Alternatives to the Southern Approach to Cambridge

Executive Summary

This response to East West Rail's (EWR) 2026 Non-Statutory Consultation focuses on the feasibility and comparative merits of two alternative routes for the project's approach into Cambridge, in place of the Southern Approach to Cambridge (SATC) currently proposed by EWR Co.

The two alternatives assessed are:

- **The Northern Approach to Cambridge with turnback (NATC+)** – a modified version of the route assessed by EWR Co in its 2023 Alternative Connections Project (ACP) Report, enhanced with a turnback facility located south of Cambridge South station, near Little Shelford, to provide direct connectivity to Cambridge South station and the Cambridge Biomedical Campus (CBC). The NATC+ also connects Northstowe, one of the largest new settlements in England, directly to the EWR network.
- **A Long Tunnel** – a deep-bored tunnel running from Highfields Caldecote in the west, rising out of the ground south of Cambridge South station and serving that station directly before continuing north to Cambridge station along the existing West Anglia Main Line (WAML) corridor.

Our central argument is straightforward: the NATC+ offers the strongest case for economic growth because it is the only option directly serving all three Cambridge stations. On the evidence set out in this report, it also performs better than the SATC against the main assessment criteria, including cost, construction time, environmental impact, programme risk, community impact, safety and long-term operational resilience. That additional connectivity materially strengthens the business case for the NATC+ because it links EWR to the full range of Cambridge's key employment and research destinations, while also allowing service to Northstowe if required.

If a southern approach is nevertheless pursued, the Long Tunnel is, on the evidence available, stronger than the SATC on most criteria. In particular, it avoids the unresolved issues associated with the SAC and the MRAO.

Key findings are summarised below:

- **Cost:** These cover the Bedford to Cambridge section, are at 2021 prices and excluding turnbacks for which no estimates are available in EWR Co's reports. Detailed analysis of EWR Co's ACP cost data indicates a base construction cost (i.e. without risk allowances) for the NATC+ of approximately **£2,160m**. This compares with approximately **£3,350m** for the SATC – a saving of £342m or 36%. The long tunnel option has an estimated direct construction cost of approximately **£3,550m** (including permanent way, railway control systems, train power systems, telecoms, buildings and property and enabling works). Crucially, the SATC also carries unknown and potentially very large additional mitigation costs associated with the Eversden and Wimpole Woods SAC and the Mullard Radio Astronomy Observatory (MRAO), neither of which affects the alternatives.
- **Programme:** The NATC+ involves less disruption to the existing operational railway than the SATC and could be delivered in a shorter timeframe. The SATC's multiple worksites and environmental risks create greater overall programme risk.

- **Operations:** The NATC+ achieves full direct connectivity to Cambridge South station and the CBC, eliminating EWR Co's primary stated objection to the northern approach. More importantly, it is the only option that directly serves all three Cambridge stations—Cambridge North, Cambridge and Cambridge South—whereas the SATC directly serves only Cambridge and Cambridge South. That wider connectivity materially strengthens the NATC+ business case. The NATC+ also serves the Cambridge Science Park and can serve Northstowe directly. The NATC+ allows freight to bypass Cambridge entirely, via a west-north chord at the Milton grade-separated junction and a further south-east chord south of Ely connecting to the Felixstowe–Nuneaton freight line. The SATC forces freight through Cambridge, impacting operations and generating noise for residents, particularly near Coldham's Common.
- **Environment:** Both alternatives avoid impacts on the Eversden and Wimpole Woods SAC and associated priority habitats. The SATC also carries serious and unresolved risks of electro-magnetic interference and vibration to the Mullard Radio Astronomy Observatory (MRAO), a matter which has been under discussion with the University of Cambridge since about 2020 with no resolution.
- **Impact on Residents:** The SATC passes through or close to densely populated residential areas in south Cambridgeshire, bringing a new railway to communities that have no existing line, in addition to significantly worsening conditions for those already adjacent to a railway. Both alternatives substantially reduce these harms.
- **Economic Development:** Connectivity to Cambridge South station and the CBC is achieved by both alternatives. The NATC+ has the decisive additional advantage that it directly serves Cambridge North as well as Cambridge and Cambridge South, making it the only option that directly serves all three Cambridge stations. That wider connectivity materially strengthens its business case compared with the SATC, which directly serves only Cambridge and Cambridge South. The NATC+ also provides connectivity to Northstowe. We are not aware of science parks around the proposed Cambridge East Station.
- **Project Risk:** The SATC faces exceptional project risk including Habitats Regulations Assessment risk for the SAC, unresolved MRAO interference risk and the complexity of multiple constrained urban worksites. Both alternatives offer significantly better risk profiles.

1. Introduction

1.1 Purpose of this Response

This document forms part of Cambridge Approaches' response to East West Rail's 2026 Non-Statutory Consultation. Its purpose is to demonstrate that there are viable, feasible alternatives to the Southern Approach to Cambridge (SATC) and to provide an evidence-based comparative assessment of those alternatives against the SATC across a range of criteria.

1.2 Background

East West Rail is a proposed new railway linking Oxford, Milton Keynes and Cambridge. The section currently under development – the eastern section, connecting Bedford to Cambridge – is the subject of this consultation response. EWR Co is currently consulting on its preferred route, which approaches Cambridge from the south-west, running through the southern suburbs before serving Cambridge South station and continuing to Cambridge station.

In 2022, EWR Co produced the Affordable Connections Project (ACP) report (the contents of which were released in the 2023 Route Update Assessment, which assessed a number of alternative route options including a northern approach to Cambridge. That report concluded that:

"The northern approach is estimated to be in the order of £290-380m [about 20%] *cheaper than the southern approach."*[1]

"a northern approach would be quicker to construct than a southern approach"[2]*,*

"Environmental impacts and opportunities Assessment Factor (AF14)- The revised northern approach design is considered to perform better than the southern approach"[3]*,*

"Both the South Option A and North Option B designs assessed can support a 4tph EWR service to and from Cambridge."[4]

"South Option A is more constrained in comparison to North Option B in its ability to support significant growth in freight paths."[5]

EWR Co rejected it principally on the grounds that it would not provide direct connectivity to Cambridge South station and the Cambridge Biomedical Campus (CBC) without passengers changing trains at Cambridge station. This response demonstrates that this objection is answered by the addition of a turnback facility south of Cambridge South station.

The second alternative – a long tunnel between Highfields Caldecote and Great Shelford – has not previously been subject to detailed feasibility assessment by EWR Co, despite having been raised by communities and stakeholders on several occasions. This response refers to published engineering data and comparable project precedents to support serious consideration of this option.

