TRANSPORT

LCC09

Scheme Name:
North Hykeham Relief Road

Promoting Authority:
Lincolnshire County Council

Orders:
The Lincolnshire County Council (A1461 North Hykeham Relief Road) Compulsory Purchase Order 2024; and **The Lincolnshire County Council (A1461 North Hykeham Relief Road) (Classified Road) (Side Roads) Order 2024.**

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Subject:
Climate Change

Author:
Rachel Jones BSc, MSc

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NORTH HYKEHAM RELIEF ROAD

CLIMATE CHANGE - PROOF OF EVIDENCE

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1.1 Qualifications

1.1.1 My name is Rachel Jones. I have 32 years' experience working in climate change and sustainability.

1.1.2 I hold a Batchelors Degree in Environmental Science from the University of Sussex in 1989 and a Masters Degree in Pollution and Environmental Control from the University of Manchester Institute of Science and Technology in 1993.

1.1.3 I am currently a Director at Ramboll where I have worked for nearly 2 years.

1.2 Relevant Experience

1.2.1 During my career I have prepared climate and sustainability strategies and assessments across a number of sectors including highways, rail, ports, real estate and aviation.

1.2.2 My experience on road schemes includes sustainability impact assessments on the A34, M65, Garden Village Handforth, and A5.

1.3 Scope of Involvement

1.3.1 I was engaged by Lincolnshire County Council as part of a team at Ramboll to assess the climate impacts of the North Hykeham Relief Road (NHRR), referred to herein after as the Scheme.

1.3.2 My team produced a Climate Chapter, including a greenhouse gas (GHG) emissions assessment, a vulnerability to climate change assessment and an in-combination climate change impacts assessment, for inclusion in the Environmental Statement published in 2023 **[CD7.1]**.

1.3.3 This Proof of Evidence provides information on the methodological approach for the climate assessment chapter, the standards used and the results. It also considers the Scheme in the context of UK planning and climate policy.

1.3.4 The evidence I present responds to the Scheme and draws upon that information related to the climate assessment presented in Chapter 15 of the North Hykeham Relief Road Environmental Impact Assessment **[CD7.1]**. The assessment was specific to the date it was undertaken however where appropriate I have updated the information to include matters that have been raised since so that it reflects the up-to-date position.

1.3.5 I have been assisted by other professional advisors of Ramboll in the preparation of my Evidence.

1.3.6 I will provide evidence on the effect of the Scheme on climate during construction and operation to demonstrate that the conclusions show that the Scheme effects are not significant with respect to climate impacts.

1.3.7 I shall conclude that there are no detailed developments in design and changes to policy since permission was granted that change the conclusions of the ES **[CD7.1]** for climate and which remain sound and reliable.

2 DEVELOPMENT OF THE SCHEME

2.1 Background

2.1.1 The NHRR, previously known as the Lincoln Southern Bypass (LSB), will link the recently constructed Lincoln Eastern Bypass (LEB) with the Lincoln Western Relief Road (LWRR) and the A46 on the Strategic Road Network (SRN). The NHRR is the last major highway scheme contained within the Lincoln Integrated Transport Strategy (LITS) **[CD4.2]** and provides a complete ring road around the greater Lincoln urban area, comprising both Lincoln and North Hykeham.

2.1.2 A full description of the Scheme is set out in Chapter 4 of the ES **[CD7.1]**. In summary, the Scheme comprises the demolition of the six existing residential buildings on site, site clearance and the construction of approximately 8km of 70mph (120kph design speed) dual all-purpose two lane carriageway running to the south of the existing settlements of North and South Hykeham in an east/west direction between the A46 Hykeham Roundabout and the A15 Sleaford Road Roundabout at the west end of the Lincoln Eastern Bypass.

2.1.3 The following key features are proposed from west to east as part of the overall route of the new road:

- A46 North Hykeham Roundabout – an increase in size and number of circulatory lanes, an additional arm for the Scheme and signalisation of the roundabout, together with an associated combined footway/cycleway;
- South Hykeham Road Roundabout and associated Toucan crossing facility to the north of the roundabout;
- South Hykeham Road to Wath Lane combined footway/cycleway to the south of the Scheme;
- South Hykeham Bat Bridge;

- Wath Lane Crossing and Accommodation Bridge;
- River Witham Bridge;
- Brant Road Roundabout with associated crossing Toucan facility to the north of the roundabout and the realignment of Somerton Gate Lane;
- Somerton Gate Lane Bat Culvert;
- Station Road Bridge;
- Temporary material processing area
- Realigned Viking Way PRoW;
- Grantham Road Roundabout and associated crossing Toucan facility to the north of the roundabout;
- Modification of the existing signalised junction at A607 Grantham Road and High Dyke to incorporate a pedestrian crossing facility;
- A15 Sleaford Roundabout, associated Toucan crossing facility to the north of the roundabout and an additional arm; and
- Dualling of a 190m section of the Lincoln Eastern Bypass.

