



East West Rail Consultation June 2026

Response from the University of Cambridge.

- 1. Please tell us which of the following describes your interest in the project: (Please tick all that apply)**

University of Cambridge Response

- Affected local land/property owner (please provide Party ID letter reference in question 2)
- Organisation

- 2. If you have received a letter identifying you as having an interest in land affected by the project, please add your Party ID reference number in the box below:**

University of Cambridge Response

We have received a notice and letters giving a **Party ID of 3840**. We note however, that this letter and notice did not correctly identify all our property interests, so we would invite EWR Co. to clarify our land ownerships with us.

- 3. Please provide your contact details: (If you would prefer to remain anonymous, we would be grateful if you could provide the first part of your postcode, so we can understand where you live in relation to the project)**

University of Cambridge Response

Title: Mrs

First name: Jessica

Surname: Cunningham

Address (First line): Greenwich House

Address (Second line): Madingley Rise, Madingley Road

Town/City: Cambridge

County: Cambridgeshire

Postcode: CB3 0TX

Email address: jess.cunningham@admin.cam.ac.uk

4. If you are responding on behalf of an organisation, group or affected landowner, please provide further details below:

University of Cambridge Response

Organisation/group/landowner name: University of Cambridge

Organisation/group/landowner address: Estates Division

Organisation/group/landowner address: Greenwich House, Madingley Rise

Organisation/group/landowner address (Town/City): Cambridge

Organisation/group/landowner address (County) Cambridgeshire

Organisation/group/landowner address (Postcode) CB3 0TX

Your role in organisation, group or representing landowner: Transport Manager – Strategic Projects

5. Please provide your age range:

University of Cambridge Response

No response

Bicester

6. Please use the box below to provide any feedback you have about our revised underpass proposals for London Road level crossing.

University of Cambridge Response

No response

Bletchley West passing loops and train maintenance depot

7. Please use the box below to provide any feedback you have about our proposals for a train maintenance depot and passing loops at Bletchley West.

University of Cambridge Response

No response

Bletchley Station eastern entrance

8. Please use the box below to provide any feedback you have about our proposals for an eastern entrance at Bletchley station.

University of Cambridge Response

No response

Fenny Stratford to Kempston station connectivity

9. Please use the box below to provide any feedback you have about our connectivity proposals to the new stations including walking, wheeling, cycling and equestrian routes.

University of Cambridge Response

No response

Marston Vale Line level crossing proposal updates

10. Please use the boxes below to provide any feedback you have on our proposals for these level crossings.

University of Cambridge Response

No response

South of Bedford and Bedford St Johns station

11. Please use the box below to provide any feedback you have about our revised proposals for south Bedford and Bedford St Johns station.

University of Cambridge Response

No response

Bedford station

12. Please use the box below to provide any feedback you have about our proposals to redevelop Bedford station.

University of Cambridge Response

East West Rail will provide the connectivity and access to the opportunities needed to expand academic collaboration and will provide innovators, spinout founders, entrepreneurs, and major industry with the space, access to talent, and capital to enable them to grow and scale in the region.

This will be essential if the region and the UK are to harness the potential of new frontier technologies and to realise the growth potential of sectors identified in the Government's National Industrial Strategy and the region's Local Growth Plan.

In 2026, the University announced transformative new partnerships that will bring globally significant innovation infrastructure, including the UK's most powerful quantum computer, to Cambridge.

The University recently announced that it will expand the Zenith AI supercomputer at Cambridge West and link it to the UK Atomic Energy Authority's Sunrise fusion programme. This initiative will deploy the world's largest AI supercomputer dedicated to fusion energy development, located in Culham, Oxfordshire. An excellent example of a transformative partnership between both ends of the East West Rail line.

The connectivity of areas of high residential growth such as Bedford, and Tempsford will enable our staff to reduce their journey times to our key sites considerably, particularly to our sites in the west of Cambridge, by as much as 75%, and increase connectivity to the wider 'integrated' transport network that will emerge over the coming years.

It will be imperative that passive provision is built in from the early design stages with the ambition for growth in Cambridge in mind. This will ensure that future development to add capacity does not undermine the day-to-day operations of existing services or the activities of passengers. This should include for track and station infrastructure as well as first /last mile trips from the outset.

Cambourne

13. Please use the box below to provide any feedback you have about our proposals for Cambourne station.

University of Cambridge Response

East West Rail will provide the connectivity and access to the opportunities needed to expand academic collaboration and will provide innovators, spinout founders, entrepreneurs, and major industry with the space, access to talent, and capital to enable them to grow and scale in the region.

This will be essential if the region and the UK are to harness the potential of new frontier technologies and to realise the growth potential of sectors identified in the Government's National Industrial Strategy and the region's Local Growth Plan.

The University recently announced that it will expand the Zenith AI supercomputer at Cambridge West and link it to the UK Atomic Energy Authority's Sunrise fusion programme. This initiative will deploy the world's largest AI supercomputer dedicated to fusion energy development, located in Culham, Oxfordshire. An excellent example of a transformative partnership between either end of the East West Rail line.

The connectivity of areas of high residential growth such as Cambourne will enable our staff to considerably reduced journey times and provide connectivity to the wider 'integrated' transport network that will emerge over the coming years.

We expect two major transport infrastructure projects to be completed prior to East West Rail reaching Cambridge. The Camborne to Cambridge busway will be a new artery connecting Camborne, a Town expected to grow significantly under Local Plan projections, with Cambridge West (the University's own Innovation District). Also, the Cambridge South-East Transport busway will be a new sustainable transport option for key housing, research and innovation sites in the south of the city. We look forward to working with East West Rail and partners to ensure new transport infrastructure is well connected and aligned to ensure seamless door-to-door journeys.

It will be imperative that passive provision is built in from the early design stages with the ambition for growth in Cambridge in mind. This will ensure that future development to add capacity does not undermine the day to day operations of existing services or the activities of passengers. This should include for track and station infrastructure as well as first /last mile trips from the outset.

Cambridge Station Clifton Road eastern entrance

14. Please use the box below to provide any feedback you have about our proposals for the new eastern entrance at Cambridge station.

University of Cambridge Response

The University welcomes East West Rail's latest proposals, which includes ambitious new plans to increase capacity here in Cambridge, with a new entrance at Cambridge Central Station

A new entrance at Cambridge station will be a welcome addition to the City and a proposal to open this entrance as soon as feasible would be very welcome.

The new entrance will improve access and provide staff, students and local residents with an alternative. Reducing traffic congestion and easing pressure on the main station entrance should improve the quality of people's journeys and quality of life for those who live, work and socialise in the CB1 area.

To maximise this opportunity, connectivity with other modes and integration of local transport infrastructure and services will be imperative, as will working with local partners to ensure an integrated design as the various schemes come forward.

There is a real opportunity to create a sense of place which will be imperative to support the surrounding communities and ensure that residential communities benefit from the improved connectivity and accessibility without compromising quality of life, place and safety resulting from an increase in footfall and potential traffic.

Cambridge Eastern Station

15. Please use the box below to provide any feedback you have about our proposals for Cambridge East station.

University of Cambridge Response

The University welcomes East West Rail's latest proposals, which include ambitious new plans to increase capacity here in Cambridge, with a new station at Cambridge East. Housing availability and affordability continue to constrain growth in the region. The redevelopment of the Cambridge airport site at Cambridge East will be a new urban quarter for the city, providing homes, infrastructure and leisure facilities for thousands of residents. Population and employment growth have outpaced the systems needed to support them. New transport infrastructure connected to substantial housing projects essential for continued growth.

It will be imperative that passive provision is built in from the early design stages with the ambition for growth in Cambridge in mind, particularly around this new station area and the opportunity to connect passengers travelling along the Newmarket and Ipswich corridor to the Science parks in the north of the City with onward travel. This will ensure that future development to add capacity does not undermine the day-to-day operations of existing services or the activities of passengers. This should include for track and station infrastructure as well as first /last mile trips from the outset.

Cambridge Eastern train care centre

16. Please use the box below to provide any feedback you have about our proposals for Cambridge Eastern train care centre.

University of Cambridge Response

No response

Other Feedback

17. Please use the box below to provide any further feedback you have about the project and our proposals for East West Rail. Please include relevant location information to help us understand your feedback.

University of Cambridge Response

The Executive Summary of our full response to question 17 was submitted via the online portal and the full response to question 17, due to the size of the document, was submitted via the consultation email address (consultation@eastwestrail.co.uk) as indicated on the consultation portal.



East West Rail Consultation June 2026

Response from the University of Cambridge

University of Cambridge Response to Question 17

Question 17. Anything else - Please use the box below to provide any further feedback you have about the project and our proposals for East West Rail. Please include relevant location information to help us understand your feedback.

1 Executive Summary

- 1.1 Whilst the University is supportive of the East West Rail connection (“**the Proposed Project**”) in principle, as the proposals currently stand, they give rise to a number of serious concerns regarding the potentially significant adverse impacts on the University’s estate. In particular, its nationally and internationally important research facilities at Lord’s Bridge and Cambridge Biomedical Campus. These concerns have been highlighted consistently with East West Rail Company (“**EWR Co**”), and acknowledged, and must be fully addressed to the University’s satisfaction to ensure that the operation of the University’s estate, and delivery of its vital services and research activities can continue without compromise.
- 1.2 The University welcomes the work undertaken through collaboration between the University and EWR Co since the previous consultation (November 2024 – January 2025), specifically regarding the Mullard Radio Astronomy Observatory at Lord’s Bridge, to establish the evidence that confirms the level of impact on our estate and the research activities. However, the progress of mitigation has been limited. There is no reference within the consultation documents as to the extent of the impact, any suggestions of mitigation, or the extent of the ‘at source’ (along the railway) mitigation that will be required to provide the University with confidence that EWR Co are taking their responsibility to protect the University’s research and UK science seriously.
- 1.3 Until such time as the issues and concerns detailed within this Consultation response have been addressed to the University’s satisfaction, and details of mitigation have been agreed, the University must register and maintain its objection to the proposals between Comberton and Cambridge (Proposed Project route Sections 7 and 8) with particular reference to the University assets at the following locations:
 - 1.3.1 The Mullard Radio Astronomy Observatory (“**MRAO**”) at Lord’s Bridge;
 - 1.3.2 The Anne McLaren Building (“**AMB**”) at the Cambridge Biomedical Campus (“**CBC**”);
 - 1.3.3 The Cambridge University Press and Assessment site, to the north of Long Road Bridge; and

- 1.3.4 Granta Backbone Network (“**GBN**”), in the vicinity of the Long Road Bridge.
- 1.4 There are a number of other sites and areas of land owned and/or used by the University, which will need to be the subject of additional dialogue between the University and EWR Co to enable the University to fully understand EWR Co’s proposals and requirements in relation to them, as well as the associated impacts on the University’s use of and/or legal interests in them.
- 1.5 It is hoped that through collaboration and ongoing dialogue at all levels, agreement can be reached such that full mitigation of the impacts (if avoidance, through realignment, is not possible) of the Proposed Project on, and thus protection of, the University’s assets can be assured. This includes, in particular, the nationally and internationally renowned research facilities located at Lord’s Bridge. Until protection of the University’s assets impacted by the Proposed Project route Sections 7 and 8 can be assured, the University has no alternative but to maintain its objection to the Proposed Project, including when the Development Consent Order (DCO) application is submitted.

2 Key Areas of Concern

- 2.1 Having reviewed the Consultation materials (namely the Brochure, plans etc.), the University has identified 5 key areas of concern, which are summarised below:
 - 2.1.1 To ensure that vibration and electromagnetic sensitive research undertaken at the MRAO can continue uninterrupted and otherwise unaffected, which will necessitate any increases in baseline electromagnetic interference (“**EMI**”) and vibration levels resulting from the construction and operation of the Proposed Project, to be fully mitigated effective across the whole of the MRAO site.
 - 2.1.2 To ensure that vibration and electromagnetic sensitive research undertaken at the AMB can continue uninterrupted and otherwise unaffected, which will necessitate any increases in baseline EMI and vibration levels resulting from the construction and operation of the Proposed Project, to be fully mitigated.
 - 2.1.3 To ensure that the University’s privately owned optical fibre network, the GBN, is not harmed or impacted during either the construction or operational phase of the Proposed Project and can continue to operate uninterrupted and otherwise unaffected.
 - 2.1.4 To ensure that access to University buildings, land and facilities (including but not limited to the MRAO and AMB research facilities) for staff, students and visitors, is maintained at all times, particularly with regards to emergency services ‘blue light’ routes and access to emergency health care facilities.
 - 2.1.5 The extent of temporary possession and permanent acquisition of land proposed, specifically at the Cambridge University Press and Assessment site and in general terms.
- 2.2 The University has been engaging with EWR Co with regard to the Proposed Project since as early as 2019 and provided detailed written responses to EWR Co’s non-statutory consultations in June 2021 and January 2025 (“**2021 Consultation Response**” see **Appendix 1** and “**2025 Consultation Response**” see **Appendix 2**). This consultation response sets out and in some areas re-states the University’s concerns which are yet to be addressed.

3 **Abbreviations**

The following abbreviations are used in this response:

AMB	Anne McLaren Building
AMI	Arcminute Microkelvin Imager
COAST	Cambridge Optical Aperture Synthesis Telescope
CBC	Cambridge Biomedical Campus
DCO	Development Consent Order
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EIA	Environmental Impact Assessment
e-MERLIN	Enhanced Multi-Element Radio Linked Interferometer Network
EWR	East West Rail
EWR Co	East West Railway Company
ITU	International Telecommunication Union
ITU-R	International Telecommunication Union – Radiocommunication Sector
LSTM	Line Source Transfer Mobility
MRAO	Mullard Radio Astronomy Observatory
MROI	Magdalena Ridge Observatory Interferometer
RAS	Radio Astronomy Service
REACH	Radio Experiment for the Analysis of Cosmic Hydrogen
RFI	Radio Frequency Interference
SARAO	South African Radio Astronomy Observatory
SKA1-LOW	Square Kilometre Array Low Configuration
SKA	Square Kilometre Array
SKA-Mid	Square Kilometre Array Mid-Frequency Array
STFC	Science and Technology Facilities Council
UKRI	UK Research and Innovation
VC	Vibration Criterion

4 EWR Co Engagement with the University to Date

- 4.1 As noted above, the University has been engaging with EWR Co regarding the Proposed Project since as early as 2019, and as regards its potential impacts on the MRAO in particular, since 2020, by way of meetings, exchanges of written correspondence and non-statutory consultation responses, including the 2021 and 2025 Consultation Responses.
- 4.2 Detailed information regarding the EMI and vibration sensitive equipment at the MRAO was first shared with EWR Co in 2021. Initially, to ensure protection of the MRAO through appropriate route alignment and, in more recent years, to ensure suitable mitigation options of the proposed alignment were identified early in the design process, thereby avoiding the current position the University (and EWR Co) finds itself in.
- 4.3 EWR Co acknowledged in December 2021 by way of email exchanges that the EMI levels from a new railway would exceed the background levels at the MRAO. Therefore, a meeting was held between the University and EWR Co in early 2022 to explore the impacts of the Proposed Project on the MRAO.
- 4.4 Following announcement of the EWR southern approach into Cambridge in 2023, a meeting was subsequently held at the MRAO in late 2023 to discuss the surveys required to fully assess the impact of EMI, vibration and noise on the University's assets and have open discussions on the potential options for mitigation. Additional detailed technical information regarding the MRAO site and equipment was shared by the University in 2023 and again in April 2024. However, it was not until spring 2025 that EWR Co undertook a Vibration and Electromagnetic Compatibility ("**EMC**") baseline assessment to support the ongoing investigation of the impact of vibration and EMI at the site. Although initial draft baseline information was provided by EWR Co to the University in summer 2025, it was not until late 2025 that a finalised Vibration Assessment Report and a finalised EMC Report were shared with the University.
- 4.5 The University understands EWR Co intend to undertake further vibration surveys and assessments at the MRAO this summer (2026) to provide a fuller assessment of the vibrational impacts, but as noted above, these should have been carried out sooner.
- 4.6 Discussions regarding potential mitigation options have been ongoing for a number of years, and despite the University identifying several options to investigate quantitatively, there is little evidence that EWR Co have fully considered these and certainly there is no reference to this within the consultation documentation made available. Instead EWR Co have continued to hand the problem back to the University, asking whether it could agree to compromise research that is at the forefront of international science.

5 The MRAO

- 5.1 The MRAO is situated at Lord's Bridge (as shown in **Appendix 3**) on the A603, approx. 5 miles south-west of central Cambridge. The location of the MRAO is indicatively shown on the route plan in **Appendix 4** and the MRAO is shown in **Appendix 5**. Lord's Bridge is approx. 111 acres in size and currently houses 10 EMI and / or vibration sensitive radio and optical telescopes, some of which are shown in Figure 1.
- 5.2 At its closest point, the route alignment of the Proposed Project is within 150m of the MRAO boundary and within 800m of multiple installed facilities, many of which include some of the most sensitive astronomical equipment.

