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Member of the SNC-Lavalin Group

Wiltshire Local Plan Review 2022

Transport Evidence Base

May 2023

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Introduction

Wiltshire have been undertaking a review of their 2015 Local Plan, the Local Plan Review has seen amendments to proposed housing and employment allocations. As part of the Local Plan Review, there is a need to understand and assess the transport implications of these changes. Wiltshire also want to take this opportunity to identify how they can achieve different outcomes – ultimately shifting travel patterns, towards more sustainable travel. This reflects their Climate Change Strategy and supports in the wider context of decarbonisation pathways. This report follows government issued Planning Practice Guidance (PPG) to provide a transport evidence base in support of the 2022 Local Plan Review.

1. Introduction

1.1. Local Plan Transport Assessments

The Local Plan process is set out in the Town and Country Planning Regulations 2012, Regulation 19 of this requires that the local authority should rigorously assess the Plan before it is published to ensure that, in their view, it is sound and meets all the necessary legal requirements and that it will be submitted to the Planning Inspectorate for examination in public. This also applies to changes to the Plan arising from additional work and reviews.

To support and justify what is in the Plan an evidence base is required, this can relate to a wide range of elements with a transport assessment forming a key part.

The government in their Planning Practice Guidance (PPG) of March 2015 state that *"**It is important for local planning authorities to undertake an assessment of the transport implications in developing or reviewing their Local Plan so that a robust transport evidence base may be developed to support the preparation and/or review of that Plan**"* (Transport evidence bases in plan making and decision taking - GOV.UK (www.gov.uk), March 2015).

It goes onto describe that a transport assessment ***"…can facilitate approval of the Local Plan and reduce costs and delays to the delivery of new development, thus reducing the burden on the public purse and private sector"*** *and that* ***"The transport evidence base should identify the opportunities for encouraging a shift to more sustainable transport usage, where reasonable to do so; and highlight the infrastructure requirements for inclusion".***

1.2. Wiltshire's Transport Assessment

In 2020 Wiltshire Council started undertaking a review of their current Local Plan, adopted as part of the Core Strategy in 2015. Atkins provided support to Wiltshire Council with the production of a transport assessment which formed the 2020 transport evidence base.

Whilst the outcomes of the previous transport assessment were deemed a robust assessment of Wiltshire's growth agenda, it did highlight the need for further consideration of site allocations and did not reflect Wiltshire's now emerging and committed policy position in relation to carbon neutrality.

Wiltshire Council subsequently amended the housing allocation in terms of numbers and locations, triggering the need for an updated transport assessment of those changes which will form part of the evidence base for this current Local Plan Review (LPR) 2022.

This transport assessment whilst providing an evidence base of the impacts of the Local Plan Review looks more deeply at how different packages of interventions can mitigate impacts and make changes in travel behaviours towards more sustainable outcomes and support Local Plan carbon neutrality in the context of Wiltshire's broader net zero pathway targets. With an understanding of what works best these have been considered in the context of the proposed developments.

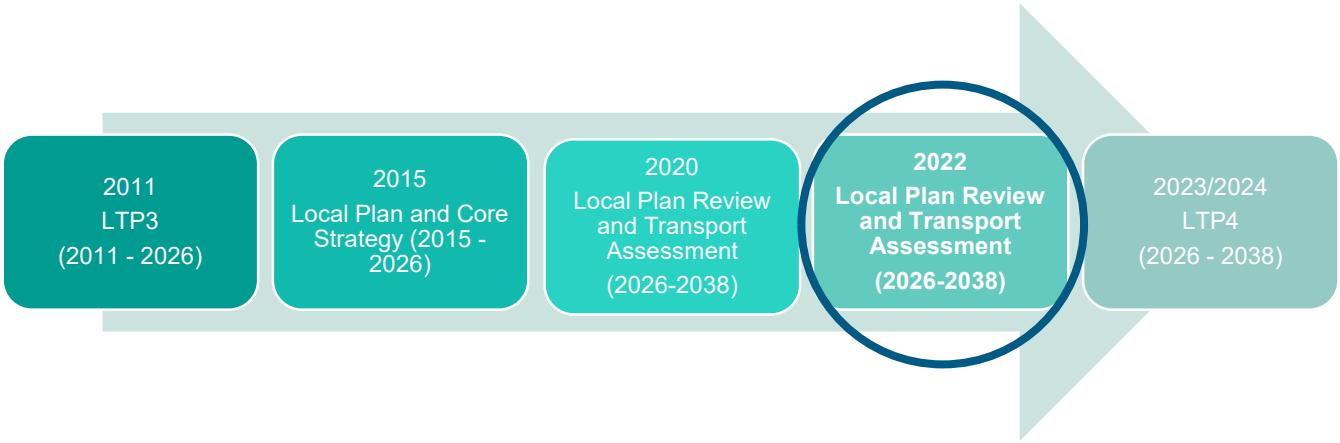
1.3. Policy Context

The current Local Plan was adopted in 2015. This was reviewed in 2020 reflecting the Local Transport Plan (LTP) 3. Currently the LPT4 is under development which better reflects the UK's and Wiltshire's emerging and committed policy position in relation to the climate crisis and carbon neutrality. Figure 1-1 illustrates the position of the Local Plan within the wider timeline of related planning documents. Over this time the local and national policy landscape has materially changed.

Reflecting this change in policy context within the LPR requires a shift in approach. Rather than a 'predict and provide' approach, which assumes ongoing traffic growth in response to population and employment growth where private car use mode share is assumed to remain static, a transition is required towards a **'decide and provide'** approach; deciding what the preferred future looks like and providing the means to work towards it, whilst accommodating uncertainty. This is essential if Wiltshire and the UK are to achieve legally binding net zero by 2050 objectives.

Whilst this report is focussed primarily in context of the LPR and not the wider challenge for Wiltshire it provides background than can help as a longer-term guide for Wiltshire Council in understanding and embedding the scale of interventions required when developing future plans, particularly the LTP4, in order to meeting their wider commitments.

Figure 1-1 - Wiltshire Council - Timeline of Local Plan related stages



1.4. Scope of assessment

This report aims to support understanding and decision making at different levels.

- The impacts of the LPR it compares the 2022 LPR to the original Local Plan including committed development agreed as part of that process.
- The challenge towards meeting net zero targets it looks at what can be achieved in terms of carbon emission reductions from packages of interventions.
- Consider how this understanding can be applied across proposed development.

More detail on the range of outputs can be found in the associated Appendices and Annex material.

Stages undertaken as part of this assessment are illustrated in Figure 1-2. Together they support the PPG requirements described above by providing:

- An understanding of the impacts of the Local Plan Review focussing on likely generation of trips across the region, by mode and the impact on the highway network.
- Consideration of whether previously proposed transport plans and mitigations are negated by the changes under the Local Plan Review.
- Defining opportunities to prioritise the use of alternative modes and sustainable travel behaviour.
- Understand the extent to which various packages of interventions can influence travel behaviour.
- Identify the contribution packages of interventions could influence carbon emissions from transport and contribute towards net zero targets.

The intervention Scenarios have been defined to reflect the varying commitments and targets within Wiltshire and to test how interventions can help achieve them. As per the 'decide and provide' approach, interventions within each package are considered as 'Levers' which can be pulled or pushed in different formations and at different levels of intensity to reach the extent of behaviour change required in each Scenario.

1.4.1. Meeting PPG expectations

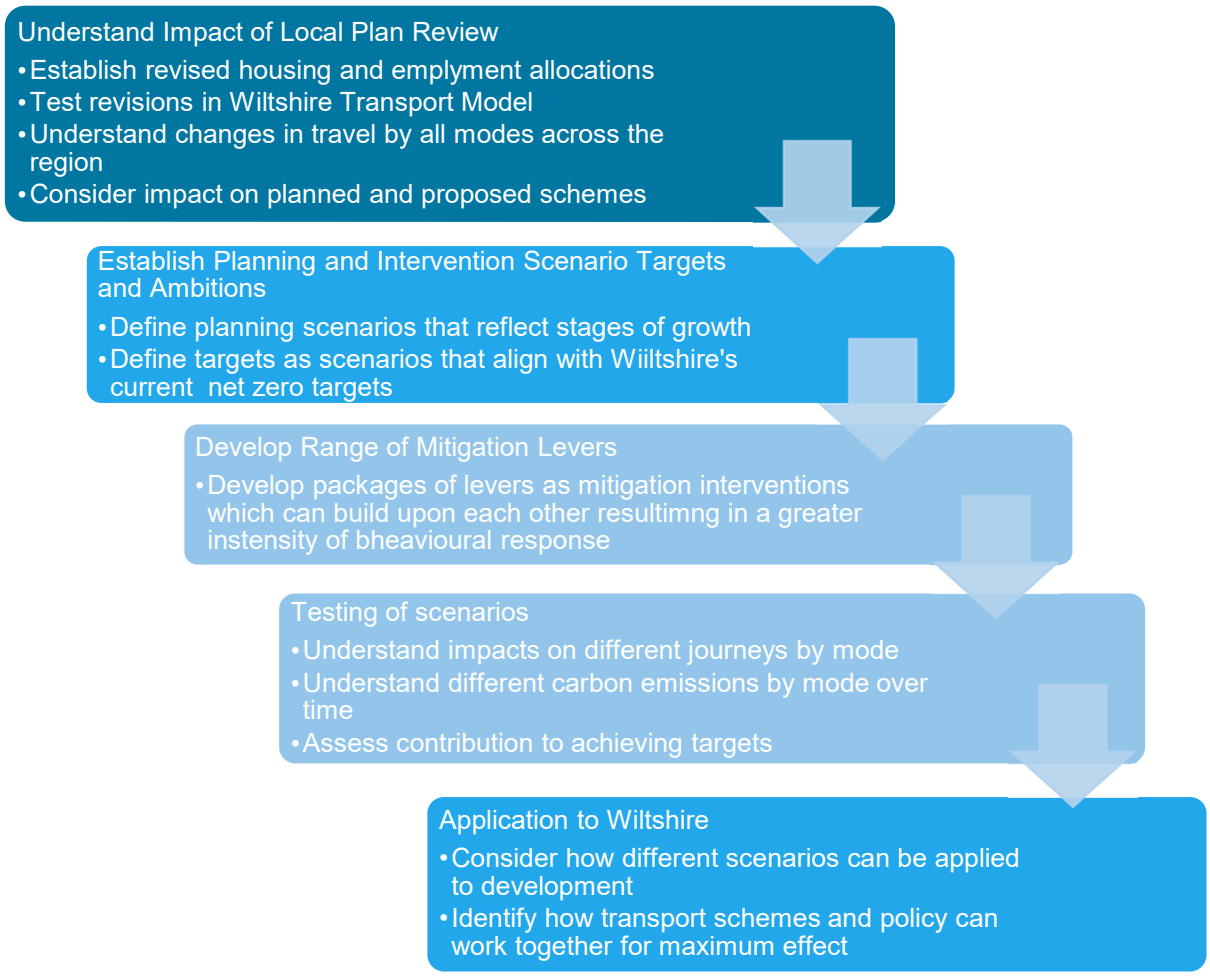
The key issues, which should be considered in developing a transport evidence base, are defined by the PPG and listed below alongside how and where this report meets these needs:

- Assess the existing situation and likely generation of trips over time by all modes – the generation of trips from the LPR is quantified by mode and can be found in Section 3.6.
- The impact on the locality in economic, social and environmental terms – whilst not included as part of the key scope of this transport assessment it is considered at a high level in Section 3.8.
- Assess the opportunities to support a pattern of development that, where reasonable to do so, facilitates the use of sustainable modes of transport – again, whilst it was not in the scope of this study to define areas of development, the impact of the emerging plan is commented on in Section 4.7.
- Highlight and promote opportunities to reduce the need for travel where appropriate – how different packages of scheme impact travel behaviour is the basis of Chapter 4 and Chapter 5 indicates how levers could be applied to different types of developments.
- Identify the short, medium and long-term transport proposals across all modes – based on findings from testing interventions this is acknowledged in Section 4.10.

- Identify opportunities to prioritise the use of alternative modes in both existing and new development locations if appropriate – prioritising the use of alternative modes is considered in the development of the levers included in each Scenario tested, the approach is described in Section 4.3 with details provided through Chapter 4.
- Consider the cumulative impacts of existing and proposed development on transport networks and assess the quality and capacity of transport infrastructure and its ability to meet forecast demands – the impact of the LPR on the highway network is considered through Chapter 3.

Given the context that this report is about understanding the impacts of the 2022 LPR and what can be done to support net zero, there is a focus on identifying proposals to encourage more sustainable travel behaviour and how they can be applied physically on the network or within planning procedure.

Figure 1-2 - Stages involved in the LPR transport assessment



1.5. Scenarios

The assessment of changes throughout this report is based on understanding different Scenarios. It is important to clarify what these are as they are referred to throughout this report.

Planning Scenarios

There are three planning Scenarios that build on each other reflecting proposed changes to housing and employment growth:

- **Base (2018)** - 'Existing' situation in 2018 without any agreed development from the Local Plan.
- **Core (2038)** - Forecast situation for 2038 based on the adopted 2015 Local Plan, 'committed' development between 2018 and 2038 as per the uncertainty log (Base 2018+Committed Growth).

- **Forecast Scenario 1 Business as Usual (BAU) LPR (2038)** - Forecast situation for 2038 based on the revised allocations in the Local Plan Review of 2022. (Base 2018 + Committed Growth + LPR Growth).

Intervention Scenarios

There are then three intervention Scenarios defined by Wiltshire to determine the level of interventions required to achieve different outcomes:

- **Scenario 2 Do Minimum** – to understand if transport interventions can be provided to avoid, if / where possible, new highway construction as identified within the previous Local Plan Review work (2020) as necessary to accommodate growth by 2038.
- **Scenario 3 Do Something** – to develop a package of interventions which focuses on reducing the carbon emissions generated by the LPR growth. This is based on the Tyndall Centre climate commitments report for Wiltshire, which identifies a target decarbonisation pathway for Wiltshire of a countywide target of reducing carbon by 95.7% from 2015 levels by 2040. Following the pathway would keep cumulative emissions within the county's fair share of the UK's carbon budget, identified by the Tyndall Centre to align with the Paris Agreement commitments and deliver net zero carbon emissions by 2050.
- **Scenario 4 Do Maximum** – to develop a package of interventions which looks for a greater reduction in carbon than Scenario 3. The aim is that this would achieve the Anthesis High Ambition pathway, in alignment with Wiltshire Council's aspiration presented in the draft Climate Strategy. The High Ambition pathway assumes a 77% reduction in all-sector emissions in Wiltshire between 2019 and 2045. This incorporates the following changes in the transport sector by 2040, relative to 2019:
  - 25% reduction in travel miles.
  - 13% reduction in road transport (trips).
  - 35% increase in Public Transport (trips).
  - 133% increase in Active Travel (trips).
  - 94% ULEV vehicle fleet.
  - 20% increase in Low Carbon Freight mileage.
  - 15% decrease in Road Freight Mileage.
  - 73% reduction in energy used per mile travelled.

1.6. Reporting

The report is structured around the following chapters and Appendices:

- Chapter 2 – summary of **Modelling Approach** of baseline and mitigation Scenarios.
- Chapter 3 – considers the **Impacts of the Local Plan Review,** Scenario 1.
- Chapter 4 – sets out the levers applied in Scenarios 2, 3 and 4 to **Mitigate the Impacts of the Local Plan** and reports the impact on transport modes and carbon emissions.
- Chapter 5 – provides information around **Lever application and high-level cost information** for the interventions, indicating how the some of the interventions could be applied to the different types of development.
- Chapter 6 – **Summary and Conclusions** considers recommendations and next steps.
- Appendix A – **Baseline Report (October 2022)** which documented the outcomes of testing the LPR housing allocations (July 2022), Scenario 1, in the WTM.
- Appendix B – **Forecast Scenario Report** is the technical note around the approach and outcomes of the intervention Scenario modelling.
- Appendix C – **Assumption Evidence Base** for modelling assumptions in Intervention Scenarios.

2. Modelling Approach

To forecast the likely number of trips by mode arising from changes in housing and employment allocations, how they then might respond to transport related interventions and what the carbon emissions of those trips are, a range of different models have been utilised to work together. The approach used is summarised in this section with more detail available in the Wiltshire LPR 2022 - Baseline Report TN v3.pdf attached in Appendix A Baseline BAU Report.

2.1. Summary of Modelling approach

The shift in the approach to testing outcomes of different scenarios also requires a shift in methodology and assessment tools from the 2020 LPR.

Previously, the 2020 LPR Transport Assessment (Wiltshire_Local_Plan_Transport_Review.pdf) utilised the Wiltshire Transport Model (WTM). This responded to the requirement of testing responses to different transport interventions (as per the 'decide and provide' framework). Atkins has also developed a streamlined and proportionate multi-modal model – the 'Interim Strategic Model' (ISM) for the 2023 Local Plan Review. This is described in detail in Appendix A Baseline BAU Report.

Applying the ISM allows trips starting or ending within Wiltshire to respond to different assumptions, relating to interventions, which can shift them to different modes or be removed completely from the network, depending on the type and strength of intervention. Background effects such as the changing local demographics, car ownership, vehicle operating cost and fares are incorporated via DfT standard assumptions in NTEM (National Trip Ends Model) and TAG (Transport Appraisal Guidance).

The ISM is a strategic level model and as such is not best placed to assess more local impacts around development locations. The impacts of the Local Plan and response to interventions are quantified across the region and is consistent with the already deployed WTM. The ISM follows many aspects of the DfT TAG but does omit certain steps such as fully iterating the travel demand and highway assignment to account for congestion. Steps have been taken to monitor for the impact of this.

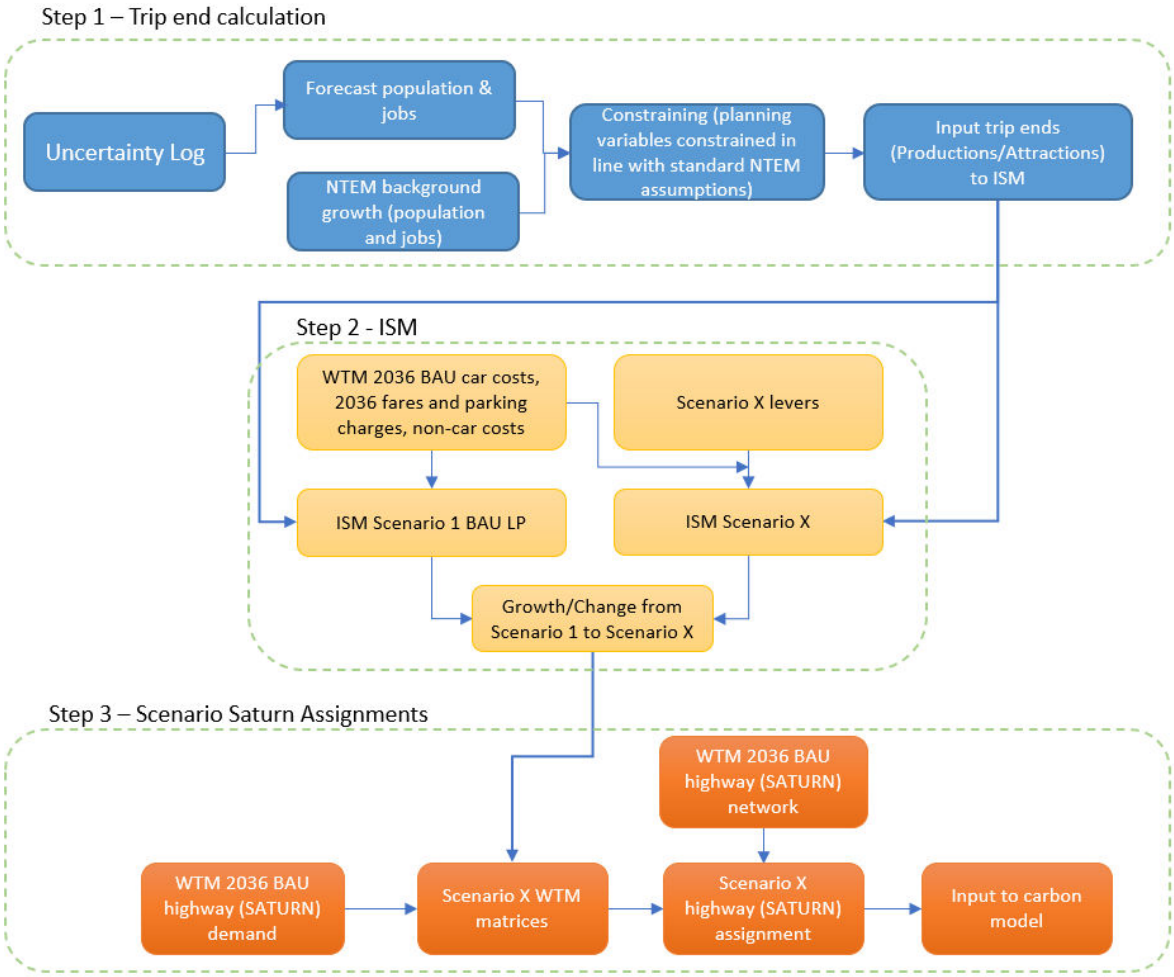
In support of targets towards net zero there is a need to understand the impact on carbon in the region from both the change in housing allocations and the subsequent mitigation Scenarios. Atkins has developed a carbon tool that is supported with outputs from the WTM and the ISM process. This model produces carbon emissions estimates from surface transport (road and rail), by year, in line with best practice in emissions calculations. This is also described in detail in Appendix A Baseline BAU Report.

2.2. Forecasting outline

The modelling approach utilises different elements with identifiable roles to get a range of outputs covering detailed forecasts of trip numbers, patterns, purposes, mode and carbon impact. Figure 2-1 presents the forecasting methodology in a flowchart with key elements including:

- Trip end calculations are derived by applying the forecast growth in population (from housing and employment) through the National Trip End Model (NTEM).
- The trip distributions are applied to the Integrated Strategic Model (ISM) to derive the change in trips across the different Scenarios. This is a simplified model developed with 2018 as the base year.
- The SATURN BAU (2036) model run is used to 'prime' ISM with the 2036 vehicle journey times, having added residential growth.
- Trips are then applied in the SATURN model which uses the Wiltshire Transport Model (WTM) matrices to distribute trips by mode, trip purpose for origins and destinations in the region.
- Trips by mode are then considered in the carbon model which applies assumptions around vehicle type to understand emissions over time.

Figure 2-1 - Forecasting Methodology



2.3. Demand modelling

To establish the ISM as part of the demand modelling process a series of validation and calibration checks along with Realism tests were undertaken to confirm its appropriateness for testing the changes in housing allocations and mitigation packages. This has demonstrated the appropriateness of the model to report changes to demand for trips by purpose, mode and origin and destination in the forecast year.

The SATURN component of the WTM was reviewed for use in the 2020 modelling process and considered robust for assessments of this nature, therefore the 2018 Base model has been adopted for this work. This model represents an average 12-hour weekday in 2018 and was converted to a Peak Hour (PH) model based on observed data.

2.4. Modelling assumptions

There are a number of assumptions included in the model that influence the way it responds and allocates changes. There are also assumptions on how assessments have been undertaken and reported. These are summarised in this section.

2.4.1. Future forecast year

The Wiltshire Core Strategy covers the period up to 2026 and identifies site allocations to meet the identified need. Wiltshire Council is currently undertaking a LPR, a refresh of the review undertaken in 2020, seeking to establish the requirement for additional housing and employment sites in Wiltshire up to 2038.

The WTM has an established forecast year of 2036, whilst the Local Plan review period is 2038. The degree of certainty associated with a forecast Scenario diminishes through time, which means it is difficult to accurately distinguish between two distinct forecast years separated by only two years. Given that there is no significant difference to be accounted for between the two years the 2036 modelled forecast year is considered to be the

same as the 2038 end of Local Plan period, as such the forecast year presented through this report is defined as 2038.

2.4.2. Core Scenario (2038) assumptions

The Core Scenario is the basis of most comparisons through this report and is intended to provide the foundation for evidence-based decision making. It uses a central traffic forecast and aims to account for the following five sources of uncertainty in forecasting by reference to available sources:

1. Model parameter errors – source: base model and realism tests.
2. National uncertainty in travel demand – demographic projections & traveller characteristics (source: NTEM 7.2).
3. National uncertainty in travel costs – forecast fuel prices or government policy (source: TAG Databook).
4. Local uncertainty in travel demand – proposed local land use developments (source: uncertainty log).
5. Local uncertainty in travel costs – proposed transport infrastructure (source: uncertainty log).

The uncertainty log for 2022 for the Wiltshire and Swindon regions has been updated and included in the Core model.

2.4.3. Sites

As with the 2020 Local Plan work, specific employment sites were not considered as part of this assessment. Employment growth was taken from the Hardisty Jones Associates (HJA) report and assumed that the location was proportional to housing growth location (for more information, see Section 3.2 of the 2020 Wiltshire Local Plan Task 1-5 Report).

2.4.4. BAU Housing Allocations

The model includes housing allocations as per the LPR allocation in February 2021. These have altered slightly with a final allocation being approved in October 2022. On review the difference, of additional 700 households, was considered to be relatively minor and not considered to have a significant impact on the outcomes of the traffic impacts presented.

2.4.5. Trip rates

To establish the likely trip rates from changes to housing and population TRICS trip rates are used. This is multi-modal data (walking, cycling and public transport trips) for residential and commercial sites. This is used to determine Core Strategy growth, whilst background growth was constrained to NTEM (National Trip End Model). Table 2-1 shows the vehicular trip rates used.

Trip distributions are assumed to remain consistent with existing settlement patterns and do not allow for changes in self-containment, internalisation, or attractions from the Local Plan.

Table 2-1 - Development TRICS vehicle trip rates

Development Type	AM (08:00-09:00)			IP (10:00-16:00)			PM (17:00-18:00)		
	Arr	Dep	Tot	Arr	Dep	Tot	Arr	Dep	Tot
Residential[1]	0.12	0.33	0.45	0.15	0.15	0.30	0.28	0.15	0.43
Mixed commercial[2]	0.68	0.30	0.98	0.44	0.43	0.88	0.76	0.95	1.71

1. Residential rates are per dwelling. Private owned houses are based on 67 days of data from 31 regions in England and Wales. The average number of dwellings from the sample was 79.
2. Mixed commercial trip rates are per 100 sqm and consist of a weighted average of retail, B1, B2 and B8 uses.

It is also worth noting that the ISM produces daily person trips for various Scenarios which differ from vehicle trips taken from SATURN. The change in trips reported are person trips taken directly from ISM. These are applied to the SATURN matrices using the methodology described in Section 2.2.1 of Appendix B.

2.5. Carbon modelling

The process of understanding carbon impacts is part of the wider modelling approach. It builds on traffic information from the SATURN model for each of the modelled Scenarios. The full detail on the approach to carbon modelling is described in Appendix A of the Baseline BAU Report.

The model comprises three elements, each of which is summarised separately in this section:

2.5.1. Carbon Baseline (2018)

The carbon baseline represents surface transport emissions within Wiltshire's boundary and is based primarily on:

- Detailed model data on the volume and type of traffic by vehicle category (cars, vans, goods vehicles, buses) on the roads in the 2018 modelled year.
- The composition of the fleet for each vehicle category (in terms of the proportions of vehicles of different sizes, efficiency, and fuel / energy source).
- Emissions factors (grammes of carbon emitted per vehicle kilometre) by vehicle type and speed band.

Emissions estimates represent well to wheel carbon dioxide equivalent (CO2e) emissions and are summarised by vehicle type in Table 2-2.

Table 2-2 – Modelled baseline transport emissions within Wiltshire, 2018, WTW, CO_2e

Vehicle type	Emissions (k tonnes, CO_2e p.a.)[1]
Car	855
LGV	245
HGV	250
Bus	5
Diesel rail	40
Total	**1,390**

1 Figures are rounded to the nearest 5 k tonnes and may not sum due to rounding

Well to wheel, well to tank and tank to wheel emissions

Well to wheel (WTW) emissions include emissions associated with extracting, generating and transporting the fuel or energy to the vehicle (**well to tank, WTT**) as well as the emissions generated directly by vehicle use i.e. tailpipe emissions (**tank to wheel, TTW**). Many summaries of transport sector emissions focus on TTW emissions to avoid double counting (e.g. with the industrial sector of the emissions associated with diesel production). However, it is important to understand the WTT component to understand the full emissions impacts of travel, particularly for EVs which have no tail pipe (TTW) emissions. Well to wheel is consistent with the 'End user' definition of emissions used by BEIS in their local authority emissions statistics.

2.5.2. Carbon forecast

The estimate of forecast emissions for 2038 built on the 2018 Baseline by accounting for changes in:

- The number of vehicle kilometres travelled by different categories of vehicles (cars, vans, goods vehicles, buses), reflecting changes in total trip numbers, mode choice and trip lengths.
- The composition of the fleet for each vehicle category (in terms of the proportions of vehicles of different sizes, efficiency, and fuel / energy source), determining emissions produced per kilometre travelled.

Changes in vehicle kilometres were obtained from the modelled Scenarios for 2038.

For fleet composition, three different baseline Scenarios were produced to reflect different assumptions regarding changes through time, in particular in relation to the uptake of zero emissions vehicles in response to national government action. The three Scenarios tested comprise:

- No national action (continuation of recent trends).
- National light fleet action (bans on petrol and diesel cars and vans sales in 2030 but HGV and bus fleet remains same).
- National fleet action (bans on sales for all petrol and diesel vehicles between 2030 and 2040).

The fleet composition Scenarios were combined with a change in carbon intensity of electricity generated through time derived from projections, as used in the TAG databook.

2.5.3. Carbon emissions trajectory

To understand how forecast emissions compare with target decarbonisation pathways, it is helpful to develop a year-by-year trajectory through time. To achieve this, the modelled data for 2018 and 2036 was supplemented with estimates of traffic for the additional years of 2021, 2026, 2031, 2038, 2041, 2046, and 2050. These estimates were derived through interpolation and extrapolation of the data for the two modelled years, informed by the DfT's Road Traffic Forecast 2018 which provides Reference Scenario traffic forecasts at 5-year intervals to 2050 for the South-West by road type and vehicle type.

The estimated traffic forecasts for these years were combined with relevant fleet composition and emissions factors to provide emissions estimates in each year to inform the trajectory.

3. Assessing impacts of Local Plan Review growth

Wiltshire Council is in the process of developing a revision to its Local Plan identifying growth in housing and employment across the county over the course of the new plan period. This growth will generate additional demands on the transport network; these additional demands will need to be mitigated, suppressed, or accommodated in the form of increased non-car mode share to limit adverse impacts resulting from forecast growth.

This chapter summarises the impacts of this LPR growth in comparison to the Local Plan and committed development. It should be noted that the numbers presented in this section relating to current housing allocations are under ongoing review and may change slightly from what is presented here, although it is not expected that the overall quantum would increase significantly to require further revision or review.

3.1. Housing Growth

The 2022 LPR includes an additional 14,295 (6%) households between 2018 and 2038 compared to current allocations of the 2015 Local Plan. It is worth noting that this is fewer than proposed in the 2020 LPR, by 6,071 households (Table 3-3). The proposed housing allocations in the 2022 LPR are mapped in Figure 3-1 across Wiltshire, with areas picked out in Figure 3-2 to Figure 3-6.

The total numbers relating to these areas are included in more detail in Table 3-1. These demonstrate how the scale of development is widely spread across the region. There is no ‘key development’ region with most settlements having some increase ranging between 75 to 2,735 dwellings. Swindon had a relatively low number of proposed dwellings in the 2018 Baseline situation compared to the other areas, around one quarter, which is reflected in the total proposed number with the Local Plan Review. Other changes related to the LPR are included in:

- Table 3-2 presents the employment land growth requirements for Wiltshire over the plan period to 2038. It presents office and industrial employment land growth, in hectares (Ha), by Housing Market Area (HMA). This shows that Swindon and Trowbridge have relatively low levels of office and industrial space planned compared to Salisbury and Chippenham.
- Table 3-3 shows the variation between housing allocations in the 2020 Local Plan review and the 2022 Local Plan Review (October 2022) with 6,071 fewer housing allocations. There was no variation in the scale of employment land allocations between the two reviews. This indicates that in Chippenham and Trowbridge the planned number of dwellings is significantly reduced, in Swindon there is a small change and in Salisbury there is a significant increase.

Figure 3-1 - Plan of proposed housing developments across Wiltshire

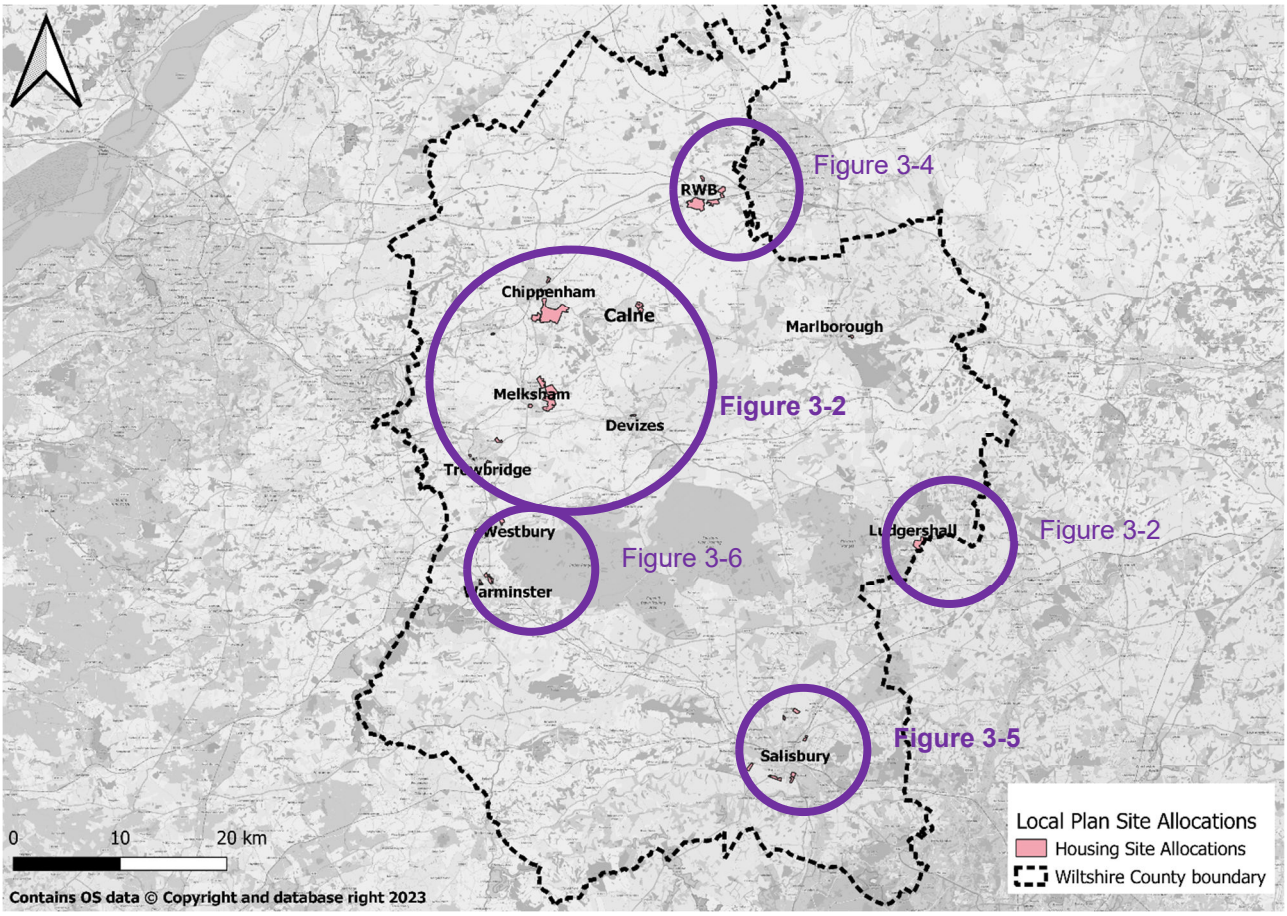


Figure 3-2 – Ludgershall housing development location

Figure 3-3 - Chippenham, Melksham, Calne, Devizes housing development locations

Figure 3-4 - Royal Wootton Bassett housing development locations

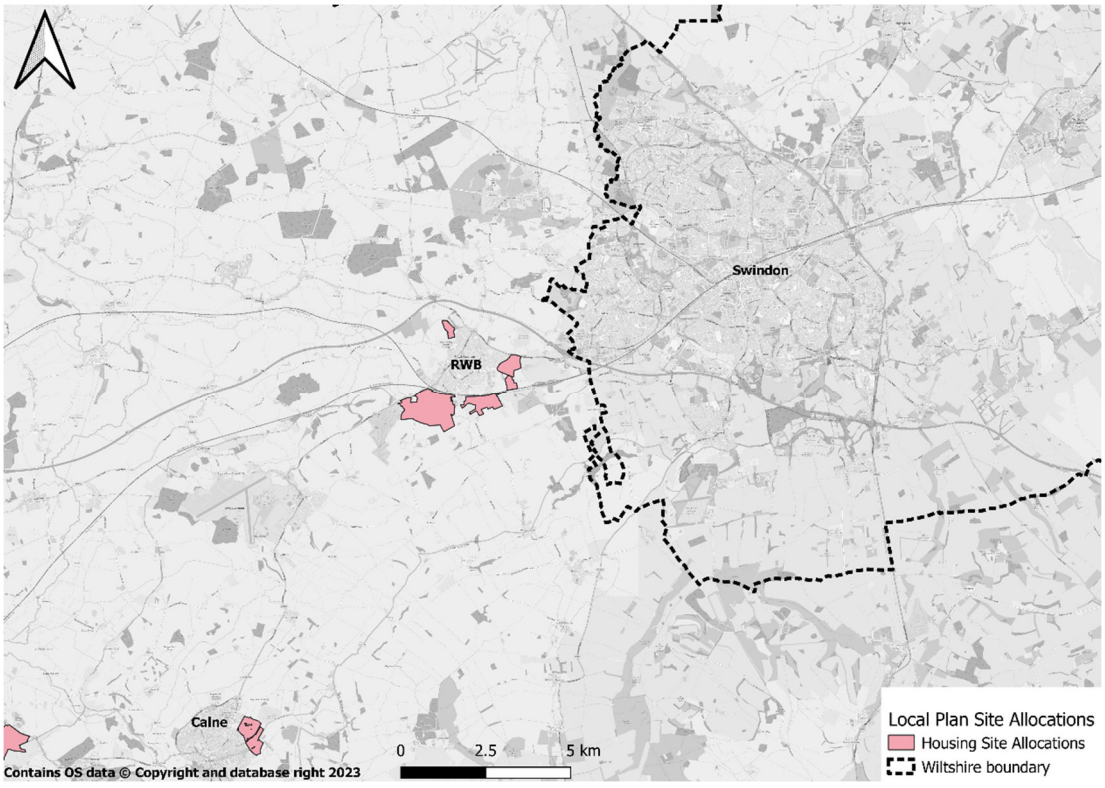


Figure 3-5 - Salisbury housing development locations

Figure 3-6 - Warminster and Westbury housing development locations

Table 3-1 - Total Dwellings / Households: 2038

HMA	Settlement	Base (2018)	Core Growth (2018-38)	LP Growth (2018-38)	2038 Base + Core	2038 Base + Core + LP
Chippenham	Calne	8,379	773	530	9,152	9,682
	Chippenham	15,452	3,127	2,725	18,579	21,304
	Corsham	2,700	170	235	2,870	3,105
	Devizes	6,416	343	365	6,759	7,124
	Malmesbury	8,772	350	80	9,122	9,202
	Melksham	8,618	1,196	1,045	9,814	10,859
	Rest of HMA	13,109	-	1,055	13,109	14,164
	Total	**63,446**	**5,959**	**6,035**	**69,405**	**75,440**
Salisbury	Amesbury	64,389	2,371	375	72,148	76,383
	Salisbury		3,163	1,315		
	Tidworth and Ludgershall		1,483	1,220		
	Wilton		742	0		
	High Post		-	0		
	Rest of HMA		-	1,325		
	Total	**64,389**	**7,759**	**4,235**	**72,148**	**76,383**
Swindon	Royal Wootton Bassett	6,059	-	1,690	6,059	7,749
	West of Swindon	-	-	-	-	-
	Marlborough	10,576	175	210	10,751	11,566
	Rest of HMA		-	605		
	Total	**16,635**	**175**	**2,505**	**16,810**	**19,315**
Trowbridge	Trowbridge	17,418	3,704	465	21,122	21,587
	Warminster	8,058	1,750	100	9,808	9,908
	Westbury	7,385	855	495	8,240	8,735
	Bradford on Avon	30,241	150	75	30,391	30,851
	Rest of HMA		-	385		
	Total	**63,102**	**6,459**	**1,520**	**69,561**	**71,081**
Wiltshire		**207,572**	**20,352**	**14,295**	**227,924**	**242,219**

Source: Wiltshire Council

Core = Uncertainty log, i.e. committed housing 2018 up to 2036

LP = Local Plan Housing (in addition to Core housing)

Table 3-2 - Employment Land Requirements (Local Plan period 2020 - 2038)

HMA	Settlement	Office (Ha)	Industrial (Ha)	Industrial + Office (low)	Industrial + Office (High)	Industrial + Office (Average)
Chippenham	Calne	0.2 – 0.5	2.7	2.9	3.2	3.1
	Chippenham	1.5 – 3.8	5.2	6.7	9.0	7.9
	Corsham	1.2 – 3.1	4.3	5.5	7.4	6.5
	Devizes	0.7 – 1.8	3.2	3.9	5.0	4.5
	Malmesbury	0.6 – 1.4	2.4	3.0	3.8	3.4
	Melksham	0.5 – 1.2	6.9	7.4	8.1	7.8
	Rest of HMA	1.2 – 3.1	9.3	10.5	12.4	11.5
	Total	**5.9 – 14.9**	**34.0**	**39.9**	**48.9**	**44.4**
Salisbury	Amesbury	0.7 – 1.8	4.6	5.3	6.4	5.9
	Salisbury	2.2 – 5.4	3.7	5.9	9.1	7.5
	Tidworth and Ludgershall	0.2 – 0.4	0.4	0.6	0.8	0.7
	Wilton	0.1 – 0.2	0.5	0.6	0.7	0.7
	High Post	-	5.0	5.0	5.0	5.0
	Rest of HMA	2.8 – 7.0	8.1	10.9	15.1	13.0
	Total	**6.0 – 14.8**	**22.3**	**28.3**	**37.1**	**32.7**
Swindon	Royal Wootton Bassett	0.8 – 2.1	4.1	4.9	6.2	5.55
	West of Swindon	0.0	0.0	0.0	0.0	0.0
	Marlborough	0.4 – 1.1	0.7	1.1	1.8	1.45
	Rest of HMA	1.1 – 2.7	7.4	8.5	10.1	9.3
	Total	**2.3 – 5.9**	**12.2**	**14.5**	**18.1**	**16.3**
Trowbridge	Trowbridge	1.4 – 3.5	3.4	4.8	6.9	5.9
	Warminster	0.5 – 1.1	1.1	1.6	2.2	1.9
	Westbury	0.7	2.1	2.8	2.8	2.6
	Bradford on Avon	0.4 – 1.0	0.1	0.5	1.1	0.8
	Rest of HMA	0.4 – 0.8	2.0	2.4	2.8	2.6
	Total	**3.4 – 7.1**	**5.3**	**12.1**	**15.8**	**14.0**
Wiltshire		**17.6 – 42.7**	**77.2**	**94.8**	**119.9**	**107.35**

Source: Wiltshire Council

Table 3-3 – Difference in growth 2018-2038, between Local Plan Reviews - 2020 and 2022

HMA	Settlement	LP (2020) Allocation	LP (2022) Allocation	Difference
Chippenham	Calne	420	530	110
	Chippenham	5,100	2,725	-2,375
	Corsham	190	235	45
	Devizes	245	365	120
	Malmesbury	-	80	80
	Melksham and Bowerhill	2,585	1,045	-1,540
	Rest of HMA	1,470	1,055	-415
	Total	**10,010**	**6,035**	**-3,975**
Salisbury	Amesbury	690	375	-315
	Salisbury	710	1,315	605
	Tidworth and Ludgershall		1,220	1,220
	Wilton	-	-	-
	Rest of HMA	1,470	1,325	-145
	High Post	-		-
	Total	**2,870**	**4,235**	**1,365**
Trowbridge	Trowbridge	90	75	-15
	Warminster	1,800	465	-1,335
	Westbury	260	100	-160
	Bradford on Avon	1,125	495	-630
	Rest of HMA	1,470	385	-1,085
	Total	**4,745**	**1,520**	**-3,225**
Swindon	Royal Wootton Bassett	245	1,690	1,445
	West of Swindon	1,026	-	-1,026
	Marlborough	-	210	210
	Rest of HMA	1,470	605	-865
	Total	**2,741**	**2,505**	**-236**
Wiltshire		**20,366**	**14,295**	**-6,071**

3.2. Employment Growth

Table 3-4 below presents the forecast jobs by HMA and the respective annual growth rate. This is a comparison provided by Hardisty Jones Associates (HJA). They are the mid-point of two different total forecast figures for Wiltshire, provided by Oxford and Cambridge Econometrics. HJA have then estimated change by HMA proportional to change in housing allocations.

Table 3-4 - Forecast change in jobs 2020 - 2038

HMA	Jobs in 2020	Jobs in 2038	Change in Jobs	Annual rate
Chippenham HMA	95,780	102,260	6,480	360

HMA	Jobs in 2020	Jobs in 2038	Change in Jobs	Annual rate
Salisbury HMA	75,780	83,770	8,000	444
Swindon (Wiltshire) HMA	28,150	30,690	2,540	141
Trowbridge HMA	58,860	63,120	4,260	237
Wiltshire	**258,570**	**279,840**	**21,280**	**1,182**

Source: Wiltshire Council, HJA report

For ISM modelling, annual rate of jobs has been considered to arrive the forecast year jobs, whilst the background growth was constrained to NTEM (National Trip End Model).

3.3. Highway Network

As well as housing and employment allocations the model includes committed infrastructure changes to the highway network. These are introduced in the model as part of the Core (2038) Scenario and maintained in the LPR BAU (Scenario 1) and all intervention Scenarios. This includes new site-specific access and the Chippenham new southern distributor road, with connection to A4 at Forest Farm.

Whilst the following sections do consider where the biggest changes in the network occur and sections might be reaching capacity in general, assessments of change are made at a regional level. The strategic modelling is not suitable for microanalysis of particular sections of the network or junction performance but has been used to give a prediction of the impact on junctions and roads.

3.4. Forecast traffic flows

The following section presents the forecast impact of the revised Local Plan Review, reflecting the difference between Scenario 1 BAU LPR (2038) and the Core (2038) Scenario.

Table 3-5 compares the change in traffic flow as a result of the LPR at key locations within Wiltshire. Generally, it indicates that the increase of the LPR growth is not significant. The largest increases are seen on the A350 in Chippenham and the M4 between J17 and J18 and the AM Peak hour eastbound on the A4312.

These are illustrated in Figure 3-7 and Figure 3-8 which provides a visual representation of the changes in traffic flow for the AM and PM peak hours respectively. This indicates that change in traffic is widely spread, with the most concentrated change predicted around Chippenham.

Table 3-5 – Changes in Peak Hour car flows at key locations: Scenario 1 and Core

Location	Change in Cars
A350 Chippenham	200-400 each way between A350 south, Lackham and Chequers R/b, <100 elsewhere
M4	80-150 between Jn 17 and 18, >50 between Jn 16 and 17
A4 London Road	100-200
A350 east of Trowbridge	<50
A350 Westbury	<20
A350 Warminster	<20
A303	60-170 (greatest impact north of Amesbury)
A36 southeast Salisbury	<50
A36 (west of Salisbury)	~50
BANES (Bath and NE Somerset)	<50
Swindon (main network links)	Generally <100, AM peak hour has increase of ~350 PCUs eastbound on A4312

Figure 3-7 - Change in traffic flow BAU LPR (Scenario 1) compared to Core (AM peak hour)

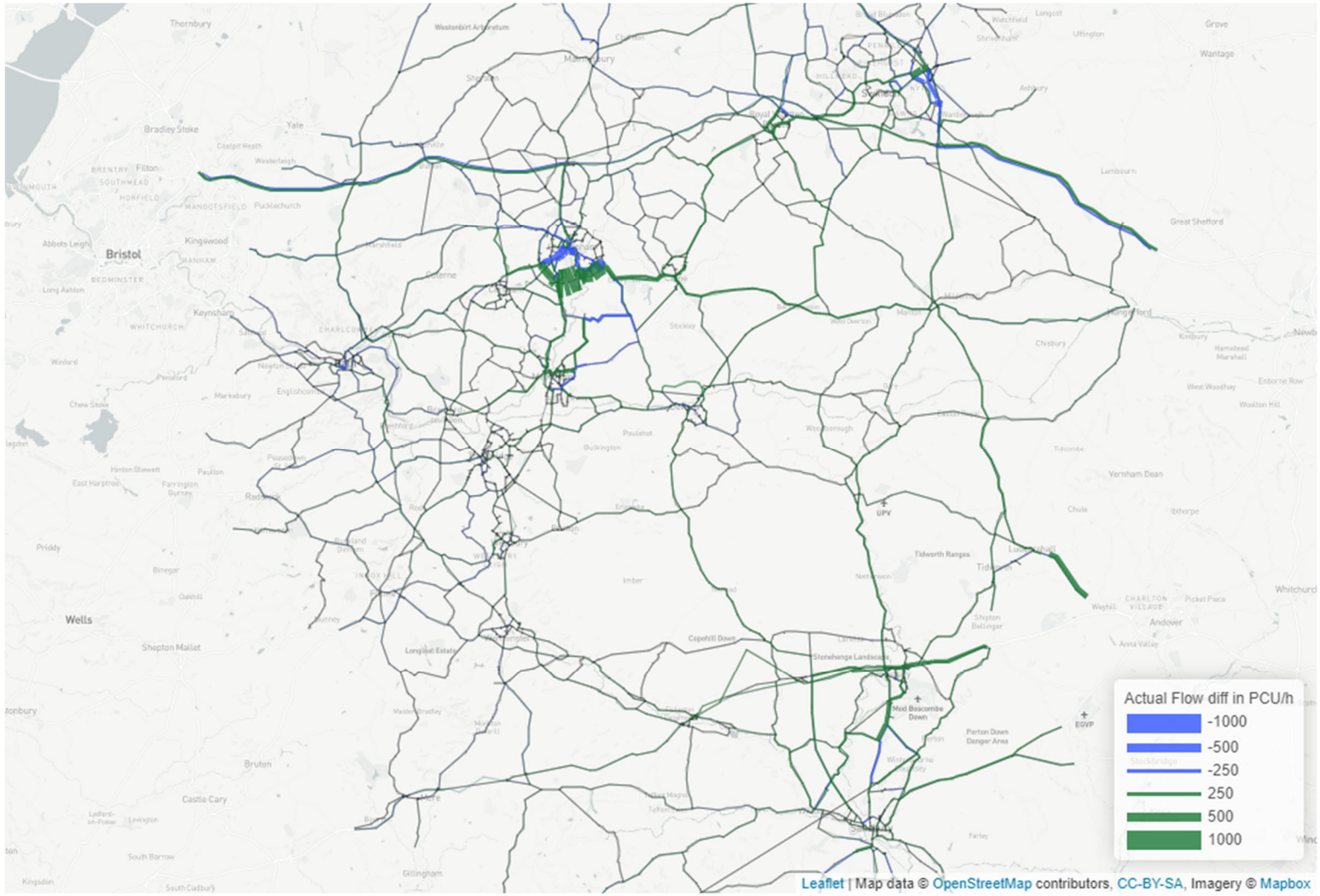
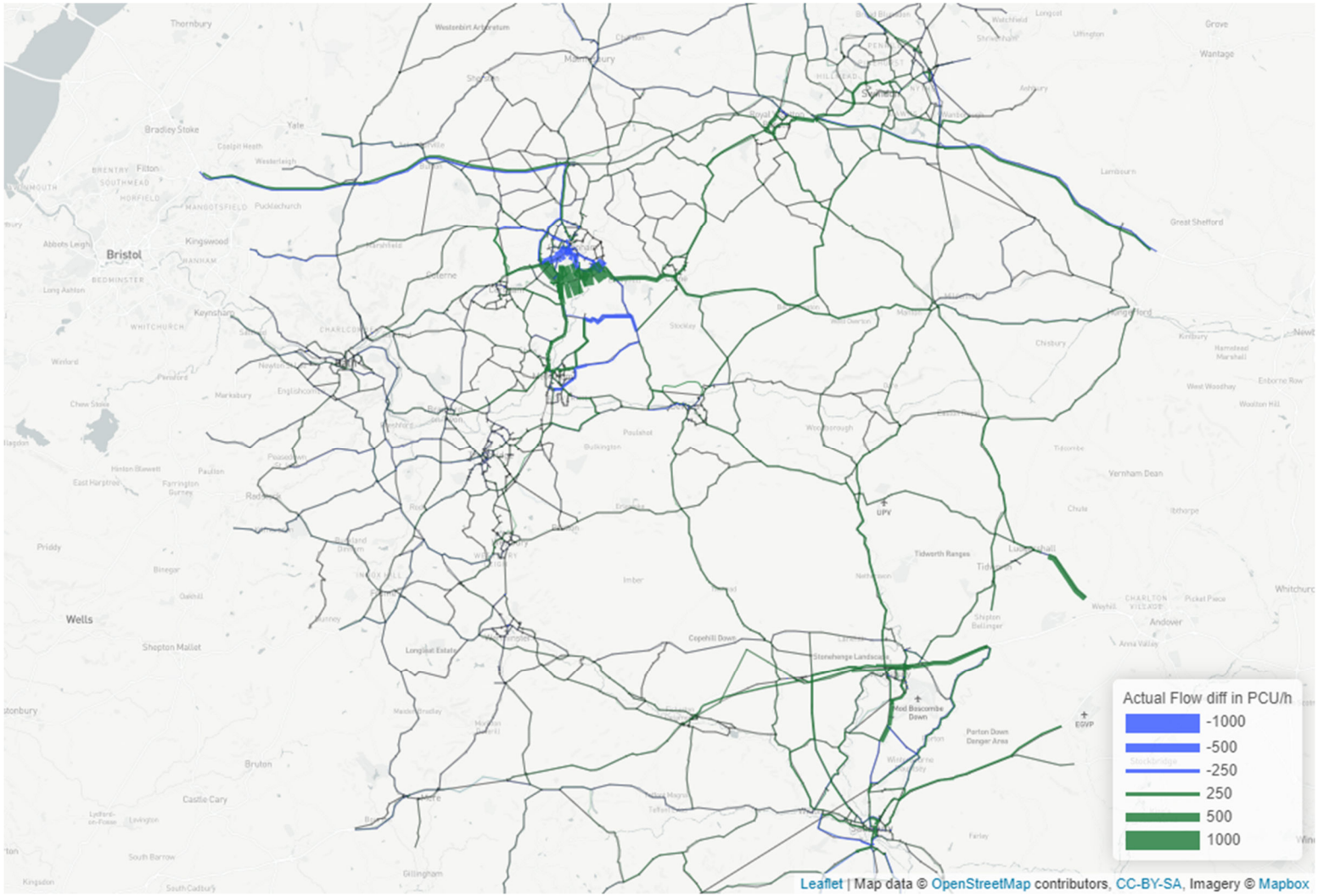


Figure 3-8 - Change in traffic flow BAU LPR (Scenario 1) compared to Core (PM peak hour)



3.5. Link Capacity (Volume/Capacity)

Analysis of volume / capacity (V/C) at both strategic and local levels is an important indicator for identifying impacts caused by the Local Plan growth. Severe impact on roads or junctions might be expected where values exceed 85%. Figure 3-9 to Figure 3-12 compare V/C (%) as a result of the predicted impact of the demand associated with the Local Plan review across different regional areas.

In general, traffic growth due to Local Plan is minimal and where V/C is reaching high levels this is linked to increases in housing. The 2022 Local Plan growth is likely to increase V/C above 85%, or exacerbate existing links with high V/C, at some key links including:

- **Chippenham, Calne and Melksham** - The A350 south of Chippenham, the A4 Bath Road, the A4 London Road through Calne, and the A350 at Melksham. This is in line with the previous 2020 local plan work. However, the overall magnitude of change is reduced, corresponding with the overall decrease in housing between the 2020 and 2022 local plan review assessments.
- **Trowbridge, Westbury, and Warminster** - The A350 southbound between Westbury and Warminster, A350 east of Trowbridge, and the A361 already experience high V/C percentages and are predicted to experience a 1-2% point increase.
- **Salisbury and Amesbury** - The A338 southbound at St Thomas' Bridge Roundabout, the A36 southeast of Salisbury, and Porton Road through Amesbury. Notably the A354 approach to Harnham Junction has shown an increase in V/C from 85% to 97%. Note - the change on the A345 Castle Road reflects growth previously expected in High Post which has since been removed from the 2022 Local Plan Review housing allocations.
- **Royal Wootton Bassett** - Noe Marsh Road, and Bincknoll Lane / Swindon Road (A3102) junction.

Figure 3-9 - A350 Chippenham, Calne, Melksham V/C% - 2038 Scenario 1 (AM peak)

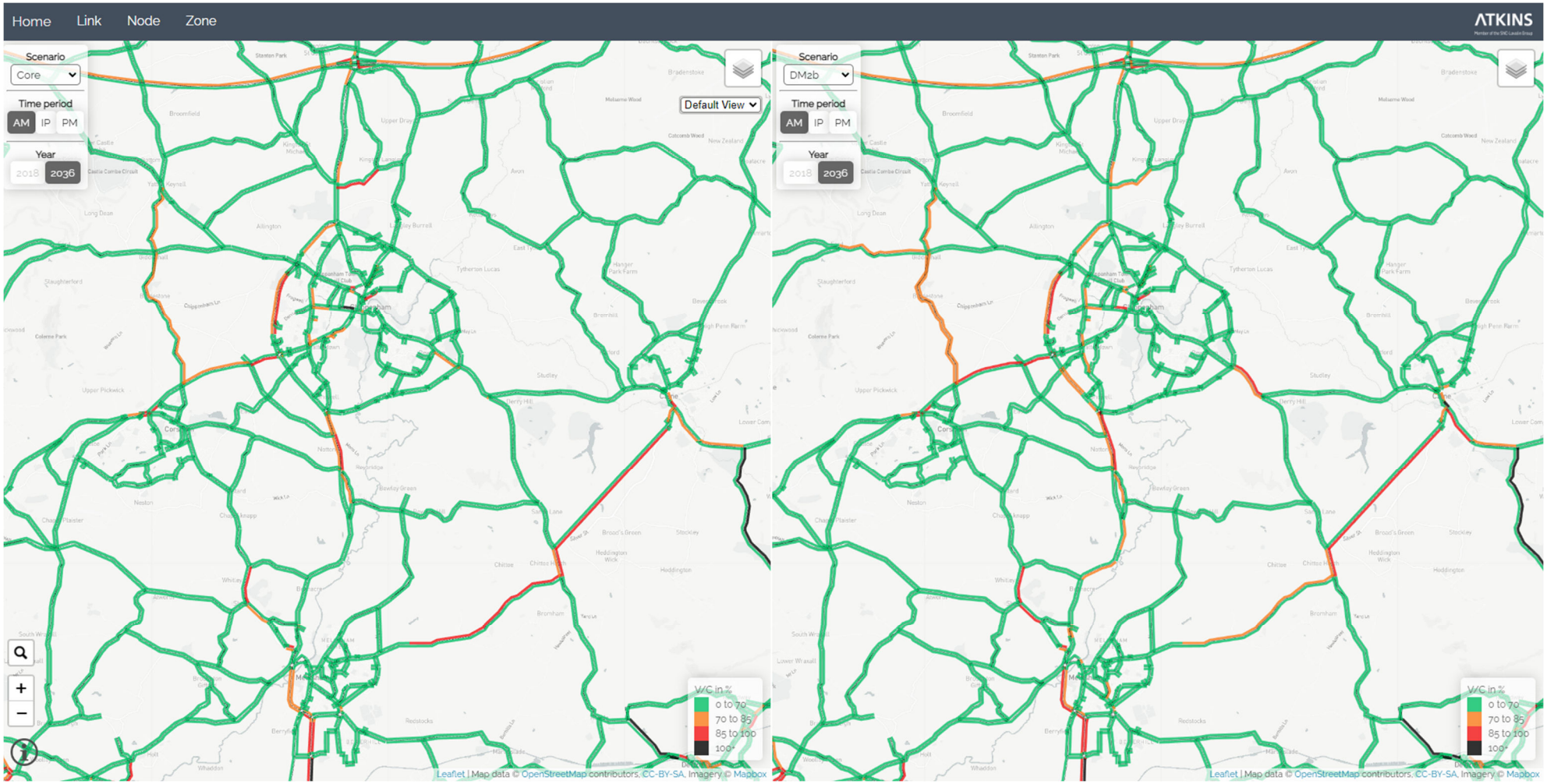


Figure 3-10 **- A350 Trowbridge, Westbury, Warminster V/C% - 2038 Scenario 1 (AM peak)**

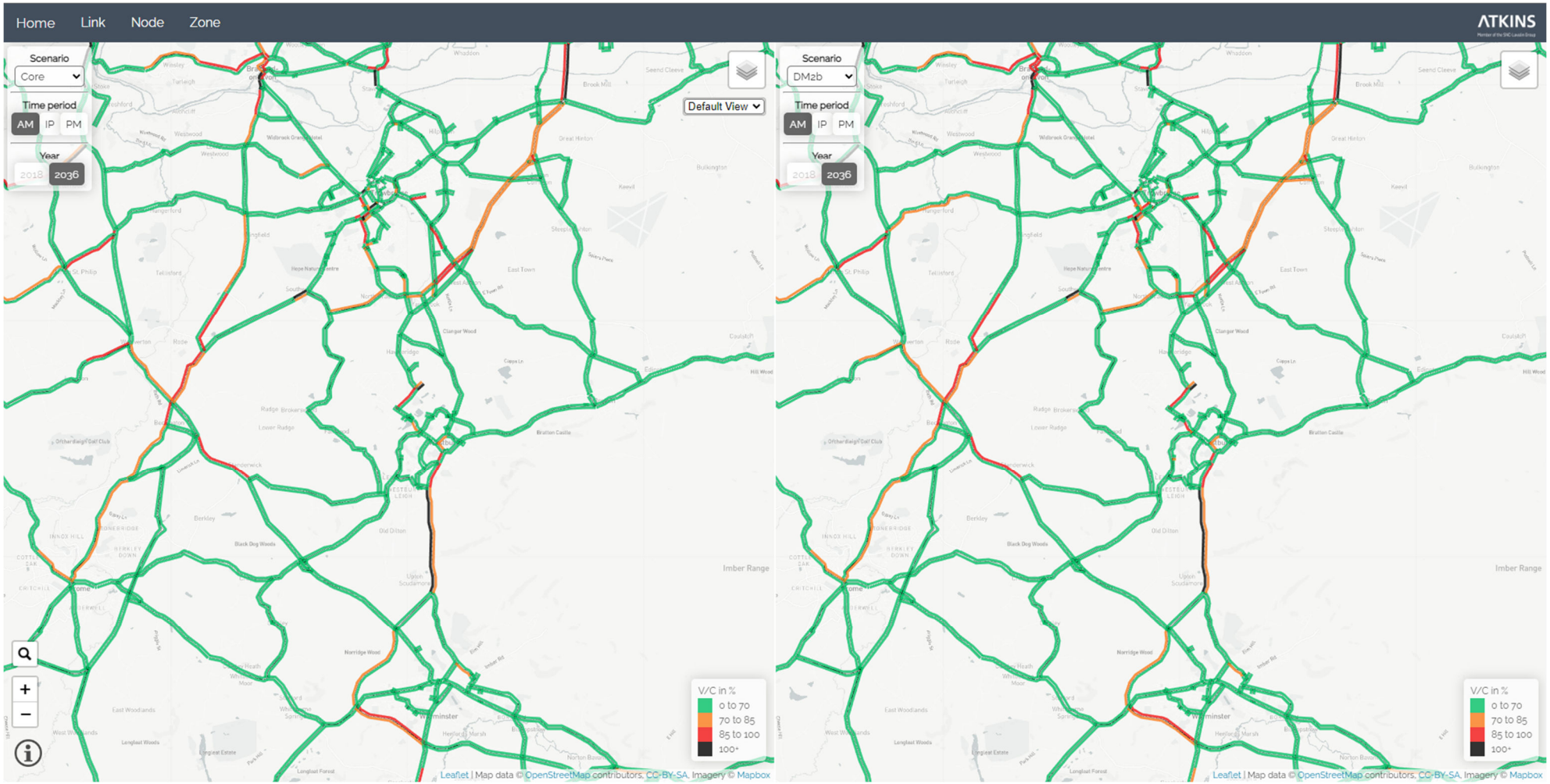


Figure 3-11 - Salisbury and Amesbury V/C% - 2038 Scenario 1 (AM peak)

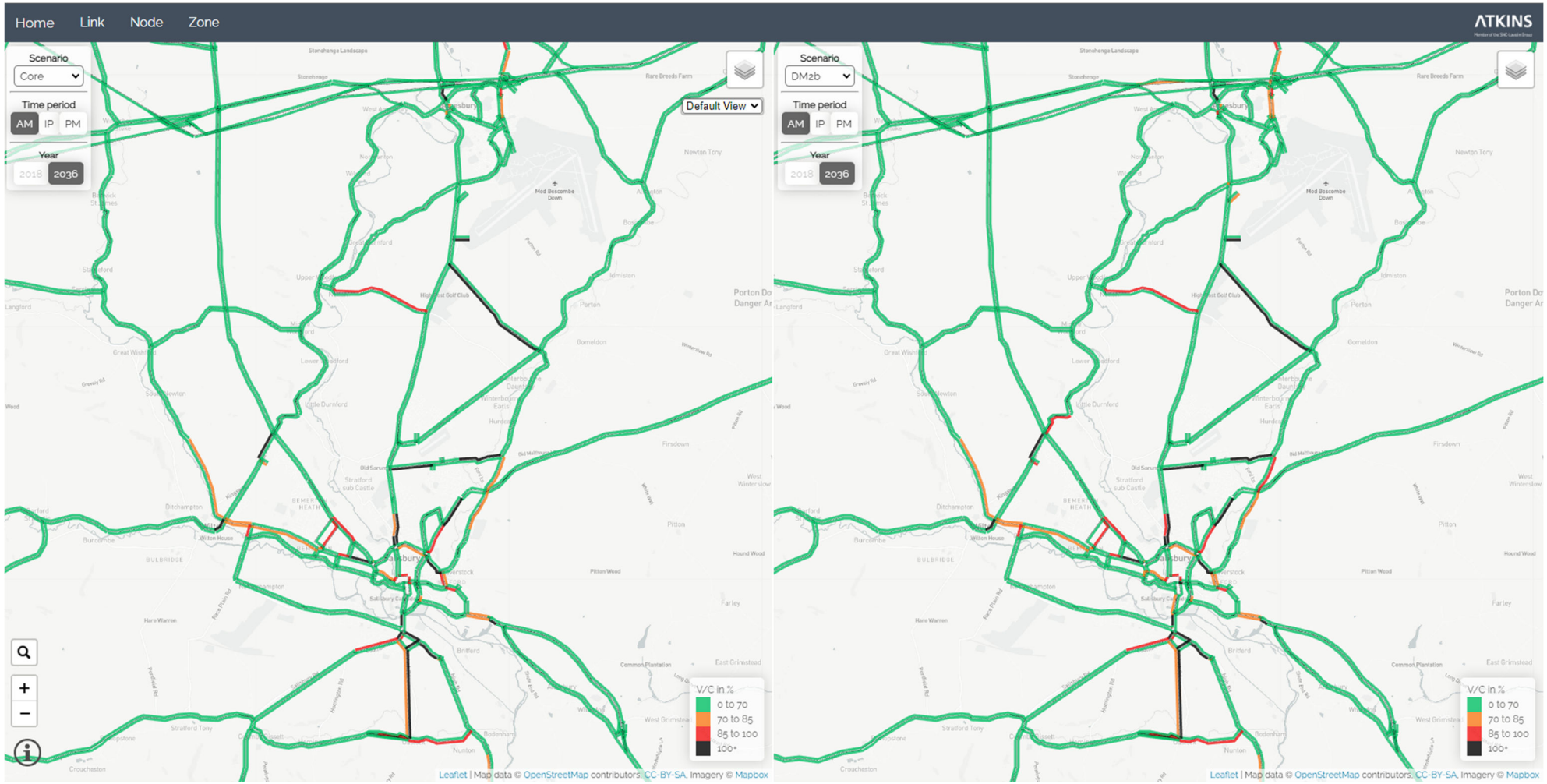
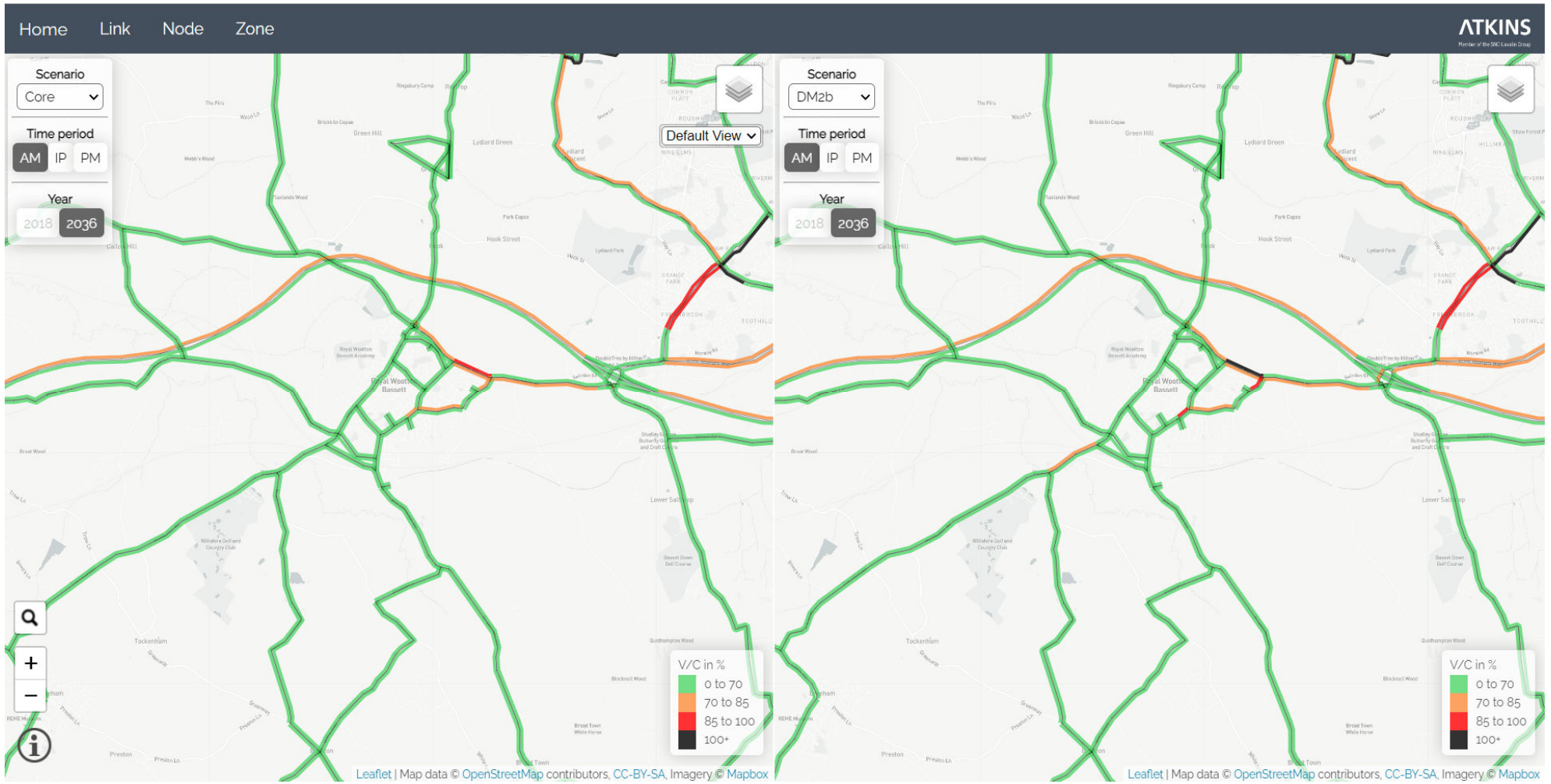


Figure 3-12 - Royal Wootton Bassett V/C% - 2038 Scenario 1 (AM peak)



3.6. Traffic impacts by mode

The modelling approach allows us to identify the change in trips by mode share as a result of the LPR. Table 3-6 and Table 3-7 presents the summary of impacts on total trips and mode share respectively. It indicates that the LPR is predicted to result in a growth in trips across all modes by 1.5%, with car having by far the largest increase of 9,791 trips and walk trips also increasing notably by 4,413 trips. There is a very minimal change in mode share.

