells

Picocells, or in-building coverage systems, provide a more localised coverage than microcell installations. They are generally in buildings where coverage is poor or where there is a dense population of users (for example, airport terminals, office buildings, or shopping centres). Picocell base station equipment is usually located in a central plant equipment room (near the main distribution frame) of a building or other service area and can include:

- cables that run from the base station through the building risers connecting the base station equipment to antennas
- small antennas located on ceilings or walls.

Picocells operate like microcell external base stations and at a low power level.

Figure 7 Left: Picocell antenna suspended from a ceiling. Right: A cone shaped picocell on a ceiling.

4.1.4 Fixed wireless base station

A fixed wireless network provides broadband services from a radio network base station to a small, outdoor antenna. It does not have intercellular handover functions. A fixed wireless network generally uses long term evolution (LTE) technology and provides services to a fixed number of premises within a coverage area. It differs from mobile wireless services where speeds can be affected by the number of people moving into and out of the coverage area. The speed available in a fixed wireless network is designed to be relatively steady.

A fixed wireless base station includes an equipment shelter close to the tower or mast on which the antenna is attached. Fixed wireless antenna could be co-located on existing infrastructure.

4.1.5 Smart poles

Smart poles integrate street poles such as light and power poles to include multiple technologies such as smart lighting systems, sensors, wireless connectivity (Wi-Fi and mobile base station for multiple Carriers), and other functions into one cohesive unit.

Figure 8 A smart pole

4.2 Associated facilities

4.2.1 Underground housing

Underground housing for telecommunications facilities includes pits, boxes, enclosures, manholes or other underground equipment or shelter housing that house or provide access to equipment beneath ground level. Each have a surface lid that sits flush with the adjoining ground surface.

Figure 9 Underground housing for telecommunications facilities

4.2.2 Above-ground housing

Above-ground housing provides shelter for telecommunications infrastructure in facilities ranging from a pillar, roadside cabinet, pedestal, equipment shelter, in-building subscriber connection equipment, solar panel, building connection equipment and in-building network equipment.

Figure 10 Left: Pillar Right: Cabinet

4.2.3 Underground facilities

An underground conduit or cable is placed into the ground by hauling, trenching, direct burial or directional drilling, with the ground reinstated and the cable hidden. An underground conduit or cable may be on any land.[2]

Underground boring or directional drilling sees a new line bored or directionally drilled underground with a conduit inserted through the bore hole and a cable hauled through the conduit in the underground bore hole from one end point to the other.

Figure 11 Cable being inserted into duct

4.2.4 Above-ground optical fibre cable facilities

A single or bundle of optical above-ground cables may be installed above the land or body of water by attachment to a public utility structure such as a power pole or building. The maximum external cross section of the single or bundled cables would be 48 mm. Some above-ground equipment such as enclosures, terminals, boxes and/or power supplies may be associated with the optical above-ground cable(s).

4.2.5 Emergency facilities

In an emergency, telecommunication facilities or works may be required to protect:

a. the safety or health of persons
b. the environment
c. the integrity of a telecommunications network or a facility from failure or a significant disruption to service.

[2] Where 'land' is defined in planning legislation, including (a) the sea or an arm of the sea; (b) a bay, inlet, lagoon, lake or body of water, whether inland or not and whether tidal or non-tidal; (c) a river, stream or watercourse, whether tidal or non-tidal, and (d) a building erected on the land.

4.2.6 Temporary facility

Temporary facilities provide

a. service coverage during maintenance or emergency maintenance
b. service coverage during the construction or installation of a replacement telecommunications facility
c. additional service coverage at events such as sporting carnivals, cultural festivals, business conventions, or the like.

Figure 12 Temporary macrocell base station (2 panel antennas) on lattice support mount.

4.2.7 Ancillary facilities

Base stations generally require ancillary facilities to protect the facility, workers and the public; provide access; minimise visual impacts; or to support construction or operation. This includes:

- safety rails, fences or guards
- staircases and ladders
- steel walkways
- spreader beams supporting shelters
- screens and shrouds
- cable trays
- pole, rail or pedestal mounts
- EME safety or operational signage
- anti-climbing devices
- power supply facilities such as cabling, stand by generators and small solar arrays
- raised platforms in flood-liable land
- remote radio units
- tower mounted and mast head amplifiers
- triplexers/splitters/combiners.