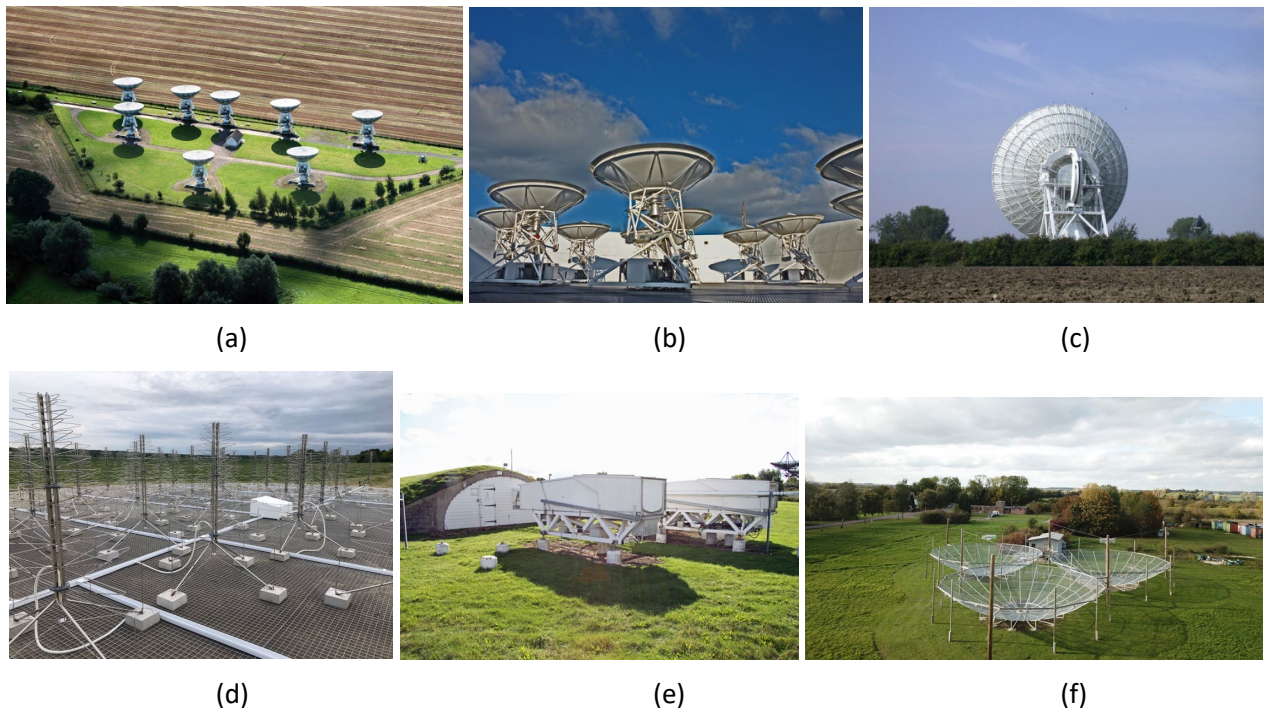


Figure 1. a) Large Arcminute Microkelvin imager (AMI) array b) Small AMI array c) e-Merlin 32-m dish d) Large SKA prototype array e) COAST telescopes and laboratory f) HERA-3 compact array at the MRAO at Lord's Bridge

Scientific importance of the MRAO

- 5.3 The University's mission is "to contribute to society through the pursuit of education, learning and research at the highest international levels of excellence".
- 5.4 The University is a leading global centre for Astronomy and Astrophysics, which are centred in three Departments: Physics (the Cavendish Laboratory, including the MRAO), the Institute of Astronomy (IoA), and the Department of Applied Mathematics and Theoretical Physics (DAMTP).
- 5.5 Radio Astronomy is a scientific discipline whose early development was led by British scientists, especially at the MRAO. Research carried out at the MRAO has been recognised with two Nobel Prizes in Physics — to Sir Martin Ryle (1974) for the development of aperture synthesis imaging, and to Antony Hewish (1974) for the discovery of pulsars. This is undoubtedly helping inspire new generations of brilliant and talented engineers, physicists and astronomers across the UK, and globally, and is critical to attracting and retaining current staff and postdoctoral researchers. The MRAO and the work it facilitates is significant, not just to the University and Cambridge, but to the UK, international science and research institutes, the UK Government and beyond.
- 5.6 All three University Departments carry out cutting-edge research, but the strength of the MRAO has long been in the development of ever more sophisticated experimental techniques for astronomical measurements, first at radio wavelengths, and now also at higher frequencies. The MRAO is one of only two major centres in the UK (with Jodrell Bank at the University of Manchester being the other), that design, build and operate internationally competitive radio and other telescopes along with their associated receivers and instruments. There are only a handful of equivalent centres of excellence in the world.

- 5.7 The radio and optical telescopes that are located at the MRAO measure signals that are very weak, and hence highly susceptible to many forms of interference, specifically light pollution, EMI and mechanical vibration from domestic and industrial plant, and other sources such as vehicles and trains. The MRAO is recognised by Ofcomⁱ as a UK Radio Astronomy Service (RAS) station in the UK Frequency Allocation Table, with spectrum coordination protection at the bands allocated to radio astronomy, consistent with ITU Radio Regulations footnote 5.149ⁱⁱ. Recent Ofcom decisions, for example on the Upper 6 GHz band, continue to set explicit interference limits at the MRAO, confirming that the site's protected status is actively maintained.
- 5.8 The topography of Lord's Bridge and thus the MRAO is characterised by low-lying, open land that provides a horizon-to-horizon view that is essential for the operations of some of the most sensitive telescopes. A defining and irreplaceable characteristic of MRAO is its exceptionally low radio-frequency interference ("**RFI**") environment. This quiet electromagnetic backdrop, sustained by the rural setting and careful local management of emissions, is what makes the highly sensitive measurements that modern radio astronomy demands possible. Sites of comparable quality are extremely rare in southern England. On-site scientific observation with instruments such as Radio Experiment for the Analysis of Cosmic Hydrogen ("**REACH**") and Arcminute Microkelvin Imager ("**AMI**") is only possible due to the unusually low radio-frequency interference environment by UK and Western European standards being sufficient for the science that is targeted and the proximity to Cambridge being essential for daily operation, calibration and student involvement. The combination of that quietness has allowed internationally significant research to be carried out for more than 60 years.
- 5.9 The current research and development are very much at the forefront of science globally, with ongoing activity comprising a mixture of scientific observations, and the development of new techniques and instrumentation to be deployed elsewhere in the world. The work undertaken is part of national and international collaborations that not only bring in significant research income to the University, but allow the University's scientists, and UK science, to stay at the forefront of their fields and to take on leading roles in international programmes, such as the Square Kilometre Array ("**SKA**") and the Enhanced Multi-Element Radio Linked Interferometer Network ("**e-MERLIN**") telescope, which would not otherwise be possible.
- 5.10 The e-MERLIN telescope at the MRAO is, by way of example, a high performance, high sensitivity 32m diameter radio telescope operated by the University of Manchester as part of e-MERLIN array on behalf of the UK Science and Technology Facilities Council ("**STSC**") for radio astronomy research. The e-MERLIN combines signals from 7 radio telescopes across the UK, with a separation of 220km. Crucially, the geographical position of this telescope at the MRAO provides the longest baselines of the e-MERLIN, i.e. the largest separations from the other radio telescopes in the array. It is this longest separation of 220km which gives the e-MERLIN its capability of producing high-resolution radio images of a wide range of astrophysical objects, and phenomena from nearby stars to the most distant galaxies and quasars.
- 5.11 The University's interests and expertise in developing the underpinning technologies required for contemporary astrophysics are focused on the radio and optical/infrared regions of the electromagnetic spectrum. In the radio region, a major focus has been towards the study of the early phases of structure formation in the Universe, so-called Epoch of Re-ionization. University academics have been significantly involved in the science planning and technology design of the SKA, a €billion scale international radio telescope project, and have participated directly in the HERA SKA precursor experiment, which assisted in the development of the full SKA.

- 5.12 The University academics were responsible for completing the design of the Square Kilometre Array Low Configuration (“**SKA1-LOW**”) antenna and array systems. 131,000 copies of these critical telescope elements are currently being constructed and deployed around the world. The academic team also designed a new wideband HERA front-end system, which has allowed exploration of both the Epoch of Re-ionization and the Cosmic Dawn. More recent activity has focused on the REACH global experiment, deployed in South Africa, which aims to detect the 21-cm signal from the Cosmic Dawn and the Epoch of Re-ionization, thereby offering a completely new probe of structure formation in the early Universe.
- 5.13 Separately from the radio astrophysics, the University academics also undertake research on optical and near-infrared astrophysics at the MRAO. University academics are world leaders in the design of optical/ interferometric array telescopes and their subsystems. They are also embedded in several international large-telescope spectrograph projects where skills in precision opto-mechanics, the design and testing of cryogenic systems, and software architecture for instrument control, are all deployed. While much of this work takes place at the main Cavendish Laboratory site at Cambridge West, a specialised thermally and vibrationally stable laboratory located at the MRAO provides a uniquely large (25m × 5m) environment in which ultra-sensitive equipment can be tested and validated. Current optical/infrared projects include; the design and delivery of key elements of the Multi-Object Optical and Near-infrared (“**MOONS**”), ArmazoNes high Dispersion Echelle (“**ANDES**”) spectrographs for the European Southern Observatory in Chile, the assembly and validation of the High Accuracy Radial-velocity Planet Searcher 3 (HARPS3) ultra-precision spectrograph for the Isaac Newton Telescope in La Palma, and the design and construction of critical subsystems for the \$100M scale Magdalena Ridge Observatory Interferometer (**MROI**) in the USA.
- 5.14 The testing that that is undertaken at the MRAO is only possible due to the ‘quiet’ nature of the site.

6 Potential Impacts on the MRAO

- 6.1 The Proposed Project alignment introduces two categories of physical impact on the MRAO. These are:

6.1.1 Electromagnetic interference (EMI)

Rolling stock and lineside signalling equipment generate emissions across the radio spectrum that radio-astronomy receivers cannot reject. For instruments such as REACH and SKA prototypes, even low-level intermittent EMI is sufficient to corrupt or invalidate measurements that take months or years to accumulate. The protection currently provided by the site’s quietness cannot be reconstructed locally once it is lost.

6.1.2 Vibration

Ground-borne vibration from train movements affects precision optical and structural systems. The Cambridge Optical Aperture Synthesis Telescope (“**COAST**”), used as a development laboratory for optical-infrared telescope hardware (including for MROI in the US), depends on sub-micron mechanical stability for testing and characterisation. Sustained low-frequency vibration also degrades radio-dish pointing and surface accuracy on the operational antennas at the site. Mitigation against persistent ground vibration of the kind generated by passing trains is technically difficult and, at lower frequencies, usually only partial.

Time-domain Observing

- 6.2 A further, distinct concern is the loss of unconstrained observing time. A defining strength of the MRAO is the ability to observe whenever the science demands it; most critically for rapid follow-up of transient events such as gamma-ray-burst afterglows, fast radio bursts and gravitational-wave electromagnetic counterparts, and where scientific value falls steeply within minutes-to-hours after the trigger event. Any mitigation that addresses railway-induced EMI or vibration by imposing scheduled “quiet windows” is not equivalent to the current capability; trains run on a fixed timetable, transient astrophysical events do not. The loss of free observing time is itself a substantive scientific loss. In discussions with the University, it has been accepted by EWR Co, that as a result of passenger and freight trains from the Proposed Project, the levels of EMI experienced at the MRAO will increase and intensify, as will the levels of vibration. The research taking place at the MRAO is extremely susceptible to EMI and vibration which at certain levels significantly increase observing overheads, reduce observing efficiency, compromise certain classes of measurements, limit future scientific capability, and potentially makes some experiments unviable unless fully mitigated.

EMI Impacts

- 6.3 Initial information shared by EWR Co in 2021 highlighted that EMI levels resulting from the Proposed Project would exceed the EMI requirements for the MRAO. Despite this, detailed EMI assessments studies were only undertaken in 2025. The results of these more detailed EMI surveys carried out by EWR to measure the existing background electromagnetic spectrum at the MRAO were provided to the University in 2025 and have been reviewed by the University’s appointed EMI consultant. These appeared to show that the existing EMI signature was inexplicably quite elevated. To check this, a limited ‘spot check’ was carried out by the University’s consultants at the MRAO using their own equipment in February 2026. The University’s astrophysics team also shared their own data with the consultants, with both data sets showing a significantly lower background electromagnetic spectrum than EWR Co’s survey results.
- 6.4 To obtain certainty on the existing background electromagnetic spectrum at the MRAO, the University has, with EWR Co’s agreement, carried out further surveys to determine the true background electromagnetic spectrum which will be key in assessing the effectiveness of the mitigation measure(s) that can be applied to retain the operation of the MRAO. The University and their EMI consultant are currently working with EWR to provide clarity on the EMI impacts.
- 6.5 It is clear from the initial assessment undertaken by the University, and previously acknowledged by EWR Co, that any mitigation measures will have to be implemented (by EWR) at source to ensure that they are effective across the whole of the MRAO to protect equipment and operations and not restricted to specific areas of the site.

Vibration Impact

- 6.6 The COAST laboratory located at the MRAO is used to conduct research and in the development of components for the multiple next-generation telescopes which are highly sensitive to vibration. Sensitive interferometric equipment founded on piles that extend into the underlying Gault clay have a very low threshold of Vibration Criterion (“**VC**”). It is anticipated that an increase in the current vibration levels at the MRAO will have a significant impact on the viability of the facility for continued research and development activities.
- 6.7 An assessment of the vibration levels that would be generated by passenger and freight traffic on the new EWR line was undertaken by the University’s Vibration Consultant to

evaluate the potential vibration impacts from the Proposed Project alignment on the COAST laboratory. The COAST laboratory lies within 800m to the north northeast of the Proposed Project alignment and at this distance, Rayleigh and Stoneley wave propagation characteristics, the unique geology (head deposits overlying stiff Gault clay), and measured attenuation behaviour are key determinants of the vibration levels likely to reach the COAST laboratory foundations.

- 6.8 A vibration survey carried out by EWR Co, and shared with the University, was based exclusively on road-traffic measurements which are insufficient to characterise vibration propagation within the Gault clay layer because they do not capture sub-surface wave behaviour relevant to piled (railway) foundations.
- 6.9 The analysis indicates that very low frequency components (around 1 Hz) could propagate with minimal attenuation, while vibration at typical railway generated frequencies (20–80 Hz) is expected to decay rapidly, particularly for Rayleigh waves within the overburden. However, the clay interface has the potential to support Stoneley waves, which suffer little amplitude decay and may couple efficiently into the piled foundations. Understanding the probability of Stoneley wave generation and their magnitude will be key in concluding presence and magnitude of the Proposed Project's-generated vibration waves, be they Stoneley and / or Rayleigh. EWR Co and the University have agreed that a Line Source Transfer Mobility (“LSTM”) survey will be conducted, the output of which will be used to inform the potential vibration mitigation measures for implementation by EWR Co.
- 6.10 At the time of the Consultation Brochure being published by EWR Co, the vibration impact on the COAST laboratory and the MRAO in general, had not been fully assessed by EWR Co.
- 6.11 What is already understood by the University at this stage, is that any vibration mitigation measures cannot be implemented at the COAST laboratory and, as is the case with EMI, will have to be implemented by EWR Co at source to ensure that they are effective across the whole of the MRAO and not restricted to specific areas of the site.

7 The University's Concerns Regarding the Design and Consultation Process

- 7.1 As an internationally renowned learning and research institution, and one of the key stakeholders and employers in the city of Cambridge and the wider Cambridgeshire region, the University expected its concerns regarding the impacts on the MRAO and the AMB to have been given early and proper consideration by EWR Co.
- 7.2 Page 10 of the Consultation Brochure acknowledges the importance of the area between Oxford and Cambridge in terms of attracting innovation and recognises the key role that the University (and the University of Oxford) play in that. However, whilst it refers expressly to the research centre at Harwell Campus in Oxfordshire, it notably does not refer to the MRAO. Indeed, the Consultation Brochure makes only one reference to the MRAO (and the University). This is on page 242 and merely expresses an intention to continue to work with the University to assess the EMI/EMC and vibration impacts of the Project on the MRAO. There is no mention of EWR Co's intention to consider the review of or implementation of mitigation options:

“The railway would pass to the south-west of the Mullard Radio Astronomy Observatory (MRAO). We will continue to work with the University of Cambridge to assess and understand the electromagnetic compatibility/interference (EMC/EMI) and vibration impacts of the project on the MRAO. We are also conducting studies on other railways to identify lessons and inform our joint working.”

- 7.3 We have seen no evidence that the MRAO and its sensitivity were given any consideration during the route alignment selection process by EWR Co despite the University engaging with EWR Co as early as in 2019 and discussing the sensitivities and baseline requirements prior to the southern approach route alignment being agreed. The absence of adequate information on the potential impacts on the MRAO during the formative stages of the Proposed Project calls into question the decision-making to date.

Environmental Assessment

- 7.4 Given the protection the MRAO is afforded from inappropriate development by the extant South Cambridgeshire District Council (“**SDCD**”) and Cambridgeshire County Council (“**CCC**”) Local Plans and the emerging Greater Cambridge Draft Local Plan, along with the protection of radio frequencies as set out in international regulationsⁱⁱⁱ, it is essential that effective environmental assessment is undertaken by EWR Co to establish the potential likely significant effects of the Proposed Project on radio astronomy research at the MRAO and full mitigation of the same. This was highlighted on pages 4 and 5 of the University’s 2025 Consultation Response (see **Appendix 2**).
- 7.5 The route alignment decision appears to have proceeded without any in depth technical assessment of the potential impacts of the Proposed Project on the MRAO. Further assessments are only now being undertaken at the instigation of the University to assess the level of harm. This retrospective action does not follow the mitigation strategy as set out in the Government’s Guidance on Environmental Impact Assessments (May 2020).

Mitigation Strategy Shortfall

- 7.6 As set out in Government Guidance on Environmental Impact Assessment^{iv}, ‘*Developers are encouraged to identify any features of their proposed development and any measures envisaged to avoid or prevent what might otherwise have been significant adverse effects on the environment*’ (Paragraph: 023 Reference ID: 4-023-20170728) and ‘*Where alternative approaches to development have been considered, the Environmental Statement should include a description of the reasonable alternatives studied which are relevant to the proposed development and its specific characteristics and provide an indication of the main reasons for the choice made, including a comparison of the environmental effects*’ (Paragraph: 035 Reference ID: 4-035-20170728).
- 7.7 Mitigation is important to the process of the Environmental Impact Assessment (“**EIA**”), as it ensures that adverse impacts of a development are minimised or completely avoided. The Institute of Environmental Management and Assessment (“**IEMA**”) Impact Assessment Guidelines (August 2024)^v, describe a ‘mitigation hierarchy’ as follows (1) avoid; (2) prevent; (3) reduce; and (iv) offset.
- 7.8 It is stated in the Guidelines that the mitigation hierarchy can guide decision making at all stages of a project, however, critically, the upper levels of the mitigation hierarchy are most achievable the earlier they are applied, i.e. the **concept, feasibility and site selection phases of a project provide the best opportunities for avoiding a significant environmental impact**. (IEMA’s emphasis).
- 7.9 The current EWR proposals in proximity to Lord’s Bridge have not attempted to address the first rung(s) on the hierarchy ladder to avoid the MRAO:
- 7.9.1 **Avoid (realignment of the railway)** – this could be achieved by routing the railway further away from the MRAO – at least outside the ‘Lord’s Bridge Restricted Area’, as set out in the planning policy identified above. This is the only measure that fully preserves the MRAO site’s research value. However, no consideration appears to have been given to altering the alignment of

Section 7, Comberton to Shelford route of the Proposed Project to prevent EMI and vibration impacts on the MRAO, despite the University's requests for EWR Co to do so. Instead, the railway is proposed to run through the heart of the Lord's Bridge Restricted Area and within 1km of the Square Kilometre Array ("SKA") testing site and the COAST laboratory.