1.3 Scope and Methodology

This response draws on:

- EWR Co's own published assessments, including the 2023 ACP Report, the Route Update Announcement (RUA), and the 2026 Non-Statutory Consultation documents.
- EWR Co's ACP construction cost data, supplemented by independent benchmarking using the Grose and Hellier method and HS2 cost modelling.
- Published tunnelling engineering data and comparators from recent UK major infrastructure projects.
- Published environmental, economic and planning data relevant to the comparative assessment.

This response does not present full feasibility designs – that level of detail is appropriately the responsibility of EWR Co as part of its scheme development. Rather, it demonstrates that the alternatives are feasible and merit serious assessment and that on the balance of evidence they represent better solutions than the SATC for achieving EWR's objectives.

[1] 2023 Route Update Announcement - Engineering and Technical Report, 8.3.42
[2] 2023 Route Update Announcement - Engineering and Technical Report, Section 8.3.40
[3] 2023 Route Update Announcement - Engineering and Technical Report, Section 8.3.66, Table 34
[4] 2023 Route Update Announcement - Engineering and Technical Report, Appendices, Cambridge Area Assessment Summary Report, Section 6.1
[5] 2023 Route Update Announcement, Appendix 13 – Cambridge Area Assessment Summary Report, 2023

1.4 Structure of this Response

Following this introduction, the document is structured as follows:

- Section 2 describes each of the three options (SATC, NATC+ with turnback, Long Tunnel).
- Section 3 presents EWR Co's feasibility evidence for the northern approach and the additional feasibility evidence for the turnback.
- Section 4 presents tunnelling feasibility evidence for the long tunnel.
- Section 5 provides a systematic comparative assessment of the three options.
- Section 6 presents conclusions.

2. Description of the Three Options

2.1 The Southern Approach to Cambridge (SATC) – EWR Co's Preferred Option

EWR Co's preferred route approaches Cambridge from the south-west, crossing undulating topography through the Green Belt between the M11 and the A10, passing through or adjacent to a series of villages and suburban areas before serving Cambridge South station on a widened corridor and then proceeding north to Cambridge station. The key features of the SATC are:

- A new railway corridor crossing agricultural land and Green Belt in South Cambridgeshire, traversing undulating chalk topography with significant earthwork requirements, including crossings of the River Rhee and its floodplain.
- Interaction with the Eversden and Wimpole Woods Special Area of Conservation (SAC), designated under UK law for its nationally important bat populations.
- Potential electro-magnetic interference and vibration impacts on the Mullard Radio Astronomy Observatory (MRAO) at Lord's Bridge, a matter of serious and unresolved concern raised by the University of Cambridge in its 2024 consultation response.
- Impacts on multiple Sites of Special Scientific Interest (SSSIs), ancient woodland, and other priority habitats.
- A new or significantly widened corridor through the southern suburbs of Cambridge, and close to many South Cambridgeshire villages, affecting residential areas, community facilities and open spaces.
- Freight trains required to pass through Cambridge on the SATC corridor, with operational and noise implications for the congested urban section and for residents near Coldham's Common.
- A turnback facility at Cherry Hinton, affecting Coldham's Common (designated common land, Local Nature Reserve and Green Belt), with acknowledged noise and visual impacts on adjacent residential properties.
- Complex engineering works including four-tracking of the existing railway corridor between Coldham's Lane and Mill Road Bridge and four-tracking of the corridor between Cambridge station and Cambridge South station.
- Significant programme risk arising from multiple constrained urban worksites, and works on a congested section of operational railway.

2.2 The Northern Approach to Cambridge with Turnback (NATC+)

The NATC+ proposed in this response is based on EWR Co's own design from the 2023 ACP, modified to include a turnback facility south of Cambridge South station. The route:

- leaves Cambourne on two new EWR tracks, running south of Dry Drayton and Bar Hill, providing a station connection to Northstowe – one of the largest new settlements under construction in England, with a planned population of approximately 26,000.
- passes under the guided busway, which would require local realignment.
- crosses the A14 and A1307 to the west of Girton and requires rerouting of the A10 near Milton.
- joins the West Anglia Main Line (WAML) at a new grade-separated junction north of Milton. This junction would incorporate a west-north chord which, if combined with a second south-east chord just south of Ely, would allow EWR freight services to join the Felixstowe–Nuneaton freight line via the fen line, avoiding Cambridge entirely. Milton Fen Level Crossing would close and be replaced by a bridge.
- merges with the existing railway to access Cambridge North station. The station would be upgraded, including conversion of the current bay platform to a through platform with north and south turnback capabilities.
- proceeds south along the existing WAML corridor. The extended barrier downtime at Fen Road Level Crossing resulting from increased train frequency would necessitate closure of that crossing, with alternative access provided. Between Coldham's Lane and Mill Road Bridge, four new tracks would be formed: the two existing WAML tracks, the extended and upgraded Down Goods Loop track to the west, and one additional track to the east replacing existing sidings. At Cambridge station, EWR would use extended existing platforms and three new platforms (9, 10 and 11) would be created.
- continues south to Cambridge South station via a 4-tracked section of track (the same as for the SATC on this section).
- proceeds to a turnback facility located south of Cambridge South station in Little Shelford, just to the north of the Hauxton Road level-crossing, where additional switch and crossing trackwork allows the formation of a siding between the two main lines.

It is emphasised that the turnback facility is located between the two main lines of the existing railway to avoid conflict with main-line movements. More than 1.2 kilometres of track is available north of the Hauxton Road level-crossing for the turnback, providing sufficient space for operational length, switching geometry, braking and acceleration distances and signal clearances. The facility would have minimal impact on the scheduled monument to the north and would be partially screened from residential properties by the existing tree plantation.

2.3 The Long Tunnel Option

The Long Tunnel option proposes a deep-bored tunnel connecting Highfields Caldecote in the west to a portal near Great Shelford in the east, a distance of approximately 15 kilometres. The tunnel rises out of the ground south of Cambridge South station, which it serves directly, before continuing north to Cambridge station along the 4-tracked WAML.

Key features of the Long Tunnel option include:

- a tunnel of sufficient diameter to accommodate standard UK main-line rolling stock, including freight trains
- deep-bored construction using tunnel boring machines (TBMs), a proven technique used on comparable UK projects including HS2
- portal locations at Highfields Caldecote (west) and east of Great Shelford, in open countryside and away from densely populated areas

- the tunnel route avoids all bat SAC habitats, SSSIs, and other protected sites along the surface corridor and is entirely below ground including through the area of MRAO sensitivity
- surface works are confined to the portal areas and the existing railway corridor at the eastern end, where four-tracking between Cambridge South station and Cambridge station is required, the same as for the SATC on this section
- freight trains would be able to use the tunnel, subject to operational protocols consistent with those used in existing UK and European railway tunnels.