4.2.8 Maintenance and routine maintenance

Maintenance includes any one or combination of testing, replacement, repair, defect rectification, overhaul and reconstruction to restore to the original operating design parameters.

Maintenance should not result in any more than a minimal increase in size, area occupied by, or noise levels associated with the facility.

Routine maintenance is the regular or scheduled inspections and investigations to determine the safety or condition of telecommunications infrastructure, minor repairs and upkeep to keep the infrastructure operating in a safe working condition.

Appendix A – Glossary

Asymmetric digital subscriber line (ADSL) allows existing twisted pair telephone lines to access the Internet at high speeds. ADSL provides continuously-available, 'always on' connection. It uses most of the channel to transmit downstream to the user and only a small part to receive information from the user. ADSL simultaneously accommodates analog (voice) information on the same line.

Aerial/antenna is a structure or device that sends or receives electromagnetic wave signals.

Aerial cabling is an outside communications cable suspended from poles or other overhead structures.

Array of antennas means 2 or more antennas connected and arranged in a regular structure to form a single antenna.

Carrier is a telecommunication carrier under the *Telecommunications Act 1997*.

Cell is the geographic area of coverage of a base station.

Co-located is the placing of 2 or more Carriers' telecommunications facilities on the same support structure.

Coverage is the geographic area in which a Carrier intends to provide their services

Digital breaks an audio or video signal into a binary format.

Directional antenna is an antenna that focuses a narrow beam in a specific direction and includes an array of such antennas.

DSL means digital subscriber line, a family of technologies that provides digital data transmission over the wires of a local telephone network.

Electromagnetic waves/fields transmit and receive signals from mobiles phones and base stations. Mobile phones use radiofrequency (RF) waves/fields.

Equivalent land use zone is a land use zone equivalent to the named land use zone. This guideline refers to those zones set out in the standard instrument.

Feeder cable is the cable which connects an antenna to a base station transmitter or receiver.

Fibre-to-the-premises (FTTP) network is a telecommunication architecture based on fibre-optic cables run directly to the customer's premises.

Frequency refers to the number of times per second an electromagnetic wave oscillates, measured in hertz (Hz) from 1 Hz as one oscillation per second, to 1GHz is a thousand million. Frequencies between 30 kHz and 300 GHz are widely used for telecommunications, and broadcast radio and television, and comprise the radiofrequency band. Mobile telephone systems currently operate at 800MHz, 900MHz, 1800MHz and 2100MHz.

Heritage item means a heritage item listed on a Commonwealth, State or local heritage register.

Hybrid fibre-coaxial (HFC) is a broadband network that combines optical fibre and coaxial cable to extend a network from a master headend, sometimes to regional headends, and out to a neighbourhood's hubsite, and finally to a fibre optic node which serves anywhere from 25 to 2000 homes.

Internet Protocol Television (IPTV) is a digital television service using internet protocol over a network infrastructure, including broadband.

Lattice tower is a freestanding steel framework tower.

Low-impact facility is defined in the Telecommunications (Low-impact Facilities) Determination 2018, which was made under clause 6(3) of Schedule 3 to the *Telecommunications Act 1997* (Cth).

Main distribution frame (MDF) is where inside and outside cables and conduit terminate.

Monopole is a single free-standing mast or pole.

Omnidirectional antenna sends or receives signals equally in all directions and includes an array of such antennas, and such antenna for repeater installations, GPS and the like.

Panel antenna have flat and panel-like appearance.

Radiocommunication dish is a dish directional antenna used to send and /or receive RF communications, on a point-to-point basis.

Radio traffic capacity demands means the amount of demand for wireless voice and data services in a geographic area.

Radio waves are the electromagnetic waves (signals) occurring on the radiofrequency portion of the electromagnetic spectrum.

Remote radio unit or remote radio head in wireless networks is a remote radio transceiver that connects to an operator radio control panel via electrical or wireless interface.

Repeater installation means a RF installation used where a signal is to be improved. Repeaters may be used in shops or commercial buildings to improve coverage.

RF field hazard area shows the assessed hazardous area related to RF fields prepared for occupational exposure purposes related to a telecommunication facility.

Subscriber connection is an installation to connect premises to a telecommunications network.

Sufficient call quality is a service level metric that may include latency or speed.

Support mount is a structure to support the facility but does not include a tower.

Telecommunications network is a system, or series of systems, that carries, or is capable of carrying, communications by means of guided or unguided EME, or both.

