

Hereford Western Bypass

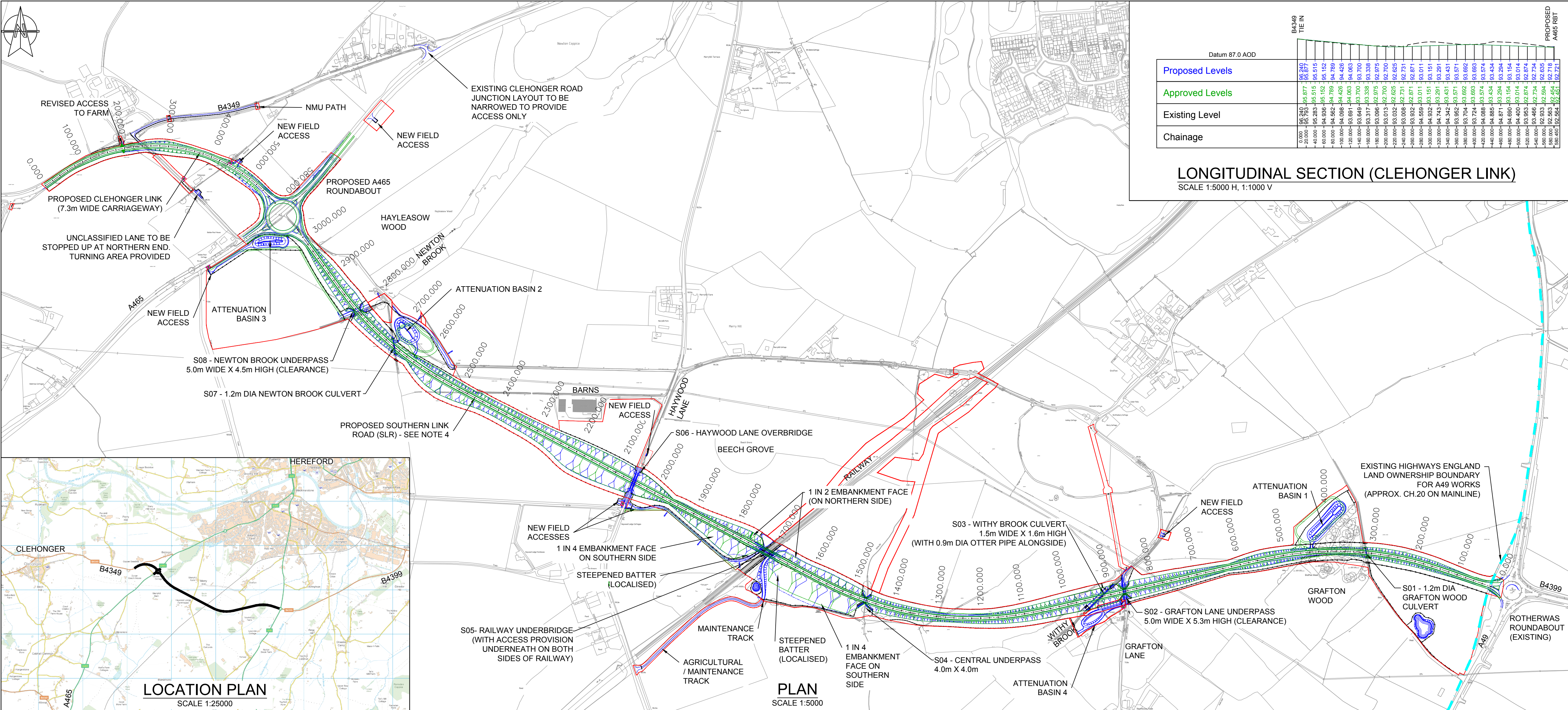
Phase One Full Business Case Appendices

Herefordshire Council

June 2026

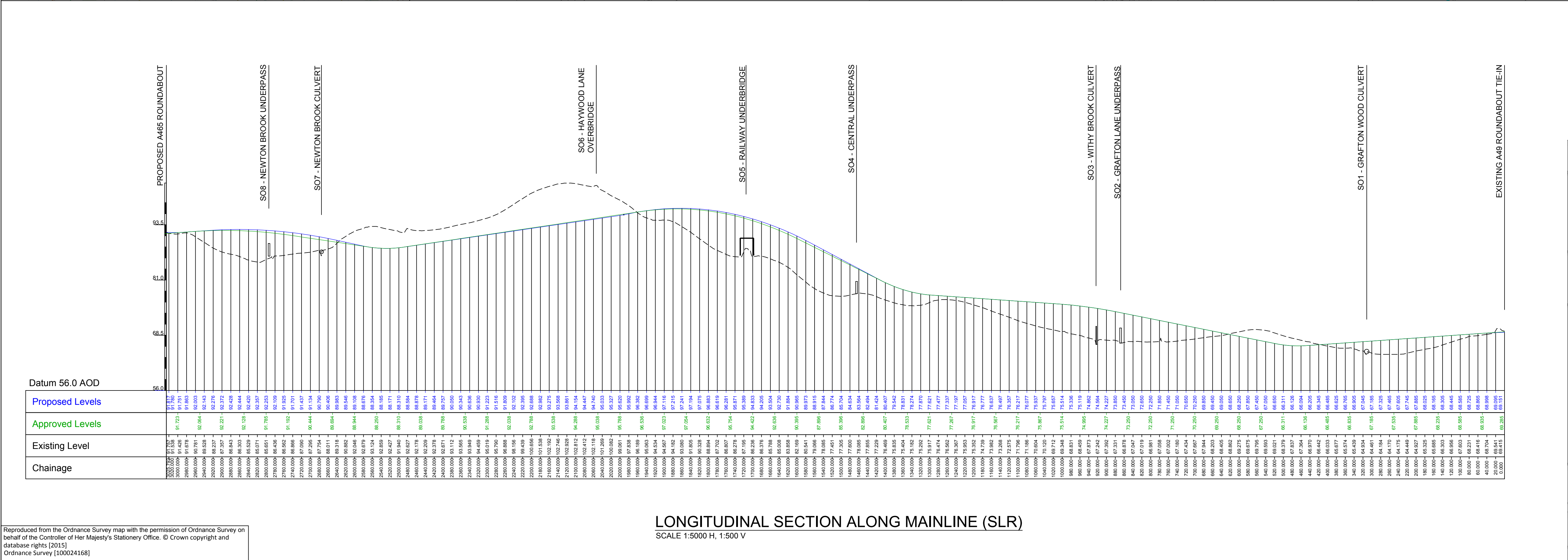
Appendix A	Phase One Scheme Layout
Appendix B	Stakeholder Letters of Support
Appendix C	Carbon Management Plan
Appendix D	Project Risk Register
Appendix E	Equality Impact Assessment
Appendix F	Economic Appraisal Report
Appendix G	Quantified Risk Assessment Report
Appendix H	Distributional Impact Assessment
Appendix I	Alternative Mode Assessment
Appendix J	Appraisal Specification Report
Appendix K	Appraisal Summary Table
Appendix L	Team CVs
Appendix M	Project Programme
Appendix N	QRA Risk Register
Appendix O	Planning Application and Design Review
Appendix P	Compulsory Purchase Order Plans
Appendix Q	Public Consultation Report
Appendix R	Communication and Engagement Plan
Appendix S	Benefits Management and Evaluation Plan

Appendix A – Phase One Scheme Layout



NOTES	
1.	DO NOT SCALE FROM THIS DRAWING. USE FIGURED DIMENSIONS ONLY.
2.	ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
3.	ALL CUT SLOPES TO BE 1 IN 3 AND FILL SLOPES TO BE 1 IN 2 UNLESS OTHERWISE STATED ON THE DRAWING.
4.	SOUTHERN LINK ROAD (SLR) TO BE 7.3m WIDE WITH 2m 1.0m WIDE HARD STRIPS, AS STANDARD SINGLE ALL PURPOSE RURAL CARRIAGEWAY REFERENCE S2 IN TD27/05 "CROSS SECTIONS AND HEADROOMS"

KEY	
	APPROVED PROFILE
	PROPOSED PROFILE
	EXISTING GROUND PROFILE
	RED LINE BOUNDARY
	HIGHWAYS ENGLAND BOUNDARY



P01	21/01/19	FIRST ISSUE	LP	GJ	MJ
Rev	Date	Description	By	Chk	App
FIT FOR INFORMATION					
Site/Project: SWTP SOUTHERN LINK ROAD					
Title: ROUTE PLAN AND LONGITUDINAL SECTION PRE AND POST PLANNING COMPARISON					
Drawn: L Perrett			Checked: G Jones		
Designed: L Perrett			Approved: M Jones		
Date: 16/01/19		Scale: AS SHOWN	A1	Sheet:	
Container Number:					Revision:
3512983BP-WSP-XX-ZE-DR-J-00030					P01
© Copyright Parsons Brinckerhoff					

Appendix B – Letters of Support

From: Antony Lowther <antony.lowther@ajlowther.co.uk>
Sent: 04 June 2026 09:01
To: Tompkins, Scott
Cc: Tony Faulkner
Subject: Hereford Bypass Project

Dear Scott

I am delighted that the bypass project is moving again and I write on behalf of AJ Lowther & Son Ltd to offer our full support to the project.

The benefits of the bypass are numerous and well described elsewhere but I would like to add three examples of how current congestion negatively affects AJ Lowthers and the county as a whole:

- 1 We are no longer able to recruit or retain staff, who would like to work for us, but who live to the north of the city because of the increased journey time caused by the traffic congestion.
- 2 We have a strong customer base in north Herefordshire and Shropshire which means we are either running our lorries through Hereford or taking a huge detour to travel up the M5.
- 3 We have worked with Hereford Galvanisers for over 50 years but we are finding the congestion in Hereford has made it less time consuming and costly to deal with a galvanising plant in Newport; loss of business to Herefordshire and more cost for us.

In addition we are well aware of the lack of available sites for businesses to expand in Herefordshire and the new industrial land will make a huge difference to the businesses and economic growth in the county. On the previous two occasions we have expanded our business we have moved outside of the county to Wiltshire and Somerset. Hopefully the bypass will come quickly enough that our next expansion can be in our home county.

Please keep driving this project forward. The county is behind you as are AJ Lowthers.

Yours faithfully

Antony Lowther
For and on behalf of
A J Lowther and Son Ltd



Tel: 01600 890482

This email (including any attachments) is confidential.

A J Lowther & Son Ltd may monitor and record all emails.

The views expressed in this email are those of the sender and not A J Lowther & Son Ltd



From: Ed Pitt <ed.pitt@kgd.co.uk>
Sent: 03 June 2026 17:17
To: Tompkins, Scott
Subject: Hereford By Pass

Dear Scott

Having attended your "Back The Bypass" launch where the bypass plans were updated last month I can confirm that as a business owner employing 140 high skilled jobs in Rotherwas, that this bypass will enable us to further expand our business and make significant employment increases.

Currently the traffic in the city centre is prohibitive to us gaining employees from particularly north of the river wye but also from the west. Traffic conditions for 2 hours every morning and every night ensure that an addition hour of daily travel time put people off wishing to work in Rotherwas.

I personally live north of the city and sit everyday morning and night, I have done this for 35 years and if I work till I am 67 another 16 years, I will have spent a total of approximately 13,000 hours sat in traffic congestion in Hereford. This is 1.5 years, which is probably 4% of my time on earth awake, what a waste!!! Or as the average person works 1800 hours per year, I could of worked another 7 years!!!!

The bypass would open up Industrial Land, Housing Land, and connectivity which is desperately required, we have been promised this bypass since the 1980's it is now needed more than ever. The overwhelming majority of people want the by pass, it should be a national and local priority.

If anyone wishes to visit us at Rotherwas or commute with me for a week they may better understand why this is critical, the arguments which state it will not assist congestion are ridiculous. At least 70% of our employees would use a bypass from North of the river wye to access Rotherwas!!

Many thanks
Ed

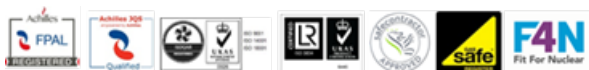
Regards,

Ed Pitt.
Managing Director.



Netherwood Road
Rotherwas Industrial Estate
Hereford
HR2 6JU

✉ ed.pitt@kgd.co.uk
☎ 01432 374 374 (Switchboard)
☎ 01432 374 377 (Direct Line)
🌐 www.kgd.co.uk





M J Ainge & Co. Ltd

15 Southern Avenue | Leominster | Herefordshire | HR6 0QF | U.K | T: 01568 613600 | F: 01568 613599 | E: sales@shiresequestrian.com

TO WHOM IT MAY CONCERN

8th June 2026.

We are a company based in Leominster and as such we are not directly affected by the congestion in Hereford.

However, we have staff who travel through Hereford every day as employees in our Leominster office and warehouse who find the congestion a real problem. We also have customers who travel through Hereford to visit us and have to allow extra time in order to arrive on time for their appointment.

When I visit or travel through Hereford, I am always disappointed to find that the town centre is unnecessarily congested, which is a pity for such an attractive market town.

I feel that a bypass around Hereford is long overdue and would do much to attract business and tourists to the town.

Yours sincerely,

Malcolm Ainge
Chairman
Shires Equestrian

Herefordshire Council
Hereford Bypass Project
Attn: Scott Tompkins
Plough Lane
Hereford HR4 0LE



To Whom It May Concern,

My name is Josh Salmon Company Director of Elite Plastics Ltd on Rotherwas Industrial Estate.

Our company extrudes, prints, converts and recycles polythene products manufacturing polythene films, bags and covers. We consider ourselves the most forward-thinking, sustainable and progressive polythene manufacturers in the UK. We operate from our site on Rotherwas 24 hours a day, 7 days a week non-stop production. The products we manufacture here in Hereford are distributed across the whole of the UK, Ireland and into Europe.

We currently employ around 85 members of staff and have an annual turnover of approximately £17.5 million, with the business continuing to grow year on year.

Over the last 10 years, Elite Plastics has become a strong example of local manufacturing success. We have more than tripled our production operation, significantly increased employment, and continue to target further growth that will support both our business and the wider local economy. In recent years alone, we have invested over £5 million into site expansion, state-of-the-art production lines, advanced technology and a large solar PV installation with over half a megawatt of capacity.

Elite Plastics sees itself as one of the most forward-thinking and progressive polythene manufacturers in the UK. We have won an award for our bold sustainability initiatives and actions. At a time when manufacturing is often seen as a sector in decline, Elite Plastics sees it as an opportunity for growth due to the strength of our operation and, most importantly, the quality of our people here in Hereford.

For these reasons, Elite Plastics Ltd strongly supports the completion of Phase One of the Hereford Bypass.

We state the above because everyone within Elite Plastics understands how to drive growth, success and improvement. We know what drives it, and a key part of that is making big and bold moves. It is abundantly clear to Elite Plastics Ltd and the clear consensus of our staff that completion of Phase One of the Hereford Bypass is fundamental and critical to the economic growth, success and improvement of not only Elite Plastics and our future growth plans but, more importantly, the growth plans and ambitions of the city and county.

Hereford does not attract a fraction of the investment it needs and deserves. Hereford's productivity ranking is among the lowest in the UK. Small tweaks and changes will not make any meaningful change. Big, bold and ambitious action must be taken and if we as a city and county are to thrive we must act quickly and immediately. We will not repeat every benefit in detail, as many are already clear and will be covered by others. But they include attracting more people, more space for businesses, more jobs, better transport links, improving quality of life in the city, quicker journeys – the list goes on. We also need to consider what will happen if we do not act. The outcome is obvious: we will stay stuck where we are, chasing the tails of others. If we want a thriving city and county that leads the way for current and future generations, Phase One of the Hereford Bypass is not optional; it is a fundamental, critical and essential must. Even then it will only be the start because it will unlock much more.

At Elite Plastics, we know that growth requires ambition, investment and action. We are passionate about growth because we see first-hand how it improves lives, creates jobs, strengthens businesses and supports families. We want the same ambition for Hereford and the wider county because we are proud to live and work here. The answer is clear: the consequences of this decision will determine the future of the city. The right choice must be made.

HIGH QUALITY POLYTHENE | EXTRUDE | PRINT | CONVERT | RECYCLE

REGISTERED OFFICE: Twyford Road, Rotherwas Industrial Estate, Hereford, HR2 6JR
REGISTERED NO: 2465066 VAT: 549 4655 03

Scott Tompkins
Infrastructure Delivery Director
Herefordshire Council
Plough Lane
Hereford
HR4 0LE

4-6-2026

Dear Mr Tompkins,

Re: Support for Hereford Bypass – Phase One

I am writing to express our strong support for the Hereford Bypass Phase One project.

We recognise the critical importance of this scheme in improving transport infrastructure across Hereford and the wider county. The proposed link between the A49 and A465 represents a significant step forward in addressing congestion and improving accessibility, particularly to key employment areas such as Rotherwas.

We believe the benefits outlined in the business case are both compelling and necessary. In particular, we welcome the anticipated reduction in traffic on key routes including Belmont Road, Walnut Tree Avenue, and Holme Lacy Road, which will help improve journey reliability, road safety, and environmental conditions for residents and businesses alike.

Beyond Phase One, we strongly support the vision for the full bypass scheme. The potential to unlock economic growth through new housing, employment land, and job creation is vital for the long-term prosperity of Herefordshire. Improvements in transport resilience, air quality, and opportunities for enhanced public transport and active travel will further strengthen the region's attractiveness for investment and development.

As an organisation operating within the area, we see firsthand the challenges posed by current transport constraints. We are confident that this project will play a key role in enabling sustainable growth, supporting local businesses, and enhancing connectivity across the county.

We are therefore pleased to support the Hereford Bypass Phase One project and the wider ambitions associated with the full scheme, and we encourage its progression through to delivery.

Yours sincerely,

Tim Morris

Operations Director

ABT Products

Design | Manufacture | Support

ABT Products Ltd, Ashburton Ind. Est., Ross on Wye, Herefordshire, HR9 7BW, UK. T. +44 (0)1989 563656 F. +44 (0)1989 566824

Co. Reg No. (England & Wales) 1021755 VAT No. (UK) 806 6228 34

- cabs
- chassis
- roll bars
- complex steel fabs
- tube manipulation
- autophoretic coating

For vehicles and equipment:

- industrial
- construction
- agriculture
- materials handling

National Highways Letter of Support

Placeholder

Hereford Enterprise Zone Letter of Support

Placeholder

Appendix C – Carbon Management Plan



Hereford Bypass Phase 1 - Carbon Management Plan

Quality Information

Prepared by	Checked by	Verified by	Approved by
Aiman Zaidi Consultant AECOM	Alex McMahon Principal Sustainability Consultant AECOM	Ian Davies Carbon & ESG Director AECOM	Paul Bate Project Director AECOM

Revision History

Revision	Revision date	Details	Authorised	Name	Position
P01	May-26	First iteration - FBC footprint	Yes	Paul Bate	Project Director

Related Documents

Document Number	Document Title	Link

Please open this CMP in Excel for full functionality

© 2026 AECOM Limited. All Rights Reserved.

AECOM Limited ("AECOM") has prepared this document for the sole use of Herefordshire Council ("Client") in accordance with the terms and conditions of appointment ("the Appointment").

AECOM shall have no duty, responsibility and/or liability to any party in connection with this document howsoever arising other than that arising to the Client under the Appointment. Save as provided in the Appointment, no warranty, expressed or implied, is made as to the professional advice included in this document or any other services provided by AECOM.

This document should not be reproduced in whole or in part or disclosed to any third parties for any use whatsoever without the express written authority of AECOM. To the extent this document is reproduced in whole or in part or disclosed to any third parties (whether by AECOM or another party) for any use whatsoever, and whether such disclosure occurs with or without the express written authority of AECOM, AECOM does not accept that the third party is entitled to rely upon this document and does not accept any responsibility or liability to the third party. To the extent any liability does arise to a third party, such liability shall be subject to any limitations included within the Appointment, a copy of which is available on request to AECOM.

Where any conclusions and recommendations contained in this document are based upon information provided by the Client and/or third parties, it has been assumed that all relevant information has been provided by the Client and/or third parties and that such information is accurate. Any such information obtained by AECOM has not been independently verified by AECOM, unless otherwise stated in this document. AECOM accepts no liability for any inaccurate conclusions, assumptions or actions taken resulting from any inaccurate information supplied to AECOM from the Client and/or third parties.

Limitations

AECOM shall not be responsible and/or liable as a result of or in connection with any copying and/or amendment to this document without AECOM's prior written consent and/or for any use of this document for any purpose other than that for which it was prepared.

The methodology adopted and the sources of information used by AECOM in providing its services are outlined in this document. The work described in this document is based on the conditions encountered and the information available during the said period of time. The scope of this document and the services are accordingly factually limited by these circumstances. AECOM shall not be liable for any change in the conditions after they were encountered by AECOM and/or any change in the information and/or assumptions based on which this document was prepared.

AECOM disclaim any undertaking or obligation to advise any person of any change in any matter affecting this document, which may come or be brought to AECOM's attention after the date of this document.

The opinions expressed in this document and the comments and recommendations given are based on the assessment of readily available information.

Certain statements made in this document that are not historical facts may constitute estimates, projections or other forward-looking statements and even though they are based on reasonable assumptions as of the date of this document, such forward-looking statements by their nature involve risks and uncertainties that could cause actual results to differ materially from the results predicted. AECOM specifically does not guarantee or warrant any estimate or

Accountability & Sign-off

1. Accountability within the Client organisation

This CMP is a live document, which should be updated throughout the project lifecycle as opportunities are investigated, taken forward and implemented, and as further opportunities and actions are identified. For effective implementation of the CMP, it is important for accountability to be clearly defined. The Accountable Person within the Client organisation should be identified in the table below, and should sign off on the CMP at the end of each project stage.

Project Stage	Name of Accountable Person within the Client organisation	Email of Accountable Person	Carbon Management Plan signed off?	Date of Carbon Management Plan sign off
Outline Design	N/a - not a requirement at the time	-	-	-
Detailed Design	Gary Macdonnell	gary.macdonnell@herefordshire.gov.uk		
Construction	Gary Macdonnell	gary.macdonnell@herefordshire.gov.uk		

2. Sign-off by a Suitably Qualified Carbon Practitioner

This CMP should be reviewed by a Suitably Qualified Carbon Practitioner at each project lifecycle stage to check it is being implemented effectively. The Suitably Qualified Carbon Practitioner should use the table below to sign off on this review when it has been completed.

Project Stage	Name of Suitably Qualified Carbon Practitioner	Email of Carbon Practitioner	Carbon Management Plan signed off?	Date of Carbon Management Plan sign off
Outline Design	N/a - not a requirement at the time	-	-	-
Detailed Design	Ian Davies	ian.davies@aecon.com	Yes	15 May 2026
Construction	TBC			



Introduction

Project Hereford Bypass Phase 1

Client Herefordshire Council

This Carbon Management Plan (CMP) describes how carbon emissions associated with the Hereford Bypass Phase 1 will be minimised in line with the government and organisational net zero commitments. The outputs of the CMP will be project-specific and will support the project team to effectively embed carbon reduction measures throughout the project lifecycle by encouraging early consideration of carbon reduction opportunities and providing clear governance structures and processes to achieve the carbon reduction targets identified for the project.

The CMP helps the project team by:



The CMP is a live document and will be updated throughout the design and construction of the project.

The 'Instructions' tab provides more information on how to interact with this CMP.

Benefits of this CMP

This CMP will allow the client to effectively manage carbon throughout the project lifecycle by encouraging early consideration of carbon emissions and creating appropriate governance structures and processes.

The figure below, taken from PAS 2080, demonstrates how there is a decrease in carbon reduction potential over a project's lifecycle.

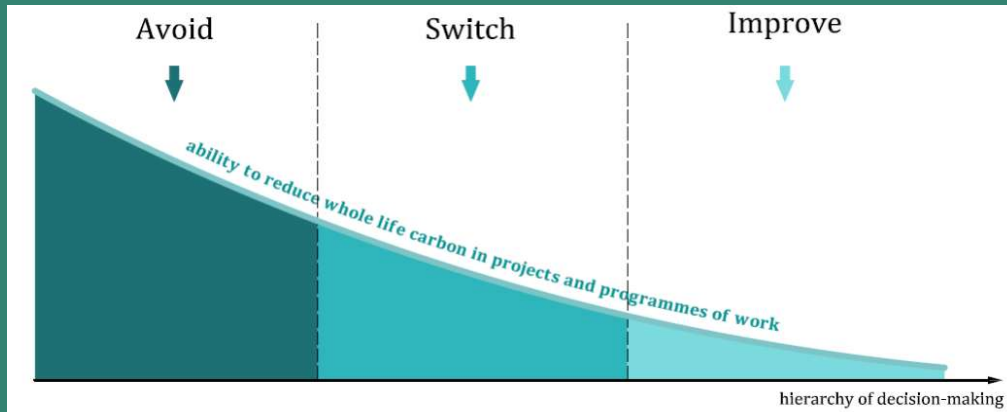
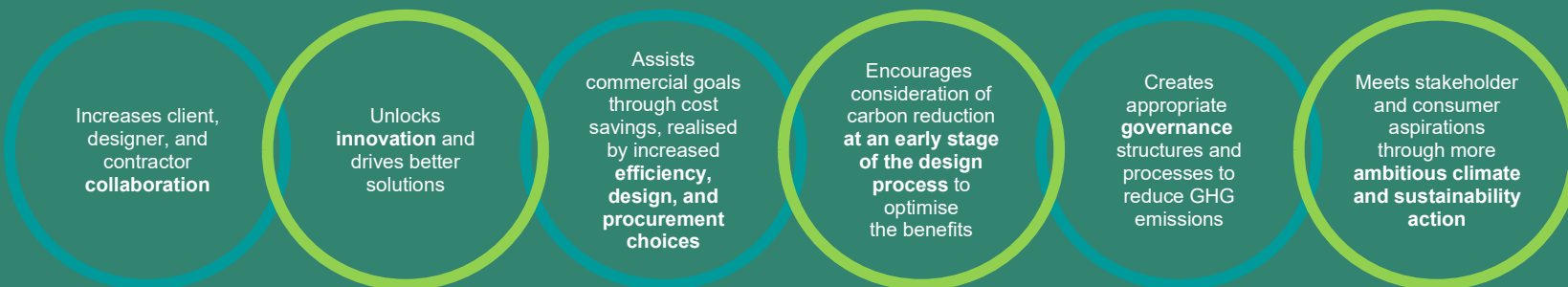


Figure: PAS 2080:2023 Carbon Reduction Hierarchy

The figure demonstrates that the most significant carbon savings are achievable during the early stages of a project, as it is possible to implement more fundamental and transformative measures. For example, some cases include avoiding the project or project components, or by switching mode, method or material. As a project moves beyond the design stage to the delivery and operation phases, further carbon reduction is possible by making processes more efficient and by selecting materials for maintenance with a lower embodied carbon value. However, while there is less scope for high-impact reduction measures at the later stages, it is still essential to consider reduction measures across all lifecycle stages. In addition to mitigating climate change, effective carbon management also provides the following benefits:

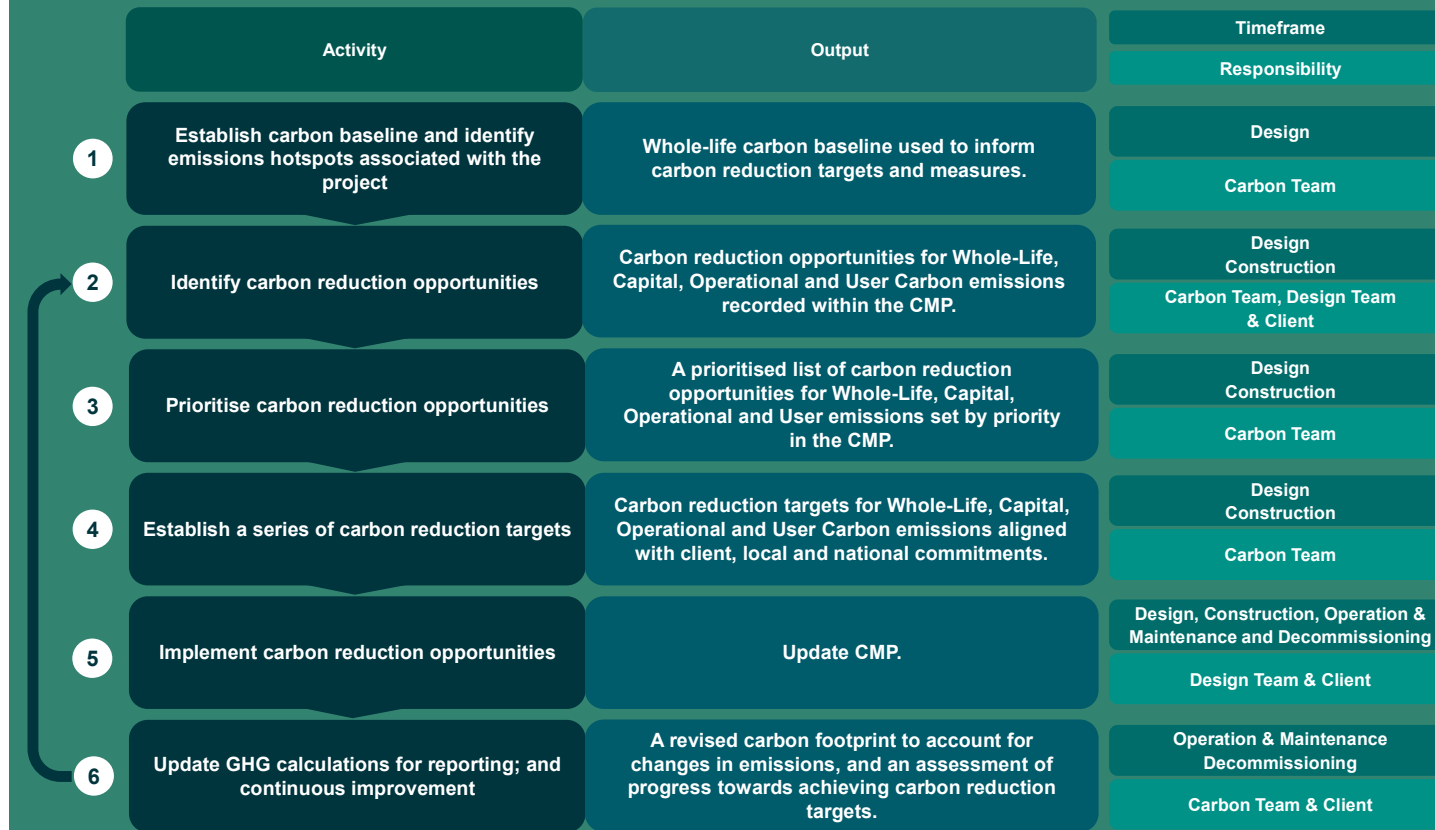


Consistency and continuity across the project's lifecycle are crucial for effective carbon management in any project. By implementing a proactive whole-life and systems approach early on, it is possible to integrate carbon management throughout the project, resulting in more efficient carbon mitigation and improved sustainability outcomes.

Approach

The figure below presents the high-level CMP approach. The process has been built upon the principles of the PAS 2080 carbon management process and provides a framework that allows parties involved in developing a building or infrastructure project to collaborate to optimise the overall carbon impact of a system, network or asset. The process focuses on project elements where the most effective carbon reduction opportunities can be implemented.

Carbon management is a continual process where carbon reduction opportunities are identified, prioritised, investigated and implemented where feasible. The CMP will be reviewed and updated through an ongoing review process. The Client will provide this CMP to the appointed contractor and communicate the CMP's requirements through the contractual mechanism in place for the project delivery.



AECOM

Instructions

The CMP enables the project team to monitor progress against the carbon reduction targets set for the project. The CMP records decarbonisation opportunities and actions across the project lifecycle that will in time create the appropriate practice and behaviours to deliver against the targets. The status of opportunities, actions and progress against decarbonisation targets are displayed in the **Dashboard** tab, which can be used to communicate performance to the project team.

The CMP should be provided to the organisations appointed to deliver each lifecycle stage.

Targets

- Carbon reduction targets should be developed to support delivery of the CMP.
- Targets support decision making by tracking the projects decarbonisation performance throughout its lifecycle.
- Targets should be discussed by the project team during each lifecycle stage to agree what actions should be taken and by who.
- Target performance should be reviewed and updated as the project progresses through design, construction and operation.
- *Note: Given the late stage and retrospective nature of this CMP, target setting might not be appropriate for Phase 1, but should be considered for Phase 2.*

Opportunities

- To achieve the targets, opportunities to reduce carbon should be identified throughout the project lifecycle e.g. during workshops and ongoing discussions.
- Opportunities should be recorded within the **Opportunities** tab to aid decision-making (by rating each opportunity based on set criteria) and track the performance of the programme throughout its lifecycle.
- Opportunities should be assigned an owner and fall under one of the following categories: Strategy & Governance, Innovative Design, Lower Carbon Products and Lean Construction Techniques.

Actions

- Opportunities requiring further investigation should be given an action and recorded within the **Actions** tab.
- Actions are the activities required to explore and implement opportunities to support delivery against the decarbonisation targets and track carbon performance throughout the project lifecycle.
- Actions should be assigned an owner and regularly reviewed and updated as the project progresses through design, construction and operation.

How to use this spreadsheet

The project team are required to update the CMP throughout each project gateway stage. A Suitably Qualified Carbon Practitioner should review the CMP at each stage to check it is being implemented effectively. The Suitably Qualified Carbon Practitioner should sign off on this review in the Carbon Team Sign-off tab when it has been completed.

Further tabs requiring input at each project stage are outlined below. The other tabs contained within this CMP are for information only.

Select tab below Description

Carbon Assessment	This tab contains data tables for carbon footprint data to be entered into. Footprints produced to date should be included here. There is also space for future carbon footprints to be added as and when they are produced, when additional carbon footprint data is added, the charts should be updated as required.
-------------------	--

Scheme Summary

The full extent of the proposed Hereford Western Bypass scheme is shown in Figure 1. The scheme consists of two parts; Phase One which forms the focus of this Carbon Management Plan, and Phase Two which is at an earlier stage of scheme development.

Phase One of the bypass will provide a new link road between the A465 and A49 to the south-west of Hereford city centre. It is a 3km long section of rural all-purpose single carriageway, with a design speed of 60mph. The scheme was developed to an advanced stage and received planning permission in 2016 (which remains extant).

Purpose

Phase One of the Hereford Bypass is considered to be the most effective way to deliver a number of key objectives, including:

Network Reliability – Through providing a more direct and reliable route to the Hereford Enterprise Zone/Rotherwas for all users from the south / southwest of Hereford with journey time savings of more than six minutes during the peak periods, following completion of the Phase One scheme.

Reducing Congestion – By relieving pressure on residential routes in the South Wye area, particularly along the A465 Belmont Road, Holme Lacy Road and Walnut Tree Avenue, by reducing daily traffic flows by up to 25%, following completion of the scheme.

Improve Road Safety across the South Wye Area following completion of the scheme through reducing the overall number of accidents within the study area.

Improving air quality and noise levels from road transport on key receptors across South Wye, particularly in the residential Belmont area following completion of the scheme.

Supporting economic growth and business productivity in Hereford through improving the connectivity of the Enterprise Zone and Rotherwas through reduced travel times to increase inward investment jobs growth.

Improve social outcomes across the South Wye area by reducing traffic levels in residential areas and providing an improved environment, following completion of the scheme.

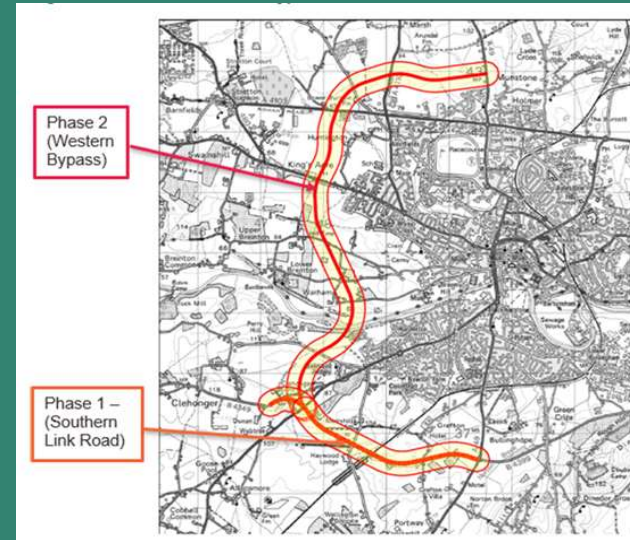


Figure 1: Hereford Bypass Phase 1 & 2.

Source: Scheme Information Report. <https://www.herefordshire.gov.uk/media/ftpliccz/herford-bypass-phase-one-scheme-information-report.pdf>

Policy and Legislation

This tab captures the project specific key legislation, policies, commitments and guidance concerning achieving carbon emissions reductions over the lifetime of the project as outlined below. Further instructions on how to use this tab are provided within the 'Instructions' tab.

Ref.	Type	Name	Description	Reference
1	Carbon Management Guidance	PAS 2080:2023 Carbon Management in Buildings and Infrastructure	PAS 2080:2023 is the specification followed for managing whole life carbon in infrastructure – in the provision, operation, use and end-of-life of new projects or programmes of work as well as the management or retrofit of existing assets and networks. PAS 2080 is targeted at practitioners in these organisations who are responsible for different aspects of delivery in the built environment where carbon management has a role to play.	PAS 2080:2023 30 Apr 2023 BSI Knowledge (bsigroup.com)
2	Carbon Management Guidance	DfT Carbon Management Guidance – Management Case (December 2022)	DfT Carbon Management Guidance explains how DfT uses the HM Treasury 2022 Green Book and supplementary business case guidance when developing transport business cases and preparing advice on spending decisions. It is primarily aimed at those who are involved in developing transport proposals. The Guidance follows the Green Book's five case model, which is the government's best practice model for spending and investment decisions. The Guidance sets out how specific transport-related factors and valuation issues are applied in this context.	DfT Carbon Management Guidance – Management Case Transport business case guidance - GOV.UK (www.gov.uk). https://www.gov.uk/government/publications/transport-business-case/transport-business-case-guidance
3	Carbon Management Guidance	Transport Appraisal Guidance: Unit A3 environmental impact appraisal (May 2025)	The Transport Appraisal Guidance gives guidance on environmental impact appraisal to inform the business case for a transport investment proposal. This TAG unit provides guidance for appropriately qualified environmental practitioners/topic specialists on appraising the impact of transport proposals on the built and natural environment, and on people. When using the guidance in this TAG unit, environmental practitioners/topic specialists should refer to current European and UK legislation, regulations and policy, and best practice.	Transport Appraisal Guidance: Unit A3 environmental impact appraisal TAG: environmental impacts worksheets - GOV.UK (www.gov.uk). https://assets.publishing.service.gov.uk/media/681b6bd143d6699b3c1d29ba/tag-unit-a3-environmental-impact-appraisal.pdf
4	Carbon Management Guidance	Construction Playbook	The Construction Playbook sets out key policies and guidance for how public works projects and programmes are assessed, procured and delivered. The Playbook sets out policies which aim to: - Set clear and appropriate outcome-based specifications; - Favour longer term contracting across portfolios; - Standardise designs; - Drive innovation; - Create sustainable contracting arrangements that incentivise better social, economic and environmental outcomes; - Embed social value; and - Increase the speed of end-to-end project and programme delivery.	Construction Playbook The Construction Playbook – September 2022 (publishing.service.gov.uk)
5	International	The Paris agreement	Published by the United Nations Framework Convention on Climate Change (UNFCCC), the Paris Agreement is a framework for facilitating a global response to the threat of climate change and keeping global temperature rise this century well below 2°C above pre-industrial levels. A more ambitious aim within the Paris Agreement is limiting the temperature increase to 1.5°C.	United Nations Framework Convention on Climate Change (UNFCCC; 2015). The Paris Agreement: https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement
6	National	The Climate Change Act 2008 (2050 Target Amendment) Order 2019	In June 2019, the UK Government adopted the Climate Change Act 2008 (2050 Target Amendment) Order 2019. This amended the Climate Change Act 2008 which set the target for the UK to achieve an 80% reduction of GHG emissions by 2050 (compared to 1990 levels). It also, more ambitiously, revised the target intending to achieve a reduction of 100% (net zero carbon) target by 2050. Achieving the revised net zero carbon target will require future GHG emissions to fall within the sixth carbon budget ceiling established by Government (i.e., either avoided or offset). The Sixth Carbon Budget, required under the Climate Change Act, will advise Ministers on the volume of GHGs the UK can emit during 2033-2037. The sixth budget is imposed by The Carbon Budget Order 2021 setting the budget for the same budgetary period at 965 million tonnes of carbon dioxide equivalent (MtCO ₂ e). These carbon budgets set a cap on the maximum level of net carbon produced by the UK for a five-year budgetary period. This will set the path to the UK's net zero emissions target in 2050, as the first carbon budget to be set into law following that commitment. The Committee on Climate Change (CCC) recently stated that, "[It]... will revise its assessment of the appropriate path for emissions over the period to 2050 as part of its advice next year on the sixth carbon budget." Whilst some tightening of the current carbon budgets is likely to occur when they are reviewed and revised later this year, to reflect the recent commitment to a net zero carbon economy by 2050, the CCC has indicated that the trajectory will be steeper over time; therefore, it is the later carbon budgets rather than near term ones which will see more stringent reductions.	HMSO (2019) The Climate Change Act 2008 (2050 Target Amendment) Order 2019: The Climate Change Act 2008 (2050 Target Amendment) Order 2019 (legislation.gov.uk)

7	National	The Carbon Budget Order 2021	The Carbon Budget Order 2021 imposes the sixth carbon budget, setting the budget for the same budgetary period (2033-2037) at 965 million tonnes of carbon dioxide equivalent (MtCO ₂ e). Emission limits for the 4th, 5th and 6th carbon budget periods are set by the Climate Change Act to date. The emissions limits provided for the 7th, 8th, and 9th budget periods indicate what is likely based on data published by the CCC and have not been passed into law. The CCC published guidance for the 7th carbon budget in February 2025, which has not yet been ratified into law by the government.	The Carbon Budget Order 2021. S2021/750. The Carbon Budget Order 2021 (legislation.gov.uk)The Carbon Budget Order 2021 (legislation.gov.uk) https://www.theccc.org.uk/publication/the-seventh-carbon-budget/
8	National	DfT, National Policy Statement for National Networks (May 2024)	The Secretary of State will use this policy statement as the primary basis for making decisions on development consent applications for NSIPs on the national road networks in England. The policy states that carbon impacts need to be considered as part of the appraisal of scheme options (in the business case), before submitting an application for Development Consent Order (DCO). Where the development is subject to Environmental Impact Assessment (EIA), any Environmental Statement will need to describe an assessment of any likely significant climate factors following the requirements in the EIA Directive. Applicants should provide evidence of the carbon impact of the project and an assessment against the Government's carbon budgets. Evidence of appropriate mitigation measures in both design and construction should be presented. The project's impact on the Government's ability to meet its carbon reduction targets will be a material factor in the decision-making process. The Secretary of State for Transport has committed to a review of this policy in light of the net zero target.	Department for Transport (2024) National NetworksNational Policy Statement: https://assets.publishing.service.gov.uk/media/65e9c5ac62ff48001a87b373/national-networks-national-policy-statement-web.pdf
9	National	National Planning Policy Framework (NPPF)	The NPPF, published in March 2012 and recently revised in December 2024 and Feb 2025, sets out the Government's planning policies for England and how these are expected to be applied. The NPPF states that planning systems should support the transition to a low carbon economy through: - making effective use of land - minimising waste and pollution - mitigating and adapting to climate change - supporting renewable energy and associated infrastructure	National Planning Policy Framework. Ministry of Housing, Communities & Local Government (2012). https://assets.publishing.service.gov.uk/media/67aafe8f3b41f783cca46251/NPPF_December_2024.pdf
10	National	National Planning Practice Guidance (PPG) on Climate Change	This PPG for Climate Change advises identifying and implementing suitable mitigation and adaptation measures in the planning process.	National Planning Practice Guidance on Climate Change. Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government (DLUHC) (2014). https://www.gov.uk/guidance/climate-change
11	National	Decarbonising Transport: A Better, Greener Britain (July 2021)	This plan sets out the Department for Transport's commitments and the actions needed to decarbonise UK transport to net zero by 2050. Key road-network elements of the department's decarbonisation plan include: - Increasing cycling and walking; - Facilitating ultra-low or zero emission buses from 2025; - Phased removal of all emissions from road transport (cars, vans, motorcycles and scooters). This includes all new cars and vans being zero emission at tailpipe by 2035, and ending the sale of non-zero emission HGVs by 2040; - Investing in local transport systems to allow local authorities to invest in local road priorities including those relating to reducing congestion and improving air quality; - Driving local level transport decarbonisation by making carbon reductions a fundamental part of local transport planning and funding; - Reviewing and maximising the use of low carbon fuels, including hydrogen; - Improving road travel efficiency (e.g. car clubs, sustainable travel reward schemes); and - Investing in R&D to support transport decarbonisation plans.	Decarbonising transport: a better, greener Britain: https://www.gov.uk/government/publications/transport-decarbonisation-plan
12	National	DfT Operational Sustainability Strategy 2021 – 2025 [still the current version - however successor strategy is expected]	Sets out the internal actions the DfT will take to improve operational sustainability performance up until 2025. It states, ' For any major projects requiring funding decisions, business cases will be produced to assess the cost-benefit across all three pillars of sustainability (economic, social, and environmental). All business cases will follow HMT's Green Book guidance and will use the methodology outlined for valuing the financial cost of carbon emissions to help present the environmental benefit in an easily comparable format. Business cases will be presented to senior management for approval before project implementation.'	DfT operational sustainability strategy 2021 to 2025: https://www.gov.uk/government/publications/dft-operational-sustainability-strategy-2021-to-2025#:~:text=Details,with%20the%20Greening%20Government%20Commitments
13	Local	Aiming for 2030: Herefordshire Council Carbon Management Plan 2026/27-2030/31	The Herefordshire Council Carbon Management Plan (2026/27–2030/31) provides a clear framework for quantifying and reducing emissions across council operations, including infrastructure-related activities such as highways and public realm services. It adopts a structured approach based on the Greenhouse Gas Protocol and highlights the significant role of contracted services—such as the Public Realm contract—in contributing to overall emissions, underlining the importance of embedding carbon management within procurement and delivery of infrastructure schemes. The plan also identifies practical measures directly relevant to road schemes, including fleet decarbonisation, low-carbon fuels, energy-efficient street lighting, and the integration of emissions reduction requirements into contracts. This approach reinforces the need for infrastructure projects to consider whole-life carbon, minimise emissions through design and construction, and align with the council's wider net zero and environmental objectives.	Herefordshire Council Carbon Management Plan 2026/27-2030/31: https://councillors.herefordshire.gov.uk/documents/s50133887/Appendix%201%20for%20Carbon%20Management%20Plan%20202627-203031.pdf

14	Local	Local Transport Plan 5 2025-2041 Final LTP	The Herefordshire Local Transport Plan 5 (2025–2041) establishes the strategic framework for transport investment and infrastructure delivery across the county, with a strong emphasis on supporting environmental objectives and addressing climate change. The plan promotes a shift towards lower-carbon travel, including increased provision for walking, cycling and public transport, alongside the rollout of zero-emission vehicles and supporting infrastructure such as EV charging. This direction reinforces the expectation that new road schemes should be planned and delivered in a way that minimises carbon impacts and supports the transition to a net zero transport system. LTP5 emphasises the role of infrastructure design in enabling behavioural change, improving air quality, and supporting wider environmental and health outcomes. As such, the plan provides a clear policy basis for requiring road schemes to adopt a whole-life carbon approach, ensuring that both construction (embodied carbon) and operational impacts are minimised, and that schemes contribute positively to the decarbonisation of the local transport network.	Local Transport Plan 5 2025-2041: https://www.herefordshire.gov.uk/media/axnj2fo/local-transport-plan-5-ltp5-2025-2041.pdf
If required, add new rows above this row.				



Governance and RACI Matrix

This tab captures the project specific RACI. Further instructions on how to use this tab are provided within the 'Instructions' tab.

Roles and Responsibilities	
Select Role from drop-down	Responsibilities
Project Manager	- Setting and monitoring carbon targets - Liaising with local authorities - Engaging with the appointed design manager and construction manager - Overall responsibility for implementation of CMP throughout the project lifecycle, including overseeing and reviewing CMP implementation during the use stage.

Key		
R	Responsible	Main responsibility/ doer of the activity.
A	Accountable	The value chain member is accountable for ensuring the activity is completed to the level required.
C	Consulted	Value chain member who is actively engaged and contributes input to the doer of the activity.
I	Informed	Value chain member who is kept aware of how and when the activity is being completed and is ready to provide inputs if necessary.

RACI Matrix								
CMP activities			Carbon Team	Designer	Contractor	Client	Named individual(s) responsible	
			AECOM	AtkinsRealis	Graham	Herefordshire Council		
1	Establish the embodied carbon baseline		Establish carbon baseline and identify emission hotspots.	R	C	N/A	AI	
2	Identify carbon reduction opportunities		Facilitate early identification of opportunities to deliver carbon reduction solutions and drive innovation throughout the project lifecycle.	R	R	R	AI	
3	Prioritise carbon reduction opportunities		Prioritise carbon reduction opportunities based on their significance and alignment with local policies and targets.	R	C	C	AI	
4	Establish carbon reduction targets		Establish a series of carbon reduction targets influenced by the carbon baseline and carbon reduction opportunities set out in Activities 1-3. <i>- Note: Given the late stage and retrospective nature of this CMP, this might not be appropriate</i>	R	C	C	AI	
5	Implement carbon reduction opportunities	Design	Implementing carbon reduction opportunities across design phases.	C	R	C	AI	
		Construction	Ongoing evaluation of the carbon emissions associated with the product and construction phases of each lifecycle stage.	C	C	R	AI	
		Operation	Ongoing evaluation and monitoring of the carbon emissions associated with the use and operations of each lifecycle stage.	N/A	N/A	N/A	RA	
6	Monitoring and Reporting		Ongoing review and identification of opportunities and actions to deliver targets and monthly review of the CMP by project team.	C	R	R	AI	

The diagram below outlines key enablers to aid implementation of the CMP across the project lifecycle. The ongoing delivery of the CMP throughout the project lifecycle enables effective monitoring and reporting of progress against carbon reduction goals.





Opportunities and Actions Dashboard

This tab is automated and provides an overview of the carbon reduction opportunities and actions associated with the project.

Headlines

Number of opportunities	33
Number of open actions	0

Information: Categorisation of Opportunities

Click + button on the left to reveal

Information: Prioritisation of Opportunities

Click + button on the left to reveal

Opportunities - Overview

The number of opportunities identified for each category within the 'Opportunities' tab are displayed below.

Green bars represent opportunities that have been implemented

Blue bars represent opportunities that have been committed

Yellow bars represent opportunities under consideration and need to be further explored

Dark Grey bars represent opportunities that will not be taken forward (i.e. archived)

Grey bars represent opportunities that have not been assigned a status (implemented, committed, under consideration or archived)

The 'Opportunities' tab also includes a field to capture any supporting commentary that has informed the categorisation of the opportunity.

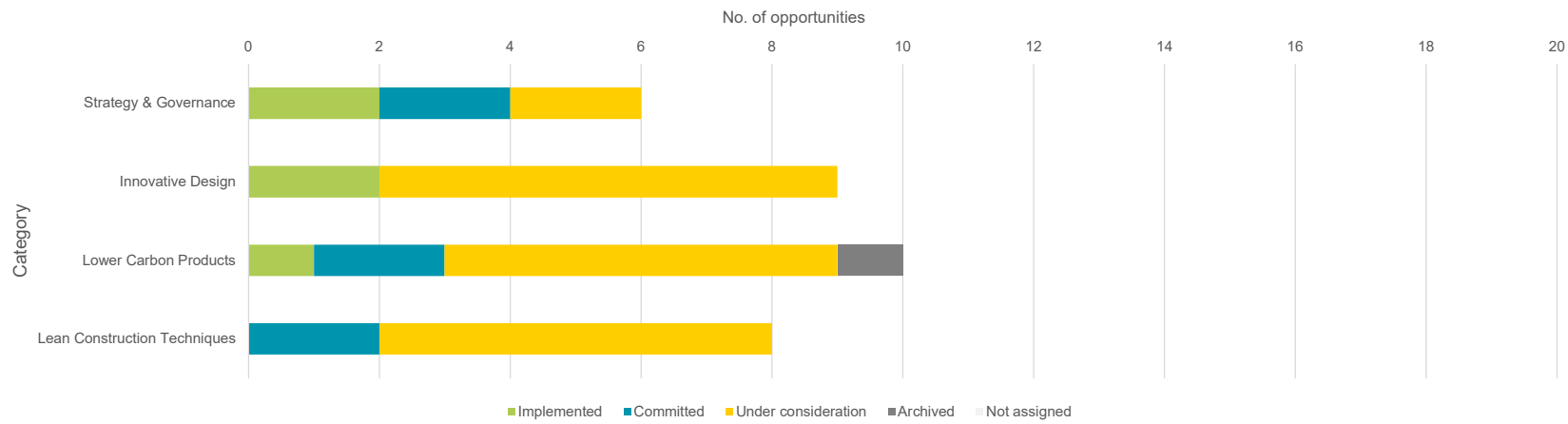
Overview of categories:

Strategy & Governance: incentivise carbon reduction across all forms of project governance, embed decarbonisation into procurement, project delivery and challenge existing standards to encourage low-carbon innovation.

Innovative Design: using smart design to reduce material requirements, extend design life and reconfigure existing assets, rather than building from scratch.

Lower Carbon Products: choosing lower carbon materials for use in construction such as recycled aggregates, cement replacements, and glass reinforced plastic (GRP).

Lean Construction Techniques: use of smart construction techniques that reduce the carbon impact of the construction phase, often involving the use of alternative fuels and power such as solar, and off site fabrication to reduce material consumption and waste.



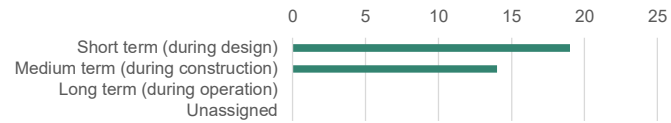
Category	Total no. opportunities	Status				
		Implemented	Committed	Under consideration	Archived	Not assigned
Strategy & Governance	6	2	2	2	0	0
Innovative Design	9	2	0	7	0	0
Lower Carbon Products	10	1	2	6	1	0
Lean Construction Techniques	8	0	2	6	0	0
Total no. opportunities	33	5	6	21	1	0
No. opportunities not assigned to a category	0					

Delivery timeframe	Total no. opportunities
Short term (during design)	19
Medium term (during construction)	14
Long term (during operation)	0
Total no. of opportunities assigned to a delivery timeframe	33
Unassigned	0

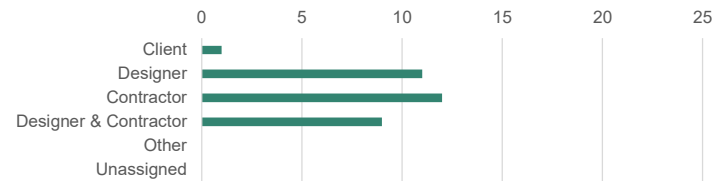
Responsible for investigation and delivery	Total no. opportunities
Client	1
Designer	11
Contractor	12
Designer & Contractor	9
Other	0
Total no. of opportunities assigned responsibility	33
Unassigned	0

Priority rating	Total no. opportunities
A	7
B	2
C	18
D	6
Total no. of opportunities assigned a rating	33
Unassigned	0

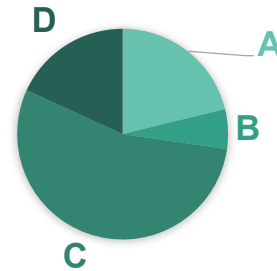
No. opportunities by delivery stage



No. opportunities by responsibility



No. opportunities by priority rating



Actions - Overview

The progress of actions designated as short, medium and long term within the 'Actions' tab are displayed below.

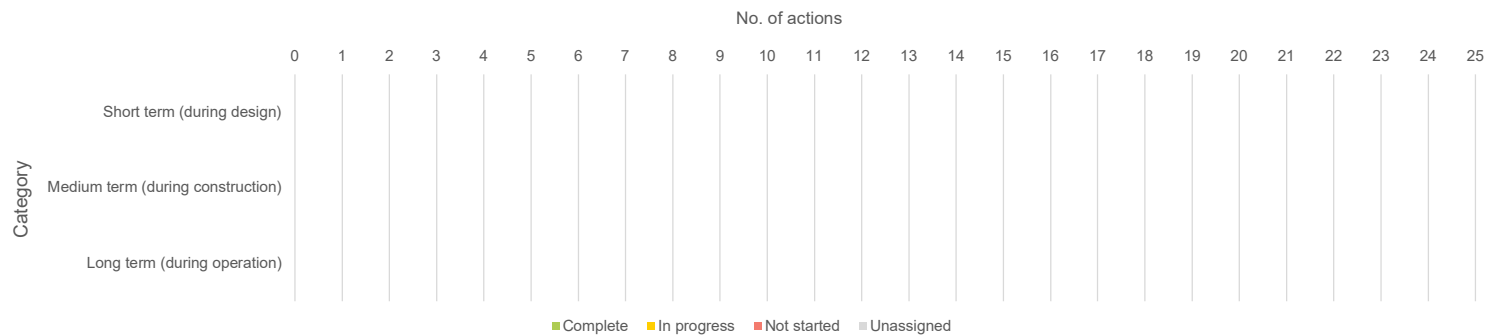
Green bars represent actions that are complete

Yellow bars represent actions that are in progress

Red bars represent actions that have not yet been started

Grey bars represent actions that have not been assigned a status (complete, in progress or not started)

The 'Actions' tab also includes a field to capture any supporting commentary for investigation and delivery of each action.



Delivery timeframe	Total no. actions assigned status	Status			
		Complete	In progress	Not started	Unassigned
Short term (during design)	0	0	0	0	0
Medium term (during construction)	0	0	0	0	0
Long term (during operation)	0	0	0	0	0
Total no. actions	0	0	0	0	0
No. actions not assigned to a category		0			

Responsible for investigation and delivery	Total no. actions
Client	0
Designer	0
Contractor	0
Designer & Contractor	0
Other	0
Total no. of actions assigned responsibility	0
Unassigned	0

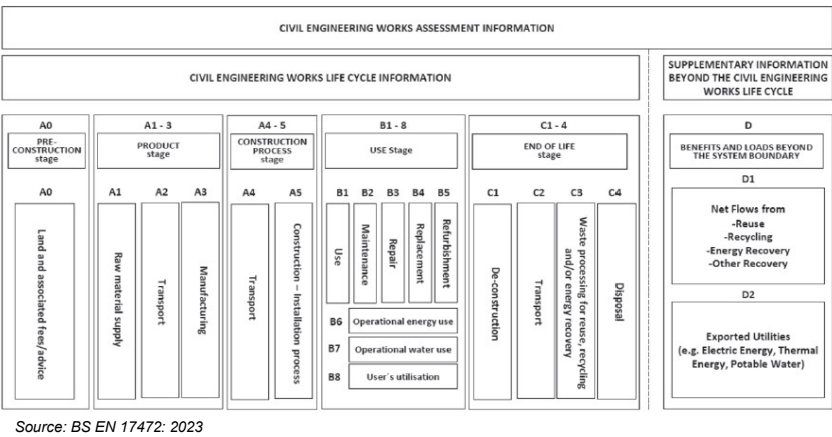


Carbon Baseline Overview

The GHG Assessment has been undertaken in line with the GHG Protocol and PAS 2080:2023 GHG quantification requirements. GHG emissions are broken down by the BS EN 17472 lifecycle stages presented to the right. The focus of this assessment is on the GHG emissions associated with construction, with some quantification of operational emissions where possible. The emissions during construction are considered to be within the direct control of the scheme. While it is possible to influence operational GHG emissions such as road user emissions through the design, these are considered outside the direct control of the scheme.

The tables and the graphs below provide the estimated project lifecycle carbon footprint for each of the project’s design stage. The carbon footprints indicate the main project carbon hotspots, commonly the embodied carbon in the raw materials and emissions associated with their transportation. Construction activities and ongoing maintenance and replacement of assets during operation also contribute to the carbon footprint.

Select Figure	Information Displayed	Key Details
Figure 3	Cumulative Whole-Life Carbon Emissions	With an initial spike in emissions at the construction stage from the embodied carbon, transportation and construction activities, followed by a gradual increase in cumulative emissions over the operational lifetime of the scheme. These operational emissions are from the maintenance and replacement of assets during operation. These operational emissions are considered to represent a worst-case scenario, as the modelling has not fully accounted for expected decarbonisation of materials, transportation, construction activities, or the UK power grid over the operational lifetime, which will need to happen if the UK is to meet its 2050 net zero emissions target.