3. Feasibility of the Northern Approach with Turnback

3.1 EWR Co's Own Assessment of the Northern Approach

EWR Co's 2023 ACP report[6] assessed the northern approach in detail and confirmed its technical feasibility. The northern approach was assessed against the same criteria as the southern approach. Key findings of EWR Co's own consultants are summarised below:

Criterion	Northern Approach (ACP)	Southern Approach (SATC)
Direct construction cost (exc preliminaries and profit)	£755–853m (Bedford to Cambridge)	£1,271–1,442m (Bedford to Cambridge)
Delivery programme	Likely faster; less disruption to existing railway	More complex; greater disruption to operational railway
Environmental performance	Avoids Eversden/Wimpole SAC; fewer earthworks on flatter terrain	Impacts SAC, multiple SSSIs and ancient woodland
Flood risk	Greater risk in flat fenland terrain – manageable with design	River Cam floodplain crossings
Properties within 200m of corridor*	More properties (but less dense)	Denser residential areas
Direct station connectivity / business case	Direct to all three Cambridge stations with turnback: Cambridge North, Cambridge and Cambridge South. Stronger business case through wider connectivity.	Direct to Cambridge and Cambridge South only. Weaker business case than NATC+ because Cambridge North is not directly served.

* Cambridge Approaches disputes EWR Co's property assessment as it does not distinguish between properties that are close to existing railways and those that are not.

EWR Co's sole substantive reason for rejecting the northern approach was its failure to serve Cambridge South station and the CBC directly. Passengers would otherwise need to change at Cambridge station, approximately doubling journey times for CBC-bound travellers (cited example: 21 minutes to 39 minutes from Tempsford/St Neots). This is the single objection that the turnback proposal in this response answers directly.

It should be noted that the ACP report does not appear to have identified Fen Road Level Crossing as a factor against the northern approach; the crossing closure required by increased

[6] EWR Co, Alternative Connections Project Report, 2023

train frequency on the WAML is a manageable engineering measure, as confirmed by EWR Co's own documentation which treats it as a standard mitigation.

3.2 Feasibility of the Turnback South of Cambridge South Station

The turnback facility proposed is located south of Cambridge South station, north of the Hauxton Road level-crossing, using land between the existing up (towards London) and down (away from London) main lines.

3.2.1 Spatial Feasibility

More than 1.2 kilometres of track is available north of the Hauxton Road level-crossing. This is more than sufficient to accommodate the full requirements of a turnback:

- Operational train length: approximately 150 metres (consistent with EWR platform lengths).
- Reverse curves and switch and crossing geometry to accommodate approach speed: approximately 400 metres.
- Braking and acceleration distances, signal clearances: accommodated within the remaining approximately 650 metres.

EWR Co raised concern that trains entering the turnback would need to slow to 20–30mph, impacting the congested main-line timetable. This concern is addressed as follows:

- Significantly, there is a speed warning indicator on the main line about 100m north of the Hauxton Road level-crossing, warning train drivers of a significant change in upcoming line speed, in this case to 50mph for Shepreth Branch Junction. This confirms that main-line trains are already decelerating where the turnback siding would meet the main line. The speed differential between turnback movements and main-line trains at this point is therefore materially less than EWR Co's analysis assumed.
- The allowance provided for acceleration (or braking) noted above is more than sufficient for trains to achieve 50mph, so nullifying any disruption to the main-line timetable.
- The central location of the turnback siding between the two main lines means that reversed EWR trains can rejoin the main line towards Cambridge without conflicting with Up Main (London-bound) train movements, avoiding timetable disruption.

3.2.2 Impact on the Scheduled Monument and Priority Habitat

EWR Co raised concerns about impact on the scheduled monument to the north and on the priority habitat tree plantation to the south. These concerns are addressed as follows:

- The existing railway corridor at this location would need to be widened by approximately 5m. Part of this space would be accommodated within Network Rail's land – the exact amount would be determined by EWR Co's consultants. The remainder can be taken from either the scheduled monument side, the tree plantation side, or a combination of both.
- Any required incursion into the approximately 30m wide tree plantation represents a very narrow take from what is a substantial woodland feature. The remaining woodland would continue to provide visual screening and ecological function. By contrast, the SATC impacts the internationally protected Eversden and Wimpole Woods SAC, numerous SSSIs and ancient woodland – harms that are orders of magnitude greater than a possible small incursion at Little Shelford.
- Any impact on the scheduled monument would be subject to Scheduled Monument Consent and detailed design would aim to minimise such impact. It is noted that

EWR Co's own SATC proposals involve several impacts on scheduled monuments, including in Great Shelford, confirming that impacts of this type are not automatically prohibitive.

3.2.3 Impact on Residents

The turnback location south of Cambridge South station is in a significantly less built-up area than EWR Co's proposed Cherry Hinton turnback:

- There are approximately 4 residential properties within 100 metres of the end of the Little Shelford turnback siding.
- The Cherry Hinton turnback is adjacent to established residential streets and has been acknowledged by both EWR Co and Cambridge City Council to represent a significant change in the acoustic character of the neighbourhood, with noise impacts during both construction and operation.
- The Little Shelford turnback would be largely screened from residential properties by the existing tree plantation.
- The turnback operating hours would be comparable to those of existing train movements on the SBR line meaning that there would be a negligible change in existing noise climate due to the turnback.

3.2.4 Operational Arrangements

Under the proposed operating pattern, EWR trains from the west arrive at Cambridge South station, where all passengers would alight. The empty train proceeds south to the turnback. The driver walks to the cab at the other end of the train, or a relief driver steps directly into the cab at the Cambridge South end, and the train departs north towards Bedford. This is a standard rail operation carried out routinely at thousands of turnback locations across the UK network. It is the same as would be required for the Cherry Hinton turnback.

4. Feasibility of the Long Tunnel Option

4.1 Overview

A tunnel between Highfields Caldecote in the west and a portal near Great Shelford in the east would carry the EWR railway beneath the full extent of the sensitive western approaches to Cambridge, rising out of the ground south of Cambridge South station, which it serves directly. This option has not been subject to formal feasibility assessment by EWR Co despite requests from communities and stakeholders.

4.2 Tunnelling Feasibility

A tunnel of approximately 15km in length is constructable using current tunnel boring machine (TBM) technology. The following technical parameters are relevant.

4.2.1 Geology

The subsurface geology along the proposed tunnel alignment, based on published British Geological Survey data, comprises predominantly:

- Chalk bedrock at depth, a well-understood and widely tunnelled formation in the UK.
- Gault clay overlying the chalk, a formation with extensive UK tunnelling precedent (including sections of HS2 and HS1).

- Superficial deposits of boulder clay, alluvium and sands and gravels in the Bourn Brook and River Cam valleys.
- A relatively shallow water table in some sections, which would require management during construction but presents no fundamental barrier to TBM tunnelling.

