

DISCUSSION PAPER COVERSHEET

Discussion Paper title: Connectivity you can count on: a discussion paper on achieving good, reliable mobile performance

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Name: Keith Sheridan

Ranlytics response to *Connectivity you can count on*

A discussion paper on achieving good, reliable mobile performance

Submitted by Ranlytics UK Limited · 29th July 2026

How we came across this discussion paper

Other: in the course of discussion with Ofcom.

1. Who we are, and why we are responding

Ranlytics is an independent radio frequency measurement, monitoring, and analytics company. We design and build the measurement devices and the software required to process, store, report on, and analyse measurement data; we collect the data; and we run the platform that processes it. We do not sell handsets, spectrum, network equipment or connectivity; we do not offer consulting or implementation services; and we are not owned by anyone who does.

We focus on three related areas:

- CERNO is our on-demand walk and drive testing platform, collecting complete engineering grade measurement and test data, and supported by extensive automation that simplifies, accelerates, and lowers the cost of measuring and mapping mobile coverage and service quality, in-building and outdoors.
- KALLO is our continuous, real-time RF monitoring device that runs unattended at a fixed location for as long as the question requires, measuring all deployed public and private mobile networks, returning extensive radio metrics, and performing scripted voice call and data throughput testing, and returning call statistics, SIP messages, throughput, latency and jitter, RRC events, and full QMDL logs.
- LURA is our fully-automated, zero-touch drive testing device, deployable on fleet vehicles including those operated by postal operators and parcel delivery organisations, repeatedly traversing a high proportion of the road network and collecting complete engineering grade measurement and test data for every public and private network, accurate to 1 metre resolution.

A single analytics platform, RAN-DPS, sits behind all three to process and store the measurement data collected by CERNO, KALLO, and LURA; enabling querying, reporting, mapping and analysis of all data that has ever been collected.

In 2025 Ofcom commissioned a fleet-based coverage and service quality measurement project from us in Northern Ireland, using our LURA devices installed on parcel delivery vehicles collecting continuously as those vehicles ran their ordinary routes. A separate report on that work is in preparation. We refer to the operating model here because it bears on several of the questions Ofcom has asked, particularly those about cost and refresh cadence, but we rely on no result from it in this response.

We are engaged on related measurement questions in other countries, globally; including measurement of all public mobile operators' coverage and service quality in another European country using LURA devices deployed on delivery fleet vehicles.

Three characteristics of how we work matter to a regulator. We hold no commercial stake in any mobile operator or satellite operator anywhere. We do not measure any aspect of network users' interactions with any network, and do not collect any personally-identifiable information whatsoever. Measurements are generated by dedicated and purpose-built measurement instruments, and all measurement data we do collect is stored securely, access-controlled, and handled under the applicable contractual and data-protection framework. And because our equipment is characterised and quality-assured and the method is documented, a third party can repeat the methodology we use, audit the processing chain, and test whether the conclusions sit within the stated measurement uncertainty. Given the complex and continuously-changing nature of mobile network systems, and the built and natural environments in which mobile networks operate, nobody can reproduce the exact radio conditions of a particular day or week, but they can check the way those conditions were measured, and that is the property which makes measurement usable in an adjudication.

Finally, a word about what this response is not. This is not a criticism of crowdsourced measurement, of Ofcom's research suppliers, or of the studies published alongside the discussion paper. The Greater Manchester study and the rail measurement study are both good pieces of work, and we say so with some specificity below. Nor do we suggest that Ofcom's coverage reporting is inaccurate; it does what a prediction-based methodology can do, and does it competently. The difficulty is that the questions now being put to Ofcom, by Parliament, by government, and that are set out in this paper, have outgrown what any prediction-based methodology can answer. That is a mismatch between instrument and question rather than a failure of execution, and it can be closed.

2. Our response in summary

Ofcom's proposed benchmark is sound. The evidence base underneath it is not yet strong enough to carry the weight Ofcom intends to place upon it, and much of the reason is set out in Ofcom's own footnotes.

The proposal defines good performance as at least 5 Mbit/s download, at least 1.5 Mbit/s upload and latency of no more than 50 ms, achieved in at least 90% of measurements. We support the standard and the ambition. Setting a public reference point is the right instinct, and the thresholds are defensible.

The difficulty lies in the words "of measurements". A benchmark expressed as a proportion of crowdsourced measurements has a denominator fixed not by geography, by population or by policy, but by where handsets enabled to collect that data happened to be, are switched on, have the supporting application running, have enabled accurate location tracking of the handset, and are able to attempt a connection. Ofcom says as much at footnote 39, noting that crowdsourced data *"does not capture locations where no coverage is available and connectivity is therefore not possible, meaning overall user experience may be worse than these figures alone suggest"*. Footnote 96 makes the same point about rural areas, where *"there will be large parts of rural areas in which people do not tend to seek to use their mobile devices (or there is no signal at all) and which will not be reflected in the figures"*.

Both statements are correct. Together they mean the benchmark is least able to see the places where the policy problem is worst. We would not go so far as to call 79% a formal upper limit, because time weighting, indoor sampling, handset mix, and the treatment of failed tests could each move a measured figure either way.

The narrower claim is enough: 79% is an observed-attempt score rather than a geography-complete estimate, and because locations at which no connection can be established are absent or under-represented, it is likely to be optimistic relative to a measured geographic denominator.

Three further properties matter for a number Ofcom means to track over years. It is not independently reproducible, since the panel composition and the underlying records are not available to anyone outside. It is not methodologically stable; Ofcom's own crowdsourced reporting has twice stated that its findings are not directly comparable with the preceding edition, once on a change of data supplier, and once on a change of operating-system filtering. And it cannot report the one thing rural policy most needs, which is where there is no usable service at all.

None of which argues for replacing crowdsourced data. Crowdsourcing produces very large volumes of observations across many places and times, at a very low marginal collection cost relative to dedicated field measurement, and Ofcom's Greater Manchester report reaches the sensible conclusion that it works best "as a broad screening tool" with dedicated field measurement providing "the more precise evidence needed to validate those patterns". We agree. Our submission is simply that the validating layer needs to exist at national scale and on a continuous refresh cycle, rather than as a handful of commissioned studies.

The reasons and propositions that follow are developed throughout the rest of this response:

- The first is that the policy direction is already settled. The Statement of Strategic Priorities designated on 27th April 2026, asks Ofcom to *"provide specific coverage and performance data for the UK's road and rail infrastructure in its reporting, considering both measured and crowdsourced data to take a proportionate approach"*, and adds that *"Ofcom should consider working with local authorities, as well as third party organisations to gather this data in a robust manner"*. Government's growth goals attach a Q3 2026/27 milestone to strengthening that evidence base. What we set out below supports an established direction rather than proposing a new one.
- The second is that Ofcom already runs measurement and already publishes it. Ofcom's spectrum assurance vehicles have collected 4G and 5G signal strength on the road network since 2020, released as open data under the Open Government Licence. The principle is therefore settled. What limits the dataset is scale. Ofcom records *"over 12,000 miles"* driven since 2020, collected largely as *"part of the engineers' business as usual duties"*, and states plainly that *"We do not have data for the whole of the UK"*. Neither the method nor the mandate are missing. The extent of coverage, and the frequency of measurement data refresh are. Ofcom has also stated the underlying principle in its own words. Explaining the use cases for that dataset, Ofcom wrote that *"any infrastructure deployment plans that require reliable mobile connectivity from all four main networks at specific point locations should be based on real world measurement data, rather than the much less granular predictive coverage maps that the operators themselves publish"*. The example under discussion was the siting of electric vehicle chargers, and we do not present it as a statement about national mapping. Ofcom is equally clear in the same document that its own measurements are *"taken in a snapshot of time and location and cannot be directly compared to mobile coverage predictions"*. Both statements are right, and together they describe the gap precisely. Ofcom already holds the view that decisions at specific locations need measured evidence, and already knows that a sparse and infrequently refreshed snapshot cannot be set against a prediction. What is missing is not the principle but a dataset dense enough, and refreshed often enough, to bear the comparison.
- The third is that the historical cost impediment that has prevented widescale dedicated measurement has been materially weakened. Dedicated measurement has always been priced as experienced technician-based field work, project by project. The rail study covered 24 lines, roughly a third of the

network, once in each direction, over three weeks, and was carried out by three people riding the trains with test units on board. It is a good study, and it produced granular findings that are not present in Ofcom's existing national reporting. It is also, by design, a single point-in-time snapshot. **Saturation measurement** (defined as the repeated testing of all operators' networks across extensive geographical areas using automated and calibrated measurement devices deployed on both fleet and various off-road vehicles) changes the unit economics, because the vehicle, the driver, the route and the fuel are already paid for, and what is added is an unattended measurement device. Coverage and refresh vary with the geographical area, and the participating vehicles. For a deployment of the kind we would propose here, the design objective is to repeatedly measure coverage on 90% or more of the road network within the measurement area, on a refresh cycle of approximately two weeks, augmented by devices deployed on off-road vehicles such as farming and forestry vehicles. The achievable figure depends on the specific geographies to be included, and on fleet density, and it should be established and independently reported during a pilot rather than taken on our word.