Tower is a freestanding ground-based structure that supports a telecommunications facility at a height where it can satisfactorily send and receive waves, but does not include the facility.

Tower mounted amplifier or mast head amplifier is a low-noise amplifier mounted as close as practical to the antenna in mobile masts or base transceiver stations. It assists to receive weaker signals.

Transmission tower is a steel tower or mast carrying high-tension electricity lines, telephone wires, or other cables and lines.

Transmitter is electronic equipment that generates RF EME connected to an antenna via a feeder cable.

Triplexer/splitter/combiner are band-pass filters, simultaneously passing RF in both directions through a common connector while the band-pass filters provide isolation between ports.

VDSL or very-high-bit-rate DSL is a transmission medium that provides a maximum span of about 1,500 m over a twisted-pair cable.

Wavelength is the distance in metres between any two similar points on a radio wave. The lower the frequency of a wave the longer the wavelength.

WiFi is the wireless transmission of data used by devices such as a laptop, PC or mobile phone.

Wireless facility transmits and receives radio frequency waves to communicate within a cellular network or to facilitate backhaul transmissions to a mobile telephone exchange.

Wireline facility transmits signals between network elements via a guided path such as copper or optical fibre.

WiMax or Worldwide Interoperability for Microwave Access, provides wireless transmission of data using a variety of transmission modes, from point-to-point links to portable internet access. It is 'a standards-based technology enabling the delivery of last mile wireless broadband access as an alternative to cable and DSL'.

Appendix B – Example conditions of consent

PART A — ADMINISTRATIVE CONDITIONS

A1 Development description

Development consent is granted only to carrying out the development described in detail as follows.

A2 Development in accordance with plans

The development will be generally in accordance with development application number … submitted on …, and in accordance with the supporting documentation submitted with that application, including:

List Statements of Environmental Effects, plans, drawings, reports etc.

A3 Inconsistency between documents

In the event of any inconsistency between conditions of this consent and the drawings/documents referred to above, the conditions of this consent prevail.

PART B — PRIOR TO ISSUE OF CONSTRUCTION CERTIFICATE

B1 Payment of levy fee

Payment of the prescribed long service levy fee is to be made to council prior to the issue of a construction certificate.

B2 Airspace

Council should, prior to the release of the construction certificate, receive a report showing[3]:

1. compliance with relevant site and height requirements specified by the Civil Aviation Regulations 1998 and the Airports (Protection of Airspace) Regulations 1996.
2. the development does not penetrate any OLS shown on any relevant OLS plan prepared for an aerodrome or airport within 30 km of the proposed development and reported to the Civil Aviation Safety Authority.

PART C — PRIOR TO COMMENCEMENT OF WORKS

C1 Construction certificate

A construction certificate issued by the principal certifying authority (PCA) is to be deposited with Council at least 48 hours prior to commencement of any building work on the site.

Construction management

[3] See Advisory Circular 139-08 *Reporting of Tall Structures and Hazardous Plume Sources* issued by the Civil Aviation Safety Authority.

C2 Contact telephone number

Prior to the commencement of the works, the applicant will give the Council a 24 hour telephone number that will be in operation for the duration of the construction works.

Compliance

C3 Compliance report

Prior to the commencement of works, the applicant, or any party acting upon this consent, will give the Council a report addressing compliance with all relevant conditions of this consent.

PART D — DURING CONSTRUCTION

Site maintenance

D1 Erosion and sediment control

All erosion and sediment control measures will be effectively maintained for the duration of the construction works and until all ground disturbed by the works is stabilised and rehabilitated so that it no longer acts as a source of sediment.

Construction management

D2 Approved plans onsite

A copy of the approved and certified plans, specifications and documents incorporating conditions of approval and certification will be kept on the site at all times and be readily available for perusal by any officer of Council or the PCA.

D3 Site notices

All site notices will be prominent at site boundaries to inform the public. These notices must be at least 841mm x 594mm (A1) with any text a minimum of 30 point type size. They must be durable, weatherproof and on display throughout duration of the construction works.

Site notices must include approved hours of work, the name of the site/project manager, the responsible managing company (if any), its address and 24 hour contact phone number, including construction/noise complaint.

D4 Contact telephone number

The 24-hour contact telephone number must be continually attended by a person with authority over the works for the duration of the construction works and must be displayed for public viewing at the entrance to the site.

