

Your response

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Section 2: The quality of mobile connectivity we want to see - What are your views on the use of the Map Your Mobile good performance metric and how should the measure evolve over time? What are your views on the usefulness of: - the 90% figure as a benchmark applicable across geographies and based on crowdsourced data?, and - Whether the 90% benchmark is realistic and sufficiently ambitious?	Confidential? – N
Section 3: Market-led improvements in mobile network quality - What information do customers need about network quality to choose the best network for their needs, and where are the main gaps in current provision of that information? - How well does Map Your Mobile currently meet customer and stakeholder needs, and what specific improvements would make it more useful?	Confidential? – N
Section 4: Connectivity in busy areas What do you think are the biggest barriers to achieving better mobile performance in town and city centres and why?	Confidential? N The biggest driver of bad mobile performance in town and city centres is available capacity and capacity usage, rather than coverage. This tends to be a temporal problem, i.e. the issues tend to appear at certain busy times. While it is the general perception that these issues can only be detected through active network testing, this ap-

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• What do you think should be Ofcom's main priorities for our future work in this area? • What information would stakeholders, especially local authorities / planning authorities find useful for Ofcom to provide further insights on and why?	proach has its limits as performance is highly time-dependent. Network testing device mounted on bin lorries passing these locations at the start or end of the day will not detect these issues. However, a crowdsourcing approach based on collecting all relevant radio parameters (i.e. not just RSRP – but also RSRQ and SNR) can detect where and when network performance is declining (and what to do about it) The issue is exacerbated by the threat to existing capacity and coverage provision through the increase in NTQ's (Notice to Quit) which erode the available coverage and capacity The third factor is the challenges posed by the planning system. The UK planning system is notoriously slow moving and difficult to navigate. What is even more frustrating is the schizophrenia that exists within Local Authorities –the “digital inclusion” side of the house which wants better coverage and capacity while the planning department often seems to make its choices based on aesthetic grounds only and has little understanding of the coverage and capacity needs. This is often further exacerbated by the MNO's approach to obtaining planning permission, which is often not articulating the need for additional coverage/capacity or doing so in a deeply technical way (which is often not understandable for non-specialists). While a lot of the industry focus is on the planning process, We see that a digital twin platform bringing together the information relevant for the different stakeholders resolves a lot of these issues. Such a platform articulates the current coverage and capacity situation, the impact of any changes (NTQ's and new proposed sites) as well as visualise alternative options and the aesthetic and planning considerations. Such a platform needs to be technically credible, but not be understandable by non-specialists. From our experience in the UK and elsewhere, this kind of platform helps bring all stakeholder together, understand the tradeoffs and significantly accelerate the decision making process.

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Section 5: Connectivity in indoor, shared public places • What do you think are the biggest barriers to achieving better mobile performance indoors and why? • What do you think should be Ofcom's main priorities for our future work in this area? • What information would you find useful for Ofcom to provide further insights on in relation to connectivity indoors and why?	Confidential? – N The dominant paradigm for indoor connectivity provision has traditionally been “outside in”. This has come under pressure recently, through the confluence of two factors: the increasing insulation requirements of new builds and retrofits, resulting in lower overall building permeability and the move to higher communication frequencies, resulting in overall shorter ranges and lower building permeability. This means that the coverage paradigm has to shift from “outside in” to “inside in” – i.e connectivity infrastructure needs to be delivered from inside the building. The third factor is the capital constraints of the operators who are pushing the financial responsibility for the deployment of these indoor systems towards the building owners and tenants for all but the busiest and most prestigious locations. While commercial and residential building owners can make a commercial decision as to whether or not to pay for the deployment of an indoor system, other organisations do not have such a luxury. Specifically, organisations such as hospitals for whom mobile connectivity is not a “nice to have” are now forced to pay for their own indoor mobile connectivity. Soon this might extend to festival organisers and large venue owners as part of their responsibilities under “Martyn’s Law”. We believe that Ofcom can play a role in this space by explicitly including coverage inside major public buildings such as hospitals and schools as part of its licensing requirements. It can also work with other agencies to include indoor coverage requirements as part of the building regulations for any new builds.
Section 6: Connectivity on trains • What do you think are the biggest barriers, technical and commercial, to achieving better mobile performance on trains? Which are most significant and why?	Confidential? – Y / N

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• Do you agree with our proposal to work with government to support improvements in train connectivity? • What information would you find useful for Ofcom to provide further insights on in relation to connectivity on trains and why?	
Section 7: Connectivity in rural areas • What do you think are the biggest barriers to achieving better mobile performance in rural locations and why? • What do you think should be Ofcom's main priorities for our future work in rural locations and what outcomes should we aim to achieve? • What solutions (technical, commercial, policy or delivery) could improve rural mobile performance? • What information would you find useful for Ofcom to provide further insights on in relation to rural connectivity and why?	Confidential? N Rural connectivity issues are almost always driven by coverage. And our experience shows that the combination of crowdsourced radio data, combined with our geospatial AI can accurately identify these locations and areas. Interestingly enough, recently the European Commission published a report (https://digital-strategy.ec.europa.eu/en/library/assessment-future-connectivity-needs-precision-farming-adoption) on the connectivity needs of the agricultural sector, with a focus on the needs of precision farming. This report highlighted network notspots and indoor coverage as particular pain points as well as highlighting the need for high-quality, ubiquitous coverage to support the next generation of precision farming. In terms of priorities, we believe that, first of all, an accurate assessment of the size of the problem should be the number one priority. Secondly, alternative operators such as Wavemobile can play a role, as can things like national roaming. D2D satellite connectivity can also play a key role. We would also like to highlight one more issue in this space, relating to new housing developments. These are not necessarily built in rural locations, but typically on the rural-urban fringe, the edge of existing city and towns. Traditionally, connectivity provision in these locations will be basic. However, the deployment of large volumes of brick and concrete, as well as the steep increase in the number of users at any given point in time

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	will lead to significant degradation in connectivity quality. More often than not the problem is eventually addressed retro-actively, i.e. if enough inhabitants complain, operators will look at the problem and propose a new infrastructure location. However, this location will inevitably have some aesthetic impact which will cause additional issues. If connectivity impacts were to be considered as part of the planning and design process of the development, solutions could be designed in from day-one and accommodated aesthetically. We therefore believe there is a role for Ofcom to work with planning authorities and housing developers to create a framework to include mobile connectivity planning as part of the overall planning and development process, rather than an afterthought. We believe that Manchester City and the Greater London Authority have already taken steps in that direction

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