2.2 Development Since Planning Submission

2.2.1 Planning Permission **[CD7.1]** for the Scheme has been granted with consent given in May 2024 and a section 73 consent in January 2025 **[CD7.2]**. The planning policy that applied at the time consent was issued was followed as is the necessary approach. The position has, however been updated since and this proof will consider matters as they apply at the time of the inquiry

2.2.2 Since the completion of the ES in 2023 **[CD7.1]**, minor design refinements have been made to highway elements as part of the Regulation 25 Request **[CD7.1]**. These resulted in small changes to the scheme layout not altering the planning permission or my assessment of it. In addition, updated traffic data for the Core Scenario were issued on 14 March 2025. This data reflects revised forecasts and baseline conditions. Alongside this, updates have been made to the tools used for the climate change assessment, including the release of the latest versions of the Defra background emission maps **[CD6.23]** and the Road Traffic Emission Factors Toolkit (EFT) **[CD6.24]**, which are used to estimate GHG emissions associated with road traffic.

2.2.3 Based on professional advice received since the granting of planning permission, including a review of the updated design changes, revised traffic data, and relevant emissions and climate modelling tools, it is considered that the development of the Scheme's design does not alter the conclusions presented in the Climate Chapter of the ES **[CD7.1]**. The evidence confirms that the Scheme's contribution to GHG emissions remains consistent with previous assessments, and that the embedded mitigation and adaptation measures continue to ensure the Scheme's resilience to climate change. As such, the position set out in the ES **[CD7.1]**., in terms of both GHG emissions and climate vulnerability, remains valid and unchanged by the updates described above.

3 ASSESSMENT OF THE SCHEME PROPOSALS

3.1 Introduction

3.1.1 The section summarises the climate assessment undertaken for inclusion in the Environmental Statement published by Lincolnshire County Council in 2023 **[CD7.1]**. It covers National legislation, Planning Policy and guidance relevant to climate at the time of the assessment.

3.1.2 The climate assessment was undertaken to meet the requirements of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017, SI 571 **[CD2.5]** to ensure a comprehensive and robust assessment of environmental matters during the planning application process. Schedule 3, Paragraph 5f, requires that a description of the likely significant effects of the development on the environment resulting from the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change are presented in the Environmental Statement **[CD7.1]**.

3.1.3 The Climate Assessment was specific to the date it was undertaken. As the assessment was conducted in 2023, updates to the information have not been required. The original assessment remains relevant, reflecting the position on climate policy, including the publication in February 2025 of the seventh carbon budget for the period 2038-2042.

3.2 Method of assessment

Greenhouse Gas Emissions

3.2.1 The GHG assessment **[CD7.1]** was undertaken in line with guidance published by the Department of Transport (DfT) in the DMRB LA 114 Climate **[CD6.1]** along with the guidance published by IEMA for assessing GHG emissions from a project for EIA **[CD6.5]**. IEMA's guidance provides advice on screening, scoping, assessing carbon emissions and determining significance and mitigation measures. Unlike many other EIA topics there is no defined threshold which if exceeded is deemed significant.

3.2.2 The purpose of the GHG assessment **[CD6.5]** is to calculate estimated emissions arising as a result of the Scheme over its lifetime and to assess the significance of their impact on the climate. A 60-year design life was considered appropriate. The assessment addressed emissions from construction (i.e. embedded carbon in materials, fuel use during construction or the reuse of recovered materials from elsewhere on the Site), operation (i.e. emissions from electricity used for signs and lighting and emissions from maintenance) and emissions from road users. The scope (i.e. emissions sources for inclusion in the assessment) and temporal (i.e. time period over which the assessment is undertaken) boundary of the assessment is considered appropriate for a planning application of this type.

3.2.3 The sensitive receptor for the GHG impact assessment is the global climate. In line with DRMB 114 **[CD6.1]** and IEMA guidance **[CD6.5]**, all GHG emissions will contribute to climate change and might be considered significant.

3.2.4 No industry thresholds have been agreed to determine the significance of a Scheme's impact on the climate. LA 114 **[CD6.1]** and IEMA **[CD6.5]** therefore consider it is a good practice approach to compare the Scheme's carbon footprint against an existing carbon budget (global, national, sectoral, regional, or local), to identify the percentage impact the project will contribute to climate change. This provides a sense of scale of the magnitude of impact.

