



England's Connected Heartland (ECH)
5G Innovation Region:
5G Railway Project

Prior Information Notice

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1 Introduction

1.1 Overview

On behalf of England's Connected Heartland 5G Innovation Region (ECH 5GIR), Oxfordshire County Council (OCC) will procure a contract for a single Supplier to install and operate a 5G NR Standalone mobile private network managed service along approximately 30km of the East West Rail line between Bicester and Bletchley.

The project aims to deliver high speed mobile connectivity to railway users of all kinds. It aims to improve the commercial sustainability of rail mobile connectivity by providing services from the same infrastructure to trackside neighbours, and to develop the technical and commercial blueprint to extend the model more widely.

This Prior Information Notice (PIN) is intended to alert potential bidders to the forthcoming procurement procedure and to present the current view of the requirements. We want to engage with potential bidders with the expertise, experience, and innovative solutions to design, build and operate a scalable 5G standalone mobile private network in a railway setting.

We invite interested parties to review this notice and consider the opportunity to contribute to a project that promises to enhance rural railway connectivity and set a model for similar networks elsewhere in the UK and beyond.

1.2 DSIT 5G Innovation Regions (5GIR) Programme

The Department for Science, Innovation and Technology (DSIT) 5G Innovation Regions (5GIR) programme is a pioneering initiative by the UK Government, designed to foster the development and deployment of 5G and advanced wireless technologies across the country. With a funding pool of approximately £36million, the programme has identified ten regions, including ECH, to become hubs of digital innovation. The DSIT 5G Innovation Regions funding must be spent by 31st March 2025.

These 5GIRs are expected to lead the way in demonstrating how advanced wireless connectivity can transform public services, drive economic growth, and stimulate innovation. They will target a wide range of sectors including manufacturing, health, transport, agriculture, and public services, where advanced connectivity can lead to significant improvements in efficiency, productivity, and service delivery. Widespread adoption of 5G and advanced wireless technologies is essential to unlock their full potential in enhancing services, stimulating economic growth, and fostering innovation.

The goal is to ensure businesses and communities can leverage the benefits of advanced wireless technologies, bridging the digital divide and propelling the UK towards a more connected, technologically advanced future.

The adoption of 5G technology within these Innovation Regions is expected to function as a catalyst for private sector investment, driving demand for advanced connectivity solutions. This, in turn, can lead to the development of new business models, services, and applications that leverage the unique capabilities of 5G. Successful adoption entails

developing and sharing best practices, lessons learned, and scalable models that can be replicated across other regions to amplify the impact of the 5GIR programme nationwide.

The adoption of 5G technology within the 5GIRs is not simply a case of upgrading infrastructure; it involves creating an ecosystem that fosters innovation, enhances market competitiveness, and improves the quality of life for communities. By encouraging the uptake of 5G, the 5GIR programme aims to ensure that the benefits of this advanced technology are realised across the UK, making it a key driver of the country's digital strategy and economic resilience.

1.3 ECH 5G Innovation Region

Co-ordinated by OCC, the ECH 5GIR was formed in 2023 to become one of ten regions to successfully bid for DSIT 5GIR funds. It is a partnership between councils in Oxfordshire, Berkshire, Buckinghamshire, Bedfordshire and Cambridgeshire, with a long-term vision for driving the use of advanced wireless across the region.

The region's councils have strong digital infrastructure teams with a track record in improving fixed broadband connectivity. Whilst this remains an important regional focus, they are now working to extend the reach of advanced wireless connectivity, enabling wider adoption of the technology as a means of improving business productivity and public service delivery, and supporting further innovation. ECH will leverage the transformative potential of advanced wireless connectivity and digital technologies for economic and social benefit.

ECH has selected part of the newly reopening East West Rail line between Bicester and Bletchley for the deployment and operation of a 5G mobile private network to support railway and trackside neighbour use cases for advanced wireless connectivity.

Through this project, ECH aims to develop a repeatable model to demonstrate and drive commercially sustainable 5G networks on the rail network across the region and beyond.

The area represented by England’s Connected Heartland is illustrated below.