- The fourth is that measurement is already Ofcom's own accuracy standard, and that Ofcom already validates predictions by measurement rather than with crowdsourced data collection. Operators must supply predictions *"that have an average prediction error of between +/-3dB and with the standard deviation of the prediction error of less than 8dB when compared to our drive survey measurements"*. Ofcom records that "our periodic drive testing has showed that these predictions are on average reasonable, but subject to a significant prediction error at a local level". The Connected Nations methodology undertakes to *"continue to monitor, through drive testing, the accuracy of all operators' coverage predictions"*. We propose no new method. The proposal is that Ofcom be able to apply the standard it already uses across a far larger and repeatedly refreshed road sample, rather than only through periodic limited campaigns. Fleet measurement and Ofcom's own drive surveys are the same category of evidence, but they are not automatically interchangeable, and any fleet-sourced dataset used to test the +/-3 dB requirement would need to be normalised against Ofcom's reference installation first.
- The fifth is that other regulators have built the governance for this already. The FCC admits third-party measured data into a formal process that can compel a change to the official national coverage map, subject to a published data specification and certification by a qualified engineer. Arcep has run independent field measurement campaigns every year since 1997. Separately, it audits operators' declared coverage maps by field measurement against a binding reliability threshold, under a specification requiring a minimum of ten measurements per square kilometre. BEREC's common position holds that *"Measurements by drive-testing offer an effective method of testing the accuracy of mobile signal predictions and verifying the availability of mobile services"*. Ofcom would not be experimenting.

3. The strategic policy direction, and the question Ofcom is being asked

We set this out briefly because it should shape the answer, and because it is the strongest argument available to Ofcom internally.

The Statement of Strategic Priorities, designated under section 2A of the Communications Act 2003 on 27th April 2026, asks Ofcom to keep under review *"its definitions of what constitutes 'good' 4G and 5G and the signal strength thresholds it uses to measure this"*; to *"provide timely coverage and performance data sets to consumers"* reported *"on a per Local Authority, combined authority and per constituency basis"*; and to provide *"specific*

coverage and performance data for the UK's road and rail infrastructure in its reporting, considering both measured and crowdsourced data to take a proportionate approach". It then says that "Ofcom should consider working with local authorities, as well as third party organisations to gather this data in a robust manner".

That last sentence is unusual and, we suspect, deliberate. It contemplates evidence gathered outside Ofcom, to a standard that Ofcom sets. We recognise that a Statement of Strategic Priorities is a framework to which Ofcom must have regard rather than a direction to procure anything, and we are not suggesting otherwise.

Alongside it sits a clear account of what is currently being reported. Answering a question in the House of Lords on 6th July 2026 about how operators' coverage claims are verified, the Government said that *"Ofcom models mobile coverage using predicted received signal strength rather than by voice or SMS availability"*. Answering a Commons question on 10th July 2026 about comparing consumer experience against operators' published assurances, the Government said Ofcom's reporting *"is based primarily on coverage predictions from the mobile network operators (MNOs)"*. Asked on 22nd April 2026 whether independent data had been considered, the Government replied that *"Any use of independent data to support the mapping of mobile coverage and performance of mobile networks needs to be done in a robust way; this is something Ofcom are currently exploring"*.

And on 26th March 2025, in a response to a question in the House of Commons on the specific subject of Ofcom's coverage reporting, the Minister of State said: *"I am sure that every Member of the House would agree that Ofcom's reporting of mobile coverage is rather over-optimistic and does not reflect people's lived experience."* He added later that *"the connectivity that people think they are getting from Ofcom is simply not what they are actually getting"*.

We quote that not to make a point at Ofcom's expense, but because it defines the standard against which the eventual answer will be judged. A prediction, however carefully validated, cannot tell a Member of Parliament what the service is on a particular road in a particular week. A crowdsourced index, however large, cannot tell them what the service is where nobody measured it. Both ultimately require measured evidence, and fleet-based collection materially reduces the cost of obtaining it.

4. Five layers, five different questions

A good deal of the difficulty in this debate comes from asking one dataset to answer a question it was never built for. Ofcom should be explicit, in public, about which layer answers which.

Evidence layer	The question it answers well	The question it cannot answer
Operator prediction	Where should a signal be present, everywhere, under specific stated assumptions?	Whether a particular service is actually present, and what grade of service is being delivered, at a given place and time.
Crowdsourced experience	What did a changing sample of real users experience, where their devices generated observations?	What is the service being delivered at individual addresses; and where no observations were generated, which includes every no-service location.
Controlled saturation measurement (repeated testing of all operators' networks)	What level of service quality does each network actually deliver across a defined route or area, under known and	What happens indoors, or how performance varies hour by hour at a fixed point.

Evidence layer	The question it answers well	The question it cannot answer
across extensive geographical areas using automated and calibrated measurement devices deployed on both fleet and various off-road vehicles)	repeatable conditions, accurate to each address?	
Targeted field study	What is happening in a named venue, on a named journey, and at a named problem location?	Whether that finding generalises, or whether it has changed since the point-in-time measurement was made.
Continuous fixed monitoring	Does performance at a critical location hold up over time, what are the root causes of degraded coverage, and is an intervention working?	Anything about the location not being monitored.

Ofcom already uses, commissions or publishes examples of four of these five. The thin one is controlled saturation measurement, and it happens to be the layer that does most of the regulatory work. A tightly scoped field study can also produce a defined geographic denominator and a reproducible result; what saturation measurement adds is the ability to do so at broad geographic scale, at individual address resolution, on a regular refresh cycle.

One small change of language would also do a surprising amount of work. A crowdsourced result reports observed user performance, meaning the share of attempts that passed. A controlled measurement result reports measured geographic reliability, meaning the share of a defined route, area or address set that passed under an auditable method. Both are legitimate; they are not the same number and should not carry the same label. Ofcom's paragraph 2.20 already makes the point carefully. Naming the two quantities differently would stop the distinction being lost the moment somebody else repeats the figure.

5. 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?

We support the metric. Defining good performance as a joint condition across download speed, upload speed, and latency improves considerably on a signal-strength threshold, because it measures what consumers actually care about. Ofcom's own consumer research bears this out; participants did not meaningfully distinguish coverage from performance and defined quality functionally, as "*enabling me to do whatever I need to do whenever I need to do it*". A metric that fails when latency fails, even when throughput passes, is closer to that lived definition than anything Ofcom has published before. The rail study demonstrates the value of the choice, having found latency to be the binding constraint on most journeys even where download and upload passed. Additionally, uplink congestion can be the binding constraint at other times on the same track. The study's peak and off-peak comparison on the Bedford to London route recorded median upload speeds of 0.1 and 0.3 Mbit/s for two operators at peak, against 2.0 and 2.1 Mbit/s for the same two off-peak, which is the difference between failing and passing the 1.5 Mbit/s threshold with the same equipment on the same line. A composite metric that treats upload as a first-class condition will capture that. A signal strength threshold never would.

On how it should evolve, we would suggest the following.

Availability should be counted as a measured outcome rather than treated as missing data, and here it helps to separate three technically distinct cases. A location at which a device cannot register or establish a cellular connection is ordinarily absent from a crowdsourced performance measure altogether, because no performance test can begin, and that gap cannot be closed from within crowdsourced data. A registration failure, a failed data session or an active test that times out is different, being observable, and depending on the collection method it may already be retained. Our recommendation is that all three be explicitly retained and reported wherever the collection method can see them, and to be transparent about the first, which it cannot. Of everything in this response, that is the change we would most like to see.