Noise and vibration

D5 Hours of Work

Construction, including the delivery of materials to and from the site, is restricted to between 7:00 am and 5:00 pm, Mondays to Saturdays inclusive. There is no work on Sundays and public holidays.

Works may be undertaken outside these hours if NSW Police of other authorities require delivery of materials outside these hours, or to respond to an emergency. Residents likely to be affected by the works must be notified of the timing and duration of these works at least 48 hours prior to commencement.

Heritage

D6 Impact of below ground (sub-surface) works – non-Aboriginal relics

If any previously unidentified archaeological relics are uncovered, all works must cease immediately and Department of Premier and Cabinet (DPC) contacted. An archaeological assessment and an excavation permit under the *Heritage Act 1977* may be required before further works can be considered. Works will not recommence until the applicant receives written authorisation from DPC.

D7 Impact of below ground (sub-surface) works – Aboriginal relics

If any previously unidentified Aboriginal archaeological relics are exposed during construction works, work will immediately cease and DPC contacted accordance with the National Parks and Wildlife Act 1974. All necessary approvals must be obtained continue the work. Works will not recommence until an appropriate strategy for managing the objects has been determined in consultation with the Department of Planning and Environment and DPC provides written authorisation.

PART E — PRIOR TO OCCUPATION OR COMMENCEMENT OF USE

E1 Road damage

The cost of repairing any damage caused to any public authority's assets adjoining the site as a result of construction works must be met in full by the applicant prior to the issue of an occupation certificate.

E2 Electromagnetic emissions

If the development is part of infrastructure for a public mobile phone network, Council should, before commencement of use, receive:

1. a report in the format required by the Australian Radiation Protection and Nuclear Safety Agency that shows predicted levels of electromagnetic energy surrounding the development will comply with the safety limits imposed by the Australian Communications and Media Authority and the Electromagnetic Radiation Standard.
2. a report showing compliance with the C564:2020 Mobile Phone Base Station Deployment Industry Code.

ADVISORY NOTES

AN1 Compliance with Building Code of Australia

The applicant is advised to consult with the PCA about any modifications needed to comply with the Building Code of Australia prior to submitting the application for a construction certificate.

Appendix C – Surveys

ARPANSA surveys of RF EME levels.

1997–99

ARPANSA measured RF EME levels at 14 locations near GSM mobile phone base stations during 1997-99, finding that emissions were well below the limit of 450 μW/cm2 set by 'Maximum Exposure Levels to Radiofrequency Fields – 3 kHz to 300 GHz' (RPS 3). Levels were comparable to television and FM radio transmitters and considerably lower than those from AM radio transmitters.

2003

A study of 60 base stations, including GSM and 3G technologies, confirmed that RF EME levels were well below general public exposure limits.

2007–13

This survey aimed to confirm that the highest levels of measured RF EME was within the limits set by the ARPANSA radiofrequency exposure standard RPS 3 and consistent with the predictions made in the relevant EME reports for each installation.

The ARPANSA Standard is based on established health effects and included safety margins. It is designed to protect the public including who could be vulnerable (the elderly, the infirm, pregnant women and children).

The measurement sites covered a range of network operators, technologies, geography and type of installations.

All measurements were well below the limits in the ARPANSA Standard and generally below those in EME reports. This confirms ARPANSA's assessment, and that of international health authorities such as the World Health Organisation (WHO) and the International Commission on Non-Ionising Radiation (ICNIRP) that there is no established scientific evidence to support adverse health effects.

Find the full surveys on the ARPANSA website.

Appendix D – Radiofrequency hazard fields

Radiofrequency (RF) beams are typically narrow vertically but quite broad in horizontally. These create RF fields with the only locations where RF field intensity exceeds exposure limits in the immediate proximity of the antennas.

The following diagrams show the typical extent of RF field hazard areas associated with different types of mobile phone base station facilities.

With hazard areas only a short distance from the antennas, the only way a transmitting facility will not comply with RPS S-1 is if these areas are accessible to the public. For this reason, mandatory site practices restrict access to antennas to protect people from locations where RF fields may exceed exposure limits.