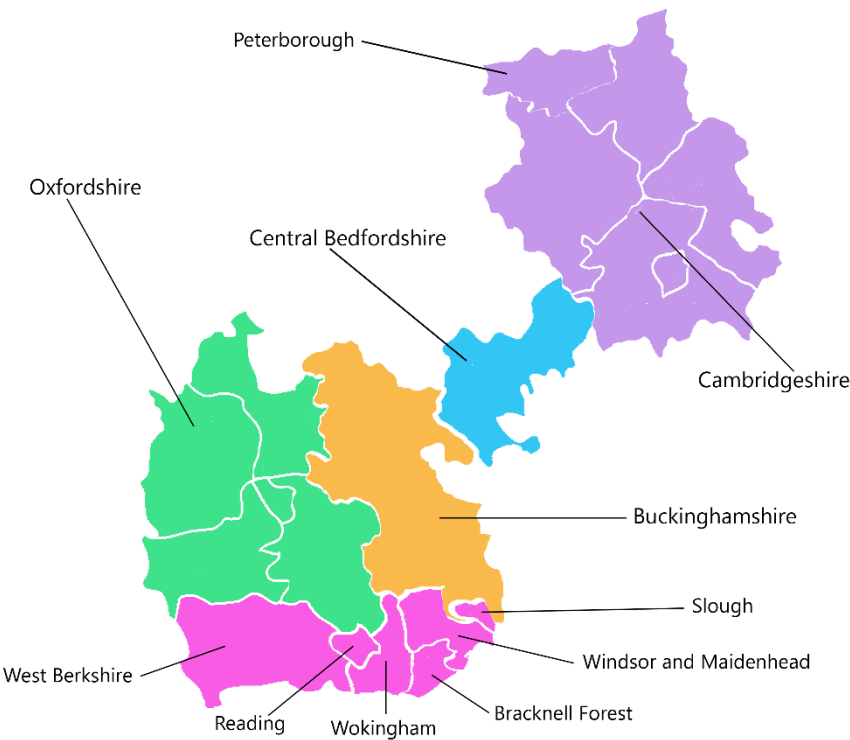


Fig 1: ECH 5GIR region



Fig 2 East West Rail - Bicester to Bletchley

1.4 East West Rail

The “Varsity Line” railway line from Oxford to Cambridge closed to passenger traffic in the 1960s. East West Rail is a major project to reopen the line in three stages, beginning with the section between Oxford and Milton Keynes. New track has now been laid between Bicester and Bletchley, and services are planned to run from next year.