7.9.2 **Prevent (mitigation at source)** – at present, there is still no empirical evidence that mitigation at source is possible to limit the impact of the railway, should it be located in the Restricted Zone, without compromising the research and operations at the MRAO. As mentioned above, the University and EWR Co are working collaboratively to identify the most suitable mitigation option(s) but examples of engineering measures would be; putting the railway underground by tunnelling or cut-and-cover near the observatory, EMI-suppressed traction systems, RF-bonded catenary, low-vibration track form, and appropriate signalling/communications choices. Each can reduce impact, but most will typically only do so partially. Mitigation must be designed to demonstrably meet radio-astronomy protection thresholds at the bands listed for the MRAO site (notably the protection criteria set out in ITU-R Recommendation RA.769), which are typically many orders of magnitude below conventional EMI compliance levels. Mitigation that meets only commercial EMI standards will not protect the science.

7.10 EWR Co are already planning to construct a tunnel at Chapel Hill to the south-west of the MRAO, and the proposed length of that tunnel has already been increased from 700m to 940m seemingly in response to earlier consultation feedback:

“South of Harlton Road, the railway would enter a bat protection tunnel where the land rises steeply at Chapel Hill and Money Hill south of Haslingfield. As outlined in our You Said, We Did Autumn Update, the length of this tunnel has increased since our last consultation, from 700 metres to 940 metres. This has allowed us to reduce the size of cuttings required at each end of the tunnel, also reducing the amount of material that needs to be transported during construction and the cost of construction.”

7.11 However, the Consultation Brochure fails to consider tunnelling or any form of enclosure as a potential mitigation option for the MRAO.

7.12 The University is very concerned that EWR Co has assumed a mitigation strategy that depends solely on measures that would fundamentally compromise existing and future research at the MRAO site. The University is equally concerned that the impacts of the Proposed Project on the MRAO have not been given sufficient consideration. The University continues to object to the approach to environmental assessment and mitigation being proposed and requests that EWR Co urgently consider ways to avoid or mitigate adverse impacts on the University's nationally and internationally important radio astronomy research at the MRAO.

Consequences if the MRAO could no longer operate in its current location

7.13 Economically, radio astronomy represents an investment of several hundred million pounds in the UK. As an example, the UK's STFC's contribution to the SKA project is of the order of £200m (construction and early operations), making the UK the primary funder. Radio astronomy research based at the MRAO and Cavendish Laboratory is currently in the order of circa £3M/year and is expected to continue for at least the next decade. A further example of research funding is the REACH telescope, awarded £2.4 million by the UK Research Innovation ("UKRI") to study the birth of the very first stars of our universe. REACH maintains a development and test facility at the MRAO and plays an important role in ongoing instrument development and validation activities.

- 7.14 As detailed in section 5 of this consultation response, the MRAO is the operational and development home for several flagship instruments and programmes of national and international significance. Its strategic value, however, is not exhausted by current activities; the site is also the natural UK candidate to host the next generation of radio-astronomy experiments and instrumentation programmes over the coming two to three decades. Both the present portfolio and the future opportunity pipeline are at risk if the impacts of the Proposed Project are not fully mitigated. Examples of future research and opportunities are as follows:
- 7.14.1 **SKA instrumentation and prototyping** — a critical UK site for SKA hardware development, testing and verification, supporting grants are currently in the order **£3 million per year**.
 - 7.14.2 **REACH** — a global 21-cm radiofrequency cosmology experiment requiring the cleanest available spectrum environment.
 - 7.14.3 **AMI** — an interferometric array for galaxy-cluster science, cosmology, and rapid follow-up of transient events (e.g. gamma-ray burst afterglows, fast radio bursts), where scientific value is highest in the minutes-to-hours after the trigger.
 - 7.14.4 **COAST bunker** — an optical-instrumentation development laboratory (principally for high-precision optical/infrared telescope hardware), requiring a large (5m x 25m) temperature-stable environment with sub-micron mechanical stability and low vibration disturbance levels.

Impact on Forward Planning

- 7.15 There are three risk areas in which we are already seeing or expect to see impact as a direct result of the proposed EWR scheme. They are:
- 7.15.1 Risk of degradation of the MRAO environment directly impacting the five-to-ten-year planning horizons, as well as multi-year grant cycles. Radio-astronomy programmes operate on five to ten-year planning horizons and multi-year grant cycles. Grant bids must factor in the risk of an unrecoverable site-environment degradation; recruitment to projects with a site whose long-term viability is uncertain is harder to secure.
 - 7.15.2 **Financial impact** — The MRAO currently underpins approximately £3M/year of UK SKA grant funding alone, alongside grants supporting REACH, AMI and instrumentation development. Over a 20-year horizon (the natural amortisation period for radio-astronomy and large optical/infrared telescope infrastructure), the UK research base stands to lose in excess of £100m in directly displaced grant income from current programmes alone.
 - 7.15.3 **The largest loss is opportunity, not income.** The dominant impact is forward-looking. The MRAO is the UK's natural host site for future radio-astronomy experiments, instrumentation programmes and national facilities over the coming two-to-three decades. Successor instruments to SKA, next-generation 21-cm experiments beyond REACH, time-domain and multi-messenger follow-up programmes will define the field in the 2030s and 2040s. Large-scale efforts not yet specified will require precisely the combination of quietness, infrastructure and Cambridge-based expertise that this site uniquely provides. Once that combination is destroyed, the UK loses not just the current projects, but the option of planning and running their successors.

- 7.16 If the EWR route is not realigned or mitigation at source is not delivered to protect the whole of the MRAO at Lord's Bridge, the potential impacts of the Proposed Project would be serious enough to prejudice the current activities and future capabilities of the site. The MRAO cannot be relocated: the combination of radio-quietness, statutory protection, infrastructure and expertise would significantly undermine the robustness of the research undertaken both on site and through its connections. Its principal value lies not only in the activities currently hosted, but in the future opportunities the site is uniquely placed to host; successor instruments, next-generation experiments, and programmes not yet specified. Damage to that future is **already accruing** through the uncertainty the Proposed Project has introduced into multi-year planning.

8 Planning Policy Protection Afforded to the MRAO

- 8.1 The Proposed Project would be in direct conflict with established planning policy specifically designed to provide a strict level of protection to the MRAO.
- 8.2 The national and international importance of the research undertaken at the MRAO is recognised by SCDC and CCC, who for many years in successive Local Plans, have adopted planning policy which protects the MRAO research facility from impacts that would result from inappropriate development. The current policy in the adopted South Cambridgeshire Local Plan (2018) is provided below:

Policy TI/7: Lord's Bridge Radio Telescope

- 8.2.1 *Within the 'Lord's Bridge Restricted Area' (defined on the Policies Map), planning permission will only be granted for development that would not result in any risk of interference to the Mullard Radio Astronomy Observatory at Lord's Bridge.*
- 8.2.2 *Within the 'Lords Bridge Consultation Area 1' (defined on the Policies Map), development proposals that could adversely affect the operation of the Mullard Radio Astronomy Observatory at Lord's Bridge will be subject to consultation with the University of Cambridge, and account will be taken of the risk of interference to the equipment being used at the Observatory. Planning permission will be refused where interference would be caused that could not be overcome by conditions or by the use of planning obligations.*
- 8.2.3 *Within the 'Lords Bridge Consultation Area 2' (defined on the Policies Map), development proposals for telecommunications and microwave operations that could adversely affect the operation of the Mullard Radio Astronomy Observatory at Lord's Bridge will be subject to consultation with the University of Cambridge, and account will be taken of the risk of interference to the equipment being used at the Observatory. Planning permission will be refused where interference would be caused that could not be overcome by conditions or by the use of planning obligations.*
- 8.3 The SCDC Local Plan goes on to state that *'The international importance of the Mullard Radio Astronomy Observatory at Lord's Bridge must be safeguarded. The Observatory contains unique radio and optical telescopes operated by the Universities of Cambridge and Manchester / Jodrell Bank. The telescopes measure signals that are very weak, and hence highly susceptible to many forms of interference, specifically electrical interference, light pollution and mechanical vibration from domestic, industrial plant and other sources such as vehicles and aircraft. Arrangements are made to consult the University of Cambridge about the technical consequences for the Observatory of proposed development. Harm caused to the Observatory will be overcome with the use of*

conditions or planning obligations to regulate the installation and use of equipment likely to interfere with the operation of the Observatory' .

- 8.4 CCC has an adopted policy (Policy 39: Mullard Radio Astronomy Observatory, Lord's Bridge) in its 2018 local plan which aligns with the policy in the SCDC local plan and requires consultation with the University with regards to any development proposals within the consultation area set out on the adopted policy map.
- 8.5 It states that: *'Development proposals within the Lord's Bridge Consultation Area, covering the whole of Cambridge City Council's administrative area, which could adversely affect the operation of the Mullard Radio Astronomy Observatory will:*
- 8.5.1 *be subject to consultation with the University of Cambridge; and*
- 8.5.2 *only be granted planning permission where there is no harm to its scientific operation or where any harm can be overcome by measures secured by condition or planning obligation'.*
- 8.6 The supporting text to this policy states that: *'The Mullard Radio Astronomy Observatory at Lord's Bridge is of international importance and must be safeguarded. The observatory contains unique radio and optical telescopes operated by the University of Cambridge, the University of Manchester and Jodrell Bank. The telescopes measure signals that are very weak and hence highly susceptible to many forms of interference: specifically to electrical interference; microwave interference from telecommunications masts and equipment; and light pollution and mechanical vibration from domestic, industrial plant and other sources, such as the movement of vehicles, including aircraft.*
- 8.7 *The Mullard Radio Astronomy Observatory is within South Cambridgeshire District Council's administrative area. There is one consultation area, which covers the whole of Cambridge City Council's administrative area, requiring consultation with the University of Cambridge on applications involving microwave transmission, such as telecommunications masts and equipment'.*

The Greater Cambridge Draft Local Plan

- 8.8 The Greater Cambridge Draft Local Plan has recently undergone its Regulation 18 consultation, with Regulation 19 consultation planned to take place over summer 2026. The Plan is a joint plan combining the administrative areas of SCDC and CCC. Like previous plans, it continues to stress the importance of, and to protect, the MRAO.
- 8.9 Draft Policy I/Sl: *Safeguarding Important Infrastructure* states within criterion 6 that *'Development proposals within the Lord's Bridge Restricted and Consultation Areas*
- 8.9.1 *Within the 'Lord's Bridge Restricted Area' (defined on the Policies Map), planning permission will only be granted for development that would not result in any risk of interference to the Mullard Radio Astronomy Observatory at Lord's Bridge.*
- 8.9.2 *Within the 'Lords Bridge Consultation Area 1' (defined on the Policies Map), development proposals that could adversely affect the operation of the Mullard Radio Astronomy Observatory at Lord's Bridge will be subject to consultation with the University of Cambridge, and account will be taken of the risk of interference to the equipment being used at the Observatory. Planning permission will be refused where interference would be caused that could not be overcome by conditions or by the use of planning obligations.*

- 8.9.3 *Within the 'Lords Bridge Consultation Area 2' (defined on the Policies Map), development proposals for telecommunications and microwave operations that could adversely affect the operation of the Mullard Radio Astronomy Observatory at Lord's Bridge will be subject to consultation with the University of Cambridge, and account will be taken of the risk of interference to the equipment being used at the Observatory. Planning permission will be refused where interference would be caused that could not be overcome by conditions or by the use of planning obligations.*
- 8.10 The draft policy has been supported by the University in its formal response to the Regulation 18 consultation. The University's response stated that:
- 'The Observatory contains unique radio and optical telescopes which are of international importance and must be safeguarded. The facilities measure signals that are very weak, and hence highly susceptible to many forms of interference, specifically electromagnetic interference (EMI), light pollution and mechanical vibration from domestic, industrial plant and other sources such as vehicles and aircraft.*
- The Observatory has been home of some of the largest and most advanced radio astronomy instruments in the world since it opened in 1957. Notably, these instruments have supported research leading to 2 Nobel prizes and countless discoveries which have placed Cambridge and the UK at the forefront of astronomy research.*
- Currently, the observatory is home to several state-of-the-art aperture synthesis radio telescopes, such as the Large and Small Arcminute Microkelvin Imager arrays and the 32m dish which is part of the e-Merlin national facility. It is also important for several internationally leading instrument development projects.*
- In these cases, instruments are developed in Cambridge and via collaboration elsewhere and tested at the observatory before being deployed (often in large numbers) to other sites. Most important of these are the developments that Cambridge leads for the Square Kilometre Array (SKA) which is under construction in South Africa and Australia, and which currently brings ~£3M/year to the university in research funds. The SKA is a €1.2bn construction project in its first phase.*
- Cambridge leads the design of several elements of the telescope including the software and, importantly, the low-frequency telescope which will be deployed to Western Australia. There are two test arrays at Lord's Bridge and a third currently in construction. Furthermore, phase II of the SKA (~ 10x the size of phase I) will start its development phase in the coming years, with the observatory expected again to take a central role in the international development efforts due to its unique characteristics'.*
- 8.11 The response also noted the conflict within the policy that the land required for EWR's current alignment is also safeguarded, which would appear to be premature given the evidence set out in this letter that the alignment as currently proposed will cause harm to the MRAO if mitigation cannot be successfully achieved.
- 8.12 The proposed route for EWR will run through the heart of the Lord's Bridge Restricted Area, as shown in **Appendix 4**. Therefore, it triggers the need to comply with the adopted local plan policy in the 2018 SCDC Local Plan which states that *'planning permission will only be granted for development that would not result in any risk of interference to the Mullard Radio Astronomy Observatory at Lord's Bridge'*.
- 8.13 The University has and continues to be consulted by SCDC on applications that may impact MRAO. There have not been any applications in recent times that, following consultation with MRAO, have necessitated any objection being raised. This shows the

effectiveness of the preventative policy set out clearly in both local plans, which highlights the clear constraint and requires applicants and the local authority to consider this constraint in the preparation of development proposals.

9 The Anne McLaren Building (AMB)

The Importance of the AMB

- 9.1 In addition to impacts on the MRAO, the University is also concerned about the impact on research at the AMB.
- 9.2 The AMB, named after Dame Anne McLaren, one of the world's leading specialists in reproductive medicine, was built to replace three other research facilities used by the University's School of the Biologic Sciences to provide a modern, world class facility to promote the expertise of the University in biomedicine.
- 9.3 The biomedical research facility at the AMB represents a major investment in UK scientific research and is a unique facility within the Cambridge Biomedical Campus ("**CBC**"). The research conducted at the AMB furthers the understanding of how diseases occur and is vitally important to the development of new treatments for conditions including cancer, dementia and diabetes. It supports globally important research activities across the CBC, including pioneering research into Covid-19. This includes: the use of imaging equipment to test the flow of dyes that is then adopted for wider imaging purposes in medical treatment (including nuclear medicine); the modelling of disease including through the use of genetic modification to develop cures; and the replication of organs in vitro to aid drug development and organ replacement technology.
- 9.4 The AMB facility is rare. The University does not have access to an equivalent facility should the AMB be unable to operate within its core design parameters.

Cambridge South Infrastructure Enhancements (CSIE) Order

- 9.5 The Network Rail (NR) Cambridge South Infrastructure Enhancements Scheme resulted in the construction of the new Cambridge South Station, due to become operational in June 2026, on the existing main line serving Cambridge. The works involved construction of a four-platform station and associated structures, the slewing of the existing main line, and the installation of two new loop lines connected via new switches and crossings. These works were delivered in the vicinity of the CBC where several buildings are sensitive to noise, vibration and EMI.
- 9.6 The AMB houses research facilities and specialist scientific instruments which are sensitive to noise and vibration. The building also accommodates University personnel engaged in and supporting the research activities, as well as equipment and personnel from other institutions which lease research facilities at the AMB.
- 9.7 Adjacent to the AMB is 'Plot 9'. This land area is also a University asset. Plans for this land parcel are being considered and developed by the University however, given Plot 9's location within the CBC, it is highly likely that it will be used for research purposes. The University is therefore concerned that the additional EWR Co rail traffic and increases in EMI, noise and vibration levels will impose additional limitations to the development options for Plot 9.

Noise and Vibration at the AMB

- 9.8 There are known limits for noise and vibration at the AMB which reflect the sensitive nature of the research. The AMB was designed and constructed in order that noise and vibration from existing sources, notably the railway line, road vehicles and other external sources in the baseline environment, would not exceed acceptability limits and before Cambridge South Station was constructed there were no adverse effects of this kind. Exceedance of the acceptable limits for noise and vibration impact the quality of the research and the operations of the AMB.
- 9.9 Assessments were undertaken to establish the potential impacts of noise and vibration on the AMB from the construction and operation of the CSIE Scheme. Whilst noise and vibration impacts resulting from the construction of the new station were anticipated to be a concern, additional noise and vibration impacts were identified resulting from the operation of the proposed CSIE Scheme works because (a) the main line is slewed slightly closer to the AMB (b) the nearest of the proposed new loop lines is closer to the AMB than the existing main line and (c) trains would run over gaps in the rails in the proposed new switches and crossings which would connect the loop lines to the main line.
- 9.10 Given the sensitive nature of the research undertaken within the AMB, operational (noise and vibration and EMI) limits need to be safeguarded to ensure that the operation of the new railway line does not impose any greater risk or impacts on the quality and credibility of the research at the AMB. The works undertaken by NR, which have included the use of aluminothermic welds on the new sections of track or switches and crossings within 180m to the centre of the AMB are of concern to the University as they may, if not properly maintained by NR, have an adverse impact on the operation of the AMB facility.
- 9.11 The University is deeply concerned that the additional passenger and freight traffic that would result on the West Anglian mainline when the Proposed Project becomes operational, will accelerate the deterioration of the aluminothermic welds installed by NR. Therefore, the University is seeking to understand what assurances will be given, and what practical measures will be put in place by EWR Co to mitigate the impact of its operation on the integrity of the welds and the resulting impact on the quality and credibility of the research being carried out at the AMB.

EMI at the AMB

- 9.12 Assessments were undertaken to establish the potential EMI impacts of the CSIE Scheme on the AMB. There was a requirement that the CSIE Scheme could not increase EMI impact on the AMB, including associated high-voltage and medium-voltage equipment. NR was required to carry out agreed mitigation works prior to the CSIE becoming operational.
- 9.13 The University is also concerned that the additional passenger and freight traffic that would result on the West Anglian mainline when the Proposed Project becomes operational, will increase the acceptable levels of EMI and vibration and is seeking to understand from EWR Co what assurances will be given to mitigate the cumulative impacts on the AMB.