The components should be published alongside the composite. A composite pass or fail conceals the reason for failure, whereas publishing the pass rate for download, upload and latency separately, with the underlying distributions, tells an operator or a local authority which lever applies.

Where the data supports it, the reason for failure should be reported too. The rail study did exactly this, classifying every failing measurement against legacy radio access technology, no signal, weak signal, poor signal quality, and other causes, and concluding that weak received signal level accounted for between 41% and 55% of classified failures across the four operators. That classification is operationally useful, because the different causes call for different interventions. Failure classification should become a standing feature rather than something one commissioned study happened to do, noting that it requires radio-layer metrics that a simple throughput-and-latency test does not produce.

Voice call metrics should be reported separately. For many people, and in most emergencies, a reliable call is still the thing that matters most, and the answer to the House of Lords on 6th July 2026 identifies the gap clearly: coverage is modelled on predicted received signal strength *"rather than by voice or SMS availability"*. A good performance metric built entirely on data thresholds does not close that gap either.

Finally, confidence should be stated and sample counts published. Ofcom already suppresses district-level reporting below a sample threshold, and footnote 42 of this discussion paper quantifies it: *"Where there are fewer than 100 performance samples from any MNO in a postcode district, we show the postcode area performance in that district for all MNOs."* The rule is sound. It is also, in effect, an acknowledgement that local sample density is thin in precisely the places where a local score would be most useful. In passing, the Map Your Mobile methodology describes the same mechanism without the number, referring only to *"a statistically confident number of results"*, so the threshold is public only because this paper disclosed it. We would encourage Ofcom to state it in the methodology as well. The crowdsourced dataset behind Map Your Mobile comprises around 20 million samples over a rolling twelve month period for the whole United Kingdom. Publishing the sample count alongside the score, and stating plainly where a score has been suppressed and why, would strengthen the metric rather than weaken it. A user who can see that a rural district has been suppressed has learned something important.

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?

Regarding the level, we believe that 90% is about right and we would not argue for more. It stretches from 79% without being unattainable, and Ofcom's international comparison shows leading markets achieving broadly that level. A single national figure, applied uniformly rather than varied by geography, is intelligible and hard to argue with, and it should stay that way. A benchmark that varies by geographic region invites an immediate argument about which category a given location belongs to. The rural gradient in Figure 7.1, from 83% in large

cities to 70.5% in remote rural areas, is more useful as a published finding than it would be as a set of separate targets.

On this basis, we would ask Ofcom to reconsider defining the benchmark exclusively in terms of crowdsourced measurements. Three problems arise, and we set them out as technical matters rather than as criticism of the data or its supplier.

- The first is the moving denominator. A location at which no connection can be established cannot generate an active performance observation at all, which exerts an upward selection pressure relative to a geography in which many measurements were made, and does so most strongly in sparsely populated and poorly served areas. Other panel, device, indoor, and temporal effects may work in either direction, and we do not claim to have quantified the net result. The central point survives all of that: the resulting percentage is not an unbiased measure of geographic serviceability, and Ofcom's own footnotes confirm this. A headline number carrying an acknowledged selection effect of that kind is difficult to defend when challenged, and it is being challenged.
- The second is auditability. A benchmark that will be quoted in Parliament, used by local authorities to build investment cases, and cited by operators in response to complaints ought to be verifiable by somebody other than the organisation that produced it. At present it is not reproducible from outside. We suggest nothing improper. Independent verifiability is simply a property that regulators normally want in a number they intend to hold people to, and it is achievable here at modest cost. The FCC in the United States, we note, chose to build exactly that property into its own challenge process.
- The third is continuity. A benchmark is a time series measurement by definition, and Ofcom proposes to track progress against it for years. Its crowdsourced reporting has twice broken comparability with the preceding edition, once because of a change of data supplier, and once due to a change of operating-system filtering. Neither change was wrong; each improved the analysis. But without an independent, stable methodology producing a consistent reference layer, Ofcom can't separate a change in the network from a change in the panel, the handset mix, or the data supplier.

There is a fourth point about the instrument itself, worth stating because it is not widely understood outside of the mobile coverage measurement community. A benchmark built on consumer handsets inherits the properties of the handset population. Devices differ in antenna performance, in the bands they support, in modem behaviour, in the manner in which they are being used at the time at which they make a measurement, in their location at the time at which they make a measurement (is a handset in a vehicle, or in the hand of a pedestrian, or on a roadside café table when making a measurement), and in the radio metrics their operating systems expose, and they are not calibrated against one another. More importantly, the serving technology, cell, and band that each handset is using at any given time are selected through network-configured priorities, are subject to device capability, and local radio conditions, including load. They are not under the measuring device's control, and they are not chosen to characterise anything. A measurement therefore describes whichever carrier, technology, and band the network had steered that handset onto at the moment at which a measurement is made, which is exactly what you want if the question is what users experience, and not what you want if the question is how a particular band performs across a particular area. Ofcom's own Mobile Matters analysis is confined to Android, and Ofcom explains why: from iOS 15 onwards the operating system restricts the background testing on which that collection depends. For Map Your Mobile, Ofcom has not published the operating-system composition of the panel at all, describing it only as measurements "*collected from real mobile users*" "*across a diverse set of devices*". None of this invalidates crowdsourcing. It explains why a controlled reference layer is needed alongside it.

None of that argues against using crowdsourced data. It argues for having something to compare it against. A dedicated and documented measurement chain per operator, with technology and band recorded continuously and locked where the question requires per-band attribution, produces a picture that a self-selecting handset population cannot.

Our recommendation is therefore an addition rather than a redesign. Maintain the 90% benchmark and keep crowdsourced data as the primary consumer-facing instrument. Add a deterministic reference layer, refreshed on a known cycle, measuring the same three thresholds with calibrated engineering-grade equipment that produces consistent measurement data across the entire fleet of measurement devices. Use it to calibrate the crowdsourced index so the series survives methodological change; to establish what proportion of the road network and of rural working land carries no usable service at all; to report at address-level resolution rather than only area-wide averages; and to give Ofcom an independent, reproducible answer when a specific published figure is disputed.

6. Section 3: market-led improvements and information for customers

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?

Ofcom's own consumer research answers most of this better than we could. Participants wanted two levels of information, a simple statement of which network is best where they are and a deeper layer for the more engaged. They wanted language framed around activities rather than percentages. They found the distinction between performance and coverage technocratic, and several could not interpret the map key.

We would add one gap the research identifies without naming. Several participants said, in different words, that they discounted published information because it did not match their own experience. One said of a provider's own indicator that "*they were telling me everything's fine when everything's not fine*". Ofcom's independence was the reason participants trusted Map Your Mobile once they found it. That trust is an asset with a specific vulnerability, in that it depends on the published figure matching lived experience closely enough that a user does not conclude that the tool is wrong, and can't be trusted. If the published result repeatedly diverges from lived experience, that trust will erode.

The practical gap is therefore not more information. It is information a sceptical user can check and find true, which is an argument for measurement reaching the places where the map is currently most likely to be wrong, and representing coverage and service quality accurately, with a high degree of geographical precision, and updated frequently to reflect the then-current coverage conditions.

How well does Map Your Mobile currently meet customer and stakeholder needs, and what specific improvements would make it more useful?

Map Your Mobile improves substantially on what preceded it, and the move to 50m by 50m prediction squares was worthwhile. Five suggestions follow.

Provenance should be visible at the point of interpretation. Ofcom does explain, in its methodology and supporting guidance, that the coverage layer derives from operator predictions, and the performance layer from crowdsourced observations across a wider postal district. Our point concerns where that explanation sits. A user forms a conclusion at the map and the result panel, not in the methodology note, and the two layers are

different kinds of statement about the world, produced by different parties, with different denominators. Identifying the source of each layer in the interface, with separate toggles, would close the gap without adding complexity for anybody who does not want it.

"No measured data" should be distinguished from "poor service". A consumer looking at a rural postcode cannot easily tell the two apart at present, yet they are different facts with different consequences, and conflating them is what leads a rural user to conclude that the tool is wrong.

Confidence and freshness should be published with every score. Ofcom already knows where its inputs are weak, and stating that improves trust rather than damaging it.