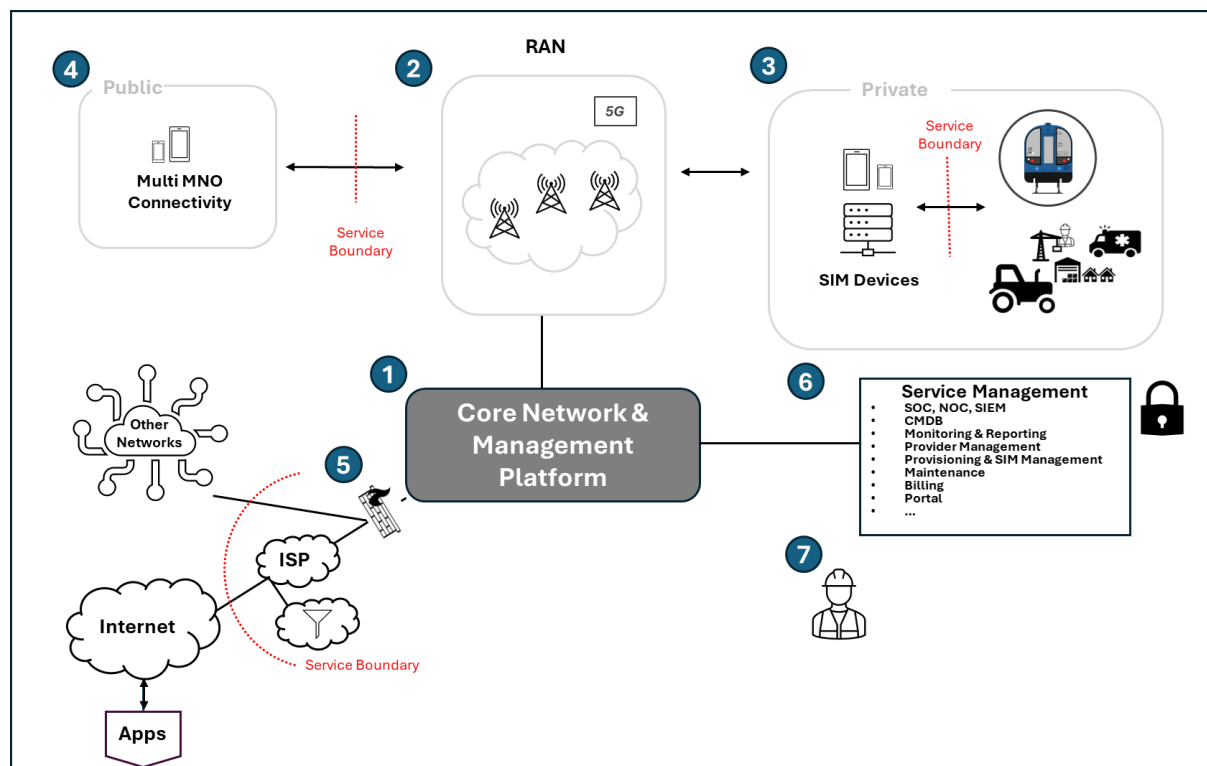
More information is available at www.eastwestrail.co.uk

2 Service Requirements

2.1 Requirements Overview

The project aims to provide high bandwidth mobile connectivity to railway and trackside neighbour users. The Supplier will design, build and operate 5G Standalone Mobile Private Network services to deliver that connectivity.

The principal elements of the required network are shown in the diagram below.



Key:

1. Core Network and Management Platform - the 5G network core and the management platform(s) for the technical solution and service management
2. RAN - radio infrastructure, including masts, radios and antennas, edge computing and backhaul
3. Public Network approach to maximise the wider benefit of the solution's infrastructure
4. Mechanisms to allow edge devices direct and indirect access to the network
5. Gateways to connect edge devices to other networks

6. Service Management functions that the Supplier will provide
7. Implementation management

2.2 Core Network and Management Platform

The platform should provide the following functionality.

Core and RAN configuration and control including:

- Operation of the RAN itself
- Monitoring
- User access/permissions to applications
- Data and venue services across the region
- Security management of all devices, data, platforms and networks
- Configuration Management
- Device and SIM provisioning and management

Service Management:

- Reporting, including performance and service reporting
- Change requests and change control
- Incident Management
- Maintenance management
- Billing
- Document library
- Portal access for the Council to use for self service operations

2.3 Service Management

The Supplier will be responsible for the technical operations (NOC and SOC) for the services and will be responsible for all aspects of service management.

The Council envisages that the number of direct customers for the network will be small, and that a wholesale and retail model may be appropriate. The Council aims to explore this element further with potential bidders.

The Council intends to set in place contractual agreements to define clear service boundaries.

2.4 Radio Access Network

The Supplier will provide resilient, configurable and extensible outdoor 5G RAN coverage and capacity. The network may be used to support other radio technologies such as Wi-Fi or LPWAN to meet the needs of trackside use cases.

Please see the traffic type and density figures in the trackside description section of this document.

The Supplier will provide resilient backhaul connectivity to the RAN using a combination of diversely routed fibre, satellite or microwave connectivity.

The Supplier will ensure suitable licenses, wayleaves and other permissions are in place to deploy and operate the RAN.

The Supplier will provide all aspects of the passive and active RAN infrastructure and operations.

2.5 Edge Devices

The Supplier will make connectivity available to a range of user equipment including modems, mobile handsets and tablets via SIMs provided under the contract. It is envisaged that some edge devices will be provisioned with e-SIMs through a simple QR code approach, so that some user types can use their own compatible devices for temporary access to the private network.