10 **The University's other land interests impacted by the Proposed Project**

- 10.1 The University has identified several areas of University owned land affected by the Proposed Project. It is unclear whether some of these areas will be affected by temporary possession for the carrying out of works and/or permanent land take.
- 10.2 It is understood from discussion with EWR Co that where land is taken for habitat compensation and/or mitigation, it would be permanent but there may be an opportunity for land to be transferred back to original the owners (subject to agreements securing the ongoing management of the habitat created).
- 10.3 University land interests and assets impacted by the Proposed Project are as follows:

Land interest at the AMB

- 10.3.1 The University has been advised by EWR Co that for the Cambridge route (Section 8) EWR Co do not require additional land take beyond that which NR required for Cambridge South Station (i.e. as per its CSIE Order for Cambridge South Station), and that land owned by the University is not required in order to facilitate the two additional proposed tracks or for the demolition and reconstruction of Long Road Bridge. We accepted that advice in good faith, for the purpose of the 2025 Consultation Response, and ask that amended plans be shared at the earliest opportunity.

Land interest at Cambridge University Press and Assessment sites

- 10.3.2 The University has recently received information relating to EWR proposals that impact land and property at the Cambridge University Press and Assessment sites (see **Annexes 1 and 2**). We would welcome further engagement from EWR Co to enable a better understanding of EWR Co's requirement for and proposed use(s) of this land, as follows:

Land Registry Title Number CB292950 (see Annex 1) –The proposed land take appears to affect the main access route into the Cambridge University Press and Assessment's European warehouse that requires access at least 12 hours a day, 6 days a week. Any disruption to this would have a severe impact on operations. We request confirmation of the extent of land required and its purpose.

Land Registry Title Number CB 345456 (see Annex 2) - previous discussions have been held with EWR Co representatives and the University welcomes further discussions to confirm the extent of land required and its purpose.

Land Registry Title Number CB379377 (see Annex 2) – This is the main Cambridge University Press and Assessment site and any disruption would have a severe effect on University business and operations. It is not clear from the Proposed Land Use and Titles Plans as to the proposed use of this land. The University require further details and consultation prior to responding further.

Granta Backbone Network asset at Cambridge Route Section 8, Sheet 01

- 10.3.3 The University's Granta Backbone Network (optical fibre network "GBN") provides high-speed connectivity linking over 80 University sites, research centres and colleges.

- 10.3.4 GBN cabling is located adjacent to the Proposed Project in the area where the works detailed in Cambridge Route Section 8, Sheet 01 (see **Appendix 6** and **Annex 3**) are located “*Proposed A1134 Long Road overbridge and realignment to replace existing bridge*”. The University would welcome consultation to understand how the proposed works could potentially impact the GBN and to agree mitigation measures to prevent any disruptions to its operation.

Potential Impact on Flood Risk and Drainage

- 10.3.5 Comberton to Shelford Route Section 7, Sheet 2 of the East West Rail Permanent Drawings Map Index (see **Annex 4**), Grid Reference TL 38775 54278

- 10.3.6 The University assumes the linear feature outlined on Figure 2 is to accommodate a discharge from the proposed flood compensation area or balancing pond shown to the south.

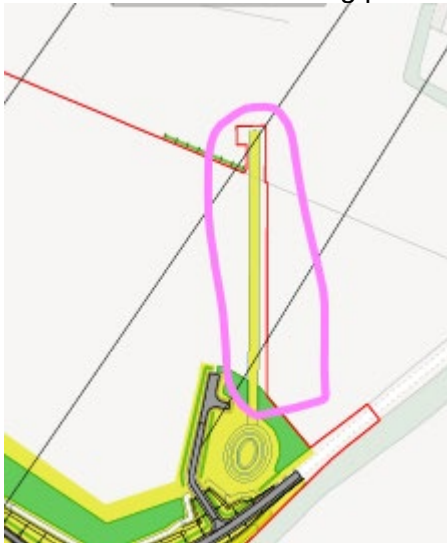


Figure 2. Grid Reference TL 38775 54278

- 10.3.7 The watercourse into which this would discharge currently only receives flow from the south from one c.5” twin wall plastic field drain, shown in Figure 3.



Figure 3. c.5” twin wall plastic field drain

10.3.8 Whilst the University has not been provided with EWR drainage plans, so cannot comment with certainty, we believe the proposal will increase flow in this water course by introducing cross-catchment water. This watercourse is not suitable to receive additional flows for the following reasons:

- (i) The bed is silted above the level of the current input pipe (see Figure 3).
- (ii) The Victorian brick arch culvert that takes the ditch under the former Bedford to Cambridge railway line, c.250 meters to the north, is in very poor condition. It is delaminating, deformed, and could collapse. Increasing flows would bring forward its failure (see Figure 4).



Figure 4. Victorian brick arch culvert

Potential Impact on access to Field Grid Reference TL3854 5930

10.3.9 Comberton to Shelford Route Section 7, Sheet 2 of the East West Rail Permanent Drawings Map Index (see **Annex 4**)

10.3.10 Field TL3854 5930, outlined in red below, which is used by the University for the production of arable crops is only accessible from the field to the east at either end of a ditch and hedge line (access points marked yellow in Figure 5).



Figure 5. Field Grid Reference TL3854 5930

10.3.11 Due to wet ground conditions, the access route at the north is not useable for much of the year. It is essential that access is maintained across the works strip shown outlined in Figure 6, to enable the University to continue to farm the field.

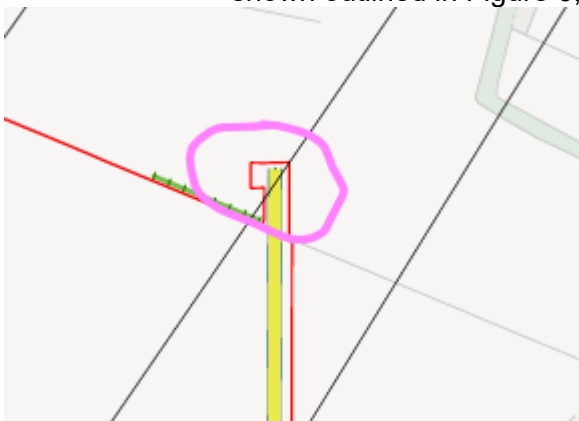


Figure 6. Access Route to Field Grid Reference TL3854 5930

10.3.12 It is also essential that land take is only temporary, not permanent, in order not to create a permanent access problem devaluing field TL3854 5930 significantly. We propose that this area is not shown as a “Grassland Strip” or incorporated into habitat mitigation calculations as this would be inconsistent with its need to be retained for access.

Potential impact on access to storage buildings and land within the MRAO site at Lord’s Bridge

10.3.13 Comberton to Shelford Route Section 7, Sheet 2 of the East West Rail Permanent Drawings Map Index (see **Annex 4**) Grid Reference TL 38622 53651

- 10.3.14 Storage buildings and land on the MRAO Site are accessed along a concrete road outlined in Figure 7. This access needs to remain open at all times and otherwise unrestricted throughout the construction and operation of the Proposed Project. The University has the following concerns in that regard:
- (i) The proposed Works Order Plan appears to include a section of the concrete road owned by the University within the EWR Co works area, (circled on Figure 7). The University is unclear as to why this is needed and whether it is needed exclusively and temporarily or permanently.
 - (ii) The proposed works area hugs tightly the southern edge of the University's access road. There is a requirement for a standoff of at least 2 meters from the road to enable passage by large farm machinery which can overhang the road.
 - (iii) The University has not been made aware of, and how the access road is intended to operate once the railway line is in operation. We request confirmation of the rights of access that will be granted, details on the party that will maintain common sections of the road and to what standard the new side road will be constructed to ensure access and security of the road.



Figure 7. Storage buildings and land on the MRAO Site (Grid Reference TL 38622 53651)

Potential Impact on Stability of Bank Adjoining Cambridge Road

- 10.3.15 Comberton to Shelford Route Section 7, Sheet 2 of the East West Rail Permanent Drawings Map Index (see **Annex 4**) Grid Reference TL 38635 53678
- 10.3.16 In between the MRAO and Cambridge Road, a bank was built to reduce interference to research equipment from traffic passing along the road. In the section highlighted pink on Figure 8, it appears that the base of the bank will

be impacted by the Proposed Project. No information has been provided as to how the stability of the bank will be ensured into the future.



Figure 8. Bank at Grid Reference TL 38635 53678

Potential Impact on Road Safety Works to the Comberton Road Crossing of the Former Bedford Cambridge Railway Line.

- 10.3.17 Comberton to Shelford Route Section 7, Sheet 2 of the East West Rail Permanent Drawings Map Index (see **Annex 4**) Grid Reference TL 38270 54460
- 10.3.18 The proposed works order area includes the embanked road crossing on the south side of the old Bedford to Cambridge Railway Line.
- 10.3.19 The University owns the old railway line, together with the road bridges that cross it. There are structural issues with the Comberton Road bridge that will likely need significant work during the timespan of the Proposed Project. One option being investigated is to remove the bridge and embankments, dropping the level of the road significantly. It is essential to protect future highway safety that these or alternative proposals to remedy defects in the bridge are not compromised by the Proposed Project.
- 10.3.20 It is requested that certainty be given that the University will be given the opportunity to take back land used for habitat creation, subject to appropriate agreements as to the future management of the land, and that the University will be paid a commuted sum to cover the costs of management required by those agreements. There must be a commitment to a reasonable timescale for such transfers to be made, for example 12 months from the running of the first train, and other than where required to secure future management of habitat no onerous restrictions or covenants should be included in the transfers.

11 Expectations of EWR Co before the DCO application is submitted

- 11.1 The University will continue to work collaboratively with EWR Co to progress to resolution on all the issues identified in this consultation response to the University's satisfaction. However, as is clear from the Consultation Brochure, EWR have not undertaken a full options appraisal, meaning that further assessment work is required by EWR Co to consider realignment of the proposed Comberton and Cambridge route (Proposed Project route Sections 7 and 8) or, in the alternative, full mitigation at source by EWR Co to prevent impacts on the MRAO. The mitigation at source options that the University considers should be explored include a tunnel/faraday cage option or enclosure that offers protection of the whole of the MRAO at Lord's Bridge.
- 11.2 EWR Co accepts the severity of the impact of the Proposed Project on the MRAO site and its research. Whilst the University commits to working collaboratively with EWR Co, it is EWR Co's responsibility to review its design and/ or implement mitigation at source to protect the whole of the MRAO in accordance with the University's needs as first indicated as far back as 2019 to date, including in this consultation response.
- 11.3 The University expects EWR Co to commit to full protection of the MRAO Site, either through realignment of the railway between Comberton and Cambridge or, should this not be possible, then the only other option is mitigation 'at source' (at the railway), mitigation that retains (and does not erode any further) the current parameters from the boundary of the MRAO closest to the existing alignment of the Proposed Project.
- 11.4 In relation to the protection of the University's other assets, the University expects as follows:
- 11.4.1 **The AMB** – assurances from EWR Co that the noise and vibration and EMI impacts arising from the additional passenger and freight traffic that would result on the West Anglian mainline when the Proposed Project becomes operational is (i) fully assessed cumulatively with the operation of the CSIE project; and (ii) fully mitigated to ensure the integrity of (and prevent any acceleration in the deterioration of) the aluminothermic welds installed by NR as part of the construction of the CSIE project. This is to prevent any impacts on the quality and credibility of the research being carried out at the AMB.
- 11.4.2 **The GBN** – an explanation of how the proposed works could potentially impact on the GBN and for EWR Co to agree mitigation measures with the University to prevent any disruption to the operation of the GBN.
- 11.4.3 **Flood and drainage impacts** – an explanation of how the proposed works could potentially impact on the University's land and infrastructure, and for EWR Co to agree mitigation measures with the University to prevent any disruption to the operation of the University's estate.
- 11.4.4 **Access to Field Grid Reference TL3854 5930** – assurances that access is maintained to enable the University to continue to farm the field. Moreover, that temporary and not permanent land take is proposed by EWR Co.
- 11.4.5 **Access to storage buildings and land within the MRAO site at Lord's Bridge** – open and unrestricted access to storage buildings and land on the MRAO Site at all times throughout the construction and operation of the Proposed Project.

- 11.4.6 **Stability of Bank Adjoining Cambridge Road** – stability of the Bank to be ensured by EWR Co throughout the construction and operation of the Proposed Project.
- 11.4.7 **Road Safety Works to the Comberton Road Crossing of the Former Bedford Cambridge Railway Line** – the opportunity for the University to take back land used by EWR Co for habitat creation for the Proposed Project.

12 Conclusion

- 12.1 As set out in this consultation response, the University will continue to engage constructively and collaboratively with EWR Co to agree a resolution to the above issues of concern prior to EWR Co's submission of the application for a DCO for the Proposed Project. However, given that the Proposed Project has the potential to have significant adverse impacts on the MRAO and the AMB in particular, the University reserves its right to make representations in respect of the proposed DCO, and to participate fully in the Examination process, should that be necessary.
- 12.2 In relation to the impacts on the MRAO, these are so severe, realignment of the route for the proposed Comberton and Cambridge route (Proposed Project route Sections 7 and 8) is the only fully effective remedy to enable the MRAO to continue operating unaffected; full mitigation at source to fully protect the whole of the MRAO site is next-best. Otherwise, the Proposed Project would have a devastating effect on UK radio astronomy.

Endnotes

ⁱ Ofcom *Space science and meteorology spectrum allocations in the UK* (Publication date: 19 August 2022)

ⁱⁱ ITU-R Recommendation RA.769 and footnote 5.149

ⁱⁱⁱ ITU-R Recommendation RA.769

^{iv} [Environmental Impact Assessment - GOV.UK](#)

^v [jema-mitigation-in-eia-guidance-final.pdf](#)

Appendices

Appendix 1	University of Cambridge 2021 Consultation Response
Appendix 2	University of Cambridge 2025 Consultation Response
Appendix 3	MRAO at the Lord's Bridge
Appendix 4	Indicative MRAO Site on Route Plan
Appendix 5	MRAO Plan with Assets
Appendix 6	Granta Backbone Network Cable Location on Long Road

Annexes

Annex 1	Land Registry Title Number CB292950
Annex 2	Land Registry Title Number CB345456, CB379377 and CB452563
Annex 3	Cambridge Route (Section 8, Sheet 01)
Annex 4	Comberton to Shelford Perm (Section 7, Sheet 2)



Freepost
East West Rail
consultation@eastwestrail.co.uk

9 June 2021

Dear Mr Sparrow

East West Rail Consultation May 2021 : Response from the University of Cambridge

The University welcomes the progress being made by Network Rail to develop the much needed East West Rail (EWR) link between Oxford, Cambridge and beyond and agrees with the project's strategic objectives. The opportunity to shape the scheme ahead of formal statutory consultation later this year is also welcomed as is the continued engagement of the Network Rail project team.

As a major employer within the Cambridge region, we are aware that around 50% of our 12,300 staff commute to the city from outlying areas. This has resulted in door-to-door journey times for many that are in excess of 1.5 hours due to congestion on the highway or poor connectivity/services on public transport. Based on the University's travel to work data we estimate that between 30-40% of our staff living outside of Cambridge could benefit from the opportunities EWR has to offer in terms of reduced journey times, improved accessibility and access to affordable homes. We see significant potential benefits to the University through the widening of its local labour market, and for existing students and staff through improved partnerships and knowledge exchange programmes that could be made possible by the Oxford-Cambridge Arc.

Our response seeks to provide feedback where appropriate to the specific questions identified in the consultation and provides an insight into the University's key priorities for the development of this corridor. These include:

Linking Oxford and Cambridge: The University of Cambridge strongly encourages the selection of any route capable of facilitating *both*:

1. Direct access to and from Oxford and Cambridge, which considerably reduces overall journeys times.
2. A service capable of facilitating economic and housing growth and addressing rural connectivity whilst maximising sustainability.

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The University agrees that all the proposed southern entry routes into Cambridge offer considerable journey time savings over current arrangements amongst other benefits. Therefore, we must support those route(s) which give priority for the greatest potential housing growth and improvements to rural connectivity. With this in mind, we have identified the following as our key priorities:

Building door-to-door connectivity: The University welcomes the opportunities provided by EWR. In particular:

Generally: It is critical to the University and many other employers that our staff have the opportunity to live within reasonable door-to-door travel times. EWR should therefore aim to enhance homes-jobs connectivity across the Cambridgeshire area. This will widen the net of affordable homes for the Cambridge Labour market and reflect a central tenet of Cambridge's 2014 Devolution Deal. In time, EWR should also be firmly aligned with the forthcoming ARC Spatial Framework for the Oxford-Cambridge corridor.

This is particularly relevant to key workers and other low paid staff across Cambridgeshire but also specifically those based on the Cambridge Biomedical Campus (CBC) for whom ease of access is currently limited.

Specifically: We support the potential EWR brings to address the public infrastructure deficit to the West of Cambridge, where nationally significant housing sites of over 20,000 people are growing without adequate public transport. EWR could provide a solution to this as well as the knock-on congestion problems on the A428 and A1309 and other key corridors should suitable interchange and first/last miles facilities be provided. It is important that EWR accounts for local transport improvement initiatives along both these routes.

Area for further investigation: - The University has numerous operations across Cambridge and would like to specifically highlight the operations of the Mullard Radio Astronomy Observatory (MRAO) at Lords Bridge which is located in an area of protective development due to the vibration and electromagnetic sensitivities of the nationally important activities undertaken here.

The existing consultation documents do not provide enough information for the University to fully assess the impact of the proposals or the possible mitigation opportunities that may exist.

We **strongly urge** continued engagement with the EWR project team to ensure we can undertake a comprehensive assessment of the proposal's impact on the activities of the MRAO. Once this information is available both the University and Network Rail would be in a position to understand what mitigation opportunities could be applied to ensure the activities can continue.

Integrating existing transport systems: The Cambridgeshire and Peterborough Combined Authority (CPCA) and the Greater Cambridge Partnership (GCP) are together delivering £1.6bn of devolution agreements, principally focused on transport infrastructure. EWR will need to work carefully with our regional and local partners to ensure its final route compliments existing regional projects that, at our end of the central corridor, already include Cambridge South Station, the developing integrated public transport network and specifically the improvements along the A428 and A1307. This will be critical for achieving integrated transport access to Cambridge's key employment & research sites, including; West Cambridge, The Science Park to the North as well as Granta Park and Babraham Research Campus to the South East.