Both chalk and gault clay are well-understood TBM materials. The chalk in particular is a relatively benign tunnelling medium, and TBM contractors have extensive experience of these conditions. Our assessment concludes that no geological feature along this alignment presents an insurmountable obstacle to construction.

4.2.2 Tunnel Specification

The tunnel would be designed to the following indicative specifications:

- Internal diameter sufficient to accommodate standard UK loading gauge W12, including freight vehicles where required.
- Twin-bore construction (one bore per direction of travel), consistent with modern main-line railway tunnels, providing both operational efficiency and compliance with current tunnel safety regulations.
- Emergency access and egress points at regular intervals, consistent with Rail Tunnel Safety Regulations and requirements of the Office of Rail and Road (ORR).
- Ventilation systems designed to manage piston effects and air quality for both passenger and freight operations.

HS2 has approximately 25 per cent of its total route in tunnel (around 50 kilometres), demonstrating that long-distance main-line railway tunnels are a well-established part of the UK infrastructure toolkit.

4.2.3 Portal Locations

The western portal at Highfields Caldecote and the eastern portal south of Great Shelford are both in relatively open, lower-sensitivity countryside, avoiding residential areas, protected habitats and scheduled monuments. Standard construction techniques would be deployed for the portal construction, perhaps using contiguous bored piles of varying length, and does not require permanent above-ground infrastructure of significant scale.

4.3 Freight Compatibility

Freight trains can and do operate through railway tunnels of this specification, subject to appropriate operational protocols. The relevant evidence includes:

- Freight locomotive characteristics and ventilation requirements are well understood and can be managed through appropriate ventilation system design and scheduling protocols.
- Freight trains routinely operate through the Channel Tunnel (50 km) and the Severn Tunnel (7 km).
- Axle loading in the proposed tunnel would be designed to accommodate standard freight axle weights, consistent with the W12 loading gauge requirements applicable to the EWR corridor generally.

Our assessment concludes that freight trains can feasibly operate through the proposed tunnel using protocols already in routine use on the UK and European rail networks.

4.4 Indicative Cost

Costs are divided into the following categories:

- Direct construction costs
- Indirect construction costs (site management, overheads, profit, security, etc). There are 2 parts to 'indirect costs' – 'Indirect construction costs' and 'Other indirect costs' (see 2023 Route Update Announcement - Engineering and Technical Report, Appendices, Appendix 8 Cost Estimates Table 9)
- Base construction costs (= direct costs + indirect costs)
- Total construction costs (= base construction costs plus risk provision)

Direct tunnel construction costs have been assessed using two methods, both baselined to 2021 prices for consistency with ACP cost data:

- Grose and Hellier benchmarking method[7]: approximately £912m at 2019 prices, equivalent to approximately £984m at 2021 prices.
- HS2 cost method[8]: approximately £1,170m at 2021 prices.

The base construction cost includes indirect costs such as contractors' overheads and profits, preliminaries and design costs. These, particularly the preliminaries, are expected to be much lower for a tunnel where there are far fewer construction compounds and manpower requirements than for the other two options.

In assessing the base cost of the long tunnel, allowances have been made based on the ACP Appendix to account for:

Bedford to Cambourne direct costs (based on S approach into Bedford)	£483m
Additional cost for N approach into Bedford	£470m
4-tracking costs between Cambridge and Cambridge South stations	£180m
Costs for p-way, railway control systems, train power systems, telecoms, building and property etc	£146m
Construction indirect costs based on figures for the H2 (NATC) option	£372m
Other indirect costs based on figures for the H2 (NATC) option	£730m

These additional elements have been added to the higher of the two estimates of direct construction tunnel cost to give an indicative **base cost of £3,550m**.

A risk provision has not been added to these figures. Risk assessment is highly variable and can skew the figures to reflect bias. We believe, however, that the risk for tunnels can be significantly lowered by obtaining a high quality and thorough ground investigation.

5. Comparative Assessment of the Three Options

This section provides a systematic comparison of the SATC, the NATC+ with turnback and the Long Tunnel across ten criteria.

[7] Case study: Benchmarking tunnelling costs and production rates in the UK, Infrastructure and Projects Authority, December 2018 https://www.gov.uk/government/publications/case-study-benchmarking-tunnelling-costs-and-production-rates-in-the-uk

[8] HS2 Guide to Tunnelling Costs, June 2015, https://www.gov.uk/government/publications/hs2-guide-to-tunnelling-costs

5.1 Cost

5.1.1 Capital Construction Cost

The data in this section is intended to provide a guide to the comparative costs of the options rather than estimates of outturn costs. We have used cost data from EWR Co's Affordable Connections Project (ACP) as it directly compared the NATC with the SATC. We estimated the tunnel costs in section 4.4 of this report where we included additional long tunnel option costs based on data in the ACP and 2023 Route Update Announcement reports and appendices.

The table below sets out the base construction costs for the Bedford to Cambridge section baselined at Q2 2021 prices. The base costs exclude risk provisions.

Cost Item	SATC	NATC+	Long Tunnel
Base construction cost (Bedford to Cambridge, Q2 2021 prices, exc turnback costs & exc risk provision)	**£3,350m**[9] (reference)	**£2,160m**[10] (-35%)	**£3,550m**[11] (+6%)
Turnback facility (no costs available so relative costs provided)	**Reference**	**Lower**	**Same as SATC**
SAC mitigation costs	**Unknown** - potentially very large	**None**	**None**
MRAO mitigation / compensation costs	**Unknown** - potentially very large	**None**	**None**
Property compensation (inc in base construction cost above)	**Very high** (large land-take for cuttings & embankments)	**Low/moderate** (minimal cuttings and embankments)	**Very low** (small land-take as mostly underground except at portals & Camb section)
Whole-life operational cost	**High** (undulating topography affects fuel costs, many curves affect rail maintenance, more structures)	**Low/medium** (generally flat ground, fewer curves & structures)	**Low** (gentle gradients, straighter track, easy maintenance access)

The table shows:

1) The base construction cost of the NATC+ is by far the lowest option considered.
2) The base construction cost of the long tunnel option is slightly higher than the SATC.

When the SATC's additional mitigation costs for the SAC and the MRAO are quantified, the difference between the NATC+ and the SATC is likely to become greater and the base construction cost of the long tunnel option may less than that of the SATC. EWR Co has provided no estimate for either of these cost items, yet both involve mitigation of uncertain and potentially substantial scale. The NATC+ and the long tunnel are exposed to neither risk.

[9] 2023 Route Update Announcement - Engineering and Technical Report, Appendices, Appendix 8 Cost Estimates Table 9
[10] 2023 Route Update Announcement - Engineering and Technical Report, Appendices, Appendix 8 Cost Estimates Table 9
[11] This report section 4.4

The Long Tunnel's higher direct construction cost must be set against its significantly lower environmental mitigation, property compensation, noise mitigation, and operational costs. A thorough whole-life cost analysis – which EWR Co has not undertaken for the alternatives – is likely to narrow this gap materially.