2.6 Devices and Equipment

The customers will use a wide range of devices procured separately, including 5G CPE, LoRaWAN gateways, WiFi Access Points, and a wide range of devices that connect to those intermediate devices.

The Train Operating Company or the Rolling Stock Company will provide on-train equipment to connect to the network and relay it inside the train.

2.7 Gateways

The Supplier will provide gateway services to securely manage data flows from edge devices on the private network to other networks.

Some devices will be connected across a gateway to a customer's corporate network.

Other devices may require internet connectivity to access cloud applications. The Supplier will provide an internet service for these devices, including configurable content filtering to prevent inappropriate use.

2.8 Public Network Impact

Subject to the agreement of the public network operators, the solution needs to provide a method to use the same infrastructure to improve public network coverage and capacity from all public mobile network operators as required.

2.9 Design, Implementation and Testing

The Supplier will be responsible for managing the project and for planning, designing, deploying and demonstrating operational readiness of all aspects of the solution by 31st March 2025.

3 East West Rail

3.1 Location

The project will address mobile connectivity for railway and trackside neighbour use cases on approximately 30km of new East West Rail line between Bicester and Bletchley.

The rail line itself is now completed. Passenger traffic services are expected to start early in 2025, subject to confirmation. The Train Operating Company and the Rolling Stock Company have not yet been publicly announced, though this is understood to be imminent.

3.2 Use Cases

The project's 5G mobile private network will support a wide range of use cases for mobile connectivity on trains, on the railway, and for trackside neighbours in the countryside through which the railway line passes.