In addition to large infrastructure integration EWR must also enable first/last mile sustainable travel solutions for existing and new communities along its route to facilitate door to door sustainable travel. This should be achieved through route and train design and station locations that maximise housing development (including affordable and key worker housing) and reduce to the need for further rural traffic generation.

Supporting existing corridors: Our most economically productive transport corridor is that connecting Cambridge to London and we have no evidence to suggest that this has or will change in the future. Linking EWR into this corridor, preferably through a Cambridge entry-point at Cambridge South, will be essential for connecting the “Golden Triangle” of London, Oxford and Cambridge. There are also important but less well-developed corridors between Cambridge and Norwich (specialising in Agri-Tech) and between Cambridge and Ipswich (specialising in IT), both of which would benefit from the Eastward expansion of East West Rail in the future. In addition, a fast and frequent connection to the East Coast Main Line will be extremely valuable for linking Cambridge and its hinterland more effectively with northern parts of the UK. Indeed, existing models suggest that current patterns of growth will facilitate the northward, eastward and southward expansion of the Cambridge Cluster. The final alignment of EWR route entry into Cambridge should be selected with this in mind.

Enhancing the environment: EWR should consider how it can realise its objectives with a net gain to the natural capital of the region. We welcome the proposed additional work to fully assess the impact of the scheme on the environment.

In addition the University would like reassurance that Network Rail will work with Central Government to enable a zero-carbon fuel solution from day one of operation and the design of the project should reflect this ambition as it develops.

Utilising technology: We encourage EWR to consider how it can incorporate cutting-edge data and transport technologies from both Cambridge & Oxford to make the rail connection a “living lab” for commuters and emerging innovations. This will help ensure the Oxford-Cambridge ARC delivers on the government’s construction and rail sector deals while simultaneously improving cross-country infrastructure.

The investment in the EWR and associated infrastructure along the corridor is welcomed and will support existing and future investment by the University and others. It will help to ensure that Cambridge remains a growing and sustainable centre of excellence and a world leader in the fields of higher education and research. It will help the city to nurture its growing industries and will facilitate a further expansion of its knowledge-based economy, while retaining the high quality of life and place that underpins our city and supports its standout economic success. It will help spread access to Cambridge’s many opportunities to communities across its hinterlands.

We fully support and remain committed to the overriding aim of the EWR. This task is more important than ever if we are to sustain Cambridge’s pace of growth and ambitions for sustainability.

If you have any questions or would like to discuss any of the points raised in this response, please do not hesitate to contact me.

Yours sincerely



Graham Matthews



Mr David Hughes
Chief Executive
East West Rail

By email

24 January 2025

Dear Mr Hughes

Non-Statutory Consultation Response

Thank you for the opportunity to engage with East West Rail on the emerging proposal for the railway, through the current non-statutory consultation and through dialogue with your design teams.

The University continues to support the strategic objectives of East West Rail. Development of the railway will enable mass transit movements by sustainable modes, and have a significant beneficial impact in extending the travel to work area for Cambridge including, importantly, the Cambridge Biomedical Campus. The railway will support the continued growth of the Greater Cambridge area, significantly enlarging its travel to work area and providing connection to innovation economies along the route.

There are specific points of details that are raised below. These respond to specific questions in the non-statutory consultation, and are submitted as online responses in addition to this letter.

Croxton to Toft route section (Question 16):

Around 20% of University staff that commute into Cambridge travel along the A428/Madingley Road corridor and the University welcomes the intention to build a new station at Cambourne. It is important that any new station:

- Supports first mile/last mile journeys from/to Cambourne, for the benefit of residents, workers and visitors.
- Is integrated with the proposed Cambourne to Cambridge bus service, which will connect Cambourne to Cambridge via the University's Cambridge West development, a strategically important employment location for which outline planning permission was granted in June 2023 for development of 370,000m² of academic and commercial

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research space, with up to 170,000m² commercial research. There is a strategic imperative for East West Rail to integrate seamlessly with Cambourne to Cambridge in order to facilitate travel for work journeys from locations served by train stations to the west of Cambourne.

- Is integrated with other public transport services.

Collaboration between East West Rail and the Greater Cambridge Partnership, Cambridgeshire County Council and bus operators should take place in order to identify design solutions for inclusion in statutory consultation.

Comberton to Shelford route section (Question 20):

The University is concerned about the potential for significant adverse environmental effects that would affect the Mullard Radio Astronomy Observatory (MRAO) and as highlighted in our previous response ([view here](#)) and in ongoing discussions with the East West Rail technical teams.

The MRAO is situated at Lord's Bridge on the A603 south of Cambridge, as shown in the plans in Annex A.

National and International Importance of MRAO

The Observatory contains unique radio and optical telescopes which are of international importance and must be safeguarded. The facilities measure signals that are very weak, and hence highly susceptible to many forms of interference, specifically electric-magnetic interference (EMI), light pollution and mechanical vibration from domestic, industrial plant and other sources such as vehicles and aircraft.

The Observatory has been home of some of the largest and most advanced radio astronomy instruments in the world since it opened in 1957. Notably, these instruments have supported research leading to 2 Nobel prizes and countless discoveries which have placed Cambridge and the UK at the forefront of astronomy research. Currently, the observatory is home to a number of state of the art aperture synthesis radio telescopes, such as the Large and Small Arcminute Microkelvin Imager arrays and the 32-m dish part of the e-Merlin national facility. It is also important for a number of internationally leading instrument development projects. In these cases, instruments are developed in Cambridge and via collaboration elsewhere and tested at the observatory before being deployed (often in large numbers) to other sites. Most important of these are the developments that Cambridge leads for the Square Kilometre Array (SKA) which is under construction in South Africa and Australia, and which currently brings ~£3M/year to the university in research funds. The SKA is a €1.2bn construction project in its first phase. Cambridge leads the design of several elements of the telescope including the software and, importantly, the low-frequency telescope which will be deployed to Western Australia. There are two test arrays at Lord's Bridge and a third currently in construction. Furthermore, phase II of the SKA (~ 10x the size of phase I) will start its development phase in the coming years, with the observatory expected again to take a central role in the international development efforts due to its unique characteristics. Other uses of the observatory that could be heavily impact by the EW rail project include the smaller (in comparison to the SKA) wide field instruments used by the radio cosmology group, e.g. the REACH project (a £2.4M ERC/UKRI project).

As well as instrument development for new large radio telescopes, the Observatory also hosts a large vibrationally- and temperature-stable optics laboratory that is used to test and validate optical instruments that support and are used in several large international ground-based telescope projects. As for the radio-focused work, instruments are developed in Cambridge and via collaboration elsewhere, and tested at the observatory before being deployed at other sites abroad.

Further details of MRAO and its operating requirements are attached as Annex B.

Ofcom's publication [Space Science and Meteorology Spectrum Allocations in the UK](#) (19th August 2022) identifies MRAO as a nationally important radio astronomy site, and sets out global regulations on the allocation and use of certain frequency bands, some of which are specific to Cambridge.

Environmental Assessment

Given the national and international importance of the MRAO, the protection from development as set out in the Cambridge and South Cambridgeshire Local Plans, and the protection of radio frequencies as set out in international regulations, it is essential that effective environmental assessment is undertaken by East West Rail relative to the impact of the proposed railway on radio astronomy research by MRAO at Lord's Bridge.

East West Rail has selected a preferred route, however without having assessed the environmental effects on research at the Observatory, and environmental impacts are not included in the consultation material. The Environmental Update Report merely states at paragraph 11.2.7 that 'The Mullard Radio Astronomy Observatory includes an array of radio telescopes situated near the Bourn Brook crossing, as well as south of the A603. The potential for electromagnetic interference between East West Rail's traction power system and this facility is being assessed, with a view to integrating protective measures within the railway design. Potential vibration impacts may also need to be mitigated.'

East West Rail appear to assume that the actual emissions from the operation of the railway will correspond to the maximum levels permitted by BS EN 50121-2 'Railway applications. Electromagnetic compatibility. Emission of the whole railway system to the outside world.' This is a major concern, as constant emissions at maximum levels would have a significantly detrimental impact on the work of the MRAO, well above the criterion of 'any risk of interference' as set out in Planning Policy T1/7 (1). It is unlikely that the railway would operate to the maximum levels all of the time, however, actual predicted emissions need to be understood in order to assess the likelihood of risk to interference to MRAO and consequently compliance/non-compliance with planning controls.

Despite the absence of any detailed information from the proposed East West Rail, University experts in radio astronomy research and optical instrument development anticipate that the effects from EMI and vibration during the construction and/or operational phases, arising from the unmitigated proposals as set out in the consultation documents, will be significant. There is a clear and obvious risk of interference to research. It is expected, therefore, that the East West Rail consultation proposal will not be compliant with Part 1 of Policy T1/7: Lord's Bridge Radio Telescope in the South Cambridgeshire District Local Plan.

The University urges East West Rail to carry out an assessment of the likely environmental effects arising from the construction and operations of the route and specifically concerning EMI and vibration in the vicinity of Lord's Bridge, so that a conclusion can be reached on the amount of interference likely to be caused, and to identify what measures could be put in place to mitigate harmful effects.

The assessment should be based on:

- measurements of the existing background EMI and vibration levels at Lord's Bridge;
- measurements of EMI and vibration from railway existing infrastructure and rolling hybrid powered rolling stock; this is important as it seems likely that actual EMI emissions may be less than the maximum permitted under BS EN 50121-2. These measurements should be made:
 - On a railway in similarly flat terrain.

- On a railway with similar power supply and rolling stock to that proposed for EWR, with both passenger and freight trains.
- At a range of distances from the railway chosen, to establish the fall off of EMI and vibration disturbances with distance.
- At the full range of frequencies of EMI interest up to at least the upper frequency specified by OfCom.

Measurements of both background and predicted EMI and vibration levels should be shared with the University early in 2025, well in advance of statutory consultation later in the year. When available, potential mitigation can be discussed and a strategy agreed, to identify how EMI can be managed down to a level which would comply with adopted planning policy.

Mitigation Strategy

As set out in [Government Guidance on Environmental Impact Assessment](#), ‘Developers are encouraged to identify any features of their proposed development and any measures envisaged to avoid or prevent what might otherwise have been significant adverse effects on the environment (Paragraph: 023 Reference ID: 4-023-20170728)...and ‘Where alternative approaches to development have been considered, the Environmental Statement should include a description of the reasonable alternatives studied which are relevant to the proposed development and its specific characteristics and provide an indication of the main reasons for the choice made, including a comparison of the environmental effects’ (Paragraph: 035 Reference ID: 4-035-20170728).

Mitigation is important to the process of EIA, as it ensures that adverse impacts of a development are minimised or completely avoided. The [Institute of Environmental Management and Assessment \(IEMA\) Impact Assessment Guidelines \(August 2024\)](#), describe a ‘mitigation hierarchy’ as follows:

1. Avoid - Identify and avoid potential environmental and social impacts from the outset through considering carefully, for example, the project need, scale, design, location and duration.
2. Prevent - Where impacts from a proposal still pose risk of significant adverse effects to receptor, seek to prevent those effects from occurring by taking action/s to either remove the impact at source or intervene in its pathway to prevent it affecting the receptor.
3. Reduce - If further avoidance and/or prevention are not possible for any remaining aspects, all remaining impacts must be mitigated with guidance from a competent expert with the aim of minimising adverse effects. Mitigation can take many forms and should be specific to the project conditions and context, whilst drawing on good practice and guidance. Mitigation should be reliable, achievable and secured by condition, requirement or legal agreement.
4. Offset - Lastly, any remaining unmitigated or residual impacts should be offset and compensated for.

It is stated in the Guidelines that the mitigation hierarchy can guide decision making at all stages of the project, however, critically, the upper levels of the mitigation hierarchy are most achievable the earlier they are applied, i.e. the **concept, feasibility and site selection phases of the project provide the best opportunities for avoiding a significant environmental impact.** (IEMA’s emphasis).

The consultation proposals for land in proximity to Lord’s Bridge do not include any measures in the priority levels of the hierarchy, however:

1. Avoid – could be achieved by routing the railway further away from MRAO – at least outside the ‘Lord’s Bridge Restricted Area’ as set out in planning policy identified above – or by putting the railway in a tunnel as it passes MRAO. Neither of these options are proposed nor appear to have been explored. Instead, the railway is proposed to run

through the heart of the Lord's Bridge Restricted Area and within 1km of the SKA testing site and the COAST optical laboratory.

2. Prevent – could be addressed by designing the railway at grade, with appropriate vibration suppression, and screened behind an earth bund, neither of which are proposed. Instead, the railway is proposed to operate on an 11m high embankment, without any form of screening, as it passes Lord's Bridge.

We are concerned that East West Rail has assumed reliance on a mitigation strategy that depends solely on measures that would compromise research through the release of radio frequencies up to the maximum levels under BS EN 50121-2, not currently in use, and with no regard to vibration disturbance suppression.

The University does not support the approach to environmental assessment and mitigation being proposed and request that East West Rail urgently consider ways to avoid and prevent adverse impact on the University's nationally and internationally important radio astronomy research.

Until an effective environmental assessment is undertaken, and the operating environment for radio astronomy and other instrument development research is secured and protected for the long-term, to the satisfaction of the University, we are unable to support the current route proposals for the area around Lord's Bridge.

Land Acquisition

It is understood from discussion with officers at East West Rail that land taken for habitat compensation and/or mitigation would initially be permanent land take, but there may be an opportunity for transfers back to original owners subject to agreements securing the ongoing management of habitat created. This includes land within the core of the Mullard Radio Observatory. Control over the future use and occupation of this land is important to secure future research undertaken at the observatory. It is requested that certainty be given that landowners will be given the opportunity to take back land used for habitat creation, subject to appropriate agreements as to the future management of the land, and that landowners will be paid a commuted sum to cover the costs of management required by those agreements. There must be a commitment to a reasonable timescale for such transfers to be made, for example 12 months from the running of the first train, and other than where required to secure future management of habitat no onerous restrictions or covenants should be included in the transfers.

Cambridge Route Section (Question 21)

Anne Maclaren Building

The consultation documents show land acquisition from the University's estate at Cambridge Biomedical Campus, specifically from land around the Anne Maclaren Building and from the adjacent Plot 9 (land parcel references 23144 and 23145). We have since been advised by the design team for the Cambridge route section that East West Rail do not need the additional land beyond which Network Rail has agreed for Cambridge South Station (i.e as per the Transport and Works Act Order Consent), and that University land is not required in order to facilitate the two additional tracks proposed or for the demolition and reconstruction of Long Road Bridge. We have accepted that advice in good faith, for the purpose of this consultation, and ask that amended plans be shared at the earliest opportunity.

The Anne Maclaren Building contains research that is sensitive to vibration impact and to EMI. A Land and Works Agreement (LWA) between the University and Network Rail contains information on vibration and EMC compatibility and management measures that will also apply to the East West Rail proposals. The LWA will be sent under separate cover and is to be treated in confidence.

Cherry Hinton Turnback

The University supports the proposal to create a turnback at Cherry Hinton. This would create the opportunity to create a new station at Cambridge East, supporting the development of thousands of homes and jobs, and enabling cross-city mass-transit movement.

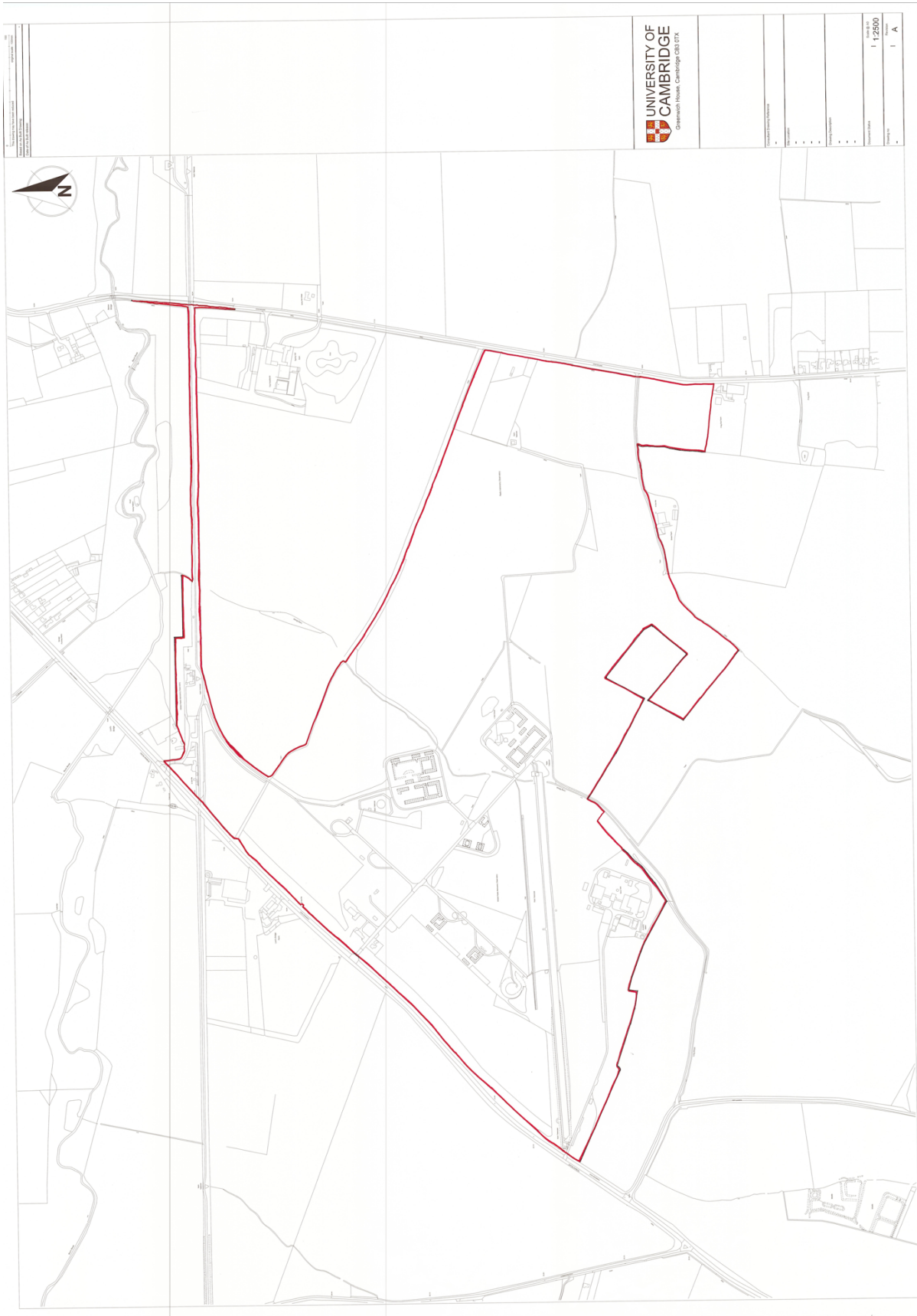
I trust that that this response will be given due consideration and we look forward to working with you in a collaborative spirit to resolve the issues raised, in advance of statutory consultation.

