Chapter 5 – Economic Dimension

A38 Bromsgrove Route Enhancement Programme

March 2023

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5. Economic Dimension

5.1 Purpose

This chapter sets out the Economic Dimension for investment in the A38 BREP Phase 3. It summarises the appraisal, identifying the economic impacts and resultant value for money in line with the principles set out in TAG. The scheme has been presented in a Do Something scenario and compared against a Do Minimum scenario which assumes no scheme is implemented. The details of the scheme included in the Do Something scenario are provided as part of the Strategic Dimension (Chapter 3). In addition, the Traffic Modelling Chapter (Chapter 4) and its appendices document the modelling approach and results.

The Economic Dimension provides information on the:

- Longlist Appraisal.
- Methodologies, Assumptions, and Data.
- Social-Cost Benefit Analysis of Short List.
- Uncertainty Analysis.
- Distributional Analysis.
- Place-Based Analysis.
- Wider Analysis.
- Appraisal Summary Table.
- Value for Money.
- Key Findings and Recommendations.

The Economic Dimension is supported by the Traffic Modelling Chapter (Chapter 4), the Environmental Report (Appendix S.3).

5.2 Background

The A38 in Bromsgrove is an important corridor on the Major Road Network (MRN). It acts as a key strategic link, providing access to the Strategic Road Network (SRN), as well as offering an important local function as an eastern bypass to Bromsgrove town centre and providing access to housing, services and employment frontages.

Worcestershire County Council (WCC) is delivering a major upgrade of the A38 corridor between M5 Junction 4 to the north and the junction of A38 with B4094 Worcester Road to the south, which is approximately 7.5 miles (12 km) long. This Full Business Case (FBC) seeks funding to deliver Phase 3 of the major upgrade of the A38 corridor between M42 Junction 1 to the north and the junction of A38 with B4094 Worcester Road to the south, which is approximately 3.8 miles (6.1 km) long. This corridor forms part of the strategic north south spine through Worcestershire, connecting Worcester, Droitwich, Bromsgrove to Birmingham to the North and Gloucester and Bristol to the south as an alternative to the M5 route. The study area is shown in Figure 5.1.

The A38 corridor is a multi-functional route serving a range of users which contributes to the problems and issues. The key characteristics are:

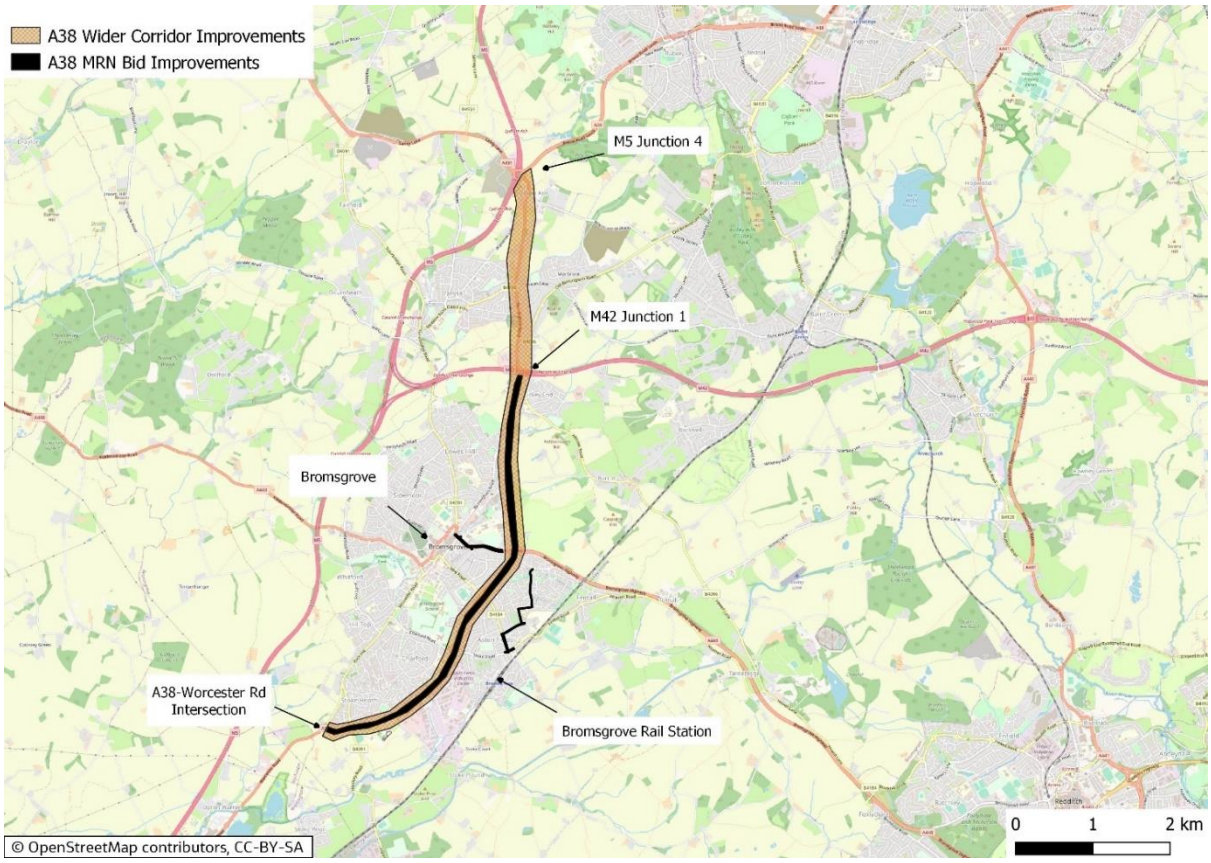
- The route performs a range of different functions, including as a link to the SRN, a corridor to bypass Bromsgrove town centre, a distributor road for journeys that have

an origin and/or destination in Bromsgrove and a local access route for residents and businesses that have direct frontages on to the corridor.

- The corridor comprises sections with differing speed limits, levels of frontage and access points in addition to varying levels of pedestrian and cyclist provision. In addition, the driving experience along the route varies due to the differing land uses along sections of the A38 from residential, open field to employment and retail.
- The two features of the A38 corridor outlined above, combined with high levels of car dependency across Bromsgrove, result in substantial congestion.

The A38 BREP comprises a package of schemes delivering targeted improvements to junctions and significant enhancement of facilities for active modes.

Figure 5.1: Scheme location



This situation is projected to worsen in the future as new housing and employment planned for the local area are delivered. The planned growth in housing will increase the demand for travel. The following points summarise the planned developments in the area:

- The Bromsgrove District Plan (adopted in 2017) includes major residential development sites around the edge of Bromsgrove, with Perryfields Road and Whitford Road being particularly relevant to the A38. Smaller residential allocations are also found in surrounding areas. In total the Local Plan identifies a need for 7,000 dwellings and 28 Hectares of employment land in the period 2011-2030. However, the adopted Local Plan only allocated land for 4,700 dwellings to 2023, noting that allocating land for the remaining 2,300 homes would be subject to a Green Belt review as part of a Local Plan Review. Subject to the ongoing Local Plan review, the scheme may further support delivery of additional homes and employment land.

- The Local Plan Review will also identify development allocations for growth beyond 2030 and in its Issues and Options consultation put forward various scenarios. The consultation documents published in September 2019 proposed that the new Plan will have a likely start date of 2023 and an end date of 2040. Over this period the Plan will be required to provide for at least 6,443 dwellings and up to 90 Hectares of employment land.
- Within close proximity of the A38 corridor area there are significant cross-boundary allocations within the adopted Local Plan for Redditch. This includes an additional 3,400 dwellings (and 5.5 hectares of employment land) on the border with Redditch but located within Bromsgrove District, to meet Redditch's housing need, as identified in their own Local Plan. The allocation at Foxlydiate is particularly relevant to the A38.
- In addition, there are further allocations within the Redditch Local Plan (and sited within Redditch itself). Around 3,000 dwellings and 27.5 hectares of employment land are to be accommodated within Redditch Borough.

Table 3.34 of the Strategic Dimension shows key development sites in the vicinity of the A38 identified within the adopted Local Plans. The quantum of proposed development (housing and employment) within the adopted Local Plans requires enhancements to transport infrastructure, including the A38. Whilst no individual development site currently has planning conditions that restrict development in advance of delivery of the A38 schemes, there are planning linkages between the A38 BREP and the delivery of allocations identified in adopted Local Plans, and this is reflected in the requirement for S106 contributions to the BREP scheme. The A38 in its current form is a key constraint to additional future development allocations through the Local Plan review process. Therefore, in summary, the A38 BREP supports the delivery of 5310 homes and 13.45 Hectares of employment land based on the current plan. Subject to the ongoing Local Plan review, the scheme may further support delivery of additional homes.

To effectively support the future development of Bromsgrove and to deliver economic growth, significant improvements are required to the corridor itself, supported by targeted improvements for other modes.

The scheme for which funding is sought through this MRN bid is an important part of the overall approach to transport in Bromsgrove. It will support ongoing work that is aiming to enhance both the major and local road network, as well as encouraging walking, cycling and the use of public transport.

5.3 Introduction

The wider A38 BREP corridor enhancement is being delivered in four phases, these phases are presented in Figure 5.2 and described below:

- Phase 1 (funded by Worcestershire Local Enterprise Partnership (WLEP), Greater Birmingham and Solihull Local Enterprise Partnership (GBSLEP) and National Highways' Growth and Housing Fund (GHF)), provided for capacity upgrades at M5 Junction 4, M42 Junction 1 (completed in 2020/21) and the Barley Mow Lane junction with the A38 (completed in 2019). The works are included in the Do Minimum scenario for the A38 BREP Phase 3, as these have now been completed on site.
- Phase 2 comprised of the early delivery elements (also referred to as Schemes 2a, 2b and 4) of the BREP package presented at both the Strategic Outline Case (SOC) and Outline Business Case (OBC) stages. The early delivery schemes have been delivered early using WLEP local contribution funding to take advantage of the local

funding availability. These works are an important part of the overall BREP scheme, contributing to the improvement of active mode facilities on the corridor.

- Scheme 2a: An active travel corridor on the A38 between Charford Road and Harvington Road that includes a 3m wide cycleway and 2m wide segregated pedestrian / cycle facility provision of connection to Harvington Road.
- Scheme 2b: An active travel corridor providing connection between the A38 and Scheme 2A to South Bromsgrove High School, it includes the provision of a 3m wide shared cycle path and footpath.
- Scheme 4 is a signal toucan crossing of A448 to east of Fordhouse Road, to provide connectivity between Blackwood Road (Heart of Worcestershire College) and Regents Park Road and Fordhouse Road, and tie into Scheme E, Scheme 3 and Scheme 9.

- Phase 2 schemes have been developed as part of the overall strategic active mode upgrade as part of the A38 BREP package. The FBC will continue adopting the same approach presented in the OBC submission in relation to these schemes: they form part of Phase 3 Do Minimum scenario, and their economic and financial impacts are reported as a sensitivity test in the Economic Dimension. It should be noted that the Phase 2 package offered a High Value for Money to taxpayers.
- Phase 3 includes three active mode, two local public transport and six hybrid highway capacity and active travel improvement schemes which were included in the OBC submission:

  - Three active mode improvement schemes, namely Schemes 3, 6 and 9.
  - Two local public transport improvement schemes which have not changed compared to the OBC stage. Local public transport improvements, notated as Scheme 7 (provision of upgrades to 9 bus stops including provision of physical infrastructure/shelters and wind turbines/solar panels powered Real Time Information (RTI) screens. Scheme 8 which includes the provision of select vehicle detection at New Road and Charford Road junctions to support buses in crossing the A38 corridor, on the primary routes between the Town Centre and Bromsgrove Rail Station (Scheme 8 will be delivered at the same time as Schemes C and D).
  - Six hybrid schemes containing highways capacity and active travel improvements which were included in the OBC submission. These are Schemes: C to F and parts of Schemes A and B (only limited elements of the latter two schemes have been moved to Phase 4).
- Phase 4 includes schemes that were originally included in the OBC stage but have now been moved to Phase 4. This was due to higher inflation experienced in 2022, resulting in increased scheme costs. Phase 4 includes the following schemes:

  - Three highways improvement schemes: Scheme G and the complementary remaining parts of Schemes A and B that have been removed from OBC stage.
  - Two active mode improvement schemes, namely Schemes 1 and 5.
- Phase 4 schemes (See Figure 5.2) have been removed from all aspects of this bid and will be progressed once alternative funding sources are secured hence will be subject to a separate business case.

Figure 5.2 presents the phasing of the A38 corridor improvements, while Figure 5.3 provides an overview of the highway, active mode and public transport elements of the A38 scheme,

and Figure 5.4 presents the locations of the new Shelters and RTI interventions included in Scheme 7.

Figure 5.2: A38 corridor improvement phasing

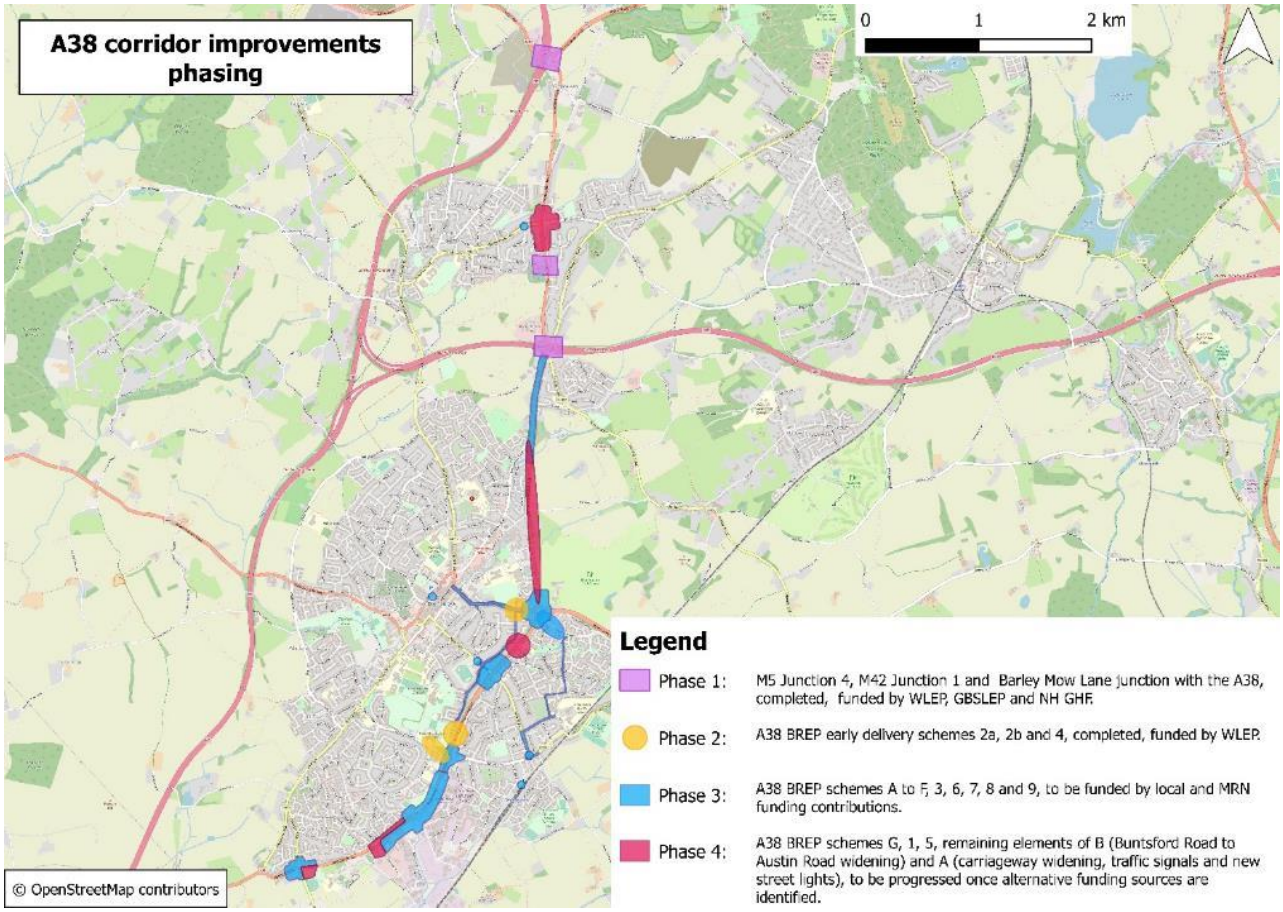
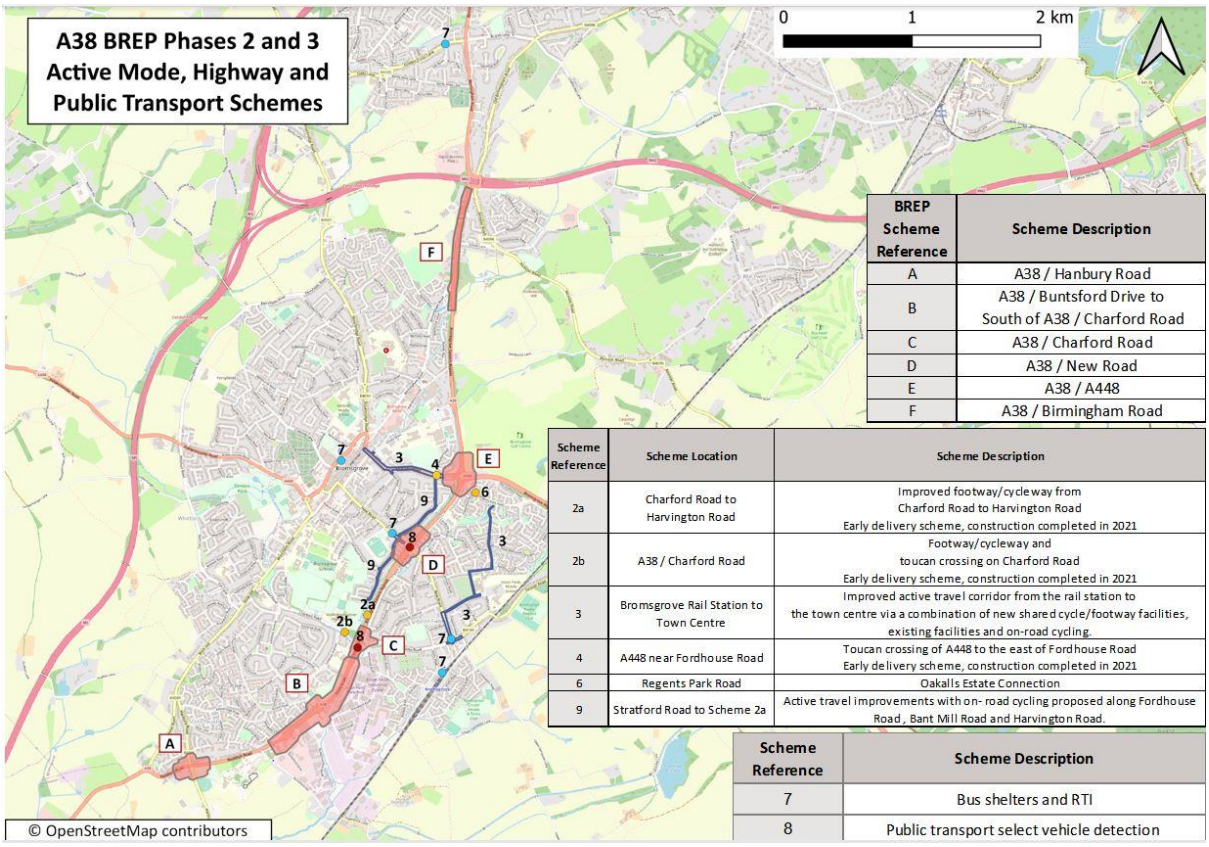


Figure 5.3: Highway, sustainable transport and public transport schemes included in the FBC stage – (Phases 2 and 3)

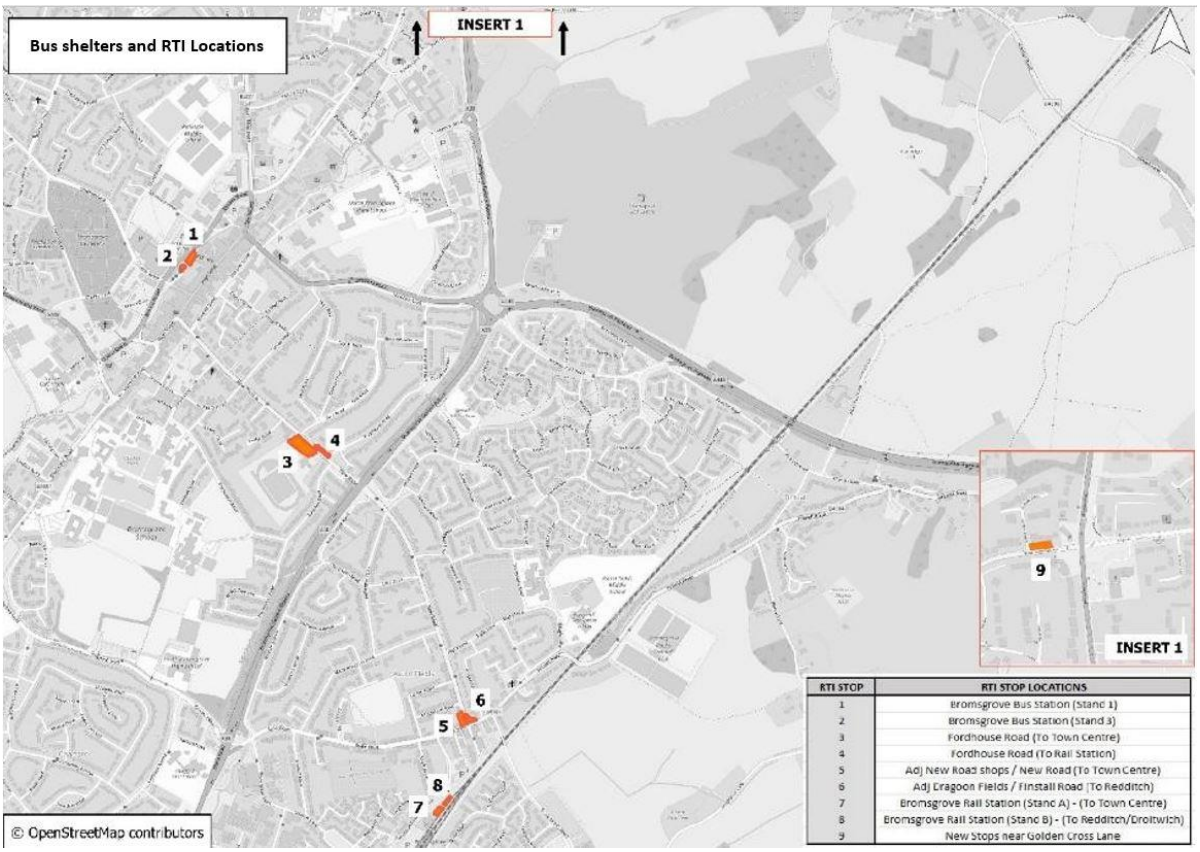


BREP Scheme Reference	Scheme Description
A	A38 / Hanbury Road
B	A38 / Buntsford Drive to South of A38 / Charford Road
C	A38 / Charford Road
D	A38 / New Road
E	A38 / A448
F	A38 / Birmingham Road

Scheme Reference	Scheme Location	Scheme Description
2a	Charford Road to Harvington Road	Improved footway/cycleway from Charford Road to Harvington Road Early delivery scheme, construction completed in 2021
2b	A38 / Charford Road	Footway/cycleway and toucan crossing on Charford Road Early delivery scheme, construction completed in 2021
3	Bromsgrove Rail Station to Town Centre	Improved active travel corridor from the rail station to the town centre via a combination of new shared cycle/footway facilities, existing facilities and on-road cycling.
4	A448 near Fordhouse Road	Toucan crossing of A448 to the east of Fordhouse Road Early delivery scheme, construction completed in 2021
6	Regents Park Road	Oakalls Estate Connection
9	Stratford Road to Scheme 2a	Active travel improvements with on- road cycling proposed along Fordhouse Road , Bant Mill Road and Harvington Road.