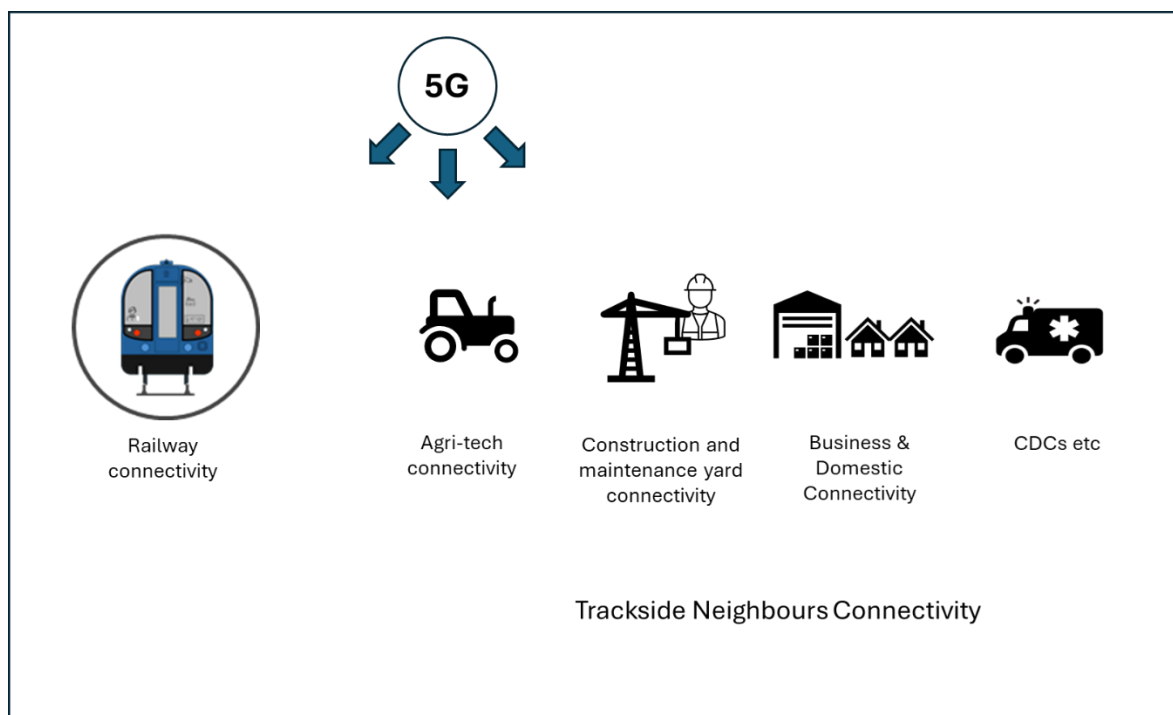


Fig 3: Example use cases

3.3 Railway 5G Use Cases

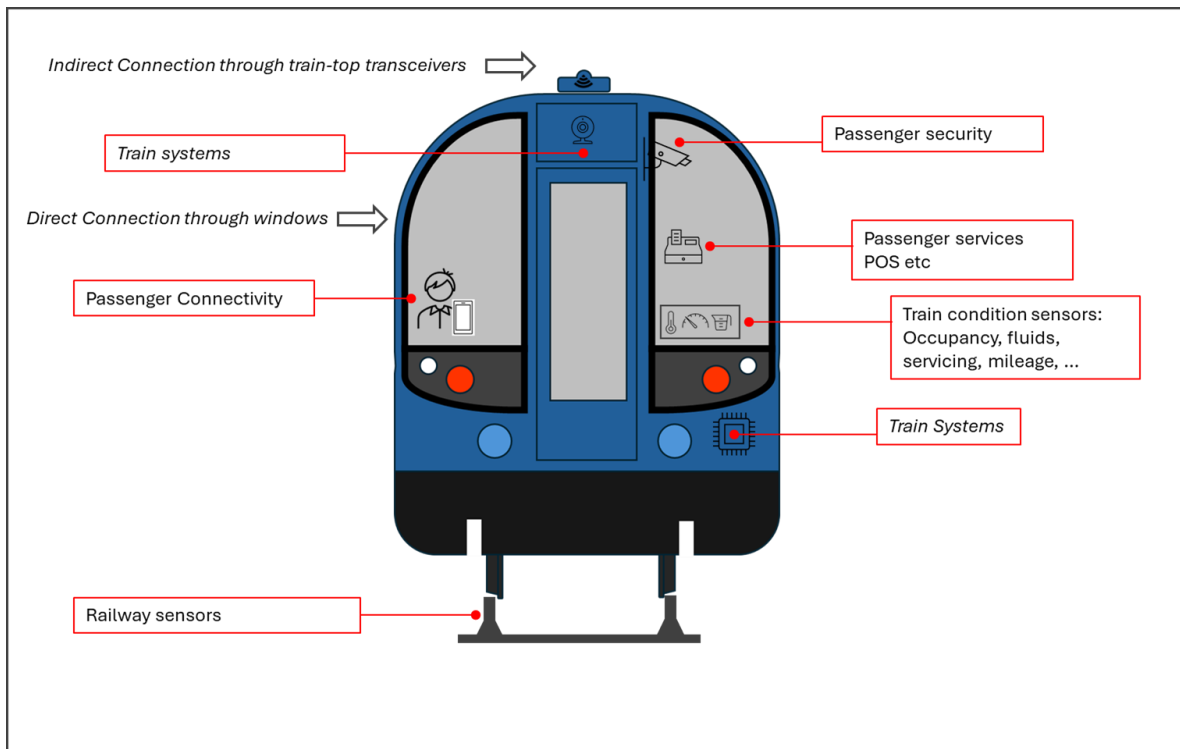


Fig 4: Railway Use Cases

The network connectivity will underpin a wide array of applications on trains and on the railway line:

- Passenger mobile broadband connectivity
This is the primary initial objective. Passengers will connect either directly from their own devices, or more likely through on board WiFi relaying the connectivity from a train-top transceiver that itself connects to the network.
- Passenger services applications such as point of sale devices.
- Passenger security CCTV systems.
- Rolling Stock data collection sensors, including for carriage and seat occupancy, train services fluid levels, service interval, mileage, vibration, temperature and other sensors. Railway condition monitoring cameras.
- Train systems, including signalling and communications solutions. These mission critical use cases are unlikely to use the private network in the near term but could conceivably do so at a much later time.
- Railway sensors, including track condition IoT sensors to detect movement, vibration and environmental conditions.