3.2.5 To determine the significance of effects from the Scheme, GHG emissions have therefore been presented against the UK carbon budgets. It is common practice in GHG accounting to consider exclusion of emission sources of less than 1% of an emissions inventory on the basis that they are not material.

3.2.6 If emissions from the Scheme are more than 1% of any carbon budget period where they arise the magnitude of the significance impact is considered high. Where the emissions from the Proposed Scheme are less than 1% of the carbon budget in which they arise the magnitude of the significance is considered low.

3.2.7 Emissions from the Scheme are calculated by comparing a do-minimum baseline scenario whereby the Scheme does not go ahead, against a do-something scenario where the Proposed Scheme is constructed and operated. The difference between the two scenarios represents the carbon impact of the Scheme.

3.2.8 Emissions from construction are calculated by applying publicly available emissions factors from Defra and the Inventory of Carbon and Energy against volumes of materials used, fuel used during construction, distances travelled, or quantities of waste disposed of.

3.2.9 Emissions from maintenance and operational energy use are calculated as for construction. For road user emissions a regional assessment was conducted to consider changes in annual road transport emissions of NOx, PM_{10} and CO_2 that may be brought about by the Scheme in the opening year (2028) and the design year (i.e. 15 years after opening, 2043) across the study area. The latest Emission Factor Toolkit spreadsheet (EFT version 11) **[CD6.25]** at the time of assessment was used to estimate these emissions. 2030 emissions were used for the design year as this is the limit of projections within the EFT.

3.2.10 The regional assessment predicted that there would be an increase in emissions of CO_2 with the Scheme as a result of an increase in vehicle km travelled. In the Scheme opening year of 2028 this was predicted to be an increase of 28,122 tonnes (7%) and 20,080 tonnes (7%) in the 2048 design year. In comparison to national CO_2 emissions targets, increases in CO_2 from the whole of the strategic road building scheme, as noted in the NPSNN, anticipated over the next 10 – 15 years are considered to be small (less than 0.1% of the annual carbon budget) and the increases associated with the Scheme are considered to be part of that small increase.

3.2.11 Emissions from construction of the Scheme, including embodied carbon materials, land use change and other construction activities, are estimated to be 37,982 tCO2e. When annualised, this equates to 12,661 tCO_2e per annum. At the time the assessment was undertaken, construction emissions were anticipated to occur during the 4th carbon budget period spanning 2023 to 2027 and the 5^{th} budget period spanning 2028 to 2032.

3.2.12 Emissions from construction and operation of the Scheme are estimated to equate to 3,933,977 tCO_2e over the 60-year project design life period. Road user emissions form 3,895,995 tCO_2e of this total while energy use for lighting and signs comprises 2,056 tCO_2e and maintenance 1,944 tCO_2e. The construction and operation emissions are less than 0.009% of the 5th (2028 to 2032) and 0.013 of the 6th (2033-2037) carbon budgets and are therefore assessed as being of low magnitude in terms of significance of impact.

3.2.13 The GHG emissions reported in the EIA **[CD7.1]** could be overestimated, particularly in relation to road user emissions. The modelling was based on government policy and guidance available at the time of assessment and does not account for more recent policies aimed at decarbonising transport in the UK by 2050. Road user emissions accounted for approximately 99.8% of the total emissions associated with the Scheme and were calculated using version 11 of Defra's Emissions Factors Toolkit **[CD6.25]**. While this version included hybrid and electric vehicle categories, the fleet composition used reflected the relatively low market share of these vehicles at the time. As such, future emissions are expected to decline, and the figures presented in the assessment may now overstate the likely emissions over the lifetime of the scheme.

Climate Change Resilience

3.2.14 The climate change resilience assessment **[CD7.1]** considers the vulnerability of the Scheme to the impacts of climate change and identifies design measures to adapt the Scheme to these impacts.

3.2.15 Existing and future climate baselines for the Scheme were developed using historic weather data from the Met Office for East of England, and future projections from the Met Office (United Kingdom Climate Change Projections (2018), UKCP18) **[CD6.26]**. UKCP18 projections for a range of average climate variables across a number of probability levels (10%, 50% and 90%) were obtained and analysed including:

- mean summer and winter daily temperatures;
- mean daily maximum summer temperatures;
- mean daily winter minimum temperatures; and
- mean summer and winter precipitation rates.

3.2.16 In addition, UKCP18 **[CD6.26]** data for severe weather, such as number of frost days, heatwaves, average summer highest daily maximum temperature, number of hot days, dry spells (10 days or more with no precipitation), heavy rain (annual number of days per year when precipitation is greater than 25mm per day) and wind, was assessed.