Table 3-6 - Summary of Impacts of LPR by mode, Scenario 1 compared to Core

Daily person trips						
Scenario	**Car**	**Bus**	**Rail**	**Cycle**	**Walk**	**Total**
Trips by mode						
2038 Core	790,136	33,786	21,066	11,916	168,510	1,025,414
2038 BAU LP (Scenario 1)	799,927	34,537	21,330	12,289	172,923	1,041,006
Difference	9,791	751	264	374	4,413	15,593
% Difference	1.2%	2.2%	1.3%	3.1%	2.6%	1.5%

Table 3-7 - Summary of Impacts of LPR by mode share, Scenario 1 compared to Core

Mode Share						
Scenario	**Car**	**Bus**	**Rail**	**Cycle**	**Walk**	**Total**
2038 Core	77.1%	3.3%	2.1%	1.2%	16.4%	100.0%
2038 BAU LP (Scenario 1)	76.8%	3.3%	2.0%	1.2%	16.6%	100.0%
Difference	-0.2%	0.0%	0.0%	0.0%	0.2%	0.0%

3.7. Impact on carbon emissions

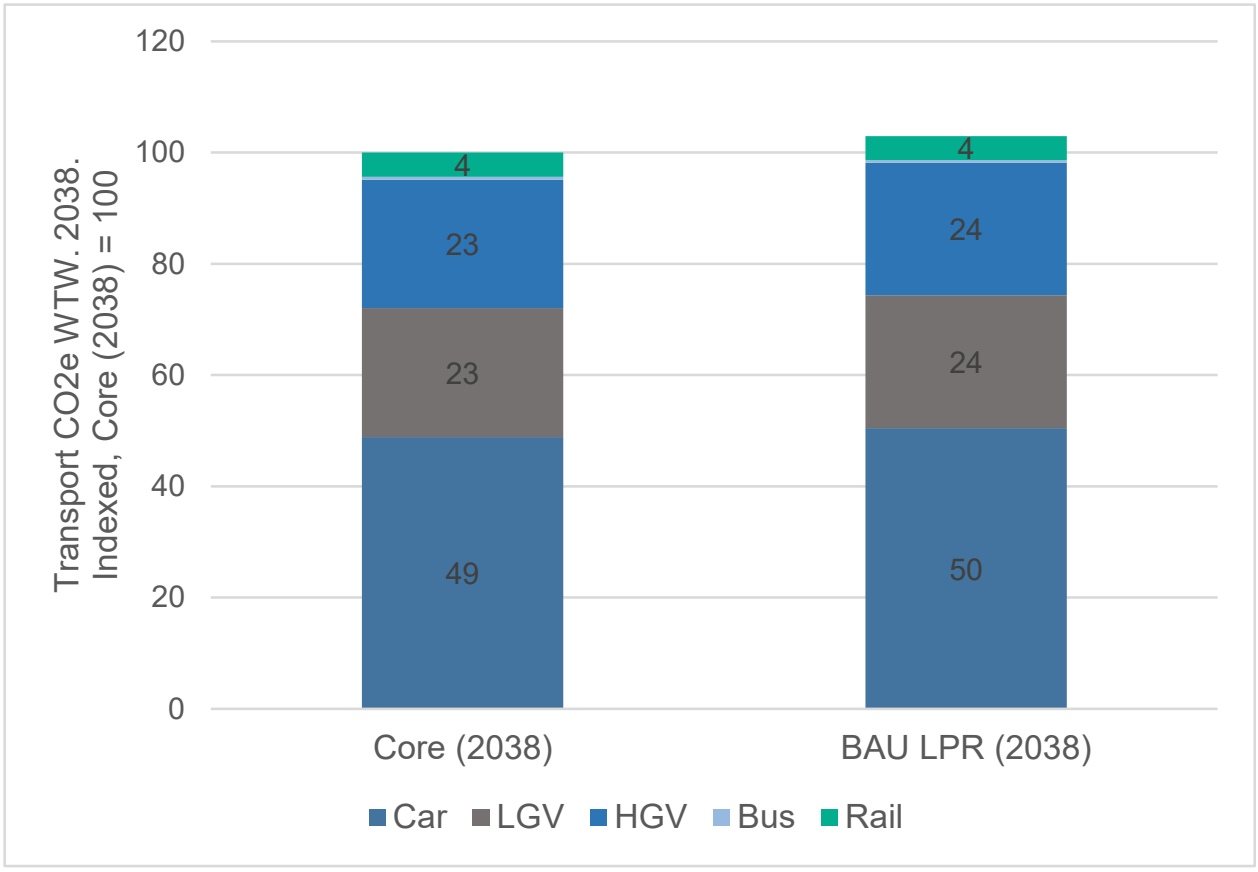
Looking at the impact on carbon emissions from transport resulting from the Local Plan Review growth, the carbon model shows that there is a 3% increase in emissions within Wiltshire compared to the Core (2038) Scenario. This is made up out of changes across different modes as shown in Table 3 -8 and Figure 3-13. It is worth noting that goods vehicle traffic and emissions levels increase alongside personal travel in response to the growth from the Local Plan Review.

Table 3 -8 - Changes in Carbon Emissions Scenario 1 compared to Core

Mode	Core (2038) (kT CO_2e p.a.) [1]	Scenario 1 BAU LPR (2038) (kT CO_2e p.a.) [1]	Percentage Change from Core (2038)
Car	410	425	3%
LGV	195	200	4%
HGV	195	200	3%
Bus	5	5	0%
Rail	35	35	0%
Total	845	870	3%

1 Figures are rounded to the nearest 5 k tonnes and may not sum due to rounding

Figure 3-13 - Carbon Emissions Scenario 1 BAU LPR (2038) indexed to Core (2038)



3.8. Summary of Local Plan Review Impacts

The Local Plan Review has increased the proposed number of dwellings across the region overall by 14,295, 6% compared to the Core Local Plan forecast. The biggest increase is in Chippenham, followed by Salisbury, Swindon and then Trowbridge.

The cumulative impacts of existing and proposed development on transport networks results in additional trips across all modes of 15,593, 1.5%, proportionally less than the increase in households, with the biggest number of trips being taken by car, 9,791 trips a day, 1,2%. The increase in number of trips is slightly lower than the increase in dwellings due to forecast reductions in both household size and trip rates. These car trips are well spread across the region, with the most concentrated change predicted around Chippenham. In some areas this contributes to links and junctions on the network already reaching or exceeding capacity and previously considered for improvement.

The Planning Practice Guidance also looks for an assessment of the existing impact on the locality in relation to the economy and social impacts. Whilst development is largely considered to have a positive impact on the economy as a higher population means more spending, it is important to ensure that the sites of developments are well placed to allow access to local services to keep that growth within the region. Likewise, if developments do not have access to local services and amenities it can have a negative impact on social impacts. This is part of the reasoning behind strategies such as ‘liveable neighbourhoods’ and ’20-minute neighbourhoods’. In the case of the LPR developments are widely spread across the region and there is a risk that as well as economic potential and positive social impacts, access to sustainable transport modes are difficult to achieve.

In terms of the environmental impacts, the additional vehicle trips result in an increase in transport carbon emissions of 3% across Wiltshire, adding to the challenge of reaching net zero targets. This is in addition to potential impacts on noise and air quality, as well as embodied carbon impacts that would result from any infrastructure schemes required at locations where capacity is being exceeded. A separate Habitats Regulation Assessment being undertaken by Wiltshire should address other environmental aspects.

4. Mitigating impacts of Local Plan growth

The Local Plan of 2015 and the Local Plan Review of 2020 both had transport assessments that looked at how to mitigate specific transport impacts, including walking and cycling measures, public transport measures and complementary measures. The challenge in this Local Plan Review is not just to alleviate the traffic impact of the additional travel movements but to ensure that measures address the carbon impact associated with those travel movements, and, if possible, contribute to addressing Wiltshire's wider net zero challenge.

As the housing allocations currently proposed by Wiltshire are widely spread across the region and not focussed on specific growth areas, the mitigations would also need to be spread across the region. This has pros and cons. The previous chapter noted how it can be more difficult to deliver positive social and economic impact when growth is widely spread. Travel associated with widely spread growth is also more difficult to directly influence as there may be less direct access to networks and movements will be more variable requiring larger, and inevitably more expensive, interventions. Yet on the positive side, widespread mitigations can have a wider reach, influencing and providing opportunities for residents and users across the region.

This chapter looks at the challenges that Wiltshire faces in reducing carbon emissions to an extent that can contribute to wider targets and reports the outputs from the model for each package of levers developed to meet the Scenario targets. The Scenarios were defined by Wiltshire to demonstrate the range of relevant targets and help to understand what is required to meet them by adding to and adjusting the intensity of the levers included in the mitigation packages defined.

4.1. Carbon challenge for Wiltshire

It is important to recognise that, with or without the additional growth from the Local Plan Review, Wiltshire faces a challenge in addressing carbon produced by transport in their county. The emissions reductions required to achieve decarbonisation targets are significant. Figure 4-1shows the forecast and target pathway levels of transport-based carbon emissions across Wiltshire1, alongside the latest BEIS estimates of transport emissions within Wiltshire.2

Several insights can be taken from this figure. Firstly, at a high-level, carbon emissions are forecast to decrease year-on-year, largely due to decarbonising vehicles and electricity production. However, even with this national action on fleet and electricity, there is still an emissions gap to be closed to achieve the target decarbonisation pathways that need to be followed to meet carbon budgets and reach net zero emissions by 2050, as called for in the Paris Climate Change Agreement.

The Tyndall Centre (Tyndall Centre - Setting Climate Commitments for Wiltshire) has produced a target decarbonisation pathway to 2050 for Wiltshire. Following the pathway would involve reducing carbon emissions by 95.7% from 2015 levels by 2040 to keep cumulative emissions within the county's fair share of the UK's national carbon budget (i.e. total emissions released before 2050 and interim target years). The national budget has been estimated by the Tyndall Centre to represent the UK's fair contribution to the global carbon reductions required by the Paris Climate Change Agreement commitment.

The pathway highlights that the timing of action is important as well as meeting the challenging 2050 Net Zero target. Once emitted, carbon emissions (and other greenhouse gases) remain in the atmosphere for decades, continuing to cause warming. Cumulative emissions are therefore the main driver of climate change and limiting cumulative emissions to meet identified carbon budgets is the key requirement for achieving climate change commitments. This means that initial rapid decarbonisation is important for successfully delivering climate change commitments.

Wiltshire have also been working with Anthesis, specialists in sustainability, to develop a more detailed decarbonisation pathway for planning for carbon reduction in the county. (Anthesis Report - Wiltshire Carbon Emissions Baselines). The 'Higher Ambition' pathway from that report shown in Figure 4-1 below requires a 55% reduction in emissions by 2030, relative to 2019 and a 77% reduction by 2045. This is not as ambitious as the Tyndall Centre pathway but is identified by Anthesis as the maximum level of climate action deemed

[1] NB this version of the emissions gap graph differs from the version included in the Baseline Report because the November 2022 and January 2023 TAG Databook updates introduced revised assumptions. These included more optimistic rates of EV uptake in the 2020s (which now exceed the levels estimated by the SMMT in their scenario assuming and ban on Petrol/Diesel car/van sales in 2030), along with reduced optimism on rates of efficiency improvements for petrol/diesel vehicles and changes in the assumptions of CO_2e emissions per litre of fuel.
The main messages from the graph remain the same, even with ambitious action to encourage EV uptake there remains a large emissions gap to be closed by other measures.
[2] Source: UK local authority and regional greenhouse gas emissions national statistics, 2005 to 2020 - GOV.UK (www.gov.uk)

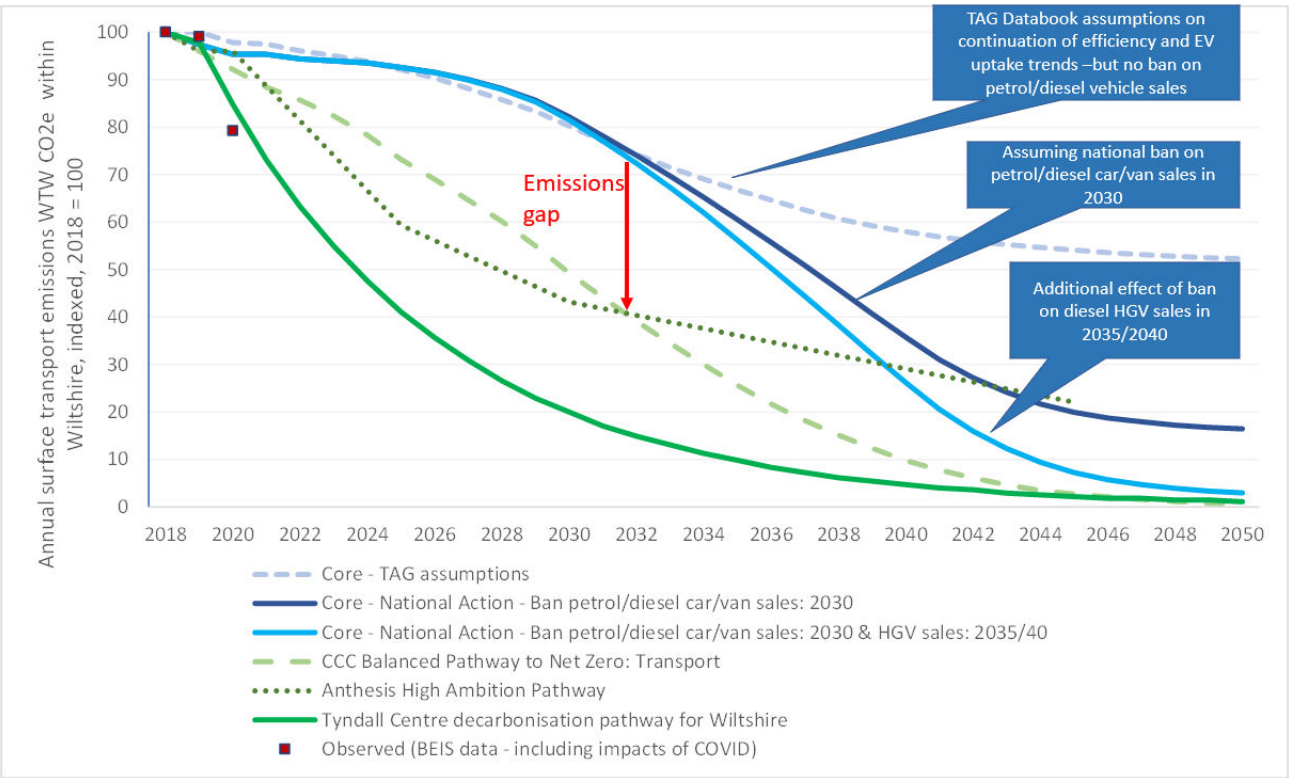
feasible, not accounting for any challenges due to skills, funding, policy, or other local factors impacting the feasibility of climate action in Wiltshire.

Both the Tyndall Centre and Anthesis pathways relate to all-sector emissions (reflecting the combined effect of emissions from transport and other energy using sectors, such as buildings). The Climate Change Committee (CCC) Sixth Carbon Budget report (Sixth Carbon Budget - Climate Change Committee (theccc.org.uk)) included a decarbonisation pathway specifically for the surface transport sector in the UK to align with the CCC's view of the UK's contribution to the Paris Agreement commitments. Figure 4-1 shows that it is less ambitious than the Anthesis High Ambition pathway initially but then more ambitious in the 2030s and 2040s.

The CCC and High Ambition pathways are both less ambitious than the Tyndall Centre pathway for Wiltshire. However, both would require a significant reduction in emissions in Wiltshire of 60% to 70% between 2019 and 2035. As outlined above, even with action from Government restricting sales of carbon emitting petrol and diesel vehicles and supporting electric vehicle uptake and decarbonisation of electricity generation, there is still a considerable anticipated gap between forecast transport emissions and these target decarbonisation pathways. Local Authorities will need to address the gap through local and regional efforts, including interventions that can influence travel behaviour and provide sustainable alternatives to car use.

The Scenarios tested as part of the assessment look to understand how levers can be applied to influence travel choices and behaviours to such an extent that carbon emissions are significantly reduced. This understanding, whilst assessed here in the context of consideration of mitigating the LPR growth impacts, provides evidence for application on a larger scale. The insights are relevant to support development of a pathway or framework for Wiltshire to consider when developing future transport schemes and strategies at a county level, such as for the LTP4.

Figure 4-1 - Forecast and target carbon reductions and observed emissions1



1 The observed data is drawn from BEIS local authority greenhouse gas statistics dataset (UK local authority and regional greenhouse gas emissions national statistics, 2005 to 2020 - GOV.UK (www.gov.uk). The latest data available is for 2020 which includes the full impact of travel restrictions due to COVID, causing a significant reduction in emissions in Wiltshire, and nationally. 2021 and 2022 figures are likely to have returned to closer to 2019 levels.

4.2. Scenarios for surface transport carbon reduction

To address the challenge of reducing carbon emissions, specifically from the Local Plan Review growth, by 'deciding' what we need to achieve and 'providing' the framework by which to achieve it, packages of interventions have been developed and tested. The interventions are a package of 'Levers' to reduce carbon emissions which can be applied within Scenarios in varying formation and with varying intensity.

The intervention Scenarios are defined by Wiltshire and applied to growth as a result of the LPR:

- **Scenario 2 Do Minimum** – to understand if transport interventions can be provided to avoid, if / where possible, new highway construction as identified within the previous Local Plan Review work (2020) as necessary to accommodate growth by 2038.
- **Scenario 3 Do Something** – to develop a package of interventions which focuses on reducing the carbon emission generated by the LPR growth. This is based on the Tyndall Centre climate commitments report for Wiltshire, which identifies a target decarbonisation pathway for Wiltshire of a countywide target of reducing carbon by 95.7% from 2015 levels by 2040. Following the pathway would keep cumulative emissions within the county's fair share of the UK's carbon budget, identified by the Tyndall Centre to align with the Paris Agreement commitments and deliver net zero carbon emissions by 2050.
- **Scenario 4 Do Maximum** – to develop a package of interventions which looks for a greater reduction in carbon than Scenario 3. The aim is that this would achieve the Anthesis High Ambition pathway, in alignment with Wiltshire Council's aspiration presented in the draft Climate Strategy. The High Ambition pathway assumes a 77% reduction in all-sector emissions in Wiltshire between 2019 and 2045. This incorporates the following changes in the transport sector by 2040, relative to 2019:
  - 25% reduction in travel miles.
  - 13% reduction in road transport (trips).
  - 35% increase in Public Transport (trips).
  - 133% increase in Active Travel (trips).
  - 94% ULEV vehicle fleet.
  - 20% increase in Low Carbon Freight mileage.
  - 15% decrease in Road Freight Mileage.
  - 73% reduction in energy used per mile travelled.

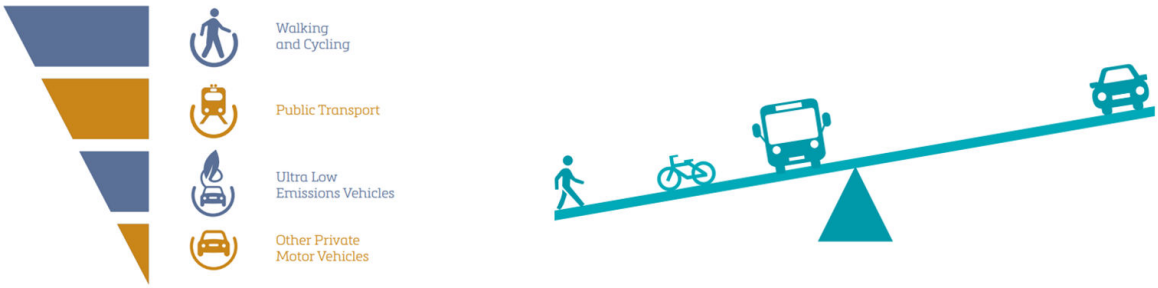
4.3. Packages of levers

Figure 4-2 illustrates the approach utilised in developing the intervention levers, which are aligned to the industry-standard Avoid-Shift-Improve framework:

- **Avoid** – reducing the number and length of trips needed, for example by improving land use planning, improving local community provision, travel planning, and levels of digital connectivity.
- **Shift** – shifting travel to more sustainable modes: public transport, walking, and cycling, away from car use.
- **Improve** – improving emissions intensity and energy efficiency of vehicles, and operational efficiency of roads, through technology improvements.

Figure 4-2 – Illustration of approach to levers development

Figure 4-3 – Priorities for developing intervention levers



The priorities utilised in developing the intervention levers are illustrated in Figure 4-3. The approach primarily aligns to the Avoid (1st priority), Shift (2nd priority) and Improve (3rd priority) framework. It also, where possible, prioritises active travel (walking and cycling) at the top of the hierarchy, followed by public transport, then ultra-low emission vehicles, and finally other private motorised vehicles, as outlined in Figure 4-3.

This approach is aligned with UK government policy and legislation, including:

- The highway code (and the recently implemented hierarchy of road users).
- The Climate Change Act 2008 (2050 Target Amendment) which introduced a binding target for the UK to bring all greenhouse gas emissions to net zero by 2050.
- The two DfT Decarbonising Transport reports (2020 and 2021) which outline the need to accelerate modal shift to public and active transport, decarbonise road vehicles including the phase out of non-zero emission cars and vans.
- DfT's Gear Change which outlines the need for improved infrastructure for those travelling on foot or by cycle.
- DfT's Bus Back Better: national bus strategy for England which outlines the need for improved bus provision as a key tenet of the public transport network.

The approach also aligns with Wiltshire Council's acknowledgement of the climate emergency and subsequent Climate Strategy which commits the county to carbon neutrality by 2030.

The levers are applied in the model through a range of assumptions. The assumptions have been derived based on available evidence from schemes currently in place or trialled in the UK or around the world. These are recorded under each Scenario, each building on the previous set of levers. In some cases, particularly in the Do Maximum Scenario 4, to elicit the degree of change required to achieve greater targets and ambitions, the strength of some levers, particularly those representing costs to the user, have been set at a notably high level. Sensitivities around the optimum values for these measures have not been tested in this study.

To allow Wiltshire to understand how they can influence outcomes, potential interventions which are reliant on changes driven by national government have been avoided, such as national road user charging, changes to fuel duty / fuel pricing. However, these packages aim to demonstrate the extent of what could be achieved and include measures that complement each other, meaning that some may fall out of the direct control of Wiltshire, for example setting and controlling rail or bus fares. Awareness of these can be beneficial in influencing wider policy.

4.3.1. Understanding the impacts and basis for comparison

The following sections of this chapter describe the levers for each of the Scenarios and consider the impact they had on the number of trips by mode. As the intention is to mitigate the impact of the LPR each Scenario is compared to the 'pre-LPR' situation, defined as the 'Core (2038)' Scenario.

The degree to which each Scenario makes an impact is considered by also looking at the change compared to the Baseline (2018) to understand how much of the impacts from Committed Growth from Local Plan could also be mitigated.

4.4. Scenario 2 – Do Minimum

Scenario 2 was intended to test levers to understand if transport interventions can be provided to avoid new highway construction identified as necessary within the previous Local Plan Review work (2020). Chapter 3 presented growth in trips from the LPR which would be accommodated by proposed highway schemes,

previously identified as necessary to accommodate growth as part of the Core, committed development, or potential improvements in areas of concern:

- MRN Schemes:
  - M4 J17.
  - Chippenham: A350 Phase 4 and 5 Dualling.
  - Melksham: A350 Melksham Bypass.
- Local Plan 2020 Mitigations:
  - Lacock: dualling of the A350 from Lackham roundabout to Melksham Bypass.
  - Melksham: Dualling of the A350 from Littleton roundabout to Melksham Bypass.
  - Staverton: improvements to the operation of Staverton Bridge (B3105 / B3106 junction).
- Additional areas of 'concern':
  - Salisbury: A338 Salisbury Junctions.
  - A3102: double A3102 / A342 junctions.
  - RWB: junction to the Swindon Road (A3102) / un-named road roundabout.
  - High Post: A345 junctions at High Post crossroads and Down Barn Road.

4.4.1. Scenario 2 levers

Scenario 2 levers are intended to provide potential solutions focussed on reducing growth at these locations to such an extent that their need is reduced or removed. As such levers are based on improvements to public transport and active travel measures have been further developed based on those originally proposed in the Local Plan Transport Review.

Table 4-1 presents the type of intervention levers implemented in Scenario 2 and the input assumptions for each these are presented in Table 4-2, alongside the evidence base sourced from research studies and post-implementation studies on the impact of interventions. The evidence base which informed selection of the model inputs for each lever is available in Appendix C.

The figures that follow the tables, **Figure 4-4** to **Figure 4-8**, provide a geographical representation of where the interventions are applied in the model focussed on reducing the Local Plan Review impacts.

Table 4-1 - Scenario 2 levers

Intervention Type	Category	Levers / Scheme	Application	Spatial Coverage Illustrated in
Avoid	Active Travel Infrastructure	Cycling infrastructure - genuine connected network	ISM	Figure 4-4
		Walking infrastructure - genuine connected network	ISM	
Avoid	Behavioural change	Workplace Travel Planning	Post ISM	
		School Travel Planning	Post ISM	
Shift	Modern Public Transport	Extended bus routes and improved frequencies	ISM	Figure 4-5
		Demand Responsive Transport (DRT) and rideshare	Post ISM	Figure 4-7
Shift	Fiscal Measures	Improved (reduced) public transport fares	ISM	Figure 4-6
		Increased parking charges	ISM	Figure 4-8
Improve	Electric Vehicle (EV) charging infrastructure	EV charging (residential) and vehicle to grid technology	Carbon Model	

Table 4-2 - Scenario 2 - Model Inputs

Intervention type	Intervention lever	Lever evidence summary	Lever model input
Avoid	Cycling infrastructure - genuine connected network	10% reduction in cycle time / cost 5% reduction in motorised vehicle trips 3% reduction in motorised vehicle miles travelled"	10% reduction in cycle distance / time
	Walking infrastructure - genuine connected network	10% reduction in walk time / cost 5% reduction in motorised vehicle trips 3% reduction in motorised vehicle miles travelled	10% reduction in walk distance / time
	Workplace Travel Planning	5% mode shift from car Assume majority - 4.5% shift to PT (bus), 0.5% to cycling Only applies to trips to place of employment	-
	School Travel Planning	5% mode shift from car Assume majority - 4.5% shift to PT (bus), 0.5% to cycling Only applies to trips to education establishment	-
Shift	Extended public transport routes and improved frequencies	35% reduction in passenger wait time for bus services	35% reduction in passenger wait time and transfer time for bus services
	Demand Responsive Transport (DRT) and rideshare	1.8% mode shift from private car to DRT (i.e., DRT added to bus)	Applied change in Post ISM
	Improved (reduced) public transport fares	10-15% reduction in fare	10% reduction in bus and rail fare
	Increased parking charges	14% (+10% to account for Wiltshire's increases between 2018 & 2022)	15% increase in parking charges
Improve	EV charging (residential) and vehicle to grid technology	No ISM input assumption – Carbon Model input assumption in line with national projections	-

Figure 4-4 - Scenario 2 - Walking and Cycling Infrastructure Improvements

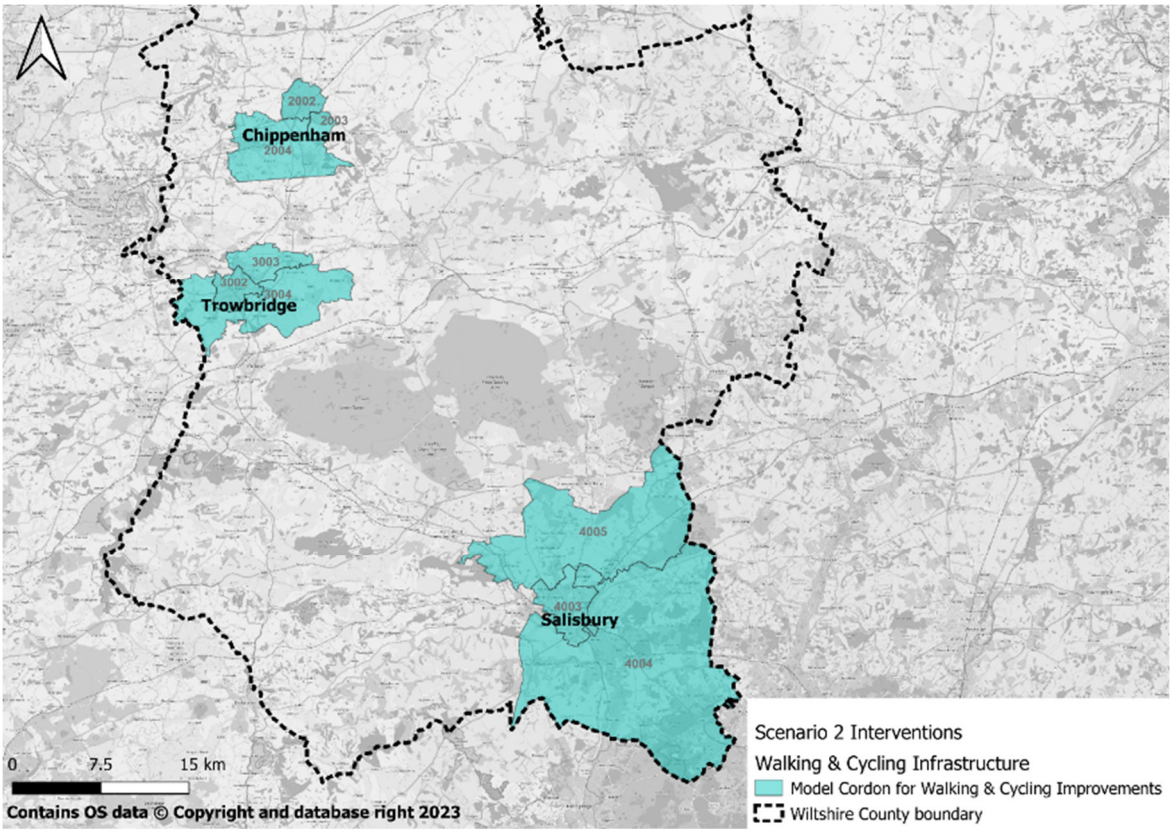


Figure 4-5 - Scenario 2 - Extended Public Transport Routes and Improved Frequencies

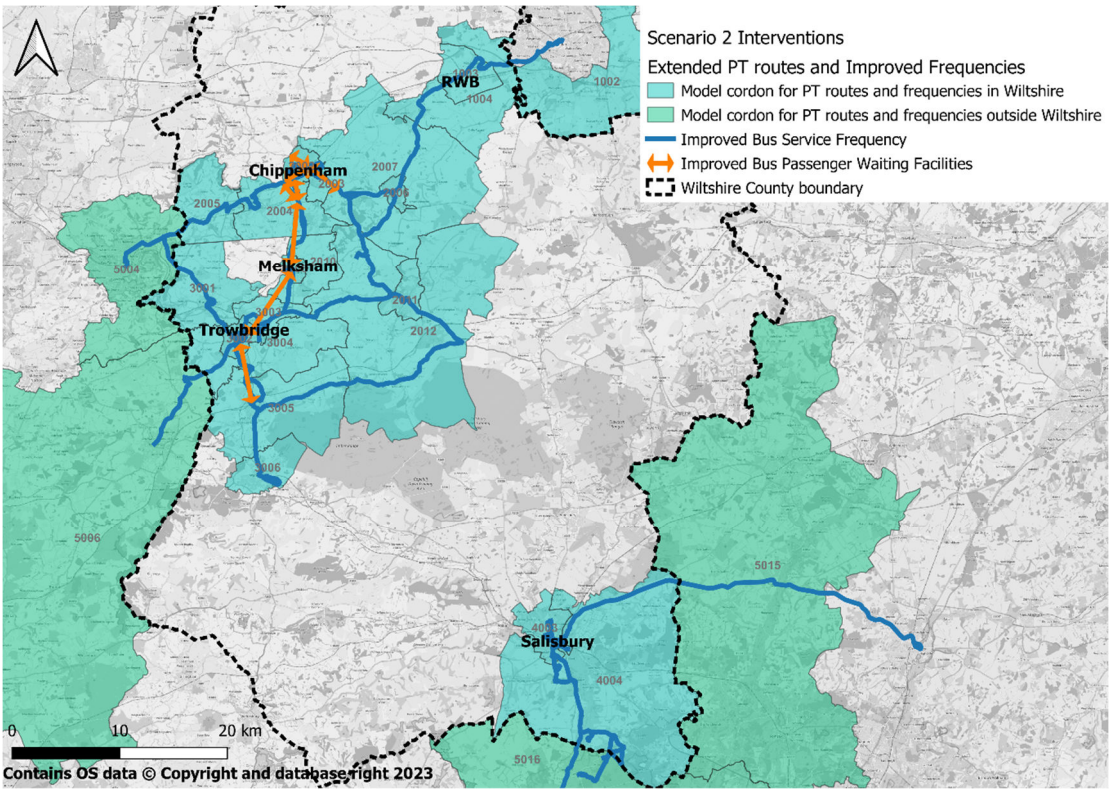


Figure 4-6 - Scenario 2 - Improved (reduced) Public Transport Fares

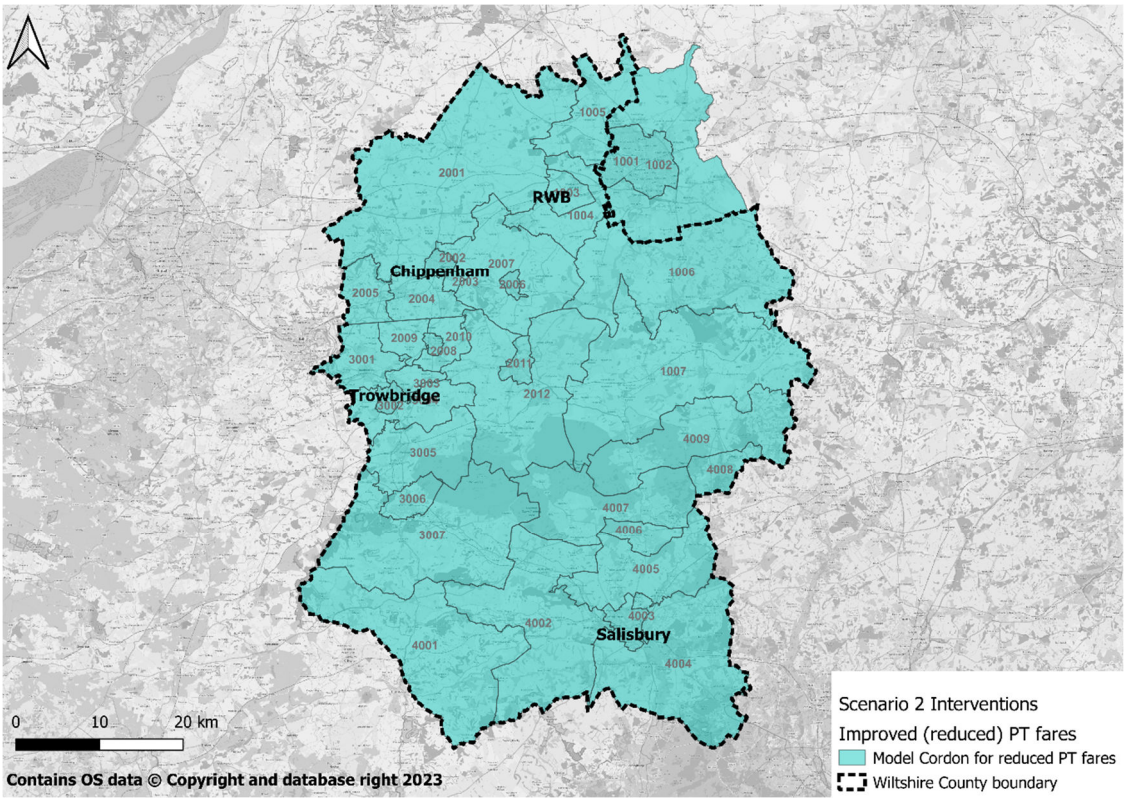


Figure 4-7 - Scenario 2 - Demand Responsive Transport

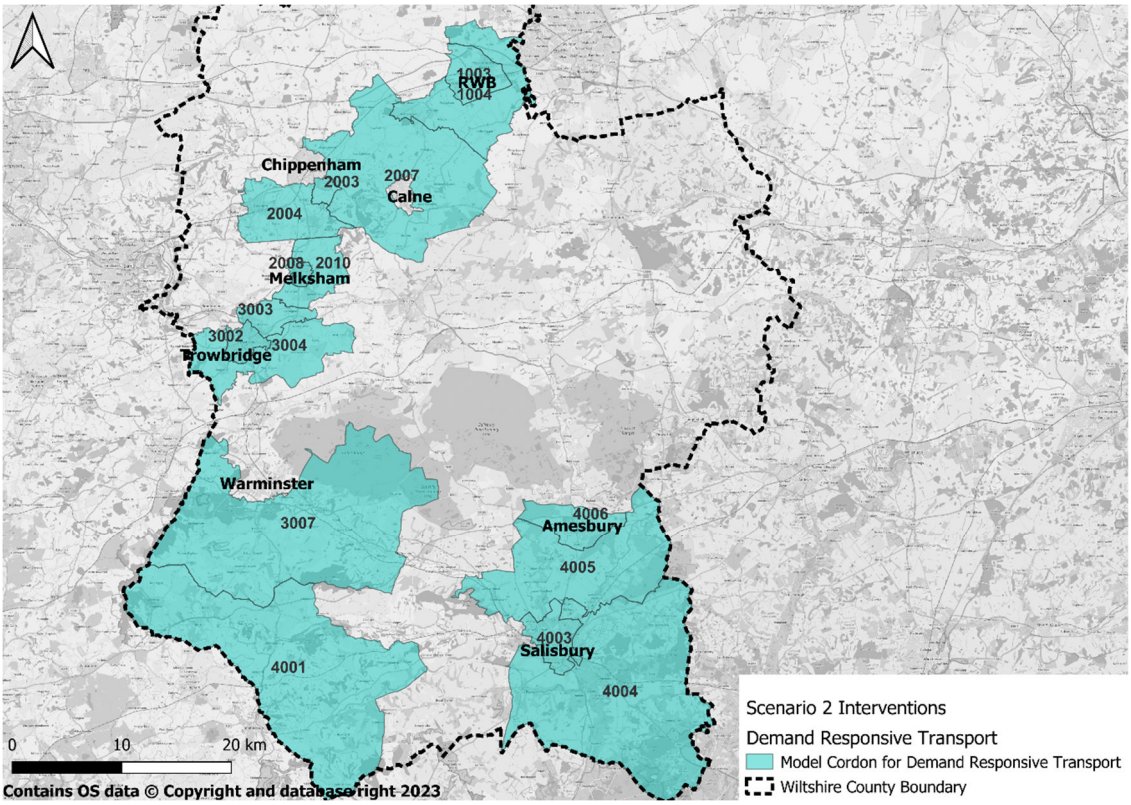
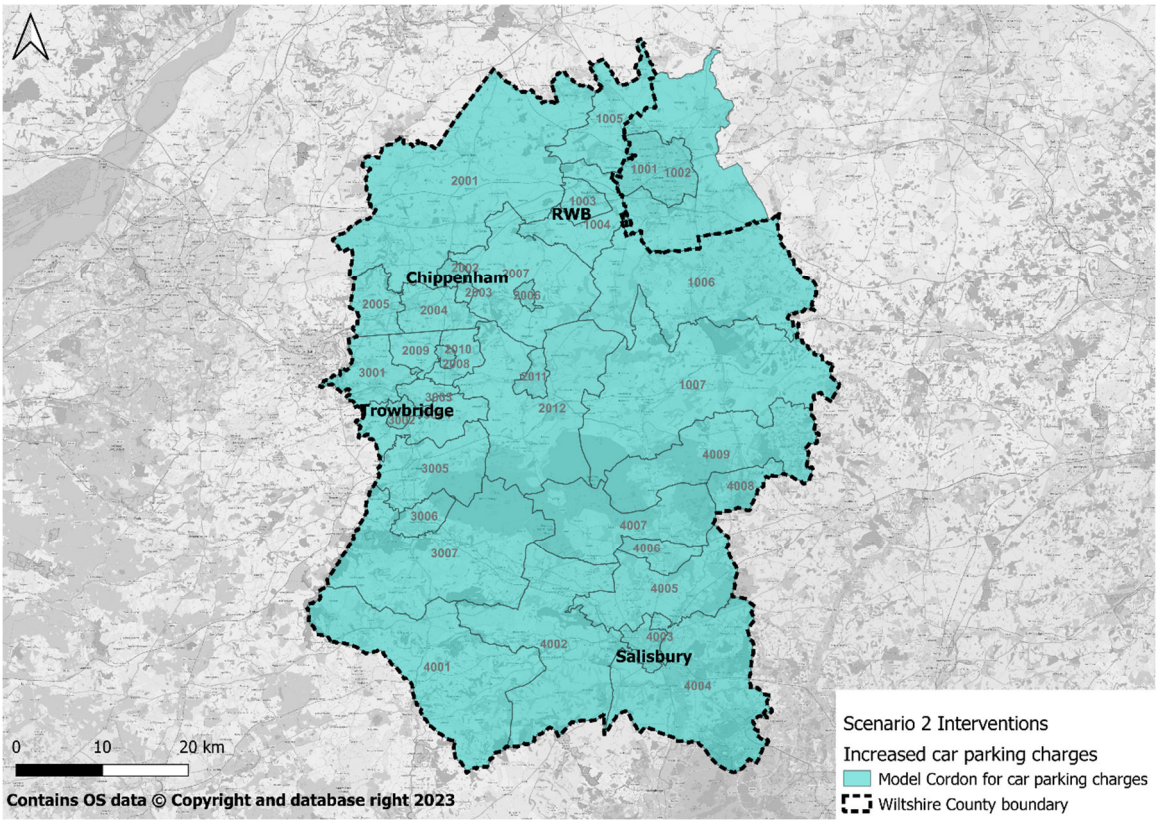


Figure 4-8 - Scenario 2 - Increased Vehicle Parking Charges



4.4.2. Scenario 2 Impacts

Table 4-3 shows the impact that the Scenario 2 levers have had towards mitigating the impact from the 2022 LPR. It has a positive change by reducing the number of car trips, even below that forecast in the Core (2038) Scenario, and as might be expected generates more trips on sustainable modes. However, comparing Scenario 2 with the Base (2018) picture, it is evident that there is still a significant increase in car trips; as shown in Table 4-4. Figure 4-9 shows the impact of the levers on carbon emissions across Wiltshire. It reflects the 1% reduction in car trips and shows the levers succeed in reducing carbon emissions from cars back to the Core (2038) position, but as there is no impact on emissions from good vehicles there is still an overall increase in emissions of 2% across Wiltshire (Table 4 -5).

Table 4-3 - Total trips by mode, Scenario 2 compared to Core (2038) – Daily person trips

Scenario	Car	Bus	Rail	Cycle	Walk	Grand Total
Core (2038)	790,136	33,786	21,066	11,916	168,510	1,025,414
Scenario 2 Do Minimum (2038)	782,717	43,809	21,540	13,045	177,959	1,039,072
Difference	- 7,419	10,023	474	1,129	9,449	13,658
% change	-1%	29%	2%	9%	5%	1%

Table 4-4 - Total trips by mode, Scenario 2 compared to Base (2018) – Daily person trips

Scenario	Car	Bus	Rail	Cycle	Walk	Grand Total
Base (2018)	697,874	33,132	20,533	11,320	150,579	913,439
Scenario 2 Do Minimum (2038)	782,717	43,809	21,540	13,045	177,959	1,039,072

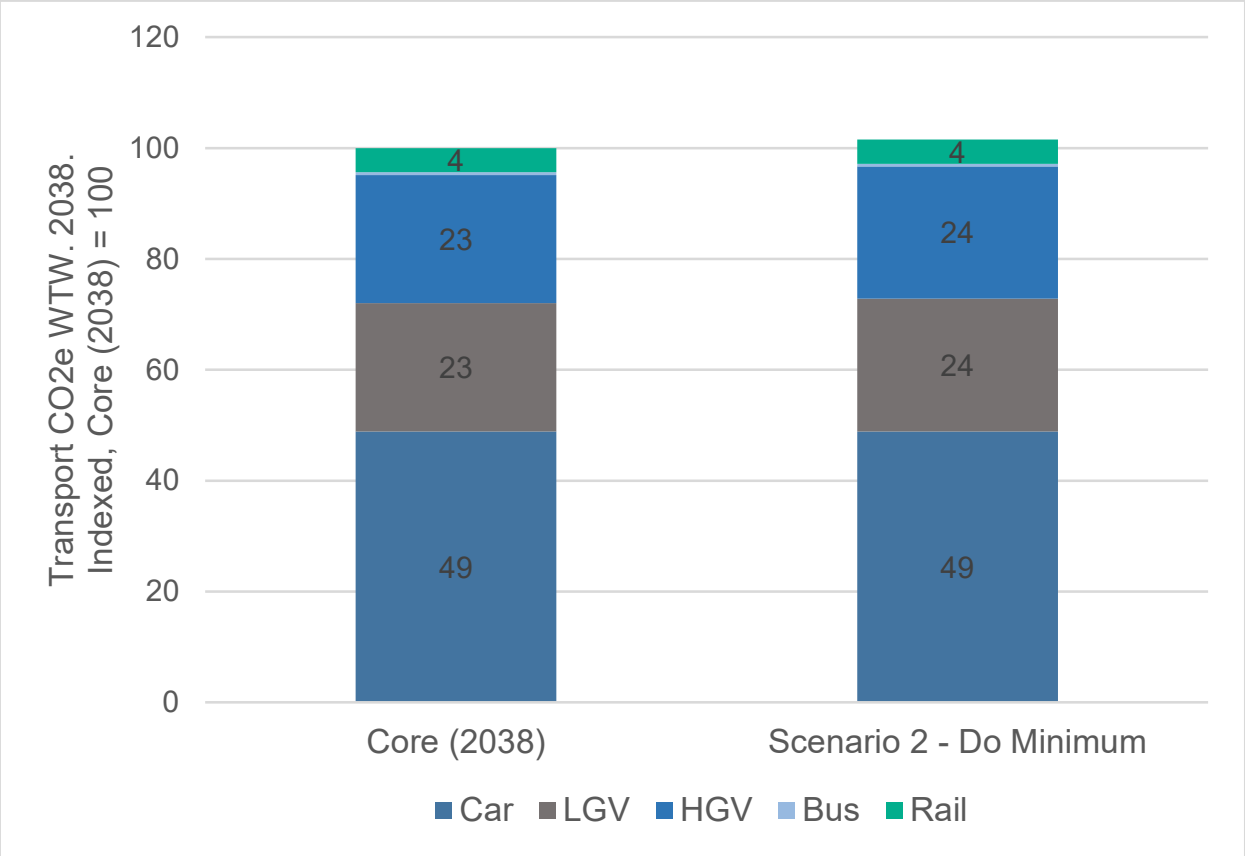
Scenario	Car	Bus	Rail	Cycle	Walk	Grand Total
Difference	84,843	10,677	1,007	1,725	27,380	125,633
% change	12%	32%	5%	15%	18%	14%

Table 4 -5 - Changes in Carbon Emissions Scenario 2 compared to Core

Mode	Core (2038) (kT CO_2e p.a.) [1]	Scenario 2 Do Minimum (2038) (kT CO_2e p.a.) [1]	Percentage Change from Core (2038)
Car	410	410	0%
LGV	195	200	4%
HGV	195	200	3%
Bus	5	5	0%
Rail	35	35	0%
Total	845	855	2%

1 Figures are rounded to the nearest 5 k tonnes and may not sum due to rounding

Figure 4-9 – Carbon Emissions Scenario 2 Do Minimum (2038) indexed to Core (2038)



4.4.3. Scenario 2 Summary

The aim of this Scenario was to see if planned infrastructure, such as the schemes described early in Section 4.4, around the county's highway network could be reduced in scale or avoided completely. The interventions tested succeed in reducing the number of car trips generated by the changes in the LPR, to 1% less than the Core (2038) situation. There was also the equivalent reduction in carbon emissions from cars, back to Core (2038) levels. However, the changes to traffic levels are minimal and the growth planned as part of the committed Local Plan would still need to be accommodated in some way. As such there is no evidence to suggest that the levers proposed in Scenario 2 would result in a big enough change to avoid the need for transport schemes needed to accommodate growth from the Local Plan. A stronger set of levers, such as those considered in Scenarios 3 and 4, would be necessary to achieve a greater level of change.

4.5. Scenario 3 – Do Something

Scenario 3 is described as 'Do Something' to reflect the ambition for a package of levers to go some way towards achieving countywide carbon reduction targets by offsetting the emissions impacts of the LPR growth to limit the net increase in emissions to near zero. This is to be assessed against the Tyndall Centre carbon reduction pathway for Wiltshire which identifies the need for a 95.7% reduction in carbon emissions to be achieved by 2040 (relative to 2015).

In Chapter 3 the impact of the BAU Local Plan Review (Scenario 1) on countywide transport carbon emissions was forecast to be in the region of an increase of 3% compared to the Core in 2038. So that is the magnitude of reduction that would be sought to be achieved across Wiltshire. Comparing the levels from Scenario 3 relative to Scenario 1 so that the LPR growth causes very limited net increase in emissions. Section 4.4.3 indicated that Scenario 2 levers did not bring emissions back to Core (2038) levels. So, to achieve the Scenario 3 target, a wider range of levers need to be included that, as well as providing sustainable alternatives to encourage mode shift, both provide disincentives to not continuing to travel by car and reduce the need to travel overall.

4.5.1. Scenario 3 levers

Table 4-6 presents the type of intervention levers implemented in Scenario 3 and the input assumptions for each of these are presented in Table 4-7, alongside the evidence base sourced from research studies and post-implementation studies on the impact of interventions. The evidence base which informed selection of the model inputs for each lever is available in Appendix C.

It is important to note that the levers deployed in Scenario 2 carry over into Scenario 3. The levers presented here are therefore the additional levers introduced for Scenario 3. The levers have been specified to focus on influencing travel choices for movements to, from and within the LPR growth areas.

The figures that follow, Figure 4-10 to Figure 4-16, provide a geographical representation of where the interventions are applied across the county.

Table 4-6 - Scenario 3 levers

Intervention type	Category	Levers / Scheme	Application	Spatial extent illustrated in
Avoid	Active Travel Infrastructure	Micro-consolidation: trolley / cargo bike / electric vehicle last-mile delivery	Scenario Saturn matrices	Figure 4-16
		Flexible pick-up / drop-off points for home deliveries	Scenario Saturn matrices	
Avoid	Behavioural change	Personalised Travel Planning	Post ISM	Figure 4-13
Avoid	Land Use Planning	Mixed-use developments meeting greater range of local needs	ISM	Figure 4-16
		Local amenities within short walk and cycle (15-minute neighbourhood)	ISM	Figure 4-15
Avoid	IT Infrastructure	Home working (superfast broadband, house design to allow for workspace)	Prior ISM	Figure 4-13
Shift	Fiscal Measures	Introduction of mobility credits	ISM	Figure 4-13
		Workplace Parking Levy	ISM	Figure 4-14
Shift	Shared Mobility	Bike share	ISM	Figure 4-13
		Car share (club)	Carbon Model	Figure 4-13
		Mobility hubs - integrated network	ISM	Figure 4-13

Intervention type	Category	Levers / Scheme	Application	Spatial extent illustrated in
Shift	Street design & access restrictions	Low Traffic Neighbourhoods (LTNs) - active travel priority	ISM	Figure 4-11
		Controlled parking zones	ISM	Figure 4-12
Improve	Efficient driving / network	Roll-out and support eco-driving training	Carbon Model	Figure 4-10
		Implement speed limit reductions	Carbon Model	Figure 4-10

Table 4-7 - Scenario 3 - Model Inputs

Intervention type	Intervention lever	Lever evidence summary	Lever model input
Avoid	Micro-consolidation: trolley / cargo bike / electric vehicle last-mile delivery	10% reduction in delivery vehicle traffic volume	1.6% reduction in total LGV demand (16% of LGV is assumed as delivery vehicles)
	Flexible pick-up / drop-off points for home deliveries	15% reduction in delivery vehicle km travelled	2.4% reduction in total LGV demand (16% of LGV is assumed as delivery vehicles)
	Personalised Travel Planning	5% mode shift from car Assume majority - 4% shifts to PT (bus), 0.5% to cycling, 0.5% to walking Applied to homebased trips other than: 1) homebased trips to workplace, 2) homebased trips to school / education facility	-
	Mixed-use developments meeting greater range of local needs	3% reduction vehicle trips, 5% reduction in vehicle miles / Km travelled - only applies to Local Plan-growth related trips	5% reduction in car / bus distance and time skims 10% reduction in cycle distance / time 20% reduction in walk distance / time
	Local amenities within short walk and cycle (15-minute neighbourhood)	Reductions of: 23.1% car use / mode share, and 5% vehicle miles / Km travelled	10% reduction in cycle distance / time 10% reduction in walk distance / time
	Home working (superfast broadband, house design to allow for work space)	16% reduction in vehicle miles / Km for car trips to place of employment (trips removed, not shifted to another mode) - applied to all commute trips, rather than solely those associated with Local Plan housing sites	16% reduction in commuting trips input to ISM (HBW purpose)
Shift	Introduction of mobility credits	2% increase in bus mode share 2% increase in rail mode share 1% increase in cycle mode share (5% reduction in car mode share)	0.5% shift in trip productions from 1+ car availability to 0 Car availability category
	Workplace Parking Levy	10% reduction in commuting journeys by car £450 / space / year (employer cost) - indexed to RPI	Charge of £450 / space / year converted to daily charge (i.e., 450/365) and added to existing parking charges
	Bike share	2% reduction in car availability in future year +2% to bike	5% reduction in cycle distance/ time skims – to indirectly replicate the access to bikes
	Car share (club)	Amend post-ISM model run - within carbon tool - ratio of car	-

Intervention type	Intervention lever	Lever evidence summary	Lever model input
		trips to vehicle trips amended (9 vehicles replaced per car club space)	
	Mobility hubs - integrated network	5% reduction in access/egress/transfer times for PT in ISM	5% reduction in bus and rail access, egress and transfer times
	Low Traffic Neighbourhoods (LTNs) - active travel priority	5% reduction in vehicle trips / vehicle miles/Km travelled	10% reduction in cycle and walk distance/ travel times 5% increase in car skims
	Controlled parking zones	10% reduction in car traffic within town centres	Free parking sites included in the analysis are converted to paid parking using minimum parking cost in the sector
Improve	Roll-out and support eco-driving training	CO_2 reductions of: 2.6% - 4.8% - private vehicles 10% - freight (HGV and LGV)	-
	Implement speed limit reductions	10 - 20% CO_2 reduction (70 - 60mph) 22.3% CO_2 reduction (30mph to 20mph) - 75.9% CO_2 reduction (40mph to 30mph)	-

Figure 4-10 - Scenario 3 - Eco-driving training & Speed limit reductions

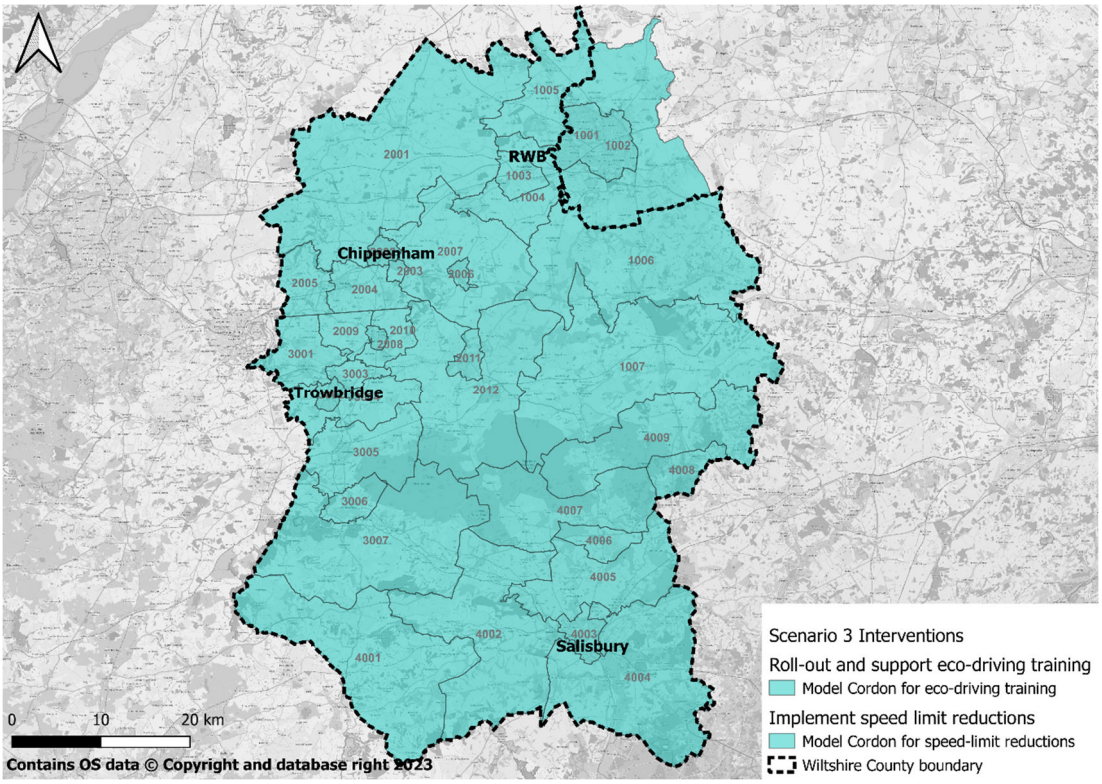


Figure 4-11 - Scenario 3 - Low Traffic Neighbourhoods (LTNs)

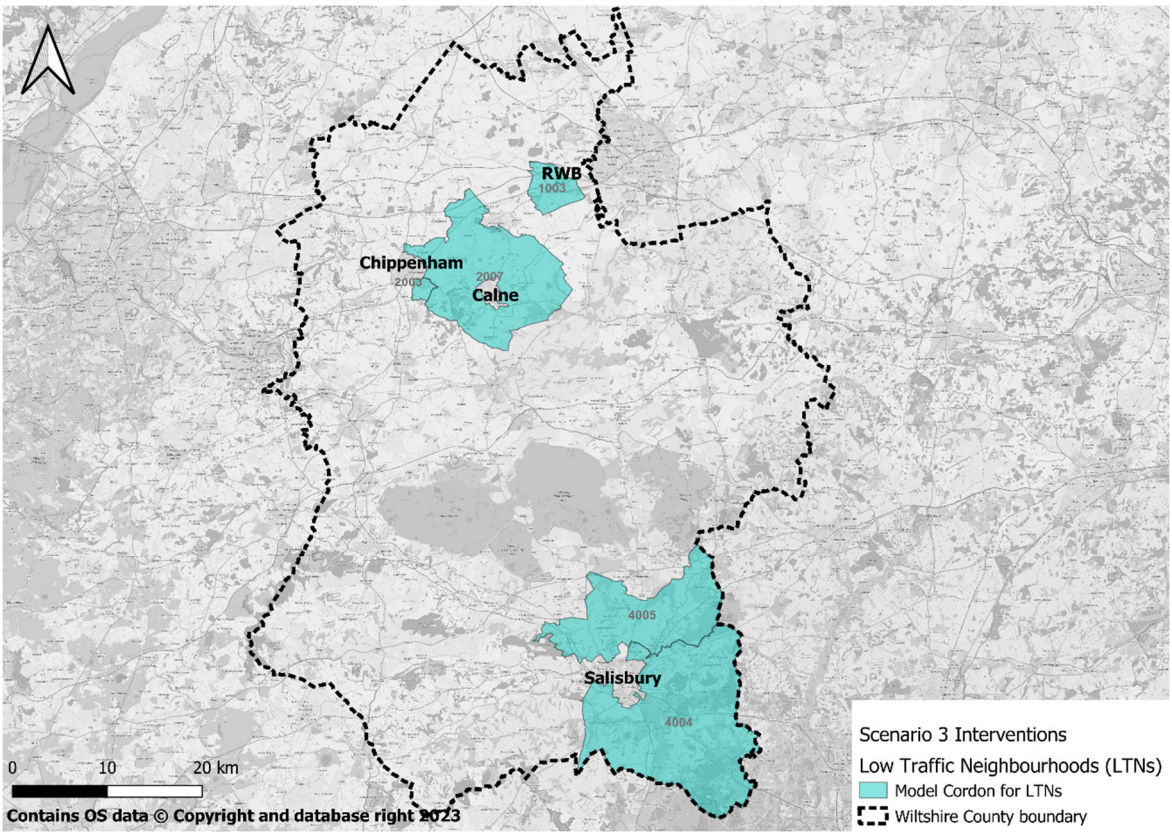


Figure 4-12 - Scenario 3 - Controlled Parking Zones (CPZs)

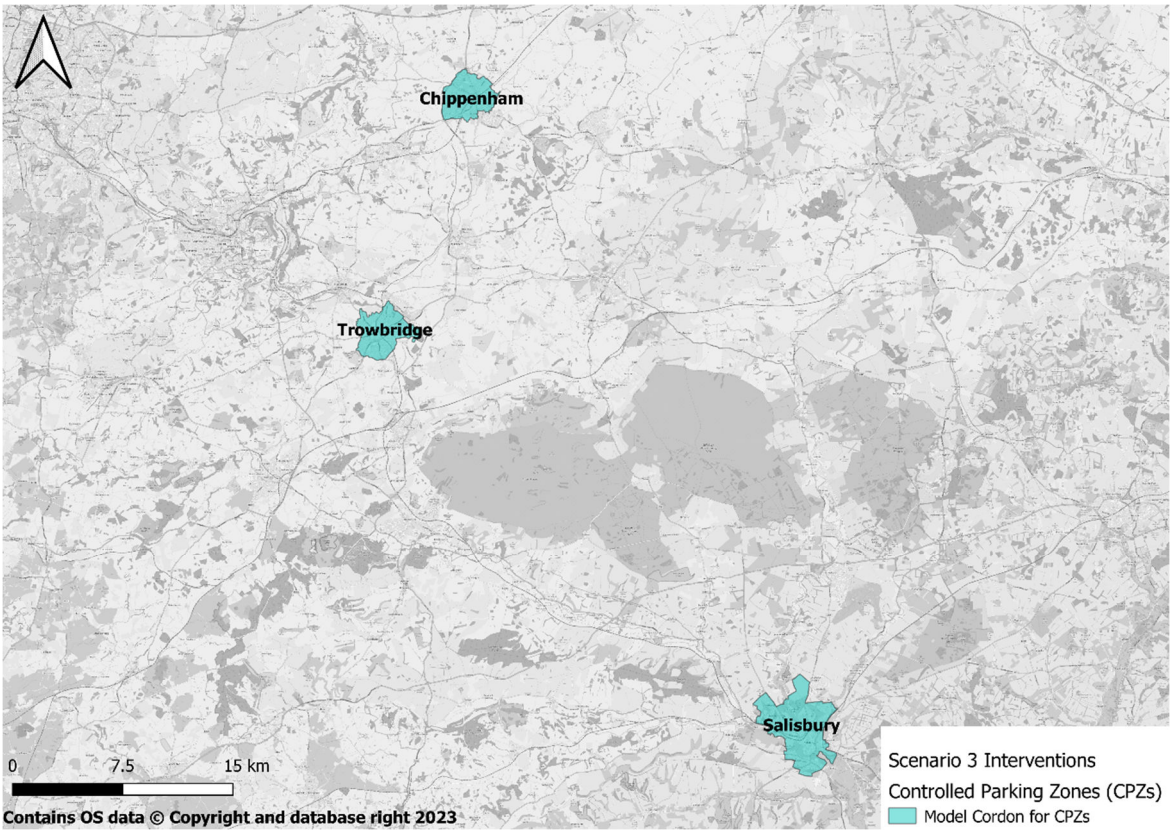


Figure 4-13 - Scenario 3 - Credits, Home-working, Travel Planning, Mobility share & Hubs

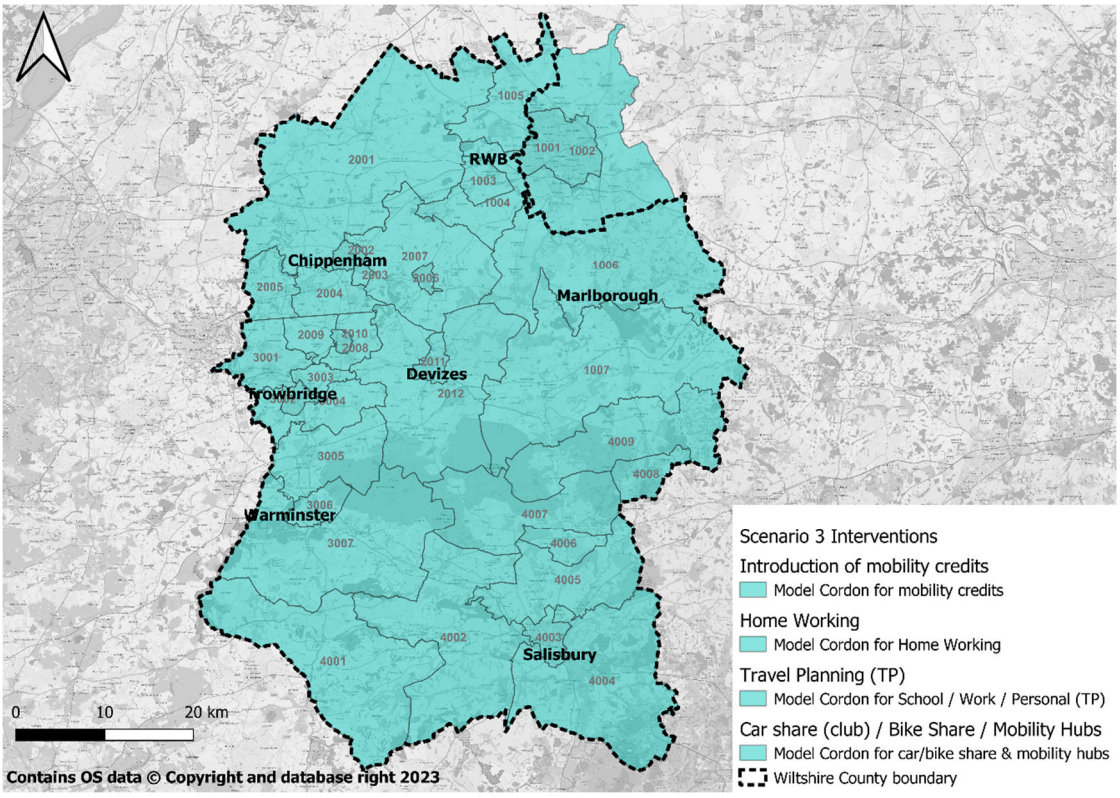


Figure 4-14 - Scenario 3 - Workplace Parking Levy

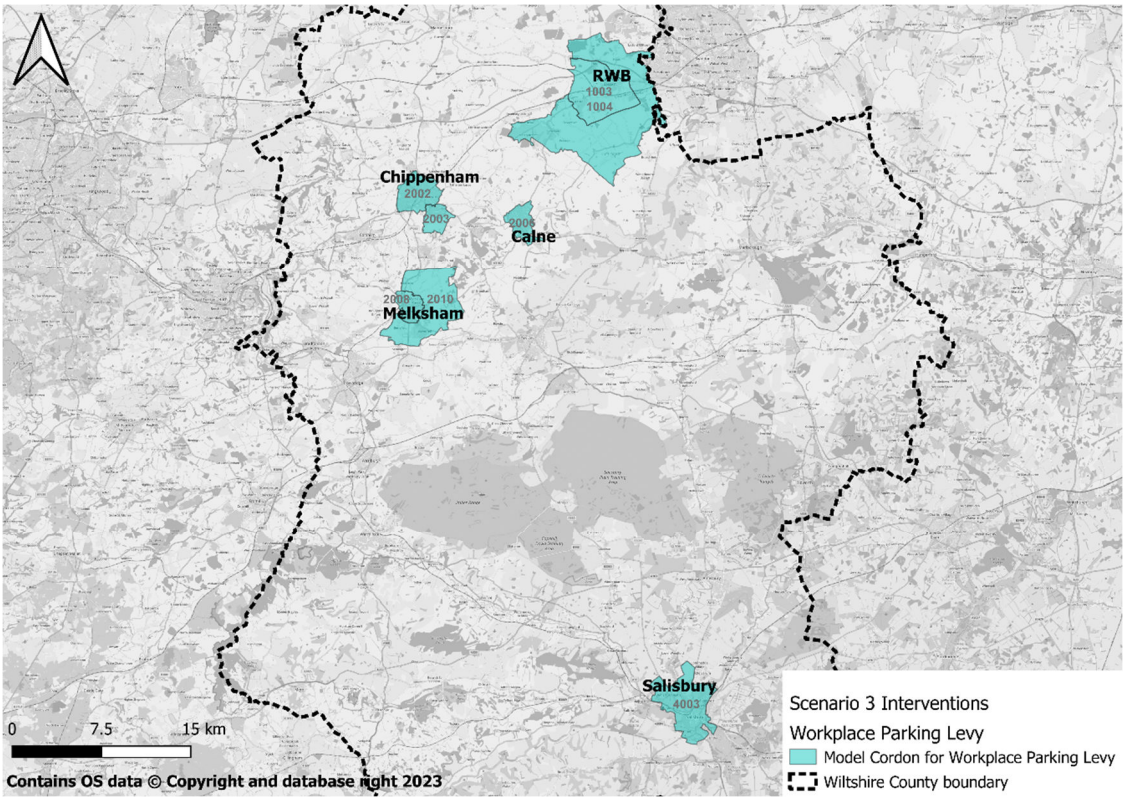


Figure 4-15 - Scenario 3 - 15 Minute Neighbourhood

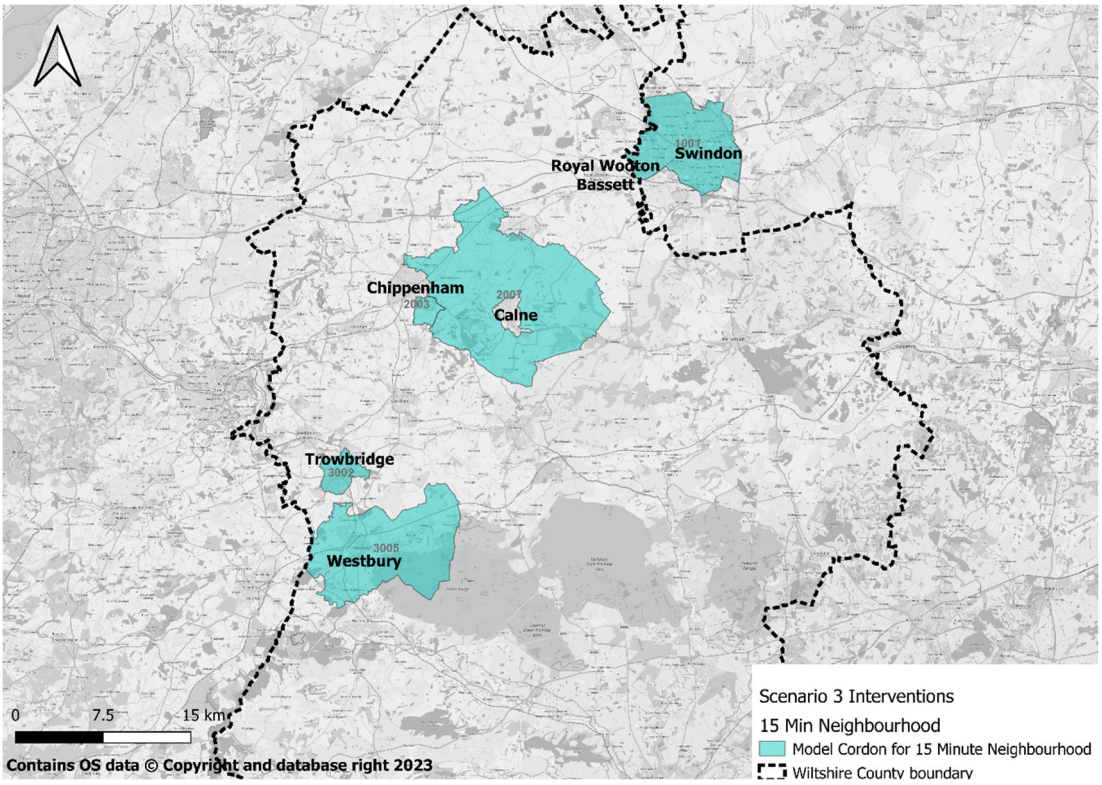
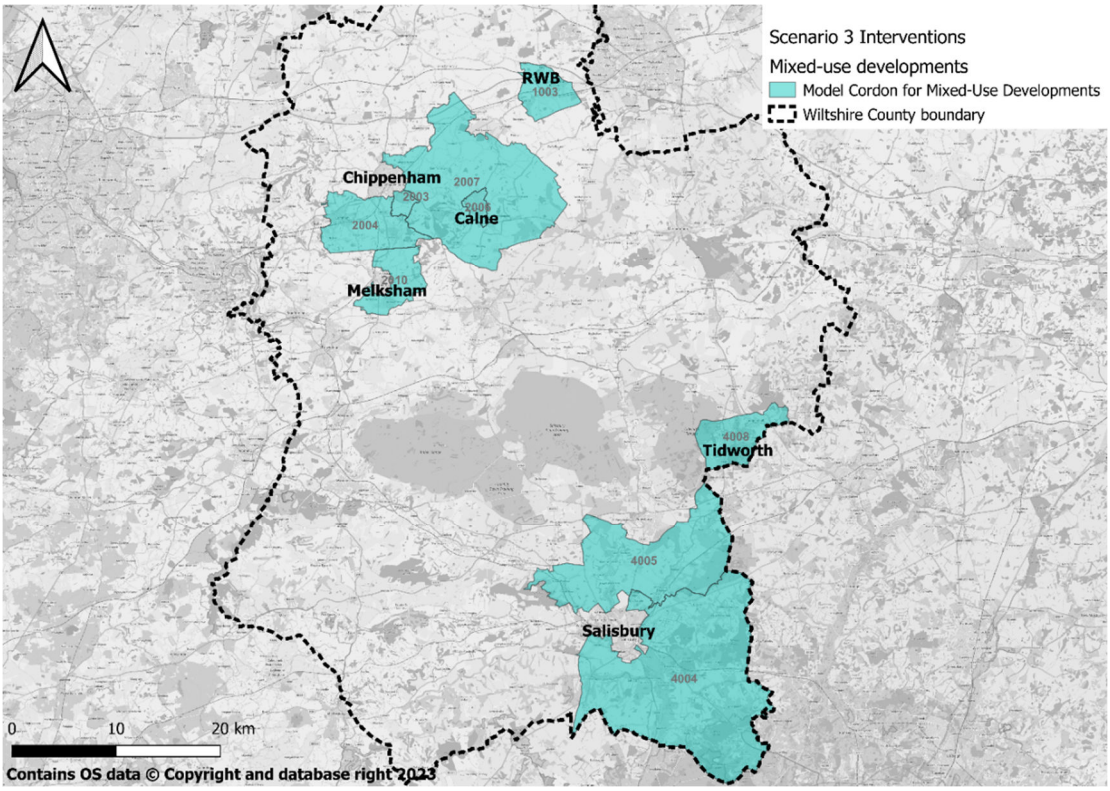


Figure 4-16 - Scenario 3 - Mixed-Use Developments and Delivery interventions



4.5.2. Scenario 3 impacts

Table 4-8 shows how these additional levers make a significant change in the number of car trips across the county, 7% fewer, compared to the Core Scenario with Local Plan Committed Growth without any mitigation, reducing the number of trips from the LPR several times over. There has also been a big increase in the number of bus and cycle trips in response to the levers. Overall, the total number of trips has decreased compared to the Core Scenario as levers that aim to avoid trips take effect.