3.4 Trackside Neighbour 5G Use Cases

The project aims to maximise the commercial sustainability of the railway connectivity by exploiting the same infrastructure to deliver connectivity services to the rural trackside neighbours passed by the railway line.

These trackside neighbour use cases include:

- AgriTech solutions for neighbouring farms, including soil and machinery monitoring, precision agriculture and autonomous equipment, drones and other technology.
- Construction applications and maintenance yards in respect of the HS2 site at Calvert.
- FWA broadband solutions for rural business and domestic premises.
- Community Diagnostic Centres and other mobile services temporarily located next to the railway, for example in station car parks.

3.5 Location Map and Statistics

A mobile private network covering approximately 30km of rail line is required. The ITT will provide more detail about the specific areas of coverage required, taking account of the estimated current coverage from MNOs.

A map of the railway is provided below, indicating some of the key locations.



The estimated numbers of devices and throughputs for the network are summarised below. At this stage, they are based on high level assumptions to provide an order of magnitude scope for the project.

Demand & Device Type	Maximum Expected Device Count	Total Contended Downlink Bandwidth	Total Contended Uplink Bandwidth
 High	20	7	165
Machine	20	7	165
 Low	2030	257	63
Machine	2030	257	63
 Medium	1135	5613	1682
Consumer	520	520	52
Machine	615	5093	1630
Grand Total	3185	5876	1910

Table contents:

- *Eventual maximum device numbers expected for the venue*
- *Total Contended Bandwidth is bandwidth requirement per device x number of devices x estimated contention value (reflecting that not all devices will be active at the same time)*
- *Low means low bandwidth, latency tolerant devices & applications. High means high bandwidth, latency intolerant devices & applications*
- *Machine means devices like modems and sensors and fixed equipment. Consumer means devices like tablets and mobile phones*
- *Tenderers may assume that demand will be evenly distributed along the length of the line*

4 Spectrum

The Council plans to submit medium power Shared Access License applications to Ofcom in the 3.8-4.2 GHz spectrum based on an outline radio plan for a possible network.

The aim of the application is to determine as soon as possible whether spectrum of that type is available and to avoid the risk that Ofcom might receive multiple applications for the same spectrum in an urgent timescale.

Details of the spectrum applications and their status will be communicated to potential bidders as soon as they are available.

Bidders may wish to make their own spectrum arrangements. There is no obligation to use the licenses that the Council hopes to confirm, nor to use the spectrum band that the Council has assumed may be applicable.

5 Survey

The Council aims to conduct a survey of the existing MNO coverage and capacity along the path of the railway to simulate the signal that would be received by a train. It will share

the results of the survey with bidders to complement the data they may already have from their own sources.

The initial scope of the mobile private network is likely to avoid the areas with good existing network coverage and capacity to focus on the parts of the line with weak connectivity, aiming to extend connectivity further in future phases.

6 Rail features

6.1 GSM-R Masts

The Bicester-Bletchley line has eight existing trackside masts that serve railway GSM-R connectivity requirements. The masts have space available that may be suitable for the project's mobile private network RAN.

There are three 25m lattice towers and five 20m monopole masts.

Details of location, fibre connectivity, power availability and loading capacity will be provided to potential bidders as soon as possible.

6.2 432 Fibre

With support from Local Authorities, Network Rail has installed 432-fibre cable along the Bicester to Bletchley railway line that will be available for use by the project. Dark fibre from the bundle may be suitable to provide fronthaul for the project's RAN.

Eight Fibre Interface Points (FIPs) provide access to the fibre outside the curtilage of the railway.

A further 18 Fibre Splice Points (FSPs) allow new FIPs at a cost of c. £15-50k per FIP to provide off-track access to the fibre in additional locations.

Details of FIP and FSP locations will be provided to potential bidders as soon as possible.

6.3 Multifunctional Columns and Bridges

Support structures for the project's RAN infrastructure could include multifunctional columns on highways adjacent to the railway. Oxfordshire and Buckinghamshire councils propose to work with the Supplier to upgrade lighting columns for that purpose as required.