Scheme Reference	Scheme Description
7	Bus shelters and RTI
8	Public transport select vehicle detection

Figure 5.4: Scheme 7/ Shelters and RTI stop locations



RTI STOP	RTI STOP LOCATIONS
1	Bromsgrove Bus Station (Stand 1)
2	Bromsgrove Bus Station (Stand 3)
3	Fordhouse Road (To Town Centre)
4	Fordhouse Road (To Rail Station)
5	Adj New Road shops / New Road (To Town Centre)
6	Adj Dragoon Fields / Finstall Road (To Redditch)
7	Bromsgrove Rail Station (Stanc A) - (To Town Centre)
8	Bromsgrove Rail Station (Stanc B) - (To Redditch/Droitwich)
9	New Stops near Golden Cross Lane

5.4 Longlist/Shortlist Appraisal

The A38 BREP scheme has a long history of options generation, development, and assessment. The following paragraphs provide a brief summary.

5.4.1 Longlist/Shortlist Appraisal During the SOC and OBC Stages

As part of the development of the SOC (submitted in Summer 2019), a high-level Options Assessment Report (OAR) was prepared. It described the work undertaken to appraise, develop and sift the package of measures for which funding is sought. The OAR highlights the issues and challenges on the corridor and identifies deliverable schemes to address these. In doing so it builds on the scheme development work initially undertaken to support the 2016 WLEP OBC and the 2019 DfT SOC.

This document has been later updated to accompany the OBC submission (late 2022) as Appendix S.1. It reflects the progression of the modelling, assessment, appraisal and development of the design at that time. In particular, all traffic modelling data had been updated, reflecting the development of a Production – Attraction (PA) based model. The economic appraisal was also enhanced compared to that presented at the SOC stage. As part of this update, the following was undertaken in preparation of the OBC:

- Updating of the traffic model to take account of the DfT comments on the model form. The 2017 Base year model utilised an Origin – Destination method for determining the 2025 and 2040 forecast year travel patterns. For the OBC submission, the model was converted to a Production – Attraction (PA) model.
- Updating of the active mode provisions to take account of public engagement feedback, LTN 1/20 standards, and best practice up to 2021. The active mode schemes also delivered enhanced linkages to residential areas to support the strategic case in linking the town centre and residential areas to Bromsgrove Rail Station.
- Review of the highway schemes prepared for SOC stage, taking into account public engagement responses, updated Design Manual for Roads and Bridges (DMRB) standards, LTN 1/20 standards, and the latest modelling information for the 2040 design year.

The DfT Early Assessment and Sifting Tool (EAST) has been used at an early stage in the development of scheme interventions for this business case. High-level information in respect of problems, impacts and constraints is drawn from the evidence developed for the corridor.

A review of the available evidence was undertaken including a review of a potential western bypass alignment via the EAST assessment method as part of an evaluation for the purpose of this business case, and in line with the A38 BREP objectives and wider policies.

At a strategic level there were seven clear longlisted options for improving the A38 corridor, based upon information considered from a review of policy, and evaluation of the A38 corridor. These strategic options are:

- Active Mode Improvements to A38 corridor.
- Small scale public transport infrastructure improvements (Such as RTI, signal control improvements).
- New public transport network (full network upgrade).
- Upgrade the existing A38 junctions at grade.
- Upgrade the existing A38 junctions with grade separated junctions.
- Upgrade A38 to dual carriageway.

- Build new highway alignment on west side of Bromsgrove (Western Bypass).

The EAST assessment concluded that a combination of the following strategic shortlisted options is expected to be the best in easing the A38 corridor identified problems for minimal impacts on the environment and communities:

- Active Mode Improvements to A38 corridor and the wider area.
- Small scale public transport infrastructure improvements (Such as RTI, signal control improvements).
- Upgrade the existing A38 junctions at grade.

As part of the corridor review all sections of the A38 between M5 Junction 4 to the B4084 Worcester Road junction have been considered on a link and junction basis for a combination of highway capacity and active modes options. The corridor has been assessed for Active Mode improvements based upon gaps in the network, and in creating a fuller network within Bromsgrove to enhance the recently developed NPIF funded schemes. Hence, a large number of location specific highway and active mode options were generated and assessed as part of the shortlist assessment. This assessment is documented in Appendix S.1 that includes the OBC stage OAR which describes in detail the work undertaken to generate, appraise, develop and sift potential options. Also, Section 3.4.5 of the Strategic Dimension provides a comprehensive summary of the scheme options development and assessment.

5.4.2 Further Appraisal After the OBC Submission

An Addendum to the OAR is appended to this FBC submission as an update to the OBC stage OAR (Appendix S. 7), which presents additional optioneering work that took place after the OBC submission.

Building on the OBC stage OAR, Section 3.4.5.4 of the Strategic Dimension provides an overview of additional optioneering and phasing work to the scheme components carried out after the OBC submission. This includes the following:

- Replacement of the OBC stage walking/cycling bridge (Scheme 3) from Harvington Road to Old Station Road with the new Scheme 3 active travel corridor enhancements: In order to ensure compliance with LTN 1/20 standards, the bridge design included large access ramps compared to what was initially envisaged, resulting in wider environmental and local concerns, in addition to impacts on the value for money.
- Introduction of a new active mode corridor improvement Scheme 9: An LTN 1/20 compliance assessment was undertaken following the OBC submission which highlighted the need for traffic calming measures along the corridor which were not previously envisaged.
- Changes due to phasing of the Scheme: Due to higher inflation experienced in 2022, resulting in increased scheme costs, OBC schemes (in addition to the new Schemes 3 and 9) have been separated into Phase 3 and Phase 4 where Phase 3 schemes form the basis of this FBC, while Phase for 4 schemes will be progressed once alternative funding is identified.
- A multi criteria scoring of each scheme within highway and active mode improvements package was used to identify the components of Phases 3 and 4, where individual schemes were qualitatively scored to provide a clear view on how each scheme was performing when compared with each other. A seven-point scale (-3 to +3) was used to assess the following impacts/criteria: Relative Cost to Benefits Ratio, journey time benefits, safety, enhance active travel, third party contributions, land acquisition and deliverability.

- The scoring helped WCC identify all the schemes of the A38 BREP package that could potentially be delivered in Phase 3 and those that could potentially be moved to the next phase (Phase 4). As far as the A38 BREP OBC schemes were concerned, the core of the package remained as is for the A38 BREP Phase 3 FBC and therefore WCC believes Phase 3 schemes will remain robust in terms of their strategic case.

The final result of the scheme development is summarised in Table 5.1. This includes Phases 2 and 3 schemes which form the bases of this FBC.

Table 5.1: Highways, active travel and public transport improvement schemes included in the FBC stage (Phases 2 and 3)

Ref	Scheme location	Description of proposed schemes
		Hybrid schemes containing highways capacity and active travel improvements (Phase 3)
A	A38 / Hanbury Road	Provide a longer left turn lane on the Eastern A38 approach, undertaking using white lining and carriageway surfacing, within existing kerb line.
B	A38 / Buntsford Drive to south of A38 / Charford Road	Provision of an additional northbound traffic lanes from A38/ Sherwood Road/Austin Road Roundabout to A38 / Charford Lane approach. New toucan crossings over Sherwood Road and A38 North. Development of Active Travel Corridor Link parallel to A38, providing a 3m wide shared footway/cycleway from Buntsford Drive Sherwood Road and a segregated pedestrian / cycle route on the east side of the A38 between Sherwood Road to Charford Road (Scheme C and Scheme 2), as part of a wider cycle strategy for A38 corridor. Pedestrian / Cyclist linkage to Sherwood Road towards Bromsgrove Rail Station. Additional provision of an upgraded footway on the west side of A38.
C	A38 / Stoke Road / Charford Road	Widening of the existing narrow 60m long two-lane approach and realignment of Charford Road. Widening of Culvert on Stoke Road to facilitate third lane over structure and realign ahead and right turn movement lane to improve access into the left turn lane to the A38 Southbound. Enhance pedestrian crossing widths across A38 corridor to 5m to support volume of pedestrians crossing over the A38 at grade. Provision of 4m wide footway/cycleway connection to link with Scheme B. Upgrade of uncontrolled crossings of Stoke Road (Upgrade to toucan) and Charford Road (Upgraded to pelican). Widen existing parking bays on Charford Road, to facilitate improved exit lane width from A38. Improved footway connection between A38 North and Warwick Avenue. Provision of on-crossing detection equipment at signals.
D	A38 / New Road	Provision of additional southbound traffic lane on A38. Realign Northbound A38 corridor to accommodate changes in southbound direction. Provision of an additional ahead lane from New Road West approach, with associated widening of A38 East exit. Provide new staggered pedestrian crossing on New Road West approach and exit in vicinity of Fordhouse Road and Bant Mill Road. Provision of wider crossing widths to support any future uplift in pedestrian movements. Provision of on-crossing detection equipment at signals. Reconfiguration of signal timings to accommodate separate phases for New Road East and West.

Ref	Scheme location	Description of proposed schemes
E	A38 / A448 (Oakalls Roundabout)	Provision of two additional flare lanes (30 and 85m) on A38 north approach. Provision of a 61m flare lane on A448 East approach. Provision of longer flare lane (100m) on A38 South approach. Provision of 46m flare on A448 West approach. Provision of toucan crossings on A38 South and A448 Stratford Road approaches. Provision of 2 lane exit on A38 South and A448 West. Provision of Pedestrian crossing facilities across A38 North and A448 West arms. Signalisation of both A38 and A448 arms. Provision of cycle connection from A448 West to Regents Park Road, to connect to Schemes 4 and 6). Provision of cycle route from A448 West toucan crossing to A38 North to link to Scheme 7). Provision of MOVA signal control. Provision of an extra exit lane westbound on the A448 Stafford Road. Inclusion of an additional circulatory lane. New footway connection from Scheme 4 on northern side of A448 West to Toucan Crossing by circulatory.
F	A38 / Birmingham Road to south of M42 Junction 1	Realignment of Birmingham Road junction, to accommodate two southbound lanes through junction, with a 3m wide footway on the eastern side of the A38, narrowing to a minimum of 2m in front of properties in front of dwelling curtilages. Provision of on crossing detection to Birmingham Road signals, and pedestrian crossing near Barnsley Hall Drive. Provision of localised widening of kerb lines to accommodate two lanes southbound from M42 J1 to Birmingham Road. School Lane to be converted to left out only, and car left in only, with associated kerb adjustments. Banning of right turn into School Lane. Consideration of lining and signing scheme on Alcester Road between School Lane and Birmingham Road (Cost excluded for Alcester Road scheme). Conversion of existing 40mph section from south of Birmingham Road to North of M42 J1 to 30mph.
Active Mode Schemes (Phases 2 and 3)		
2a*	Charford Road to Harvington Road	Active Travel Corridor – A38 between Charford Road and Harvington Road a 3m wide cycleway and 2m wide segregated pedestrian / cycle facility provision of connection to Harvington Road.
2b*	Charford Road to Harvington Road (extension along Charford Road)	Active Travel Corridor - Connection between the A38 and Scheme 2A to South Bromsgrove High School, to provide a 3m wide shared cycle path and footpath.
3	Bromsgrove Rail Station to Town Centre	Active Travel Corridor for pedestrians and cyclists from the Bromsgrove Rail Station to the town centre via a combination of segregated cycle routes, new shared cycle/footway facilities, existing facilities and on-road cycling. The route follows New Road, Rigby Lane, Drummond Road, the existing shared facility in Oakalls estate to join Scheme 6, into Scheme E at Oakalls roundabout and then along Stratford Road to the Town Centre.

Ref	Scheme location	Description of proposed schemes
4*	A448 near Blackwood Road	Signal Toucan Crossing of A448 to east of Fordhouse Road, to provide connectivity between Blackwood Road (HOW College) and Regents Park Road and Fordhouse Road up to eastern extent of zig zag markings, and tie into Scheme E, Scheme 3 and Scheme 9.
6	Regents Park Road Connection to Oakalls Loop	Provision of a footway/cycleway connection between Scheme E and the existing cycle provision within the Oakalls Estate of Bromsgrove, to provide further connectivity from the north and west of Bromsgrove to the Rail Station.
9	Stratford Road to Scheme 2a	Active Travel Corridor with on- road cycling proposed along Fordhouse Road, Bant Mill Road and Harvington Road including traffic calming measures and a new toucan crossing on New Road.
Public Transport Schemes (Phase 3)		
7	Bus shelters and RTI	Provision of upgrades to bus stops to install additional information on the route between the Town Centre and Bromsgrove Rail Station. This allows for 9 bus stop upgrades (including provision of physical infrastructure/shelters), plus wind turbines/solar panels powered RTI screens at Town Centre (Bromsgrove Bus Station), Fordhouse Road (By the Ryland Centre), New Road, Finstall Road (near Dragoon Field), Rail Station and new stops on Golden Cross Lane (near Marlbrook Crossroad). A Smart Interchange Point will be delivered for 1 stand at Bromsgrove Bus Station and 1 Stand at Bromsgrove Rail Station, allowing connection with the strategic corridor routes, and providing a location for Demand Responsive Transport (DRT).
8	Public transport select vehicle detection	Provision of select vehicle detection at New Road and Charford Road junctions to support buses in crossing the A38 corridor, on the primary routes between the Town Centre and Rail Station, will be delivered at the same time as Schemes C and D.

**Phase 2 Schemes 2a, 2b and 4 have been constructed as an early delivery scheme, funded by WLEP.*

5.5 Methodologies, Assumptions and Data

Table 5.2 summarises the methodologies adopted for assessing short-term and long-term outputs of the A38 Phase 3 schemes. More detailed methodologies are discussed throughout the Economic Dimension.

Place Based Analysis: The scheme appraisal has been undertaken considering a place-based analysis. This is flagged throughout the Economic Dimension in boxes similar to this. These boxes are then summarised in section 5.11 of this report.

Table 5.2: Assessment methodology of scheme outputs

Highways Schemes

Outcome (short-term)	Outcome (medium / long-term)	Assessment Methodology
Decreased congestion on junctions along A38 through Bromsgrove area	Carbon impacts. Impact to local greenhouse gas emissions.	Quantitative Monetised Assessment. Emissions of carbon dioxide have been estimated for the Opening Year (2025) and Future Assessment Year (2040) in the Do Minimum and Do Something scenarios using the TAG Databook approach (v1.20.1).
	Noise and air pollution impacts Improvements in public health.	Quantitative Monetised Assessment. The damage costs approach has been used to value the impact of the proposed scheme on local air quality, in line with requirements set out in TAG Unit A3. Emissions of oxides of NOx and PM2.5 have been estimated for the Opening Year (2025) and Future Assessment Year (2040) in the Do Minimum and Do Something scenarios, using Defra's Emission Factors Toolkit (EFT), version 11. Noise impact has been quantified/monetised using a noise model. The noise model Study Area has been determined through review of the initial traffic model outputs following the criteria in DMRB LA 111. The proposed Phase 3 schemes do not result in any obvious bypassed routes; therefore, the Study Area has been taken as a 600m buffer around the proposed scheme and sections of the A38 linking the proposed scheme together. In accordance with Transport Analysis Guidance (TAG) Unit A3, noise modelling has been undertaken to predict noise levels at all noise sensitive receptors within the Study Area.
Improved journey times along the A38	Reduced commute time. More time to spend on recreational activities.	Quantitative Monetised Assessment. Travel time reductions form part of the Level 1 Transport User Benefits. This has been quantified through strategic modelling for the Opening Year (2025) and Future Assessment Year (2040) in the Do Minimum and Do Something scenarios. These impacts have also been monetised for a 60-year appraisal period using DfT's TUBA program (TUBA Version 1.9.17, economics file 1.20.2, for Core, High Growth and Low Growth Scenarios, with input matrices provided by the transport models.

Outcome (short-term)	Outcome (medium / long-term)	Assessment Methodology
	Travel time savings for business users and transport users.	
	Cost reductions for transport allowing businesses to operate more efficiently.	
Improved accessibility	Facilitates the delivery of Local Plans allocations.	Not assessed. Recognising that all proximate major development sites already have planning permission granted and as agreed with DfT, no formal dependent development assessment was undertaken.
	Easier journey means a greater number of people will be willing to travel to / from this area. Businesses have access to a wider range of workers and skills.	Quantitative Monetised Assessment. A Level 2 Wider Impacts Assessment has been completed in line with the guidance set out in TAG. This assessment includes Induced Investment (TAG Unit A2.2), Employment Effects (TAG Unit A2.3) and Productivity Impacts (TAG Unit A2.4). The DfT's Wider Impacts in Transport Appraisal (WITA) V2.2 tool has been used to estimate the wider economic impacts.
	Better access from Bromsgrove to West Midlands major employment areas. Businesses have access to a wider range of workers and skills.	

Active Modes Schemes

Outcome (short-term)	Outcome (medium / long-term)	Assessment Methodology
Removal of potential conflicts between pedestrians and cyclists (short-term) Increased in the number of pedestrians	Enhancements for pedestrians and cyclists can promote a long-term shift to active modes.	Quantitative Monetised Assessment. The DfT's Active Mode Appraisal Toolkit (The May 2022 release has been used to assess relevant Phase 3 scheme benefits as part of a wider value for money assessment. The social impacts assessments have been undertaken in line with TAG Units A4.1 and consider impacts to physical activity, journey quality, collisions, security, accessibility, affordability and severance.