Table 3 -8 shows carbon emissions across Wiltshire from car trips are reduced by an equivalent 7% compared to the Core 2038 Scenario as shown in Figure 4-17. There is a marginal reduction (1%) in LGV emissions compared to Scenario 2, reflecting the levers focussed on local deliveries. However, the levers have limited impact on the increased good vehicles trips and emissions generated by the LPR, meaning that the overall reduction in carbon emissions across the county is only 2%.

Whilst the change is significant, when considering the difference to the Base 2018 Scenario Table 4-9 shows that there is still an overall increase in trips across all modes.

Table 4-8 - Total trips by mode, Scenario 3 compared to Core – Daily person trips

Scenario	Car	Bus	Rail	Cycle	Walk	Grand Total
Core (2038)	790,136	33,786	21,066	11,916	168,510	1,025,414
Scenario 3 Do Something (2038)	734,285	52,528	21,424	14,083	185,978	1,008,298
Difference	-55,851	18,742	358	2,167	7,468	-17,116
% change	-7%	55%	2%	18%	10%	-2%

Table 4-9 – Total trips by mode, Scenario 3 compared to Base – Daily person trips

Scenario	Car	Bus	Rail	Cycle	Walk	Grand Total
Base (2018)	697,874	33,132	20,533	11,320	150,579	913,439
Scenario 3 Do Something (2038)	734,285	52,528	21,424	14,083	185,978	1,008,298

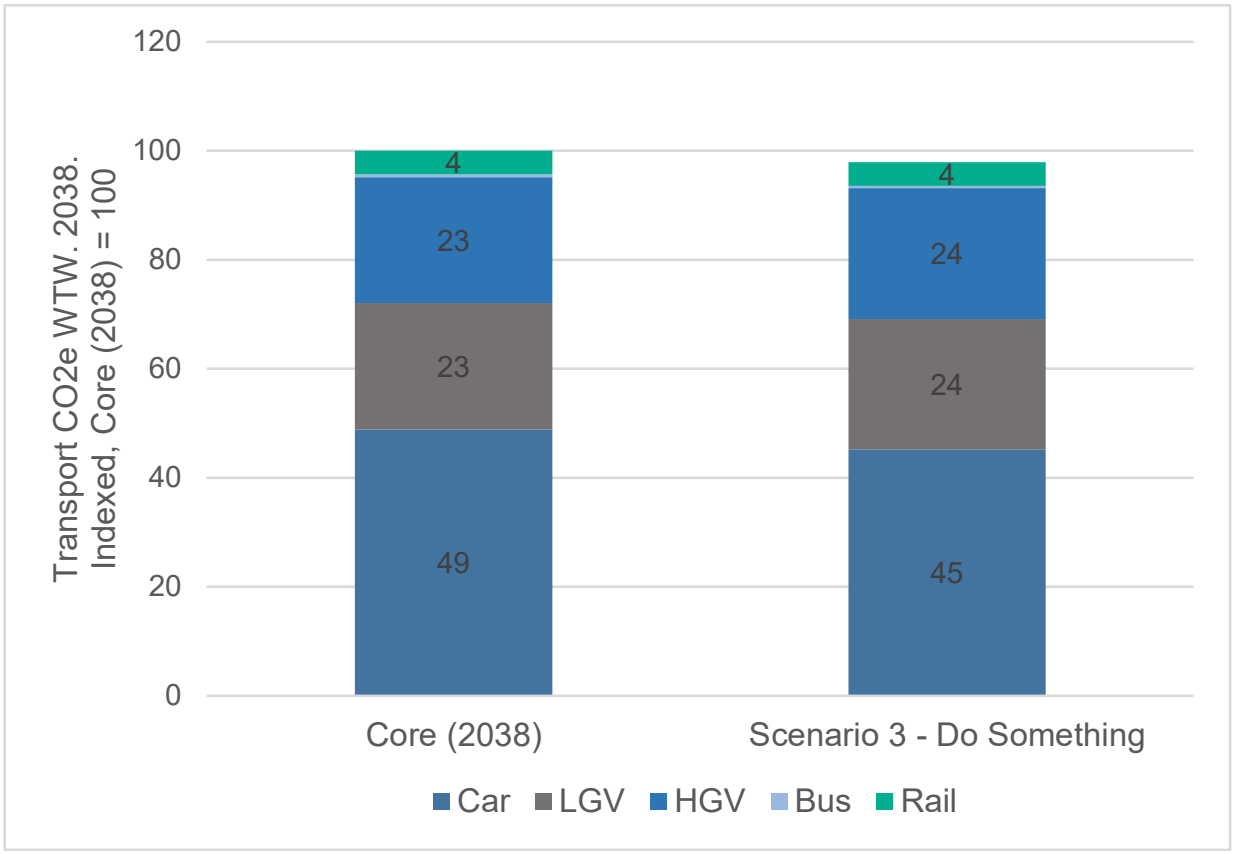
Scenario	Car	Bus	Rail	Cycle	Walk	Grand Total
Difference	36,411	19,396	891	2,763	35,399	94,859fer
% change	5%	59%	4%	24%	24%	10%

Table 4 -10 - Changes in Carbon Emissions Scenario 3 compared to Core

Mode	Core (2038) (kT CO_2e p.a.) [1]	Scenario 3 Do Something (2038) (kT CO_2e p.a.) [1]	Percentage Change from Core (2038)
Car	410	380	-7%
LGV	195	200	3%
HGV	195	200	3%
Bus	5	5	-1%
Rail	35	35	0%
Total	845	825	-2%

1 Figures are rounded to the nearest 5 k tonnes and may not sum due to rounding

Figure 4-17 - Carbon Emissions Scenario 3 indexed to Core



4.5.3. Scenario 3 summary

The target for Scenario 3 'Do Something' was to reduce emissions generated by the LPR growth by 95.7%. The levers applied are estimated to more than achieve this target, reducing countywide emissions to 2% lower than in the 'pre-LPR' Core (2038) Scenario.

The strength of these levers is in their range and scale of implementation which result in significant change to travel behaviour for trips to, from and within the LPR growth areas and consequently on carbon emissions generated. Measures such as this, if applied consistently across the county, could have a wider reaching effect, achieving greater results.

Furthermore, the levers, are considered to be relatively easy to implement.

However, whilst Scenario 3 'Do Something' does mitigate the carbon emissions from the LPR growth, it only reduces countywide emissions by a small margin indicating that these interventions would do little in terms of supporting wider net zero targets across the county.

4.6. Scenario 4 – Do Maximum

Scenario 4 is described as 'Do Maximum' because it aims to go beyond the Scenario 3 in terms of ambition of testing levers that could considerably contribute towards transport carbon reduction targets across the county as a whole. The Council's ambition for the pathway towards net zero for transport is defined as the 'High Ambition' pathway and is set out in the Anthesis Report. This ambition is defined for comparison in terms of achieving a desired change across a range of modes from 2019 to 2040, including:

- 25% reduction in travel miles.
- 13% reduction in road transport.
- 35% increase in Public Transport.
- 133% increase in Active Travel.
- 94% ULEV vehicle fleet.
- 20% increase in Low Carbon Freight mileage.
- 15% decrease in Road Freight Mileage.
- 73% reduction in energy used per mile travelled.

To quantify how these relate to LPR impacts we can use the model outputs to interpret and compare the following impacts of the levers of LPR trips compared to pre-LPR Core (2038) Scenario:

- 13% reduction in road transport – interpreted as 13% fewer car trips.
- 35% increase in Public Transport – interpreted as 35% more joint bus and rail trips.
- 133% increase in Active Travel – interpreted as 133% more joint cycle and walk trips.

Clearly this is an ambitious target and, as Scenario 3 did not achieve these outcomes, the Scenario 4 set of levers required need to work harder to achieve behavioural change.

Most levers in Scenario 3 involved measures to avoid journeys, so it is necessary to focus levers included in Scenario 4 around shifting journeys. This involves more fiscal measures that would significantly add cost to less sustainable journeys. As with other Scenarios the comparison is against both the Core (2038) and the Base (2018) situation.

4.6.1. Scenario 4 levers

Table 4-11 presents the intervention levers implemented in Scenario 4. As for Scenario 3, the levers have been specified to focus particularly on influencing travel choices for movements to, from and within the LPR growth areas, rather than influencing all movements across the county. Congestion charging and low emission charging zones are implemented, and the modelling process accounts for any rerouting and penalties arising from the implementation of the charge.

It is important to note that the levers deployed in Scenarios 2 and 3 carry over into Scenario 4; the levers presented in Table 4-11 are therefore the additional levers introduced for Scenario 4 – in addition to those introduced in Scenarios 2 and 3.

The inputs and assumptions for each of the levers utilised in Scenario 4 are presented in Table 4-11 and Table 4-12, alongside the evidence base sourced from research studies and post-implementation studies on the impact of interventions. The evidence base which informed selection of the model inputs for each lever is available in Appendix C.

To achieve the maximum response as well as introducing new measures, those previously included are 'strengthened' to create a greater response. The rows with text in italics and blue highlight are levers which were introduced in previous Scenarios, but which have had their model input assumption amended for Scenario 4.

It is worth noting that the level of cost applied to the Congestion Charging and Low Emission Zones levers, of £30 and £25 a day, are intended to reflect 2038 prices, with equivalent 2018 prices of prices a £20 and £17. These are higher than levels currently charged (Feb 2023) in London, £15 and £12.50 respectively. Reflecting an increase of around a third to elicit a greater impact.

The figures that follow the tables, Figure 4-18 to Figure 4-20, provide a geographical representation of where the interventions are applied across the county.

Figure 4-18 presents the spatial extent of the zones modelled for Scenario 4 for Congestion Charging and Low Emission Zones. The zones modelled are relatively coarse: focusing on the built-up urban area of the five towns: Royal Wootton Bassett; Chippenham; Melksham; Trowbridge; and Salisbury. Where possible these avoid the Strategic Road Network (SRN). It should be noted that, should either of these interventions be selected in the future, whether as part of the Local Plan Review, the Local Transport Plan, or any other project, that further development work would be required. These zones have been developed purely to test the theoretical decarbonisation benefits of these types of interventions, in conjunction with other levers.

Table 4-11 - Scenario 4 levers

Intervention type	Category	Levers / Scheme	Application	Spatial extent illustrated in
Avoid	Active Travel Infrastructure	Micro-consolidation: trolley / cargo bike / electric vehicle last-mile delivery	Scenario Saturn matrices	Figure 4-16
		Flexible pick-up / drop-off points for home deliveries	Scenario Saturn matrices	
	Land Use Planning	Co-working spaces (local, in new developments / disused shops)	Carbon Model	Figure 4-20
Shift	Modern Public Transport	Mobility as a Service (MaaS) - integrated public transport, on-demand, and shared mobility services	ISM	Figure 4-19
	Fiscal Measures	Improved (reduced) public transport fares	ISM	Figure 4-6
		Increase parking charges	ISM	Figure 4-8
	Shared Mobility	Bike Share	ISM	Figure 4-13
		Electric vehicle car share (club)	Carbon Model	Figure 4-19
	Street design	Low Traffic Neighbourhoods (LTNs) - active travel priority	ISM	Figure 4-11
	Access restrictions	Congestion charging zones	WTM (car costs input to ISM)	Figure 4-18
		Low emission zones - Clean Air Zones	WTM (car costs input to ISM)	Figure 4-18

Table 4-12 - Scenario 4 - Model Inputs

Intervention type	Intervention lever	Lever evidence summary	Lever model input
Avoid	Micro-consolidation: trolley / cargo bike / electric vehicle last-mile delivery	15% reduction in delivery vehicle (LGV) traffic volume	2.4% reduction in total LGV demand (16% of LGV is assumed as delivery vehicles)
	Flexible pick-up / drop-off points for home deliveries	20% reduction in delivery vehicle (LGV) traffic volume	3.2% reduction in total LGV demand (16% of LGV is assumed as delivery vehicles)
	Co-working spaces (local, in new developments / disused shops)	30.5% CO_2 reduction compared to mean commuter emissions	-
Shift	Mobility as a Service (MaaS) - integrated public transport, on-demand, and shared mobility services	15% reduction in wait time, 15% improvement in PT access / accessibility	15% reduction in bus and rail wait, access, egress, and transfer times for commute trips
	Improved (reduced) public transport fares	50% reduction in fares	50% reduction in bus and rail fares
	Increase parking charges	50% increase in car parking charges	50% increase in car parking charges
	Bike Share	15.5% reduction in car avail in future year +15.5% to bike	10% reduction in cycle distance/ time skims
	Electric vehicle car share (club)	Car VMT. Reduce VMT - EV: -7% for each household. Emissions. Reduce GHG emissions - EV: -6% for each household.	-
	Low Traffic Neighbourhoods (LTNs) - active travel priority	15% reduction in vehicle trips / vehicle miles/Km travelled	15% reduction in cycle and walk distance/ travel times, 10% increase in car distance and time skims
	Congestion charging zones	£30/day charge (i.e., Nearly £20/day charge as per 2018 prices)	£30/day charge Car skims from Saturn model input to ISM
	Low emission zones - Clean Air Zones	£25/day for non-compliant vehicles (utilising the London ULEZ criteria) (i.e., Nearly £17/day as per 2018 prices)	£25/day for non-compliant vehicles Car skims from Saturn model input to ISM

Figure 4-18 - Scenario 4 - CC and LEZ spatial extent for modelling

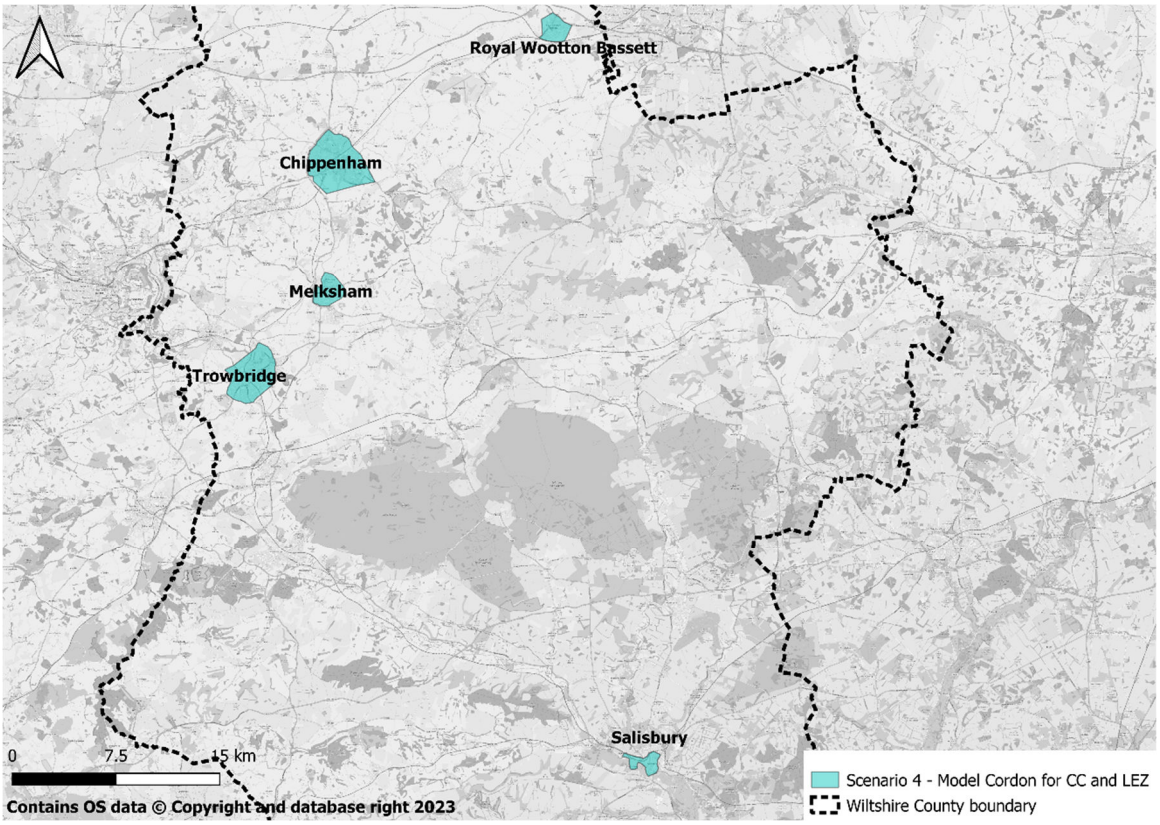


Figure 4-19 - Scenario 4 - Mobility as a Service and EV Car Club

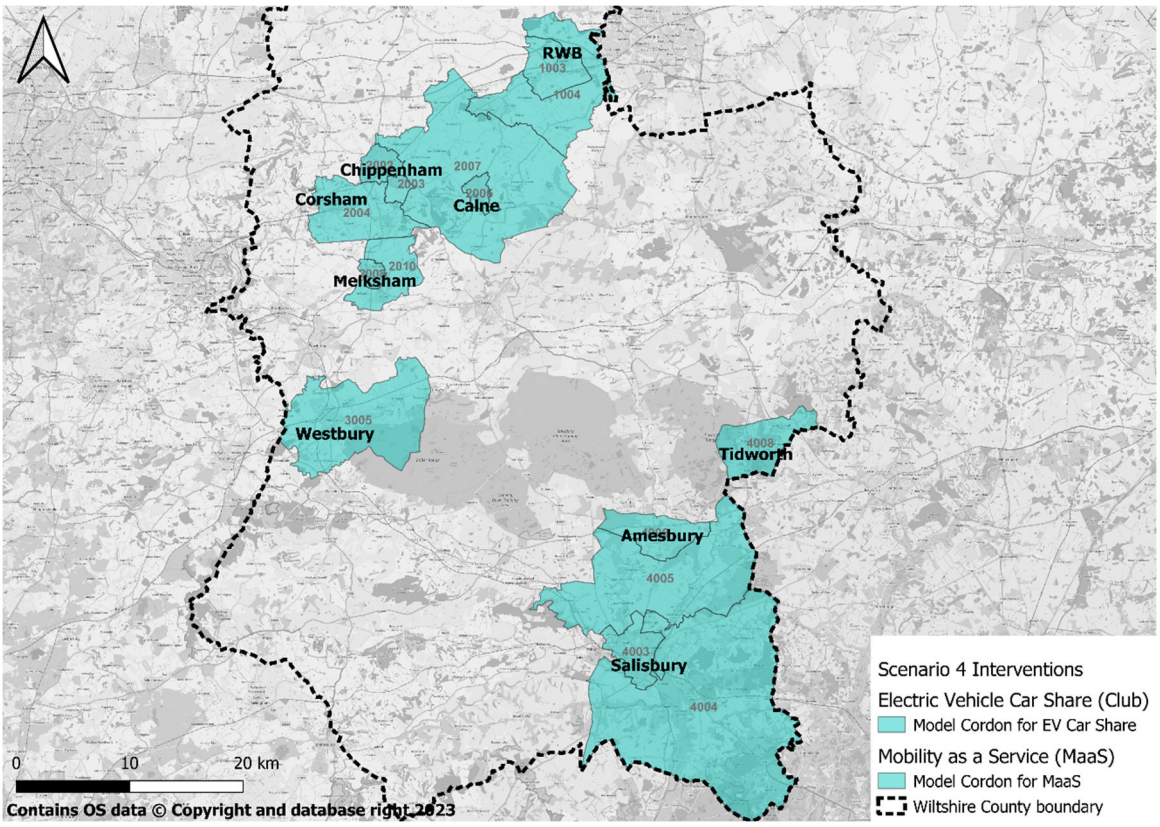
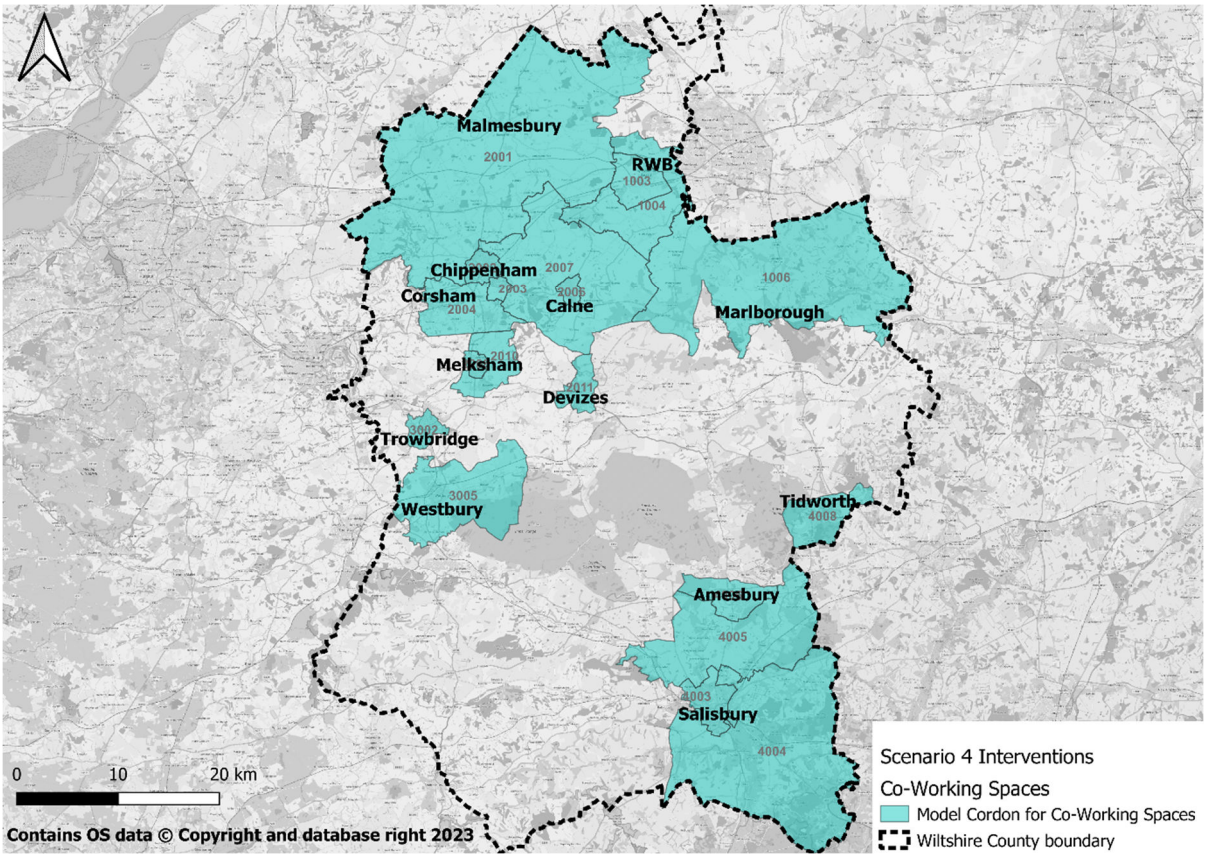


Figure 4-20 - Scenario 4 - Co-Working Spaces



4.6.2. Scenario 4 impacts

Table 4-13 shows the impact of additional levers in Scenario 4. Car trips have decreased by three times as much as Scenario 3, at 22% fewer compared to the Local Plan Committed Growth without any mitigation. There has also been a big increase in the bus trips and notably by rail. Both cycle and walking trips have also increased by around fourfold. Overall, the total number of trips has decreased by 4% compared to the Core Scenario.

Notably this is the only Scenario that results in fewer car trips than the Base (2018) Scenario, combatting growth in car trips from committed development as shown in Table 4-18. Under this Scenario there is the possibility of negating some of the planned infrastructure improvements required to support the Local Plan growth.

Table 4 -15 and Figure 4-21 show carbon emissions from cars, in line with changes in trips, have been reduced by 23% across Wiltshire compared to the Core (2038) Scenario. Across all carbon emitting modes this results in a reduction of 10%, reflecting a greater reduction in carbon than in total trips (4%) indicating how the balance in trips has shifted to active travel.

Table 4-13 - Total trips by mode, Scenario 4 compared to Core (2038) – Daily person trips

Scenario	Car	Bus	Rail	Cycle	Walk	Grand Total
Core (2038)	790,136	33,786	21,066	11,916	168,510	1,025,414
Scenario 4 Do Maximum (2038)	613,764	77,816	30,740	20,218	240,963	983,502
Difference	-176,373	44,030	9,674	8,303	72,454	-41,912
% change	-22%	130%	46	70%	43%	-4%

Table 4-14 – Total trips by mode, Scenario 4 compared to Base

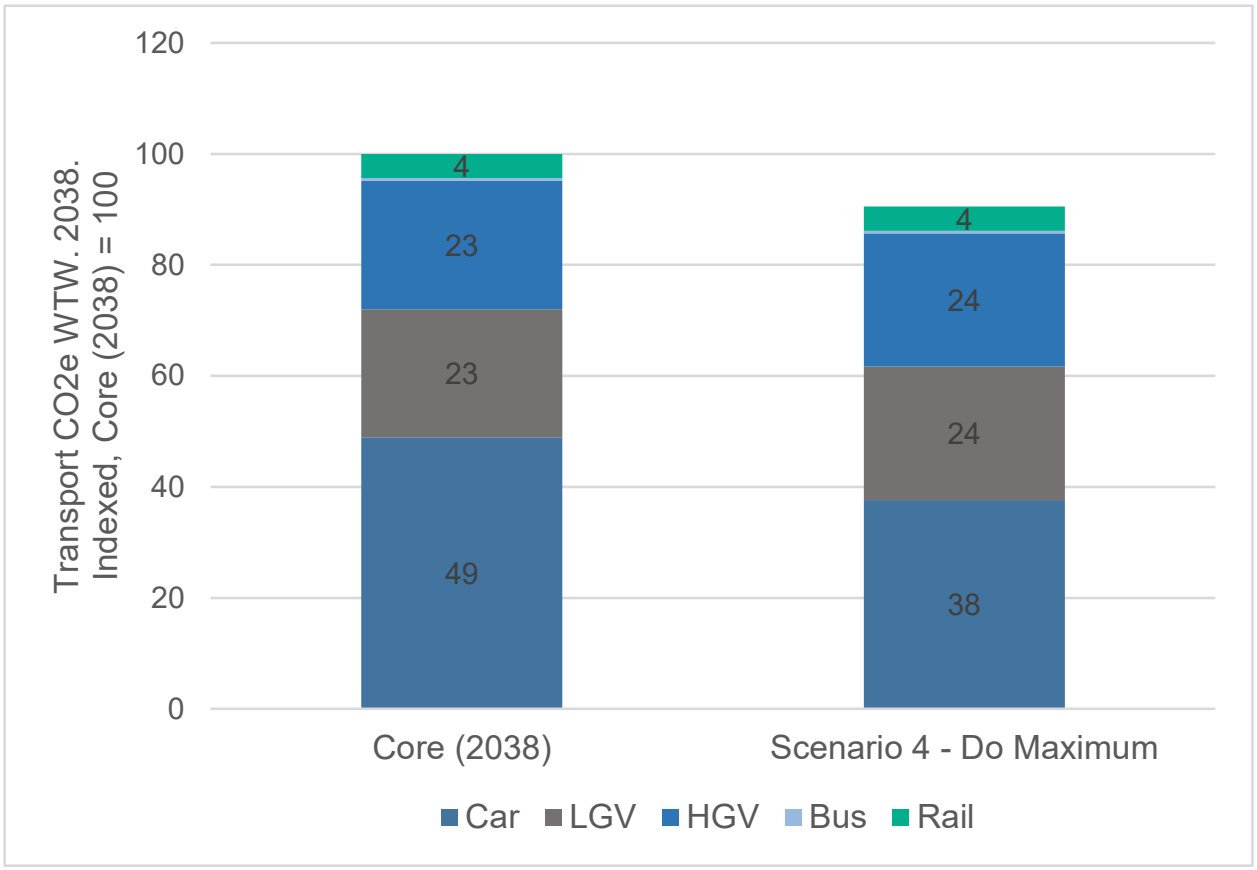
	Daily Person Trips					
Scenario	**Car**	**Bus**	**Rail**	**Cycle**	**Walk**	**Grand Total**
Base (2018)	697,874	33,132	20,533	11,320	150,579	913,439
Scenario 4 Do Maximum (2038)	613,764	77,816	30,740	20,218	240,963	983,502
Difference	-84,110	44,684	10,207	8,898	90,384	70,063
% change	-12%	135%	50%	79%	60%	8%

Table 4 -15 - Changes in Carbon Emissions Scenario 4 compared to Core

Mode	Core (2038) (kT CO_2e p.a.) [1]	Scenario 4 Do Maximum (2038) (kT CO_2e p.a.) [1]	Percentage Change from Core (2038)
Car	410	315	-23%
LGV	195	205	4%
HGV	195	205	4%
Bus	5	5	-3%
Rail	35	35	0%
Total	**845**	**765**	**-10%**

1 Figures are rounded to the nearest 5 k tonnes and may not sum due to rounding

Figure 4-21 - Carbon Emissions Scenario 4 Do Maximum (2038) indexed to Core (2038)



4.6.3. Scenario 4 summary

The success of the levers in achieving the Scenario 4 metrics for comparison is outlined in Table 4-16. It shows that the car trip reduction of 22% meets the target of 12%, the public transport target of 35% increase is

considerably exceeded by a 98% increase, but the active travel increase of 45%, whilst still a significant increase, is below the target of 133%.

Table 4-16 - Scenario 4 targets

Scenario	Road transport (Car Trips)	Public Transport (Combined Bus and Rail)	Active Travel (Combined Walk and Cycle)
Core (2038)	790,136	54,852	180,426
Scenario 4 Do Maximum (2038)	613,764	108,556	261,181
Difference	-176,373	53,704	80,755
% change	-22%	98%	45%
Target	-12%	35%	133%

Not achieving the active travel target might indicate the need for further consideration. Is the level of change that Wiltshire is aspiring to feasible and deliverable? Could the types of levers be adjusted to produce that level of change? Could development be located in a way that would be more likely to support shift to active travel? For example, could more sites be located nearer current networks and neighbourhoods so that frequent journeys are short and safe enough to be feasible by walking and cycling? Is the demographic of the development likely to be young and fit enough to swap journeys to active travel modes? These are all aspects that should be incorporated into early stages of the planning process.

Overall, though the package of levers in Scenario 4 can be considered a success in achieving the shift in travel behaviour it set out for. Fiscal measures have been largely relied upon to achieve this and the success of those measures are clear. However, it is acknowledged that whilst these measures are effective, because of the journey cost implications, they may be considered less popular. Although, given the extent of changes that could be possible other infrastructure schemes planned in the county may in turn not be required.

4.7. Summary of impacts across all Scenarios

The sections above have reported the outcome of each Scenario. This section presents the outcome of changes in trips, mode shares and carbon impacts in collated tables to aid comparison across Scenarios.

4.7.1. Impact on Trips

Table 4-17 presents the total trip numbers by mode for each Scenario, whilst Table 4-18 presents the mode shares for each Scenario. Figure 4-22 gives a more diagrammatical representation of change in total trips by mode.

As we have demonstrated in the separate summaries above, Scenario 4 sees a higher reduction in car trips and thus higher mode shift to PT and active travel modes. This is driven largely by the introduction of Congestion Charging Zones and Low Emission zones in various locations (RWB, Chippenham, Melksham, Trowbridge, and Salisbury).

Compared to the pre-LPR Core (2038) Scenario:

- Scenario 2 results in fewer car trips.
- Scenario 3 results in fewer total trips.
- Bus sees the biggest proportional increase.
- Walking has the biggest total trip increase. (It is to be noted that the trip numbers for bus includes mode shift from car to demand responsive transport (DRT), these are added to bus mode because DRT is not modelled in ISM).

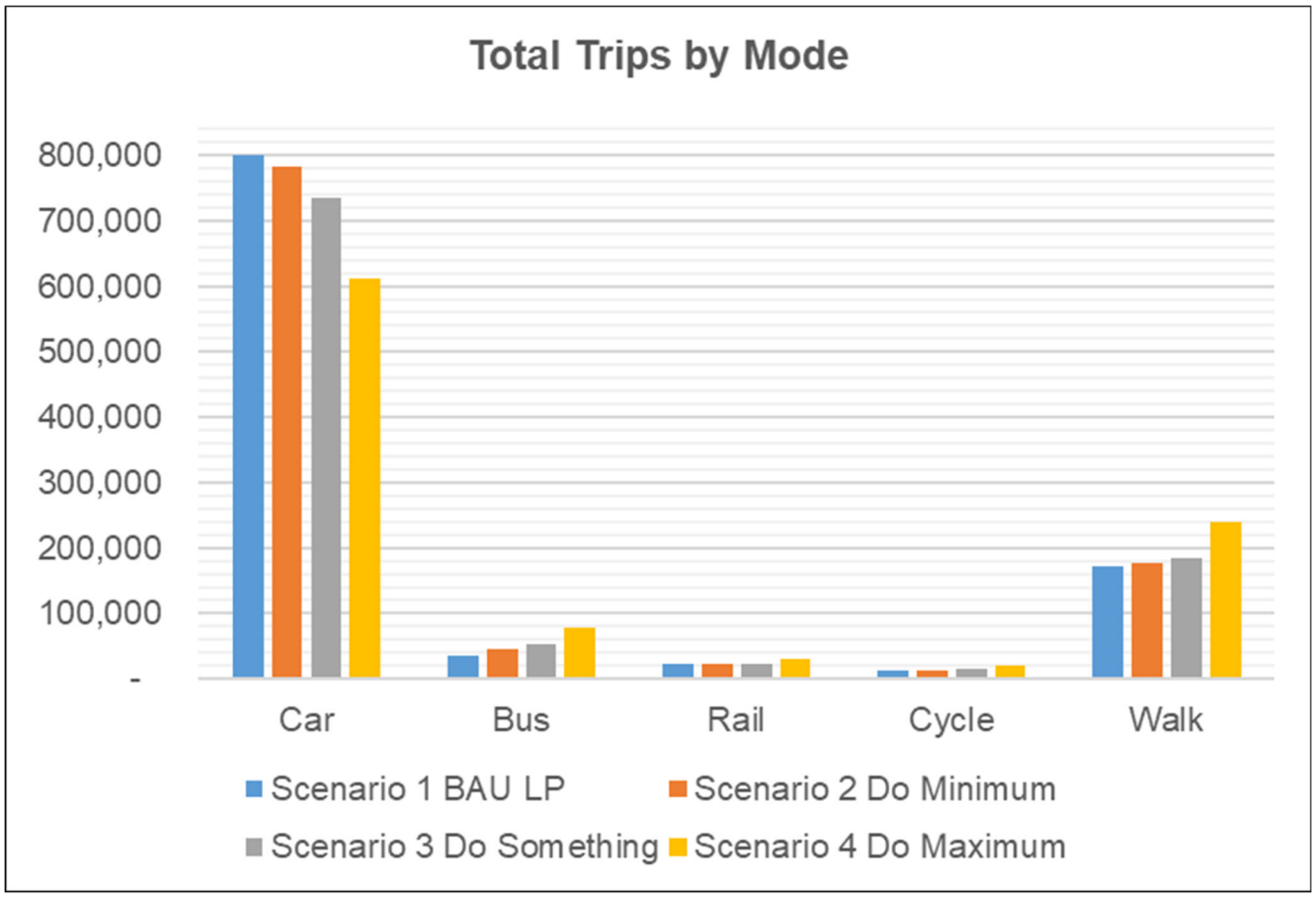
Table 4-17 – Overall Trips by Scenario by Mode and % difference to Core

Daily Person Trips						
Scenario	**Car**	**Bus**	**Rail**	**Cycle**	**Walk**	**Grand Total**
Core (2038)	**790,136**	**33,786**	**21,066**	**11,916**	**168,510**	**1,025,414**
Scenario 1 BAU LP	799,927	34,537	21,330	12,289	172,923	1,041,006
% difference to Core (2038)	1.2%	2.2%	1.3%	3.1%	2.6%	1.5%
Scenario 2 Do Minimum	782,717	43,809	21,540	13,045	177,959	1,039,072
% difference to Core (2038)	-1%	29%	2%	9%	5%	1%
Scenario 3 Do Something	734,285	52,528	21,424	14,083	185,978	1,008,298
% difference to Core (2038)	-7%	55%	2%	18%	10%	-2%
Scenario 4 Do Maximum	613,764	77,816	30,740	20,218	240,963	983,502
% difference to Core (2038)	-22%	130%	46	70%	43%	-4%

Table 4-18 – Overall Mode Share by Scenario

Scenario	Car	Bus	Rail	Cycle	Walk	Grand Total
Core (2038)	77.1%	3.3%	2.1%	1.2%	16.4%	100.0%
Scenario 1 BAU LP	76.8%	3.3%	2.0%	1.2%	16.6%	100.0%
Scenario 2 Do Minimum	75.3%	4.2%	2.1%	1.3%	17.1%	100.0%
Scenario 3 Do Something	72.8%	5.2%	2.1%	1.4%	18.4%	100.0%
Scenario 4 Do Maximum	62.4%	7.9%	3.1%	2.1%	24.5%	100.0%

Figure 4-22 - Total trips by mode



4.7.2. Impacts on carbon

Table 4 -19 shows the change in carbon emissions, across Wiltshire, compared to the Core (2038) Scenario which includes committed development from the Local Plan. As would be expected, the reduction increases significantly with the level of levers applied. Scenario 2 mitigates the impact from car trips alone, whilst Scenario 3 more than achieves the target of reducing overall emissions from the Local Plan. Scenario 4 goes further with a significant reduction in car trips and an overall reduction of 10% in transport- based emissions across the county.

Table 4 -19 - Reduction in Transport Carbon Emissions compared to Core

Scenario	Scenario 1 BAU LPR (2038)	Scenario 2 - Do Minimum	Scenario 3 - Do Something	Scenario 4 - Do Maximum
Car	3%	0%	-7%	-23%
LGV	4%	4%	3%	4%
HGV	3%	3%	3%	4%
Bus	0%	0%	-1%	-3%
Rail	0%	0%	0%	0%
Total	**3%**	**2%**	**-2%**	**-10%**

Figure 4-23 looks at how countywide transport emissions in these Scenarios compare to the Core (2038) Scenario and the different target pathways. This clearly shows that all Scenarios have reduced emissions compared to 2018 as a result of the national measures towards decarbonising vehicles. Of the intervention packages, Scenario 4 makes the most significant change towards achieving the targets but there is still a considerable gap at the countywide level between projected emissions and the target pathways. It is likely closing this gap would require:

- Application of the Scenario 4 levers more extensively across the county. Scenario 4 focusses on applying levers to trips travelling to, from and within the LPR growth areas and, if considering car emissions alone, already closes approximately 70% of the gap between Scenario 1 and the High Ambition pathway at the county level. More extensive application would deliver more widespread change in private travel choices in the county in terms of amount of travel, choice of sustainable modes and of type of car used, leading to a more substantial reductions in emissions.
- Application of interventions to address goods vehicles emissions, which account for nearly 40% of the total emissions in the Core Scenario by 2038. Scenario 4 does not have a significant impact on goods vehicle emissions as freight measures are typically most effectively applied at the regional or national level.
- Additional action at regional and national level to alter travel choices (such as introduction of forms of charging for road use) and to promote electric and other zero emission vehicle uptake.

Separate Scenarios to estimate the impacts of more extensive application of Scenario 4 levers or goods vehicle levers were not a part of this study. However, Figure 4-24 shows how countywide emissions in Scenarios 1 to 4 compare to emissions in the Core 2038 if national action to ban the sales of petrol and diesel vehicles is assumed to occur[3] (partly reflecting the measures in the second and third bullet point above). The comparison shows that in these circumstances Scenario 4 comes much closer to closing the gap with the High Ambition pathway. If car emissions are considered alone, emissions are reduced the level required to follow the High Ambition pathway in this Scenario, although a considerable gap remains to the CCC and Tyndall Centre pathways.

This analysis highlights that integrated action across many levers will be required at local, regional and national level to close the emissions gap between forecast emissions and target pathways required to meet carbon reduction commitments.

[3] Assumptions based on a national ban on petrol and diesel car and van sales in 2030 (as announced by Government in November 2020) and on diesel HGV sales bans. In 2040 for vehicles over 26 tonnes and 2035 for vehicles under 26 tonnes (as announced by Government in November 2021). Car/van fleet forecast is based on the Society of Motor Manufacturers and Traders (SMMT) Central Forecast published in June 2021[3]. The HGV forecast assumes that the uptake of Zero Emissions Vehicles in the fleet will occur in line with the forecasts in the CCC's Sixth Carbon Budget Balanced Pathway

Figure 4-23 – Carbon emissions of Scenarios compared to Core 2038 and national pathways

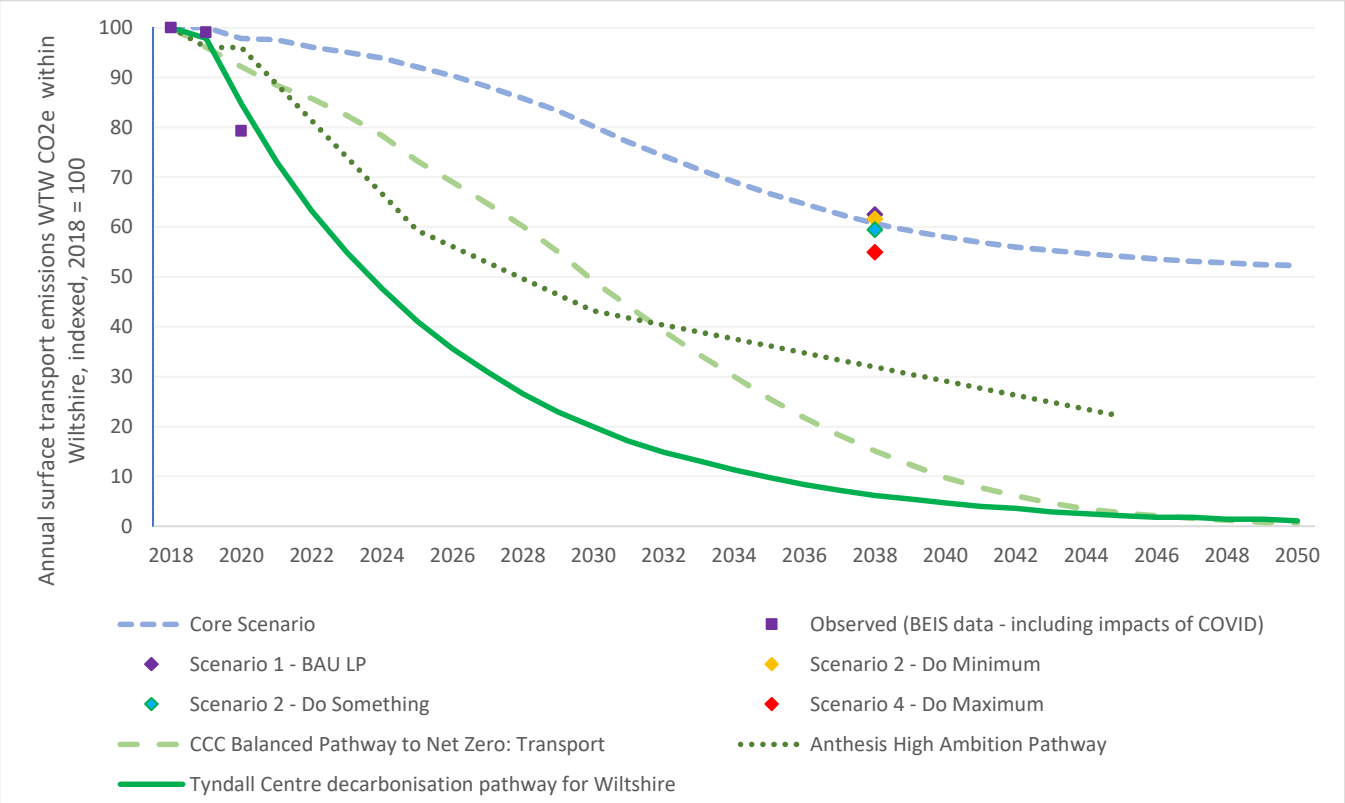
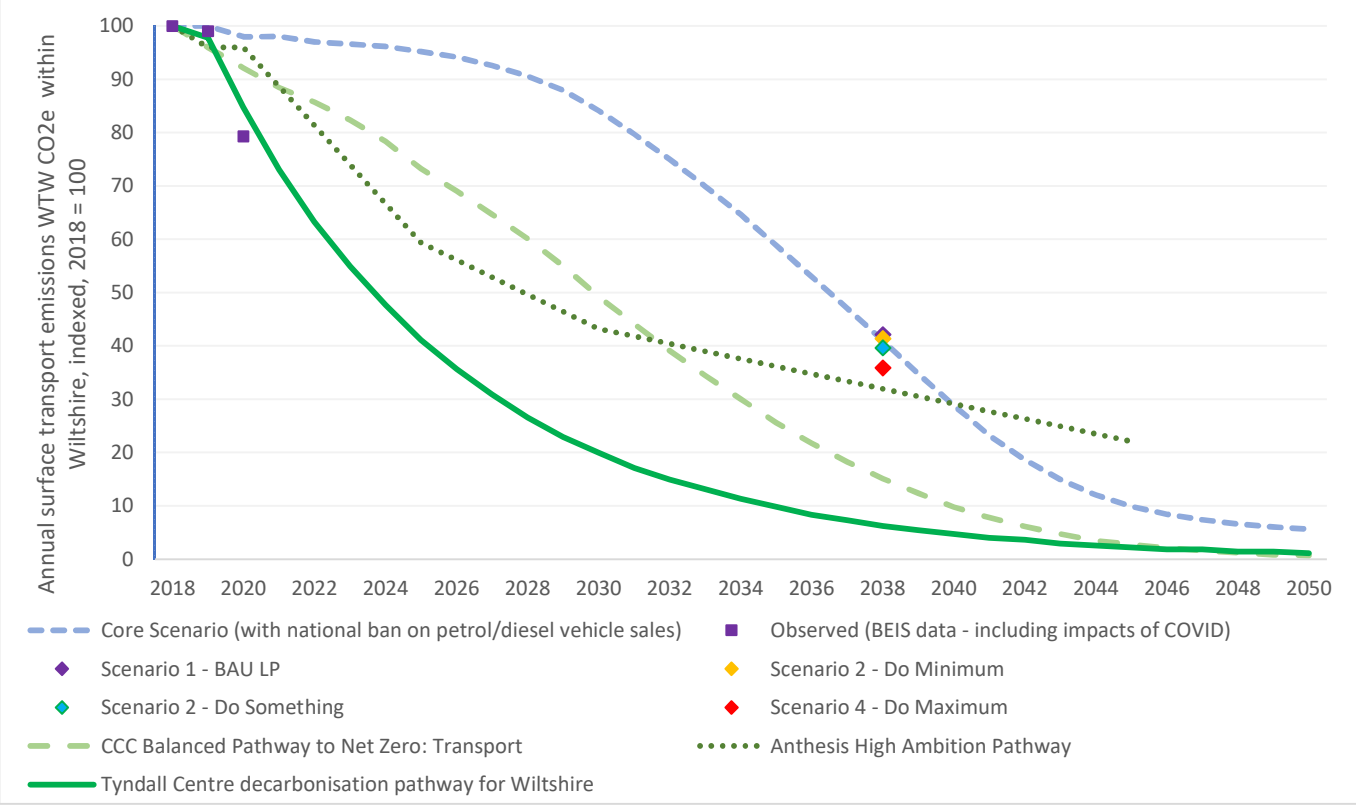


Figure 4-24 – Carbon emissions of Scenarios compared to Core 2038 and national pathways, assuming national action to ban petrol/diesel car/van/goods vehicle sales



4.8. Wider impacts

As with all transport schemes there can be wider impacts to a region outside of the basic shift in travel behaviour and resulting change in carbon emissions. Indeed, the Planning Practice Guidelines (PPG) referred to in Section 1.2 notes that a transport evidence base should consider the impact on economic, social and environmental terms. Whilst this study has not gone into any detailed assessment of wider impacts it is worth acknowledging what they are and how they are considered as part of the ongoing work that Wiltshire are undertaking. Some of the key wider impacts of transport schemes such as those included in the Scenarios testing include:

- Economic benefits beyond those experienced from journey time and reliability can be a significant benefit to a region as an effective transport system can encourage investment from businesses, providing access to employment for residents, reducing deprivation and by increasing the desirability of an area it can increase land and housing values. Improvements in safety and reduction in accidents can also be a valuable benefit.
- Environmental impacts of transport schemes can be varied, covering aspects such as biodiversity, air quality, noise and heritage. And impacts can be a blend of both negative and positive depending on the scheme. For example, a cycle scheme could have some impact on land but could result in improved air quality and reduced noise levels on parts of the network and a healthier population. A full and detailed environmental assessment should be undertaken of all transport schemes with identification and implementation of mitigations. Wiltshire will be undertaking a Habitat Regulations Assessment as part of an environmental assessment on roads likely to be impacted by the Local Plan Review.
- Socio-economic impacts from schemes can be seen as the most visible as it is the local residents and communities around schemes that will bear those impacts. It is important to consider potential impacts on different groups within the community, including minority groups and those with disabilities, in relation to aspects such as access to services, health and wellbeing and potential severance. Transport schemes should be developed with socio-economic impacts in mind. For example, walking and cycle routes could improve access to green space and nature, but need to be considered as safe and accessible to all. Wiltshire will be undertaking an Equalities Impact Assessment as part of the Local Plan Review.
- Impacts outside of Wiltshire could be seen in neighbouring counties. Only impacts internal to Wiltshire have been assessed but potentially vehicle miles and access to services could be displaced outside of the county as interventions impact on the ways and means people travel.
- Greater contribution to net zero can be more widely achieved if an intensive countywide approach is taken to how travel needs can be managed. The Scenarios tested have focussed levers in the zones identified in the Local Plan Review for additional development. However, different schemes, if well planned and focussed on the right demographics could have a wider reach both geographically and by journey type resulting in a greater change than expected.

In relation to the Scenarios tested it is likely that Scenario 4 would have the largest magnitude and range of impacts and Scenario 2 the least. On balance Scenario 3 would deliver a greater range of benefits with much fewer negative impacts than Scenario 4 and therefore could be seen as the most beneficial in relation to wider impacts.

4.9. Deliverability

It is one thing to develop a package of transport schemes, test them in a model and report on what that could mean for journeys in the county. It is another thing to identify the likelihood of those schemes being implemented. All of the schemes included in the Scenarios tested are in theory feasible and deliverable, having been implemented somewhere to some extent. Whether there is the desire and ability to deliver schemes in a particular region is then at the influence of a number of factors such as:

- Funding and affordability – is there a source of funding identified that will cover the likely cost?
- Benefits – does the scheme deliver enough benefit towards the required outcome to warrant it?
- Management – is there a suitable arrangement for developing, managing and operating the scheme?
- Stakeholder support – can stakeholder objections be managed or mitigated? Often the biggest barrier to progressing schemes can be the lack of support as stakeholders may not be as invested in the required outcome. Stakeholder management is a critical part of transport scheme development and must balance wider needs and views.
- Carbon management – does the carbon impact of constructing and operating the scheme warrant the benefit from reduced transport emissions?

In relation to Scenarios 2 and 3 the levers as defined are considered to be the most deliverable, although Scenario 2 delivers little in terms of wider benefit.

Scenario 4 involves a much greater logistical, expensive and controversial challenge. Implementing measures such as congestion charging zones may in theory be a solution to reducing car travel, but schemes can falter under pressure and conflict from various interest groups. Although that should not be reason to dismiss schemes which align with policy and would deliver results.

On balance Scenario 3 might be considered the most deliverable by incorporating relatively simple deliverable schemes and contributing more significantly to intended outcomes of mitigating LPR growth.

4.10. Summary of mitigating impacts of Local Plan Review

This chapter has shown how packages of transport schemes when applied together can influence travel behaviour to varying degrees meeting a range of targets and ambitions. Three Scenarios were defined by Wiltshire each with specific targets to understand what would be required of packages of interventions to mitigate the growth of the LPR and to meet or contribute towards net zero carbon emission targets. Packages of levers were developed to try and match those ambitions and tested to understand the predicted level of impact. Because the targets differ across Scenarios there is not a direct comparison in terms of whether they are met or not. However, the change in trips and carbon are directly comparable and demonstrate that to start making change that can contribute to reversing carbon levels that significant fiscal measures are likely to be required.

Of all the Scenarios tested this would have the biggest contribution towards net zero targets but it also raises questions about what more could be done to meet the active travel target and whether the gap could be filled through more targeted planning of developments.

Table 4-20 – Summary of the Success of Scenarios

Scenario	Key Addition	Change in Car Trips Compared to Pre-LPR (Core 2038)	Carbon Emissions compared to Pre-LPR (Core 2038)	Target	Target Met?	Contribution to Net Zero
LPR Growth (Scenario 1)	+14,295 houses	+1%	+3%			Increased Emissions
Do Minimum Mitigation (Scenario 2)	Active Travel Infrastructure Travel Planning Improved Public Transport Demand Responsive Transport Reduce Parking Fares Increased Parking Charges EV Infrastructure	-1%	+2%	Avoid need for Highway Infrastructure Changes to accommodate Growth	Marginal Reduction – not likely to avoid need for Infrastructure	Increased Emissions
Do Something Mitigation (Scenario 3)	Micro Consolidation Centres Local Facilities Workplace Parking Levy Mobility Credits Shared Mobility Active Travel Neighbourhoods Controlled Parking Speed limit reductions	-7%	-2%	Remove growth the LPR	More than removed car trips and carbon emissions less than pre-LPR	Emissions marginally reduced
Do Maximum Mitigation (Scenario 4)	Co working spaces Reduced PT Fares Increased Parking Charges Congestion Charging Zones Low Emission Zones	-22%	-10%	Meet Anthesis 'High Ambition Pathway'	For car and PT trips meets target	Emissions significantly reduced

5. Lever application and high-level cost information

Section 5 explores the potential application of, and cost information for, the intervention levers presented in Section 4.

Section 5 comprises two stages:

1. Delineation of intervention levers between a) those which could be aligned to Local Plan sites and b) those which would need to be aligned to, and implemented as part of, wider policy initiatives – Section 5.2
2. Collation of high-level costs for those interventions identified in Section 5.1 as Local Plan site-aligned – Section 5.2

This approach is prudent as it is necessary, for planning, costing and implementation, to determine which interventions could be aligned to specific Local Plan sites, and which are better suited to be costed and delivered as part of the implementation phase of strategic policy initiatives.

5.1. Application of intervention levers

Table 5-1 summarises which of the intervention levers could be aligned to Local Plan housing site allocations, and which are aligned to wider (non-Local Plan) policy interventions and projects. Those which are alignable to Local Plan housing sites have then been delineated by the size of the new local plan site – by dwellings – in bands: 1) 0-50 dwellings, 2) 50-150 dwellings, 3) 150-500 dwellings, and 4) more than 500 dwellings.

Table 5-1 - Intervention summary matrix

Intervention Lever	Size of local plan settlement							
	0-50 dwellings		50-150 dwellings		150-500 dwellings		More than 500 dwellings	
	LP site	Wider policy	LP site	Wider policy	LP site	Wider policy	LP site	Wider policy
Cycling infrastructure	Y	Y	Y	Y	Y	Y	Y	Y
Walking infrastructure	Y	Y	Y	Y	Y	Y	Y	Y
Workplace Travel Planning	N/A	Y	N/A	Y	N/A	Y	N/A	Y
School Travel Planning	N/A	Y	N/A	Y	N/A	Y	N/A	Y
Extended public transport routes and improved frequencies	N	Y	N	Y	Y	Y	Y	Y
Demand Responsive Transport (DRT) & rideshare	Y	Y	Y	Y	Y	Y	Y	Y
Improved (reduced) public transport fares	N	Y	N	Y	N	Y	N	Y
Increase parking charges	N	Y	N	Y	N	Y	N	Y
EV charging (residential)	Y	Y	Y	Y	Y	Y	Y	Y
Micro-consolidation trolley / cargo bike / EV last-mile delivery	N	Y	Y	Y	Y	Y	Y	Y
Flexible pick-up / drop-off points for home deliveries	Y	Y	Y	Y	Y	Y	Y	Y
Personalised Travel Planning	N/A	Y	N/A	Y	N/A	Y	N/A	Y
Mixed-use development	Y	Y	Y	Y	Y	Y	Y	Y
15 minute neighbourhood	Y	Y	Y	Y	Y	Y	Y	Y
Home working	N/A	Y	N/A	Y	N/A	Y	N/A	Y

Intervention Lever	Size of local plan settlement							
	0-50 dwellings		50-150 dwellings		150-500 dwellings		More than 500 dwellings	
	LP site	Wider policy	LP site	Wider policy	LP site	Wider policy	LP site	Wider policy
Introduction of mobility credits	N	Y	N	Y	N	Y	N	Y
Workplace Parking Levy	N	Y	N	Y	N	Y	N	Y
Bike Share	N	N	Y	Y	Y	Y	Y	Y
Car Share (club)	Y	Y	Y	Y	Y	Y	Y	Y
Mobility hubs	Y	Y	Y	Y	Y	Y	Y	Y
Type of mobility hub	E	N/A	C	N/A	C	N/A	A	N/A
Low Traffic Neighbourhoods	Y	Y	Y	Y	Y	Y	Y	Y
Controlled Parking Zones	N	Y	N	Y	N	Y	N	Y
Eco-driver training	N	Y	N	Y	N	Y	N	Y
Speed limit reductions	Y	Y	Y	Y	Y	Y	Y	Y
Co-working spaces	Y	Y	Y	Y	Y	Y	Y	Y
Mobility as a Service (MaaS)	N	Y	N	Y	N	Y	N	Y
Congestion charging zones	N	Y	N	Y	N	Y	N	Y
Low emission zones - Clean Air Zones	N	Y	N	Y	N	Y	N	Y

5.2. High-level cost information

High-level cost information for those levers, identified (Table 5-1) as potentially alignable to Local Plan sites, has been collated and produced. Those levers which are, instead, aligned to / or reliant upon wider policy initiatives and which would struggle to be aligned to individual Local Plan site(s) have not had cost information collated.

The majority of the cost information has been sourced from third parties – Section 5.2.1 through Section 5.2.7; with some cost information (Section 5.2.8 and Section 5.2.9) produced by Atkins.

Cost information has been collated and presented in a per item / per scheme format rather than agglomerated totals, to facilitate greater flexibility and adaptability should either: a) the Local Plan site location(s) and / or quantums change, or b) intervention levers be amended into a new preferred Scenario / package of measures for implementation in the future.

Cost information is at a high-level, commensurate with the strategic county-wide nature of the Local Plan. The information has been collated as indicative to inform discussion and decisions regarding which interventions are to be progressed further in the planning and design process. The cost information provided will need to be revisited and updated as individual schemes are identified and design development progresses. Cost information will also need to be updated to reflect ongoing variation and volatility regarding inflation.

5.2.1. Demand Responsive Travel (DRT) – cost information

Table 5-2 presents cost information for individual elements required to operate DRT services.

N.B. cost information for DRT services have been extracted from a report produced in May 2021 for Torbay Council; costs would therefore need to be revisited and potentially amended to account for variables which may have changed in any intervening period between 2021 and implementation of a DRT scheme in Wiltshire; for example: VAT, fuel prices / fuel duty, inflation.

Table 5-2 - DRT cost elements

Feature	Cost	Unit
DRT service using provider app per vehicle deployed	£7,500	Per vehicle
Real time vehicle tracking per annum per vehicle deployed	£1,250	Per vehicle
Account based registration service	£8,300	Per platform
Future booking functionality	£8,300	Per platform

Source: Torbay Council (WSP) Demand Responsive Transport Services Feasibility Study - https://www.torbay.gov.uk/media/16255/torbay-drt-feasibility-study-may21.pdf

Table 5-3 presents cost information per vehicle, based on cost element information (Table 5-2).

Table 5-3 - DRT: costs per vehicle

Number of vehicles in DRT scheme	Cost / vehicle
1 Vehicle	£25,350
5 Vehicles	£12,070
10 Vehicles	£10,410
15 Vehicles	£9,857
20 Vehicles	£9,580
25 Vehicles	£9,414
30 Vehicles	£9,303
35 Vehicles	£9,224
40 Vehicles	£9,165

Source: Torbay Council (WSP) Demand Responsive Transport Services Feasibility Study - https://www.torbay.gov.uk/media/16255/torbay-drt-feasibility-study-may21.pdf

5.2.2. Micro-consolidation(e-cargo bikes) – cost information

Table 5-4 presents cost information for capital and operating costs associated with E-Cargo bikes.

These costs have been sourced from 'E-cargo bike local authority project summaries' which presents transparency data from Department for Transport (DfT) and Active Travel England (ATE) funding awarded to local authorities.

The cost information which informed the values presented in Table 5-4 are shown in Table D-1 in Appendix D.1

Table 5-4 - E-Cargo Bike - cost information

	CapEx cost information	OpEx cost information
Average cost / bike	£4,996	£1,200 / year

Source: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1035420/e-cargo-bike-local-authority-project-summaries.csv/preview

5.2.3. Flexible pick-up / drop-off points for home deliveries – cost information

Table 5-5 presents cost information for flexible parcel collection locations (automated parcel storage / collection). These figures were sourced from InPost's UK expansion investment data.

Table 5-5 - Flexible parcel collection - cost information

Capital investment	Units	Cost / unit
£100,000,000	10,000	£10,000

Source: https://apex-insight.com/inpost-investing-100m-in-uk-parcel-lockers/

It is worth noting the following:

- If a suitable proposition (e.g. integrated with mobility hubs installed in new developments), or an existing customer base exists, then it is likely the logistics companies will make the capital investment, as well as ongoing operational costs, rather than the Local Planning Authority;
- Final mile costs equate to approx. 70% of the total delivery fee from the merchant to end customer – flexible parcel lockers therefore reduce merchant and logistics company costs.

Table 5-6 presents some additional information from one of Europe's largest existing operators of automated parcel collection locations.

Table 5-6 - Additional information re: automated parcel collection points

InPost data
Automated parcel collection sites are approx. 25-30% cheaper than delivery to a customer door, on average
Automated parcel collection sites generate approx. 75% less CO_2 emissions than delivering to customer door
InPosts' Polish operations reduced 53Kg / day of CO_2 compared to delivering to a customer door
InPosts' Polish operations saved 54 million litres of fuel in 2021 compared to delivering to a customer door

Source: https://www.doddle.com/blog/case-study-what-does-inposts-annual-report-tell-us-about-lockers-and-out-of-home-delivery/

5.2.4. Introduction of mobility credits – cost information

Table 5-7 presents cost information for the introduction of mobility credits. It is worth re-iterating, as outlined in Appendix C, that the costs presented are in relation to scrappage-scheme-linked mobility credits; as the evidence-base points to these being more effective.

The average cost from Table 5-7 is £3,167 per mobility credit offered.

Table 5-7 - Mobility credits - cost information

Cost	Source	Hyperlink
£2,500	British Vehicle Rental and Leasing Association (BVRLA) - Mobility credits: economic analysis	https://www.bvrla.co.uk/uploads/assets/uploaded/0cff08cd-d653-4173-a2dfad0f2081951c.pdf
£2,000 - £4,000	BVRLA - Mobility credits - Scrappage scheme	https://www.bvrla.co.uk/uploads/assets/uploaded/117ffa63-be62-49a1-9a518f4943eca7e4.pdf
£4000	Urban Mobility Partnership - Consumers in the driving seat	https://www.ump.org.uk/wp-content/uploads/2019/05/Consumers-in-the-driving-seat.pdf

5.2.5. Mobility hubs – cost information

Table 5-8 presents cost information for mobility hubs. These figures were sourced from CoMoUK's report *'The Design Process – Mobility Hubs Realised'*.

Further detail and information on CoMoUK's costs are included in Table D-2 in Appendix D.2. Information on the specification CoMoUK utilised when developing their design guidance and cost information is presented in Table D-3 in Appendix D.2.

Table 5-8 - Mobility hubs - cost information

Type ref	Type of hub	Item		Item cost	Total cost
A	Large interchange or city centre	1.1	Works cost	£427,000	**£631,277**
		1.2	Preliminaries (20%)	£85,400	
		1.3	Contractor overheads & profit (12%)	£61,488	
		1.4	Design development & construction contingency (10%)	£57,389	
B	Transport corridor hub	1.1	Works cost	£338,000	**£499,699**
		1.2	Preliminaries (20%)	£67,600	
		1.3	Contractor overheads & profit (12%)	£48,672	
		1.4	Design development & construction contingency (10%)	£45,427	
C	Business park or new housing development hub	1.1	Works cost	£185,000	**£273,504**
		1.2	Preliminaries (20%)	£37,000	
		1.3	Contractor overheads & profit (12%)	£26,640	
		1.4	Design development & construction contingency (10%)	£24,864	
D	Suburbs or mini hub	1.1	Works cost	£225,000	**£332,640**
		1.2	Preliminaries (20%)	£45,000	
		1.3	Contractor overheads & profit (12%)	£32,400	
		1.4	Design development & construction contingency (10%)	£30,240	
E/F	Small market town or village / tourism hub	1.1	Works cost	£180,300	**£266,890**
		1.2	Preliminaries (20%)	£36,200	
		1.3	Contractor overheads & profit (12%)	£26,064	
		1.4	Design development & construction contingency (10%)	£24,326	

Source: CoMoUK - The Design Process - Mobility Hubs Realised: https://uploads-ssl.webflow.com/6102564995f71c83fba14d54/630f763354842c66afddb22c_CoMoUK%20The%20design%20process%20-%20mobility%20hubs%20realised.pdf

5.2.6. Bike share – cost information

Table 5-9 presents cost information for bike share schemes. These figures were sourced from CoMoUK's report *'Bike Share Guidance for Local Authorities (2022)'*. It is important to note that the figures were calculated by CoMoUK in 2022 and that the author highlights that capital cost estimates cover the whole of the mobilisation phase of the scheme and may increase with inflation.

Further detail and information on some of the variable and input criteria used by CoMoUK are presented in Table D-4 and Table D-5 in Appendix D.3.

Table 5-9 - Bike share - cost information (capital funding ranges)

Bike fleet - composition	Population	~250,000	~300,000	~750,000
	Bike Numbers	**350-800**	**500-1000**	**1000-2500**
100% pedal bike fleet	Lower range of prices - £1,500	£0.5 - £1.2m	£0.75 - 1.5m	£1.5 - £3.7m
	Higher range of prices - £2,500	£0.85 - £2.0m	£1.5 - £2.5m	£2.0 - 6.25m
	Lower range of prices - £3,000	£1.0 - £2.4m	£1.5 - £3.0m	£3.0 - £7.5m

Bike fleet - composition	Population	~250,000	~300,000	~750,000
	Bike Numbers	350-800	500-1000	1000-2500
100% e-bike fleet	Higher range of prices - £4,500	£1.5 - £3.6m	£2.25 - £4.5m	£4.5 - £11.25m
Mixed fleet: 70% pedal / 30% e-bike	Lower range of prices – mixed fleet	£0.7 - £1.5m	£.10 - £1.7m	£2.0 - £4.8m
	Higher range of prices – mixed fleet	£1.0 - £2.5m	£1.5 - £3.0m	£3.1 - £7.75m

Source: CoMoUK Bike Share Guidance for Local Authorities (2022) - https://uploads-ssl.webflow.com/6102564995f71c83fba14d54/637d049543d8ef05b11341e8_CoMoUK%20bike%20share%20guidance%20for%20local%20authorities%202022.pdf

As outlined in Table 5-9; capital funding range estimates equate to:

- £2 - £15 per head of population;
- £1,500 - £4,5000 per bike.

5.2.7. Car share (club) – cost information

Table 5-10 presents cost information for car share (club) schemes. These figures were sourced from CoMoUK's *Business Case for Community Car Clubs* report. Further information is presented in Appendix D.4; including:

- Table D-7 – annual running costs.
- Table D-8 – income from car club rates.
- Table D-9 – income from membership fees per car.
- Table D-10 – income from mileage rates per car.
- Table D-11 – income from hourly charges per car.
- Table D-12 – car share club breakeven utilisation levels and rates for two-vehicle scheme.
- Table D-13 – car share club breakeven utilisation levels and rates for six-vehicle scheme.

Table 5-10 - Start-up costs - Capital costs of setting up community car club

	Item	Independent, without telematics	Independent, with low-cost telematics	Franchise, with telematics
Capital cost per vehicle	Purchase price	£8,000	£8,000	£8,000
	Vehicle branding	£80	£80	£80
	Branding of parking space	£30	£30	£30
	System for accessing keys	£20	£350	£1,600
	Total upfront cost/vehicle	**£8,130**	**£8,460**	**£9,710**
Capital cost per scheme	Set-up of booking/billing system	£0	£770	£1,000
	Total upfront cost per scheme (irrespective of vehicle numbers)	**£0**	**£770**	**£1,000**

Source - CoMoUK Business Case for Community Car Clubs - https://uploads-ssl.webflow.com/6102564995f71c83fba14d54/62dab86144830462346a07c4_CoMoUK%20Business%20Case%20for%20Community%20Car%20Clubs.pdf

The CoMoUK report highlights several key findings of note, including:

- *Average utilisation rates for existing community car club schemes is 14% (approx. 4 hrs / day).*
- *It is not desirable to achieve utilisation rates of above 25% - if members are unable to book a vehicle when desired they may leave the club and purchase a car.*
- *It is difficult to make a two-vehicle scheme financially viable / sustainable. At typical utilisation rates (14%), the scheme would need to charge >£10/hr – it is unlikely that people would pay this figure.*
- *A scheme would require six vehicles to become financially sustainable at existing average utilisation rates while charging hourly rates comparable to some commercial operators.*

5.2.8. Active travel infrastructure – cost information

Table 5-11 presents a summary of cost information for active travel infrastructure. Further detail on cost information is available in Appendix E.1

The improvements include a number of features:

- New cycle routes (on-carriageway, segregated, and off-road).
- Improved pedestrian crossings.
- Amended junctions.
- Street lighting and path lighting – improvements and new provision.
- Pedestrian / cycle bridge.
- Traffic calming features.

Table 5-11 - Active travel infrastructure - cost information

	Package totals		
Item	**Chippenham**	**Trowbridge**	**Salisbury**
Total implementation cost (inc. risk budget)	£12,663,000	£9,314,500	£11,413,500
Design	£880,000	£647,500	£793,000
Total	**£13,543,000**	**£9,962,000**	**£12,206,500**

5.2.9. Public transport improvements – cost information

Section 5.2.9 presents cost information for the public transport (bus service) improvements proposed in Section 4 as potential intervention levers to assist with Wiltshire's decarbonisation of transport associated with Local Plan growth, as follows:

- High-level cost information for bus service frequency improvements – Section 5.2.9.1.
- High-level cost information for bus stop infrastructure improvements – Section 5.2.9.2.

5.2.9.1. Public transport: service frequency – cost information

Table 5-12 summarises the costs associated with bus service frequency improvements. These are based on achieving a 35% reduction in passenger wait times for accessing existing bus services (as outlined in Sections 4.4, 4.5, 4.6, and Appendix C).

Cost information presented in Table 5-12 is based on costs developed by Wiltshire Council and Atkins as part of the Wiltshire Bus Service Improvement Plan (BSIP)[4]. The costs were adjusted to account for inflation utilising the Consumer Price Index[5]. Costs in Table 5-12 are high-level – they present an annual cost but do not factor in any offset from increased bus fare revenue which would likely be a result of increased bus patronage resulting from an improved user experience (facilitated by a significant reduction in passenger wait time).

Further information on how the cost information summarised in Table 5-12 was calculated is presented in Table E-4 in Appendix E.2.