Railway bridges are managed by Network Rail. It may be possible to upgrade lighting columns on bridges or to use bridges and gantries to support RAN infrastructure in locations with good line of sight to the railway. The Council aims to work with Network Rail to understand the scope for this support and will provide details to potential bidders as soon as possible.

6.4 Existing Masts

The Council notes that existing mobile network masts adjacent to the railway may be suitable for hosting the project's RAN infrastructure and that MNO coverage patterns could be adjusted to provide connectivity to the new railway.

6.5 Network Rail

The Council proposes to be a single point of contact between potential bidders and Network Rail during the procurement process, so that all potential bidders receive the same information and that communications with Network Rail are simplified.

7 Contract Structure

OCC intends to procure a single supplier contract for 5G Standalone Mobile Private Network managed services with a term of seven to ten years.

The estimated total value of the contract over its term is £10 million. The estimated value of the initial order is approximately £1.5 million for the first three years.

The estimated total contract value represents the expected price for the initial order over the remaining term and an estimate for the value of possible further extensions of the service along the East West Line.

The contract is designed for extensibility. ECH hopes that through the procurement process and the initial deployment along the rail line, the commercial model for 5G connectivity for railway and neighbouring connectivity in rural areas will become clearer. From that knowledge, ECH hopes to grow the scope of the deployment to complete the Bicester to Bletchley section and to make orders for further venues across the region. The same commercial models could be replicated by other regions under similar contracts.

Possible extension of the scope of the network will be priced according to a pricelist model that will be part of the tender response.

The Council, working with the ECH partners and other organisations, will manage the contract with the Supplier, who will be responsible for all other elements of the service delivery.

It is envisaged that the Supplier will be incentivised to provide connectivity services to trackside neighbours and railway users, directly and through resellers. A gainshare mechanism in the contract will reflect the Council's initial investment.

The contract terms will be comparable with those of the Crown Commercial Services Network Service 3 (RM6116) Framework.

8 Procurement plan

The Council plans to procure the services using the Open Procedure.

This Prior Information Notice is intended to alert potential bidders to the forthcoming procurement and its type, and timetable and provide an overview of the planned services.

The Council has some questions for potential bidders which are shown in the ECH 5G Railway PIN Supplier Response template. Potential Bidders are invited to return a completed template to allow the Council to take account of their feedback.

A webinar is planned that aims to bring the outline requirements to life for potential bidders. The webinar will be recorded and made available to all potential bidders.

To register for the webinar please follow the link below:

[ECH 5GIR 5G Railway PIN Webinar Registration](#)

Short individual 1:1 sessions to discuss commercially sensitive feedback will be available. To book a 1:1 session, please complete the ECH 5G Railway PIN Supplier Response template and return it via the Portal.

The Invitation to Tender (ITT) will present a delivery scenario for evaluation that is as close as possible to the order that the Council intends to make. However, it is possible that the actual order placed will be different from that scenario, for example if there is a mismatch between price and available budget.

The ITT process will include scope for potential bidders to submit clarification questions in respect of the procurement specification.

Estimated dates for the key stages in the procurement process are shown in the table below.

Stage	Description	Estimated Completion Date
PIN Publication	Prior Information Notice to alert potential bidders to the planned procurement	24/04/24
1:1 Requests	Potential bidders optionally request 1:1 session	29/04/24
Webinar and 1:1s	Optional webinar to hear current plans, and 1:1s to discuss commercially sensitive feedback.	29/04/24 – 01/05/24
PIN Responses	Potential bidders respond to PIN questions	03/05/2024
ITT Publication	Open procedure published	17/05/2024
ITT Clarifications Deadline	Bidders submit clarification questions if necessary	21/06/2024
ITT Responses	Bidders complete ITT response.	05/07/2024
Evaluation	Preferred Bidder identified	26/07/2024
Standstill Period	Mandatory Standstill period ends	05/08/2024
Contract Award	Signed contract with Supplier	23/08/2024
Implementation	Initial order delivery complete	31/03/2025

All dates are estimates. They are subject to change as necessary to reflect evolving discussions and market feedback.

[End]