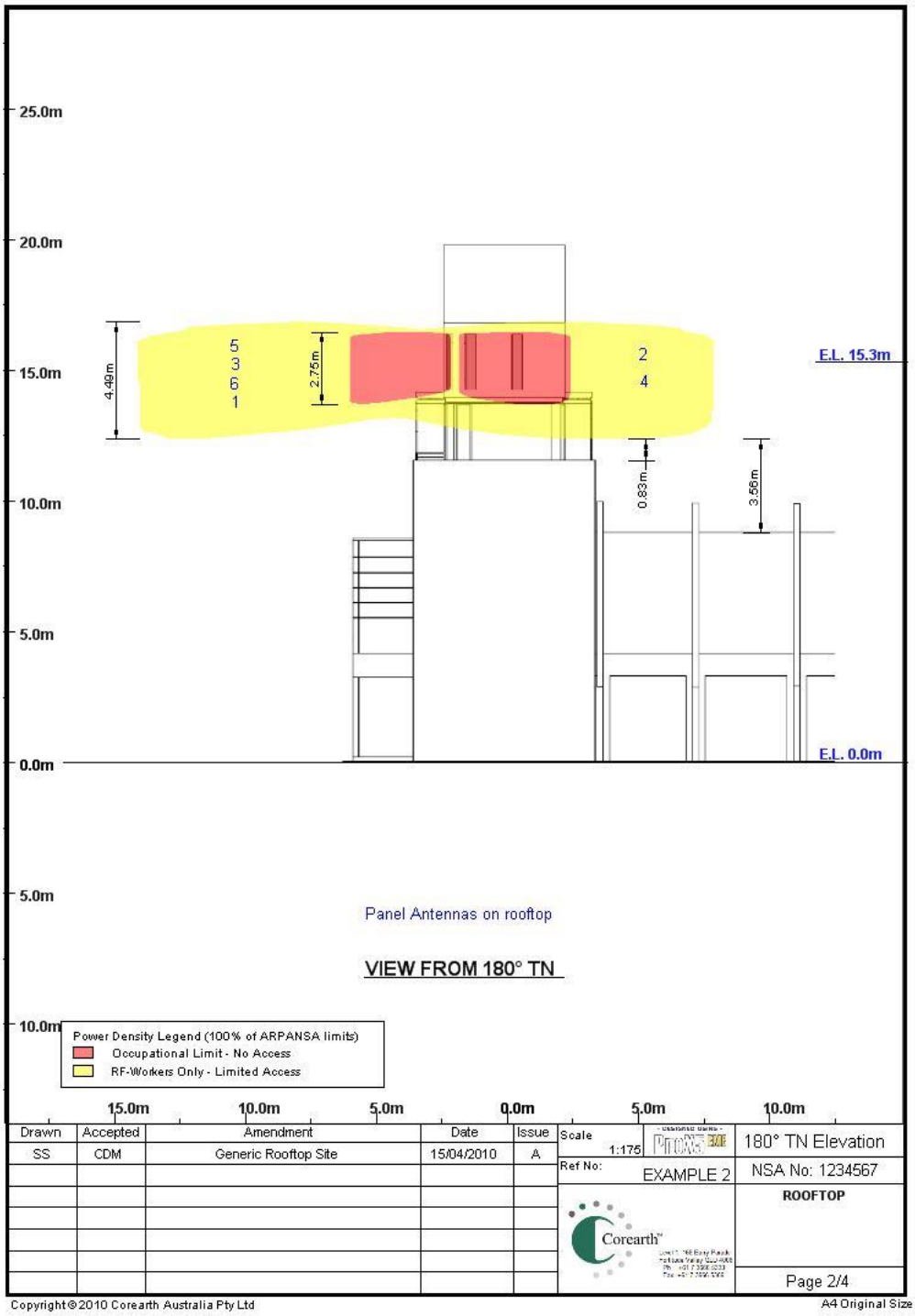

Figure 13 : Typical extent of RF field hazard areas of mobile phone base station on roof of building