Material Breakdown - Carbon Hotspots

Material	FBC Design		As Built	
	Embodied Carbon (tCO ₂ e)	% Embodied Carbon	Embodied Carbon (tCO ₂ e)	Percentage (%)
Asphalt	1,899.7	22.0%		0%
Aggregate fill	1,768.1	20.5%		0%
Steel	1,245.2	14.4%		0%
Readymix	1,175.2	13.6%		0%
Plastic	664.0	7.7%		0%
Precast Concrete	413.6	4.8%		0%
Steel barrier	320.7	3.7%		0%
Geotextile	297.0	3.4%		0%
Cabling	147.6	1.7%		0%
Aluminium sign	125.9	1.5%		0%
Mixed fencing	101.5	1.2%		0%
Concrete Kerb Drain	101.1	1.2%		0%
Aggregate - sub-base	80.8	0.9%		0%
Concrete Pipe	51.2	0.6%		0%
Other	246.4	2.9%		0%
Total Emissions (tCO₂e)	8,638	100%	-	

PAS 2080 Lifecycle Stage % of Baseline

PAS 2080 Lifecycle Stage			Baseline Emissions (tCO ₂ e)	% baseline emissions
Before Use Stage	A0	Preconstruction Stage	-	-
	A1-A3	Before Use Stage	8,638	37%
	A4	Transport	4,814	21%
	A5	Construction - Installation process	2,647	11%
Use Stage	B2-B5	Maintenance, repair, replacement, refurbishment	7,257	31%
	B6	Operational Energy Use	74	0%
	B8	User's utilisation	-	-
Total			23,429	

Ref.	Opportunity	Description	Category	Responsible for investigation and delivery	Impact potential: - Low - High	Ease of implementation: - Difficult - Easy	Priority rating (impact vs implementation)	Delivery timeframe (short, medium or long term)	Action identified? (Y/ N)	Status	Comment
	(Input the opportunity)	(Provide a description for the opportunity)	(Select the relevant carbon reduction hierarchy category)	(Select the responsible stakeholder)	(Indicate the considered effectiveness)	(Indicate the considered ease of implementation)	(Automatically populated)	(Select the appropriate projected delivery timeframe)	(Indicate if actions are required for implementation)	(Select the current status. If an opportunity is 'archived', approval is needed from xxx)	(Provide comments to support opportunity selection)
Opp-01	Early integration of carbon reduction measures in the design	Designers to push for low carbon measures in design early where possible by holding design review meetings to identify and discuss carbon reduction opportunities. Also engage early with supply chain partners and contractors to identify carbon reduction opportunities.	Strategy & Governance	Designer	High	Difficult	B	Short term (during design)	No	Under consideration	This will be difficult to implement at this stage given how far through the design is now.
Opp-02	Challenge design standards specifications to drive low-carbon innovations	Question conventional standards and specifications where they conflict with low-carbon outcomes.	Strategy & Governance	Designer	High	Easy	A	Short term (during design)	No	Under consideration	Value engineering exercise undertaken. Some departures from standards.
Opp-03	Reduce congestion along A465 and Holme Lacy Road	Increasing attractiveness of bus and active travel schemes and reducing traffic flows is a fundamental aim of the project. This can be done through improved bus priority measures, enhanced walking and cycling infrastructure, safer and more direct routes and, prioritised signalling.	Strategy & Governance	Designer	High	Easy	A	Short term (during design)	No	Implemented	Implemented - this is what the scheme will be achieving.
Opp-04	Include carbon-related reductions within the contracts	Include measurable carbon targets and KPIs and performance reporting requirements in all procurement frameworks and supply chain contracts to reinforce delivery of reductions during construction.	Strategy & Governance	Client	High	Easy	A	Short term (during design)	No	Implemented	Incentives in Grahams contracts they set e.g. minimising idling
Opp-05	Develop a waste management strategy	Prioritise prevention and set clear targets for diverting construction waste from landfill. Minimise waste generation, maximise reuse on site where possible, and recycle waste materials, in line with the waste hierarchy.	Strategy & Governance	Designer & Contractor	Low	Easy	C	Medium term (during construction)	No	Committed	Grahams will be doing one
Opp-06	Encourage engagement with carbon reduction across the workforce	Embed carbon reduction behaviours within site operating procedures and a Construction Travel Plan, encouraging engagement through measures such as active travel, car sharing, and efficient site access arrangements.	Strategy & Governance	Designer & Contractor	Low	Easy	C	Medium term (during construction)	No	Committed	Will be encouraged by Grahams - policies in place
Opp-07	Use of ACLA in base and binder asphalt layers	Adopt ACLA within lower pavement layers as part of value engineering to reduce embodied carbon. This creates a carbon sink and potential carbon neutral material, and could increase asphalt life but there is no evidence yet.	Innovative Design	Designer	High	Difficult	B	Short term (during design)	No	Under consideration	ACLA has been explored on the project as one of many solutions in the value engineering and has been raised with Herefordshire council.
Opp-08	Substitute concrete retaining structures with reinforced earth	Use of reinforced earth instead of precast or in-situ concrete.	Innovative Design	Designer	High	Easy	A	Short term (during design)	No	Under consideration	Being looked at through value engineering. Some reinforced earth already in the design, but possible planning constraints around others.
Opp-09	Minimise total surfaced area	Reduce fully surfaced carriageway width, e.g. by using hard strips in place of full-width surfacing.	Innovative Design	Designer	High	Easy	A	Short term (during design)	No	Under consideration	Part of value engineering - linked to Opp-14
Opp-10	Plant trees and limit their removal	Minimise vegetation removal. Where unavoidable, offset through targeted planting of suitable species.	Innovative Design	Designer	Low	Difficult	D	Short term (during design)	No	Under consideration	Extensive landscaping works alongside the scheme. However, planning permissions was granted before Biodiversity Net Gain was a requirement, so there's limited opportunity given how mature the design is
Opp-11	Use driven posts for steel safety barriers	Specify driven posts for steel barriers to reduce concrete requirements.	Innovative Design	Designer	Low	Difficult	D	Short term (during design)	No	Under consideration	Will be using driven posts where possible, but there are concerns around appropriateness for the design.
Opp-12	Design for Manufacture & Assembly (DFMA)	Maximise potential for offsite and modular fabrication, prioritising precast concrete elements such as headwalls and underpasses, to reduce site waste and construction activities.	Innovative Design	Designer	Low	Easy	C	Short term (during design)	No	Under consideration	Maximise opportunities for offsite and modular fabrication, particularly for headwalls and underpasses, wherever practicable.
Opp-13	Incorporate innovative drainage products such as Fildrain	Incorporate products such as Fildrain to replace traditional drainage blankets, reducing the need for imported quarry materials. Fildrain offers ease of transport, lower weight, and reduced material usage.	Innovative Design	Designer & Contractor	Low	Easy	C	Short term (during design)	No	Under consideration	Its suitability for this scheme will be assessed.
Opp-14	Streamline design and alignment to reduce material demand	Review geometry and structure sizes to reduce earthworks volumes and material requirements.	Innovative Design	Designer & Contractor	Low	Easy	C	Medium term (during construction)	No	Implemented	Already included in value engineering. Some minor tweaks have been implemented
Opp-15	Reduce embankment height	Reduce embankment height, where possible, to minimise the volume of imported fill and associated earthworks.	Innovative Design	Designer	Low	Easy	C	Short term (during design)	No	Implemented	Minor tweaks made through value engineering - linked to Opp-14
Opp-16	Optimise foundation types	Foundation design to prioritise structures with pads rather than piling to reduce carbon, cost and complexity.	Lower Carbon Products	Designer & Contractor	High	Easy	A	Short term (during design)	No	Implemented	Pavement design had already been optimised already and implemented in the scheme.
Opp-17	Reuse waste materials on site or locally	Reuse excavated material from site where possible to minimise off-site disposal and import quantities.	Lower Carbon Products	Contractor	High	Easy	A	Short term (during design)	No	Under consideration	This will be considered
Opp-18	Use of recycled plastic kerbs	Consider use of recycled plastic kerbs which are manufactured from plastic waste and have lower embodied carbon compared to concrete. They are lighter weight, durable and resistant to rot and corrosion.	Lower Carbon Products	Designer	Low	Difficult	D	Short term (during design)	No	Archived	Issues with long term maintenance - unlikely to be taken forward.
Opp-19	Use of unbound pavements on accesses	Use of unbound pavements on accesses where possible	Lower Carbon Products	Designer & Contractor	Low	Difficult	D	Short term (during design)	No	Under consideration	Some access roads required, so unbound to be prioritised if possible. Requires landowner agreements so could be difficult.
Opp-20	Use recycled asphalt (RA) in asphalt mixtures	Use recycled asphalt (RA) in asphalt mixtures to reduce the need for virgin materials	Lower Carbon Products	Designer & Contractor	Low	Easy	C	Short term (during design)	No	Under consideration	To be considered alongside ACLA - being discussed in VE and needs to be discussed with Herefordshire
Opp-21	Procure local goods and services	Procure local goods and services to reduce transportation emissions	Lower Carbon Products	Designer & Contractor	Low	Easy	C	Short term (during design)	No	Committed	Will be done as standard
Opp-22	Use warm mix asphalts	Use warm mix asphalts to reduce fuel use on site	Lower Carbon Products	Contractor	Low	Easy	C	Medium term (during construction)	No	Under consideration	Fairly standard these days
Opp-23	Do not over-specify concrete compressive strength	Do not over-specify concrete compressive strength in design to minimise embodied carbon	Lower Carbon Products	Designer & Contractor	Low	Easy	C	Short term (during design)	No	Committed	Standard practice - this will be considered

Opp-24	Use recycled fill materials	Use recycled fill materials (Class 1A, 6F2 etc.) to limit quarrying of virgin aggregates. Transportation distance should be considered though as transporting recycled aggregates over large distances could actually be higher carbon than local virgin material	Lower Carbon Products	Contractor	Low	Easy	C	Medium term (during construction)	No	Under consideration	Transportation distance should be considered as transporting recycled aggregates over large distances could actually be higher carbon than local virgin material
Opp-25	Consider low carbon cement replacements	Consider low carbon cement replacements to reduce embodied carbon	Lower Carbon Products	Contractor	Low	Easy	C	Medium term (during construction)	No	Under consideration	This will be considered, although possible applications may be limited given then nature of the design
Opp-26	Work towards zero earthworks waste	Work towards zero earthworks waste to minimise emissions associated with disposal	Lean Construction Techniques	Contractor	Low	Easy	C	Medium term (during construction)	No	Committed	Already being done - will be further considered
Opp-27	Temporary traffic management optimisation	Minimum traffic management on public roads. Minimising disruptions and therefore traffic and idling	Lean Construction Techniques	Contractor	Low	Difficult	D	Medium term (during construction)	No	Under consideration	
Opp-28	Minimise use of diesel generators	Avoid diesel generators; use grid electricity wherever possible	Lean Construction Techniques	Contractor	Low	Easy	C	Medium term (during construction)	No	Under consideration	Going to try to connect to the grid, pending permissions etc. - to be explored further
Opp-29	Integrated site compound layout and use of stabilised materials	Use of stabilised materials for compounds and access roads. One larger setup using stabilised soils for access roads etc., rather than blacktop	Lean Construction Techniques	Contractor	Low	Difficult	D	Medium term (during construction)	No	Under consideration	Easy enough in practice, but depends on client appetite
Opp-30	Use of existing local sewer connections	Use of existing local sewer connections for site compounds	Lean Construction Techniques	Contractor	Low	Easy	C	Medium term (during construction)	No	Under consideration	This will be explored, but low carbon impact
Opp-31	Use HVO fuel/ electricity for construction plant and generators	Use HVO fuel/ electricity for construction plant and generators to reduce emissions	Lean Construction Techniques	Contractor	Low	Easy	C	Medium term (during construction)	No	Under consideration	Telehandlers etc. could be possible, but possibly harder for larger materials handling equipment
Opp-32	Use of modern low-emission plant and equipment	Use efficient engines and emissions control technologies (e.g. AdBlue/Selective Catalytic Reduction systems) to reduce exhaust emissions.	Lean Construction Techniques	Contractor	Low	Easy	C	Medium term (during construction)	No	Under consideration	
Opp-33	Optimise earthworks logistics	Optimise earthworks planning to avoid double handling/ movement. Maul Haul optimisations minimise haul routes	Lean Construction Techniques	Contractor	Low	Easy	C	Medium term (during construction)	No	Committed	Already underway - will be considered further

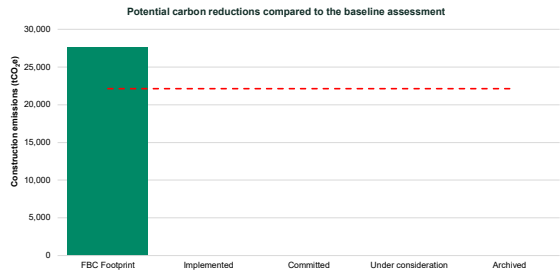
Decarbonisation Trajectory

This tab is automated and provides an overview of the carbon baseline emissions and potential decarbonisation resulting from the carbon reduction opportunities identified (where it is possible to quantify carbon reductions).

Decarbonisation Trajectory

The chart below presents the carbon baseline and potential carbon reduction reductions based on the status of individual opportunities. The red line represents the carbon reduction target, and quantified opportunities represent the pathway toward achieving it. Opportunities categorised as "committed", "under consideration", or "archived", have been included to demonstrate savings that might be achievable in the future. This tab provides an overview of the collective impact of all carbon reduction opportunities.

The total emissions savings presented in this tab may include double counting, as some opportunities overlap and target the same emission sources. To avoid duplication, opportunities should be evaluated in isolation to understand their specific impact. For a detailed breakdown of individual opportunities and their estimated savings, please refer to the 'Opportunities' tab. To avoid duplication, opportunities should be reviewed regularly and assessed independently to ensure accurate impact quantification. Overlapping opportunities must be clearly distinguished to maintain a reliable decarbonisation trajectory.



The chart below presents the top 10 carbon reduction opportunities identified in this project.

Top 10 opportunities			
ID	Opportunity	Carbon saving	% of saving against total savings
1	1	1	
2	2		
3	3		
4	4		
5	5		
6	6		
7	7		
8	8		
9	9		
10	10		

Opportunities	Potential Saving (tCO ₂ e)	Comment
Design	-	Total of options in design stage
Construction	-	Total of options construction stage
Operation and Maintenance	-	Total of options in operation and maintenance
Decommissioning	-	Total of options in decommissioning
All stages	-	Total of options across all stages

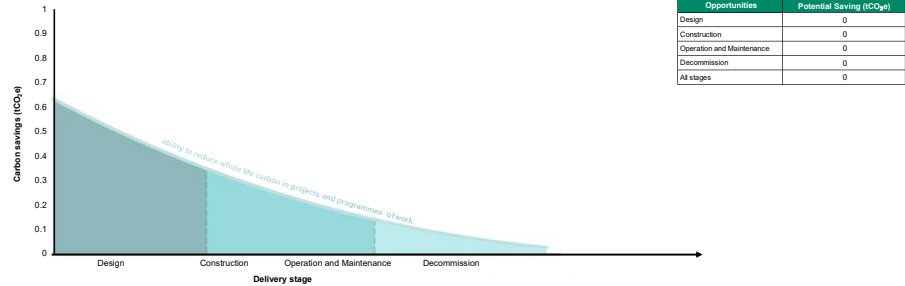
Opportunities	Potential Saving (tCO ₂ e)	Comment
Implemented	-	Total of options implemented
Committed	-	Total of options committed
Under consideration	-	Total of options under consideration
Archived	-	Total of archived options
Options (excl. archived)	-	Carbon savings based on opportunities drawn through

Scenario	Emissions (tCO ₂ e)	Comment
FBC Footprint	27,673	Emissions based on FBC design.
Implemented	27,673	Emission based on options implemented
Committed	27,673	Emission based on options committed and implemented
Under consideration	27,673	Emission with carbon savings based on opportunities drawn through
Target	22,139	Emission based on Target reduction percentage



A target to reduce whole-life carbon by 30% compared to the baseline represents an achievable target, but one that requires some further work to be achieved.

The chart below presents the current carbon savings quantified at each delivery stage. The trend line, adapted from the PAS 2060 carbon reduction hierarchy figure emphasises that the greatest carbon savings are made during the early stages of a project.



Opportunities	Potential Saving (tCO ₂ e)
Design	0
Construction	0
Operation and Maintenance	0
Decommission	0
All stages	0

Carbon quantified opportunities

The details below have been automatically pulled through from the 'Opportunities' tab if an opportunity has been categorised as quantified. Additional opportunities should continue to be quantified as further data becomes available (e.g. construction activity data), and any additional measures that are identified should be quantified where possible too.

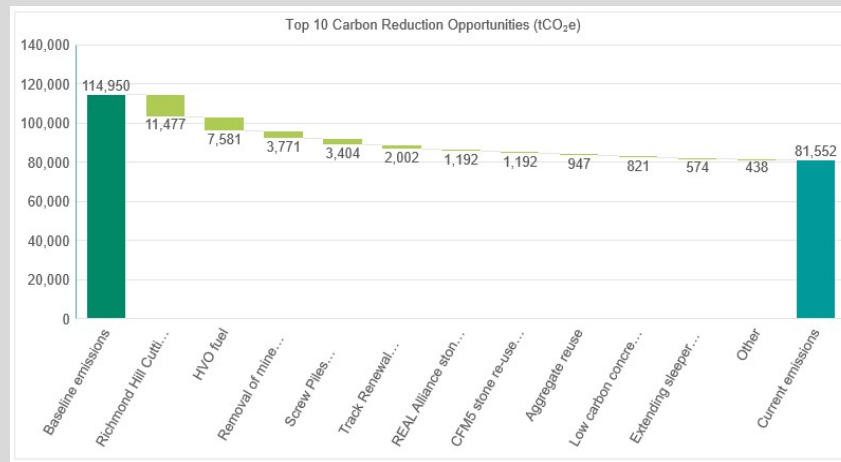
[illegible]

Example Carbon Reduction Opportunities Savings

Due to data availability, it is currently not possible to quantify carbon savings from carbon reduction measures and opportunities.

However, this tab has been developed to enable quantification of carbon savings for opportunities and measures at future project stages, as the design progresses and more granular, accurate data becomes available.

To highlight how carbon savings data will be presented once quantified, an example waterfall graph presenting



Appendix D – Project Risk Register

ID	Type	Date logged	Risk Name	Description	Mitigation Measures	Owner
0.12	open	Jun-25	General & Staff Resources	Possible delay to works/ additional works due to delay in receipt of original design information for phase 1 along with missing information, including missing document issue register.	Missing native format drawings and models likely to increase time required to update recreate drawings and models where revisions are required	HC
0.13	open	Jun-25	General & Staff Resources	Change of Local Government threat to project, works on site to commence Dec 26. Scheme was cancelled previously due to change in local government.	Importance of keeping to programme and contract award enabling commencement of works on site Dec 26. Strategic risk - hence cost not assigned	HC
0.14	open	Jan-26	General & Staff Resources	Judicial review against a planning decision for the supplementary planning application within 6 weeks from the date of the decision (linked to 0.13)	Provide technical support and information to the Client. Site clearance during PCSA stage. AtkinsRealis to continue from Tender Stage work and keep design within constraints	HC
0.15	open	May-26	General & Staff Resources	Key Herefordshire staff leave organisation or are absent due to sickness causing delay to programme, missing key deadlines or project inefficiencies	Provide appropriate organisational resilience and succession planning.	HC
0.16	open	May-26	General & Staff Resources	Key Atkins/Grahams / AECOM staff leave organisation or are absent due to sickness causing delay to programme, missing key deadlines or project inefficiencies	Provide appropriate organisational resilience and succession planning.	Grahams/Atkins/ AECOM
1.1	Open	Jan-26	PM	The 2018 Bill of Quantity/Activity Schedule does not match the 2018 Scope and/or quantities calculated in PCSA stage and/or measured quantities differ from those developed in PCSA stage	Experienced team involved in the PCSA stage. Continuity of the team. Raise TQ's to resolve. Opportunity for optimisation of Earthworks Material Strategy to reduce imported fill.	HC
1.2	Open	Jan-26	PM	Pricing volatility occurs between tender submission and contract award	Make an allowance for escalation based on feedback from supply chain and review of performance of current indices	HC

ID	Type	Date logged	Risk Name	Description	Mitigation Measures	Owner
2.1	open	Mar-25	Highways	Potential that the WCHAR for Phase 1 will need to be updated	We have planning and WCHAR would simply create further pressure relating to foot / cycle access along proposed route. Initial discussions with National Highways point towards exemption. AECOM will provide report for HC to issue to National Highways.	HC
2.2	open	Mar-25	Highways	Potential for undertaking additional Topographical surveys	Topo survey exists. Some further site based topo survey will be required at the extent of the red line boundary, particularly immediately to the south of the railway bridge. Also some issues at extent of tie-ins with existing and also at balancing ponds.	HC
2.3	open	Mar-25	Highways	Potential for update of accommodation works (Bruton Knowles currently progressing). Potential to have to reproduce drawings if we can't get CAD versions.	Any accommodation works issues require resolving ASAP to prevent future programme delays.	HC
2.4	open	Mar-25	Highways	Potential for delays and design changes resulting from requirement to obtain National Highways Technical approval and legal agreement at tie-in with A49.	There are some departures from standard on the new leg of the A49 roundabout (entry deflection criteria and exit width). These should be able to be resolved with minimal effort. Note this is a pre-commencement condition for this section and discharge of planning condition is required before temporary accesses to site from A49 can be approved	HC
2.5	Open	Jun-25	Highways	Potential to encounter tar bound material and potential for inappropriate pavement design at tie-ins due to lack of pavement investigation and survey information with associated H&S and design life implications	Complete pavement investigations at tie-ins in advance of construction to verify significance of issue and inform design	HC
2.6	Open	Jun-25	Highways	Potential for the pavement foundation design suitability and design life to be affected by Geotechnical concerns.	Verify geotechnical properties to confirm pavement design. Assumed now covered in D&B contract - assumed AECOM's input limited to potential review	D&B
3.1	Open	Jun-25	Structures	Risk of incomplete checks as insufficient information has been provided to confirm that the culvert size of structure S01 is correct (the flood level is not shown).	Update in PCSA design review	D&B
3.2	Open	Jun-25	Structures	Delays in Network Rail approvals eg due to refusal to re-approve outdated AIP and D&C certificates. (S05)		HC
3.3	Open	Jun-25	Structures	Re-certification design costs and TAA costs for railway bridge) S05)		HC

ID	Type	Date logged	Risk Name	Description	Mitigation Measures	Owner
4.1	open	Jun-25	Drainage	Potential shallow groundwater in the vicinity of drainage attenuation ponds leading to the potential need for a liner incorporating uplift mitigation. This could require significant over excavation to provide the bulk fill overburden necessary for mitigation against uplift, or may require additional drainage measures to draw down groundwater levels. The earthworks and groundwater conditions for each pond will need to be reviewed and this could impact on the planning red line boundary	Consider completing additional testing to verify effectiveness of proposed balancing ponds. AECOM currently preparing proposal (Nov 25).	D&B/HC
4.2	open	Jun-25	Drainage	Hydrological risk arising due to the limited results from the soakaway testing will need to be reviewed	Consider completing soakaway tests to understand efficiency and scale of any soakaways required.	D&B
5.1	Open	Oct-25	Geotechnics	Phase 1: Due to geotechnical risks & opportunities identified potential for additional GI and changes to GIR/GDR, earthworks and drainage design	Review design during PCSA stage and undertake additional GI where required to inform any changes.	HC
5.2	open	Oct-25	Geotechnics	Phase 1: Infilled quarry and clay pits were recorded in the vicinity of the scheme in the GIR. There is a risk that they or other un-recorded areas contain unsuitable or contaminated material which will require assessment of contamination or settlement and the design of mitigation and treatment.	Potential to review any additional information available on these historic features and the potential for other contaminated or unsuitable material. Designer cost impact only, does not include construction cost impacts.	HC
5.3	Open	Jan-26	Geotechnics	The ground conditions provided within the tender documentation are underestimated (unforeseen) including hydrogeology	Timely communication with the Client Plan and agree additional GI scope early within PCSA stage to inform design freeze	D&B
5.4	Open	Jan-26	Geotechnics	Unforeseen ground conditions encountered during construction differ from those identified in the PCSA stage, including hydrogeology (links to ID 5.14)	Raise EWN and discuss with Client. Allowance for Designer's Site Rep (DSR) to raise any issues and feedback to designers. Additional pre-surveys done in front of the works. Implement design changes as necessary.	HC

ID	Type	Date logged	Risk Name	Description	Mitigation Measures	Owner
5.5	Open	Jan-26	Geotechnics	Project is impacted Weather > 1 in 10 years	Material specifications; Considering use of lime addition to RMF during placement, to achieve classification and provide wider ranges for moisture content. Confirm float within Tender Programme on earthworks items is adequate during PCSA stage. Sense check Tender Programme bulk earthworks seasonality of March to October seasons against final earthworks design.	HC
5.6	Open	Jan-26	Geotechnics	UXO may be discovered during intrusive ground activities e.g. excavation during the construction stage	UXO surveys to be undertaken in PCSA stage. UXO awareness and site procedures. Safe systems of work for intrusive ground activities. Agree emergency response arrangements.	D&B
6.1	open	Mar-25	Environmental	Potential that additional ecological surveys and assessments are required eg Habitats Regulations Assessment	Undertake PEA for supplementary planning applications as soon as possible	HC
6.2	open	Mar-25	Environmental	There is a risk that the Archaeological watching brief could identify further works to be required.	Undertake mitigation early in programme	HC
6.3	open	Mar-25	Environmental	Potential for fees payable to Natural England to obtain species licences for GCN and Dormouse along with additional mitigation measures with associated time constraints which could impact on construction programme.	Undertake mitigation early in programme	HC
6.4	open	Jun-25	Environmental	Potential for undertaking stand-alone invasive species surveys completed in isolation from other surveys. If invasive species left unidentified they could spread further. Additional costs of managing impact, potential programme delays. Some species are much easier to identify when plants are flowering.	Early surveys undertaken and on-going. Follow Environment Agency guidelines.	HC
6.5	open	Oct-25	Environmental	Delays to access for ecological survey works may result in missed survey windows and project delays.	Maintain regular updates with PM team and HC, and check ins with land agent to ensure that they are aware of survey window deadlines	HC
6.6	Open	Jan-26	Environmental	Archaeological finds are discovered on site (links to 6.5 and 6.16)	Watching Brief throughout construction. Targeted investigations in sensitive areas as part of the PCSA contract.	HC
6.7	Open	Jan-26	Environmental	Invasive non-native species (INNS) - Plants could be found on site e.g. Japanese knotweed (links to 6.17)	Undertake surveys (at the correct time of year). Timing of site clearance.	HC
6.8	Open	Jan-26	Environmental	The existing ancient/veteran tree at S04 causes construction issues	Surveys on tree roots to be undertaken in PCSA stage.	D&B

ID	Type	Date logged	Risk Name	Description	Mitigation Measures	Owner
8						
8.1	open	Jun-25	Statutory Undertakers	Excessive Statutory Utilities diversion lead in/delivery times on SLR	Once appointed Contractor to engage early on with Utility Companies regarding making arrangements for diversions (for the SLR scheme).	HC
8.2	Open	Jan-26	Statutory Undertakers	Uncharted services are discovered on site	Undertake GPR Survey. Permit to Dig.	D&B
9.1	open	Mar-25	Planning	Potential that a S73 application will be required	Discuss any proposed changes with HC planning. We note that the structures drawings submitted at planning contained a high level of detail. The detail differed to that provided at detailed design.	HC
9.2	open	Jun-25	Planning	Secure consent trafficking of partially constructed railway bridge for earthworks haulage.	Opportunity as haul route already priced for. Supplementary planning application being submitted for haul route	D&B
9.3	open	Nov-25	Planning	Potential for Supplementary Planning application to require an environmental impact assessment - resulting in additional cost/ delay to planning approvals and construction as well as additional environmental surveys	Submit planning pre-app followed by EIA scoping request	HC
9.4	Open	Jan-26	Planning	Deviations from planned possessions (shortened and/or cancelled possessions) affects works e.g. beam lift	Contingency in the programme. Good planning and early engagement.	D&B
9.5	Open	Jan-26	Planning	There is a risk that there will be a significant lead-in to getting approval of Traffic Management on the National Highways network (A49), and the Traffic Management required could be more onerous than anticipated	Early Engagement with National Highways. Traffic Management Working Groups with key stakeholders. Use internal experience from recent National Highways project deliveries.	D&B
10.1	open	Mar-25	Accommodation Works	Potential for issues relating to severance of land / PROW / water supplies. Delays in confirming how to proceed can cause programming issues once on site.	Bruton Knowles to provide details of agreements asap.	HC/BK
10.2	open	Mar-25	Accommodation Works	Additional design work required to provide access to land parcels severed by the works - potential for land ownership to have changed and different access requirements now required to previous or accommodation works scope changes due to land owner negotiations	Bruton Knowles to identify any such situations asap.	HC

ID	Type	Date logged	Risk Name	Description	Mitigation Measures	Owner
11.1	open	Mar-25	Stakeholders	Potential for additional TROs /SROs above those already identified / obtained.	Need for additional TROs /SROs or TTROs particularly around Haywood lane curently being reviewed by Sharpe Pritchard	HC
11.2	open	Mar-25	General & Staff Resources	Potential that the statutory orders will need to be amended or updated, resulting in delays to CPO	Some amendments required to orders, currently being revised. May require further cabinet approvals. Sharpe Pritchard progressing revised orders.	HC
11.3	open	Nov-25	Stakeholders	Potential for CPO to be required for land acquisition resulting in design change, delays to construction and possible public enquiry following	Bruton Knowles currently completing negotiations with land owners.	HC

Appendix E – Equality Impact Assessment

Hereford Western Bypass

Equality Impact Assessment

June 2026

Quality information

Prepared by	Checked by	Verified by	Approved by
Romesa Khawaja Graduate Sustainability Consultant	Cat Thornton Social Impact Consultant	Dr Eva Kleinert Associate Director	Darren Abberley Associate Director

Revision History

Revision	Revision date	Details	Authorized	Name	Position
1.0	09/06/2026	First draft for client review	EK	Dr Eva Kleinert	Associate Director

Prepared for:

Herefordshire Council

Prepared by:

Dr Eva Kleinert
Associate Director
M: +44 (0) 7442 027113
E: eva.kleinert@aecom.com

AECOM Limited
Exchange Station
Tithebarn Street, Liverpool L2 2QP
United Kingdom

T: +44 151 331 8900
aecom.com

© 2026 AECOM Limited. All Rights Reserved.

AECOM Limited ("AECOM") has prepared this document for the sole use of Herefordshire Council ("Client") in accordance with the terms and conditions of appointment (ref no: 60746644 Hereford Bypass Programme) dated *February 2025* ("the Appointment").

AECOM shall have no duty, responsibility and/or liability to any party in connection with this Report howsoever arising other than that arising to the Client under the Appointment. Save as provided in the Appointment, no warranty, expressed or implied, is made as to the professional advice included in this Report or any other services provided by AECOM.

This Report should not be reproduced in whole or in part or disclosed to any third parties for any use whatsoever without the express written authority of AECOM. To the extent this Report is reproduced in whole or in part or disclosed to any third parties (whether by AECOM or another party) for any use whatsoever, and whether such disclosure occurs with or without the express written authority of AECOM, AECOM does not accept that the third party is entitled to rely upon this Report and does not accept any responsibility or liability to the third party. To the extent any liability does arise to a third party, such liability shall be subject to any limitations included within the Appointment, a copy of which is available on request to AECOM.

Where any conclusions and recommendations contained in this Report are based upon information provided by the Client and/or third parties, it has been assumed that all relevant information has been provided by the Client and/or third parties and that such information is accurate. Any such information obtained by AECOM has not been independently verified by AECOM, unless otherwise stated in this Report AECOM accepts no liability for any inaccurate conclusions, assumptions or actions taken resulting from any inaccurate information supplied to AECOM from the Client and/or third parties.

Table of Contents

1.	Introduction	1
1.1	Methodology and approach	1
1.2	Report structure	1
2.	Scheme overview.....	2
2.1	Compulsory Purchase Orders	3
3.	Legislation and policy review	4
3.1	National level	4
3.1.1	Equality Act 2010 and the Public Sector Equality Duty (PSED).....	4
3.1.2	Integrated National Transport Strategy for England 2026.....	4
3.1.3	Road Investment Strategy 3 (RIS3) 2026-2031	5
3.1.4	National Planning Policy Framework 2024	5
3.2	Local level.....	6
3.2.1	Herefordshire Local Plan Core Strategy 2011-2031	6
3.2.2	Herefordshire Infrastructure Delivery Plan 2014	6
3.2.3	Herefordshire Council Plan 2024-2028.....	6
3.2.4	Herefordshire Local Transport Plan 2025-2041	6
3.2.5	Herefordshire Joint Local Health and Wellbeing Strategy 2023-2033	7
3.2.6	Herefordshire Equality Policy 2024-2027.....	7
4.	Baseline evidence review	8
4.1	Introduction.....	8
4.2	Population baseline	8
4.2.1	Population.....	8
4.3	Protected Characteristic Groups.....	8
4.3.1	Age	8
4.3.2	Sex	9
4.3.3	Disability	9
4.3.4	Ethnic Group.....	9
4.3.5	Religion.....	10
4.3.6	Legal partnership.....	12
4.3.7	Sexual orientation.....	12
4.3.8	Gender identity	13
4.4	Socio-economic disadvantage	13
4.5	Key issues and Evidence.....	14
4.5.1	Children and Young People	14
4.6	Protected Characteristic Groups.....	15
4.6.1	Age: Older people.....	15
4.6.2	Sex	15
4.6.3	Sexual Orientation and Gender Reassignment	16
4.6.4	Pregnancy and maternity.....	16
4.6.5	Disability	17
4.7	Socio-economic disadvantage	18
5.	Consultation and engagement	19
	South Wye Transport Package Consultation	19
6.	Assessment of impacts	19
7.	Conclusion and recommendations.....	27

Figures

Figure 2-1 Hereford Western Bypass Scheme.....	2
--	---

Tables

Table 4-1 Population count and change	8
Table 4-2 Age breakdown by geographical area	9
Table 4-3 Sex breakdown by geographical area	9
Table 4-4 Disability breakdown by geographical area	9
Table 4-5 Ethnic group breakdown by geographical area	10
Table 4-6 Religion breakdown by geographical area.....	12
Table 4-7 Legal partnership breakdown by geographical area	12
Table 4-8 Sexual orientation breakdown by geographical area	12
Table 4-9 Gender identity by geographical area.....	13
Table 4-10 English Index of Multiple Deprivation (IMD) deciles for England and Herefordshire (2025)	14
Table 6-1 Summary of impacts.....	20

1. Introduction

AECOM has been commissioned by Herefordshire Council to produce an Equality Impact Assessment (EqIA) for Phase One of the Hereford Western Bypass Scheme. This EqIA will support Herefordshire Council in demonstrating due regard has been paid to the Equality Act 2010, in particular Section 149 of the Public Sector Equality Duty (PSED).

An EqIA is a systematic assessment of the effects of the plans or policies on groups with protected characteristics as defined by the Equality Act 2010. As a public body, Herefordshire Council has a legal duty to pay due regard to the PSED which aims to eliminate unlawful discrimination, promote equality and cohesion between different groups and advance equality of opportunity.

This EqIA considers the potential equality impacts of Phase One of the Hereford Western Bypass scheme, as part of the Full Business Case (FBC) being prepared for the scheme. This report will be updated to consider the potential impacts of Phase Two of the scheme once it has been developed further.

1.1 Methodology and approach

To assess the potential equality impacts associated with the scheme, this EqIA reviews relevant legislation and policy, local demographic and socio-economic data and previous consultation undertaken. It also includes a review of the Statement of Reasons and Order Plan for the land subject to compulsory purchase order (CPO). The assessment is informed by the 2010 Equality Act, particularly the PSED and AECOM's in-house approach to conducting EqIAs.

1.2 Report structure

Following on from this introduction section, the remainder of this report is structured as follows:

- **Chapter 2 – Scheme overview:** provides an overview of the proposed scheme and the associated compulsory purchase orders.
- **Chapter 3 – Legislation and policy review:** provides context through review of relevant national, regional and local policy associated with equalities;
- **Chapter 4 – Evidence review:** a review of population data and the key issues and evidence relevant for protected characteristic groups and a review of the consultation undertaken to date and any key equality impacts identified;
- **Chapter 5 – Consultation and engagement:** summarises the contributions made as part of the South Wye Transport Package consultation;
- **Chapter 6 – Assessment of impacts:** an assessment of the expected equality impacts associated with the Proposed Development on those with protected characteristics and experiencing socio-economic disadvantage; and
- **Chapter 7 – Conclusions and recommendations:** provides a summary of the key findings and recommendations.

2. Scheme overview

The Hereford Western Bypass scheme aims to address several challenges across the county, including a lack of crossings over the River Wye, traffic congestion in the city centre, environmental challenges such as the need to improve air quality and a range of socio-economic issues. The scheme is made up of two phases:

- **Phase One:** will provide a new link road between the A465 and the A49 to the south-west of Hereford city centre. It is a 3.6km long section of rural all-purpose single carriageway with a designed speed of 60mph. Phase One has full planning permission in place and Herefordshire Council have procured a Design and Build contractor to deliver this phase of work. (This section of the scheme was previously referred to as the 'Southern Link Road (SLR)').
- **Phase Two:** will connect the Phase One scheme at the A465 junction and route to the west of the city centre, crossing the River Wye on a viaduct structure before connecting with the A49 to the north of the city. Phase 2 of the by-pass is at a less-advanced stage and is likely to evolve further as the scheme is developed.

Phases One and Two of the bypass scheme are depicted in Figure 2-1 below.

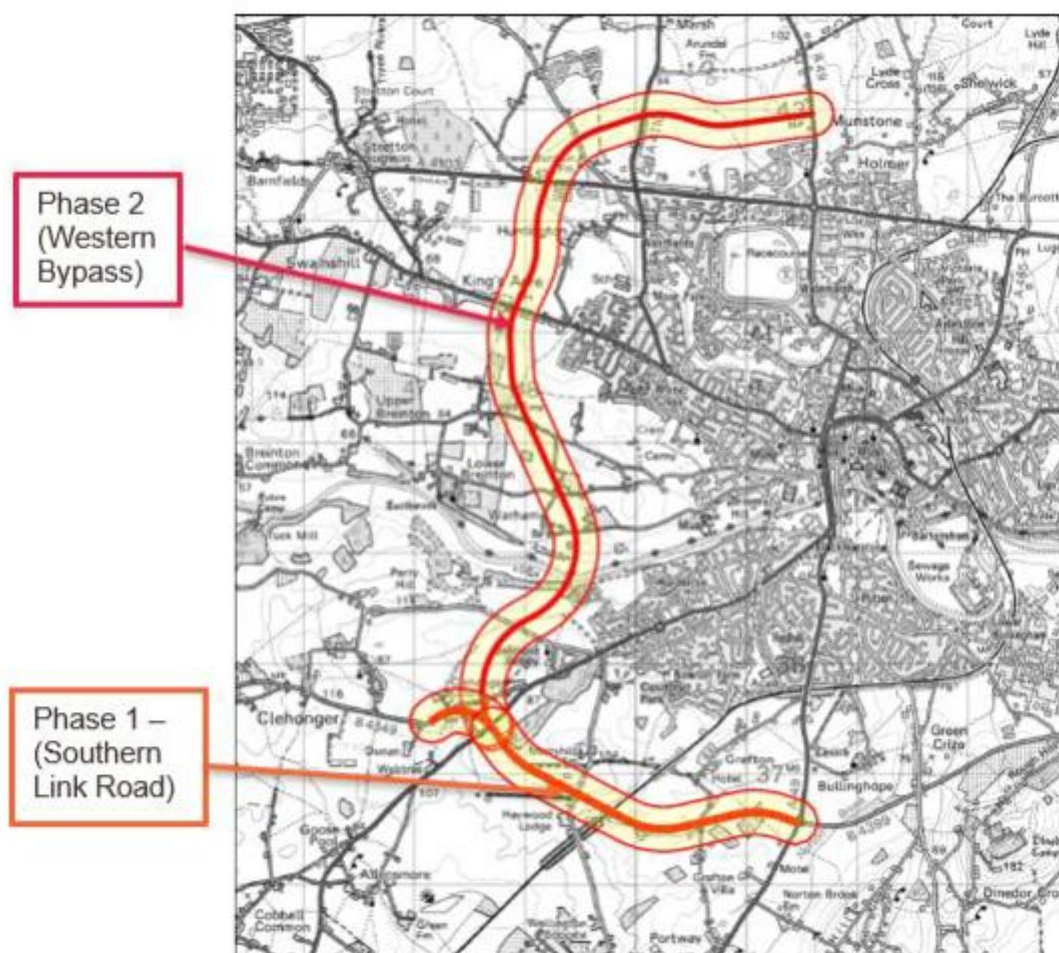


Figure 2-1 Hereford Western Bypass Scheme

2.1 Compulsory Purchase Orders

The Phase One scheme requires the acquisition of much of the land along its route, with only one parcel of land currently within the council's ownership (approximately 10-15% of the total land required). The land purchase is processing through negotiation with a fall-back position of compulsory acquisition. A Compulsory Purchase Order (CPO) overview plan identifying and updating land boundaries in relation to the scheme has been developed.

The land required for the construction of the scheme is largely agricultural land. The Order Land, which is in a variety of ownerships, is rural and largely comprises arable fields, small woodlands and coppices, small settlements, and farmland. Agreements are required with seven landowners across the scheme extent.

The council's position is that it is aiming to secure all of the necessary rights and land ownership through negotiation. It is running the CPO process in parallel as a fallback position in case a negotiated agreement cannot be reached in all cases.

Relevant land negotiations and CPOs will need to be finalised before construction can commence on each parcel of land, and therefore this is a key dependency. As of late May 2026, out of the seven affected landowners, Herefordshire Council have Heads of Terms out with two landowners.

Further detail on the land acquisition and CPO process being followed is set out in the Management Dimension.

3. Legislation and policy review

3.1 National level

3.1.1 Equality Act 2010 and the Public Sector Equality Duty (PSED)¹

The Equality Act 2010 is a major piece of UK legislation which provides the framework to protect the rights of individuals against unlawful discrimination and to advance equal opportunities for all. Section 149 of the Equality Act sets out the PSED to which Herefordshire Council, as a public body, is subject to in carrying out all its functions.

Those subject to the PSED must, in the exercise of their functions, have due regard to the need to:

- Eliminate unlawful discrimination, harassment and victimisation and other conduct prohibited by the Act;
- Advance equality of opportunity between people who share a protected characteristic and those who do not; and
- Foster good relations between people who share a protected characteristic and those who do not.

These are sometimes referred to as the three aims or arms of the PSED. The Act explains that having due regard for advancing equality involves:

- Removing or minimising disadvantages suffered by people due to their protected characteristics;
- Taking steps to meet the needs of people from protected groups where these are different from the needs of other people; and
- Encouraging people from protected characteristics groups to participate in public life or in other activities where their participation is disproportionately low.

The Act states that meeting different needs involves taking steps to take account of disabled people's disabilities. It describes fostering good relations as tackling prejudice and promoting understanding between people from different groups. It states that compliance with the duty may involve treating some people more favourably than others.

The duty covers the following eight protected characteristics: age, disability, gender reassignment, pregnancy and maternity, race, religion or belief, sex and sexual orientation. Public authorities also need to have due regard to the need to eliminate unlawful discrimination against someone because of their marriage or civil partnership status. This means that the first arm of the duty applies to this characteristic, but that the other arms (advancing equality and fostering good relations) do not apply.

3.1.2 Integrated National Transport Strategy for England 2026

In April 2026, the DfT published Strategy for Integrated Transport² which sets out a national vision for a transport system that is safe, reliable, affordable and accessible for all. The underlying principles focus on using transport to create better connected places, putting people at the heart of transport and working in partnership with local leaders and experts.

¹ UK Government (2010). Equality Act 2010. Available at: [Equality Act 2010](#)

² Department for Transport (2026) Better Connected: A Strategy for Integrated Transport. Available at: [Better Connected: A Strategy for Integrated Transport](#)

The strategy sets out 8 key priorities:

- Simplify payments and information
- Provide safe and dependable journeys
- Make travel accessible and affordable
- Create healthier communities
- Align transport and development
- Champion data and technology
- Empower local leaders
- Optimise decision-making and appraisal

The emphasis on empowering local leaders to deliver integrated, multimodal transport networks for local needs is of relevance for the development of the Proposed Scheme. The strategy also mandates a shift away from isolated modal planning in favour of integrated connections between different modes of travel, supported by integrated ticketing and real-time information. The strategy has a strong focus on active travel and the need to prioritise infrastructure for walking, wheeling and cycling and a commitment to reduce inequalities. The strategy also states that Local Authorities should engage directly with disabled people and other underrepresented groups to develop solutions that remove barriers to travel and improve personal security.

3.1.3 Road Investment Strategy 3 (RIS3) 2026-2031

The Road Investment Strategy 3 (RIS3)³, published by the Department for Transport in 2026, sets out the government's priorities for the strategic road network in England for the period 2026–2032. It focuses on delivering a network that supports economic growth while improving safety, reliability, environmental outcomes and accessibility.

RIS3 emphasises the importance of a safe and inclusive road network that meets the needs of all users. Key objectives include improving safety, enhancing connectivity, and ensuring the network is accessible to a diverse range of users, including disabled people and those in underserved communities. The strategy also highlights the need to better integrate the strategic road network with public transport and active travel to support more inclusive journeys.

The strategy promotes inclusive design and the removal of barriers to travel, encouraging features such as safe crossings, clear information and provision for walking, wheeling and cycling. It also reinforces the requirement for National Highways to consider equality in decision-making and to engage with communities to understand user needs.

RIS3 is relevant to the Proposed Scheme through its focus on safety, accessibility and inclusive design, supporting the delivery of infrastructure that reduces barriers to travel and improves outcomes for all users.

3.1.4 National Planning Policy Framework 2024

The National Planning Policy Framework⁴ sets out national policy for planning in England, including transport, sustainability and environmental integration. The framework places a strong emphasis on the need to reduce travel, promote sustainable transport, integrate transport and land use planning and protect natural assets.

The framework highlights that Local Transport Strategies should minimise car dependence by supporting high quality active travel networks and strong public transport connectivity into spatial planning. There is also an emphasis on aligning green infrastructure with transport

³ Department for Transport (2026) Draft Road Investment Strategy 3 (RIS3) 2026–2032. Available at: <https://assets.publishing.service.gov.uk/media/69c4265e471d520038d0f64a/ris3.pdf>

⁴ Ministry of Housing, Communities & Local Government (2024) National Planning Policy Framework. Available at: [National Planning Policy Framework](#)

corridors which is of particular relevance given Herefordshire's rural landscape. The framework also requires the consideration of environmental sensitivity in route planning and scheme design.

3.2 Local level

3.2.1 Herefordshire Local Plan Core Strategy 2011-2031

The Herefordshire Local Plan Core Strategy⁵ sets out the long-term vision for sustainable development across the county, including policies on housing, transport, environment and community wellbeing. It aims to support economic growth while protecting the natural environment and promoting inclusive, sustainable communities.

The Core Strategy emphasises the importance of accessible transport in supporting social inclusion and economic participation. It promotes improved connectivity between rural and urban areas, sustainable travel modes, and the reduction of reliance on private cars. Policies encourage the development of infrastructure that supports walking, cycling and public transport, alongside safe and efficient road networks.

3.2.2 Herefordshire Infrastructure Delivery Plan 2014

The Herefordshire Infrastructure Delivery Plan (IDP)⁶ identifies the infrastructure required to support planned growth within the county, including transport, utilities, education and health facilities. It provides a framework for coordinating infrastructure investment to ensure development is supported by appropriate services and facilities.

The IDP highlights the importance of transport infrastructure in enabling access to key services, employment and education. It identifies capacity improvements, safety enhancements and connectivity as key priorities, particularly in areas experiencing growth or existing infrastructure constraints.

3.2.3 Herefordshire Council Plan 2024-2028

The Herefordshire Council Plan⁷ sets out the council's strategic priorities and commitments, focusing on improving residents' quality of life, supporting economic growth and protecting the environment.

A key theme of the plan is creating stronger, more connected communities, with an emphasis on improving transport accessibility and connectivity. The plan highlights the importance of enabling people to access services, employment and social opportunities, particularly in rural areas. It also promotes sustainable and active travel, alongside measures to improve road safety.

3.2.4 Herefordshire Local Transport Plan 2025-2041

The Herefordshire Local Transport Plan (LTP5)⁸ sets out the long-term strategy for transport across the county. It aims to create a transport system that is safe, sustainable, accessible and supports economic development while reducing environmental impacts.

LTP5 places strong emphasis on reducing transport inequalities and improving accessibility for all users, including those with protected characteristics and those without access to private vehicles. It promotes integrated transport solutions, with a focus on active travel, public transport improvements and better connectivity across rural areas. The plan also

⁵ Herefordshire Council (2015) Herefordshire Local Plan Core Strategy 2011–2031. Available at: <http://www.colwallneighbourhoodplan.org.uk/Documents/Adopted%20Core%20Strategy.pdf>

⁶ Herefordshire Council (2014) Herefordshire Infrastructure Delivery Plan. Available at: https://www.herefordshire.gov.uk/media/nixca31s/infrastructure_delivery_plan_2014.pdf

⁷ Herefordshire Council (2024) Herefordshire Council Plan 2024–2028. Available at: https://www.herefordshire.gov.uk/media/v5wnuag/herefordshire_council_plan_2024-28.pdf

⁸ Herefordshire Council (2025) Herefordshire Local Transport Plan (LTP5) 2025–2041. Available at: <https://www.herefordshire.gov.uk/media/alxnj2fo/local-transport-plan-5-ltp5-2025-2041.pdf>

prioritises safety, decarbonisation and inclusive design, encouraging the removal of barriers to travel and improved user experience across all modes.

3.2.5 Herefordshire Joint Local Health and Wellbeing Strategy 2023-2033

The Health and Wellbeing Strategy⁹ sets out the approach for the Council and local partners to address the population's health and wellbeing needs. The strategy identifies that over half of Herefordshire's population live in rural areas which presents geographical barriers to services, education and employment and that those without access to private cars can risk social isolation. The strategy sets out four key ambitions.

- **Thriving communities:** communities will foster wellbeing and resilience, where children and young people feel safe and develop the confidence and skills to be the best that they can be. There will be a sense of belonging with everyone feeling empowered to shape their local communities.
- **Healthy and sustainable places:** residents will live and work in environments that prioritise health and wellbeing, with neighbourhoods designed to create healthier and safer environments.
- **Opportunity for all:** there will be improved access to quality education and employment opportunities. A progressive and inclusive local economy will create the right jobs, supporting social mobility and closing the inequalities gap.
- **Healthy people:** people will be empowered to take control of their health and lead healthy lives. Everyone will have equitable access to information, services and preventative support they need.

3.2.6 Herefordshire Equality Policy 2024-2027

The Equality Policy¹⁰ sets out Herefordshire Council's commitment to promoting equality, diversity and inclusion across all its functions. It outlines the responsibility to eliminate discrimination, advance equality of opportunity and foster good relations across all nine protected characteristics. It highlights the need for the integration of equality considerations into service planning and decision making. The Council also pledges to address social issues impacting equality and to strive for accessible services and environments.

⁹ Herefordshire Council (2023) Herefordshire Joint Local Health and Wellbeing Strategy 2023-2033. Available at: [Herefordshire Joint Local Health and Wellbeing Strategy 2023 - 2033](#)

¹⁰ Herefordshire Council (2024) Equality Policy 2024-2027. Available at: [Equality policy 2024-27](#)

4. Baseline evidence review

4.1 Introduction

This section provides a baseline of the local population and a review of key evidence related to protected characteristic groups. The baseline draws on analysis of Census 2021 data, alongside other datasets available at the Local Authority and national scales. Socio-economic conditions have been examined using the Indices of Deprivation (IoD) 2025, which are published at LSOA level.

The population and protected characteristics baseline analyses data at three geographical levels:

- Local Study Area (for Phase One) – comprised of Lower Super Output Areas 016D and 21A Herefordshire to capture the population in close proximity to Phase One of the Scheme;
- Herefordshire Local Authority – to capture the wider local population;
- England – to allow for national comparison.

4.2 Population baseline

4.2.1 Population

Table 4-1 Population count and change outlines the population count across the Study Area, Herefordshire and England, and compares it against the % change between the 2011 and 2021 census. The data shows that the Study Area experienced significant population growth, increasing by 104%. In contrast, population growth in Herefordshire was considerably lower at 1.9%, while England recorded a larger increase than the county, at 6.6%, but still substantially below the level observed in the Study Area.

Table 4-1 Population count and change

Year	Study Area (%)	Herefordshire (%)	England (%)
2011	1749	183,477	53,012,456
2021	3567	187,034	56,490,048
% Change	+104	+1.9	+6.6

Source: Census 2011¹¹, Census 2021¹²

4.3 Protected Characteristic Groups

4.3.1 Age

Table 4-2 Age breakdown by geographical area outlines the age breakdown across the three geographies. The table shows the Study Area has a generally older age profile than both Herefordshire and England with a higher proportion of residents being aged 65 and over (28.8%), compared with 25.9% in Herefordshire and 18.3% in England. However, the working-age population (16-64) is smaller in the Study Area at 55.9%, below the Local Authority and national levels. The Study Area has a smaller proportion of children aged 0-15 (15.3%) compared to the rest of Herefordshire (16%) and the national figure (18.5%).

¹¹ ONS (2011) 2011 Census Available at: [2011 Census Report for areas in England and Wales - Nomis](#)

¹² ONS (2021) 2021 Census Available at: [2021 Census Profile for areas in England and Wales - Nomis](#)

Table 4-2 Age breakdown by geographical area

Age (years)	Study Area (%)	Herefordshire (%)	England (%)
0-15	15.3	16.0	18.5
16-64	55.9	58.1	63.0
65 and over	28.8	25.9	18.3

Source: Census 2021¹²

4.3.2 Sex

Table 4-3 Sex breakdown by geographical area highlights that the Study Area, Herefordshire, and England all exhibit a broadly even split between males and females. The Study Area has a slight male majority, with 50.2% of residents identifying as male, differing from both Herefordshire and England where females slightly outnumber males.

Table 4-3 Sex breakdown by geographical area

Sex	Study Area (%)	Herefordshire (%)	England (%)
Female	49.8	50.9	51.0
Male	50.2	49.1	49.0

Source: Census 2021¹²

4.3.3 Disability

Table 4-4 outlines levels of disability across the Study Area, Herefordshire and England. The Study Area has a similar percentage of residents whose day-to-day activities are limited a lot (7.7%) compared with Herefordshire (7.5%) and England (7.3%). A comparable pattern is seen among those whose activities are limited a little, with the Study Area at 11.2%, closely aligning with Herefordshire (11.1%) and slightly exceeding England (10.0%). Similarly, the proportion of residents reporting a long-term physical or mental health condition that does not limit daily activities is slightly higher in the Study Area (7.8%) than in Herefordshire (7.6%) and England (6.8%).

Table 4-4 Disability breakdown by geographical area

Level of disability	Study Area (%)	Herefordshire (%)	England (%)
Day-to-day activities limited a lot	7.7	7.5	7.3
Day-to-day activities limited a little	11.2	11.1	10
Has long term physical or mental health condition but day-to-day activities are not limited	7.8	7.6	6.8
No long term physical or mental health condition	73.3	73.8	75.9

Source: Census 2021¹²

4.3.4 Ethnic Group

Table 4-5 summarises the ethnic composition of the Study Area compared with Herefordshire and England. The Study Area is notably less ethnically diverse, with 94.6% of residents identifying as White English, Welsh, Scottish, Northern Irish or British, compared to around 72–74% at the Local Authority and national level. Smaller White ethnic groups are present at low but comparable levels, while Roma representation is absent. All other ethnic groups are significantly underrepresented in the Study Area, with particularly low proportions of Asian and Black residents. Notable ethnic groups in the Study Area, compared to national levels, include Other White at 3.9%.

Table 4-5 Ethnic group breakdown by geographical area

Ethnic group		Study Area (%)	Herefordshire (%)	England (%)
White	English, Welsh, Scottish, Northern Irish or British	94.6	71.8	73.5
	Irish	0.6	1.6	0.9
	Gypsy or Traveller	0.4	0.1	0.1
	Roma	0.0	0.2	0.2
	Other	2.9	8.1	6.3
Mixed/ Multiple Ethnic Groups	White and Black Caribbean	0.2	1.1	0.9
	White and Black African	0.2	0.5	0.4
	White and Asian	0.1	1.2	0.8
	Other	0.3	1.1	0.8
Asian/ Asian British	Indian	0.1	4.0	3.3
	Pakistani	0.0	1.5	2.8
	Bangladeshi	0.0	0.6	1.1
	Chinese	0.1	0.7	0.8
	Other	0.2	1.8	1.7
Black/ African/ Caribbean/ Black British	African	0.0	2.4	2.6
	Caribbean	0.1	0.9	1.1
	Other Black	0.0	0.4	0.5
Other Ethnic Group	Arab	0.0	0.4	0.6
	Other	0.1	1.7	1.6

Source: Census 2021¹²

4.3.5 Religion

Table 4-6 summarises the religious profile of the Study Area compared with Herefordshire and England. The Study Area has a higher proportion of Christian residents (59.3%) than both Herefordshire (54.9%) and England (46.3%), alongside a lower share reporting no religion (33.5% compared to around 36–37% elsewhere). Other religious groups are very limited in the Study Area, with notably lower proportions of Hindu, Muslim, and Sikh residents than nationally.

Table 4-6 Religion breakdown by geographical area

Religion	Study Area (%)	Herefordshire (%)	England (%)
Christian	59.3	54.9	46.3
Buddhist	0.2	0.3	0.5
Hindu	0.1	0.2	1.8
Jewish	0.0	0.1	0.5
Muslim	0.1	0.4	6.7
Sikh	0.0	0.1	0.9
Other religion	0.3	0.5	0.6
No religion	33.5	36.6	36.7
Religion not stated	6.5	6.9	6.0

Source: Census 2021¹²

4.3.6 Legal partnership

Table 4-7 summarises the legal partnership status of residents in the Study Area, Herefordshire, and England. The Study Area has a higher proportion of married residents (54.7%) than both Herefordshire (49.7%) and England (44.5%), and a lower proportion of those who have never married (27.6% compared to 30.4% and 37.9% respectively). Levels of divorce are slightly lower in the Study Area (8.8%) than regionally and nationally, while the proportion of widowed residents (6.8%) is broadly in line with England (6.1%).

Table 4-7 Legal partnership breakdown by geographical area

Legal partnership status	Study Area (%)	Herefordshire (%)	England (%)
Never married	27.6	30.4	37.9
Married	54.7	49.7	44.5
Registered civil partnership	0.5	0.3	0.2
Separated, but still legally married or still legally in a civil partnership	1.7	2.1	2.2
Divorced or civil partnership dissolved	8.8	10.2	9.1
Widowed or surviving civil partnership partner	6.8	7.4	6.1

Source: Census 2021¹²

4.3.7 Sexual orientation

Table 4-8 summarises sexual orientation data for Herefordshire and England from the 2021 Census. Specific data for the Study Area is not available. The proportion of the populations identifying as gay or lesbian and as bisexual are lower in Herefordshire, at 1.0% and 0.9% respectively, compared with 1.5% and 1.3% across England. Other minority sexual orientation categories account for very small shares of the population in both areas and are broadly similar.

Table 4-8 Sexual orientation breakdown by geographical area

Sexual orientation	Study Area (%)	Herefordshire (%)	England (%)
Straight or Heterosexual	N/A	89.7	89.4

Sexual orientation	Study Area (%)	Herefordshire (%)	England (%)
Gay or Lesbian	N/A	1.0	1.5
Bisexual	N/A	0.9	1.3
Pansexual	N/A	0.1	0.1
Asexual	N/A	0.0	0.1
Queer	N/A	0.0	0.0
All other sexual orientations	N/A	0.1	0.2
Not answered	N/A	8.1	7.5

Source: Census 2021¹²

4.3.8 Gender identity

Table 4-9 highlights gender identity figures across the different geographies. This data was unavailable for the Study Area. In both Herefordshire and England, small proportions identified as trans women or trans men (both 0.1%), while identification as non-binary and other gender identities accounted for negligible shares of the population. The proportion of residents reporting a gender identity different from their sex registered at birth but without specifying an identity was slightly lower in Herefordshire (0.1%) than in England (0.2%).

Table 4-9 Gender identity by geographical area

Gender identity	Study Area (%)	Herefordshire (%)	England (%)
Gender identity the same as sex registered at birth	N/A	93.2	93.5
Gender identity different from sex registered at birth but no specific identity given	N/A	0.1	0.2
Trans woman	N/A	0.1	0.1
Trans man	N/A	0.1	0.1
Non-binary	N/A	0.0	0.1
All other gender identities	N/A	0.0	0.0
Not answered	N/A	6.4	6.0

Source: Census 2021¹²

4.4 Socio-economic disadvantage

The Indices of Multiple Deprivation (IMD) is used to assess and rank the relative deprivation of areas within England. The country is divided into almost 34,000 LSOAs. This is calculated by using seven domains of deprivation: income, employment, education, health, housing, crime and living environment.

The IMD ranks LSOAs from decile 1 (the 10% most deprived LSOAs) to 10 (the 10% least deprived). Overall, the 2025 IMD ranked Herefordshire more deprived than 54% of local authority districts in England. Similarly, the Study Area is 55% more deprived than neighbourhoods in England.

Table 4-10 provides a breakdown of the proportion of LSOAs that comprise Herefordshire that fall into each deprivation decile. As shown, 12.8% of LSOAs fall into deciles 1-3 (most deprived nationally), whilst 17.3% fall into deciles 8-10 (least deprived). 70% of the LSOAs in Herefordshire fall into the middle deprivation deciles (4-7). Although a relatively smaller

proportion of LSOAs fall into deciles 1-3 compared to England as a whole, there can be pockets of deprivation within areas that are less deprived.

Table 4-10 English Index of Multiple Deprivation (IMD) deciles for England and Herefordshire (2025)

English Index of Multiple Deprivation 2025 All Deciles										
Deciles	1	2	3	4	5	6	7	8	9	10
England	10	10	10	10	10	10	10	10	10	10
Herefordshire	0.9	6.4	5.5	17.3	24.5	15.5	12.7	8.2	7.3	1.8

Source: *English Indices of Deprivation 2025*¹³

Both LSOAs that comprise the Phase One Study Area (Herefordshire 016D and 021A) fall within the fifth deprivation decile. However, they face relatively high levels of deprivation regarding the ‘barriers to housing and services’ domain (with 021A in the 10% most deprived and 016D in the 20% most deprived). The 021A LSOA also falls into the 10% most deprived decile with regards to the ‘living environment’ domain¹⁴.

4.5 Key issues and Evidence

The information below highlights some of the key issues and evidence for protected characteristic groups relevant for this Scheme. The evidence will be used to support the assessment of impacts.

4.5.1 Children and Young People

- In 2021, the Study Area had a smaller proportion of children aged 0-15 (15.3%) compared to Herefordshire (16%) and compared to the national figure (18.3%). Children and young people are particularly sensitive to transport-related impacts including exposure to traffic related noise and air pollution, and road safety risks especially where construction activities, traffic diversions or increased traffic speeds occur¹⁵.
- During construction, children can experience a range of temporary but potentially significant effects, particularly in areas close to the Proposed Scheme. For example, increased construction traffic and route disruption can impact the perceived and actual safety for children. This may also result in a temporary loss or restriction of access to play spaces and community facilities, which can adversely affect children’s wellbeing and opportunities for physical activity and social interaction.
- Children are affected by transport issues in distinct ways because they are more physically vulnerable, less independent, and rely heavily on others and the transport system to access essential services such as education, healthcare and play. In 2024, the National Travel Survey (NTS) found that for 11–16-year-olds, 18% of trips to and from school are by local bus¹⁶ (with bus use rising sharply for longer journeys, reaching 58% for trips 5 miles and over). Younger children rely more on walking and car travel.

¹³ Ministry of Housing, Communities and Local Government (MHCLG). *English Indices of Deprivation 2025 – Local Deprivation Explorer (Index of Multiple Deprivation)*. Available at: [Overall \(IMD\) | Local Deprivation Explorer](#)

¹⁴ Ministry of Housing, Communities and Local Government (MHCLG). *English Indices of Deprivation 2025 – Local Deprivation Explorer (Index of Multiple Deprivation)*. [Overall \(IMD\) | Local Deprivation Explorer](#)

¹⁵ UK Health Security Agency (2025) Transport interventions at schools: health impacts and benefits. Available at: <https://www.gov.uk/government/publications/transport-interventions-at-schools-health-impacts-and-benefits>

¹⁶ Department for Transport (2025) National Travel Survey 2024: Travel to and from School. Available at: <https://www.gov.uk/government/statistics/national-travel-survey-2024/nts-2024-travel-to-and-from-school>

- In England, walking is still the most common way children get to school, with 51% of trips for ages 5-10 and 37% for ages 11-16 made by walking in 2024. Cycling remains very low (around 2% for both age groups)¹⁶. Parents' responses in the NTS highlight that road danger is a key barrier: among those whose children do not currently walk more, "safer roads" (slower speeds/less traffic/better driver behaviour) is one of the most-cited factors that would encourage more walking. Traffic disruptions and diversions may affect the safety of children.
- Children can benefit from safe active travel because it directly supports healthy development, independence, and daily physical activity. However, they are also more constrained by real and perceived danger.
- Children are disproportionately impacted by road danger because they are more physically vulnerable and because risk affects their freedom to travel independently (often leading to parental escorting and more car trips). Nationally, DfT's official road casualty statistics show that in 2024, '16-and-under' accounted for 11% of all casualties and 4% of fatalities in Great Britain, underlining the continued scale of child exposure to road injury risk¹⁷.
- Reports into the effects of road traffic noise and behavioural problems in children¹⁸ state that traffic-related noise is correlated more broadly with lower health-related quality of life in children and they are more vulnerable to the effects of poor air quality compared to the overall population.
- The Phase One scheme may reduce congestion which may improve air quality and road safety in areas where children live, attend school and access services. Additionally, it may improve journey times and network reliability, supporting better access to schools and youth services.

4.6 Protected Characteristic Groups

4.6.1 Age: Older people

- The Study Area has a higher proportion of residents aged 65+ (28.8%) compared to both Herefordshire (25.9%) and England (18.3%). Older people are more likely to have reduced mobility and increased reliance on accessible transport options, and be more vulnerable to social isolation, particularly in rural areas with limited transport options.
- The rural nature of Herefordshire presents geographical barriers to services, particularly for those without access to a private car. Older people are more likely to rely on public transport to access services such as shops, post offices and healthcare centres. Whilst the Proposed Scheme may make transport access more difficult during construction, it is expected to improve traffic flow, improve public transport connectivity and reduce congestion, increasing accessibility in the long term.

4.6.2 Sex

- The Study Area shows a balanced gender split, consistent with county and national trends. However, evidence shows that women are more likely to use public transport and multi-stop and multi-purpose trips, combining travel to work with trips for other purposes such as taking children to school, looking after family members or shopping¹⁹.

¹⁷Department for Transport (2025) Reported Road Casualties Great Britain: Annual Report 2024. Available at: <https://www.gov.uk/government/statistics/reported-road-casualties-great-britain-annual-report-2024/reported-road-casualties-great-britain-annual-report-2024>

¹⁸ World Health Organization (2016) Transport and Health: Effects of Transport on Health (Systematic Review). Available at: <https://pmc.ncbi.nlm.nih.gov/articles/PMC4749080/>

¹⁹ Walk Wheel Cycle Trust (2023) Exploring Gender and Active Travel. Available at: <https://www.walkwheelcycletrust.org.uk/our-blog/research/exploring-gender-and-active-travel/>

- As women are more likely to make multi-modal journeys, diversions during construction can disproportionately impact women travelling in this way. Conversely, if journey times reduce and connectivity is increased, multi-stop and multi-purpose trips can become more convenient and accessible.
- Personal safety concerns, particularly when using active travel routes or public transport, may be impacted during construction due to changes to route and potentially reduced lighting, particularly for women.

4.6.3 Sexual Orientation and Gender Reassignment

- There is no specific data available for sexual orientation and gender identity at the Study Area. In Herefordshire, approximately 2.1% of the population identify as LGBTQIA+ and 0.3% of the population identify as a gender minority, including individuals who are trans or identify differently from their sex registered at birth. This is slightly lower compared to national figures.
- LGBTQIA+ and trans people may experience heightened concerns around personal safety when travelling, particularly in public or unfamiliar environments. In 2024/25 there was 18,702 reported offences relating to sexual orientation and 3,809 related to transgender hate crimes²⁰. The fear of harassment or hate crime may influence how, when and whether individual travel, including avoiding certain routes, travelling at specific times or relying on more expensive transport options such as taxis.
- The LGBTQIA+ community may have safety concerns during temporary changes to routes, including diversions onto less well-lit or less populated roads or disruption to familiar travel patterns, requiring the use of unfamiliar or perceived unsafe environments. These factors may result in behavioural changes, including reduced travel, avoidance of certain routes or times, or increased reliance on private or supported transport. This reflects a form of “hidden barrier” to mobility, where travel is technically possible but practically constrained by perceived risk.
- LGBTQIA+ may need to travel longer distances to access inclusive services, social networks or gender-affirming healthcare, often located in larger urban centres. Limited public transport options mean individuals may have fewer safe and accessible alternatives if routes are disrupted. Additionally, any increased in journey times or complexity during construction may therefore reduce access to these essential or supportive spaces.
- Improved connectivity can support access to services, employment and social opportunities, as well as reduce congestion and travel times, which may improve the overall travel experience.

4.6.4 Pregnancy and maternity

- Pregnant women are mobility restricted, particularly at later stages of pregnancy and may have concerns or issues with regards to accessibility and safety as well as needing to access facilities whilst feeling nauseous or ill whilst travelling.
- Research into acute effects of air pollutants on spontaneous pregnancy loss²¹ found pregnant women are also more vulnerable to poor air quality, which increases the risk of miscarriage, premature births, and low birth rates.
- Hereford continues to enjoy good air quality with no exceedances of the annual mean NO₂ objective. Herefordshire Council are in the process of revoking the Hereford

²⁰ Home Office (2025) Hate Crime, England and Wales: Year Ending March 2025. Available at: <https://www.gov.uk/government/statistics/hate-crime-england-and-wales-year-ending-march-2025/hate-crime-england-and-wales-year-ending-march-2025>

²¹ National Library of Medicine (2018) Health Impacts of Environmental Exposure (Study). Available at: <https://pubmed.ncbi.nlm.nih.gov/30528056/>

AQMA as it has been compliant for over five years. The opening of Phase One is not expected to lead to any exceedances of the air quality threshold for NO_x or particulate matter. The scheme is therefore not anticipated to have any impacts on pregnant women.