5.6 Social Cost-Benefit Analysis of Short List

5.6.1 Economic Impacts

5.6.1.1 General Economic Assumptions

The appraisal-wide economic parameters and assumptions are drawn from the requisite units of the DfT's appraisal guidance contained in various TAG guidance units and the TAG databook v1.20.2. The relevant discounting parameters and appropriate appraisal period were adopted and used in TUBA to assess the level 1 highway benefits. Key assumptions made for the economic assessment are:

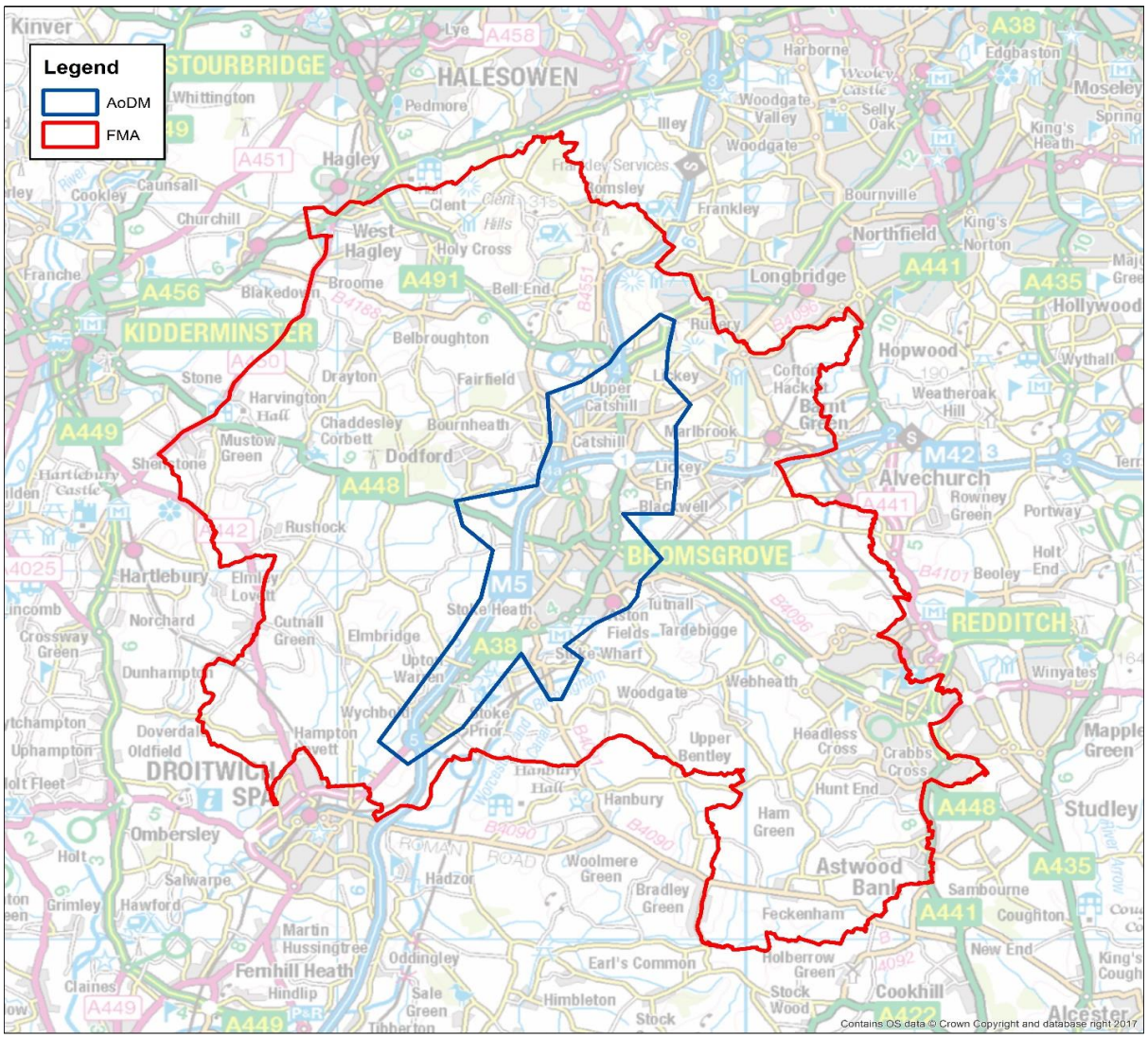
- Opening year 2025, preparation and construction profile from 2020-2025.
- Appraisal based on model years 2025 and 2040; and three modelled hours – AM, IP, and PM, using annualisation factors.
- Appraisal period is 60 years.
- Value of Time (VoT), Vehicle Operating Costs (VOC), and other economic parameters are as defined in the TAG Data Book v1.20.2, as applicable at the start of the economic appraisal.
- Price base year is 2010.
- Current year for discounting is 2023 (Note: Costs are deflated from 2023 to 2010 using the GDP deflator, then both costs and benefits are discounted to the Present Value Year of 2010).
- Discount rate is 3.5% for 30 years from current year then 3% thereafter.
- LGVs are split into Freight and Personal trips in the proportion of 88% and 12% respectively, based upon default TUBA economic parameters.
- HGVs have been split into OGV1 and OGV2 in the proportion 73% and 27% respectively, based upon observed local data.

5.6.1.2 Transport Modelling to Inform Economic Assessments

This section details the transport modelling methodology used as an input to the impact assessments of highway user benefits, construction delay, maintenance delay, greenhouse gases, air quality and noise.

The transport model, known as the A38 BREP SOC model, was previously developed and used to inform the 2019 SOC. Based on DfT feedback, updates to the highway and demand model have been undertaken for the OBC submission, the resultant model is referred to as the A38 BREP OBC model. This has subsequently been updated to the A38 BREP FBC model. The A38 BREP Phase 3 FBC model is a variable demand model which, in conjunction with the highway assignment model, has been deemed as a suitable tool for the A38 BREP Phase 3 scheme assessment. The model extent is shown in Figure 5.5 and is comprised of a Fully Modelled Area (FMA) and an External Area. The Fully Modelled Area is an area over which the A38 BREP scheme impacts are significant and certain or more likely. It is further subdivided as an Area of Detailed Modelling (AoDM), where the impacts of the scheme are significant and certain, and the Rest of the Fully Modelled Area (RoFMA) where the impacts of scheme were more likely but weak in magnitude. The area outside of the FMA is designated the External Area (EA). In the External Area impacts of interventions were predicted to be reasonably assumed as negligible.

Figure 5.5: A38 BREP FBC Phase 3 Model Extent



Information on the model development (including data collection), model validation and forecasting are appended to the Transport Modelling Chapter (Chapter 4), named:

- Traffic Data Collection Report (November 2021).
- Local Model Validation Report (November 2021).
- Variable Demand Model Report (November 2021).
- Traffic Forecasting Report (March 2023).

Note that all modelling reports, other than the Traffic Forecasting Report, remain unchanged since the OBC. The Traffic Forecasting Report has been updated to reflect the Phase 3 schemes.

The modelling framework has been developed to represent a 2017 Base Year to which the model has been calibrated and validated. To assess the economic impacts of the proposed A38 BREP Phase 3 scheme, the following modelling scenarios have been included:

- Opening year (2025) - Do Minimum (Without Scheme).
- Opening year (2025) - Do Something (With Scheme).
- Future assessment year (2040) - Do Minimum (Without Scheme).
- Future assessment year (2040) - Do Something (With Scheme).

In addition to the model scenarios outlined above, the high and low growth sensitivity tests have been undertaken, further info is provided in Section 4.10 (Sensitivity and Risk Profile) and in the Traffic Forecasting Report (Appendix TM.5).

The forecast model outputs in terms of skims (demand, time, distance) for all user classes modelled (Car– Home based work, Car– Employer's business, Car– Other journey purposes, LGVs and HGVs) have been extracted to feed into the economic appraisal for the calculation of transport user benefits using TUBA. Link flow, congested speeds, travel times, and junction performance data have been used to inform Cost and Benefit to Accidents – Light Touch (COBALT) and Queues and Delays at Roadworks (QUADRO) assessments.

5.6.1.3 Highway Users

5.6.1.3.1 Methodology

The assessment of Transport Economic Efficiency benefits and costs has been conducted using DfT's TUBA computer program (TUBA Version 1.9.17, economic parameters 1.20.2) for the Core Scenario (and Sensitivity Tests), with input matrices provided by the transport modelling process.

In the assessment, three standard time periods have been used in TUBA as follows:

- AM Peak (weekday 07:00 to 10:00).
- PM Peak (weekday 16:00 to 19:00).
- Inter-peak (weekday 10:00 to 16:00).

The traffic model has three weekday time periods; AM peak hour, Average Inter peak hour and PM peak hour. The modelled period benefits calculated by TUBA have been converted into an estimate of annual benefits using annualisation factors – expanding the modelled periods to be used to represent a full year.

The annualisation factors are based on daily flow distribution, plotted based on average flow profiles across 58 automatic traffic counts in both directions, with full validated datasets. Taking flow as a proxy for congestion, the analysis of annualisation factors has been based on the average traffic flow across all surveyed ATC sites. The 2-way ATC data was aggregated into average weekday hourly flow and analysed. For economic modelling purposes, the flow-based approach has been adopted for further estimation of annualisation factors which are summarised in Table 5.3 below. The annualisation factors are derived based on the standard 253 working days per year.

Table 5.3: Annualised number of hours in each time slice

Time period	Annualised hours
AM	473
PM	491
IP	2047

Further information on the annualisation factors is presented in Appendix E.1 (Economic Impacts Report), and details on the traffic counts can be found in Appendix TM.3 (A38 Bromsgrove – VISUM model Local Model Validation Report).

TUBA output files (.out) produced for each scenario contain a list of errors and warnings during the program execution. Any errors encountered that caused the program to stop have

been rectified. Warnings and serious warnings represent possible anomalies in the input data and have been investigated. All TUBA output files are included in Appendix E.1 (Economic Impacts Report).

The study area for the transport economic efficiency elements of the economic assessment is the Fully Modelled Area *(*FMA*)* as shown Figure 5.5. All movements in the skims not interacting with the FMA have been excluded using a masking process.

5.6.1.3.2 Assessment Outcome

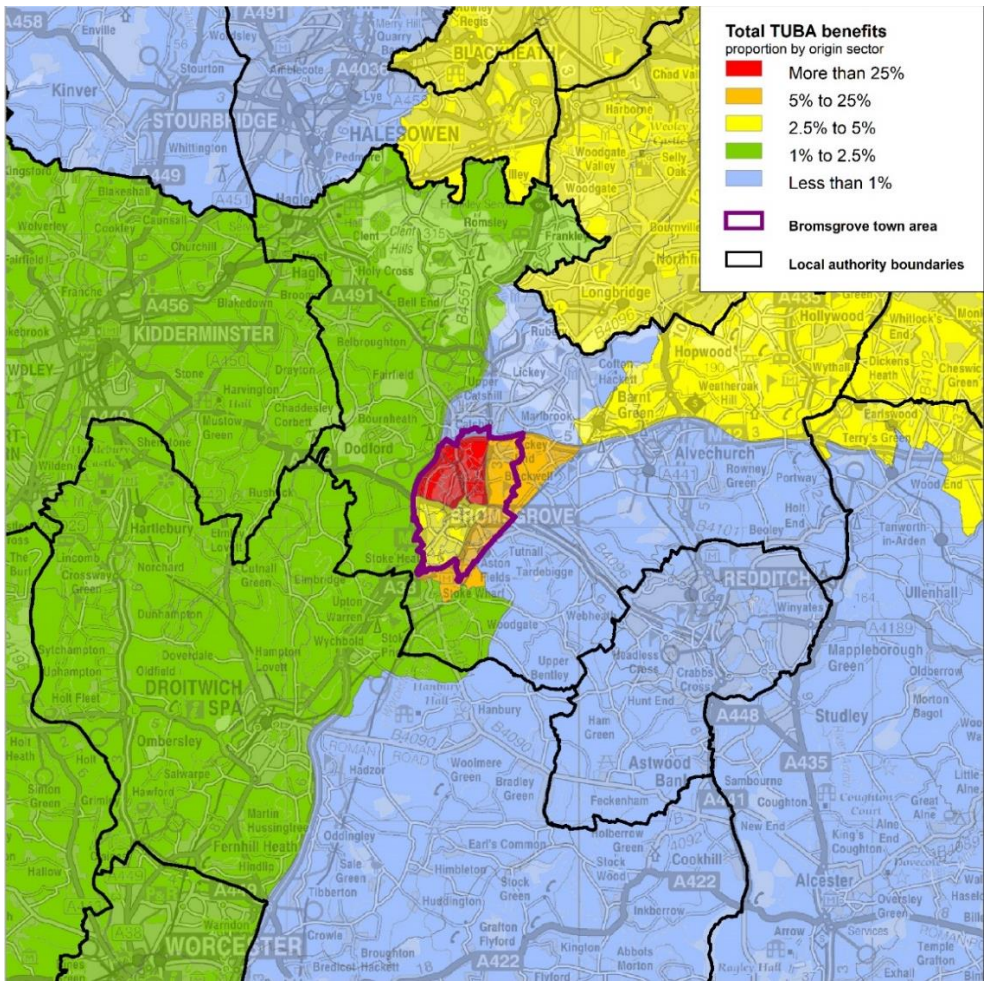
The key economic impact included in the present value of benefits is the time saving. The A38 BREP Phase 3 scheme has been shown in the modelling to reduce travel times, especially during peak hours, thus, commuters will value the savings derived from this scheme. It is expected that the surrounding network in Bromsgrove will benefit from reduced congestion because of the scheme attracting users toward the improved A38 corridor. The benefit is measured as a change in the road user cost due to the time savings for the users without and with the scheme.

This scheme generates £47,895K of travel time benefits, £2,406K in 2010 Present Value of Benefits (PVB) of fuel VOC benefits, and £-207k PVB of non-fuel VOC benefits. This equates to a total user benefit of £50,094K in 2010. Further details of the breakdown of these benefits are provided in the Economic Impact Report (Section 4.1.1 of Appendix E.1)

The AM period accounts for 34% of the benefits and the PM peak period accounts for 47% of the benefits. The interpeak accounts for the remaining 19% of benefits demonstrating the scheme is largely alleviating peak period congestion benefits, linking to the MRN priority and A38 BREP Phase 3 Package objective of reducing congestion.

Figure 5.6 displays the TUBA benefits by origin sector graphically. The figure demonstrates that most benefits originate from sectors within Bromsgrove town centre (north)

Figure 5.6: Share of TUBA benefits by sector



The transport user benefits (excluding developer contributions or indirect tax revenues) have reduced compared to OBC from £57,348k down to £50,094k. This is largely because the scheme includes fewer elements to reduce delays, although some of the difference is due to the use of an updated TUBA economics file.

Full TUBA outputs are included in Appendix E.1 (Economic Impacts Report).

Place Based Analysis: The majority of the welfare benefits (Journey Time and VoC reduction) associated with the TUBA output are for travellers within the Bromsgrove District. The distributional impact assessment (section 5.9) also confirms that the scheme is overall beneficial for all travellers from all levels of deprivation. This will contribute to increased availability of productive time, as well as supporting the levelling up agenda.

5.6.1.4 Bus Facilities

5.6.1.4.1 Methodology

The analysis considered the annualised number of boarders at each bus stop (Table 5.4). No change in patronage was assumed across this appraisal period.

*Table 5.4: Bus Boarding Counts**

Location	Average Weekday Boarders	Average Saturday Boarders	Average Sunday Boarders	Total Weekly Boarders	Total Annual Value
Bromsgrove Bus Station	112	98	43	699	36,360
Bromsgrove Rail Station	16	14	6	100	5,194
Fordhouse Road vicinity	3	3	1	21	1,094
Golden Cross Lane (near Marlbrook Crossroad)	5	5	2	34	1,777
Aston Fields	1	0	0	3	163

**Source: WCC.*

Generalised journey time savings associated with the following bus facility improvements were applied to the quantum of boarders, pivoting from benchmarks set out in TAG Databook Table M3.2.1:

- 1.47 minutes per boarder unlocked through provision of RTI at all stops.
- 1.08 minutes per boarder unlocked through provision of new or improved bus shelters at all stops.
- 1.27 minutes per boarder unlocked through provision of interchange facilities at one stand at Bromsgrove Rail Station and 1 stand at Bromsgrove Station (i.e. 50% of boarders at each location).

Market price values of time from TAG Databook Table A1.3.2 were then applied for different journey purposes (commuters, business travellers, other users) to understand the journey time saving enabled by provision of bus facility enhancements. Note that standard journey purpose splits were derived for bus boarders, using 'PSV users' within TAG Databook Table A1.3.4.

No formal analysis of the potential quantified or monetised impact of provision of select vehicle detection at New Road and Charford Road junctions was undertaken. This reflects the view that the system would only apply to late running buses, recognising that use of the system as standard could cause significant delays and disbenefits for other highway users.

5.6.1.4.2 Assessment Outcome

The bus facility interventions are expected to generate some £340K PVB of generalised time saving benefits. Of this, £108K PVB of journey time saving benefits is for commuting users, £11K PVB for business users and £220K PVB for other purpose users. Whilst these benefits are perceived values rather than actual journey time, they are still accounted for as travel time benefits in the TEE.

This has increased from the OBC value of £151K because at FBC it was possible to include benefits associated with improved bus shelters and interchange facilities. Further details on the methodology are provided in Appendix E.1 (Economic Impacts Report).

Place Based Analysis: Better quality bus facilities will contribute to a more modern and connected experience for residents and visitors within Bromsgrove.

5.6.1.5 Construction and Maintenance

5.6.1.5.1 Methodology

Impacts due to the construction periods were assessed using the QUADRO (QUeues And Delays at ROadworks), software released by the DfT. The impacts were analysed using QUADRO 2022 which was the latest available version at the time of the FBC submission. The methodology followed the guidance set out by the DfT in the QUADRO Manual supplied with the program.

The purpose of the program is to provide a method for assessing the total cost of major road maintenance works and during construction. There are three elements of this user cost: delay (value of time), vehicle operating costs, and accident costs. When assessing maintenance works, the total of the works and road user costs are considered.

In line with QUADRO guidance, count sites near or on the junctions/roads affected were used to inform the input flows. Based on the input flows and count dates (including year) a flow profile for a 7-day week was produced for further analysis.

Information about the roads (including type of road/environment and speed limit) was taken from a combination of google maps and street view which informed the QUADRO road type. Construction information input to QUADRO was based on the planned construction details (supplied by WCC), this included:

- The length of the construction period.
- The start/end date of construction.
- Type of impact (lane narrowing / road closure) of the construction.
- Diversion routes.

The construction details are summarised in Table 5.5 which shows the tender construction schedule and the type and length of impact for each scheme. Further detail on the construction phases is provided in the Management Dimension (Chapter 8) and detailed construction programmes are provided in Appendix M.2.

Similarly, maintenance impacts have been estimated based upon anticipated road traffic disruptions over the 60-year appraisal period. This assessment is consistent with the maintenance regime as detailed in the Financial Dimension Appendix F.3.

Table 5.5: Construction schemes and their proposed duration, start and end dates

Scheme	Construction start date	Construction end date	Construction duration	Description of traffic management	Duration of reduced capacity*	Narrow Lanes**	Overnight works under shuttle signals***	Maintenance requirements****
A	Nov 24	Nov 24	2 weeks	Overnight narrow lanes for resurfacing and relining		2 weeks		No additional maintenance required
B	Mid. Sept 23	Nov 24	14.5 months	- Off peak day time traffic shuttle signals for 1 month. - Narrow lanes, 5 months for the NB carriageway, and 5 months for the SB carriageway. - Overnight shuttle signals for 2 weeks to allow resurfacing/lining works.	1 month	10 months	1 month	Overnight traffic management required once every 5 years, and a 1-day lane closure is required every 3 years.
C	Mid. March 24	Feb 25	11.5 months	- Overnight capacity reduction for 4 weeks. - A38 NB reduced to single lane through junction for 24 weeks. - 4-way signals in place for 18 weeks. - Overnight capacity reduction at junction for 1 week to allow resurfacing/lining works.	6 months NB 4 months SB		1 month	Overnight traffic management required once every 5 years, and a 2-week lane closure is required every 15 years.
D	Mid. Oct 23	Aug 24	10.5 months	- A38 NB reduced to single lane and New Road (west) reduced to single lane approach for 7 weeks. - All approaches reduced to single lane, 4 separate stage junction operation. Overnight only for 8 weeks, and 20 weeks during both day and night. - Overnight shuttle signals for 1 week to allow resurfacing/lining works.	7.5 months NB only		1 month	Overnight traffic management required once every 5 years.
E	Mid. Aug 23	June 25	22.5 months	- A38 NB and A38 SB approach reduced to single lane entry All approaches reduced to single lane for 2 weeks. - All approaches reduced to single lane for 9 weeks. - Overnight works with shuttle signals on A38 for 2 weeks. Stratford Road diverted via New Road	3 months		2 weeks	Overnight traffic management required once every 5 years, a 2-week overnight traffic management required once every 25 years, and a 1-week lane closure is required every 15 years.
F	Sep 24	March 25	7 months	- A38 NB and Birmingham Road reduced to single lane for 17 weeks. - Right turn into Birmingham Road banned for 8 weeks. Diversion via A38 / Stratford Road - Narrow lane on A38 SB for 4 weeks	3 months NB only	1 month	2 weeks	Overnight traffic management required once every 5 years.

Scheme	Construction start date	Construction end date	Construction duration	Description of traffic management	Duration of reduced capacity*	Narrow Lanes**	Overnight works under shuttle signals***	Maintenance requirements****
6	Jan 25	Feb 25	2 months	Narrow lanes or some temporary traffic signals on Regents Park Road for 4 months for construction *Note: excluded from QUADRO traffic impacts during construction as AADT and speeds are both low.*				Overnight traffic management required once every 5 years.
3	Dec 23	August 24	9 months	Lane narrowing to allow footway widening etc. in 100m sections throughout construction period. 3 months of other works not requiring TM *Note: only the west side has been included in QUADRO for estimating traffic impacts during construction as AADT and speeds are both low on east of the A38.*		9 months		Overnight traffic management required once every 16 years.
7	Mid. Aug 23	Mid. Oct 23	2 months	Minor localised traffic management *Note: excluded from QUADRO traffic impacts during construction as the works are minor, AADT is low, and speeds are low.*				No additional maintenance required
9	Aug 23	Nov 23	4 months	- Narrow lanes on New Road for 2 months - 3 nights of overnight closure to resurface for new toucan. - 2 months of stop/go boards to install traffic calming along the Scheme 9 corridor. *Note: excluded from QUADRO traffic impacts during construction as AADT and speeds are both low.*	4 months	4 months		Overnight traffic management required once every 5 years.

**Where 2 lanes approach a junction, they reduce to 1 lane.*

***11% reduction in capacity due to the use of narrow lanes.*

****A maximum of 100m is allowed for the shuttle signals.*

*****Additional to current maintenance activities.*

5.6.1.5.2 Construction Assessment Outcome

The total impact for all the different schemes/locations was found to be **-£1,040K PVB.** This consists of -£1,072k of user impacts, -£8k of greenhouse gas benefits, and £40k of indirect tax benefits. Table 5.6 below presents the construction disbenefits broken down for each specific scheme.