3.2.17 Furthermore, the H++ climate scenarios were used to test the sensitivity of vulnerable safety critical features, to ensure that such features will not be affected by more extreme changes to the climate beyond that projected in UKCP18. H++ scenarios are a set of plausible 'high-end' climate change scenarios which are typically extreme climate change scenarios on the margins or outside of the 10th to 90th percentile range presented in the UKCP09. The UKCP18 projections **[CD6.26]** do not include an updated H++ scenario and therefore, the H++ scenarios developed from UKCP09 remains current. The H++ scenarios covered the following climate hazards: heat waves, cold snaps, low and high rainfall, droughts, floods and windstorms.

3.2.18 The climate change resilience assessment **[CD7.1]** covers the lifecycle of the Scheme including construction and operation. During this period a number of receptors to climate change were identified including:

- The infrastructure (stockpiles, earthworks and watercourses), workforce and local residents.
- The Scheme assets during their operation and maintenance; and
- End users of the Scheme.

3.2.19 A number of potential climate change impacts have been identified during construction and operation of the Scheme. During construction potential impacts included:

- Rainfall events could affect the ability to undertake certain construction activities leading to programme delays and increased project costs.
- Rainfall events could result in the erosion of stockpiles and resultant silting of drainage assets. This could result in secondary impacts such as localised flooding or release of pollutants to watercourses.
- Windstorms could result in the damage of stockpiles. Secondary impacts could include site personnel welfare impacts.
- Windstorms could result in damage to temporary hoarding used in construction and ability to undertake specific construction activities (e.g. site crane operations) increasing project costs.
- Heatwaves and higher temperatures could result in site personnel welfare impacts, for example, heat stress, dehydration and unsafe working conditions.
- Heatwaves and higher temperatures could increase risks to site personnel associated with increased potential for dust generation and dispersal.

- Heatwaves and higher temperatures could affect the ability to undertake certain construction activities leading to programme delays (e.g. pouring of concrete and asphalt) and increased project costs.

3.2.20During operation of the Scheme potential impacts included:

- Wetter winters and increased frequency of intense rainfall events could result in the overwhelming of drainage assets. This could result in secondary impacts such as localised flooding.
- Wetter winters and increased frequency of intense rainfall events could result in increased groundwater levels.
- Wetter winters and increased frequency of intense rainfall events could result in damage to road surfaces and pavements due to scour.
- Wetter winters and increased frequency of intense rainfall events could result in localised surface water flooding which could lead to hydroplaning and unsafe driving conditions.
- Increasing frequency of dry summer periods could lead to vegetation failure.
- Damage to sign/signals and minor structures (e.g. gantries) and vegetation as a result of wind loading or wind-blown debris.
- Increased likelihood of greater thermal loading overstressed bearings that could eventually compromise structural stability of the asset.
- Stress on road surfaces (i.e. degradation of macrotexture and reduction of texture depth, wearing away of asphalt compromising support layers).
- Freeze-thaw during cold snaps and extreme high temperatures can cause damage to road surfaces including road and pavement cracking and deformation resulting in a reduction of road service life.

- Shrink swell processes resulting in desiccation cracking and embankment and earthwork instability.
- Increased frequency and severity of extreme heat events (i.e. heat waves) could result in the soft landscape design (trees and shrubs) being compromised (e.g. plant failures).

3.2.21 It was concluded on this basis that the Scheme may be vulnerable to a range of climate change effects. These were assessed in accordance with the methodology set out in Chapter 15 of the Environmental Statement published in 2023 **[CD7.1]** which identified that these impacts were all considered to have a low significant residual effect following the implementation of appropriate resilience measures. No significant impacts were identified and there is nothing to justify a different view being taken.

In-combination Climate

3.2.22 To assess the direct and indirect effects of climate relevant to the Scheme, the additive impacts of climate change to those effects identified in the other relevant Environmental Statements' **[CD7.1]** chapters have been considered. Effects that were originally identified in other Environmental Statements' **[CD7.1]** chapters but considered not significant may have to be reconsidered and could require additional design and/or mitigation measures should there be an additive effect as a result of climate change. Identified additive impacts are summarised below:

- **Vegetation Stress and Loss**: Drought, heatwaves, and pests may cause vegetation dieback, reducing the effectiveness of mitigation planting and affecting local landscapes, biodiversity, and habitat creation efforts.

- **Soil and Water Impacts**: Drought can lead to soil erosion, cracking, and reduced groundwater recharge. Heavy rainfall may increase runoff and the spread of contaminants, degrading water quality and site stability.
- **Material Suitability**: Weather extremes can render excavated material (either too dry or too wet) unsuitable for reuse, increasing the need for treatment or off-site disposal.
- **Dust and Air Quality**: Dry conditions and construction activities may elevate dust levels, affecting human health and sensitive receptors.
- **Noise and Human Annoyance**: Higher temperatures may lead to more people sleeping with windows open, increasing their exposure to construction and operational noise.
- **Potential Positive Effect**: Longer growing seasons may enhance vegetation growth and carbon sequestration, offering some environmental benefit.