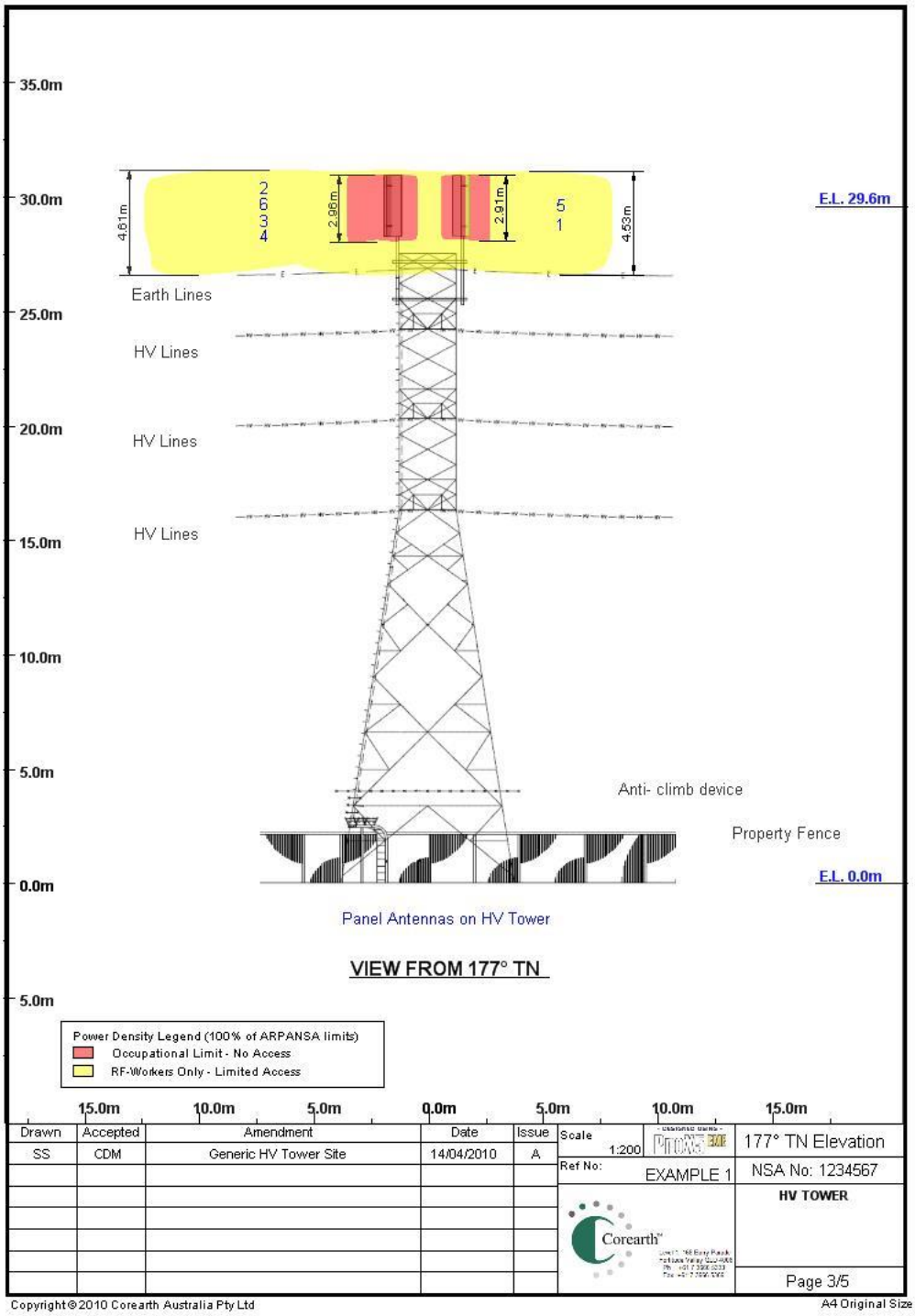

Figure 14: Typical extent of RF field hazard areas of mobile phone base station on electricity tower