Table 5.6: Quadro Disbenefit broken down by scheme, by year (£'000s)

Scheme	Disbenefit Year	Impact by year (PVB)
A	2024	-£1.06
B	2023	-£188.49
	2024	-£72.51
C	2024	-£207.29
	2025	-£128.42
D	2023	-£22.30
	2024	-£65.78
E	2023	-£12.21
	2025	-£54.20
F	2024	-£162.86
	2026	-£100.90
3	2023	-£2.55
	2025	-£21.59
Total		**-£1,040.17**

The total disbenefits for the FBC Phase 3 schemes (A to F, 3, 6, 7 and 9) were found to be **-£1,040K PVB** which shows a reduction of disbenefits compared to the OBC stage (which was -£3,202K PVB), which is due to the removal of Phase 4 schemes that were included in the OBC stage Schemes G, 1, 5 (footbridge) and parts of Schemes A and B, and the fact that the tender process traffic management plan provides more accuracy than at OBC, in addition to a shorter construction duration (that reduced from three years in the OBC to two years in the FBC). Schemes 6, 7 and 9 are not shown in Table 5.6 due the limited scale and nature of the proposed works which are expected to be off-line with minimal impact on traffic.

5.6.1.5.3 Maintenance Assessment Outcome

Table 5.7 displays the QUADRO delay during maintenance. The total disbenefits for the FBC Phase 3 schemes (A to F, 3, 6, 7 and 9) were found to be **-£287K PVB.** This consists of -£240k of user impacts, -£60k of greenhouse gas benefits, and £13k of indirect tax benefits.

At the OBC stage, the total maintenance impact was -£298K PVB; the reduction in disbenefits reflects the removal of Phase 4 schemes.

Table 5.7: Quadro Delay During Maintenance (£'000s)

Impact	Car - Commute	Car - Other	Cars - Business + LGV	HGV
User Impacts	-£53.85	-£85.82	-£28.72	-£71.68
Greenhouse Gases	-£60.13			

5.6.1.6 Reliability

5.6.1.6.1 Methodology

Reliability impacts have been assessed in line with section 6.3 of TAG Unit A1.3 User and Provider Impacts using inputs from the A38 BREP FBC model. This approach is based on the forecast changes in the standard deviation of travel time from changes to journey time and distance given by the formula

$$\Delta\sigma_{ij} = 0.0018\left(t_{ij2}^{2.02} - t_{ij1}^{2.02}\right)d_{ij}^{-1.41}$$

Where: $\Delta\sigma_{ij}$ is the change in standard deviation of journey time from *i* to *j* (seconds); t_{ij2}, t_{ij1} are the DS and DM journey times from *i* to *j* (seconds) respectively; and d_{ij} is the distance from *i* to *j*.

TAG A1.3 paragraph 6.3.4 gives the recommended value for the Reliability Ratio as 0.4 for all journey purposes. This is then used along with the $\Delta\sigma_{ij}$ values to determine the Reliability Benefit given by,

$$Reliability\ Benefit\ = -\frac{1}{2}\sum_{ij}\Delta\sigma_{ij}\cdot\left(T_{ij}^{0}+T_{ij}^{1}\right)\cdot VOR.$$

Where: VOR is the reliability ration, T^0_{ij} and T^1_{ij} are demand in the without scheme and with scheme models.

5.6.1.6.2 Assessment Outcome

The term reliability refers to variation in journey times that individuals are unable to predict. Table 5.8 displays the reliability benefit calculated and shows a positive reliability benefit for the AM and PM peak hours indicating a more reliable journey time is anticipated. In the interpeak hour a more marginal benefit/disbenefit is shown.

Table 5.8: Reliability Benefit (£'000s, 2010 prices and values)

Year	Time Period	Commute	Employers' business	Other purpose
2025	AM	25.67	5.56	11.16
	IP	-0.54	-0.19	-1.85
	PM	39.10	12.99	19.94
2040	AM	43.70	8.49	19.64
	IP	2.39	1.54	5.35
	PM	65.59	16.43	33.87

The hourly reliability benefits were thereafter annualised using the annualisation factors used in user benefit calculations in TUBA and benefits calculated over the 60-year appraisal period. The total reliability benefits from the A38 BREP Phase 3 schemes (Schemes A to F, 3, 6, 7 and 9) is **£1,488k** as shown in Table 5.9. This has marginally reduced from the OBC value of £1,550k, largely due to the removal of Phase 4 schemes that were included in the OBC stage (Schemes G, 1, 5 (footbridge) and parts of Schemes A and B).

As per TAG unit A1.3, Section 6.3.5, any reliability benefits estimated using the approach for urban roads should be identified separately from other economic benefits and only be reported in the AST.

Table 5.9: Reliability benefits over 60-year appraisal period (£'000s, 2010 prices and values)

Commute	Employers Business	Others	Total
798.24	213.10	476.62	1,487.96

The reliability benefits reflect alternative routes readily available in urban areas such as Bromsgrove for users to divert away from incidents/delays that reduce capacity on a particular route.

5.6.1.7 Level 2 – Wider Economic Impacts

5.6.1.7.1 Methodology

A Wider Impacts assessment has been completed in line with the guidance set out in TAG Unit A2.1. Wider economic impacts occur due to market failures that are prevalent within non-transport markets. Thus, traditional welfare impacts don't wholly reflect the full range of benefits, therein requiring for the quantification of wider impacts separately.

These wider benefits arise as a result of the impact of a reduction in generalised journey times and costs filtering through to non-transport markets, including:

- Induced Investment (TAG Unit A2.2) - Increased or decreased output in imperfectly competitive markets. These are typically 10% of the business user benefits.
- Employment Effects (TAG Unit A2.3) - Labour market impacts from more/less people working as a result of better accessibility to employment opportunities.
- Productivity Impacts (TAG Unit A2.4) - Agglomeration impacts: a reduction in generalised costs will increase the effectivity density of economic activity within the area. Leading to an increase in productivity measured through GDP.

For the purpose of this analysis, the DfT's Wider Impacts in Transport Appraisal (WITA) V2.2.1.0 has been used to estimate the wider economic impacts. Three model years have been adopted 2025, 2040 and 2084. The inclusion of the last model year of 2084 is based on exponential growth year on year after the last model year in WITA runs, which appears to be caused by error within the WITA model. To overcome this, a proxy 2084 year was developed which used the same input matrices as 2084, but economic data relating to the year 2084.

Additional detail on the assessment methodology is included in the Appendix E.1 (Economic Impacts Report).

5.6.1.7.2 Assessment Outcome

Based on the analysis undertaken in WITA, it is estimated that the wider economics benefits as a result of Phase 3 schemes (A to F, 3, 6, 7 and 9) are **£15,734K PVB**. These benefits correspond to the local authority districts that are captured by the Fully Modelled Areas.

As only static clustering has been modelled, the reduction in generalised travel costs will increase the effective density of economic activity within the area, giving rise to the agglomeration impacts. The agglomeration impacts are primarily concentrated around Bromsgrove/Redditch with a small proportion of the impacts materialising within Wychavon and Wyre Forest.

To model the output change in imperfectly competitive markets, as per DfT guidance, 10% of the business user benefits have been adopted. This quantifies the benefits to be £997K PVB. The breakdown of the benefits by impact category can be seen in Table 5.10.

Table 5.10: Wider economic impacts summary (£'000s)

Wider Impact Type	Benefits £'000s (2010 prices and values)
Imperfect competition impacts	997
Agglomeration impacts	13,747
Labour supply impacts	990
Total	**15,734**

Phase 3 schemes (A to F, 3, 6, 7 and 9) benefits of **£15,734k** have marginally increased since the OBC value of £14,189k, despite the removal of Phase 4 schemes that were included in the OBC stage (Schemes G, 1, 5 (footbridge) and parts of Schemes A and B). This is attributed to the latest VoT growth factors being adopted and use of the latest version of WITA. The FBC assessment adopted the latest WITA that was available (v2.2), whilst the OBC analysis was undertaken using WITA V2.0 BETA.

Place Based Analysis: The significant wider impacts, particularly associated with agglomeration, demonstrate the potential for Bromsgrove District to become a more effective and productive economic centre. The improved labour supply impact also demonstrates the potential for greater access to better paid and more productive jobs within Bromsgrove and larger cities such as Birmingham.

5.6.1.8 Development Impacts

Recognising that all proximate major development sites already have planning permission granted and as agreed with DfT, no formal dependent development assessment was undertaken. However, given that four proximate development sites are required to make a Section 106 contribution to scheme delivery, a clear planning link between the proposed intervention and key development sites exists. Within this context, the scheme is considered to facilitate and support development rather than fundamentally unlock the following sites:

- Whitford Road.
- Perryfields Road.
- Foxlydiate.
- Brockhill.

The development impacts facilitated at these sites is outlined in Table 5.11 and Table 5.12 which demonstrate that some 5,310 homes, 1,130 gross Full Time Equivalent (FTE) jobs,

and more than £58,000K in Gross Value Added (GVA) per annum could be realised at sites that the proposed A38 BREP Phase 3 will support.

Table 5.11: Quantum of Development at Facilitated Development Sites

Site	Homes	Floorspace (sq m)					
		Retail (A1-3)	B1c	B1a	Education	Care	Community (D1)
Perryfields	1,300	*	*	*	*	*	*
Whitford Rd	490	400					
Foxlydiate	2,560	900			*	*	900
Brockhill	960	970					
Total	5,310	2,270	0	0	0	0	900

**FTE employment for the Use Classes has been taken from documentation associated with the approved planning applications rather than calculated based on the quantum of development.*

The quantum of development has been used to inform the gross FTE employment at facilitated development sites as displayed in Table 5.12. No development quantum is displayed for Perryfields Road and Foxlydiate (education and care) as figures from the approved planning applications were available for use. The resultant GVA for each site is shown in Table 5.13.

Table 5.12: Gross Full Time Equivalent *(FTE) Employment at Facilitated Development Sites-Jobs*

Site	Retail (A1-3)	B1c	B1a	Education	Care	Community (D1)	Total
Perryfields	40	732		33	120		925
Whitford Rd	23						23
Foxlydiate	51			50	20	6	127
Brockhill	55						55
Total	170	732		83	140	6	1,131

Table 5.13: Gross GVA per annum at Facilitated Development Sites

Site	GVA p.a. (£'000s, 2019 Prices)
Perryfields Road	52,710
Whitford Road	641
Foxlydiate	3,490
Brockhill	1,554,438
Total	**58,396**

The outcome of this assessment is unchanged since the OBC stage because S106 contributions are unchanged. Further detail on derivation of these development-related impacts is provided in Appendix E.1 (Economic Impacts Report).

Place Based Analysis: By unlocking the sites listed in this assessment and the associated increase in GVA, the A38 BREP will fundamentally contribute towards an increased popularity of the Bromsgrove District. This has the potential to result in further gentrification in other areas outside of the specified developments, and potentially present further opportunities for levelling up.

5.6.2 Social Impacts

5.6.2.1 Physical Activity

5.6.2.1.1 Methodology

Phase 3 Schemes A to F include highways schemes that propose hybrid highway capacity and active mode improvements. The highway improvements are anticipated to have little to no effect upon Physical Activity (and therefore are excluded from this assessment), however, the active mode enhancement elements of the schemes are considered in the assessment. Hence, Schemes B to F are included as they contain active modes enhancements, while Phase 3 Scheme A is not included as it does not include any active mode elements (Paragraph 2.1 of Appendix E.9 - Physical activity AMAT presents the full details of active mode enhancements included in Phase 3 schemes). Phase 2 early delivery Schemes 2a, 2b and 4 are not included as already built. Phase 4 schemes (Schemes G, 1, 5 (footbridge) and parts of Schemes A and B) are removed from all aspects of this business case including this assessment.

The assessment of physical activity provided at SOC stage was based on assumptions about levels of walking and cycling. For OBC and FBC stages, baseline walking and cycling count data has been utilised. Comprehensive pedestrian and cycle surveys were undertaken in February 2020 (pre-Covid Lockdown). Count locations along the A38 stretched from the junction with Four Oaks Drive (to the north) to Buntsford Drive (to the south).

As pedestrian and cyclist improvements to the A38 corridor are comprehensive (new crossings, upgraded crossings, new segregated lane provision etc), it has been assumed that every pedestrian or cyclist interacting with the A38 will incur a benefit. Where new schemes have been added after the OBC submission (the new Schemes 3 and 9 active mode corridor enhancements) and where no count data was available, a catchment area method was adopted.

Analysis of raw count data has been undertaken to identify unique pedestrians and cyclists interacting with the A38 corridor, so that duplicate benefits are not claimed.

The Propensity to Cycle Tool (PCT) has been used to forecast cycle demand once the scheme is implemented. The number of cyclists in the Government Target, near market (govnearmkt_slc) figure has been extracted for the relevant Middle Super Output Areas (MSOAs) in Bromsgrove.

The schemes have been assessed using the May 2022 version of DfT's Active Mode Appraisal Toolkit (AMAT). Due to the nature of individual location-based interventions, how they work together to provide an improved overall package on the A38 corridor, and considering the availability of count data, schemes have been assessed as two packages of investment:

- Schemes B to F, and Scheme 6 have been assessed as one package, to avoid double counting of benefits, and over representation of any one scheme.

- Scheme 3 and Scheme 9 are grouped together and assessed based on a 200 metres catchment area method.

Due to the nature of the scheme to be provided, east-west movements across the A38 corridor (currently a significant barrier to movement) and north-south movements adjacent to the A38 have all been considered.

Further information on the approach to physical activity including assumptions and impacts is provided in Appendix E.1 (Economic Impacts Report) and Appendix E.9 (Physical activity AMAT).

5.6.2.1.2 Assessment Outcome

The estimated impact on increased physical activity levels has been estimated and monetised as part of the economic analysis, using the Active Mode Appraisal Toolkit, and is valued at **£19,479K** (2010 prices and values) (this figure only includes reduced risk of premature death and absenteeism. If all other active mode impacts are considered then the total figure increases to £22,292K). This value has reduced from £24,638k (or £28,314K if total active mode impacts are considered) in the OBC stage, largely due to the removal of Phase 4 Schemes G, 1 and 5 (footbridge), in addition to the replacement of the OBC stage Scheme 3 footbridge with the FBC stage Scheme 3 active mode corridor improvements.

The physical activity impacts are considered to be **Moderate Beneficial.**

Place Based Analysis: The significantly improved walking and cycling facilities provided a more connected experience by reducing the requirement to use cars to access local services and Bromsgrove Rail Station. Social welfare will be improved through the health benefits captured in this assessment.

5.6.2.2 Journey Quality

5.6.2.2.1 Methodology

TAG unit A4.1 identifies three main components of journey quality as follows:

- Traveller Care – This focuses on the general transport environment such as cleanliness, facilities, the provision and quality of information, smoothness of the ride and the extent of overcrowding.
- Travellers View – Largely based on the views of both the townscape and landscape during the journey.
- Travellers Stress – This is based on the convenience of the journey including the ease of using the route, and levels of congestions.

The guidance suggests that the assessment of Journey Quality Impacts should be considered neutral if most or all the sub factors are classed as neutral or if the positive aspects of certain subfactors are counteracted by the negative impacts within other sub factors. If the Journey Quality is classed as being beneficial or adverse then the severity of this is assessed against how many travellers are likely to be affected, a slight adverse classification would be attributed if only a low number of traveller's Journey Quality were impacted by the scheme.

The schemes were assessed against these three main components from both a highway and active mode perspective. Mode shifts is excluded from final assessment because the results all show as benefits and therefore the final assessment will not double count benefits.

5.6.2.2.2 Assessment Outcome

Based on the analysis, the main benefits of the scheme are from reducing traveller stress by providing a safer and more reliable Highway, Active Mode and public transport network, with schemes in place to combat the congestion of future years. There is unlikely to be much impact on traveller views. Both sets of schemes will be designed to the latest standards and guidance making sure that traveller care is at the forefront of each design.

The overall impact of the Highway and Active Mode schemes on journey quality is anticipated to be **Moderate Beneficial.** This is unchanged since the OBC submission because the A38 BREP Phase 3 scheme still provides improvement in journey quality, even with the removal of Phase 4 Schemes 1, 5 and G.

The estimated impact on journey quality levels has been estimated and monetised as part of the economic analysis, using the AMAT and is valued at **£2,259k PVB**, which is slightly reduced from the OBC value of £2,962k due to the removal of Phase 4 Schemes G, 1 and 5 (footbridge)**.**

5.6.2.3 Collisions

5.6.2.3.1 Methodology

The impact of accidents assessed using COBALT version 2.1.0.0. COBALT is the Department for Transport's (DfT) software for assessing the impact of a scheme on accidents.

Default COBALT parameters were used to estimate a monetary value for the prevention of these collisions. The modelled forecast years 2025 and 2040 were used and the results extrapolated to cover a full 60-year appraisal period.

The COBALT study area matches the FMA, as presented in Figure 5.5. This has been updated for the FBC, as the OBC previously only included selected links within the AoDM.

Observed collision data, covering the mapped area, were obtained from the DfT STATS19 database. The data provides information on location, date, and severity of each collision. It was mapped onto the network to provide the number of accidents on each COBALT link, by year, for the five years from February 2015 to January 2020, inclusive. This assessment utilised pre COVID-19 pandemic safety data, as more recent data might not show accurate levels of collisions on the network due to the numerous lockdowns on the highway network's traffic levels.

Across the Bromsgrove and Catshill area, a total of 215 accidents were observed between February 2015 and January 2020. Of the 215 accidents observed across the COBALT network, 2% (4 accidents) were fatal, 18% (39 accidents) were serious and 80% (172 accidents) were slight. Whilst 215 accidents were observed across the COBALT network, 79 were observed along A38 study area (this includes the junction approaches). Further information on the collisions along the A38 study area is provided in the Strategic Dimension (Chapter 3).

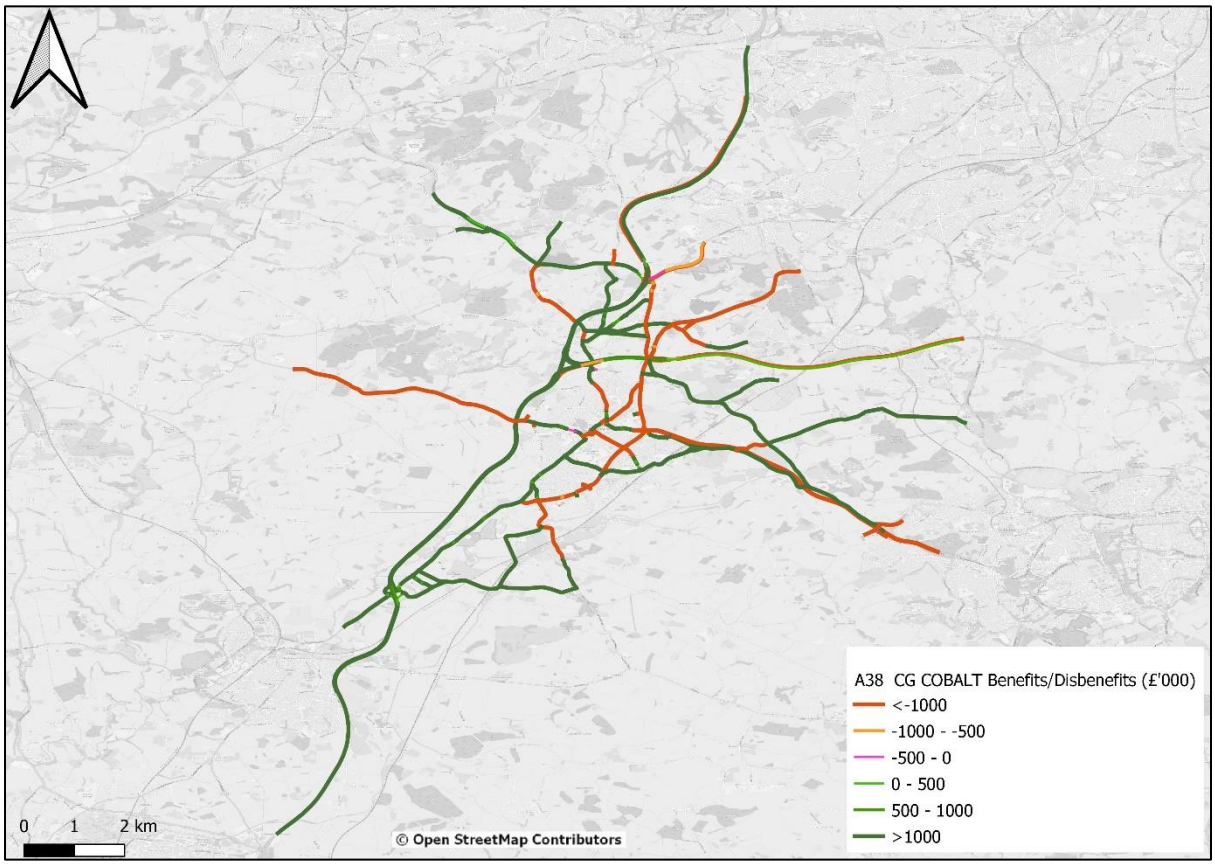
5.6.2.3.2 Assessment Outcome

Table 5.14 sets out the results from the economic appraisal run in COBALT software. Detailed analysis and assumptions can be found in Appendix E.1 – Economic Impacts Report. Figure 5.7 shows the location of accident impacts across the FMA.

Table 5.14: COBALT results (over a 60-year appraisal period) (Costs and benefits discounted to 2010, £'000s)

COBALT Economic Summary *Costs and benefits discounted to 2010 (£'000s).*		
Total Without-Scheme Accident Costs (£'000s)		401,306.42
Total With-Scheme Accident Costs (£'000s)		390,628.92
Total Accident Benefits Saved by Scheme (£'000s)		10,677.50
Accident Summary		
Total Without-Scheme Accidents		9,455.27
Total With-Scheme Accidents		9,155.50
Total Accidents Saved by Scheme		299.77
Casualty Summary		
Total Without-Scheme Casualties	Fatal	102.0
	Serious	1,156.0
	Slight	11,992.5
Total With-Scheme Casualties	Fatal	100.7
	Serious	1,126.0
	Slight	11,633.6
Total Casualties Saved by Scheme	Fatal	1.3
	Serious	30.0
	Slight	358.8

Figure 5.7: COBALT Benefit Map



Fatal, slight, and serious accidents are all predicted to decrease. The proposed scheme provides a benefit of **£10,678K PVB** and a total accidents savings of 299.8 over 60 years. The accident impacts are considered to be **Moderate Beneficial**. The PVB has significantly increased from the OBC value of £5,499K because of the inclusion of a wider study area.