3.2.23 It was concluded on this basis that the Scheme may be vulnerable to a range of climate change effects. These were assessed in accordance with the methodology set out in Chapter 15 of the Environmental Statement published in 2023 **[CD7.1]** which identified that these impacts were all considered to have a low significant residual effect following the implementation of appropriate resilience measures. No significant impacts were identified and there is nothing to justify a different view being taken.

3.3 Scheme Mitigation Measures

Greenhouse Gas Emissions

3.3.1 Various measures have been proposed to mitigate the impact of the Scheme on the climate and have been incorporated into the design and construction planning of the Scheme, for example:

- Limestone from the escarpment will be reused where possible.
- Sections of current road and private means of access roads will be reused as access roads during construction where possible.
- Most of the roundabout will be constructed online (built on the same alignment or footprint as the existing road). This reduces material requirements.
- A bridge at the A46 end of the Scheme was originally anticipated and included within the feasibility design and optioneering phase. However, this bridge is no longer required and will not be constructed, saving materials.
- Where possible, pipes used for drainage will be made of HDPE, which has lower material and carbon requirements than concrete.
- Where possible, ditches will be used for transporting water rather than pipes. This reduces material requirements associated with constructing pipes.
- In regard to drainage, kerbs will not be used, reducing concrete requirements. In addition, grass verges are to be used as opposed to gullies.

3.3.2 The design of the Scheme is being developed to optimise the cut/fill balance of site materials to minimise the need to import/export material. Processing of material will take place on site. Material excavated will be reused under Definition of Waste: Code of Practice (DoW CoP) **[CD6.51]**. This reduces emissions from the transportation of materials as well as emissions from any off-site activity associated with their provision or removal.

3.3.3 A Construction Environmental Management Plan (CEMP) **[CD8.82]** will be prepared to reduce the impact of construction activities. This CEMP **[CD8.82]** would include a Site Waste Management Plan which will lead to a reduction in emissions from the transportation and treatment of waste. Waste arisings will be prevented and designed out where possible. Where re-use and prevention are not possible, waste arisings would be managed. in line with the waste hierarchy Opportunities to re-use material resources will be sought where practicable.

3.3.4 The appointed contractor is required to implement a range of measures to reduce GHG emissions from site compounds, plant, logistics, and supply chains. This includes the use of electric and hybrid equipment, solar and wind power, sustainable drainage systems (SUDS), and smart tracking of logistics to optimise efficiency. Additional requirements involve harvesting rainwater, sourcing sustainable fuel alternatives like HVO, and ensuring early planning of site facilities. The appointed contractor is also required to train staff on efficient working practices, while subcontractor and supplier engagement will prioritise sustainability, including the use of low carbon materials and minimisation of waste.

3.3.5 The appointed contractor is required to lower GHG emissions across the supply chain by reusing materials, eliminating single-use plastics, and reducing unnecessary haulage. Temporary works will be designed with long-term use in mind to prevent waste, such as incorporating materials into permanent infrastructure and using low-impact surfacing. The appointed contractor is also required to assess sustainable sewage treatment options and manage invasive species and demolition waste responsibly, with the aim of reusing materials on-site and reducing the need for additional permits or offsite disposal.

Climate Change Resilience

3.3.6 A range of mitigation and resilience measures were designed into the Scheme to increase its resilience to climate change impacts.

3.3.7 All weather and climate-related impacts on construction activities are expected to be mitigated through best practice site management, adherence to design and construction standards, good engineering practice, and the implementation of specific measures outlined in the Environmental Statement (ES) **[CD7.1]** and the Register of Environmental Actions and Commitments within the Construction Environmental Management Plan (CEMP) **[CD8.82]**.

3.3.8 Measures to enhance resilience during construction will include the use of materials with appropriate durability (e.g. resistance to thermal loading), placement of stockpiles outside flood zones and surface water flow paths, and appropriate stockpile management to limit damage during extreme weather. Construction activities such as earthworks may be suspended during heavy rainfall. Best practice procedures will be applied to vulnerable tasks (e.g. pavement laying and crane operation), and measures to manage heat stress in site personnel will be in place. Materials and structures will be inspected before and after extreme weather events. A non-exhaustive list of embedded mitigation and adaptation measures addressing the climate risks identified in the Climate Change Risk Assessment has been provided in Table 15-24, Section 15.6: Assessment of Effects of the ES **[CD7.1]**. Additional embedded measures have been described in Chapter 4: The Scheme of the ES **[CD7.1]**.