[4] https://www.wiltshire.gov.uk/media/7413/Wiltshire-Council-s-Bus-Services-Improvement-Plan/pdf/Wiltshire_Councils_Bus_Service_Improvement_Plan.pdf?m=637710990105300000

[5] https://www.ons.gov.uk/economy/inflationandpriceindices/datasets/consumerpriceinflation

Table 5-12 - Public transport: service frequency improvements - cost information

	Required improvements		
	Mon-Sat Daytime	**Mon-Sat Evening**	**Sunday**
Total number of frequency improvements	33.7	7.0	8.8
2021 cost / improvement	£150,000	£50,000	£30,000
2021 cost sub-total	£5,060,192	£350,000	£262,500
2021 cost total	£5,672,691		
2021-2021 CPI factor	1.191		
2023 cost sub-total	£6,026,689	£416,850	£312,638
2023 cost total	**£6,756,177**		

5.2.9.2. Public transport: stop infrastructure – cost information

Table 5-13 presents the cost sources and assumptions utilised to derive high-level cost information regarding improvements to existing bus stop infrastructure.

The inflation factors utilised were derived utilising the Consumer Price Index[6].

Table 5-13 - Public transport: stop infrastructure - cost assumptions

Item	Base cost	Base cost date	Civils contingency (20%)	Staff and overheads (33%)	Inflation factor	April 2023 cost	Source
Supply and install flag	£100	Feb-21	£20	£33	1.213	£200	Wales Bus Network Reform & Design
Supply and install pole	£300	Feb-21	£60	£99	1.213	£600	Wales Bus Network Reform & Design
Supply and install timetable display case	£100	Feb-21	£20	£33	1.213	£200	Wales Bus Network Reform & Design
Supply and install CCTV	N/A	N/A	N/A	N/A	N/A	£5,000	Spon's 2023 External PTZ camera dome with power
Supply and install basic quality shelter	£7,000	Feb-21	£1,400	£2,310	1.213	£12,300	Wales Bus Network Reform & Design
Real-Time Passenger Information LCD TFT	£100	Oct-21	£1,600	£2,640	1.168	£13,600	Oxfordshire BSIP
Total per stop						**£31,900**	

***N.B.** 2023 costs are rounded*

Table 5-14 summarises the potential cost of delivering improvements to existing bus stop infrastructure, utilising the 'per-stop' costs presented in Table 5-13.

[6] https://www.ons.gov.uk/economy/inflationandpriceindices/datasets/consumerpriceinflation

To derive the number of stops on each of the route corridors, bus stop data from the DfT – National Public Transport Access Nodes (NaPTAN) dataset[7]. NaPTAN data was imported into a Geographical Information System (GIS) to quantify the number of stops present on each corridor.

For cost information purposes it has been assumed that 50% of extant bus stops would require implementation of improvements.

Table 5-14 - Public transport: stop infrastructure - cost information

	Route corridor						
	Westbury to Trowbridge	**Trowbridge to Melksham**	**Melksham to Notton**	**Notton to Chequers roundabout**	**Notton to The Pheasant**	**Chequers roundabout to Derry Hill**	**The Pheasant to Chippenham**
Total number of stops	80	41	21	0	4	38	24
Estimated number of bus stop improvements	40	20.5	10.5	0	2	19	12
Cost of shelter	£31,900						
Total per route	***£1,276,000***	***£653,950***	***£334,950***	***£0***	***£63,800***	***£606,100***	***£382,800***
Total	**£3,317,600**						

5.2.9.3. Public transport – cumulative cost information

Table 5-15 summarises the cumulative cost information for bus service frequency and bus stop infrastructure improvements.

Table 5-15 - Public transport - cumulative cost information

Item	**Cost (uplifted to 2023 values)**
Bus service frequency improvements	**£6,756,177**
Bus stop infrastructure improvements	**£3,317,600**
TOTAL	**£10,073,777**

5.3. Cost summary

High-level cost information for those levers, identified (Table 5-1) as potentially alignable to Local Plan sites, has been collated and produced. Those levers which are, instead, aligned to / or reliant upon wider policy initiatives and which would struggle to be aligned to individual Local Plan site(s) have not had cost information collated.

The majority of the cost information has been sourced from third parties – Section 5.2.1 through Section 5.2.7; with some cost information (Section 5.2.8 and Section 5.2.9) produced by Atkins.

Cost information has been collated and presented in a per item / per scheme format rather than agglomerated totals, to facilitate greater flexibility and adaptability should either: a) the Local Plan site location(s) and / or quantums change, or b) intervention levers be amended into a new preferred Scenario / package of measures for implementation in the future.

Cost information is at a high-level, commensurate with the strategic county-wide nature of the Local Plan. The information has been collated as indicative to inform discussion and decisions regarding which interventions are to be progressed further in the planning and design process. The cost information provided will need to be revisited and updated as individual schemes are identified and design development progresses. Cost information will also need to be updated to reflect ongoing variation and volatility regarding inflation.

[7] https://beta-naptan.dft.gov.uk/

6. Summary and conclusions

Growth from the Local Plan Review is not significant in terms of traffic levels across Wiltshire, with an expected increase in car trips of 1% and 1.5% trips across all modes. However, in the current climate, with challenging targets towards net zero carbon emissions, by 2050 any increase cannot be seen as acceptable.

Three Scenarios were tested to understand how applying different levers through influencing behaviours can reduce the LPR growth (Scenario 1) of car trips and carbon and potentially support wider net zero targets:

- Scenario 2 as a 'Do Minimum' applied a mixture travel planning, improved active travel infrastructure and public transport improvements.
- Scenario 3 as a 'Do Something' strengthened the degree to which the Scenario 2 levers were applied and added on elements around mobility hubs, accessibility to facilities and started to introduce restrictive measures through controlled parking zones.
- Scenario 4 as a 'Do Maximum' added on improvements in planning and public transport but notably also employed fiscal measures such as charging and low emission zones.

✗ Scenario 2 did mitigate the increase in car trips generated by the LPR, although not enough to remove the need for additional infrastructure on the highway to accommodate background growth and did not achieve a net carbon effect for the increase in trips across all modes.

✓ Scenario 3 achieved the aim of mitigating the number of trips and carbon emissions to pre-LPR levels, although only marginally and would not have a significant effect in reducing levels across the County.

Scenario 4 then demonstrated how by applying fiscal measures travel behaviours can be influenced resulting in a threefold reduction in car usage and a fivefold reduction in carbon emissions.

An approach to targeting LPR growth and supporting measures to minimise carbon emissions can be developed from the understanding derived from the Scenarios. However, looking at the impact of these Scenarios in the wider context of Wiltshire's net zero carbon reduction targets even after employing Scenario 4, there would still be a considerable emissions gap to be overcome. The solution is likely to include applying the harder hitting fiscal measures from Scenario 4 at a more holistic level across Wiltshire, beyond the movements to, from and within the LPR growth areas. Further measures to address emissions from goods vehicles will also be required, along with additional action at regional and national levels to alter travel choices and promote electric and other zero emission vehicle uptake.

6.1. Targeting growth from Local Plan Review

To target growth from the Local Plan Review would require inclusion of the range of levers identified in Scenario 2 and Scenario 3 which could be appropriately and proportionally incorporated into the specific transport assessments for each development site, targeting impact on the growth from these developments.

By embedding these interventions into the planning process, it will act as a positive demonstration of longer-term ambitions and needs, and at the same time accepting that transport interventions can have only a limited influence. Future planning for growth needs to consider carbon impact from the outset, in terms of both siting and access to facilities to reduce demand for travel.

6.2. Targeting wider carbon emissions to support net zero targets

At the beginning of this report, it was noted that recommendations are to be seen not just as a one-off solution, but as a longer-term guide in understanding and embedding the scale of interventions required when developing future plans to meet wider carbon reduction commitments. Scenario 4 has demonstrated the sort of measures that could be employed to start to achieve this by reversing growth in emissions.

However, looking at this impact in context of the challenge across the wider region there is still a considerable gap to close to reach the target carbon reduction pathways at a county level. There are opportunities to expand on the level of success in Scenario 4 by applying measures more widely across Wiltshire. National policy will also play an important role over time, including introducing freight measures and encouraging rapid uptake of electric and other zero emission vehicles. However, changes in vehicle fleet take time and to minimise the impact of carbon on climate change rapid decarbonisation is important so measures taken to reduce emissions now will have an important effect.

The LTP4 is currently under development and offers a timely opportunity to start embedding these principles and schemes through more detailed discussion and planning to ensure a level of commitment needed to drive implementation. This also offers Wiltshire an opportunity to demonstrate their commitment and willingness to support measures that will deliver notable change.

Appendices

Appendix A. Baseline BAU Report

Wiltshire LPR 2022

Technical Note

Wiltshire Council

24th October 2022

Baseline Report

Notice

This document and its contents have been prepared and are intended solely as information for Wiltshire Council and use in relation to Local Plan Review (Transport) 2022

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Client signoff

Client	Wiltshire Council
Project	Wiltshire LPR 2022
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Contents

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Tables

Figures

List of Abbreviations

Abbreviation	Definition	Abbreviation	Definition	Abbreviation	Definition
ADV	Atkins Data Visualisation	LP	Local Plan	V/C	Volume to Capacity ratio
BAU	Business As Usual	LPR	Local Plan Review	VOCs	Vehicle Operating Costs
BSIP	Bus Service Improvement Plan	LSOA	Lower Super Output Area	VoT	Value of Time
DfT	Department for Transport	LTP	Local Transport Plan	WTM	Wiltshire Transport Model
drSS	draft revised Spatial Strategy	MSOA	Middle Super Output Area		
FEMA	Functional Economic Market Area	NHBEB	Non Home Based Employers' Business		
GJT	Generalised Journey Time	NHBO	Non Home Based Other		
Ha	Hectare	NPPF	National Planning Policy Framework		
HAM	Highway Assignment Model	NPPG	National Planning Policy Guidance		
HBEd	Home Based Education	NTEM	National Trip End Model		
HBED	Home Based Employers' Business	NTS	National Travel Survey		
HBO	Home Based Other	OAN	Objectively Assessed Need		
HBW	Home Based Work	O/D	Origin/Destination		
HMA	Housing Market Area	ONS	Office for National Statistics		
ISM	Interim Strategic Model	ORR	Office of Road and Rail		
JTW	Journey to Work	P&R	Park & Ride		
LAD	Local Authority District	SHMA	Strategic Housing Market Assessment		
LCWIP	Local Cycling Walking Infrastructure Plan	SWRTM1	South West Regional Transport Model		
LHNA	Local Housing Needs Assessment	TAG	Transport Assessment Guidance		
LLPG	Local Land and Property Gazetteer	TFR	Traffic Forecasting Report		

Introduction

1. Introduction

1.1. Report Purpose

This report aims to describe the scope, input assumptions and development of models and tools for the upcoming (Autumn 2022) local plan (LP) review. It describes the work undertaken (in 2020 and 2021, utilising the evidence base available at that time) as part of the local plan review, the changes to the assumptions and evidence base following public consultation in 2021, and the "new" tools and models intended for use in the next phase of the LPR.

1.2. Background

Wiltshire Council is in the process of developing a new Local Plan to set out the policies and strategies to demonstrate how growth in housing and employment will be accommodated across the county over the course of the new plan period. The extant, adopted, Local Plan covers a plan period to 2026. The new Local Plan will cover a plan period to 2038.

Atkins provided support during 2019-2021 to Wiltshire Council for the Local Plan Review (LPR) process, utilising Wiltshire's strategic transport model (further information on the assessment undertaken in 2020 is presented in Section 1.3). The outcomes of this work were deemed a robust assessment of Wiltshire's growth agenda at that time. However, Wiltshire Council has subsequently amended the growth quantum and locations for housing and employment, and the local and national policy landscape has materially changed. The work undertaken in 2020-2021 was reflective of the extant Local Transport Plan (LTP) 3, rather than the work-in-progress LTP4; the new LTP reflects the UK's and Wiltshire's emerging and committed policy position in relation to the climate crisis and carbon neutrality.

Wiltshire Council therefore have a requirement that additional work be undertaken to identify scenarios to plan for, considering the emerging changes to travel behaviours and the need to shift existing and proposed travel patterns towards more sustainable modes to achieve Net Zero targets. This will include:

- Updating the LPR work undertaken in 2020-2021 to reflect amended housing and employment figures, growth locations, and proposed infrastructure changes;
- Include assessment of Market Town growth, alongside Principal Settlements, in the above task;
- Undertake additional spatial scenario tests for Salisbury, Royal Wootton Bassett and Chippenham;
- Include considerations / impacts from the DfT Transport Decarbonisation Plan;
- Include an element of uncertainty testing reflecting the potential longer-term impact of the Covid-19 pandemic;
- Interlink the LPR with pertinent emerging workstreams: LTP4, LCWIP(s) (Local Cycling Walking Infrastructure Plans), and BSIP (Bus Service Improvement Plan); and
- Avoid extensive new road building, and therefore the associated embodied and tailpipe carbon, if possible.

Wiltshire Council have set four scenarios to model, at the time of writing this report, including:

1. Business As Usual – update the Wiltshire highway model to assess 2022 quantum of growth, scenario where no change is included regarding travel volumes, patterns, or mode choice;
2. Scenario to avoid, where possible, the new highway construction identified within the previous LPR as required to accommodate the forecast level of growth (LPR work to avoid impacting committed MRN and development schemes and/or impacting those schemes which deliver improvements to public or active transport);
3. Scenario to achieve 91.2% carbon net zero by 2036 or as advised following a review of the Tyndall modelling; and
4. Scenario to achieve 100% 2030 net zero carbon target.

The above decarbonisation scenarios, in the context of the LPR, relate to growth associated with the Local Plan only, rather than the wider transportation decarbonisation goals of Wiltshire – this latter remit falls under the scope of the revised LTP (LTP4).

The amended approach to the LPR – transitioning from a 'predict and provide' approach which assumes ongoing traffic growth in response to population and employment growth where private car use mode share is assumed to remain static, towards a 'decide and provide' approach; deciding what the preferred future looks like and providing the means to work towards it, whilst accommodating uncertainty – is essential if Wiltshire and

the UK are to achieve our legally binding Net Zero by 2050 objectives. This shift in approach also requires a shift in methodology and assessment tools.

A highway-only model for Wiltshire exists (a SATURN-DIADEM model) – the Wiltshire Transport Model (WTM) – however, this model has limitations; it was not designed with a 'decide and provide' approach or decarbonisation scenario planning in mind, it was designed to forecast traffic growth and the resulting impacts to enable infrastructure interventions to be developed.

In order to respond to the challenge of decarbonising transport, the scenario-led approach to the LPR requires the additional functionality of a multi-modal model, to formulate the required LPR evidence base, and determine the efficacy of interventions developed to facilitate decarbonisation and modal shift.

To respond to this requirement Atkins has developed a spreadsheet-based multi-modal model – the 'Interim Strategic Model' (ISM). The ISM includes the following functionality:

- Travel demand changes as a result of land use, population, and employment trends: an ability to estimate travel demand changes at a local and county level due to internal development, demographic trends, behaviour change (e.g. working from home) and national / regional growth impacting on Wiltshire;
- Modal shift between travel modes, particularly from car to active modes, bus rail, and Park and Ride, and between these modes;
- Changes in destinations of trips due to spatial development (change in urban vs. rural development, locations of employment), or changes in accessibility and transport costs;
- Impact of additional driving costs, specifically area-based parking costs and capacities, and charging schemes;
- Changes in public transport services, including more frequent, faster, and more accessible services, fare changes, interchanges, as well as 'soft' measures, such as new vehicles and travel information;
- Walk and cycle provision, both as complete journeys and as access / egress legs within a multi-modal journey, including quality of cycle provision;
- Behavioural and attitudinal changes, such as changes in trip rates (the likely impacts of more sustainable, self-sufficient, internalised communities) and the potential long-term shifts (post-Covid 19) in employment travel behaviour; and
- Assumptions around working from home proportions and the distances people are likely to travel.

In addition to the need for a multi-modal model, a carbon tool is required – to assess both the baseline / BAU (travel behaviour and patterns in Wiltshire continues as they have previously) and the decarbonisation scenarios. This model produces carbon emissions estimates from surface transport (road and rail), by year, in line with best practice in emissions calculations. The carbon model includes information on:

- Fleet composition; including vehicle type, vehicle size, and vehicle fuel or energy use; and
- Emissions factors (in gCO2e / km) for each vehicle type and speed band.

The model will provide estimated total surface transport emissions within Wiltshire in each scenario in each year, differentiated by tailpipe (tank to wheel) and upstream (well to tank) emissions – providing the basis for comparing the emissions forecasts for each scenario with Wiltshire's decarbonisation pathway.

1.3. Overview of the 2020 Local Plan assessment

Between late 2019 and early 2021 Atkins supported Wiltshire Council in undertaking a review[1] of forecast growth in the county to 2036.

Atkins was appointed to provide transport planning support for the review process utilising Wiltshire's strategic highway model; this included:

- Development of the WTM to ensure it reflected 2018 traffic conditions on the highway network. Full details of model development are included in the Local Model Validation Report (LMVR)[2];
- Development of forecast scenarios to reflect future development and planned transport schemes;
- Analysis of the impacts of prospective Local Plan growth on the highway network;
- Initial assessment of the scope to improve active travel and public transport; and

[1] *Wiltshire_Local_Plan_Transport_Review.pdf*
[2] WTM LMVR (Issue 6a): 'Wiltshire 2018 Base Model LMVR Issue 6a_v1.0.docx'

- Development of options for mitigation of the impacts arising from LP growth on the highway network.

The LPR assessment work undertaken in 2020 -2021 covered the following scenarios:

- 2036 Do Nothing 228,000 households (additional 20,000 from 208,000 households in 2018 Base):
  a. Including all Wiltshire Core Strategy growth and planned infrastructure: and
  b. Excluding post Wiltshire Core Strategy growth and associated infrastructure;
- 2036 Do Minimum (246,000 households (further 18,000 additional households) (Do Nothing with prospective LP growth and minimal access infrastructure); and
- 2036 Do Something (Do Minimum with prospective LP growth plus transport mitigation measures).

The 2020 Local Plan assessment was focused on the Principal Settlement areas (Chippenham, Trowbridge, and Salisbury); the Market Towns were not included in the assessment. The study highlighted that, without mitigation measures, there could be capacity constraints and congestion issues on the local and strategic highway network between settlements.

The 2020 assessment included suggested mitigation interventions, through provision of:

- High-level cycle routes in the three Principal Settlement areas;
- Public transport, through improvements to:
  - Passenger waiting facilities at stops and interchanges;
  - Real Time Passenger Information (RTPI) at key stops
  - Increased number of services;
  - Diversion of extant services to new housing, and
  - Exploring Dynamic Demand Responsive Transport (DDRT) solutions.
- Highway infrastructure investment included:
  - Eastern and southern distributor roads at Chippenham and improvements to the A350 Chippenham Bypass,
  - A bypass in Melksham, Staverton,
  - Improvements to the M4 Junction 17, the A338 Southern Salisbury junction, and
  - Dualling of sections of the A350 (between Lackham roundabout and Melksham bypass and Melksham bypass and Littleton roundabout)

1.4. Report structure

The remainder of this report provides an overview of two elements in Wiltshire's Local Plan process.

1. **Overview of changes to the local plan (section 2 – 4)**:

Provides the 2022 LP change in employment and housing growth forecast in Wiltshire over the plan period to 2038, and how this differs from the previous growth forecasts assessed in 2020. It includes the change in outcomes Wiltshire have selected as the vision for what this growth looks like, and how it affects the county. It also includes an update of the Wiltshire Highway Model to determine the effect of growth on the local highway network.

- Local Plan 2022:
  - Section two – Overview of Local Plan;
- Business as Usual:
  - Section three – 2036 'Business As Usual' (BAU) SATURN model assumptions; and
  - Section four – 2036 BAU model outputs.

2. Overview of the evidence-based models and tools developed to create a baseline (section 5 – 9).

The baseline is a key step in the Local Plan review and assessment process, representing the likely effects if the planned scale of growth occurs without any change in transport and travel patterns. This baseline will provide the data yardstick against which the scenario planning process can test the effectiveness of the interventions required to reach the desired outcomes Wiltshire have specified. This baseline development includes:

- Multi-Modal Interim Strategic Model:
  - Section five – Key features of the Interim Strategic Model (ISM);

- Section six – 2018 ISM Data collection;
- Section seven – 2018 ISM Baseline;
- Section eight – 2018 ISM Base model calibration; and

- Carbon Model:
  - Section nine – 2018 Carbon base and 2036 Carbon BAU baseline.

This is all summarised in Section ten – Summary and conclusions.

Section 1 Introduction Summary

This report aims to describe the scope, input assumptions and development of models and tools for the upcoming (Autumn 2022) local plan (LP) review. It describes the previous iteration of the (2020) local plan review, the changes to the assumptions since, and the "new" tools and models intended for use in the upcoming LPR.

In 2020 Atkins provided support to Wiltshire Council for the Local Plan Review (LPR) process, utilising Wiltshire's strategic transport model. However, Wiltshire Council has subsequently amended the growth quantum and locations for housing and employment, and the local and national policy landscape has materially changed. The work undertaken in 2020 was reflective of the extant Local Transport Plan (LTP) 3, rather than the work-in-progress LTP4; the new LTP reflects the UK's and Wiltshire's emerging and committed policy position in relation to the climate crisis and carbon neutrality.

Wiltshire Council therefore have a requirement that additional work be undertaken to identify scenarios to plan for, considering the emerging changes to travel behaviours and the need to shift existing and proposed travel patterns towards more sustainable modes to achieve Net Zero targets. This will include:

- Updating the 2020 LPR work to reflect amended housing and employment figures and growth locations;
- Include assessment of Market Town growth, alongside Principal Settlements, in the above task;
- Undertake additional spatial scenario tests for Salisbury and Chippenham;
- Include considerations / impacts from the DfT Transport Decarbonisation Plan;
- Include an element of uncertainty testing reflecting the potential longer-term impact of the Covid-19 pandemic;
- Interlink the LPR with pertinent emerging workstreams: LTP4, LCWIP(s) (Local Cycling Walking Infrastructure Plans), and BSIP (Bus Service Improvement Plan); and
- Avoid extensive new road building, and therefore the associated embodied and tailpipe carbon, if possible.

The amended approach to the LPR – transitioning from a 'predict and provide' approach which assumes ongoing traffic growth in response to population and employment growth where private car use mode share is assumed to remain static, towards a 'decide and provide' approach; deciding what the preferred future looks like and providing the means to work towards it, whilst accommodating uncertainty – is essential if Wiltshire and the UK are to achieve our legally binding Net Zero by 2050 objectives. This shift in approach also requires a shift in methodology and assessment tools.

To respond to this requirement Atkins has developed a spreadsheet-based multi-modal model – the 'Interim Strategic Model' (ISM).

In addition to the need for a multi-modal model, a carbon tool is required – to assess both the baseline / BAU (growth in Wiltshire continues as is has previously) and the decarbonisation scenarios. This model produces carbon emissions estimates from surface transport (road and rail), by year, in line with best practice in emissions calculations.

2. Local Plan Review 2022

2.1. Overview

Wiltshire Council is in the process of developing a new Local Plan to set out the policies and strategies to demonstrate how growth in housing and employment will be accommodated across the county over the course of the new plan period. The extant Local Plan, adopted in 2015, covers a plan period to 2026. The new Local Plan will cover a plan period to 2038.

Consultation undertaken by Wiltshire Council in early 2021 identified that between 40,800 and 45,630 new dwellings and up to 26 hectares of employment land is required over the period to 2038. This growth will generate additional demands on the transport network; these additional demands will need to be mitigated, suppressed, or accommodated in the form of increased non-car mode share in order to limit adverse impacts resulting from forecast growth.

2.2. Objectives of the 2022 Local Plan Review

Since the adoption of the extant Local Plan in 2015 significant changes in the legal and policy context have taken place. Arguably the most significant change occurred in 2019 when the Government passed into law an amendment to the 2008 Climate Change Act (The Climate Change Act 2008 (2050 Target Amendment) Order 2019) which, in conjunction with the 2015 Paris Agreement binding international treaty on climate change, have profound implications for the UK. The UK is now legally obliged to ensure it becomes Net Zero carbon as a nation by 2050. This requires significant and immediate change across all industries, including transport, in order to reach the nation's decarbonisation goals.

In response to the changing legal and policy landscape, Wiltshire Council have set four scenarios, at the time of writing this report, to model as part of the Local Plan 2022 review process, including:

1. Business As Usual – update the Wiltshire highway model to assess the quantum of growth (determined in 2022), scenario where no change is included regarding travel volumes, patterns, or mode choice;
2. Scenario to avoid, where possible, the new highway construction identified within the previous LPR as required to accommodate the forecast level of growth (LPR work to avoid impacting committed MRN and development schemes and / or impacting those schemes which deliver improvements to public or active transport);
3. Scenario to achieve 91.2% carbon net zero by 2036 or as advised following a review of the Tyndall modelling; and
4. Scenario to achieve 100% 2030 net zero carbon target.

The above decarbonisation scenarios, in the context of the LPR, relate to growth associated with the Local Plan only, rather than the wider transportation decarbonisation goals of Wiltshire – this latter remit falls under the scope of the revised LTP (LTP4).

2.3. Dwellings

This section presents the scale of housing growth forecast in Wiltshire over the Local Plan period to 2038.

Wiltshire's housing growth quantum are based on the Strategic Housing Market Assessment (SHMA) and Local Housing Needs Assessment (LHNA) which determines the scale of growth required, by HMA, in order to meet the county's Objectively Assessed Need (OAN) – as required by the NPPF and PPG.

Housing Market Areas (HMAs) are an important criteria in UK policy and plan making. The National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG) highlight that housing need assessments – based on Objectively Assessed Need (OAN) – should cover the spatial area of HMAs, which may or may not be cross-boundary[3].

Housing 'need' is treated as synonymous with 'demand' by the NPPF and PPG, i.e. housing need quantum should be treated as a measure of future demand, rather than aspiration – the housing that households are willing and able to buy or rent in a given area, either from their own resources or with assistance from the State.

UK Government Guidance on Plan Making defines a HMA as 'a geographical area defined by household demand and preferences for all types of housing, reflecting the key functional linkages between places where

[3] *Planning Advisory Service (PAS) Good Plan Making Guide: https://www.local.gov.uk/sites/default/files/documents/principle-6-7ae.pdf*

people live and work'. These are broadly defined by: a) the relationship between housing demand and supply across different locations, using house prices and rates of change in prices, b) migration flow and housing search patterns, and c) contextual data such as travel to work areas, retail, and school catchment areas[4].

Table 2-1 presents the housing growth quantum for Wiltshire over the plan period to 2038

- **Base (2018)**: extant (2018) number of dwellings
- **Core (2036)**: 'committed' housing growth between 2018 and 2036 (i.e., uncertainty log)
- **LP (2038)**: the number of dwellings associated with the Local Plan (LP) review
- **2036 Do-Nothing**: 'Base (2018) + Core (2036)' (i.e., modelled 'Core' scenario)
- **2036 Do-Minimum**: 'Base (2018) + Core (2036) + LP (2038)' (i.e., modelled 'LP' scenarios)

Table 2-1 - Total Dwellings / Households: 2036

HMA	Settlement	Base (2018)	Core (2036)	LP (2038)	2036 Do Nothing	2036 Do Minimum
Chippenham	Calne	8,379	773	460	9,152	9,612
	Chippenham	15,452	3,127	2,345	18,579	20,924
	Corsham	2,700	170	195	2,870	3,065
	Devizes	6,416	343	370	6,759	7,129
	Malmesbury	8,772	350	100	9,122	9,222
	Melksham	8,618	1,196	1,565	9,814	11,379
	Rest of HMA	13,109	-	555	13,109	13,664
	Total	**63,446**	**5,959**	**5,590**	**69,405**	**74,995**
Salisbury	Amesbury	64,389	2,371	400	72,148	77,858
	Salisbury		3,163	1,255		
	Tidworth and Ludgershall		1,483	1,105		
	Wilton		742	60		
	High Post		-	1,390		
	Rest of HMA		-	1,500		
	Total	**64,389**	**7,759**	**5,710**	**72,148**	**77,858**
Swindon	Royal Wootton Bassett	6,059	-	1,675	6,059	7,734
	West of Swindon	-	-	-	-	-
	Marlborough	10,576	175	195	10,751	11,521
	Rest of HMA		-	575		
	Total	**16,635**	**175**	**2,445**	**16,810**	**19,255**
Trowbridge	Trowbridge	17,418	3,704	365	21,122	21,487
	Warminster	8,058	1,750	-	9,808	9,808
	Westbury	7,385	855	455	8,240	8,695
	Bradford on Avon	30,241	150	55	30,391	30,791
	Rest of HMA		-	345		

[4] *NPPG – Plan Making: https://www.gov.uk/guidance/plan-making*

HMA	Settlement	Base (2018)	Core (2036)	LP (2038)	2036 Do Nothing	2036 Do Minimum
	Total		6,459	1,220	69,561	70,781
Wiltshire		207,572	20,352	14,965	227,924	242,889

Source: Wiltshire Council

Core = Uncertainty log, i.e. committed housing 2018 up to 2036

LP = Local Plan Housing (in addition to Core housing)

Do-Nothing = Base + Core

Do-Minimum = Base + Core + LP

2.4. Employment

This section presents the scale of employment land growth forecast in Wiltshire over the Local Plan period through to 2036.

The employment land required is based on the Swindon and Wiltshire Functional Economic Market Area (FEMA) Assessment and the Wiltshire Employment Land Review.

A FEMA is not constrained by administrative boundaries but reflects the way the economy works; the relationships between where people live and work, the scope of service market areas and catchments. This assessment undertaken for Wiltshire and Swindon councils drew upon an array of evidence to identify the functional economic geography of Swindon and Wiltshire. The conclusion of the study was that there are three FEMAs:

1. A Swindon / M4 Corridor FEMA in the north of the area which extends beyond the Swindon Borough administrative boundary. The area includes parts of northern Wiltshire, the southern reaches of the Cotswold District, and parts of the western reaches of Oxfordshire and Berkshire. However, the core is within the Swindon and Wiltshire administrative area;
2. An A350 Corridor and West / Central Wiltshire Towns FEMA. This overlaps part of the Swindon / M4 Corridor FEMA with the town of Chippenham falling into both. Defined primarily by the A350 this is a polycentric FEMA that operates as a corridor;
3. A Salisbury / Amesbury / A303 Corridor FEMA in the south and east of the area. There is overlap with the A350 FEMA, although Salisbury Plain provides something of a natural geographical barrier.

Table 2-2 presents the employment land growth requirements for Wiltshire over the plan period to 2038. it presents office and industrial employment land growth, in hectares (Ha), by Housing Market Area (HMA).

Employment growth has been presented by HMA and settlement, rather than by FEMA, within this report for a number of reasons, including:

- Simplicity and legibility – presenting employment and housing growths utilising the same geographic areas across both data sets enables comparison of both growth types;
- Assessment – the Wiltshire Transport Model, utilised previously for the 2020 LPR, is set up to input data requirements, and model results, by HMA.C

As outlined in Section 2.3, Wiltshire is forecast to expand from 207,572 households to 242,889 households – an increase of 35,317 households by the end of the plan period (2036), of which 14,965 is growth associated with the Local Plan.

The 2022 LP represents an increase of + 14,965 households (7% increase) compared to the Core Strategy. This is a reduction in growth of -5,401 from the 20,336 contained in the 2020 LP. The 2020 LP made provision for an increase of 20,336 households, which represented growth of 10%; the 2022 LPR growth is therefore 3% less than 2020 LP growth.

Table 2-2 - Employment Land Requirements (Local Plan 15-year plan period)

HMA	Settlement	Office (Ha)	Industrial (Ha)	Industrial + Office (low)	Industrial + Office (High)	Industrial + Office (Average)
Chippenham	Calne	0.2 – 0.5	2.7	2.9	3.2	3.1
	Chippenham	1.5 – 3.8	5.2	6.7	9.0	7.9
	Corsham	1.2 – 3.1	4.3	5.5	7.4	6.5
	Devizes	0.7 – 1.8	3.2	3.9	5.0	4.5
	Malmesbury	0.6 – 1.4	2.4	3.0	3.8	3.4
	Melksham	0.5 – 1.2	6.9	7.4	8.1	7.8
	Rest of HMA	1.2 – 3.1	9.3	10.5	12.4	11.5
	Total	**5.9 – 14.9**	**34.0**	**39.9**	**48.9**	**44.4**
Salisbury	Amesbury	0.7 – 1.8	4.6	5.3	6.4	5.9
	Salisbury	2.2 – 5.4	3.7	5.9	9.1	7.5
	Tidworth and Ludgershall	0.2 – 0.4	0.4	0.6	0.8	0.7
	Wilton	0.1 – 0.2	0.5	0.6	0.7	0.7
	High Post	-	5.0	5.0	5.0	5.0
	Rest of HMA	2.8 – 7.0	8.1	10.9	15.1	13.0
	Total	**6.0 – 14.8**	**22.3**	**28.3**	**37.1**	**32.7**
Swindon	Royal Wootton Bassett	0.8 – 2.1	4.1	4.9	6.2	5.55
	West of Swindon	0.0	0.0	0.0	0.0	0.0
	Marlborough	0.4 – 1.1	0.7	1.1	1.8	1.45
	Rest of HMA	1.1 – 2.7	7.4	8.5	10.1	9.3
	Total	**2.3 – 5.9**	**12.2**	**14.5**	**18.1**	**16.3**
Trowbridge	Trowbridge	1.4 – 3.5	3.4	4.8	6.9	5.9
	Warminster	0.5 – 1.1	1.1	1.6	2.2	1.9
	Westbury	0.7	2.1	2.8	2.8	2.6
	Bradford on Avon	0.4 – 1.0	0.1	0.5	1.1	0.8
	Rest of HMA	0.4 – 0.8	2.0	2.4	2.8	2.6
	Total	**3.4 – 7.1**	**5.3**	**12.1**	**15.8**	**14.0**
Wiltshire		**17.6 – 42.7**	**77.2**	**94.8**	**119.9**	**107.35**

Source: Wiltshire Council

Section 2 Local Plan 2022 Summary

Wiltshire Council is in the process of developing a new Local Plan to set out the policies and strategies to demonstrate how growth in housing and employment will be accommodated across the county over the course of the new plan period. The extant Local Plan, adopted in 2015, covers a plan period to 2026. The new Local Plan will cover a plan period to 2038.

Since the adoption of the extant Local Plan in 2015 significant changes in the legal and policy context have taken place. Arguably the most significant change occurred in 2019 when the Government passed into law an amendment to the 2008 Climate Change Act (The Climate Change Act 2008 (2050 Target Amendment) Order 2019) which, in conjunction with the 2015 Paris Agreement binding international treaty on climate change, have profound implications for the UK. The UK is now legally obliged to ensure it becomes Net Zero carbon as a nation by 2050. This requires significant and immediate change across all industries, including transport, in order to reach the nation's decarbonisation goals.

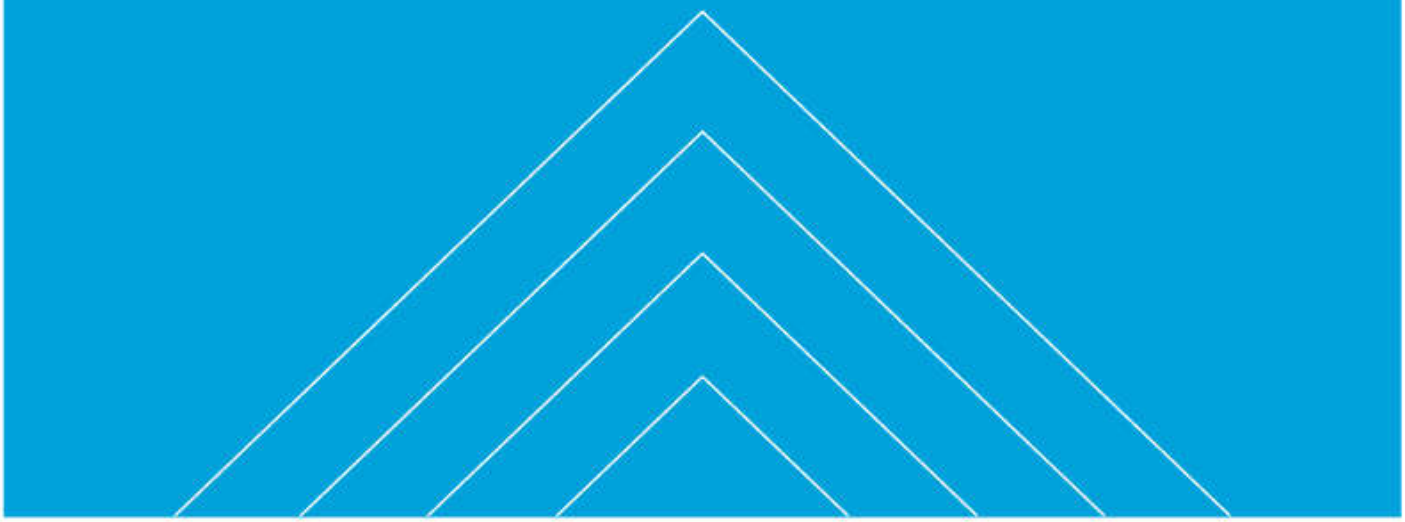
In response to the changing legal and policy landscape, Wiltshire Council have set four scenarios to model as part of the Local Plan 2022 review process, including:

1. Business As Usual – update the Wiltshire highway model to assess 2022 quantum of growth, scenario where no change is included regarding travel volumes, patterns, or mode choice;
2. Scenario to avoid, where possible, the new highway construction identified within the previous LPR as required to accommodate the forecast level of growth (LPR work to avoid impacting committed MRN and development schemes and/or impacting those schemes which deliver improvements to public or active transport);
3. Scenario to achieve 91.2% carbon net zero by 2036 or as advised following a review of the Tyndall modelling; and
4. Scenario to achieve 100% 2030 net zero carbon target.

The above decarbonisation scenarios, in the context of the LPR, relate to growth associated with the Local Plan only, rather than the wider transportation decarbonisation goals of Wiltshire – this latter remit falls under the scope of the revised LTP (LTP4).

The 2022 LP represents an increase of + 14,965 households (7% increase) compared to the Core Strategy. This is a reduction in growth of -5,401 from the 20,336 contained in the 2020 LP. The 2020 LP made provision for an increase of 20,336 households, which represented growth of 10%; the 2022 LPR growth is therefore 3% less than 2020 LP growth.

Business As Usual Modelling



3. 2036 BAU assumptions

3.1. Defining Business as usual

The Business as Usual (BAU) scenario represents the forecast Wiltshire transport network associated with planned development and infrastructure as part of the Wiltshire Core Strategy and Local Plan. The following model demand scenarios will form the basis of coding for the BAU scenario:

Table 3-1 - BAU scenario definitions and assumptions

Scenario	Demand Assumptions	Infrastructure Assumptions
2036 Do Nothing (Core)	Includes all Core Strategy (Uncertainty log) growth and associated infrastructure Excludes prospective Local Plan growth	Base + Core infrastructure (as defined in the Uncertainty Log provided by Wiltshire Council)
2036 Do Minimum	Core with prospective Local Plan growth Chippenham preferred site Option 1 or 2	Core + Local Plan site-specific access. Chippenham new northern or southern distributor roads

The Wiltshire SATURN strategic transport model was reviewed for use in the 2020 modelling process and considered robust for assessments of this nature, therefore the Base 2018 model has been adopted for this work. This model represents an average 12-hour weekday in 2018 and was converted to a Peak Hour (PH) model based on observed data. The time periods represented are:

- AM Peak Hour (08:00 – 09:00);
- Interpeak (IP) average hour (10:00 – 16:00); and
- PM Peak Hour (17:00 – 18:00).

Throughout this report, any reference to AM, IP or PM refer to the peak hour model unless otherwise stated. Full details of the Base model specifications are documented in the LMVR[5].

3.2. Core / Do Nothing assumptions

The Core scenario is intended to provide the foundation for evidence-based decision making using a central traffic forecast. This aims to account for the following five sources of uncertainty in forecasting:

1. Model parameter errors – source: base model and realism tests;
2. National uncertainty in travel demand – demographic projections & traveller behaviour (source: NTEM 7.2);
3. National uncertainty in travel costs – forecast fuel prices or government policy (source: TAG Databook);
4. Local uncertainty in travel demand – proposed local land use developments (source: uncertainty log); and
5. Local uncertainty in travel costs – proposed transport infrastructure (source: uncertainty log).

For full details of the Core model development, including how national and local uncertainty have been applied, see Chapter 3 of the Wiltshire Traffic Forecasting Report (TFR)[6].

3.2.1. Local Uncertainty

Updated information on developments and infrastructure in the uncertainty log for 2022 for the Wiltshire and Swindon regions are included in the Core model. The current and forecast number of households within each model sector for these regions are shown in Table 2-1. This includes the number of households specifically included within the uncertainty log which meet the TAG scheme likelihood criteria of 'more than likely' or 'near certain' (see Section 3.4.2 of the TFR for details), constrained to NTEM 7.2 projections for the

[5] *Wiltshire 2018 Base Model LMVR Issue 6a_v1.0.docx*

[6] *Wiltshire Traffic Forecasting Report Issue 6a.docx*

South West region. A plot showing some of the main developments in the uncertainty log is shown in Figure 3-1 (excluding Swindon).

The full uncertainty log used to develop the Core scenario is provided in Appendix A.

Figure 3-1 - Core developments included within Uncertainty Log

3.3. Local Plan assumptions

The Wiltshire Core Strategy covers the period up to 2026 and identifies sites allocations to meet the identified need. Wiltshire Council is currently undertaking a Local Plan Review, a refresh of the review undertaken in 2020, seeking to establish the requirement for additional housing and employment sites in Wiltshire up to 2038.

The WTM has an established forecast year of 2036, whilst the Local Plan review period is 2038. The degree of certainty associated with a forecast scenario diminishes through time, which means it is difficult to accurately distinguish between two distinct forecast years separated by only two years. Therefore, it has been deemed proportionate to assume the 2036 modelled forecast year as a proxy for 2038, reflecting the additional two years' (2036 - 2038) of proposed Local Plan growth in the 2036 forecast year.

This refresh involves updated housing assumptions, including the Chippenham and Melksham dwelling allocations being halved since previous estimates. These sites could influence future traffic demands and distribution, and therefore have an impact on planned infrastructure schemes in Wiltshire. As with the 2020 Local Plan work, specific employment sites were not considered as part of this assessment. In this, it was assumed that the proportion of employment growth by main settlement is consistent with housing growth (for more information, see Section 3.2 of the 2020 Wiltshire Local Plan Task 1-5 Report).

3.4. Local Plan Dwelling totals

The total number of dwellings associated with the 2022 emerging Local Plan by Housing Market Area (HMA) and settlement are summarised in Table 3-2. The Swindon HMA includes Local Authority Districts (LADs) in Wiltshire, excluding Swindon itself. The table also includes the dwelling estimates assumed in the Local Plan assessment undertaken in 2020. The dwelling totals included in the Core and Local Plan land use scenarios are presented in Table 2-1. It should be noted that areas outside of the Wiltshire local authority area (including Swindon town) are assumed to retain NTEM v7.2 growth.

Table 3-2 - Summary of emerging Local Plan dwelling forecast (2020-2036)

HMA	Settlement	LP (2020)	LP (2022)	Difference
Chippenham	Calne	420	460	40
	Chippenham	5,100	2,345	-2,755
	Corsham	190	195	5
	Devizes	245	370	125
	Malmesbury	-	100	100
	Melksham and Bowerhill	2,585	1,565	-1,020
	Rest of HMA	1,470	555	-915
	Total	**10,010**	**5,590**	**-4,420**
Salisbury	Amesbury	690	400	-290
	Salisbury	710	1,255	545
	Tidworth and Ludgershall	-	1,105	1,105
	Wilton	-	60	60
	Rest of HMA	1,470	1,390	-80
	High Post	-	1,500	1,500
	Total	**2,870**	**5,710**	**2,840**
Trowbridge	Trowbridge	90	365	-35
	Warminster	1,800	-	-1,435
	Westbury	260	455	-260
	Bradford on Avon	1,125	55	-670
	Rest of HMA	1,470	345	-1,125
	Total	**4,745**	**1,220**	**-3,525**
Swindon	Royal Wootton Bassett	245	1,675	-50
	West of Swindon	1,026	-	649
	Marlborough	-	195	-
	Rest of HMA	1,470	575	-895
	Total	**2,741**	**2,445**	**-296**
Wiltshire		**20,366**	**14,965**	**-5,401**

3.5. Wiltshire Preferred site locations

This section considers the locations of the housing sites detailed in the Uncertainty Log and the Wiltshire Council preferred Local Plan. All new development sites have been coded to load directly on to adjacent links of the existing highway network as specific site access junctions have not yet been confirmed.

3.5.1. Chippenham

There has been a significant reduction in the proposed housing provision in Chippenham since the 2020 Local Plan work, with a reduction of 2,755 dwellings (Table 3-2). The preferred Local Plan sites are depicted in Figure 3-2 alongside the Core Strategy site locations and infrastructure.

The Uncertainty Log includes the following update:

- Addition of former Wiltshire College, Cocklebury Road, Chippenham development consisting of 140 new dwellings.

3.5.2. Trowbridge

The Trowbridge Local Plan housing sites have changed significantly since the 2020 Local Plan work, with the two large sites to the north no longer forming the preferred site options for Trowbridge. Instead, smaller sites in and around the centre of the town have been identified for development. The preferred Local Plan sites are depicted in Figure 3-3 alongside the Core Strategy site locations and infrastructure.

The Uncertainty Log includes the following update:

- Addition of The Pavilions White Horse Business Park, Windsor Road, Trowbridge, consisting of 104 new dwellings.

3.5.3. Salisbury

The refreshed Local Plan preferred site locations in Salisbury has seen the addition of multiple new sites, including a major development of 1500 dwellings at High Post. The preferred Local Plan sites are depicted in Figure 3-4 alongside the Core Strategy site locations and infrastructure.

The Uncertainty Log includes the following update:

- Addition of Hampton Park development adjacent to Bishopdown in the north of Salisbury.

3.5.4. Market Towns

Since the 2020 work, Local Plan site specific locations for market towns have been allocated by Wiltshire Council. This includes the following locations which previously had no specific housing sites:

- Amesbury, Bradford on Avon, Calne, Corsham, Devizes, Malmesbury, Marlborough, Royal Wootton Bassett, Tidworth and Ludgershall, Warminster, Westbury, and Wilton.

Figure 3-2 – Chippenham: housing sites and schemes in Uncertainty Log and Local Plan

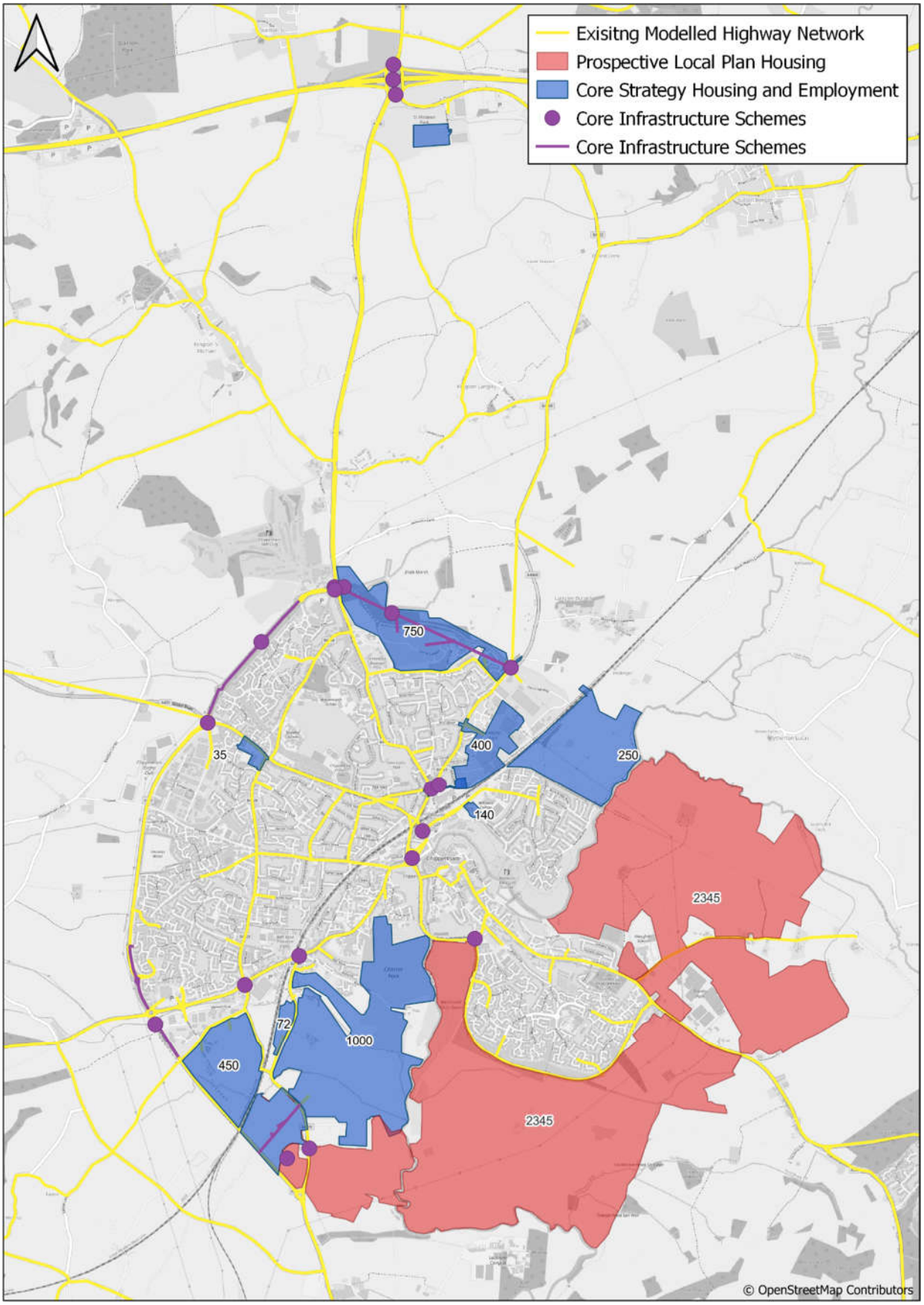


Figure 3-3 - Trowbridge: housing sites and schemes in Uncertainty Log and Local Plan

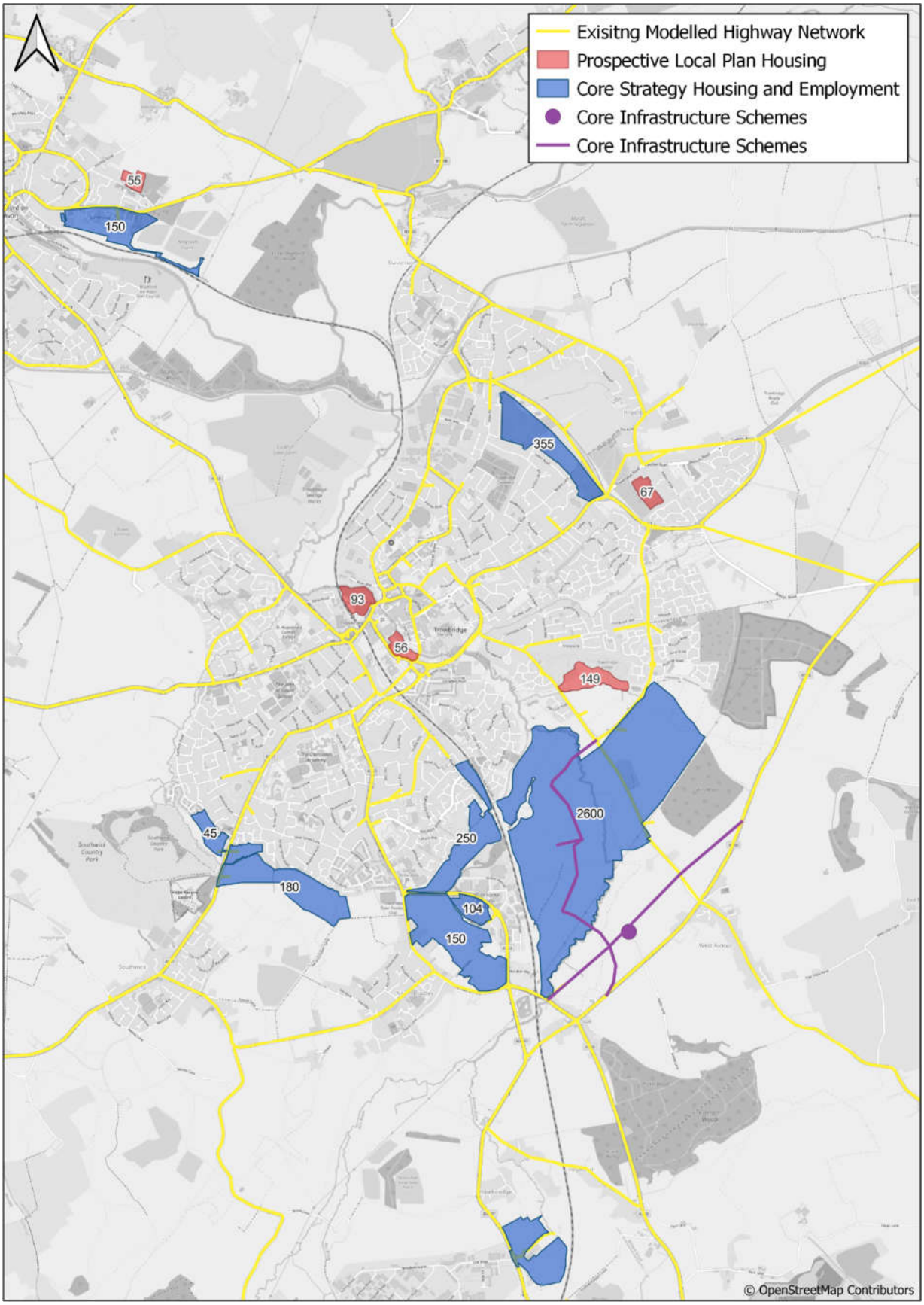
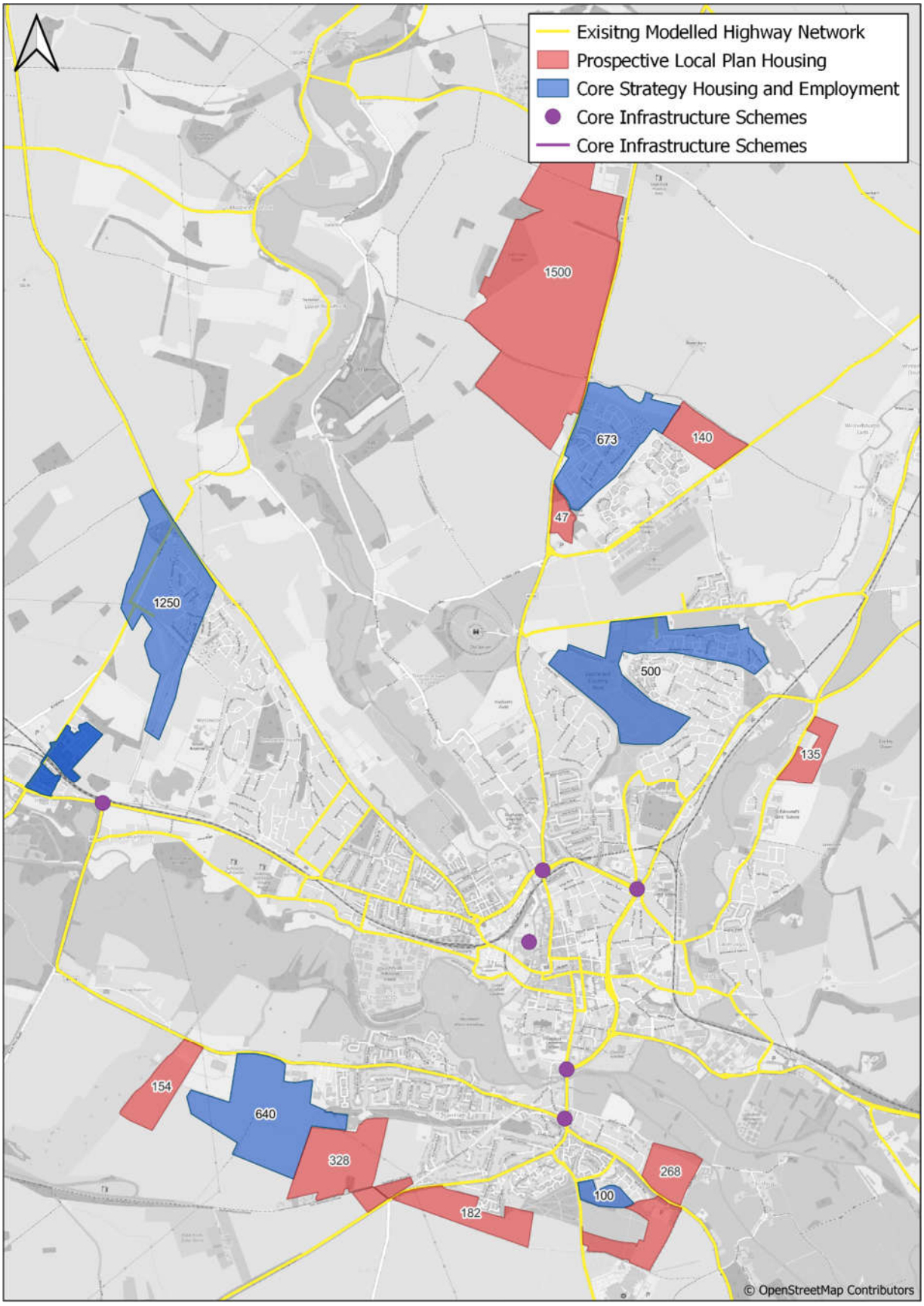


Figure 3-4 - Salisbury: housing sites and schemes in Uncertainty Log and Local Plan



3.6. Model scenarios

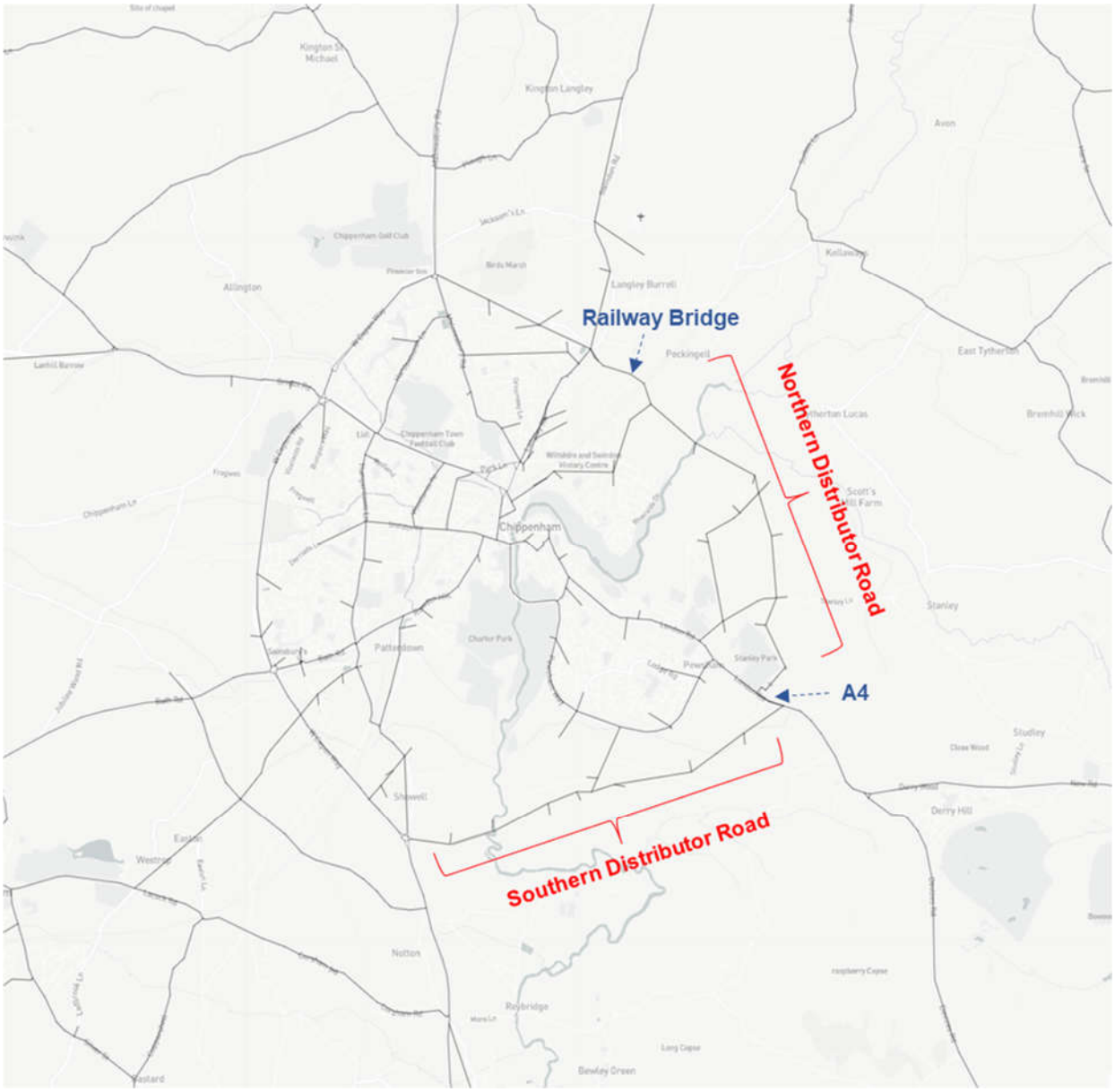
The model demand scenarios forming the basis of coding the Local Plan growth requirements which will assist with the impact assessment and identification and testing of mitigation measures are detailed in Table 3-3.

- The demand growth assumptions are based on the housing forecasts presented in Table 2-1, whilst an explanation of the process followed to derive the associated demand matrices is provided in Section 3.6.
- The infrastructure assumptions are based on the uncertainty log, which is included in Appendix A. Figure 3-5 provides reference to the location of the Chippenham northern and southern distributor road options.

Table 3-3 - Model scenario definitions and assumptions

Scenario	Demand Growth Assumptions	Infrastructure Assumption
2018 Base	Base (2018)	Base (2018)
2036 Core Do-Nothing (DN)	2036 DN: Base (2018) + Core (2036), with background growth constrained to NTEM. This **excludes** prospective Local Plan growth.	Base + Core infrastructure (Uncertainty Log, Appendix A)
2036 Do Minimum (DM)1a	2036 DM: Base (2018) + Core + LP (2036), with background growth constrained to NTEM. This **includes** prospective Local Plan growth.	DN + site specific access points Chippenham **northern distributor** road with connection to Rawlings Green Road and railway bridge, **without** connection to the A4 east of Stanley Park Playing Fields
2036 DM1b	Same as DM1a	DN + site specific access points Chippenham northern distributor road with connection to Rawlings Green Road and railway bridge, **with** connection to the A4 east of Stanley Park Playing Fields
2036 DM2a	Same as DM1a	DN + site specific access points Chippenham **southern distributor** road, **without** connection to the A4 at Forest Farm
2036 DM2b	Same as DM1a	DN + site specific access points Chippenham **southern distributor** road, **with** connection to the A4 at Forest Farm

Figure 3-5 - Chippenham northern and southern distributor road options



3.7. Demand forecasting for each scenario

In order to assess the impacts of the prospective Local Plan growth and determine suitable mitigation measures, the following steps were undertaken to derive highway demand for the model scenarios detailed in Table 3-1 above.

- Housing numbers for each scenario in the Uncertainty Log and draft revised Spatial Strategy (drSS) provided by Wiltshire Council are summarised in Table 2-1;
- The Core (Do Nothing) scenario includes committed housing, employment, and infrastructure identified within the Wiltshire Core Strategy and Local Transport Plan. TRICS trip rates were used to determine Core Strategy growth (see Table 3-4), whilst background growth was constrained to NTEM;
- The Do Minimum (DM) scenarios include prospective Local Plan growth provided by Wiltshire Council for the principal settlements within each HMA. "Rest of HMA" Local Plan growth is reflected through the application of an alternate NTEM scenario (i.e., NTEM growth rates for Wiltshire have been revised to include the "Rest of HMA" developments); and
- Trip distributions are assumed to remain consistent with existing settlement patterns and do not allow for changes in self-containment, internalisation, or attractions as a result of the Local Plan.

Table 3-4 – Peak Hour development TRICS trip rates

Development Type	AM (08:00-09:00)			IP (10:00-16:00)			PM (17:00-18:00)		
	Arr	Dep	Tot	Arr	Dep	Tot	Arr	Dep	Tot
Residential[1]	0.12	0.33	0.45	0.15	0.15	0.30	0.28	0.15	0.43
Mixed commercial[2]	0.68	0.30	0.98	0.44	0.43	0.88	0.76	0.95	1.71

1. Residential rates are per dwelling. Private owned houses are based on 67 days of data from 31 regions in England and Wales. The average number of dwellings from the sample was 79.
2. Mixed commercial trip rates are per 100 sqm and consist of a weighted average of retail, B1, B2 and B8 uses.

Section 3 2036 Core Business as Usual (BAU) assumptions Summary

Business as Usual (BAU) is the transport network implications of planned Wiltshire housing and employment growth with no mitigation and no changes in how, where, or when people travel compared with the present – it represents a continuation of previous behaviour.

The 2018 Base Wiltshire Transport Model (utilised for the 2020 LPR) was updated for the 2022 LPR to reflect latest housing and employment quantum and spatial allocations. The model covers the following time periods: AM Peak Hour (0800-0900), Interpeak average (1000-1600), and PM Peak Hour (1700-1800). Two scenarios were modelled: 1) the 2036 Core - includes all Core Strategy growth and associated infrastructure but excludes prospective Local Plan growth, and 2) 2036 Do Minimum - which includes scenario 1, plus the prospective Local Plan growth.

The 2036 Core scenario used TRICS trip rates to determine the Core Strategy growth and background NTEM growth assumptions to forecast the expected number of trips.

The 2036 Do Minimum uses alternate scenario NTEM trip growth data.

Specific housing development locations, as supplied by Wiltshire Spatial Planning Service. Specific employment sites have not yet been identified and are not therefore considered as part of this assessment (the same approach as previously utilised for the 2020 LPR). It has been assumed that the proportion of employment growth by main settlement to the whole Wiltshire and Swindon regions is consistent with that for housing growth.

Since 2020, Local Plan site-specific locations for market towns have been allocated by Wiltshire Council, this includes the following locations which previously had no location-specific sites: Amesbury, Bradford-on-Avon, Calne, Corsham, Devizes, Malmesbury, Marlborough, Royal Wootton Bassett, Tidworth and Ludgershall, Warminster, Westbury, and Wilton. These locations, and the growth assigned to them, have been included in the BAU modelling undertaken.

Trip distributions are assumed to remain consistent for each settlement, whether Principal or Market Town. This does not allow for changes in self-containment, internalisation, or attractions as a result of the Local Plan within the BAU Saturn modelling. The ISM has this functionality.

4. BAU Model outputs

4.1. Overview

This section provides a summary of the changes to the following since the 2020 Local Plan work for each of the scenarios tested:

- Highway demand (trip matrix);
- Traffic flow; and
- Volume to capacity ratio (V/C).

The Atkins Data Visualisation (ADV) tool has been developed to display detailed model results for various metrics via an interactive user-friendly online platform without the requirements of specific software. This has been used to support the analysis presented in the below sections.

The outputs presented represent forecast scenario DM2b; however, results for DM1a, 1b and 2a are available in Appendix A. Additionally, due to the large network coverage of the Wiltshire Transport Model, these outputs will mainly focus on direct impacts of the scenarios tested and their implications on the Wiltshire and Swindon regions.

4.2. Highway Demand changes in Wiltshire

The impact of the overall highway trip matrix by peak hour for trips with an origin and / or destination in Wiltshire is presented in Table 4-1. Definitions of the scenarios are presented in Table 3-3. The highway demand matrices in the WTM are expressed in term of passenger car units (PCUs) (car / LGV: 1 PCU, HGV: 2.5 PCUs).

Table 4-1 - Highway demand in Wiltshire (PCUs)

Local Plan assessment year	Scenario	No. house-holds	AM peak hour	Inter peak hour	PM peak hour
2022	Base (2018)	207,572	91,068	75,282	97,015
	Core (2036) (DN)	227,924	108,058	91,355	113,944
	DM (2036) (LP)	242,889	111,870	93,316	115,670
2020	Base (2018)	207,572	79,239	62,630	82,526
	Core (2036) (DN)	235,804	91,035	74,786	93,038
	DM (2036) (LP)	245,860	95,676	78,766	99,471
2022 - 2020	Base (2018)	0	11,829	12,652	14,489
	Core (2036) (DN)	-7,880	17,023	16,569	20,906
	DM (2036) (LP)	-2,971	16,194	14,550	16,199

Includes car and freight trips, internal, inbound, and outbound from Wiltshire only

4.3. BAU Traffic flows

Table 4-2 compares the difference in traffic flow between the Core and the DM2b scenario at key locations within Wiltshire. For reference, the table also includes a comparison between equivalent scenarios previously modelled as part of the 2020 Local Plan assessment (see Section 3.4.1 of the Task 1-5 Report).

The output indicates that the impact of the emerging 2022 Local Plan will be less than previously modelled in 2020, with each of the key roads identified experiencing reduced growth from the Core scenario than previously reported. This corresponds with the values in Table 3-2 which shows an overall reduction of 5,401 dwellings between the 2020 and 2022 Local Plan figures, resulting in fewer overall trips on the Wiltshire network.

Table 4-2 - Traffic flow differences (PCUs): DM2b vs Core scenarios

Location	LP 2022 assessment (DM2b - Core)	LP 2020 assessment (DM1 - DN1)
A350 Chippenham	200-400 each way between A350 south, Lackham and Chequers Roundabout <100 elsewhere	300-600 additional PCUs each way
M4	80-150 between Junction 17 and 18 >50 between Junction 16 and 17	300-400
A4 London Road	100-200	200-250
A350 east of Trowbridge	<50	100-200
A350 Westbury	<20	<150
A350 Warminster	<20	<100
A303	60-170 (greatest impact north of Amesbury)	100-150
A36 southeast Salisbury	<50	~100
A36 (west of Salisbury)	~50	<100
BANES (between Bradford-on-Avon and Bath	<50	<150
Swindon (main network links)	Generally <100, AM peak hour has increase of ~350 PCUs eastbound on A4312	<100

Figure 4-1 and Figure 4-2 provide a visual representation of the changes in traffic flow for the AM and PM peak hours respectively.