It should be noted that although implicit in the assessment using COBALT as it considers historic accident records and forecasts changes to rates with a scheme in place, it will not explicitly take into account that the scheme includes specific provision of improved facilities that will assist people in crossing the A38, and in particular the most vulnerable road users. This is, however, captured in the assessment of severance.

5.6.2.4 Security

5.6.2.4.1 Methodology

The security assessment has been undertaken in accordance with Chapter 4 of TAG Unit A4.1 guidance and assesses how the schemes will impact the level of security for transport users.

The TAG chapter sets out six indicators for security impacts:

- Site perimeters, entrances and exits - Schemes consists of highway, walking & cycling proposals to which this indicator is not relevant.
- Formal surveillance - Schemes consists of highway, walking & cycling proposals to which this indicator is not relevant.
- Informal surveillance - The proximity to human activity will not be changed.
- Landscaping - Landscaping elements will be considered as part of the scheme but will only be a very small consideration.
- Lighting and visibility - Lighting has been a consideration of the scheme and will be improved in some instances.
- Emergency call - Schemes consists of highway, walking & cycling proposals to which this indicator is not relevant.

Based on the above, 'Informal Surveillance', 'Landscaping' and 'Lighting and Visibility' are considered within the Security assessment for the A38 BREP Phase 3 scheme. As 'Site perimeters. Entrances and exits', 'Formal surveillance', and 'Emergency call' are predominantly to do with public transport schemes they have not been considered further.

5.6.2.4.2 Assessment Outcome

The designs for the Highways and Active Mode schemes have been designed to the relevant standards and guidance. It is expected that these will maintain the existing levels of Security at each of the scheme locations, potentially with some improvements in certain areas.

The overall impact of the Highway and Active Mode schemes on security is anticipated to be **Neutral**. This is unchanged since the OBC submission as there are no additional security provisions.

5.6.2.5 Accessibility

5.6.2.5.1 Methodology

Within the Accessibility chapter of TAG Unit A4.1, it specifies the five key barriers impacting on accessibility in 'Making the Connections' (Social Exclusion Unit, 2003):

- The availability and physical accessibility of transport - For some people in isolated urban and rural areas there are limited or no public transport services or the services are unreliable, or do not go to the right places or at the right times.

- Cost of transport - Some people find the costs of personal or public transport very high or unaffordable.
- Services and activities located in inaccessible places - Developments including housing, hospitals, business and retail are often located in areas not easily accessible to people without a car.
- Safety and security - Some people will not use public transport or walk to key services because of the fear of crime or anti-social behaviour.
- Travel horizons - Some people are unwilling to travel long journey times or distances or may not know about or trust transport services.

Building on this, accessibility may be presented as reflecting the range of opportunities and choices people have in connecting with jobs, services and friends and families. The level of access will depend on where people choose to live, where services are located, and the availability of 'home delivery' of goods or services. It is also about the availability and affordability of transport; providing journeys that are appropriate in terms of time and cost. Improving accessibility can be achieved through one or a combination of these elements.

The Highway schemes associated with this programme will not be investigated as 'Accessibility' focused on individuals without access to a car.

5.6.2.5.2 Assessment of Outcome

Based on the five key barriers set out in Accessibility chapter of TAG Unit A4.1, the Active Mode schemes and highway schemes with active mode elements are anticipated to have a slight beneficial impact upon availability and access to transport, as well as access to services and activities.

Regarding access to transport, Schemes 3, 6, and 9 are making connections to Bromsgrove Rail Station easier for those not using a private vehicle. Schemes 7 and 8 make improvements to bus stations and primary routes between the Town Centre and the Rail Station. This then allows access to cities such as Birmingham and Worcester. All of the schemes are also linking residential areas to the town centre and employment areas, which prior to their implementation have been more difficult to access.

As Scheme 3 is an 'enhanced' connection then this will provide an accessibility benefit to those residents living nearby. With regards to safety and security, there will be a slight beneficial impact as the new schemes will not make the existing situation worse but provide an improvement. As these Active Mode schemes do not involve public transport measures, the cost of transport and travel horizons has not been assessed.

The Active Mode schemes, Highway schemes with active mode elements, and public transport schemes of A38 BREP Phase 3 are expected to improve access across the A38 corridor and provide links to facilities and services. Therefore, the overall impact is anticipated to be **Slight Beneficial.** This is unchanged since the OBC submission as the benefits of the scheme are still realised for Phase 3, even with the omission of the Phase 4 elements (Scheme 1, 5 and G).

5.6.2.6 Affordability

5.6.2.6.1 Methodology

One of the recommended approaches to measure relative affordability is to use the Index of Multiple Deprivation (IMD). The most recent measure of IMD across England was undertaken in 2015 and are based on LSOAs (Lower-layer Super Output Areas). These are small areas with a similar population size and approximately 1,500 residents or 650 households. The IMD itself is based on seven domains of deprivation as follows:

- Income Deprivation (22.5%).
- Employment Deprivation (22.5%).
- Education, Skills and Training Deprivation (13.5%).
- Health Deprivation and Disability (13.5%).
- Crime (9.3%).
- Barriers to Housing and Services (9.3%).
- Living Environment Deprivation (9.3%).

Each LSOA is ranked – with 1 being the most deprived across England with the 32,844 being the least deprived. The LSOAs are divided into 10 equal groups with LSOAs in decile 1 fall within the most deprived 10% of LSOAs nationally and LSOAs in decile 10 fall within the least deprived 10% of LSOAs nationally.

5.6.2.6.2 Assessment Outcome

This analysis demonstrates that there will be no change in costs to users with regards to the Highway schemes. Charges such as car fuel/non-fuel costs, public transport fares, and walking and cycling fares not expected to change.

For the active mode schemes, those who have been attracted to travel by more sustainable methods rather than via private vehicle will see a reduction in their car fuel and non-fuels costs. Bus and Rail fares are not expected to be affected by the schemes.

The assessment against several factors indicates there will be beneficial affordability impacts from car fuel and non-fuel costs, and with regards to active travel modes. Existing public transport fares will not be affected by the schemes. As 2,000 additional future daily walking and cycling trips (on an average weekday) are being positively affected in respect of personal affordability, the overall impact of the schemes on personal affordability is anticipated to be **Slight Beneficial.** This is unchanged since the OBC submission as the benefits of the scheme are still realised for Phase 3, even with the omission of the Phase 4 elements (Scheme 1, 5 and G).

5.6.2.7 Severance

5.6.2.7.1 Methodology

Severance is defined as the separation of residents from facilities and services they use within their community caused by substantial changes in transport infrastructure or by changes in traffic flows.

Severance primarily concerns pedestrians, cyclists, and horse riders. To ensure a consistent approach, classification should be based on pedestrians only. The impact of Severance on cyclists will differ for two reasons: they travel more quickly; and crossing facilities may not be available to them.

Severance is only considered to be an issue where either vehicle flows are significant enough to impede pedestrian movement or where infrastructure presents a physical barrier to movement. In this case, the infrastructure implemented as a part of the A38 BREP Phase 3 scheme (specifically the Active Mode Schemes) will reduce severance along the A38 corridor.

5.6.2.7.2 Assessment Outcome

Table 5.15 sets out the assessment of the Active Mode Schemes with regards to Severance. The new schemes relieve existing severance issues. With the combined number of

additional future walking and cycling trips (over 2,000 daily) provision of these elements the scheme is expected to have a **Moderate Beneficial** impact on severance, relative to existing conditions

Highway Schemes have not been assessed for their impact on Severance as the impact is considered to be neutral. No additional physical barriers to movement will be provided and the increase in vehicle flows will be negligible, therefore there will not be an additional impediment to pedestrian movement. In the 2040 AM period modelled scenario, the flows along the A38 are anticipated to increase by up to 473 vehicles per hour in the AM peak and 530 vehicles per hour in the PM peak in the northbound direction. In the southbound direction, the A38 will experience an increase of up to 440 vehicles per hour in the AM peak and up to 476 vehicles per hour in the PM Peak. There are appreciable increases in flow of up to 789 vehicles along the A448 between the A38 and Redditch due to the scheme. These increases are due primarily to traffic re-routeing from alternative routes (B4096, B4184) that experience a reduction in flows and using the A448 to access the A38

Table 5.15: A38 BREP Severance Impacts and Mitigation (Active Mode schemes)

Scheme	Severance Impact	Notes
3	Moderate Beneficial	As this infrastructure is new, it is reducing an existing Severance issue.
6	Slight Beneficial	As this infrastructure is new, it is reducing an existing Severance issue.
9	Moderate Beneficial	As this infrastructure is new, it is reducing an existing Severance issue.

Scheme 6 has been rated as ‘slight beneficial’ as no such crossing infrastructure exists at this location, but the intervention is minor. Scheme 3 has been rated as ‘moderate beneficial’ as the intervention involves provision of significant new pedestrian and cycle infrastructure which will impact residents crossing the A38 corridor.

The A38 MRN Active Mode Impact Assessment also recognises that the A38 is a cause of Severance in Bromsgrove. Implementing these schemes will have a positive effect on Severance within the town to cross this route. In total, over 2,000 new pedestrian and cycle future trips (on an average weekday) will benefit from reduced severance, in addition to all existing pedestrians and cyclists.

With the combined number of additional future walking and cycling trips at over 2,000 daily, provision of these elements as part of a wider scheme is expected to have a **Moderate Beneficial** impact on severance, relative to existing conditions. The existing PRoW and NCN cycle networks will not be affected.

The level of benefit has reduced from the OBC stage due to the removal of Phase 4 Schemes 1 and 5 (footbridge).

5.6.2.8 Option and Non-use Values

Option and Non-Use Values have not been assessed as a part of A38 BREP Phase 3 Social Impact Appraisal. Chapter 7 of TAG Unit 4.1 states that Option and Non-Use Values should be assessed if the scheme being appraised includes measures that will substantially change the availability of transport services within the study area.

As the schemes that form the A38 BREP Phase 3 will not substantially change the availability of transport services within the study area these values shall not be assessed.

5.6.3 Environmental Impacts

5.6.3.1 Air Quality

5.6.3.1.1 Methodology

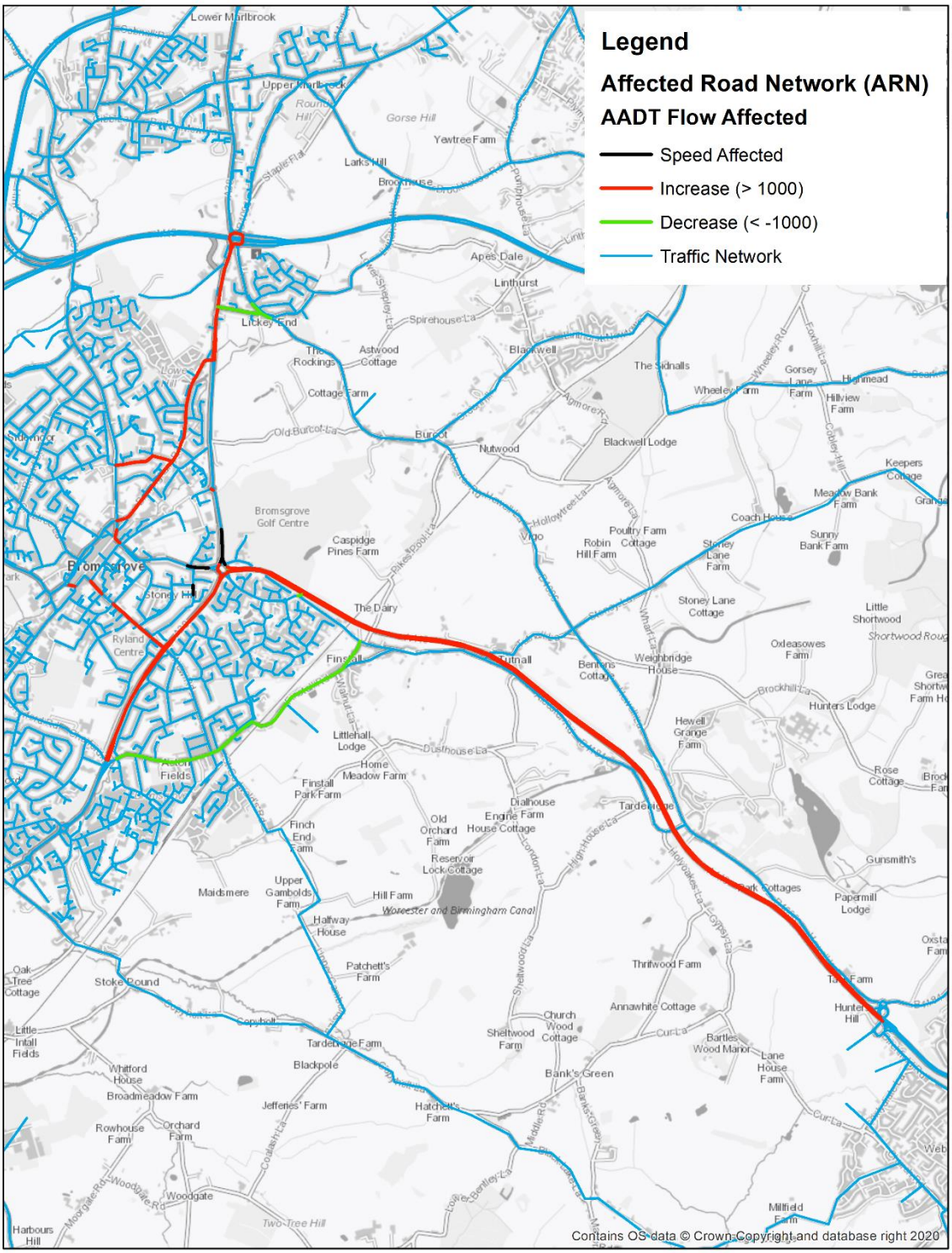
In accordance with TAG Unit A3 as the proposed scheme is unlikely to affect legal pollution limits and air quality impacts are unlikely to have a Net Present Value (NPV) greater than £50,000K (due to the size and nature of the proposed scheme), then the damage costs approach has been used to value the impact of the proposed scheme on local air quality.

As a result, emissions of oxides of nitrogen (NOx) and particulate matter less than 2.5 µm in diameter (PM2.5) have been estimated for the Opening Year (2025) and Future Assessment Year (2040) Do Minimum and Do Something scenarios, using Defra's Emission Factors Toolkit (EFT), version 11. AM, IP, PM, and OP period flows of LDVs and HDVs and average speeds were input to the EFT.

Emissions have been estimated for the extent of the Affected Road Network (ARN) presented in Figure 5.8 below, defined in accordance with the criteria defined in DfT Design Manual for Roads and Bridges (DMRB) LA 105 Air Quality guidance. The red links have increases in AADT more than 1000, and green have decreases in AADT less than -1000. The black links are also included in the ARN because the speed band has changed.

These emissions estimates have been entered into the TAG Air Quality Valuation Workbook, as shown in Appendix E.2 (Air Quality Valuation Workbook).

Figure 5.8: Air Quality Study Area



5.6.3.1.2 Assessment Outcome

As a result of the Proposed Scheme reducing congestion and therefore increasing the attractiveness of the network, traffic flows and emissions along the A38 and A448 are anticipated to increase. Therefore, estimated increases in emissions are anticipated by 108 tonnes of NOx and 20 tonnes of $PM_{2.5}$ (over a 60-year appraisal period).

The total value of the change in air quality is estimated to be **- £888K PVB** (-£351 K PVB for NOx and - £537K PVB for $PM_{2.5}$). This is a larger disbenefit than the OBC value of -£784k PVB, largely due to the updated EFT.

The AQ study area focused on areas of greatest potential negative impact linked to the current concentration levels, with generally more receptors placed in these locations as a means of ensuring confidence in properly capturing any impacts in these areas. These areas are often in locations which will experience the worse impact when linked to any change in traffic demand. For example, in Bromsgrove, most of the AQMAs are on the A38 corridor. It is not expected nor proportionate to include similar numbers of receptors in locations where lower concentrations of pollutants exist. This means the AQ assessment is inherently negatively weighted – and so there are areas where air quality will have improved and have been excluded from the assessment as a result of the need to maintain a proportionate approach and conservative outcome.

A detailed air quality assessment undertaken to support this business case indicates there would be no exceedances of relevant air quality objectives at any modelled human health receptors in the opening year, either with or without the proposed scheme. The assessment also indicates that the proposed scheme is unlikely to have a significant effect on national compliance with the annual mean NO_2 air quality Limit Value. As such, and in accordance with DMRB LA 105, the air quality impacts of the Proposed Scheme are considered to be **Neutral**.

It is anticipated that whilst there is an overall increase in emissions of air pollutants, the scheme represents a slight betterment in emissions per vehicle kilometre travelled.

5.6.3.2 Noise

5.6.3.2.1 Methodology

A quantitative noise assessment has been undertaken using a 3D noise model, which considered a combination of topographical and Lidar data. The noise model Study Area has been determined through review of the initial traffic model outputs following the criteria in DMRB LA 111. The proposed Phase 3 schemes do not result in any obvious bypassed routes; therefore, the Study Area has been taken as a 600m buffer around the proposed scheme and sections of the A38 linking the proposed scheme together.

In accordance with TAG Unit A3, noise modelling has been undertaken to predict noise levels at all noise sensitive receptors within the Study Area. Impacts have been estimated for the Opening Year (2025) and Future Assessment Year (2040) Do Minimum and Do Something scenarios.

The latest TAG Noise Workbook at the time of the assessment has been used to undertake the following comparisons for the FBC stage for both daytime and night-time periods.

Night-time noise levels have been derived from the predicted daytime noise levels using the Method 3 conversion technique described within the Transport Research Laboratories report “Converting the UK traffic noise index LA10,18h to EU noise indices for noise mapping”. The completed Noise Workbook, provided in Appendix E.3 (Noise Workbook), provides the Net Present Value and Net Annoyance which are summarised below and in the reported in the Appraisal Summary Table.

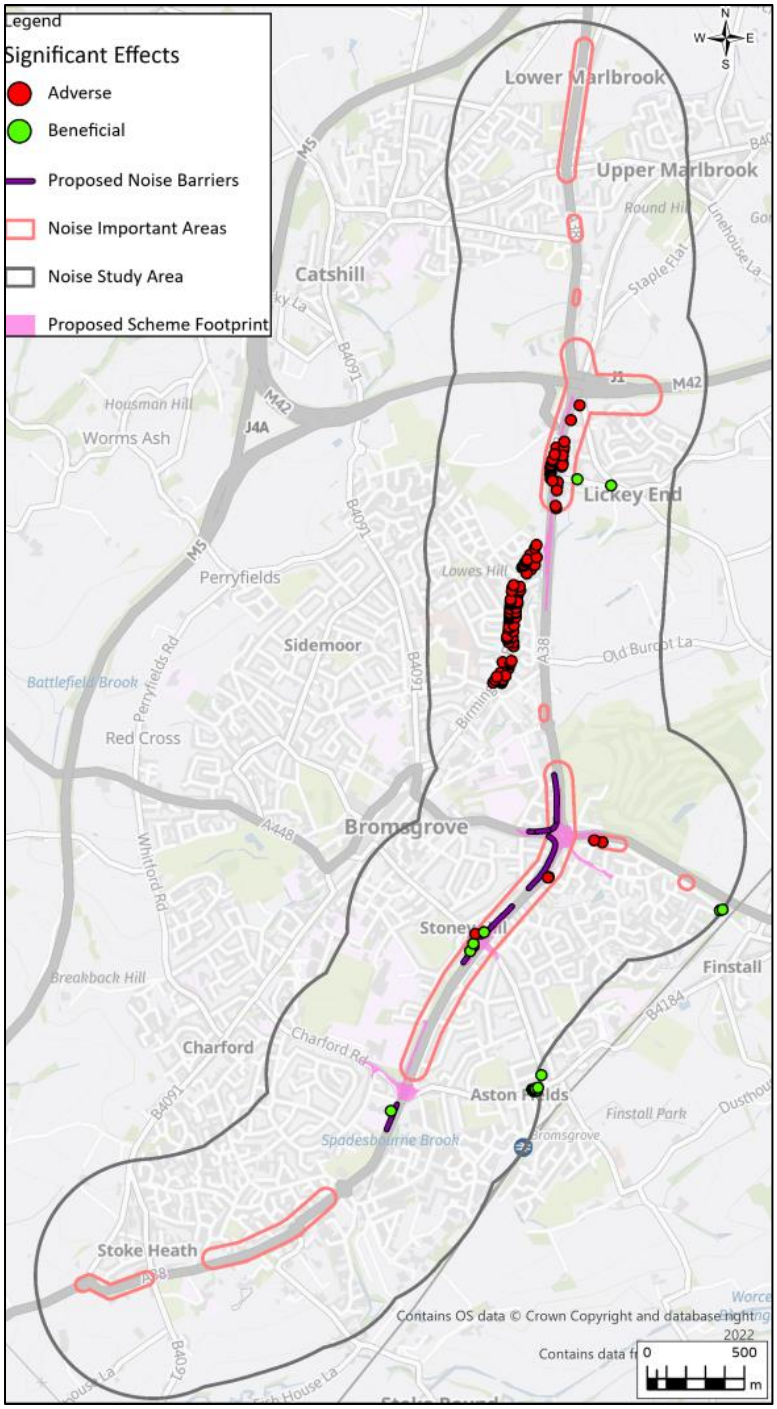
The noise assessment was based on the use of 18hr (06:00 – 00:00) Annual Average Weekday Traffic Flow data.