3.3.9 The integral safety of the Scheme has been assessed against the UKCP18 projections **[CD6.26]** (including RCP8.5), a screening process to identify vulnerable safety-critical features under H++ climate scenarios. During the operational phase, most resilience effects will be addressed through the embedded design measures. Further discipline-specific operational mitigation and adaptation measures are included in relevant ES chapters **[CD7.1]**.

3.3.10 Essential operational measures will include slope stability design to minimise landslip risks, water ingress protection for electrical and operational equipment, the use of surface materials with appropriate skid and thermal resistance, and drainage systems designed in line with climate change allowances. Active and passive pollution prevention systems will be incorporated, and soft landscaping features will be regularly inspected and maintained, particularly following extreme weather events.

In-combination Climate

3.3.11 A range of mitigation and resilience measures have been designed into the Scheme to increase its resilience to climate change impacts. These include:

- A Dust Management Plan **[CD8.81]** aligned with best practice guidance to control emissions from construction activities, supported by site layout planning, screening bunds, and effective suppression techniques.
- Retention of existing vegetation and sensitive route alignment to reduce visual and ecological impacts.
- A Landscape and Ecology Management Plan (LEMP) **[CD8.83]** specifying native species planting to strengthen habitat connectivity, visual integration, and ecological resilience.

- Selection of tree and plant species tolerant to changing climate conditions, including extreme rainfall and longer growing seasons.
- Monitoring and maintenance of new vegetation for at least five years to ensure successful establishment, with drought mitigation measures as needed.
- Temporary drainage systems and surface water management infrastructure to manage runoff and maintain water quality.
- Pollution control measures such as swales, sediment forebays, vortex chambers, and isolation valves integrated into the drainage strategy.
- Construction practices set out in the CEMP **[CD8.82]**, covering material handling, contamination prevention, and flood risk avoidance.
- Noise and vibration mitigation through Best Practicable Means (BPM), quiet working methods, early installation of hoarding and barriers, and community communication.
- Ground investigation and testing to support material reuse and reduce waste during construction.

3.4 Development Since Planning Submission

3.4.1 Since the completion of the ES in 2023 **[CD7.1]**, minor design refinements to highway elements have been made as part of the Regulation 25 Request **[CD7.1]**. These changes resulted in slight adjustments to the Scheme layout. In addition, updated traffic data for the Core Scenario were issued on 14 March 2025, reflecting revised forecasts and baseline conditions. Updates have also been made to the tools used in the climate change assessment, including the latest versions of the Defra background emission maps and the EFT **[CD6.24]**, which are used to estimate GHG emissions associated with road traffic.

3.4.2 To assess the potential implications of the updated traffic data, a high-level comparison of road traffic emissions was carried out. This assessment used both EFT version 11 **[CD6.25]**, which was originally used in the ES **[CD7.1]**, and the latest version, EFT version 13. This allowed for a comparative analysis to determine whether the updates in traffic data and emissions factors materially affect the conclusions of the original assessment. Emissions were reviewed across the relevant UK carbon budgets, including the recently confirmed 7th carbon budget (2028–2042), which totals 535,000,000 tCO_2e. The results are summarised within Table 3-1.

Table 3.1: Summary of Net Scheme's GHG emissions per relevant carbon budget

Project stage	EFT Version	Net Scheme'a GHG emissions per relevant carbon budget (tCO_2e)			
		4th (2023-2027)	5th (2028-2032)	6th (2033-2037)	7th (2038–2042)
UK Carbon Budget		1,950,000,000	1,725,000,000	965,000,000	535,000,000
Construction (between 2026-2028)		25,321	12,661	0	
Operation (modelled from 2028)	11 (2023 traffic data)	-64	136,586	126,101	
	11 (2025 traffic data)	-64	26,529	25,517	24,505
	13 (2025 traffic data)	-64	29,226	30,770	32,313
Total	**11 (2023 traffic data)**	**25,258**	**149,247**	**126,101**	
	11 (2025 traffic data)	**25,258**	**39,190**	**25,517**	**24,505**
	13 (2025 traffic data)	**25,258**	**41,887**	**30,770**	**32,313**

3.4.3 Using EFT version 11 **[CD6.25]** with the original 2023 traffic data, the Scheme's total net GHG emissions were estimated at approximately 25,258 tonnes of CO_2e in the 4th carbon budget period (2023–2027), 149,247 tonnes in the 5th (2028–2032), and 126,101 tonnes in the 6th (2033–2037). These emissions represent approximately 0.0013%, 0.009%, and 0.0131% of the 4th, 5th, and 6th UK carbon budgets, respectively. No emissions were previously reported for the 7th budget.