4.6.5 Disability

- Approximately 7.7% of the Study Area population are limited 'a lot' in their day-to-day activities, with a further 11.2% limited 'a little', indicating a notable proportion of residents with accessibility needs. As a result, a significant group may be more sensitive to disruption during construction and to changes in accessibility and connectivity during operation.
- Disabled people often rely on accessible, reliable and door to door transport systems to access essential services. During construction, road closures, diversions and reduced network reliability may make journeys more difficult or lengthier, while during operation, changes to the network may either improve or reduce accessibility depending on route design and connectivity.
- Across the UK, transport accessibility barriers remain widespread, including poorly designed streets and inconsistent infrastructure. There is a risk that, during both construction and operation, temporary or permanent changes to layouts, crossings or routes could introduce new barriers if inclusive design is not fully integrated.
- Disabled people typically make fewer and shorter journeys, meaning they may rely heavily on familiar, predictable routes. Disruption during construction, including temporary closures or altered travel patterns, may therefore have a disproportionate impact, and changes during operation may require adaptation to new or more complex routes.
- In Herefordshire's rural context, impacts are likely to be more pronounced due to limited public transport availability, resulting in fewer alternative routes during construction. There is also a greater reliance on private vehicles, taxis or community transport, which may be affected by diversions or delays, alongside longer travel distances to services, meaning disruptions or changes could significantly increase journey times.
- During construction, temporary works and traffic management may restrict crossing points or access routes. During operation, increased traffic speeds and volumes on certain routes may reduce the ability or willingness to cross roads, and new infrastructure may act as a physical or psychological barrier, particularly for those with reduced mobility.
- Disabled people may be disproportionately affected by both actual and perceived safety risks. Construction traffic, including HGV movements, may increase safety concerns and reduce confidence to travel. During operation, changes in traffic conditions, such as higher speeds or unfamiliar road layouts, may further reduce confidence in navigating the network, potentially leading to reduced independent mobility and increased reliance on carers or others.
- Access to healthcare, employment, education and social networks may be affected. During construction, temporary disruption to routes and services may reduce accessibility, particularly where alternative options are limited. During operation, the bypass may improve strategic connectivity and journey times, although these benefits may not be evenly experienced, particularly by those who do not rely on private vehicles.
- Generally, potential benefits include reduced traffic levels and congestion, which may improve local accessibility, road safety and air quality for nearby communities.

4.7 Socio-economic disadvantage

- Slow or unreliable transport can reduce effective access to employment (particularly for part-time work and low wage jobs). Reduced congestion in can improve journey reliability which can increase the number of reachable jobs within typical commute thresholds.
- Lower-income households can have fewer viable transport options. For those in more rural areas, they may experience forced-car ownership due to limited alternative transport options which can have negative economic impacts due to the costs associated with private cars. For households without access to car, this can make visiting essential services, education and employment opportunities more difficult and lead to household members being more reliant on public transport options.
- Different neighbourhoods are likely to experience various levels of transport connectivity and can also face transport disruption during construction. This can have disproportionate negative socio-economic impacts for different neighbourhoods through reduced access to services and employment.
- The completed scheme will provide improved access to the Hereford Enterprise Zone, particularly from the southwest quadrant of the city improving access to employment opportunities for residents of this area.

5. Consultation and engagement

Whilst there has not been a recent public consultation on Hereford Western Bypass Phase One, a consultation took place around route options and the planning process (2015 onwards) for the scheme when it was referred to as Southern Link Road. There were also wider bypass/transport package consultations between April 2017 and Feb–Mar 2018.

South Wye Transport Package Consultation

In 2014, a consultation was commissioned by Herefordshire Council as part of the South Wye Transport Package. The consultation focused on options for the new Southern Link Road²² along with sustainable transport improvements. The consultation took place between 1 July 2014 and 8 August 2014. In-person events were held (with a total attendance of 199 people across the exhibitions) and there were 231 questionnaire responses.

The responses identifies that there was support for the opinion that traffic conditions in the South Wye area needed to be improved, congestion along the A465 and A49 was identifies as a transport problem, particularly the number of HGVs. In addition, the responses highlighted that accessibility to public transport was a key issue and that there should be greater cycling infrastructure and public transport provision.

6. Assessment of impacts

This section assesses the potential positive and negative impacts of Phase One of the Hereford Western Bypass scheme on protected characteristics groups. The assessment considers disproportionate and differential impacts on protected characteristic groups.

The assessment takes mitigation measures into consideration and combines the sensitivity of those affected with the predicted magnitude using the assessment matrix presented in Table 6-1 below.

²² Southern Link Road was the previous term used to describe Phase One. Four route options were presented for connecting the A49 and the A465.

Table 6-1 Summary of impacts

Potential Impact	Key groups affected	Description of effects	Overall impacts	Mitigations/ further actions
Construction				
Air quality and noise	Children and older people People with respiratory or cardiovascular conditions Pregnant people	Construction works and increased construction traffic can reduce local air quality and cause noise. Older people, children, some people with disabilities and pregnant people can also be particularly vulnerable to the negative health impacts of poor air quality and noise. Overall, it is anticipated that with the mitigation measures in place, any impacts during construction works are negligible. Due to the negligible impacts, it is not anticipated that there will be disproportionate or differential equality impacts for protected characteristic groups.	Neutral	Timing controls to limit works during sensitive hours (e.g., near schools, care homes). In addition, best practice mitigation measures should be followed to minimise air quality impacts (for example, keeping machinery and dust causing activities away from receptors, erect screens or barriers around dusty activity, ensuring vehicles are switched off when station).

Restricted access during construction	Older people and children, people with mobility impairments	Temporary road closures, diversions, or disruption and can limit access to services. This can have disproportionate impacts on people with mobility impairments if diversions result in increased journey times or make journeys by car more difficult for users who require a car as a mobility aid. However, since the vast majority of the scheme on a completely new alignment, separate from the existing road and across current agricultural land, these impacts will be minimal.	Negative (minimal)	Construction management plans aim to maintain access to homes, healthcare, and services at all times. Targeted communication with accessible formats (easy-read, multiple languages if needed)
Traffic and road safety	Children, disabled people, older people	Increased traffic during construction may have negative impacts for groups at greater risk of road traffic accidents (children, older people, disabled people) ²³ . This could increase fear and intimidation whilst making journeys and have negative health and safety impacts for such groups. However, since the vast majority of the scheme on a completely new alignment, separate from the	Negative (minimal)	A traffic management plan should be in place throughout the construction phase.

²³ Brake (2023) Research from Break shows the Extent of Child Road Casualties. Available at: [Research from Brake shows the extent of child road casualties | Brake](#)

		existing road, these impacts will be minimal.		
Operation				
Road safety	Benefits groups such as disabled people, elderly pedestrians, children and families People less likely to own cars such as low-income households and ethnic minorities	The bypass may reduce collisions on residential roads by decreasing traffic and congestion. This can positively impact groups at greater risk of pedestrian traffic accidents (such as children, older people and some people with disabilities). However, there may be a slight increase in severe collisions due to the higher-speed route.	Mixed (Moderate Positive urban / Minor-Moderate Negative rural)	To enhance safety, safe design principles will be used throughout the development of Phase One.
Accessibility and Journey Times	Elderly, disabled people	It is anticipated that the bypass will deliver shorter and more reliable journey times by easing congestion and removing traffic from in appropriate rural and residential roads. This may result in improved connectivity to jobs, services and healthcare which can support rural populations, benefit people with limited public transport access; and can reduce travel stress for those reliant on car travel (e.g., carers). This may also	Positive	Not applicable.

		bring positive socio-economic impacts.		
Economic opportunities	Working-age residents, including those in lower-income groups	Bypasses can stimulate local economic development, job creation, and investment and improve access to the enterprise zone and jobs. It is expected that through the provision of a more direct link to the Hereford Enterprise Zone (HEZ), a major employment site in Hereford, productivity will be improved by reducing the costs to businesses caused by congestion and delay, establishing a more attractive location for inward investment, and by improving residents' access to training, work and services. This may positively impact young people in accessing	Positive	Enhance equal access by linking employment zones to public transport and cycling routes.

		additional employment opportunities.		
Community severance	Older people and children, people with mobility impairments	New road schemes can result in community severance, making it more difficult for communities to access schools, shops or healthcare appointments which can disproportionately impact protected characteristic groups. However, whilst Phase One of the Bypass passes 500m from Grafton, the Scheme does not pass through villages resulting in severance. Access between Gratton and the A49 Ross Road will be maintained at all times. Overall, therefore no negative impact is anticipated.	Neutral	Construction management plans aim to maintain access to homes, healthcare, and services at all times. Targeted communication with accessible formats (easy-read, multiple languages if needed)
Air and noise pollution	Benefits lower-income communities located along congested routes (e.g., Belmont) Could negatively impact those in previously quieter areas including deprived communities unable to relocate; elderly, children, people with disabilities, pregnant women.	With the scheme operational, both decreases and increases in pollutant concentrations are anticipated, due to changes in traffic flows and road layouts associated with the scheme, which could lead to improvements or deteriorations in air quality, respectively.	Neutral for Air Quality, Positive for Noise.	Low-noise road surfaces, acoustic barriers near settlements, Tree planting buffers and green corridors

		This is also expected to be the case in terms of changes to noise pollution.		
Land Acquisition and Displacement	Lower-income households, those dependent on farming land affected	It is recognised that the compulsory purchase of homes or land can disrupt communities and cause financial and emotional distress. However the council's approach is to use CPO as a last resort and has been actively pursuing a negotiated approach to land acquisition. The scheme is anticipated to reach an agreement with seven landowners for the acquisition of their land, through negotiation. The land to be acquired is largely agricultural. It is not anticipated that the loss of agricultural land will have significant commercial economic impacts. However, if the CPO process is required to resolve any	Neutral	Herefordshire Council has been engaged with landowners regarding different options to minimise the impact of the scheme on land and properties. Relevant information exchange with affected landowners has been on-going for the last 18 months, with provisions being made to support affected landowners as far as possible. This includes maintaining access for an additional crop season, moving Public Rights of Way to maintain access in the local area and landowners being compensated for land required at commercial rates.

		outstanding issues they could have negative wellbeing impacts. These can be more pronounced for some protected characteristic groups (for example, children).		
--	--	---	--	--

7. Conclusion and recommendations

This assessment has considered the potential impacts of Phase One of the Hereford Western Bypass on groups with protected characteristics, informed by a review of baseline demographic data, relevant policy context, and the identification of potential construction and operational effects.

Overall, the assessment identifies a combination of temporary adverse effects during construction and longer-term beneficial effects during operation, particularly in relation to improved connectivity, reduced congestion along key links and potential economic opportunities. However, there are also localised negative impacts, including potential negative impacts associated with loss of land resulting if compulsory purchase becomes necessary, and some redistribution of environmental impacts (e.g. noise and air quality) to new areas.

In relation to the PSED under Section 149 of the Equality Act 2010, this EqlA provides evidence that Herefordshire Council has had due regard to the three statutory aims:

- **Eliminating unlawful discrimination, harassment and victimisation:**
The assessment has identified potential disproportionate impacts on certain groups (such as older people, children and disabled people), particularly during construction and in relation to accessibility and safety. Appropriate mitigation measures (e.g. traffic management, maintaining access, and environmental controls) have been recommended to minimise these risks.
- **Advancing equality of opportunity:**
The scheme has the potential to improve access to employment, services and healthcare – particularly for rural populations and those currently affected by congestion and poor connectivity. Consideration has also been given to the differing needs of protected groups, for example those with mobility impairments or increased reliance on public transport.
- **Fostering good relations between different groups:**
Based on the assessment, no overall impacts in terms of relations between different groups are expected as a result of the scheme.

The EqlA demonstrates that equality considerations have been embedded within the design and assessment process and that potential adverse impacts have been identified transparently alongside mitigation measures. However, the assessment also highlights some limitations, including the evolving nature of Phase 2 and limited primary consultation data specific to equality groups at this stage.

To strengthen ongoing compliance with the PSED, it is recommended that:

1. Communication with residents and protected characteristic groups is embedded within the construction communication plan to ensure local communities and groups are kept informed of progress and traffic management proposals and are given the opportunity to provide feedback. This can help to facilitate protected characteristic groups sharing specific needs or requirements during construction.
2. Construction management plans include specific measures to protect vulnerable groups (e.g. clear signage, safe diversions, accessible communications).
3. Monitoring and review mechanisms are established to track equality outcomes during construction and operation.
4. The EqlA is updated at key project milestones, including the progression of Phase 2, to ensure that equality considerations remain current and robust.

Appendix F – Economic Appraisal Report

Hereford Western Bypass Phase 1

Economic Appraisal Report

June 2026

Quality Information

Prepared by	Checked by	Approved by
David Harris	Mark Dazeley	Paul Bate
Associate Director	Regional Director	Regional Director

Revision History

Revision	Revision date	Details	Authorised	Name	Position
v1		For issue	Y	Mark Dazeley	Regional Director

Prepared by:

David Harris
Associate Director
david.harris@aecom.com

AECOM Limited
Aldgate Tower
2 Leman Street
London
E1 8FA

aecom.com

© 2026 AECOM Limited. All Rights Reserved.

AECOM Limited ("AECOM") has prepared this Report for the sole use of Herefordshire Council ("Client") in accordance with the terms and conditions of appointment (ref no: 60746644 Hereford Bypass Programme) dated February 2025 ("the Appointment").

AECOM shall have no duty, responsibility and/or liability to any party in connection with this Report howsoever arising other than that arising to the Client under the Appointment. Save as provided in the Appointment, no warranty, expressed or implied, is made as to the professional advice included in this Report or any other services provided by AECOM.

This Report should not be reproduced in whole or in part or disclosed to any third parties for any use whatsoever without the express written authority of AECOM. To the extent this Report is reproduced in whole or in part or disclosed to any third parties (whether by AECOM or another party) for any use whatsoever, and whether such disclosure occurs with or without the express written authority of AECOM, AECOM does not accept that the third party is entitled to rely upon this Report and does not accept any responsibility or liability to the third party. To the extent any liability does arise to a third party, such liability shall be subject to any limitations included within the Appointment, a copy of which is available on request to AECOM.

Where any conclusions and recommendations contained in this Report are based upon information provided by the Client and/or third parties, it has been assumed that all relevant information has been provided by the Client and/or third parties and that such information is accurate. Any such information obtained by AECOM has not been independently verified by AECOM, unless otherwise stated in this Report. AECOM accepts no liability for any inaccurate conclusions, assumptions or actions taken resulting from any inaccurate information supplied to AECOM from the Client and/or third parties.

Table of Contents

Section 1 – Overview	1
1.1 Introduction	1
1.2 Scheme Overview	1
1.3 Report Structure	2
Section 2 – Estimation of Scheme Costs	4
2.1 Introduction	4
2.2 Summary of Scheme Costs	4
Section 3 – Estimation of Benefits – TUBA	5
3.1 Introduction	5
3.2 TUBA Economic Assumptions	5
3.3 TUBA Annualisation Assumptions	5
3.4 Selected Count Data	5
3.5 Flow Profile by day type classification	6
3.6 Annualisation Factors	9
3.7 Masking of TUBA Forecasts	10
3.8 Summary of TUBA Forecasts	14
3.9 Review of TUBA Warnings	18
3.10 Distribution of Benefits	19
Section 4 – Estimation of Benefits – Greenhouse Gases	20
4.1 Introduction	20
4.2 TAG workbook	21
Section 5 – Estimation of Benefits – Construction Impacts	22
5.1 Summary	22
Section 6 – Estimation of Benefits – Accidents	24
6.1 Introduction	24
6.2 Input Files	24
6.3 Accident Rates and Area of Influence used in CoBA-LT Assessment	24
6.4 Estimated Accident Impact of the Proposed Scheme	25
Section 7 – Estimation of Benefits – Journey Time Reliability	27
7.1 Introduction	27
7.2 Methodology	27
7.3 Summary of Results	27
Section 8 – Local Noise Assessment	29
8.1 Summary	29
Section 9 – Air Quality Assessment	30
9.1 Summary	30
Section 10 – Wider Impacts Assessment	31
10.1 Introduction	31
10.2 Agglomeration	31
10.3 Labour supply impacts	31
10.4 Increased output in imperfectly competitive markets	31
10.5 Results	31
Section 11 – Assessment of Distributional Impacts	33
11.1 Introduction	33
11.2 Transport User Benefits	33
11.3 Noise	33
11.4 Air Quality	34
11.5 Accidents	34
11.6 Security	34
11.7 Accessibility	35

11.8 Severance.....	35
11.9 Personal Affordability	35
11.10 Summary	35
Section 12 – TEE, Public Accounts and AMCB Tables	37
12.1 Introduction	37

List of Tables

Table 2-1: Scheme Cost Calculation (£000s).....	4
Table 3-1: Number of days by classification type in 2025	6
Table 3-2: Allocation of hours (06:00-21:00) by day type classification to modelled time periods.....	9
Table 3-3: Final Annualisation Factors	10
Table 3-4: Included Sector-Sector Movements (Shown in Grey).....	12
Table 3-5: Discounted TUBA Benefits – Core Scenario, 2023 Prices and Values, £1000s	14
Table 3-6: Discounted TUBA Benefits (excluding greenhouse gases) by Time Period, 2023 Prices and Values, £1000s.....	15
Table 3-7: TUBA Benefits – High Economic Growth, 2023 Prices and Values, £1000s	17
Table 3-8: TUBA Benefits - Low Economic Growth, 2023 Prices and Values, £1000s.....	17
Table 3-9: TUBA Benefits by Scenario and Modelled Year, 2023 Prices and Values, £1000s	17
Table 3-10: Summary of TUBA Warnings	18
Table 4-1: Summary of Greenhouse Impacts	21
Table 6-1: Summary of Accident Assessment.....	25
Table 7-1: Summary of Reliability Benefits by User Class	28
Table 10-1: Benefits arising from agglomeration impacts, 2023 prices and values	32
Table 10-2: Benefits arising from labour supply Impacts, 2023 prices and values	32
Table 10-3: Benefits arising from increased output in imperfectly competitive markets, 2023 prices and values	32
Table 10-4: Summary of wider economic impacts, 2023 prices and values	32
Table 11-1: Distributional Impact Appraisal Matrix	35
Table 12-1: Transport Economic Efficiency (TEE) Table, 2023 Prices and Values, £000s	38
Table 12-2: Analysis of Monetised Costs and Benefits (AMCB), 2023 Prices and Values, £000s	39
Table 12-3: Analysis of Monetised Costs and Benefits (Adjusted), 2023 Prices and Values, £000s.....	40

List of Figures

Figure 1-1: Scheme Location	2
Figure 3-1: Location of Count Sites Used in Annualisation Calculation.....	6
Figure 3-2: Combined Flow Profile for Area of Influence (Weekday, Weekend, Holidays).....	7
Figure 3-3: Flow Profile and allocated time-period for annualisation (Weekdays)	8
Figure 3-4: Flow Profile and allocated time-period for annualisation (School holiday).....	8
Figure 3-5: Flow Profile and allocated time-period for annualisation (Weekend and Public holiday).....	9
Figure 3-6: TUBA Assessment Sector System: Hereford and surrounding area	10
Figure 3-7: TUBA Assessment Sector System: West England and Wales	11
Figure 3-8: TUBA Assessment Sector System: Furthest extent (excluding Scotland)	11
Figure 3-9: Core Scenario TUBA Benefits by Year (2023 Prices and Values, £000s).....	15
Figure 3-10: Discounted TUBA Benefits per hour	16
Figure 3-11: Discounted CAS TUBA Benefits by Year (2023 Prices and Values, £000s).....	18
Figure 3-12: Distribution of Travel Time Benefits by Forecast Change in Travel Time	19
Figure 4-1: VECAT analysis area	20
Figure 6-1: Defined Area of Influence for Accident Appraisal	25
Figure 11-1: SEISA Income Quintiles in the Area of Impact (Hereford)	33

Section 1 – Overview

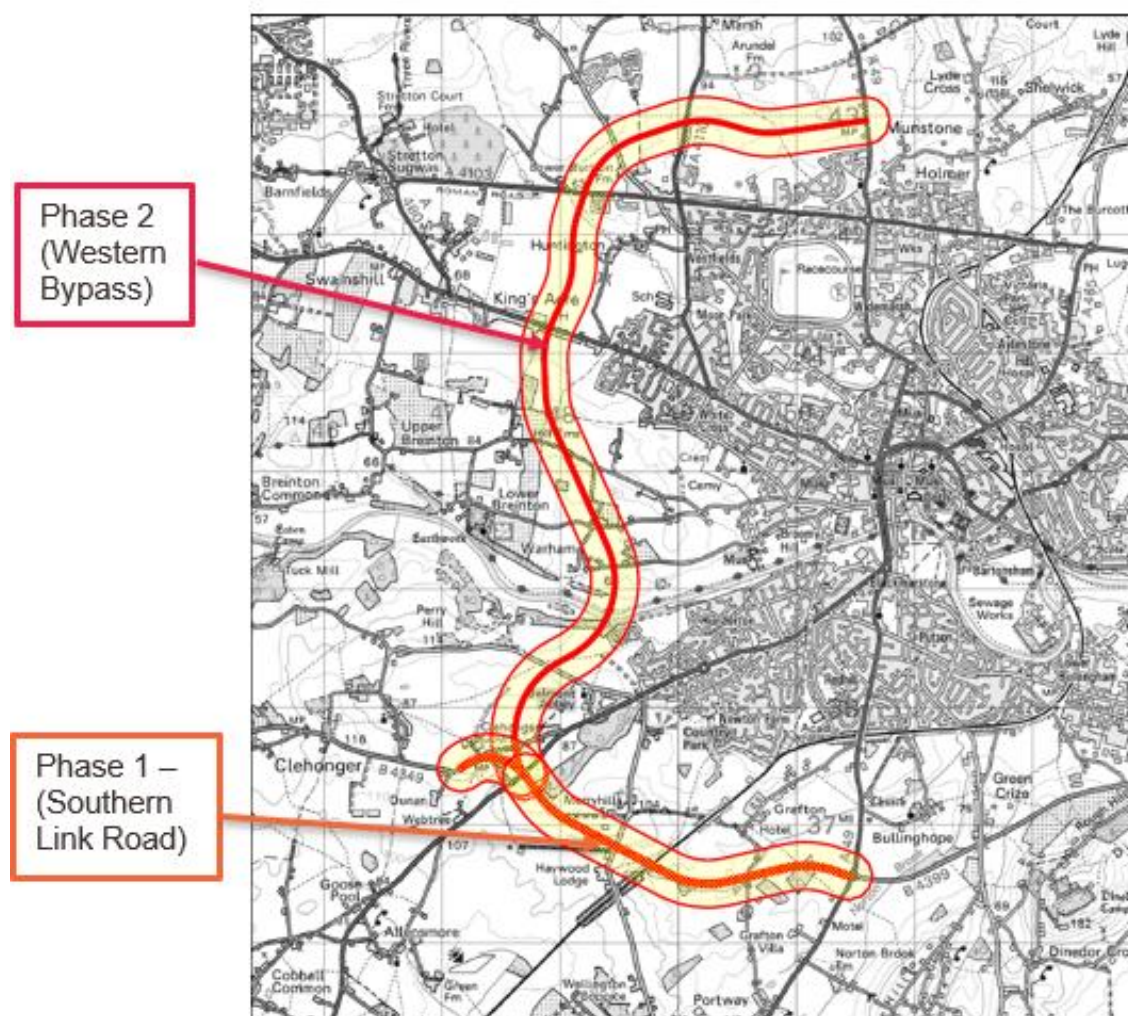
1.1 Introduction

- 1.1.1 This report presents an economic evaluation of the proposed Hereford Western Bypass Phase 1 scheme (called the “scheme”) using forecasts derived from the Hereford Strategic Transport Model (HSTM). The evaluation follows the methodology outlined in the Appraisal Specification Report and supports the Full Business Case (FBC) submission for the Scheme.
- 1.1.2 The economic assessment covers the results of the appraisal conducted using the Core Scenario but also includes sensitivity tests for the High and Low Scenarios from the Common Analytical Scenarios (CAS). It evaluates the scheme's impact on journey time reliability, physical activity and accidents. Additionally, the assessment considers the scheme's costs and includes these costs when calculating a Benefit Cost Ratio (BCR).
- 1.1.3 This Economic Appraisal Report outlines the forecast monetised impacts of the scheme. However, there are other important objectives and impacts that have not been monetised, which play a significant role in the decision-making process.

1.2 Scheme Overview

- 1.2.1 The full extent of the Western Bypass is shown in **Figure 1-1**, and is made-up of two parts; Phase One consisting of the road link between the A49 and A465 formerly referred to as the Southern Link Road (SLR) that is the “scheme”, and Phase Two which connects with Phase One at the A465 junction and forms the northern section of the route, linking back to the A49 north of the city. The alignment of Phase One is fixed and has the benefit of having full planning permission in place. The alignment of Phase Two is at an earlier stage of development with proposals expected in 2027.
- 1.2.2 Phase One will provide a new link road between the A465 and A49 to the south-west of Hereford city centre. It is a 3km long section of rural all-purpose single carriageway, with a design speed of 60mph. The scheme was developed to an advanced stage and received planning permission in 2016 (which remains extant), with work commencing on a Full Business Case (FBC) for the South Wye Transport Package (SWTP) (which included the Phase One scheme) in 2018.
- 1.2.3 The scheme seeks to address existing congestion and the associated traffic problems in the corridor, with the aim of facilitating future growth. Additionally, Phase One and Two combined seek to enhance network reliability and resilience by providing a second major road crossing of the River Wye to reduce reliance on the A49 Greyfriars Bridge.

Figure 1-1: Scheme Location



1.3 Report Structure

1.3.1 This Economic Appraisal Report contains the following sections:

- Section 2– Estimation of Scheme Costs, detailing the derivation of the costs of construction and maintenance for the Scheme.
- Section 3– Estimation of Benefits – TUBA, detailing the TUBA assessment to estimate the Core Scenario user benefits of the Scheme, and the assessment for High and Low Scenarios.
- Section 4– Estimation of Benefits – Greenhouse Gases; detailing the derivation of the assessment of Scheme-related greenhouse gases using the DfT's Vehicle Emissions Carbon Tool (VECAT) and greenhouse gases TAG workbook.
- Section 5– Estimation of Benefits – Construction Impacts: detailing the derivation of the assessment of Scheme-related construction impacts, using SATURN and TUBA software.
- Section 6– Estimation of Benefits – Accidents, detailing the application of the approach set out in CoBA-LT to assess the change in accidents forecast to result from the Scheme.
- Section 7– Estimation of Benefits – Journey Time Reliability: Journey Time Reliability: this section details the assessment of the benefits due to improved journey time reliability through the inclusion of the Scheme.
- Section 8– Local Noise Assessment: this section details the assessment of the impact of the Scheme on local traffic noise levels through the inclusion of the Scheme.
- Section 9– Air Quality Assessment: this section details the assessment of the impact of the Scheme on air quality levels with the inclusion of the Scheme.

- Section 10– Wider Impacts Assessment: this section summarises the assessment of the forecast Wider Impacts (as defined in TAG Unit A2.1) of the Scheme.
- Section 11– Assessment of Distributional Impacts: this section details the screening and assessment (where deemed necessary) of the distributional impacts of the Scheme in-line with the guidance set out in TAG Unit A4.2.
- Section 12– TEE, Public Accounts and AMCB Tables: this section provides the TAG Transport Economic Efficiency (TEE), Public Accounts, and Analysis of Monetised Costs and Benefits (AMCB) tables required for the Full Business Case submission.

Section 2 – Estimation of Scheme Costs

2.1 Introduction

- 2.1.1 This section details the costs of construction and maintenance of the Scheme as used in the economic assessment.

2.2 Summary of Scheme Costs

- 2.2.1 Project cost estimates encompass every expenditure necessary to deliver, operate, and maintain the Hereford Southern Bypass – Phase 1 throughout the full appraisal horizon. These costs cover:

1. Investment costs

- a. Capital construction
- b. Land and compensation
- c. Statutory undertakers' works
- d. Utility diversions
- e. Environmental mitigation measures
- f. Contractual administration and project management
- g. Design, supervision, and risk allowances

2. Operating, maintenance and renewal costs

- a. Routine maintenance (inspections, minor repairs)
- b. Periodic renewal (resurfacing, structural renewal)
- c. Lifecycle replacement over the appraisal period

- 2.2.2 The base costs for the scheme have been estimated through a bill of quantities. The costs encompass project development activities, construction, and support resources and are distributed between financial years 2026/27 and 2028/29. Sunk project development costs incurred between financial years 2024/25 and 2025/26 inclusive have been excluded as they are unrecoverable regardless of the scheme's construction.

- 2.2.3 The present value cost (PVC) of the scheme has been developed in line with DfT TAG Unit A1.2 Scheme Costs. The initial base cost has been calculated as the total cost developed through the bill of quantities, excluding sunk costs and QRA. This results in an initial base cost of £37.2m in 2026 prices.

- 2.2.4 DfT TAG Unit A1.2 requires an adjustment for optimism bias or contingency, with the larger value applied. An optimism bias uplift of 11.8% was derived through a mitigation assessment and exceeds the QRA uplift of 8.8%; therefore, the optimism bias adjustment has been applied, resulting in a cost of £41.8m in 2026 prices.

- 2.2.5 Costs were then deflated and discounted to 2023 values, resulting in a scheme cost of £33.2m. A market price adjustment was subsequently applied in accordance with DfT TAG Unit A1.2. This results in a total PVC of £39.59m in 2023 factor prices in accordance with WebTAG requirements. **Table 2-1** below summarises the Scheme cost calculations.

Table 2-1: Scheme Cost Calculation (£000s)

Base Cost (2026 prices)	Real Cost Adjustment (2026 Prices)	Optimism Bias Adjustment (2026 Prices)	Deflated, Discounted, and Corrected for Market Prices (2023 Prices)
£37,162.5	£37,381.5	£41,792.6	£39,558.1

Section 3 – Estimation of Benefits – TUBA

3.1 Introduction

- 3.1.1 TUBA is the Department for Transport's appraisal software used to estimate the transport user benefits (changes in time and vehicle operating costs), changes in indirect tax revenue and greenhouse gases as the result of a proposed scheme.
- 3.1.2 Using the forecast year models developed for the appraisal of the Scheme, the forecast demand, time and distance matrices for the Without and With Scheme forecasts for the Core Scenario have been used for the TUBA assessment.
- 3.1.3 This assessment has used forecast models for the following years:
- 2028 – Opening Year for the Scheme;
 - 2043 – Design Year, 15 years after the Opening Year; and
 - 2061 as the forecast horizon year.
- 3.1.4 A 60-year appraisal period has been adopted, in-line with TAG, from the assumed scheme opening year of 2028 to a horizon year of 2087. The current year assumed within the assessment is 2026, with the benefits and costs given in 2023 prices and values.

3.2 TUBA Economic Assumptions

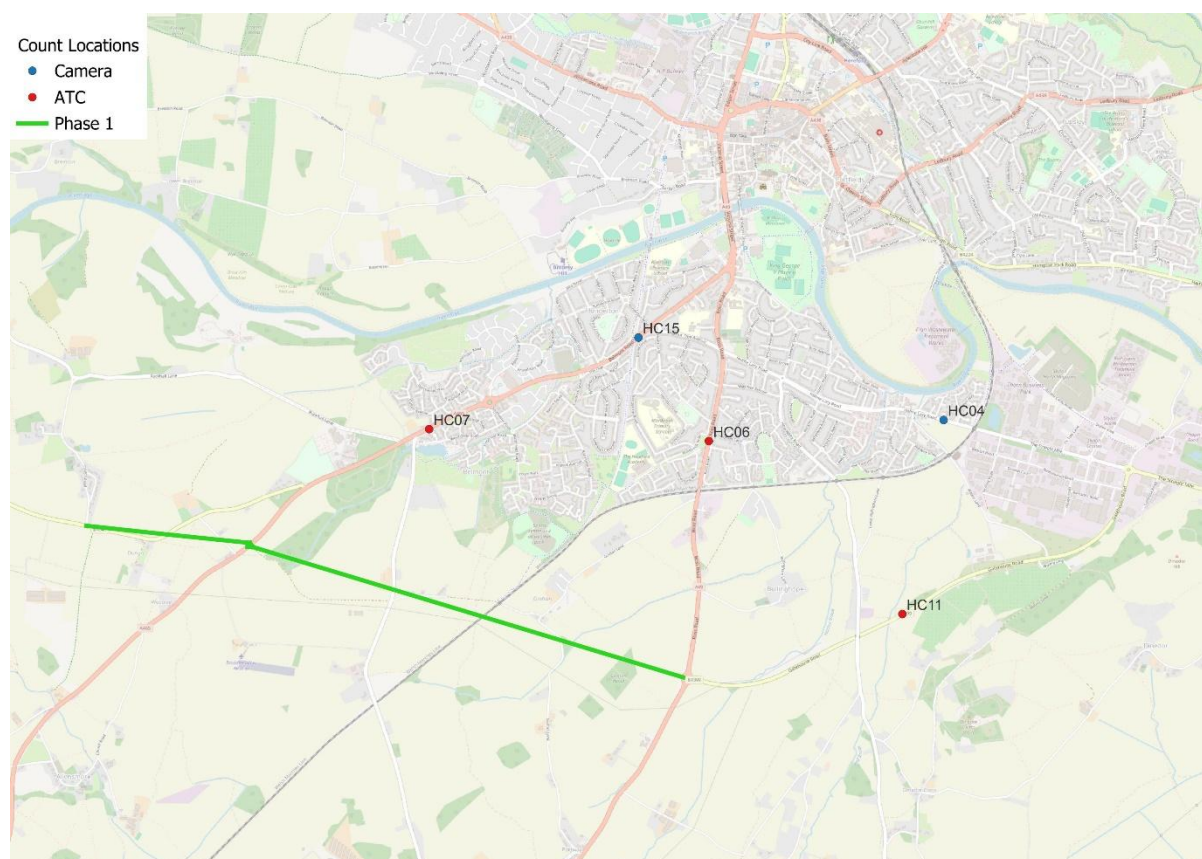
- 3.2.1 The assessment of the Scheme has made use of the standard TUBA economics file issued with v1.10.01 of the software based on the V2.03 TAG databook (May 2026); however, amendments have been made to the file to provide consistency with the user classes in the HSTM highway assignment.
- 3.2.2 The latest May 2026 TUBA Economic parameters file contains revised vehicle type assumptions for LGV personal and LGV freight. Within HSTM, the highway model includes a single LGV user class. To make the model outputs compatible, we have applied splits to LGV and HGV to increase the number of user classes input to TUBA from five to seven with LGV split into Freight/No-freight and HGV split into OGV1 and OGV2
- 3.2.3 This change has been made to all relevant TUBA economics files, including the High and Low scenarios as well as the standard file.

3.3 TUBA Annualisation Assumptions

- 3.3.1 The highway model contained within HSTM represents three weekday modelled hours; an AM peak hour (08:00 to 09:00), an average interpeak hour (between 09:00 and 15:00), and a PM peak hour (16:00 to 17:00). In addition, there is Saturday peak hour (11:00 to 12:00).
- 3.3.2 A freeflow hour assignment using negligible demand was also created to reflect uncongested travel conditions outside of the peak hours during a typical week. This assignment would reflect time savings of the scheme only and not the impacts of congestion so would be a conservative estimate of benefits for hours with moderate traffic levels.
- 3.3.3 Time and distance data from these five representative modelled hours are used as an input to TUBA, along with factors to reflect how many hours in a year each reflect so that annual benefits can be calculated. These are referred to as annualisation factors and their derivation is discussed in the following sections.

3.4 Selected Count Data

- 3.4.1 Long-term automatic traffic count data have been obtained for locations south of Hereford, close to the scheme, for the full years of 2023, 2024 and 2025. Within this data set, five count sites were identified within the Scheme area. **Figure 3-1** shows the locations of the count sites selected. Data from the five sites were analysed; checks were undertaken to ensure that British Summer Time (BST) was correctly reflected and data was consistent between ATC sites and ATC locations.

Figure 3-1: Location of Count Sites Used in Annualisation Calculation

© OpenStreetMap contributors

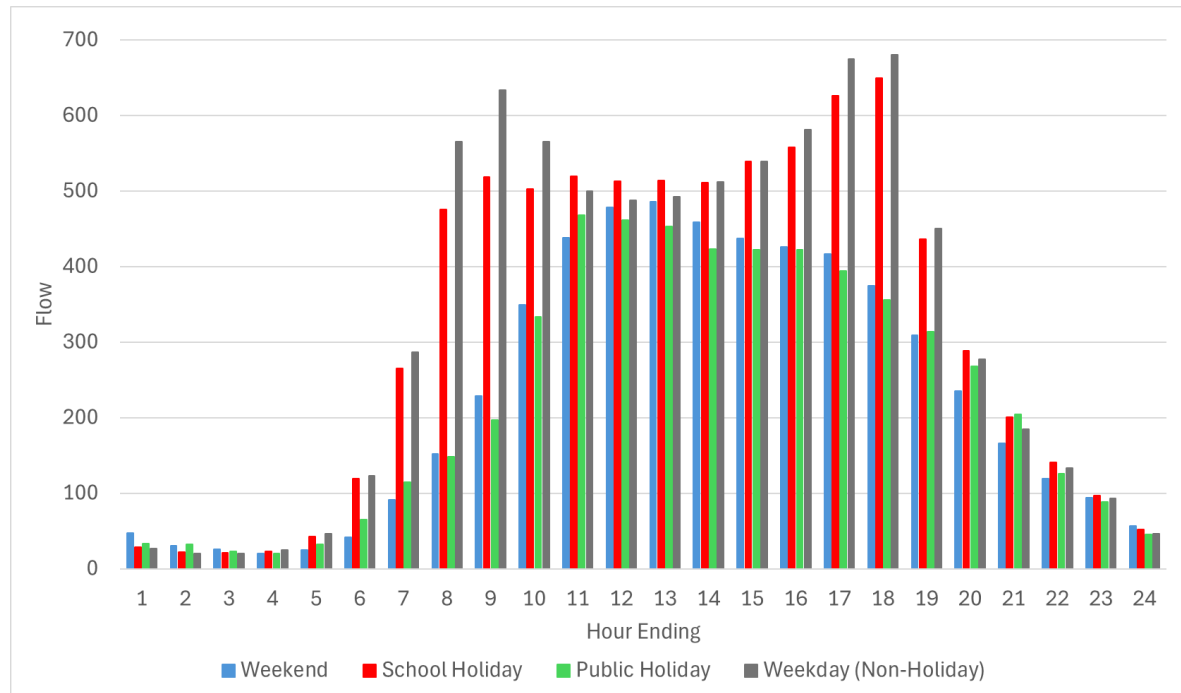
- 3.4.2 Data from all sites were processed for use in the annualisation calculations, with each dataset undergoing cleaning and quality assurance checks. Days throughout the year were categorised according to school holidays, public holidays, weekdays, weekends, and individual days of the week to identify distinct travel patterns.
- 3.4.3 Analysis indicated that the majority of sites exhibited similar traffic patterns, with the exception of HC11. Consequently, it was considered unnecessary to include all sites in the final analysis, and only HC06 and HC11 were retained as representative examples.
- 3.4.4 Sensitivity testing was undertaken using alternative assumptions, including the inclusion of all sites. However, these tests had a negligible impact on the resulting annualisation factors. This is because the factors are primarily influenced by the distribution of traffic within the AM peak, interpeak, and PM peak periods, and the variation observed between sites during these periods was insufficient to materially affect the calculated annualisation factors.
- 3.4.5 Analysis of the travel patterns showed that there were distinct patterns for each of the following day types shown in Table 3-1 with the number of days each represents in 2025.

Table 3-1: Number of days by classification type in 2025

Day Type	Quantity in 2025
Public Holiday	8
Weekend	104
Weekday	199
School Holiday	54
Total	365

3.5 Flow Profile by day type classification

- 3.5.1 **Figure 3-2** presents the weighted average profiles for HC06 and HC11 by day type. The results indicate that the traffic profiles for public holidays and weekends are sufficiently similar to justify combining these categories. It is also evident that the characteristic AM peak observed on typical weekdays is largely absent during school holiday periods, reflecting a reduction in school-related travel demand.

Figure 3-2: Combined Flow Profile for Area of Influence (Weekday, Weekend, Holidays)

- 3.5.2 **Figure 3-3 to Figure 3-5** present the flow profiles for a typical non-holiday weekday, a school holiday weekday, and a combined weekend/public holiday day type. Each hour has been allocated to one of the modelled periods described in **Section 3.3**.
- 3.5.3 The profiles indicate that off-peak flow patterns are generally consistent across all day-type classifications. For weekends and public holidays, traffic flows remain relatively uniform between 10:00 and 17:00, with demand levels comparable to those observed during the Saturday modelled period. During school holidays, the AM peak period is notably less pronounced, with demand levels similar to those observed during the interpeak period.
- 3.5.4 **Figure 3-3 to Figure 3-5** also demonstrate the presence of shoulder peak periods. On weekdays, these occur immediately following the PM peak, while on weekends and public holidays they are evident during both the morning and evening periods. For the purposes of the annualisation calculations, these shoulder peak periods have been assumed to be representative of interpeak demand levels and have therefore been assigned the corresponding interpeak costs.

Figure 3-3: Flow Profile and allocated time-period for annualisation (Weekdays)

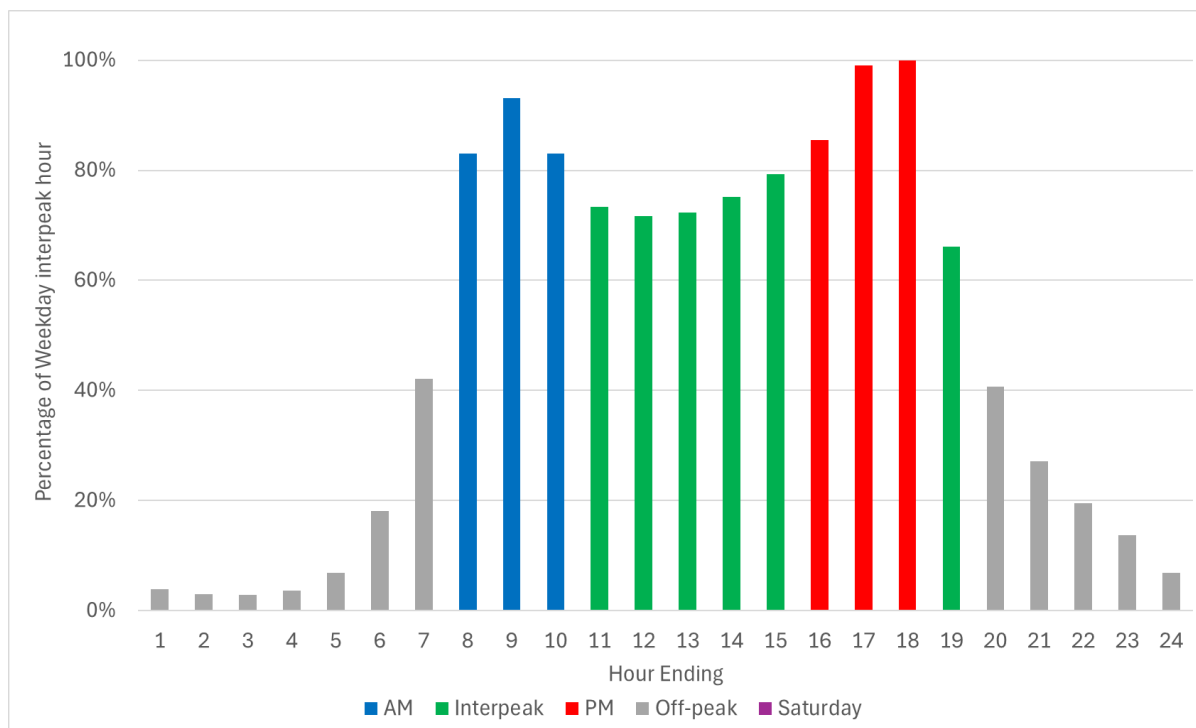


Figure 3-4: Flow Profile and allocated time-period for annualisation (School holiday)

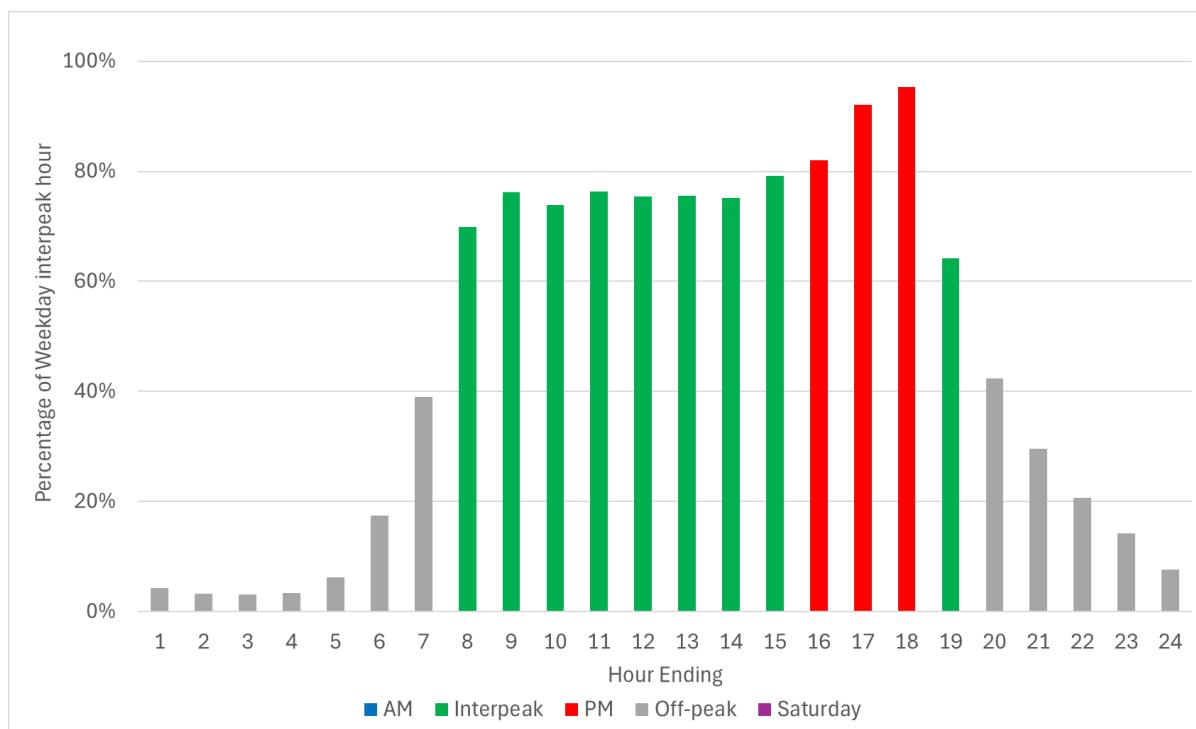
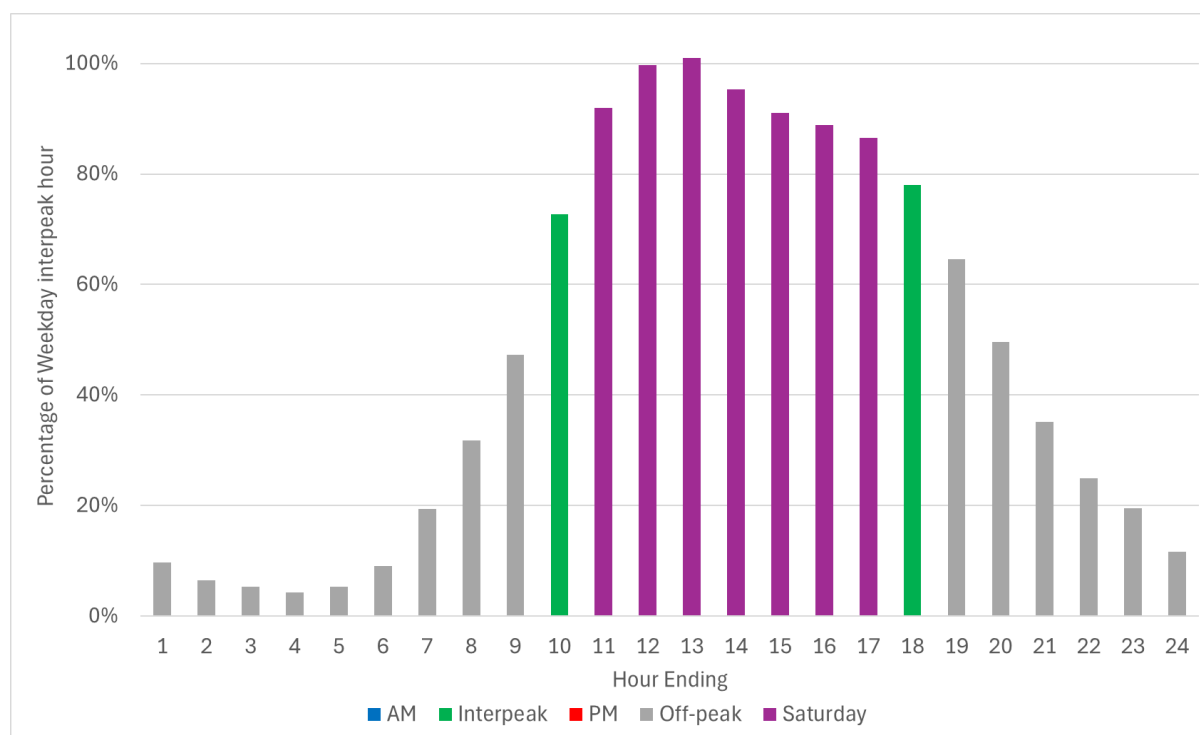


Figure 3-5: Flow Profile and allocated time-period for annualisation (Weekend and Public holiday)



- 3.5.5 Based on the observed flow profiles and the assumptions described above, each hour of the day has been allocated to the most appropriate modelled time period for the purposes of the annualisation calculations. **Table 3-2** summarises the allocation of hours by day-type classification to the corresponding modelled period.
- 3.5.6 The allocations reflect the temporal distribution of traffic demand observed within each day type, including the treatment of shoulder peak periods as representative of interpeak conditions. The resulting classifications provide the basis for applying the appropriate demand and cost assumptions when deriving annualisation factors.
- 3.5.7 Hours between 21:00 and 06:00 have been excluded from **Table 3-2** as these periods are consistently characterised by low traffic volumes across all day types and have been assumed to represent off-peak conditions for both demand and cost calculations.

Table 3-2: Allocation of hours (06:00-21:00) by day type classification to modelled time periods

Hour	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Weekday	OP	AM	AM	AM	IP	IP	IP	IP	IP	PM	PM	PM	IP	OP	OP
School holiday	OP	IP	IP	IP	IP	IP	IP	IP	IP	PM	PM	PM	IP	OP	OP
Weekend and Public Holiday	OP	OP	OP	IP	S	S	S	S	S	S	S	IP	OP	OP	OP

3.6 Annualisation Factors

- 3.6.1 **Table 3-3:** presents the final annualisation factors derived from the analysis described above. The factors have been calculated using the classified day-type profiles and the allocation of hours to the modelled time periods, taking account of variations in traffic demand across weekdays, school holidays, weekends, and public holidays.
- 3.6.2 In addition to the annualisation factors, the table sets out the demand and cost assumptions applied to each time period for input into TUBA. For each modelled period, the table identifies the representative demand level used in the calculations and the corresponding cost basis assumed for annualisation.

Table 3-3: Final Annualisation Factors

Period	Description	Demand	Cost	Factor
1	AM Peak (weekday)	AM	AM	554
3	Interpeak	IP	IP	1793
2	PM Peak (weekday + school holiday)	PM	PM	718
4	Off-Peak	IP	Freeflow	1016
5	Weekend+ Bank Holiday	Saturday	IP	840

3.7 Masking of TUBA Forecasts

3.7.1 It is typical for any highway assignment model of the scale of HSTM to exhibit model ‘noise’ between any two assignment results. This can manifest itself as changes in assigned volumes and / or travel costs between the ‘With Scheme’ and ‘Without Scheme’ forecasts in areas of the model not expected to be impacted by the scheme.

3.7.2 A sectoring system has been defined (largely based on Middle Layer Super Output Areas and Districts within Herefordshire and counties surrounding Herefordshire) to remove this model assignment noise from the economic assessment of the scheme. Benefits and disbenefits between sectors which are not expected to experience any change in travel costs due to the scheme are removed from the assessment.

3.7.3 **Figure 3-6** to

3.7.4 **Figure 3-8** show the sector system adopted, with **Table 3-4** showing the movements which have been included (highlighted in grey) and excluded (unhighlighted) from the assessment. In summary:

- all movements to / from the Area of Influence have been included in the assessment except for trips from Central Hereford; and
- for other movements, only those considered likely to experience a material change in travel conditions as a result of the scheme have been included.

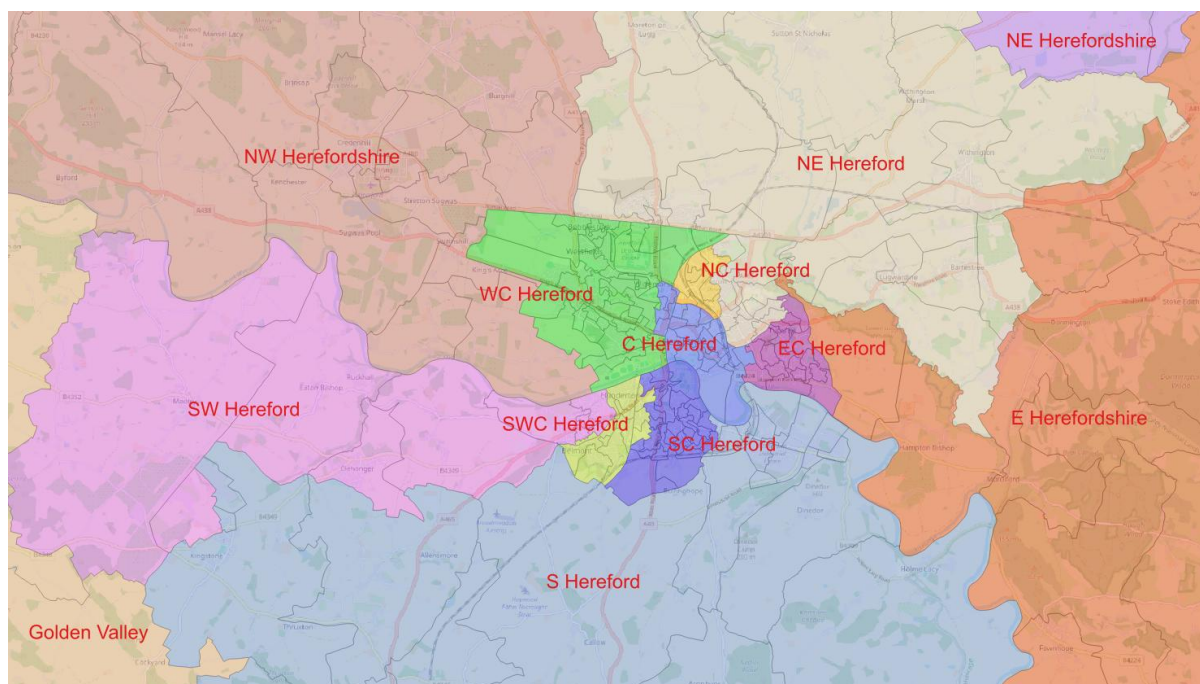
Figure 3-6: TUBA Assessment Sector System: Hereford and surrounding area

Figure 3-7: TUBA Assessment Sector System: West England and Wales

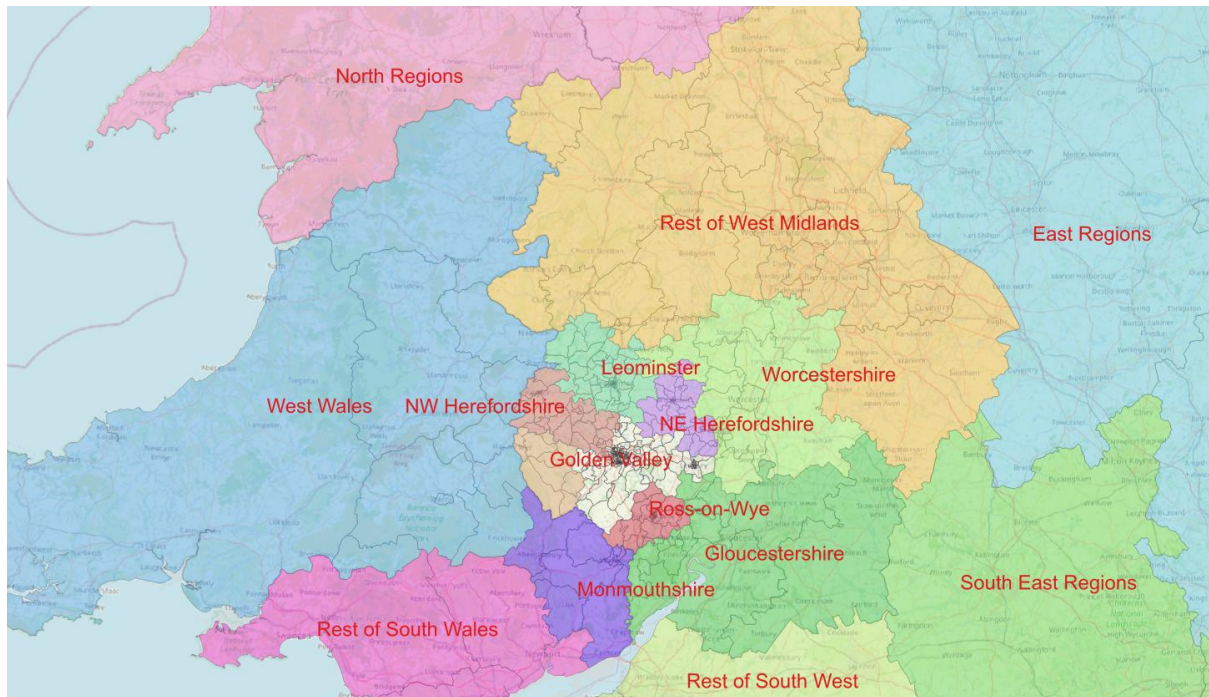


Figure 3-8: TUBA Assessment Sector System: Furthest extent (excluding Scotland)



Table 3-4: Included Sector-Sector Movements (Shown in Grey)

	NC Hereford	C Hereford	EC Hereford	WC Hereford	NE Hereford	SC Hereford	S Hereford	SWC Hereford	SW Hereford	E Herefordshire	NW Herefordshire	Ross-on-Wye	Golden Valley	Leominster	NE Herefordshire	Rest of West Midlands	Worcestershire	Gloucestershire	Monmouthshire	Rest of South Wales	West Wales	North Regions	East Regions	South East Regions	Rest of South West	Scotland
NC Hereford																										
C Hereford																										
EC Hereford																										
WC Hereford																										
NE Hereford																										
SC Hereford																										
S Hereford																										
SWC Hereford																										
SW Hereford																										
E Herefordshire																										
NW Herefordshire																										
Ross-on-Wye																										
Golden Valley																										
Leominster																										
NE Herefordshire																										
Rest of West Midlands																										
Worcestershire																										
Gloucestershire																										
Monmouthshire																										
Rest of South Wales																										
West Wales																										
North Regions																										
East Regions																										
South East Regions																										
Rest of South West																										
Scotland																										

NE Herefordshire																												
Rest of West Midlands																												
Worcestershire																												
Gloucestershire																												
Monmouthshire																												
Rest of South Wales																												
West Wales																												
North Regions																												
East Regions																												
South East Regions																												
Rest of South West																												
Scotland																												

3.8 Summary of TUBA Forecasts

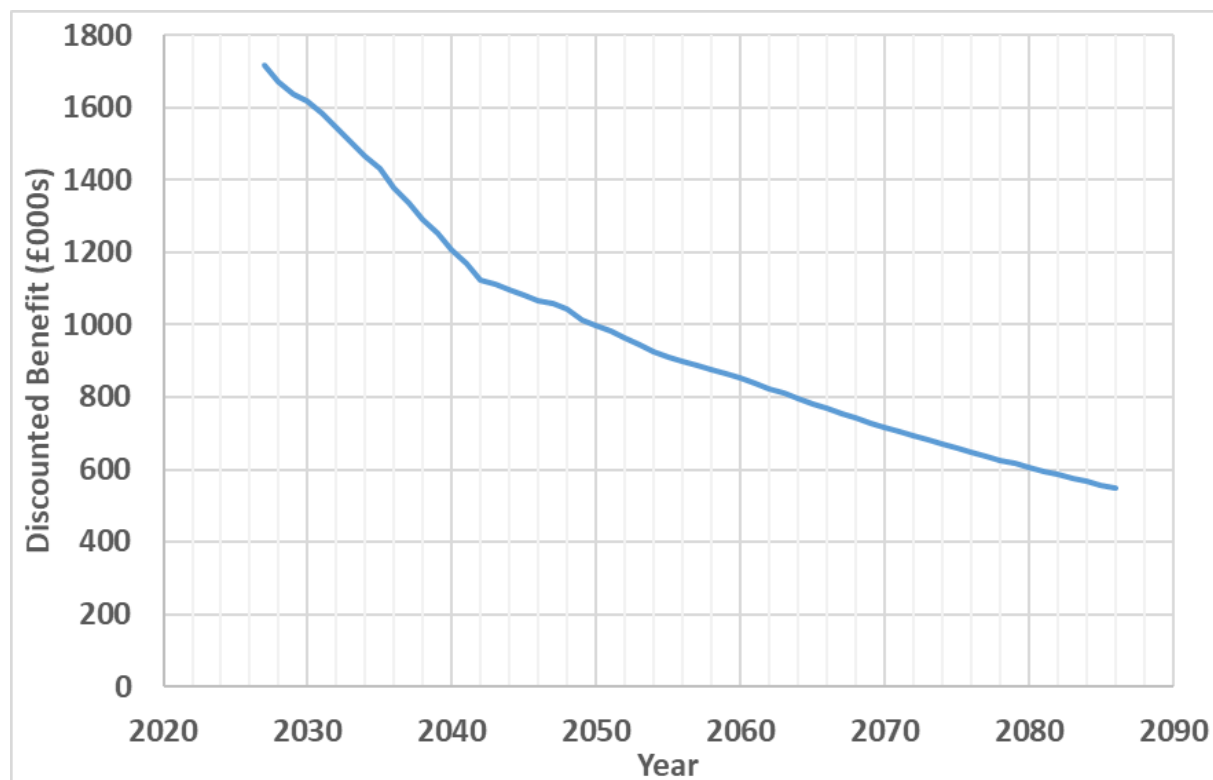
- 3.8.1 **Table 3-5** summarises the TUBA scheme benefits for the Core Scenario including benefits accumulated over the 60-year appraisal period which includes all the modelled forecast years.
- 3.8.2 **Table 3-5** also provides a breakdown of the scheme benefits by trip purpose, split by travel time savings and changes in vehicle operating costs, and for indirect tax revenues as required within the TAG Transport Economic Efficiency (TEE) table.
- 3.8.3 Table 3-5 shows that for the Core Scenario the estimated present value of benefits from the TUBA assessment is around £58m over the 60-year appraisal period. This includes forecasts of around £52m in travel time benefits, £14m of vehicle operating cost benefits and a £7.5m increase in indirect tax revenues.
- 3.8.4 TUBA also reports greenhouse gas impacts. TUBA greenhouse gas impacts are not used for the FBC and are thus not reported in this EAR. A separate greenhouse gas assessment has been calculated outside TUBA using the DfT's VECAT. This is discussed in Section 4.

Table 3-5: Discounted TUBA Benefits – Core Scenario, 2023 Prices and Values, £1000s

	Travel Time	Vehicle Operating Costs	Total
Non-Business: Commuting	£11,961	£47	£12,008
Non-Business: Other	£22,764	£15,734	£38,498
Business (Freight)	£9,571	-£1,175	£8,396
Business (Personal)	£7,378	-£544	£6,834
Total	£51,674	£14,062	£65,736

Indirect Tax Revenues	-£7,490
Present Value of Benefits	£58,246

- 3.8.5 TUBA assumes that the input time, distance and demand matrices are constant after the final forecast year of 2061. The only impact on benefits after the final modelled year are changes in value of time and discounting. This usually results in a “tailing off” of the scheme benefits after the final modelled year.
- 3.8.6 **Figure 3-9** below shows this in graph form. The scheme benefits, even allowing for discounting, increase after the scheme opening year until the scheme design year of 2043. From this point, the Scheme benefits no longer increase at a rate to offset the impact of discounting and start to decrease, with the decrease occurring faster after the final modelled year of 2061.