Figure 4-1 - Change in traffic flow (2036 DM2b vs Core, AM peak hour)

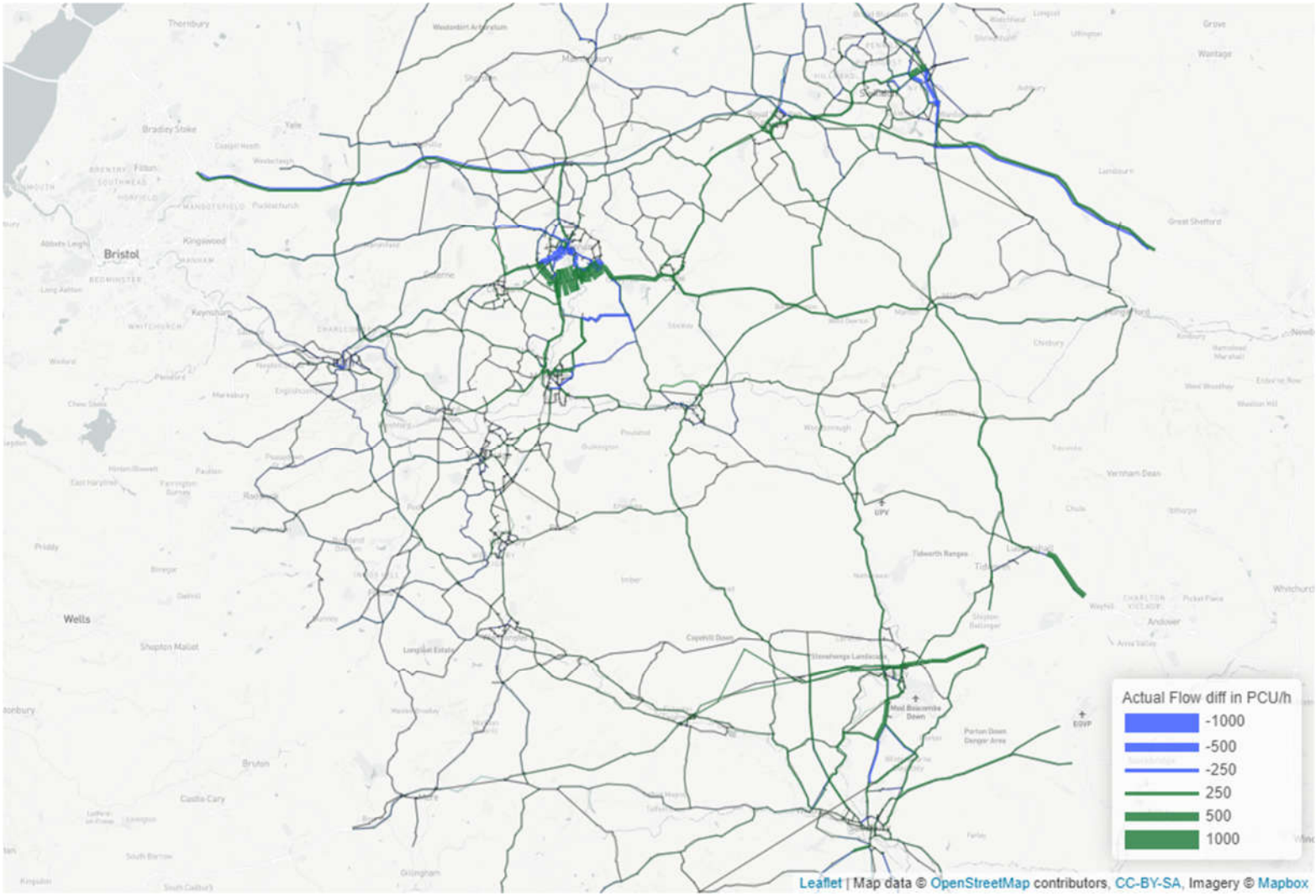
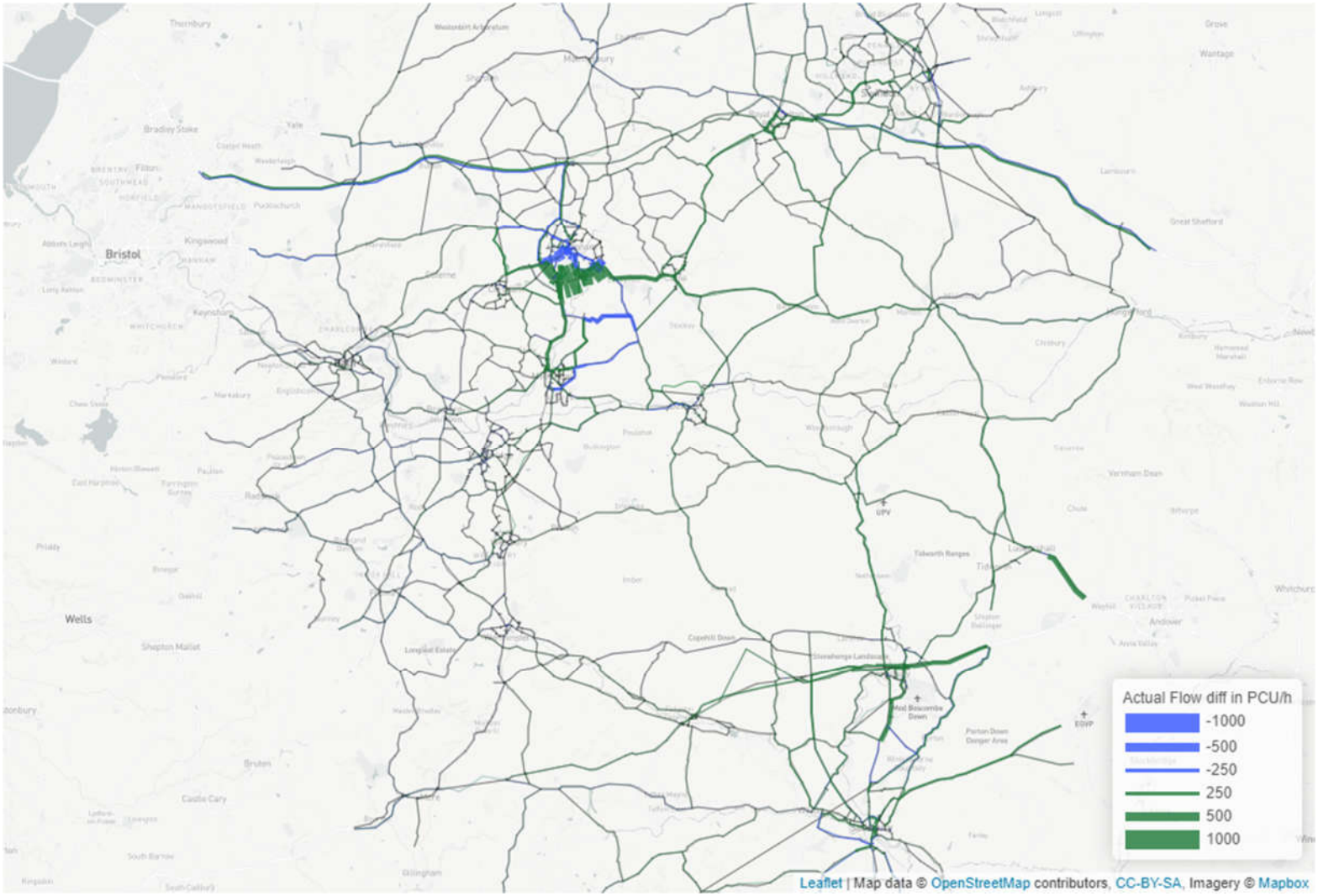


Figure 4-2 - Change in traffic flow (2036 DM2b vs Core, PM peak hour)



4.4. BAU Link Capacity (Volume/Capacity)

Analysis of volume / capacity (V/C) at both strategic and local levels is an important indicator for identifying impacts caused by the Local Plan growth, where values exceeding 85% indicate the potential for a severe impact on junctions or roads within the transport network (see Section 2.3.1 in the 2020 Local Plan Review report for more information).

Figure 4-3 to Figure 4-6 compare V/C (%) between the 2036 Core and DM2b scenarios to identify the predicted impact of the demand associated with the Local Plan review. A separate figure is provided for the following areas of Wiltshire:

- Chippenham, Calne, and Melksham (Figure 4-3)
- Trowbridge, Westbury, and Warminster (Figure **4-4**)
- Salisbury and Amesbury (Figure 4-5)
- Royal Wootton Basset (Figure 4-6)

4.4.1. Chippenham, Calne, and Melksham

The 2022 Local Plan growth is likely to increase V/C above 85%, or exacerbate existing links with high V/C, on key links including:

- The A350 south of Chippenham, the A4 Bath Road, the A4 London Road through Calne, and the A350 at Melksham.

This is in line with the previous 2020 local plan work. However, the overall magnitude of change is reduced, corresponding with the overall decrease in housing between the 2020 and 2022 local plan review assessments.

4.4.2. Trowbridge, Westbury, and Warminster

In general, there is minimal change in V/C due to the additional demand associated with the 2022 Local Plan growth. However, various links already experiencing high V/C percentages have experienced a percentage point increase of 1-2%. This includes the following key links:

- The A350 southbound between Westbury and Warminster, A350 east of Trowbridge, and the A361.

4.4.3. Salisbury and Amesbury

Several key junctions within this area are experiencing significant changes in V/C. In particular, the A354 approach to Harnham Junction has shown an increase in V/C from 85% to 97% between the Core and DM2b scenarios. Other notable increases on key links include:

- The A345 Castle Road, the A338 southbound at St Thomas' Bridge Roundabout, the A36 southeast of Salisbury, and Porton Road through Amesbury.

The change in V/C on links and junctions in and around Salisbury and Amesbury is shown to be greater than previously reported for the 2020 work. This is likely a result of additional housing allocations for the Salisbury HMA, including the High Post development, resulting in an overall increase in 2,840 dwellings since the previous local plan work (see Table 3-2).

4.4.4. Royal Wootton Bassett

In general, there is minimal change in V/C due to the additional demand associated with the 2022 Local Plan growth. However, there is an increase in V/C at two key locations in Royal Wootton Bassett that are already predicted to be operating close to capacity in the Core scenario:

- Noe Marsh Road, and Bincknoll Lane / Swindon Road (A3102) junction.

Figure 4-3 - A350 Chippenham, Calne, Melksham V/C% (2036 Core & DM2b, AM peak hour)

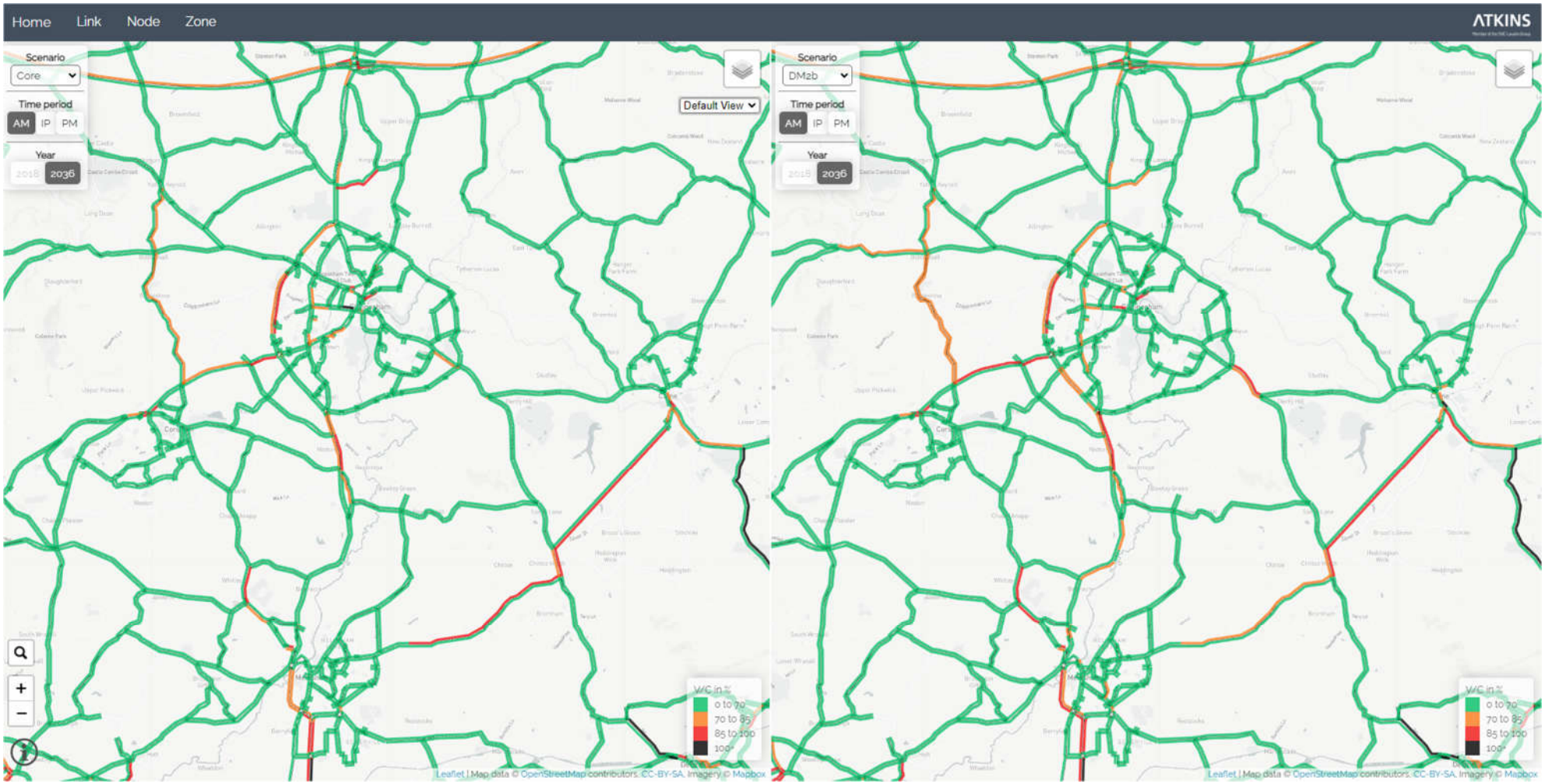


Figure 4-4 - A350 Trowbridge, Westbury, Warminster V/C% (2036 Core & DM2b, AM peak hour)

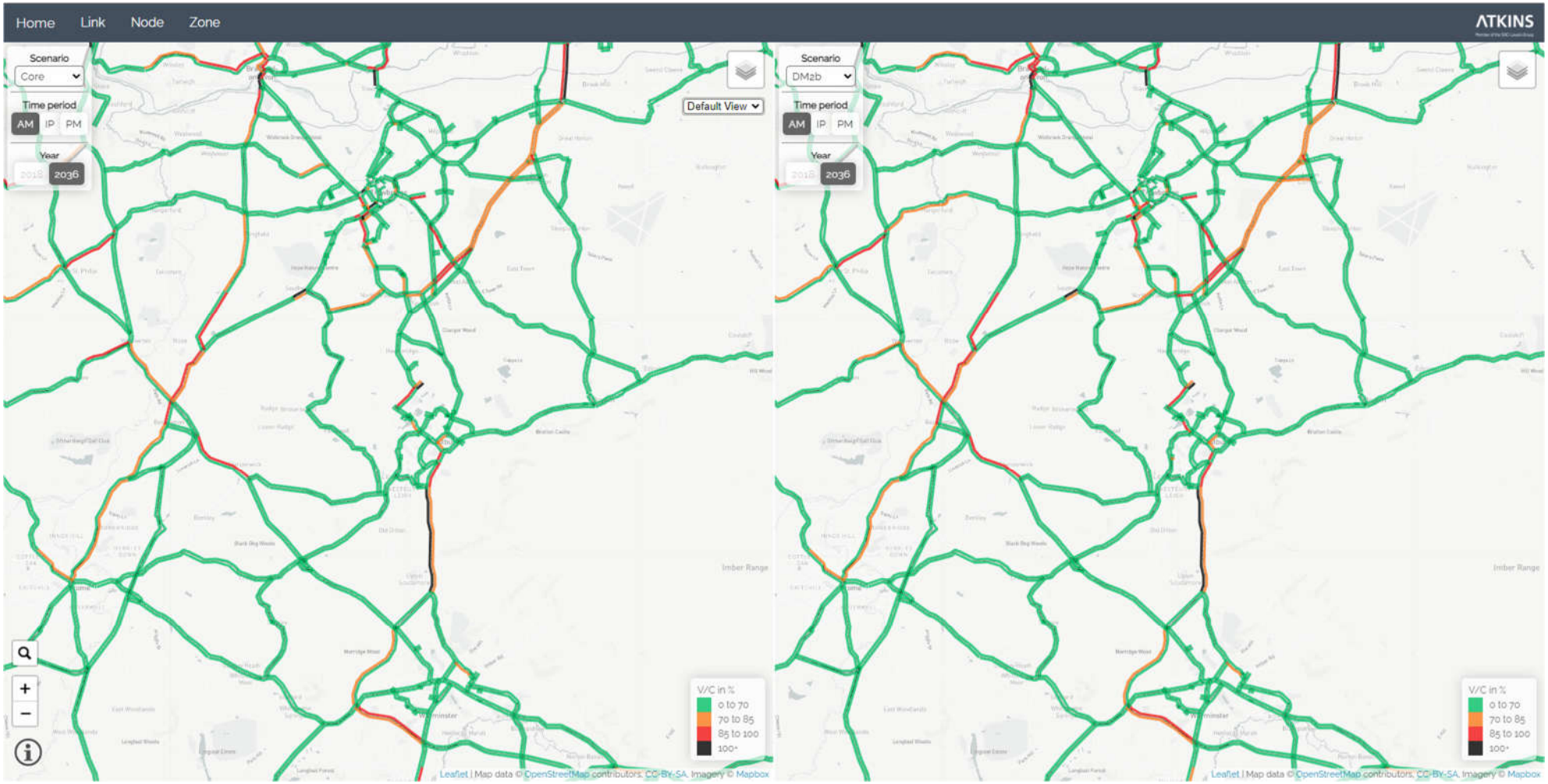


Figure 4-5 - Salisbury and Amesbury V/C% (2036 Core and DM2b, AM peak hour)

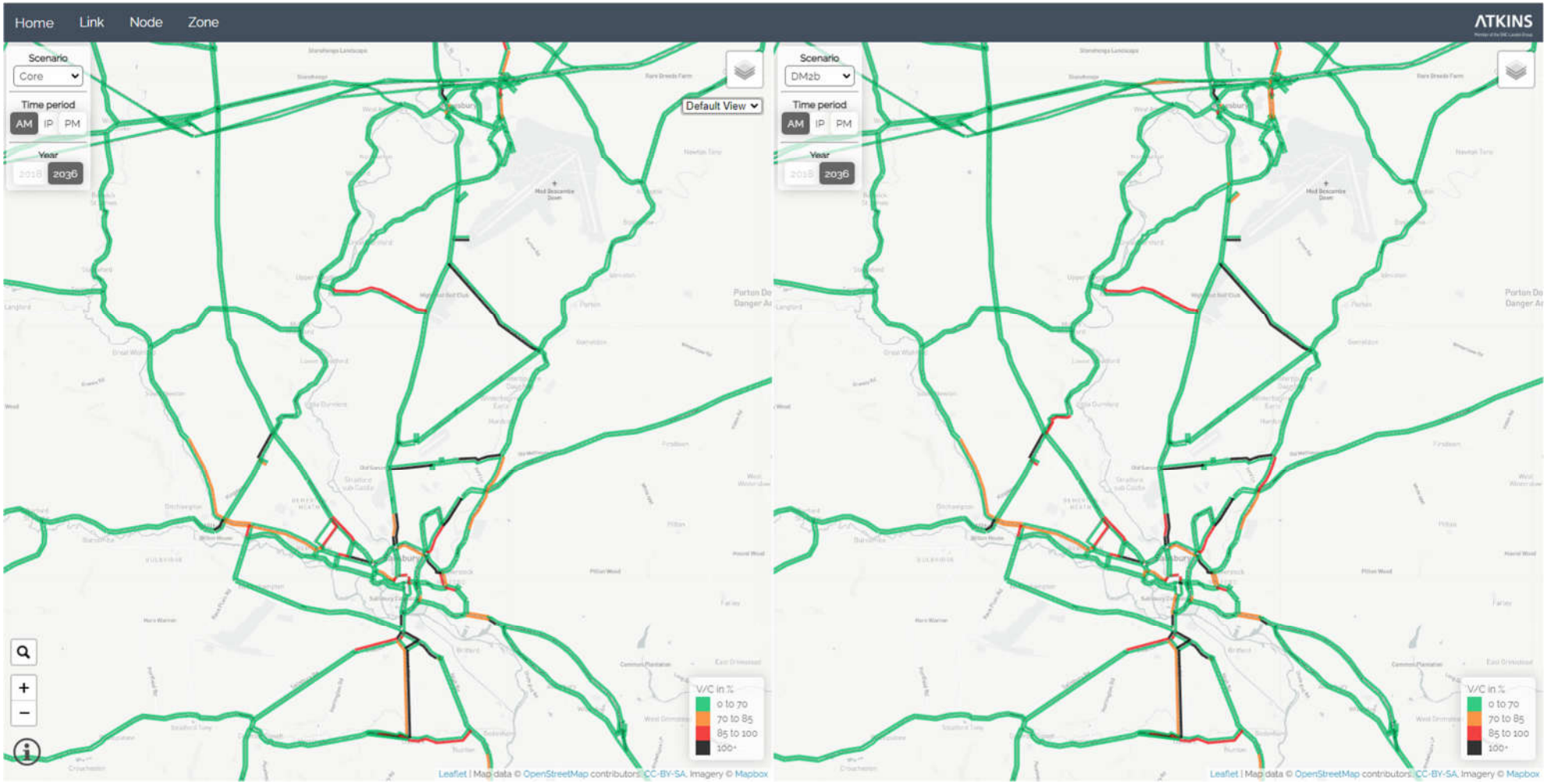
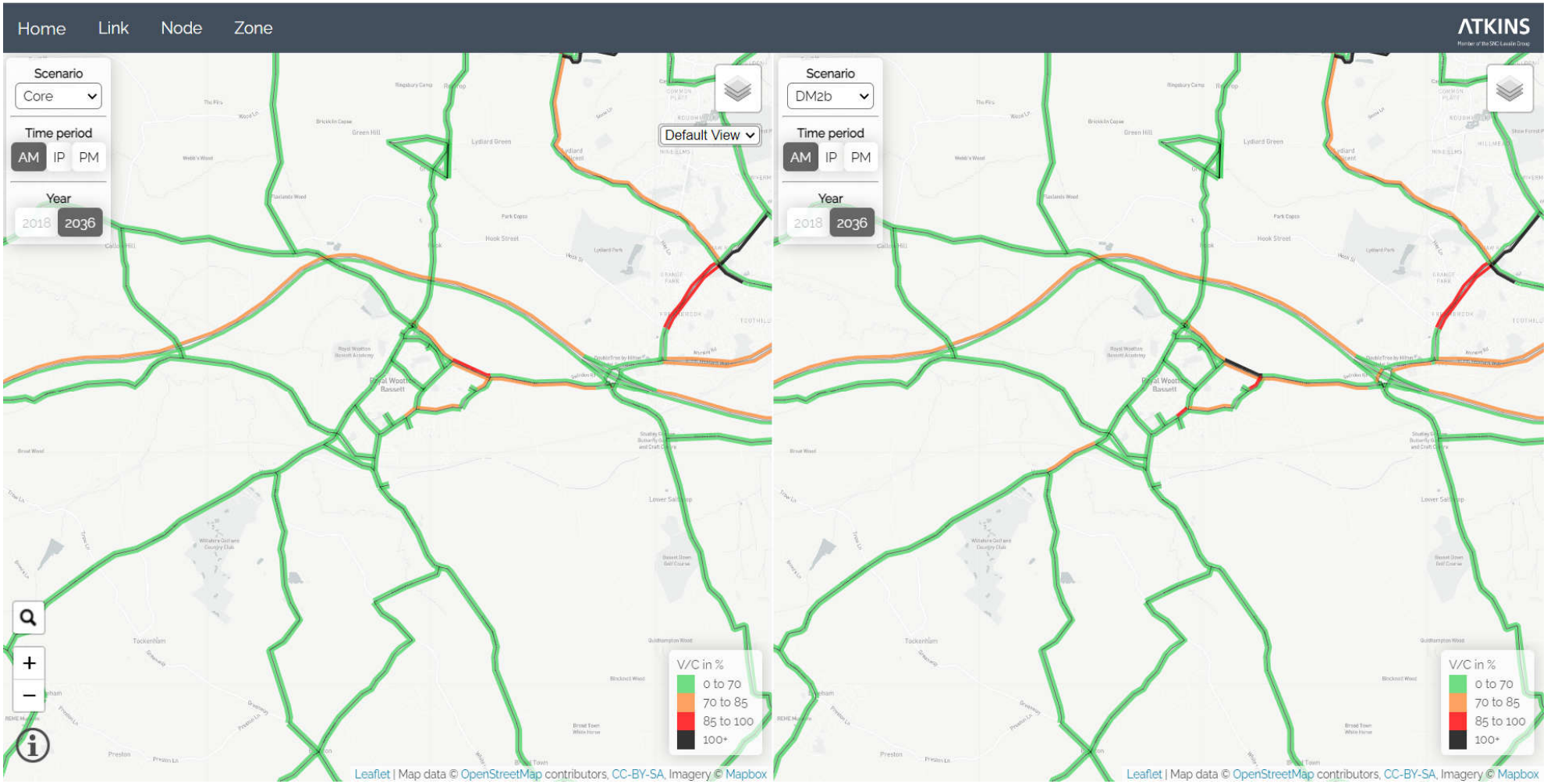


Figure 4-6 - Royal Wootton Bassett V/C% (2036 Core and DM2b, AM peak hour)



Section 4 BAU Model outputs Summary

The 2022 LP represents an increase of + 14,965 households (7% increase) compared to the Core Strategy. This is a reduction in growth of -5,401 from the 20,336 contained in the 2020 LP. The 2020 LP made provision for an increase of 20,336 households, which represented growth of 10%; the 2022 LPR growth is therefore 3% less than 2020 LP growth.

The 2022 model forecasts an additional 3,811 AM Peak Hour trips (+4% compared to the Core Strategy), 1,962 Interpeak trips (+2%), and 1,726 PM Peak Hour trips (+2%).

The 2020 LPR forecasted 4,641 (+5%), 3,980 (+5%), and 6,433 (+7%) respectively for these periods.

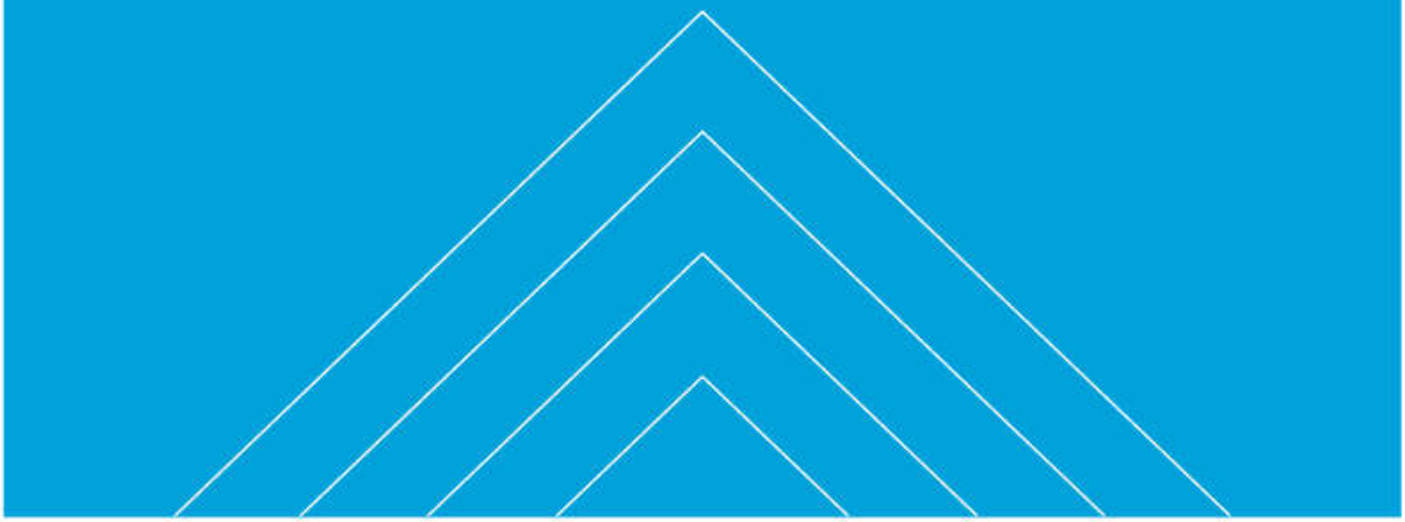
The 2022 LPR forecast is therefore a reduction of 830, 2,018, and 4,707 trips respectively for these periods: reductions of 1%, 3%, and 5%.

Modelling outputs indicate that the impact of the emerging 2022 LP will be less than the 2020 LP, with each of the key roads identified experiencing reduced growth, corresponding with the overall reduction in dwellings of -5,401 between the 2020 and 2022 LP.

The forecast impacts on highway capacity are mixed:

- In the Chippenham, Calne, Melksham area LP growth is likely to increase volume/capacity (V/C) above 85% or exacerbate links with high V/C on the A350 south of Chippenham, the A4 Bath Road, the A4 London Road through Calne and the A350 at Melksham - this in line with 2020 LP results, however the overall magnitude of change is reduced in the 2020 LP
- In the Trowbridge, Westbury, Warminster area those links - such as A350 between Westbury and Warminster, the A350 east of Trowbridge, and the A361 - already experiencing high V/C percentages are forecast to see small increases of 1-2%
- In the Salisbury and Amesbury area the change in V/C is shown to be greater with 2022 LP growth than with 2020 LP growth, likely as a result of additional housing allocations for the Salisbury HMA (+2,840 dwellings compared to 2020 LP). In particular, the A354 approach to Harnham Junction is forecast for V/C to increase from 85% to 97%.
- In Royal Wootton Bassett there is an increase in V/C on Noe Marsh Road and at the Bincknoll Lane / Swindon Road (A3102) junction, both of which are already predicted to be operating close to capacity in the Core scenario.

Interim Strategic Modelling (ISM)



5. Key features of the Interim Strategic Model (ISM)

5.1. Purpose of the ISM

This section outlines the proposed method to provide a strategic, multi-modal, demand modelling capability for Wiltshire which will support the Local Plan process. The purpose of ISM is to develop a simplified model linking the demographic and land use data sources to see how changes in the transport supply and demand in the county influence the trip distributions and mode shares modelled by the ISM.

5.2. Overview of the ISM

This section describes the key steps in formulating the ISM; namely the specification, collation, and application of data in the spreadsheet-based modelling tool. This section will cover:

- Specification of key model components;
- Model Base Year; Modelling approach; Linking the ISM to SATURN;
- Fully Modelled Area and External Area; Zoning & Sector System;
- Time Periods; User Classes / Vehicle Types / Modal; and
- Generalised Cost Formulations and Parameters.

5.2.1. Model Base Year

The ISM has been developed with 2018 as base year to match the base year of WTM. The key data driving the model was hence taken from 2018, namely trip end data coming from the National Trip End Model (NTEM), and the use of NTEM, Nomis Census, LLPG information to ensure land use and population estimates were up-to-date and accurate. Key economic assumptions (including Value of Time estimates) were taken for a 2018 value year and 2010 price year, from the latest TAG Databook available (November 2021, V1.17).

There were some data sources however which were not available for 2018 and were not updated as it was decided that they were sufficiently representative of 2018 conditions:

- Highway (car) skims were taken from the Wiltshire Transport Model (WTM), which has a base year of 2018, and the public transport skims were extracted from TRACC with fares being collated from multiple sources. These informed the travel characteristics and costs between sectors in the model, for the different modes and purposes. Their contents were checked before use in the model, to ensure their representativeness for a 2018 base year, and were scaled where necessary;
- 2011 Census Journey to Work (JTW) data was used as a comparator for the Home-Based Work purpose in the calibration of the ISM. Even at 2011 levels, this data still provided a valuable guide to mode shares and trip length distributions in Wiltshire; and
- 2022 parking data was used for calculation of 2018 parking costs which was collated from various sources.

5.2.2. Linking the ISM to SATURN

An existing (SATURN-DIADEM) model of Wiltshire is available which was re-calibrated using 2018 data in Wiltshire region. The ISM is linked to SATURN through highway journey times and costs via the SATURN Highway Assignment Model (HAM), including network changes and congestion effects. The ISM produces the changes in mode share and trip distribution of all the modes with the change in highway skims obtained from SATURN model.

5.2.3. Fully modelled area and external area

The fully modelled area consists of four HMAs namely Swindon, Chippenham, Trowbridge, and Salisbury. Swindon HMA is further divided into two based on district boundary as shown in Figure 5-1.

In determining the geographic coverage of the model, it is usual to consider a detailed inner area in which all transport behaviours are modelled, and outer area(s) in which there is progressively less detail, and few transport responses are represented. Further to this, TAG Unit M2.1 (Section 2.4) advises that a demand model is divided into an internal area, in which all travel demand is modelled, and an external area, in which only trips to / from the internal area are considered. For the ISM, the split between the internal and external area is as shown in Table 5-1 and Figure 5-2.

Figure 5-1 - Wiltshire Housing Market Areas

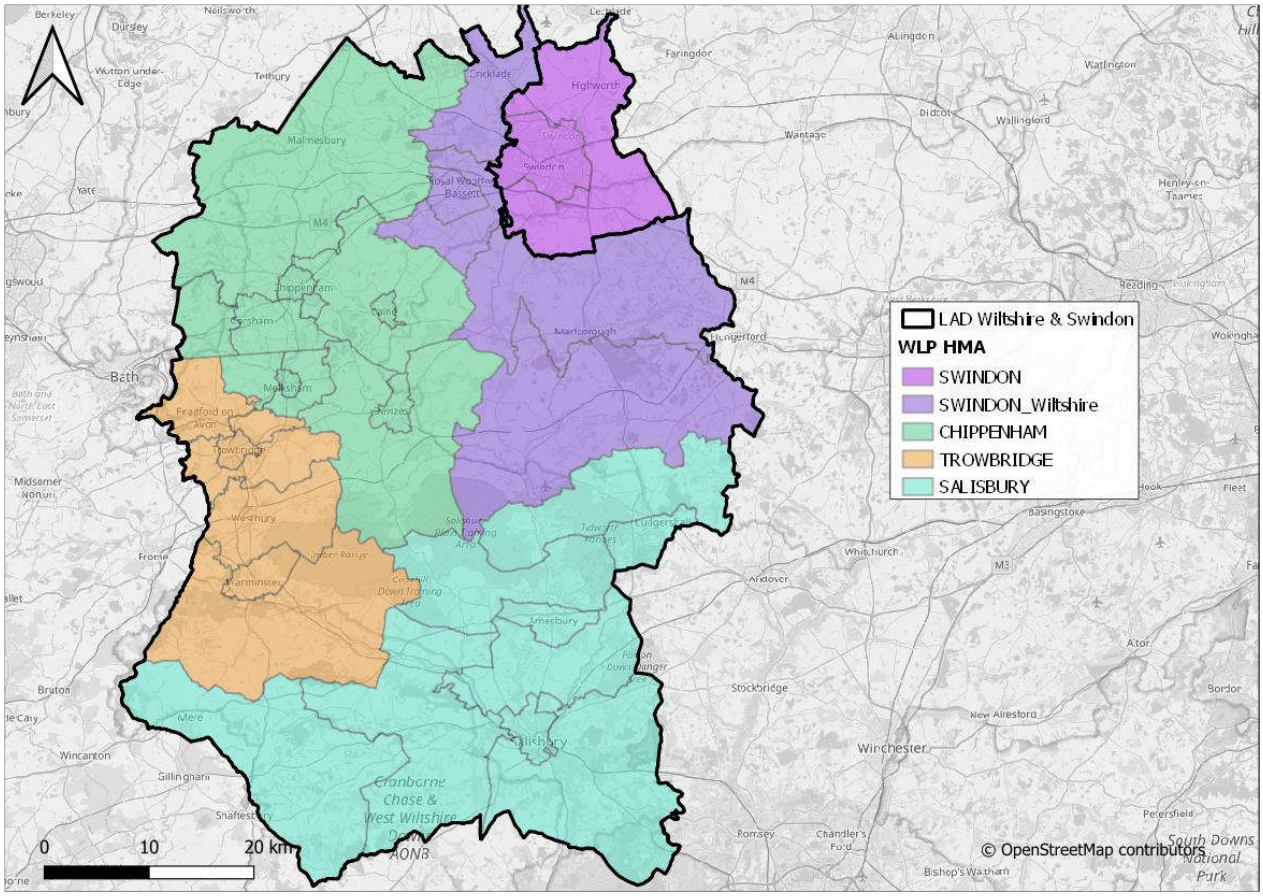
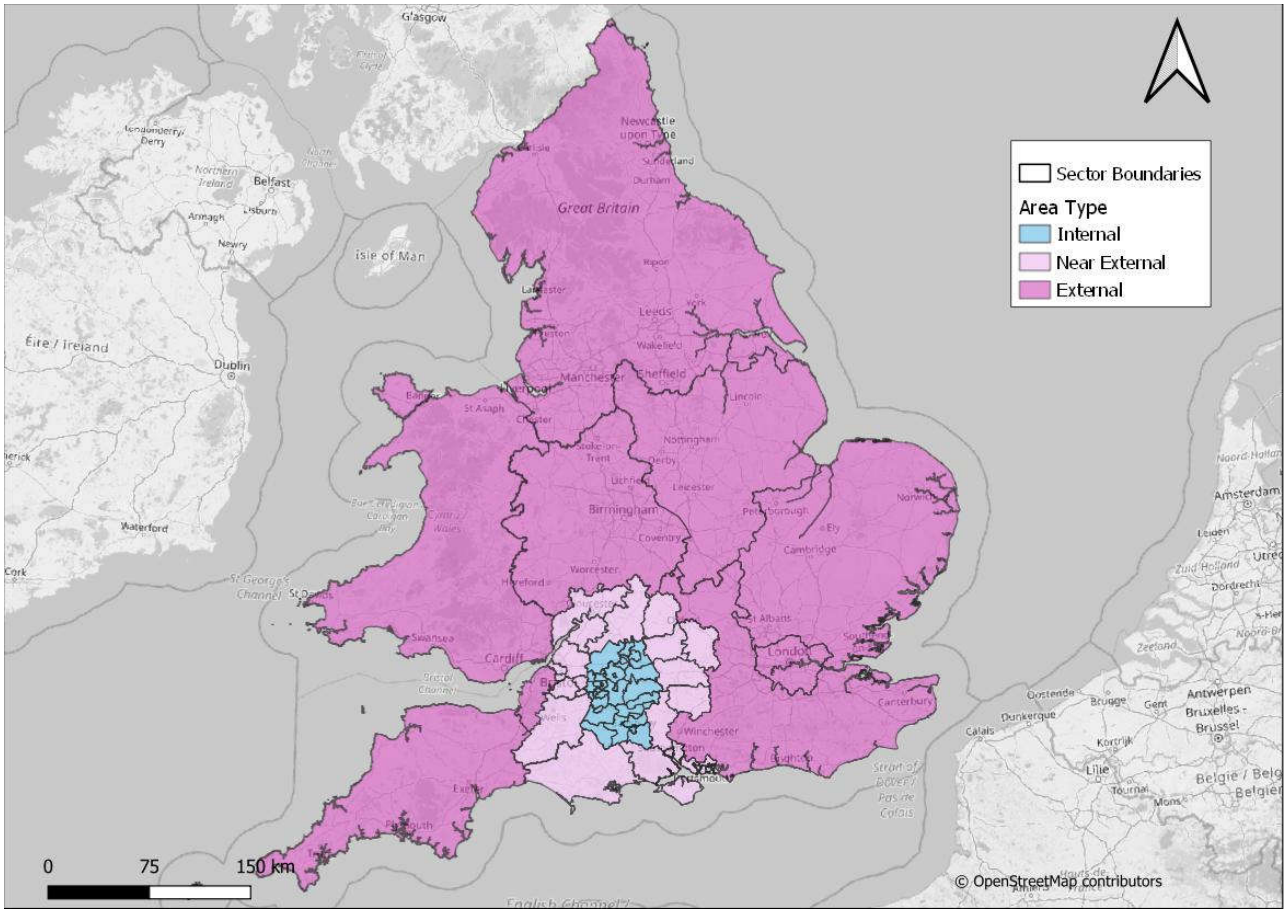


Table 5-1 - Model functionality by area type

Area type	Areas Covered	Demand Model
Internal	Wiltshire and Swindon	All trips generated in this area are represented in the ISM, with full choice of mode and destination, including external areas.
Near External	Districts surrounding internal area	For the external area, only trips with destinations in the internal area are represented. For these, choice of travel mode and destination within the internal area are represented. Other trips are 'external to external' and not considered by the model.
External	Rest of England and Wales	

Figure 5-2 - Internal and External Areas in ISM



5.2.4. Zoning and sector system

Given the constraints placed on the ISM by its need to operate in Microsoft Excel, the level of aggregation in the breakdown of the geographic area of the model was given extensive consideration. A balance had to be struck between sufficient detail in the internal area, in particular the major population centres in the county, and the smooth operation of the ISM. At a local level the specific sectoring was determined by a range of factors, including:

- Accounting for town centres / urban / rural areas;
- Examining travel patterns within internal area and internal to external area; and
- Future schemes and developments.

It was agreed with Wiltshire Council that a system of 60 sectors representing the whole of England and Wales, with the smallest sectors in the Internal Area and increasingly large sectors in the External Area, would be the most appropriate system to adopt. Given the role of the ISM as an interim modelling tool, it was decided that the geographical areas would be named as 'Sectors'. However, the ISM Sectors operate in the same manner as 'Zones' normally would in a full-fledged Multi-Modal Model, but the semantic distinction was made to make clear the interim nature of the current geographical breakdown.

The 60-Sector system was derived as aggregations of Lower Super Output Areas (LSOAs) / Middle Layer Super Output Areas (MSOAs). These adhered to LAD boundaries, as well as working with the zoning system of the WTM. The External Area features larger areas, typically made up of multiple Districts in the near external area and based on regions in the external area. The 60-Sector system is shown in Figure 5-3 to Figure 5-5 showing this at different levels of scale.

Table 5-2 - ISM 60 Sector System

Area	HMA (internal)	Sector No.	Sector Name
Internal	Swindon	1001	Swindon
		1002	Rest of Swindon
	Swindon HMA in Wiltshire LAD	1003	Royal Wootton Bassett
		1004	Rest of RWB
		1005	West of Swindon
		1006	Marlborough North
		1007	Marlborough South
	Chippenham	2001	North Wiltshire
		2002	Chippenham
		2003	Pewsham
		2004	Corsham
		2005	West of Corsham
		2006	Calne
		2007	Chippenham Rural
		2008	Melksham
		2009	West of Melksham
		2010	East of Melksham
		2011	Devizes
		2012	Central Wiltshire
	Trowbridge	3001	Bradford on Avon
		3002	Trowbridge
		3003	Hilperton
		3004	South of Trowbridge
		3005	Westbury
		3006	Warminster
		3007	South of Warminster
	Salisbury	4001	Salisbury SW
		4002	Salisbury West
		4003	Salisbury
		4004	Salisbury SE
		4005	South of Amesbury
		4006	Amesbury
		4007	North of Amesbury
		4008	Tidworth
		4009	Pewsey

Area	HMA (internal)	Sector No.	Sector Name
Near External	N/A	5001	Stroud
		5002	South Gloucestershire
		5003	Bristol
		5004	Bath
		5005	Rest of Bath & NES
		5006	Mendip & South Somerset
		5007	Dorset, B, C & P
		5008	Rest of Gloucestershire
		5009	Cotswold
		5010	West Oxfordshire
		5011	Vale of White Horse
		5012	Oxford & South Oxfordshire
		5013	West Berkshire
		5014	Basingstoke & Deane
		5015	Test Valley
		5016	New Forest & IW
		5017	Southampton & Others
External	N/A	6001	South West
		6002	London
		6003	South East
		6004	East of England
		6005	East Midlands
		6006	West Midlands
		6007	Wales
		6008	Rest of England

Figure 5-3 – Sector60 System (National level)

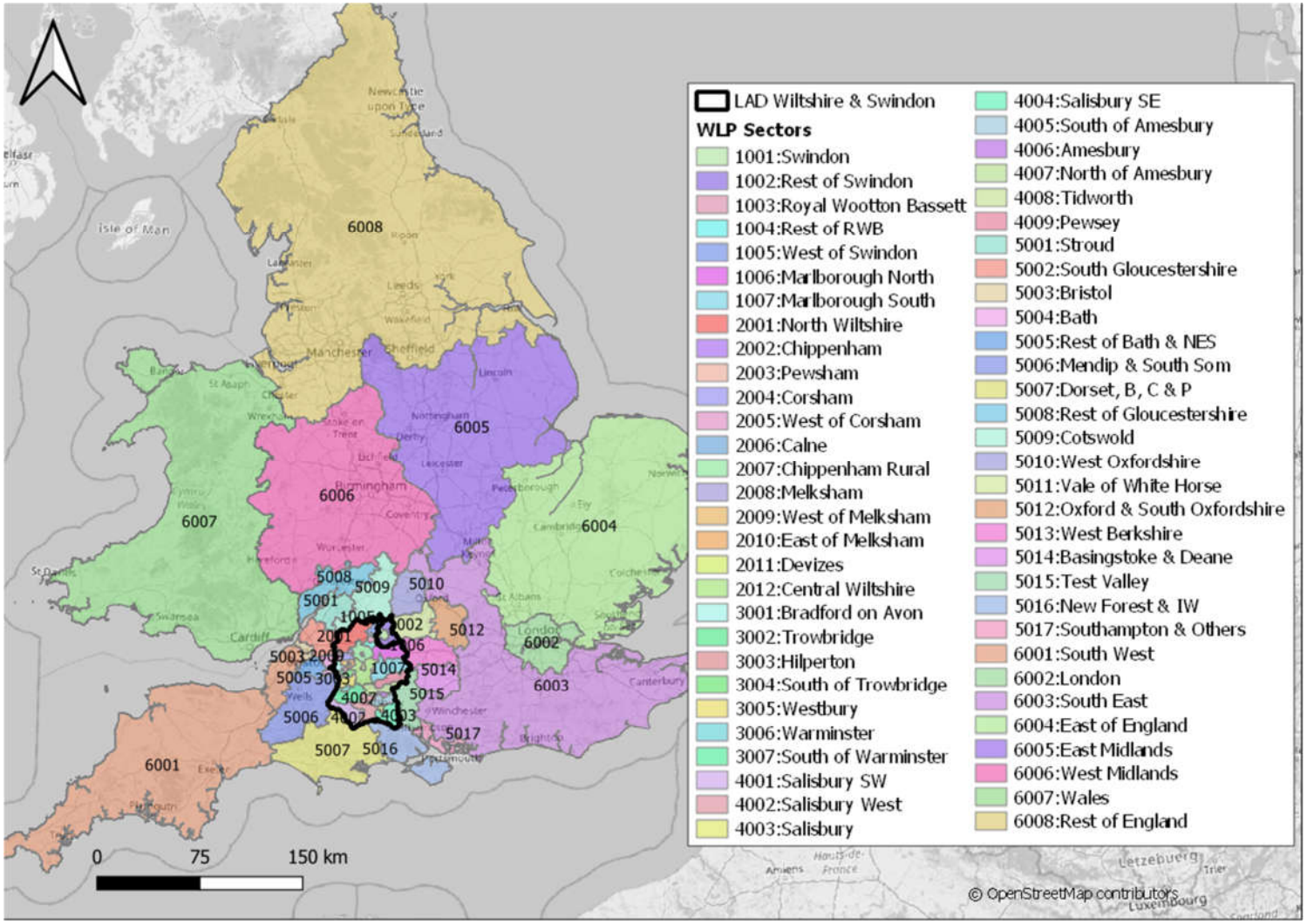


Figure 5-4 – Sector60 System (County level)

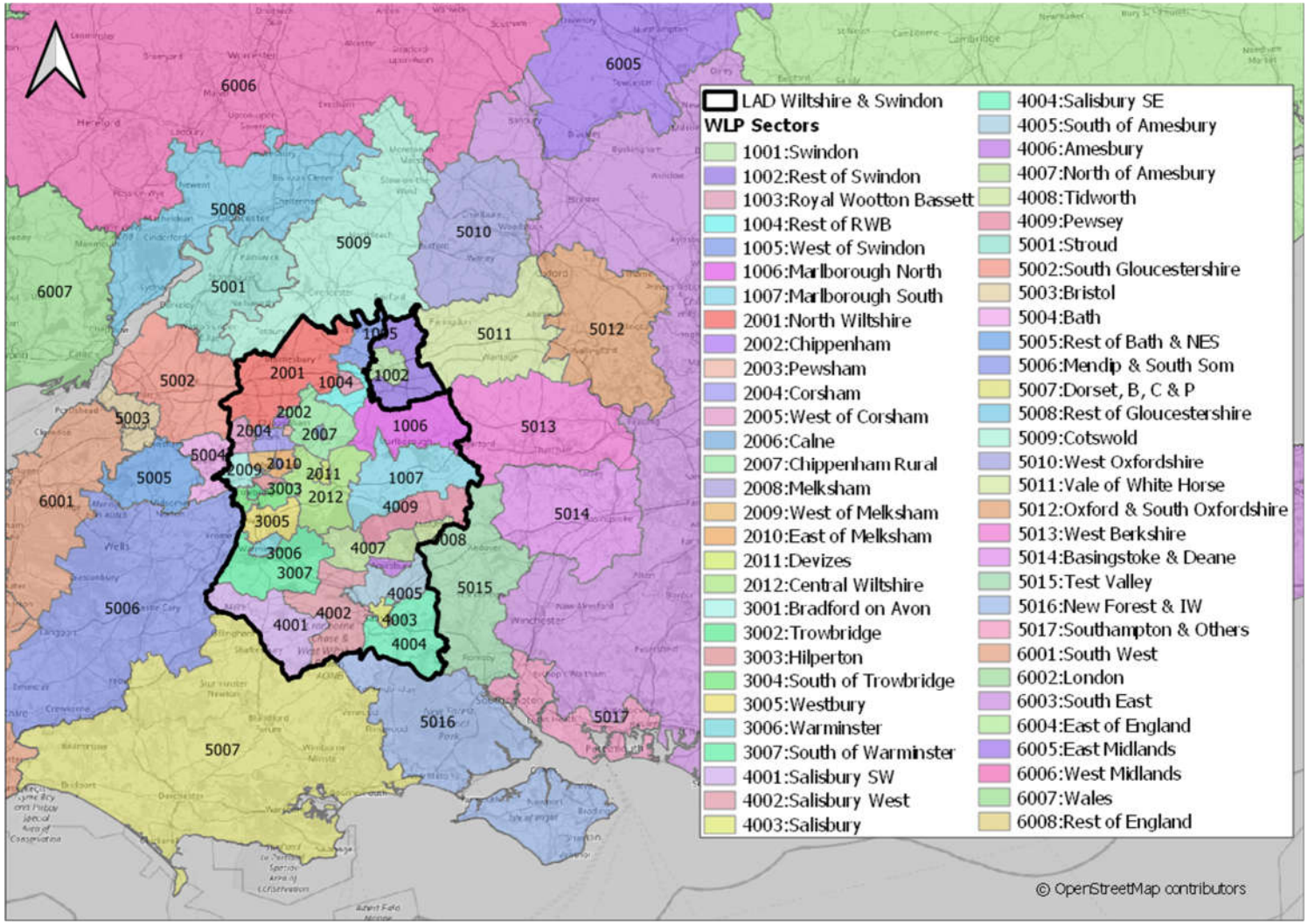
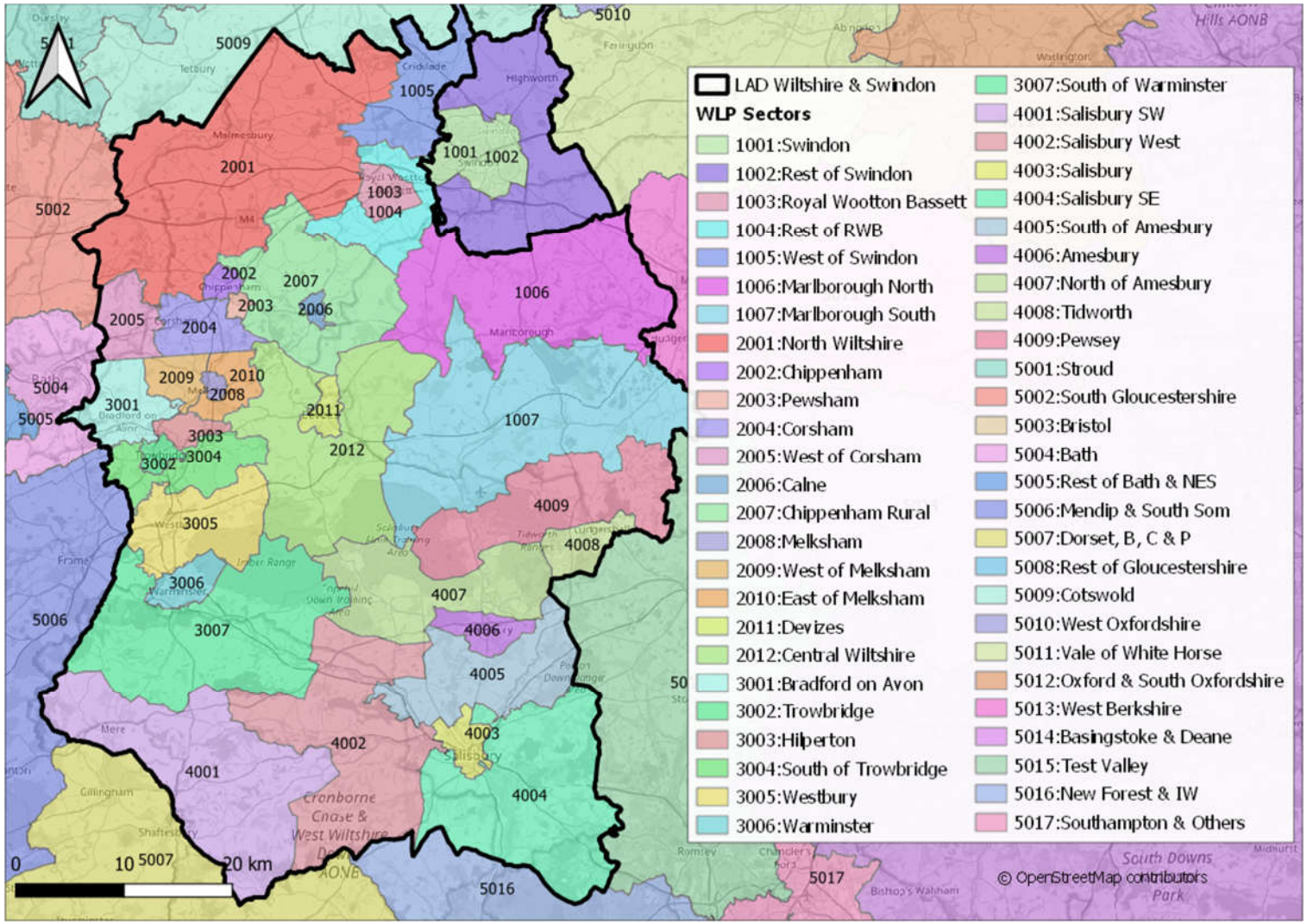


Figure 5-5 – Sector60 System (Local level)



5.2.5. Time periods

The ISM operates on a 24-hour Production-Attraction level and outputs Sector-Sector trips by mode and purpose and can further be split by person group (explained in 5.2.6). The ISM therefore represents an average weekday in the neutral month in 2018.

5.2.6. User classes, vehicle types and modal information

5.2.6.1. User classes

TAG unit M2-1 recommends that a typical Variable Demand Model (VDM) should feature at least three categories of trip purpose (commuting, employer's business and other) as "these categories are likely to have different elasticities and different distributions in both time and space, and substantially different values of time."

The ISM has been designed to include the following trip purposes:

- Home-Based Work (HBW);
- Home-Based Employers' Business (HBEB);
- Home-Based Education (HBEd);
- Home-Based Other (HBO);
- Non-Home-Based Employers' Business (NHBEB); and
- Non-Home-Based Other (NHBO).

The trip ends within the ISM were based initially on NTEM v7.2 which was available and hence the trip purpose definitions are aggregations of those defined within NTEM. NTEM includes eight Home-Based (HB) and seven Non-Home-Based (NHB) purposes as set out in Table 5-3 below.

It should be noted that home-based work and education purposes would normally be doubly-constrained, such that the total trips to each model zone match the jobs or school places available. Due to the simplifications in the ISM, this has not been possible to implement, and all purposes are simply 'singly-constrained'. The impact of this was considered during calibration and should be monitored during forecasting.

Table 5-3 - NTEM Trip Purposes

Home-based Purpose	Non-home-based Purpose
HB Work	NHB Work
HB Employers Business	NHB Employers Business
HB Education	NHB Education
HB Shopping	NHB Shopping
HB Personal Business	NHB Personal Business
HB Recreation / Social	NHB Recreation / Social
HB Visiting friends & relatives	N/A
HB Holiday / Day trip	NHB Holiday / Day trip

The ISM combines the following trip purposes from NTEM:

- HB Shopping, HB Personal Business, HB Recreation / Social, HB Visiting friends & relatives and HB Holiday / Day Trip are all combined as HB Other; and
- NHB Work, NHB Education, NHB Shopping, NHB Personal Business, NHB Recreation / Social and NHB Holiday / Day trip are combined as NHB Other.

5.2.6.2. Vehicle Types

Within the ISM, 'main mode' choice is considered between car, public transport, walk, and cycle. Experience with similar models built by Atkins has shown that this four-way split is appropriate to represent the most

significant choices of travel mode, as the four modes have very distinct trip length distributions and cost characteristics.

A sub-mode choice is then provided between car modes (Car-only versus Bus Park and Ride) and, separately, between public transport modes (Bus, Rail, and Rail Park and Ride) for the base year.

5.2.6.3. Demand Segmentation

In the model development, it was crucial to consider the most appropriate format, segmentation, and aggregation of the data to be used in informing the ISM Base Year. This specification was therefore the first step in converting that data into an interim model.

The segmentation in NTEM consists of a combination of a person type and a household type, representing a range of ages, genders, and working statuses, as well as household and car occupancy. There are 88 combinations of person types and household types, which are termed traveller types.

For the ISM, the NTEM segmentation was not used in full, and was significantly simplified, given the interim nature of the model, and the requirement for a working model within Microsoft Excel. The gender segments and working status were removed from the person types, as well as household size. Furthermore, education trips generated by children under 16-years old (mainly primary and secondary school students) together with associated escorting trips generated by adults are not considered in the ISM. Adult students were grouped together with all the other adults who are economically inactive to be treated as 'Other' combined, and household car availability was simplified to with and without car.

This produced a total of six segments (or person groups) for each trip purpose as shown in Table 5-4. This number is made from three person groups by two levels of car availability. In addition, there were some combinations that have an insignificant number of trips, and hence could be removed. These are because certain age groups (e.g. 75+) have insignificant trip rates for certain purposes (e.g. HBW, HBEB, HBEd, and NHBEB). Those demand segments applied in the model are shown by an 'X' in Table 5-4.

Table 5-4 - ISM Segmentation Breakdown

	HBW	HBEB	HBEd	HBO	NHBEB	NHBO
Employed 16-74 (with/without car)	X	X		X	X	X
Others (including students) 16-74 (with/without car)			X	X		X
75+(with/without car)				X		X

Trip ends were generated for each of the above combinations in NTEM, and were input to the ISM (to be further distributed between modes, destinations, and sub modes), and further compressed as follows:

- HBW by employed 17-74 without car;
- HBW by employed 17-74 with car;
- HBEB by employed 17-74 without car;
- HBEB by employed 17-74 with car;
- HBEd by others 16-74 without car;
- HBEd by others 16-74 with car;
- HBO by all 16+ without car;
- HBO by all 16+ with car;
- NHBEB by all 16+ without car;
- NHBEB by all 16+ with car;
- NHBO by all 16+ without car; and
- NHBO by all 16+ with car.

Note that all the HBO trips are combined across three types of adult population and only segmented by two types of car availability. HBEd trips are effectively generated by adult students who have been grouped into others.

5.3. Generalised cost formulations and parameters

ISM mode choice is informed by their Generalised Journey Time (GJT) formulations. These formulae combine the elements shown in Table 5-5 in Step 1 of the ISM VDM, which are subsequently applied to the trip ends in Step 2. The detailed mathematical formulae can be found in the ISM spreadsheets themselves.

Table 5-5 - Generalised Journey Time Components

Sub-Mode	Component
Car-only	Distance
	Value of Time
	Vehicle Operating Cost
	Tolls
	Parking Charges
	Destination-Specific Constants
	Mode-Specific Constants
	Car Occupancy
	Damping Factors
Bus PR	Car-only GJT excluding parking charges
	Park and Ride site parking charges
	Bus GJT excluding access/egress time
Bus	In-Vehicle Ride Time
	Access Time
	Egress Time
	Interchange Time
	Fare
	Destination-Specific Constants
	Mode-Specific Constants
	Damping Factors
Rail	In-Vehicle Ride Time
	Access Time
	Egress Time
	Interchange Time
	Fare (dependent on time period)
	Destination-Specific Constants
	Mode-Specific Constants
	Damping Factors
Rail PR	Car-only GJT excluding parking charges
	Rail station parking charges (dependent on purpose)
	Rail GJT excluding access/egress time
Cycle	Cycle Distance
	Cycle Speed (fixed parameter)
	Destination-Specific Constants
	Mode-Specific Constants
	Damping Factors
Walk	Walk Distance
	Walk Speed (fixed parameter)
	Destination-Specific Constants
	Mode-Specific Constants
	Damping Factors

Section 5 Summary

The ISM is the strategic, multi-modal, demand modelling capability of the project – linking demographic and land use data to see how changes in transport supply and demand in the county influence trip distributions and mode shares. This is something the highway-only WTM isn't capable of doing.

The ISM has been developed with 2018 as a base year and incorporates data from NTEM, Nomis Census, LLPG, DfT TAG Databook, the WTM, TRACC, and public data sources for car parking and public transport.

The modelled area consists of 4 HMAs - Swindon, Chippenham, Trowbridge and Salisbury, the Swindon HMA is divided in two - one representing Swindon HMA in Swindon LAD and one representing Swindon HMA in Wiltshire HMA - resulting in a total of 5 HMAs.

The geographic coverage of the model, and level of detail, is aligned with DfT TAG guidance, which advises a demand model is divided into an internal area - in which all travel demand is modelled - and an external area - in which only trips to / from the internal area are considered. A total of 60 geographic sectors, representing both internal and external areas have been adopted - 35 are internal, 17 near external, and eight external.

The ISM includes six trip purposes: Home-Based Work, Home-Based Employers' Business, Home-Based Education, Home-Based Other, Non-Home-Based Employers' Business, and Non-Home-Based Other, double the minimum recommended by DfT. Four main transport modes are included: car, public transport, walk, and cycle. Sub-mode choices between car modes (car-only versus Bus Park and Ride) and between public transport modes (Bus, Rail, and Rail Park and Ride) are also included.

Travel mode choice within the ISM is informed by generalised journey time and cost formulations.

6. 2018 Data collection

6.1. Data sources

The development of the ISM base year has been grounded in the collation and verification of detailed and up-to-date data sets covering both the demographic and land use influences on travel patterns, and the current transport provision in Wiltshire. This section sets out how different areas of the collated evidence base feed into the design and specification of the ISM.

Table 6-1 shows how the data used in the ISM development can be grouped into three main areas: Transport Demand, Transport Supply, and Model Parameters; and two levels: Entities and Data Sources.

Table 6-1 - Data used in ISM development

Transport Demand	Transport Supply	Model Parameters
Entities – Data Sources		
Dwellings & Population - National Trip End Model (NTEM)	Highway cost skims - Wiltshire Transport Model (WTM)	Economic assumptions - DfT Transport Appraisal Guidance (TAG)
Workers - Nomis labour market statistics (Office for National Statistics data portal)	Public Transport & Active cost skims - Non-car cost skims from TRACC and fare data from multiple portals	Values of Time/Vehicle Operating Costs - TAG
In and Out Commuters - 2011 Census	Park and Ride cost details - Office of Road and Rail (ORR) Station Usage Estimates	Parking costs - Wiltshire Parking Data (MiPermit Portal)
Employment - LLPG		
Public Transport Patronage - National Travel Survey		

Table 6-1 shows the range of areas that were considered in developing the ISM, plus the sources from which this information was obtained. Once the full range of data had been collated, it was applied within the ISM itself.

With the appropriate data collated and processed based upon the characteristics set out above, the final step in setting up the ISM was to apply this data within a VDM framework, capable of both providing the insights required by Wiltshire Council and fulfilling its role as an interim, spreadsheet-based solution.

The data set out in Table 6-1 was applied to the ISM in one of four broad ways:

- Informing Base Year Travel Demand (Dwellings, Population, Workers etc.);
- Informing Modal Travel Characteristics (Highway and Non-Car Skims; Values of Time and other parameters);
- Verifying Input Data (Checking and verifying the above two points); and
- Calibrating the ISM (Census JTW data; NTS data).

6.2. Sources and derivation of 'cost' data (SATURN and TRACC)

Cost data is primarily derived from two sources as mentioned in Table 6-1 (i.e. Wiltshire Transport Model (WTM) for Car mode, and TRACC for non-car modes).

As discussed in section 5.2.2, Wiltshire Transport Model (WTM) is an existing (SATURN-DIADEM) model based on National Highway's South West Regional Transport Model (SWRTM1) using 2015 mobile phone data and was re-calibrated using 2018 data in the Wiltshire region. Both peak hour and peak period models are available. The following highway skims were extracted from the SATURN assignment model for various peaks (i.e.AM / IP / PM) at a zonal level.

- Distance in meters;

- Time in minutes; and
- Toll in pence.

These skims are converted to ISM sector level through demand weighted average and is detailed in 7.4.1.

TRACC is a multi-modal transport accessibility tool which is designed to generate travel times for a full range of transport modes between various origins and destinations. For the ISM, non-car cost skims (i.e. bus, rail, cycle and walk) are generated from TRACC at MSOA level and are converted to ISM sector level. These skims are generated for 2018 and are discussed in detailed in section 7.4.2.

Section 6 Data Summary

In developing the 2018 base model, the following data was collected:

- Transport demand: dwellings, population, workers, in and out commuters, employment, public transport patronage; and
- Transport supply: highway cost skims, public transport cost skims, active mode cost skims, Park and Ride cost details.

Data was sourced from: NTEM, the WTM, DfT TAG, Nomis labour market statistics, TRACC (active mode cost skims), MiPermit Portal (Wiltshire parking data), 2011 Census, ORR station usage estimates, LLPG, and the National Travel Survey.

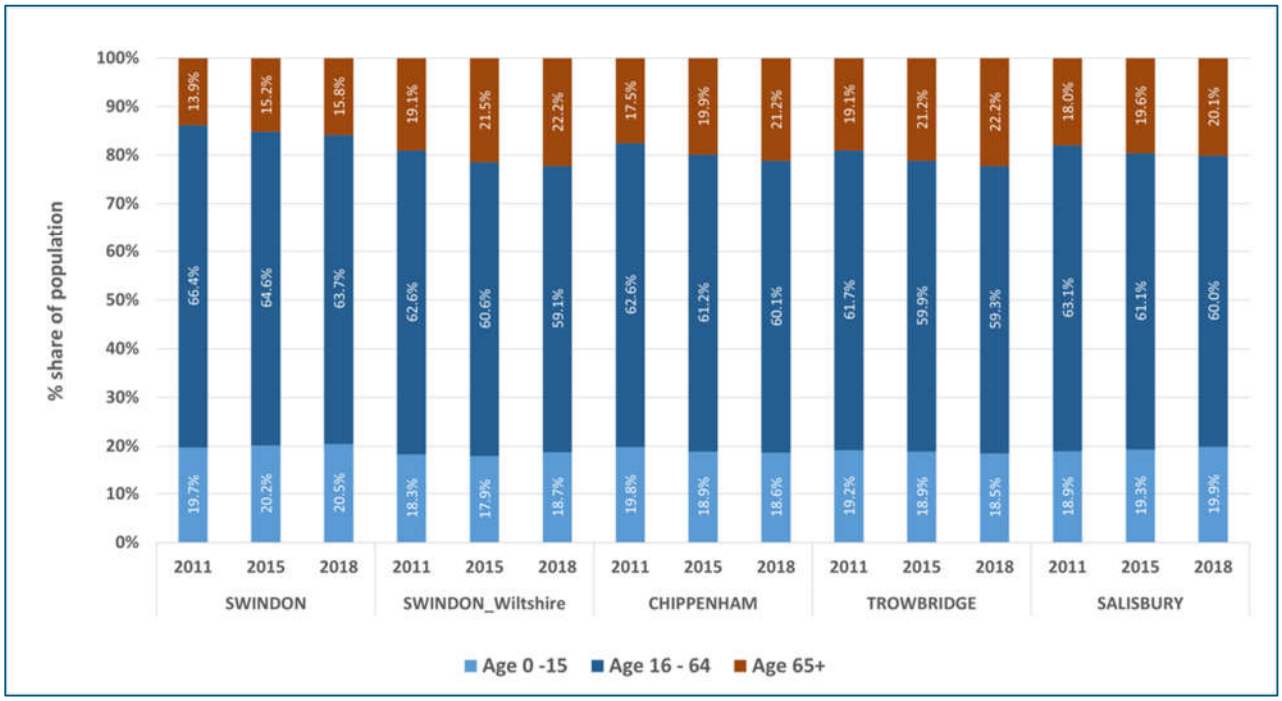
7. 2018 ISM Baseline

7.1. 2011 to 2018 growth in land use and travel

This section displays insights and commentary resulting from the land use data analysis (i.e., population) undertaken and check the trends in growth of population from 2011 to 2018.

1Figure 7-1 shows the age breakdown of population by HMA in Wiltshire, for 2011, 2015, and 2018 and how three age cohorts have changed over the period 2011-2018 in each HMA according to Nomis data. Across all the HMAs, the share of those aged 65 and above has increased, with the largest increase in share occurring in Chippenham HMA. The share of population taken by those aged 0-15 has remained stable across the HMAs from 2011 to 2018.

1Figure 7-1 - Population share by age cohort, 2011-2018 – Nomis



A check on the trends in total population by HMA according to both NTEM and Nomis data are shown in Figure 7-2 and Figure 7-3. Note that the Nomis data has been normalised to match NTEM population levels in 2011 but maintaining Nomis growth rates for 2011-2020. It should also be noted that NTEM data is a forecast based upon the land use inputs to the National Trip End Model whereas the Nomis data is based upon labour market estimates carried out each year.

Figure 7-2 - Population by year and LAD, 2011-2020 – NTEM

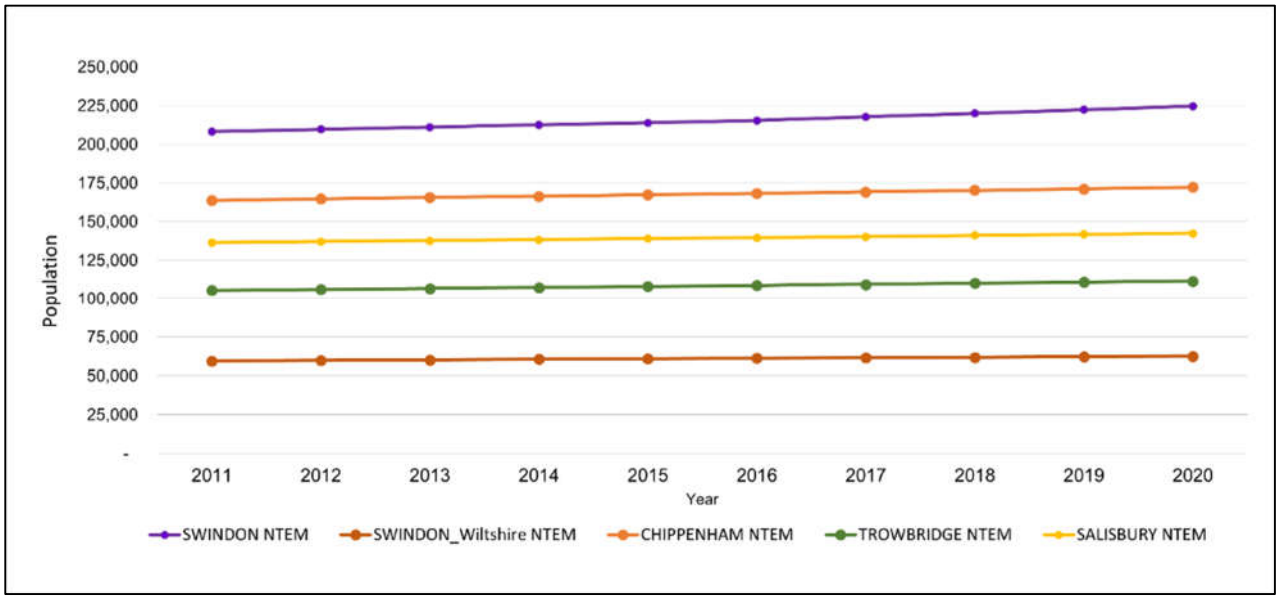
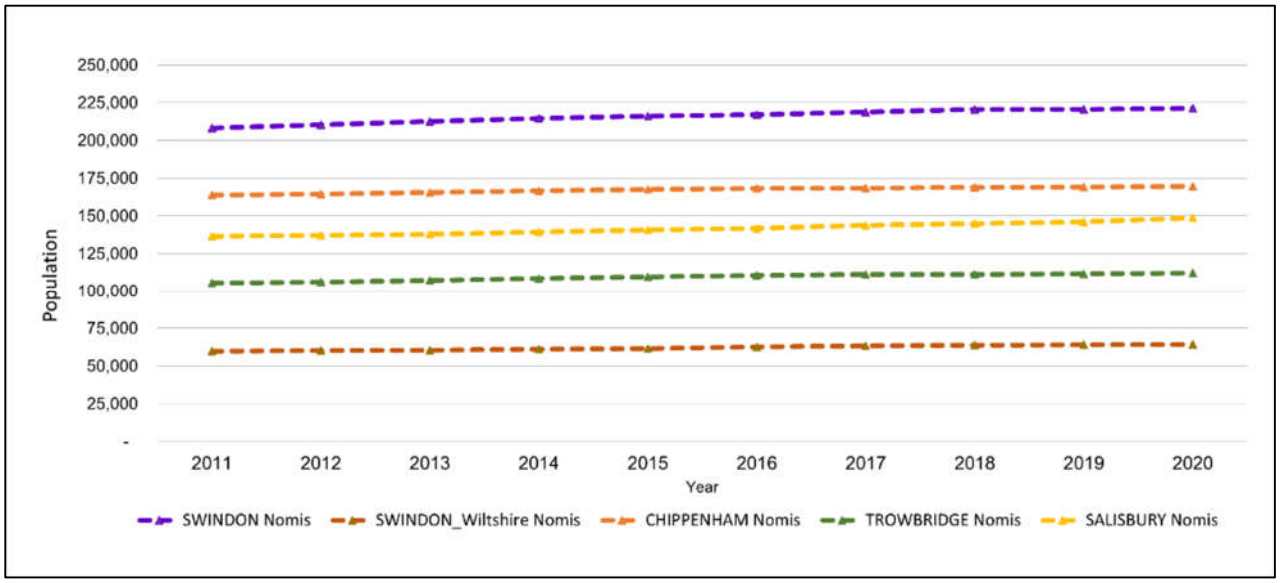


Figure 7-3 - Population by year and LAD, 2011-2020 – Nomis



This shows that the close match between NTEM and Nomis trends over the period 2011-2018 continued into 2020. The Nomis and NTEM data shows increases in total population in all HMAs in 2018, with 5.3% and 4.4% growth respectively in the study area. Population growth in Salisbury is higher in Nomis estimates compared to NTEM growth and Chippenham exhibits less growth. Further, the growth of population within Wiltshire (i.e., excluding Swindon) based on LLPG data over the period 2011-2018 is high with 7.1% compared to Nomis with 5.0% and NTEM with 3.9%. The differences in growth are due to the nature of the data and do not affect the ISM baselining.