3.4.4 When the same version of the toolkit (EFT version 11) **[CD6.25]** was used with the updated 2025 traffic data, the results showed substantial reductions in operational emissions, dropping to 39,190 tonnes in the 5th budget, 25,517 tonnes in the 6th and 24,505 tonnes in the 7th budget (2038–2042). When the same version of the toolkit (EFT version 11) **[CD6.25]** was used with the updated 2025 traffic data, the results showed substantial reductions in operational emissions, dropping to 39,190 tonnes in the 5th budget, 25,517 tonnes in the 6th and 24,505 tonnes in the 7th budget (2038–2042). These correspond to approximately 0.0023% of the 5th carbon budget, 0.0026% of the 6th, and 0.0046% of the 7th budget (535 $MtCO_2e$). Emissions in the 4th carbon budget remained unchanged at 25,258 tonnes (0.0013%), since construction emissions, assigned to this period, have not been updated due to the minor changes to the design.

3.4.5 Applying EFT version 13 **[CD6.24]** with the 2025 traffic data resulted in slightly higher estimates due to updates in emissions factors and vehicle fleet assumptions. The recalculated emissions were 41,887 tonnes in the 5th carbon budget (0.0024%), 30,770 tonnes in the 6th (0.0032%), and 32,313 tonnes in the 7th (0.0060%). Emissions in the 4th budget remained consistent at 25,258 tonnes (0.0013%).

3.4.6 One notable difference between EFT versions 11 and 13 is the trend in emissions reduction across the budgets. With EFT version 13, the reduction in CO_2 emissions over time appears to occur more gradually. This is likely due to the tool incorporating updated assumptions around fleet composition, electrification uptake, and behavioural change. As traffic volumes increase in the later budgets (particularly between 2028 and 2043), the rate of decarbonisation in EFT version 13 is slower than in version 11, meaning emissions remain higher in version 13 over the same period. In contrast, EFT version 11 projected more optimistic declines in emissions, likely due to pre-pandemic assumptions. Indeed, the EFT version 11 user guide notes that: *"It should be noted that the default fleet projections in EFT* version *11 are based on fleet growth assumptions which were current before the Covid-19 outbreak in the UK. In consequence, default fleet outputs from the tool do not reflect short- or longer-term impacts on emissions in 2020 and beyond resulting from behavioural change during the national or local lockdowns."* This difference helps explain why total emissions for the later carbon budgets (5^{th} to 7^{th}) are generally higher under EFT version 13, despite using the same 2025 traffic data.

3.4.7 In all three scenarios (2023 ES, updated traffic with EFT version 11 **[CD6.25]**, and updated traffic with EFT version 13), the Scheme's emissions account for less than 0.01% of each relevant UK carbon budget. This confirms that, even when applying the most up-to-date data and assumptions, the Scheme's contribution to national GHG totals remains negligible. Therefore, the updated analysis supports the original conclusion that the Scheme will not result in a significant impact in terms of the UK's carbon budgets or climate change objectives.

4 SUMMARY AND CONCLUSION

4.1.1 Planning permission **[CD7.1]** has been given for the scheme and the application contained all relevant detail including an extensive and comprehensive Environmental Statement **[CD7.1]**.

4.1.2 A climate assessment was undertaken to meet the requirements of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 **[CD2.5]**, SI 571 to ensure a comprehensive and robust assessment of environmental matters during the planning application process. The Climate Assessment **[CD7.1]** was specific to the date it was undertaken. As the assessment was conducted in 2023, updates to the information have not been required. The original assessment remains relevant, reflecting the position on climate policy, including the publication in February 2025 of the seventh carbon budget for the period 2038-2042.

4.1.3 The climate assessment included a GHG assessment to calculate estimated emissions arising as a result of the Scheme over its lifetime and to assess the significance of their impact on the climate.

4.1.4 A climate change resilience assessment was also undertaken to consider the vulnerability of the Scheme to the impacts of climate change and to identify any design measures to adapt the Scheme to these impacts.

4.1.5 In addition, an in-combination climate impacts assessment was completed to assess the direct and indirect effects of climate relevant to the Scheme and the additive impacts of climate change to those effects identified in the other relevant Environmental Statements' chapters **[CD7.1]**.

4.1.6 The GHG impact assessment presented in the Environmental Statement **[CD7.1]** has demonstrated the effect the construction and operation of the Scheme will have in respect of GHG emissions and has presented them into an overall context.