Figure 3-9: Core Scenario TUBA Benefits by Year (2023 Prices and Values, £000s)

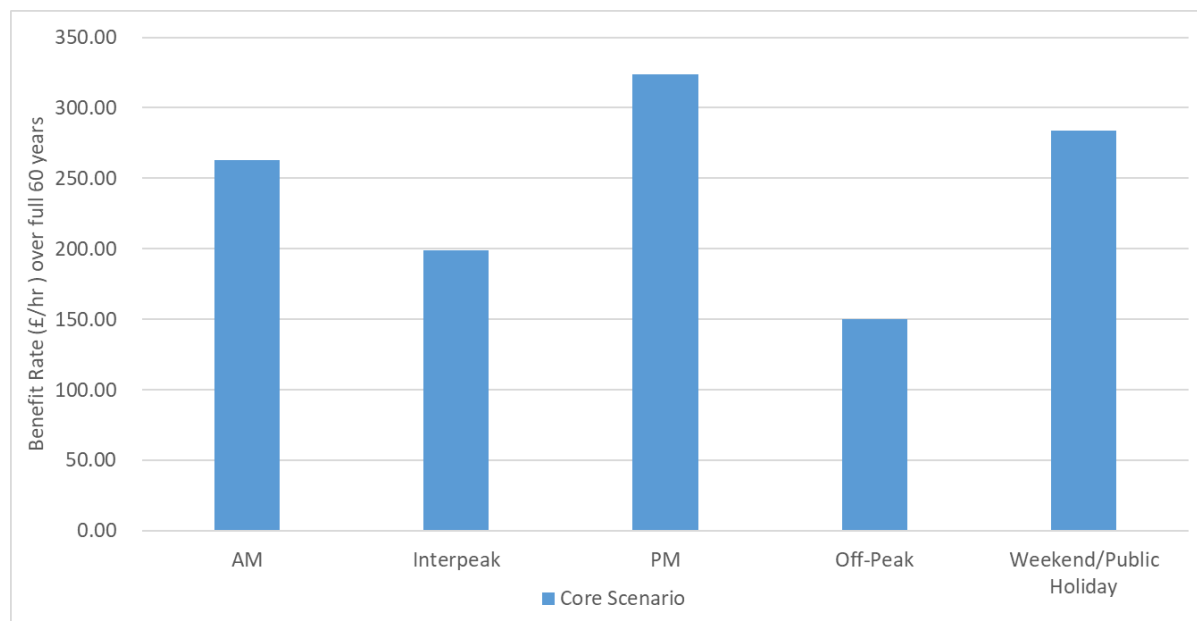
- 3.8.7 **Table 3-6** provides a breakdown in the forecast scheme benefits by the five time periods included within the TUBA assessment and combined for the three modelled forecast years of 2028, 2043 and 2061. The overall 60-year appraisal value is also included.
- 3.8.8 The results in **Table 3-6** are strongly influenced by the calculated annualisation factors, among which the annualisation factor for the Interpeak period is the largest.

Table 3-6: Discounted TUBA Benefits (excluding greenhouse gases) by Time Period, 2023 Prices and Values, £1000s

Year	AM	Interpeak	PM	Off-Peak	Weekend	60 year Total
Core Scenario	£8,732	£21,379	£13,953	£9,156	£12,514	£65,734

Note: figures may not match those presented in Table 3-5 due to rounding within the TUBA output files

- 3.8.9 **Figure 3-10** shows the forecast scheme benefits within the four time periods expressed on a per hour basis, i.e. excluding the effects of annualisation. This figure shows that forecast scheme benefits per hour are forecast to be highest in the morning, evening and weekend peaks, with the lowest levels of scheme benefits per hour forecast during the interpeak and off-peak.

Figure 3-10: Discounted TUBA Benefits per hour

Common Analytical Scenarios

- 3.8.10 As detailed within the 'HSTM Core Scenario Forecasting Report', the HSTM model can be set up to test CAS sensitivity tests using the methodology detailed within the TAG Uncertainty Toolkit and TAG Unit M4.
- 3.8.11 The CAS are a set of seven consistent, off-the-shelf and multi-modal scenarios exploring national level uncertainties which have been developed by the DfT for the purposes of sensitivity testing of forecasts. As described in Section 4.1.2 of Unit M4, the CAS are preferred substitutes for the High and Low Growth Scenarios.
- 3.8.12 Two of the CAS were selected for assessment, based on their relevancy to the scheme and likely impacts on the scheme appraisal. These CAS are:
- High Economic Growth;
 - Low Economic Growth;
- 3.8.13 Using these CAS sensitivity tests, TUBA assessments of the scheme benefits have been undertaken using all the forecast years. The appropriate TUBA economics file has been used in each case, as discussed in the TUBA 1.10.01 CAS guidance document. The results of these sensitivity tests are detailed in **Table 3-7** and **Table 3-8**.

Table 3-7: TUBA Benefits – High Economic Growth, 2023 Prices and Values, £1000s

	Travel Time	Vehicle Operating Costs	Total
Non-Business: Commuting	£13,648	-£16	£13,632
Non-Business: Other	£25,392	£16,727	£42,119
Business (Freight)	£10,724	-£1,348	£9,376
Business (Personal)	£8,435	-£515	£7,920
Total	£58,199	£14,848	£73,047

Indirect Tax Revenues	-£7,959
Present Value of Benefits	£65,088

Table 3-8: TUBA Benefits - Low Economic Growth, 2023 Prices and Values, £1000s

	Travel Time	Vehicle Operating Costs	Total
Non-Business: Commuting	£10,798	£79	£10,877
Non-Business: Other	£20,374	£14,989	£35,363
Business (Freight)	£8,857	-£1,172	£7,685
Business (Personal)	£6,015	-£483	£5,532
Total	£46,044	£13,413	£59,457

Indirect Tax Revenues	-£7,235
Present Value of Benefits	£52,222

3.8.14 The results of the CAS sensitivity tests are as would be expected. The High Economic Growth scenario produces larger benefits as the scenario involves greater levels of economic growth and corresponding higher traffic levels, which in-turn cause more congestion in the Without Scheme case. The Behavioural and Low Growth scenarios produce correspondingly lower benefits due to lower levels of growth and car traffic growth.

3.8.15 The following table provides further detail on the forecast scheme benefits detailed above. **Table 3-9** provides a summary of the forecast scheme benefits for the Core Scenario and the CAS.

Table 3-9: TUBA Benefits by Scenario and Modelled Year, 2023 Prices and Values, £1000s

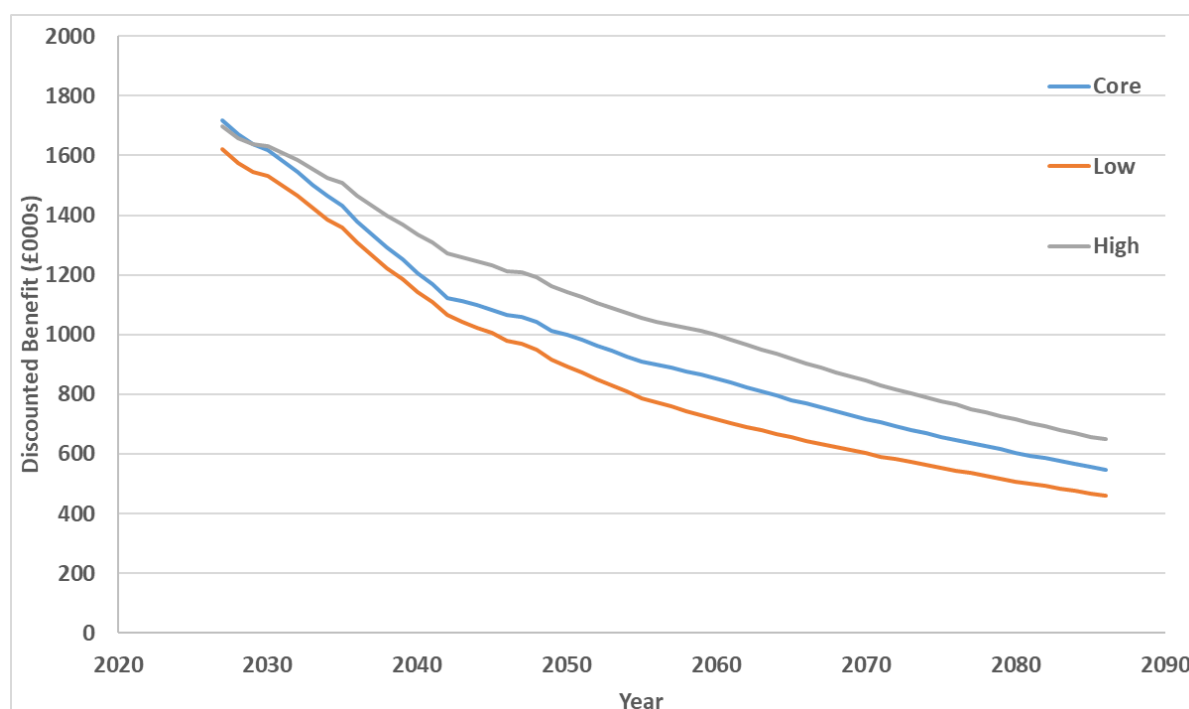
Scenario	2028	2043	2061	60-year Total
Core Scenario	£2,545	£1,210	£903	£65,736
Low Economic Growth	£2,448	£1,147	£757	£59,457
High Economic Growth	£2,540	£1,374	£1,051	£73,047

Note: figures may not match those presented in Table 3-5 due to rounding within the TUBA output files

3.8.16 **Figure 3-11** illustrates the annual distribution of the CAS TUBA benefits. It highlights that the benefits for the Core Scenario generally sit between the High and Low Economic Growth scenarios by year as

well as for the total benefits over the 60-year period. The benefit profiles for the other CAS scenarios closely follow that of the Core Scenario.

Figure 3-11: Discounted CAS TUBA Benefits by Year (2023 Prices and Values, £000s)



Note: figures may not match those presented in Table 3-5 due to rounding within the TUBA output files

3.9 Review of TUBA Warnings

- 3.9.1 In-line with the guidance given by the TUBA User Manual and associated guidance notes, all warnings produced by the Core Scenario have been investigated. In total, TUBA identified 85,416 warnings, none of them “serious”.
- 3.9.2 The TUBA User Manual Tables 5.2 to 5.4 outline the various limits used by TUBA to identify warnings. There is also information on how serious warnings are identified, which occur where the ratio of the Without Scheme to With Scheme time or distance is above 3 or below 1/3. **Table 3-10** briefly outlines the warnings produced by TUBA for this scheme assessment.

Table 3-10: Summary of TUBA Warnings

Warning	Total	Serious
DS speeds greater than limit for the following	130,824	0
DS speeds less than limit for the following	234,839	0
DM speeds greater than limit for the following	130,668	0
DM speeds less than limit for the following	235,951	0
Ratio of DM to DS travel distance lower than limit	13,677	0
Ratio of DM to DS travel distance higher than limit	4,220	0
Ratio of DM to DS travel time higher than limit	15,196	0

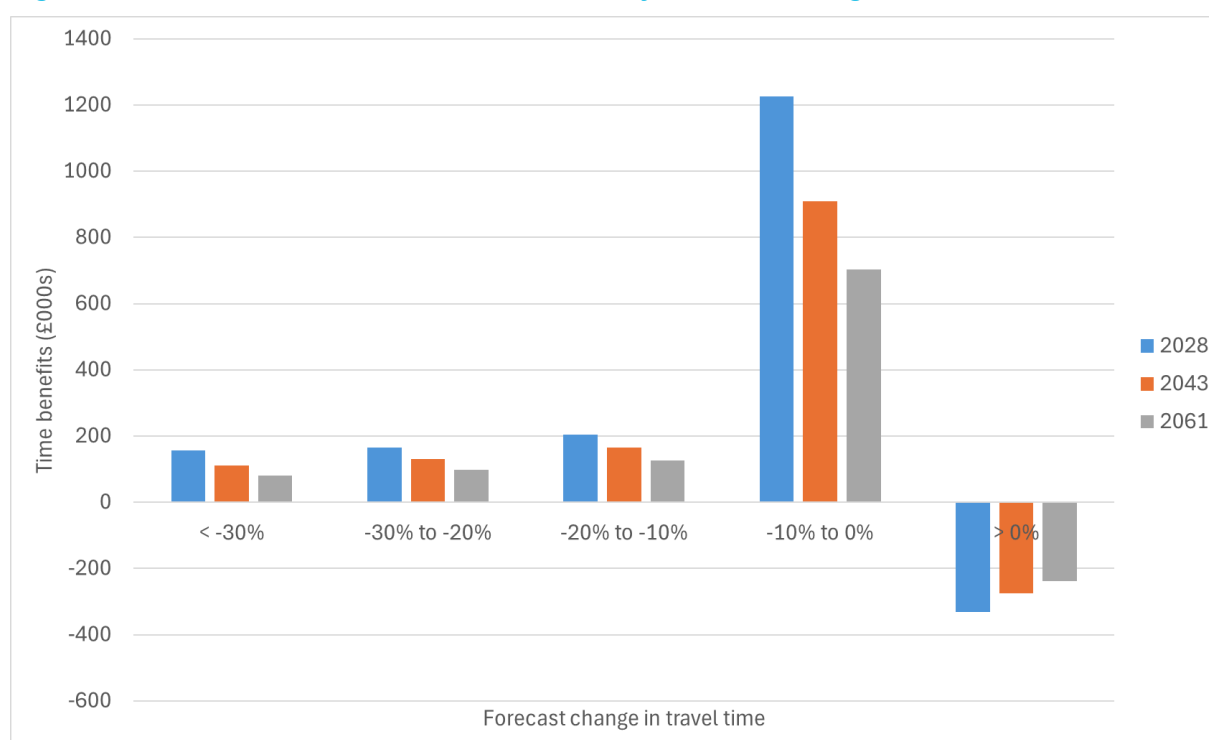
- 3.9.3 All the warnings produced by TUBA when assessing the Core Scenario have been reviewed.
- 3.9.4 Time ratios are outside TUBA's preferred range of 0.67-1.5 for a (proportionally) small number of cells and none of these warnings are serious (outside the range 0.3-3). The total trips associated with cells with time ratio warnings is of the order of ~60 across all purposes for each modelled year. This is very small number compared to the overall number of trips. Accordingly, it was decided that there is no need for numerical interpolation to address any material rule-of-half errors.

- 3.9.5 The distance ratios are exceeded by the order of ~130 across all purposes for each modelled year. This is still a very small number compared to the overall number of trips and with similarly negligible effect on total user benefit.
- 3.9.6 A very large number of “speeds outside range” warnings are generated (none of them serious).
- 3.9.7 Speeds greater than the limit of 85kph are numerous, the largest speed generated being 99 kph. However, these relate almost entirely to HGV travel and generally represent motorway movements external to the AOI. The substantial majority have zero trips; they represent around 1,200 trips in total in 2043, almost entirely external-external trips.
- 3.9.8 There are also a large number of speeds below than the limit of 12kph, but the vast majority of these have zero trips. The non-zero cells represent around 400 trips in total, with speeds ranging from 3-12 kph, and exclusively very short local movements of less than 2.5km. This number of small trips will not have a material impact on overall benefits.

3.10 Distribution of Benefits

- 3.10.1 The distribution in benefits by the change in forecast travel times was also reviewed. A plot of the distribution of benefits by change in travel times is shown in **Figure 3-12**.
- 3.10.2 As can be seen in **Figure 3-12**, most benefits are associated with relatively small changes in travel times. Most travel time benefits (and negative impacts) are associated with a change of minus 10% to plus 10% in forecast travel times. This trend is also constant across all forecast years, showing stability in the model forecasts and the estimate of travel time changes.

Figure 3-12: Distribution of Travel Time Benefits by Forecast Change in Travel Time



Section 4 – Estimation of Benefits – Greenhouse Gases

4.1 Introduction

4.1.1 The DfT's Vehicle Emissions Carbon Tool (VECAT) and the DfT's greenhouse gases TAG workbook have been used to estimate the greenhouse gas impact of the scheme.

4.1.2 Vehicle Emissions Carbon Tool

4.1.3 The methodology outlined in Department for Transport (DfT) Transport Appraisal Guidance (TAG) Unit A3 has been followed in this assessment, alongside the use of VECAT.

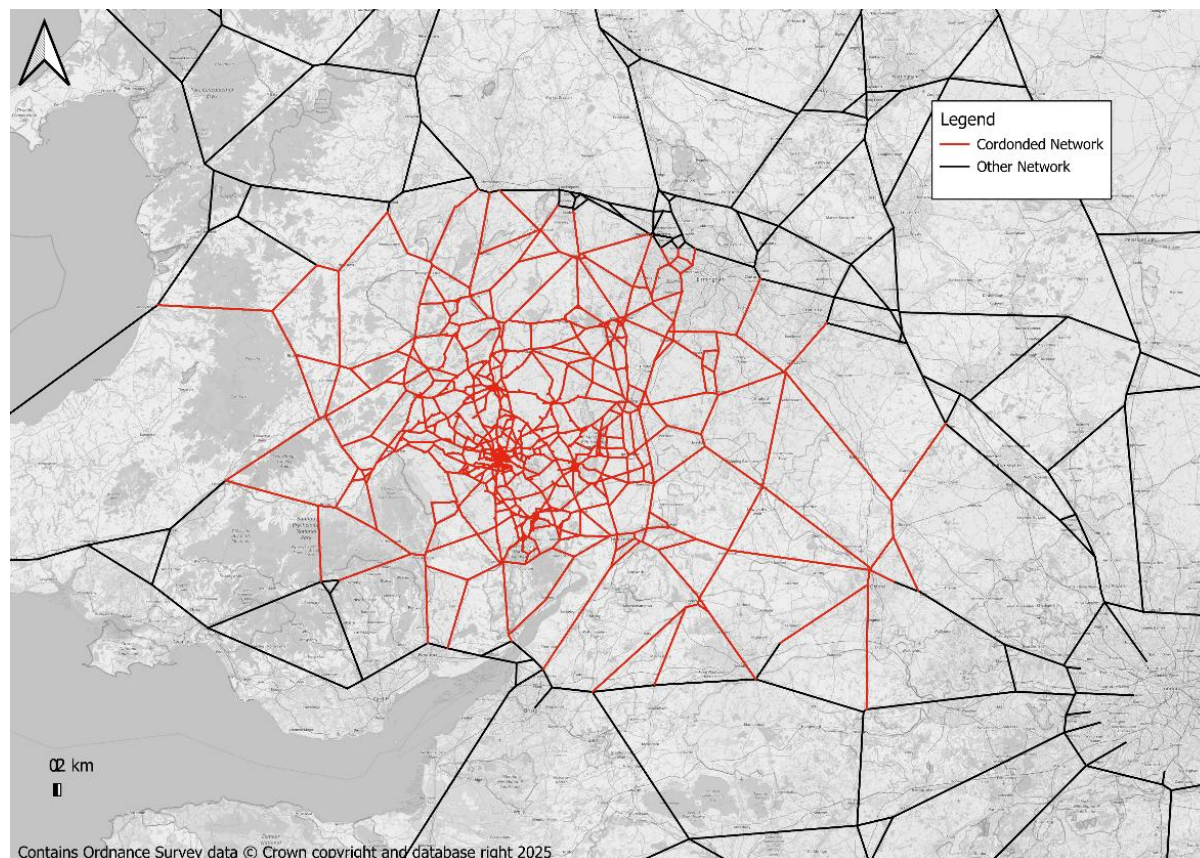
4.1.4 The TAG greenhouse gases workbook is used to assess the monetary value of the impacts of proposed transport schemes on CO₂(e) emissions over a 60-year appraisal period.

4.1.5 To inform the assessment, traffic data were extracted from the HSTM (AM peak hour, interpeak average, PM peak hour, Off-Peak and weekend periods) for Without Scheme and With Scheme forecasts in the forecast years (2028, and 2043)¹.

4.1.6 VECAT v1.01 was used in the estimation of CO₂(e) emissions for time period-flow traffic data for each modelled year, with and without the scheme. The assessment was undertaken using the full traffic dataset provided by the traffic model forecasts.

4.1.7 VECAT provides CO₂(e) output for traded and non-traded emissions. In this instance, traded emissions are those associated with generating the power to charge electric and plug-in hybrid vehicles, and non-traded emissions are those associated with vehicle exhausts. Changes in CO₂(e) emissions from the opening year (2028) to the end of the 60-year appraisal period with and without the scheme in place, for traded and non-traded emissions, were input into the Greenhouse Gases Workbook (May 2025). To ensure that the emissions assessment captures Phase 1's area of influence while excluding areas beyond its likely impact, a defined emissions analysis area was applied. This area, illustrated in **Figure 4-1**, includes the full simulation network and an extended buffer network.

Figure 4-1: VECAT analysis area



¹ The 2061 model year has been excluded from the network-based benefits assessment due to elevated levels of model noise and uncertainty in the forecast outputs. Further investigation is required to ensure robustness.

4.2 TAG workbook

- 4.2.1 The CO₂ equivalent emissions from VECAT have been imported to the DfT's greenhouses gases workbook. The results are summarised as follows in **Table 4-1**, in 2023 prices, discounted to 2023, in market prices.

Table 4-1: Summary of Greenhouse Impacts²

	Core	High	Low
NPV of greenhouse gas impact over 60 years	£864,905	£1,107,965	£802,940
Upper estimate of NPV	£1,298,433	£1,663,196	£1,205,693
Lower estimate of NPV	£431,631	£553,030	£400,498
Change in CO ₂ (e) over 60 years (tonnes)	-4,040	-5,158	-3,618
Of which traded (tonnes)	-65	-73	-77
Change in CO ₂ (e) in 2028 (tonnes)	-260	-276	-258

Section 5 – Estimation of Benefits – Construction Impacts

5.1 Summary

- 5.1.1 Construction is due to commence in December 2026, and it is expected that it will be completed in September 2028.
- 5.1.2 Due to the nature of the scheme, traffic management will be required at A465 Abergavenny Road and A49 Ross Road.
- 5.1.3 The contractor (John Graham Construction Ltd) will develop the construction traffic management plan during the pre-construction development phase. The contract includes specification documents prepared for the same works in September 2018. These documents were well developed, and it is reasonable to assume that the proposed traffic management requirements will be similar to those specified in the original contract.
- 5.1.4 Appendix 1/17 of the specification provided details of the traffic safety and management for the scheme.
- 5.1.5 The traffic management proposals including programme and layout will be submitted by the contractor for approval by Herefordshire Council. The traffic management requirements at the A49 roundabout will also require approval by National Highways.
- 5.1.6 The A465 roundabout will be constructed offline with the tie-ins to the existing highway network completed under temporary signal operation. Such works are likely to require single way working for four weeks at each tie-in. Thus, the A465 will operate under single way working for a total duration of eight weeks.
- 5.1.7 The existing A49 roundabout was designed to enable a fourth arm to be added on its western side to accommodate the new southern link road proposals. It is anticipated that these works will be completed by narrowing the carriageway width on the A49 northbound approach and exit to a single lane. However, the overall extent of works and depth of pavement construction will require approval by National Highways. If it requires additional pavement works on the circulatory carriageway further traffic management measures may be required. A temporary site access will be provided on the western side of the roundabout for the duration of the works. This will operate without disrupting regular traffic as the site traffic will effectively use the new fourth arm of the roundabout.
- 5.1.8 The table below is taken from the 2018 specification (the term 'SCW NSL' stands for single carriageway national speed limit).

Highways, Private Roads and Other Ways Affected by the Works

Location	Predicted 24 Hour Annual Average Daily Traffic AADT	% HGVs	Use of route by Buses / Coaches	Average Speed of Cars MPH	Speed Limit MPH (if proposed, mandatory or advisable)	Type(s) of Traffic Control	Special Facilities (Pedestrian/ Equestrian)	Whether to be kept open or closed
A465 Abergavenny Road	20,623	4.62%	Yes	24.9	SCW NSL	Traffic Signals		To be kept open
A49 Ross Road	22,153	5.73%	Yes	25.3	SCW NSL	Subject to agreement with Highways England		To be kept open

- 5.1.9 There is a requirement for temporary traffic signals to be operated manually from 07:00-09:00 and 16:00-18:00 (Monday to Friday) to minimise disruption during peak hours. There is also a requirement that traffic shall be free flowing over bank holidays and that the contractor is to liaise with Herefordshire Council and National Highways to identify and accommodate special events.
- 5.1.10 The A49, A465 and B4349 Clehonger Road are used extensively by public transport. The Contractor will be required to liaise with the various bus companies and provide them with sufficient notice of any restrictions to enable them to make alternative arrangements for routeing their vehicles or relocating stops.
- 5.1.11 In the absence of a construction management plan at the time of writing, a spreadsheet assessment of the construction impacts on existing highway users have been undertaken.

5.1.12 This analysis has assumed no user delays at the eastern end of the scheme (A49 tie-in) and traffic management measures at the western end of the scheme (A465 tie-in). Following the discussion above, the following assumptions have been made for this western A465 tie-in:

- A465 tie-in is assumed to occur during 2028;
- 24-hour AADT (2-way) of 6420, of which 207 is HGV (*derived from 2028 HSTM 'without scheme' forecast);
- 8-weeks of single-way working;
- average delay per vehicle of 2 minutes across the day;
- 2028 values of time derived from TAG May26 data book;
- journey purpose splits derived from TAG May26 data book; and
- 2028 value of time savings discounted to 2023 using a discount rate of 3.5%.

5.1.13 The result of this analysis is a net cost of £0.187m (£0.029m for HGV, £0.158m for light vehicles), expressed in 2023 prices and values.

Section 6 – Estimation of Benefits – Accidents

6.1 Introduction

- 6.1.1 CoBA-LT (Cost and Benefit to Accidents – Light Touch) is a cost-benefit analysis package available from the DfT in the form of a spreadsheet. It is used to forecast changes in the numbers of accidents and casualties associated with a change to the highway network, and to monetise these impacts.

6.2 Input Files

- 6.2.1 CoBA-LT v2.10 which was released in April 2026 has been used, with link and junction combined rates used throughout. The following parameters / dimensions have been used in the CoBA-LT analysis:

- **CoBA-LT Parameter File**

- 2026 version 2.10, November 2025 TAG data book, has been used without modification

- **CoBA-LT Input File**

- Current Year: 2026
 - Base Year: 2023
 - Forecast Years: 2028 and 2043³
 - Scheme Opening Year: 2028
 - AADT traffic flow data have been calculated using factors derived from long-term count data analysis; the same data were used for the air quality assessment
 - Default national accident rates based on DfT's CoBA-LT 2026 parameter file have been used

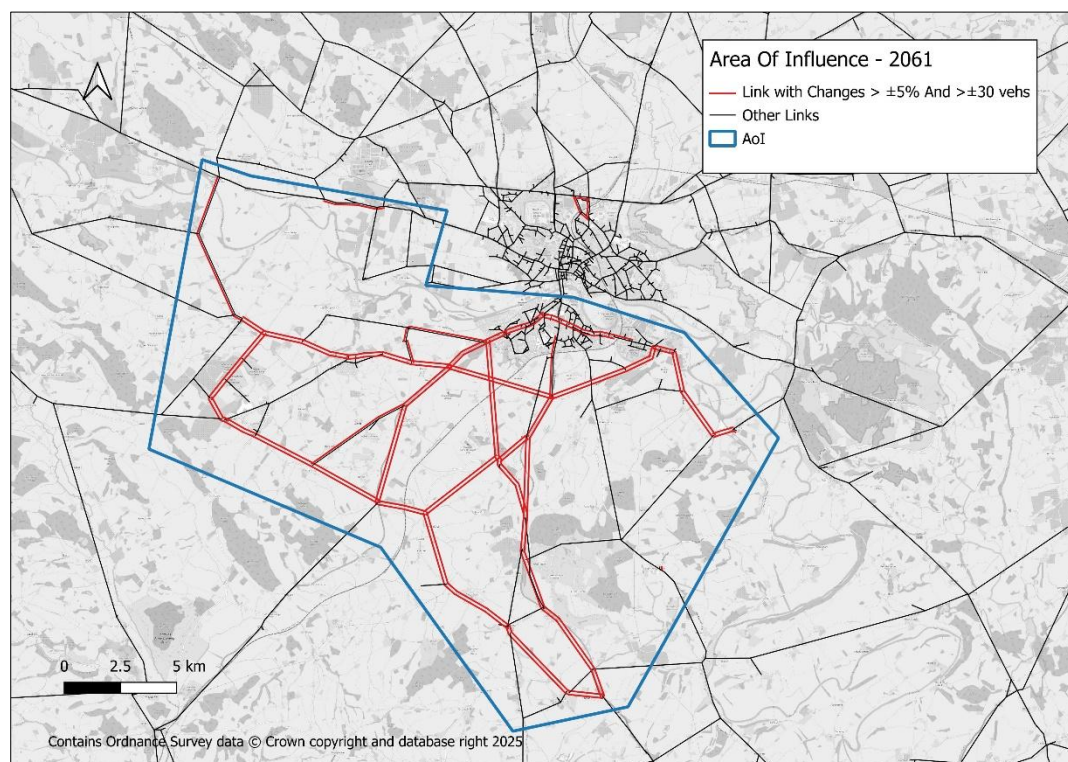
- 6.2.2 The CoBA-LT input / output files are provided as part of a package accompanying this Economic Appraisal Report.

6.3 Accident Rates and Area of Influence used in CoBA-LT Assessment

- 6.3.1 CoBA-LT contains default national accident rates, defined as the number of Personal Injury Accidents (PIAs) per million vehicle kilometres (mvkm). Varying by road type and speed limit band, these accident rates have been used to calculate the total number of accidents in the absence of any credible local data.

- 6.3.2 For this scheme, the Area of Influence (Aoi) has been defined as shown in **Figure 6-1**. Links experiencing both a $\pm 5\%$ change in flow and an absolute change of ± 30 vehicles between the Without Scheme and With Scheme forecasts in any model period in 2061 are highlighted in red. A total of 931 modelled links (with scheme) within the Aoi have been included in the COBALT assessment.

³ The 2061 model year has been excluded from the network-based benefits assessment due to elevated levels of model noise and uncertainty in the forecast outputs. Further investigation is required to ensure robustness.

Figure 6-1: Defined Area of Influence for Accident Appraisal

Map contains Ordnance Survey data © Crown copyright and database right 2025

6.4 Estimated Accident Impact of the Proposed Scheme

- 6.4.1 Using the inputs specified in Section 6.2, default accident rates, and the AoI discussed in Section 6.3, CoBA-LT was used to appraise the scheme over a 60 year period. Accident rates are therefore constant between scenarios for a given link.
- 6.4.2 The summary results are provided in Table 6-1, with the monetised values expressed in £000s and in 2023 prices and values.

Table 6-1: Summary of Accident Assessment

Economic Summary (£000s in 2023 prices and values)

CAS		Core	High	Low
Economic Summary 2023 values and prices	Accident Costs Without-Scheme (£000s)	247,128	276,167	228,239
	Accident Costs With-Scheme (£000s)	248,137	277,561	229,096
	Benefit of Scheme (£000s)	-1,009	-1,394	-857

Accident Summary

Accidents Summary (PIAs)	Accident Numbers Without-Scheme	2,896	3,278	2,649
	Accident Numbers With-Scheme	2,879	3,261	2,633
	Benefit of Scheme	17.3	16.4	16.4

Casualty Summary

Casualties Numbers Without-Scheme	Fatal	32.8	36.9	30.0
	Serious	411.0	465.0	375.7
	Slight	3460.5	3913.6	3166.8
Casualties Numbers With-Scheme	Fatal	33.9	38.2	31.0
	Serious	412.0	466.6	376.5
	Slight	3449.4	3905.1	3155.7
Benefit of Scheme	Fatal	-1.1	-1.2	-0.9
	Serious	-1.0	-1.6	-0.8
	Slight	11.1	8.5	11.1

- 6.4.3 Overall, the Core scenario shows a net accident disbenefit of £1 million (2023 prices and values). This disbenefit reflects the significant higher economic weighting applied to fatal, which outweighs the benefits associated with the reduction in slight casualties.
- 6.4.4 The Core scenario for Phase 1 of the bypass results in a small reduction in total personal injury accidents (PIAs), decreasing from 2,896 accidents in the without-scheme scenario to 2,879 accidents with Phase 1, representing a saving of 17 accidents over the appraisal period.
- 6.4.5 In terms of casualties, The Core scenario leads to a reduction in slight casualties, with 11 fewer slight casualties compared to the without-scheme scenario. However, there is a marginal increase in fatal and serious casualties, with increases of 1.1 fatal and 1.0 serious casualties. The reduction in slight casualties is likely due to traffic being diverted away from lower-speed roads within Hereford.
- 6.4.6 Compared with the Core scenario, the High CAS scenario results in a higher number of fatal casualties due to higher traffic growth assumptions and therefore a higher net accident disbenefit of £1.4 million. Conversely, the Low CAS scenario results in fewer fatal casualties and therefore a lower net accident disbenefit of £0.9 million.
- 6.4.7 It should be noted that these results are a technical outcome of the methodology used within CoBA-LT, which calculates the product of vehicle-kilometres travelled and standard national accident rates, rates which increase in severity above 40mph. Therefore, by adding a new stretch of 3km road with the national speed limit, which will also draw in traffic into the area of influence as a result of the scheme, the modest increase in more serious casualties as a result of the scheme is not unexpected.

Section 7 – Estimation of Benefits – Journey Time Reliability

7.1 Introduction

- 7.1.1 The change in journey time reliability has been estimated based on the guidance contained within TAG Unit A1.3, Section 6.3 for urban roads. This approach considers the ratio of the assigned time within the highway model to the free-flow time as a measure of the standard deviation in journey times and monetises this using the same assumptions as adopted within the TUBA assessment of the forecast scheme impacts (see Section 3).
- 7.1.2 For reliability assessment purposes affected roads are classed as SRN, Urban or Other.
- 7.1.3 For SRN roads the MYRIAD program would be used and Unit A1.3 details the calculations to be used for urban roads.
- 7.1.4 In practice the scheme would be classified as an 'Other' road but Unit A1.3 does not provide a methodology for quantifying 'Other' roads, it only has a qualitative process based on link stress, the relevant section restated as follows:
- 7.1.5 Since the scheme serves as an alternative route to urban roads, the urban road methodology has been applied for the assessment, but only within the urban area south of Hereford. The Area of Influence (Aol) has been defined consistently with that used for the CoBA-LT assessment, as shown in Figure 6-1 in 6.3.2

7.2 Methodology

- 7.2.1 Using a cordon model defined by the Aol shown in **Figure 6-1**, the assigned time and distance, and free-flow time, have been skimmed from the assignments, for each time-period. The following expression (defined in TAG A1.3, §C.3.3) has been applied to each time-period for the Core Scenario and 'With Scheme' Scenario in the 2028, 2043 and 2061 forecast years:

$$\sigma = 0.4 * 0.16 * \left(\frac{Time_{Assigned}}{Time_{FreeFlow}} \right)^{1.02} * Dist^{-0.39} * Time_{Assigned}$$

- 7.2.2 The change in the forecast journey time variability (σ) between the Without Scheme and With Scheme forecasts have then been used in a standard 'rule-of-a-half' calculation using the assignment demand to estimate the journey time benefits. This has used the same periods and demand/cost combinations as defined for the Core Scenario TUBA assessment.
- 7.2.3 To monetise these benefits, the results of the above calculation have been converted from vehicles (the units of the highway assignment model) to people (the units of the appraisal) using the standard vehicle occupancies as defined within TUBA v1.10.01. These have then been annualised based on the factors defined in **Table 3-3**:
- 7.2.4 These savings have been applied to the model forecast years. Linear interpolation has been applied to the years in-between the model forecast years to estimate benefits for these in-between years. As within TUBA, the benefits are assumed to be constant for all years after 2061 within the 60-year appraisal period. Based on this and using the values of time adopted within the TUBA assessment of the scheme, the journey time reliability benefits have been converted to a monetary value.
- 7.2.5 Within the TUBA assessment, a value of time which varies by trip-length has been adopted for car business trips, but this approach cannot be applied within the journey time reliability analysis, as the cordon model does not include information on the total trip-length for business trips. Therefore, the average business value of time, as defined within TUBA v1.10.01, has been applied for this trip purpose.
- 7.2.6 These monetary values have then been discounted to 2023 using the standard assumptions included within TAG.

7.3 Summary of Results

- 7.3.1 Applying the methodology outlined above to the Core Scenario and Common Analytical Scenarios (CAS) produces the reliability benefits given in **Table 7-1**. This assessment forecasts that the journey time reliability benefits are approximately £1.7m over 60 years for the Core Scenario.

- 7.3.2 The High CAS scenario forecasts higher journey time reliability benefits of approximately £2 million over the 60-year appraisal period, reflecting higher traffic growth. In contrast, the Low CAS scenario results in lower benefits of approximately £1.4 million over the same period.

Table 7-1: Summary of Reliability Benefits by User Class⁴

User Class	Core	Low	High
HGV	£27,157	£23,586	£31,661
LGV	£178,284	£130,843	£256,429
Employers' Business	£175,290	£154,329	£211,608
Car Other	£861,662	£699,620	£950,084
Car Commute	£472,083	£408,662	£628,611
Total	£1,714,476	£1,417,041	£2,078,393

⁴ The 2061 model year has been excluded from the network-based benefits assessment due to elevated levels of model noise and uncertainty in the forecast outputs. Further investigation is required to ensure robustness.

Section 8 – Local Noise Assessment

8.1 Summary

- 8.1.1 Major (≥ 5 dB) increases in road traffic noise are expected at receptors in close proximity to the scheme; this impacted area is however sparsely populated.
- 8.1.2 Despite being close to the scheme, receptors along Haywood Lane are expected to experience a minor decrease in road traffic noise. This is due to fewer vehicles using this road with the scheme constructed.
- 8.1.3 Major decreases in road traffic noise are expected along the closed section of the B4349. Reductions in traffic noise are also expected along Belmont Road, Walnut Tree Avenue and Holme Lacy Road. However, the scale of these reductions falls below the threshold to be included in the economic analysis of this impact.
- 8.1.4 Due to the introduction of the scheme minor increases in road traffic noise are expected along the B4349 between the scheme and Clehonger. These changes are just above the threshold to be included within the economic analysis of this impact. The minor noise increase continues from Clehonger along the B4352 into Madley. From Madley minor increases in road traffic noise are expected along Bage Pitch Road up to the A438. This is due to rerouting of traffic which would have otherwise used an existing route prior to scheme opening.
- 8.1.5 These existing routes from where traffic has been diverted are expected to experience minor decreases in road traffic noise. From east to west these are as follows:
 - roads through Callow and Portway off Haywood Lane;
 - the road connecting Haywood Lane to the B4348;
 - the B4348 from this junction to St Bartholomew's Church, Thruxton;
 - B4348 between Blackthorn and the junction with the B4349; and
 - Stone Street Between Blackthorn and the B4352.
- 8.1.6 The following numbers of households are forecast to experience material changes in noise with the scheme in place with the scheme delivered, in the design year of 2043.
 - 290 households experience increased daytime noise;
 - 226 household experience reduced daytime noise;
 - 74 households experience increased nighttime noise; and
 - 129 household experience reduced nighttime noise.
- 8.1.7 The monetised impact of the change in traffic noise was calculated using the relevant TAG workbook (based on guidance produced by Defra on assessing the impacts of transport related noise from different sources). This resulted in a net benefit of £0.960m in discounted 2023 prices and values.

Section 9 – Air Quality Assessment

9.1 Summary

- 9.1.1 The air quality study area is located within Hereford. Herefordshire Council has declared two air quality management areas (AQMA) for exceedances of the NO₂ annual mean objective, one of which is in the city of Hereford (as described in the Strategic Dimension). However, the scheme is located outside these, located approximately 2.5 km from the closest AQMA (Hereford AQMA). The nearest monitoring site to the scheme reported an annual mean NO₂ concentration of 20.3 µg/m³ in 2024. This is diffusion tube site 79, which is located approximately 2.3 km to the north of the scheme, at a roadside location on Belmont Road in Hereford. The scheme is located in a rural area to the south of Hereford, meaning that monitored concentrations are therefore likely to be lower than those reported at the nearest monitoring site. It is also worth noting that Herefordshire council are in the process of revoking the AQMA within Hereford as the NO₂ concentration levels have been below the threshold values by 10% for the last five years.
- 9.1.2 With the scheme operational, both decreases and increases in pollutant concentrations are anticipated, due to changes in traffic flows and road layouts associated with the scheme, which could lead to relative improvements or deteriorations in air quality respectively.
- 9.1.3 The largest increases in forecast traffic flows are on roads located in close proximity to the scheme. These include the southern section of the A465, on approach and leaving the proposed roundabout within the scheme, as well as the B4349 and the Clehonger Link, located between the A49/B4399 roundabout and the proposed roundabout on the A465. There are properties located within 20 metres and 50 metres of these roads, which could experience a deterioration in local air quality. However, when considering the magnitude of the change in traffic flow, the existing air quality, the impacts are not likely to be significant.
- 9.1.4 The largest decreases in traffic flows were seen on a rural road off the A49 and along the northern section of the A465, as it travels through Belmont towards Hereford. There are properties located within 20 metres of these roads, which could experience an improvement in local air quality. However, when considering the magnitude of the change in traffic flow, the existing air quality, the impacts are not likely to be significant.
- 9.1.5 In addition, decreases in traffic flow were also predicted in the more populated areas to the south of Hereford and therefore improvements in air quality at residential properties would also be expected in these areas. However, the magnitude of change in the number of vehicles on the roads was below the criteria to be included in the quantitative air quality appraisal. For example, a decrease of approximately 700 vehicles per day is anticipated on Walnut Tree Avenue and a decrease of approximately 600 vehicles per day is anticipated on Holme Lacy Road.
- 9.1.6 Overall, the air quality impacts are considered to be not material, with a very slight overall monetised disbenefit of £0.08m in discounted 2023 prices and values.

Section 10 – Wider Impacts Assessment

10.1 Introduction

- 10.1.1 Wider economic impacts arise because market failures in secondary (non-transport) markets, such as the product, labour, and land markets, mean that the full welfare impact of a transport investment may not be reflected in the transport market. The underlying assumption is that improved connectivity and accessibility between areas will effectively reduce the 'economic distance' between enterprises, increasing business productivity and competition.
- 10.1.2 The wider economic impacts are described in TAG Unit A2 and can be divided into three distinct groups on the basis of land-use change: fixed land-use, implicit land-use change; and explicit land-use change. As none of the housing or employment developments assumed in the forecasting are specifically dependent upon the scheme (although the scheme will be one of the enablers for this growth), wider economic impacts were assessed based on the assumption of fixed land-use and calculated using the DfT's Wider Impacts in Transport Analysis (WITA) software (v2.3).
- 10.1.3 In assessing the potential scale of wider economic impacts, it is useful to determine the extent to which the scheme is located within or sufficiently close to a 'Functional Urban Area' (FUR), and hence to check that the range of possible wider economic impacts is likely to materialise. FURs contain a high density of businesses that are able to benefit from clustering, through achieving agglomeration (productivity) benefits such as learning, networking and coordination. The scheme is located on the edge of the Hereford FUR, but also has MRN and SRN connections to the nearby Leominster and Ledbury FURs to the north and southeast respectively. Agglomeration effects decay over distance. Empirical evidence suggests that for agglomeration to occur the relative travel times must be within 45 minutes; peak morning journey times to Worcester are generally more than this, although interpeak and evening peak journey times from those locations may be feasible within 45 minutes.

10.2 Agglomeration

- 10.2.1 WITA was used to assess static clustering, the impact on productivity of the decrease in generalised travel costs that in effect brings firms and employees closer together and assumes no change in land-use. It was not considered justifiable to assess productivity impacts on the basis of land-use change brought about by the scheme (dynamic clustering), given there are a number of drivers and factors behind forecast increases in employment and dwellings, not all of which can be attributed to the scheme.

10.3 Labour supply impacts

- 10.3.1 WITA was used to assess labour supply impacts. Transport costs are likely to affect the overall costs and benefits to an individual from working. In deciding whether to work, an individual will weigh travel costs against the wage rate of the job travelled to. A change in transport costs is therefore likely to affect the incentive to work and hence the overall level of labour supplied in the economy.
- 10.3.2 As the scheme reduces the generalised cost of travel, mainly through improved travel times rather than a reduction in vehicle operating costs, there will be a higher level of labour supplied in the economy due to its implementation. It should be noted that only the tax revenues from changes in the labour supply are counted as additional benefits.

10.4 Increased output in imperfectly competitive markets

- 10.4.1 As detailed in TAG, the impact of increases or decreases in output in imperfectly competitive markets is calculated as a factor of the total business user benefits derived from TUBA. The estimate of the factor of benefits to take is specified in TAG Unit A2.2 Paragraph 4.3.1 as 13.4%. This can also be applied to journey time reliability assessments, although this was not undertaken in this case, and would only have had a very small positive benefit.

10.5 Results

- 10.5.1 **Table 10-1** shows the forecast benefits arising from agglomeration, by industrial sector. It shows there are positive agglomeration impacts realised from the scheme, providing around £0.73m of benefits across the 60-year appraisal period. This is due to the reductions in journey times and delays (for both personal and business trips) as the scheme improves the connectivity and accessibility between suppliers and firms. Most of the benefits are associated with Herefordshire (£0.47m), the district in which there is the largest congestion relief and increase in accessibility.

Table 10-1: Benefits arising from agglomeration impacts, 2023 prices and values

Industrial sector	Value of benefit
Manufacturing	£13,384
Construction	£98,425
Consumer services	£242,701
Producer services	£372,055
Total	£726,565

- 10.5.2 As the scheme is forecast to reduce the cost of travel, through improved travel times and reliability, there will be a higher level of labour supplied in the economy due to its implementation. As shown in Table 10-2, there is expected to be a marginal tax revenue increase of more than £0.31m.

Table 10-2: Benefits arising from labour supply impacts, 2023 prices and values

Economic impact type	Value of benefit
Welfare Benefit from Labour Supply Impact	£781,991
Tax Revenues from the Labour Market Impact of Additional Workers	£312,796
Total	£1,094,787

- 10.5.3 The impact of increases or decreases in output in imperfectly competitive markets, calculated as an uplift factor of the total business (including freight) user benefits derived from the conventional transport user benefit appraisal, is estimated to be £2.06m (Table 10-3).

Table 10-3: Benefits arising from increased output in imperfectly competitive markets, 2023 prices and values

Economic impact type	Value of benefit
Output Change in Imperfectly Competitive Markets	£2,057,168

- 10.5.4 The overall wider economic impacts, as summarised in Table 10-4, are estimated to be £3.88m. Of these, just over half (53%) are forecast to be realised through Change in Imperfectly Competitive Markets, with the scheme improving accessibility between firms and their suppliers, markets and workers, with much of this benefit accruing in Herefordshire.

Table 10-4: Summary of wider economic impacts, 2023 prices and values

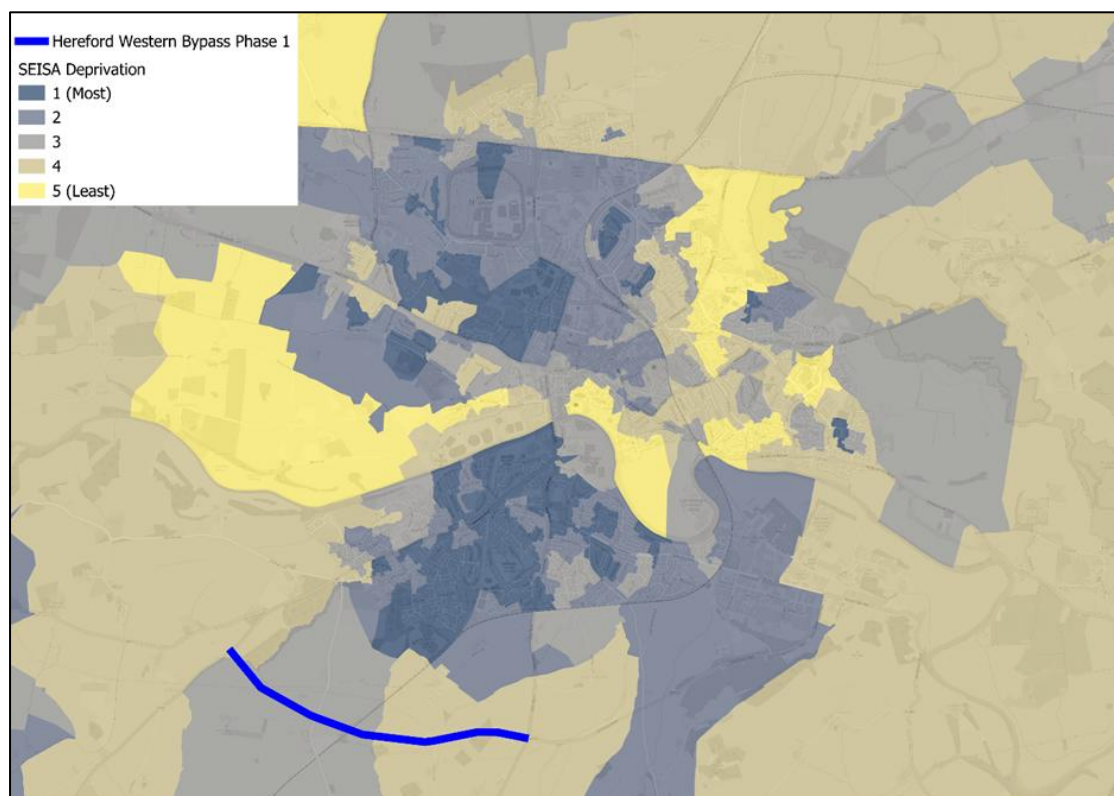
Economic impact type	Value of benefit
Agglomeration	£726,565
Labour market impacts	£1,094,787
Imperfectly competitive markets	£2,057,168
Total	£3,878,520

Section 11 – Assessment of Distributional Impacts

11.1 Introduction

- 11.1.1 A distributional impacts assessment has been undertaken for the indicators described in the DfT's TAG Unit on Distributional Impact Appraisal (Unit A4.2). The assessment presented here includes reference to the Higher Education Statistics Agency Socioeconomic Index for Small Areas (SEISA), derived from 2021 Census data, and from which the population was categorised nationally into five equal groups (see **Figure 11-1**), from Group 1 (the 20% most deprived) through to Group 5 (the 20% least deprived).

Figure 11-1: SEISA Income Quintiles in the Area of Impact (Hereford)



11.2 Transport User Benefits

- 11.2.1 The user benefits assessment used TUBA outputs filtered to include only trips with a home location inside the Aol (defined for the distribution analysis as Herefordshire). Non-business trips ('commuting' and 'other' purposes) were aggregated by 2025 English Indices of Deprivation income quintile representing income level at LSOA scale.
- 11.2.2 The assessment revealed that user benefits are unevenly distributed across income groups, with significant benefits accruing to the middle-income group.
- 11.2.3 The middle-income group (Group 3) (34% of the population) receives 53% of the benefits.
- 11.2.4 The least deprived income group (Group 5) (8% of the population) receives 1% of the benefits.
- 11.2.5 The other income groups receive benefits in-line with their proportion of population.
- 11.2.6 This distribution represents a neutral outcome from an equity perspective, with disadvantaged groups receiving a proportionate share of the benefits. These groups are concentrated in South Wye. While they may not benefit from personal transport user benefits, due to lower car ownership and a higher propensity to use active modes within the city, they are not adversely affected by the change in travel pattern that produces the user benefits for other groups as there is a reduction in traffic in South Wye with the scheme.

11.3 Noise

- 11.3.1 Traffic noise impacts were assessed for 2,314 affected residential buildings within 600m of the scheme and affected links. These are all in the rural area outside the city. Both daytime (LAeq,16h) and night-time (LAeq,8h) traffic noise levels were evaluated. The analysis found that:

- Most people in the affected area experience no change in noise levels.
- Of those experiencing change, more experience an increase than a decrease; the scheme has an overall negative noise impact in the distributional impact analysis.
- In the daytime, income Group 2 is adversely impacted to the greatest extent due to an increase in traffic near Clehonger village on the B4349. Income Group 3 is positively impacted to the greatest extent due to a preponderance of receptors on indirect rural east-west routes relieved of traffic by the scheme. Groups 1 and 4 have proportionate adverse impacts and Group 5 is not present.
- Impacts on both children and older people are generally in-line with their proportion of the affected population.

11.3.2 Non-residential sensitive locations (schools, health centres, community centres, religious sites) show negligible noise impacts (less than 3dB change), resulting in a neutral assessment.

11.4 Air Quality

11.4.1 Air quality impacts were assessed for 2,437 affected residential receptors within 200m of affected links, analysing both PM2.5 and NO2 concentrations for the scheme design year. The analysis found that:

- Most people in the affected area experience no change in air quality.
- Overall, there is a beneficial impact, indicating decreased PM2.5 and NO2 pollution with the scheme.
- Groups 1 and 3 benefit most due to their locations concentrated along Belmont Road and rural east-west routes where traffic is reduced by the scheme.
- Group 2 has slight adverse PM2.5 and slight beneficial NO2 impacts. Adverse PM2.5 impacts are concentrated close to Clehonger village.
- Group 5 has large adverse impacts due to being concentrated on the A49 near Much Birch which shows a small increase in traffic with the scheme.
- The impact on children is positive, and broadly proportional to population.

11.4.2 Non-residential sensitive receptors (schools, nurseries, care homes, GP surgeries) showed imperceptible changes in NO2 and imperceptible or very small PM2.5 changes.

11.5 Accidents

11.5.1 The accident assessment focused on identifying locations where there are clusters of accidents and casualties and which of the vulnerable groups have atypical casualty rates in the AoI.

11.5.2 Locations identified as having clusters of casualties in the STATS19 data are almost all junctions on the A49 and A465.

11.5.3 In the rural areas, casualty proportions for the vulnerable groups are like the county as a whole. In the urban areas of South Wye, there are higher proportions of Children and Cyclists and lower proportions of Older people than the county as a whole. South Wye has a younger population than the county as a whole and a greater propensity for active travel as journeys are shorter within the city.

11.5.4 The scheme reduces traffic at many of the affected junctions which are where indirect east-west routes currently used to go between the A49 and A465 join these roads. Notably this includes the B4348/A465 junction at Lock's Garage. Other affected junctions are in South Wye. The scheme generally reduces traffic in South Wye where the Cyclist and Child casualty proportions are high.

11.5.5 Impacts are moderate beneficial for Cyclists and Children and slight beneficial for Older people, Pedestrians, Motorcyclists and Young Male Drivers.

11.6 Security

11.6.1 The Scheme is designed to maintain pedestrian access where road layout changes are proposed.

11.6.2 The possible impact on security indicators is assessed as neutral, and therefore no detailed distributional impacts assessment of security was undertaken.

11.7 Accessibility

- 11.7.1 The Scheme maintains pedestrian access where road layout changes are proposed. There are no proposals to relocate services due to the Scheme which would change access for public transport users.
- 11.7.2 The possible impact on public transport accessibility is assessed as neutral, and therefore an assessment of the distributional impacts of accessibility was not undertaken.

11.8 Severance

- 11.8.1 Severance assessment focused on links meeting TAG criteria for significant flow changes with flow per hour greater than the equivalent of 150 passenger car units, within areas likely to generate walking trips to amenities (within 800m) or bus stops (within 400m).
- 11.8.2 Routes meeting these criteria are either villages with some amenities or the Belmont Road-Walnut Tree Avenue-Holme Lacy Road-Straight Mile corridor. On the latter corridor the scheme reduces traffic and the impact is consistently beneficial. The affected population is mostly located in South Wye and includes significant numbers of people with no car availability, young people and disabled people. Impacts are assessed as slight beneficial for Older people and moderate beneficial for No-Car, Young and Disabled groups.

11.9 Personal Affordability

- 11.9.1 Personal affordability impacts were assessed focusing on changes in vehicle operating costs due to the scheme. The scheme is likely to increase journey distance for east-west traffic using the scheme and produce adverse impacts (although it is worth noting that any increase in operating costs is more than offset by the benefits from reduced journey times).
- 11.9.2 In the wider area there are slight positive impacts for the A49 corridor.
- 11.9.3 The overall impact is adverse with the largest impact on the middle income group (Group 3) and the least impact on the lowest (Group 1) and highest (Group 5) income groups.

11.10 Summary

- 11.10.1 The Distributional Impact Assessment is summarised for all indicators in **Table 11-1**. The scheme has mostly positive distributional impacts, benefitting the lowest 4 income groups and the younger, more deprived population in South Wye. Adverse impacts for personal affordability are to be expected for a scheme that generates longer faster journeys. The noise modelling did not cover the city where traffic is expected to reduce, and some benefit could be expected.

Table 11-1: Distributional Impact Appraisal Matrix

	Distributional impact of income deprivation					Are the impacts distributed evenly?	Key impacts - Qualitative statements (example below)
	0-20%	20-40%	40-60%	60-80%	80-100%		
User benefits	✓✓.	✓✓.	✓✓✓.	✓✓.	✓.	No	Positive benefits are felt by all income groups due to a reduction in journey time with the scheme in place. Benefits favour the middle income group and the highest income group has a disproportionately small share of benefits.
Noise	xx.	xxx.	✓✓✓.	xx.	neutral	No	Noise impacts favour those in the middle income group. The affected areas for that group are the indirect west-east routes relieved by the scheme. The highest income group is not

	Distributional impact of income deprivation					Are the impacts distributed evenly?	Key impacts - Qualitative statements (example below)
	0-20%	20-40%	40-60%	60-80%	80-100%		
							represented. All other groups experience noise disbenefits. 80% of the assessed population have no change in daytime noise.
Air quality PM_{2.5}	✓✓✓-	x-	✓✓✓-	✓✓-	xx-	No	PM2.5 impacts favour the most-deprived and middle income group. Due to their location in South Wye The second-most and least deprived groups experiences PM2.5 disbenefits. 80% of the assessed population have no change in PM2.5 concentration.
Air quality NO₂	✓✓✓-	✓-	✓✓✓-	✓✓-	xxx-	No	NO2 impacts favour the most-deprived and middle income group. Due to their location in South Wye The least deprived group experiences NO2 disbenefits. 85% of the assessed population have no change in NO2 concentration.
Affordability	x--	xx--	xxx--	xx--	x--	No	Affordability disbenefits are felt by all income groups due to longer journeys with the scheme in place. The most- and least-deprived income quintiles have a smaller share of disbenefits and the middle-income group has a larger share of disbenefits compared with population.
Accessibility							Not assessed.

Section 12 – TEE, Public Accounts and AMCB Tables

12.1 Introduction

12.1.1 Using the monetised benefits described in the preceding sections of this Economic Appraisal Report, this section draws these together to produce the Transport Economic Efficiency (TEE) and Analysis of Monetised Costs and Benefits (AMCB) tables defined within TAG.

12.1.2 All values in these tables are in £000s.

12.1.3 Two 'Analysis of Monetised Costs and Benefits' (AMCB) tables are provided:

- the first (**Table 12-2**) including third party contributions (none) and the full scheme costs, but excluding adjusted benefits (journey time reliability and wider impacts);
- the second (**Table 12-3**) including third party contributions (none), the full scheme costs and adjusted benefits.

Table 12-1: Transport Economic Efficiency (TEE) Table, 2023 Prices and Values, £000s

Non-business: Commuting		ALL MODES		ROAD	
<u>User benefits</u>		TOTAL		Private Cars and LGVs	
Travel time		£11,961		£11,961	
Vehicle operating costs		£47		£47	
User charges		£0		£0	
During Construction & Maintenance		£0		£0	
NET NON-BUSINESS BENEFITS: COMMUTING		£12,008		(1a)	£12,008
Non-business: Other		ALL MODES		ROAD	
<u>User benefits</u>		TOTAL		Private Cars and LGVs	
Travel time		£22,764		£22,764	
Vehicle operating costs		£15,734		£15,734	
User charges		£0		£0	
During Construction & Maintenance		£0		£0	
NET NON-BUSINESS BENEFITS: OTHER		£38,498		(1b)	£38,498
Business					
<u>User benefits</u>				Goods Vehicles	Business Cars & LGVs
Travel time		£16,949		£9,571	£7,378
Vehicle operating costs		-£1,719		-£1,175	-£544
User charges		£0		£0	£0
During Construction & Maintenance		-£187		-£29	-£158
Subtotal		£15,043		£8,367	£6,676
Private sector provider impacts					
Revenue		£0			
Operating costs		£0			
Investment costs		£0			
Grant/subsidy		£0			
Subtotal		£0		(3)	
Other business impacts					
Developer contributions		£0		(4)	£0
NET BUSINESS IMPACT		£15,043		(5) = (2) + (3) + (4)	
TOTAL					
Present Value of Transport Economic Efficiency Benefits (TEE)		£65,549		(6) = (1a) + (1b) + (5)	

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2023 prices and values.

Table 12-2: Analysis of Monetised Costs and Benefits (AMCB), 2023 Prices and Values, £000s

Analysis of Monetised Costs and Benefits		
Noise	£960	(12)
Local Air Quality	-£80	(13)
Greenhouse Gases	£865	(14)
Journey Quality	-	(15)
Physical Activity	-	(16)
Accidents	-£1,009	(17)
Economic Efficiency: Consumer Users (Commuting)	£12,008	(1a)
Economic Efficiency: Consumer Users (Other)	£38,498	(1b)
Economic Efficiency: Business Users and Providers	£15,043	(5)
Wider Public Finances (Indirect Taxation Revenues)	-£7,490	- (11) - sign changed from PA table, as PA table represents costs, not benefits
Present Value of Benefits (see notes) (PVB)	£58,795	(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)
Broad Transport Budget	£39,558	(10)
Present Value of Costs (see notes) (PVC)	£39,558	(PVC) = (10)
OVERALL IMPACTS		
Net Present Value (NPV)	£19,237	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	1.5	BCR=PVB/PVC

Note: This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

Table 12-3: Analysis of Monetised Costs and Benefits (Adjusted), 2023 Prices and Values, £000s

Analysis of Monetised Costs and Benefits including wider economic impacts and journey time reliability		
Noise	£960	(12)
Local Air Quality	-£80	(13)
Greenhouse Gases	£865	(14)
Journey Quality	-	(15)
Physical Activity	-	(16)
Accidents	-£1,009	(17)
Economic Efficiency: Consumer Users (Commuting)	£12,008	(1a)
Economic Efficiency: Consumer Users (Other)	£38,498	(1b)
Economic Efficiency: Business Users and Providers	£15,043	(5)
Wider Public Finances (Indirect Taxation Revenues)	-£7,490	- (11) - sign changed from PA table, as PA table represents costs, not benefits
Wider Impacts	£3,879	
Journey Time Reliability	£1,714	
Present Value of Benefits (see notes) (PVB)	£64,388	(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)
Broad Transport Budget	£39,558	(10)
Present Value of Costs (see notes) (PVC)	£39,558	(PVC) = (10)
OVERALL IMPACTS		
Net Present Value (NPV)	£24,829	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	1.6	BCR=PVB/PVC

Note: This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

Appendix G – Quantitative Risk Assessment

Hereford Western Bypass

Phase One Quantitative Risk Assessment Report

Herefordshire Council

June 2026

Quality information

Prepared by	Checked by	Verified by	Approved by
Helen Holm Associate Director	Darren Abberley Associate Director	Paul Bate Regional Director	Darren Abberley Associate Director

Revision History

Revision	Revision date	Details	Authorized	Name	Position
V1	05.06.2026	V1 Issue	Yes	Darren Abberley	Approver

Distribution List

# Hard Copies	PDF Required	Association / Company Name

Prepared for:

Herefordshire Council

Prepared by:

AECOM Limited

6th Floor
3 Rivergate
Temple Quay
Bristol
BS1 6ER

T: +44 117 901 7000
aecom.com

© 2026 AECOM Limited. All Rights Reserved.

This document has been prepared by AECOM Limited ("AECOM") for sole use of our client (the "Client") in accordance with generally accepted consultancy principles, the budget for fees and the terms of reference agreed between AECOM and the Client. Any information provided by third parties and referred to herein has not been checked or verified by AECOM, unless otherwise expressly stated in the document. No third party may rely upon this document without the prior and express written agreement of AECOM.

Table of Contents

1.	Introduction.....	5
2.	Risk Model Inputs	5
	Baseline Capital Expenditure	5
	Risk Identification and Categorisation	5
	Risk Quantification	5
3.	Risk Model Outputs	6
	Risk Value	6
	Highest Ranked Risks	6
	Appendix A Document copies.....	7
A.1	@Risk Output	7
A.2	Risk Register	9

1. Introduction

A Quantitative Risk Assessment (QRA) was undertaken for Phase One of the Hereford Bypass project. This technical report briefly outlines the risk identification (risk register) and the QRA processes and presents the QRA outputs as run on the 44 active risks within the register, and a listing of the top five risks at the time of this revision.

The main purpose of the QRA is to support the scheme costing by predicting the level of risk contribution, having a defined level of confidence, to cover the construction of the scheme. QRA allows for uncertainty in unplanned additional cost items that cannot be included in the project costs.

The QRA process involves four steps. Step 1 is identification of all risks affecting the project through risk workshops and risk reviews resulting in a risk register (the risk register will be continually reviewed and updated). Step 2 is analysis of the various risks by defining their distributions in terms of probabilities, impacts and knock-on effects. This information is also gathered through abovementioned workshops and other interactions. Step 3 is undertaking the risk modelling using Monte Carlo simulation (in this project @Risk® software was used). Step 4 is analysing the results against required contingency needs for the project.

The risk model has been constructed by AECOM using Microsoft Excel and @Risk® software packages. The model used the Monte-Carlo simulation theory by replicating 10,000 iterations of likely project risk scenarios. Confidence levels relating to the cost of the scheme are obtained from the distribution of the averaged results produced by the simulations.

2. Risk Model Inputs

Baseline Capital Expenditure

The current estimated capital cost of the scheme has been considered in determining the extent of risks used in the QRA analysis.

Risk Identification and Categorisation

A risk register is developed through risk workshops. This revision of the Risk Register and this iteration of the QRA is referred to as “Hereford Bypass Phase One Risk Register QRA v1”. The current version of the Risk Register is included in Appendix 1.

The risks that are input into the QRA are taken directly from the risk register for the scheme. Each risk is assessed for its Financial Risk and Delay risk.

Risk Quantification

Individual risks were defined in terms of their distributions, likelihood/probabilities, impacts and knock-on effects, etc., through a workshop which took place on the 1st of May 2026 and was attended by Herefordshire Council Officers, Graham Construction Team Members as well as AECOM Project Team members.