Yours sincerely

A handwritten signature in black ink, appearing to be 'Graham Matthews', written in a cursive style.

Graham Matthews

Annex A Location of the MRAO





MULLARD RADIO ASTRONOMY OBSERVATORY

1. The role of MRAO in supporting the University's Mission

The mission of the University of Cambridge is to contribute to society through the pursuit of education, learning and research at the highest international levels of excellence.

Astronomy and Astrophysics are in a most exciting phase, at the heart of efforts to tackle the great cosmological questions of the origin and nature of the Universe, and also, since the discovery of planets orbiting solar-type stars other than our own Sun in the mid 1990s, questions about the origins of Earth-like planets and life. Cambridge is one of the leading centres globally for this work, and it is centred in three Departments: Physics (the Cavendish Laboratory, including the Mullard Radio Astronomy Observatory, or MRAO), the Institute of Astronomy (IoA), and the Department of Applied Mathematics and Theoretical Physics (DAMTP).

All three Departments carry out cutting-edge research on these fundamental questions, but the particular strength of the MRAO has long been in the development of ever more sophisticated experimental techniques for astronomical measurements, first at radio wavelengths, and now also at higher frequencies. In short, designing, building and operating ever better radio and other telescopes and their associated receivers and instruments. MRAO is one of only two major centres in the UK (with a handful of equivalent places in the rest of the world), with Jodrell Bank at the University of Manchester being the other.

The site at Lord's Bridge is central to this work; the quiet environment and proximity to the researchers, with low levels of electromagnetic interference, has allowed this astonishing technical progress since 1957. The current work is still very much at the forefront of science, with the current activity a mixture of scientific observations, and the development of new techniques and instrumentation to be deployed elsewhere in the world. All of this work is part of wide national and international collaborations.

Not only does this work bring in significant research income, but the MRAO facilities allow Cambridge scientists to stay at the forefront of their fields and take on leading roles in international programmes (such as the SKA) which would not otherwise be possible.

The MRAO interests and expertise in developing the underpinning technologies required for contemporary astrophysics are focused in the radio and optical/infrared regions of the electromagnetic spectrum. In the radio, a major focus has been towards the detection and study of the Epoch of Re-ionization. The team has been intimately involved in the science planning and technology design of the Square Kilometre Array (SKA) – a €billion scale international radio telescope project – and has participated directly in HERA SKA precursor experiment. The MRAO team were responsible for completing the design of the SKA1-LOW antenna and array systems, and thousands of copies of these critical telescopes elements are currently being constructed and deployed. MRAO researchers also designed a new wideband HERA front-end system, which has allowed exploration of both the Epoch of Re-ionization and the Cosmic Dawn. More recent activity has focused on the REACH global experiment – deployed in South Africa – which aims to detect the 21-cm signal from the

Cosmic Dawn and the Epoch of Re-ionization thereby offering a completely new probe of structure formation in the early Universe.

At optical and near-infrared wavelengths, MRAO staff are world leaders in the design of interferometric array telescopes and their subsystems and are also embedded in several international large-telescope spectrograph projects where skills in precision opto-mechanics, the design and testing of cryogenic systems, and software architecture for instrument control are all deployed. While much of this work takes place at the main Cavendish Laboratory site a specialised thermally and vibrationally stable laboratory located at Lord's Bridge provides a unique large (25m × 5m) environment in which ultra-sensitive equipment can be tested and validated. Current optical/infrared projects include the design and delivery of key elements of the MOONS and ANDES spectrographs for the European Southern Observatory in Chile, the assembly and validation of the HARPS3 ultra-precision spectrograph for the Isaac Newton Telescope in La Palma, and the design and construction of critical subsystems for the \$100M-scale Magdalena Ridge Observatory Interferometer in the USA.

2. Scientific achievements by MRAO (past and present ground breaking research)

The story of MRAO is one of scientific success. It is impossible to include all the contributions to our understanding of the Universe that have started at the MRAO. Simply put, the developments that have taken place at the MRAO and Cavendish Astrophysics since World War II have changed the way in which we understand the universe we live in. To name only a few of the most remarkable achievements, one cannot forget about the discovery of pulsars (neutron stars) by Hewish and Brunel (<https://en.wikipedia.org/wiki/Pulsar>). This is a discovery that not only revealed to the world a completely new type of natural phenomena but opened a world of possibilities to study the universe via interactions of matter and wave, using some of the most accurate natural clocks known to humans: neutron stars. This discovery has been recognised with countless awards, including a Nobel Prize for A. Hewish (<https://www.nobelprize.org/prizes/physics/1974/summary/>) and many others for JB Brunell (e.g. Copley Medal, etc).

The technique of Earth-rotation Aperture Synthesis (https://en.wikipedia.org/wiki/Aperture_synthesis) is another invention that took place at the MRAO which changed the face of Physics and Astronomy. Developed by M Ryle since the 1950s, it is the main technique used still today by radio telescopes everywhere, as it allows these instruments to survey the sky orders of magnitude faster than other techniques such as mechanical scanning. It was recognized with a Nobel Prize for Ryle in 1974. It led for example the production of the first maps of the radio sky and to the early source counts (also made here at the MRAO) that favoured the Big Bang theory over a steady-state universe. The developments of instrumentation and techniques such as aperture synthesis continue today at the MRAO, adapting the algorithms that Ryle et al developed to modern computing systems such as the ones that will be used by the largest and most powerful radio telescope ever to exist, the SKA. Cambridge holds a world-leading position in the international multi-billion pounds SKA project, head-quartered at Jodrell Bank, Manchester. Today, the Cavendish Astrophysics group has diversified its research portfolio, but its main strength over others continues to be the strong emphasis on the development of the instruments later used for astronomical observations. This development starts at the conception phase, when our researchers plan what experiment is needed to probe a particular

mystery in Physics, all the way to the actual engineering development, fabrication, testing, etc All happening at our doorstep at the Lords Bridge site of the MRAO. A very current example of this is the REACH telescope, recently awarded 2.4 million pounds by UKRI (<https://gtr.ukri.org/projects?ref=EP%2FY02916X%2F1>) to study the birth of the very first stars of our Universe, to understand how the universe went from dark and simple to complex and full of light in its most fundamental transformation to date. This discovery, in turn, promises to answer some fundamental questions about the nature of dark matter and its role in the formation of stars, galaxies and the rest of celestial objects. REACH is currently building a radio telescope at the MRAO.

As specific examples of some scientific milestones achieved recently thanks to the instruments at the MRAO, we could cite the follow-up of one of the brightest bursts of electromagnetic radiation in the sky ever recorded (the brightest in history at Gamma Ray frequencies) by the AMI array in October 2022. GRB 221009A was followed since its very early and unexpected appearance in the sky by the AMI telescope (and only by the AMI telescope for a large fraction of time) providing a unique insight in the nature of this cosmological phenomena (<https://www.nature.com/articles/s41550-023-01997-9>). Another example, on the engineering side, would be the development since 2011 of the SKALA antennas for the SKA1-LOW array, of which 131,000 copies (<https://www.skao.int/en/explore/telescopes/ska-low>, <https://cdr.skatelescope.org/#profiles?lfaa>) are currently being built to make the largest and most powerful radio telescope in history.

3. The value of radio astronomy research generally and MRAO specifically to UK and international research

Radio astronomy has led to many discoveries and insights about the universe, including:

- Cosmic Microwave Background Radiation: The afterglow of the Big Bang, discovered in the 1960s by astronomers looking for the source of radio antenna interference
- Pulsars: Rapidly spinning remnants of supernova explosions that emit regular radio waves
- Quasars: Some quasars are strong radio sources, and were the first radio-emitting objects to be discovered
- Galaxy structure: Radio astronomers use hydrogen's characteristic emission to map out the structure of galaxies
- Solar activity: Radio telescopes can observe the Sun and solar activity
- Planet mapping: Radio telescopes can be used for radar mapping of planets

Radio astronomy has changed the way we view the universe by providing a different view of the sky that optical instruments like the Hubble Space Telescope cannot see. Radio telescopes allow astronomers to study the radio waves emitted by astronomical objects to learn about their composition, structure, and motion. Radio astronomy data can also be used to create images that show characteristics like temperature, clumpiness, and strength of radio emissions.

With the development of next-generation radio observatories like the SKAO (www.skao.int), radio astronomy is about to live a second golden age (after the first one already led by researchers at the MRAO). As such, radio astronomy plays a fundamental role in society, by

answering some of the most fundamental questions about our universe's past, present and future.

Financially, radio astronomy represents an investment of several hundred million in the UK alone. As an example, the UK's contribution to the SKA project is of the order of £200M (construction and early operations), making the UK the prime funder. For Cambridge, radio astronomy research based at the MRAO and Cavendish Astrophysics currently comes at a rate of ~£3M/year, and expected to continue for the at least the next decade.

It is also worth noting how the technological developments in radio astronomy projects, regularly find their way to the commercial arena and the wider societal impact due to their pioneering nature. A well-known example of this is the invention of WiFi (<https://www.csiro.au/en/research/technology-space/it/wireless-lan#:~:text=We%20invented%20wireless%20LAN&text=The%20invention%20came%20out%20of,their%20behaviour%20in%20different%20environments>). Advances in astronomical technology have a direct impact in everyday technology. This includes computers, satellites, GPS, solar panels, digital cameras, airport security scanners, and MRI scanners, amongst others (<https://www.cfa.harvard.edu/big-questions/how-can-astronomy-improve-life-earth#:~:text=Computers%2C%20satellites%20and%20the%20smartphones,greatest%20wells prings%20of%20human%20ingenuity>).

Radio astronomy is considered by many a “British invention” with pioneers in Cambridge and Manchester amongst others. It is certainly a scientific discipline whose early development was led by British scientists, especially here in Cambridge at the MRAO (https://en.wikipedia.org/wiki/Radio_astronomy). This is undoubtedly helping inspire new generations of brilliant and talented engineers, physicist and astronomers across the country. The history of MRAO is full of groundbreaking discoveries and world class research (<https://www.astro.phy.cam.ac.uk/about/history>). In a few lines one cannot start to make justice to this story, portrayed in history of science books (e.g. https://books.google.co.uk/books/about/The_Early_Years_of_Radio_Astronomy.html?id=v2SqL0zCrwcC&redir_esc=y), countless public talks (e.g. <https://talks.cam.ac.uk/talk/index/7600>) and science museums (e.g. <https://www.sciencemuseum.org.uk/objects-and-stories/astronomy-and-cosmology>) across the country and beyond.

4. Research Compatibility

The EMI environment (aka radio spectrum for our purposes) is an ever-changing resource. Below, we show a plot of this environment taken a few years ago at the MRAO Lords Bridge site at frequencies below 500 MHz. This clearly shows some bands that are clean (or cleaner), and some bands contaminated. It is extremely important to understand that this is a snapshot of a situation constantly evolving in time at cadences from seconds to minutes to hours, days, weeks, etc. In radio astronomy, we constantly need to deal with EMI or Radio Frequency Interference (RFI) as we call it. We deploy systems and techniques to either detect and flag (usually to be discarded at some point) contaminated frequency bands, or to equalize the effect of the contamination, depending on how much knowledge of it we have and its nature. As communication systems move to the digital domain (e.g. TV or radio) the nature of the contamination (frequency bands, power levels, etc) change. At the MRAO we aim to leverage a relatively clear existing EMI environment for our research. We adapt our observations when needed and we find workarounds when possible. Typically, knowing specific channels of

contamination is the easiest thing to deal with. In other words, wideband noise is our biggest enemy. Knowing that some narrow channels are contaminated, perhaps during only a period, and perhaps only in a certain polarization of the wave, provide us the ability to operate our instruments effectively.

Furthermore, the radio astronomy science done at the MRAO has changed its use of the spectrum all the time since the early days. This is not only because RFI was appearing at certain bands, but also, and most importantly, because the most interesting science required observations at different frequencies. These frequencies have sometimes gone up, typically enabled by modern radio technology, but also sometimes have gone down in frequency. For example, to the MHz regime, where we aim to exploit a particular radio emission from hydrogen to study the infant universe. While ultimately we may need to deploy instruments in far remote locations (where RFI is even lower), the use of the MRAO as a deployment site requires of a radio-quiet spectrum.

In summary, when trying to “protect” a world-class radio observatory like the MRAO, one can not only look at the observation frequencies of the telescopes in operation at a given time but needs to look at the higher-level picture. We therefore come out with requirements (in line with the specifications and standards from the ITU) across large frequency bands, where we expect the science to take place over the next few decades. Otherwise, in the presence of new, permanent, wide-band noise, such as the one that may be introduced by an installation such as the EW rail project, the operations at the observatory would be at risk.

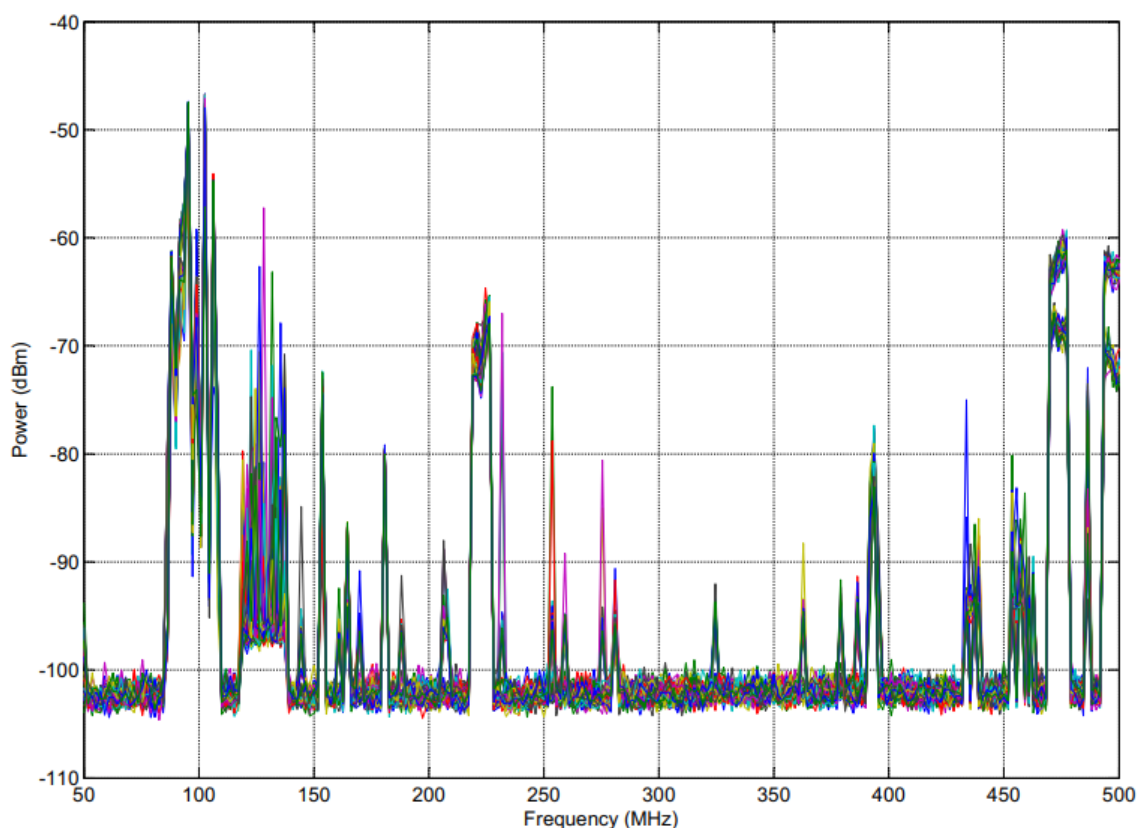


Figure B1. Plot of the EMI environment at the Observatory for frequencies up to 500MHz.

In the following pages we provide a description of some of the active instruments on site as an example. As described above, this is just a snapshot in time. The observatory continues development (as it has done until now) based on where the science takes it.



Figure B2 - Plan of the observatory and equipment locations (google maps)

Name: Square Kilometre Array (SKA)	
Plan Location: Plan Location A	Date of Installation: 2011, 2015, 2019, 2022
Description: <i>Phased arrays with 64 and 16 elements each. 2 m tall aerials.</i>	
Sensitivity: EMI	Frequency Range/Compatibility Requirement: 50-350 MHz
Whether equipment is sensitive in specific directions, and specification: Equipment is sensitive in all directions (widefield instrument)	
Current Research Being Undertaken <i>These arrays are currently used to develop calibration techniques for the full SKA system in Western Australia.</i>	
Anticipated Research in the early 2030s and beyond: Aerials will be replaced with new designs. Arrays for SKA Phase II will be built as well.	

Name: AMI Small Array	
Plan Location: Plan Location B	Date of Installation: Early 2000s
Description: <i>10 element dish array inside enclosure (no ceiling)</i>	
Sensitivity: EMI	Frequency Range/Compatibility Requirement: 12-18 HGz
Whether equipment is sensitive in specific directions, and specification: Sensitive in all directions (depending on where the dishes are pointing to), but partially protected by the enclosure walls.	
Current Research Being Undertaken: <i>Use as a monitor of transient events in the sky.</i>	
Anticipated Research in the early 2030s and beyond: Unclear at the moment. Transient studies is the most likely application then.	