7.2. Patterns of movement in 2018

The 2018 Base Year Travel Demand was derived from a range of sources to create a set of trip ends (productions and attractions) for each sector pairing in the model, by demand segment. Section □ provides an overview of the information that fed into the process and this section provides detail on how the trips that go into the Base Year ISM were derived.

7.2.1. Productions

Productions were built up primarily from estimates of population and dwellings, using data from NTEM, Nomis and LLPG as the basis. The LLPG dataset provided granular and up-to-date property information for Wiltshire district (Swindon was excluded in the dataset), enabling cross-referencing of dwellings at a detailed spatial level.

7.2.1.1. Obtain NTEM 2018 population estimate and check against Census and LLPG

The first step was to obtain the NTEM estimate of population for 2018 for each sector in the ISM. However, given this dataset is an estimate, a detailed check was undertaken on the accuracy of the population estimates.

To do this, the rates of population per dwelling were calculated; firstly for 2011 and then for 2018, using the NTEM population estimate and a 2018 estimate of dwellings from the LLPG dataset.

7.2.1.2. Obtain Nomis Mid-Year 2018 population estimate

A second population estimate was obtained for Mid-Year 2018 from Nomis, the ONS' statistics portal.

7.2.1.3. Obtain Adjusted Population

Final adjusted population is arrived at by applying the 2011 to 2018 growth in LLPG dataset on the 2011 NTEM population and applying a household size correction factor (ratio of 2018 Household (Hh) size to 2011 Hh size). The adjusted population is comparable to NTEM 2018 estimates with only Salisbury HMA having more than 5% change, which again is similar to Nomis 2018 Mid-year Estimates.

7.2.1.4. Obtain NTEM 2018 Productions and adjust external area according to In-Commuting

Separately, the NTEM 2018 trip productions was extracted and then adjusted for trips interacting between external area and Internal Area. 2011 Census JTW data on External-to-Internal area trips was used to scale the external productions. Note that this was applied across all purposes; it was decided that the patterns in the Census JTW data, whilst based upon commuting trips, were applicable to trips of all purposes. The external sector totals resulting from this process are shown in Table B-1.

7.2.1.5. Apply ratio of population estimates to NTEM 2018 Productions

To derive the final level of 2018 Productions, the ratio of population in the two population datasets (NTEM 2018 and Adjusted population) was calculated for each sector before being applied to each purpose (separately) of the NTEM 2018 Productions by sector. This step effectively scaled the NTEM Productions dataset according to the best estimate of 2018 Population in each sector. Note this was applied to the internal area only. Table C-1 presents the calculations at HMA level.

The last step in the derivation of the trip ends was to combine the Student and Other segments in the NTEM data as 'Others', to match the ISM segmentation detailed in Section 5.2.6.

7.2.2. Attractions

Attractions were also primarily built up from NTEM data. As mentioned in Section 5.2.6, ISM is doubly-constrained for home based work trips, which means that jobs act absolute constraints.

7.2.2.1. Obtain NTEM 2018 Attractions and adjust external area according to Out-Commuting

The first step in forming the attractions for input to the ISM was to extract the NTEM 2018 Attractions dataset, and then adjust the external area attractions to account for rates of Out Commuting from the Internal Area. 2011 Census JTW data on Internal-to-External area trips was used to scale the external attractions. Note that as with productions this was applied across all purposes (see Table B-2).

7.3. Demand Summaries

After the preparation of the Productions and Attractions by purpose and segment, these were input directly to Step 2 of the ISM VDM. The summaries of Productions and Attractions by internal district and external sector and purpose, as input to the ISM are shown in Table 7-1 and Table 7-2.

Table 7-1 - ISM Productions by HMA / external sector and segment

HMA/ sector	Internal/ External	HBW		HBEB		HBEd		HBO		Total
		ER_16-74				Others_16-74		All_16+		
		0 Car	1+ Car	0 Car	1+ Car	0 Car	1+ Car	0 Car	1+ Car	
Swindon	Internal	2,493	36,608	196	5,279	262	1,251	7,988	67,993	**122,071**
Swindon_ Wiltshire	Internal	751	15,190	65	2,415	132	696	2,861	30,172	**52,282**
Chippenham	Internal	2,428	42,142	189	6,095	303	1,780	8,564	81,332	**142,833**
Trowbridge	Internal	1,991	26,574	147	3,552	257	1,068	6,881	52,832	**93,302**
Salisbury	Internal	6,177	56,956	432	6,938	678	1,907	16,651	95,108	**184,846**
Gloucestershire	External	248	3,960	20	590	35	160	876	7,867	**13,756**
Bath, Bristol & South Gloucestershire	External	625	5,024	47	633	272	493	1,904	9,410	**18,408**
SW Near External	External	378	4,854	30	676	60	221	1,437	10,510	**18,164**
Oxfordshire excl. Cherwell	External	116	1,733	9	243	29	70	353	3,138	**5,691**
East Near External	External	165	2,813	12	399	15	92	546	5,349	**9,392**
South Near External	External	232	2,074	18	270	60	109	834	4,547	**8,143**
SW External	External	104	1,068	8	147	22	53	383	2,353	**4,137**
East & London	External	460	3,186	39	430	74	144	1,131	5,746	**11,211**
Midlands & Wales	External	287	2,162	21	283	79	127	1,008	4,567	**8,535**
North External	External	205	1,187	15	147	47	57	637	2,328	**4,622**
Total		**16,660**	**205,529**	**1,249**	**28,097**	**2,326**	**8,229**	**52,053**	**383,251**	**697,394**

Table 7-2 - ISM Attractions by HMA / external sector and purpose

HMA/sector	Internal / External	HBW	HBEB	HBEd	HBO	NHBEB	NHBO	Total
Swindon	Internal	41,712	5,240	31,348	86,999	6,992	38,375	**210,666**
Swindon_Wiltshire	Internal	15,229	1,933	12,060	35,120	2,696	15,220	**82,258**
Chippenham	Internal	43,413	5,546	30,829	88,117	7,818	37,218	**212,942**
Trowbridge	Internal	26,307	3,359	16,684	65,277	4,669	28,160	**144,457**
Salisbury	Internal	62,045	7,974	35,623	137,029	10,847	56,837	**310,356**
Gloucestershire	External	4,324	594	3,038	10,506	810	4,727	**23,999**
Bath, Bristol & South Gloucestershire	External	10,837	1,408	9,696	22,331	1,923	10,263	**56,458**
SW Near External	External	3,288	446	2,301	7,829	612	3,216	**17,692**
Oxfordshire excl. Cherwell	External	3,720	494	3,383	7,524	706	3,431	**19,258**
East Near External	External	7,496	1,001	4,479	15,489	1,413	6,872	**36,751**
South Near External	External	2,090	263	1,559	5,147	370	2,118	**11,547**
SW External	External	1,011	135	700	2,481	184	1,005	**5,517**
East & London	External	9,791	1,275	6,909	19,250	1,636	8,385	**47,247**
Midlands & Wales	External	1,519	190	1,163	3,583	263	1,457	**8,175**
North External	External	713	84	524	1,600	118	647	**3,686**
Total		**233,495**	**29,942**	**160,297**	**508,284**	**41,058**	**217,933**	**1,191,008**

7.4. 'Cost' of movement in 2018

The 2018 modal travel characteristics provide a set of costs and parameters to be entered directly into the ISM, enabling the formulation of GJT for each sector Production/Attraction (PA) pairing in the model, by demand segment. Section 6.1 provides an overview of the sources of information and provides detail on the processing and checks undertaken on the data.

7.4.1. Car Costs

As mentioned in section 6.2, highway (car) cost characteristics, encompassing travel distance, travel time and any incurred tolls, was extracted directly from the WTM Base Year run for three peaks (i.e., AM, IP, and PM). The WTM is the primary highway model in Wiltshire, with a detailed network and zoning system across the County or Region. As such, it provides the most appropriate source for skims of car cost characteristics to feed into the ISM.

In aggregating the skims from the WTM zoning system to the ISM 60-Sector system, it was checked on a sectoral and User Class-basis that the original values were carried through the process and that the skims entered the ISM reflected the WTM accurately.

7.4.1.1. Parking Costs

Parking data (i.e., parking spaces and parking charge) was collected from the MiPermit online portal, Swindon Borough Council and Wiltshire Council website. Note that the parking charges used are current charges (i.e., year 2022) as seen in the portal and no correction has been applied. Further, parking utilisation data was obtained from the cabinet papers related to the 2014-15 parking review reports.

In total, the charges for 128 car parks were recorded, with a short-stay (typically two hours) and long-stay (typically the longest possible stay) charge recorded for each site. The sites were matched against the ISM sectors, and charges averaged across site, weighted by the number of parking spaces at each site. This produced average parking charges for each sector, for short- and long-stay, which were then input directly to the ISM.

Parking charges for Bus Park and Ride sites, and Railway Stations, were collated separately from online sources. Table 7-3 provides a summary of parking data at HMA level.

Table 7-3 – Parking Analysis

HMA	Parking spaces				
	Total	Paid	Free	% Utilisation	% to AM + IP destination car demand
Swindon	4,143	4,134	9	100%	8%
Swindon_Wiltshire	1,058	920	138	84%	12%
Chippenham	3,043	2,846	197	74%	10%
Trowbridge	1,861	1,301	560	59%	10%
Salisbury	3,448	2,987	461	66%	12%
Total Study Area	**13,553**	**12,188**	**1,365**	**79%**	**10%**

It is observed that the total number of parking spaces are 10% of the AM+IP car destination demand in the study area. At a sector level, Salisbury and Devizes have a higher percentage of parking spaces with 29% and 25% respectively as shown in Table 10-4. Utilisation of parking spaces is high in Swindon (i.e., 100%) compared to other HMAs.

7.4.2. Non-car costs

As mentioned in section 6.2, public transport and active mode (non-car) cost characteristics were extracted from TRACC for 2018 at MSOA level in the internal area and sector level in the external area. These were then converted to sector level and as such provide a useful basis for skims covering bus, rail, cycle, and

walking travel. It is to be noted that the bus skims for externals are not generated due to limitations in TRACC. Table 7-4 sets out the skims extracted from TRACC for use in the ISM. PM skims were assumed to be similar to AM.

The data from TRACC for cycle and walk has been converted to sector level through weighted average based on the origin MSOA population whereas for bus census JTW bus origin demand was used. The rail data has been converted to sector level based on the ORR data (station entries and exits).

Bus fares were obtained through a distance-based regression equation developed for another study in a neighbouring district. In this regard, highway distance skims were used as proxy to calculate bus fares. Rail fares were obtained for the current year 2022 and has been adjusted to the base year 2018 based on RPI and then converted to sector level weighted by the station usage data.

Table 7-4 - Non-car skims extracted from TRACC

Sub-Mode	Component	Unit	Dimension (MSOA/Sector pair)
Bus	In-Vehicle Ride Time	Minutes	AM and IP
	Access Walk Time	Minutes	AM and IP
	Egress Walk Time	Minutes	AM and IP
	Interchange Time (wait and interchange combined)	Minutes	AM and IP
Rail	In-Vehicle Ride Time	Minutes	AM and IP
	Access Time	Minutes	AM and IP
	Egress Time	Minutes	AM and IP
	Interchange Time (wait and interchange combined)	Minutes	AM and IP
Cycle	Cycle Distance	Metres	Day
	Cycle Speed	Minutes	Day
Walk	Walk Distance	Metres	Day
	Walk Speed	Minutes	Day

The following sense checks were undertaken on the processed skims:

- Comparison of Highway Distance and time skims vs Google Maps;
- Comparison of Walk and Cycle Distance skims vs Google Maps;
- Sense check of Rail speeds between sector OD pairs; and
- Sense check of Bus speeds between sector OD pairs.

It was found that the ISM sector-to-sector highway distance skims derived from WTM base model are close to the distance obtained from Google Maps. Cycle and Walk time skims obtained from TRACC are a little closer to Google Maps, whereas rail and bus speeds are not varying significantly between sector OD pairs.

7.4.2.1. Park and Ride Costs

Park and Ride (both bus and rail) cost skims were not available from TRACC and instead, for the ISM, the Park and Ride costs for each sector pairing, purpose, and car availability, were simply built from a summing of three elements:

- A car leg, utilising costs from the car GJT formulation, excluding normal (i.e., public) parking charges;
- A parking leg, utilising parking costs relating to bus P&R sites/rail stations; and
- A public transport leg, using costs from the bus or rail GJT formulation, minus access time, as it is expected that a person parks at a P&R site / station and hence access time is near zero.

Section 7 ISM Baseline Summary

Population data trends, by HMA, across NTEM and Nomis data was cross-checked. Nomis data was normalised to match NTEM population levels in 2011 but to thereafter maintain Nomis growth rates for 2011-2020. There was a close match between NTEM and Nomis trends over the period 2011-2018, continued into 2020.

Nomis and NTEM data shows increases in total population in all HMAs in 2018 with 5.3% and 4.4% growth respectively in the study area. The population growth within Wiltshire district (i.e. excluding Swindon) based on LLPG data is high - at 7.1% compared with Nomis at 5.0% and NTEM at 3.9%. As the NTEM dataset for 2018 is an estimate a detailed check was undertaken of the population estimates against LLPG and Nomis (ONS) statistics. The adjusted population is comparable to NTEM 2018 estimates.

2018 Base Year Travel Demand was derived from a range of sources to create a set of trip ends (productions and attractions) for each sector pairing in the model. The productions were built up primarily from estimates of population and dwellings using data from NTEM, Nomis, and LLPG. Attractions are also primarily built up from NTEM data; as the ISM is singularly-constrained, jobs act as attraction weights rather than absolute constraints.

The 'cost' of movement in 2018 was developed, by travel mode, as follows:

- Car costs, including travel distance, travel time and any incurred tolls - extracted directly from the WTM for three peak time periods;
- Parking costs - collected from the MiPermit online portal, Swindon and Wiltshire Council websites with parking utilisation data obtained from cabinet papers related to the 2014-2015 parking review reports
  - Parking charges for Bus Park and Ride sites and railway stations collated separately from online sources
- Non-car costs extracted from TRACC for 2018 at MSOA level and converted to sector level using: weighted average based on origin MSOA population for walk and cycle, Census JTW for bus, and ORR station entries and exits for rail:
  - Bus fares obtained through a distance-based regression equation developed for another study in a neighbouring district;
  - Rail fares obtained for current year and adjusted to base year 2018 based on RPI; and
  - Park and Ride (rail and bus) developed by combining 1) car leg costs from car GJT, excluding normal (i.e., public) parking charges, 2) parking leg utilising parking costs relating to bus P&R sites / rail stations, and 3) public transport leg - using costs from bus or rail GJT minus access / egress time, as it is expected a person parks at a P&R site / station and hence access / egress times are near zero.

Sense checks were undertaken on processed skims:

- Comparison of Highway Distance and Walk and Cycle Distance and time skims vs. Google Maps data; and
- Sense check of Rail and Bus speeds between sector OD pairs.

The sense check indicated skims are closely aligned to Google Maps and rail and bus speeds do not vary significantly between OD pairs. Values of Time and Vehicle Operating Costs applied in the ISM were extracted from TAG Databook for the base year.

8. 2018 ISM model calibration

8.1. Guidance standards

Given the nature of the ISM, it has not been calibrated to specific guidelines or standards, as a fully-fledged model would normally be. Instead, proportionate to its intended application, the ISM has been calibrated with the intention of producing a model that replicates observed mode shares and trip length distributions on a sectoral basis in a reasonable manner, shows a good level of matching observed trip distributions by mode, and produces the expected direction and reasonable magnitude of response to changes in input parameters such as fuel costs.

8.1.1. Generalised Time Damping

TAG unit M2-1 suggests that cost damping is considered as a means of representing the fact that demand responses become less strong as trip length increases. A variety of methods for damping are set out to either vary the Values of Time (VoT) by distance or raise the generalised time to a power. The damping calculations applied in the ISM Step 1 spreadsheet were as follows:

- Car, bus, and rail sub-modes: For all segments, those trips over 20km are damped by power of 0.5;
- Bus P&R sub-mode: uses a damped car leg, but an undamped bus leg. This is because bus legs of P&R trips would be internal to Salisbury, and hence would be below the 20km threshold;
- Car damping applied as per car sub-mode; and
- Rail P&R sub-mode: uses an undamped car leg, but a damped rail leg. This is because the distance threshold for car trips to the closest rail station is set to 10km, less than the 20km damping threshold;
  - Rail damping applied as per rail sub-mode.

8.1.2. Parameters

8.1.2.1. Economic parameters

The TAG Databook (November 2021, v1.17) sets out Vehicle Operating Costs (VOCs), made up of six component parts; a to d parameters defined for each vehicle category representing fuel costs from TAG Databook, and a1 and b1 are parameters for distance related costs and vehicle capital saving (only relevant to working vehicles) defined for each vehicle category respectively representing non-fuel costs. The VOC parameters used for car in the base year ISM Variable Demand Modelling (VDM) are shown in Table 8-1. The choices of mode and destination made in the VDM hence consider differences in operating costs resulting from the speed of travel between the alternatives available.

Table 8-1 - VDM vehicle operating cost parameters (pence/Km 2010 prices, 2018 values)

VOC component	Non work	Work
a	50.191	41.826
b	8.810	7.344
c	-0.093	-0.078
d	0.001	0.001
a1	3.831	4.945
b1	0.000	135.946

Values of Time (VoT) applied in the ISM VDM were also extracted from the TAG Databook for the base year, as set out in Table 8-2. It can be seen, across purposes, that the VoT for Employer's Business was applied to HBEB and NHBEB respectively, the VoT for Other trips was applied to HBEd, HBO and NHBO, and the VoT for commuting trips was applied to HBW only. Across sub-mode, in line with guidance, cycle and walk modes utilise VoT values from Bus.

Table 8-2 - VDM VoT (pence per minute, 2010 prices, 2018 values)

Purpose	Car	Bus	Rail	Cycle	Walk
HBEB	27.11	15.36	44.71	15.36	15.36
HBEd	8.28	8.28	8.28	8.28	8.28
HBO	8.28	8.28	8.28	8.28	8.28
HBW	18.15	18.15	18.15	18.15	18.15
NHBEB	27.11	15.36	44.71	15.36	15.36
NHBO	8.28	8.28	8.28	8.28	8.28

Table 8-3 presents the Car occupancy per trip by purpose. These are also extracted from TAG Databook for 2010 price year and 2018 value year. Car occupancy factors along with VoT is used in the calculation of GJT.

Table 8-3 - Car Occupancy factors

Purpose	OCC
HBEB	1.19
HBEd	1.67
HBO	1.67
HBW	1.17
NHBEB	1.19
NHBO	1.67

8.1.3. 2011 Census Journey-to-Work data

The most valuable source of information for assessing commuting patterns and mode shares produced by the ISM is 2011 Census JTW data. This provides, on a MSOA-MSOA basis, journeys from home to work by 10 modes / categories.

During processing of this data, it was aggregated according to the ISM 60 Sector system, and the modes / categories were grouped as follows to match the main mode and sub-mode choices in the ISM:

- **Car** formed from 'Driving a car or van'; 'Passenger in a car or van'; 'Taxi' and 'Motorcycle, scooter or moped';
- 'Bus, minibus or coach' (**Bus**) retained;
- **Rail** formed from 'Underground, Metro, Light Rail, Tram'; and 'Train';
- 'Bicycle' (**Cycle**) and 'On foot' (**Walk**) retained; and
- 'Work mainly at or from home' was dropped as a category.

8.2. Modelled HBW travel patterns

A key measure of the success of the ISM in replicating observed travel patterns is by comparing the outputs from the model (24hr PA trips by mode and demand segment) against 2011 Census Journey-to-Work data. This comparison can only take place for the Home-Based Work (HBW) purpose but encompasses two separate comparisons; of mode share on a whole model, district, and sectoral basis; and of trip distributions by mode, across Car trips; Bus (+ Bus P&R), Rail (+ Rail P&R), Cycle and Walk. All the calibration outputs are presented at HMA level.

8.2.1. HBW Mode Shares

Table 8-4 and **Table** 8-5 show a comparison of HBW mode shares in the Census JTW and ISM dataset of productions and attractions respectively, for the internal HMAs and external areas. Table E-1 presents the mode share comparison at a sector level.

Table 8-4 shows a good match between the modelled and observed production mode shares. This occurs both at an overall model level and throughout the HMAs and external areas. This suggests that the fundamental balance of trips across modes is reasonable, and therefore the parameters and cost characteristics driving these balances are likely to be accurate, across purpose. The major differences are seen in Near External and External area mode shares which are affected by the limitations of PT skims from TRACC, also due to data recording errors in the census JTW dataset for cycle and walk modes for trips between far External / External to Internal area and vice-versa.

Table 8-4 - Mode share of Productions; Census 2011 vs ISM (HBW purpose only)[7]

HMA	Census JTW					ISM					
	Car	Bus	Rail	Cycle	Walk	Car	Bus	Rail	Cycle	Walk	Total
Salisbury	71.8%	5.2%	2.8%	3.7%	16.4%	74.2%	3.9%	3.6%	3.1%	15.1%	**100.0%**
Swindon _ Wiltshire	79.6%	3.3%	2.8%	2.5%	11.8%	78.7%	3.7%	2.0%	2.4%	13.3%	**100.0%**
Chippenham	79.2%	2.3%	2.8%	3.4%	12.3%	78.1%	2.2%	4.1%	3.0%	12.6%	**100.0%**
Trowbridge	78.4%	2.0%	4.4%	3.1%	12.2%	76.8%	2.6%	6.3%	3.2%	11.2%	**100.0%**
Swindon	73.8%	9.6%	1.5%	4.7%	10.5%	76.0%	7.1%	2.1%	4.3%	10.4%	**100.0%**
Near External	90.5%	2.1%	4.4%	1.0%	2.0%	92.5%	3.6%	3.4%	0.5%	0.1%	**100.0%**
External	86.5%	4.2%	9.3%	0.0%	0.0%	93.4%	0.0%	6.6%	0.0%	0.0%	**100.0%**
Total	**77.7%**	**5.0%**	**3.0%**	**3.3%**	**10.9%**	**78.7%**	**4.1%**	**3.0%**	**3.6%**	**10.5%**	**100.0%**

There is a generally good overall match between the modelled and observed attraction mode shares shown in **Table** 8-5. The internal area comparison is generally strong across modes, but there are a couple of larger discrepancies in the external area. In particular, the external area is receiving higher car trips and rail trips in the model compared to the observed data. For a better comparison, Cycle, and Walk trips have been proportionally added to other modes in the Census data.

[7] High values in green, low in red

Table **8-5 - Mode share of Attractions; Census 2011 vs ISM (HBW purpose only)**[7]

HMA	Census JTW					ISM					
	Car	Bus	Rail	Cycle	Walk	Car	Bus	Rail	Cycle	Walk	Total
Salisbury	73.2%	5.2%	1.8%	3.7%	16.2%	75.1%	4.7%	2.0%	3.2%	15.0%	**100.0%**
Swindon _ Wiltshire	78.3%	3.6%	0.5%	3.3%	14.3%	79.3%	3.0%	0.6%	2.5%	14.6%	**100.0%**
Chippenham	79.6%	2.1%	0.7%	3.8%	13.7%	80.4%	2.0%	0.6%	3.3%	13.6%	**100.0%**
Trowbridge	78.1%	2.5%	1.6%	3.4%	14.3%	79.1%	1.6%	2.8%	3.6%	12.8%	**100.0%**
Swindon	73.7%	9.2%	2.0%	4.6%	10.5%	72.3%	9.3%	2.7%	4.6%	11.1%	**100.0%**
Near External	89.1%	2.6%	5.9%	0.9%	1.5%	92.8%	0.3%	6.8%	0.1%	0.0%	**100.0%**
External	77.4%	4.0%	18.6 %	0.0%	0.0%	79.6%	0.0%	20.4%	0.0%	0.0%	**100.0%**
Total	**77.7%**	**5.0%**	**3.0%**	**3.3%**	**10.9%**	78.7%	4.1%	3.0%	3.6%	10.5%	**100.0%**

8.2.2. HBW Trip Distributions

To analyse whether the distribution of trips between sectors in the model was realistic, the distribution of modelled ISM trips from production sector-to-sector was compared with observed Census JTW data. The 2011 Census data was scaled so that the total number of trips matched the total in the ISM distribution, enabling comparison. This was undertaken for each mode, and a summary by internal HMA and external area is set out in Table 8-6 to Table 8-9.

Note that this scale of geographical aggregation does not particularly well reflect active mode trips, which are primarily short-distance (and intra-zonal). Hence cycle and walk trips have been combined and included in Table 8-9.

Table 8-6 - HBW Trip Distribution; 2011 Census (Scaled) vs ISM 2018 – Car

	HMA	Salisbury	Swindon_ Wiltshire	Chippenham	Trowbridge	Swindon	Near External	External	Total
Census 2011(Scaled)	Salisbury	17,479	560	703	582	222	6,712	1,709	**27,966**
	Swindon_Wiltshire	673	3,372	1,465	164	3,314	2,578	1,071	**12,637**
	Chippenham	887	1,612	19,825	2,561	2,780	6,641	1,954	**36,261**
	Trowbridge	1,205	158	3,463	11,911	252	4,976	893	**22,857**
	Swindon	142	2,761	1,390	85	32,405	6,475	3,821	**47,079**
	Near External	6,444	1,193	4,196	3,341	5,450	-	0	**20,624**
	External	2,407	679	1,474	634	2,312	-	0	**7,506**
	Total	**29,236**	**10,335**	**32,516**	**19,278**	**46,736**	**27,382**	**9,447**	**174,930**
ISM	Salisbury	15,496	772	1,414	1,417	1,447	5,554	2,926	**29,027**
	Swindon_Wiltshire	1,044	2,361	1,663	454	3,224	2,780	1,017	**12,542**
	Chippenham	2,156	1,670	15,872	2,826	3,679	6,758	1,838	**34,799**
	Trowbridge	2,119	443	2,791	10,041	1,273	4,566	691	**21,924**
	Swindon	2,221	3,723	4,104	1,325	24,854	8,371	3,396	**47,994**
	Near External	5,309	1,684	5,142	3,242	5,177	0	0	**20,554**
	External	1,475	834	2,229	509	3,043	0	0	**8,089**
	Total	**29,819**	**11,487**	**33,216**	**19,813**	**42,698**	**28,029**	**9,868**	**174,930**

Table 8-7 - HBW Trip Distribution; 2011 Census (Scaled) vs ISM 2018 – Bus

	HMA	Salisbury	Swindon_ Wiltshire	Chippenham	Trowbridge	Swindon	Near External	External	Total
Census 2011(Scaled)	Salisbury	1,380	15	25	12	9	177	46	**1,665**
	Swindon_Wiltshire	24	110	41	5	207	26	21	**434**
	Chippenham	32	34	459	57	80	155	32	**850**
	Trowbridge	26	2	65	287	5	71	21	**477**
	Swindon	20	190	43	3	4,278	212	278	**5,024**
	Near External	127	16	52	115	88	-	0	**398**
	External	86	19	34	29	130	-	0	**297**
	Total	**1,695**	**386**	**718**	**509**	**4,797**	**642**	**398**	**9,146**
ISM	Salisbury	468	136	101	36	744	42	0	**1,527**
	Swindon_Wiltshire	170	57	43	17	295	2	0	**585**
	Chippenham	186	65	343	33	343	29	0	**999**
	Trowbridge	121	44	62	206	319	1	0	**752**
	Swindon	681	111	103	88	3,491	18	0	**4,491**
	Near External	256	28	182	30	295	0	0	**791**
	External	0	0	0	0	0	0	0	**-**
	Total	**1,882**	**440**	**835**	**411**	**5,486**	**91**	**-**	**9,146**

Table 8-8 - HBW Trip Distribution; 2011 Census (Scaled) vs ISM 2018 – Rail

	HMA	Salisbury	Swindon_ Wiltshire	Chippenham	Trowbridge	Swindon	Near External	External	Total
Census 2011(Scaled)	Salisbury	307	2	2	16	4	254	689	**1,275**
	Swindon_Wiltshire	4	16	4	3	4	55	427	**513**
	Chippenham	8	6	67	20	186	643	593	**1,524**
	Trowbridge	46	1	39	199	37	879	289	**1,491**
	Swindon	3	8	39	6	86	287	657	**1,087**
	Near External	272	16	116	159	610	-	0	**1,173**
	External	196	29	81	69	571	-	0	**947**
	Total	**837**	**79**	**349**	**473**	**1,499**	**2,120**	**2,654**	**8,010**
ISM	Salisbury	13	0	21	89	2	229	1,044	**1,398**
	Swindon_Wiltshire	7	0	4	44	4	158	106	**323**
	Chippenham	125	0	12	50	688	480	473	**1,828**
	Trowbridge	176	24	4	1	509	446	629	**1,790**
	Swindon	0	0	80	241	0	748	284	**1,352**
	Near External	156	61	58	156	319	0	0	**751**
	External	301	5	89	119	55	0	0	**569**
	Total	**778**	**90**	**268**	**701**	**1,578**	**2,060**	**2,535**	**8,010**

Table 8-9 - HBW Trip Distribution; 2011 Census (Scaled) vs ISM 2018 – Cycle and Walk

	HMA	Salisbury	Swindon_ Wiltshire	Chippenham	Trowbridge	Swindon	Near External	External	Total
Census 2011(Scaled)	Salisbury	6,931	87	107	71	3	184	0	**7,382**
	Swindon_Wiltshire	88	1,749	135	23	93	50	0	**2,138**
	Chippenham	131	122	6,185	123	43	155	0	**6,759**
	Trowbridge	100	20	139	3,779	7	132	0	**4,177**
	Swindon	5	162	22	3	8,650	170	0	**9,011**
	Near External	214	48	126	126	123	-	0	**637**
	External	0	0	0	0	0	-	0	**-**
	Total	**7,468**	**2,186**	**6,715**	**4,125**	**8,919**	**690**	**-**	**30,104**
ISM	Salisbury	7,131	9	2	6	0	2	0	**7,149**
	Swindon_Wiltshire	56	2,305	15	0	115	1	0	**2,492**
	Chippenham	3	22	6,831	70	7	12	0	**6,945**
	Trowbridge	8	0	90	3,979	0	22	0	**4,099**
	Swindon	0	135	9	0	9,150	2	0	**9,295**
	Near External	15	3	45	54	9	0	0	**125**
	External	0	0	0	0	0	0	0	**-**
	Total	**7,213**	**2,474**	**6,991**	**4,108**	**9,280**	**38**	**-**	**30,104**

8.3. Trip length distributions

Another measure of whether the overall pattern of trips in the model matches observed data is to examine the distributions of trip lengths by purpose and mode. For this comparison, data from 2011 Census JTW was used as this was more suitable for HBW purpose than NTS. A close match is observed between the ISM and Census 2011 trip patterns for active modes. For car, there is broadly good parity (see Figure 8-1 to Figure 8-4) up to 35 miles but there are more trips in ISM for the 35-50 miles distance band .

For public transport, the profile of ISM is similar to the Census with the spikes taking place at the right distances. However, the Census shows more trips in the 3-10 miles range and less trips in the 25-50 mile range when compared to ISM. It is not uncommon to have such disparities that could be due to several simplifying assumptions (for example on the different fare structures) and given that ISM is itself a simplification of the full VDM responses. The fact that other metrics such as mode shares by sector correlates well to observed data and realism testing gave good results give some assurance that the model is robust.

8.4. Bus Patronage

Wiltshire Bus Service Improvement Plan (BSIP)-2021 provides the 2017-18 bus patronage as 9.89 million passengers which converted to an average daily patronage would be 31,903. This is a close match to the modelled number of bus trips in the ISM, which was 31,571.

Across the five P&R sites in Salisbury, there is car parking capacity for approximately 2,300 vehicles, but ridership figures indicate that there are only 1,436 daily return trips on bus services from these sites. This suggests an underutilisation of the Park and Ride sites (source: Salisbury Transport Strategy-2018). This is also a close match to the modelled number of bus trips in the ISM, which was 1,433.

8.5. Comparison with SATURN (Highway Model)

Table 8-10 presents a comparison of Car HBW distribution between Census 2011, BAU highway base model, and ISM at HMA level. Overall, it shows an acceptable match with intra sectoral trips in Swindon having a smaller share compared to the highway model and Census 2011.

Figure 8-1 - Trip Length Distribution Comparison for HBW – Car

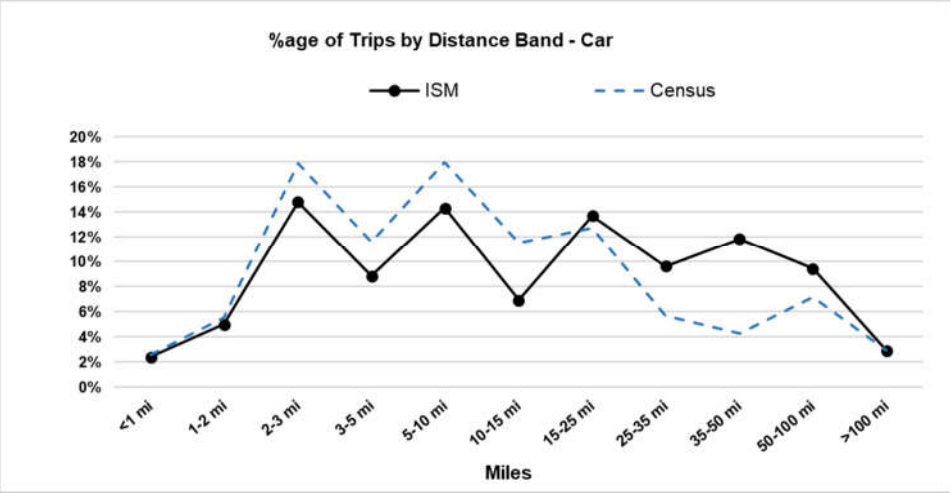


Figure 8-2 - Trip Length Distribution Comparison for HBW – PT

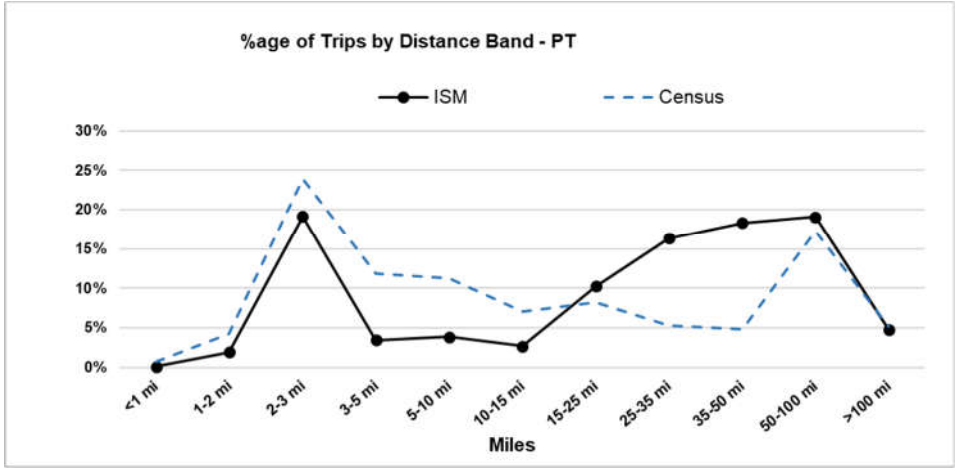


Figure 8-3 - Trip Length Distribution Comparison for HBW – Cycle

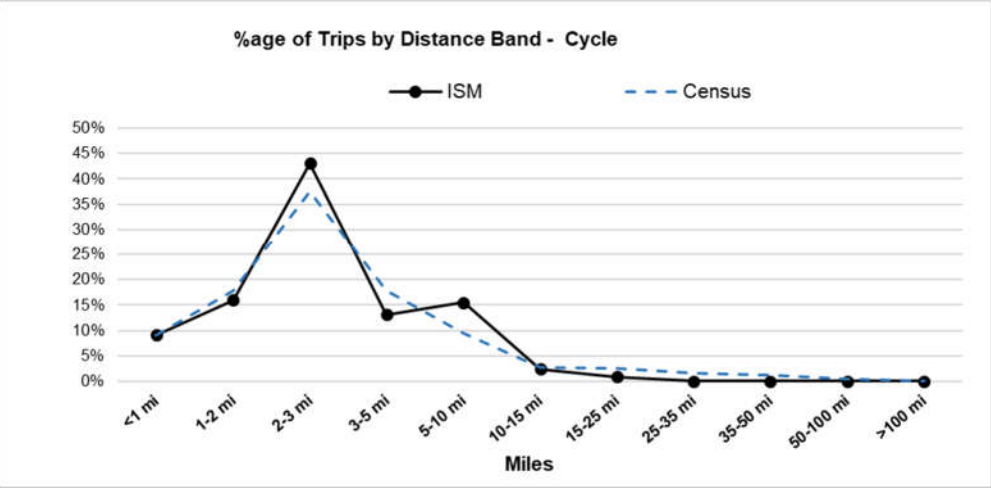


Figure 8-4 - Trip Length Distribution Comparison for HBW – Walk

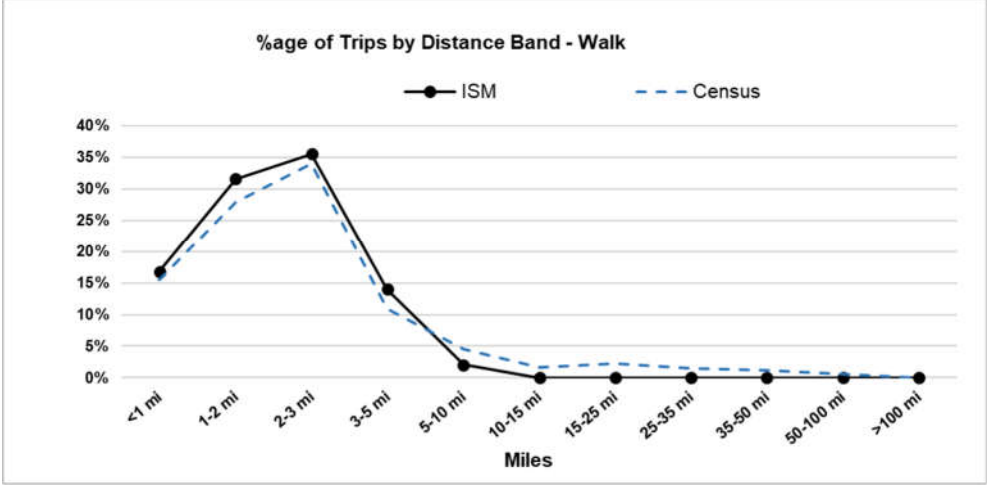


Table 8-10 – HBW Comparison: Census 2011, Saturn Car and ISM Car (% of Grand Total)

Data Source	HMA	Salisbury	Swindon Wiltshire	Chippenham	Trowbridge	Swindon	Near External	External	Total
Census JTW	Salisbury	10.0%	0.3%	0.4%	0.3%	0.1%	3.8%	1.0%	**16.0%**
	Swindon Wiltshire	0.4%	1.9%	0.8%	0.1%	1.9%	1.5%	0.6%	**7.2%**
	Chippenham	0.5%	0.9%	11.3%	1.5%	1.6%	3.8%	1.1%	**20.7%**
	Trowbridge	0.7%	0.1%	2.0%	6.8%	0.1%	2.8%	0.5%	**13.1%**
	Swindon	0.1%	1.6%	0.8%	0.0%	18.5%	3.7%	2.2%	**26.9%**
	Near External	3.7%	0.7%	2.4%	1.9%	3.1%	0.0%	0.0%	**11.8%**
	External	1.4%	0.4%	0.8%	0.4%	1.3%	0.0%	0.0%	**4.3%**
	Total	**16.7%**	**5.9%**	**18.6%**	**11.0%**	**26.7%**	**15.7%**	**5.4%**	**100.0%**
BAU Car HBW	Salisbury	9.9%	0.2%	0.3%	0.5%	0.1%	3.4%	0.4%	**14.7%**
	Swindon Wiltshire	0.2%	0.9%	0.8%	0.1%	2.2%	1.0%	0.2%	**5.3%**
	Chippenham	0.4%	0.8%	11.0%	2.0%	0.9%	3.2%	0.4%	**18.8%**
	Trowbridge	0.5%	0.1%	2.0%	5.6%	0.1%	2.1%	0.1%	**10.4%**
	Swindon	0.0%	2.1%	1.0%	0.1%	28.3%	3.0%	0.6%	**35.0%**
	Near External	3.5%	1.1%	3.7%	2.3%	3.4%	0.0%	0.0%	**14.0%**
	External	0.4%	0.2%	0.4%	0.1%	0.7%	0.0%	0.0%	**1.8%**
	Total	**14.8%**	**5.3%**	**19.1%**	**10.7%**	**35.6%**	**12.7%**	**1.7%**	**100.0%**
ISM Car HBW	Salisbury	8.9%	0.4%	0.8%	0.8%	0.8%	3.2%	1.7%	16.6%
	Swindon Wiltshire	0.6%	1.3%	1.0%	0.3%	1.8%	1.6%	0.6%	7.2%
	Chippenham	1.2%	1.0%	9.1%	1.6%	2.1%	3.9%	1.1%	19.9%
	Trowbridge	1.2%	0.3%	1.6%	5.7%	0.7%	2.6%	0.4%	12.5%
	Swindon	1.3%	2.1%	2.3%	0.8%	14.2%	4.8%	1.9%	27.4%
	Near External	3.0%	1.0%	2.9%	1.9%	3.0%	0.0%	0.0%	11.7%
	External	0.8%	0.5%	1.3%	0.3%	1.7%	0.0%	0.0%	4.6%
	Total	17.0%	6.6%	19.0%	11.3%	24.4%	16.0%	5.6%	100.0%

8.6. Realism tests

To check the response of the model to changes in input parameters and characteristics, three 'Realism Tests' were undertaken on the ISM in line with TAG [unit M2.1 chapter 6], and their results compared against recommended values.

These tests involve changing the cost or time characteristics within the model and determining the resulting change in output demand. The three tests performed were:

- Car fuel own-cost vehicle-km elasticity, where fuel cost is increased by 10%. Non-fuel vehicle operating costs are not changed;
- Public transport fare own-cost trip elasticity, where fares are increased by 10% (including bus, rail, and P&R fares); and
- Car own-travel time trip elasticity, where car in-vehicle time is increased by 10%.

TAG guidance (Unit M2-1, Section 6.4) suggests the following results should be achieved for all realism tests, which were used as a guide when calibrating the model:

- Car fuel cost responses: in the range -0.09 to -0.37, with employer's business trips near to -0.09, discretionary trips near to -0.4, and commuting and education somewhere near the average;
- Public transport fare responses: in the range -0.37 to -1.43, with lower values for non-discretionary purposes than discretionary purposes and bus fare responses in the range -0.4 to -1.48; and
- Car own-time responses: negative and smaller in magnitude than -2.0.

Table 8-11 shows the full elasticity results for all tests undertaken, across all purposes. The table shows generally good responses in the model to the three realism tests, all elasticities negative as expected. The Car Fuel responses show an all-purpose elasticity of -0.33, within recommended range of responses to a 10% fuel cost increase. In addition, the results by purpose show the expected variation by purpose, with less elastic responses in HBW, HBEB and NHBEB, and more elastic responses in discretionary purposes (HBO and NHBO).

The results of the PT fare response is also good, with the overall PT response across all purposes at -0.87, within the recommended range. The overall bus fare response is -0.81 falling between -0.7 to -0.9 range recommended by the DfT

Table 8-11 - Realism Test Results (Excluding External-External trips)

Purpose	Car Fuel Elasticity	Car Time Elasticity	PT Fare Components		PT Fare Elasticity (Combined result)
			Bus Fare Elasticity	Rail Fare Elasticity	
HBW	-0.18	-0.19	-0.62	-0.56	-0.60
HBEB	-0.09	-0.13	-0.79	-0.23	-0.56
HBEd	-0.32	-0.36	-0.38	-0.33	-0.38
HBO	-0.45	-0.28	-0.98	-1.72	-1.23
NHBEB	-0.15	-0.22	-0.65	-0.14	-0.35
NHBO	-0.39	-0.27	-0.84	-0.67	-0.79
All purpose	**-0.33**	**-0.25**	**-0.81**	**-0.98**	**-0.87**

Section 8 2018 ISM Base model calibration Summary

The ISM has been calibrated with the intention of producing a model that replicates observed mode shares and trip length distributions on a sectoral basis in a reasonable manner, shows matching observed trip distributions by mode, and produces the expected direction and reasonable magnitude of responses (elasticity) to changes in input parameters, such as fuel costs, public transport fares and highway journey times.

The most valuable source of information for assessing commuting patterns and mode shares produced by the ISM is 2011 Census JTW data.

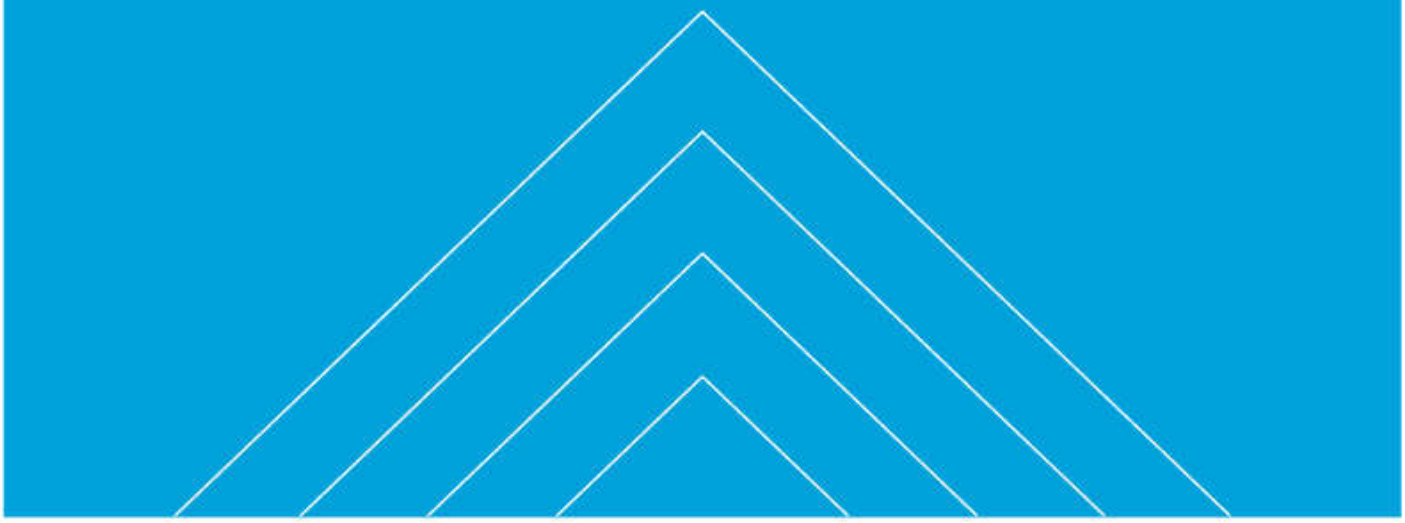
Comparison checks show a good match between modelled and observed production mode shares - at both an overall model level, and throughout the HMAs and external areas, suggesting the fundamental balance of trips across modes is reasonable and therefore that parameters and cost characteristics driving these results are likely to be accurate across trip purposes.

There is a good overall match between modelled and observed attraction mode shares. Results for the internal area is robust across modes but there are discrepancies in the distant external areas - the external area receives higher car trips and rail trips in the model compared to observed data. The distribution of modelled trips from production sector to sector was compared with observed Census JTW. It should be noted that the scale of geographical aggregation does not reflect active travel mode trips as these are primarily short distance and therefore intra-zonal.

The distribution of trip lengths by purpose and by mode was also undertaken. Overall, a close match was observed between the ISM and Census 2011 trip patterns

A series of three 'Realism Tests' were undertaken on the ISM and their results compared against recommended values. These generally returned good responses for the model.

Carbon Modelling



9. Carbon base and Business as Usual

9.1. Overview

The carbon baseline represents surface transport emissions within Wiltshire and is based primarily on:

- Detailed model data on the volume and type of traffic on the roads; and
- Emissions factors (grammes of carbon emitted per vehicle kilometre) by vehicle type and speed band.

Emissions estimates have been produced for the two modelled years of 2018 and 2036 and represent well to wheel carbon dioxide equivalent (CO_2e) emissions within Wiltshire's boundary.

The remainder of this section sets out:

- The data sources used for the 2018 base emissions estimate;
- The additional data sources used for the future Business as Usual estimates (for the Do Nothing (Core) scenario and the Do Minimum (DM2b) scenario);
- The calculation steps undertaken;
- An overview of the baseline emissions estimates produced: and
- The emissions gaps implied by the baseline emissions forecast.

Well to wheel, well to tank and tank to wheel emissions

Well to wheel (WTW) emissions include emissions associated with extracting, generating and transporting the fuel or energy to the vehicle (**well to tank, WTT**) as well as the emissions generated directly by vehicle use i.e. tailpipe emissions (**tank to wheel, TTW**). Many summaries of transport sector emissions focus on TTW emissions to avoid double counting (e.g. with the industrial sector of the emissions associated with diesel production). However, it is important to understand the WTT component to understand the full emissions impacts of travel, particularly for EVs which have no tail pipe (TTW) emissions. Well to wheel is consistent with the 'End user' definition of emissions used by BEIS in their local authority emissions statistics.

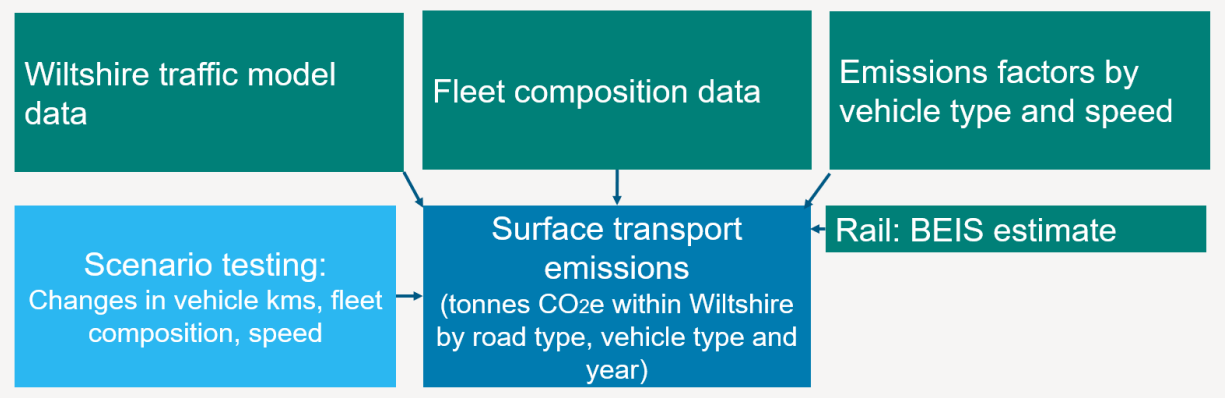
9.2. Data sources for 2018

Figure 9-1 provides a simple summary of the carbon calculator used to produce the carbon baseline estimates. The green boxes highlight the main inputs which fall in four main categories:

- Wiltshire traffic model data;
- Fleet composition data;
- Emissions factors; and
- BEIS rail emissions estimate.

Each input category is discussed in more detail in the following sections.

Figure 9-1 – Summary of carbon calculator



9.2.1. Wiltshire traffic model data

Traffic data for each modelled road link in the authority formed the primary input to the carbon calculations.

The key inputs were traffic flows, distances, and speeds by speed band (each band covering a range of 5 mph) for each vehicle type (car, LGV and HGV), for. each Wiltshire road link[8, 9] and for each modelled time period.

9.2.2. Fleet composition data

For the 2018 Base, fleet composition data (i.e. the proportions of vehicles by fuel / energy type) was taken from the DfT's Transport Analysis Guidance data book[10] (November 2021 version), which is also consistent with the assumptions used in the National Atmospheric Emissions Inventory (NAEI)).

9.2.3. Emissions factors

The emissions factors (in gCO2e/vehicle km) were derived from three key components:

- Estimates of fuel consumption/electricity use:
  - Tank to wheel energy consumption (in litres or kWh per vehicle km for each vehicle type in each speed band) using functions from the DfT TAG databook, which relate fuel consumption or electricity use to vehicle type, fuel type, speed, year, and distance of travel (also consistent with NAEI[11] (National Atmospheric Emission Inventory) and drawn from the European COPERT (Calculation Of Pollutant Emissions from Road Transport) emissions model.
    - The NAEI is compiled by the National Environmental Technology Centre on behalf of the Department for Environment, Food and Rural Affairs (DEFRA), it is the standard reference air emissions inventory for the UK and includes emission estimates for a wide range of important pollutants. These include: greenhouse gases, regional pollutants leading to acid deposition and photochemical pollution, persistent organic pollutants and other toxic pollutants such as heavy metals.
    - COPERT is a MS Windows-based software programme, financed by the European Environment Agency (EEA), developed to calculate air pollutant emissions from road transport.
- Carbon intensity factors to convert fuel and electricity consumption estimates to estimated emissions impacts - using kg CO_2e / litre of fuel from the DfT's TAG databook and kg $_{CO2e}$ / per kWh of electricity from the BEIS dataset[12, 13] (using domestic grid average intensity as recommended by BEIS for carbon

[8] DfT traffic count data. Available at: Map Road traffic statistics - Road traffic statistics (dft.gov.uk)
[9] Road length statistics (RDL) - GOV.UK (www.gov.uk)
[10] DfT (2021) Transport Analysis Guidance. Available at: Transport analysis guidance - GOV.UK (www.gov.uk)
[11] https://naei.beis.gov.uk/
[12] BEIS data tables to support the Treasury Green Book supplementary appraisal guidance on valuing energy use and greenhouse gas (GHG) emissions. Available at: https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal.
[13] Using domestic grid average intensity for the baseline rather than marginal intensity, which is recommended in the TAG databook to appraise changes in energy use.

baselining rather than marginal intensity which is recommended in the TAG databook to appraise changes in energy use).

- Well to tank uplift factor to apply to tank to wheel emissions from petrol, diesel, and electricity - using the uplift factors from BEIS Greenhouse Gas Conversion Factors[14].

9.2.4. Rail emissions estimate

The rail emissions estimate for 2018 was drawn directly from the BEIS Local Authority carbon emissions estimate for Wiltshire for 2018[15].

9.3. Data sources for 2036

The 2036 Business as Usual emissions estimates are calculated in the same way as the 2018 estimates, accounting for the two key variables influencing future transport emissions i.e.:

- Changes in the number of vehicle kilometres travelled by different categories of vehicles (cars, vans, goods vehicles, buses etc.), reflecting changes in trip numbers, trip lengths, and mode choice; and
- The composition of the fleet for each vehicle category (in terms of the proportions of vehicles of different sizes, efficiency, and fuel / energy source), determining emissions produced per kilometre travelled.

Forecast vehicle kilometres were obtained from the Business as Usual forecasts for 2036 for the Do Nothing Core scenario and Do Minimum 2b scenario as outlined in Chapters 3 and 4.

For fleet composition, three different baseline fleet scenarios were produced to reflect different assumptions regarding changes through time, in particular in relation to the uptake of zero emissions vehicles, as follows:

- Baseline - no national action scenario reflects the DfT TAG databook (November 2021) assumptions on slow, steady electrification of the fleet and improvement in efficiency. These assumptions are also consistent with the assumptions used in the NAEI. They do not account for Government action to ban petrol and diesel car and van sales (first in 2040 and then in 2030) and diesel HGV sales (in 2035 and 2040, dependent on size); and
- National fleet action scenarios reflect a view of the impact of the Government's sales bans for petrol and diesel vehicles. The scenarios are sequential to show the impacts of bans on different vehicle types:
  - National light vehicle fleet action – petrol / diesel car / van sales ban reflects the potential impact on uptake of electric vehicles of the national action to ban petrol and diesel car and van sales in 2030, as announced in November 2020. The fleet forecast is based on the Society of Motor Manufacturers and Traders (SMMT) Central Forecast published in June 2021[16]. The HGV fleet is assumed to remain as in the baseline, i.e. a fully diesel fleet with some efficiency improvements through time.
  - National fleet action - sales ban for all petrol / diesel vehicles. This scenario builds on the car / van sales ban to include a representation of the impact of the diesel HGV sales bans that were confirmed by Government in November 2021. The sales ban dates are 2040 for vehicles over 26 tonnes and 2035 for vehicles under 26 tonnes[17] and the scenario assumes that the uptake of Zero Emissions Vehicles (ZEV) in the HGV fleet will occur in line with the forecasts in the CCC's Sixth Carbon Budget Balanced Pathway[18],[19].

For all three fleet scenarios, the change in carbon intensity of electricity generated was derived from the BEIS projections, as used in the TAG databook.

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[14] Greenhouse gas reporting: conversion factors 2020 - GOV.UK (www.gov.uk)

[15] UK local authority and regional carbon dioxide emissions national statistics: 2005 to 2018 - GOV.UK (www.gov.uk)

[16] SMMT June 2021, New Car Market and Parc Outlook to 2035. Available at: SMMT new car market and parc outlook to 2035, by powertrain - SMMT. These forecasts were also sense checked against other sources including the National Grid Future Energy Scenarios and CCC 6th Carbon Budget report to ensure they represented mid-range forecasts

[17] DfT (2021) Consultation on when to phase out the sale of new, non-zero emission heavy goods vehicles. Available at: Heavy goods vehicles: ending the sale of new non-zero emission models - GOV.UK (www.gov.uk)

[18] CCC, 2020, Sixth Carbon Budget Dataset Sixth Carbon Budget - Climate Change Committee (theccc.org.uk)

[19] The CCC's estimate of the change in HGV fleet was used as it is the main forecast available for freight emissions. The forecast is likely to be at the optimistic end of the range in terms of the rate of reduction of HGV emissions (the equivalent forecast for cars/vans is more optimistic than the SMMT and other forecasts). It does, however, provide a reasonable indication of the pace of change and is of limited relevance as the effects are largely felt in the late 2030s and 2040s, whilst this analysis is more focussed on the 2020s and early 2030s.

Areas of uncertainty influencing future surface transport emissions

There are a number of areas of uncertainty in forecasting future transport emissions including:

- Levels of traffic demand;
- Rate of uptake of electric cars and vans;
- Future trends in purchase of SUVs and large cars;
- Rate of development and uptake of zero emissions HGVs; and
- Speed of decarbonisation of the electricity grid.

The data used for the baseline scenarios are intended to be central forecasts to provide a robust estimate. The calculations also allow for sensitivity testing as needed.

9.4. Data for emissions trajectory

To provide an emissions trajectory for comparison with target decarbonisation pathways, the modelled data for 2018 and 2036 was supplemented with estimates of traffic for the additional years of 2021, 2026, 2031, 2041, 2046, and 2050. These estimates were derived through interpolation and extrapolation of the data for the two modelled years, and informed by the DfT's Road Traffic Forecast 2018[20] which provides Reference Scenario traffic forecasts for the South West by road type and vehicle type.

The estimated traffic forecasts for these years were combined with relevant fleet composition and emissions factors to provide emissions estimates in each year.

[20] DfT (2018) Road Traffic Forecasts. Available at: Road traffic forecasts 2018 - GOV.UK (www.gov.uk)

9.5. Calculations

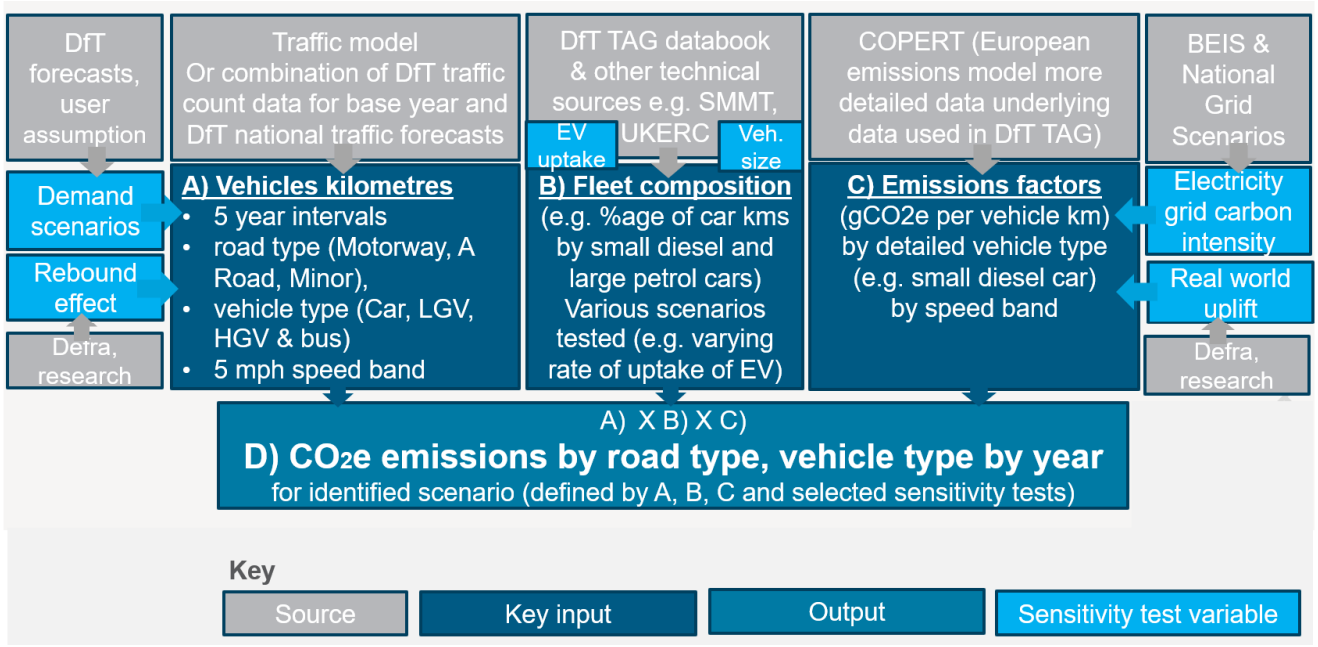
The calculations of emissions totals, for both years (2018 and 2036), involved the following steps:

1. Calculation of vehicle km travelled by road type, vehicle type (car, LGV, HGV), time period, and speed band (each band representing a 5 mph range);
2. Application of an uplift to allow for traffic on the minor roads that are not captured in the model, based on road length from OS Open Roads mapping layer and DfT Road Length statistics and average traffic counts for B roads, C roads, and unclassified roads for 2015 to 2018 in Wiltshire from DfT traffic count data;
3. Calculation of fuel consumption/electricity use for traffic within Wiltshire for 2018, for each vehicle type, each speed band, and each time period. The calculations used the TAG fuel consumption formulae which relate fuel consumption to vehicle type, fuel type, speed, year, and distance of travel;
4. Expansion of the fuel and electricity consumption estimates periods (in litres and kWh respectively) for the modelled time to represent:
   a. Full weeks - using the Wiltshire Traffic Model expansion factors; and
   b. Full years - on the assumption of 245 working days per year and the rest of the year being weekend days or bank holidays; and
5. Conversion of fuel and electricity consumption estimates to estimated emissions impacts by year using the DfT and BEIS carbon intensity factors (kg CO_2e / litre of fuel or kWh of electricity) by year.

Figure 9-2 provides a summary of the calculations in the carbon tool, it also highlights a number of sensitivities that have been built into the tool to allow scenario testing at a later date including:

- Electric vehicle uptake rates;
- Rebound effect (reflecting the tendency for people to drive more when costs are lower, for instance when driving EVs);
- Real world uplift for emissions (reflecting the fact that observed vehicle emissions in real life driving conditions are typically greater than the rates estimated in test conditions);
- Rate of decarbonisation of electricity provision.

Figure 9-2 – Summary of carbon calculations



9.6. Baseline emissions

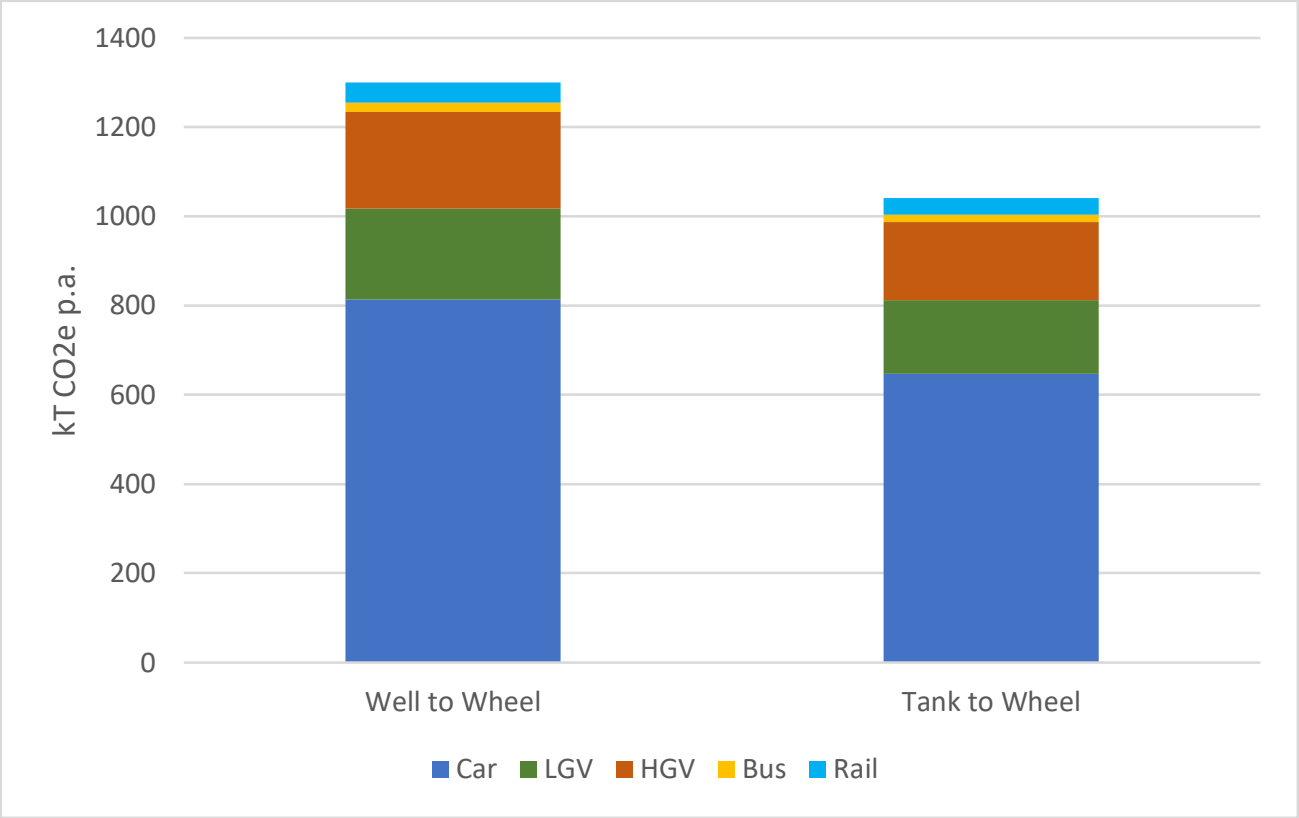
9.6.1. 2018 emissions

The estimated baseline transport emissions for 2018 are summarised in Figure 9-3, disaggregated by vehicle type and shown separately for tank to wheel and well to wheel emissions. Total estimated emissions are approximately 1300 kilotonnes (kT) p.a. (well to wheel), with the well to tank component accounting for about 20% of the total.

Cars are estimated to account for 63% of the 2018 emissions, followed by Heavy Goods Vehicles (HGVs) accounting for 16%, Light Goods Vehicles (LGVs) 15%, rail 4%, and buses 2%.

Of the road total, motorways account for just over 20%, A roads for just under 50%, and minor roads for just under 30% of total emissions

Figure 9-3 – Estimated surface transport emissions, Wiltshire, 2018 (kT CO_2e)



A sense check on the emissions estimate produced was undertaken, comparing the 2018 emissions estimate against the BEIS local authority road vehicle emissions estimate for Wiltshire for 2018[21]. The calculated figure for the county was just under 110% of the BEIS total. The differences are likely to be largely explained by minor differences in the process of estimating traffic totals and the distribution of traffic by speed band and in the Tank to Wheel to Well to Wheel conversion factor used.

To set the transport emissions in context, the BEIS Local Authority carbon estimates suggested that surface transport accounted for approximately 47% of the emissions within Wiltshire's boundaries in 2018, (or 38% of emissions assumed by BEIS to be within Local Authority control, i.e. excluding motorway and rail emissions for transport)[22].

[21] UK local authority and regional carbon dioxide emissions national statistics: 2005 to 2018 - GOV.UK (www.gov.uk)
[22] Ibid

9.6.2. Future business as usual emissions

Figure 9-4 shows forecast future emissions in the two Business as Usual scenarios: the Do Nothing (Core) and Do Minimum 2b scenarios, both shown for each of the three fleet baseline scenarios outlined in Section 9.3 above.

The three dotted lines in the figure relate to the Do Nothing traffic scenario. All three assume the same traffic growth based on the 2018 and 2036 modelled forecast growth extrapolated (and interpolated) using the DfT's National Traffic Forecasts 2018 Reference Case, which provides forecasts by road type and vehicle type for the South West. The three lines shown vary in terms of assumptions of how the vehicle fleet will change through time:

- The no national action scenario – shows the impacts of steady improvements in vehicle efficiency and some electrification of the fleet which offsets the forecast traffic growth to achieve a marked reduction in annual emission relative to 2020 throughout the time period; and
- The two national fleet action scenarios show the sequential impact of the Government's announced ban on the sale of petrol and diesel cars and vans in 2030 and HGVs in 2035 and 2040 (dependent on size). The bans have limited impact until the mid-2030s, but by the 2040s lead to a significant forecast reduction in vehicle emissions because of the increased electrification of the fleet.

The three solid lines in Figure 9-4 show the same three fleet baseline forecasts for the Do Minimum 2b traffic scenario. The comparison between the pairs of dotted and solid lines for each fleet forecast shows that the additional vehicle kilometres associated with the Local Plan allocation (in DM2b) add 2% to 3% to road transport emissions across the authority in each case (relative to the Do Nothing Core scenario).

Whilst this might be considered relatively modest as a percentage the figures below start to illustrate that even with national action on petrol/diesel engines that cars still contribute significantly towards surface transport emissions. Bearing this in mind mitigation against additional emissions from the Local Plan Growth can only have a positive wider reaching impact and directly contribute to the Wiltshire targets, particularly for 2036.

Figure 9-4 – Estimated future surface transport emissions in the Do Nothing (Core) and Do Minimum 2b scenarios in three baseline fleet scenarios, Wiltshire (kT CO_2e, indexed, 2020 = 100) DRAFT

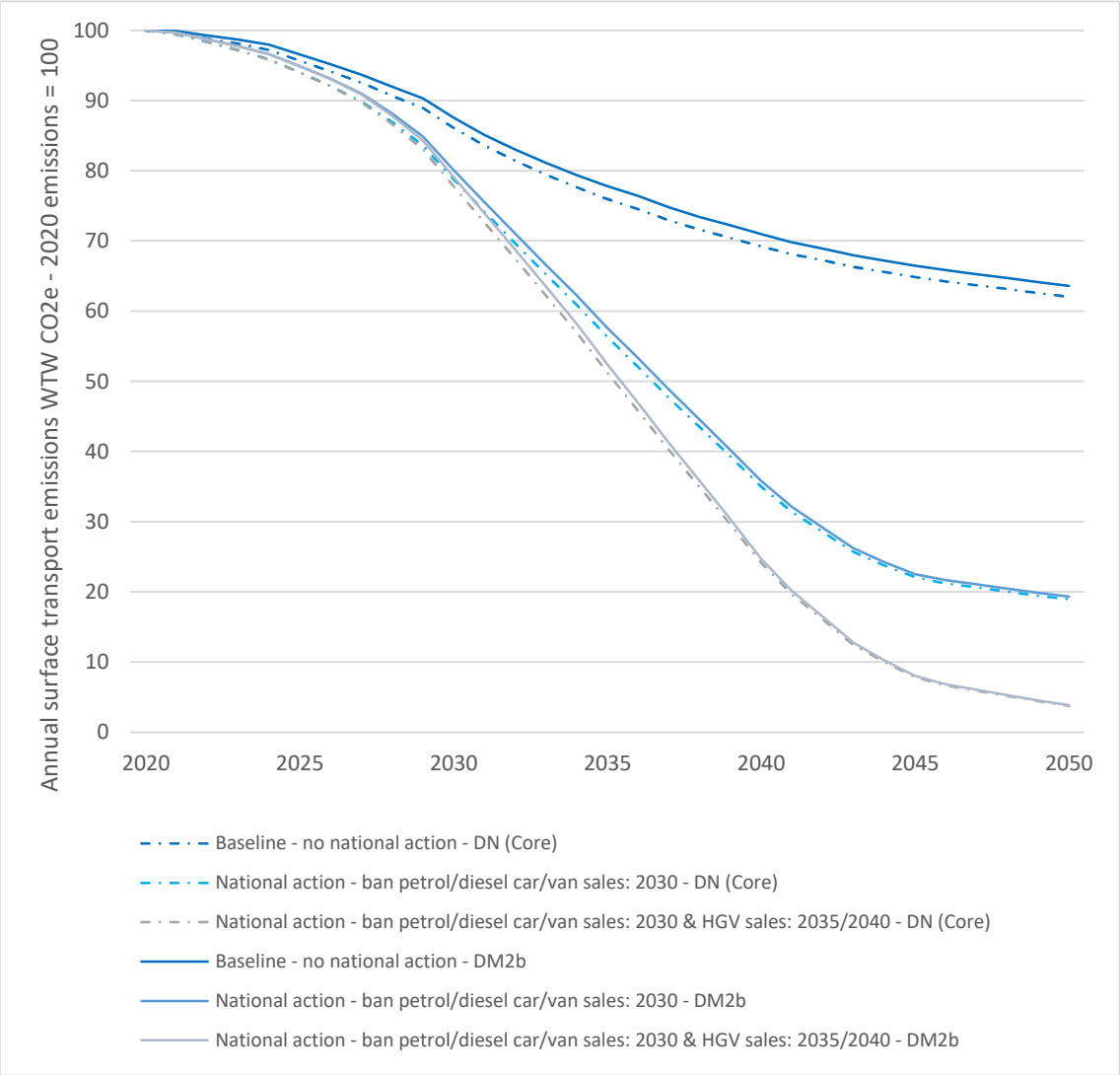


Figure 9-5 shows emissions in the Do Nothing (Core) scenario in the second national fleet action scenario (with sales bans for petrol/diesel cars, vans, and HGVs) disaggregated by vehicle type. Figure 9-6 shows the equivalent for the Do Minimum 2b scenario. Although emissions totals are 2% to 3% higher in the Do Minimum scenario throughout, the pattern shown is very similar to that for the Do Nothing. The balance between vehicle types varies to an extent through the time period as the car and van fleet are forecast to move to zero emissions vehicles more quickly than the HGV fleet, reducing their contribution to emissions. By the end of the time period all elements of the fleet are forecast to have largely switched to zero emissions vehicles such as electric vehicles, so the balance of the (much reduced) emissions between vehicle types is similar to 2018. The scenarios assume no decarbonisation of the rail sector, so rail accounts for an increasing proportion of emissions through time.