For each risk, the key inputs recorded to use in the QRA model are Cost Impact Estimate (Minimum, Maximum, and Likely), Delay Impact Estimate (Minimum, Maximum, and Likely), and Likelihood (in broad categories of Almost Certain, Likely, Possible, Unlikely, or Rare).

These values are then used in the model to determine a Mean Outcome and a Risk Exposure for each risk and for each iteration. The Monte Carlo simulation ran 10,000 iterations to achieve the results.

3. Risk Model Outputs

Risk Value

The table below shows the Grand Total Risk value (Financial + Delay) for the project; the @Risk output is shown in Appendix 1. Both 50th Percentile risk value and 80th Percentile risk value (referred to as P(50) and P(80) respectively) are shown in the table below.

Table 1: Grand Total Risk Value

	P(20) (000's)	P(50) (000's)	P(80) (000's)	P(mean) (000's)
Grand Total Risk (Financial + Delay)	£1,915	£2,962	£4,417	£3,263

Highest Ranked Risks

The top 5 risks (Grand Total Risk: Financial + Delay) identified by the sensitivity testing are listed below.

Table 2: Top 5 risks associated with the scheme

Rank	Risk Ref	Description
1	0.14	Delay caused by judicial review against a planning decision for the supplementary planning application within 6 weeks from the date of the decision
2	1.1	The 2018 Bill of Quantity/Activity Schedule does not match the 2018 Scope and/or quantities calculated in PCSA stage and/or measured quantities differ from those developed in PCSA stage
3	1.2	Pricing volatility occurs between tender submission and contract award
4	2.4	Potential for delays and design changes resulting from requirement to obtain National Highways Technical approval and legal agreement at tie-in with A49.
5	0.15	Key Herefordshire staff leave organisation or are absent due to sickness causing delay to programme, missing key deadlines or project inefficiencies

Appendix A Document copies

A.1 @Risk Output

The key outputs of the QRA are shown next highlighting the P(20), P(50) and P(80) risk values.

Results

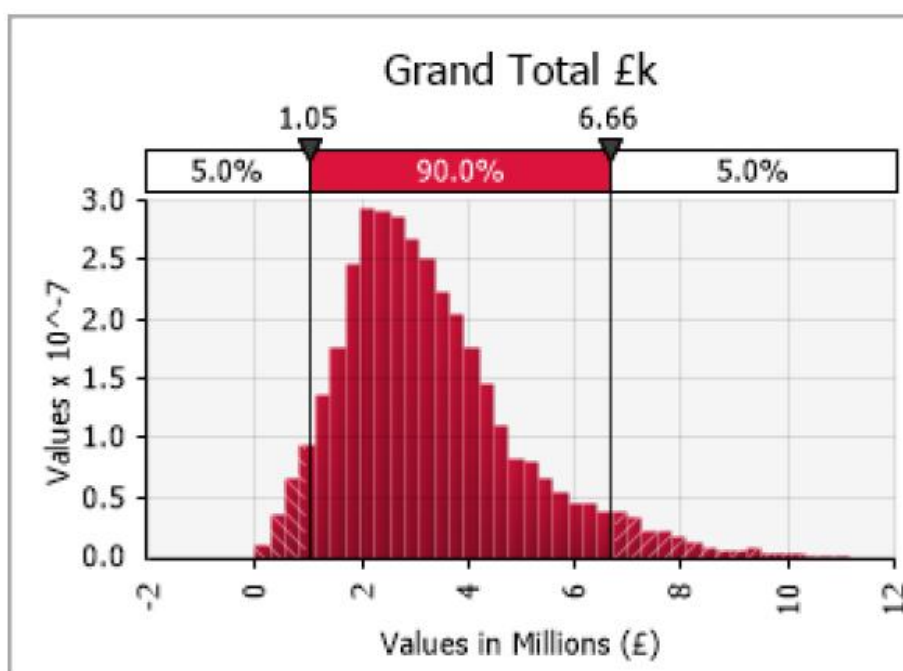


Grand Total £k

Report: **Compact Output Report**

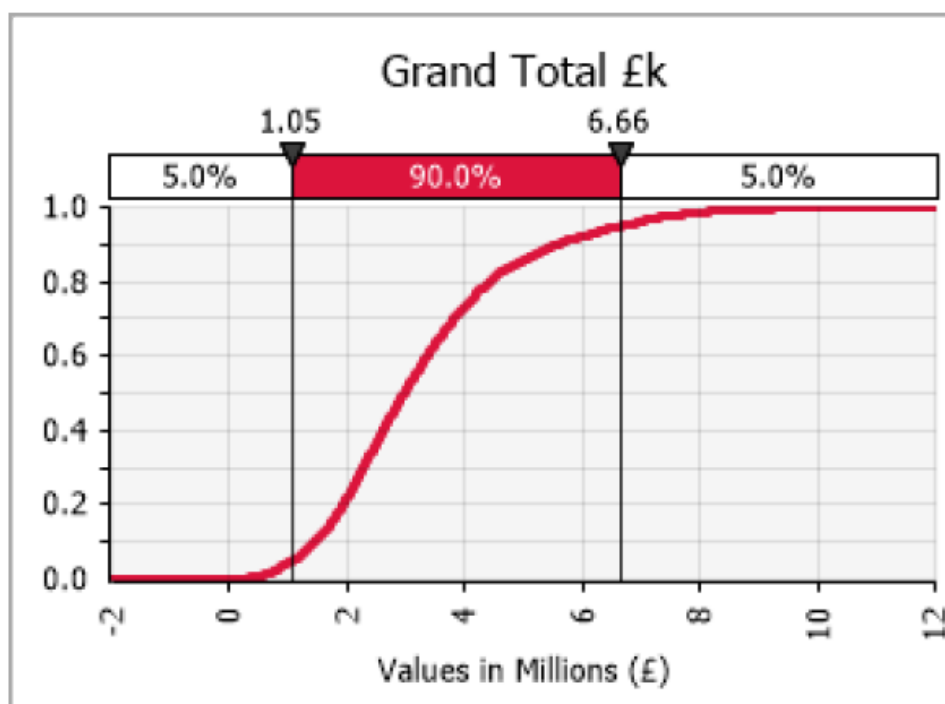
Performed By: **helen.holm**

Date: **19 May 2026**



Summary Statistics

Statistic	Value
Minimum	£9,771.17
Maximum	£11,169,034.61
Mean	£3,263,319.51
Std. Deviation	£1,667,121.68
Variance	2.779E+012
Skewness	1.0063
Kurtosis	4.1515
Median	£2,962,370.21
Mode	£2,213,618.59
Left X	£1,050,492.82
Left P	5%
Right X	£6,655,759.69
Right P	95%



<i>Percentiles</i>	
Percentile	Value
1%	£529,790.48
2.5%	£775,015.20
5%	£1,050,492.82
10%	£1,435,875.90
20%	£1,915,190.68
25%	£2,107,564.26
50%	£2,962,370.21
75%	£4,088,975.30
80%	£4,417,459.77
90%	£5,561,868.43
95%	£6,655,759.69
97.5%	£7,418,916.11
99%	£8,284,793.52

A.2 Risk Register

Hereford Western Bypass					Herefordshire Council		Cost Impact estimate				Time impact estimate		
ID	Type	Date logged	Risk Name	Description	Mitigation Measures	Owner	Min (£)	Max (£)	Likely (£)	Likelihood	Min (days)	Max (days)	Likely (days)
0.12	open	Jun-25	General & Staff Resources	Possible delay to works/ additional works due to delay in receipt of original design information for phase 1 along with missing information, including missing document issue register.	Missing native format drawings and models likely to increase time required to update recreate drawings and models where revisions are required	HC	£10,000	£50,000	£25,000	50%	0	20	10
0.13	open	Jun-25	General & Staff Resources	Change of Local Government threat to project, works on site to commence Dec 26. Scheme was cancelled previously due to change in local government.	Importance of keeping to programme and contract award enabling commencement of works on site Dec 26. Strategic risk - hence cost not assigned	HC	£0	£0	£0	0%	0	0	0
0.14	open	Jan-26	General & Staff Resources	Judicial review against a planning decision for the supplementary planning application within 6 weeks from the date of the decision (linked to 0.13)	Provide technical support and information to the Client. Site clearance during PCSA stage. AtkinsRealis to continue from Tender Stage work and keep design within constraints	HC	£0	£1,000,000	£250,000	20%	40	258	65
0.15	open	May-26	General & Staff Resources	Key Herefordshire staff leave organisation or are absent due to sickness causing delay to programme, missing key deadlines or project inefficiencies	Provide appropriate organisational resilience and succession planning.	HC	£0	£100,000	£30,000	50%	0	60	20
0.16	open	May-26	General & Staff Resources	Key Atkins/Grahams / AECOM staff leave organisation or are absent due to sickness causing delay to programme, missing key deadlines or project inefficiencies	Provide appropriate organisational resilience and succession planning.	Grahams/Atkins/ AECOM	£0	£50,000	£20,000	20%	0	15	5
1.1	Open	Jan-26	PM	The 2018 Bill of Quantity/Activity Schedule does not match the 2018 Scope and/or quantities calculated in PCSA stage and/or measured quantities differ from those developed in PCSA stage	Experienced team involved in the PCSA stage. Continuity of the team. Raise TQ's to resolve. Opportunity for optimisation of Earthworks Material Strategy to reduce imported fill.	HC	-£400,000	£2,000,000	£1,600,000	95%	0	0	0
1.2	Open	Jan-26	PM	Pricing volatility occurs between tender submission and contract award	Make an allowance for escalation based on feedback from supply chain and review of performance of current indices	HC	-£400,000	£2,000,000	£1,600,000	50%	0	0	0
2.1	open	Mar-25	Highways	Potential that the WCHAR for Phase 1 will need to be updated	We have planning and WCHAR would simply create further pressure relating to foot / cycle access along proposed route. Initial discussions	HC	£5,000	£50,000	£15,000	15%	0	0	0
2.2	open	Mar-25	Highways	Potential for undertaking additional Topographical surveys	Topo survey exists. Some further site based topo survey will be required at the extent of the red line boundary, particularly	HC	£5,000	£30,000	£20,000	95%	0	10	5
2.3	open	Mar-25	Highways	Potential for update of accommodation works (Bruton Knowles currently progressing). Potential to have to reproduce drawings if we can't get CAD versions.	Any accommodation works issues require resolving ASAP to prevent future programme delays.	HC	-£20,000	£50,000	£20,000	75%	0	20	0
2.4	open	Mar-25	Highways	Potential for delays and design changes resulting from requirement to obtain National Highways Technical approval and legal agreement at tie-in with A49.	There are some departures from standard on the new leg of the A49 roundabout (entry deflection criteria and exit width). These should be able to be resolved with minimal effort. Note this is a pre-commencement condition for this section and discharge of planning condition is required before temporary accesses to site from A49 can be approved	HC	£10,000	£400,000	£250,000	20%	0	80	40
2.5	Open	Jun-25	Highways	Potential to encounter tar bound material and potential for inappropriate pavement design at tie-ins due to lack of pavement investigation and survey information with associated H&S and design life implications	Complete pavement investigations at tie-ins in advance of construction to verify significance of issue and inform design	HC	£20,000	£300,000	£80,000	20%	0	0	0
2.6	Open	Jun-25	Highways	Potential for the pavement foundation design suitability and design life to be affected by Geotechnical concerns.	Verify geotechnical properties to confirm pavement design. Assumed now covered in D&B contract - assumed AECOM's input limited to potential review	D&B	£0	£60,000	£15,000	25%	0	5	1
3.1	Open	Jun-25	Structures	Risk of incomplete checks as insufficient information has been provided to confirm that the culvert size of structure S01 is correct (the flood level is not shown).	Update in PCSA design review	D&B	£0	£20,000	£10,000	25%	0	0	0
3.2	Open	Jun-25	Structures	Delays in Network Rail approvals eg due to refusal to re-approve outdated AIP and D&C certificates. (S05)		HC	£0	£1,250,000	£250,000	15%	5	60	20
3.3	Open	Jun-25	Structures	Re-certification design costs and TAA costs for railway bridge) S05)		HC	£50,000	£150,000	£75,000	95%	0	60	0
4.1	open	Jun-25	Drainage	Potential shallow groundwater in the vicinity of drainage attenuation ponds leading to the potential need for a liner incorporating uplift mitigation. This could require significant over excavation to provide the bulk fill overburden necessary for mitigation against uplift, or may require additional drainage measures to draw down groundwater levels. The earthworks and groundwater conditions for each pond will need to be reviewed and this could impact on the planning red line boundary	Consider completing additional testing to verify effectiveness of proposed balancing ponds. AECOM currently preparing proposal (Nov 25).	D&B/HC	£0	£400,000	£100,000	20%	0	20	5
4.2	open	Jun-25	Drainage	Hydrological risk arising due to the limited results from the soakaway testing will need to be reviewed	Consider completing soakaway tests to understand efficiency and scale of any soakaways required.	D&B	£20,000	£50,000	£30,000	50%	0	0	0
5.1	Open	Oct-25	Geotechnics	Phase 1: Due to geotechnical risks & opportunities identified potential for additional GI and changes to GIR/GDR, earthworks and drainage design	Review design during PCSA stage and undertake additional GI where required to inform any changes.	HC	-£2,000,000	£2,000,000	£0	0.5	-40	40	0
5.2	open	Oct-25	Geotechnics	Phase 1: Infilled quarry and clay pits were recorded in the vicinity of the scheme in the GIR. There is a risk that they or other un-recorded areas contain unsuitable or contaminated material which will require assessment of contamination or settlement and the design of mitigation and treatment	Potential to review any additional information available on these historic features and the potential for other contaminated or unsuitable material. Designer cost impact only, does not include construction cost impacts.	HC	£0	£120,000	£20,000	10%	0	0	0
5.3	Open	Jan-26	Geotechnics	The ground conditions provided within the tender documentation are underestimated (unforeseen) including hydrogeology	Timely communication with the Client Plan and agree additional GI scope early within PCSA stage to inform design freeze	D&B	£0	£750,000	£500,000	15%	10	50	20
5.4	Open	Jan-26	Geotechnics	Unforeseen ground conditions encountered during construction differ from those identified in the PCSA stage, including hydrogeology (links to ID 5.3.16)	Raise EWN and discuss with Client. Allowance for Designer's Site Rep (DSR) to raise any issues and feedback to designers. Additional pre-surveys done in front of the works. Implement design changes as necessary.	HC	£0	£1,750,000	£500,000	15%	1	110	60
5.5	Open	Jan-26	Geotechnics	Project is impacted Weather > 1 in 10 years	Material specifications; Considering use of lime addition to RMF during placement, to achieve classification and provide wider ranges for moisture content. Confirm float within Tender Programme on earthworks items is adequate during PCSA stage. Sense check Tender Programme bulk earthworks seasonality of March to October seasons against final earthworks design.	HC	£0	£1,500,000	£250,000	25%	0	60	20
5.6	Open	Jan-26	Geotechnics	UXO may be discovered during intrusive ground activities e.g. excavation during the construction stage	UXO surveys to be undertaken in PCSA stage. UXO awareness and site procedures. Safe systems of work for intrusive ground activities. Agree emergency response arrangements.	D&B	£20,000	£100,000	£50,000	5%	0	10	0
6.1	open	Mar-25	Environmental	Potential that additional ecological surveys and assessments are required eg Habitats Regulations Assessment	Undertake PEA for supplementary planning applications as soon as possible	HC	£10,000	£70,000	£30,000	30%	0	5	0
6.2	open	Mar-25	Environmental	There is a risk that the Archaeological watching brief could identify further works to be required.	Undertake mitigation early in programme	HC	£0	£200,000	£100,000	10%	0	50	15
6.3	open	Mar-25	Environmental	Potential for fees payable to Natural England to obtain species licences for GCN and Dormouse along with additional mitigation measures with associated time constraints	Undertake mitigation early in programme	HC	£20,000	£50,000	£30,000	50%	0	60	0
6.4	open	Jun-25	Environmental	Potential for undertaking stand-alone invasive species surveys completed in isolation from other surveys. If invasive species left unidentified they could spread further. Additional costs of managing impact, potential programme delays. Some species are much easier to identify when plants are flowering.	Early surveys undertaken and on-going. Follow Environment Agency guidelines.	HC	£0	£80,000	£10,000	20%	0	5	3
6.5	open	Oct-25	Environmental	Delays to access for ecological survey works may result in missed survey windows and project delays.	Maintain regular updates with PM team and HC, and check ins with land agent to ensure that they are aware of survey window deadlines	HC	£0	£20,000	£10,000	30%	0	20	10
6.6	Open	Jan-26	Environmental	Archaeological finds are discovered on site (links to 6.5 and 6.16)	Watching Brief throughout construction. Targeted investigations in sensitive areas as part of the PCSA contract.	HC	£0	£2,500,000	£100,000	50%	7	129	7
6.7	Open	Jan-26	Environmental	Invasive non-native species (NNS) - Plants could be found on site e.g. Japanese knotweed (links to 6.5.17)	Undertake surveys (at the correct time of year). Timing of site clearance.	HC	£10,000	£200,000	£120,000	10%	5	20	10
6.8	Open	Jan-26	Environmental	The existing ancient/veteran tree at S04 causes construction issues	Surveys on tree roots to be undertaken in PCSA stage.	D&B	£0	£50,000	£20,000	25%	0	100	0
8													
8.1	open	Jun-25	Statutory Undertakers	Excessive Statutory Utilities diversion lead in/delivery times on SLR	Once appointed Contractor to engage early on with Utility Companies regarding routing arrangements for diversions (for the SLR scheme).	HC	£0	£0	£0	40%	0	30	15
8.2	Open	Jan-26	Statutory Undertakers	Uncharted services are discovered on site	Undertake GPR Survey. Permit to Dig.	D&B	£0	£1,250,000	£50,000	10%	0	30	0
9.1	open	Mar-25	Planning	Potential that a 573 application will be required	Discuss any proposed changes with HC planning. We note that the Structures drawings submitted at planning contained a high level of detail. The detail differed to that provided at detailed design.	HC	£0	£50,000	£25,000	75%	0	60	0
9.2	open	Jun-25	Planning	Secure consent trafficking of partially constructed railway bridge for earthworks haulage.	Opportunity as haul route already priced for. Supplementary planning application being submitted for haul route	D&B	-£500,000	£0	-£500,000	30%	0	0	0
9.3	open	Nov-25	Planning	Potential for Supplementary Planning application to require an environmental impact assessment - resulting in additional cost/ delay to planning approvals and construction as well as additional environmental surveys	Submit planning pre-app followed by EIA scoping request	HC	£25,000	£50,000	£30,000	10%	0	40	0
9.4	Open	Jan-26	Planning	Deviations from planned possessions (shortened and/or cancelled possessions) affects works e.g. beam lift	Contingency in the programme. Good planning and early engagement.	D&B	£0	£250,000	£100,000	10%	0	50	20
9.5	Open	Jan-26	Planning	There is a risk that there will be a significant lead-in to getting approval of Traffic Management on the National Highways network (A49), and the Traffic Management required could be more onerous than anticipated	Early Engagement with National Highways. Traffic Management Working Groups with key stakeholders. Use internal experience from recent National Highways project deliveries.	D&B	£0	£150,000	£100,000	20%	0	20	0
10.1	open	Mar-25	Accommodation Works	Potential for issues relating to severance of land / PROW / water supplies. Delays in confirming how to proceed can cause programming issues once on site.	Bruton Knowles to provide details of agreements asap.	HC/BK	£0	£50,000	£30,000	25%	0	20	10
10.2	open	Mar-25	Accommodation Works	Additional design work required to provide access to land parcels severed by the works - potential for land ownership to have changed and different access requirements now required to previous or accommodation works scope changes due to land owner negotiations	Bruton Knowles to identify any such situations asap.	HC	-£100,000	£100,000	-£20,000	10%	0	0	£0
11.1	open	Mar-25	Stakeholders	Potential for additional TROs / SROs above those already identified / obtained.	Need for additional TROs / SROs or TTROs particularly around Haywood lane currently being reviewed by Sharpe Pritchard	HC	£20,000	£40,000	£30,000	50%	0	50	0
11.2	open	Mar-25	General & Staff Resources	Potential that the statutory orders will need to be amended or updated, resulting in delays to CPO	Some amendments required to orders, currently being revised. May require further cabinet approvals. Sharpe Pritchard progressing revised orders.	HC	£10,000	£50,000	£25,000	0	0	60	0
11.3	open	Nov-25	Stakeholders	Potential for CPO to be required for land acquisition resulting in design change, delays to construction and possible public enquiry following	Bruton Knowles currently completing negotiations with land owners.	HC	£0	£250,000	£100,000	40%	0	390	40

Appendix H – Distributional Impact Assessment

Hereford Western Bypass Phase 1 Distributional Impacts Appraisal Report

June 2026

Quality information

Prepared by

Luke Pestaille
Graduate Consultant

Checked by

Dr Alex Chappell
Principal Consultant

Approved by

Paul Bate
Regional Director

Revision History

Revision	Revision date	Details	Authorised	Name	Position
v1.2	June 2026	Final Version	Yes	PB	TD

Prepared by:

Luke Pestaille
Graduate Consultant

AECOM Limited
Marlborough Court
10 Bricket Road
St Albans
Hertfordshire
AL1 3JX

aecom.com

© 2026 AECOM Limited. All Rights Reserved.

AECOM Limited ("AECOM") has prepared this Report for the sole use of Herefordshire Council ("Client") in accordance with the terms and conditions of appointment (ref no: 60746644 Hereford Bypass Programme) dated February 2025 ("the Appointment").

AECOM shall have no duty, responsibility and/or liability to any party in connection with this Report howsoever arising other than that arising to the Client under the Appointment. Save as provided in the Appointment, no warranty, expressed or implied, is made as to the professional advice included in this Report or any other services provided by AECOM.

This Report should not be reproduced in whole or in part or disclosed to any third parties for any use whatsoever without the express written authority of AECOM. To the extent this Report is reproduced in whole or in part or disclosed to any third parties (whether by AECOM or another party) for any use whatsoever, and whether such disclosure occurs with or without the express written authority of AECOM, AECOM does not accept that the third party is entitled to rely upon this Report and does not accept any responsibility or liability to the third party. To the extent any liability does arise to a third party, such liability shall be subject to any limitations included within the Appointment, a copy of which is available on request to AECOM.

Where any conclusions and recommendations contained in this Report are based upon information provided by the Client and/or third parties, it has been assumed that all relevant information has been provided by the Client and/or third parties and that such information is accurate. Any such information obtained by AECOM has not been independently verified by AECOM, unless otherwise stated in this Report. AECOM accepts no liability for any inaccurate conclusions, assumptions or actions taken resulting from any inaccurate information supplied to AECOM from the Client and/or third parties.

Table of Contents

1.	Introduction	4
1.1	The Scheme and Characteristics of the Area	4
1.2	Assessment of Distributional Impacts	10
1.3	Sources of Data	11
2.	Distributional Impacts of User Benefits	12
2.2	Screening of User Benefits	12
2.3	Assessment and Appraisal of User Benefits	12
3.	Distributional Impacts of Noise	14
3.2	Screening of Noise	14
3.3	TAG Appraisal of Noise	14
3.4	Study Area	15
3.5	Noise Modelling	15
3.6	Results for Distributional Impacts Appraisal	15
3.7	Noise Impacts by Income Deprivation	17
3.8	Noise Impact on Vulnerable Groups	19
3.9	Noise Impacts at Sensitive Locations	23
4.	Distributional Impacts of Air Quality	25
4.2	Screening of Air Quality	25
4.3	Assessment and Appraisal of Air Quality	25
4.4	Appraisal Methodology	25
4.5	PM _{2.5} Impacts by Income Deprivation	26
4.6	NO ₂ Impacts by Income Group	27
4.7	Air Quality Impact on Vulnerable Groups	28
4.8	Air Quality Impacts on Sensitive Receptors	30
5.	Distributional Impacts of Accidents	34
5.2	Screening of Accidents	34
5.3	Assessment and Appraisal of Accidents	34
6.	Distributional Impacts of Security	41
6.2	Screening of Security	41
7.	Distributional Impacts of Accessibility	42
7.2	Screening of Accessibility	42
8.	Distributional Impacts of Severance	43
8.2	Screening of Severance	43
8.3	Assessment and Appraisal of Severance	43
9.	Distributional Impacts of Personal Affordability	50
9.2	Screening	50
9.3	Assessment and Appraisal	50
9.4	Personal Affordability Worksheet	53
10.	Output Summary Table	54
11.	DI Appraisal Matrix	55
12.	AST Entry	57

Figures

Figure 1-1: Scheme Location and the City of Hereford	5
Figure 1-2: Land Use Around Hereford	5
Figure 1-3: Levels of Deprivation (SEISA)	7
Figure 1-4: Proportion of Children	7
Figure 1-5: Proportion of Young People	8
Figure 1-6: Proportion of People Aged 70 and Over	8
Figure 1-7: Proportion of households with no car within the centre of Hereford	9
Figure 1-8: Proportion of people with disabilities within the centre of Hereford	9
Figure 2-1: User Benefits Shown at LSOA Scale	13
Figure 3-1: Affected Residential Noise Receptors with Noise Changes (2043 Day)	16
Figure 3-2 Affected Residential Noise Receptors with Noise Changes (2043 Night)	16
Figure 3-3: Residential Noise Changes and Deprivation Levels (2043 Day)	18
Figure 3-4: Residential Noise Changes and Deprivation Levels (2043 Night)	19
Figure 3-5: Residential Noise Changes and Child Proportion (2043 Day)	21
Figure 3-6: Residential Noise Changes and Older Proportion (2043 Day)	21
Figure 3-7: Residential Noise Changes and Child Proportion (2043 Night)	22
Figure 3-8: Residential Noise Changes and Older Proportion (2043 Night)	23
Figure 3-9: Non-residential Locations Considered for Noise Impact Assessment	24
Figure 4-1: PM _{2.5} Change by Household and Deprivation Levels (2043)	27
Figure 4-2: NO ₂ Change by Household and Deprivation Levels (2043)	28
Figure 4-3: PM _{2.5} Change by Household and Proportion of Children (2043)	29
Figure 4-4: NO ₂ Change by Non-Residential and Proportion of Children (2043)	30
Figure 4-5: PM _{2.5} Change at Non-residential Sensitive Receptors and Deprivation	33
Figure 4-6: NO ₂ Change at Non-residential Sensitive Receptors and Deprivation	33
Figure 5-1: Accident AoI Vehicle Flow Changes (PCU) for 2043	35
Figure 5-2: Casualty Clusters in South Wye (Urban AoI)	39
Figure 5-3: Casualty Clusters in Affected Rural Areas (Rural AoI)	40
Figure 8-1: Links Meeting the Severance Screening Criteria	44
Figure 8-2: OSM Bus Stops and Identified Links for Severance	45
Figure 8-3: OSM Points of Interest and Identified Links for Severance	45
Figure 8-4: Zone to Bus Stop Paths Within Buffer of Severance Links	46
Figure 8-5: Zone to Points of Interest Lines Within Buffer of Severance Links	47
Figure 9-1: Personal Affordability by Lower Super Output Area	52

Tables

Table 1.1: Social Groups Assessed for Each Indicator	10
Table 2.1: Distributional Impacts of User Benefits (2043 Core Scenario Only)	13
Table 3.1: Impact of Noise on the Population by Income Band (2043 Daytime)	18
Table 3.2: Impact of Night-time Noise on the Population by Income Band (2043)	19
Table 3.3: Impact of Noise on the Population by Vulnerable Group (2043)	20
Table 3.4: Impact of Night-time Noise on the Population by Vulnerable Group (2043)	22
Table 3.5: Non-residential Locations Considered for Noise Impact Assessment	23
Table 4.1: Distributional Impacts of PM _{2.5} by Income Band (2043)	26
Table 4.2: Distributional Impacts of NO ₂ on Population by Income Band (2043)	27
Table 4.3: PM _{2.5} Impacts for Children (2043)	28
Table 4.4: NO ₂ Impacts for Children (2043)	29
Table 4.5: Non-residential Sensitive Receptors (2043 PM _{2.5})	31
Table 4.6: Non-residential Sensitive Receptors (2043 NO ₂)	32
Table 5.1: Casualties by Vulnerable Group and Road Class within Herefordshire	36
Table 5.2: Casualties by Vulnerable Group and Road Class within the AoI	37
Table 5.3: Casualties by Vulnerable Group and Road Class within the Urban AoI	37
Table 5.4: Casualties by Vulnerable Group and Road Class within the Rural AoI	38
Table 8.1: Summary of Severance Appraisal by Area	49
Table 9.1: Distributional Impacts of Personal Affordability from TUBA	51

1. Introduction

1.1 The Scheme and Characteristics of the Area

- 1.1.1 Hereford is a cathedral city and county town in the county of Herefordshire, which is in the West Midlands region of England, approximately 16 miles east of the border with Wales.
- 1.1.2 Phase One of the Hereford Western Bypass will connect the A49 at the B4399 roundabout in Grafton, south of Hereford, to the A465 at a new roundabout junction with the B4349 in Clehonger, south-west of Hereford. The new road being developed for the scheme will cross open farmland and the Hereford to Newport Railway Line.
- 1.1.3 By providing a direct link between the A49 and the A465, Phase One of the Hereford Western Bypass aims to reduce the west-east commuting and freight traffic that currently uses Ross Road (A49), Belmont Road (A465), Walnut Tree Avenue and Holme Lacy Road in South Wye, and secondary rural routes to the south of the City.
- 1.1.4 The west-east traffic using indirect routes contributes to congestion and the environmental impacts of slow-moving traffic across residential areas of South Wye. It also contributes to turning traffic at accident-prone junctions including many on Belmont Road, Ross Road, Holme Lacy Road in the City, and at Lock's Garage on the A465.
- 1.1.5 **Figure 1-1** shows the location of Phase One of the Hereford Western Bypass ('the scheme') relative to the City of Hereford.
- 1.1.6 **Figure 1-2** shows the location of amenities and employment areas in Hereford. There is a concentration of amenities in the centre of Hereford. Employment is concentrated around Hereford Enterprise Zone (Rotherwas), the City Centre and the A49 corridor north of the River Wye (Avara Foods, Heineken, Special Metals and others). Shopping is concentrated in the City Centre and to the north along the A49. The rest of the city north of the River Wye is dominantly residential. South of the River Wye (South Wye) the city is almost entirely residential. These locations act as origins and destinations for journeys that define the patterns of travel within Hereford.

Figure 1-1: Scheme Location and the City of Hereford

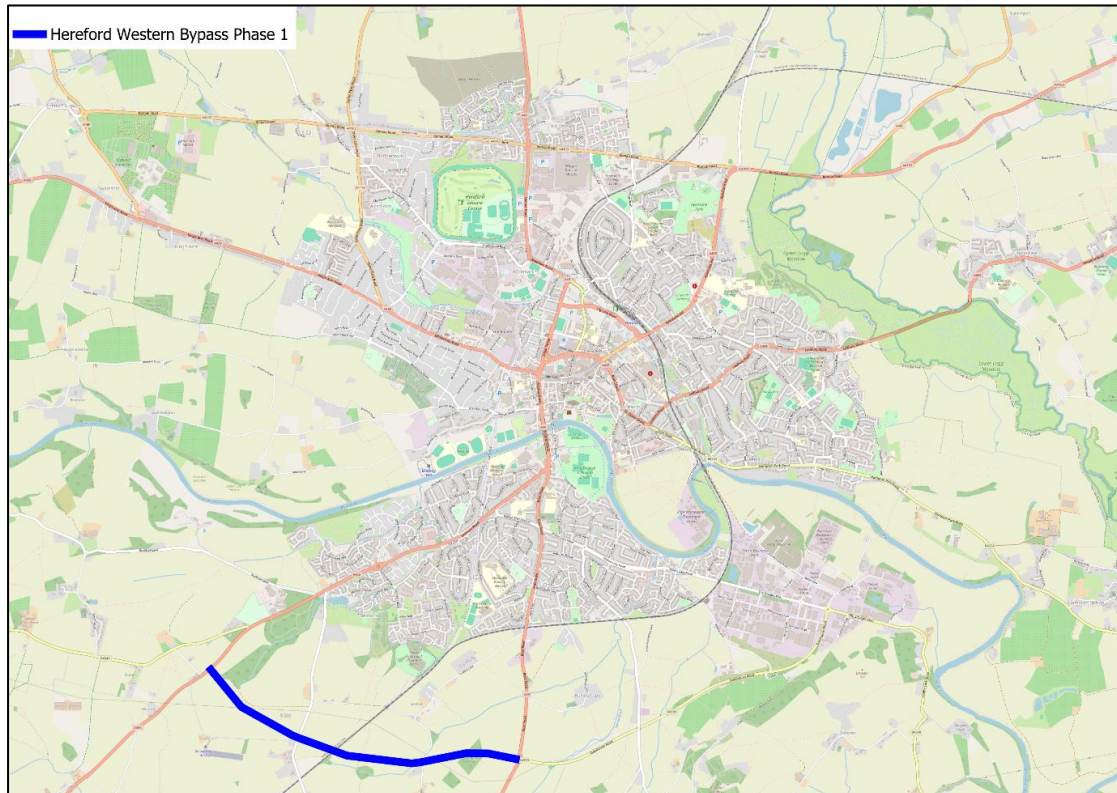
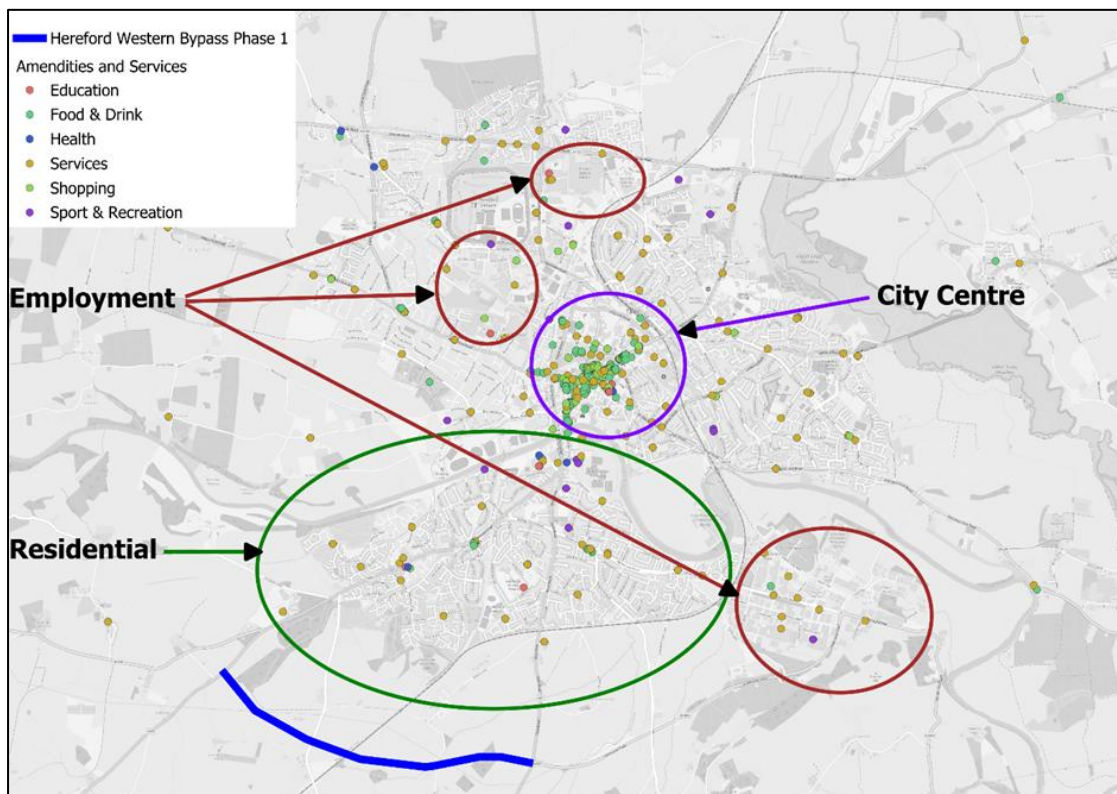


Figure 1-2: Land Use Around Hereford



1.1.7

- 1.1.8 **Figure 1-3** shows the distribution of deprivation across Hereford. This is the SEISA deprivation index based on the 2021 Census which is calculated at Output Area (OA) scale which enables it to pick up small areas of deprivation that Indices at larger geographies would miss. The most deprived areas are predominantly located in the city and surrounding rural areas are relatively affluent. Within Hereford there are places that are in the most deprived 20% of areas in England. There are pockets with this high level of deprivation across the city with concentrations to the west of the City Centre in Whitecross and a large area of South Wye. Affluent areas in the least deprived 40% of areas in England are close to the River Wye and in the eastern part of the city. The scheme itself crosses rural areas in quintiles 3 and 4 (40% to 80%).
- 1.1.9 **Figure 1-4** shows the proportion of the population in Hereford that are under 16 years old from the 2021 Census at OA scale. Higher proportions (>20%) of children are generally concentrated in the city, particularly in parts of South Wye where some OAs exceed 30% children. This indicates many families and fewer older people in these areas. In contrast, lower proportions of children are typically observed in the surrounding rural areas.
- 1.1.10 **Figure 1-5** shows the proportion of the population aged between 16 and 25 from the 2021 Census at OA scale. Proportions are typically slightly higher in the City compared to surrounding rural areas. A higher proportion (20%-40%) is recorded in the City Centre and at the bottom of Aylestone Hill. This reflects the location of the NMITE student accommodation.
- 1.1.11 **Figure 1-6** illustrates the proportion of the population aged 70 and over from the 2021 Census at OA scale. Central Hereford generally exhibits lower proportions of this age group, typically ranging between 10% and 30%. The surrounding areas show a significantly higher concentration of older residents, with many locations exceeding 30% of the population. Many areas with a low proportion of children have a high proportion of older residents. This pattern reflects differing lifestyle and employment needs, as this age group is largely retired. Fayre Oaks Park is the OA with the highest proportion of residents aged 70 and over. It is an over-50's community with more than 60% of residents aged 70 or over.
- 1.1.12 **Figure 1-7** reveals the proportion of households without access to a car from the 2021 Census at OA scale. A high percentage of no-car households is evident within central Hereford and South Wye. There are a number of reasons for this – student population in the city centre, areas of deprivation, areas with more older people and a higher propensity to make journeys by active modes in a relatively small city. In contrast, most rural areas surrounding Hereford have fewer than 10% of households without access to a car, as irrespective of deprivation level a car is required to efficiently access employment and services.
- 1.1.13 **Figure 1-8** shows the proportion of the population within each output area who identify as disabled from the 2021 Census at OA scale. Hereford shows areas with a higher proportion of disabled residents (>30%), which may reflect requirements of greater need for services and availability of public transport services. There is some correlation with areas of older population (e.g. Fayre Oaks, Beattie Avenue) and the halls of the Royal National College for the Blind on Venns Lane. In contrast, the surrounding rural areas tend to display lower proportions of people with disabilities, potentially influenced by the reduced accessibility and availability of services in these locations due to the need for vehicles.

Figure 1-3: Levels of Deprivation (SEISA)

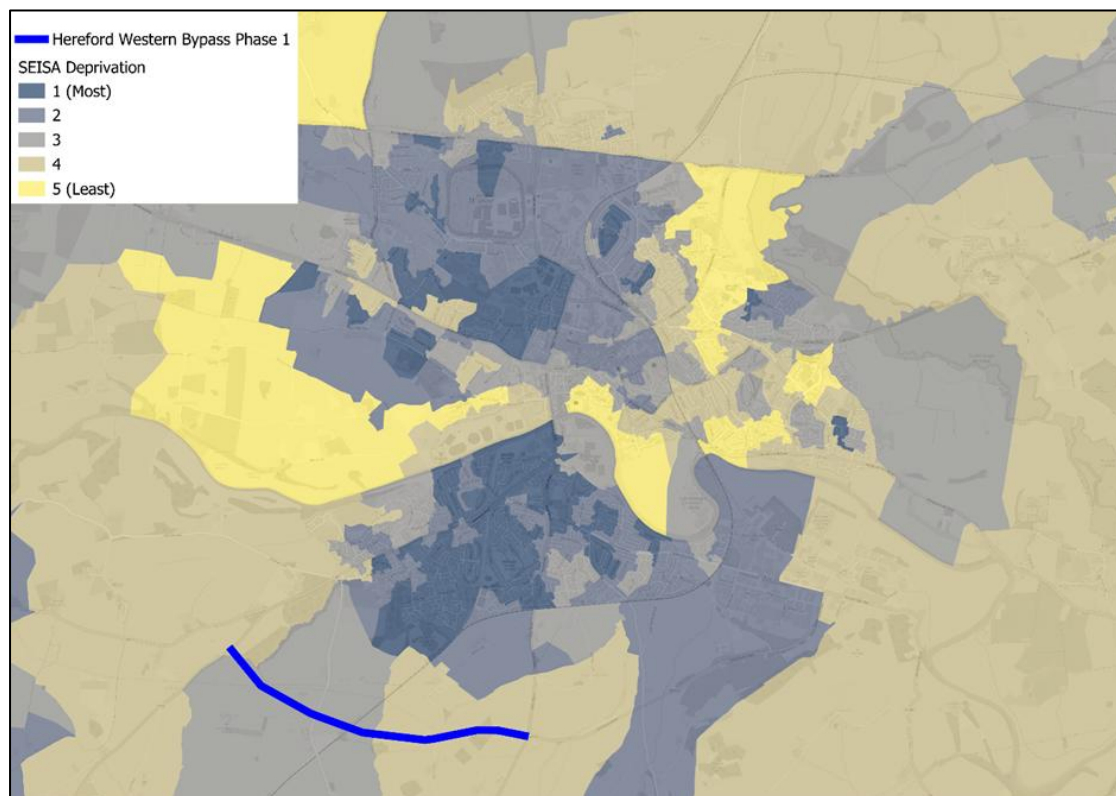


Figure 1-4: Proportion of Children

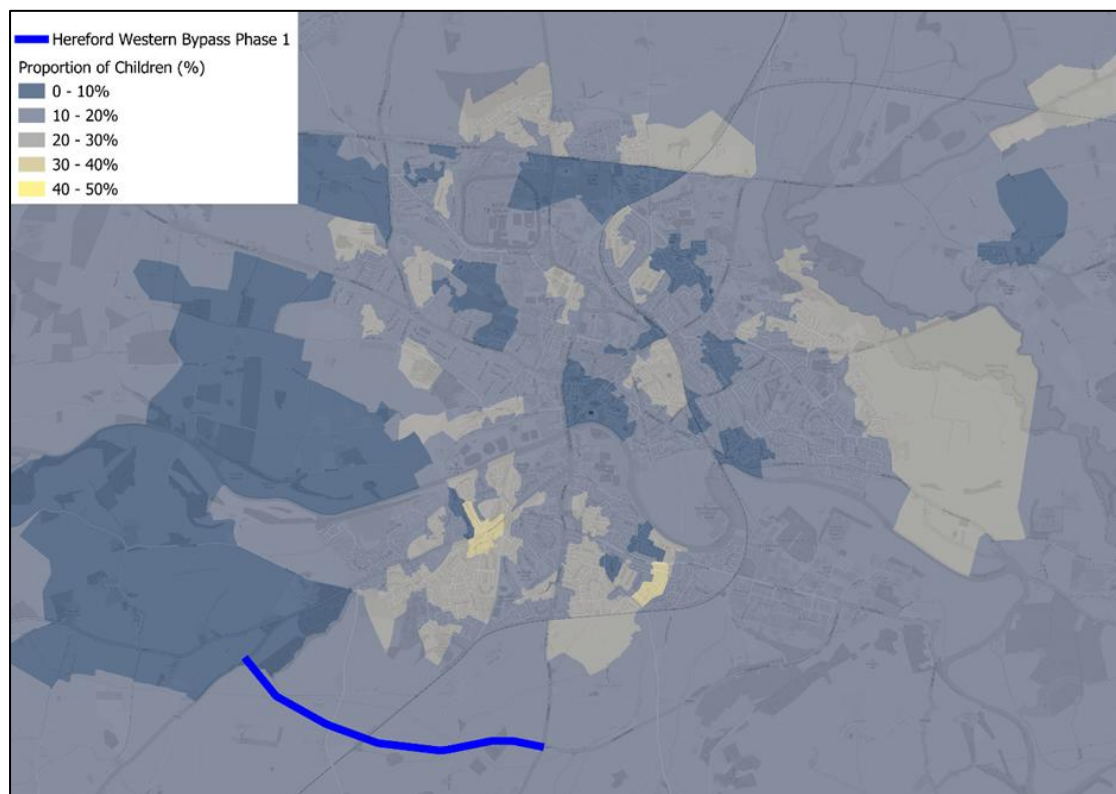


Figure 1-5: Proportion of Young People

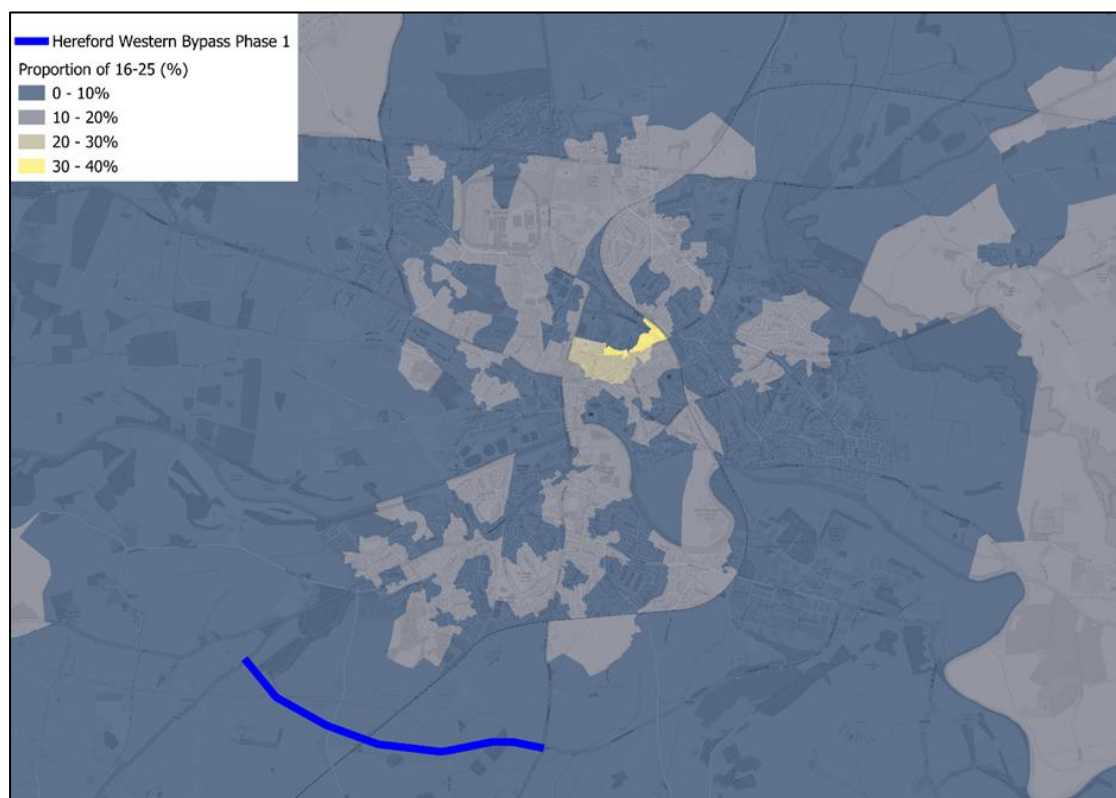


Figure 1-6: Proportion of People Aged 70 and Over

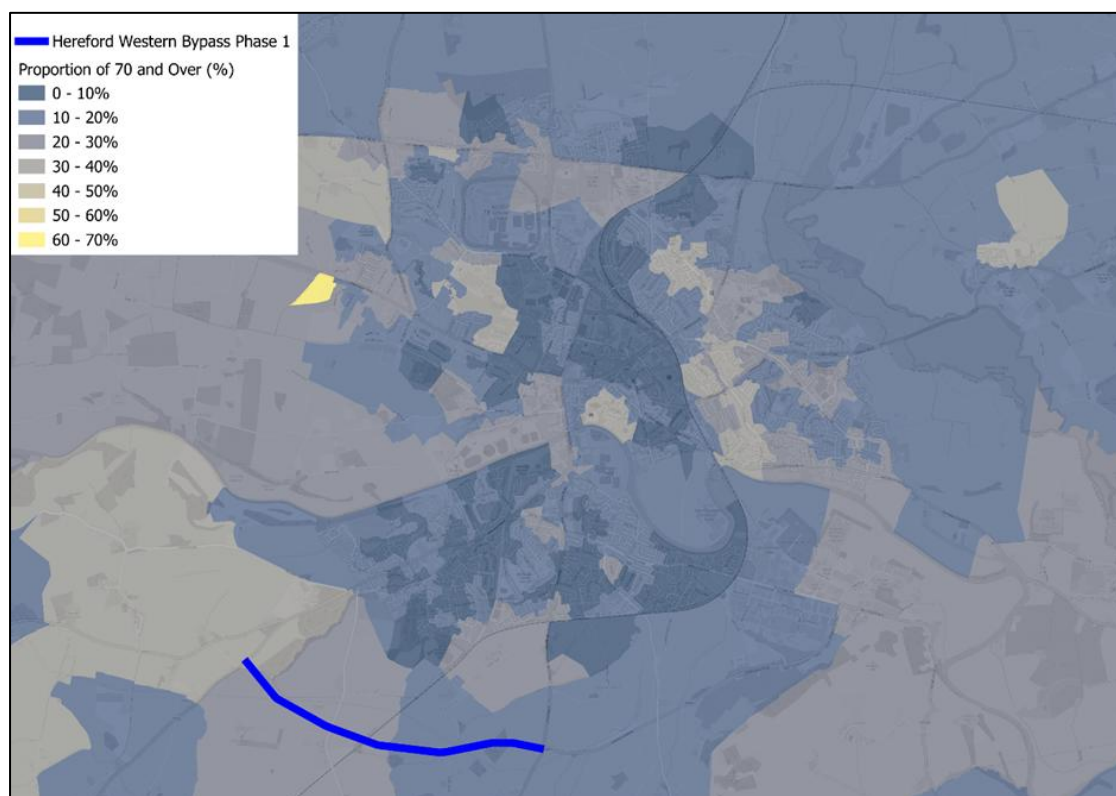


Figure 1-7: Proportion of households with no car within the centre of Hereford

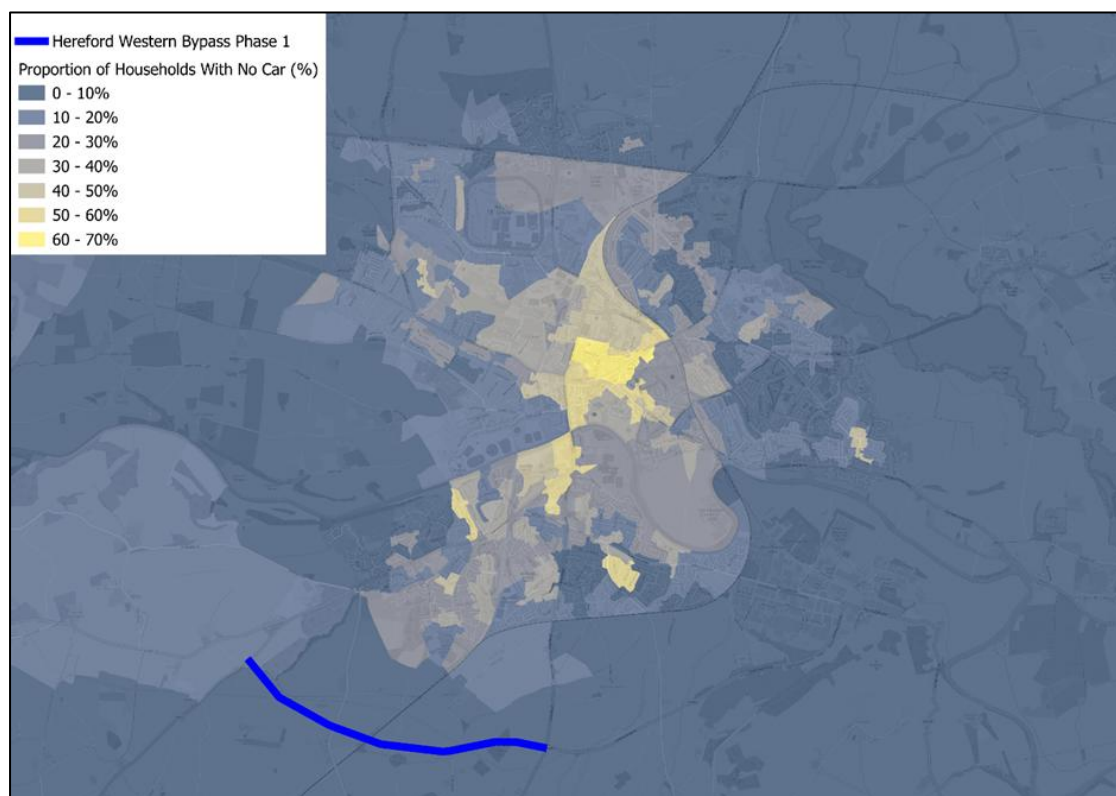


Figure 1-8: Proportion of people with disabilities within the centre of Hereford



1.2 Assessment of Distributional Impacts

1.2.1 Distributional impacts consider the variance of transport intervention impacts across different social and economic groups. Both beneficial and adverse impacts need to be considered as well as identification of social groups likely to be affected (TAG Unit A4.2, May 2024).

1.2.2 TAG specifies the consideration of distributional impacts for several indicators:

- user benefits (economic benefits for non-business travel);
- noise impact of the scheme on the resident vulnerable population;
- air quality impact of the scheme on the resident vulnerable population;
- changes in accident rate;
- security (related to access to public transport);
- severance (primarily for active travel);
- accessibility (ease of access to services by public transport); and
- personal affordability (economic cost of non-business travel).

1.2.3 Not all social groups are sensitive to each indicator; and it is only necessary to investigate affected groups. They are set out in TAG Unit A4.2 and are reproduced in **Table 1.1**:

Table 1.1: Social Groups Assessed for Each Indicator

Social Group	User Benefits	Noise	Air Quality	Accidents	Security	Severance	Accessibility	Affordability
Income distribution	✓	✓	✓				✓	✓
Children: proportion of population aged <16		✓	✓	✓	✓	✓	✓	
Young adults: proportion of population aged 16-25				✓			✓	
Older people: proportion of population aged >70		✓		✓	✓	✓	✓	
Proportion of population with a disability					✓	✓	✓	
Proportion of population of Black and Minority Ethnic (BME) origin					✓		✓	
Proportion of households without access to a car						✓	✓	
Carers: proportion of households with dependent children							✓	

1.2.4 For each indicator a three-step approach is used as defined in TAG:

- **Step 1 - Screening Process:** Identify the likely impacts for each indicator in the different scenarios (the outcome of this step is the TAG screening proforma);
- **Step 2 - Assessment:** Determine the area of impact (AoI) of the transport intervention, identify the distribution of the socio-economic groups in the area; and identify the local amenities in the area;
- **Step 3 - Appraisal of Impacts:** Core analysis of the impacts.

1.3 Sources of Data

- 1.3.1 Analysis used a variety of sources of data to allow the scheme impacts to be defined at Census Lower Super Output Area (LSOA) and Output Area (OA) scale. Primarily, 2021 Census data was utilised at OA scale allows for a detailed and disaggregated analysis of deprivation and other population characteristics. This diverges from the socio-demographic data sources suggested within TAG Unit A4.2, as these are largely outdated and are superseded by the data available after the 2021 Census and after the COVID19 pandemic.
- 1.3.2 The 2021 Census Bulk Data from Nomis was utilised for the analysis of different social groups as it provides all data from the 2021 Census at every geographic scale (OA, LSOA, MSOA, and others). This allows for breakdown of the proportion of different social groups at a small scale within the area of impact for each indicator.
- 1.3.3 Where the Area of Impact (AoI) for an indicator is small relative to LSOA geography, OAs are used to avoid missing the variation in impact across the population. Due to the sparse population in rural Herefordshire LSOAs tend to be geographically very large, so analysis by OA is required to avoid missing pockets of deprivation and other vulnerable characteristics.
- 1.3.4 The Higher Education Statistics Agency Socioeconomic Index for Small Areas (SEISA) was mostly used as a proxy for income rather than the English Indices of Deprivation (IoD) Income Deprivation Index.
- 1.3.5 The income domain of the 2025 English Indices of Deprivation was used in the user benefits and personal affordability appraisals to represent income as the scale of the appraisal (the whole County of Herefordshire) was large enough to use LSOA geography.
- 1.3.6 Data from the STATS19 collision reporting system was utilised for road-related accidents to analyse collisions and casualties. This allowed for all the casualty data to be analysed for a given collision.
- 1.3.7 Additional data from Open Street Map is used to capture data on the land use and amenities within Herefordshire. This provides more background information to support the analysis of travel patterns and affected areas within the AoI for each indicator.
- 1.3.8 These socio-economic data are combined with the forecast traffic data from the Core Scenario transport model; and further outputs from standard Department for Transport (DfT) processes such as TUBA (transport user benefits), COBALT (accident valuation) and environmental modelling used to monetise changes due to the scheme. This allows changes in transport impacts, such as user benefits, air quality, and noise levels to be mapped to the characteristics of the affected population.

2. Distributional Impacts of User Benefits

- 2.1.1 The transport user benefits of the proposed scheme were calculated using the DfT's TUBA software for a standard period of 60 years. The pattern of benefits for the distributional impact appraisal was extracted from the 2043 (design year) TUBA data and is presented in this section. The total benefits are from the full 60 years calculation and will follow a similar pattern.
- 2.1.2 For distributional impacts, only the benefits resulting from non-business journeys were considered. Business trips are experienced by businesses and not individuals. The non-business trips in HSTM are allocated to one of 5 quintiles in the 2025 Indices of Deprivation (IoD) income domain data, representing income, at Lower Super Output Area (LSOA) scale.

2.2 Screening of User Benefits

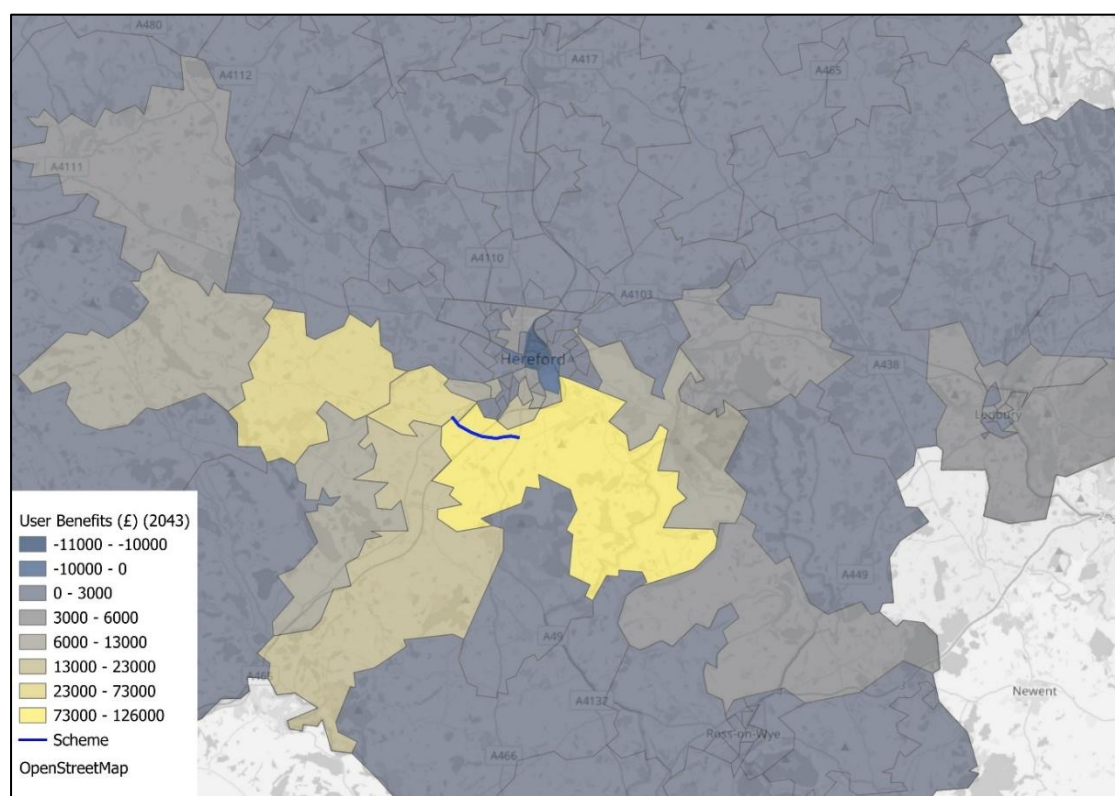
- 2.2.1 Time benefits are a key impact of the proposed scheme, so a distributional impact assessment of user benefits is required. TAG states that once the user benefits are assessed using the TUBA software or equivalent, a full distributional impact analysis should be undertaken.

2.3 Assessment and Appraisal of User Benefits

- 2.3.1 The Area of Impact (AoI) for user benefits appraisal was defined as all of Herefordshire.
- 2.3.2 The user benefits calculated by TUBA are filtered to only include trips which have a home location inside the Area of Impact. The non-business trips, namely 'commuting' and 'other' purpose trips, were aggregated by IoD income domain quintile, representing income level of the resident population. The user benefits include monetisation of changes in travel time and changes in fuel and non-fuel operating costs for travel. Benefits relating to changes in indirect taxation and greenhouse gases are excluded from this analysis. The results of the distribution impacts assessment for user benefits are presented in **Table 2.1**.
- 2.3.3 The user benefits are unevenly distributed across the population. All income groups have net beneficial impacts from the scheme. The proportion of benefits is broadly in-line with the proportion of the population for the two lowest, most deprived, groups and group 4. Group 3 receives a disproportionately large share of benefits and group 5 receives a disproportionately small share of benefits.
- 2.3.4 **Figure 2-1** shows the distribution of user benefits by LSOA around Hereford. The main area experiencing beneficial impacts is south of the River Wye extending to the west and southeast of the scheme. The largest benefits are for the LSOA containing Hereford Enterprise Zone (Rotherwas) and the LSOAs to the west of the scheme containing Clehonger and Madley. Beneficial impacts decrease with distance from the scheme as fewer journeys further away use the area directly influenced by the scheme. Apart from three LSOAs in the centre of Hereford which have small adverse impacts, all LSOAs in Herefordshire have beneficial impacts.

Table 2.1: Distributional Impacts of User Benefits (2043 Core Scenario Only)

	Quintile					Total
	1 Low income	2	3	4	5 High Income	
Population	10,876	27,195	62,706	68,018	15,390	184,185
% Population	6%	15%	34%	37%	8%	
Total Benefits (£) (2043)	12,970	50,333	254,615	161,664	5,104	484,687
Total Disbenefit (£) (2043)	-	-	-	-	-	
% Benefits	3%	10%	53%	33%	1%	
% Disbenefit	-	-	-	-	-	
Assessment ¹	✓✓	✓✓	✓✓✓	✓✓	✓	

Figure 2-1: User Benefits Shown at LSOA Scale¹ See TAG Unit A4.2 Table 8.

3. Distributional Impacts of Noise

- 3.1.1 Children and older people are identified as being vulnerable to changes in noise levels. It is also considered that people with a lower income are less likely to afford mitigation against noise (e.g. installing insulation or double glazing). As a result, income groups are also included in the analysis of the distributional impacts of noise as suggested by TAG.

3.2 Screening of Noise

- 3.2.1 According to TAG Unit A3, noise impacts are likely to occur when an intervention results in changes to traffic flows or speeds. Both are forecast to occur in the case of the proposed scheme, and its impacts on the specified key groups of people have been assessed.

3.3 TAG Appraisal of Noise

- 3.3.1 The noise appraisal for the proposed highway improvements has been undertaken based upon the TAG Unit A3.
- 3.3.2 The appraisal considers absolute traffic noise levels, changes in traffic noise levels and the impacts on residential properties for the following scenarios:
- Without Scheme 'Do-Minimum' 2028 (DM 2028): opening year;
 - Without Scheme 'Do-Minimum' 2043 (DM 2043): forecast year (15 years after full opening);
 - With Scheme 'Do-Something' 2028 (DS 2028): opening year; and
 - With Scheme 'Do-Something' 2043 (DS 2043): forecast year (15 years after full opening).
- 3.3.3 The TAG Unit A3 appraisal involves the following steps:
1. Scoping;
 2. Quantification of noise impacts;
 3. Estimation of the affected population;
 4. Monetary valuation of noise impacts; and
 5. Distributional Impact (DI) Analysis.
- 3.3.4 The appraisal presented here covers Steps 2 to 4. The DI analysis follows.
- 3.3.5 Step 2 (quantification of noise impacts) requires the calculation of the with-scheme and without-scheme noise impacts using CRTN.
- 3.3.6 The daytime noise metric used in the TAG appraisal is the façade level $L_{Aeq,16hr}$ (defined as 07:00 to 23:00 hours). Therefore, the predicted road traffic noise level, $L_{A10,18hr}$ (the standard noise metric output from a CRTN calculation), needs to be converted to an equivalent $L_{Aeq,16hr}$. The conversion factor is:

$$L_{Aeq,16hr} = L_{A10,18hr} - 2 \text{ dB}$$

- 3.3.7 Night noise impacts (23:00 to 07:00) can be assessed based on transformations between day and night-time metrics and should be based on free-field noise levels. For this appraisal, noise levels have been converted using the revised TRL Method 3² as follows:

$$L_{Aeq,8hr} = 0.90 \times L_{A10,18hr} - 3.77 \text{ dB (non-motorway roads)}$$

- 3.3.8 Step 3 (estimation of the affected population) involves calculating the difference in the estimated population affected by noise, comparing with-scheme and without-scheme cases. The estimation of affected population is carried out using the TAG Noise Workbook³ using an average household size of 2.3 people per household.
- 3.3.9 Step 4 (monetary valuation of noise impacts) appraises the monetary valuation attributed to changes in noise, and is based on the estimation of the number of disability adjusted life years (DALYs) lost or gained. The monetary valuation is intended to complement the Step 3 quantitative noise appraisal (i.e. the number of households experiencing increases or decreases in noise). These monetary values come from the TAG Noise Workbook.
- 3.3.10 Step 5 (DI Analysis) is described in TAG Unit A4.2. The noise results have been provided to the transport team to undertake this analysis.