The loop between the prediction layer and measurement should be closed at scale. Ofcom's accuracy requirement on operator predictions is already expressed by reference to its own drive survey measurements, at ± 3 dB average error with a standard deviation below 8 dB, and the Connected Nations methodology undertakes to *"continue to monitor, through drive testing, the accuracy of all operators' coverage predictions"*. Ofcom is also candid in Connected Nations about what a prediction can and cannot do, describing signal strength predictions as *"while generally reasonable for determining average coverage over a wide area"* subject to *"significant uncertainty when trying to determine coverage in a specific location, particularly where the signal strength is low"*. That sentence is, in our view, the most important one Ofcom has published on this subject, because almost every question now being put to Ofcom is a question about a specific location where the signal strength is low. It is worth adding what sits underneath that. Ofcom records in its Connected Nations methodology that *"operators supply predictions to Ofcom based on a 50% confidence level across a pixel"*, and derives its own high and very high confidence levels from that starting point by working back from on-the-ground thresholds and allowing for prediction error, local variability, and handset differences, which it takes together as a combined standard deviation *"in the region of 12 dB"*. That is a transparent and defensible method. It also means that the coverage layer is a balance of probabilities at pixel level, carrying a stated uncertainty of that order, and it is not always read that way by those relying on it. What limits the verification is that it is periodic and, as the House of Commons Library records, *"done mainly on roads"*. Road-based verification is not a design weakness; roads are where a great deal of use occurs and where measurement is practical. Volume and refresh are the weakness. A saturation dataset collected continuously by delivery fleets and off-road vehicles is the same category of evidence as Ofcom's drive surveys, produced at national scale on an approximately two-week data refresh cycle, and once cross-calibrated against Ofcom's own reference it would let the ± 3 dB requirement be tested across far more of the country than periodic campaigns allow.

An annual accuracy statement for the prediction layer is worth considering. If Ofcom could state each year how well operator predictions matched independent measurement, by operator and by geographic area, that single table would do more for the credibility of the tool than any interface change, and it would create a direct commercial incentive for operators to improve their models. Arcep publishes findings of exactly this kind; its most recent verification campaign, based on more than 270,000 measurements taken by an independent contractor, found that three operators' *"very good coverage"* mobile internet maps still contained at least one area where local map reliability fell between 95% and 97%, against a binding threshold of 98%.

7. 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?

We defer to others on planning, which is plainly a real constraint and well evidenced in the paper. The barrier we can speak to is diagnostic.

In dense urban environments a failed session can be caused by insufficient signal, insufficient capacity at that moment, interference, handover behaviour, uplink noise, or the handset itself. Each has an entirely different remedy: a new site, additional spectrum at an existing site, an antenna change, a parameter change, or nothing at all. Crowdsourced throughput and latency data records that the session failed. What it cannot reliably say is which cause was responsible, because it does not carry the radio-layer and protocol evidence needed to separate them and cannot control for the handset.

A second reason this matters more than it used to is physical. As higher-frequency and beamformed layers carry more of the traffic, blockage, street geometry, built and natural environmental factors, antenna patterns, and beam selection can produce sharp local gradients that broad prediction pixels and sparse survey routes will not resolve. Fast fading exists at every cellular frequency, so this is a question of degree rather than of kind, but the degree has changed. A method that reports at intervals substantially longer than the distance over which the measured quantity changes will understate the variation that is actually present. What follows is not that more raw samples are better, but that the reporting resolution and the test route density have to be specified against the frequency layer in question.

None of this is hypothetical. The Greater Manchester study found coverage very high and consistency of quality the limiting factor, with some networks degrading by up to 50 percentage points at peak. A signature of that shape, with received signal level broadly stable and throughput deteriorating at predictable busy periods, is strongly consistent with congestion or another capacity constraint, subject to ruling out backhaul limits, traffic-management policy and test-endpoint effects. A different signature, with received signal level low throughout, points to coverage issues. Separating them requires continuous observation at a fixed point with radio metrics measured, which is exactly what that study's seven-day static installations provided. In our view that was the most valuable methodological choice in the whole study, and Ofcom should treat it as the template rather than as a supporting detail.

There is also a growing problem of evidential fragmentation. Local authorities are already commissioning their own coverage drive test surveys, using different devices, routes, test methodologies, thresholds, and reporting formats. The results cannot easily be compared, combined, or reused by Ofcom, government, or the operators. Left alone, this produces a patchwork that will not sum to a national picture, and it will produce contradictory local figures that undermine confidence in all of them.

What do you think should be Ofcom's main priorities for our future work in this area?

We recommend three things ahead of further one-off surveys.

Publishing a common measurement and reporting specification is the highest-value, lowest-cost action available to Ofcom in this whole area, and it follows directly from the Statement of Strategic Priorities, which asks Ofcom to consider working with local authorities and third-party organisations *"to gather this data in a robust manner"*. A specification would say what is measured, with what class of equipment, at what sampling

density, with what positional accuracy, how no-service is recorded, how results are aggregated, and how they are reported. Ofcom does not have to collect the data in order to control its quality.

A data schema and an ingestion route would let properly collected local data contribute to national reporting rather than sitting in a hundred separate reports. The FCC's challenge process is a working precedent for accepting third-party measurement without lowering the evidentiary bar, requiring a complete description of the methodology, conformance to a published data specification, and certification by a qualified engineer or official.

And continuous monitoring should be preferred to repeat visits wherever capacity is the suspected cause. A week of observation answers questions that a single point-in-time walk test or drive test cannot: how performance varies by hour and by day, whether a problem is chronic or episodic, whether it is worsening, what the possible root causes are, and whether an intervention worked. That last point matters, because Ofcom now carries the primary responsibility for monitoring the Network Commitment given by VodafoneThree, and will be asked repeatedly over the next eight years whether it is being delivered. The commitment itself is expressed in inputs, the number of sites, and the spectrum deployed. The questions that Ofcom will be asked will be about outputs, and specifically whether service in a particular place has improved. Consistent, repeated measurement over the same routes to produce a saturation measurement dataset is what connects the two.

What information would stakeholders, especially local authorities and planning authorities, find useful for Ofcom to provide further insights on and why?

We are not, and do not seek to represent the views of, local or planning authorities. However, we can say that in our experience of working with public bodies, the questions that actually change a decision are narrow and consistent. Where in my area is service worst, by operator, right now? Is that a coverage problem or a capacity problem? Is it getting better or worse? Which specific streets, buildings, and areas should I prioritise? All four require accurately geolocated, per-operator, repeat measurement at a resolution finer than postcode district and preferably at individual address level, together with planning and asset information that can be matched to the measured gaps.

A national layer of accurate, up-to-date, quantitative measurement data collected to a common specification answers all four for every authority at once, and potentially at materially lower aggregate cost than each authority commissioning its own. It also gives every authority something that none of them can produce alone, which is a defensible comparison with the authority next door.

8. Section 5: connectivity in indoor, shared places

What do you think are the biggest barriers to achieving better mobile performance indoors and why?

We agree with Ofcom's analysis, and the Greater Manchester findings on building fabric match what we see in our own work. Two points to add, both about evidence rather than engineering.

Indoor performance is the hardest thing in this field to measure credibly from crowdsourced data, and Ofcom's own annex says so, noting that determining indoor location from crowdsourced records is unreliable because satellite positioning is weak or blocked inside buildings, so a probabilistic classification has to be applied to decide whether a measurement was indoors at all. That is a reasonable approach to a problem that is genuinely difficult for general-purpose crowdsourced data, and also a reason not to build indoor policy on that layer alone.

There is a second effect worth putting as a question rather than an assertion, because the answer depends on the collection software and the operating system. Indoors is where a handset is most likely to be on Wi-Fi rather than on the mobile network, and whether cellular observations continue while Wi-Fi is active, and how they are treated if they do, determines whether the indoor cellular sample is representative at all. Ofcom should put that question to its supplier and publish the answer, because the environment in which most mobile data is consumed is the one where this matters most. Where a venue's performance will be discussed with its landlord, or used to justify investment in dedicated in-building mobile coverage infrastructure, the evidence has to be positionally certain: measured inside the building, at a known point, on a known floor, at a known time.