Figure 9-5 – Estimated future road surface transport emissions by vehicle type in Do Nothing (Core) national fleet action scenario, Wiltshire (kT CO_2e, indexed, 2020 = 100) DRAFT

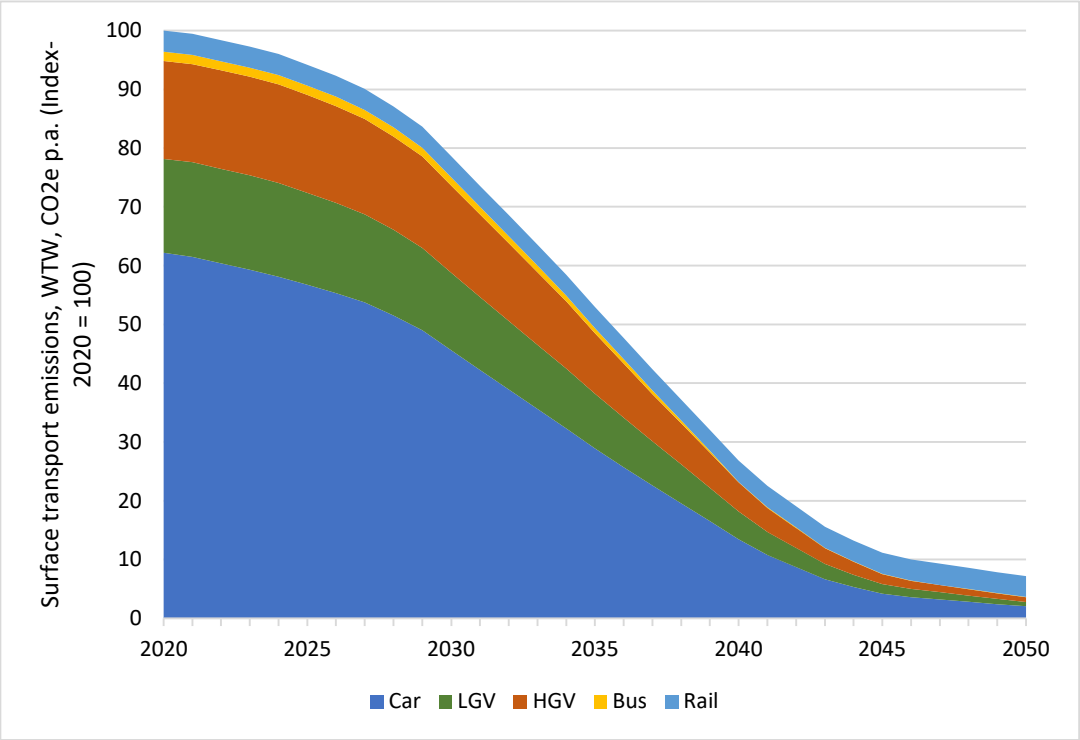
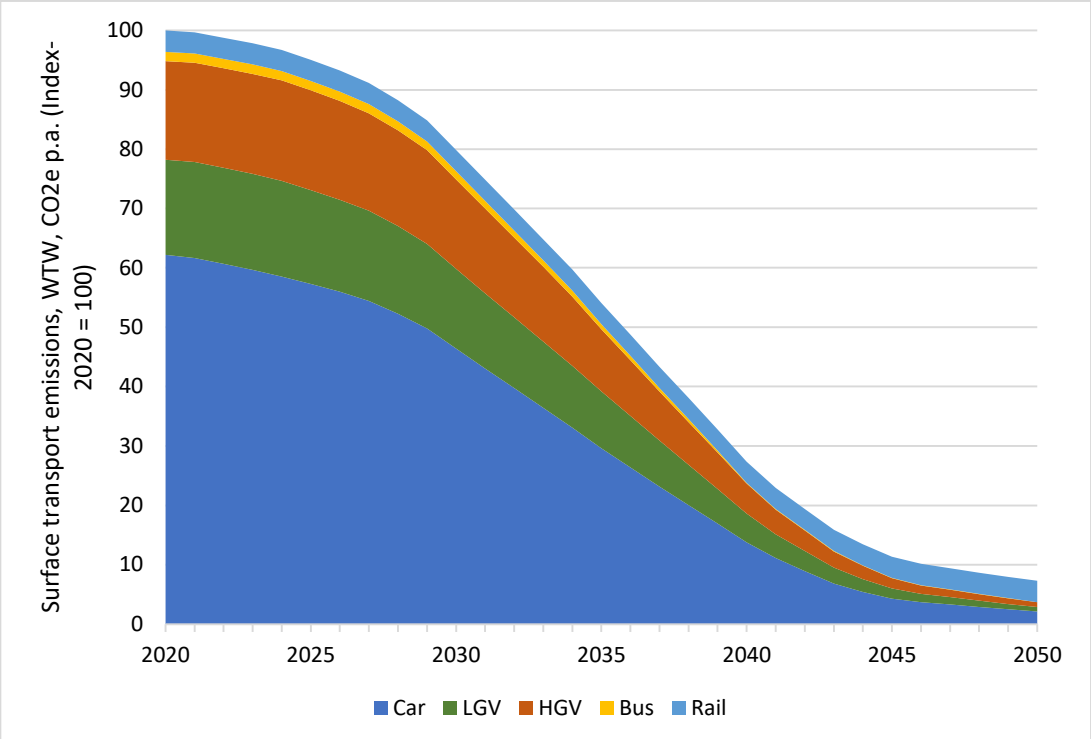


Figure 9-6 – Estimated future road surface transport emissions by vehicle type in Do Minimum 2b national fleet action scenario, Wiltshire (kT CO_2e, indexed, 2020 = 100) DRAFT

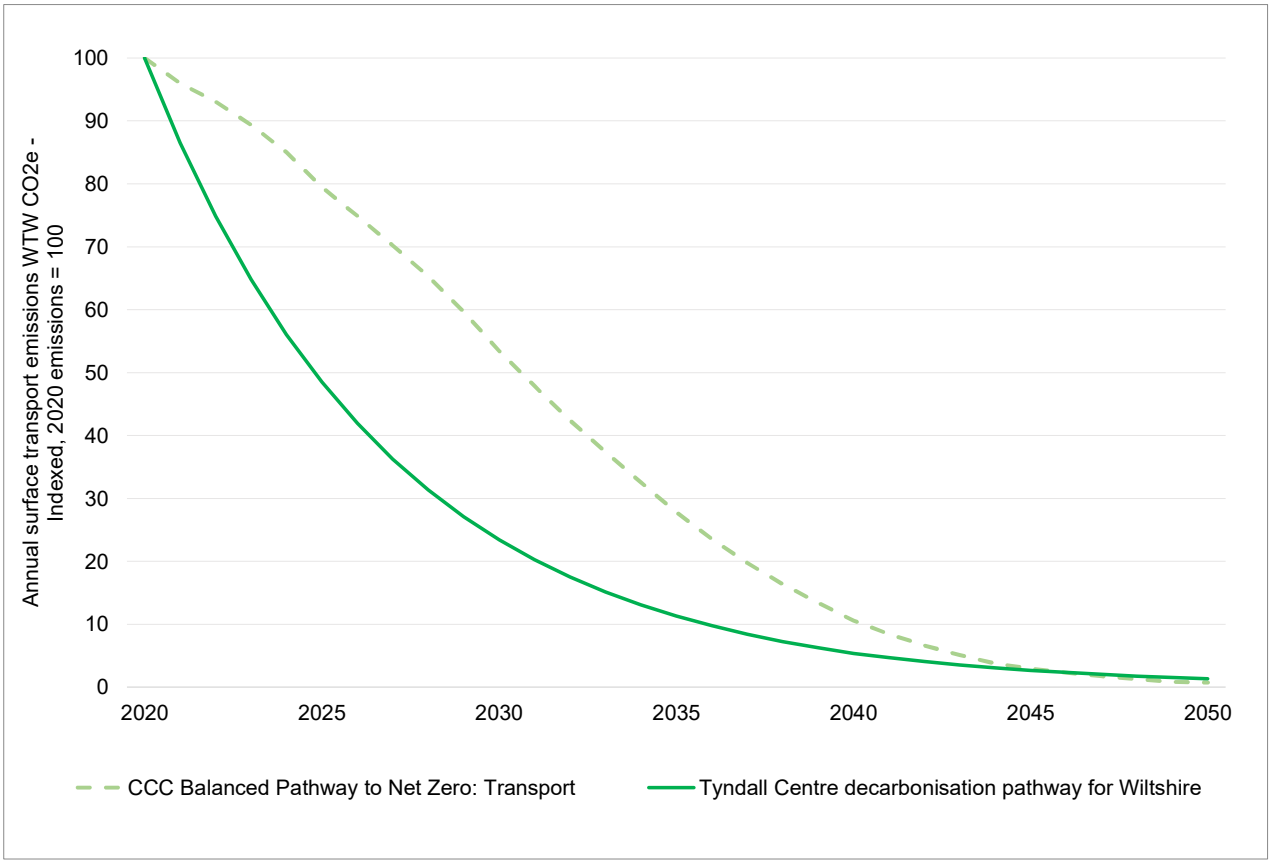


9.7. Emissions gap

Balancing the transport carbon implications of the Local Plan allocation would require a reduction of 2% to 3% in surface transport emissions across the authority. Whilst this target is relatively modest, it is important to see it in the context of the wider challenge faced by the transport sector in the authority (and nationally) in terms of the scale of emissions reductions that need to be achieved over the same time period in order to meet decarbonisation commitments at the local and national level.

Figure 9-7 shows two trajectories (decarbonisation pathways) that illustrate the scale of decarbonisation required over the decades to 2050.

Figure 9-7 – Target decarbonisation pathways for Wiltshire (kT CO_2e, indexed, 2020 = 100)



The first of these two trajectories, the dotted green line, shows the Balanced Pathway to Net Zero by 2050 from the Sixth Carbon Budget report, which was published by the Climate Change Committee (CCC) in December 2020[23]. It represents the surface transport component of the CCC's most recent view of a feasible and balanced pathway to achieving the UK's net zero and intermediate emissions reductions targets and budgets[24].

The solid green line shows the second and even more ambitious decarbonisation pathway, which represents the view of academic experts at the Tyndall Centre for Climate Change Research on the rate of decarbonisation required to stay within Wiltshire remaining carbon budget[25]. The budget covers all emitting sectors and reflects their estimate of Wiltshire's proportionate share of a remaining global budget of carbon emissions. The global budget has been estimated as the level that would limit cumulative global emissions enough to achieve a high probability of meeting the global target of limiting temperature increase to 1.5°C. The Tyndall Centre take a more stringent view than the CCC on the remaining budget allocated to countries such as the UK, after taking into account issues such as international equity and the need to avoid over

[23] Climate Change Committee (CCC) (2020) The Sixth Carbon Budget. Available at: Sixth Carbon Budget - Climate Change Committee (theccc.org.uk)

[24] Note that the CCC Balanced Pathway represents all sector emissions pathway and follows a similar path but with a slightly less steep reduction in emissions to 2040.

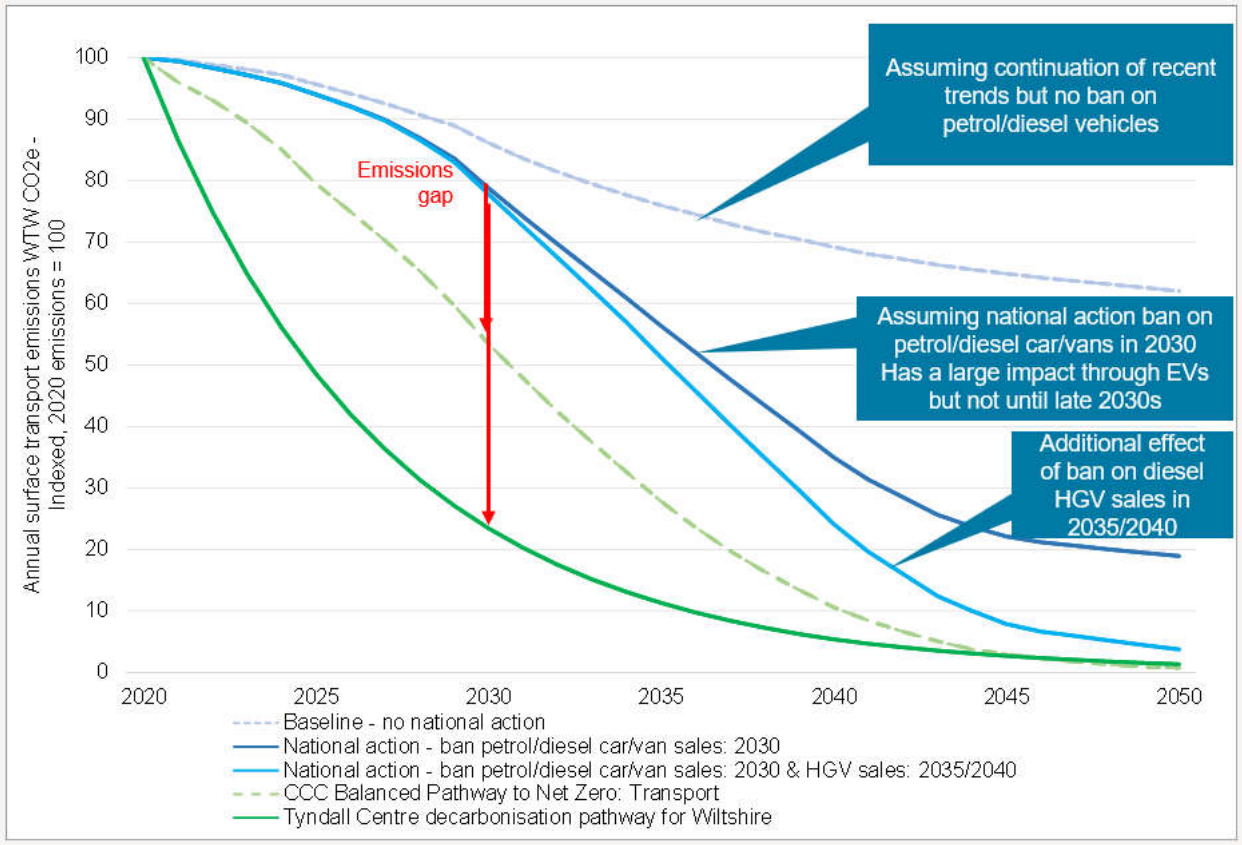
[25] Tyndall Centre for Climate Change Research (undated) Available at: Tyndall Carbon Budget Reports (manchester.ac.uk).

reliance on future carbon removals technology[26]. This leads to a lower budget for the UK requiring a more rapid decarbonisation pathway as shown in Figure 9-7.

The scale of emission reductions required to achieve each pathway is large. Even the less ambitious CCC pathway would require a 70% reduction in surface transport emissions between 2019 and 2035. Both pathways in Figure 9-7 therefore highlight the significant scale of the decarbonisation challenge faced in Wiltshire and nationally.

Figure 9-8 combines the forecast Do Nothing (Core) Business as Usual emissions from Figure 9-4 (blue lines) with the target decarbonisation pathways from Figure 9-7 (green lines).

Figure 9-8 – Illustrative emissions gap for Wiltshire for Do Nothing (Core) scenario



The comparison between the blue and green lines in Figure 9-8 highlights that, even with ambitious national action on moving to a zero emissions fleet (in the national fleet action scenario), a substantial gap remains between the projected emissions in the central national fleet action scenario and both the Tyndall Centre and CCC target pathways in the 2020s and 2030s.

The emissions gap is important because it represents additional emissions being released each year beyond the target emissions level, adding to the cumulative total of emissions released.

The cumulative emissions between now and 2050 will be the main driver of Wiltshire's contribution to climate change because carbon emissions (and other greenhouse gases) remain in the atmosphere for decades causing warming. Decarbonisation pathways and targets are specified on the basis of total 'budgets' or upper limits of cumulative emissions to 2050 that are identified by climate scientists to limit the risk of serious climate change. This means that the decarbonisation pathway followed and the rate of emissions reduction year-on-year will matter more in limiting climate change than meeting the Net Zero target date.

The emissions gaps (illustrated by the red arrows) therefore need to be closed if Wiltshire is to make its contribution to national carbon reduction targets. Reductions in emissions to balance the impact of the Local Plan allocation will need to be made in the context of this wider need for rapid decarbonisation, which will

[26] For instance: Anderson, K. et al. (2020) A factor of two: how the mitigation plans of 'climate progressive' nations fall far short of Paris-compliant pathways, Climate Policy. Vol 20.

inform the next Local Transport Plan.

Section 9 Carbon Summary

Estimates of surface transport emissions in Wiltshire have been made using information on vehicle kilometres by road type, vehicle type, and speed band from the Wiltshire Traffic Model and emissions factors per vehicle kilometre from the sources underlying the TAG databook.

Estimated emissions in 2018 are approximately 1300 kTonnes CO_2e, considering both tailpipe (Tank to Wheel) and upstream (Well to Tank) emissions, of which nearly -63% of the 2018 emissions, followed by Heavy Goods Vehicles (HGVs) accounting for 16%, Light Goods Vehicles (LGVs) 15%, 6% public transport (rail and bus). Motorways account for nearly 20% of road emissions, A roads for nearly 50%, and minor roads for approximately 30%.

Emissions are anticipated to reduce significantly through time as emissions reductions caused by forecast improvements in vehicle efficiency and transition of the fleet to electric vehicles and other zero emissions vehicles are forecast to offset traffic growth.

The additional vehicle kilometres associated with the Local Plan allocation (in Do Minimum 2b) are forecast to add 2% to 3% to emissions in the Do Nothing (Core) scenario. Measures to mitigate this increase in emissions will need to be set in the context of the wider challenge faced to rapidly reduce transport sector emissions across the authority to meet decarbonisation commitments.

There are a number of uncertainties in forecasting emissions (such as rate of change of the fleet and travel speeds and behaviour). However, forecasts clearly show that, even when the national commitments to ban the sales of petrol and diesel vehicles between 2030 and 2040 are accounted for, there remains a significant gap between the estimates of Business as Usual transport emissions in the authority and the decarbonisation pathways that need to be achieved to meet decarbonisation commitments, particularly in the 2020s and 2030s.

These gaps are important because it is the cumulative emissions between now and 2050 that will determine the scale of climate change rather than annual emissions in any given target year such as 2050. Measures will be needed to achieve rapid decarbonisation across Wiltshire. Additional vehicle kilometres and emissions associated with the Local Plan allocation will increase the scale of the challenge.

10. Summary and conclusions

10.1. Local Plan Overview

Wiltshire Council is in the process of developing a new Local Plan to set out the policies and strategies to demonstrate how growth in housing and employment will be accommodated across the county over the course of the new plan period. The extant Local Plan, adopted in 2015, covers a plan period to 2026. The new Local Plan will cover a plan period to 2038.

Consultation undertaken by Wiltshire Council in early 2021 identified that between 40,800 and 45,630 new dwellings and up to 26 hectares of employment land is required over the 18 year period to 2038. This growth will generate additional demands on the transport network; these additional demands will need to be mitigated, suppressed, or accommodated in the form of increased non-car mode share in order to limit adverse impacts resulting from forecast growth.

10.2. BAU Modelling

Business as Usual (BAU) is the transport network implications of planned Wiltshire housing and employment growth with no mitigation and no changes in how, where, or when people travel compared with the present – it represents a continuation of previous behaviour.

The 2018 Base Wiltshire Transport Model (utilised for the previous LPR assessment – based on data assumptions produced in 2020) was updated for the 2022 LPR transport evidence base to reflect latest housing and employment quantum and spatial allocations. The model covers the time periods: AM Peak Hour (0800-0900), Interpeak average (1000-1600), and PM Peak Hour (1700-1800). Two scenarios were modelled: 1) the 2036 Core - includes all Core Strategy growth and associated infrastructure but excludes prospective Local Plan growth, and 2) 2036 Do Minimum - which includes scenario 1, plus the prospective Local Plan growth up to 2038.

The 2036 Core scenario used TRICS trip rates to determine the Core Strategy growth and background NTEM growth assumptions to forecast the expected number of trips. The 2036 Do Minimum uses alternate scenario NTEM trip growth data.

Specific housing development locations, as supplied by Wiltshire Spatial Planning Service. Specific employment sites have not yet been identified and are not therefore considered as part of this assessment (the same approach as previously utilised for the 2020 LPR). It has been assumed that the proportion of employment growth by main settlement to the whole Wiltshire and Swindon regions is consistent with that for housing growth.

Since 2020, Local Plan site-specific locations for market towns have been allocated by Wiltshire Council, this includes the following locations: Amesbury, Bradford-on-Avon, Calne, Corsham, Devizes, Malmesbury, Marlborough, Royal Wootton Bassett, Tidworth and Ludgershall, Warminster and Westbury.

Trip distributions are assumed to remain consistent for each settlement, whether Principal or Market Town. This does not allow for changes in self-containment, internalisation, or attractions as a result of the Local Plan within the BAU Saturn modelling. The ISM has this functionality.

The 2022 LP represent an increase of + 14,965 households (7% increase) - compared to Core Strategy. This is a lower level of growth compared to the 2020 LP.

The 2022 model forecasts an additional 3,811 AM Peak Hour trips (+4% compared to the Core Strategy), 1,962 Interpeak trips (+2%), and 1,726 PM Peak Hour trips (+2%).

Highway modelling outputs indicate that the impact of the emerging 2022 LPR evidence base will be less than the 2020 LPR evidence base on the highway network, with each of the key roads identified experiencing reduced growth. The forecast impacts on highway capacity are mixed:

- In the Chippenham, Calne, Melksham area LP growth is likely to increase volume / capacity (V/C) above 85% or exacerbate links with high V/C on the A350 south of Chippenham, the A4 Bath Road, the A4 London Road through Calne, and the A350 at Melksham - this in line with 2020 LP results; however, the overall magnitude of change is reduced;
- In the Trowbridge, Westbury, Warminster area those links - such as A350 between Westbury and Warminster, the A350 east of Trowbridge, and the A361 - already experiencing high V/C percentages are forecast to see small increases of 1-2%; and

- In the Salisbury and Amesbury area the change in V/C is shown to be greater with 2022 LP growth than with 2020 LP growth, likely as a result of additional housing allocations for the Salisbury HMA (+2,840 dwellings compared to 2020 LP). In particular, the A354 approach to Harnham Junction is forecast for V/C to increase from 85% to 97%.
- In Royal Wootton Bassett there is an increase in V/C on Noe Marsh Road and at the Bincknoll Lane / Swindon Road (A3102) junction, both of which are already predicted to be operating close to capacity in the Core scenario.

10.3. ISM build and calibration

The ISM is the strategic, multi-modal, demand modelling capability of the project – linking demographic and land use data to see how changes in transport supply and demand in the county influence trip distributions and mode shares. This is something the highway-only WTM isn't capable of doing.

The ISM has been developed with 2018 as a base year and incorporates data from NTEM, Nomis Census, LLPG, DfT TAG Databook, the WTM, TRACC, and public data sources for car parking and public transport.

The modelled area consists of 4 HMAs - Swindon, Chippenham, Trowbridge and Salisbury, the Swindon HMA is divided in two - one representing Swindon HMA in Swindon LAD (which has no growth associated under the Wiltshire Local Plan) and one representing Swindon HMA in Wiltshire HMA - resulting in a total of 5 HMAs.

The geographic coverage of the model, and level of detail, is aligned with DfT TAG guidance, which advises a demand model is divided into an internal area - in which all travel demand is modelled - and an external area - in which only trips to / from the internal area are considered. A total of 60 geographic sectors, representing both internal and external areas have been adopted - 35 are internal, 17 near external, and eight external.

The ISM includes six trip purposes: Home-Based Work, Employers' Business, Education, Other and Non-Home-Based Employers' Business & Other, double the minimum recommended by DfT. Four main transport modes are included: car, public transport, walk, and cycle. Sub-mode choices between car modes (car-only versus Bus Park and Ride) and between public transport modes (Bus, Rail, and Rail Park and Ride) are also included.

Travel mode choice within the ISM is informed by generalised journey time and cost formulations.

In developing the 2018 base model, the following data was collected:

- Transport demand: dwellings, population, workers, in and out commuters, employment, public transport patronage; and
- Transport supply: highway cost skims, public transport cost skims, active mode cost skims, Park and Ride cost details.

Data was sourced from: NTEM, the WTM, DfT TAG, Nomis labour market statistics, TRACC (active mode cost skims), MiPermit Portal (Wiltshire parking data), 2011 Census, ORR station usage estimates, LLPG, and the National Travel Survey.

Population data trends, by HMA, across NTEM and Nomis data was cross-checked. Nomis data was normalised to match NTEM population levels in 2011 but thereafter maintain Nomis growth rates for 2011-2020. There was a close match between NTEM and Nomis trends over the period 2011-2018, continued into 2020.

Nomis and NTEM data shows increases in total population in all HMAs in 2018 with 5.3% and 4.4% growth respectively in the study area. The population growth within Wiltshire district (i.e. excluding Swindon) based on LLPG data is high - at 7.1% compared with Nomis at 5.0% and NTEM at 3.9%. As the NTEM dataset for 2018 is an estimate a detailed check was undertaken of the population estimates against LLPG and Nomis (ONS) statistics. The adjusted population is comparable to NTEM 2018 estimates.

2018 Base Year Travel Demand was derived from a range of sources to create a set of trip ends (productions and attractions) for each sector pairing in the model. The productions were built up primarily from estimates of population and dwellings using data from NTEM, Nomis, and LLPG. Attractions are also primarily built up from NTEM data; as the ISM is singly-constrained, jobs act as attraction weights rather than absolute constraints.

The 'cost' of movement in 2018 was developed, by travel mode, as follows:

- Car costs, including travel distance, travel time and any incurred tolls - extracted directly from the WTM for three peak time periods;
- Parking costs - collected from the MiPermit online portal, Swindon and Wiltshire Council websites with parking utilisation data obtained from cabinet papers related to the 2014-2015 parking review reports;
  - Parking charges for Bus Park and Ride sites and railway stations collated separately from online sources;
- Values of Time and Vehicle Operating Costs applied in the ISM were extracted from TAG Databook for the base year;
- Non-car costs extracted from TRACC for 2018 at MSOA level and converted to sector level using: weighted average based on origin MSOA population for walk and cycle, Census JTW for bus, and ORR station entries and exits for rail;
  - Bus fares obtained through a distance-based regression equation developed for another study in a neighbouring district;
  - Rail fares obtained for current year and adjusted to base year 2018 based on RPI; and
  - Park and Ride (rail and bus) developed by combining 1) car leg costs from car GJT, excluding normal (i.e., public) parking charges, 2) parking leg utilising parking costs relating to bus P&R sites / rail stations, and 3) public transport leg - using costs from bus or rail GJT minus access / egress time, as it is expected a person parks at a P&R site / station and hence access / egress times are near zero.

Sense checks were undertaken on processed skims and are closely aligned to Google Maps and rail and bus speeds do not vary significantly between OD pairs:

- Comparison of Highway Distance, Walk and Cycle Distance and time skims vs. Google Maps data; and
- Sense check of Rail and Bus speeds between sector OD pairs.

10.3.1. Model calibration and realism

The ISM has been calibrated with the intention of producing a model that replicates observed mode shares and trip length distributions on a sectoral basis in a reasonable manner, shows a good level of matching observed trip distributions by mode, and produces the expected direction and reasonable magnitude of responses to changes in input parameters, such as fuel costs.

The most valuable source of information for assessing commuting patterns and mode shares produced by the ISM is 2011 Census JTW data.

Comparison checks show a good match between modelled and observed production mode shares - at both an overall model level, and throughout the HMAs and external areas, suggesting the fundamental balance of trips across modes is reasonable and therefore that parameters and cost characteristics driving these balances are likely to be accurate across purposes.

There is a good overall match between modelled and observed attraction mode shares. The internal area is strong across modes but there are discrepancies in the external areas - the external area receives higher car trips and rail trips in the model compared to observed data. The distribution of modelled trips from production sector to sector was compared with observed Census JTW. It should be noted that the scale of geographical aggregation does not particularly well reflect active travel mode trips as these are primarily short distance and therefore intra-zonal.

The distribution of trip lengths by purpose and by mode shows a close match between the ISM and Census 2011 trip patterns

A series of three 'Realism Tests' on the ISM generally returned good responses for the model compared against recommended values.

10.3.2. Suitability and purpose of model

The ISM, following review, cross-checks, and ‘reality checks’ is deemed fit for purpose in the context of the 2022 LPR – facilitating multi-modal variable demand assessment of decarbonisation interventions developed to meet the scenario outcomes Wiltshire have set in relation to employment and housing growth in the county.

The model will enable fast, transparent, and cost-effective assessment of interventions – enabling Atkins and Wiltshire Council to understand whether interventions are effective in reaching the required future outcomes.

10.4. Carbon

Estimates of surface transport emissions in Wiltshire have been made using information on vehicle kilometres by road type, vehicle type, and speed band from the Wiltshire Traffic Model and emissions factors per vehicle kilometre from the sources underlying the TAG databook.

Estimated emissions in 2018 are approximately 1300 kTonnes CO2e, considering both tailpipe (Tank to Wheel) and upstream (Well to Tank) emissions, of which nearly 65% are estimated to be generated by car travel, 17% by HGVs, 16% by LGVs, and approximately 5% by public transport (rail and bus). Motorways account for nearly 20% of road emissions, A roads for nearly 50%, and minor roads for approximately 30%.

Emissions are anticipated to reduce significantly through time as emissions reductions caused by forecast improvements in vehicle efficiency and transition of the fleet to electric vehicles and other zero emissions vehicles are forecast to offset traffic growth.

There are a number of uncertainties in forecasting emissions (such as rate of change of the fleet and travel speeds and behaviour). However, forecasts clearly show that, even when the national commitments to ban the sales of petrol and diesel vehicles between 2030 and 2040 are accounted for, there remains a significant gap between the estimates of baseline emissions and the decarbonisation pathways that need to be achieved to meet decarbonisation commitments, particularly in the 2020s and 2030s.

These gaps are important because it is the cumulative emissions between now and 2050 that will determine the scale of climate change rather than annual emissions in any given target year such as 2050.

10.5. Conclusions

Based on data reviewed and analysed to date, and model development and testing work undertaken, Atkins are in a position – once Wiltshire's outcome scenarios are re-confirmed – to commence the next phase of the project: scenario testing.

10.6. Next steps

The next steps of the project are:

1. Gateway review activities; and
2. Commence Phase 3 of the LPR.

We anticipate that tasks and activities for item one – gateway review – will include:

- Reviewing the BAU findings / results with Wiltshire, responding to any queries, and agreeing the outputs of this phase of the LPR;
- Discuss and agree with Wiltshire the list of scenario levers developed to meet decarbonisation objectives; and
- Discuss and finalise the outcomes with Wiltshire, e.g. 100% Net Zero Carbon LP growth by 20XX, to determine if these have shifted from those within the scope.

An overview of item two - Phase 3 tasks of the LPR scope - is presented below:

- Scenario testing – utilising the ISM and Carbon Model;
- Iterative testing with update reports on alignment of intervention levers with Wiltshire's desired outcomes; with levers and their application amended if required;
- Localised impact assessments;
- Determining interventions required; and
- Development of mitigation measures.

Appendix A. Uncertainty Log

A.1. Developments

Model Sector	Development site name	Planning Permission	No. of dwellings (2018 onwards)	Non-resi land use	Employment (ha)	Uncertainty Category	Completion Date	Included in the model?
Rural Central	Land at Kingston Farm	W/13/00643/FUL	150	Mixed Use	3	Near Certain	2020	Yes
Calne	Land east of Beversbrook Farm	-	0	Mixed Use	3.2	Reasonably foreseeable	Unknown	No
Chipp Rural	East of Farrells Field	-	30	-	-	Near Certain	2026	Yes
Chippenham	Birds Marsh	N/12/00560/OUT	750	A1, B1, B2, B8	2.7	Near Certain	2027	Yes
Chippenham	Rawlings Green	15/12351/OUT	250	-	-	More than likely	2027	Yes
Chippenham	Rowden Park	14/12118/OUT	1000	-	-	More than likely	2030	Yes
Chippenham	Hunters Moon	16/12493/FUL	450	B1, B2, B8	2.3	More than likely	2027	Yes
Melksham	Land North of Sandridge Common	17/01096/REM	100	-	-	More than likely	2022	Yes
Melksham	Land East of Spa Road	14/10461/OUT	450	-	-	More than likely	2025	Yes
Melksham	Land East of Semington Road	17/10416/VAR	150	-	-	More than likely	2023	Yes
Melksham	Land South of Western Way	16/01123/OUT	235	-	-	More than likely	2025	Yes
Rural Central	Hawkeridge Business Park Land	14/03118/OUT	0	Mixed Use	14.7	More than likely	2030	Yes

Model Sector	Development site name	Planning Permission	No. of dwellings (2018 onwards)	Non-resi land use	Employment (ha)	Uncertainty Category	Completion Date	Included in the model?
	North and South of Mill Lane Hawkeridge Westbury BA13 4LD							
Rural Central	North Acre Industrial Estate	-	0	Mixed Use	3.8	Reasonably foreseeable	Unknown	No
Trowbridge	Elizabeth Way	-	355	-	-	More than likely	2028	Yes
Trowbridge	West Ashton Road	W/11/01663/REM	0	B1, B2, B8	10	Reasonably foreseeable	Unknown	No
Trowbridge	Elm Grove Farm	-	250	-	-	More than likely	2025	Yes
Trowbridge	Ashton Park Urban Extension	15/04736/OUT	2600	A1-A5, B1, B2, B8, C2,C3, D1	10	More than likely	2037	Yes
Trowbridge	Land off A363 at White Horse Business Park	-	150	-	-	More than likely	2024	Yes
Trowbridge	Southwick Court	-	180	-	-	More than likely	2025	Yes
Trowbridge	Church Lane	-	45	-	-	More than likely	2022	Yes
Trowbridge	Upper Studley	-	20	-	-	More than likely	2024	Yes
Westbury	Land at Station Road	17/12194/REM	300	-	-	Near Certain	2028	Yes
Westbury	Off B3098, adjacent to Court Orchard /	-	35	-	-	More than likely	2022	Yes

Model Sector	Development site name	Planning Permission	No. of dwellings (2018 onwards)	Non-resi land use	Employment (ha)	Uncertainty Category	Completion Date	Included in the model?
	Cassways Braton							
SE Wilts	Drummond Park Depot	E/11/0001/OUT	475	-	-	More than likely	2026	Yes
SE Wilts	North of Tidworth Road	K/042723/O	0	Commercial	12	Reasonably foreseeable	Unknown	No
SE Wilts	Ludgershall	15/02770/FUL	246	-	-	Near Certain	2024	Yes
SE Wilts	Ludgershall Garden Centre Granby Gardens	E/2013/0234/OUT	181	-	-	More than likely	2021	Yes
SE Wilts	Riverbourne Fields, Tidworth	-	311	-	-	Near Certain	2020	Yes
SE Wilts	Riverbourne Fields	14/05389/VAR	289	-	-	Near Certain	2016	No
SE Wilts	Larkhill	-	444	-	-	Near Certain	2024	Yes
SE Wilts	Bulford	-	227	-	-	Near Certain	2024	Yes
SE Wilts	Land immediately to the south and west of Archers Gate	15/02530/OUT	400	-	-	Near Certain	2027	Yes
SE Wilts	Kings Gate	-	1300	-	-	Near Certain	2027	Yes
SE Wilts	Fuggleston e	S/2012/0814	1250	Commercial	0.08	Near Certain	2027	Yes
SE Wilts	Hampton Park	S/2009/1943	500	-	-	Near Certain	2018	Yes
SE Wilts	Longhedge	13/00673/OU	673	Commercial	0.08	Near Certain	2021	Yes
SE Wilts	UKLF	S/2011/0517	450	Commercial	0.03	Near Certain	2021	Yes

Model Sector	Development site name	Planning Permission	No. of dwellings (2018 onwards)	Non-resi land use	Employment (ha)	Uncertainty Category	Completion Date	Included in the model?
SE Wilts	Netherhampton Road	-	640	-	-	More than likely	2027	Yes
SE Wilts	Churchfields & Engine Sheds	-	1100	-	-	Reasonably foreseeable	2036	No
SE Wilts	Central Car Park	-	200	Commercial	0.04	Reasonably foreseeable	2024	No
SE Wilts	Erskine	13/04870/OUT	292	-	-	Near Certain	2021	Yes
Swindon	Central Swindon	-	3000	A1, A2 & B1a	14.37	Near Certain	2021	Yes
Swindon	Wichelstowe	S/13/1524	3178	B1, A1,A2,A3	7.34	Near Certain	2021	Yes
Swindon	Commonhead	S/10/0842	890	B1 and/or B2, A1	13.28	Near Certain	2021	Yes
Swindon	NEV	-	8270	B1a, B1b/c or B2, B8, A1	41.2	Near Certain	2021	Yes
Swindon	Tadpole Farm	S/11/1588	1695	B1 and/or B2, A1	5.1	Near Certain	2021	Yes
Swindon	Kingsdown	-	1650	A1	0.1	Near Certain	2021	Yes
Swindon	Highworth (Blackworth Industrial Estate)	-	200	B8	5	Near Certain	2021	Yes
Swindon	Wroughton	S/03/1887	179	-	-	Near Certain	2021	Yes
Swindon	Delta 300	S/08/1897	0	B8	0.5	Near Certain	2021	No
Swindon	Edison Rd, Dorcan	S/15/1024 and S/OUT/17/0069	1	C2	0.6	Near Certain	2021	No
Swindon	Penny Ln, Drakes Way	S/06/0968	0	B1	0.6	Near Certain	2021	No
Swindon	Europa/Britania	S/07/1828	0	Manufacturing	0.06	Near Certain	2021	No

Model Sector	Development site name	Planning Permission	No. of dwellings (2018 onwards)	Non-resi land use	Employment (ha)	Uncertainty Category	Completion Date	Included in the model?
Swindon	Adjacent to Abbey Stadium	-	0	Office – business park	4	Near Certain	2021	No
Swindon	Hilmead (excluding planning application 17/0507 zone - 2056)	-	0	Light industrial	7.9	Near Certain	2021	No
Swindon	Keypoint - K3	S/10/1780	0	Distribution/ office	2.6	Near Certain	2021	No
Swindon	Rivermead	-	0	Light industrial	1.3	Near Certain	2021	No
Swindon	Site 10a - South Marston Park	S/06/0054	0	Office	0.6	Near Certain	2021	No
Swindon	Site 10b - South Marston Park	S/03/0860	0	B2.B8.B1	0.5	Near Certain	2021	No
Swindon	Site 4 - South Marston Park	-	0	Light industrial	0.7	Near Certain	2021	No
Swindon	G - Park (remainder)	-	0	Large Distribution	15.25	Near Certain	2021	No
Swindon	Plot 9 Windmill Hill (allocation)	S/11/1624	0	Office	2.38	Near Certain	2021	No
Swindon	Hreod Burna North	S/09/2196	273	-	-	Near Certain	2021	No
Swindon	Okus Industrial Estate, Okus Road	-	26	-	-	Near Certain	2021	No
Swindon	GWR Sports Ground, Shrivenham Rd	-	201	-	-	Near Certain	2021	No

Model Sector	Development site name	Planning Permission	No. of dwellings (2018 onwards)	Non-resi land use	Employment (ha)	Uncertainty Category	Completion Date	Included in the model?
Swindon	Tilley's Lane West, Lower Stratton	-	55	-	-	Near Certain	2021	No
Swindon	Westlea Police Station, Shaw Road	S/06/0054	70	-	-	Near Certain	2021	No
Swindon	Bampton's, Stratton Road	S/OUT/15/0377	61	-	-	Near Certain	2021	No
Swindon	Tilley's Lane Industrial Estate	-	37	-	-	Near Certain	2021	No
Swindon	Tilley's Lane East	-	37	-	-	Near Certain	2021	No
Swindon	Ferndale Road/Norman Road	-	34	-	-	Near Certain	2021	No
Swindon	East Side of Highworth Road	-	32	-	-	Near Certain	2021	No
Swindon	Locarno Ballroom, The Square, Old Town	S/TIME/11/1272	115	A3/A4	0.12	Near Certain	2021	No
Swindon	Ridgeway School, Inverary Road, Wroughton	-	60	-	-	Near Certain	2021	No
Swindon	South of Kiln Lane, Swindon	S/15/2014 and S/02/3792	32	-	-	Near Certain	2021	No
Swindon	Pipers Way (Burmah Castrol)	S/05/1720	616	-	-	Near Certain	2021	No
Swindon	83 Ermin Street Blunsdon	S/13/0364	57	-	-	Near Certain	2021	No

Model Sector	Development site name	Planning Permission	No. of dwellings (2018 onwards)	Non-resi land use	Employment (ha)	Uncertainty Category	Completion Date	Included in the model?
Swindon	89, 91, 93 Ermin Street Blunsdon	S/17/0458	15	-	-	Near Certain	2021	No
Swindon	99 Ermin Street Blunsdon (Hills)	S/13/1223	61	-	-	Near Certain	2021	No
Swindon	Land North of Ermin Street and High Street Blunsdon (Linden Homes).	14/1304	69	-	-	Near Certain	2021	No
Swindon	Land off High Street Blunsdon	S/OUT/16/2034	52	-	-	Near Certain	2021	No
Swindon	Abbey Farm	14/0080	350	A1, D1	1.9	Near Certain	2021	No
Swindon	Abbey Stadium	S/RES/16/0272	100	-	-	Near Certain	2021	No
Swindon	Triangle site, Lady lane	15/1025	52	-	-	Near Certain	2021	No
Swindon	Land north of Latham land	17/0211	0	B1a	0.3	Near Certain	2021	No
Swindon	Holdcroft Broadbush	S/17/0528	54	-	-	Near Certain	2021	No
Swindon	Swindon Gateway North	S/16/0505	0	A1	0.07	Near Certain	2021	No
Swindon	Market House, Market Square (Tented Market)	17/0673	101	A1/A3	0.1	Near Certain	2021	No
Swindon	Aspen House	17/0665	118	A	0.06	Near Certain	2021	No
Swindon	Burderop Park	17/0128	79	-	-	Near Certain	2021	No

Model Sector	Development site name	Planning Permission	No. of dwellings (2018 onwards)	Non-resi land use	Employment (ha)	Uncertainty Category	Completion Date	Included in the model?
	(former ch2m)							
Swindon	Hillmead Drive	17/0507	0	B2, B1, B8	0.67	Near Certain	2021	No
Swindon	Croft Road Business Village	-	0	A2, B1	0.2271	More than likely	2021	No
Swindon	North Star - circa 1,000 homes + strategic leisure facility	-	1000	D2	16	Near Certain	2021	No
Swindon	Land Adjacent To 160 Croft Road	S/OUT/17/0882	62	-	-	Near Certain	2021	No
Swindon	Blagrove Service Station	-	102	-	-	Near Certain	2021	No
Swindon	Berkeley Farm	S/RES/17/0635	100	-	-	Near Certain	2021	No
Swindon	Abbey Stadium 2	s/12/1826	121	-	-	Near Certain	2021	No
Swindon	The Plantation Broad Bush Blunsdon	-	70	-	-	Near Certain	2021	No
Swindon	Grove Farm, Tadpole Lane, Swindon	-	250	-	-	Near Certain	2021	No
Swindon	Tented Market Site, Market Street, Swindon TC	-	0	-	-	Near Certain	2021	No
Swindon	Falcon House, Debenhams Building,	-	70	-	-	Near Certain	2021	No

Model Sector	Development site name	Planning Permission	No. of dwellings (2018 onwards)	Non-resi land use	Employment (ha)	Uncertainty Category	Completion Date	Included in the model?
	Swindon TC							
Swindon	Railway Station regeneration	-	250	-	-	Near Certain	2021	No
Swindon	Brunel Centre	-	370	-	-	Near Certain	2021	No
Swindon	Newburn Sidings	-	100	-	-	Near Certain	2021	No
Swindon	Hill Cottage Blunsdon Hill	S/OUT/17/1032	0	-	-	Near Certain	2021	No
Devizes	Underhill Nursery, Market Lavington	-	50	-	-	Hypothetical	Unknown	No
Warminster	East of the Dene	-	100	-	-	Hypothetical	Unknown	No
Warminster	Bore Hill Farm	-	70	-	-	More than likely	2023	Yes
Malmesbury	Ridgeway Farm, Crudewell	-	50	-	-	Hypothetical	Unknown	No
SE Wilts	Land at Rowbarrow	-	100	-	-	More than likely	2023	Yes
Chippenham	Langley Park	16/04269/FUL	0	A1	0.0174	Near Certain	Unknown	Yes
Chippenham	Langley Park - Additional	16/03515/OUT	400	A1, A3, C1, C3	1.3656	More than likely	2026	Yes
Chipp Rural	Land South-East of Junction 17 of M4	17/03417/OUT	0	B8	9.290304	More than likely	Unknown	Yes
Chippenham	Hullavington Airfield	18/08271/OUT	0	B1	4.415	Reasonably foreseeable	Unknown	No
Chippenham	Land at Hungerdown Lane	17/09445/FUL	35	A1	Unknown	Near Certain	Unknown	Yes

Model Sector	Development site name	Planning Permission	No. of dwellings (2018 onwards)	Non-resi land use	Employment (ha)	Uncertainty Category	Completion Date	Included in the model?
Chippenham	Land at Showell Farm	N/13/00308/OUT	0	B1 (a), (b) & (c), B2, B8	5	More than likely	2036	Yes
Chippenham	Forest Farm	15/11153/OUT	200	B1	Unknown	Hypothetical	Unknown	No
Chippenham	Land at Patterdown Road	16/09277/OUT	72	-	-	More than likely	2022	Yes
Chippenham	Riverside	15/12363/OUT	1500	A1, A2, A3, A4, B1, B2, C2, C3, D1, D2	5	Hypothetical	Unknown	No
Devizes	Lay Wood	15/12095/REM	220	-	-	Near Certain	2021	Yes
Devizes	Land at Quakers Road	15/01388/OUT	123	-	-	More than likely	2022	Yes
Chipp Rural	Land west of Salisbury Road	15/02026/OUT	175	C1	-	Near Certain	2023	Yes
SE Wilts	Land at Empress Way	E/2013/0234/OUT	270	-	-	More than likely	2025	Yes
Melksham	Former George Ward School	14/11295/REM	261	-	-	Near Certain	2020	Yes
Corsham	Land at Bradford Road	16/09292/REM	170	-	-	More than likely	2020	Yes
Corsham	Land north of Bath Road	13/05188/OUT	130	-	-	Reasonably foreseeable	2025	No
Westbury	Land at The Mead	14/10977/REM	220	-	-	Near Certain	2020	Yes
Westbury	Land north of Bitham Park	14/09262/OUT	300	-	-	More than likely	2024	Yes
Calne	Land at Prince Charles Drive	14/11179/OUT	130	-	-	More than likely	2021	Yes

Model Sector	Development site name	Planning Permission	No. of dwellings (2018 onwards)	Non-resi land use	Employment (ha)	Uncertainty Category	Completion Date	Included in the model?
Calne	Land off Abberd Lane	15/05254/REM	124	-	-	Near Certain	2019	Yes
Calne	Land to east of Oxford Road	16/07209/VAR	200	-	-	More than likely	2022	Yes
Calne	Land north of Low Lane	17/00679/OUT	165	A1	-	More than likely	2023	Yes
Malmesbury	Land to south of Filands	15/05015/REM	180	-	-	Near Certain	2020	Yes
Malmesbury	Backbridge Farm	-	170	-	-	More than likely	2023	Yes
Warminster	West of Warminster urban extension	Various	1550	A1-A5, B1, B2, B8	6	Near Certain	2033	Yes
Swindon	Ridgeway Farm	-	700	D1	-	Near Certain	2021	Yes
Devizes	Land to the north of Marshall Road, Devizes, Wiltshire	16/12285/OUT	50	-	-	More than likely	2028	No
SE Wilts	Land off Firs Road, Alderbury, Wiltshire	17/04001/OUT	50	-	-	Near Certain	2026	No
SE Wilts	Harnham Park, Netherhampton Road, Salisbury, SP2 8PF	18/04067/OUT	82	-	-	Near Certain	2028	No
SE Wilts	Land to the East of A345 and West of Old Sarum Salisbury Wiltshire SP4 6BW	19/00537/FUL	65	-	-	Near Certain	2022	No

Model Sector	Development site name	Planning Permission	No. of dwellings (2018 onwards)	Non-resi land use	Employment (ha)	Uncertainty Category	Completion Date	Included in the model?
Westbury	Land at Westbury Sailing Lake Station Road Westbury Wiltshire	17/01314/VAR	300	-	-	Near Certain	2028	No
Malmesbury	Land at Burton Hill Burton Hill Malmesbury Wiltshire	16/11603/OUT	59	-	-	Near Certain	2028	No
Corsham	Land South of Bradford Road Rudloe	17/01661/VAR	88	-	-	Near Certain	2021	No
Warminster	Land north of Grovelands Way Warminster BA12 8TB	17/05360/OUT	130	-	-	Near Certain	2029	Yes
Malmesbury	Land south of Filands Malmesbury	19/11569/OUT	71	-	-	Near Certain	2022	No
North of Royal Wootton Bassett	Land at Pound Farm South View Lyneham Wiltshire	20/02387/OUT	50	-	-	Near Certain	2022	No
Corsham	"Land south of Westwells Road, Neston,							
Corsham"	18/09884/OUT	81	-	-	Near Certain	2022	No	
SE Wilts	E V Naish Ltd Crow Lane Wilton Salisbury Wiltshire	16/07192/FUL	62	-	-	Near Certain	2025	No

Model Sector	Development site name	Planning Permission	No. of dwellings (2018 onwards)	Non-resi land use	Employment (ha)	Uncertainty Category	Completion Date	Included in the model?
SE Wilts	UK House Complex including 79 and 89 Endless Street Castle Street Salisbury Wiltshire	17/03957/FUL	91	-	-	Near Certain	2021	No
SE Wilts	Land Adjoining the Old Manor Hospital Wilton Road Salisbury Wiltshire	16/12244/FUL	56	-	-	Near Certain	2022	No
SE Wilts	Land at Hillbrush Company Ltd Woodlands Road Mere	17/00047/VAR	59	-	-	Near Certain	2021	No
SE Wilts	Land Adjoining the Old Manor Hospital Wilton Road Salisbury Wiltshire	16/10838/FUL	51	-	-	Near Certain	2023	No
SE Wilts	141 Castle Street, Salisbury, SP1 3TB	18/12068/FUL	66	-	-	Near Certain	2022	No
Trowbridge	Ex West Wiltshire District Council Offices Bradley Road Trowbridge Wiltshire	17/05669/FUL	79	-	-	Near Certain	2022	No

Model Sector	Development site name	Planning Permission	No. of dwellings (2018 onwards)	Non-resi land use	Employment (ha)	Uncertainty Category	Completion Date	Included in the model?
Westbury	Westbury and District Hospital The Butts Westbury BA13 3EL	17/05669/FUL	56	-	-	Near Certain	2022	No
Trowbridge	The Pavilions White Horse Business Park Windsor Road Trowbridge Wiltshire	17/05497/PNCOU	104	-	-	Near Certain	2025	Yes
Chippenham	Former Wiltshire College Cocklebury Road Chippenham Wiltshire	17/05828/FUL	140	-	-	Near Certain	2025	Yes
Calne	Land at Silver Street Calne Wiltshire	16/04124/FUL	154	-	-	Near Certain	2025	Yes
SE Wilts	Land Adjacent to High Post Business Park	PL/2021/11914	-	E(g), B2, B8, Sui Generis	1.2744	Reasonably foreseeable	Unknown	No
SE Wilts	Land north of Tidworth Road, Ludgershall (Castledown Business park)	K/042723/O	-	B1, B2, B8	10	Reasonably foreseeable	Unknown	No
SE Wilts	Land Adjacent to Dead Maid Quarry Industrial Estate, Mere	20/03877/REM	-	B1, B8	1	More than likely	2030	Yes

Model Sector	Development site name	Planning Permission	No. of dwellings (2018 onwards)	Non-resi land use	Employment (ha)	Uncertainty Category	Completion Date	Included in the model?
Westbury	Hawkeridge Business Park Land North and South of Mill Lane Hawkeridge Westbury BA13 4LD	14/03118/OUT	-	B1, B2, B8	14	More than likely	2030	No
Devizes	Land at Horton Road, Devizes	PL/2021/08425	-	B2, B8, E(G 1-3)	7	Reasonably foreseeable	Unknown	No

A.2. Infrastructure

Area	Transportation intervention/name	Source / Link	Description of the intervention	Estimated opening year	Uncertainty Category	Included in the model?
Melksham	A350 Farmers Roundabout Improvements	A350 Melksham Bypass - Traffic and Economics Assessment Report	Signalisation introduced at the roundabout which will be linked to traffic signals at the Asda entrance and A365 junction. Alterations to entry traffic lanes and circulatory carriage.	2019	Near Certain	Yes
Trowbridge	A350 Yarnbrook and West Ashton Relief Road	A350 Melksham Bypass - Traffic and Economics Assessment Report	Construction of 2.5km of new carriageway, conversion of West Ashton signals into three-arm junction, stopping up the existing A350 and construction of three new roundabouts.	2021	Near Certain	Yes

Area	Transportation intervention/name	Source / Link	Description of the intervention	Estimated opening year	Uncertainty Category	Included in the model?
Chippenham	A350 Chippenham Phase 3 - Bypass Improvements	A350 Melksham Bypass - Traffic and Economics Assessment Report	Widening of the A350 to dual two-lane between Cepen Park South and Chequers roundabout, additional widening for approximately 250m north of Cepen Park South roundabout and 250m south of Chequers roundabout, widening of A4 approach and exit to Chequers roundabout, widening of the A350 to dual two-lane between Badge and Brook roundabout.	2018	Near Certain	Yes
Chippenham	A350 Chippenham Phase 1 - Malmesbury Road Roundabout Amendments	A350 Melksham Bypass - Traffic and Economics Assessment Report	Increased capacity and signalisation of Malmesbury Road roundabout.	-	Near Certain	Yes
Chippenham	M4 J17 Improvements	A350 Melksham Bypass - Traffic and Economics Assessment Report	Signalisation of the two M4 slip road arms to the roundabout and the corresponding circulatory carriageway.	-	Near Certain	Yes
Chippenham	A350 Chippenham Phase 2 - Bypass Improvements	A350 Melksham Bypass - Traffic and Economics Assessment Report	Upgrade the existing two-lane A350 Chippenham Bypass to dual two-lane standard between Bumpers Farm	-	Near Certain	Yes

Area	Transportation intervention/name	Source / Link	Description of the intervention	Estimated opening year	Uncertainty Category	Included in the model?
			Roundabout and Brook Roundabout			
Badbury Wick	M4 J15 Improvements	A303 Stonehenge - Amesbury to Berwick Down	Upgrading capacity and changing layout of gyratory at J15 (Swindon East). £4.5m 3rd party scheme required to accommodate nearby urban extension of Swindon at Commonhead. Additional lane on gyratory, additional lane on A419 southbound approach, and dedicated turning lane onto eastbound M4 slip. Enhanced £8.7m scheme with additional improvements to approach roads the subject of bid for Highways England HGF.	2020	More than likely	Yes
New Eastern Villages	Nythe Road / Oxford Road	CH2M_2017_NEV Masterplan	The proposed junction would consist of two 3.25m wide lane approach in both directions, with cycling facilities and a bus stop. (See source page for details)	2036	Near Certain	No
New Eastern Villages	A419 White Hart Junction Improvements	Atkins Designs	Proposes to widen the existing circulatory	2021	Near Certain	Yes

Area	Transportation intervention/name	Source / Link	Description of the intervention	Estimated opening year	Uncertainty Category	Included in the model?
			carriageway on White Hart roundabout to three lanes around the whole roundabout. Closes two links leading in to the roundabout, including Merlin Way and Ermin Street and introduce two new links, the first off-slip from A419 northbound and the second a slip road leading onto the A419 northbound. (See source page for details)			
New Eastern Villages	Gablecross	Atkins Designs	Removing the existing roundabout arrangements and implement a large signalised 4 arm junction. (See source page for details)	2021	Near Certain	Yes
New Eastern Villages	(Gablecross) Police Station Access	CH2M_2017_NEV Masterplan	Situated off the A420 east of Gablecross junction. At present there are no facilities for vehicles to turn right into the police station access for the A420 east (westbound). (See source	2021	Near Certain	No

Area	Transportation intervention/name	Source / Link	Description of the intervention	Estimated opening year	Uncertainty Category	Included in the model?
			page for details)			
New Eastern Villages	Old Vicarage Lane / A420	CH2M_2017_NEV Masterplan	Widen the existing priority junction and introduce signal control. The junction would be widened to allow two lanes in either direction on the A420 to be introduced. (See source page for details)	2036	Near Certain	No
New Eastern Villages	New Eastern Villages Eastern Access	Estimated Design	Flared approach to each of the New Eastern Villages access in both directions on the A420 and signalization of the Western and Eastern access junctions. (See source page for details)	2036	Near Certain	Yes
New Eastern Villages	Southern Connector Road (SCR)	CH2M_2017_NEV Masterplan	The different test variants have different priority movements associated with the SCR. (See source page for details)	2021	Near Certain	Yes
New Eastern Villages	Southern Connector Road (SCR) - with SCR movements having priority	CH2M_2017_NEV Masterplan	The different test variants have different priority movements associated with the SCR. (See source page for details)	2021	Near Certain	No

Area	Transportation intervention/name	Source / Link	Description of the intervention	Estimated opening year	Uncertainty Category	Included in the model?
New Eastern Villages	SCR junction with Wanborough Road to provide straight through movements only	CH2M_2017_NEV Masterplan	The different test variants have different priority movements associated with the SCR. (See source page for details)	2021	Near Certain	No
New Eastern Villages	SCR junction with Wanborough Road to provide Wanborough Road northbound traffic left turn access to SCR and SCR northbound traffic right turn access to Wanborough Road	CH2M_2017_NEV Masterplan	The different test variants have different priority movements associated with the SCR. (See source page for details)	2021	Near Certain	No
New Eastern Villages	SCR junction with Wanborough Road to provide all turning movements	CH2M_2017_NEV Masterplan	The different test variants have different priority movements associated with the SCR. (See source page for details)	2021	Near Certain	No
New Eastern Villages	Great stall bridge to accommodate Public Transport, cyclists, and pedestrian movements only	CH2M_2017_NEV Masterplan	Provide a link between Merlin Way to the west of the A419 and the New Eastern Villages site to the east. In some test variants the bridge is only open to public transport and non-motorised users, which would have two lanes. (See source page)	2036	Near Certain	No

Area	Transportation intervention/name	Source / Link	Description of the intervention	Estimated opening year	Uncertainty Category	Included in the model?
New Eastern Villages	Great stall bridge to accommodate all traffic movements	CH2M_2017_NEV Masterplan	Provide a link between Merlin Way to the west of the A419 and the New Eastern Villages site to the east. (See source page)	-	Hypothetical	No
New Eastern Villages	Improvements to the Covingham Road/Dorcan Way transport corridors;	SLP	Roadway improvements	2036	Near Certain	No
New Eastern Villages	A new road link under the Bristol to London railway line connecting the development north and south at Rowborough;	SLP	Roadway improvements	2036	Near Certain	No
New Eastern Villages	1000 (3ha.) space Park and Ride site	SLP	Park and Ride site	2021-26	Reasonably foreseeable	No
New Eastern Villages	NEV QBC	Rapid Transit programme	Package of measures to support bus services from NEV to the town centre	2020	Reasonably foreseeable	No
Central Swindon	Whalebridge from the east	SLP	Junction Enhancement	Unknown	Near Certain	No
Central Swindon	Groundwell Road/Victoria Road from the south and east	SLP	Junction Enhancement	Unknown	Near Certain	No
Central Swindon	Whitehouse Roundabout	SLP	Junction Enhancement	Unknown	Near Certain	No
Central Swindon	Westcott Place	SLP	Junction Enhancement	Unknown	Near Certain	No
Central Swindon	1000 space car park	SLP	To the north of the railway line	2021-26	Reasonably foreseeable	No

Area	Transportation intervention/name	Source / Link	Description of the intervention	Estimated opening year	Uncertainty Category	Included in the model?
Central Swindon	Swindon Bus Exchange	LGF scheme	New Bus Station facility at western end of Fleming Way.	2020	Near Certain	No
Central Swindon	Kimmerfields Phase 2 Car Park	TC Regen Scheme	New car park on the Kimmerfields site. Approx. 450 spaces.	2036	Near Certain	No
Central Swindon	Fleming Way re-modelling	TC Regen Scheme	Alteration to Fleming Way layout including removal of subway at The Parade and creation of two way bus route closed to general traffic.	2020	Near certain	No
Central Swindon	Swindon Station Regeneration	One Public Estate programme	Re-development of Swindon Railway Station to provide enhanced passenger and operational capacity, improved transport interchange for bus, taxi and cycle, new Multi-storey Car Park at North Star, and new bridge / tunnel crossing of the railway.	2021-26	Hypothetical	No
Central Swindon	Regent Circus Bus Lane	Rapid Transit programme	Bus lane at Regents Circus to Princes Street	2018	Near Certain	No
Wichelstowe	Express bus link to Swindon Town Centre and additional public transport	SLP	Public Transport links	Unknown	Reasonably foreseeable	No

Area	Transportation intervention/name	Source / Link	Description of the intervention	Estimated opening year	Uncertainty Category	Included in the model?
	links within the site;					
Wichelstowe	Walking and cycle links to Swindon's existing communities and the wider countryside	SLP	Walking and Cycling links	Unknown	Reasonably foreseeable	No
Wichelstowe	Link to Junction 16 of the M4	SLP	New road linking Wichelstowe to M4 J16 including new crossing of the M4.	2022	More than likely	Yes
Wichelstowe	Link from Croft Road to Hay Lane	SLP	Internal road layout linking to the above.	2022	Near Certain	Yes
Wichelstowe	Park and Ride site	SLP	Park and Ride site	Unknown	Reasonably foreseeable	No
Commonhead	Public transport links to Swindon Town Centre	SLP	Public Transport links	Unknown	Reasonably foreseeable	No
Commonhead	Walking and cycle links to Swindon's existing communities, Coate Water Country Park and Great Western Hospital	SLP	Walking and Cycling links	Unknown	Reasonably foreseeable	No
Commonhead	Access to the site from Marlborough Road	SLP	Access	Already complete	Near Certain	No
Coate	Coatewater Junction	-	-	2021	Near Certain	No
Tadpole Farm	Contributions towards mitigation on the highway network;	SLP	Highway network mitigations	-	Hypothetical	No

Area	Transportation intervention/name	Source / Link	Description of the intervention	Estimated opening year	Uncertainty Category	Included in the model?
Tadpole Farm	Access routes from Tadpole Lane and a new route north	SLP	Vehicular access routes from Tadpole Lane and a new route north to connect to Swindon via Ermin Street, Blunsdon (the former A419) and under the new A419(T) at the existing underpass;	2021	Near Certain	Yes
Tadpole Farm	Measures to discourage through traffic from Thamesdown Drive to Blunsdon via Tadpole Lane;	SLP	Access	2021	Near Certain	No
Tadpole Farm	Tadpole Farm QBC	Rapid Transit programme	Package of measures to support bus services	2019	Reasonably foreseeable	No
Kingsdown	A new all vehicular bridge across the A419 to connect to the Swindon urban area as the primary access route;	SLP	New Bridge	2036	Reasonably foreseeable	No
Kingsdown	Vehicular access routes from Cold Harbour Junction and the B4019 east of Broad Blunsdon, designed in such a way to discourage additional trips through Broad Blunsdon and Broadbush and protect the amenity of	SLP	Access	2036	Reasonably foreseeable	No

Area	Transportation intervention/name	Source / Link	Description of the intervention	Estimated opening year	Uncertainty Category	Included in the model?
	Kingsdown Lane including appropriate green infrastructure;					
Kingsdown	Mitigation contributions for the highway network	SLP	Highway network mitigations	Unknown	Reasonably foreseeable	No
Haydon	Thamesdown Drive to Barnfield Link	LLMTS Bid	A new road connecting the Thamesdown Drive / Purton Road junction with the Barnfield Roundabout on Great Western Way. Standard likely to be SC2 7.3 metre width.	Unknown	Hypothetical	No
Peatmoor	Mead Way Junction Improvements	NPIF Bid (in preparation)	Improvements to the Mead Way / Purton Road junction (conversion to signals), the Withymead and Westmead Roundabouts (conversion to signals) and the Mead Roundabout on Great Western Way.	2019/20	Hypothetical	No
Toothill	Mannington Roundabout improvement	Rapid Transit programme	Junction improvement to provide increased capacity.	2018	Near Certain	Yes
East Wichel	Pipers Way Bus Lane	Rapid Transit programme	Bus lane and associated improvements on Pipers Way	2018	Near Certain	No
Upper Stratton	Moonrakers Roundabout	Rapid Transit programme	Re-modelling of junction to provide increased	2019	Reasonably foreseeable	No

Area	Transportation intervention/name	Source / Link	Description of the intervention	Estimated opening year	Uncertainty Category	Included in the model?
			capacity and bus priority			
Blagrove	M4 J16 Improvement	LGF scheme	Junction improvement at J16 involving slip road widening, circulatory carriageway widening and new layout improving access between Wroughton and Wootton Bassett.	2018	Near Certain	Yes
Bristol Channel	Severn River Crossing Toll	-	Toll charge to be ended by beginning of 2019.	2019	Near Certain	Yes
Amesbury	Stonehenge Tunnel	Highways England Website	To move the A303 into a tunnel that would run below Stonehenge	Unknown	More than likely	Yes
Chippenham	A350 Chippenham Phase 4 - Bypass Improvements	Early MRN 'pen picture'	Further dualling and junction improvements	2023	Reasonably Foreseeable	No
Chippenham	A350 Chippenham Phase 5 - Bypass Improvements	Early MRN 'pen picture'	Further dualling and junction improvements	2023	Reasonably Foreseeable	No
Chippenham	Bumpers Farm Roundabout Improvements	-	Signalisation of Bumpers Farm Roundabout.	2022	Near Certain	Yes
Chippenham	Little George Roundabout Improvements	-	Signalisation of Little George roundabout.	Unknown	Near Certain	Yes
Chippenham	Pew Hill and Foundry Lane through road	-	New through road between Pew Hill and Foundry Lane	Unknown	Near Certain	Yes

Area	Transportation intervention/name	Source / Link	Description of the intervention	Estimated opening year	Uncertainty Category	Included in the model?
Chippenham	Pheasant Roundabout capacity improvement	Hunter's Moon, Chippenham Transport Assessment - Appendix B	Introduction of toucan crossing and new turn allocations.	2026	Near Certain	Yes
Chippenham	Malmesbury Road roundabout - Bird's Marsh Access	Drawing	New arm for Bird's Marsh Development	2026	Near Certain	Yes
Chippenham	A350 - B4258 Link Road	Chippenham Design Sketches v2	New junction on A350 and link road through to B4528	Unknown	Near Certain	Yes
Chippenham	Roundabout on B4528	-	Delivered as part of Rowden Park - to link to Showel Farm access road	2026	Near Certain	Yes
Chippenham	Station Hill/New Road Junction	Chippenham Design Sketches v2	Conversion of mini-roundabout to signalised T-junction.	Unknown	More than likely	Yes
Chippenham	Rowden Hill roundabout improvements	Chippenham Design Sketches v2	Flare on approach from south	Unknown	More than likely	Yes
Chippenham	Pewsham Way/Ave La Fleche roundabout improvements.	Chippenham Design Sketches v2	2 lane exit on Ave la Fleche	Unknown	More than likely	Yes
Chippenham	Malmesbury Road roundabout improvements	Chippenham Design Sketches v2	Elongation and further signalisation	Unknown	More than likely	Yes
Chippenham	Hospital link road - Ave la Fleche to Bath Road	-	Cuts into Rowden Park country park land	Unknown	Reasonably Foreseeable	No
Chippenham	Bridge Centre Gyratory	-	Several options	Unknown	More than likely	Yes
Chippenham	M4 J17 - amendments. Three lanes on circulatory carriageway.	Drawing - Chippenham Gateway - M4 J17 - Proposed	Includes a flare on A350, 3 lane on southern circulatory, 3 lane flare on	Unknown	Near Certain	Yes

Area	Transportation intervention/name	Source / Link	Description of the intervention	Estimated opening year	Uncertainty Category	Included in the model?
		Mitigation for Junction 17	B4122, signalisation of A350 and B4122 arms			
Chippenham	Birds Marsh spine road (s/b termed North Chippenham Link Road)	Drawing	First link of northern distributor from Malmesbury Rd Rbt to Mauds Heath Causeway.	2026	Near Certain	Yes
Chippenham	Parsonage Way realignment	Drawing Title - Landscape Proposals 683-02A	Double roundabout on Mauds Heath, linked to Birds Marsh.	Unknown	Near Certain	Yes
Chippenham	Further M4 17 Amendments	Drawing Title - M4 Jct 17 Signalisation of A429 Approach (Hullavington Airfield Project)	Three lanes on northern circulatory carriageway and a signalised A249 arm	Unknown	More than likely	Yes
Chippenham	Hullavington Access	Drawing Title - Vehicular access from A429 - Three Arm (Hullavington Airfield Project)	New roundabout at A429 and Hullavington Road Junction, and then a further roundabout on Hullavington Road for access to site.	Unknown	More than likely	No
Trowbridge	Staverton Bypass	Atkins Feasibility	-	Unknown	Hypothetical	No
Trowbridge	Longfield Gyratory Capacity Improvements	Trowbridge Transport Strategy	-	Unknown	Hypothetical	No
Trowbridge	Trinity Rbout Capacity Improvements	Trowbridge Transport Strategy	-	Unknown	Hypothetical	No
Trowbridge	Wicker Hill / Broad Street	Atkins Detailed Design	One way reversal scheme	Unknown	Hypothetical	No

Area	Transportation intervention/name	Source / Link	Description of the intervention	Estimated opening year	Uncertainty Category	Included in the model?
Devizes	A361 London Road / Windsor Drive	Atkins Detailed Design	Capacity improvements	2018	Near Certain	Yes
Salisbury	H01 Harnham Gyratory - remodelling	Salisbury Transport Strategy		2026	More than likely	Yes
Salisbury	H02 Exeter Street roundabout enhancements	Salisbury Transport Strategy	-	2026	More than likely	Yes
Salisbury	H03 St Pauls Roundabout enhancements	Salisbury Transport Strategy	MOVA upgrade	2026	Reasonably Foreseeable	No
Salisbury	H04 Route hierarchy	Salisbury Transport Strategy	Development of a hierarchy of routes that restricts traffic movements in the city	2026	Reasonably Foreseeable	No
Salisbury	HO5 UTMC improvements	Salisbury Transport Strategy	Use and improve UTMC in accordance with the route user hierarchy in Core Policy 61	2026	More than likely	Yes
Salisbury	H06 College Roundabout capacity enhancement	Salisbury Transport Strategy	-	2026	Hypothetical	No
Salisbury	H07 A36 Bourne Way capacity enhancements (Petersfinger P&R junction)	Salisbury Transport Strategy	-	2026	Hypothetical	No
Salisbury	H08 St Marks Roundabout capacity enhancements	Salisbury Transport Strategy	-	2026	More than likely	Yes
Salisbury	H09 Park Wall Junction (A36/A3094) improvements	Salisbury Transport Strategy	-	2026	More than likely	Yes
Salisbury	H10 Clean Air Zone	Salisbury Transport Strategy	-	2026	Unknown	No