3.4 Study Area

- 3.4.1 TAG Unit A3 does not specify the study area to consider. LA 111 states that “An operational study area defined as the area within 600 m of new road links or road links physically changed or bypassed by the project can be sufficient for most projects, but it can be reduced or extended to ensure it is proportionate to the risk of likely significant effects.”
- 3.4.2 Following this guidance 600 m around the Proposed Scheme as well as routes expected to experience more than a 1 dB change in road traffic noise level was selected as the study area. Roads bypassed by the scheme are all included as affected routes. Bage Pitch Road is an affected route from Madley to the A438 however due to the small number of receptors along this route the study area was only extended 600 m either side of this road from Madley. This is following the assessment proportionality guidance in TAG Unit A3. The total number of residential receptors in the study area is 2393.

3.5 Noise Modelling

- 3.5.1 All predicted road traffic noise levels have been calculated using the SoundPLAN© noise prediction software (version 9.1 Update 19/02/2026), set to predict the $L_{A10,18hr}$ traffic noise level at receptor locations in accordance with CRTN.
- 3.5.2 SoundPLAN© models have been built for the without-scheme scenarios for both the opening year (2028) and forecast year (2043), and for the with-scheme scenarios for both years. All calculations are based on the predicted traffic flows and associated variables for the opening year and forecast year as supplied in the form of 18-hour AAWT (annual average weekday traffic), traffic speeds in km/h, and HGV percentages.

3.6 Results for Distributional Impacts Appraisal

- 3.6.1 The results supplied for distributional impacts analysis and appraisal are shown in
- 3.6.2 **Figure 3-1** and **Figure 3-2** for daytime and night-time respectively. These show the change in noise for receptors close to the affected road network. Most receptors have no change in

² P.G Abbott (TRL) and S.J. Stephenson (2006) *Method for Converting the UK Road Traffic Noise Index $L_{A10,18h}$ to the EU Noise Indices for Road Noise Mapping*

³Department for Transport (May 2026) *TAG Unit A3 Environmental Impact Noise Worksheet* accessed on 27th May 2026 <https://assets.publishing.service.gov.uk/media/6a171249c7335e2ca6daac19/tag-workbook-noise.xlsx>

noise. The remainder have impacts commensurate with the reassignment of traffic on rural routes.

Figure 3-1: Affected Residential Noise Receptors with Noise Changes (2043 Day)

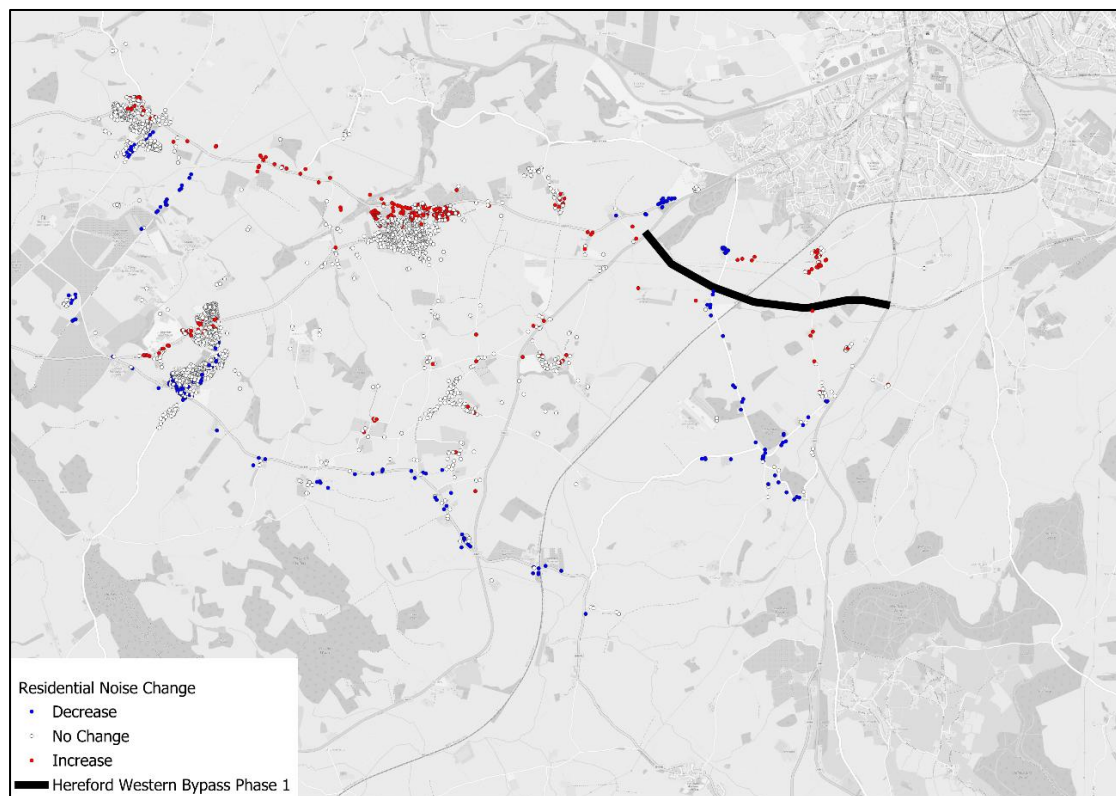
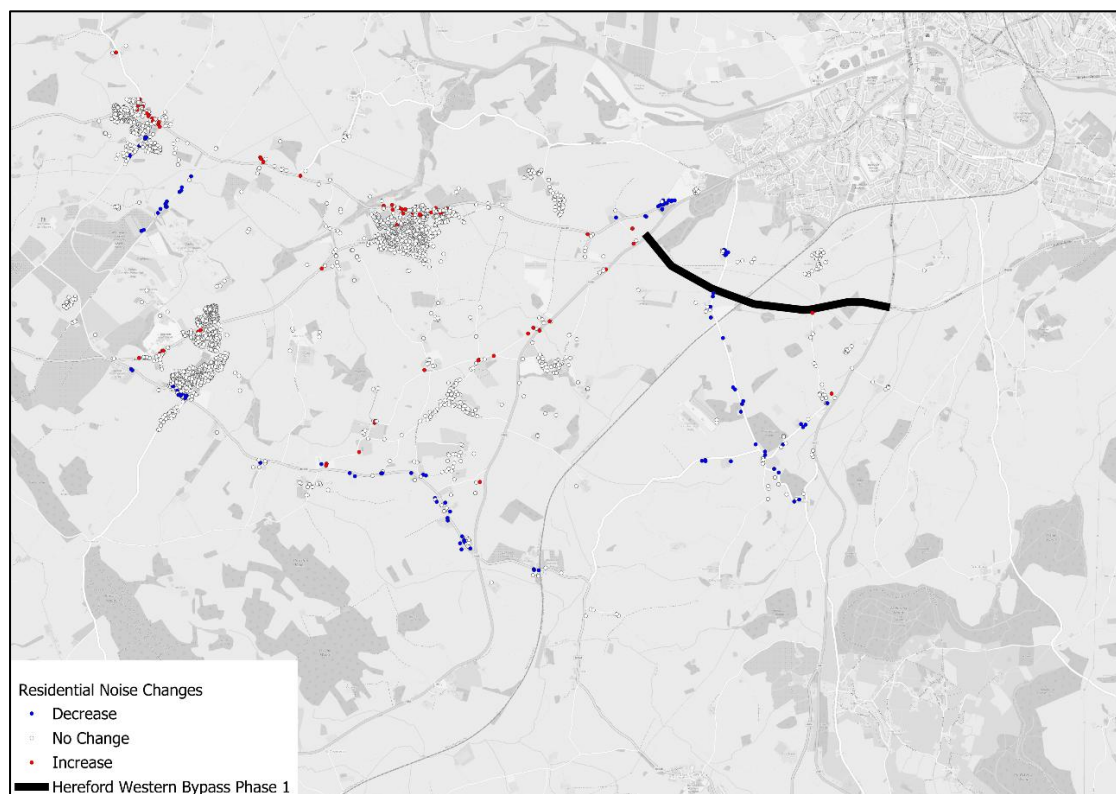


Figure 3-2 Affected Residential Noise Receptors with Noise Changes (2043 Night)

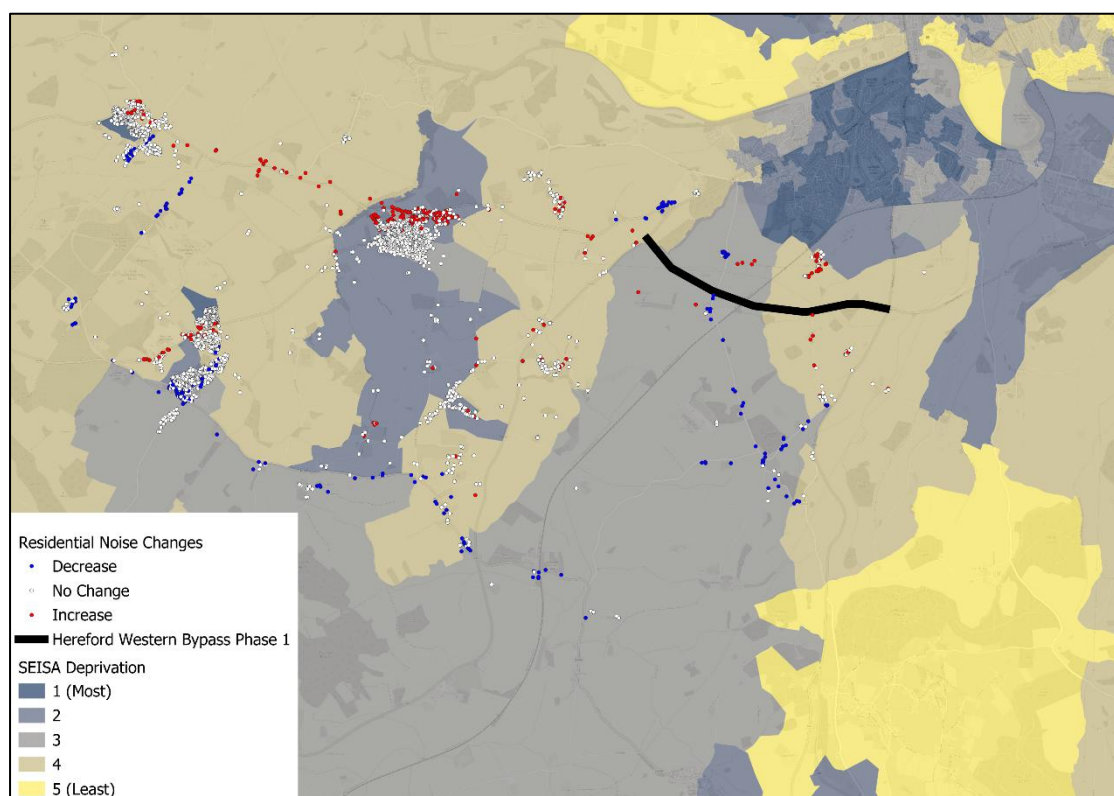


3.7 Noise Impacts by Income Deprivation

- 3.7.1 Traffic noise modelling data were provided for residential buildings for the 'with-scheme' scenario and the 'without-scheme' scenarios for the 2043 forecast year, representing the design year. The traffic noise level assigned to each building is based on the façade which undergoes the worst-case change in the long-term due to the scheme. The Output Area (OA) in which each of these buildings is located was identified and the income and population characteristics for that OA are assumed for its residential buildings.
- 3.7.2 The populations in each income group that would experience improvements in noise quality (i.e. reductions in traffic noise), no change, or decrease in noise quality (i.e. increases in traffic noise) were calculated.
- 3.7.3 The income group data by Output Area derived from the 2021 Census using the SEISA method was used to split the population by income. The area covered by the noise modelling is relatively small relative to LSOA geography and the more granular SEISA data at OA scale is at a more suitable scale to derive variations in noise impact by income.
- 3.7.4 There are higher proportions of the population in income groups 2 and 4 (34% and 39%) and lower proportions in groups 1 and 3 (11% and 16%) in the Area of Impact (Aol) for noise. Group 5, the least deprived, is not present. This pattern is due to the selected Aol, whereas including South Wye would give a population dominated by the lowest two income groups such as that seen for the air quality modelling.
- 3.7.5 **Table 3.1** shows the forecast daytime noise impacts, whether positive, negative or neutral, for households in each of the five income groups for 2043. Most households have no change in noise. 270 households have increased noise and 207 have decreased noise. These are distributed unevenly between income groups. Groups 1 and 4 have adverse impacts broadly in line with the proportion of population. Group 2 has a higher proportion of adverse impacts than population due to an increase in traffic on the B4349 in Clehonger village. Group 3 has a beneficial impact due to receptors largely falling on the west-east routes relieved of traffic by the scheme. Group 5 is not present.
- 3.7.6 Although improvements in traffic noise impacts could be expected within the city, it was not considered proportionate to do detailed noise modelling at this stage.
- 3.7.7 **Figure 3-3** shows the location of the modelled noise receptors with changes in noise, alongside the SEISA level of deprivation, where 1 is most deprived, and 5 is least deprived group. The concentration of adverse noise impacts along the B4349 in Clehonger village is clearly seen and the mostly beneficial noise impacts in the large area assigned to income group 3.

Table 3.1: Impact of Noise on the Population by Income Band (2043 Daytime)

	Income Quintile					Total
	1 (Low)	2	3	4	5 (High)	
Increased noise	8	135	13	114	0	270
Decreased noise	1	16	101	89	0	207
No change in noise	248	630	267	692	0	1,837
Net winners/losers	-7	-119	88	-25	0	-63
Percentage of net winners/losers	11%	189%	-140%	40%	0%	
Percentage of Population	11%	34%	16%	39%	0%	
Assessment4	xx	xxx	✓✓✓	xx	neutral	

Figure 3-3: Residential Noise Changes and Deprivation Levels (2043 Day)

3.7.8 To identify the distributional impacts of changes in night-time noise levels, an assessment by income deprivation quintile was also carried out using night-time noise levels ($L_{Aeq,8 \text{ hour}}$, façade) for 2043. The results of this assessment are shown in **Table 3.2** and **Figure 3-4**.

3.7.9 The results show that very few households experience a change in night-time noise levels. Of those that do, 117 experience an decrease in noise and 70 an increase. Across income groups, the impact of the scheme is unevenly distributed. Like the daytime forecast, groups 2 and 3 have large impacts, negative and positive respectively, for similar reasons to the

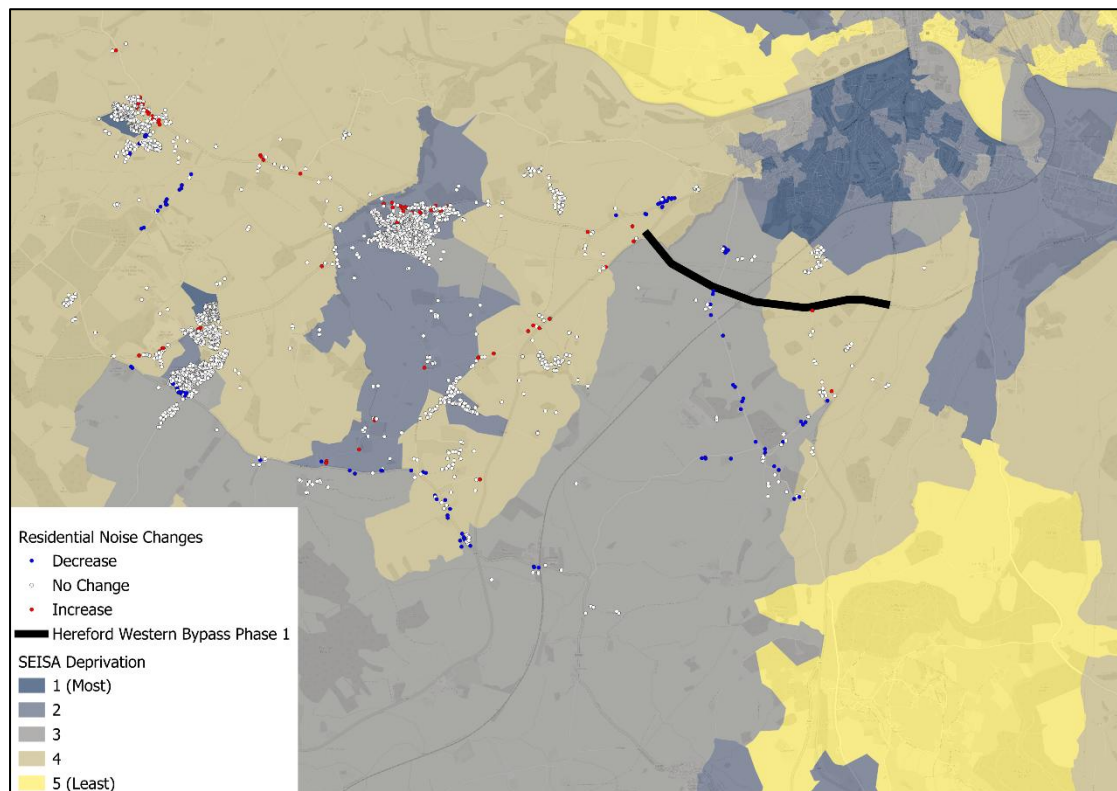
⁴ *Ibid.*

daytime analysis (3.7.6). Groups 1 and 4 have slight beneficial impacts in this case and group 5 is not present.

Table 3.2: Impact of Night-time Noise on the Population by Income Band (2043)

	Income Quintile					
	1 (Low)	2	3	4	5 (High)	Total
Increased noise	0	27	2	41	0	70
Decreased noise	0	3	62	52	0	117
No change in noise	257	751	317	802	0	2127
Net winners/losers	0	-24	60	11	0	47
Percentage of net winners/losers	0%	-51%	128%	23%	0%	
Percentage of Population	11%	34%	16%	39%	0%	
Assessment ⁵	✓	xxx	✓✓✓	✓	neutral	

Figure 3-4: Residential Noise Changes and Deprivation Levels (2043 Night)



3.8 Noise Impact on Vulnerable Groups

3.8.1 Vulnerable groups for noise impacts are defined as children and older people. Impacts at residential locations are calculated in the same way as for income, comparing the proportion

⁵ *Ibid.*

of net winners/losers to the proportion of the affected population for each group. 'Adult' results are not reported but are included in the calculation.

- 3.8.2** The proportions of the population that are children and older people used for assessment are those described in the 2021 Census in each OA. Results are shown in **Table 3.3**,

- 3.8.3 **Figure 3-5** and **Figure 3-6** for daytime noise; and in **Table 3.4**, **Figure 3-7** and **Figure 3-8** for night-time noise.
- 3.8.4 Most people do not experience a change in daytime noise. Daytime impacts are adverse for children and older people that are affected. The number of net winners/losers is small. Impacts are in-line with the population for children and disproportionately small for older people.
- 3.8.5 Most people do not experience a change in night-time noise. Night-time impacts are beneficial for children and older people that are affected. The number of net winners/losers is small. Impacts are in-line with the population for children and disproportionately large for older people.

Table 3.3: Impact of Noise on the Population by Vulnerable Group (2043)

	Vulnerable Group		Total
	Children	Older	
Population with increased noise	105	113	621
Population with decreased noise	79	99	476
Population with no change in noise	770	813	4,225
Net winners/losers	-26	-14	-145
Percentage of net winners/losers	18%	10%	
Percentage of Population	18%	19%	
Assessment	xx	x	

Figure 3-5: Residential Noise Changes and Child Proportion (2043 Day)

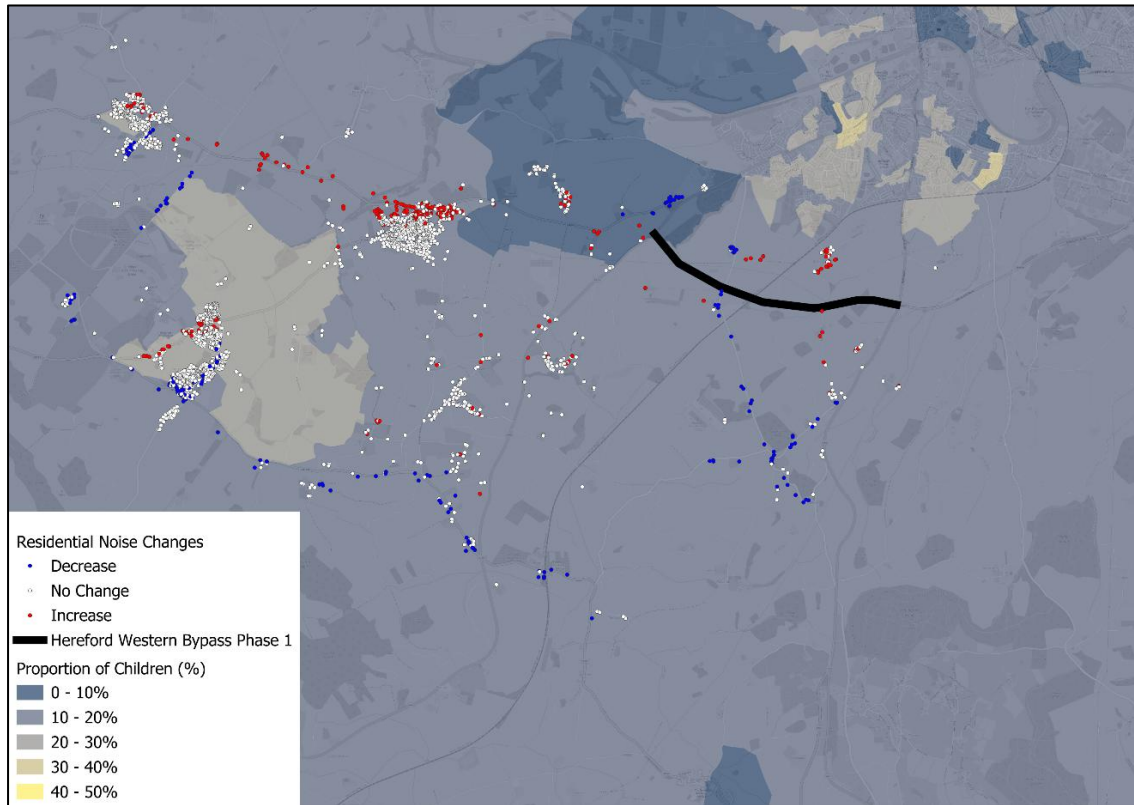


Figure 3-6: Residential Noise Changes and Older Proportion (2043 Day)

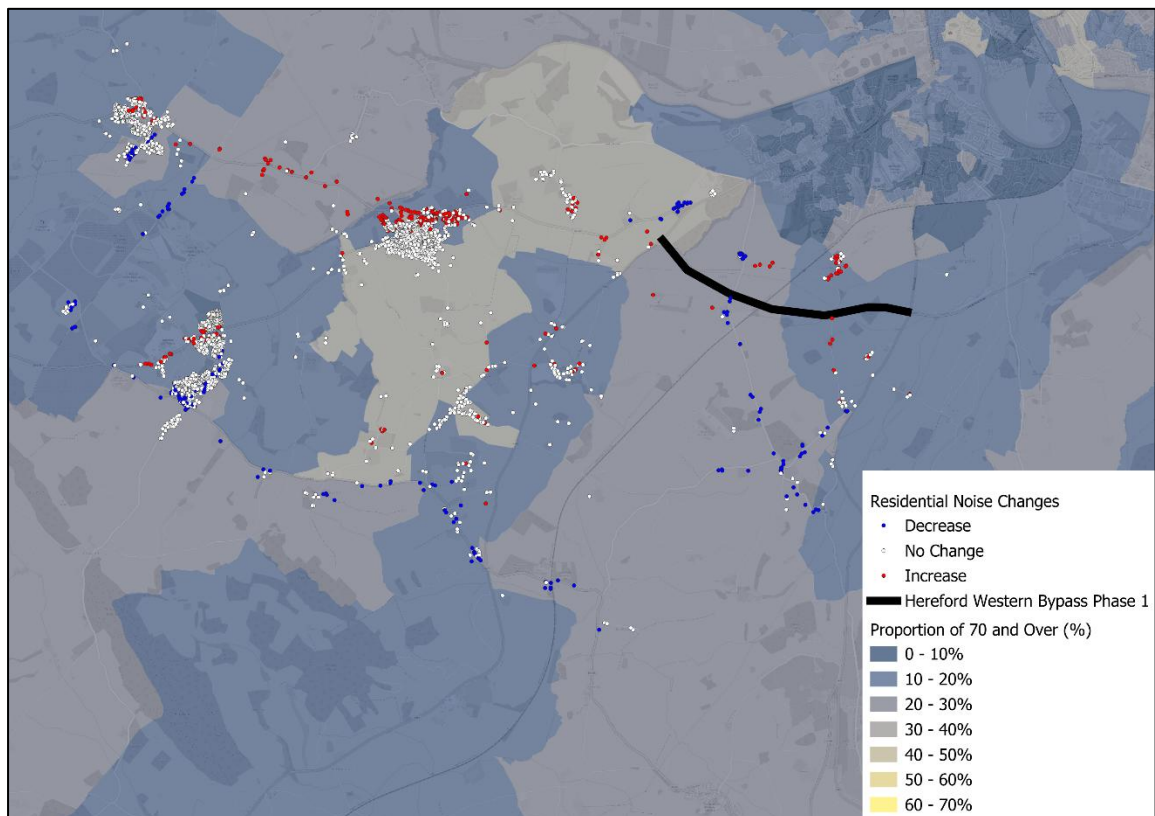


Table 3.4: Impact of Night-time Noise on the Population by Vulnerable Group (2043)

	Vulnerable Group		
	Children	Older	Total
Population with increased noise	26	33	161
Population with decreased noise	41	61	269
Population with no change in noise	887	932	4,892
Net winners	15	28	108
Percentage of net winners/losers	14%	26%	
Percentage of Population	18%	19%	
Assessment	✓✓	✓✓✓	

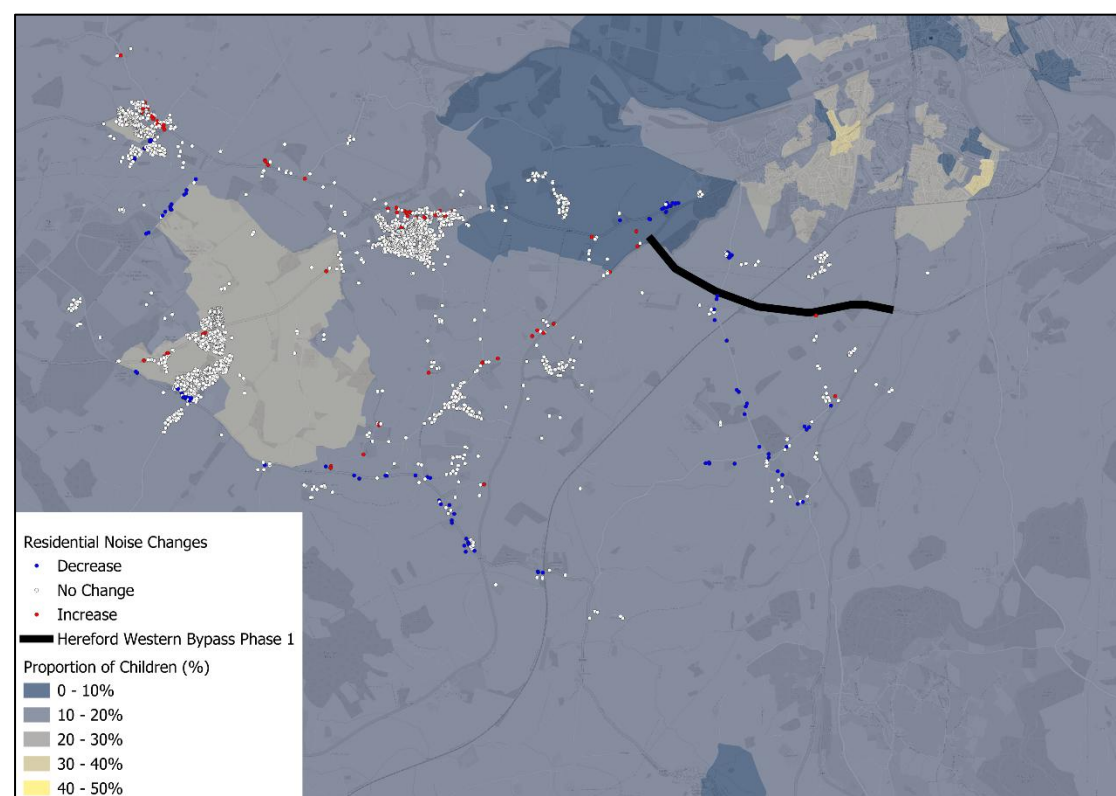
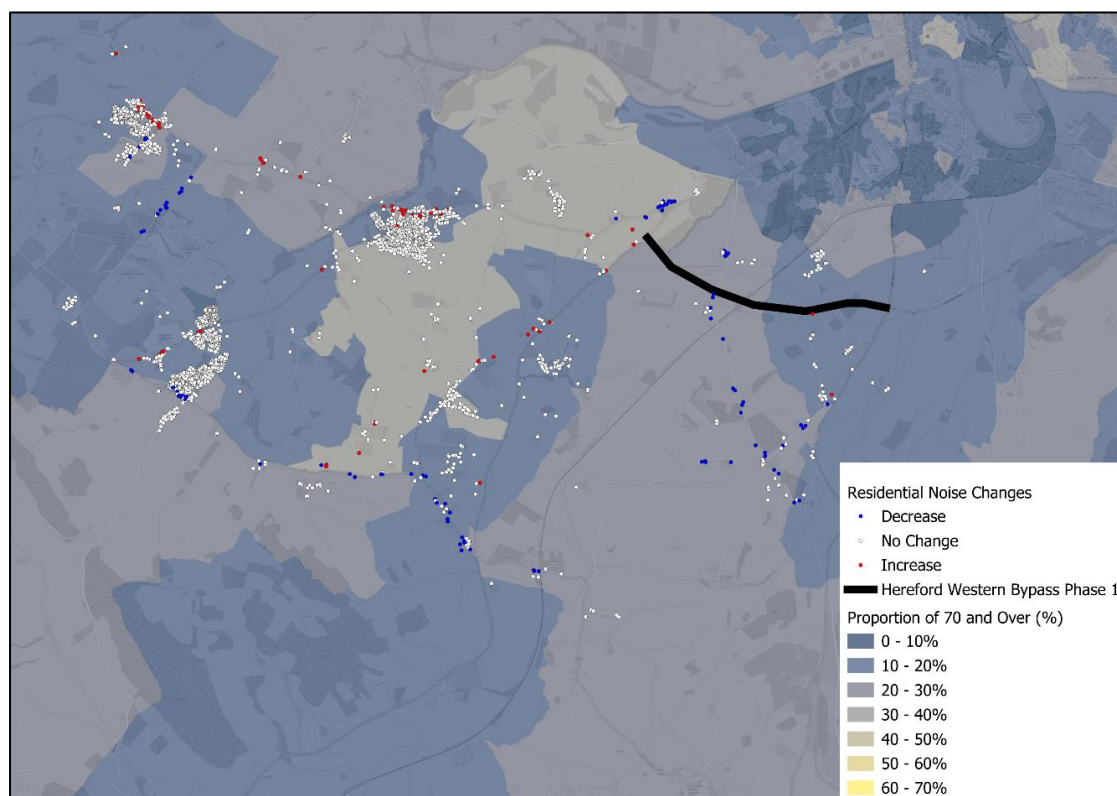
Figure 3-7: Residential Noise Changes and Child Proportion (2043 Night)

Figure 3-8: Residential Noise Changes and Older Proportion (2043 Night)

3.9 Noise Impacts at Sensitive Locations

3.9.1 Sensitive non-residential locations are places where people may congregate during the day such as schools, health centres, community centres and religious sites. At the non-residential sensitive locations listed in **Table 3.5⁶** and shown in **Figure 3-9**, noise impacts in the design year are forecast to be negligible (i.e. less than 3dB change). The assessment for noise impacts at sensitive locations is considered neutral.

Table 3.5: Non-residential Locations Considered for Noise Impact Assessment

Building	Daytime		
	2043 Without Scheme	2043 With Scheme	2043 Change
Kes Nursey, Kingstone High School, Kingstone, Hereford, HR2 9HJ	41.2	41.6	0.4
Madley Tennis Club, Madley, Hereford, HR2 9LU	42	41.3	-0.7
Down On The Farm Nursery School, Norton Brook Farm, Grafton, Hereford, HR2 8ED	45.4	45.8	0.4
Travelodge, Grafton, Hereford HR2 8ED	47.1	48.1	1
Kingstone And Thruxton Primary School, Kingstone, Hereford, HR2 9HJ	51	51.9	0.9
Madley Primary School, Madley, Hereford, HR2 9PH	51.1	51.9	0.8
St Marys Church, Madley, Hereford, HR2 9LS	53	53.9	0.9
Madley Village Hall, Madley, Hereford, HR2 9PH	62.5	63.3	0.8
Methodist Church, Madley, Hereford, HR2 9LU	56.9	54.7	-2.2
Kingstone Village Hall, Green Lane, Kingstone, Hereford, HR2 9EX	45.2	43.5	-1.7
St Michael And All Angels Church, Kingstone, Hereford, HR2 9ET	46.6	45.4	-1.2
Kingstone High School, Kingstone, Hereford, HR2 9HJ	42.7	43.5	0.8
Little Acorns Nursery, Cooks Lane, Kingstone, Hereford, HR2 9EY	42.2	40.9	-1.3

⁶ Happy Nursery Days Childcare is not an active company and is discounted from the appraisal.

Building	Daytime		
	2043 Without Scheme	2043 With Scheme	2043 Change
St. Bartholomew's Church, Thruxton, Hereford, HR2 9AX	49.8	48.6	-1.2
The Coop, Arkstone Court, Clehonger Hereford, HR2 9TR	40.7	41	0.3
Clehonger Parish Hall, Birch Hill Road, Clehonger, Hereford, HR2 9RD	55.1	56.4	1.3
Clehonger Church Of England Primary School, Gosmore Road, Clehonger, Hereford, HR2 9SN	42.3	43.6	1.3
St Andrews Church, Allensmore Village Road, Allensmore, Hereford, HR2 9AH	42.3	43.2	0.9
Pateshall Village Hall, Tram Inn, Allensmore, Hereford, HR2 9AF	48.7	49.4	0.7
All Saints Church, Church Road, Clehonger, Hereford, HR2 9SE	42.1	43	0.9
Belmont Abbey Parish Centre, Ruckhall Lane, Belmont, Hereford, HR2 9RZ	52.9	52.7	-0.2
Playing Field and Pavillion, Clehonger, Hereford, HR2 9RZ	42.9	42.5	-0.4
Callow Parish Hall, Old Callow, Callow, Hereford, HR2 8DD	61.3	59.2	-2.1
St Marys Church, Callow, Hereford, HR2 8DD	57.2	55.2	-2
St Peters Church, Bullingham Lane, Hereford, HR2 8EB	49.8	50.8	1
Slim Trading Company Ltd, Unit 1, Dene Industrial Estate, Kingstone, Hereford, HR2 9NP	43.1	43	-0.1
Kingstone Surgery, Kingstone, Hereford, HR2 9HN	52.9	54.1	1.2
<i>Happy Nursery Days Childcare, Merry Cottage, Grafton Lane, Grafton, Hereford, HR2 8BL⁶</i>	48.1	50.7	2.6

Figure 3-9: Non-residential Locations Considered for Noise Impact Assessment



4. Distributional Impacts of Air Quality

- 4.1.1 Children are considered more at risk from air pollution given that they tend to spend more time outside and therefore have the longest exposure. An assessment of impacts against income levels is also required as there is a link between low income and areas of poor air quality such as housing close to main roads.

4.2 Screening of Air Quality

- 4.2.1 Air quality impacts are likely to occur when an intervention results in changes to traffic flows or speeds. Both are happening in the case of the proposed scheme, and its impacts on the vulnerable group of people were assessed.

4.3 Assessment and Appraisal of Air Quality

- 4.3.1 The distributional analysis of the air quality impacts was carried out using an assessment of NO₂ and PM_{2.5} concentrations. To analyse the distributional impacts of air quality, it is necessary to identify the number of households within 200m of affected links on the road network. The affected road network links are those that see a change in traffic flows and/or speeds and/or proportion of HGVs (based on criteria set out in TAG Unit A4.2) because of the scheme. In total 2,437 affected residential receptors were identified.
- 4.3.2 The SEISA deprivation index was used to split the population by income. The area covered by the air quality modelling is relatively small relative to LSOA geography and the more granular SEISA data at OA scale is at a more suitable scale to derive variations in air quality impact by income.
- 4.3.3 The forecast number of people experiencing changes in air quality (at an accuracy of 0.1 µg/m³) was then defined by income quintile.
- 4.3.4 The air quality distributional impacts analysis was carried out separately for particulate matter and NO₂, as there are different speed-emission relationships for these pollutants.

4.4 Appraisal Methodology

Plan-Level Calculations

- 4.4.1 The plan level TAG appraisal provides an indication of the overall change in operational air quality associated with the proposed scheme.
- 4.4.2 The plan level methodology as per LA105 within TAG (Unit A3, Section 3: Air Quality Impacts) aims to quantify the change in exposure at properties in the opening year as a result of schemes, through the quantification of exposure for all local affected roads. The methodology follows a number of steps including:
- identification of the affected road network (ARN), which is the same as the Design Manual for Roads and Bridges (DMRB) HA207/07 (Volume 11, Section 3, Part 1) local air quality affected road network;
 - quantification of the number of properties within 0-50m, 50-100m, 100-150m and 150-200m bands, from the affected roads;
 - calculation of concentrations within each band at 20m, 70m, 115m and 175m from the road centreline using the DMRB spreadsheet tool;
 - calculation of property weighted NO₂ and PM_{2.5} concentrations;
 - calculation of the total numbers of properties that improve, worsen and stay the same for each pollutant; and

- calculation of an overall assessment score for NO₂ and PM_{2.5}.

4.4.3 An overall positive score indicates an overall worsening and an overall negative score indicates an overall improvement in air quality.

4.5 PM_{2.5} Impacts by Income Deprivation

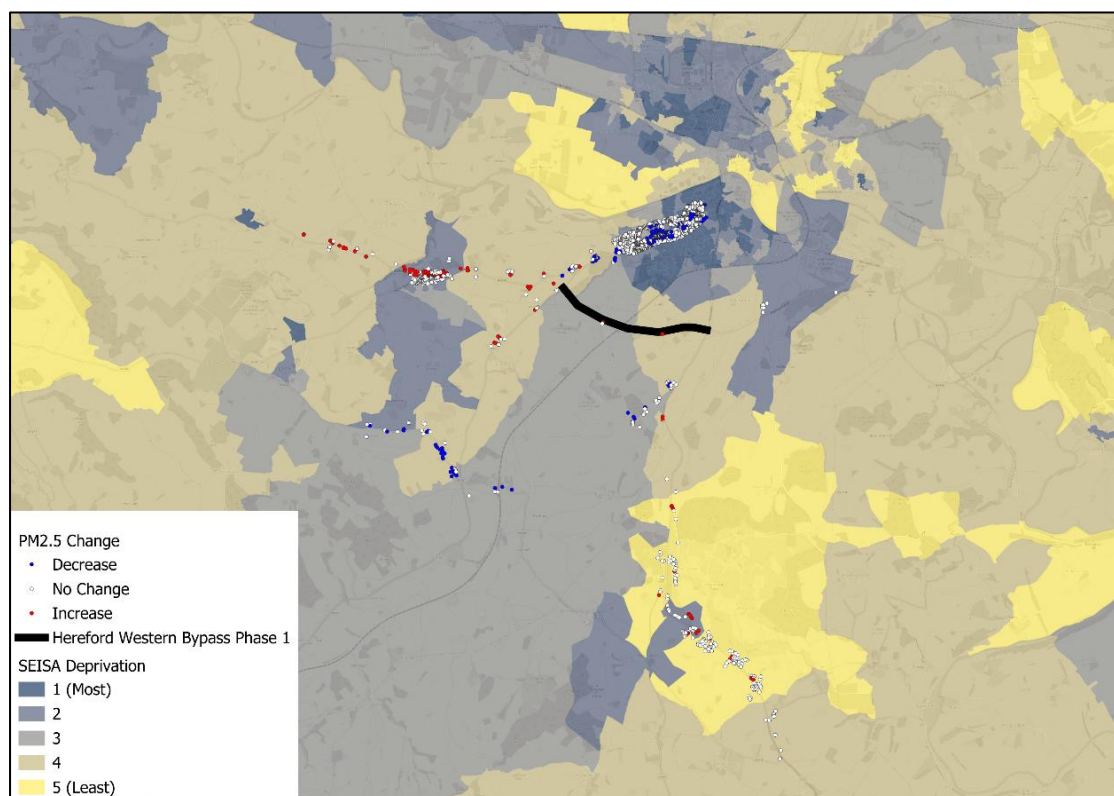
4.5.1 Table 4.1 and Figure 4-1 show the PM_{2.5} impacts, whether positive, negative or neutral, in each of the five SEISA income groups. The net winners / losers total for each group is presented as a percentage of the total net winners / losers across all income groups. This is then compared with the percentage of affected population in each of the income groups.

4.5.2 The assessment for 2043, representing the design year shows a beneficial overall impact, indicating a decrease in PM_{2.5} pollution impacts with the scheme. However, most households experience no change in PM_{2.5}. The impacts that are present are unevenly distributed across the income groups.

4.5.3 The lowest income group has large beneficial impacts. This is due to a decrease in traffic on the A465 Belmont Road in South Wye. Group two has slight adverse impacts, mainly due to an increase in PM_{2.5} on the B4349 at Clehonger village. Groups three and four have large beneficial and moderate beneficial impacts respectively. These are due to decreases in PM_{2.5} around Belmont Road and some of the routes through Tram Inn and Callow. The moderate adverse impact for group five is due to an increase in traffic and PM_{2.5} on the A49 around Much Birch.

Table 4.1: Distributional Impacts of PM_{2.5} by Income Band (2043)

	Income Quintile					
	1 (Low)	2	3	4	5 (High)	Total
Population with increased PM _{2.5}	0	96	6	30	10	142
Population with decreased PM _{2.5}	186	88	72	37	0	383
Population with no change in PM _{2.5}	682	700	256	140	134	1,912
Net winners	186	-8	66	7	-10	241
Percentage of net winners/losers	77%	-3%	27%	3%	-4%	
Percentage of Population	36%	36%	14%	8%	6%	
Assessment	✓✓✓	*	✓✓✓	✓✓	**	

Figure 4-1: PM_{2.5} Change by Household and Deprivation Levels (2043)

4.6 NO₂ Impacts by Income Group

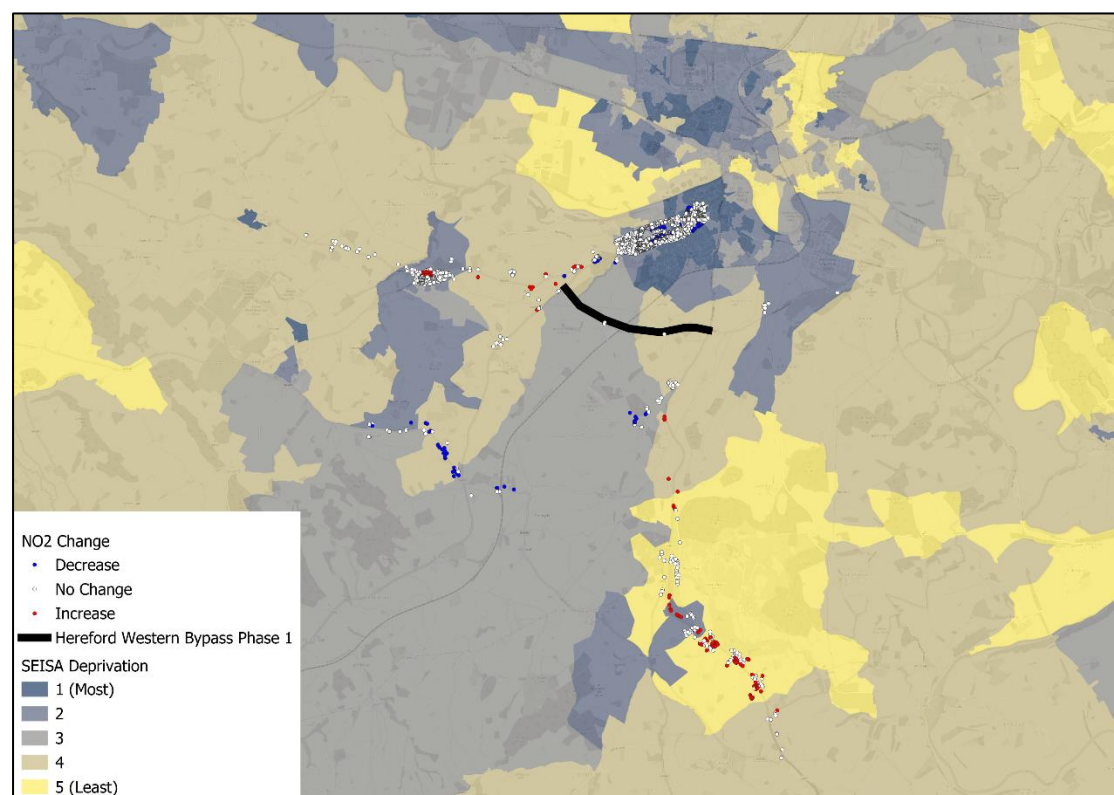
- 4.6.1 **Table 4.2** and **Figure 4-2** show the forecast NO₂ impacts in each of the five SEISA income groups. The net winners / losers for each income group are presented as a percentage of the total net winners / losers and compared to the population of the five income groups.
- 4.6.2 The assessment for 2043, representing the design year, is beneficial overall. However, most households experience no change in NO₂. The affected locations are broadly similar to those observed for PM_{2.5} (4.5.3); however, the different dispersion of NO₂ means that there are fewer affected households near the B4349 in Clehonger Village making the group two assessment of impacts slight beneficial and more affected households near the A49 at Much Birch making the group five assessment of impact large adverse.

Table 4.2: Distributional Impacts of NO₂ on Population by Income Band (2043)

	Income Quintile					
	1 (Low)	2	3	4	5 (High)	Total
Population with increased NO ₂	0	36	0	16	56	108
Population with decreased NO ₂	103	51	49	28	0	231
Population with no change in NO ₂	765	797	285	163	88	2,098
Net winners	103	15	49	12	-56	123
Percentage of net winners/losers	84%	12%	40%	10%	-46%	

Percentage of Population	36%	36%	14%	8%	6%	
Assessment	✓✓✓	✓	✓✓✓	✓✓	***	

Figure 4-2: NO₂ Change by Household and Deprivation Levels (2043)



4.7 Air Quality Impact on Vulnerable Groups

- 4.7.1 The vulnerable group for air quality impacts is defined as Children, on the basis that they may spend more time outdoors. Impacts at residential locations are calculated in the same way as for income bands, comparing the proportion of net winners/losers to the proportion of the affected population for each group. 'Adult' results are not required to be reported but are included in the calculation.
- 4.7.2 The proportions of the population that are Children that are used for assessment are derived from the 2021 Census.
- 4.7.3 For both PM_{2.5}, shown in Table 4.3 and Figure 4-3, and NO₂, shown in Table 4.4 and Figure 4-4, impacts are beneficial and proportionate. Most Children do not experience a change in air quality.

Table 4.3: PM_{2.5} Impacts for Children (2043)

	Vulnerable Group	Adults
	Children	
Population with increased PM _{2.5}	54	273
Population with decreased PM _{2.5}	181	700
Population with no change in PM _{2.5}	871	3,527
Net winners	127	427
Percentage of net winners/losers	23%	77%

Percentage of Population	20%	80%
Assessment	✓✓	-

Figure 4-3: PM_{2.5} Change by Household and Proportion of Children (2043)

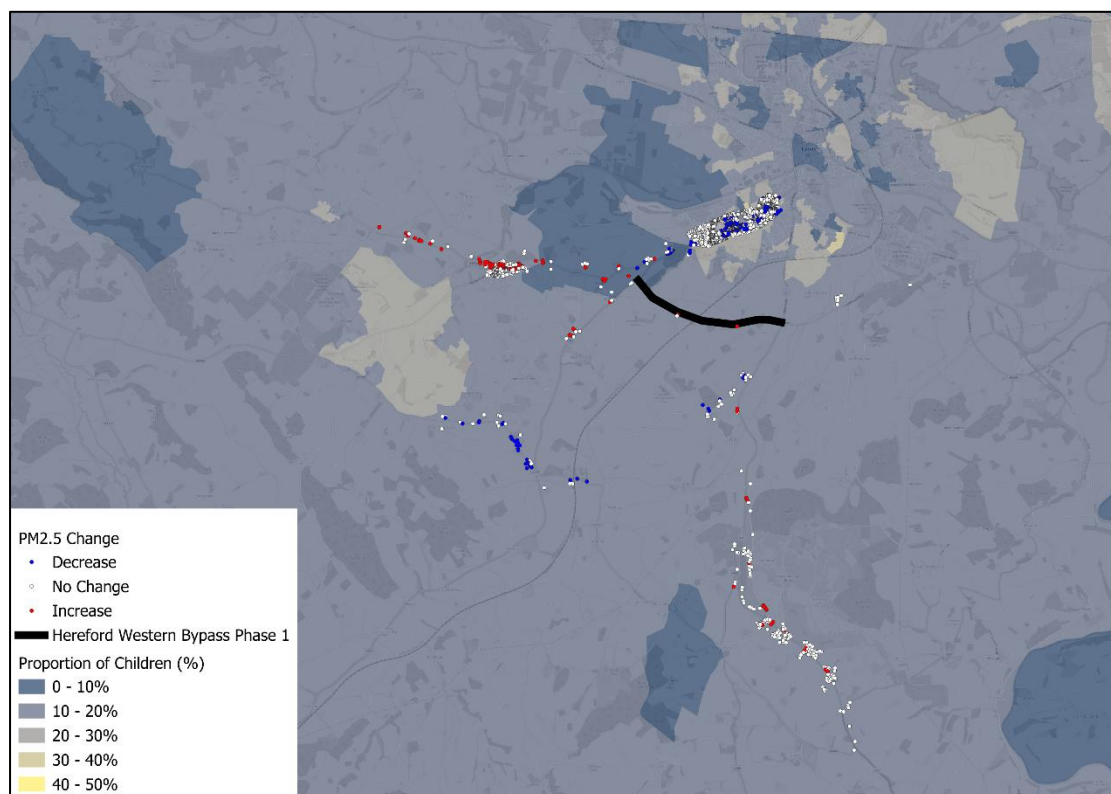
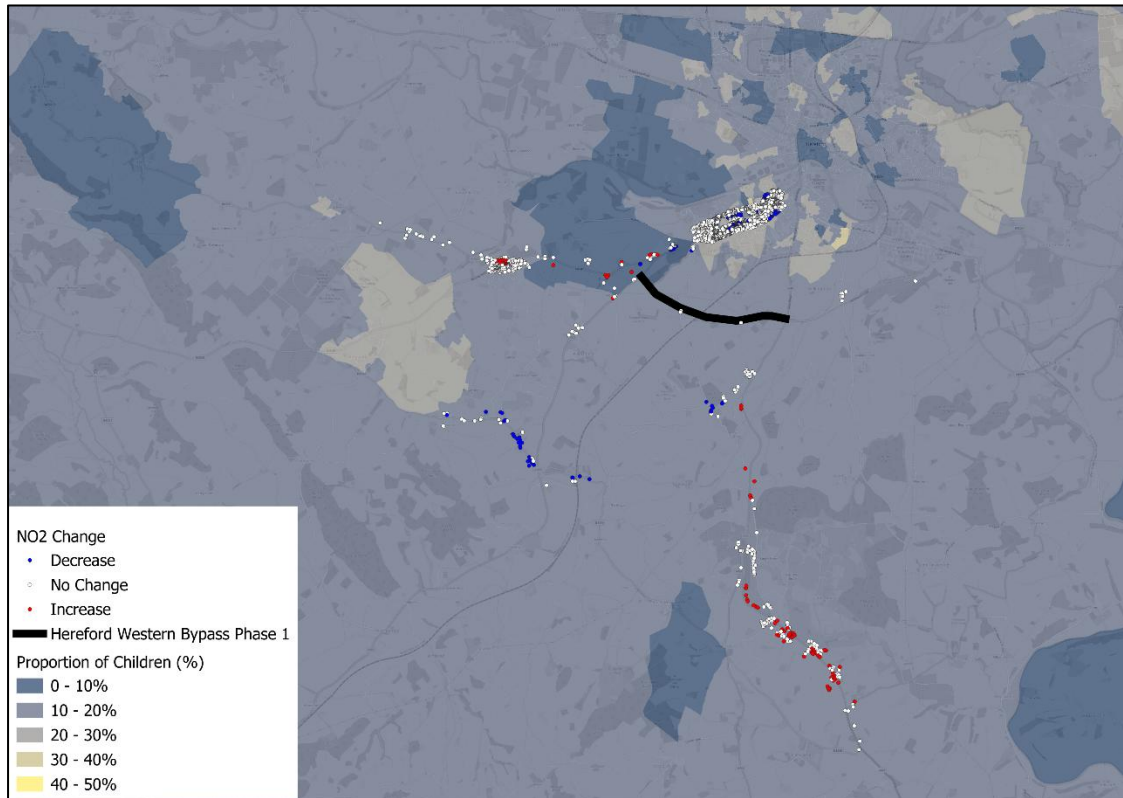


Table 4.4: NO₂ Impacts for Children (2043)

	Vulnerable Group	Adults
	Children	
Population with increased NO ₂	41	207
Population with decreased NO ₂	99	432
Population with no change in NO ₂	966	3,859
Net winners	58	225
Percentage of net winners/losers	20%	80%
Percentage of Population	20%	80%
Assessment	✓✓	-

Figure 4-4: NO₂ Change by Non-Residential and Proportion of Children (2043)

4.8 Air Quality Impacts on Sensitive Receptors

- 4.8.1 Local air quality modelling was carried out for affected non-residential receptors for the scheme opening and design years, 2028 and 2043. These are locations at which people may congregate during the day such as schools, medical centres, hospitals and churches.
- 4.8.2 Most locations have imperceptible PM_{2.5} changes. All others are small, at the minimum perceptible value of 0.1. These are mostly decreases which are located within the city. The two minimal increases are in Clehonger and Much Birch.
- 4.8.3 For all except one location (St Mary's and Thomas a Becket Church, Much Birch) the forecast NO₂ change shown in Table 4.6 is imperceptible.

Table 4.5: Non-residential Sensitive Receptors (2043 PM_{2.5})

	2043 PM_{2.5}			
	Without Scheme Scenario PM₁₀ (µg/m³)	With Scheme Scenario PM₁₀ (µg/m³)	Difference PM₁₀ (µg/m³)	Magnitude of Impact
Belmont Community Centre	5.9	5.8	-0.1	Small
Belmont Abbey Parish Centre	5	4.9	-0.1	Small
Wye Valley Manufacturing	6.8	6.8	<0.1	Imperceptible
Much Birch C of E Primary School	5.1	5.1	<0.1	Imperceptible
Much Birch Community Hall	5	5	<0.1	Imperceptible
Cleghonger Village Hall	5	5	<0.1	Imperceptible
Pateshall Village Hall	4.9	4.9	<0.1	Imperceptible
Cleghonger Primary School	4.8	4.8	<0.1	Imperceptible
Hunderton Scouts	5.6	5.6	<0.1	Imperceptible
Coppin Rise Park	5.9	5.8	-0.1	Small
Woodward Avenue Park	5.5	5.4	-0.1	Small
Blackmarston Road Park	5.5	5.5	<0.1	Imperceptible
Blackmarston Road Park Centre	5.4	5.4	<0.1	Imperceptible
Our Lady Queen of Martyrs Church	5.7	5.6	-0.1	Small
Cleghonger Recreation Ground Park	4.8	4.8	<0.1	Imperceptible
Cleghonger Recreation Ground	4.8	4.9	0.1	Small
Toros Football Club	5.3	5.2	-0.1	Small
Belmont Abbey	5	4.9	-0.1	Small
Belmont Wanderers Football Club	5.7	5.6	-0.1	Small
Belmont Haywood Country Park	5	5	<0.1	Imperceptible
Kenilworth Close Playground	5	5	<0.1	Imperceptible
Northolme Road Playground	5.4	5.4	<0.1	Imperceptible
St Junabius Church	5.1	5.1	<0.1	Imperceptible
St Mary and St Thomas a Becket Church	5.2	5.3	0.1	Small

Table 4.6: Non-residential Sensitive Receptors (2043 NO₂)

	2043 NO₂			
	Without Scheme Scenario NO₂ (µg/m³)	With Scheme Scenario NO₂ (µg/m³)	Difference NO₂ (µg/m³)	Magnitude of Impact
Belmont Community Centre	3.6	3.6	<0.1	Imperceptible
Belmont Abbey Parish Centre	2.8	2.8	<0.1	Imperceptible
Wye Valley Manufacturing	4.8	4.8	<0.1	Imperceptible
Much Birch C of E Primary School	2.8	2.8	<0.1	Imperceptible
Much Birch Community Hall	2.6	2.6	<0.1	Imperceptible
Clehonger Village Hall	2.5	2.5	<0.1	Imperceptible
Pateshall Village Hall	2.4	2.4	<0.1	Imperceptible
Clehonger Primary School	2.4	2.4	<0.1	Imperceptible
Hunderton Scouts	3.6	3.5	-0.1	Imperceptible
Coppin Rise Park	3.6	3.6	<0.1	Imperceptible
Woodward Avenue Park	3.3	3.3	<0.1	Imperceptible
Blackmarston Road Park	3.3	3.3	<0.1	Imperceptible
Blackmarston Road Park Centre	3.3	3.3	<0.1	Imperceptible
Our Lady Queen of Martyrs Church	3.6	3.6	<0.1	Imperceptible
Clehonger Recreation Ground Park	2.4	2.4	<0.1	Imperceptible
Clehonger Recreation Ground	2.4	2.4	<0.1	Imperceptible
Toros Football Club	2.9	2.9	<0.1	Imperceptible
Belmont Abbey	2.8	2.8	<0.1	Imperceptible
Belmont Wanderers Football Club	3.3	3.3	<0.1	Imperceptible
Belmont Haywood Country Park	2.7	2.7	<0.1	Imperceptible
Kenilworth Close Playground	2.8	2.8	<0.1	Imperceptible
Northolme Road Playground	3.3	3.3	<0.1	Imperceptible
St Junabius Church	2.6	2.6	<0.1	Imperceptible
St Mary and St Thomas a Becket Church	2.7	2.8	0.1	Small

Figure 4-5: PM2.5 Change at Non-residential Sensitive Receptors and Deprivation

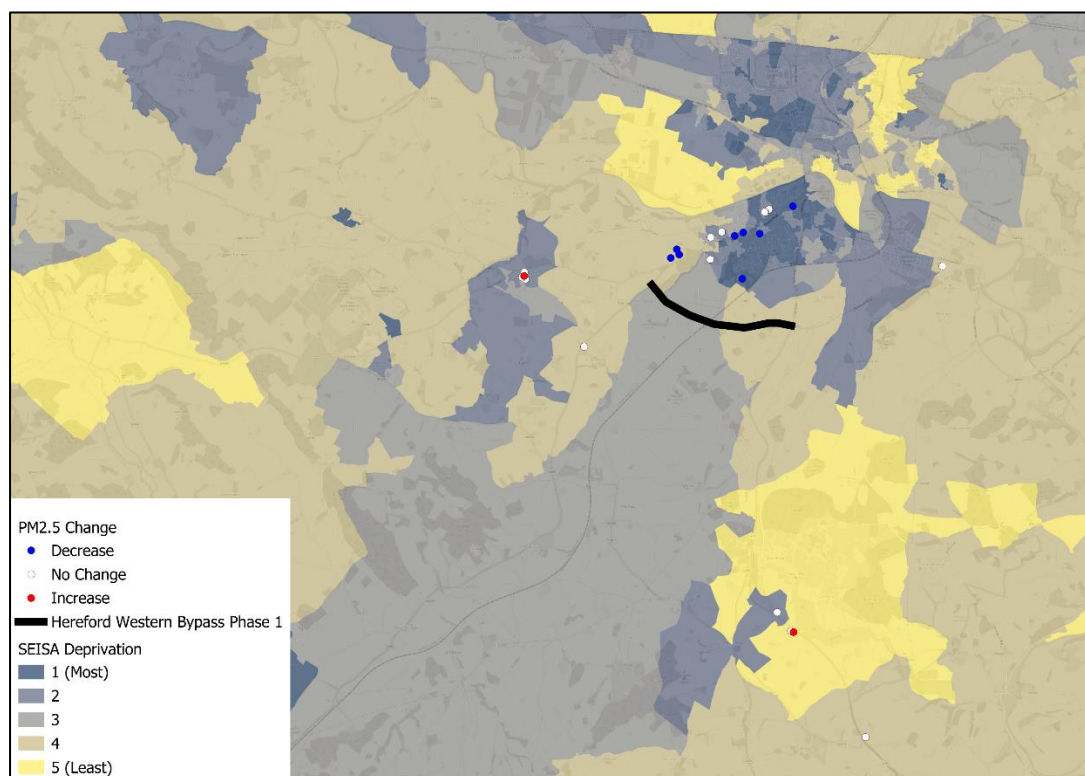
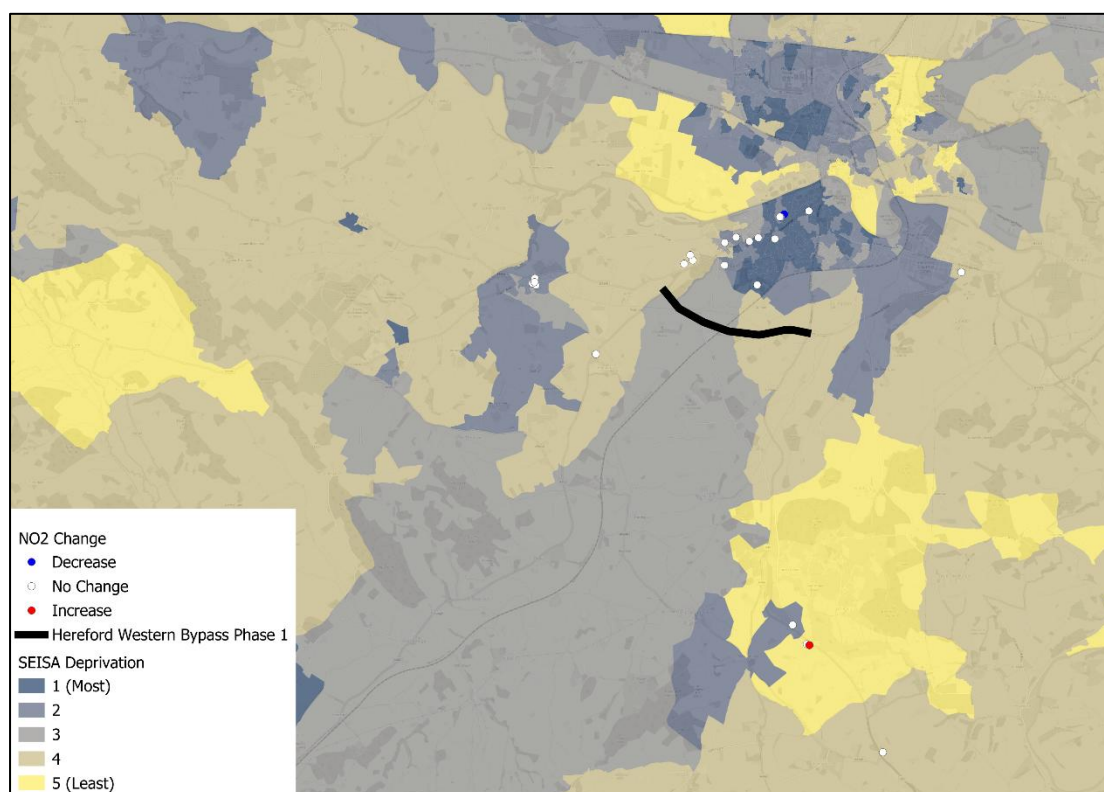


Figure 4-6: NO2 Change at Non-residential Sensitive Receptors and Deprivation



5. Distributional Impacts of Accidents

- 5.1.1 Most transport-related accidents occur on the road network so they should be considered in the assessment of a proposed road scheme. Groups living in the area that are vulnerable to accidents are children and older people, often as pedestrians. Vulnerable road users include pedestrians, cyclists and motorcyclists; and, specifically, young male drivers. Chapter 2 of TAG Unit A4.1 describes the methodology for undertaking accident impact assessments.