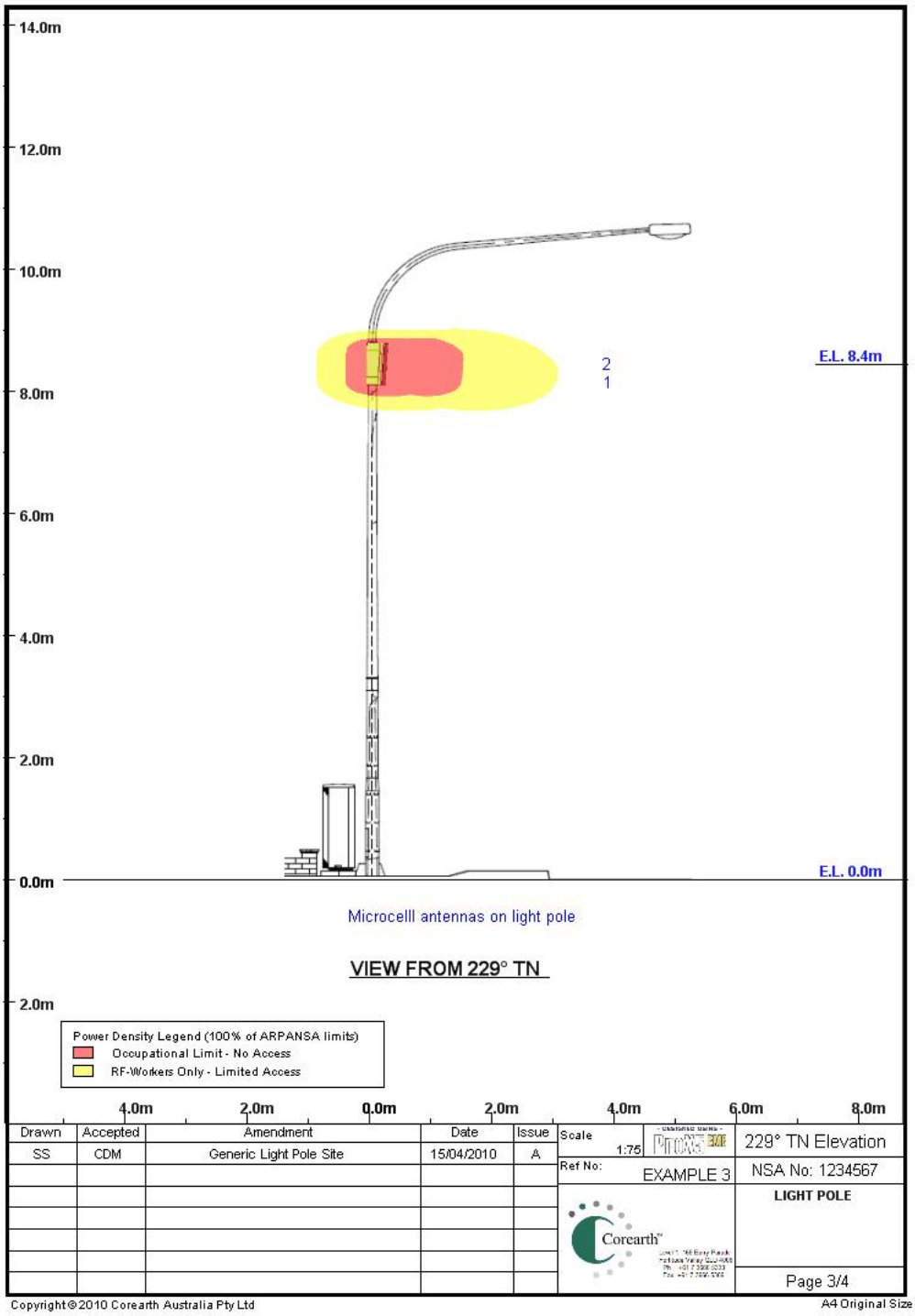

Figure 15: Typical extent of RF field hazard areas of mobile phone base station on light pole

Appendix E – Consultation and notification

For both exempt development and complying development, if the development involves the installation of fixed radiocommunications infrastructure used, intended to be used or capable of being used for public mobile telecommunications services, installation must comply with Industry Code C564:2020 Mobile Phone Base Station Deployment.

Sections 6 and 7 of the Code set out consultation and notification requirements and Appendix C contains a consultation guideline.

Visit http://www.commsalliance.com.au/Documents/all/codes to see a list of all relevant codes.

Development public mobile telecommunications services should be notified as required for development without consent, exempt development and complying development under the Transport and Infrastructure SEPP.

If a DA pathway is chosen, the relevant council notification requirements apply, rather than those in the code.

Appendix F – Regulatory and scientific framework for wireless telecommunications facilities

The Australian Communications and Media Authority

The ACMA is the Commonwealth body that regulates telecommunications and radiocommunications, including industry self-regulation, the radiofrequency spectrum and both fixed line and mobile telecommunications. It licenses Australia's telecommunications carriers.

As previously noted, mobile phone base stations should comply with RPS S-1. In addition, the ACMA's radiofrequency (RF) electromagnetic energy regulatory arrangements aim to limit exposure to EME from radiocommunications transmitters. *Radiocommunications (Electromagnetic Radiation – Human Exposure) Standard 2014* applies to most mobile and portable radiocommunications transmitters with integral antennas operating in the 100 kHz to 300 GHz frequency range.

The Standard sets limits of exposure to RF and EME for the public and workers that provides "protection against all known adverse health effects from RF EME exposure and are set well below the level at which harm may occur."