5.2 Programme

Delivery programme is a critical consideration for a project that has already experienced significant delays. However little specific programme information has been provided in this consultation and we have relied to a large extent on information in the ACP report, in documents released under Freedom of Information requests and estimates of the Long Tunnel option using the HS2 and Infrastructure and Projects Authority methodologies (see section 4.4 of this report). It is acknowledged that these sources exclude additional work now contained in this consultation (such as the turnbacks and the additional entrance at Cambridge station) but is suitable for comparison purposes.

Programme durations of all three options are highly sensitive to work interfaces with the existing rail network. All three options require 4-tracking between Cambridge and Cambridge South stations. Challenges anticipated included significant levels of disruption to normal railway operations to the south of Cambridge, a large volume of closely spaced switches and crossing (S&C) in the narrow southern corridor. In addition, Long Road bridge reconstruction was expected to cause widespread road traffic disruption.

The key differentiator between options, then, is the amount of work required outside of the Cambridge area.

The key programme comparison is as follows:

- The SATC involves complex works on and adjacent to the existing operational railway on a corridor passing through undulating countryside of south Cambridgeshire with a significant scale of earthworks, numerous large concrete structures and two short tunnels. This is compounded by the proximity to unknown mitigation work required for both the SAC and the MRAO. In particular, the grade-separated junction in Harston is in a more constrained area than that for the NATC+ near Milton. The turnback in the residential area in Cherry Hinton is likely to take longer to construct than that of the NATC+ in the more open environment of Little Shelford. EWR Co's initial programme duration assessment carried out by Costain envisaged that a 5.5 year programme could only be achieved if there were long (up to 3 months) closures of the railway were implemented[12]. Shorter duration closures would significantly increase the programme duration up to 15 years. These multiple challenging worksite constraints inevitably generate programme risk and potential for delay.
- The NATC+ involves more work in a more open and flat locations than the SATC's south Cambridgeshire corridor and there are fewer earthworks and less infrastructure to construct. The grade-separated junction with the WAML north of Cambridge is on greenfield land, which is typically fast to build on.
- The tunnelling operation for the Long Tunnel is likely to take between 4.6 and 5 years using two TBMs, one for each bore (using the same references as for the costing of tunnels) and is largely independent of all other work on the project at this stage. The 4-tracking between Cambridge South station and Cambridge station (as the SATC on this section) would be carried out while the TBM drives are being progressed. Otherwise, this option is largely independent of the existing operational railway as there would be no grade-separated junctions. Portal construction and surface connections are manageable programme elements. In particular, the Cambridge end

[12] Affordable Connections Report V0.3, Section 13.4.14

portal would feed onto the newly 4-tracked line, the western two of these tracks would be dedicated to EWR services so there would be little direct impact on the existing network. The turnback and other works would be the same as for the SATC.

On balance, the NATC+ offers the best programme prospects, with a reasonable expectation of faster delivery than the SATC or the Long Tunnel. While the TBM drives on the Long Tunnel option have a long absolute programme but they are more predictable with a lower-risk profile resulting in a programme of similar length to that of the SATC.

5.3 Operations

5.3.1 Cambridge South Station and CBC Connectivity

EWR Co's primary stated objection to the northern approach has been its failure to serve Cambridge South station and the CBC directly. The modified NATC+ with turnback addresses this objection completely:

- EWR trains serve Cambridge South station directly, without passengers needing to change at Cambridge station.
- Journey times from the west to Cambridge South are comparable to those under the SATC.
- The turnback facility enables trains to reverse and return towards Bedford in a standard operational procedure.

The connectivity penalty cited by EWR Co – a doubling of journey times for CBC travellers under the original northern approach – is eliminated by the turnback. This was EWR Co's single substantive reason for rejecting the northern approach. With the turnback included, that reason no longer holds.

5.3.2 Cambridge North, Cambridge Science Park, and Northstowe

The NATC+ provides direct service to Cambridge North station, which the SATC does not. This is one of the most significant operational advantages of the NATC+, because it means the NATC+ is the only option that directly serves all three Cambridge stations—Cambridge North, Cambridge and Cambridge South—whereas the SATC directly serves only two. That network effect matters economically: by connecting EWR to all three stations, the NATC+ reaches a wider range of jobs, research facilities and development sites, and therefore materially strengthens the scheme's business case.

First, Cambridge Science Park is a world-class technology and life sciences cluster located adjacent to Cambridge North station. Home to over 130 companies and more than 7,000 employees, it is one of the largest and most successful science parks in Europe, specialising in biotechnology, IT, and advanced technology. The park is currently undergoing a major expansion: plans have been approved or are in progress for several hundred thousand square metres of additional laboratory, office and innovation space over the coming decade, with the potential to accommodate many thousands of additional workers. Direct EWR connectivity to Cambridge North would give Science Park employees fast, direct access to Bedford, Milton Keynes and ultimately Oxford – markets that are currently difficult to access by public transport. This connectivity benefit is unique to the NATC+ and cannot be replicated by the SATC, which does not serve Cambridge North.

Second, Northstowe – a new town of approximately 26,000 residents being built between Bar Hill and Longstanton – is directly on the NATC+ corridor. A station at Northstowe would give this large new community direct rail access to Cambridge, Bedford and the wider EWR network. Northstowe currently has no rail service and the use of the guided busway is approaching capacity. The NATC+ could transform its connectivity and substantially reduce

car dependency, contributing to the sustainable growth objectives that underpin planning policy for the area. This is a significant and quantifiable benefit that the SATC cannot offer.

The NATC+ is therefore the only option that directly serves all three Cambridge stations—Cambridge North, Cambridge and Cambridge South—while the SATC directly serves only Cambridge and Cambridge South. That fuller coverage of Cambridge's principal economic and research destinations is the clearest reason why the NATC+ offers the stronger business case.

5.3.3 Freight Operations

The routing of freight is a significant operational difference between the SATC and the NATC+ that has not received sufficient attention in EWR Co's published assessments. Despite EWR Co's assessment of freight use of two freight trains per day in each direction in this section of the line, freight usage is not within EWR Co's gift to stipulate and could vary considerably from these provisions. This underlines the importance of freight in option choice.

Under the SATC, EWR freight trains would be required to pass through Cambridge on the southern approach corridor. This creates two distinct problems. First, it exacerbates operational congestion on an already heavily used section of the WAML through Cambridge, reducing timetable flexibility for both freight and passenger services. Second, it increases noise and disturbance for residents along the entire southern corridor, including those living near Coldham's Common, who would experience the combined effect of increased passenger and freight traffic on a widened urban railway.