The Study Area, presented in Figure 5.4, was derived in accordance with the guidance in DMRB LA 111.

There were very few routes with changes of 1 dB or more observed outside of the Study Area. Upon further interrogation, it was concluded that significant effects arising from these

routes were unlikely; therefore, assessment of Basic Noise Level changes beyond the Study Area was not undertaken for the proposed scheme.

Figure 5.9: Noise Assessment Study Area



5.6.3.2.2 Assessment Outcome

Day time noise levels have been predicted in accordance with the procedures set out in the "Calculation of Road Traffic Noise" and "Design Manual for Roads and Bridges LA 111 Revision 2". Night-time noise levels have been derived through using TRL report "Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping", Method 3.

Analysis of the predicted daytime noise levels indicates that 188 dwellings would indicatively be expected to meet the noise insulation eligibility criteria contained in the Noise Insulation Regulations 1975 (as amended 1988).

The number of properties predicted to experience 55dB $L_{,night}$ or greater in the future assessment year is 1632 with the scheme in place, and 1531 without the scheme in place. Therefore, there are 101 more properties above the night-time SOAEL with the scheme in place.

Zero properties are predicted to experience 80dB $L_{Aeq,16h}$ or greater in the future assessment year with the scheme and zero without the scheme in place.

Of the 140 non-residential sensitive receptors assessed in the short term, nine are expected to experience an adverse impact of minor magnitude or greater, whilst three are expected to experience a beneficial impact of minor magnitude or greater. In the long term, there are zero expected to experience an adverse impact of minor magnitude or greater and one expected to experience a beneficial impact of minor magnitude or greater.

The total value of the change in noise quality is estimated to be **-£4,629K PVB.** This disbenefit has increased from the OBC value of -£3,755k, largely due to the exclusion of parts of Scheme B (approximately 100m of highway widening on approach to Buntsford Drive roundabout up to the A38/Sherwood Road Roundabout has been moved to Phase 4).

Scheme B includes widening of the A38 and removal of some of the bund to the northwest of the A38, with noise sensitive receptors directly behind. Prior to the OBC, Scheme B was assessed as part of the full scheme; where it was found that the Scheme B caused potential significant adverse noise effects. Therefore, a noise barrier was proposed for Scheme B. The barrier was very effective as it's in an ideal location very near to the road, and with receptors close behind. Hence the proposed barrier actually changed the assessment for the nearby receptors from experiencing potential significant adverse effects, to experience significant beneficial effects. The OBC assessment therefore predicted large benefits (in terms of TAG) in the vicinity of Scheme B. Noise levels are very high in this location, and so the TAG assessment would assign a large valuation to each of those receptors as benefits "weigh" more when noise levels are high, than they do when noise levels are low.

For the FBC, part of Scheme B has moved from Phase 3 to Phase 4 along with its associated noise barrier, and so the impacts in the vicinity of Scheme B are basically negligible. By removing Phase 4 Scheme B and its barrier, the benefit described above no longer exists. The cause of the disbenefits in the area is due to the fact that the scheme encourages additional traffic along the corridor.

5.6.3.3 Greenhouse Gases

5.6.3.3.1 Methodology

Emissions of carbon dioxide (CO_2) have been estimated for the Opening Year (2025) and Future Assessment Year (2040) Do Minimum and Do Something scenarios using Defra's Emission Factors Toolkit (EFT), version 11, for all road links within Traffic Reliability Area. In order to derive CO_2 emissions on an annual basis over the required 60-year appraisal period, estimated CO_2 emissions have been linearly interpolated between the Opening Year and Design Year and assumed to remain constant thereafter. Estimated annual emissions of CO_2 in the Do Minimum and Do Something scenarios have been entered into the TAG Greenhouse Gases Workbook, as shown in Appendix E.4 (Greenhouse Gases Workbook).

The GHG study area includes the entire traffic model FMA as shown in Figure 5.5.

5.6.3.3.2 Assessment Outcome

Whilst the proposed Phase 3 schemes are expected to relieve congestion in some locations, and therefore reduce GHG emissions in these areas, the proposed schemes are anticipated to result in an increase in vehicle kilometres travelled on the network and therefore a resultant increase in Greenhouse Gas emissions. In the Scheme Opening Year the GHG emissions are anticipated to rise by 0.3%, which is therefore considered to be negligible. The 0.3% increase in GHG emission (Opening Year) is compared to an increase of 0.4% in vehicle kilometres travelled, demonstrating that the scheme represents a slight betterment to GHG emission per vehicle kilometre travelled. An estimated increase in emissions (over a 60-year appraisal period) of 97,059 tonnes of CO_2 is anticipated.

The total value of the change is estimated to be **-£7,210K PVB.** Note that during construction and maintenance, there is anticipated to be a further -£68k of disbenefit. These disbenefits have significantly increased from the OBC value of -£2,912k, largely due to the increased values of carbon and more pessimistic Electric Vehicle projections in the EFT. The EFT approach replaces the TAG approach which was used at OBC.

5.6.3.4 Townscape

5.6.3.4.1 Methodology

A qualitative assessment has been undertaken using the townscape worksheet in line with the guidance set out in TAG Unit A3 section 7.

This TAG assessment has been produced to assess the likely impacts arising from the cumulative scheme on local-level townscape. For the purpose of this assessment, site-level townscape effects have been adapted for the local-level. The assessment considers the impacts on townscape as resource in its own right.

The assessment of local-level townscape impacts has been based on the combined geographical extents of Landscape Description Units (LDUs) MW129 and MW130 identified within the regional and local-level landscape character assessment (Worcestershire Landscape Character Assessment, 2020). Judgement of impact includes townscape effects occurring after all mitigation measures have been considered ('residual effects') following an appropriate environmental and landscape design to achieve a 'best fit' within the townscape. An assessment of night-time effects has not been included as part of this assessment.

5.6.3.4.2 Assessment Outcome

The overall impact on the townscape is anticipated to be **Neutral** as the cumulative scheme does not quite fit with the overall character of the townscape. Further information on the assessment and outcomes is provided in the Environmental Report (Appendix S.3) and Appendix E.5 (Townscape Worksheet). This has improved since the OBC rating of ‘slight adverse’ due to the removal of Phase 4 schemes that were included in the OBC stage (Schemes G, 1, 5 (footbridge) and the replacement of the OBC stage Scheme 3 (new footbridge) with the FBC stage Scheme 3 active mode corridor improvements.

Place Based Analysis: A positive outcome that the significant connectivity benefits can be achieved without negative impact on the townscape.

5.6.3.5 Historic Environment

5.6.3.5.1 Methodology

A qualitative assessment has been undertaken using the historic environment worksheet in line with the guidance set out in TAG Unit A3 section 8. This considers the key historic environmental resources within the vicinity of the scheme.

5.6.3.5.2 Assessment Outcome

A heritage asset is defined by the National Planning Policy Framework (NPPF) as “a building, monument, site, place, or landscape identified as having a degree of significance meriting consideration in planning decisions, because of its heritage interest”.

Heritage assets include designated assets (World Heritage Sites, Scheduled Monuments, Listed Buildings, Conservation Areas, Registered Parks and Gardens, Registered Battlefields and Registered Historic Wrecks) and non-designated assets identified by the Local Planning Authority (for example: locally listed buildings, archaeological sites and monuments and historic landscapes).

Key heritage assets have been identified and all potential impacts are characterised. Where relevant, constraints that could influence design, programme, construction timing, methods and working areas on site are highlighted.

Appropriate mitigation measures are set out to ameliorate and compensate for the likely impacts during construction and operation, where necessary, to address any potentially significant effects and to ensure compliance of the cumulative scheme with relevant legislation and planning policy.

The overall impact on the historic environment is anticipated to be **Neutral** as the assessment has found that there will be no significant impact to existing heritage assets and no further work is required. This is unchanged since the OBC assessment.

Further information on the assessment and outcomes is provided in the Environmental Report (Appendix S.3) and Appendix E.6 (Historic Environment Worksheet).

5.6.3.6 Biodiversity

5.6.3.6.1 Methodology

A qualitative assessment has been undertaken using the biodiversity worksheet in line with the guidance set out in TAG Unit A3 section 9.

5.6.3.6.2 Assessment Outcome

The overall impact of Phase 3 schemes on the biodiversity is anticipated to have a **Neutral** as the assessment has found that there will be no significant impact to existing biodiversity and no further work is required. This is unchanged since the OBC assessment.

Further information on the assessment and outcomes is provided in the Environmental Report (Appendix S.3) and Appendix E.7 (Biodiversity Worksheet).

5.6.3.7 Water Environment

5.6.3.7.1 Methodology

A qualitative assessment has been undertaken using the water environment worksheet in line with the guidance set out in TAG Unit A3 section 10.

5.6.3.7.2 Assessment Outcome

Multiple surface water features have been identified within the study area. Two are classified by the Environment Agency under the Water Environment Regulations (WER) as 'main rivers' - River Salwarpe and Sugar/Spadesbourne Brook. Both have been assigned as high importance due to their status. All other watercourses have been assigned as a medium importance for surface water quality. For geomorphology impacts, importance for watercourses were assigned within the Environmental Assessment Report (EAR) ([redacted], 2021). One principal aquifer, one secondary A and one secondary B aquifer have been identified within the study area of the cumulative scheme. These are classified as very high, high and medium importance respectively. The cumulative scheme and wider study area has been described as covering all three flood zones but have been classified as low - medium importance due to assumed limited development and/or small floodplains associated with the smaller watercourses. Overall impacts are either of low significance or insignificant providing particular standards and guidance is implemented appropriately. The overall score is neutral as the scheme would result in a combination of effects, some positive (such as reduction in spillage risk) and some negative (increased road runoff through additional impermeable areas), with both positive and negative impacts being minimal.

The overall impact on the water environment is anticipated to be **Neutral** as all impacts are minimal with some positive and some negative impacts. This is unchanged since the OBC assessment.

Further information on the assessment and outcomes is provided in the Environmental Report (Appendix S.3) and Appendix E.8 (Water Environment Worksheet).

5.6.4 Tax Impacts

Tax revenue impacts is calculated from the TUBA transport user impacts output and the QUADRO construction and maintenance outputs. The total tax impact is -**£122K** less tax is collected through fuel consumption. The total tax impact from the OBC was -£357K. This value has changed because of the change in fuel duty linked to updated electric vehicle assumptions in TAG databook v1.20.2.

Table 5.16: Indirect Tax Revenue Breakdown (£'000s)

Indirect Tax Revenue Breakdown	Value (£'000s)
Scheme Operation	-175
Scheme Construction	40
Scheme Maintenance	13
Total	**-122**

5.6.5 Costs

5.6.5.1 Procurement Process

Section 6.6.3 of the Commercial Dimension details how tender returns were evaluated.

Schemes A to F, 6 and 8 have been procured via main works open tender. Assurance processes are defined in WCC's Procurement Code 2022-2023. The Procurement Code provides clear rules that need to be adhered to, based on the Council's Contract Standing

Orders and Financial Regulations, as well as guidance on how to procure in the most effective way.

The contract includes clauses covering liabilities and insurance, defects correction, resolving and avoiding disputes, performance bond, retention, and fair payment.

Evaluation of the tender returns have been carried out in stages Q1 to Q2 and F1 to F2 by discrete groups of evaluators:

- F1: Financial compliance gateway.
- Q1: Quality compliance gateway.
- Q2: Quality Evaluation.
- F2: Financial Evaluation.

Nine suppliers submitted returns at the Standard Selection Questionnaire (SSQ) stage. The 5 suppliers with the highest scores at SSQ stage progressed to the Invitation To Tender (ITT) stage. The 5 suppliers were:

[redacted]

Of these:

[redacted]

[redacted]WCC moved to a negotiated procedure, and they were both invited to submit revised tenders.

Tenders were evaluated as per the evaluation methodology shared with the bidders during the ITT stage (Appendix C.3 of the Commercial Dimension), [redacted] did not progress to any further stages of the evaluation.

[redacted] they are the preferred bidder.

Schemes 3 and 9 will be built using the Infrastructure Engineering Term Contract (IETC). [redacted] is the identified contractor as works for these two schemes fall under the completed design and build work, and the IETC contractor has been doing the technical work and assessment for these two new schemes since the OBC stage. In addition, a quick construction start is required for Scheme 9. Appointment of the engineering term contractor was in accordance with WCC's Procurement Code.

WCC has a framework in place with a number of suppliers for the procurement of on-street displays and associated infrastructure, this framework will be used to procure Scheme 7. Assurance processes are defined in WCC's Procurement Code 2022-2023. The Procurement Code provides clear rules that need to be adhered to, based on the Council's Contract Standing Orders and Financial Regulations, as well as guidance on how to procure in the most effective way.

5.6.5.2 Capital Costs

The Finance Dimension presents an estimate for the implementation of Phase 3 schemes of [redacted] – which is the most conservative approach to calculating the NPV and BCR values within the economic appraisal.

At OBC, the outturn cost was circa £49,800K. The capital cost has changed since OBC because it is now based upon tender costs, and the A38 BREP Phase 3 includes an updated package of schemes.

In line with TAG, sunk costs are excluded in the economic analysis in the case that they are not being retrieved. There are no sunk costs that are not being retrieved, and so the economic outturn costs are consistent with the financial costs presented in the financial dimension.

Baseline cost is a 2023Q1 figure, that is individually calculated with appropriate levels of inflation for each individual scheme before being combined. Further details can be found in the Financial Dimension.

TAG Unit A1.2 specifies that either optimism bias (20%) or p(mean) risk should be applied to the baseline outturn cost - whichever is greater. Since Value of Optimism Bias (OB) ([redacted]) is greater than the QRA Risk Value ([redacted]), OB has been used for estimating investment cost. Therefore, the final capital cost including risk for the purpose of economic analysis becomes [redacted] (excluding whole life costs which are presented subsequently). The breakdown of these costs is presented in Table 5.17 and Table 5.18.

For the Economic Dimension, the costs are discounted in TUBA to 2010 prices and GDP deflation factors applied from DfT's TAG Databook v1.20.2. The resulting value is the 2010 Present Value of Costs, which equates to a Present Value of Costs (PVC) of **£24,654K** for the scheme excluding maintenance costs, or £28,599K including the maintenance (discussed in the subsequent section).

Table 5.17: Summary of Cost Breakdown

[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]

Table 5.18: Economic Costs With and Without OB

[redacted]
[redacted]
[redacted]
[redacted]
[redacted]
[redacted]
[redacted]
[redacted]
[redacted]
[redacted]
[redacted]
[redacted]
[redacted]
[redacted]
[redacted]
[redacted]

Cost assumptions are listed below:

- The appraisal approach identifies cost items that it is considered will change in real terms with respect to the prevailing inflation rate.
- Optimism bias level for capital costs = 20% applied to costs
- Capital expenditure including optimism bias is assumed to be funded by:
    - Central Government ([redacted])
    - Local Government ([redacted])
    - Developer ([redacted])
- Values of time model are drawn from the TAG Databook v1.20.2.
- Value of time is assumed to grow in line with GDP.

Further details can be found in the Financial Dimension.

5.6.5.3 Whole Life Costing

A calculation of the whole life costs of the scheme has been carried out and calculated to be [redacted] (PVC in 2010 values and prices). This has increased from the OBC value of [redacted] (PVC in 2010 values and prices) because a detailed costing exercise has been undertaken and higher inflation values have been assumed. The calculation considers Phase 3 scheme elements only, and so excludes Phase 4 Scheme 1, 5, and G and parts of Schemes A and B.

Whole life maintenance costs were calculated by considering all the additional maintainable items which will be required in the Do Something scenario (i.e. new pavement, signals, vehicle restraint systems, real time information boards, etc), and listing all maintenance associated with the new maintainable items (i.e. resurfacing, antiskid, inspection, replacement, etc). A maintenance regime as detailed in the Financial Dimension Appendix F.3.

The process has been undertaken in line with TAG Unit A1.2. The figure includes inflation, discounting, and optimism bias in line with TAG guidance.

5.7 Overall Summary Table

5.7.1 Level 1 Impacts

The overall level 1 impacts for the core scenario are summarised in the TEE, PA, and AMCB. These are presented in Table 5.19, Table 5.20, and Table 5.21 below. These summarise the impacts of the Highway Schemes and Active Mode Schemes.

Table 5.19: Transport Economic Efficiency Table (£'000s)

Non-business: Commuting	**ALL MODES**		**ROAD**	
User benefits	**TOTAL**		**Private Cars and LGVs**	
Travel time	20,852		20,744	
Vehicle operating costs	-180		-180	
User charges	0		0	
During Construction & Maintenance	-262		-262	
COMMUTING	20,411	*(1a)*	20,302	
Non-business: Other	**ALL MODES**		**ROAD**	
User benefits	**TOTAL**		**Private Cars and LGVs**	
Travel time	15,729		15497	
Vehicle operating costs	903		903	
User charges	0		0	
During Construction & Maintenance	-459		-459	
NET NON-BUSINESS BENEFITS: OTHER	16,173	*(1b)*	15,941	
Business				
User benefits			**Road Personal**	**Road Freight**
Travel time	11,676		4,168	7,485
Vehicle operating costs	1,476		665	811
User charges	0		0	0
During Construction & Maintenance	-592		-221	-371
Subtotal	12,559	*(2)*	4,612	7,925
Private sector provider impacts				
			Road	Bus
Revenue	0		0	0
Operating costs	0		0	0
Investment costs	0		0	0
Grant/subsidy	0		0	0
Subtotal	0	*(3)*	0	0
Other business impacts				
			Road	Bus
Developer contributions	-2,592	*(4)*	-2592	0
NET BUSINESS IMPACT	9,967	*(5) = (2) + (3) + (4)*		
TOTAL				
Benefits (TEE)	46,551	*(6) = (1a) + (1b) + (5)*		

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

Table 5.20: Public Accounts Table (PA) (£'000s)

	ALL MODES		ROAD
Local Government Funding	**TOTAL**		**INFRASTRUCTURE**
Revenue	0		0
Operating Costs	3,945		3,945
Investment Costs	5,724		5,724
Developer and Other Contributions	-2,592		-2,592
Grant/Subsidy Payments	0		0
NET IMPACT	7,077	*(7)*	7,077
Central Government Funding: Transport			
Revenue	0		0
Operating costs	0		0
Investment Costs	21,522		21,522
Developer and Other Contributions	0		0
Grant/Subsidy Payments	0		0
NET IMPACT	21,522	*(8)*	21,522
Central Government Funding: Non-Transport			
Indirect Tax Revenues	122	*(9)*	122
TOTALS			
Broad Transport Budget	28,599	*(10) = (7) + (8)*	
Wider Public Finances	122	*(11) = (9)*	

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.

All entries are discounted present values in 2010 prices and values.

Table 5.21: Analysis of Monetised Costs and Benefits (AMCB) (£'000s)

Noise	-4,629	*(12)*
Local Air Quality	-888	*(13)*
Greenhouse Gases	-7,278	*(14)*
Journey Quality	2,259	*(15)*
Physical Activity	19,479	*(16)*
Accidents	10,678	*(17)*
Economic Efficiency: Consumer Users (Commuting)	20,411	*(1a)*
Economic Efficiency: Consumer Users (Other)	16,173	*(1b)*
Economic Efficiency: Business Users and Providers	9,967	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	-122	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Present Value of Benefits (see notes) (PVB)	66,049	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*
Broad Transport Budget	28,599	*(10)*
Present Value of Costs (see notes) (PVC)	28,599	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	37,450	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	2.309	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.

5.7.2 Level 2 Impacts

The breakdown of the benefits by impact category can be seen in Table 5.22. Phase 3 schemes (A to F, 3, 6, 7, 8 and 9) benefits of **£15,734k** have marginally increased since the OBC value of £14,189k, despite the removal of Phase 4 schemes that were included in the OBC stage (Schemes G, 1, 5 (footbridge) and parts of Schemes A and B). This is attributed to the latest VoT growth factors being adopted and use of the latest version of WITA. The FBC assessment adopted the latest WITA that was available (v2.2), whilst the OBC analysis was undertaken using WITA V2.0 BETA.

Table 5.22: Wider Economic Impacts Summary (Core Scenario)

Wider Impact Type	Benefits £'000s (2010 prices and values)
Imperfect competition impacts	£997
Agglomeration impacts	£13,747
Labour supply impacts	£990
Total	£15,734

The adjusted BCR, as a result of the wider economic impacts, is presented in Table 5.23.

Table 5.23: Wider Economic Impacts Summary

Scenario	Core Scenario £'000s
Present Value of Benefits (PVB)	66,049
Wider Benefits	15,734
Adjusted PVB	81,783
Present Value of Costs (PVC)	28,599
Adjusted Net Present Value (NPV)	53,184
Adjusted Benefit to Cost Ratio (BCR)	2.86
VfM Category	**High**

5.8 Uncertainty Analysis

5.8.1 High and Low Growth Sensitivity

The core scenario presented within this business case is based upon central assumptions of forecast economic conditions. TAG Unit A1.3 requires sensitivity analysis to be undertaken to provide confidence that the proposed schemes will still result in suitable value for money under various alternative assumptions. In the case of this scheme, it was considered appropriate and proportionate to undertake sensitivity analysis under high and low forecast demand growth scenarios.

High and low traffic growth model scenarios were developed. For each modelled scenario, local development is allocated first – then the overall demand is adjusted as per the national growth assumptions. The assumptions are set out in Table 5.24. The calculations are as required by TAG Unit M4.