The second barrier is that there is at present no public Ofcom performance benchmark or repeatable acceptance protocol for connectivity in shared indoor spaces. A landlord told that connectivity in their building is poor can reasonably ask, 'poor against what?'. At present there is no single public Ofcom answer. Ofcom's good performance standard could supply one, applied indoors, at defined points, by a defined method. Were that to exist, a developer could specify it, a tenant could require it, a local authority could ask for it as a planning consideration, and an in-building system could be accepted against it on handover. Establishing an indoor measurement method is, in our view, the highest-value thing Ofcom could do in this area, and it is inexpensive relative to its effect.

BEREC's common position on mobile coverage states that it was "*developed for outdoor coverage of mobile services only*". BEREC's geographical survey guidelines, updated in June 2026, permit indoor coverage to be represented through modelled attenuation classes, but specify no indoor measurement methodology or testing protocol. Individual regulators do test indoors, Arcep's annual campaigns among them. BEREC has not established a common, repeatable indoor performance-measurement and acceptance protocol. The opportunity for Ofcom here is larger than the United Kingdom.

What do you think should be Ofcom's main priorities for our future work in this area?

We recommend that Ofcom publish a repeatable indoor measurement protocol covering floor plans and zones, route completeness, which operators, which bands, which active tests, calibration, and evidence retention. Extend the good performance standard to indoor shared spaces so there is something to specify against. Require paired exterior and interior reference measurement where technically appropriate, so the external macro environment, the building's attenuation and the contribution of any in-building system can be told apart from one another; without that separation a landlord and an operator can each reasonably blame the other and neither can be shown to be wrong. And prioritise continuous monitoring over single visits at venues where capacity is the suspected cause, or where it is important to understand how coverage and service quality vary over time, since a single visit walk test of the site cannot distinguish a bad day from a bad building.

What information would you find useful for Ofcom to provide further insights on in relation to connectivity indoors and why?

We believe that a published, comparable index of connectivity in large shared buildings, produced by a consistent method, would change behaviour quickly. Landlords respond to comparison in a way they do not respond to guidance. Ofcom's own case study of a venue-wide distributed antenna system (DAS), where the three operators hosted on the DAS performed well at peak and the sole operator not hosted did not, is a good example of a finding that is immediately legible to a building owner and immediately actionable.

9. 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?

The measurement study Ofcom commissioned is, in our assessment, one of the most useful and technically revealing pieces of UK rail connectivity evidence published to date, and we would encourage Ofcom to build on it rather than treat it as complete. Its findings are stark and, we think, correct. The best-performing network met the good performance standard on 42% of tests, on-board Wi-Fi met it on 1%, and weak received signal level was the dominant classified cause of failure.

On barriers, the dominant technical one is trackside coverage. The external network is not generally dimensioned around passengers moving along railway corridors, many of which run through rural and other low-demand areas, and signal attenuation caused by the steel train carriage compounds the result. The commercial barrier is that incentives are fragmented. Mobile operators bear the cost of additional trackside infrastructure used by passengers aboard for an hour at a time. Train operating companies procure and operate on-board connectivity under differing arrangements, and Ofcom's own paper notes that they "*generally have to pay for every byte of connectivity that passengers use*", with limited scope to monetise it. Rail rolling stock owners may not capture enough of the passenger benefit to justify vehicle modification without a corresponding contractual or policy incentive. This is a coordination failure of exactly the kind Ofcom identifies in paragraph 3.16, and none of those parties will solve it alone.

We would add a third barrier that the study itself identifies and which we think deserves more weight, namely that the study cannot say how much of the measured impairment is caused by the external network, and how much is caused by the vehicle. It is explicit that no simultaneous external reference measurement was taken, so absolute vehicle penetration loss cannot be derived, and that per-class comparisons should be treated as indicative rather than controlled. Ofcom's own citation of Department for Transport work puts vehicle penetration loss at 3 to 28 dB depending on carriage type, with crowding loss between 0 and 60 dB, the upper end of that range reflecting extreme modelled conditions rather than the typical case. That range is wide enough to determine whether the better intervention is relatively expensive trackside infrastructure or a vehicle modification addressing penetration loss. Until it is measured rather than inferred, investment in rail connectivity is being allocated on an assumption.

This is measurable. A controlled paired-reference campaign, using calibrated interior and external measurement chains matched by time, serving cell, band and antenna characteristics, would accurately quantify penetration loss by rolling stock class and by loading. It would require rolling stock access, approved antenna installation and careful calibration, so it is not trivial, but it is well within reach. It was not done in the Ofcom study, and we have not identified a publicly available UK dataset built from matched simultaneous interior and exterior measurement across rolling stock classes; there may of course be proprietary or academic work that we have not found.

Do you agree with our proposal to work with government to support improvements in train connectivity?

Yes, without qualification. Ofcom should take the evidence role explicitly. It is independent of the mobile operators, the rail operators, Network Rail, and the solution suppliers, and it already holds the reporting role and the standard against which performance would be judged, which together make it the natural owner of the evidence question.

What information would you find useful for Ofcom to provide further insights on in relation to connectivity on trains and why?

We identify three things, in prioritised order.

The first is to move from measuring coverage manually on attended journeys to the use of measurement devices installed on in-service trains that operate automatically and without manual intervention to continuously measure coverage of all mobile operator/technology/band combinations on all rail routes, producing accurate coverage and service quality maps for all rail routes that are refreshed frequently.

The study undertaken by Ofcom covered 24 lines, approximately 33% of the rail network, measured once in each direction, over three weeks between 18th February and 10th March 2026, by three people riding the trains. Ofcom candidly notes that results *"may not be fully representative of connectivity patterns across different seasons, weather conditions or times of year"*, and that passenger loading, rolling stock and weather could not be controlled. Those are the right caveats, honestly made. They also mean that the study cannot answer the question everyone will ask next, which is whether things are getting better. A further pass would not fix that. What is needed is continuous measurement using unattended, automated measuring devices installed on in-service trains. We deploy exactly this model on road fleets and it transfers directly to rail, with the device installed in the vehicle, collecting on every service, and requiring no human intervention. Once installed, the marginal cost of repeated measurement across a train's normal operating diagram is substantially lower than repeated attended surveys, which is what makes measuring the remaining two-thirds of the network viable.

Unattended installation also addresses a limitation that the study reports with commendable frankness. Positional accuracy varied so much between rolling stock classes that fixed-distance segmentation had to be abandoned; only 65 per cent of journeys achieved greater than 90 per cent of GPS samples meeting a 200-metre accuracy threshold at the 2-kilometre level. Station-to-station segmentation was the correct fallback and the report explains why, but it means that on affected services the study cannot say where on a line the problem is, only which segment it occurs on. For a national reporting system that is a significant constraint, because the whole value of the exercise is knowing which stretch of track to remediate. Our installed fleet units use an externally mounted GPS antenna with dead-reckoning support and deliver metre-class positioning, and sub-metre in favourable open-sky conditions, which would materially improve on a handset receiver inside a metal carriage. Tunnels, cuttings and obstructed environments would still require map matching or interpolation, and no instrument removes that. Positional accuracy is in any event better reported as a distribution with a stated confidence and availability than as a single universal figure, and a specification should ask for it that way. Positional accuracy belongs in any measurement specification as an explicit requirement, because it silently determines whether a dataset can support a local conclusion or only a regionalised one, and it is the parameter that is most easily lost when measurement is undertaken using consumer handsets.

The second is to publish measured vehicle penetration loss by rolling stock class. That single dataset would let the Department for Transport, Network Rail, and the rail operators choose between trackside investment and vehicle modification on evidence, and would inform rolling stock procurement specifications for decades.

The third is to distinguish the causes of Wi-Fi failure. The study's treatment of throttling is careful, because the train operating companies' policies were not available to the researchers and data limits were confirmed removed for only one operator's services. Ofcom is better placed than a research supplier to obtain that information. If a meaningful part of the 1% figure is commercial policy rather than technical limitation, that is a materially different problem and should be named as such.

10. Section 7: connectivity in rural areas

What do you think are the biggest barriers to achieving better mobile performance in rural locations and why?

The economic barrier is well understood, and Ofcom sets it out correctly in paragraphs 7.10 and 7.11.