The NATC+ offers a fundamentally better solution for freight. At the Milton grade-separated junction, a west-north chord could be constructed to allow EWR freight services arriving from the west to join the existing WAML northwards without entering Cambridge. A further chord south of Ely would then provide a connection to the Felixstowe–Nuneaton Strategic Freight Network (SFN) corridor, one of the UK's most important freight arteries. This routing would allow freight to bypass Cambridge entirely, avoiding the operational and community impacts of routing through the city. The construction of these two chords represents a relatively modest additional investment for a significant operational and community benefit.

The Long Tunnel option is an improvement on the SATC as it diverts noisy and polluting freight away from residents in South Cambridgeshire into a tunnel. However, freight would still pass through Cambridge station with all the associated issues highlighted above.

5.3.4 Timetable Capacity and Flexibility

In connecting with the WAML to the north of Cambridge where rail traffic is lighter than to the south, the NATC+ interferes less with the extremely sensitive Thameslink service.

Four-tracking between Coldham's Lane and Mill Road Bridge is required under both the SATC and the NATC+ options and both provide for the same number of EWR services per hour into Cambridge.

The Long Tunnel provides additional capacity on the southern approach into Cambridge, since the tunnel approach is north of Shepreth Branch Junction on west of the WAML. This arrangement means that it would not interfere with Thameslink traffic on the 2-track section of the SBR line and would also be independent of the WAML. This frees capacity on the existing corridor and improving timetable flexibility for both EWR and any future growth in existing services.

5.4 Environmental Impact

Environmental impact is one of the most starkly differentiated criteria between the three options.

5.4.1 Special Areas of Conservation

The SATC passes in close proximity to the Eversden and Wimpole Woods SAC – an internationally protected site designated under the EU Habitats Directive (retained in UK law) for its nationally important population of barbastelle bats. A separate and detailed response from Cambridge Approaches has been made about this issue.

- The barbastelle bat is one of the UK's rarest bat species. The SAC designation reflects the exceptional national importance of this population.
- Construction and operation of the SATC in proximity to the SAC presents a significant risk of harm to bat foraging and commuting routes, which are sensitive to light, noise and vibration.
- EWR Co has not demonstrated that the impacts of the SATC on the SAC can be fully mitigated. The Habitats Regulations Assessment process requires competent authorities to satisfy themselves beyond reasonable scientific doubt that there will be no adverse effect on site integrity – a high legal standard that EWR Co has not yet met.

The NATC+ avoids the Eversden and Wimpole Woods SAC entirely, routing north of Cambridge. The Long Tunnel also avoids the SAC entirely in its subterranean section, with portal locations away from the SAC.

5.4.2 Mullard Radio Astronomy Observatory

The Mullard Radio Astronomy Observatory (MRAO) at Lord's Bridge, operated by the University of Cambridge, is one of the world's leading radio astronomy research facilities. The SATC corridor passes in relatively close proximity to the MRAO, raising serious concerns about electro-magnetic interference (EMI) from the trains' traction units and vibration from train operations affecting the sensitivity of the observatory's instruments. A separate and detailed response from Cambridge Approaches has been made about this issue.

The University of Cambridge submitted a response to EWR Co's 2024 consultation raising these concerns. Despite this, little progress appears to have been made in quantifying or resolving the risk. The MRAO risk represents a significant and unresolved project threat for the SATC, for the following reasons:

- The MRAO undertakes internationally significant scientific research. Any permanent reduction in the sensitivity of its instruments would constitute an irreversible loss of scientific capability of national importance.
- Mitigation of EMI from railway electrification in proximity to sensitive receivers is technically challenging and potentially very costly. There is no guarantee that effective mitigation is achievable at acceptable cost.
- If mitigation proves insufficient, EWR Co could face requirements to redesign, re-route, or compensate at very substantial cost – at a late stage in the project when design changes are most expensive.

Neither the NATC+ nor the Long Tunnel passes close to the MRAO. The NATC+ routes north of Cambridge; the tunnel is below ground and the horizontal alignment could be diverted if any equipment is shown to be sensitive to underground vibrations. Neither option presents any EMI risk to the MRAO. This is a significant and underweighted advantage of both alternatives.

5.4.3 Other Protected Sites and Habitats

The SATC impacts over triple the number of SSSIs, Wildlife Trust sites, Local Nature Reserves and other priority habitats than the NATC+ (nine within 10m for the SATC compared to three for the NATC+). The Long Tunnel options avoids all such sites. While the NATC+ crosses different agricultural and semi-natural land in the north of Cambridge, these are generally lower-sensitivity habitats than those affected by the SATC.

5.4.4 Green Belt

The SATC involves substantial incursion into the Cambridge Green Belt, which performs the important functions of preventing urban sprawl, preserving the special character of Cambridge, and maintaining the separation between Cambridge and its surrounding villages. The NATC+ also passes through Green Belt land in the north, but the Green Belt performs somewhat different functions in the northern arc, and the design can be configured to minimise impact. The Long Tunnel traverses the Green Belt entirely underground, with only portal locations at the surface – the most sympathetic possible treatment of this constraint.

5.4.5 Carbon and Climate

Construction carbon is by far the most significant factor in assessing the difference between options. Any possible saving in operational carbon due to modal shift from car to rail is unlikely to offset the construction carbon used over the anticipated life of the project. See our separate response on this issue.

The NATC+ option is the outright winner in respect of minimising the carbon used in construction. The SATC passes through undulating countryside requiring large scale earthworks, two tunnels and many concrete structures. The Long Tunnel is expected to use the most carbon of any option due to TBM operations, tunnel support and spoil removal, although significantly lower environmental mitigation works may offset some of this.

In terms of operational carbon, the SATC traverses undulating chalk downland, requiring trains to manage significant gradients with corresponding energy costs from repeated braking and acceleration. The NATC+'s flatter northern corridor avoids this, resulting in lower operational energy consumption and carbon emissions per train movement. The tunnel option runs at consistent depth, also avoiding gradient-related energy penalties. See our separate response on carbon issues of the railway.

5.5 Impact on Residents

A fundamental distinction must be drawn between two categories of residential impact:

- **Impact on communities adjacent to the existing railway,** where the SATC (and to some extent the NATC+ on shared sections) would increase train frequency, add tracks, and worsen conditions for residents who already live with a railway. These residents face incremental harm.
- **Impact on communities where a new railway is being introduced,** where the SATC proposes to build a new railway through or adjacent to residential areas and villages that currently have no railway. For these communities, the harm is not incremental but transformative – a fundamental and permanent change to their environment.

The SATC inflicts both types of harm. Along the southern corridor, communities such as Highfields Caldecote, Comberton, the Eversdens, Harlton, Haslingfield, Harston, Newton, Hauxton, Little Shelford and Great Shelford—many of which have no existing railway—would face the introduction of a new railway bringing noise, vibration, visual intrusion and severance. Representations from these communities have consistently documented the scale of those impacts.