Name: AMI Large Array	
Plan location: Plan Location C	Date of Installation: Early 2000s
Description: <i>8 dishes, 15.6 m in diameter</i>	
Sensitivity: EMI	Frequency Range/Compatibility Requirement: 12-18 GHz
Whether equipment is sensitive in specific directions, and specification: All directions according to pointing of the aerials.	
Current Research Being Undertaken <i>Use as a monitor of transient events in the sky.</i>	
Anticipated Research in the early 2030s and beyond: <i>Use as a monitor of transient events in the sky.</i>	

Name: COAST Bunker	
Plan Location and Coordinates: Plan Location D 52° 09' 49.4" N 0° 02' 26.3" E	Date of Installation: Circa 1990, as part of the infrastructure needed to house the optical delay lines and correlator for the Cambridge Optical Aperture Synthesis Telescope.
Description: This is a laboratory building, covered with an earth berm, and with approximate external dimensions of 25m x 10m. The long axis of the building is oriented North-South. The bunker is at ground level.	
Sensitivity: Ground vibrations	Frequency Range/Compatibility Requirement: Vibration Criterion D (VC-D) The experiments now undertaken in the COAST bunker are most sensitive to ground vibrations in the 0.1-200 Hz frequency range One of our current projects requires continuous stable periods of up to 48 hours Other experimental tests of equipment usually run for shorter periods (2-8 hours) and so can normally be scheduled to be run during "quiet" periods, e.g. at night time or early mornings.
Whether equipment is sensitive in specific directions, and specification: The COAST Bunker is sensitive to all sources of ground vibration, from all directions	
Current Research Being Undertaken: The COAST bunker was decommissioned for use as part of the Cambridge Optical Aperture Synthesis Telescope in the mid 2000s but since then has been used as a thermally and seismically quiet laboratory space where optical instruments for astronomical telescopes are characterised and tested. These instruments (and their testing set-ups) typically employ interferometric methods, and so require vibrationally-stable laboratories for their testing to take place. The large size of this space (25m × 5m) allows for very large instruments and test assemblies to be validated: such a large stable environment is not available in the main Cavendish site. Currently there are two projects that use the COAST bunker as a vibration-quiet laboratory space. The first of these is collaboration between scientists at the MRAO and staff at the New Mexico Institute of Mining and Technology (NMT) in the USA to design, construct and test the world's largest imaging synthesis telescope operating at optical/near infrared wavelengths. The collaboration to design this telescope (the Magdalena Ridge Observatory Interferometer) has been ongoing since 2003, and is currently supported by a 4.5 year \$3.7M contract extending to Q4	

2026. Should the demonstrator telescope under construction perform as expected, NMT anticipate bidding for an additional \$100M to complete the array over a subsequent 5-7 year period. Were that to happen, MRAO researchers would expect to secure an additional \$7M-10M of grant funding to deliver/upgrade hardware components to the array.

A second project, currently supported by a £1M grant from the EPSRC, that exploits the COAST bunker is focused on designing and prototyping a 2d optical lithographic engine capable of patterning substrates with nm-level accuracy over metre-sized substrates. The rationale for such an instrument is to overcome the current impasse in making large echelle diffraction gratings, where there exist only a single manufacturer worldwide that can produce gratings over 0.2m in size, and none which can fabricate metre-sized gratings. Our current grant extends until Q4 2025, but we anticipate a further 3 years of work will be needed to confirm an appropriate level of performance. The scale of funding needed for that further development would be or order £2M-4M.

Anticipated Research in the early 2030s and beyond:

It is difficult to anticipate the needs of the astronomical community beyond 5 year timescales, as the desire for future instrumentation is contingent on the discoveries that will be being made over the next 5 years. What is clear, though, is that the development of instrumentation for the currently planned next-generation of ground-based telescopes is a strategic theme of the Cavendish Astrophysics Group, and so we anticipate needing VC-D stability for at least the next 5-10 years.

Name: 32-m e-Merlin dish	
Plan Location and Coordinates: Plan Location E	Date of Installation: 1990
Description: The e-MERLIN telescope at Lords Bridge, Cambridge is a high performance, high sensitivity 32m diameter radio telescope operated by The University of Manchester as part of e-MERLIN on behalf of the UK Science and Technology Facilities Council for radio astronomy research. e-MERLIN combines signals from 7 radio telescopes across the UK, with a maximum separation of 220km in order to produce high resolution radio images of a wide range of astrophysical objects and phenomena from nearby stars to the most distant galaxies and quasars. Crucially, this telescope provides the maximum separation in the e-MERLIN array and hence the most resolution. See www.e-merlin.ac.uk	
Sensitivity: EMI	Frequency Range/Compatibility Requirement: Currently: 1.25-1.75 GHz, 4-8GHz, 18-24 GHz. Future plans would also cover 2-4 GHz and 8-16 GHz.
Whether equipment is sensitive in specific directions, and specification: The 32-m telescope is fully steerable and is used to observe objects all over the sky including those at low elevation (down to 2 degrees above the horizon). It is used 24hrs/day and up to 365 days/year, except for any maintenance activities. The thresholds for harmful interference should be based on ITU-R RA.769-2, which forms an internationally accepted definition of harmful interference to radio telescopes. Since the telescope can also be used in single dish mode, compatibility calculations should be made on that basis. Compatibility calculations should include out-of-band emission and unintended electromagnetic radiation coming in to protected radio astronomy bands (eg 1400-1427 MHz). We stress that radio telescopes are extremely sensitive (they are equipped with cryogenic receivers) and are routinely used to detect extremely faint signals, often using long integration times. We routinely and frequently study objects fainter than $1E-29$ W/Hz/m ² and our most sensitive observations can be 100x below this.	
Current Research Being Undertaken: e-MERLIN is used by hundreds of researchers across the UK and around the world, including almost all UK university astrophysics groups for a wide range of science projects including planet formation around nearby stars, star formation and evolution, galaxy formation and evolution, cosmology including dark matter and dark energy via weak gravitational lensing observations, and fundamental physics. It is also used for bi-static radar observations of asteroids, satellites and space debris including contributions to NATO research task groups. e-MERLIN is a UK National Facility and provides a world-leading unique capability for high resolution radio astronomy. It is also part of the European VLBI Network which combines all e-MERLIN telescopes with 10-15 of the largest radio telescopes in Europe, Asia and South Africa to provide milli-arcsecond resolution. (see www.evlbi.org) e-MERLIN is operated by the University of Manchester on behalf of UKRI-STFC. STFC are the principal funders. The total capital investment in e-MERLIN would be >~£40m, not including the 76-m Lovell Telescope at Jodrell Bank. The current annual operating costs exceed the STFC	

contribution of £2.7m/yr. e-MERLIN has operated since 1980 and the Cambridge 32-m telescope was added in 1990. Current operational funding is typically provided on a 5-yr rolling contract.

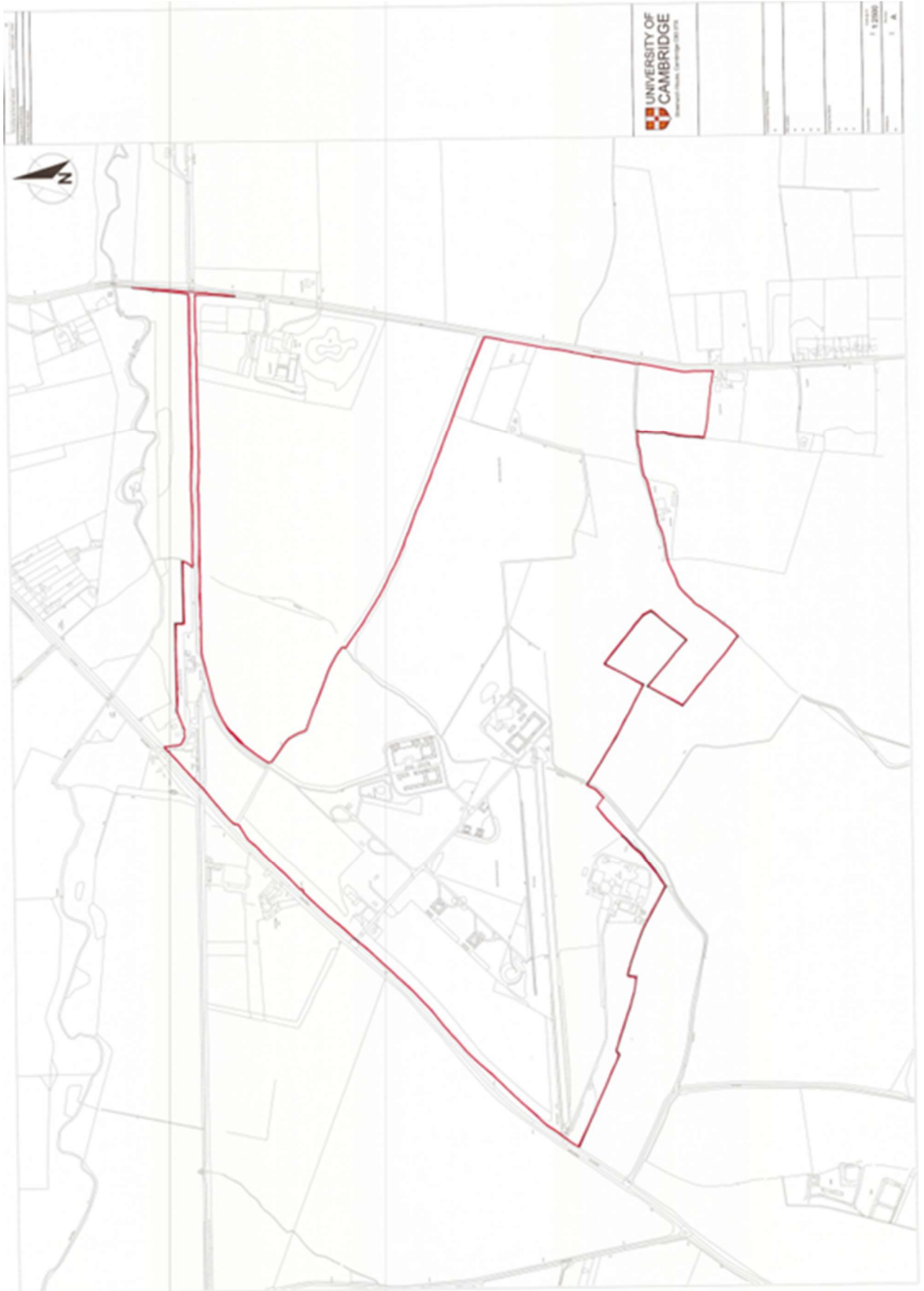
Anticipated Research in the early 2030s and beyond:

We are currently developing a (~£50m) proposal to extend e-MERLIN by adding multiple smaller dishes across the UK. This would greatly increase the sensitivity, resolution, imaging capability and flexibility of e-MERLIN. This project has been positively reviewed by STFC and we await further decisions on funding. If supported this would create a major UK facility for high resolution radio astronomy, space weather monitoring and prediction, and space situational awareness from ~2030 for another 20+years.

Name: REACH antenna	
Plan Location: 150 m south of plan Location D	Date of Installation: Q1 2025
Description: <i>30 x 30 m aerial, 2 m tall.</i>	
Sensitivity: EMI	Frequency Range/Compatibility Requirement: 10-250 MHz
Whether equipment is sensitive in specific directions, and specification: Yes, all directions.	
Current Research Being Undertaken: <i>Attempting a detection of the 21-cm line from cosmic hydrogen averaged across all directions of the sky.</i>	
Anticipated Research in the early 2030s and beyond: Unclear.	

Name: SKA MFAA array	
Plan Location: Plan Location G	Date of Installation: Circa 2015
Description: Small array prototype useful for early developments for SKA Phase II	
Sensitivity: EMI	Frequency Range/Compatibility Requirement: 300-1500 MHz
Whether equipment is sensitive in specific directions, and specification: All directions	
Current Research Being Undertaken: <i>Engineering prototype</i>	
Anticipated Research in the early 2030s and beyond: The plan is to it make it larger to make it a transient detector.	

APPENDIX 3 LOCATION OF THE MRAO AT LORD'S BRIDGE














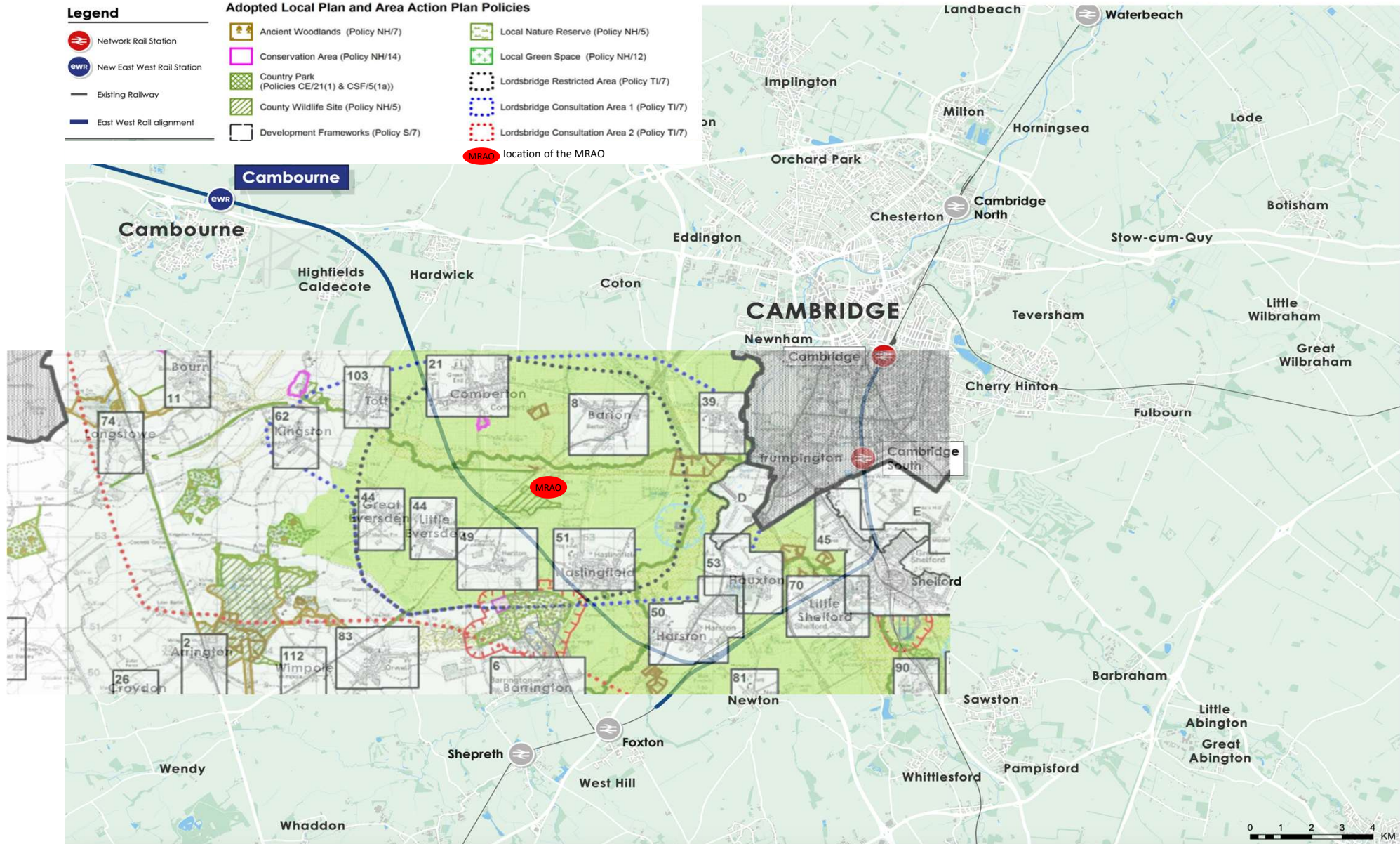
APPENDIX 4 INDICATIVE MRAO LOCATION ON ROUTE PLAN

Legend

-  Network Rail Station
-  New East West Rail Station
-  Existing Railway
-  East West Rail alignment

Adopted Local Plan and Area Action Plan Policies

-  Ancient Woodlands (Policy NH/7)
-  Conservation Area (Policy NH/14)
-  Country Park (Policies CE/21(1) & CSF/5(1a))
-  County Wildlife Site (Policy NH/5)
-  Development Frameworks (Policy S/7)
-  Local Nature Reserve (Policy NH/5)
-  Local Green Space (Policy NH/12)
-  Lordsbridge Restricted Area (Policy TI/7)
-  Lordsbridge Consultation Area 1 (Policy TI/7)
-  Lordsbridge Consultation Area 2 (Policy TI/7)
-  MRAO location of the MRAO



APPENDIX 5 MRAO PLAN WITH ASSETS AND EWR LINE

**** POSITIONS ARE APPROXIMATE ****



ASSET NAME

- A SKA arrays
- B AMI Small Array
- B Mullard Laboratory
- C AMI Large Array
- D COAST
- E 32-m E-Merlin dish
- F HERA array
- G SKA MFAA array
- H Future SKA Phase II
- I Shielded chambers
- I Lecture rooms
- J Antenna test facility*
- K REACH telescope