The barrier that we would like to highlight to Ofcom is different, and it is the reason we are responding at all. In rural areas, Ofcom does not currently have a measurement method capable of describing the problem that it is trying to solve.

That follows directly from Ofcom's own footnote 96, which acknowledges that *"there will be large parts of rural areas in which people do not tend to seek to use their mobile devices (or there is no signal at all) and which will not be reflected in the figures"*. The rural performance score of 70.5% in remote rural areas is therefore not a measure of how good service is in remote rural areas. Rather, it measures how good service is at the subset of remote rural locations where somebody with a consented handset (a handset on which the user has granted permission for the crowdsourced data collection application to run in the background, and for the accurate location of the handset to be tracked) was present and able to connect. Locations generating no measurements are not a random sample, and they will include many of the worst-served places; they may equally reflect low population, absence of panel participation, or Wi-Fi use. Crowdsourced data cannot on its own differentiate absence of service from absence of an observing device, which is precisely why a second evidence layer is needed.

A second and related problem is that an area percentage says nothing about continuity. A rural route can be nominally covered across a high proportion of its length and still contain repeated short gaps that make a call, a navigation session, a card payment, or an emergency communication unreliable. Continuity can only be measured by traversing the route, and it is the metric closest to what a rural resident actually experiences.

This is not an abstract concern. The Committee of Public Accounts found in May 2024 that *"the mobile coverage levels published by Ofcom do not always reflect the consumer experience"*, recorded that the Department *"acknowledged that people's experience of mobile coverage may be worse than what is reported by Ofcom"*, and recommended urgent action *"to ensure that it has meaningful data on mobile coverage that reflects people's actual experience"*. In the House of Commons on 12th February 2026, a Member cited Ofcom's figure that 1.45% of geographical areas lacked good voice capability against a measurement exercise by the River Severn Partnership finding that 15.33% of postcodes actually lacked good voice call quality, and observed that *"it is no good telling people that their service is good when their own phone is telling them that it not"*. In January 2026 the Government stated that it *"recognises that there are discrepancies in some cases between peoples' lived experience and the level of coverage that Ofcom reports should be available"*. The gap between reported and experienced coverage is now an increasingly prominent theme, and it is a measurement problem before it is a network problem.

There is also a category of rural connectivity that neither road-based collection nor opportunistic consumer handset-based crowdsourcing measures systematically, which is the working land beyond the road. In June 2026 we measured mobile serviceability across a 3.4 square kilometre agricultural research facility in Victoria, Australia, on all three national networks, using engineering-grade equipment mounted on a farm vehicle. Between 69% and 89% of the area, depending on the operator, had no usable coverage against the -115 dBm criterion the Australian Government's national audit treats as the floor for fair outdoor coverage. Average received signal power across the three networks ranged from -119.2 to -113.6 dBm, below that floor for two operators and about 1.4 dB above it for the third, and those averages exclude the substantial areas where no

signal was detectable at all. The crowdsourced layer of that same national audit showed the site to be fully served with adequate coverage.

We offer that not as a comment on Australia but because the same sampling risk arises in agricultural and working landscapes in Shropshire, Cumbria, Fermanagh, and elsewhere. Where agricultural, forestry, utility, and emergency workers actually spend their days is systematically under-represented in the national datasets Ofcom presently publishes, and it is precisely where connectivity has safety consequences.

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?

Establishing the true rural denominator comes before everything else. Ofcom should be able to state, on measured evidence, what proportion of the rural road network and of rural working land carries no usable service from any operator. That number does not currently exist. Parliament is asking for that number, whether or not the question is phrased that way, and it cannot be derived from crowdsourced data.

Measurement then has to reach where people are not, as well as where they are. This is the structural argument for fleet-based saturation measurement and it is easy to overstate, so we will put it carefully. Postal and logistics fleets repeatedly traverse a high proportion of the address-serving road network, including rural roads, on repeating routes, every working day. Their routes are of course correlated with population and address density, as any road network is. The point is a different one: those routes are determined by an obligation to deliver, not by where mobile service happens to work. That makes their sampling far less shaped by network quality than handset-generated observations, which are produced only where a device was present and able to connect. Instrumenting them attenuates the sampling bias at source rather than correcting for it afterwards.

Beyond the road, the same requirement applies, and here there is a methodological point we would ask Ofcom to consider when it drafts any specification. Measuring a rural A road and measuring a hill farm, a forestry track, a moorland search area, or an inshore fishing ground has to produce a single consistent measurement dataset. Where on-road and off-road measurement use different equipment or installations or measurement methodologies, the resulting differences in measurement data produced cannot be interpreted with confidence unless those instrument and installation effects have first been characterised and accounted for through cross-calibration and uncertainty analysis. Without that, the picture cannot support a statement about how much worse the working land is than the road that serves it, and that statement is the one that rural policy actually needs.

The way to secure it is to specify the measurement standard rather than the equipment: common metrics, equipment characterisation, and cross-calibration requirements, controlled installation rules and operating methodologies, uncertainty reporting, and cross-platform validation. Using a single, calibrated measurement device across on-road and off-road platforms simplifies this considerably, and ours are automated and need no manual intervention, so they fit agricultural, forestry, utility, emergency services, and maritime vehicles as readily as post and delivery vans. But equivalent equipment should be admissible wherever cross-calibration shows it produces results within the required uncertainty. We recommend that Ofcom should publish a common evidential standard for this type of measurement.

Route continuity should be published, not only area coverage.

And the outcome should be set in terms of places rather than proportions. A national percentage is a poor instrument for a rural program, because rural failure is spatially concentrated. What we would suggest Ofcom aim for is that every rural not-spot of material size is identified, located, published, and tracked until it closes.

What solutions (technical, commercial, policy or delivery) could improve rural mobile performance?

Ofcom lists the main candidates at paragraph 7.18 and we agree with the list. We make three observations.

On shared and neutral-host approaches, measurement evidence supports the case more strongly than commercial argument alone can. Where we measure all networks at a rural location and find that every operator fails there in the same way, that is hard evidence that the gap is structural rather than a consequence of any one operator's investment choices, and it strengthens the case for a shared or publicly supported intervention over an operator-specific remedy. Conversely, the Greater Manchester study found that in 59% of weak-signal locations on the transport routes tested, at least one other operator had at least a fair signal. Those two findings point to different remedies, and only per-operator measurement can tell one situation from the other. Measured evidence should be used to sort rural gaps into those two categories before deciding which policy lever applies.

On verification of existing interventions, the Shared Rural Network is reaching the point where its delivered outcome, rather than its site count, is the relevant question. A repeatable independent measurement program is the natural instrument for answering it, and for answering the same question about the Network Commitment following the Vodafone/Three merger. Independent before-and-after measurement undertaken based on the same specification is the most direct way to demonstrate that public and private investment produced the intended user outcome.

On satellite direct-to-device (D2D), we would endorse Ofcom's cautious framing in paragraph 7.13, and add one narrow point, being precise about what the terrestrial coverage boundary does and does not do under Ofcom's framework. It does not gate transmission; D2D is authorised across the United Kingdom within the host operator's licensed spectrum, subject to power flux density limits, a ten-degree minimum elevation angle, non-interference and non-protection status, and cross-border coordination. What the boundary bears on is where D2D delivers value, how the host operator manages service and device behaviour at the fringe, and how any composite coverage claim is substantiated to consumers and to Ofcom. The licence variation schedule obliges operators to supply coverage maps showing predicted power flux density at 100 metre resolution, together with predicted aggregate PFD and predicted unwanted emissions outside service areas. Those are prediction-based obligations with no measured verification attached. The FCC reached the opposite conclusion on the equivalent question, holding in its supplemental coverage from space order that, "*given the nature of SCS*", the out-of-band emission limits "*should be measured and enforced on the ground*". We raise it only because it is the same structural pattern this response is about. A measured terrestrial baseline would serve the rural coverage objective directly, and could be combined with satellite power flux density and emissions measurement when investigating adjacent channel interference or attributing a change in terrestrial performance; terrestrial measurement alone does not characterise a satellite emission and we would not suggest otherwise. We have engaged with Ofcom separately on this and will not develop it further here.

What information would you find useful for Ofcom to provide further insights on in relation to rural connectivity and why?