5.2 Screening of Accidents

- 5.2.1 TAG Unit A4.2 states that the screening process for the accident assessment should consider whether there is “any change in alignment of transport corridor (or road layout) that may have positive or negative safety impacts, or any links with significant changes in vehicle flow, speed, %HGV content or any significant change (>10%) in the number of pedestrians, cyclists or motorcyclists using road network”.
- 5.2.2 The scheme will create a change in the alignment of the transport corridor through the construction of a new road. The scheme will result in changes in traffic patterns, as people will utilise different roads because of the scheme. This will affect accidents by increasing and decreasing traffic on existing roads and moving some traffic onto the new road which is likely to be more suitable and safer for the traffic it attracts than the existing roads in residential areas of South Wye and rural roads south of Hereford.
- 5.2.3 The SATURN traffic models were used to identify the links experiencing significant changes in traffic conditions, including link-level traffic volume (measure in passenger car units (PCUs)) and the percentage changes in vehicle flows, HGV flows and speeds between the with-scheme and without-scheme models for the 2043 forecast year. These also show changes in flow, speed and %HGV that meet screening criteria for assessment and appraisal. This analysis was used to define the Area of Impact for accident appraisal.

5.3 Assessment and Appraisal of Accidents

- 5.3.1 Collision and casualty data from within Herefordshire were extracted from the STATS19 dataset to analyse the impact of accidents on vulnerable groups. Data from the years 2018 to 2024 were used, excluding 2020 and 2021 because of change in travel patterns during the COVID-19 pandemic.
- 5.3.2 The analysis was disaggregated into the area of impact and the urban and rural sub areas within the area of impact to see the distribution of vulnerable group casualties within Herefordshire and within the Aol and how these relate.
- 5.3.3 The collision and casualty data was grouped by road type, covering A roads and B roads combined, and Unclassified (U) roads. A and B roads represent the roads between villages in rural areas and the through routes in Hereford. The Unclassified roads represent minor rural roads and residential roads in the villages and Hereford.
- 5.3.4 Accident blackspots within the Aol were identified using mapping of the casualty data.
- 5.3.5 The sensitive groups that were analysed were Children, Older People, Pedestrians, Cyclists, Motorcyclists and Young Male Drivers. These groups are not mutually exclusive; for example, Children and Older People groups also represent a proportion of pedestrians.
- 5.3.6 **Figure 5-1** shows the absolute total flow change in 2043 AM and 2043 PM models (AM inner, PM outer) on links that meet at least one of the criteria for inclusion in the accidents

assessment. These are the links used in the accident appraisal. The LSOAs which contain these links form the accidents area of Impact.

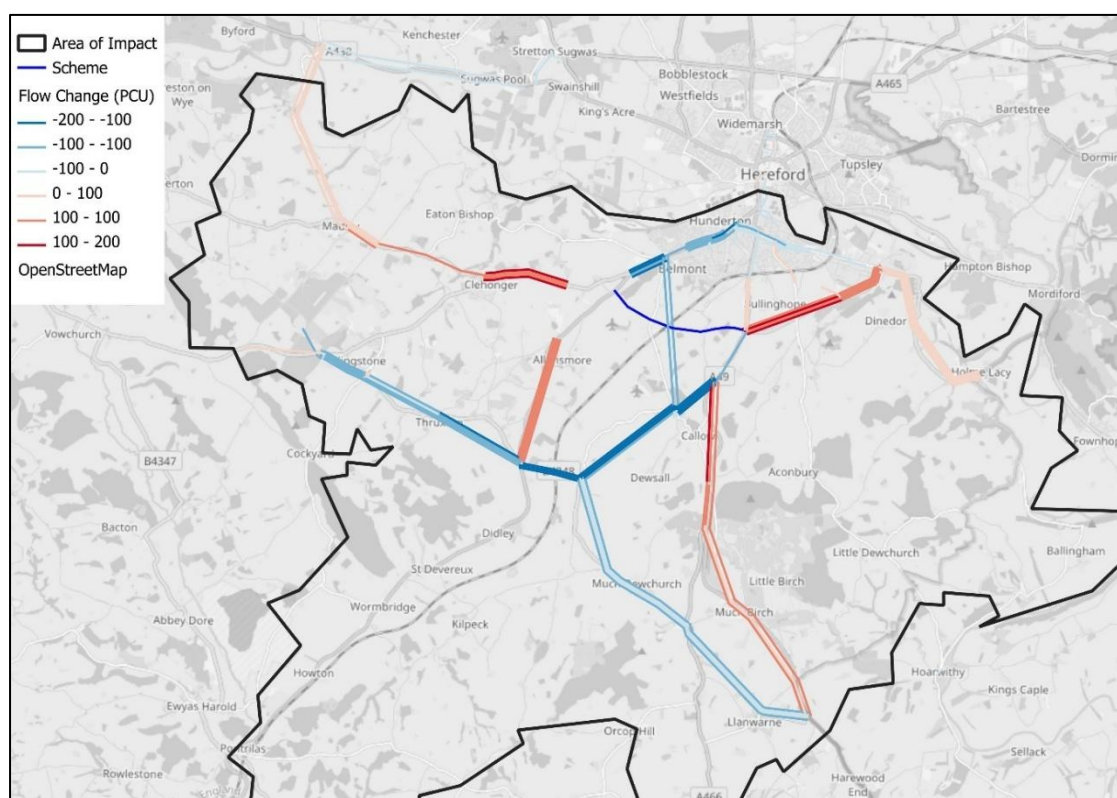
5.3.7 Forecast flow changes show a decrease in flow on routes which form indirect west-east connections parallel to the scheme – routes through:

- A465 Locks Garage turn, Tram Inn and Callow;
- Haywood Lane and Portway; and
- A465, Belmont Road and Walnut Tree Avenue.

5.3.8 Holme Lacy Road also has a decrease in flow; however, this route is currently subject to significant safety improvements as part of a separate scheme and as such is not considered explicitly in this appraisal. It is likely that the Phase 1 scheme will further improve safety on Holme Lacy Road due to a reduction in vehicle flow and a reduction in HGVs.

5.3.9 Forecast flow increases occur on roads which are directly linked to the Phase 1 scheme on routes for which the scheme represents a direct west-east link. With the scheme in place, traffic from the B4349 and the A465 to the west and the B4399 Rotherwas link road and the A49 to the east use the scheme in preference to the indirect routes listed above (5.3.7).

Figure 5-1: Accident Aol Vehicle Flow Changes (PCU) for 2043



5.3.10 Table 5.1 shows the total number of casualties within Herefordshire. The table also shows show vulnerable group casualties as a proportion of total casualties. Around three quarters of casualties are recorded at accidents involving an A or B road. For all roads, each of the vulnerable groups represents around 10% of total casualties.

- 5.3.11 **Table 5.2** shows the same analysis of casualties for the Aol. Similarly, around three quarters of casualties are recorded at accidents involving an A or B road. While the proportions are within $\pm 5\%$ of the county proportions for all roads there is some variation by road type.
- 5.3.12 The Aol is a mixture of urban and rural areas. At county level over 70% of casualties occur in rural areas. In the Aol under 60% of casualties occur in rural areas. This suggests a difference in casualty occurrence in the Aol compared to the Herefordshire. To examine this the Aol results are split into urban (Table 5.1) and rural (Table 5.2) areas. The results in Table 5.3 and Table 5.4 show that the distribution of vulnerable group casualties is like Herefordshire in the rural area with differences in proportion of 5% or less. For the urban area there are a greater proportion of Child and Cyclist group casualties and a smaller proportion of Older group casualties.
- 5.3.13 This reflects differences in population and travel characteristics in the two areas. In South Wye, there is a relatively young population, schools and a higher proportion of no-car available households, linked to the relatively high deprivation in the area. Conversely the older population is more affluent and more prevalent in the rural areas. Journeys are more likely to be by walking or cycling in South Wye due to the short distances and greater proportion of no-car households.
- 5.3.14 This difference in travel is reflected in the child casualties in the county. In rural areas the majority (80%) are as passengers as journeys are longer and typically made by vehicle. In urban areas Child casualties are split evenly between Drivers or Riders (cyclists), Passengers and Pedestrians.
- 5.3.15 The notably high proportion of Cyclist group casualties in the urban Aol (39%) on unclassified roads reflects a significant proportion (12/21) on Holme Lacy Road and the Straight Mile, particularly at the Hoarwithy Road Junction. Holme Lacy Road, particularly the Hoarwithy Road junction, is being significantly upgraded to improve safety as part of another scheme. For this analysis, it is assumed that the safety issue at this location is mitigated by the other scheme. Nevertheless, propensity to cycle is assumed to be higher in the city of Hereford than in rural areas.

Table 5.1: Casualties by Vulnerable Group and Road Class within Herefordshire

		Vulnerable Group Casualties					
		Children	Older	Pedestrian	Motorcyclist	Cyclist	Young Male Drivers
Herefordshire	All Casualties						
A or B Roads	1,691	132	233	113	172	113	190
Unclassified	491	62	55	76	49	70	79
All Roads	2,182	194	288	189	221	183	269
A or B Roads		8%	14%	7%	10%	7%	11%
Unclassified		13%	11%	15%	10%	14%	16%
All Roads		9%	13%	9%	10%	8%	12%

Table 5.2: Casualties by Vulnerable Group and Road Class within the Aol

Herefordshire	All Casualties	Vulnerable Group Casualties					
		Children	Older	Pedestrian	Motorcyclist	Cyclist	Young Male Drivers
A or B Roads	255	37	22	14	30	19	23
Unclassified	86	12	4	6	6	23	18
All Roads	341	49	26	20	36	42	41
A or B Roads		15%	9%	5%	12%	7%	9%
Unclassified		14%	5%	7%	7%	27%	21%
All Roads		14%	8%	6%	11%	12%	12%
<i>Difference from Herefordshire</i>		+5%	-5%	-3%	+1%	+4%	0

Table 5.3: Casualties by Vulnerable Group and Road Class within the Urban Aol

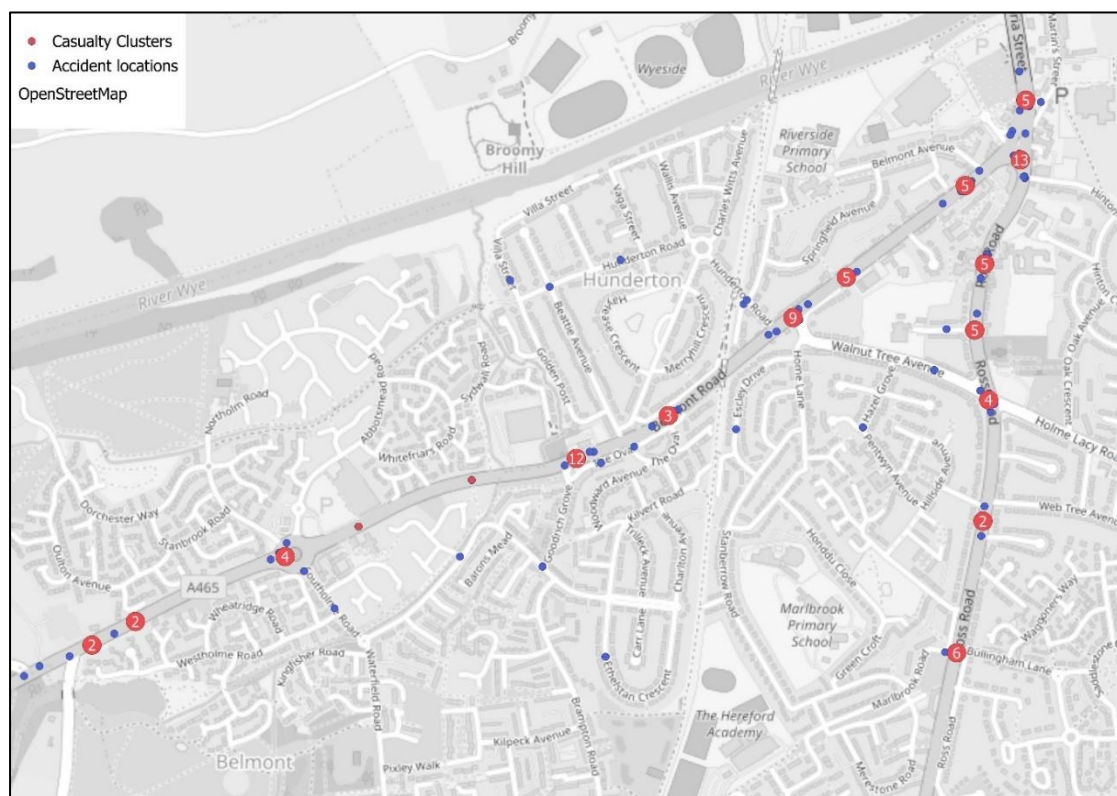
Herefordshire	All Casualties	Vulnerable Group Casualties					
		Children	Older	Pedestrian	Motorcyclist	Cyclist	Young Male Drivers
A or B Roads	89	16	3	7	15	13	9
Unclassified	54	10	2	6	5	21	12
All Roads	143	26	5	13	20	34	21
A or B Roads		18%	3%	8%	17%	15%	10%
Unclassified		19%	4%	11%	9%	39%	22%
All Roads		18%	3%	9%	14%	24%	15%
<i>Difference from Herefordshire</i>		+9%	-10%	0%	+4%	+16%	+3%

Table 5.4: Casualties by Vulnerable Group and Road Class within the Rural Aol

Herefordshire	All Casualties	Vulnerable Group Casualties					
		Children	Older	Pedestrian	Motorcyclist	Cyclist	Young Male Drivers
A or B Roads	166	21	19	7	15	6	14
Unclassified	32	2	2	-	1	2	6
All Roads	198	23	21	7	16	8	20
A or B Roads		13%	11%	4%	9%	4%	8%
Unclassified		6%	6%	0%	3%	6%	19%
All Roads		12%	11%	4%	8%	4%	10%
<i>Difference from Herefordshire</i>		+3%	-2%	-5%	-2%	-4%	-2%

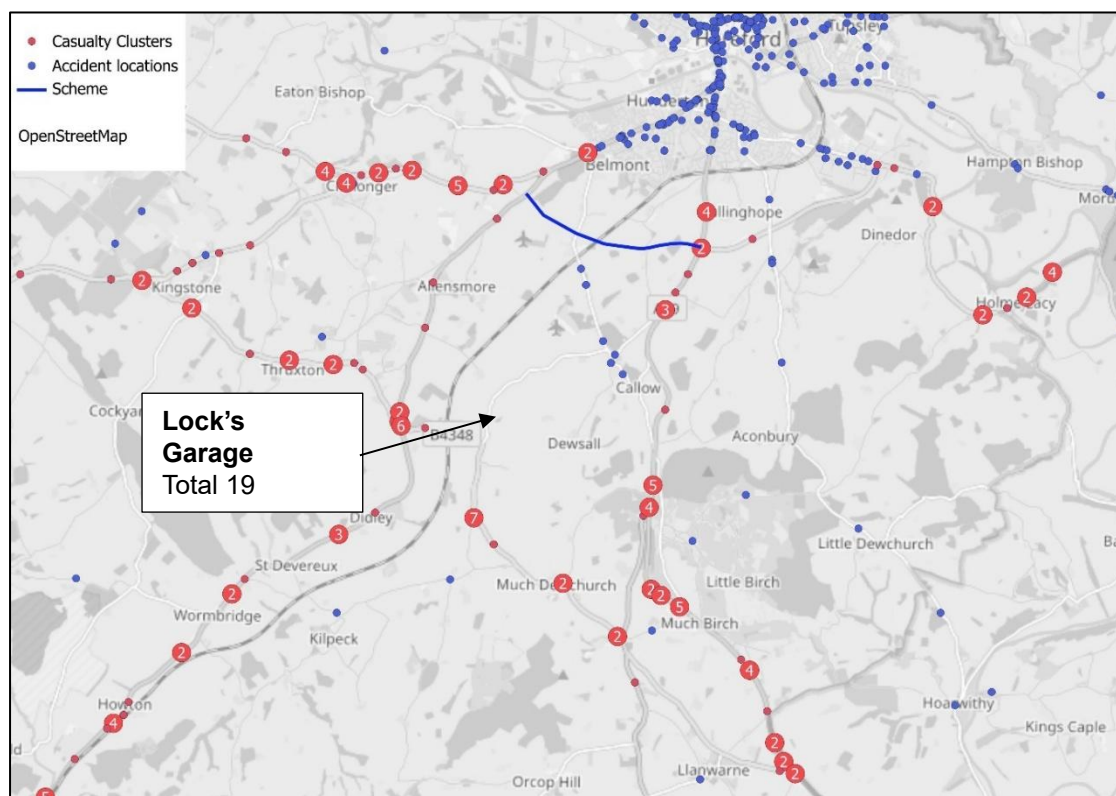
5.3.16 The STATS19 data also provides information about where accidents take place and locations where casualties tend to occur more frequently. As the changes in traffic due to the scheme are dominantly on A and B roads, clusters of locations at which casualties occurred were generated at accidents involving these roads.

- 5.3.17 **Figure 5-2** shows the locations of accidents and clusters of casualties in South Wye. Most junctions on the A465 and the A49 have recorded accidents and casualties and there are a smaller number between junctions. The largest clusters of recorded casualties are at the A465-Goodrich Grove junction, the south end of the Asda Roundabout, the A49-Walnut Tree Avenue junction and the A49-Bullingham Lane junction.
- 5.3.18 There are recent changes in layout at some of these junctions and the Walnut Tree Avenue-A49-Holme Lacy Road junction. The early-2026 introduction of a signalised junction at the new Lidl store on the A465 has reportedly made exit and entry to Goodrich Grove easier as the movement is now not always into or across free-flowing traffic. The right turn onto the A49 from Hinton Road at the south end of the ASDA Roundabout was banned in early 2026. At most times, this was previously a turn into queuing northbound traffic across southbound traffic exiting the roundabout. Traffic formerly using Hinton Road to access the A49 northbound is now forced to use the Holme Lacy Road-A49 junction. Higher traffic flows there are partly mitigated by new more efficient signals as part of the Holme Lacy Road improvements being implemented.
- 5.3.19 Reducing traffic flows on the A465, Walnut Tree Avenue, the A49 and Holme Lacy Road will tend to reduce accidents at all the locations on these routes. Distributional impacts will be positive for all groups. Children and Cyclists were identified in the casualty and population data as more significant road users in the urban area. Older people were identified and less significant in the urban area. For Children and Cyclists, the accident benefit of the scheme is likely to be moderate beneficial and for all other groups slight beneficial in the urban area.

Figure 5-2: Casualty Clusters in South Wye (Urban Aol)

- 5.3.20 **Figure 5-3** show the equivalent cluster analysis for the rural part of the Aol. As with the urban area, there are numerous clusters of casualties recorded at junction and a smaller number between junctions. The scheme shifts west-east traffic from relatively small roads onto the Phase 1 link which is a more suitable type of road for the through traffic flows which is beneficial as it should have a lower accident rate than minor roads.
- 5.3.21 On the A49 south of the Scheme, traffic increases slightly (Figure 5-1); however, many of the affected junctions link to the indirect west-east routes between the A465 and A49 that see less traffic with the scheme. This scheme is likely to be beneficial on the indirect west-east routes through Callow, Kivernoll and Portway and at the affected A49 junctions.
- 5.3.22 The cluster of 5 casualties on the B4349 east of Clehonger is a single accident. With the scheme in place this section sees an increase in forecast traffic which is adverse; however, there will be improvements to part of the route as a new link to the Phase 1 A465 roundabout will be built.
- 5.3.23 The largest cluster of casualties in the Aol is at Lock's Garage on the A465 where the B4348 forms an offset crossroads and a garage and shops exist with multiple vehicular accesses. This is a longstanding junction of concern and was modified previously to try and mitigate conflicts between the turning traffic and the A465 traffic.
- 5.3.24 With the scheme in place there are forecast to be smaller flows crossing the A465 on the B4348 and using the turning to and from the railway crossing at Tram Inn and indirect east-west routes towards the A49. This is a large beneficial impact for vehicular vulnerable groups – Children as Passengers, Older Drivers, Motorcyclists, Young Male Drivers and their Passengers. Casualties are almost all drivers and passengers here.
- 5.3.25 It is likely that the overall impact is beneficial for vulnerable groups in the rural part of the Aol and there are no concentrations of vulnerable groups in the rural population that are specifically affected.

Figure 5-3: Casualty Clusters in Affected Rural Areas (Rural Aol)



- 5.3.26 In the Aol, the accident impact is likely to be beneficial due to the redistribution of traffic from congested main roads in South Wye and less-suitable minor rural roads to the Phase 1 link. The observed proportions of casualties in the Aol are like that observed in Herefordshire as a whole, except for Children, Cyclists and Older people in South Wye. This is due to a younger population in South Wye and a higher propensity to cycle.
- 5.3.27 For Children and Cyclists there is a moderate beneficial impact due to their relatively high proportion of casualties in South Wye where the impact is beneficial. For all other groups there is a slight beneficial impact.

6. Distributional Impacts of Security

- 6.1.1 Women, teenagers, older people, people with disabilities and Black and Minority Ethnic communities tend to perceive risk more acutely when walking and using public transport. This can lead to anxiety which would ultimately stop these people from using a service. Therefore, it is important to consider the impact in personal security when making an intervention on the transport system.

6.2 Screening of Security

- 6.2.1 TAG Unit A4.2 states that the screening process for the security assessment should consider “any change in public transport waiting/interchange facilities including pedestrian access expected to affect user perceptions of personal security”.
- 6.2.2 Within the Aol, the only public transport waiting/interchange facilities are bus stops. The majority are unaffected by the scheme.
- 6.2.3 The only change identified is at Abbey Cottages Bus Stops on the B4349 close to the western end of the scheme. These are on a section of the B4349 which will become access only, meaning bus services will no longer be able to access the existing bus stops at this location. It is likely that this bus stop will be replaced by the scheme.
- 6.2.4 The impact on security is neutral, and further assessment is not required.

7. Distributional Impacts of Accessibility

- 7.1.1 The appraisal of accessibility focuses on the public transport accessibility aspect of accessing employment, services and local amenities.
- 7.1.2 Different groups of people are likely to experience the impact of accessibility differently. These groups include young people, older people, disabled people, people from black and minority ethnic communities and carers. It is important to understand their different needs and priorities. This should be undertaken with consideration of local amenities.

7.2 Screening of Accessibility

- 7.2.1 TAG Unit A4.2 states that the screening process for the assessment of accessibility should consider any “change in services, routings or timings of current public transport services within the impact area” and a “change to waiting facilities or any indirect impact on accessibility to services”.
- 7.2.2 The scheme will have little direct impact in terms of the services, routings and timings of public transport services within the impact area. This is because the scheme introduces a new road that does not already serve any existing public transport services.
- 7.2.3 The only change identified is at Abbey Cottages Bus Stops on the B4349 close to the western end of the scheme. These are on a section of the B4349 which will become access only, meaning bus services will no longer be able to access the existing bus stops at this location.
- 7.2.4 The impact on accessibility is neutral, and further assessment is not required.

8. Distributional Impacts of Severance

- 8.1.1 The socio-economic groups that are potentially vulnerable to the effects of severance arising from a transport intervention include children, older people, people with disabilities and people without access to a car. These groups may experience increased journey times because of detours, as well as an increased risk through crossing over busy roads or new infrastructure.

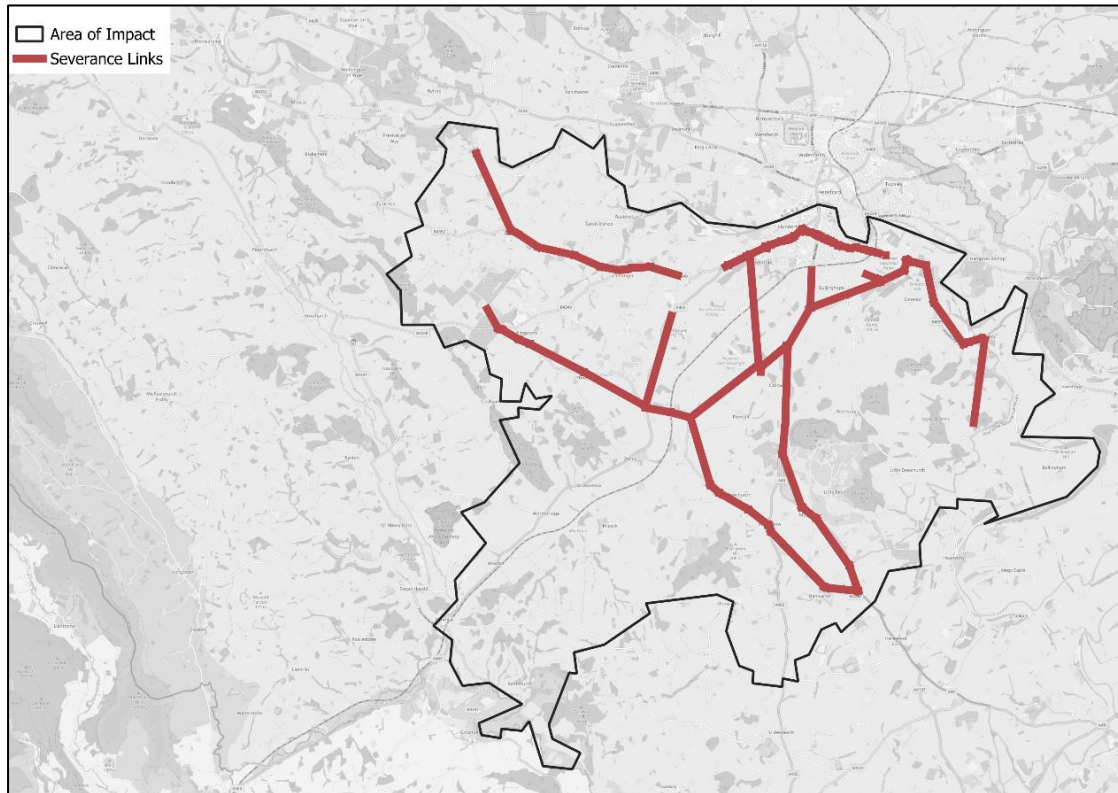
8.2 Screening of Severance

- 8.2.1 TAG Unit A4.2 states that the severance screening process should consider whether the scheme introduces or removes physical barriers to pedestrian movement and whether significant changes in vehicle speed, flow and HGV are introduced by the scheme.
- 8.2.2 Many of the change in vehicle flows and speeds associated with the scheme are expected to occur on rural A and B class roads, such as the A49, A465 and the B4399. These roads do not currently provide paths alongside them or crossing facilities such as traffic lights or pedestrian crossings. As a result, changes in traffic conditions are unlikely to impede existing pedestrian movement. Within South Wye there are expected to be reductions in traffic flow on the main roads, the A465, the A49, Walnut Tree Avenue and Holme Lacy Road.
- 8.2.3 The scheme itself may introduce perceived changes to severance where it crosses existing rights of way, where connectivity is maintained as part of the scheme design.

8.3 Assessment and Appraisal of Severance

- 8.3.1 The Area of Impact for severance was defined using outputs from the SATURN models for the AM and PM peak periods. The models were used to identify the links experiencing significant changes in traffic conditions, including link-level traffic volume (measure in passenger car units (PCUs)) and the percentage changes in vehicle flows, HGV flows and speeds between the current year and the 2043 forecast year.
- 8.3.2 The bus stops and points of interest were analysed and then filtered across the area of impact to only include bus stops within 400 metres and points of interest within 800 metres of OA centroids and within a 200-metre buffer of the identified severance links. This provided an indication of the zones and segments of the links that would be most affected by the scheme.
- 8.3.3 **Figure 8-1** shows the links that met the criteria to be analysed for severance. The links that met the criteria fall within the same area of impact defined for the accident analysis, although this does not include a filter for the absolute percentage change in flow. A large proportion of the links that met the criteria were on A or B roads, reflecting the minimum PCU requirement.

Figure 8-1: Links Meeting the Severance Screening Criteria



- 8.3.4 **Figure 8-2** shows the links with the bus stops mapped from the Open Street Map data. We can observe that there are many bus stops approaching the centre of Hereford, with a much lower number in the surrounding rural areas. The distribution is expected as the centre of Hereford has a much greater population density and a greater provision of public transport services. In rural area, many bus stops are typically along major A or B roads that connect villages and towns together.
- 8.3.5 Figure 8-3 show the links with the points of interest (POIs) from Open Street Map data representing amenities. This exhibits a similar pattern to Figure 8.2, with most services concentrated in the urban area near the centre of Hereford. This also shows additional pattern that a large proportion of the points of interest in the rural areas are along the links identified for severance assessment, whereas rural bus stops are evenly distributed across the affected links in the area.

Figure 8-2: OSM Bus Stops and Identified Links for Severance

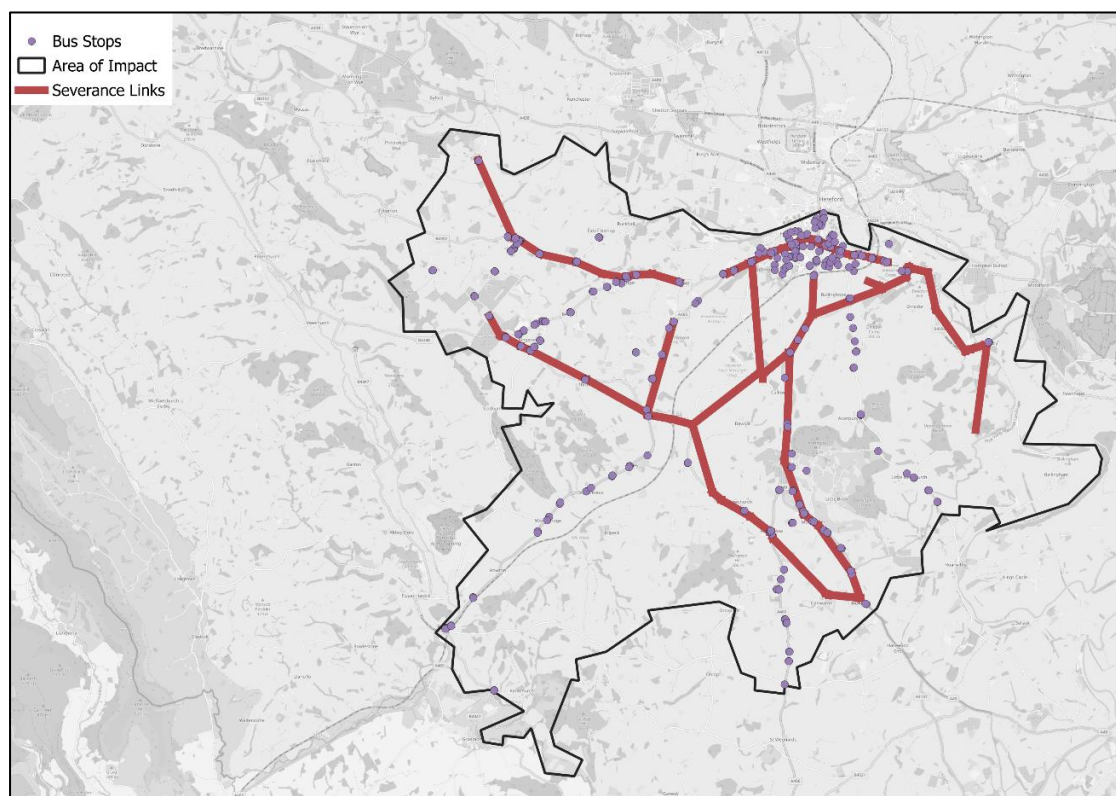
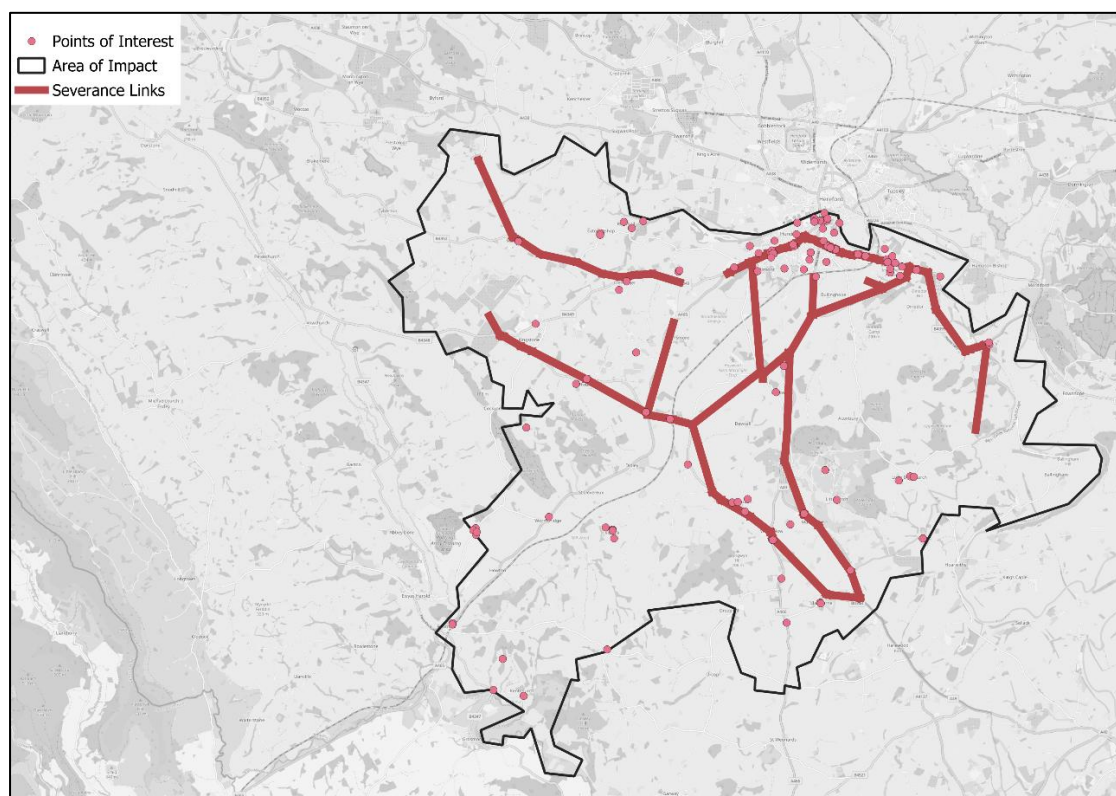


Figure 8-3: OSM Points of Interest and Identified Links for Severance



8.3.6 Figure 8-4 shows the paths from the Output Area centroids to bus stops that are shorter than 400 metres and lie within 200 metres of the severance links. This shows that there are many paths that meet this criterion at the south of the centre of Hereford, particularly around Belmont and Hunderton, reflecting the high number of OAs and bus stops in these areas

relative to the surrounding rural area. Additional locations meeting this criterion are within small villages such as Madley, Clehonger and Kingstone.

8.3.7 **Figure 8-5** shows the paths from the centroids of OAs to POIs that are shorter than 800 metres in length and are within 200 metres of the severance links. This generally follows the same pattern as the path to bus stops, with a greater proportion of paths to points of interest at the south of the centre of Hereford. There are also paths to points of interest within the more rural surrounding areas such as Madley, Clehonger and Wormelow, where points of interest that cross the severance links typically include post offices, post boxes and telephone boxes.

Figure 8-4: Zone to Bus Stop Paths Within Buffer of Severance Links

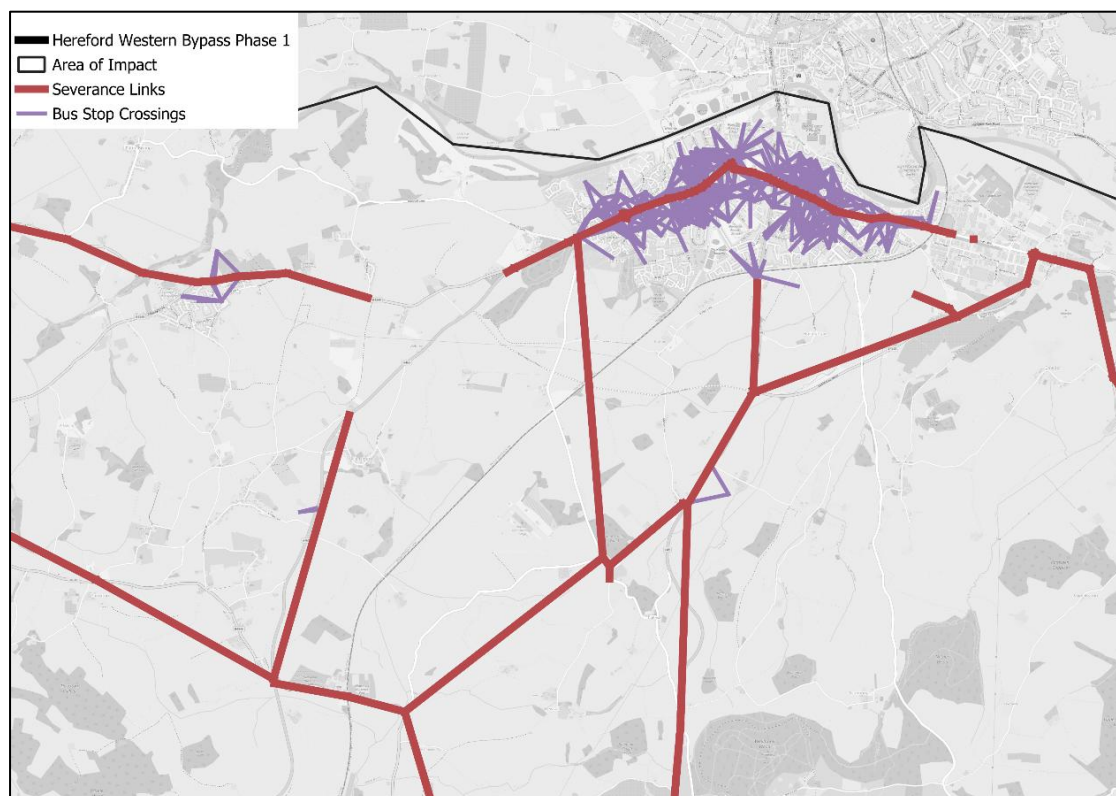
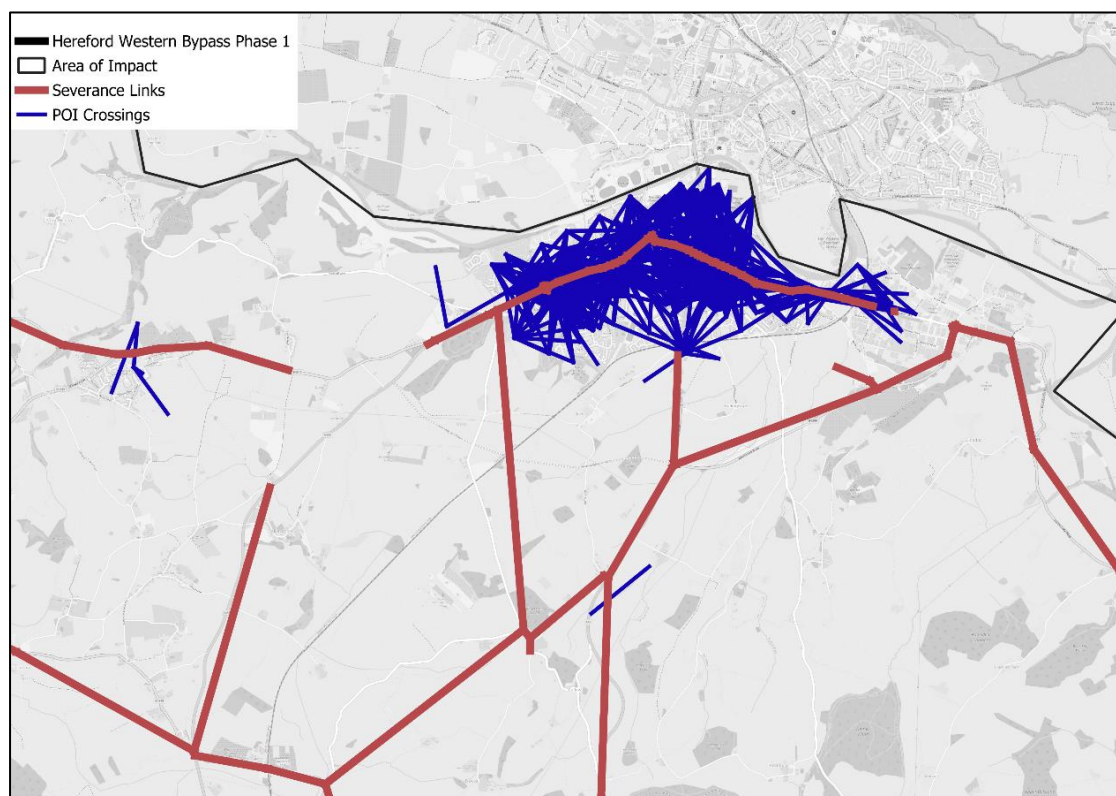


Figure 8-5: Zone to Points of Interest Lines Within Buffer of Severance Links

- 8.3.8 **Table 8.1** shows the summary of severance appraisal for the area of impact. The values of the number of people affected was obtained by combining the output area level data for each of the output areas along a section of the severance links.
- 8.3.9 The areas that were scored with a negative value for change in severance were generally along links to the south of the scheme, due to a large proportion of these links experiencing an increase in vehicle flow. These areas typically had an increase in vehicle flow as more vehicles were utilising these links because of the new bypass.
- 8.3.10 The areas that were scored with a positive value for change in severance were along links that were generally to the north of the scheme or passed into the centre of Hereford, due to many these links experiencing a decrease in vehicle flow. These typically had a decrease in vehicle flow as vehicles no longer needed to enter the centre of Hereford to make west-east journeys.
- 8.3.11 The A49 north of the scheme was considered to have a neutral change in severance. This is because this area only experienced a slight increase in flow during the AM period and no significant change in flow during the PM period. Overall, these increases in vehicle flow were not considered to not be significant enough to be given a negative score.
- 8.3.12 The locations with the highest overall effect were along the A465 and Holme Lacy Road north of the scheme. Here the Output Areas are densely populated and small compared to the length of trips being considered. Amenities are more prevalent here, resulting in a larger number of trips being considered and a greater affected population.
- 8.3.13 The locations with the lowest overall effect were along the A465 and the B4399 Rotherwas Link Road where Output Areas are large relative to the length of trips being considered. These areas had very few output areas along the severance links due to the low population density of these areas, resulting in a much lower number of people affected.
- 8.3.14 It is worth also noting that each of the groups have a relatively similar number of total people affected, except for a lower number of people within the No Car category. However, we can

see that total overall effect between the groups is disproportion, with Older People having a very low positive effect and the smallest group (No Car) experiencing the highest positive overall effect. This could suggest that in terms of severance the scheme could be disproportionately benefiting certain groups within the area of impact for severance.

- 8.3.15 The assessed impacts for the groups being considered, based on Table 8.1, are moderate beneficial for the No-Car Available, Young People and Disabled groups and slight beneficial for the Older group. This results from the area with the highest severance change being in South Wye which has a relatively young population, a higher proportion of disabled people (being close to accessible services and amenities) and a relatively high level of deprivation leading to lower car availability.

Table 8.1: Summary of Severance Appraisal by Area

Location	All social groups			No Car			Young People			Older			Disabled		
	Change in severance [A]	No of people affected [B]	Overall effect [A]*[B]	[A]	[B]	[A]*[B]	[A]	[B]	[A]*[B]	[A]	[B]	[A]*[B]	[A]	[B]	[A]*[B]
A465/Belmont Road (Urban)	Positive (+1)	4000	4000	1	900	900	1	800	800	1	500	500	1	700	700
A465/Belmont Road (Rural)	Negative (-1)	600	-600	-1	0	0	-1	100	-100	-1	100	-100	-1	100	-100
Holme Lacy Road (Urban)	Positive (+1)	4000	4000	1	800	800	1	900	900	1	400	400	1	700	700
Holme Lacy Road (Rural)	Negative (-1)	900	-900	-1	100	-100	-1	100	-100	-1	200	-200	-1	100	-100
Gatehouse Road/B4399	Negative (-1)	800	-800	-1	100	-100	-1	100	-100	-1	200	-200	-1	100	-100
A49/Ross Road (Urban)	Neutral (0)	800	0	0	100	0	0	100	0	0	100	0	0	200	0
A49/Ross Road (Rural)	Negative (-1)	2000	-2000	-1	100	-100	-1	200	-200	-1	300	-300	-1	300	-300
B4348	Positive (+1)	3000	3000	1	200	200	1	500	500	1	700	700	1	600	600
B4352/B4349	Negative (-1)	2000	-2000	-1	200	-200	-1	400	-400	-1	600	-600	-1	500	-500
Totals		18100	+4700		2500	+1400		3200	+1300		3100	+200		3300	+900

9. Distributional Impacts of Personal Affordability

- 9.1.1 Personal affordability is concerned with changes in the monetary cost of travel with the introduction of a proposed scheme (TAG Unit A4.2, May 2024). This can include charges such as toll roads and public transport fares but also changes in vehicle operating costs associated with travel.
- 9.1.2 If an assessment of the impact of the proposed scheme on personal affordability is undertaken, this should consider the impact of the proposed scheme across income groups. If the minimum cost of travel increases, it may impact the ability to travel for those with the lowest incomes.

9.2 Screening

- 9.2.1 TAG Unit A4.1 states that the screening of personal affordability should consider parking charges, car fuel and non-fuel operating costs, road user charges and the relative availability of public transport.
- 9.2.2 The scheme makes no changes in parking charges, as it focuses on the development of a new highway, rather than developing changes to existing parking spaces within the area. There are also no changes to road charges as the scheme is not a charged toll road. The availability of public transport is largely set to be unaffected, as the existing bus routes will continue to operate, except a minor modification of the B4349 at bus stop Abbey Cottages.
- 9.2.3 There are routes for which the scheme could result in a reduction of journey time while simultaneously increasing vehicle operating costs through increasing distance travelled. One such example could occur for passenger travelling between Hereford Enterprise Zone (Rotherwas) and Belmont Abbey particularly during off-peak periods.
- 9.2.4 The journey under existing conditions typically involves travel via Holme Lacy Road, Walnut Tree Avenue and southbound along Belmont Road. While this route is relatively short in distance, it involves multiple junctions and section of the urban network, which can result in higher journey times.
- 9.2.5 With the introduction of the scheme, passengers would have the option to travel along the B4349 Rotherwas link road, the new phase 1 link, and northbound along the A465. This route is expected to offer a faster journey time because of more free-flow conditions and fewer junctions; however, it is longer in the overall distance.

9.3 Assessment and Appraisal

- 9.3.1 The same TUBA outputs used for the user benefits appraisal were used for the personal affordability appraisal. These are based on the 2043 data only, to derive the pattern of benefits. The full 60-year appraisal will have significantly larger values.
- 9.3.2 The personal affordability benefits calculated by TUBA are filtered to only include trips which have home location inside the Area of Impact (Herefordshire). The non-business trips, namely 'commuting' trips and 'other' purpose trips have been aggregated by Indices of Deprivation income domain quintile, representing income level. The personal affordability benefits include changes in fuel and non-fuel operating costs and 'Non-variable costs' for travel. Benefits relating to changes in indirect taxation and greenhouse gases are excluded from this analysis. The results of the distribution impacts assessment for personal affordability are presented in **Table 9.1** and

9.3.3 Figure 9-1.

9.3.4 The personal affordability forecast from TUBA indicates adverse impacts, disbenefits, for all income groups, which are unevenly distributed across the population. The lowest and highest quintiles have a disproportionately small share of disbenefits and quintile 3 has a disproportionately large share of disbenefits.

9.3.5 The distribution of personal affordability impacts mirrors the user benefits, including time benefits impacts to some extent. The areas to the southwest and east of Hereford which have relatively large beneficial user benefits impacts have relatively larger adverse personal affordability impacts. This is due to faster, but longer, journeys due to the scheme. The increased distance due to the scheme increases vehicle operating costs which are a greater part of the affordability costs. In the user benefits appraisal, the time benefit more than offsets the increased vehicle operating costs of the longer journey.

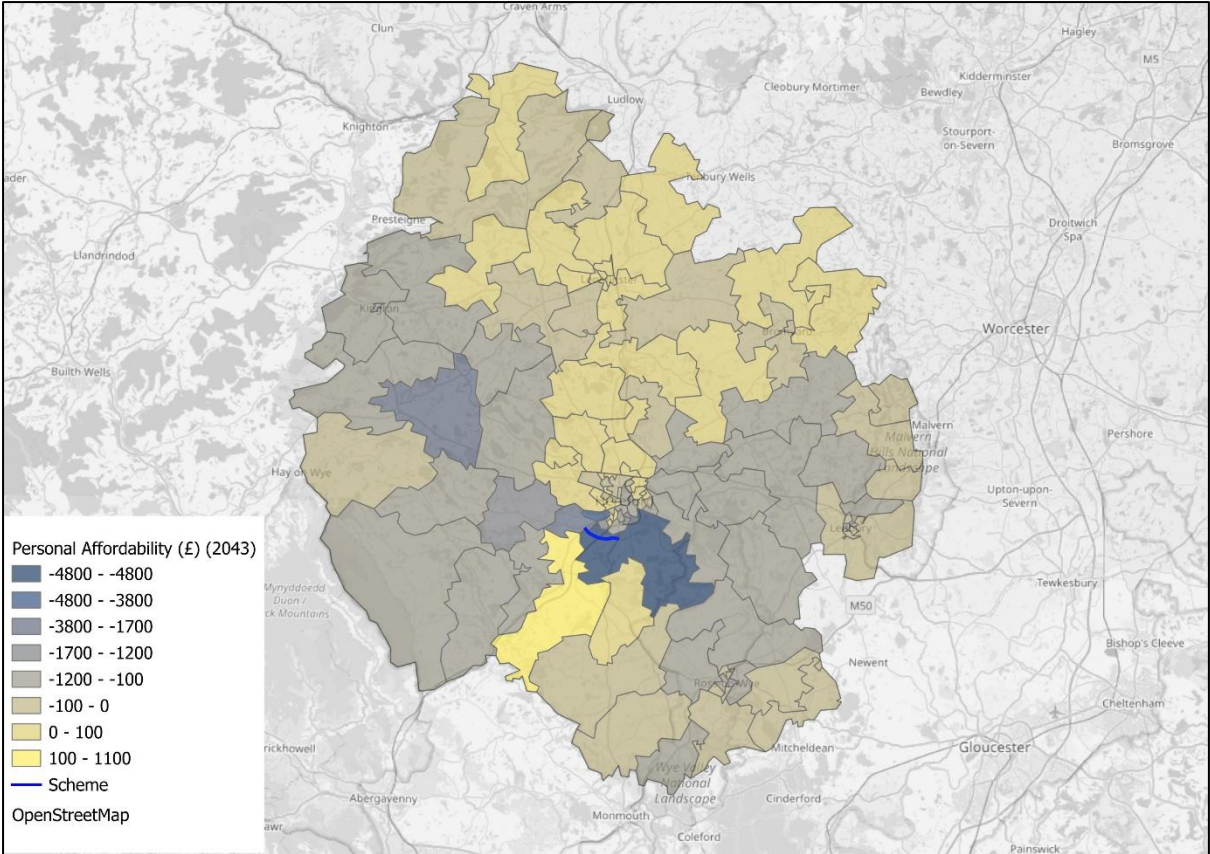
9.3.6 There are also slight beneficial personal affordability impacts for LSOAs along the A465 towards Abergavenny and north of Hereford, indicating slightly smaller vehicle operating costs. This may relate to some journeys encountering less congestion on the A465 and the A49 due to removal of the west-east traffic in South Wye.

Table 9.1: Distributional Impacts of Personal Affordability from TUBA

	Quintile					Total
	1 (Low income)	2	3	4	5 (High Income)	
Population	10,876	27,195	62,706	68,018	15,390	184,185
% Population	6%	15%	34%	37%	8%	
Total Benefits	-	-	-	-	-	
Total Disbenefits (£) (2043)	-54	-7,357	-16,050	-15,088	-311	-38,859
% Benefits						
% Disbenefits	0%	19%	41%	39%	1%	
TUBA Assessment ⁷	x	xx	xxx	xx	x	

⁷ See TAG Unit A4.2 Table 8.

Figure 9-1: Personal Affordability by Lower Super Output Area



9.4 Personal Affordability Worksheet

Mode	Monetary Modal Cost Change	Area	A49 & A465 Corridors	East and West of the Scheme, Hereford Enterprise Zone	Wider Area	Impacts considered in TUBA assessment?	Overall PA Score	Population	6%	15%	34%	37%	8%
		Income Group	All	All				Income group	1	2	3	4	5
		Core Impact						Income Quintile	0-20%	20-40%	40-60%	60-80%	80-100%
Car	Car fuel and non-fuel costs	Changes due to rerouteing and reduced congestion	Reduced congestion in South Wye Beneficial Impact	Longer west-east journeys via the Scheme Adverse Impact	Negligible monetary impacts	Yes	**		0% *	19% **	41% ***	39% **	1% *
	Road user charges	n/a	n/a	n/a	n/a	n/a	-						
	Parking charges - absolute	n/a	n/a	n/a	n/a	n/a	-						
	Parking charges - management	n/a	n/a	n/a	n/a	n/a	-						
	Other Car costs	n/a	n/a	n/a	n/a	n/a	-						
PT	Bus	n/a	n/a	no impact	no impact	No	-						
Active	Walking Cycling	n/a	n/a	n/a	n/a	n/a	-						
Overall Analyst Assessment							**		**	**	***	**	*

10. Output Summary Table

Social group and amenities indicators				User Benefits	Noise	Air Quality	Accidents ⁸	Security ⁹	Severance	Accessibility ¹⁰	Affordability	Local Authority ¹¹	England
Resident population in the impact area	Income distribution quintiles	0-20%		6%	11%	36%				-	6%	6%	20%
		20-40%		15%	34%	36%				-	15%	15%	20%
		40-60%		34%	16%	14%				-	34%	34%	20%
		60-80%		39%	39%	8%				-	39%	39%	20%
		80-100%		8%	0%	6%				-	8%	8%	20%
	Children (<16)				18%	20%	13%	-		-		16%	21%
	Young people						21%		10%	-		5%	12%
	Older people				19%		10%	-	17%	-		20%	14%
	People with a disability							-	17%	-		19%	4%
	Black Minority Ethnic							-		-		3%	8%
	No car households								13%	-		14%	25%
	Households with dependent children									-		25%	28%
	Indicator population in the impact area			184,000	5,300	5,600	33,000	-	18,900	-	184,000	184,000	60m
Amenities present within the	Schools / nurseries		✓	✓	✓	-	✓	-	✓	-	-	-	
	Playgrounds		✓	✓	✓	-	✓	-	✓	-	-	-	

⁸ Accident population is estimated as the population of the OAs forming the accident Aol.

⁹ Not assessed

¹⁰ Not assessed

¹¹ The local authority is Herefordshire.

impact area	Parks and open spaces		✓	✓	✓	-	✓	-	✓	-	-
	Hospitals		✓	✓	✓	-	✓	-	✓	-	-
	Care homes / day centres		✓	✓	✓	-	✓	-	✓	-	-
	Community centre		✓	✓	✓	-	✓	-	✓	-	-

11. DI Appraisal Matrix

	Distributional impact of income deprivation						Are the impacts distributed evenly?	Key impacts - Qualitative statements (example below)		
	0-20%								20-40%	40-60%
User benefits	✓✓	✓✓	✓✓✓	✓✓	✓	No	Positive benefits are felt by all income groups due to a reduction in journey time with the scheme in place. Benefits favour the middle income group and the highest income group has a disproportionately small share of benefits.			
Noise	xx	xxx	✓✓✓	xx	neutral	No	Noise impacts favour those in the middle income group. The affected areas for that group are the indirect west-east routes relieved by the scheme. The highest income group is not represented. All other groups experience noise disbenefits. 80% of the assessed population have no change in daytime noise.			
Air quality PM2.5	✓✓✓	x	✓✓✓	✓✓	xx	No	PM2.5 impacts favour the most-deprived and middle income group. Due to their location in Southe Wye The second-most and least deprived groups experiences PM2.5 disbenefits. 80% of the assessed population have no change in PM2.5 concentration.			
Air quality NO2	✓✓✓	✓	✓✓✓	✓✓	xxx	No	NO2 impacts favour the most-deprived and middle income group. Due to their location in Southe Wye The least deprived group experiences NO2 disbenefits. 85% of the assessed population have no change in NO2 concentration.			
Affordability	x	xx	xxx	xx	x	No	Affordability disbenefits are felt by all income groups due to longer journeys with the scheme in place. The most- and least-deprived income quintiles have a smaller share of disbenefits and the middle-income group has a larger share of disbenefits compared to population.			

Accessibility						Not assessed.
---------------	--	--	--	--	--	---------------

12. AST Entry

AST entry											
Impact	Social groups						User groups				Qualitative statement (including any impact on residential population AND identified amenities)
	Children & young people	Older people	Carers	Women	Disabled	BME	Pedestrians	Cyclists	Motor- cyclists	Young male drivers	
Noise	xx	x									Noise changes impact only 20% of the assessed population. Within the affected population slightly more people are affected by increases in noise than decreases.
Air Quality	✓✓										The scheme provides benefits in both NO ₂ and PM _{2.5} measures by reducing traffic on routes in residential areas of South Wye.
Accidents	✓✓	✓					✓	✓✓	✓	✓	The scheme provides benefits by reducing traffic in South Wye where Child and Cycling casualties are more prevalent. Population is relatively young and journeys are short and encourage cycling in South Wye. Traffic is also reduced at many junctions on the A49 and A465 that form indirect west-east routes.
Security	-	-		-	-	-					Not Assessed

												Reductions in traffic due to the scheme and amenities accessed on foot are mostly in South Wye. Here the population is younger than rural areas and has better accessibility for disabled people leading to a larger disabled population, both of whom benefit from severance improvements due to less traffic.
Severance	✓✓	✓	-		✓✓							
Accessibility	-	-	-	-	-	-						Not Assessed

Appendix I – Alternative Mode Assessment

Hereford Western Bypass

Phase One Alternative Mode Assessment

Herefordshire Council

Project number: 60746644

June 2026

Quality information

Prepared by	Checked by	Verified by	Approved by
Charlotte Jones Senior Consultant	Sonia Sivanesan Principal Consultant	Paul Bate Technical Director	Darren Abberley Associate Director

Revision History

Revision	Revision date	Details	Authorized	Name	Position
V1	09.06.2026	Draft for issue	Yes	Darren Abberley	AD

Distribution List

# Hard Copies	PDF Required	Association / Company Name

Prepared for:

Herefordshire Council

Prepared by:

AECOM Limited
The Colmore Building
Colmore Circus Queensway
Birmingham B4 6AT
United Kingdom

T: +44 (0)121 710 1100
aecom.com

© 2026 AECOM Limited. All Rights Reserved.

AECOM Limited ("AECOM") has prepared this document for the sole use of Herefordshire Council ("Client") in accordance with the terms and conditions of appointment (ref no: 60746644 Hereford Bypass Programme) dated *February 2025* ("the Appointment").

AECOM shall have no duty, responsibility and/or liability to any party in connection with this document howsoever arising other than that arising to the Client under the Appointment. Save as provided in the Appointment, no warranty, expressed or implied, is made as to the professional advice included in this document or any other services provided by AECOM.

This document should not be reproduced in whole or in part or disclosed to any third parties for any use whatsoever without the express written authority of AECOM. To the extent this document is reproduced in whole or in part or disclosed to any third parties (whether by AECOM or another party) for any use whatsoever, and whether such disclosure occurs with or without the express written authority of AECOM, AECOM does not accept that the third party is entitled to rely upon this document and does not accept any responsibility or liability to the third party. To the extent any liability does arise to a third party, such liability shall be subject to any limitations included within the Appointment, a copy of which is available on request to AECOM.

Where any conclusions and recommendations contained in this document are based upon information provided by the Client and/or third parties, it has been assumed that all relevant information has been provided by the Client and/or third parties and that such information is accurate. Any such information obtained by AECOM has not been independently verified by AECOM, unless otherwise stated in this document. AECOM accepts no liability for any inaccurate conclusions, assumptions or actions taken resulting from any inaccurate information supplied to AECOM from the Client and/or third parties.

Table of Contents

1.	Introduction	1
1.1	Hereford Western Bypass Overview	1
1.2	Report Overview	2
2.	Scheme Context	3
2.1	Scheme Objectives for Phase One	3
2.2	The role of Phase One of the bypass	3
	Case for Change	3
	The future role of Phase One of the bypass	4
3.	Alternative Modes Assessment	5
3.1	Bus Services	5
3.2	Rail Network	5
3.3	Public Rights of Way (PRoW) Network	7
3.4	Cycle Network	8
3.5	Summary	9

Figures

Figure 1-1:	Hereford Westen Bypass	1
Figure 1-2:	Hereford Transport Hub	6
Figure 1-3:	Public Rights of Way Map (Footpath UK)	7
Figure 1-4:	National Cycle Network (Sustrans)	8

Tables

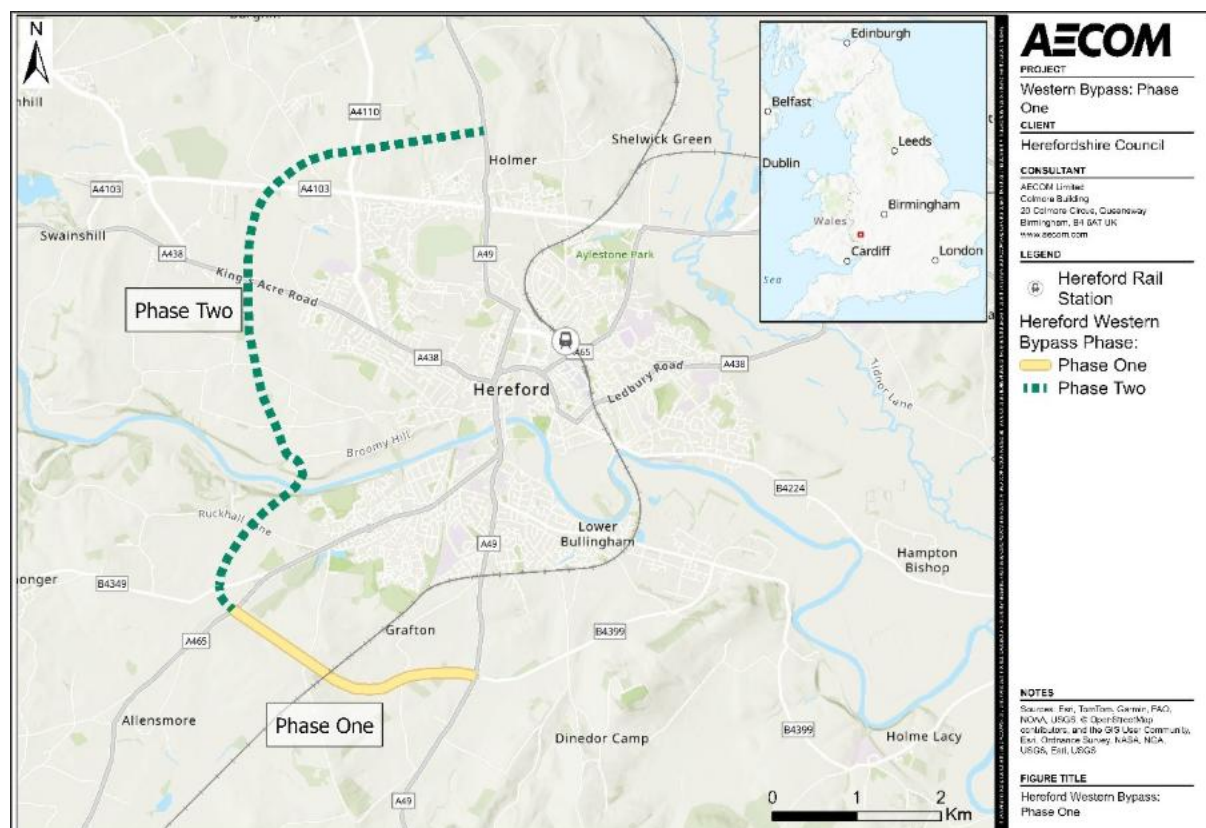
Table 1-1:	Scheme Objectives	3
Table 1-2:	Bus Services and Frequency	5

1. Introduction

1.1 Hereford Western Bypass Overview

- 1.1.1 The proposal for a bypass of Hereford was initially developed over 30 years ago in the early 1990s. Since then, various options for both eastern and western alignments (of the city centre) have been considered.
- 1.1.2 The preference for a western bypass came out of study work conducted between 2010-2013 and was included in the adopted Herefordshire Local Plan Core Strategy 2011-2031, as a key element of the long-term Hereford Transport Strategy (HTS). The scheme was identified in the Local Plan as a strategically important piece of infrastructure in reducing through traffic in the city centre and enabling the delivery of walking, cycling and bus improvements on the existing highway network, whilst helping to facilitate significant growth proposals.
- 1.1.3 At the same time, the South Wye Transport Package (SWTP) was identified in the Local Transport Plan (LTP) as an important strategy for promoting economic growth within Hereford whilst tackling specific problems in the South Wye area. The SWTP was part of the broader HTS and a key element of the package was the inclusion of a new Southern Link Road (SLR), from the A49 to the A465 (now forming 'Phase One' of the Western Bypass).
- 1.1.4 The western bypass, shown in Figure 1-1, is made up of two parts: Phase One and Phase Two which connects with Phase One and forms the northern section of the route.

Figure 1-1: Hereford Western Bypass



1.1.5 The alignment of Phase One is fixed and has the benefit of having full planning permission in place. The alignment of Phase Two is likely to evolve to enable the latest housing and employment land requirements to be accommodated. This will be considered further as part of the development of the Phase Two scheme.