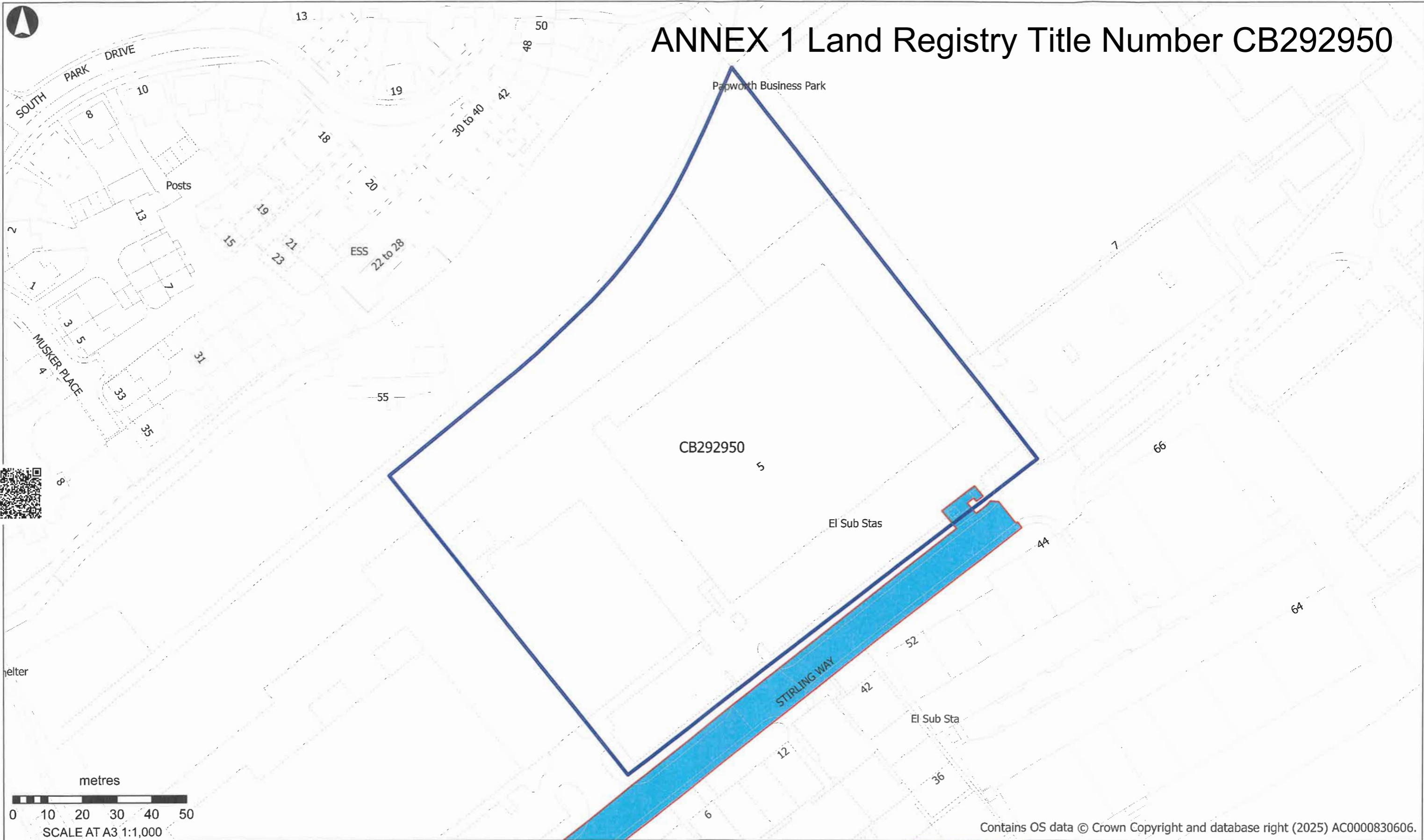
EWR PROPOSED ROUTE
(approximate)

MRAO BOUNDARY
(approximate)

APPENDIX 6 GRANTA BACKBONE NETWORK CABLE LOCATION AT LONG ROAD



ANNEX 1 Land Registry Title Number CB292950



- Draft Order Limits
- Land Registry Title(s)
- Proposed Permanent Acquisition of Land
- Proposed Temporary Possession of Land
- Proposed Temporary Possession of Land and Permanent Acquisition of Rights
- Permanent Acquisition of Subsoil and Rights and Temporary Possession of Land at Surface

The land use areas shown on this plan are illustrative and based on our current designs, which are subject to change. For further information to help you interpret the plans, please refer to our consultation document 'Your questions answered if your property is in the Draft Order Limits'

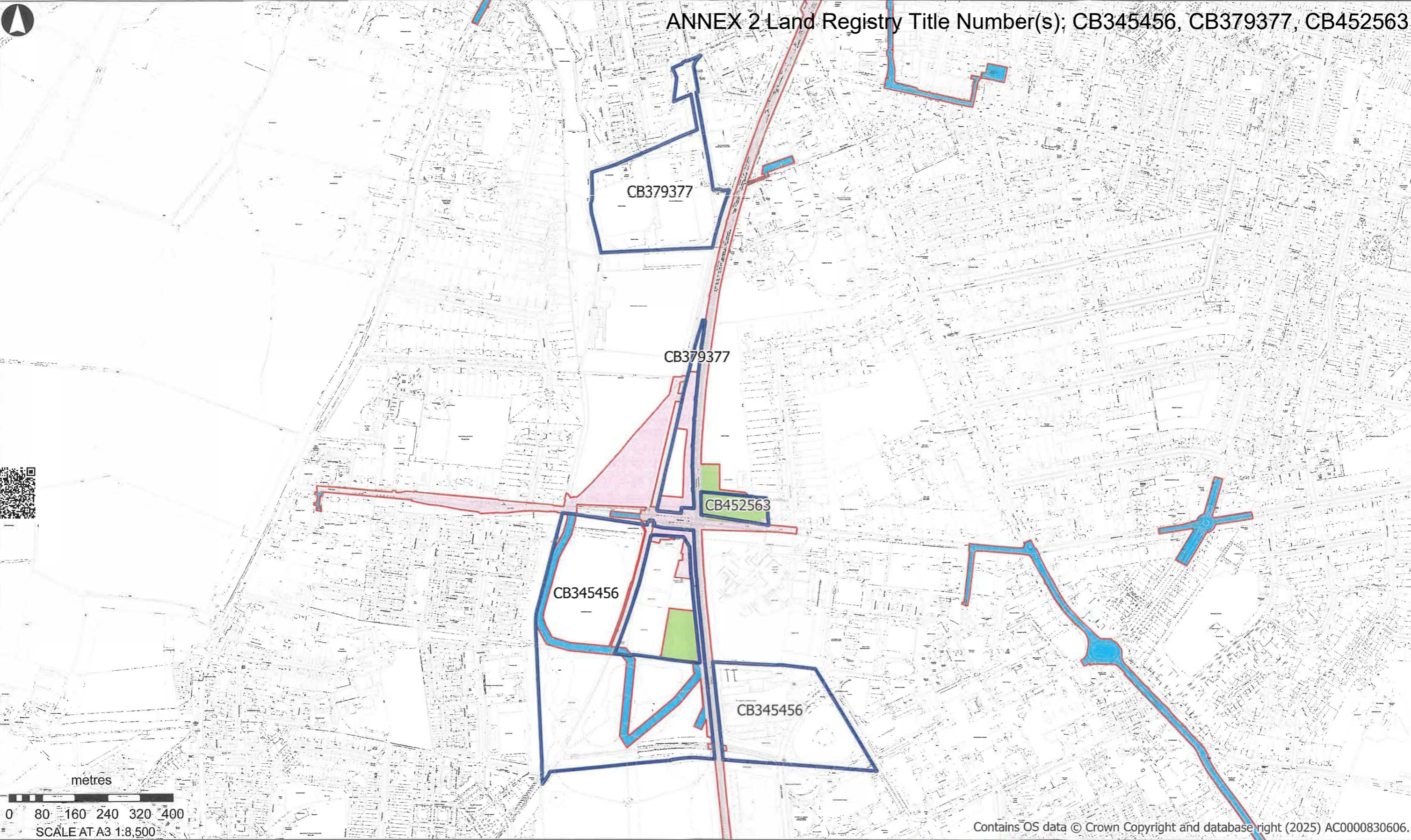
Land Registry Title Number(s): CB292950

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PROPOSAL FOR CONSULTATION

Project	EAST WEST RAIL
Drawing Title	Proposed Land Use and Title(s) Plan

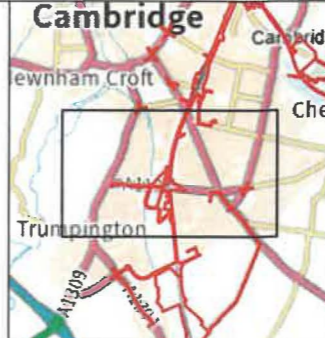


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Land Registry Title Number(s): CB345456, CB379377, CB452563

- Draft Order Limits
- Land Registry Title(s)
- Proposed Permanent Acquisition of Land
- Proposed Temporary Possession of Land
- Proposed Temporary Possession of Land and Permanent Acquisition of Rights
- Permanent Acquisition of Subsoil and Rights and Temporary Possession of Land at Surface

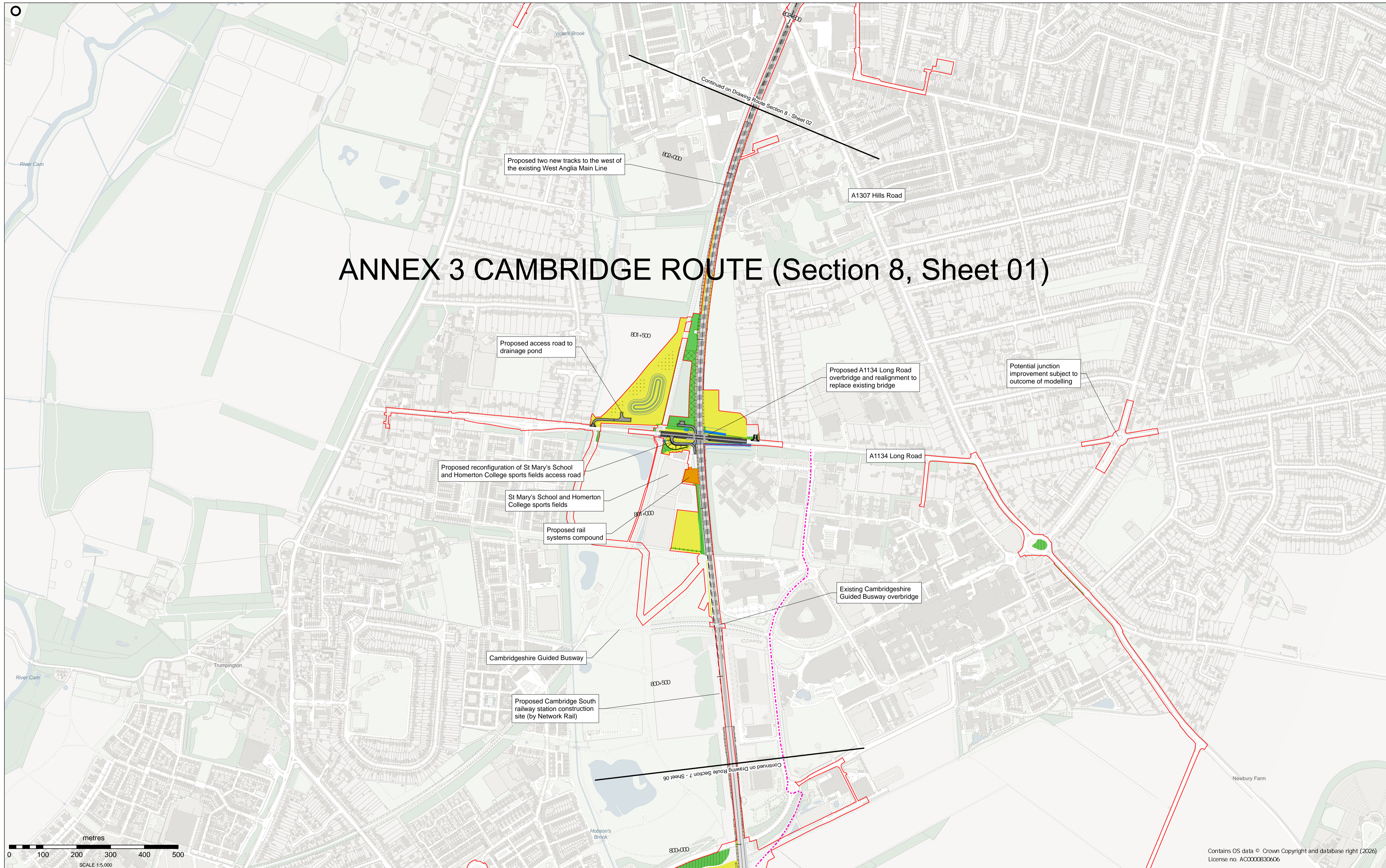
The land use areas shown on this plan are illustrative and based on our current designs, which are subject to change. For further information to help you interpret the plans, please refer to our consultation document 'Your questions answered if your property is in the Draft Order Limits'



The logo for East West Rail, featuring the text 'east west RAIL' in a stylized font. To the right is a logo for a joint venture (JV) consisting of puzzle pieces in red, blue, and green.

Project	EAST WEST RAIL
Drawing Title	Proposed Land Use and Title(s) Plan

ANNEX 3 CAMBRIDGE ROUTE (Section 8, Sheet 01)

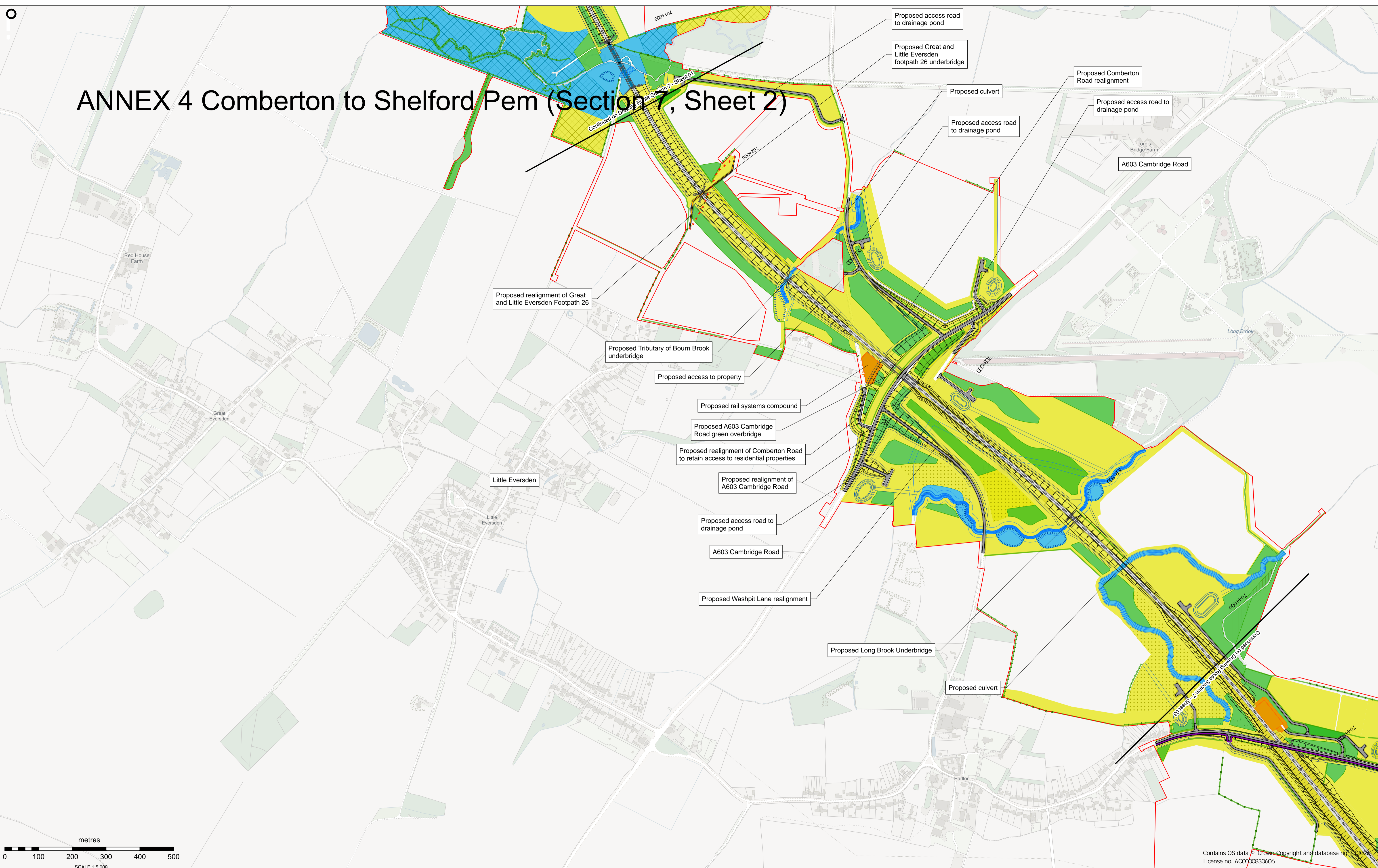


<ul style="list-style-type: none"> — Draft Order Limits — EWR alignment — Chainage (metres) — EWR existing alignment (by others) — Bridges and retaining walls proposed — Public Right of Way - existing — Public Right of Way - proposed — Public Right of Way - closed — Public Right of Way - proposed by others 	<ul style="list-style-type: none"> — Public Right of Way - closed by others — EWR planned active travel route — EWR planned active travel route (suitable for equestrians) — Planned route by others — River diversion — Permanent highway (public and private) — Engineering earthworks — Maintenance compound — Station or other building 	<ul style="list-style-type: none"> — Work by others — Drainage ditch — Drainage pond — Drainage attenuation tank (below ground) — Drainage pumping station — Noise barrier — Proposed line of trees or hedgerow — Enhanced line of trees or hedgerow — Retained line of trees or hedgerow 	<ul style="list-style-type: none"> — Flood compensation area — Proposed grassland — Proposed grassland and scattered trees — Proposed woodland — Proposed wetland — Retained habitat (See note below) — Enhanced habitat (See note below) <p>Where hatching appears over the environmental mitigation this indicates either retained mitigation (vertical lines) or enhanced mitigation (crosshatch)</p>
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PROPOSAL FOR CONSULTATION

<p>EAST WEST RAIL Permanent Drawings</p>
<p>Cambridge Route Section 8 Sheet 01</p>
<p>Project: Drawing Rev: P02</p> <p>Drawing Title: 133735-MWJ-Z0-XXX-DRG-CSE-000101</p> <p>Drawing Number: License no. AC0000830606</p>

ANNEX 4 Comberton to Shelford Pem (Section 7, Sheet 2)



<ul style="list-style-type: none"> Draft Order Limits EWR alignment Chainage (metres) EWR existing alignment (by others) Bridges and retaining walls proposed Public Right of Way - existing Public Right of Way - proposed Public Right of Way - closed Public Right of Way - proposed by others 	<ul style="list-style-type: none"> x x x Public Right of Way - closed by others — EWR planned active travel route - - - EWR planned active travel route (suitable for equestrians) - - - Planned route by others — River diversion Permanent highway (public and private) Engineering earthworks Maintenance compound Station or other building 	<ul style="list-style-type: none"> Work by others Drainage ditch Drainage pond Drainage attenuation tank (below ground) Drainage pumping station Noise barrier Proposed line of trees or hedgerow Enhanced line of trees or hedgerow Retained line of trees or hedgerow 	<ul style="list-style-type: none"> Flood compensation area Proposed grassland Proposed grassland and scattered trees Proposed woodland Proposed wetland Retained habitat (See note below) Enhanced habitat (See note below) <p>Where hatching appears over the environmental mitigation this indicates either retained mitigation (vertical lines) or enhanced mitigation (crosshatch)</p>
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PROPOSAL FOR CONSULTATION

Project EAST WEST RAIL Permanent Drawings	Drawing Title Comberton to Shelford Route Section 7 Sheet 02
Drawing Number 133735-MWJ-Z0-XXX-DRG-CSE-000101	Drawing Rev P02

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