Table 5.24: Growth assumptions

Growth Type	Low	Core	High
Local Developments	All Near Certain and More than Likely	All Near Certain and More than Likely	All Near Certain, More than Likely, and Reasonably Foreseeable
National Growth Assumptions	As Core – but with total demand reduced by 6.1% in 2025 and 11.5% of the base in 2040.	Constrained to TEMPro central growth	As Core – but with total demand increased by 6.1% in 2025 and 11.5% of the base in 2040.
Active Mode Schemes	No seasonality uplift	Central assumptions, with seasonality uplift	Additional growth assumed for 40 years and inclusion of pedestrians

The high and low traffic growth outcomes fed into further TUBA, COBALT, Noise, Air Quality and Greenhouse Gasses assessments (using similar methodologies as outlined in previous sections).

High and low growth AMAT scenarios have also been developed. For the low growth scenario, no seasonality adjustments were applied. The High Growth scenario assumed growth of walking and cycling uptake will continue for 40 years rather than the default of 20 years.

As per the core assessment, for the high and low growth assessments the AMAT impacts associated with mode shift (congestion, infrastructure maintenance, accident, local air quality, noise, greenhouse gases and indirect taxation) are not included within the Economic Tables to avoid any potential double counting. Table 5.25 presents a comparison of the benefits of the core scenario with the high and low growth scenarios for the combined Highways and Active Mode Schemes. A full breakdown of the analysis is then provided in subsequent sections.

Table 5.25: Sensitivity comparison (£'000s)

Scenario	Core Scenario	Low Growth Scenario	High Growth Scenario
Present Value of Benefits (PVB)	66,049	50,813	80,110
Present Value of Costs (PVC)	28,599	28,599	28,599
Net Present Value (NPV)	37,450	22,214	51,511
Benefit to Cost Ratio (BCR)	2.31	1.78	2.80
VfM Category	High	Medium	High
With Adjusted Benefits	(Level 2)		
Level 2 Wider Impacts	17,734	12,376	18,736
Adjusted PVB	81,783	63,189	98,845
Adjusted BCR	2.86	2.21	3.46
VfM Category	High	High	Very-High

5.8.1.1 Sensitivity Analysis (Low Growth)

The overall level 1 impacts in a low growth scenario are summarised below in the TEE, PA and AMCB This is presented in Table 5.26, Table 5.27, and Table 5.28 below.

Table 5.26: Low Growth - Transport Economic Efficiency Table (TEE) (£'000s)

Non-business: Commuting	**ALL MODES**		**ROAD**	
User benefits	**TOTAL**		**Private Cars and LGVs**	
Travel time	15,290		15,182	
Vehicle operating costs	318		318	
User charges	0		0	
During Construction & Maintenance	-262		-262	
NET NON-BUSINESS BENEFITS: COMMUTING	15,347	*(1a)*	15,238	
Non-business: Other	**ALL MODES**		**ROAD**	
User benefits	**TOTAL**		**Private Cars and LGVs**	
Travel time	9,307		9075	
Vehicle operating costs	203		203	
User charges	0		0	
During Construction & Maintenance	-459		-459	
NET NON-BUSINESS BENEFITS: OTHER	9,051	*(1b)*	8,819	
Business				
User benefits			**Road Personal**	**Road Freight**
Travel time	6,458		3,031	3,427
Vehicle operating costs	345		64	281
User charges	0		0	0
During Construction & Maintenance	-592		-221	-371
Subtotal	6,211	*(2)*	2,874	3,337
Private sector provider impacts				
			Road	Bus
Revenue	0		0	0
Operating costs	0		0	0
Investment costs	0		0	0
Grant/subsidy	0		0	0
Subtotal	0	*(3)*	0	0
Other business impacts				
			Road	Bus
Developer contributions	-2,592	*(4)*	-2592	0
NET BUSINESS IMPACT	3,619	*(5) = (2) + (3) + (4)*		
TOTAL				
Present Value of Transport Economic Efficiency Benefits (TEE)	28,017	*(6) = (1a) + (1b) + (5)*		

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

Table 5.27: Low Growth - Public Accounts Table (PA)(£'000s)

	ALL MODES		ROAD
Local Government Funding	**TOTAL**		**INFRASTRUCTURE**
Revenue	0		0
Operating Costs	3,945		3,945
Investment Costs	5,724		5,724
Developer and Other Contributions	-2,592		-2,592
Grant/Subsidy Payments	0		0
NET IMPACT	7,077	*(7)*	7,077
Central Government Funding: Transport			
Revenue	0		0
Operating costs	0		0
Investment Costs	21,522		21,522
Developer and Other Contributions	0		0
Grant/Subsidy Payments	0		0
NET IMPACT	21,522	*(8)*	21,522
Central Government Funding: Non-Transport			
Indirect Tax Revenues	214	*(9)*	214
TOTALS			
Broad Transport Budget	28,599	*(10) = (7) + (8)*	
Wider Public Finances	214	*(11) = (9)*	

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.

All entries are discounted present values in 2010 prices and values.

Table 5.28: Low Growth - Analysis of Monetised Costs and Benefits (AMCB) (£'000s)

Noise	-2,189	*(12)*
Local Air Quality	-642	*(13)*
Greenhouse Gases	-4,617	*(14)*
Journey Quality	2,166	*(15)*
Physical Activity	18,992	*(16)*
Accidents	9,301	*(17)*
Economic Efficiency: Consumer Users (Commuting)	15,347	*(1a)*
Economic Efficiency: Consumer Users (Other)	9,051	*(1b)*
Economic Efficiency: Business Users and Providers	3,619	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	-214	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Present Value of Benefits (see notes) (PVB)	50,813	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*
Broad Transport Budget	28,599	*(10)*
Present Value of Costs (see notes) (PVC)	28,599	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	22,214	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	1.777	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.

5.8.1.2 Sensitivity Analysis (High Growth)

The overall level 1 impacts in a high growth scenario are summarised below in the TEE, PA and AMCB. This is presented in Table 5.29, Table 5.30, and Table 5.31 below.

Table 5.29: High Growth - Transport Economic Efficiency Table (TEE) (£'000s)

Non-business: Commuting	**ALL MODES**		**ROAD**	
User benefits	**TOTAL**		**Private Cars and LGVs**	
Travel time	23,971		23,863	
Vehicle operating costs	-868		-868	
User charges	0		0	
During Construction & Maintenance	-262		-262	
NET NON-BUSINESS BENEFITS: COMMUTING	22,842	*(1a)*	22,733	
Non-business: Other	**ALL MODES**		**ROAD**	
User benefits	**TOTAL**		**Private Cars and LGVs**	
Travel time	21,921		21689	
Vehicle operating costs	-97		-97	
User charges	0		0	
During Construction & Maintenance	-459		-459	
NET NON-BUSINESS BENEFITS: OTHER	21,365	*(1b)*	21,133	
Business				
User benefits			**Road Personal**	**Road Freight**
Travel time	16,419		4,841	11,578
Vehicle operating costs	1,386		930	456
User charges	0		0	0
During Construction & Maintenance	-592		-221	-371
Subtotal	17,213	*(2)*	5,550	11,663
Private sector provider impacts				
			Road	Bus
Revenue	0		0	0
Operating costs	0		0	0
Investment costs	0		0	0
Grant/subsidy	0		0	0
Subtotal	0	*(3)*	0	0
Other business impacts				
			Road	Bus
Developer contributions	-2,592	*(4)*	-2592	0
NET BUSINESS IMPACT	14,621	*(5) = (2) + (3) + (4)*		
TOTAL				
Present Value of Transport Economic Efficiency Benefits (TEE)	58,828	*(6) = (1a) + (1b) + (5)*		

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

Table 5.30: High Growth - Public Accounts Table (PA) (£'000s)

	ALL MODES		ROAD
Local Government Funding	**TOTAL**		**INFRASTRUCTURE**
Revenue	0		0
Operating Costs	3,945		3,945
Investment Costs	5,724		5,724
Developer and Other Contributions	-2,592		-2,592
Grant/Subsidy Payments	0		0
NET IMPACT	7,077	*(7)*	7,077
Central Government Funding: Transport			
Revenue	0		0
Operating costs	0		0
Investment Costs	21,522		21,522
Developer and Other Contributions	0		0
Grant/Subsidy Payments	0		0
NET IMPACT	21,522	*(8)*	21,522
Central Government Funding: Non-Transport			
Indirect Tax Revenues	-254	*(9)*	-254
TOTALS			
Broad Transport Budget	28,599	*(10) = (7) + (8)*	
Wider Public Finances	-254	*(11) = (9)*	

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.

All entries are discounted present values in 2010 prices and values.

Table 5.31: High Growth – Analysis of Monetised Costs and Benefits (AMCB) (£'000s)

Noise	-5,391	*(12)*
Local Air Quality	-1,076	*(13)*
Greenhouse Gases	-8,534	*(14)*
Journey Quality	2,412	*(15)*
Physical Activity	20,912	*(16)*
Accidents	12,706	*(17)*
Economic Efficiency: Consumer Users (Commuting)	22,842	*(1a)*
Economic Efficiency: Consumer Users (Other)	21,365	*(1b)*
Economic Efficiency: Business Users and Providers	14,621	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	254	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Present Value of Benefits (see notes) (PVB)	80,110	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*
Broad Transport Budget	28,599	*(10)*
Present Value of Costs (see notes) (PVC)	28,599	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	51,511	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	2.801	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.

5.8.2 2050 Horizon Year

A sensitivity test of TUBA including 2050 model results (i.e., using forecast model outputs for 2025, 2040 and 2050) has been run and the overall level 1 impacts for the core scenario are summarised in the TEE, PA, and AMCB (Presented in Table 5.32 below). These summarise the impacts of the Highway Schemes and Active Mode Schemes. The analysis shows the total PVB amounts to £74,534K, NPV of £45,935K resulting in a Level 1 BCR of 2.61. This compares to a PVB of £66,049, NPV of £37,450 and Level 1 BCR of 2.31 reported in the Economic Dimension based on appraising 2025 and 2040 model forecasts outputs in TUBA.

Table 5.32: Analysis of Monetised Costs and Benefits (AMCB) (£'000s)*

Noise	-4,629	*(12)*
Local Air Quality	-888	*(13)*
Greenhouse Gases	-7,278	*(14)*
Journey Quality	2,259	*(15)*
Physical Activity	19,479	*(16)*
Accidents	10,678	*(17)*
Economic Efficiency: Consumer Users (Commuting)	23,068	*(1a)*
Economic Efficiency: Consumer Users (Other)	18,527	*(1b)*
Economic Efficiency: Business Users and Providers	13,002	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	317	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Present Value of Benefits (see notes) (PVB)	74,534	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*
Broad Transport Budget	28,599	*(10)*
Present Value of Costs (see notes) (PVC)	28,599	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	45,935	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	2.606	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.

5.8.3 Risk Profile

An assessment has been undertaken in order to determine the sensitivity of the benefit cost ratio with respect to change in cost. This assessment considers key levels of Benefit Cost Ratio against the risk profile set out in the Quantitative Risk Assessment (detailed in the Financial Dimension, Appendix F.2). Table 5.33 details the risk profile used for this comparison. Prices are converted to 2010 values for consistency with the rest of the Economic Dimension.

Table 5.33: Risk Profile - in 2021 and 2010 prices

A scenario test has been undertaken to demonstrate the impact to the BCR with 80th and 90th percentile costs as well as determining the level of cost change which would be required to move to the next lowest value for money band. As can be seen by the results in Table 5.34, for example, the cost would need to be above the 99th percentile in order for the core scenario BCR to reduce below 2.0. The 80th and 90th percentile risk costs make marginal impacts to the BCR.

Table 5.34: Risk Profile Scenario Test Outcome

PVB (2010 £M) - Core Scenario	**£66,049**	**Scenario Tests**					
BCR Scenario	2.31	2.48	2.37	2.30	2.00	1.50	1.00
PVC (2010 £M)	£28,599	£26,657	£27,882	£28,716	£33,024	£44,032	£66,049
Scenario NPV (2010 £M)	£37,450	£39,391	£38,167	£37,332	£33,024	£22,016	£0
Risk Overspend (2010 £M)	£4,109	£2,167	£3,392	£4,226	£8,534	£19,542	£41,559
Risk Likelihood Percentile	20% OB	Mean	80%	90%	>99%	>99%	>99%
PVB - Low Growth Scenario	**£50,813**	**Scenario**	**Tests**				
BCR	1.78	1.91	1.82	1.77		1.50	1.00
PVC (2010 £M)	£28,599	£26,657	£27,882	£28,716		£33,876	£50,813
Scenario NPV (2010 £M)	£22,214	£24,156	£22,932	£22,097		£16,938	£0
Risk Overspend (2010 £M)	£4,109	£2,167	£3,392	£4,226		£9,386	£26,323
Risk Cost Percentile	20% OB	**Mean**	**80%**	**90%**		>99%	>99%
PVB - High Growth Scenario	£80,110	Scenario	Tests				
BCR	2.80	3.01	2.87	2.79	2.00	1.50	1.00
PVC (2010 £M)	£28,599	£26,657	£27,882	£28,716	£40,055	£53,406	£80,110
Scenario NPV (2010 £M)	£51,511	£53,452	£52,228	£51,393	£40,055	£26,703	£0
Risk Overspend (2010 £M)	£4,109	£2,167	£3,392	£4,226	£15,565	£28,916	£55,620
Risk Cost Percentile	20% OB	Mean	80%	90%	>99%	>99%	>99%

The outcome of this analysis has been summarised as per the requirements of the DfT Value for Money Framework, on a scale as shown in Figure 5.10. The outcome, summarised in Table 5.35, indicates that a **High** value for money is very likely, and there is only just a possible likelihood that the BCR may drop below 2 into the Medium value for money category. However, the value for money is largely stable.

Figure 5.10: Likelihood Scale for VfM Categories (Box 6.1 of VfM Framework)

Table 5.35: Summary of Confidence in the VfM Category

VfM Category	Low	Medium	High	Very High
Likelihood	**Very Unlikely**	**Possible**	**Very Likely**	**Unlikely**
Justification	This would require low traffic growth, and a cost overspend greater than the 99th percentile.	In the core demand scenario, the risk profile would need to be greater than the 99th percentile. However, the low growth scenario could result in a BCR less than two.	It is very likely that there will be a high value for money in the core scenario and in the high growth scenario.	None of the scenarios indicate a very high value for money category.

5.9 Non-Welfare Impacts

Whilst no specific development is dependent on the scheme, S106 contributions have been requested from key developers due to the potential for these developments to put pressure on the existing network. As a result of this link, it is possible to infer some impacts to Gross Value Added (GVA).

The analysis demonstrates that at the larger proposed sites, 5,310 homes, 1,130 gross FTE jobs could lead to an increase in gross GVA per annum which the A38 BREP will support.

A total uplift in GVA is estimated at £58,395K in 2019 prices.

It is acknowledged that there is no formal dependency demonstrated between the sites and the proposed Phase 3 of the A38 BREP in transport modelling terms. Further, the various sites have planning permission prior to delivery of the scheme. As a result, these outputs and outcomes are not included in any BCR calculation. However, given the Section 106 contribution the various developments are required to make to support scheme delivery, it is important to recognise that the scheme has a facilitatory role in realising development. Hence, the analysis above is prepared for indicative purposes, rather than to inform any formal value for money metric.

5.10 Distributional Analysis

The evidence for distributional impacts associated with Phase 3 of the A38 BREP has been accumulated through research originally part of the scheme development process. A proportionate approach has been followed throughout the process, based on consideration of a combination of the size of the scheme, scale of its impacts and the analysis required to achieve levels of detail.

Analyses have been prepared in accordance with TAG Unit A4.2: Distributional Impact Appraisal, which sets out a three-step approach, as follows:

- Step One – Screening: At this stage, the variety of impacts that the scheme might have has been considered and particular impacts are prioritised for further analysis. In the first instance this is to ensure that only the most relevant indicators for the scheme are appraised.
- Step Two – Assessment: Information is collected on the geographical area likely to be affected and how different social and business groups are distributed within that geographical area. This step provides a comprehensive picture of the scheme and its influence areas.

- Step Three – Appraisal: The extent of the impact on social groups is identified, as far as practical and appropriate, taking a proportionate approach to the analysis carried out for each impact.

Full details of the distributional analysis are provided in Appendix E.11 (Distributional Impact Assessment).

5.10.1 Distributional Impacts – Screening

The first step in the assessment process involves undertaking an initial screening of the key impacts. These are specified in TAG Unit A4.2. This is in order to identify those impacts that could potentially be affected by the proposals and any that are unlikely to be affected. Key outcomes and conclusions of the initial screening are summarised in Table 5.36.

Table 5.36: Distributional Impact Assessment – Initial Screening

Impact Area	Initial Screening Outcome	Next Step
User Benefits	Impacts relating to user benefits have been formally modelled and assessed using TUBA. Benefits derived from TUBA can be assessed for distributional impact. Slight Beneficial impact overall.	Progress to Step 2
Noise	Impacts have been modelled for receptors around the scheme, in a study are covering most of Bromsgrove and slightly beyond. Slight Adverse impact overall.	Progress to Step 2
Air Quality	Any change in alignment of transport corridor or any links with significant changes in vehicle flow, speed or %HDV content: Modelling carried out indicates a Slight Adverse impact overall, but with small changes it is not significant.	Progress to Step 2
Accidents	Any change in alignment 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 network. Slight Beneficial impact overall.	Progress to Step 2
Security	Any change in public transport waiting/interchange facilities including pedestrian access expected to affect user perceptions of personal security. Schemes have been designed to the relevant standards and guidance and are expected to maintain the existing levels of security potentially with some improvements in certain areas. Neutral impact overall.	Progress to Step 2
Severance	Active travel elements include improvements to footways and highway crossings, and as such are potentially relieving existing severance issues. Scheme is considered to be beneficial to existing and new walkers and cyclists.	Progress to Step 2

Impact Area	Initial Screening Outcome	Next Step
	Slight Beneficial impact overall.	
Accessibility	The scheme is expected to have some limited impact upon accessibility as a result of active mode elements, which are expected to improve access across the A38. TAG Unit A4.2 notes that the assessment of accessibility in distributional impact should cover public transport accessibility. As such, impacts on walking and cycling accessibility are incorporated in the assessment of severance. No further assessment required.	AST distributional assessment: Neutral. No further analysis required
Affordability	The existing analysis available suggests that there will be little impact in terms of affordability, though is a potential very slight benefit from car operating costs. public transport fares unaffected. Conducting further analysis was considered to be disproportionate.	AST distributional assessment: Neutral. No further analysis required.

5.10.2 Distributional Impacts – Appraisal

Following the screening exercise and assessments, the Proposed Scheme is anticipated to have the following distributional impacts:

- User benefits: the scheme will result in a Slight Beneficial overall distributional impact.
- Noise: the scheme will result in a Slight Adverse overall distributional impact.
- Air Quality: the scheme will result in a Slight Adverse overall distributional impact.
- Accidents: the scheme will result in a Slight Beneficial overall distributional impact.
- Security: the scheme will result in a Neutral overall distributional impact.
- Severance: the scheme will result in Slight Beneficial overall distributional impact.

Since OBC, the air quality impact has worsened from the OBC score of Neutral due to the increased magnitude of impacts associated with EFTv11. Accident impacts have improved from neutral due to the inclusion of a wider study area that has been considered at FBC. Severance has improved from neutral/slight adverse due to the different balance of scheme elements included in the A38 BREP Phase 3 scheme.

A matrix of distributional impact assessment is presented in Table 5.37.

Place Based Analysis: The user benefits assessment indicates that users from all income groups experience an overall benefit and thus supporting the levelling up agenda.

However, there are noise and air quality disbenefits for all receptors, with the worst air quality impacts being for those in the 2nd and 3rd lowest income bands.

Table 5.37: Phase 3 Distributional Impact – Appraisal Matrix

		Distributional impact of income deprivation					Are impacts distributed evenly?	Key impacts Qualitative statements
		1 (most deprived)	2	3	4	5 (least deprived)		
User benefits		✓	✓	✓✓	✓✓✓	✓✓✓	✓	There is a high level of user benefit, they are distributed relatively evenly between income groups, though the least deprived areas having proportionally more benefit than population shares.
Noise	day	x	x	xxx	x	xxx	x	Uneven, but the actual impacts are small, and the area in the immediate vicinity of scheme which will see increases in noise does not contain any specifically income deprived communities.
	night	x	x	xxx	x	xxx		
Air quality		x	xxx	xxx	-	x	x	Impacts are small, with a net increase in emissions, but no impacts are considered significant. Impacts are uneven, but lower income groups are disproportionally less impacted than middle/higher income groups.

AST entry	Social groups						User groups				Qualitative statement (including impact on residential population and amenities)
Impact	Children & young	Older people	Carers	Women	Disabled	BME	Peds	Cyclists	Motor-cyclists	Young male drivers	
Noise	x	x									Some adverse impacts near the scheme, but very limited, and no significant concentrations of children in areas affected; there is a slightly higher proportion of older people than county average.
Air Quality	-										Air quality impacts are very small, and not considered significant, mostly being negligible. There are no significant concentrations of children or young people in the areas affected.
Accidents	✓	✓					✓	✓	✓	✓	Slight overall decrease in accidents spread across the network; changes in traffic flow provides benefit across all road users. No unusually high concentrations of young adults, children or disabled people near the scheme, though more elderly people than wider area averages.
Security	-	-		-		-					Existing levels of security are maintained, with some minor potential for improvements. No unusually high concentrations of children, older people, those with disabilities, or minority ethnic populations near the scheme. The overall distributional assessment on security is neutral.
Severance	✓	✓	✓		✓						Assessment of the scheme is a 'large beneficial impact', but this relates to new users opportunities; older people, those with disabilities and non-car access households have no unusually high concentrations within the vicinity of the scheme so it has a neutral overall distributional impact.