4.1.7 Unlike many other topics assessed in EIA **[CD7.1]** there are no defined thresholds for GHGs which if exceeded are deemed significant. In line with IEMA guidance **[CD6.5]**, GHG emissions from the Scheme have therefore been considered in the context of existing carbon budgets. At the time the assessment was undertaken the 6th carbon budget, covering the period 2033 to 2037, was latest to be published. Emissions from the Scheme during any year in the 4th, 5th and 6th carbon budget periods represent less than 0.014%. On the basis that emissions sources of less than 1% are not considered material in carbon accounting terms, GHG emissions from the Scheme during these carbon budget periods were considered to be of low magnitude in terms of the significance of their impact.

4.1.8 Since the EIA **[CD7.1]** was published, a further assessment of GHG emissions from the Scheme has been undertaken against the 7th carbon budget period (2038 to 2042). Using EFT v11 **[CD6.25]** and the original 2023 traffic data, emissions from the Scheme during the 7th carbon budget period equate to approximately 0.022% of the budget. This contribution remains well below the 1% threshold considered material in carbon accounting terms and is therefore still considered to be of low magnitude in terms of impact significance.

4.1.9 Additionally, further modelling has been carried out using updated 2025 traffic data and the most recent version of Defra's Emissions Factors Toolkit (EFT v13) **[CD6.24]**. Emissions were reassessed across the 5th, 6th, and 7th carbon budget periods. Applying EFT v13, estimated emissions from the Scheme were 41,887 tonnes during the 5th carbon budget (0.0024%), 30,770 tonnes during the 6th (0.0032%), and 32,313 tonnes during the 7th (0.0060%). Despite updates to the toolkit and traffic forecasts, the Scheme's emissions continue to account for less than 1% of each carbon budget, reinforcing the conclusion that its contribution to national carbon targets is negligible.

4.1.10 A comparative analysis also found that using EFT v11 **[CD6.25]** with the updated 2025 traffic data resulted in lower emission estimates: 39,190 tonnes in the 5th carbon budget (0.0023%), 25,517 tonnes in the 6th (0.0026%), and 24,505 tonnes in the 7th (0.0046%). This variation between versions can be attributed to differences in emission factors and fleet projections. Notably, the EFT v11.0 user guide acknowledged that its default fleet assumptions did not account for behavioural or market changes resulting from the COVID-19 pandemic, which likely led to more optimistic decarbonisation trajectories. In contrast, EFT v13 reflects updated expectations about electric vehicle uptake and traffic trends, showing a slower decline in emissions despite growing traffic volumes between 2028 and 2043. As a result, emissions in v13 were slightly higher overall than in v11 when using the same 2025 traffic data.

4.1.11 Regardless of the version used, all assessment scenarios confirm that the Scheme's GHG emissions constitute less than 0.01% of each relevant UK carbon budget, including the newly introduced 7th budget. The updated analysis therefore supports and strengthens the original conclusion: the Scheme will not result in a significant impact on the UK's carbon budgets or compromise national climate change objectives.

4.1.12 For GHG emissions more broadly, it can also be concluded that the original ES **[CD7.1]** estimates are likely to be overestimated. This is because the modelling of road user emissions was based on policy and fleet assumptions available at the time, which did not fully account for more recent government targets aimed at decarbonising transport, or the anticipated uptake of electric and hybrid vehicles. As policy measures are implemented and technology adoption increases, emissions from road traffic are expected to decline.

4.1.13 If current government policy targets are met, emissions from road users will likely continue to fall over the life of the Scheme, in line with the UK's legally binding commitment to reach net zero by 2050.

4.1.14 A resilient road network is an integral part of a sustainable transport network. According to Highways England in their Net Zero Highways Plan **[CD3.15]** 90% of passenger miles are travelled by road and 79% of goods are moved by road. While road travel currently has a higher carbon footprint, government initiatives aim to decarbonise the network through sustainable construction practices and the adoption of low-emission vehicles. The UK's Transport Decarbonisation Plan **[CD3.14]** outlines a trajectory to achieve net-zero emissions, including phasing out new petrol and diesel cars by 2030 and targeting net-zero road transport by 2050.

4.1.15 Sustainable development needs to consider the balance between economic, social and environmental impacts and benefits. A robust strategic road network has a major role to play in the future economic and social wellbeing of the UK allowing us to work, enjoy recreation and delivery of goods and services. Even with significant investment in rail, walking and cycling the majority of long journeys will likely still be by road in 2050.

4.1.16 The climate change resilience assessment and the in-combination climate impacts assessment identified a number of potential impacts from climate change during construction and operation of the Scheme. It is concluded however that by implementing a number of appropriate design measures and operational procedures, which are included in the Scheme, there will be no significant impacts from the climate on the Scheme.