Along the WAML corridor shared by both options (Cambridge North to Cambridge South), additional tracks and increased frequency would worsen conditions for existing residents. However, these residents already live alongside a railway; the incremental harm, while real, is categorically less severe than the introduction of a new railway to communities currently unaffected.

The NATC+ routes away from the communities facing new-railway harm under the SATC. The northern corridor affects a different set of communities and the big difference is that only

Oakington and Highfields Caldecote would be closer than 0.5km to the railway line and Oakington could be served by a nearby station. In contrast, there would be 6 'non-railway' villages within 0.5km of EWR on a southern route.

The Long Tunnel offers the most significant residential benefit. Once in tunnel, the railway is entirely below ground, generating no noise, vibration, visual intrusion or severance for surface residents above the alignment.

5.6 Economic Impact

5.6.1 Cambridge South Station and the Cambridge Biomedical Campus

EWR's primary economic justification in the Cambridge area centres on providing rail access to the Cambridge Biomedical Campus (CBC), the largest biomedical research campus in Europe, home to Addenbrooke's Hospital, the Royal Papworth Hospital, the MRC Laboratory of Molecular Biology and numerous world-leading research institutes and biotechnology companies. As demonstrated in Section 3, the NATC+ with turnback achieves direct connectivity to Cambridge South station. The economic benefit of CBC access is therefore not contingent on the SATC.

5.6.2 Cambridge North and the Cambridge Science Park

As set out in Section 5.3.2, the NATC+ provides direct rail access to Cambridge North station and within comfortable walking distance to Cambridge Science Park. There are numerous bus services also linking Cambridge North and the Science Park including a dedicated shuttle bus three times per hour – this makes a more comfortable commute in inclement weather compared with South Cambridge station where there are no buses to CBC. The Science Park is currently undergoing one of its most ambitious expansions in its history, with planning approvals and proposals for hundreds of thousands of square metres of new laboratory and innovation space designed to accommodate many thousands of additional high-value jobs in life sciences, technology and advanced manufacturing. The expansion reflects Cambridge's position as one of Europe's most important innovation ecosystems, and the Science Park's own growth strategy explicitly identifies improved public transport connectivity as a priority enabler.

Direct EWR connectivity to Cambridge North would be transformative for Science Park employers and employees, giving rapid access to the wider Oxford–Cambridge Arc and to the employment markets and universities of Milton Keynes, Bedford and beyond. More importantly, when this is added to direct service to Cambridge and Cambridge South, the NATC+ becomes the only option that serves all three Cambridge stations. That is the defining economic advantage of the NATC+: it broadens the catchment of the railway across Cambridge's principal employment and innovation hubs in a way the SATC cannot, because the SATC directly serves only Cambridge and Cambridge South. This stronger connectivity should translate into a materially stronger business case and should be central to any reappraisal.

5.6.3 Tourism and Heritage

Cambridge's tourism economy is centred on the university colleges, museums and cultural institutions of the city centre, almost all of which are directly accessible from Cambridge station. During construction, there will be a severe impact on tourism during the rail blockades required for the 4-tracking work between Cambridge and Cambridge South stations. This will be similar for all three options. However, the construction of the grade-separated junction and on-network impacts is likely to be greater than either the Cambridge portal of the Long Tunnel (because the EWR line would connect into the EWR-dedicated western tracks of the 4-tracked section N of Shepreth Branch Junction) or the Milton grade-separated junction which is on a less busy section of the network.

The southern suburbs and villages affected by the SATC corridor do not constitute a significant tourist destination in themselves. The heritage case against the SATC therefore rests primarily on the impact of construction and operation on the setting and character of affected villages and landscapes, rather than on harm to visitor attractions. Both alternatives reduce these landscape and setting impacts.

5.6.4 Land Value and Development

The SATC's corridor through south Cambridge will depress land and property values along its length during the planning, construction and operational periods. Blighted properties and reduced market activity represent economic costs falling on individual households and the wider local economy. The alternatives reduce these costs substantially, though they transfer some of them to different locations on their respective alignments.

5.7 Impact on Heritage

The Cambridge area contains an exceptional concentration of nationally designated heritage assets. The SATC's interactions with heritage include:

- The SATC passes through an area of high archaeological sensitivity, with the potential for unrecorded prehistoric, Roman and medieval remains in the agricultural land of south Cambridgeshire.
- The proposed widening of the railway corridor in south Cambridge would affect the setting of listed buildings and conservation areas in several villages.

The NATC+'s northern corridor also has archaeological sensitivity, but at a different and generally lower level of recorded significance. The Long Tunnel's below-ground route may encounter archaeology during construction of the portals, requiring management through a Written Scheme of Investigation, as is standard practice for major infrastructure projects.

Five Scheduled Monuments would be impacted by the NATC+ compared to double that number for the SATC. The Long Tunnel would impact one Scheduled Monument (West of White Hill Farm in Great Shelford).

5.8 Safety

The relevant safety comparisons between the three options include:

- Level crossings: The NATC+ requires closure of Milton Fen Level Crossing, replaced by a bridge, improving safety. The Long Tunnel removes the railway from the surface entirely along its length, eliminating level-crossing risk for the tunnelled section. The NATC+'s increased train frequency on the WAML would necessitate closure of Fen Road Level Crossing, with alternative access provided – a safety improvement.
- Construction safety: TBM tunnelling is a well-understood technique with a well-established safety record. The Accident Incident Rate (AIR) for the geotechnical & geoenvironmental industry was 31.28 in 2022 and 81.63 in 2021, considerably less than the AIR of 239.28 (2022) for the construction industry as a whole[13]. The SATC's construction in an urban, constrained environment alongside a live railway presents more complex safety challenges. The NATC+ involves the construction of fewer structures than the SATC and consequently a lower potential for falls from height, by far the most prevalent (53% in 2024/25) cause of fatal accident in construction[14].

[13] *Geotechnical & Geoenvironmental Industry Accident Statistics 2022,* May 2023 Geotechnical & Geoenvironmental Industry Accident Statistics 2022

[14] *Construction Statistics in Great Britain, 2025*, HSE, p5 https://www.hse.gov.uk/statistics/assets/docs/construction.pdf

- Operational safety: All three options would operate under the standard UK rail safety regulatory framework. No option presents inherently greater operational safety risk than the others.

5.9 Project Risk

Project risk—the risk that a scheme will cost more, take longer or deliver less than planned—is particularly relevant to EWR, which has already experienced substantial delays and cost increases. At this stage of consultation, that matters for a further reason: where major legal, technical and delivery risks remain unresolved on the preferred route, the case for testing credible alternatives becomes stronger, not weaker. A consultation that does not fairly examine those alternatives risks steering decision-makers towards a route whose most serious constraints have not yet been overcome.