A published, measured, per-operator, per-band rural coverage dataset with a repeated refresh cycle, at a resolution finer than postcode district and preferably individual address-level, reporting route continuity and showing explicitly what level of service quality is delivered by each operator at each location, and where there is no service at all. That single asset would serve consumers, local authorities, operators, government, and

Ofcom's own enforcement work, and it would let Ofcom answer a parliamentary question about any given place with evidence rather than with a model.

11. What this looks like elsewhere

We set out three precedents briefly, because each answers an objection Ofcom is likely to face internally.

The first concerns what happens when a regulator independently tests the maps it has been given, and the FCC's Mobility Fund Phase II investigation is one of the clearest large-scale validation exercises this field has produced. In connection with the Mobility Fund Phase II proceeding, FCC staff conducted nearly 10,000 miles of their own drive testing against coverage maps that the operators had submitted. The staff report, released on 4th December 2019, concluded that *"the MF-II coverage maps submitted by Verizon, U.S. Cellular, and T-Mobile likely overstated each provider's actual coverage and did not reflect on-the-ground performance in many instances"*, and recorded that only 62.3% of staff drive tests achieved even the minimum download speed the maps predicted. The FCC suspended the challenge process pending the investigation. We draw no inference from that about UK operators, whose networks and obligations are different. The methodological point is the one that is relevant: the discrepancy was invisible until somebody measured, and a finite, targeted campaign was enough to expose it.

The second concerns how third-party measurement can be admitted without lowering the bar, and the FCC's current rules are the working model. Under 47 CFR, Section 1.7006, state, local and Tribal governments, and other third parties, may challenge the accuracy of mobile coverage maps using measurement data that they collect themselves. The rule expressly permits it, providing that challengers *"may use their own software and hardware to collect data for the challenge process"*. The safeguards are procedural rather than restrictive. A challenger must supply *"a complete description of the methodology(ies) used to collect their data"*; must *"substantiate their data through the certification of a qualified engineer or official"*; must conform to a published data specification, under which any test lacking required values *"will be excluded from further analysis"*; and must satisfy geographic, temporal, and volume thresholds before a challenge can be submitted. Where a challenge succeeds or is conceded, the provider has 30 days to update its data, so the challenged area shows on the national map as lacking sufficient service. Independence and rigour are both observed with this process. A published specification plus engineer certification is what makes third-party data admissible.

The third concerns the scale and specification of a verification program, and Arcep is the most developed example. Arcep has run annual mobile quality of service measurement campaigns since 1997, procured from independent contractors, most recently based on more than a million measurements taken between June and August 2025 across every metropolitan department, evaluating voice, SMS, and mobile internet quality indoors and outdoors and on transport routes, covering roads, metro, and suburban, regional, and high-speed rail, in dense, intermediate, and rural zones. Separately, and more relevantly here, Arcep audits operators' declared coverage maps by field measurement under a binding decision. The reliability threshold is 98% for analysis zones above 1,000 km² and 95% for zones above 100 km², reliability being the ratio of measurements in a zone declared covered where the network was actually accessible, and the specification requires *"au minimum 10 mesures / km²"* within the survey perimeter. Arcep's most recent verification, based on more than 270,000 measurements by an independent contractor, found three operators' 'very good coverage' mobile internet maps still contained zones falling between 95% and 97%, and 26 maps below threshold for all operators in several zones. Arcep's verification process, comprising measurement, exchanges with the operators, and publication of the findings, led to corrections of the declared maps. That is a working model of a regulator holding declared

coverage to a measured standard, and the per-square-kilometre density figure is a more useful design parameter than any headline total.

On the method itself, BEREC's *Common Position on information to consumers on mobile coverage*, adopted on 6th December 2018 and built on a survey of 33 European national regulators, states that "NRAs should verify the reliability of mobile coverage information using, where appropriate, field measurements", and that "Measurements by drive-testing offer an effective method of testing the accuracy of mobile signal predictions and verifying the availability of mobile services". It notes that signal predictions "are a statistical representation of the coverage achieved in practice" and that radio signal level and quality "do not guarantee that a mobile user can effectively access and use mobile services". Ofcom's own entry in that document records that "Ofcom uses drive testing to establish confidence in the MNO supplied coverage predictions".

12. A proportionate implementation pathway

It would be unhelpful to argue for a stronger evidence base without also addressing what it would cost and how it could be phased. This section does that. We suggest four stages, each producing a decision, none requiring the next to be committed in advance.

Stage one, the specification. Ofcom publishes a common controlled-measurement specification and data schema covering measurement equipment class, sampling density, positional accuracy, per-operator and per-band treatment, how no service and registration failure are recorded, aggregation rules, confidence and data freshness reporting, and audit requirements. Doing so would be comparatively inexpensive, would help give practical effect to the Statement of Strategic Priorities' emphasis on gathering evidence with local authorities and third parties "in a robust manner", and would immediately make the measurement work already being commissioned across the country comparable and reusable.

We would make one technical request regarding that specification, and it matters more than it sounds. It should keep five quantities separate, because they are routinely conflated and they are not the same thing: (1) the raw logging rate of the instrument, (2) the spatial aggregation interval or grid size used for reporting, (3) the proportion of the target route or area actually being measured, (4) the number of independent repeat passes, and (5) the interval between refreshes.

A high raw logging rate is valuable for resolving mobility events, short-duration failures, and the protocol behaviour around them, and our own instruments log at an average of 50 samples per second for that reason. But adjacent samples at that rate are heavily correlated and should never be counted as independent geographic evidence; a specification that rewarded raw sample totals would reward the wrong thing and would be easy to game. What Ofcom should define instead is the maximum aggregation length or grid size appropriate to each use case, the proportion of the road network to be measured, the repeat-pass requirement, the positional uncertainty permitted, and the refresh interval. As higher-frequency and beamformed layers carry more of the traffic, local blockage, street geometry, the natural environment (which is subject to seasonal change), and beam selection create sharper spatial gradients, which makes that aggregation discipline more important rather than less. Arcep's requirement of a minimum of ten measurements per square kilometre within a survey perimeter is a useful governance precedent for the proportion of an area in which measurements are made, and should be read as a survey-density rule rather than anything to do with logging frequency.

Stage two, a multi-region, multi-environment pilot. Urban, rural, road, indoor, and rail, across more than one geographical area, using at least two independent collection methods so the specification itself is tested rather than a single supplier's implementation. The output is evidence on cost per unit of coverage, completeness, repeatability, and incremental value over the existing layers.

Stage three, fleet-scale deployment. Operational fleets covering both on-road and off-road, on a scheduled refresh basis, producing a measured national layer that becomes the foundation of 'Map Your Mobile' and Connected Nations and can be republished to local authorities.

A comment about how a stage like this can be funded, since Ofcom's budget is capped and a national measurement program has to compete with Ofcom's many other priorities. It need not be funded solely from Ofcom's core budget, nor procured as a capital-equipment program. Funding could be coordinated across central government, the devolved administrations, local and combined authorities, transport bodies, and existing connectivity program, or the layer could be procured as a managed subscription service rather than purchased outright. Any such model would need clear provisions on ownership, regulator access, publication, reuse, operator challenge rights, and supplier independence, and we would expect Ofcom to be specific about all six. The point is that an operating model built on fleets already operating creates funding options that conventional attended drive testing does not.

Stage four, continuous assurance. Implement fixed monitoring at critical venues, transport interchanges, and known marginal locations, so Ofcom has temporal reliability and early warning rather than periodic snapshots.

We make two points regarding governance. Operators should have access to the methodology and a fair opportunity to identify factual or processing errors, but should not be able to prevent publication of independently collected results. And Ofcom should retain evidence in sufficient detail to reproduce its own published conclusions, which is what makes the eventual number defensible when it is challenged.

We would be prepared to support a bounded, non-exclusive technical demonstration for a defined area of the United Kingdom, without prejudice to any future procurement process, so that the specification in stage one can be considered against real data rather than against description alone.

13. Closing

We have tried to make this response useful rather than promotional, and to anchor every load-bearing claim either in Ofcom's own published documents, in the public record, or in measurement we have carried out ourselves. Where we disagree with the paper, the disagreements are limited. The benchmark is right; the instrument beneath it is not yet sufficient to carry the load that Ofcom intends to place on it. The remainder of our response follows from that single point.