Communications Alliance Ltd Industry codes

The Communications Alliance Ltd. was established to develop voluntary industry codes of practice and technical standards. View the relevant codes at commsalliance.com.au/Documents/all/codes.

Industry Code C564:2020 Mobile Phone Base Station Deployment, noted earlier, encourages Carriers to apply a precautionary approach to the design, operation and selection of sites for public mobile telecommunications services. Under the Industry Code, Carriers are required to consider 'community sensitive' locations such as schools and hospitals and balance this with other factors, such as coverage objectives and engineering requirements, when deciding on placement for a site.

Australian Radiation Protection and Nuclear Safety Agency

ARPANSA is the Commonwealth body that establishes standards to protect the health and safety of the community, including the RPS S-1. From its examination of current scientific evidence ARPANSA has found no established health effects from low exposure to the RF EME from mobile phone base station antennas.

ARPANSA surveys environmental radiofrequency EME levels from mobile phone base station antennas, as detailed in Appendix C. The most recent, from 2007 to 2013 found measurements were well below the limits in RPS S-1.

Visit www.arpansa.gov.au for more information.

A case between Telstra and d v Hornsby Shire Council[4] in 2006 dealt with the application of the precautionary principle and the use of the RPS S-1 in the case of emission of radiofrequency EME. Telstra proposed a mobile base station in Cheltenham; this was refused by Council. Telstra appealed to the Land & Environment Court of NSW, which upheld the appeal on the basis that ACMA's standards are scientifically proved and robust.

The Court stated that councils should adopt these standards when measuring and determining EME levels, given the ACMA is responsible for ensuring exposure limits do not adversely affect the heath and amenity of the community. The Court felt neither it nor councils should pioneer new standards – rather that it is appropriate for safety standards to be set by authorities with special expertise, such as ARPANSA.

[4] https://nswlr.com.au/view/67-NSWLR-256

Appendix G – Evolution of mobile technology

Mobile phones use radio waves in the same way as other telecommunication devices such as televisions or mobile radios used by emergency services, the army and other broadcasters. The change in technology has not changed physical equipment requirements. A network requires antennas and ancillary equipment mounted at a height determined by terrain and other physical features that may block a signal. However, the size and number of these physical components has evolved; for example 5G requires smaller but larger numbers of equipment as well as upgrades to existing facilities.

First generation

Base stations and mobile phones utilised variable transmission power so that range and cell size could vary. As the system expanded and neared capacity, the ability to reduce transmission power allowed new cells to be added, resulting in more, smaller cells and thus more capacity. First generation mobile phones used analogue transmissions to communicate to base stations.

Second generation

Second generation mobile phones moved from analogue signals to digital transmissions, creating efficiencies that increased mobile phone penetration, data services for SMS (Short Message Service) and limited email. This also meant lower RF EME emissions which responded to growing health concerns. In Australia this was on the GSM (Global System Communications) Standard which is in use in over 80% of the world.

Third generation

Rather than a line being held open for the user's conversations throughout the duration of the call, third generation (3G) networks parcelled data into little packets that were reassembled into the correct order at the receiving end. More data could be sent and more efficiently.

3G handsets could be in contact with more than one base station at a time, improving voice quality and data rates. This allowed for mobile broadband for the first tie and coincided with the evolution of using smartphones for a variety of different services, previously only seen in personal computers and notebooks.

Fourth generation

The fourth generation (4G) network is more flexible, supporting cell sizes from a radius of tens of metres up to 100 km. For lower frequency bands in rural areas, 5 km is the optimal cell size; 30 km offers reasonable performance, and up to 100 km cell sizes support acceptable performance. In city and urban areas, higher frequency bands support high-speed mobile broadband, where the number of users of a particular cell could mean that a cell size may become 1 km or even less.

The increased speeds from Long Term Evolution (LTE) made mobile phones an all-in-one tool that provides the whole range of communication, networking and entertainment.

Fifth generation

The fifth generation provides better speed, latency and capacity. Less network congestion allows for superfast speeds to a greater number of devices than 3G and 4G services. 5G technology is associated with the 'Internet of Things' (IoT), whereby data is collected and utilised by a vast number of internet-connected devices.

5G allows the generation and use of data at greater quantities and greater speeds; from this, the automation, collection and sharing of data offers instant responses. 5G services also offer an alternative in areas where fixed line internet is poor or unavailable, supporting an increase in participation and quality of telecommunication services. Physical componentry has not changed, although smaller in size and larger in number.