***Note**: Accessibility and affordability are not shown. distributional impacts not assessed*

5.11 Place Based Analysis

Phase 3 schemes appraisal has been undertaken considering a place-based analysis. Were relevant, these points have been discussed throughout the Economic Dimension. In summary, the following points have been highlighted:

- Transport User Benefits: The majority of the welfare benefits (Journey Time and VoC reduction) associated with the TUBA output are for travellers within the Bromsgrove District.
- Distributional Impacts: The user benefits assessment indicates that users from all income groups experience an overall benefit and thus supporting the levelling up agenda. However, there are noise and air quality disbenefits for all receptors, with the worst air quality impacts being for those in the 2nd and 3rd lowest income bands.
- Bus Facility Benefits: Better quality bus facilities will contribute to a more modern and connected experience for residents and visitors within Bromsgrove.
- Wider Impacts: The significant wider impacts, particularly associated with agglomeration, demonstrate the potential for Bromsgrove District to become a more effective and productive economic centre. The improved labour supply impact also demonstrates the potential for greater access to better paid and more productive jobs within Bromsgrove and larger cities such as Birmingham.
- Development Impacts: By unlocking development sites and the associated increase in GVA, Phase 3 of the A38 BREP will fundamentally contribute towards an increased popularity of the Bromsgrove District. This has the potential to result in further gentrification in other areas outside of the specified developments, and potentially present further opportunities for levelling up.
- Physical Activity: The significantly improved walking and cycling facilities provide a more connected experience by reducing the requirement to use cars to access local services and Bromsgrove Rail Station. Social welfare will be improved through the health benefits captured in this assessment.
- Townscape: It is a positive outcome that the significant connectivity benefits can be achieved without negative impact on the townscape.

5.12 Appraisal Summary Table

Please see Appendix E.12 for Appraisal Summary Table.

5.13 Value for Money

Economic appraisal involves the determination of costs and benefits of a scheme using travel demand, traffic flows, journey times and other inputs from a traffic model. By comparing the costs with the benefits of a scheme over a 60-year assessment period, a Benefit Cost Ratio (BCR) has been calculated, which represents the value for money of the scheme. In line with HM Treasury's appraisal requirements, non-monetised impacts of the scheme have also been considered as part of the Value for Money assessment.

Table 5.38: Summary of Elements Included in Assessment

Impacts	Assessment Methodology	Initial BCR	Adjusted BCR
TEE - Travel Times, VOC, and bus facility improvements	TUBA assessment and bus facility improvement assessment	✓	✓
TEE - Travel Times and VOC (during construction and maintenance activities)	QUADRO assessment	✓	✓
Journey Time Reliability	Reliability assessment (section 6.3 of TAG unit A1.3)	Included in AST only	Included in AST only
Wider Impacts	Level 2 and 3 benefits		✓
Noise	Noise TAG modelling	✓	✓
Air Quality	Local AQ TAG modelling	✓	✓
Greenhouse Gases	Greenhouse Gases TAG spreadsheet	✓	✓
Accidents	COBALT assessment	✓	✓
Physical Activity	Active Mode Appraisal Toolkit (AMAT)	✓	✓
Scheme costs	Scheme costs based on tender returns These have been converted for use in the economic appraisal using a GDP deflator and converted to market prices where required. Optimism bias and risk adjustments have been applied, and operational and maintenance costs added.	✓	✓
Operation and Maintenance costs	Based on costs developed for FBC stage Phase 3	✓	✓

5.13.1 Value for Money Category

Analysis has been undertaken on this study to identify suitable solutions to the problems on the A38 corridor. The final solution included a set of highway, active travel and public transport improvements.

Potential risks may be associated with the delivery of scheme.

The assessment work presented in the Economic Dimension shows that there is a case for the A38 BREP Phase 3 schemes. The PVB equals £66,049K and when compared against a PVC of £28,599K, the scheme demonstrates an initial BCR of 2.31 demonstrating the scheme provides a 'High Value for Money'.

5.13.2 Key Impacts on the Public Finances

The broad transport budget including inflation and Optimism Bias but excluding maintenance is £24,654K (2010 present value), based upon an assumed 2023 cost of [redacted] (Including Inflation and Optimism Bias) or [redacted] (including Inflation and P(mean) Risk). An additional local

contribution will be required for maintenance, to a value of £3,945K in (2010 present value) resulting in the broad transport budget to be £28,599K (2010 present value).

The scheme improvements will reduce congestion and journey times on the junctions along Phase 3 of the A38 BREP through Bromsgrove area. The main benefits result from a reduced journey time for commuters and other users, resulting in journey time benefits of £36,584K. Similarly, business user classes and transport providers time savings benefits are £9,967K. The greatest proportion of journey time savings across all purposes are in the magnitude of 5 minutes or less per trip.

The economic assessment demonstrates how the scheme will meet the objectives defined in the Strategic Dimension, as set out below:

- Support the delivery of housing and employment growth – The modelling work shows that with the scheme in place, the congestion issues associated with future growth are reduced.
- Reduce congestion and transport costs – The scheme provides journey time and cost benefits, resulting in a highway only PVB of £47,895K.
- Maximise the efficiency of the road network – The scheme proposed makes good use of the existing infrastructure and the scheme components are targeted at most significant issues on the corridor.
- Increased journey time reliability – The reduction in congestion will improve journey time reliability.
- Improve conditions for pedestrians and cyclists - The scheme provides five components improving conditions for pedestrians and cyclists. The schemes result in total AMAT benefits of which £19,479K are associated with physical activity, and £2,259 are associated with Journey Quality.

5.13.3 Drivers for Value for Money Category

The key driver for this value for money category is the relatively high transport user benefits experienced through a significant reduction in congestion, significant benefits for pedestrians and cyclists, as well as wider impacts.

5.13.4 Confidence in Value for Money

The sensitivity testing indicates high confidence in the monetised aspects of the value for money. In summary:

- In the low growth scenario, the PVB would reduce by approximately £15,236K.
- The PVB from the active mode assessment indicated that the core scenario was very close, within £580K of the low impact scenario.
- Changes in the value for money category linked to increased scheme costs are very low. Even with 90th Percentile costs, the value for money category remains the same.

The confidence in the scheme value for money is summarised in Table 5.39 below.

Table 5.39: Summary of Confidence in the VfM Category

VfM Category	Low	Medium	High	Very High
Likelihood	**Very Unlikely**	**Possible**	**Very Likely**	**Unlikely**

5.14 Phase 2 Schemes Economic Impacts

5.14.1 PVB

The FBC for the early delivery schemes (Schemes 2a, 2b and 4) established the PVB, PVC and BCR utilising DfT's AMAT (May 2020). The outcomes from this toolkit, as set out in the FBC, are summarised in Table 5.40.

Table 5.40: Early Delivery Schemes (AMAT May 2020 version)

Impact Drivers	Estimates (present value in 2010 prices, in £'000s)
Congestion benefit	141.04
Infrastructure maintenance	0.77
Accident	23.28
Local Air Quality	3.23
Noise	1.54
Greenhouse Gases	5.38
Reduced risk of premature death	4,196.19
Absenteeism	536.22
Journey Ambience	143.03
Indirect Taxation	-10.05
Present Value of Benefits (PVB)	**5,039.86**

As presented in Table 5.41 the early delivery schemes present as PVB of £5,040K (AMAT May 2020).

For consistency with the Phase 3 FBC, the early delivery schemes have been input to the May 2022 toolkit and the outcomes are presented in Table 5.41.

Table 5.41: Early Delivery Schemes (AMAT May 2022 version)

Impact Drivers	Estimates (present value in 2010 prices, in £'000s)
Congestion benefit	164.30
Infrastructure maintenance	0.78
Accident	23.96
Local Air Quality	3.39
Noise	1.60
Greenhouse Gases	11.23
Reduced risk of premature death	4,607.34
Absenteeism	714.04
Journey Ambience	158.11
Indirect Taxation	-10.97
Present Value of Benefits (PVB)	**5,673.00**

As presented in Table 5.41 the early delivery schemes increase to a PVB of £5,673K (AMAT May 2022) under the latest guidance.

5.14.2 PVC

Estimation of early delivery scheme's PVC was also based on DfT's AMAT (May 2020), and included the following assumptions:

- Scheme capital costs, including risk allowance, in Q1 2020 prices.
- Estimated maintenance costs in Q1 2020 prices over the appraisal period.
- Optimism Bias at 15%, given the stage of scheme design.
- Discount rates over the appraisal period.
- GDP deflators for adjusting the costs.
- Market price adjustment factor.

The combined PVC of the early delivery schemes, based on the May 2020 AMAT, was estimated at £1,913K (in 2010 prices and values). Consistent with economic appraisal guidance, sunk costs are excluded from estimation of this PVC.

Due to the update of the AMAT, the scheme costs have also been recalculated in the May 2022 version using the same assumptions. The combined PVC of the early delivery schemes, based on the May 2022 AMAT, was estimated at £1,874K (in 2010 prices and values).

Further analysis has been undertaken on the Optimism Bias. When the FBC was submitted, Optimism Bias at 15% was considered to be appropriate based on the stage of scheme design and the latest TAG Unit A1.2 guidance (July 2017) at the stage of submission. TAG Unit A1.2 guidance has been updated in May 2022 following submission, which suggests Optimism Bias at 20% may be more appropriate. Therefore, combined PVC of the early delivery schemes, based on the May 2022 AMAT and applying Optimism Bias at a level of 20%, was estimated at £1,956K (in 2010 prices and values).

5.14.3 BCR

Table 5.42 presents a summary of various PVBs, PVCs and BCRs for the early delivery schemes (Schemes 2a, 2b and 4) based on the tests set out above.

Table 5.42: Early Delivery Schemes PVB, PVC and BCR

	DfT AMAT May 2020 (Optimism Bias 15%)	DfT AMAT May 2022 (Optimism Bias 15%)	DfT AMAT May 2022 (Optimism Bias 20%)
PVB (£'000)	5,040	5,673	5,673
PVC (£'000)	1,913	1,874	1,956
BCR	**2.63**	**3.05**	**2.90**

The PVB, PVC and BCR based on the DfT's AMAT (May 2022) with an applied Optimism Bias of 20% have been used to present a combined Phase 2 and Phase 3 economic table subsequently.

5.14.4 Phase 2 plus Phase 3 Schemes Economic Impacts

Table 5.43 presents a summary of the Phase 3 Schemes plus the early delivery schemes. It can be seen that independently; the Phase 2 and Phase 3 schemes offer high value for money based upon the monetised benefits alone because they both have a BCR between 2 and 3. The same is also true for the combined assessment of the combined schemes which have a BCR of 2.35.

Table 5.43: A38 BREP Phase 3 + Early Delivery Schemes PVB, PVC and BCR

	Phase 3 Schemes (this FBC)	Phase 2 Schemes (Early delivery schemes)	Phase 2 and Phase 3 Combined
PVB (£'000)	**66,049**	**5,673**	**71,722**
PVC (£'000)	**28,599**	**1,956**	**30,555**
BCR	**2.31**	**2.90**	**2.35**

5.15 Key Findings and Conclusion

The assessment work presented in the OBC stage Economic Case showed that there is a strong case for the A38 BREP scheme as it stood back in November 2021 i.e. including the following schemes:

- Hybrid highway and active mode improvement Schemes A to G.
- Active mode improvement Schemes 1, 3 (footbridge), 5 (footbridge) and 6.
- Public transport Schemes 7 and 8.

The OBC stage BREP scheme demonstrated an initial (level 1) BCR of 2.69 hence the scheme provided a 'High Value for Money (VfM)' (between 2 and 4) to taxpayers. The likelihood of achieving this VfM was estimated to be very likely. The PVB was approximately £77,300K and was compared against the PVC of circa £28,700K. With the inclusion of the wider economic benefits (level 2) a BCR of scheme demonstrated an adjusted BCR of 3.19 was calculated, which implied a High VfM. Low and high growth sensitivity tests were also undertaken. The OBC low growth scenario demonstrated a BCR of 1.98 implying a medium value for money whilst the high growth scenario demonstrated a BCR of 3.05 implying a high value for money. Analysis of the combined Phase 2 early delivery Schemes 2a, 2b and 4 and the OBC BREP schemes was undertaken. As a standalone package, the Phase 2 schemes offered a High VfM to taxpayers. When combined with the rest of the OBC A38 BREP package, a High VfM to taxpayers was anticipated with a BCR that was estimated at 2.70.

The FBC stage now includes Phase 3 schemes only, namely:

- Hybrid highway and active mode improvement Schemes C to F and parts of Schemes A and B.
- Two new active mode corridor improvement Schemes 3 and 9, in addition to Scheme 6 which has not changed since the OBC stage.
- Public transport Schemes 7 and 8 which remain unchanged since the OBC stage.

Phase 4 schemes G, 1 and parts of Schemes A and B are excluded from this FBC.

Overall, the A38 BREP Phase 3 scheme is anticipated to have a beneficial impact on transport users and the surrounding area through meeting the scheme objectives. The scheme will:

- Reduce congestion and transport costs.
- Maximise the efficiency of the road network.
- Increased journey time reliability.
- Support the delivery of housing and employment growth as outlined in the Bromsgrove District and Redditch Borough Local Plans.
- Improve connectivity for pedestrians and cyclists on and across the A38 corridor, including to the Bromsgrove Rail Station.

The expected scheme outputs, as detailed in the Logic Map set out in the Strategic Dimension (Chapter 3), are summarised in Table 5.44 alongside the quantified outcomes.

Table 5.44: Assessment summary of Phase 3 schemes' outputs (as per the Logic Map in Chapter 3)

Outcome (short-term)	Outcome (medium / long-term)	Assessment Methodology	Assessment Summary
Highways Schemes			
Decreased congestion on junctions along A38 through Bromsgrove area	Carbon impacts* Impact to local greenhouse gas emissions	Quantitative Assessment Emissions of carbon dioxide have been estimated for the Opening Year (2025) and Future Assessment Year (2040) in the Do Minimum and Do Something scenarios using the TAG Databook approach (v1.20.1).	-£7,210k (GHG over a 60-year appraisal period), and -£68k during construction and maintenance. Whilst the proposed scheme is expected to relieve congestion in some locations, and therefore reduce GHG emissions in these areas, the proposed scheme is anticipated to result in an increase in vehicle kilometres travelled on the network and therefore a resultant increase in Greenhouse Gas emissions. In the Scheme Opening Year the GHG emissions are anticipated to rise by 0.3%, which is therefore considered to be negligible. The 0.3% increase in GHG emission (Opening Year) is compared to an increase of 0.4% in vehicle kilometres travelled, demonstrating that the scheme represents a betterment to GHG emission per kilometre travelled.
	Noise and air pollution impacts Improvements in public health	Quantitative Assessment The damage costs approach has been used to value the impact of the proposed scheme on local air quality, in line with requirements set out in TAG Unit A3. Emissions of oxides of NOx and PM2.5 have been estimated for the Opening Year (2025) and Future Assessment Year (2040) in the Do Minimum and Do Something scenarios, using Defra's Emission Factors Toolkit (EFT), version 11. A quantitative noise assessment has been undertaken using a noise model. The noise model Study Area has been determined through review of the initial traffic model outputs following the criteria in DMRB LA 111. The proposed scheme does not result in any obvious bypassed routes; therefore, the Study Area has been taken as a 600m buffer around the proposed scheme and	-£888k (Air Quality over a 60-year appraisal period) Whilst the scheme is estimated to result in an overall increase in emissions of air pollutants, reductions in emissions are expected to occur in some areas (e.g. at approaches to junctions as a result of reduced congestion). Furthermore, a detailed air quality assessment undertaken to support this business case indicates there would be no exceedances of relevant air quality objectives at any modelled human health receptors in the opening year, either with or without the proposed scheme. The assessment also indicates that the proposed scheme is unlikely to have a significant effect on national compliance with the annual mean NO2 air quality Limit Value. As such, and in accordance with DMRB LA 105, the air quality impacts of the proposed scheme are considered to be not significant.

Outcome (short-term)	Outcome (medium / long-term)	Assessment Methodology	Assessment Summary
		sections of the A38 linking the proposed scheme together. In accordance with Transport Analysis Guidance (TAG) Unit A3, noise modelling has been undertaken to predict noise levels at all noise sensitive receptors within the Study Area.	-£4,629k (Noise over a 60-year appraisal period) Of the 140 non-residential sensitive receptors assessed in the short term, 9 are expected to experience an adverse impact of minor magnitude or greater, whilst 3 are expected to experience a beneficial impact of minor magnitude or greater. In the long term, there are 0 expected to experience an adverse impact of minor magnitude or greater and 1 expected to experience a beneficial impact of minor magnitude or greater.
Improved journey times along the A38	Reduced commute time More time to spend on recreational activities Travel time savings for business users and transport users Cost reductions for transport allowing businesses to operate more efficiently	Quantitative Assessment Travel time reductions form part of the Level 1 Transport User Benefits. This has been quantified through strategic modelling for the Opening Year (2025) and Future Assessment Year (2040) in the Do Minimum and Do Something scenarios. These impacts have also been monetised for a 60-year appraisal period using DfT's TUBA program (TUBA Economic File Version 1.20.2) for Core, High Growth and Low Growth Scenarios, with input matrices provided by the transport models.	Total highway user benefit of £50,094k. The Proposed Scheme is anticipated to have a positive impact to journey times. User benefits include £47,895k of travel time benefits (including bus users, £2,406K of fuel VOC benefits, and £-207k PVB of non-fuel VOC benefits. As detailed in the Chapter 4 (Traffic Modelling), the scheme results in savings of up to 2.1 minutes in the peak hours with the AM peak hour showing greater savings than the PM peak (up to 1.0 minute).
Improved accessibility	Facilitates the delivery of Local Plans allocations	N/A Recognising that all proximate major development sites already have planning permission granted and as agreed with DfT, no formal dependent development assessment was undertaken.	No qualitative assessment. Given that four proximate development sites are required to make a Section 106 contribution to scheme delivery, a clear planning link between the proposed intervention and key development sites exists.
	Easier journey means a greater number of	Quantitative Assessment	Improving journey time along the A38 results in solutions to market failures in non-transport markets. This appraisal has

Outcome (short-term)	Outcome (medium / long-term)	Assessment Methodology	Assessment Summary
	people will be willing to travel to / from this area Businesses have access to a wider range of workers and skills Better access from Bromsgrove to West Midlands major employment areas Businesses have access to a wider range of workers and skills	A Level 2 Wider Impacts Assessment has been completed in line with the guidance set out in TAG. This assessment includes Induced Investment (TAG Unit A2.2), Employment Effects (TAG Unit A2.3) and Productivity Impacts (TAG Unit A2.4). The DfT's Wider Impacts in Transport Appraisal (WITA) V2.2 tool has been used to estimate the wider economic impacts.	considered improvements due to output in imperfectly competitive markets, labour market access to employment opportunities, and increased agglomeration. Wider economics benefits are estimated at £15,734k. The reduction in generalised travel costs will increase the effective density of economic activity within the area, giving rise to the agglomeration impacts. The agglomeration impacts are primarily concentrated around Bromsgrove/Redditch with a small proportion of the impacts materialising within Wychavon and Wyre Forest.
Active Mode Scheme			
Removal of potential conflicts between pedestrians and cyclists (short-term) Increased in the number of pedestrians	Enhancements for pedestrians and cyclists can promote a long-term shift to active modes	Quantitative/ Qualitative Assessment The DfT's Active Mode Appraisal Toolkit (May 2022) has been used to assess relevant scheme benefits as part of a wider value for money assessment. The social impacts assessments have been undertaken in line with TAG Units A4.1 and consider impacts to physical activity, journey quality, collisions, security, accessibility, affordability and severance.	£19,479k - Monetised AMAT benefit based on increased physical activity levels Active Mode schemes and enhancement included in the highway schemes are expected to generate an estimated 2,000 additional walking and cycling trips on an average weekday.

** Only transport user carbon is reported in the Economic Dimension, construction carbon is presented in the Carbon Management plan (Appendix M.7 of the Management Dimension).*

Whilst Table 5.44 provides a summary of the anticipated scheme impacts against the logic model outputs, additional impacts are anticipated which are not included in the table above including:

- Construction and maintenance impacts (Travel Times and VOC).
- Wider Impacts (Level 2 and 3 (GVA) benefits).
- Journey Time Reliability impacts.
- Accidents (based on COBALT assessment).
- Scheme costs including operation and maintenance costs.

These additional impacts are included within the Value for Money Statement and Appraisal Summary Table; together demonstrating that the scheme has an overall positive impact and is a strong value for money proposition.

The assessment work presented in the Economic Dimension shows that there is a strong case for Phase 3 the A38 scheme. Phase 3 schemes demonstrate an initial (level 1) BCR of 2.31 hence the schemes provide a 'High Value for Money (VfM)' (between 2 and 4) to taxpayers. The likelihood of achieving this VfM is very likely. The PVB is equal to £66,049K and compared against the PVC of £28,599K. The low growth scenario demonstrated a BCR of 1.78 implying a medium value for money whilst the high growth scenario demonstrated a BCR of 2.80 implying a high value for money.

With the inclusion of the wider economic benefits (level 2) a BCR of Phase 3 schemes demonstrates an adjusted BCR of 2.86 is calculated which implies a High VfM. Low and high growth sensitivity tests have been undertaken. The corresponding Level 2 BCR figures for the low and high growth sensitivity tests are 2.21 and 3.46 respectively, implying High VfM for both tests.

Analysis of the combined Phase 2 (early delivery Schemes 2a, 2b and 4) and Phase 3 schemes (this FBC) has been undertaken. As a standalone package, the Phase 2 schemes offered a High VfM (with a BCR of 2.90) to taxpayers. When combined with Phase 3 schemes, a High VfM to taxpayers is anticipated with a BCR estimated at 2.35.