We would like to make one final observation. Ofcom already collects and publishes measured mobile signal strength data gathered by its own spectrum assurance vehicles, under the Open Government Licence, and has done since 2020. The principle that a regulator should hold independent measured evidence is therefore not in dispute; Ofcom settled it years ago. What has limited that dataset is that collection happens as "*part of the engineers' business as usual duties*", which has produced "*over 12,000 miles*" by the time Ofcom last published a cumulative figure in July 2022, across England, Scotland and Wales, with Ofcom noting candidly that "*We do not have data for the whole of the UK*". The method was never the constraint. The constraint was that measurement had to compete for an engineer and a vehicle.

That is what has changed. Measurement collected by unattended measurement devices deployed on vehicle fleets already operating, for reasons that have nothing to do with measurement, is not a scaled-up version of the old model. It is a different cost structure, and it is what makes a national, continuously refreshed, independently auditable evidence layer materially more affordable than conventional attended measurement methods.

Ofcom has been asked to strengthen the data and evidence on mobile coverage and quality of service by the third quarter of 2026/27, and to set out plans that include "*use of crowdsourced and measured data*". We think that that is the right direction, and we would welcome the opportunity to contribute to it.

We are content for this response to be published in full, and would be glad to discuss any part of it with Ofcom colleagues, including at a technical level.

[REDACTED]

Annex A: sources relied on in this response

Ofcom

- Ofcom, *Connectivity you can count on: a discussion paper on achieving good, reliable mobile performance*, 3 June 2026. Footnote 39; footnote 96; Figure 2.1; Figure 7.1; paragraphs 2.10, 2.12, 2.20, 2.23 and footnote 42, 3.16, 7.10, 7.11, 7.13, 7.18.
- Ofcom, *Map Your Mobile: methodology for performance and coverage thresholds*, 2025. Requirement that MNO predictions have "an average prediction error of between +/-3dB and with the standard deviation of the prediction error of less than 8dB when compared to our drive survey measurements"; "our periodic drive testing has showed that these predictions are on average reasonable, but subject to a significant prediction error at a local level"; approximately 20 million crowdsourced samples over a rolling twelve months; 50m by 50m prediction squares.
- Ofcom, *Connected Nations UK Report 2024*: signal strength predictions are "while generally reasonable for determining average coverage over a wide area" subject to "significant uncertainty when trying to determine coverage in a specific location, particularly where the signal strength is low"; and the stated intention to "use measured data, including crowdsource data, to build on the coverage predictions".
- Ofcom, *Connected Nations methodology annexes 2023 (A1.57), 2024 (A1.67) and 2025 (paragraph 61)*: "operators supply predictions to Ofcom based on a 50% confidence level across a pixel", and the derivation of high and very high confidence levels using a combined standard deviation "in the region of 12 dB". Connected Nations 2025 methodology annex: "We will continue to monitor, through drive testing, the accuracy of all operators' coverage predictions."
- Ofcom, *Mobile signal strength measurement data from our spectrum assurance vehicles*, open data under the Open Government Licence v3, first released November 2021, page updated 6 March 2026, datasets 2020 to 2025. Methodology document, 23 November 2021: "The data collection consists of two components: 1) part of the engineers' business as usual duties (BAU); and 2) focus testing where the engineers are tasked to drive specific routes." Explanation and use cases document, 6 July 2022: "Since 2020, our engineers have driven over 12,000 miles"; "We do not have data for the whole of the UK"; paragraph 3.5, "any infrastructure deployment plans that require reliable mobile connectivity from all four main networks at specific point locations should be based on real world measurement data, rather than the much less granular predictive coverage maps that the operators themselves publish"; "The signal measurements are taken in a snapshot of time and location and cannot be directly compared to mobile coverage predictions provided by the MNOs."
- Ofcom, *Plan of Work 2026/27*, statement, 20 March 2026.
- Ofcom, sample Direct to Device licence variation schedule, 9 December 2025: predicted power flux density coverage maps at 100 metre resolution; aggregate PFD limits; 10 degree minimum elevation angle.
- Research published for Ofcom and the Greater Manchester Combined Authority alongside the discussion paper, *Beyond Coverage: Mobile Connectivity in Greater Manchester*, and technical annex, June 2026.
- Research published for Ofcom alongside the discussion paper, *Connectivity on Trains Measurement Study* and line-by-line annex, June 2026. 50 journeys across 24 rail lines, approximately 33% of the total rail network, 18 February to 10 March 2026; good performance pass rates of 42%, 21%, 20% and 17% by operator and 1% for on-board Wi-Fi; failure classification; "Only 65 percent of journeys achieved greater than 90 percent of GPS samples meeting a 200-metre accuracy threshold at the 2-kilometre level"; statement that no external reference measurements were taken and absolute vehicle penetration loss cannot be derived.
- Qualitative consumer research published for Ofcom alongside the discussion paper, *Consumer experiences and understanding of mobile network quality*, fieldwork 21 October to 14 November 2025.
- Ofcom, *Mobile Matters*, 2023, 2024 and 2025 editions. The 2024 edition states that tests run on Apple iOS devices and devices where the operating system was not identified were excluded; the 2025 edition

explains that from iOS 15 onwards the operating system restricts the background testing on which that collection depends.

- Ofcom, *Map Your Mobile coverage checker: methodology*, August 2025: performance scores shown for a postcode district only where all four MNOs have "a statistically confident number of results collected across a diverse set of devices".

Government and Parliament

- Department for Science, Innovation and Technology, *Statement of Strategic Priorities for telecommunications, the management of radio spectrum and postal services*, designated under section 2A of the Communications Act 2003 on 27 April 2026, laid in draft 11 February 2026. Section 1b.
- *Ofcom growth goals: 2026 to 2027*, and the accompanying letter from the Secretary of State for Science, Innovation and Technology to the Chair of Ofcom, published 11 June 2026.
- Committee of Public Accounts, *Supporting mobile connectivity*, Thirty-Fifth Report of Session 2023-24, HC 650, 28 May 2024. Paragraph 19 and Recommendation 4.
- House of Commons Library, *Rural mobile coverage in the UK: Not-spots and partial not-spots*, CBP 7069, updated 22 December 2025.
- House of Commons, oral questions, *Mobile Coverage: Ofcom Reporting*, 26 March 2025.
- House of Commons, *Rural Mobile Connectivity*, Commons Chamber debate, 12 February 2026.
- Written questions 1590 (answered 30 July 2024), 107258 (answered 28 January 2026), 127284 (answered 22 April 2026), HL1214 (answered 6 July 2026) and 15254 (answered 10 July 2026).
- Department for Transport, *Mobile Connectivity in rolling stock: radio frequency attenuation characteristics*, 2021.

International

- Federal Communications Commission, *Mobility Fund Phase II Coverage Maps Investigation Staff Report*, released 4 December 2019.
- Federal Communications Commission, 47 CFR § 1.7006, mobile broadband availability challenge process, and the FCC Broadband Data Collection bulk mobile challenge process documentation.
- Federal Communications Commission, *Single Network Future: Supplemental Coverage from Space; Space Innovation*, Report and Order and Further Notice of Proposed Rulemaking, FCC 24-28, GN Docket No. 23-65 and IB Docket No. 22-271, released 15 March 2024. Paragraph 52: "we find that both OOB limits are warranted, and given the nature of SCS, that these limits should be measured and enforced on the ground."
- Arcep, *La qualité de service mobile* and *La couverture mobile*; décision n° 2016-1678 as amended by décision n° 2020-0376 of 31 March 2020, annexe 4, protocole de vérification; verification campaign results published 8 July 2025; annual quality of service campaign results published 20 November 2025.
- BEREC, *Common Position on information to consumers on mobile coverage*, BoR (18) 237, adopted 6 December 2018; and *Guidelines on Geographical surveys of network deployments (Version 2.0)*, BoR (26) 73, adopted 2 June 2026.
- FarrPoint, *Recommendations on a new reporting standard for mobile coverage*, prepared for the Canadian Radio-television and Telecommunications Commission, April 2025.

Ranlytics measurement

- Australian Government Department of Infrastructure, Transport, Regional Development, Communications and the Arts, *National Audit of Mobile Coverage*, methodology fact sheet, October 2025, and the published audit map layer.
- Fleet-based saturation measurement in Northern Ireland commissioned by Ofcom, 2025. Report in preparation.