1.1.6 The scope of the scheme is set out below:

- 3.6km rural all-purpose single carriageway
- Links the A465 and A49 in the South Wye area of Herefordshire
- Design speed of 60mph
- Improved access to the Rotherwas Industrial Estate and Hereford Enterprise Zone (herein referred to collectively as HEZ) for the south and west of the city
- Forms a key enabler for the delivery of the full Hereford Western Bypass

1.2 Report Overview

1.2.1 The purpose of this assessment is as follows:

- To provide an understanding of the scheme context and analysis of the travel characteristics in the study area; and
- Identify potential alternative mode solutions that could be considered alongside the bypass.

2. Scheme Context

2.1 Scheme Objectives for Phase One

- 2.1.1 A series of objectives were identified as part of the SWTP Option Assessment Report (OAR) (2019) for the scheme. These have since been reviewed and adapted to relate solely to Phase One and to ensure they are SMART (Specific, Measurable, Achievable, Relevant and Time-Based). The updated objectives for the scheme are set out in Table 1-1.

Table 1-1: Scheme Objectives

No.	Objective
1	Provide a more direct and reliable route to the HEZ for all users from the south / southwest of Hereford with journey time savings of more than six minutes during peak periods, following completion of the Phase One scheme.
2	Relieve residential route pressures in the South Wye area, particularly along the A465 Belmont Road, Holme Lacy Road and Walnut Tree Avenue, by reducing daily traffic flows by up to 25%, following completion of the scheme.
3	Improve road safety across the South Wye area following completion of the scheme.
4	Reduce the air quality and noise impacts from road transport on key receptors, across South Wye, particularly in the residential Belmont area following completion of the scheme.
5	Support economic growth and business productivity in Hereford through increased inward investment and reduced travel time.
6	Improve social outcomes across the South Wye area by reducing traffic demand and providing an improved environment, following completion of the scheme.

2.2 The role of Phase One of the bypass

Case for Change

- 2.2.1 As part of the Strategic Dimension, a detailed Case for Change has been developed in support of the Phase One scheme, based on analysis across a number of themes. The following problems and issues have been identified in relation to the study area:
- The need for a more efficient and reliable road network, particularly in the context of high levels of car dependency across rural Herefordshire.
 - Limited connectivity to the HEZ, resulting in traffic routeing along inappropriate rural and residential roads to access the site, a key example of this being recent ANPR data showing a key movement being the A465 – Walnut Tree Avenue – Holme Lacy Road.
 - Journey time unreliability resulting in potential productivity losses and increased operating cost for commuters and HGVs travelling to the HEZ.

- Clusters of road collisions across the study area and an unattractive environment for active travel.
- Congestion leading to disruptions to the reliability of local bus services in South Wye.
- High traffic flows contributing towards social impacts such as high levels of deprivation identified within South Wye and negative impacts on community cohesion.
- Noise pollution along the A465 in South Wye

The future role of Phase One of the bypass

2.2.2 These challenges reinforce the need for change and support the case for the Phase One scheme to come forward to deliver a range of environmental, safety, traffic, community and economic benefits across Hereford.

2.2.3 The Case for Change has highlighted a large number of benefits that the scheme will bring, including:

- A significant reduction in flows along residential routes including Walnut Tree Avenue, Holme Lacy Road and the A465
- Reduced journey times between the A465 and the HEZ
- A reduction in collisions over the appraisal period
- Improved reliability of bus services along the A465
- Quieter residential streets for encouraging active travel and a more pleasant environment outside of sensitive receptors such as schools in residential areas in Belmont
- Greater community cohesion and quality of life
- Improved access to future housing growth including Lower Bullingham and opportunities for employment growth and inward investment
- Improved air quality and reduced noise along residential routes between the A465 and the HEZ

3. Alternative Modes Assessment

- 3.1.1 The purpose of this section is to describe the alternative travel modes that are available within the study area and their ability to meet the needs of travellers.

3.1 Bus Services

- 3.1.1 There are multiple bus services that operate along the A465, A49 and around the Rotherwas area. The services and their frequency are detailed in Table 1-2.

Table 1-2: Bus Services and Frequency

Bus Service	Route	Frequency
23	Abergavenny – Hereford (A465)	Every 30 minutes Monday – Friday Every 2 hours Sunday
413, 440, 441	Broad Oak / Abbeydore / Longtown – Hereford (A465)	Twice a day Monday – Friday Three times a day Saturday morning No Sunday service
33	Gloucester – Hereford (A49)	Every 50 minutes Monday – Friday Every hour Saturday Every 2 hours Sunday
66	Monmouth – Hereford (A49)	Every 2 hours Monday – Saturday Every 3 hours Sunday
454	Hereford – Woolhope Nurdens (The Straight Mile)	Every hour Monday – Friday (until 14:30) No Sunday service
R	Hereford – Rotherwas Industrial Estate and HEZ	Every hour Monday – Saturday

- 3.1.2 The bus services connecting into Hereford operate with generally low frequencies, and direct links to HEZ are particularly limited. Along the A465 corridor, only Service 23 provides a relatively regular timetable. Services on the A49 are similarly infrequent, with the 33 operating roughly every 50 minutes on weekdays and the 66 only every two hours.
- 3.1.3 Local connections are also constrained as the 454 runs hourly but only until mid-afternoon and does not operate on Sundays. Crucially, HEZ is poorly served, with only a single route (Service R) providing an hourly connection from Monday to Saturday and no Sunday service, resulting in limited public transport accessibility to the employment area.

3.2 Rail Network

- 3.2.1 Hereford Railway Station is located to the north of the city centre and sits on the Marches Line, providing direct connections to major centres such as Cardiff,

Newport, Shrewsbury and Manchester, as well as links to Birmingham and London via the Cotswold Line.

- 3.2.2 The railway operates independently of HEZ, with no direct connection between the station and the employment area. HEZ is approximately a 56-minute walk from Hereford Railway Station, meaning that while the rail network supports wider regional accessibility, it does not provide a direct link to main employment site within the city.
- 3.2.3 A major scheme is currently underway to provide an Integrated Transport Hub at Hereford Station (Figure 1-2). The transport hub will tie together local heritage, public transport and active travel - creating an attractive environment for all users. The Transport Hub will include new bus stops, an indoor waiting space, toilets, and a driver restroom as well as generous pedestrian/wheeling and cycle access, covered cycle storage and cycle rental, to encourage more active travel. Construction of the Transport Hub is currently underway and it is expected to open in October 2026.

Figure 1-2: Hereford Transport Hub

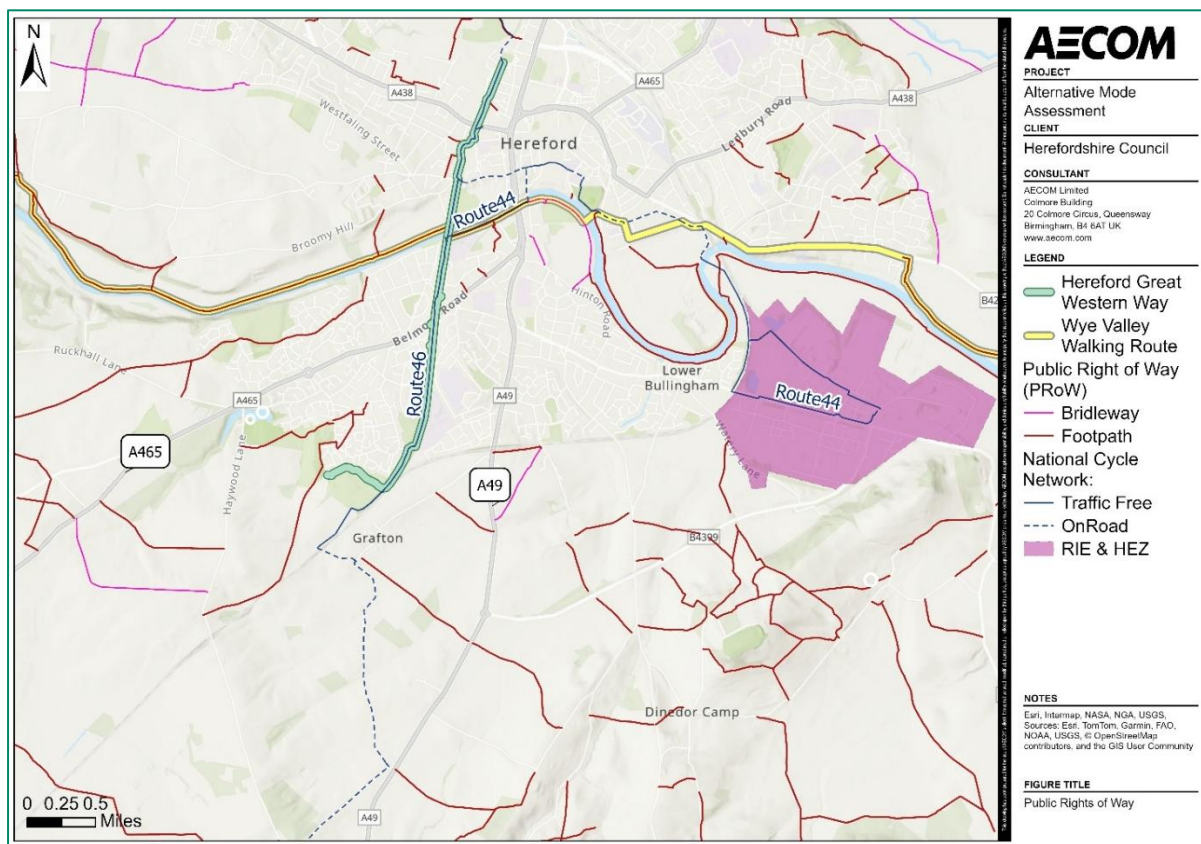


- 3.2.4 Bus services from the Transport Hub will provide connections to Monmouth, Ross-on-Wye and Llandrindod Wells, as well as routes within and around Hereford. Only one route (Service R) stops within HEZ.

3.3 Public Rights of Way (PRoW) Network

- 3.3.1 PRoW routes provide direct, low-traffic connections between surrounding rural communities, the southern edge of Hereford and the employment areas at HEZ. Many of these footways link into the wider active travel network, including the Great Western Way and Wye Valley, giving walkers and cyclists an alternative to using the main road corridors such as the A49 and A465.
- 3.3.2 Around HEZ, the PRoW network runs along the River Wye and Watery Lane, providing established walking routes in the vicinity of the Rotherwas area and linking parts of Hereford with the surrounding countryside, but not extending directly into the HEZ itself. Those walking from Hereford city centre should expect a journey of around 50 minutes to reach HEZ. This route largely avoids the PRoW network, instead following footways alongside the carriageway and sections through King George V Playing Fields.

Figure 1-3: Public Rights of Way Map (Footpath UK)¹

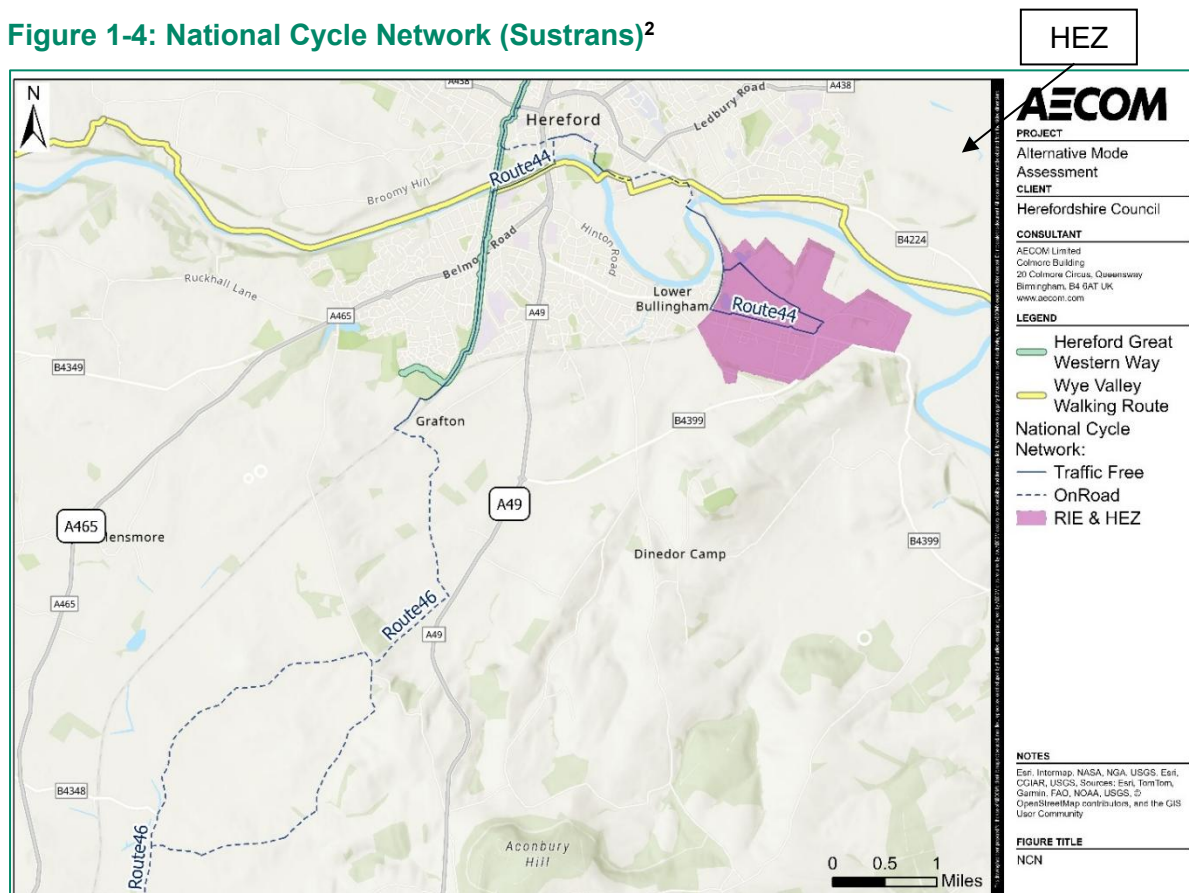


¹ <https://footpathmap.co.uk/map/>

3.4 Cycle Network

- 3.4.1 National Cycle Route (NCR) 44 and 46 pass through Hereford, with NCR 44 running directly through the HEZ. NCR 46 approaches the city by following quiet country lanes parallel to the A446 and A49 before connecting to an off-carriageway shared use footway that forms part of the Great Western Way.

Figure 1-4: National Cycle Network (Sustrans)²



- 3.4.2 Holme Lacy Road is a predominantly residential route that provides a link from the A49 to the HEZ. Herefordshire Council are currently implementing a major scheme for this road that will make the road safer, smoother and less polluting for everyone - whether they are in a car, public transport, walking, wheeling or cycling.
- 3.4.3 The Holme Lacy Road scheme includes improvements and upgrades along the corridor to turn a very well utilised corridor into a 'spinal route' connecting homes to work zones and the city centre. The upgrades will run from Oak Crescent all the way to the Thorn Business Park junction (near Rotherwas). The key aims are:
- Boost safety for all users
 - Reduce traffic jams and pollution in residential areas
 - Fix the road: better surfaces benefits drivers and reduces flooding
 - More choice: so people can drive, walk, wheel or cycle in their own dedicated spaces
- 3.4.4 The scheme, which is expected to be complete in 2027, will make it safer for people walking and cycling. The new wide, raised path will let bikes and pedestrians travel safely off the road. It will create a proper, dedicated cycle route from Rotherwas to the city and homes in the surrounding residential area.

² <https://explore.osmaps.com/>

3.5 Summary

- 3.5.1 The overall accessibility of HEZ by sustainable modes is constrained by infrequent bus services and limited direct connections. Most routes into Hereford operate at low frequencies, with only a single bus service (Service R) providing an hourly link to HEZ, with no Sunday provision. This results in poor public transport coverage for the employment area.
- 3.5.2 While Hereford Railway Station offers strong regional connectivity, it is located a 56-minute walk from HEZ, significantly reducing its usefulness for onward access. Although cycle parking and hire facilities are available at the station, onward travel by bike assumes users are confident cyclists. National Cycle Route 44 provides a signed link into HEZ but may not be suitable for all users and can be a seasonal or weather dependent option.
- 3.5.3 Walking connections to HEZ are similarly limited as the journey from Hereford city centre takes around 50 minutes and relies on footways alongside the carriageway rather than dedicated PRow routes, offering a functional but not particularly attractive or accessible walking environment.

The improvements to Holme Lacy Road will make this a more attractive environment for walking and cycling, particularly from the local residential areas. However, connectivity across the rest of the South Wye area and wider city to and from HEZ is still limited for walking, cycling and public transport.

Appendix J – Appraisal Specification Report

Hereford Western Bypass

Appraisal Specification Report

June 2026

Quality Information

Prepared by	Checked by	Verified by	Approved by
Mark Dazeley	Sonia Sivanesan	Paul Bate	Darren Abberley
Regional Director	Principal Consultant	Regional Director	Associate Director

Revision History

Revision	Revision date	Details	Authorised	Name	Position

Prepared by:

Mark Dazeley
Regional Director

AECOM Limited
Marlborough Court
10 Bricket Road
St Albans
Hertfordshire
AL1 3JX

aecom.com

© 2026 AECOM Limited. All Rights Reserved.

AECOM Limited ("AECOM") has prepared this Report for the sole use of Herefordshire Council ("Client") in accordance with the terms and conditions of appointment (ref no: 60746644 Hereford Bypass Programme) dated February 2025 ("the Appointment").

AECOM shall have no duty, responsibility and/or liability to any party in connection with this Report howsoever arising other than that arising to the Client under the Appointment. Save as provided in the Appointment, no warranty, expressed or implied, is made as to the professional advice included in this Report or any other services provided by AECOM.

This Report should not be reproduced in whole or in part or disclosed to any third parties for any use whatsoever without the express written authority of AECOM. To the extent this Report is reproduced in whole or in part or disclosed to any third parties (whether by AECOM or another party) for any use whatsoever, and whether such disclosure occurs with or without the express written authority of AECOM, AECOM does not accept that the third party is entitled to rely upon this Report and does not accept any responsibility or liability to the third party. To the extent any liability does arise to a third party, such liability shall be subject to any limitations included within the Appointment, a copy of which is available on request to AECOM.

Where any conclusions and recommendations contained in this Report are based upon information provided by the Client and/or third parties, it has been assumed that all relevant information has been provided by the Client and/or third parties and that such information is accurate. Any such information obtained by AECOM has not been independently verified by AECOM, unless otherwise stated in this Report. AECOM accepts no liability for any inaccurate conclusions, assumptions or actions taken resulting from any inaccurate information supplied to AECOM from the Client and/or third parties.

Table of Contents

Section 1 Introduction	1
1.1 Overview.....	1
1.2 Report Purpose.....	1
1.3 Stakeholder Engagement and Approach Verification	1
1.4 Report Structure	1
Section 2 Project Description	2
2.1 Scheme Background	2
2.2 Scheme Description	2
2.3 Current Stage of The Project.....	3
Section 3 Transport Modelling	4
3.1 Approach to Traffic Modelling	4
3.2 Model Suite.....	4
3.3 Model Specification	5
3.4 Calibration.....	8
Section 4 Forecasting	11
4.1 Introduction	11
4.2 Forecasting Assumptions	11
Section 5 Economic Assessment.....	13
5.1 Introduction	13
5.2 Scheme Costs	13
5.3 Scheme Impacts/ Benefits	14
5.4 Transport Economic Efficiency (TEE) – TUBA	15
5.5 Accident Benefit Analysis	16
5.6 Delays during construction and maintenance	17
5.7 Environmental Assessment	17
5.8 Journey Time Reliability.....	17
5.9 Distributional Impacts	17
5.10 Wider Economic Impact Assessment	18

List of Tables

Table 1 - Highway journey purposes	8
Table 2 – Scheme Impact Assessment Approach.....	15
Table 3 - TEE TUBA assumptions.....	16

List of Figures

Figure 1 - Hereford Western Bypass	2
Figure 2: Stage 2 of the Transport Appraisal Process	3
Figure 3: HSTM Model Suite Interactions	5
Figure 4: Existing HSTM simulation network coverage	6
Figure 5: HSTM Zone System (Overview)	7
Figure 6: HSTM Zone System (Herefordshire)	7

Section 1 Introduction

1.1 Overview

- 1.1.1 This document is the Appraisal Specification Report (ASR) for the Full Business Case (FBC) for the Hereford Western Bypass Phase 1 – Southern Link Road (the Scheme). The FBC is required to be developed to demonstrate the case for the Scheme and secure internal funding from Herefordshire Council.

1.2 Report Purpose

- 1.2.1 Although Department for Transport funding is not being sought for the Scheme, this ASR has been developed to ensure consistency and alignment with DfT's Transport Assessment Guidance (TAG¹).
- 1.2.2 The ASR is intended to set out the proposed economic appraisal approach for the FBC.
- 1.2.3 The purpose of this ASR is to set out how appraisal will be undertaken and contains detail on:
- the Scheme and the transport objectives to be addressed by the Scheme, which form a crucial part of the Strategic Dimension in the business case;
 - the focus of local objectives, reflecting the need for intervention;
 - the scope, methodology, assumptions of the transport model and traffic forecasts which will be used for the Scheme assessment and appraisal;
 - the scope, methodology, assumptions of the transport appraisal which will form the Economic Dimension of the Scheme business case; and
 - an assessment of the key risks at this stage of the study.
- 1.2.4 The aim of the ASR is to set out an appraisal approach that will form the basis of the assessment and appraisal of the Scheme.
- 1.2.5 The ASR remains a live document and will be reviewed and updated regularly during the project life cycle to reflect any changes in the scope and approach.

1.3 Stakeholder Engagement and Approach Verification

- 1.3.1 The ASR allows all stakeholders related to the project to understand the assessment and appraisal work required during the FBC stage of the work. In relation to the Scheme, the ASR operates as a reference for the Scheme consultant (AECOM), Herefordshire Council and any other relevant stakeholder to ensure that the technical work is carried out in an approved and appropriate manner.
- 1.3.2 This ASR contains details of risks that exist within the proposed work. This increases the visibility of these risks and provides greater understanding of how the technical work detailed may impact on project timescales and cost.

1.4 Report Structure

- 1.4.1 The structure of this ASR is set out in accordance with TAG and following this introduction includes:
- Section 2 - Project Description;
 - Section 3 - Transport Modelling
 - Section 4 - Forecasting; and
 - Section 5 – Economic Assessment.

¹ <https://www.gov.uk/guidance/transport-analysis-guidance-tag>

Section 2 Project Description

2.1 Scheme Background

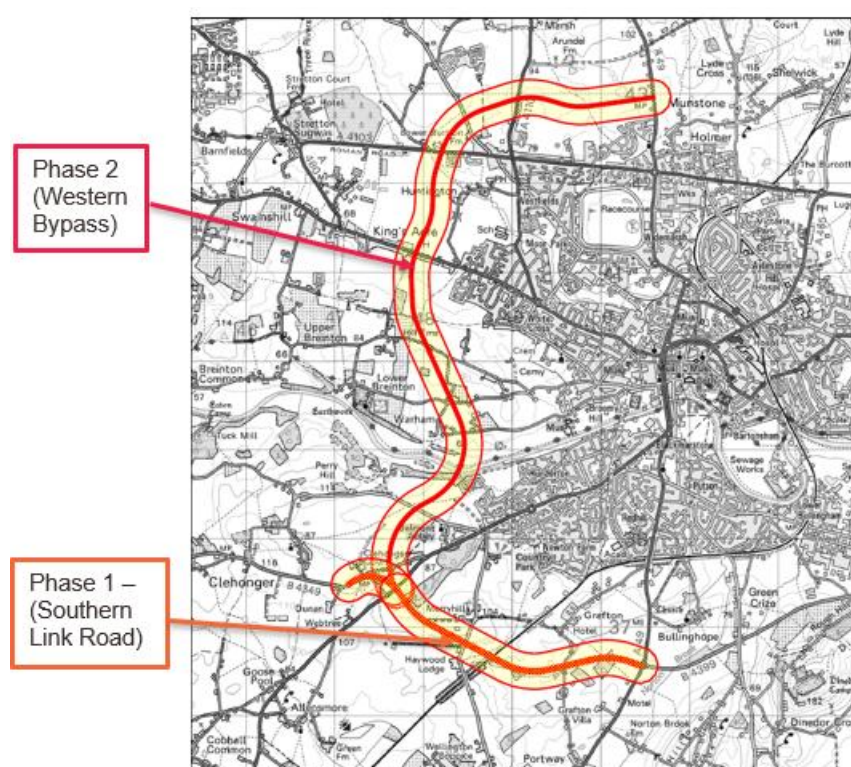
- 2.1.1 There have been long-standing plans for a bypass of Hereford city centre, going back several decades. These plans have been borne out of a need to address several underlying challenges including network resilience issues caused by a lack of crossings over the River Wye, traffic congestion along the A49, especially in Hereford City Centre, environmental considerations such as the need to improve air quality in the city, and a range of socio-economic issues including poor health and social mobility.
- 2.1.2 More recently, the need to accommodate the significant housing demands for the county as prescribed in the updated National Planning Policy Framework (NPPF) has further added to the case for new road infrastructure to support the delivery of the proposed new housing, as well as addressing the existing issues along the A49 corridor.

There has been a significant amount of work which has been previously been undertaken in developing a bypass solution for Hereford. This has considered alignments on both western and eastern sides of the city centre. In 2024, as part of the New Road Strategy for Hereford, Cabinet recommended that the Western Bypass should be taken forward to realise the county's strategic housing and employment land growth.

2.2 Scheme Description

- 2.2.1 The full extent of the Western Bypass is shown in Figure 1, and is made-up of two parts; the Phase 1 Southern Link Road (SLR) (which forms the focus of this ASR), and Phase 2 which connects with the SLR and forms the northern section of the route.

Figure 1 - Hereford Western Bypass



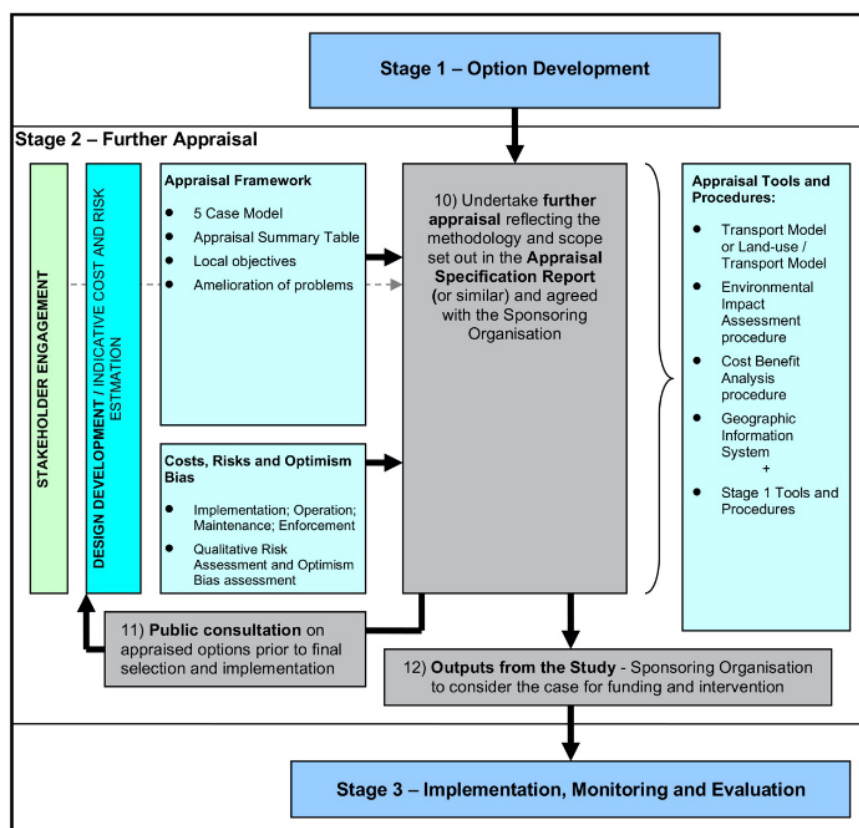
- 2.2.2 The Phase 1 element of the Scheme will provide a new link road between the A465 and A49 to the south-west of Hereford city centre. It is a 3km long section of rural all-purpose single carriageway, with a design speed of 60mph. The Scheme was developed to an advanced stage and received planning permission in 2016 (which remains extant), with work commencing on a FBC for the South Wye Transport Package (SWTP) (which included the SLR) in 2018.
- 2.2.3 The Phase 2 element of the scheme is at a less-advanced stage but involves connecting to the Southern Link Road and routing to the west of the city centre before connecting with the A49 to the north of the city.

- 2.2.4 Following the May 2019 Council elections, a decision was taken to pause on all new major road schemes for Herefordshire, including the FBC for the SWTP, before in 2021 it was formally decided by the full Council to stop progress on the Western Bypass and SWTP with other options being considered. As a result, the FBC for the scheme was not completed. However, this decision was reversed following the elections in May 2023, with the New Road Strategy for Hereford recommending in 2024 that progress should be recommenced with the Western Bypass.

2.3 Current Stage of The Project

- 2.3.1 Following the decision to recommence work with the Western Bypass, AECOM was commissioned in February 2025 to take forward the Phase 1 SLR to construction by December 2026, which includes updating the detailed design to latest standards and completing the business case for the scheme. As set out in Chapter 1, this ASR outlines the modelling and approach which will be adopted in helping to make the case for the Phase 1 element of the Scheme².
- 2.3.2 Full economic and financial appraisals will take place at this stage (building up the economic and financial dimensions within the business case), and preparations will be made for the potential contract through the development of the commercial dimension. The arrangements required to ensure successful delivery are set out in the management dimension. These details will all be presented in the FBC.
- 2.3.3 This ASR provides the specification of the methodology and scope for Stage 2 of the TAG appraisal process for the assessment of the preferred option and delivery of the FBC submission, as shown in Figure 2³. This will also include the underlying assumptions, data sources and risks around the Scheme development and assessment.

Figure 2: Stage 2 of the Transport Appraisal Process



² It should be noted Phase 2 of the Western Bypass is at a much earlier stage of scheme development, with different alignments to be considered by AECOM as a different phase of work.

³ <https://assets.publishing.service.gov.uk/media/5fbfb271d3bf7f572b163fb9/tag-transport-appraisal-process.pdf>

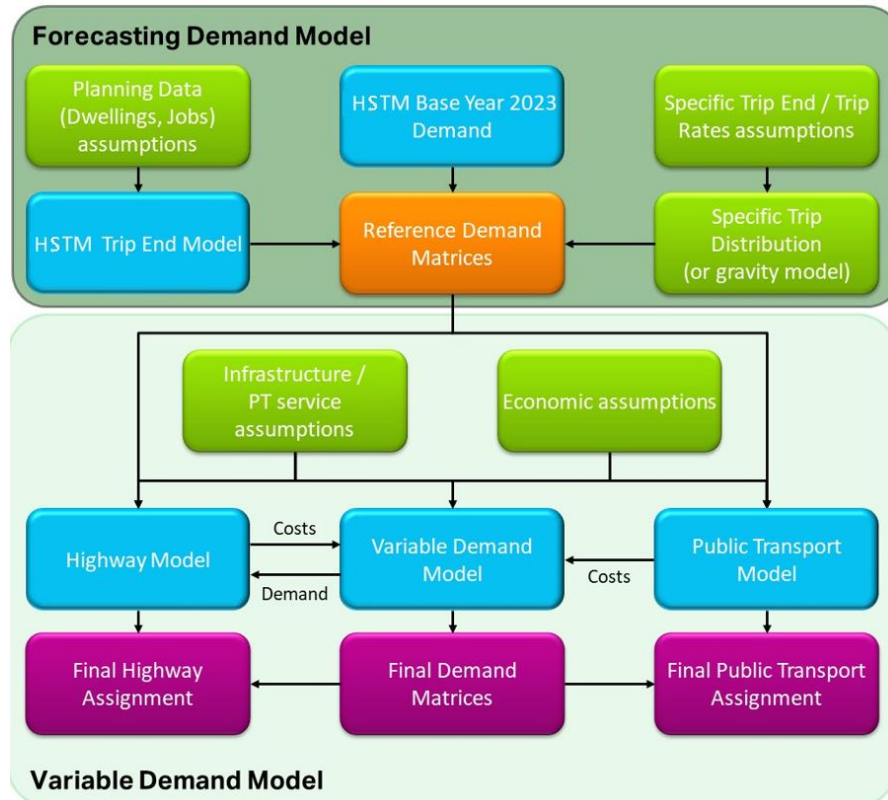
Section 3 Transport Modelling

3.1 Approach to Traffic Modelling

- 3.1.1 To understand the future network issues and to forecast the potential impact of the scheme, traffic modelling forecasts will be undertaken to provide an evidence base for the assessment of the scheme. These will also provide data to assess the Scheme impacts to underpin the strategic and economic dimensions of the business case, an updated estimate of the scheme BCR and the value for money of the scheme. The traffic model forecasts can also be used to support a range of other relevant analyses, including environmental, social and safety benefits of the scheme.
- 3.1.2 The Herefordshire Strategic Transport Model (HSTM) has been specifically developed for use in developing major transport schemes and development assessments, such as the Phase One of the bypass.
- 3.1.3 The HSTM has a base year of 2023 and was developed with reference to national guidance, particularly the DfT's TAG and followed this guidance where possible in all modelling principles, as well as using the guidance to obtain economic parameters used in the model (such as fuel prices and values of time).

3.2 Model Suite

- 3.2.1 The HSTM was developed and is maintained by AECOM on behalf of Herefordshire Council and consists of the following interlinked components:
 - a highway assignment model (SATURN);
 - a public transport model (EMME);
 - a variable demand model (EMME); and
 - a trip end model (a CTripEnd variant).
- 3.2.2 For the purposes of forecasting, the trip-end model is based on the DfT's National Trip-End Model (NTEM); implemented in Microsoft Access and Visual Basic. The demand model and public transport model are implemented in Bentley's EMME transport modelling software, and the highway model is based in the SATURN traffic assignment package.
- 3.2.3 The trip-end models carry out specialised tasks that standard transport modelling software does not generally support, hence their construction externally. EMME does not support detailed congestion or quasi-dynamic traffic modelling, so SATURN is preferred for this purpose, but SATURN does not have EMME's matrix manipulation, public transport assignment, or general transport modelling capabilities.
- 3.2.4 Figure 3 shows the interaction of the model between the base model, forecast model and demand model elements of the HSTM.

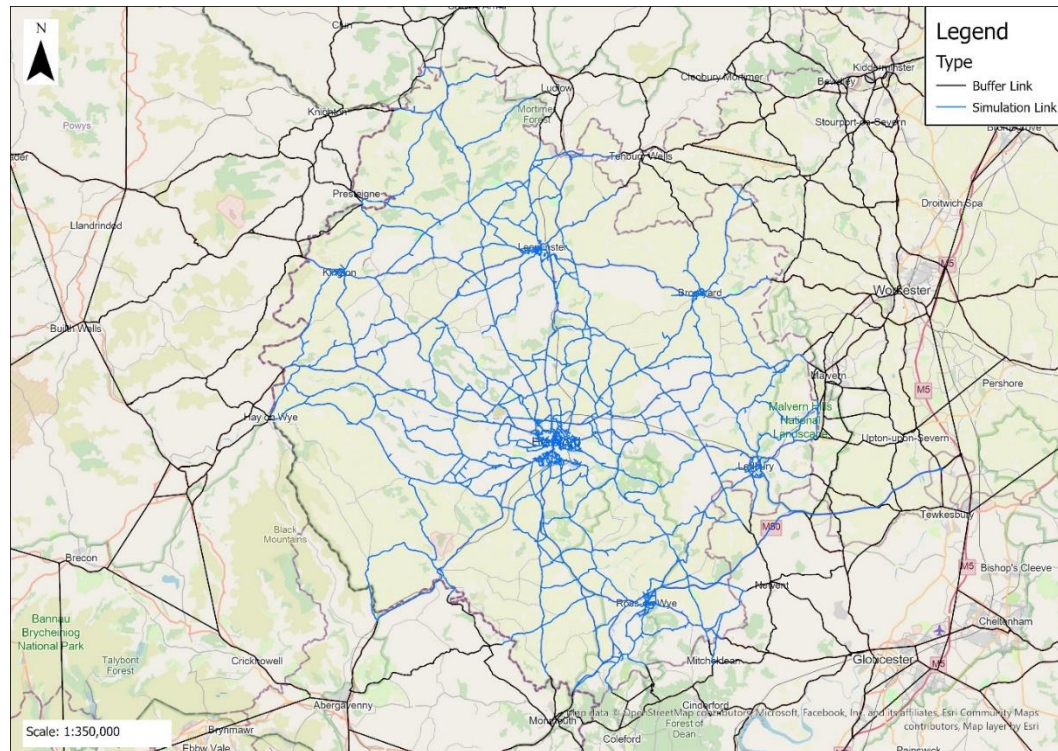
Figure 3: HSTM Model Suite Interactions

- 3.2.5 As previously highlighted, the model has been built in accordance with TAG and other relevant guidance including the Design Manual for Roads and Bridges (DMRB) where appropriate and developed as a key tool to secure wider-ranging infrastructure funding for Herefordshire.

3.3 Model Specification

Model Coverage and Highway Network Structure

- 3.3.1 The HSTM model covers the whole of mainland Great Britain with roads distant from Herefordshire represented in skeletal form. The highway network was developed from the Ordnance Survey (OS) OpenRoads dataset. This provides mapping of the road network in Great Britain and contains information on link lengths, road types/standards and provides network coordinates and link shaping to reflect the topology of the road network. Within Herefordshire, all roads of significance are modelled in detail; the coverage of the HSTM and the HSTM network is shown in Figure 4.

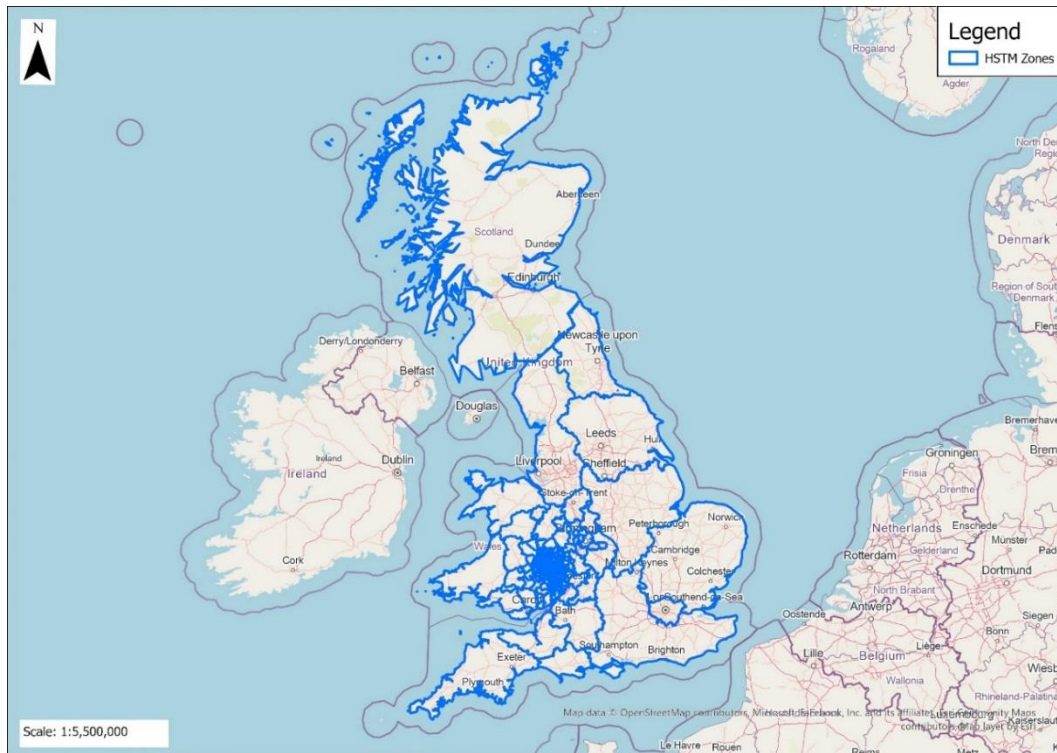
Figure 4: Existing HSTM simulation network coverage

- 3.3.2 Outside the simulation network shown in blue in Figure 4, within the highway assignment model is an area of buffer network coding (where junctions are not modelled in detail) with speed-flow curves. Within this area the modelled speeds will respond to the level of traffic.

Model Zone System

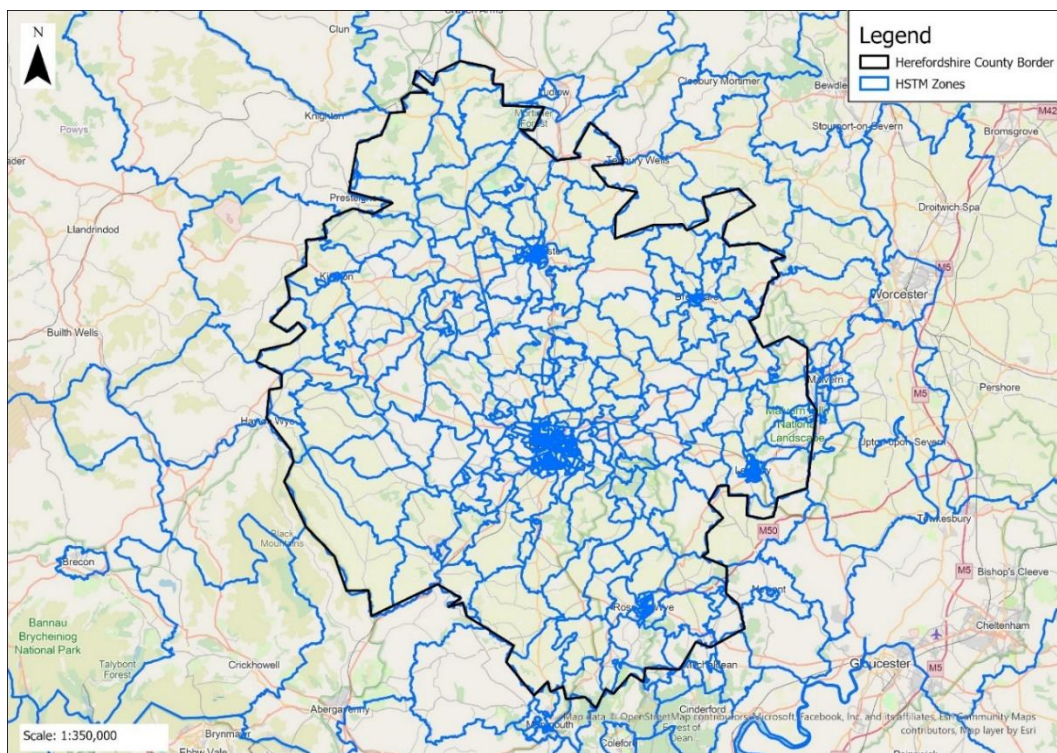
- 3.3.3 The HSTM zone system uses a newly defined zoning system covering the whole country with zone boundaries consistent with the 2011 Census Middle Super Output Areas (MSOAs) in which the mobile network data were supplied. Smaller subdivisions also follow Lower Super Output Area and Output area boundaries. To accommodate the housing developments that have occurred around the north of Hereford since 2011 in suitable zones, the smaller areas are taken from the 2021 Census geography.
- 3.3.4 Following the principle that zones should have distinct land-use, if possible, around 20 areas of largely employment or distinct land-use compared with the underlying zones were identified and put in separate 'employment' zones. Large areas of non-residential land-use such as Rotherwas and Hereford City Centre were subdivided giving 49 employment zones in total.
- 3.3.5 In total 577 zones were defined of which 475 are within Herefordshire, 86 with reasonable detail are within the MND area and parts of the West Midlands around Herefordshire and 16 are covering the rest of Great Britain.
- 3.3.6 Figure 5 and Figure 6 provide an overview of the zone system at different geographical levels.

Figure 5: HSTM Zone System (Overview)



Contains OpenStreetMap data © OpenStreetMap contributors 2026

Figure 6: HSTM Zone System (Herefordshire)



Contains OpenStreetMap data © OpenStreetMap contributors 2026

Matrix Segmentation and User Classes

- 3.3.7 The highway matrices for the HSTM are represented as production-attraction (PA) trips for home-based purposes and as origin-destination (OD) trips for non-home-based purposes, including freight.

3.3.8 The representation of PA trips for home-based trips has no direct relevance for the highway assignment model, which will assign OD vehicle matrices. The PA trips for home-based purposes are of importance for the demand model, with their use having the following key property:

- ensuring that the representation of home and non-home related land-use patterns are appropriately represented in the demand model, through the linkage of homes to trip productions rather than origins.

3.3.9 The demand matrices in the model represent the journey purposes shown in Table 1 with freight demand only derived for highway-based trips:

Table 1 - Highway journey purposes

Home / Non-Home Based	Purpose
Home-Based	Commuting
	Education
	Employers' Business
	Other
Non-Home-Based	Employers' Business
	Other
	Light Goods Vehicles
	Heavy Goods Vehicles

3.3.10 The demand model requires the most detailed segmentation of demand, with the highway and public transport assignment models reflecting an aggregation of this demand segmentation. For the highway assignment model, the travel demand is aggregated into the following five assignment user classes:

- User Class 1: HGVs;
- User Class 2: LGVs;
- User Class 3: Car Employers' Business;
- User Class 4: Car Other; and
- User Class 5: Car Commuting.

3.3.11 The HSTM contains the following calibrated time periods:

- Morning peak hour (AM): 07:00-09:00 (modelled as 08:00-09:00);
- Average interpeak hour (IP): 09:00-15:00 (modelled as an average hour);
- Evening peak hour (PM): 15:00-18:00 (modelled as 16:00-17:00); and
- Saturday peak hour: 11:00-12:00.

3.4 Calibration

3.4.1 A local model calibration and validation exercise has been undertaken for the HSTM using observed count information.

3.4.2 The calibration of the HSTM involved ensuring the model represents the on-site observed conditions by adjusting model inputs and parameters. The process involves examination of the network, checking for errors, and improving the performance of the model in terms of comparisons with observed data. Calibration statistics will be presented using the DfT's TAG criteria, reported in a Local Model Validation Report.

3.4.3 Calibration is undertaken for the four main components of the highway model:

- network;
- route choice;

- trip matrix; and
- assignment.

3.4.4 The tasks above are interlinked and hence need internal consistency to address the issues identified by the calibration process.

Network calibration

3.4.5 During the network building calibration process, the following activities are undertaken:

- review of the network coding warnings produced by the SATURN network building program SATNET;
- network distance and speed checks;
- review of junction approaches and saturation flows;
- detailed review of the coding of complex junctions; and
- exclusion of neighbouring turning counts from the validation spreadsheet.

Route choice calibration

3.4.6 At various stages of model development, the minimum cost routes for a range of selected OD pairs should be plotted and checked for plausibility. Modelled route choice depends on:

- zone size;
- network structure;
- centroid connectors;
- trip matrix accuracy;
- representation of speeds and delays; and
- junction coding accuracy.

3.4.7 Where routes are found to be implausible one or more of the above aspects have been adjusted.

Trip matrix calibration

3.4.8 As part of the trip matrix calibration, it is essential to validate the trip matrices by comparing assigned flows with traffic counts GEH statistic used to compare observed and assigned flow. The statistic uses the following formula to calculate a value for the difference between observed (ME – survey data) and modelled (MG – model SATURN flow) traffic flow:

$$GEH\ Statistic = \sqrt{\frac{(ME - MG)^2}{0.5(ME + MG)}}$$

3.4.9 The GEH statistic takes account of the fact that when traffic flows are low, the percentage difference between observed and modelled flow may be high but the significance of this difference is small and conversely, a small percentage difference on a large base might be important. The aim is to achieve at least 85% links and turns with a GEH less than 5 as specified in Unit M3.1 of TAG.

Assignment calibration

3.4.10 Unit M3.1 of the DfT's TAG also specifies the following flow validation criteria for links and turns:

- individual flows within 100 vehicles per hour for flows less than 700 vehicles per hour in more than 85% of cases;
- individual flows within 15% for flows between 700 – 2,700 vehicles per hour in more than 85% of cases; and

- individual flows within 400 vehicles per hour for flows greater than 2,700 vehicles per hour in more than 85% of cases.

3.4.11 The subsequent model outputs are assessed in compliance with the criteria outlined above.

3.4.12 TAG also contains guidance on the acceptability of journey time validation. For journey time validation, TAG recommends the following:

- modelled times along routes should be within 15% of surveyed times (or 1 minute, if higher than 15%) for at least 85% of routes.

3.4.13 The assignment model outputs are also assessed to check compliance with the journey time criteria outlined.

VDM Realism Tests

3.4.14 As noted in TAG Unit M2, once a variable demand model has been constructed, it is essential to check that it behaves 'realistically'. This is achieved by adjusting various components of travel costs and times and checking that the overall response of demand accords with general experience. The values of the parameters controlling the response of demand to costs should be adjusted until an acceptable response is achieved. This recognises the large and unavoidable uncertainties in some of the parameter values, and the importance of reflecting local conditions in relative values.

3.4.15 For the HSTM, these criteria apply principally to realism testing and consist of convergence between the highway assignment and the VDM and the elasticity range within which demand responses to changes in fuel costs and public transport costs lie. These are set out in TAG Unit M2.

Section 4 Forecasting

4.1 Introduction

- 4.1.1 As is standard practice and recommended by TAG, all assumed demand and supply side changes will be recorded in an Uncertainty Log.

4.2 Forecasting Assumptions

- 4.2.1 Using the latest information on the likely construction programme, the scheme project programme has been reviewed and the opening year is assumed to be 2028. Based upon this revised opening year, forecast models will be developed for the following years:
- 2028 – opening year;
 - 2043 – interim design year; and
 - 2061 – final horizon forecast year.
- 4.2.2 The traffic forecast for each forecast year will be consistent and constrained to NTEM growth projections but informed by the development information contained in the Uncertainty Log.
- 4.2.3 The update to the forecast models will include the following:
- incorporation of the latest TAG data book values (v2.03), that became live in late May 2026;
 - updates to forecast dwellings and jobs within the study area based on data assembled from Herefordshire Council (HC) in the modelled area and confirmed with planning officers from the Council; and
 - review of the certainty associated with potential transport infrastructure schemes their subsequent inclusion within the HSTM forecasts, confirmed with HC planning officers.

Forecast Networks

- 4.2.4 The Do Minimum highway networks will include transport schemes on the basis of their level of certainty. The description of the certainty levels is contained in Table A2 in the appendices to TAG Unit M4.
- 4.2.5 The Do Something networks will reflect the latest design of the Scheme.

Forecasting Parameters

- 4.2.6 For the forecasts, a range of parameters are used to forecast demand changes and responses, including Values of Time (VoT) and Vehicle Operating Costs (VOC).
- 4.2.7 These values will be sourced from the TAG data book v2.03, that went live at the end of May 2026.

Sensitivity Testing and Uncertainty

- 4.2.8 The forecasting will be carried out for a Core Scenario with the updates to the Core Scenario as described above. To capture the uncertainty associated with any traffic forecasts, two Common Analytical Scenarios (CAS) will be run.
- 4.2.9 These CAS have been released by DfT to help inform uncertainty in traffic forecasts covered by guidance from the DfT contained in the TAG Uncertainty Toolkit⁴.
- 4.2.10 There are seven CAS in total, with associated data and trip ends for each scenario published by the DfT. It would be disproportionate to model all seven scenarios, but the most relevant CAS will be tested, these being the High Economic Growth and Low Economic Growth scenarios.

Forecast Outputs

- 4.2.11 Traffic flow and journey time data from the models will be used to inform the economic appraisal and any environmental assessments undertaken.

⁴ <https://www.gov.uk/government/publications/tag-uncertainty-toolkit>

- 4.2.12 For the economic appraisal, forecasts of traffic volumes and generalised cost changes between the Do Minimum and Do Something will be used to assess the economic benefits of the Scheme. They will also inform the accident assessment and wider impacts of the Scheme. Details of these are available in the next section of this report.
- 4.2.13 Traffic forecasts will also be available for the environmental teams for developing any required air quality or noise models to enable the appraisal of environmental impacts. For each modelled year and scenario, the following data will be available:
- average link flow and speed data by time period and for:
 - 24-hour annual average daily traffic (AADT) data for air quality modelling;
 - 18-hour annual average weekday traffic (AAWT) data for noise modelling; and
 - percentage mix of HGV traffic (all vehicles greater than 3.5 tonnes).

Section 5 Economic Assessment

5.1 Introduction

- 5.1.1 Economic assessment involves the determination of the costs and benefits of a scheme using travel demand, traffic flows, journey times and other outputs from the transport model.
- 5.1.2 By comparing the costs with the benefits of a scheme over a 60-year assessment period, a Benefit Cost Ratio (BCR) can be calculated, which is a critical element in the assessment of the Value for Money (VfM) of a scheme. In-line with HM Treasury's appraisal requirements, non-monetised impacts of the scheme should also be considered as part of the VfM assessment.
- 5.1.3 This chapter provides a general description of the economic appraisal approach proposed for the Scheme.
- 5.1.4 The economic appraisal will be undertaken in accordance with DfT's TAG Units:
 - TAG Unit A1.1 'Cost-benefit analysis';
 - TAG Unit A1-2 'Scheme costs';
 - TAG Unit A1-3 'User and provider impacts'; and
 - DfT Value for Money Framework.
- 5.1.5 The HSTM will be used to generate the inputs into the economic appraisal, summarised in the Transport Economic Efficiency (TEE) table. The use of the HSTM will determine the trips and cost matrices by user class which will be used in the Transport User Benefit Appraisal (TUBA) software.

5.2 Scheme Costs

Base Costs

- 5.2.1 A design and build contractor for the Phase One scheme has been procured and as part of their commission, have provided a base cost profile including project development, construction, and support resource costs. The cost profile will be set out in 2026 prices and will make up the base cost estimate used within the economic assessment.
- 5.2.2 A real cost adjustment will be applied to the base costs to account for the difference between general inflation and construction inflation forecasts over the appraisal period, as costs are expected to be incurred including and up to financial year 2027/2028.
- 5.2.3 Costs will be converted into the DfT's standard price base of 2023. The cost estimates meet the following criteria, and have been checked against them:
 - include costs based on the latest scheme design;
 - exclude any costs already incurred (sunk costs);
 - exclude both recoverable and non-recoverable VAT;
 - exclude any costs that are present in both the Do-Minimum and the Do-Something scenarios;
 - includes any costs to be incurred by Central Government, and local government provided separately; and
 - includes the amount of and phasing of any developer contributions.

Optimism Bias

- 5.2.4 DfT TAG Unit A1-2 outlines the requirement for the scheme costs to be adjusted for risk and uncertainty. This will take the form of a contingency uplift derived from quantitative risk assessment (QRA) or an optimism bias adjustment. The recommended optimism bias uplift for a road scheme at FBC stage is 20%, however, the contributory factors of the optimism bias may be reconciled in line with Green Book Supplementary Guidance for Optimism Bias. It is common for the optimism bias and QRA to be different as percentages of the base cost estimate, either due to unknown unknowns (in the case that OB > QRA), or due to inherent risks of the scheme (in the case that QRA > OB).

- 5.2.5** TAG Unit A1-2 recommends the larger of the QRA and OB uplifts (as percentages of the base cost estimate) is applied.

Discounting

- 5.2.6** To present scheme costs in present values, scheme costs will be discounted back to 2023. A discount rate of 3.5% will be applied for the first 30 years from the appraisal year, with a 3% discount rate applied thereafter.

Market price adjustment

- 5.2.7** Costs will be converted from factor costs to market prices using the indirect tax correction factor contained within the most recent TAG data book v2.03 (May 2026).

5.3 Scheme Impacts/ Benefits

- 5.3.1** There are several different components that form the overall scheme benefits. Following DfT TAG contained in Unit A2.1, Section 3.2, these components are categorised into 'levels' of benefit, dependent on the level of confidence in the appraisal method:
- Level 1: these are benefits where the analysis is the most robust and where there is a high-level of confidence and form the initial assessment of VfM, and are included in the initial BCR;
 - Level 2: these represent benefits where the analysis is robust, but where the appraisal methods may be considered as 'evolving' and, as such, less certainty may be placed on the monetised impacts from the Scheme. The benefits deriving from these impacts are added to the initial assessment to generate an adjusted BCR; and
 - Level 3: these comprise both indicative monetised and non-monetised impacts. These are considered in the VfM assessment as to whether they may materially alter the overall VfM from that based upon the adjusted BCR and may form part of an overall BCR which includes these indicative and non-monetised impacts.
- 5.3.2** In determining what impacts fall under each of the different levels, guidance given in TAG A2.1 and the DfT's 'Value for Money framework' will be followed and used for the overall VfM assessment.
- 5.3.3** We will also supplement the appraisal with the production of an Economic Narrative within the FBC to articulate and justify the scope of the analysis.
- 5.3.4** Table 2 shows the impacts which are currently being considered for appraisal.

Table 2 – Scheme Impact Assessment Approach

Level 1 impacts	Level 2 impacts	Level 3 and indicative impacts	Non-monetised impacts
Quantitative and qualitative: • Construction impacts • Journey time savings • Vehicle operating costs • Indirect taxation • Accidents • Greenhouse gasses • Noise • Air quality	Quantitative and qualitative • Reliability • Static wider economic impacts	Quantitative and qualitative • None	Security Severance Accessibility Townscape Historic environment Landscape Biodiversity Water environment Affordability Access to services
Qualitative only: • Physical activity • Journey quality		Qualitative only: • Other dynamic wider economic benefits	

- 5.3.5 No development is identified as being dependant on the scheme, therefore the land value uplift associated with enabling new homes and employment growth is not included within the assessment.

5.4 Transport Economic Efficiency (TEE) – TUBA

- 5.4.1 TUBA is the industry-standard software used to derive the TEE of a scheme. It considers both business and consumer traveller impacts and the private sector provider revenues and cost elements as required by TAG.
- 5.4.2 TUBA takes trip, time and distance matrices for each forecast future year, vehicle type, journey purpose (i.e. each user class) by time period from the traffic forecast model to calculate travel time saving benefits. It does this by comparing the travel times in the Without Scheme scenario with those in the With Scheme scenario. It then applies monetary values or VoT to derive the monetary benefits of those time savings extrapolated over a standard 60-year appraisal period.
- 5.4.3 TUBA also calculates VOC changes which occur over the standard 60-year appraisal period accounting for changes in fuel, maintenance and wear and tear. These changes occur due to changes in speed and distance that result from the implementation of the scheme. Changes in VOCs due to the scheme affect the level of indirect taxation received and this is also calculated over the appraisal period.
- 5.4.4 The travel time and VOC benefits are then discounted to 2023, the DfT's standard base year for appraisal, and converted to 2023 market prices.
- 5.4.5 Table 3 provides a summary of the key assumptions to be adopted as part of the TUBA assessment.
- 5.4.6 Modelled time periods are expanded in TUBA to represent a full year of data, and this will be undertaken using annualisation factors which have been calculated using traffic count data, to derive appropriate expansion factors. As the HSTM models AM Peak, interpeak and PM Peak only, benefits for the other times (such as the weekend) will be estimated using the interpeak time period.
- 5.4.7 In accordance with best practice, the results of the TUBA assessments will be checked at several levels, including:

- sector to sector benefits;
- analysis of benefits by time period and journey purpose;
- benefits profile over 60-year period;
- analysis of benefits by size of time-saving / distance; and
- TUBA warnings will be closely checked to ensure that the results are logical and the input data were loaded correctly.

Table 3 - TEE TUBA assumptions

Item	Assumptions / Notes
Software	TUBA Version 1.10.01 released May 2025
Current year	2026 (defines the first year in which the discount rate is applied)
Scheme opening and first appraisal year	2028
Final appraisal year	2087
Appraisal period / Horizon year	60 years after scheme opening, in-line with TAG requirements
Forecast year trip, time and distance matrices from traffic model	The forecast years to be used in the option appraisal are to be confirmed but the recommendation is: • 2028 – assumed opening year • 2043 – interim design year • 2061 – final horizon forecast year
User classes	Trip, time and distance matrices for the following user classes will be input into TUBA: • Cars used for Employers' Business; • Cars used for Commuting; • Cars used for Other purposes; • Light Goods Vehicles (LGVs); and • HGVs
Economic Parameters	TUBA Economic Files v2.03, released November 2025

- 5.4.8 The results from TUBA will provide input into the following tables: Transport Economic Efficiency (TEE), Public Accounts (PA), Analysis of Monetised Cost and Benefits (AMCB) and Appraisal Summary Table (AST). The AMCB table provides a Benefit to Cost Ratio (BCR) for the scheme when all present value benefits (PVB) are compared with present value costs (PVC). The tables will be considered in relation to the results from each of the scenarios included in the appraisal.

5.5 Accident Benefit Analysis

- 5.5.1 In-line with TAG, DfT CoBA-LT software will be used to derive the accident benefits of the scheme. CoBA-LT compares the predicted numbers of accidents with and without the scheme and converts that change into monetary values by multiplying the numbers of accidents by their monetised costs. The benefits for each year are discounted to 2023 and summed over the 60-year assessment period. CoBA-LT uses nodes and links to represent the Base, Do Minimum (without scheme) and Do Something (with scheme) highway networks.
- 5.5.2 The CoBA-LT network for the scheme will cover all roads and junctions where the model predicts a significant change in flow between Do Minimum and Do Something scenarios (taken to be a change in flow of 10% or more).

- 5.5.3 CoBA-LT v2.10.01 (April 2026) software will be used for the assessment. Accident benefits will be calculated by type (slight, serious or fatal) by CoBA-LT, using the standard national average accident rates as set out in the TAG data book v2.02 (a v2.03 is not available at the time of writing). CoBA-LT will also use the latest set of forecasts used for the FBC. We assume that the accident analysis will only be conducted for the Core scenario only.

5.6 Delays during construction and maintenance

- 5.6.1 The assessment of delays resulting from the construction of the scheme will be dealt with using a spreadsheet model, underpinned by the May 2026 TAG data book.

5.7 Environmental Assessment

- 5.7.1 The impact of the scheme on the environment is sub-divided into a range of environmental impacts, as recommended by TAG. For the FBC, the assessment will examine the following impacts:

Air quality and greenhouse gases

- 5.7.2 At this stage, the assessment of air quality resulting from the construction of the scheme will be dealt with quantitatively, as indicated in Table 2, supported by the use of Defra's Emission Factor Toolkit and the TAG worksheets.
- 5.7.3 Carbon will be assessed quantitatively using the DfT's VECAT tool. This assessment will only be carried out on the Core Scenario.

Noise

- 5.7.4 At this stage, the assessment of noise resulting from the construction of the scheme will be dealt with quantitatively, as indicated in Table 2 supported by TAG worksheets.

Landscape, townscape, historic environment, biodiversity and water environment

- 5.7.5 The assessment of Landscape, townscape, historic environment, biodiversity and water environment resulting from the construction of the scheme will be dealt with qualitatively, as indicated in Table 2.

5.8 Journey Time Reliability

- 5.8.1 Reliability is defined in TAG as the variation in journey time that transport users are unable to predict. It is expected that the Scheme will provide some journey time reliability benefits through alleviating congestion and a reduction in incidents on the A465.
- 5.8.2 The impact of the scheme on the journey time reliability will be assessed in-line with the relevant guidance from TAG Unit A1.3.
- 5.8.3 TAG Unit A1.3 recommends using an urban variability approach, which is a forecast of the coefficient of variation of journey time from distance and congestion for flows in the urban area.
- 5.8.4 The urban variability approach is suitable for areas with readily available alternative urban routes and it is most suited for the study area. It is proposed to use the urban variability model approach for quantified assessment developed by Hyder et al method (described in TAG Unit A1.3).
- 5.8.5 As recommended in the guidance, the reliability benefits will not be included in the AMCB table and thus will not be included in estimates of the initial Net Present Value (NPV) and BCR for the Scheme. However, the assessment will be included in the Appraisal Summary Table (AST) and be considered in the adjusted BCR and assessment of the overall VfM of the Scheme.

5.9 Distributional Impacts

- 5.9.1 The assessment of distributional impacts resulting from the construction of the scheme will be assessed in accordance with TAG Unit A4-2.

5.10 Wider Economic Impact Assessment

- 5.10.1 The improved connectivity and accessibility provided by the Scheme, particularly to the Hereford Enterprise Zone (HEZ) will be likely to have a productivity impact in the local area and region, despite the area containing relatively low levels of professional and managerial employment in comparison to other areas in England.
- 5.10.2 These productivity impacts are likely to be experienced as TAG Level 2 impacts. These are impacts where there are productivity improvements though land-use in the study area remains static. The productivity impacts are likely to be experienced through the following mechanisms:
- static clustering impacts (agglomeration impacts) – assuming land-use does not change (i.e. land-use is fixed);
 - output change in imperfectly competitive markets – application of an uplift to business user benefits; and
 - labour supply impacts – comprising employment impacts and related GDP and taxation impacts.
- 5.10.3 The appraisal will be undertaken in alignment with TAG Units A2.1 - 2.4 and M5.3. This additional benefit would be added into the calculations for an adjusted BCR also including journey time reliability benefits. WITA software will be used to undertake the assessment.
- 5.10.4 The approach to wider impacts will cover the following areas:
- Calculation of agglomeration. The approach to calculating this is set out in TAG Unit A2.1 paragraphs 4.1.1 to 4.1.7.
 - Calculation of the effect of output change in imperfectly competitive markets. This requires the Transport Economic Efficiency (TEE) analysis using the approach set out in TAG Unit A2.1 paragraphs 4.1.8 to 4.1.10.
 - Calculation of the tax revenue from labour market impacts. This requires calculating the labour supply impact and the move to more productive jobs impact using the approach set out in TAG Unit A2.1 paragraphs 4.1.8 to 4.1.25.
- 5.10.5 The wider economic benefits from the elements above will be captured over a 60-year appraisal period, consistent with the approach adopted for the assessment of other benefits.