5.9.1 SATC Risk Profile

The SATC carries an exceptionally high project risk profile, arising from:

- The Habitats Regulations Assessment for the Eversden and Wimpole Woods SAC. If EWR Co cannot demonstrate, to the required legal standard, that there will be no adverse effect on site integrity, the SATC would require a Derogation. Such a Derogation requires the Secretary of State to be satisfied that there are no alternative options – a test that this response demonstrates has not been met.
- The unresolved electro-magnetic interference and vibration risk at the Mullard Radio Astronomy Observatory (MRAO). The University of Cambridge raised this issue in its 2024 consultation response. EWR Co has not published any technical resolution. If the MRAO risk cannot be satisfactorily mitigated, the SATC's design may require fundamental revision at very late and very costly stage in the project.
- Complex engineering in a highly constrained urban corridor, with limited opportunities for programme recovery if problems arise. The SATC requires multiple simultaneous worksites in congested south Cambridge; the more worksites, the greater the probability that delay at one cascades through the programme.
- Acute community and political opposition, creating risk of legal challenge, public inquiry delay and political intervention.
- Multiple interfaces with existing operational railway infrastructure, where construction disturbance can have cascading effects on the national network.

5.9.2 NATC+ Risk Profile

The NATC+ with turnback has a substantially lower risk profile:

- It avoids the SAC entirely, removing the Habitats Regulations Assessment risk. There is no legally mandated alternative-solution test to satisfy, because the NATC+ itself is one of the alternatives.
- It avoids the MRAO entirely, removing this unresolved and potentially very large risk.
- The new infrastructure on the NATC+ is predominantly on greenfield land, with fewer simultaneous constrained worksites and therefore lower aggregate programme risk.
- The grade-separated junction with the WAML north of Cambridge is in an open, less constrained location, and there are fewer trains north of Cambridge than on the congested southern section, reducing the operational interference risk during construction.
- Community and political opposition to the NATC+ option is likely to be lower than for the SATC where the track runs closer to communities.
- This option faces the same risks in the 4-tracking activities as for the SATC.

- EWR Co's ACP assessment noted that the northern approach faced greater flood risk than the SATC due to the flatter fenland terrain north of Cambridge. This is acknowledged but flood risk is a design and engineering challenge, not a fundamental feasibility barrier. Appropriate mitigation (raised embankments, flood-resilient structures) is standard railway engineering practice in fenland terrain and was already factored into the ACP design and conclusions.
- The construction of the turnback facility at Little Shelford is a simple, standard engineering operation with no unusual risk factors.

5.9.3 Long Tunnel Risk Profile

The Long Tunnel has a different but generally manageable risk profile:

- TBM tunnelling is a proven technology with a well-established risk management framework. While tunnelling always carries ground condition risk, the chalk and gault clay geology of the Cambridge area is well understood.
- The tunnel is largely independent of the existing railway during TBM construction, reducing cascading programme risk.
- The higher capital cost creates financial risk at the upper end, but this is a known and quantifiable risk, unlike the open-ended regulatory and legal risks of the SATC.
- Community and political opposition to the tunnel is likely to be substantially lower than for the SATC or the NATC+, given the tunnel's minimal surface impact.

5.10 Summary Comparison Table

Criterion	SATC	NATC+	Long Tunnel
Base construction cost (exc turnbacks)	**£3,350m**	**£2,160m**	**£3,550m**
SAC/MRAO mitigation costs & programme	**Unknown;** potentially very large	**None**	**None**
Whole-Life Cost	**High**	**Low/medium**	**Low**
Programme Risk	**Very high** (multiple constrained worksites)	**Lower** (greenfield, fewer worksites)	**Medium** (longer programme; predictable)
Connectivity / Business Case	**Moderate** – direct to Cambridge and Cambridge South only. Does not directly serve Cambridge North.	**Best** – the only option with direct service to all three Cambridge stations: Cambridge North, Cambridge and Cambridge South, plus Northstowe. This materially strengthens the business case.	**Moderate** – direct to Cambridge and Cambridge South only. Indirect to Cambridge North.
Freight	**Poor** – passes through Cambridge, increases congestion and noise in urban area	**Very good** – bypasses Cambridge via Milton and Ely chords minimising noise, congestion & pollution	**Poor/moderate** - passes through Cambridge, but reduced noise & pollution in rural areas
SSSIs and Priority Habitats	Multiple significant impacts	Fewer, lower-sensitivity impacts	Minimal surface impacts
Impact on residents	**High**: new railway close to multiple communities	**Low**: new track further from residents without existing railway	**Very low**: underground through sensitive areas.

Criterion	SATC	NATC+	Long Tunnel
	both close to and distant from existing railway		Similar to SATC on shared WAML section
Heritage / Scheduled Monuments	**High** 10 SMs within 10m	**Moderate 5** SMs within 10m	**Limited 1** SM within 10m (Great Shelford)
Community Opposition	**High**: established and organised	**Unknown**: likely lower as further from properties	**Low**: (minimal surface impact)
Carbon	High construction and operating carbon (more structures and undulating terrain)	High: slightly less than SATC: fewer structures and flatter terrain	High construction but slightly lower operational (level running)

6. Conclusions and Recommendations

6.1 Summary of Findings

This response has demonstrated the following:

- The Northern Approach to Cambridge with a turnback south of Cambridge South station is a technically feasible option that addresses EWR Co's principal objection (lack of direct CBC connectivity) while offering a 36% saving in direct construction cost, reduced project risk, significantly reduced environmental harm, no MRAO risk, no SAC risk, substantially lower impact on residents and, above all, direct service to all three Cambridge stations. That is the NATC+'s principal strategic advantage over the SATC, which directly serves only Cambridge and Cambridge South, and it materially strengthens the NATC+ business case.
- The Long Tunnel between Highfields Caldecote and Great Shelford is a technically feasible option that delivers direct service to Cambridge South station, avoids all SAC and MRAO risks, and minimises surface impacts to the greatest extent of any of the three options, at a direct construction cost that is higher than the SATC but lower when whole-life costs and risk-adjusted costs are considered.
- EWR Co's rejection of the northern approach was based on a single criterion – CBC connectivity – which is fully answered by the turnback proposal.
- The SATC carries an exceptionally high project risk profile including unresolved SAC Habitats Regulations risk, unresolved MRAO interference risk and multiple constrained urban worksites. Both alternatives offer materially better risk profiles.
- EWR Co has not assessed the alternatives to an equivalent level of detail as its preferred scheme. That creates an uneven evidential basis for consultation and risks closing down options before consultees and decision-makers have been given a fair opportunity to compare credible alternatives. That imbalance should be corrected before any commitment is made to the SATC.