Area	Transportation intervention/name	Source / Link	Description of the intervention	Estimated opening year	Uncertainty Category	Included in the model?
Salisbury	H11 Freight management scheme (hierarchy / routes)	Salisbury Transport Strategy	-	2026	Hypothetical	No
Salisbury	H12 Castle Roundabout capacity enhancements	Salisbury Transport Strategy	-	2026	More than likely	Yes
Salisbury	H14 Maltings/Central car park redevelopment	Salisbury Transport Strategy	Long stay car parking replaced by multi-storey short stay car park	2026	More than likely	Yes
Salisbury	SC01 - 05 Smarter Choices measures	Salisbury Transport Strategy	Workplace, residential and school travel planning, car clubs and support for electric vehicles	2026	Reasonably Foreseeable	No
Salisbury	PC01 Pedestrian improvements	Salisbury Transport Strategy	Improve pedestrian facilities and pedestrian priority in the city centre (bus routes to be maintained - pedestrianisation could be considered as part of this).	2026	Unknown	No
Salisbury	PC02 - PC15 Pedestrian and cycle route improvements	Salisbury Transport Strategy	Various walking and cycling route improvements.	2026	Reasonably Foreseeable	No
Salisbury	PT03 - Bus priority measures on Park & Ride routes (Salisbury Road / Wilton Road, Castle Road, London Road, Southampton Road, Downton	Salisbury Transport Strategy		2026	Reasonably Foreseeable	No

Area	Transportation intervention/name	Source / Link	Description of the intervention	Estimated opening year	Uncertainty Category	Included in the model?
	Road / Exeter Street)					
Salisbury	PT04 - Bus link between the hospital and Britford Park & Ride	Salisbury Transport Strategy		2026	Reasonably Foreseeable	No
Salisbury	PT05 - High frequency buses serving all new development sites - at least 4 buses per hour (PR3, Red 10, PR11, PR7, Red 5)	Salisbury Transport Strategy		2026	Reasonably Foreseeable	No
Salisbury	PT09 - Salisbury Rail Station Interchange Improvements - details subject to ongoing work being conducted in partnership between Wiltshire Council, Network Rail, and public transport operators	Salisbury Transport Strategy		2026	Reasonably Foreseeable	No
Salisbury	A36 Southampton Road upgrades		Depends on options - increased capacity; bus lanes; service lane for retail facilities along A36	Unknown	Hypothetical	No
Wilton	Wilton Rail Station	Atkins study		Unknown	Hypothetical	No
Porton	Porton Rail Station			Unknown	Hypothetical	No
Amesbury	Boscombe Down access	Atkins study			Reasonably Foreseeable	No

Appendix B. Scaling of External Trips Ends

Table B-1 - Scaling of external productions

Area	2011 Census JTW trips	2011 Census JTW trips to Wiltshire	Scaling factor	2018 Productions pre-scaling	2018 Productions post-scaling	Retaining only relevant segments
Gloucestershire	239,395	6,100	2.55%	669,084	17,618	13,756
Bath, Bristol & South Gloucestershire	356,303	8,462	2.37%	976,373	23,684	18,408
SW Near External	378,986	7,897	2.08%	1,120,837	23,278	18,164
Oxfordshire excluding Cherwell	207,314	2,655	1.28%	586,430	7,471	5,691
East Near External	185,570	4,453	2.40%	505,210	12,343	9,392
South Near External	460,378	3,496	0.76%	1,338,030	10,408	8,143
SW External	768,743	1,728	0.22%	2,353,421	5,290	4,137
East & London	8,035,469	5,170	0.06%	22,531,097	14,722	11,211
Midlands & Wales	5,001,471	3,782	0.08%	14,526,894	11,075	8,535
North External	5,710,463	2,099	0.04%	16,314,047	5,997	4,622
TOTAL	**21,344,092**	**45,842**	**0.21%**	**60,921,423**	**131,887**	**102,059**

Table B-2 - Scaling of external attractions

Area	2011 Census JTW trips	2011 Census JTW trips from Wiltshire	Scaling factor	2018 Attractions pre-scaling	2018 HB Attractions post-scaling
Gloucestershire	237,723	5,696	2.40%	671,766	18,462
Bath, Bristol & South Gloucestershire	394,176	15,546	3.94%	976,373	44,272
SW Near External	362,038	4,617	1.28%	1,120,837	13,864
Oxfordshire excluding Cherwell	220,258	5,363	2.43%	586,430	15,121

Area	2011 Census JTW trips	2011 Census JTW trips from Wiltshire	Scaling factor	2018 Attractions pre-scaling	2018 HB Attractions post-scaling
East Near External	184,201	10,436	5.67%	505,210	28,465
South Near External	434,851	2,901	0.67%	1,338,030	9,059
SW External	749,124	1,395	0.19%	2,353,421	4,328
East & London	8,195,585	13,184	0.16%	22,531,097	37,225
Midlands & Wales	4,874,473	2,161	0.04%	14,526,894	6,455
North External	5,708,142	1,022	0.02%	16,314,047	2,921
TOTAL	**21,360,571**	**62,321**	**0.29%**	**60,924,105**	**180,172**

Appendix C. Population Estimate for ISM

Table C-1 - Verification of NTEM 2018 Population Estimate and Derivation of final 2018 Productions

Derivation:	HMA	Swindon	Swindon_Wiltshire	Chippenham	Trowbridge	Salisbury	Total
A	NTEM 2011 Population	208,301	59,730	163,833	105,554	136,562	**673,981**
B	NTEM 2018 Population	220,085	62,066	170,277	110,264	141,140	**703,832**
C	Census 2011 Population	209,709	61,067	166,844	106,906	139,502	**684,028**
D	MYE 2018 Population	221,996	65,188	172,067	112,785	148,023	**720,060**
E	NTEM 2011 Hhs	88,628	25,249	69,121	45,525	55,825	**284,347**
F	NTEM 2018 Hhs	96,259	26,663	73,397	48,428	59,083	**303,829**
G	LLPG 2011 Dwellings	#N/A	26,736	71,847	48,241	58,944	**205,768**
H	LLPG 2018 Dwellings	#N/A	29,256	77,942	51,698	65,941	**224,837**
I = A/E	2011 Pop/Hh	2.350	2.366	2.370	2.319	2.446	**2.370**
J = B/F	2018 Pop/hh	2.286	2.328	2.320	2.277	2.389	**2.317**
K = H/G	LLPG Growth	#N/A	1.094	1.085	1.072	1.119	**1.093**
L = J/I	Pop/Hh Change	0.973	0.984	0.979	0.982	0.977	**0.977**
M = A*K*L; * M = A*D/C	Adjusted Population	220,506 *	64,314	173,958	111,083	149,188	**719,049**
N = M/B	Ratio of Pop Estimates	1.002	1.036	1.022	1.007	1.057	**1.023**
O	NTEM 2018 Prod	184,517	50,475	139,942	92,630	115,653	**583,217**
P = O*N	Final 2018 Productions	184,870	52,303	142,968	93,318	122,247	**595,706**

Appendix D. Parking Capacity Analysis

Table 10-4 - Parking Analysis at sector level

Sector Name	Sector Number	Total Parking Spaces	Paid spaces	Free spaces	% Utilisation	% of AM + IP destinations
Swindon	1001	4,143	4,134	9	100%	9.8%
Rest of Swindon	1002	-	-	-	-	-
Royal Wootton Bassett	1003	288	288	-	100%	21.2%
Rest of RWB	1004	-	-	-	-	-
West of Swindon	1005	34	-	34	100%	2.0%
Kennet North	1006	608	608	-	75%	16.8%
Kennet South	1007	128	24	104	84%	8.7%
North Wiltshire	2001	352	261	91	81%	6.8%
Chippenham	2002	1,154	1,154	-	85%	17.1%
Pewsham	2003	-	-	-	-	-
Corsham	2004	338	256	82	74%	12.1%
West of Corsham	2005	24	-	24	100%	1.6%
Calne	2006	75	75	-	23%	3.8%
Chippenham Rural	2007	-	-	-	-	-
Melksham	2008	342	342	-	50%	15.3%
West of Melksham	2009	-	-	-	-	-
East of Melksham	2010	-	-	-	-	-
Devizes	2011	758	758	-	72%	24.6%
Central Wiltshire	2012	-	-	-	-	-
Bradford on Avon	3001	290	260	30	81%	10.7%
Trowbridge	3002	792	346	446	73%	11.3%
Hilperton	3003	-	-	-	-	-
South of Trowbridge	3004	35	-	35	100%	2.3%

Sector Name	Sector Number	Total Parking Spaces	Paid spaces	Free spaces	% Utilisation	% of AM + IP destinations
Westbury	3005	285	242	43	43%	10.4%
Warminster	3006	459	453	6	30%	20.2%
South of Warminster	3007	-	-	-	-	-
Salisbury SW	4001	148	-	148	100%	8.6%
Salisbury West	4002	113	-	113	100%	5.7%
Salisbury	4003	3,064	2,864	200	64%	29.2%
Salisbury SE	4004	-	-	-	-	-
South of Amesbury	4005	-	-	-	-	-
Amesbury	4006	123	123	-	36%	4.3%
North of Amesbury	4007	-	-	-	-	-
Tidworth	4008	-	-	-	-	-
Pewsey	4009	-	-	-	-	-

Appendix E. Mode Share

Table E-1 - Mode share of Productions; Census 2011 vs ISM (HBW purpose only) - By Sector

Sector No	Sector Name	Census 2011					ISM					Total
		Car	Bus	Rail	Cycle	Walk	Car	Bus	Rail	Cycle	Walk	
1001	Swindon	72.6%	10.1%	1.4%	5.0%	10.8%	75.0%	7.4%	2.3%	4.5%	10.8%	**100.0%**
1002	Rest of Swindon	83.6%	5.3%	1.6%	1.8%	7.6%	84.6%	5.0%	0.9%	2.7%	6.8%	**100.0%**
1003	Royal Wootton Bassett	78.8%	5.6%	0.9%	3.0%	11.7%	80.4%	5.5%	0.5%	3.6%	9.9%	**100.0%**
1004	Rest of RWB	78.7%	4.5%	1.3%	4.6%	11.0%	79.6%	3.3%	1.6%	3.6%	11.9%	**100.0%**
1005	West of Swindon	85.3%	3.1%	1.4%	2.5%	7.6%	86.1%	2.4%	1.0%	2.6%	7.9%	**100.0%**
1006	Kennet North	73.9%	2.2%	3.4%	2.0%	18.5%	71.9%	3.3%	1.0%	1.4%	22.4%	**100.0%**
1007	Kennet South	82.9%	2.1%	5.5%	1.5%	8.0%	78.8%	3.6%	5.4%	1.6%	10.5%	**100.0%**
2001	North Wiltshire	83.3%	1.6%	2.7%	2.0%	10.3%	83.0%	0.9%	4.4%	1.1%	10.7%	**100.0%**
2002	Chippenham	72.3%	1.6%	6.4%	3.5%	16.3%	71.3%	1.8%	8.8%	3.4%	14.7%	**100.0%**
2003	Pewsham	78.6%	2.2%	4.7%	2.7%	11.8%	76.4%	3.1%	6.6%	3.6%	10.4%	**100.0%**
2004	Corsham	80.2%	3.3%	2.2%	3.5%	10.9%	80.2%	1.8%	3.6%	3.1%	11.3%	**100.0%**
2005	West of Corsham	79.2%	3.5%	1.6%	5.0%	10.8%	81.2%	0.9%	3.6%	2.5%	11.8%	**100.0%**
2006	Calne	78.8%	3.6%	1.6%	3.6%	12.4%	76.8%	2.9%	2.7%	3.6%	14.0%	**100.0%**
2007	Chippenham Rural	88.5%	2.2%	3.8%	1.3%	4.2%	81.1%	0.8%	4.7%	3.4%	10.0%	**100.0%**
2008	Melksham	78.9%	2.8%	0.8%	5.0%	12.5%	77.6%	2.9%	2.7%	3.3%	13.5%	**100.0%**
2009	West of Melksham	86.0%	2.4%	1.3%	3.4%	6.9%	84.4%	1.8%	2.8%	3.2%	7.8%	**100.0%**
2010	East of Melksham	86.0%	2.4%	1.3%	3.4%	6.9%	82.8%	1.5%	2.8%	3.2%	9.6%	**100.0%**
2011	Devizes	72.4%	1.8%	1.0%	4.7%	20.1%	69.0%	5.5%	0.3%	4.7%	20.6%	**100.0%**
2012	Central Wiltshire	86.3%	1.8%	2.1%	2.2%	7.5%	87.2%	2.2%	1.6%	1.9%	7.1%	**100.0%**
3001	Bradford on Avon	76.8%	2.2%	8.8%	2.5%	9.7%	78.6%	1.1%	9.6%	2.4%	8.3%	**100.0%**
3002	Trowbridge	73.7%	2.3%	4.0%	3.4%	16.6%	71.7%	2.3%	7.3%	3.7%	15.1%	**100.0%**
3003	Hilperton	86.3%	1.9%	2.8%	2.9%	6.1%	81.9%	2.6%	4.4%	3.2%	8.0%	**100.0%**
3004	South of Trowbridge	89.1%	1.6%	2.9%	2.0%	4.5%	82.8%	4.1%	3.5%	3.5%	6.0%	**100.0%**
3005	Westbury	83.0%	1.8%	4.4%	2.3%	8.4%	80.0%	3.1%	5.7%	3.0%	8.1%	**100.0%**
3006	Warminster	73.2%	1.8%	2.8%	4.9%	17.3%	72.4%	4.1%	4.4%	3.5%	15.5%	**100.0%**
3007	South of Warminster	87.6%	1.6%	4.3%	1.3%	5.3%	89.9%	1.0%	4.7%	1.9%	2.6%	**100.0%**
4001	Salisbury SW	81.5%	1.4%	6.1%	1.6%	9.2%	83.5%	0.5%	5.6%	1.1%	9.3%	**100.0%**
4002	Salisbury West	81.1%	6.4%	3.5%	2.1%	6.9%	83.6%	3.2%	1.7%	3.1%	8.4%	**100.0%**
4003	Salisbury	61.4%	7.5%	2.6%	5.1%	23.5%	63.7%	4.1%	6.2%	4.0%	22.0%	**100.0%**
4004	Salisbury SE	84.8%	3.7%	2.5%	2.2%	6.8%	84.2%	3.8%	6.4%	2.1%	3.5%	**100.0%**
4005	South of Amesbury	85.5%	2.9%	2.6%	2.8%	6.2%	83.0%	1.4%	2.0%	2.9%	10.7%	**100.0%**

Sector No	Sector Name	Census 2011					ISM					Total
		Car	Bus	Rail	Cycle	Walk	Car	Bus	Rail	Cycle	Walk	
4006	Amesbury	81.2 %	5.1%	0.7%	2.6%	10.4 %	81.0%	4.6%	1.0%	3.1%	10.4%	**100.0 %**
4007	North of Amesbury	71.3 %	4.5%	4.5%	4.4%	15.3 %	75.0%	5.7%	0.7%	2.9%	15.7%	**100.0 %**
4008	Tidworth	59.3 %	5.1%	1.0%	5.0%	29.6 %	68.0%	4.7%	0.0%	4.0%	23.4%	**100.0 %**
4009	Pewsey	85.8 %	2.1%	5.3%	1.3%	5.5%	91.9%	2.1%	0.0%	1.7%	4.3%	**100.0 %**
5001	Stroud	93.1 %	0.0%	5.6%	0.7%	0.6%	93.6%	1.8%	4.5%	0.1%	0.0%	**100.0 %**
5002	South Gloucestershire	90.5 %	1.7%	4.4%	1.0%	2.4%	94.4%	0.7%	4.6%	0.3%	0.0%	**100.0 %**
5003	Bristol	79.8 %	1.9%	13.9 %	1.6%	2.8%	84.5%	2.4%	13.0%	0.2%	0.0%	**100.0 %**
5004	Bath	84.5 %	2.0%	10.8 %	1.0%	1.7%	79.0%	13.2%	3.7%	3.2%	0.9%	**100.0 %**
5005	Rest of Bath & NES	93.3 %	0.9%	4.2%	0.5%	1.1%	96.2%	3.3%	0.0%	0.6%	0.0%	**100.0 %**
5006	Mendip & South Somerset	92.0 %	3.1%	1.9%	1.0%	1.9%	95.7%	0.0%	4.1%	0.1%	0.0%	**100.0 %**
5007	Dorset, B, C & P	92.5 %	1.6%	2.6%	0.7%	2.6%	97.5%	0.0%	2.5%	0.0%	0.0%	**100.0 %**
5008	Rest of Gloucestershire	89.8 %	2.5%	3.4%	1.1%	3.3%	88.3%	6.8%	4.9%	0.0%	0.0%	**100.0 %**
5009	Cotswold	95.9 %	1.2%	1.0%	1.0%	0.9%	93.1%	6.3%	0.0%	0.6%	0.0%	**100.0 %**
5010	West Oxfordshire	97.0 %	0.7%	0.4%	0.4%	1.6%	100.0%	0.0%	0.0%	0.0%	0.0%	**100.0 %**
5011	Vale of White Horse	91.7 %	3.9%	1.6%	1.6%	1.3%	98.2%	1.7%	0.0%	0.1%	0.0%	**100.0 %**
5012	Oxford & South Oxfordshire	72.5 %	3.8%	17.3 %	2.0%	4.4%	93.2%	6.8%	0.0%	0.0%	0.0%	**100.0 %**
5013	West Berkshire	92.4 %	2.3%	1.7%	1.2%	2.3%	96.6%	0.0%	3.3%	0.1%	0.0%	**100.0 %**
5014	Basingstoke & Deane	89.4 %	0.7%	8.6%	0.0%	1.4%	90.1%	0.6%	9.2%	0.0%	0.0%	**100.0 %**
5015	Test Valley	92.6 %	2.4%	2.8%	0.6%	1.6%	92.6%	6.8%	0.0%	0.7%	0.0%	**100.0 %**
5016	New Forest & IW	93.0 %	3.7%	0.6%	0.7%	2.0%	96.1%	3.8%	0.0%	0.1%	0.0%	**100.0 %**
5017	Southampton & Others	88.5 %	2.6%	4.6%	1.4%	2.9%	91.1%	1.6%	7.3%	0.0%	0.0%	**100.0 %**
6001	South West	91.1 %	1.3%	7.7%	0.0%	0.0%	94.7%	0.0%	5.3%	0.0%	0.0%	**100.0 %**
6002	London	58.2 %	11.0 %	30.8 %	0.0%	0.0%	63.8%	0.0%	36.2%	0.0%	0.0%	**100.0 %**
6003	South East	87.1 %	4.1%	8.7%	0.0%	0.0%	91.3%	0.0%	8.7%	0.0%	0.0%	**100.0 %**
6004	East of England	86.0 %	5.5%	8.6%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	**100.0 %**
6005	East Midlands	94.4 %	2.4%	3.2%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	**100.0 %**
6006	West Midlands	92.8 %	3.8%	3.4%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	**100.0 %**
6007	Wales	86.5 %	2.9%	10.6 %	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	**100.0 %**
6008	Rest of England	91.3 %	4.2%	4.5%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	**100.0 %**

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Appendix B. Forecast Scenario Report

Technical Note

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Subject:	Appendix B. Forecast Scenario Report		
Author:	Avinash Bejawada		
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Client signoff

Client	Wiltshire County Council
Project	Wiltshire Local Plan
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1. Introduction

1.1. Purpose of the Document

This technical note sets out the key input assumptions, and the relevant output analysis carried out, for the scenario tests undertaken using the ISM (Interim Strategic Model – a variable demand model) tool for the Wiltshire Local Plan (LP) Review transport evidence base study.

The scenarios tested are intended to be purely illustrative to help develop an understanding of the influences of different types of spatial allocation of growth / schemes in the county on the carbon intensity of transport impacts associated with Local Plan growth, as well as the impacts of intervention 'levers' on reducing the carbon impact of transport arising from Local Plan growth.

1.2. Document Structure

The remainder of this report is structured as follows:

Section 2: An overview of the scenario tests undertaken.

Section 3: Land use and development assumptions input to ISM for all scenarios, which are used to determine the number of trips generated (trip productions) and the locations to which they are attracted (trip attractions).

Section 4: Assumptions on travel characteristics which are input globally to the model. These include vehicle operating costs (including fuel), travellers' values of time, car occupancy, parking charges, and public transport fares.

Section 5: Detailed explanations of each scenario, levers considered and how they are implemented in the ISM.

Section 6: Analysis of the scenario test results.

2. Summary of Scenarios Tested

2.1. Scenarios

Wiltshire Council have set four scenarios to model detailed in **Section1.5** of the main report. Summary of the scenarios is presented below.

Scenario Name	Implementation
Base (2018)	Within ISM
Core (2038)	Within ISM
Scenario 1 Business as Usual (BAU) LPR (2038)	Within ISM
Scenario 2 Do Minimum	Within ISM and Post ISM
Scenario 3 Do Something	Within ISM including Prior and Post ISM
Scenario 4 Do Maximum	Within ISM including Prior and Post ISM

2.2. Methodology

Business as Usual scenario (or Scenario 1) is considered as the reference case for forecast year, and as such Scenario 1 ISM is based on BAU Wiltshire Transport Model (WTM) of highway modelling i.e., car skims from WTM model run are fed into ISM. There are two ISM runs for Scenario 1 as mentioned below:

1. Scenario 1 Core – Based on 2036 Do Nothing (DN)/Core WTM model run
2. Scenario 1 BAU LP (Core+LP) – Based on 2036 Do Minimum (DM2b) WTM model run

The model definitions of 2036 WTM are shown in Table 2-1. Scenario 1 Core is compared against Scenario 1 Core+LP to understand the impact/change in demand and mode shares as a result of the local plan growth.

Table 2-1 – WTM Model definitions

Scenario	Demand Growth Assumptions	Infrastructure Assumptions
Core (2038)	Includes all Core Strategy (Uncertainty log) growth and associated infrastructure Excludes prospective Local Plan growth	Base + Core infrastructure (as defined in the Uncertainty Log provided by Wiltshire Council)
Scenario 1 Business as Usual (BAU) LPR (2038)	WTM Base (2018) + Core, with background growth constrained to NTEM + prospective Local Plan growth.	DN+ site specific access points Chippenham southern distributor road, with connection to the A4 at Forest Farm

Trip ends (productions and attractions) for the above two scenarios are calculated separately with Scenario 1 core considering developments only from uncertainty log and the Scenario1 BAU LP considering developments from both uncertainty log and Local Plan

The remaining scenario ISM runs (scenario 2, 3 and 4) are undertaken by applying respective scenario levers to scenario 1 Core+LP. The levers considered for each scenario, and how they are implemented within the ISM, are presented in Chapter 5. Growth (or change) in car trips between scenario 2 (and scenario 3 and 4) vs scenario 1 Core+LP is calculated, and this growth is applied to the DM2b car (Saturn) demand to obtain scenario 2 (and scenario 3 and 4) highway matrices. The WTM Highway assignments are then run for the three scenarios to provide inputs to the carbon model. The methodology adopted for calculating the trip ends, running the ISM scenarios and the input to Carbon tool is shown in **Section 2.1** of main report.

2.2.1. Absolute Models Applied Incrementally (AMAI) approach

The car trips in each ISM scenario, used to calculate growth, are obtained through Absolute Models Applied Incrementally (AMAI) type of pivoting with up to 9 cases as shown in Table 2-2Table 2-2. The 2018 WTM car demand is considered as base (B), 2018 ISM and 2036 ISM car trips are considered as synthetic base (S_b) and synthetic forecast (S_f) respectively. The basic calculation procedure is given in below equation:

$$F = B \times \frac{S_f}{S_b}$$

where:

S_f is the synthetic forecast (S_f), i.e. 'synthetic' trips for a future year from the ISM;
S_b gives the synthetic base (S_b) for the base year from the ISM;
B is the base (B) matrix from the WTM.
F is the resulting forecast car demand for respective scenario

Table 2-2 - Cases used in Pivoting process

Case	B (2018 WTM)	S_b (2018 ISM)	S_f (2036 ISM)	F (2036 Scenario)
Case1	0	0	0	0
Case2	0	0	>0	Sf
Case3	0	>0	0	0
Case4	0	>0	>0	Max (0, Sf-Sb)
Case5	>0	0	0	B
Case6	>0	0	>0	B + Sf
Case7	>0	>0	0	0
Case8	>0	>0	>0	B + Sf -Sb (Extreme growth)
Case9	>0	>0	>0	B*Sf/Sb (Normal Growth)

The difference of the resulting forecast car demand (F_i) for each Scenario (i) from Scenario1 forecast car demand (F_1) is applied to 2036 WTM car demand to arrive growth factors.

3. Land use and trip end assumptions

3.1. Land use assumptions

3.1.1. Introduction

The approach to deriving the population and jobs assumptions is outlined below. It should be noted that population is derived based on the assumed households in each sector, using assumptions on household size. Further, it should be noted that NTEMv7.2 was used along with Uncertainty Log and Local Plan growth assumptions available for Wiltshire. A snapshot of HMA and sector system considered for ISM is shown in Figure 3-1 to Figure 3-3.

Figure 3-1 - Wiltshire HMAs

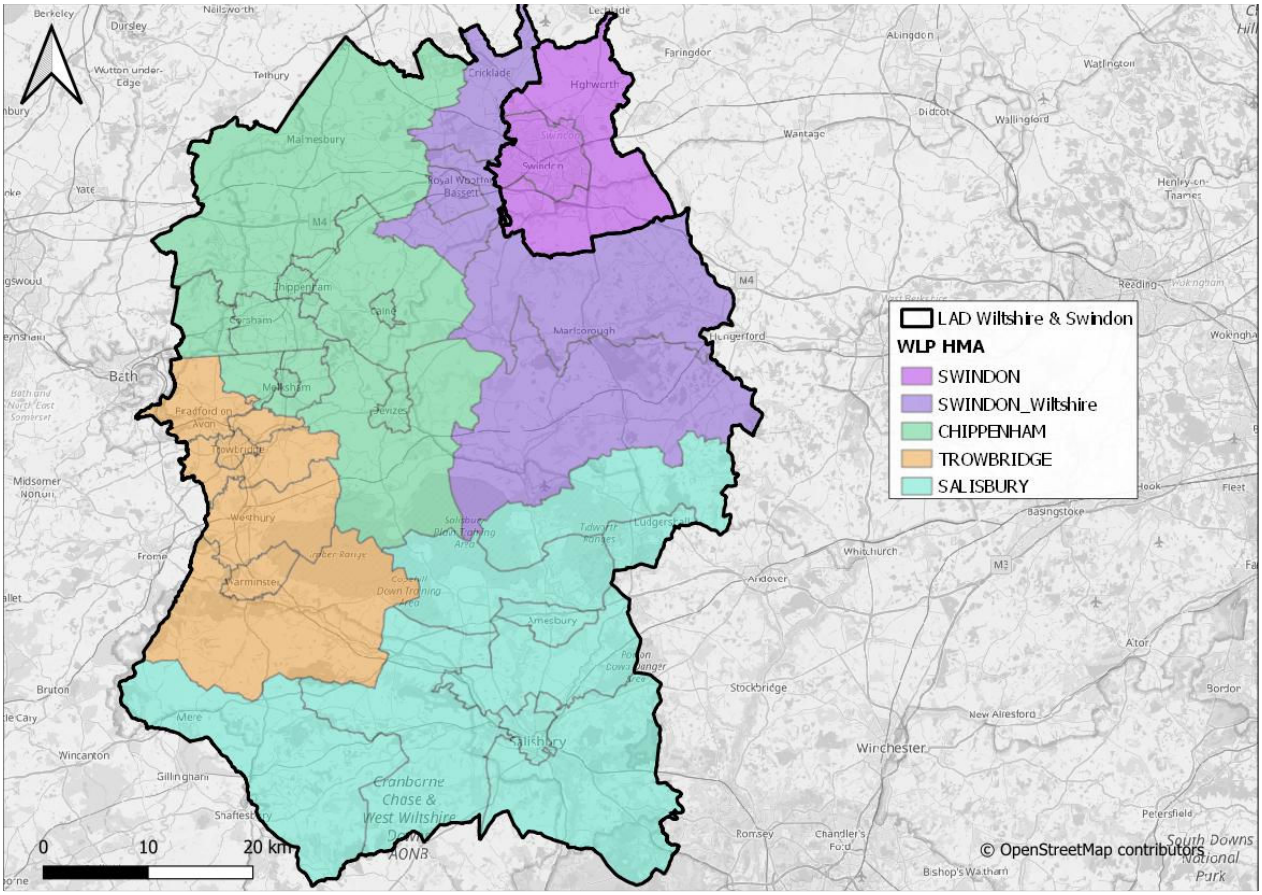


Figure 3-2 - Sector System County Level

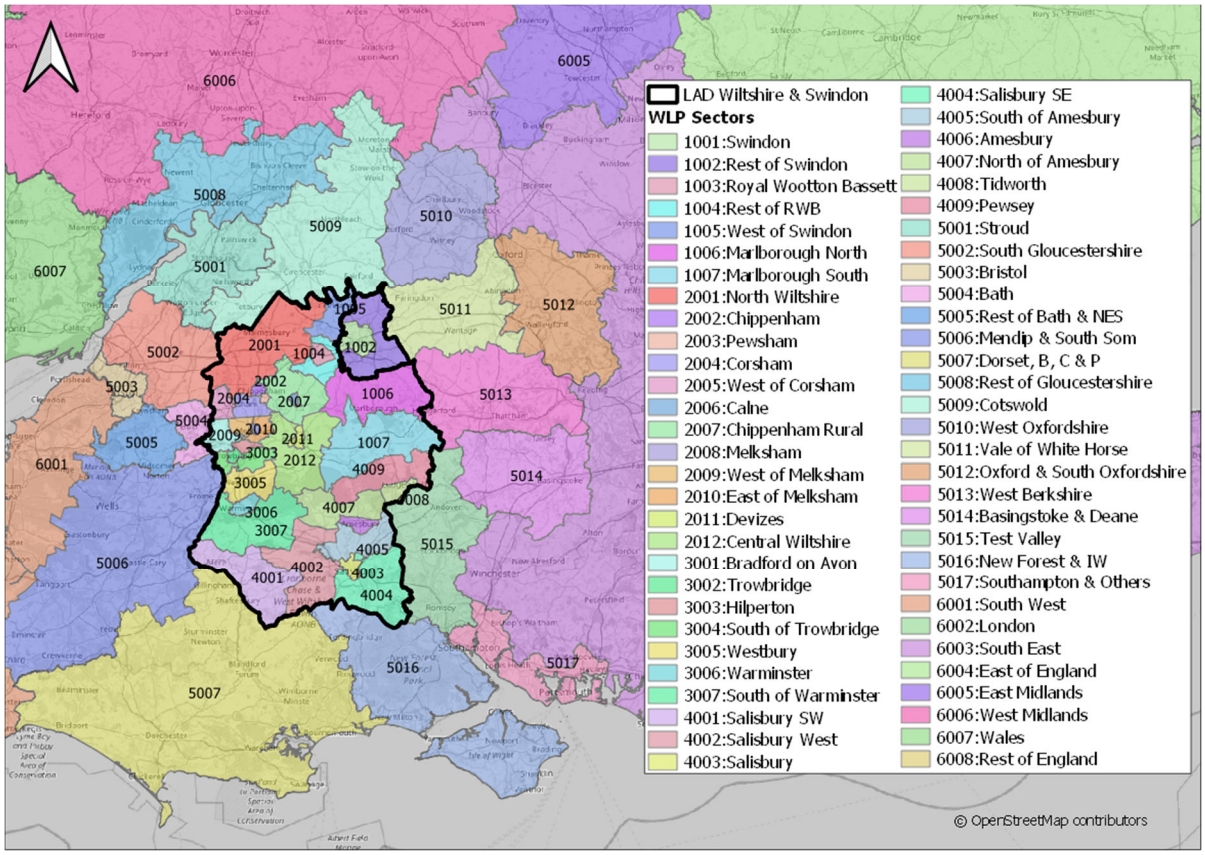
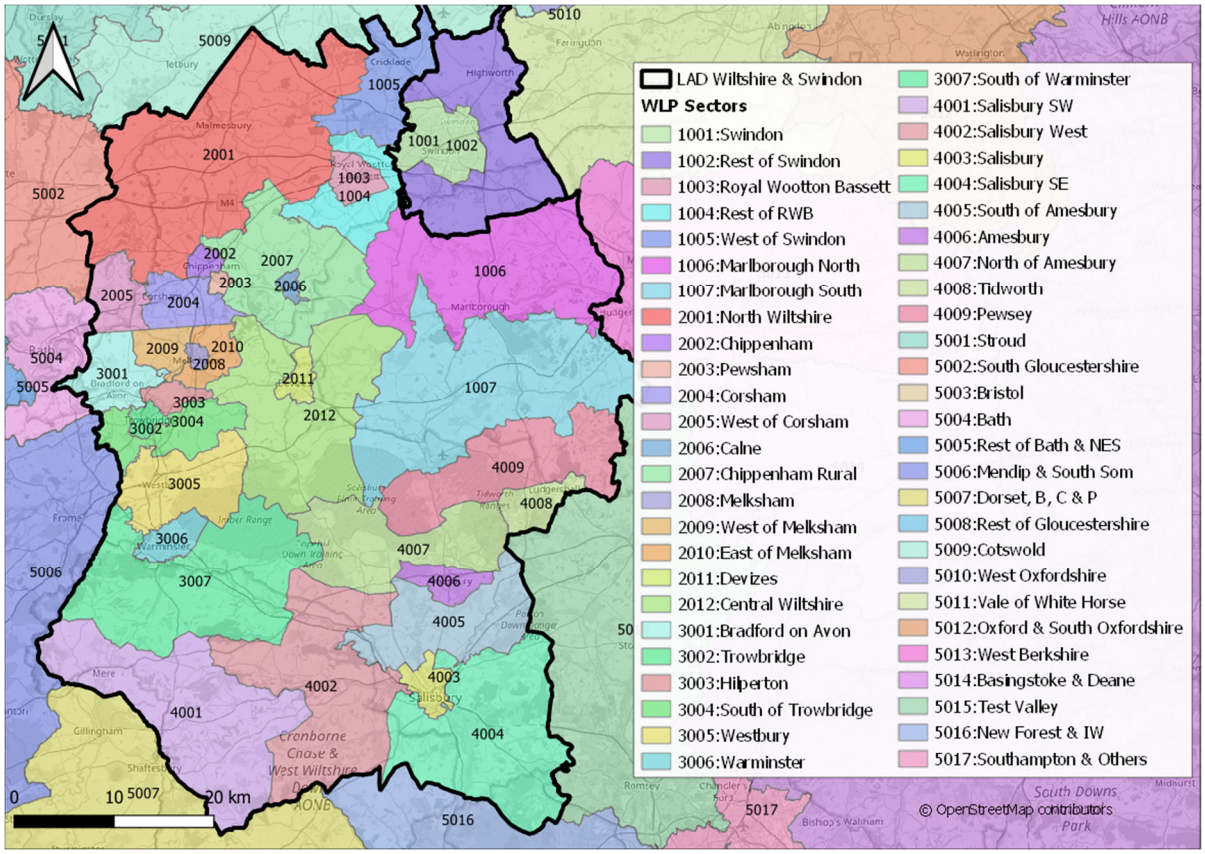


Figure 3-3 - Sector System local level



3.1.2. 2036 Core Population and Jobs

The dwelling and job growth assumptions adopted for WTM, using data derived from the uncertainty log (UL) compiled at sector level and HMA level, have been used for the ISM 2036 Core Scenario. The target 2036 totals of households (Hhs) and jobs for each HMA as set out by WTM have been used as HMA control totals to further process sector level households for year 2036 in the ISM, the process known as constraining. It should be noted that only dwelling growth is considered from UL and jobs growth is from NTEM.

Assumptions at sector level:

- Sector level growth in households is defined by the UL which covers all future developments by sites from 2018 to 2036.
- Sector level total households for each HMA for 2036 are summed up to meet the HMA level control total set out by the HMA level assumptions.

Table 3-1 presents the target totals of households and jobs at HMA level for 2036 core Scenario, and target 2036 population based on the target households and household size. The target totals at HMA level for Core scenario with UL growth are same as that of NTEM totals due to the constraining process but the totals at sector level are different from NTEM.

Table 3-1 - 2036 Core Households, Jobs and Population at HMA level

HMA	Target 2036 Hhs	Target 2036 jobs	Target 2036 Population
Salisbury	70,235	88,273	162,041
Swindon_Wiltshire	31,133	32,576	69,511
Chippenham	85,255	92,016	189,077
Trowbridge	55,785	55,145	122,901
Swindon	118,901	128,261	263,103
Wiltshire total*	**242,408**	**268,010**	**543,530**

*Only Wiltshire including 'Swindon_Wiltshire' (areas of Wiltshire adjacent to Swindon) but excluding Swindon itself.

3.1.3. 2036 BAU LPR Population and Jobs

For 2036 Core+LP scenario growth from both UL and Local plan are considered to derive the target totals of households and jobs for 2036. Assumptions are similar to 2036 core Scenario. Table 3-2 presents the target totals of households and jobs at HMA level for 2036 core Scenario, and target 2036 population based on the target households. Local plan growth is restricted to Wiltshire and hence target totals for Swindon HMA do not differ between the Core and Core+LP scenarios.

Table 3-2 - 2036 BAU LPR Households, Jobs and Population at HMA level

HMA	Target 2036 Hhs	Target 2036 jobs	Target 2036 Population	Hhs diff from Core	Jobs diff from Core	Population diff from Core
Salisbury	75,556	91,778	174,721	5,321	3,505	12,680
Swindon_Wiltshire	30,267	33,474	67,466	-866	898	-2,044
Chippenham	86,416	93,710	192,411	1,162	1,694	3,334
Trowbridge	56,466	56,476	124,396	680	1,331	1,495
Swindon	118,901	128,261	263,103	-	-	-
Wiltshire total*	**248,705**	**275,438**	**558,994**	**6,298**	**7,428**	**15,464**

*Only Wiltshire excluding Swindon

3.2. Trip end data

3.2.1. Introduction

This section explains briefly how further trip end data by production and attraction have been processed for 2036 for each scenario, based on projected population and jobs. The 2036 reference case travel demand was primarily derived from NTEM v7.2 to create a set of trip ends (productions and attractions) for each sector pairing in the model, by demand segment.

3.2.2. Purpose and Modes

Trip purposes are the same in all 2036 scenario tests as in 2018 base i.e.,

- Home-Based Work (HBW);
- Home-Based Employers' Business (HBEB);
- Home-Based Education (HBEd);
- Home-Based Other (HBO);
- Non-Home-Based Employers' Business (NHBEB); and
- Non-Home-Based Other (NHBO).

All home-based purposes are further classified into 0 car availability and 1+ car availability.

All scenarios have the modes of car, bus, bus P&R, rail, rail P&R, cycle, and walk similar to base.

3.2.3. Productions

Homebased trips are derived based on the projected population by sector for defined segments multiplied by trip rates for each segment. Non-homebased trips are then derived based on home-based trips at the attraction end. Both the homebased and non-homebased trip rate values are derived from NTEM v7.2. Target population in Table 3-1 and Table 3-2 are used to scale the productions for Core and Core+LP scenarios respectively. Table 3-3 and Table 3-4 below presents the trip productions at HMA level for Core and Core+LP scenarios respectively.

Trip productions for Scenario 1 Core+LP are used for Scenario 2 as the levers for Scenario 2 do not warrant any change to the Land use or trip end assumptions.

Table 3-5 presents the trip productions for Scenario 3 affected by two levers – 'Introduction of Mobility Credits' and 'Home Working' presented in Table 5-2. These two levers remain unchanged in Scenario 4 and no additional levers are proposed that influence the land use/trip end data, and hence trip ends for Scenario 3 and Scenario 4 remain the same.

Table 3-3 – Daily Trip Productions for Scenario 1 Core

HMA	HBW		HBEB		HBEd		HBO		Total
	ER_16-74				Others_16-74		All_16+		
	0 Car	1+ Car	0 Car	1+ Car	0 Car	1+ Car	0 Car	1+ Car	
Salisbury	1,883	37,658	150	5,585	218	1,377	7,613	78,475	132,959
Swindon_Wiltshire	592	14,778	52	2,405	130	804	2,946	34,707	56,413
Chippenham	1,916	41,587	151	6,148	311	2,065	8,877	94,483	155,538
Trowbridge	1,450	26,607	110	3,721	242	1,253	6,696	62,993	103,071
Swindon	4,819	63,344	346	8,196	665	2,637	16,769	124,486	221,262
External	2,258	29,753	178	4,154	642	1,833	8,607	65,375	112,800
Wiltshire total*	**5,840**	**120,629**	**463**	**17,859**	**901**	**5,499**	**26,132**	**270,657**	**447,981**

*Only Wiltshire excluding Swindon

Table 3-4 - Trip Productions for Scenario 1 BAU LPR

HMA	HBW		HBEB		HBEd		HBO		Total
	ER_16-74				Others_16-74		All_16+		
	0 Car	1+ Car	0 Car	1+ Car	0 Car	1+ Car	0 Car	1+ Car	
Salisbury	2,000	40,601	160	6,049	231	1,483	8,082	84,603	**143,211**
Swindon_Wiltshire	581	14,398	50	2,334	125	777	2,875	33,705	**54,845**
Chippenham	1,902	42,182	150	6,289	311	2,116	8,857	96,178	**157,985**
Trowbridge	1,467	26,938	111	3,767	245	1,268	6,775	63,753	**104,325**
Swindon	4,819	63,344	346	8,196	665	2,637	16,769	124,486	**221,262**
External	2,258	29,753	178	4,154	642	1,833	8,607	65,375	**112,800**
Wiltshire total*	**5,951**	**124,119**	**472**	**18,439**	**912**	**5,644**	**26,589**	**278,240**	**460,367**

*Only Wiltshire excluding Swindon

Table 3-5 - Trip Productions for Scenario 3 Do Something

HMA	HBW		HBEB		HBEd		HBO		Total
	ER_16-74				Others_16-74		All_16+		
	0 Car	1+ Car	0 Car	1+ Car	0 Car	1+ Car	0 Car	1+ Car	
Salisbury	1,851	33,935	191	6,019	239	1,476	8,505	84,180	136,395
Swindon_Wiltshire	548	12,033	62	2,322	129	773	3,043	33,537	52,448
Chippenham	1,775	35,255	182	6,257	321	2,105	9,338	95,697	150,932
Trowbridge	1,346	22,515	130	3,748	251	1,262	7,094	63,434	99,780
Swindon	4,819	63,344	346	8,196	665	2,637	16,769	124,486	221,262
External	2,258	29,753	178	4,154	642	1,833	8,607	65,375	112,800
Wiltshire total*	**5,520**	**103,738**	**565**	**18,347**	**940**	**5,616**	**27,981**	**276,848**	**439,555**

*Only Wiltshire excluding Swindon

Table 3-6 below presents the percentage difference of trip productions for Scenario 1 and Scenario 3 against base. There is an increase in car trips in all purposes in Scenario 1 Core and Core+LP. Scenario 3 also shows an increase in car trips except for HBW which is an impact of levers considered. This impact is shown in Table 3-7.

Table 3-6 - % difference of trip productions from base

Scenario Comparison	HMA	HBW		HBEB		HBEd		HBO		Total
		ER_16-74				Others_16-74		All_16+		
		0 Car	1+ Car	0 Car	1+ Car	0 Car	1+ Car	0 Car	1+ Car	
Scenario 1 Core vs Base	Salisbury	-24%	3%	-23%	6%	-17%	10%	-5%	15%	9%
	Swindon_Wiltshire	-21%	-3%	-21%	0%	-1%	16%	3%	15%	8%
	Chippenham	-21%	-1%	-20%	1%	3%	16%	4%	16%	9%
	Trowbridge	-27%	0%	-25%	5%	-6%	17%	-3%	19%	10%
	Swindon	-22%	11%	-20%	18%	-2%	38%	1%	31%	20%
	External	-20%	6%	-19%	9%	-8%	20%	-5%	17%	11%
	Wiltshire total*	**-24%**	**0%**	**-23%**	**3%**	**-6%**	**15%**	**-1%**	**16%**	**9%**

Scenario Comparison	HMA	HBW		HBEB		HBEd		HBO		Total
		ER_16-74				Others_16-74		All_16+		
		0 Car	1+ Car	0 Car	1+ Car	0 Car	1+ Car	0 Car	1+ Car	
Scenario 1 BAU LPR vs Base	Salisbury	-20%	11%	-18%	15%	-12%	19%	1%	24%	17%
	Swindon_Wiltshire	-23%	-5%	-23%	-3%	-5%	12%	0%	12%	5%
	Chippenham	-22%	0%	-20%	3%	3%	19%	3%	18%	11%
	Trowbridge	-26%	1%	-25%	6%	-5%	19%	-2%	21%	12%
	Swindon	-22%	11%	-20%	18%	-2%	38%	1%	31%	20%
	External	-20%	6%	-19%	9%	-8%	20%	-5%	17%	11%
	Wiltshire total*	**-22%**	**3%**	**-21%**	**6%**	**-4%**	**18%**	**1%**	**20%**	**12%**
Scenario 3 Do Something vs Base	Salisbury	-26%	-7%	-3%	14%	-9%	18%	6%	24%	12%
	Swindon_Wiltshire	-27%	-21%	-5%	-4%	-2%	11%	6%	11%	0%
	Chippenham	-27%	-16%	-4%	3%	6%	18%	9%	18%	6%
	Trowbridge	-32%	-15%	-12%	6%	-2%	18%	3%	20%	7%
	Swindon	-22%	11%	-20%	18%	-2%	38%	1%	31%	20%
	External	-20%	6%	-19%	9%	-8%	20%	-5%	17%	11%
	Wiltshire total*	**-28%**	**-14%**	**-6%**	**6%**	**-1%**	**17%**	**6%**	**19%**	**7%**

Table 3-7 - % difference of trip productions Scenario 3 Do Something vs Scenario 1 BAU LPR

HMA	HBW		HBEB		HBEd		HBO		Total
	ER_16-74				Others_16-74		All_16+		
	0 Car	1+ Car	0 Car	1+ Car	0 Car	1+ Car	0 Car	1+ Car	
Salisbury	-7%	-16%	19%	0%	3%	0%	5%	0%	-5%
Swindon_Wiltshire	-6%	-16%	23%	-1%	3%	-1%	6%	-1%	-4%
Chippenham	-7%	-16%	21%	-1%	3%	-1%	5%	-1%	-4%
Trowbridge	-8%	-16%	17%	0%	3%	-1%	5%	0%	-4%
Swindon	0%	0%	0%	0%	0%	0%	0%	0%	0%
External	0%	0%	0%	0%	0%	0%	0%	0%	0%
Wiltshire total*	-7%	-16%	20%	-1%	3%	0%	5%	-1%	-5%

3.2.4. Attractions

Trip attractions are also primarily built up from NTEM data. Job growth rates from 2018-2036 have been applied to 2036 attractions to each sector for HBW, HBEB and NHBEB purposes to forecast the target attractions for the corresponding purposes (HBW, HBEB and NHBEB) in Core+LP scenario. For the other purposes (HBEd, HBO and NHBO) attractions were assumed to be the reference NTEM 2036 volumes without any further tweaks. Table 3-8 and Table 3-9 below presents the trip attractions at HMA level for Core and Core+LP scenarios respectively. Table 3-10 presents the trip attractions for Scenario 3.

Table 3-8 - Trip Attractions for Scenario 1 Core

HMA	HBW	HBEB	HBEd	HBO	NHBEB	NHBO	Total
Salisbury	43,054	5,594	32,012	95,949	7,500	41,590	**225,698**

HMA	HBW	HBEB	HBEd	HBO	NHBEB	NHBO	Total
Swindon_Wiltshire	**16,062**	**2,106**	**13,080**	**40,070**	**2,944**	**17,104**	**91,366**
Chippenham	45,905	6,052	33,755	101,221	8,561	42,080	**237,574**
Trowbridge	27,790	3,661	18,343	75,097	5,114	31,932	**161,936**
Swindon	64,968	8,632	38,650	159,174	11,849	64,066	**347,339**
External	47,109	6,387	36,317	109,855	8,773	47,255	**255,697**
Wiltshire total*	**132,811**	**17,413**	**97,189**	**312,337**	**24,119**	**132,706**	**716,574**

*Only Wiltshire excluding Swindon

Table 3-9 - Trip Attractions for Scenario 1 BAU LPR

HMA	HBW	HBEB	HBEd	HBO	NHBEB	NHBO	Total
Salisbury	44,763	5,816	32,012	95,949	7,798	41,590	**227,927**
Swindon_Wiltshire	16,505	2,164	13,080	40,070	3,025	17,104	**91,948**
Chippenham	46,750	6,163	33,755	101,221	8,718	42,080	**238,688**
Trowbridge	28,461	3,749	18,343	75,097	5,238	31,932	**162,819**
Swindon	64,968	8,632	38,650	159,174	11,849	64,066	**347,339**
External	47,109	6,387	36,317	109,855	8,773	47,255	**255,697**
Wiltshire total*	**136,479**	**17,893**	**97,189**	**312,337**	**24,779**	**132,706**	**721,383**

*Only Wiltshire excluding Swindon

Table 3-10 - Trip Attractions for Scenario 3 Do Something

HMA	HBW	HBEB	HBEd	HBO	NHBEB	NHBO	Total
Salisbury	37,601	5,816	32,012	95,949	7,798	41,590	**220,765**
Swindon_Wiltshire	13,864	2,164	13,080	40,070	3,025	17,104	**89,307**
Chippenham	39,270	6,163	33,755	101,221	8,718	42,080	**231,208**
Trowbridge	23,907	3,749	18,343	75,097	5,238	31,932	**158,265**
Swindon	64,968	8,632	38,650	159,174	11,849	64,066	**347,339**
External	47,109	6,387	36,317	109,855	8,773	47,255	**255,697**
Wiltshire total*	**114,642**	**17,893**	**97,189**	**312,337**	**24,779**	**132,706**	**699,546**

*Only Wiltshire excluding Swindon

Table 3-11 below presents the percentage difference of trip attractions for Scenario 1 and Scenario 3 against base. There is an increase in trips in all purposes in Scenario 1 Core and Core+LP whereas Scenario 3 shows a decrease in HBW trips which is an impact of levers considered. This impact is shown in Table 3-12.

Table 3-11 - % difference of trip attractions from base

Scenario Comparison	HMA	HBW	HBEB	HBEd	HBO	NHBEB	NHBO	Total
Scenario 1 Core vs Base	Salisbury	3%	7%	2%	10%	7%	8%	7%
	Swindon_Wiltshire	5%	9%	8%	14%	9%	12%	11%
	Chippenham	6%	9%	9%	15%	9%	13%	12%
	Trowbridge	6%	9%	10%	15%	10%	13%	12%
	Swindon	5%	8%	8%	16%	9%	13%	12%
	External	5%	8%	8%	15%	9%	12%	11%
	Wiltshire total*	**5%**	**8%**	**7%**	**13%**	**9%**	**12%**	**10%**
Scenario 1 BAU LPR vs Base	Salisbury	7%	11%	2%	10%	12%	8%	8%
	Swindon_Wiltshire	8%	12%	8%	14%	12%	12%	12%
	Chippenham	8%	11%	9%	15%	12%	13%	12%
	Trowbridge	8%	12%	10%	15%	12%	13%	13%
	Swindon	5%	8%	8%	16%	9%	13%	12%
	External	5%	8%	8%	15%	9%	12%	11%
	Wiltshire total*	**8%**	**11%**	**7%**	**13%**	**12%**	**12%**	**11%**
Scenario 3 Do Something vs Base	Salisbury	-10%	11%	2%	10%	12%	8%	5%
	Swindon_Wiltshire	-9%	12%	8%	14%	12%	12%	9%
	Chippenham	-10%	11%	9%	15%	12%	13%	9%
	Trowbridge	-9%	12%	10%	15%	12%	13%	10%
	Swindon	5%	8%	8%	16%	9%	13%	12%
	External	5%	8%	8%	15%	9%	12%	11%
	Wiltshire total*	**-9%**	**11%**	**7%**	**13%**	**12%**	**12%**	**8%**

Table 3-12 - % difference of trip attractions Scenario 3 Do Something vs Scenario 1 BAU LPR

HMA	HBW	HBEB	HBEd	HBO	NHBEB	NHBO	Total
Salisbury	-16%	0%	0%	0%	0%	0%	-3%
Swindon_Wiltshire	-16%	0%	0%	0%	0%	0%	-3%
Chippenham	-16%	0%	0%	0%	0%	0%	-3%
Trowbridge	-16%	0%	0%	0%	0%	0%	-3%
Swindon	0%	0%	0%	0%	0%	0%	0%
External	0%	0%	0%	0%	0%	0%	0%
Wiltshire total*	**-16%**	**0%**	**0%**	**0%**	**0%**	**0%**	**-3%**

4. General assumptions on transport characteristics

4.1. Parameters

4.1.1. Economic Parameters

The TAG Databook (November 2021, v1.17) sets out Vehicle Operating Costs (VOCs), made up of six component parts; a to d parameters defined for each vehicle category representing fuel costs from TAG Databook, and a1 and b1 are parameters for distance-related costs and vehicle capital savings (only relevant to working vehicles) defined for each vehicle category, respectively representing non-fuel costs. The VOC parameters used for car in the base year ISM Variable Demand Modelling (VDM) are shown in Table 4-1. The choices of mode and destination made in the VDM hence consider the differences in operating costs resulting from the speed of travel between the alternatives available.

Table 4-1 - VDM vehicle operating cost parameters (pence/Km 2010 prices, 2036 values)

VOC component	Non work	Work
a	28.161	23.468
b	5.900	4.997
c	-0.057	-0.047
d	0.000	0.000
a1	3.119	3.936
b1	0.000	135.946

The Values of Time (VoT) applied in the ISM VDM were also extracted from the TAG Databook for the base year, as set out in Table 4-2. It can be seen, across purposes, that the VoT for Employer's Business was applied to HBEB and NHBEB (home-based and non-home-based employers' business) respectively, the VoT for Other trips was applied to HBEd, HBO, and NHBO (home-based education, home-based other and non-home-based other), and the VoT for commuting trips was applied to HBW (home-based work) only. Across sub-modes, in line with guidance, cycle and walk modes utilise the VoT values from Bus.

Table 4-2 - VDM VoT (pence per minute, 2010 prices, 2036 values)

Purpose	Car	Bus	Rail	Cycle	Walk
HBEB	33.49	18.98	55.24	18.98	18.98
HBEd	10.23	10.23	10.23	10.23	10.23
HBO	10.23	10.23	10.23	10.23	10.23
HBW	22.42	22.42	22.42	22.42	22.42
NHBEB	33.49	18.98	55.24	18.98	18.98
NHBO	10.23	10.23	10.23	10.23	10.23

Table 4-3 presents the Car occupancy per trip by purpose. These are also extracted from TAG Databook for 2010 price year and 2036 value year. Car occupancy factors, along with VoT, is used in the calculation of GJT.

Table 4-3 - Car Occupancy factors

Purpose	OCC
HBEB	1.19
HBEd	1.67
HBO	1.67
HBW	1.17
NHBEB	1.19
NHBO	1.67

4.2. PT Fares

The derivation of bus and rail fares for the Base Year is described in baseline BAU report attached in Appendix A. TAG Unit M4 recognizes the uncertainty of future charging policy, mainly if fares are left to the discretion of the operator. The changes in public transport fares over time for Wiltshire were estimated by reviewing historical fare data for bus and rail separately as detailed below.

4.2.1. Rail fares

TAG Unit A5.3 paragraph 2.3.6 states: "*Demand and revenue forecasts should be based on current fares policy (usually a nominal increase of RPI+X%). Nominal fare increases should be converted to real terms using the GDP deflator. TAG Data Book Table A5.3.1 provides the relevant GDP deflator and RPI series".*

Projected rail fare increase over RPI in nominal terms is converted to real terms using the GDP deflator. DfT analysis show that the rail fares increase by 24% between 2018-2036 which is an annual average increase of approximately 1.2%.

4.2.2. Bus Fares

The changes in the bus fares over time in nominal terms were derived using historical fare data taken from DfT's local bus fare index table BUS0405a[1]. DfT analysis show that the bus fares in nominal terms increased by approx. 51%. This trend in nominal terms is extrapolated for the forecast year 2036 and is adjusted using GDP deflator to convert to real terms. Bus fare index in real terms shows an increase by 34% between 2018-2036 which is an annual average increase of approximately 1.6%.

4.3. Parking Charges

The increase in parking charges from 2018 to 2036 is maintained at the same level as the increase in rail fares, an increase of 24% from 2018 to 2036, which is an annual average increase of approximately 1.2%.

[1] Bus Statistics (https://www.gov.uk/government/organisations/department-for-transport/series/bus-statistics)

5. Scenario Descriptions

This chapter explains how the inputs are derived for each ISM scenario run based on the application of levers. Input assumptions of the levers vary, therefore wherever possible levers are implemented via ISM (change in costs, trip ends etc) and remaining levers are implemented Post ISM (simple mode shift from car to other modes) and in carbon model.

5.1. Scenario 1 BAU LP

The ISM Scenario 1 is a Business as Usual (BAU) scenario equivalent to the 2036 DM2b version of the WTM run (model demand and infrastructure assumptions are presented in Section 3.6 of the baseline BAU report attached in Appendix A.

5.1.1. Car Costs

Highway (car) cost characteristics, encompassing travel distance, travel time, and any incurred tolls were extracted directly from the WTM 2036 BAU run for three peaks i.e., AM, IP, and PM and input to the ISM.

5.1.2. Parking Costs

Car parking charges for the year 2036 are increased by 24% from the base year charges as explained in Section 4.3.

5.1.3. Non-car Costs

Public transport (Bus and Rail) and active mode (Cycle and Walk) cost characteristics remain the same as in the base year, except for the PT fares. Rail and Bus fares for year 2036 are increased by 24% and 34% respectively from the base year fares, as explained in Section 4.2.

5.2. Scenario 2 Do Minimum

Table 5-1 below presents the levers / interventions implemented in Scenario 2 aimed at reducing embodied carbon from new transport infrastructure construction by determining whether these highway construction schemes are still required. It also presents the impact of levers on inputs to ISM (costs by mode) and the sectors/sector pairs considered for each lever. **Error! Reference source not found.** in **Error! Reference source not found.** provides the evidence base and source references for the levers developed.

These levers are applied on mode wise skims used in Scenario 1 thereby changing the costs of travel based on levers.

Table 5-1 – Levers / Schemes included in Scenario 2 Do Minimum

Intervention Type	Category	Levers / Scheme	Application	Impact on ISM	Sectors Affected	Sector pairs Affected	
Avoid	Active Travel Infrastructure	Cycling infrastructure - genuine connected network	ISM	10% reduction in cycle travel distance/ time	2002 2003 2004 3002 3003 3004 4003 4004 4005	2001-2002 2001-2003 2001-2007 2002-2003 2002-2007 2002-2004 2003-2007 2003-2004	2004-2007 3002-3003 3002-3004 3003-3004 4003-4004 4003-4005 4004-4005
		Walking infrastructure - genuine connected network	ISM	10% reduction in walk travel distance/ time			
Avoid	Behavioural change	Workplace Travel Planning	Post ISM	5% mode shift from car - 4.5% to PT (bus), 0.5% to cycling Only applies to Commute trips	All internal	All internal	
		School Travel Planning	Post ISM	5% mode shift from car - 4.5% to PT (bus), 0.5% to cycling Only applies to trips to school / education facility	All internal	All internal	
Shift	Modern Public Transport	Extended public transport routes and improved frequencies	ISM	35% reduction in passenger wait time and transfer time for bus services	1002 1003 1004 2002	3001 3002 3003 3004	1001-1003 1001-1004 1001-2002 1001-2003 2004-5004 2005-5004 2008-2004 2008-2010

Intervention Type	Category	Levers / Scheme	Application	Impact on ISM	Sectors Affected		Sector pairs Affected	
					2003	3005	1001-2006	2008-3002
					2004	3006	1001-2007	3001-5004
					2005	4003	2002-2003	3002-3001
					2006	4004	2002-2004	3002-3003
					2007	5004	2002-2005	3002-3004
					2008	5006	2002-2006	3002-3005
					2010	5015	2002-2007	3002-3006
					2011	5016	2002-2008	3002-5004
					2012	6003	2002-2010	3002-5006
							2002-3002	3003-5004
							2002-3003	3005-3006
							2002-3004	3005-2012
							2002-3005	4003-4004
							2002-3006	4003-5016
							2002-5004	6003-5015
							2002-5006	6003-4004
							2002-5004	6003-4003
							2003-5004	
		Demand Responsive Transport (DRT) and rideshare	Post ISM	1.8% mode shift from private car to DRT	1003	3003	Trips originating in these sectors	
					1004	3004		
					2003	3007		
					2004	4001		
					2007	4003		
					2008	4004		
					2010	4005		
					3002	4006		

Intervention Type	Category	Levers / Scheme	Application	Impact on ISM	Sectors Affected	Sector pairs Affected
Shift	Fiscal Measures	Improved (reduced) public transport fares	ISM	10% reduction in bus and rail fare	All internal	All internal
		Increased parking charges	ISM	15% increase in parking charges	All internal	All internal
Improve	Electric Vehicle (EV) charging infrastructure	EV charging (residential) and vehicle to grid technology	Carbon Model	-	-	-

5.3. Scenario 3 Do Something

Table 5-2 presents the levers / schemes implemented in Scenario 3 in addition to levers from Scenario 2. **Error! Reference source not found.** in **Error! Reference source not found.** provides the evidence base and source references for the levers developed.

These levers are applied on mode wise skims used in Scenario 2 thereby changing the costs of travel based on levers.

Table 5-2 – Additional Levers / Schemes included in Scenario 3 Do Something

Intervention Type	Category	Levers / Scheme	Application	Impact on ISM	Sectors Affected	Sector pairs Affected
Avoid	Active Travel Infrastructure	Micro-consolidation: trolley / cargo bike / electric vehicle last-mile delivery	Scenario Saturn matrices	1.6% reduction in total LGV demand (16% of LGV is assumed as delivery vehicles)	1003 2003 2004 2006 2007 2010 4004 4005 4008	To / from these sectors
		Flexible pick-up / drop-off points for home deliveries	Scenario Saturn matrices	2.4% reduction in total LGV demand (16% of LGV is assumed as delivery vehicles)		
Avoid	Behavioural change	Personalised Travel Planning	Post ISM	5% mode shift from car - 4% shifts to PT (bus), 0.5% to cycling, 0.5% to walking	All internal	All internal

Intervention Type	Category	Levers / Scheme	Application	Impact on ISM	Sectors Affected	Sector pairs Affected
Avoid	Land Use Planning	Mixed-use developments meeting greater range of local needs	ISM	Reduction in skims for Car by 5% Bus In Vehicle Travel Time (IVTT) by 5% Cycle by 10% and Walk by 20%	1003 2003 2004 2006 2007 2010 4004 4005 4008	Intra sectoral
		Local amenities within short walk and cycle (15-minute neighbourhood)	ISM	10% reduction in cycle and walk skims (distance / time)	1003 2003 2007 3002 3005	Intra sectoral
Shift	Fiscal Measures	Introduction of mobility credits	Prior ISM	0.5% shift in trip productions from 1+ car availability to 0 Car availability category	All internal	All internal
		Workplace Parking Levy	ISM	Charge of £450 / space / year converted to daily charge (i.e., 450/365) and add to existing parking charges	1003 1004 2002 2003 2006 2008 2010 4003	-

Intervention Type	Category	Levers / Scheme	Application	Impact on ISM	Sectors Affected	Sector pairs Affected
Shift	Shared Mobility	Bike share	ISM	5% reduction in cycle skims – to indirectly replicate the access to bikes	All internal	All internal
		Car share (club)	Carbon Model	-	-	-
		Mobility hubs - integrated network	ISM	5% reduction in PT access, egress, and transfer times	All internal	All internal
Shift	Street design & access restrictions	Low Traffic Neighbourhoods (LTNs) - active travel priority	ISM	10% reduction in cycle and walk travel distance / times 5% increase in car distance and time skims	1003 2003 2007 4004 4005	To / from these sectors
		Controlled parking zones	ISM	Free parking sites included in the analysis are converted to paid parking	2002 3002 4003	-
Improve	Efficient driving / network	Roll-out and support eco-driving training	Carbon Model	-	-	
		Implement speed limit reductions	Carbon Model	-	-	-
Avoid	IT Infrastructure	Home working (superfast broadband, house design to allow for workspace)	ISM	16% reduction in trip productions for commute (HBW purpose)	All internal	All internal

5.4. Scenario 4 Do Maximum

Table 5-3 presents the levers / interventions implemented in Scenario 4, in addition to those levers from Scenarios 2 and 3. **Error! Reference source not found.** in **Error! Reference source not found.** provides the evidence base and source references for the levers developed.

These levers are applied on mode wise skims used in Scenario 3 thereby changing the costs of travel based on levers.

Table 5-3 – Additional Levers / Schemes included in Scenario 4 Do Maximum

Intervention Type	Category	Levers / Scheme	Application	Impact on ISM	Sectors Affected	Sector pairs Affected
Avoid	Active Travel Infrastructure	Micro-consolidation: trolley / cargo bike / electric vehicle last-mile delivery	Scenario Saturn matrices	2.4% reduction in total LGV demand (16% of LGV is assumed as delivery vehicles)	1003 2003 2004 2006 2007 2010 4004 4005 4008	To / from these sectors
		Flexible pick-up / drop-off points for home deliveries	Scenario Saturn matrices	3.2% reduction in total LGV demand (16% of LGV is assumed as delivery vehicles)		
Avoid	Land Use Planning	Co-working spaces (local, in new developments / disused shops)	Carbon Model	-	-	-
Shift	Modern Public Transport	Mobility as a Service (MaaS) - integrated public transport, on-demand, and shared mobility services	ISM	15% reduction in bus and rail wait, access, egress, and transfer times for commute trips	1003 1004 2002 2003 2004 2006 2007 2008 2010 3005 4003 4004 4005 4006 4008	To / from these sectors
Shift	Fiscal Measures	Improved (reduced) public transport fares	ISM	50% reduction in bus and rail fares	All internal	All internal
		Increase parking charges	ISM	50% increase in car parking charges	All internal	All internal
Shift	Shared Mobility	Bike Share	ISM	10% reduction in cycle distance/ time skims	All internal	All internal

		Electric vehicle car share (club)	Carbon Model	-	-	-
Shift	Street design	Low Traffic Neighbourhoods (LTNs) - active travel priority	ISM	15% reduction in cycle and walk distance/ travel times, 10% increase in car distance and time skims	1003 2003 2007 4004 4005	To / from these sectors
Shift	Access restrictions	Congestion charging zones	WTM 2036 BAU model	Car skims from Saturn model input to ISM	1003 2002 2003 3002 4003	-
		Low emission zones - Clean Air Zones				

Note that unless explicitly specified the above levers are applied only to internal sector pairs i.e., Wiltshire-Wiltshire and with an exception to Wiltshire-Swindon interaction

6. Scenario Results

6.1. Introduction

This section provides a summary of the key outputs from scenario runs in terms of total demand by mode, mode share, car trips by purpose.

6.2. Demand by mode and mode share

Table 6-1 and Table 6-2 presents the total trips by mode for each scenario for the whole model and internal area respectively. There is an increase in trips from Scenario 1 Core to Scenario1 BAU LP and decrease in trips from Scenario 2 to Scenario 4 due to the impact of levers.

There is a shift in mode share from Car to PT and active travel due to the impact of levers in Scenario 2, 3 and 4.

Table 6-1 – Total demand by scenario by mode

Run	Car	PT		Cycle	Walk	Grand Total
		Bus	Rail			
Base	697,874	33,132	20,533	11,320	150,579	913,439
Scenario 1 Core	790,136	33,786	21,066	11,916	168,510	1,025,414
Scenario 1 BAU LP	799,927	34,537	21,330	12,289	172,923	1,041,006
Scenario 2 Do Minimum	782,717	43,809	21,540	13,045	177,959	1,039,072
Scenario 3 Do Something	734,285	52,528	21,424	14,083	185,978	1,008,298
Scenario 4 Do Maximum	613,764	77,816	30,740	20,218	240,963	983,502

Table 6-2 – Internal area demand by scenario by mode

Run	Car	PT		Cycle	Walk	Grand Total
		Bus	Rail			
Base	579,159	30,470	15,399	11,163	150,417	786,607
Scenario 1 Core	658,304	31,226	15,667	11,771	168,342	885,310
Scenario 1 BAU LP	667,733	31,961	15,881	12,144	172,754	900,473
Scenario 2 Do Minimum	650,586	41,199	16,036	12,896	177,788	898,505
Scenario 3 Do Something	602,786	49,883	15,832	13,936	185,808	868,245
Scenario 4 Do Maximum	484,547	74,679	24,273	20,020	240,776	844,296

Table 6-3 and Table 6-4 presents the mode shares for each scenario for the whole model and internal area respectively

Table 6-3 - Overall mode share by scenario

Run	Car	PT		Cycle	Walk	Grand Total
		Bus	Rail			
Base	76.4%	3.6%	2.2%	1.2%	16.5%	100.0%
Scenario 1 Core	77.1%	3.3%	2.1%	1.2%	16.4%	100.0%
Scenario 1 BAU LP	76.8%	3.3%	2.0%	1.2%	16.6%	100.0%
Scenario 2 Do Minimum	75.3%	4.2%	2.1%	1.3%	17.1%	100.0%
Scenario 3 Do Something	72.8%	5.2%	2.1%	1.4%	18.4%	100.0%
Scenario 4 Do Maximum	62.4%	7.9%	3.1%	2.1%	24.5%	100.0%

Table 6-4 - Internal area mode share by scenario

Run	Car	PT		Cycle	Walk	Grand Total
		Bus	Rail			
Base	73.6%	3.9%	2.0%	1.4%	19.1%	100.0%
Scenario 1 Core	74.4%	3.5%	1.8%	1.3%	19.0%	100.0%
Scenario 1 BAU LP	74.2%	3.5%	1.8%	1.3%	19.2%	100.0%
Scenario 2 Do Minimum	72.4%	4.6%	1.8%	1.4%	19.8%	100.0%
Scenario 3 Do Something	69.4%	5.7%	1.8%	1.6%	21.4%	100.0%
Scenario 4 Do Maximum	57.4%	8.8%	2.9%	2.4%	28.5%	100.0%

Table 6-5 below presents the car trips by scenario in Wiltshire and Swindon authorities and Wiltshire separately and respective % change from base

Table 6-5 - Car trip productions by scenario

Run	Car Trips		% Change from Base	
	Wiltshire & Swindon	Only Wiltshire	Wiltshire & Swindon	Only Wiltshire
Base	577,866	343,472	0.0%	0.0%
Scenario 1 Core	657,257	378,485	13.7%	10.2%
Scenario 1 BAU LP	666,624	388,034	15.4%	13.0%
Scenario 2 Do Minimum	652,862	374,905	12.2%	7.9%
Scenario 3 Do Something	608,251	332,764	3.9%	-5.3%
Scenario 4 Do Maximum	515,414	246,434	-16.2%	-36.6%

Table 6-6 presents the total trips by scenario at sector level and

Table 6-7 presents the % difference of total trips from base for each scenario. Table 6-8 presents the car trips by scenario at sector level and

Table 6-9 presents the % difference of car trips from base for each scenario.

There is a gradual decrease in car trips from Scenario 2 to Scenario 4 due to the impact of levers. A significant decrease in car trips is achieved in Scenario 4 especially in the sectors with congestion charge and Loew mission charge i.e., Royal Wotton Bassett, Chippenham and Calne, Melksham, Trowbridge and Salisbury.

Table 6-6 - Sector Level total trips by scenario

Sector	Base	Scenario 1 Core	Scenario 1 BAU LP	Scenario 2 Do Minimum	Scenario 3 Do Something	Scenario 4 Do Maximum
1001 Swindon	269,861	300,410	300,257	300,841	299,523	293,791
1002 Rest of Swindon	27,101	51,145	51,155	51,162	51,145	51,256
1003 Royal Wootton Bassett	11,767	12,653	14,057	14,004	13,234	12,475
1004 Rest of RWB	6,693	7,007	6,934	6,940	6,518	6,112
1005 West of Swindon	10,436	11,512	10,850	10,852	10,330	10,344
1006 Kennet North	16,510	18,121	16,857	16,775	15,957	15,841
1007 Kennet South	13,960	14,839	14,007	14,009	13,295	13,312
2001 North Wiltshire	26,922	27,687	26,633	26,549	25,123	24,843
2002 Chippenham	29,545	35,587	34,755	34,404	32,542	29,283
2003 Pewsham	6,039	5,959	5,721	5,721	5,403	5,318
2004 Corsham	13,424	14,755	14,528	14,479	13,692	13,166
2005 West of Corsham	7,814	8,009	7,748	7,752	7,321	7,438
2006 Calne	17,330	18,211	17,567	17,496	16,596	16,425
2007 Chippenham Rural	7,342	8,230	13,320	13,323	12,697	12,396
2008 Melksham	14,988	16,165	15,672	15,582	14,841	13,735
2009 West of Melksham	3,310	3,391	3,266	3,268	3,104	3,083
2010 East of Melksham	6,790	8,745	11,402	11,409	10,857	10,572
2011 Devizes	18,550	19,805	19,673	19,457	18,484	17,945
2012 Central Wiltshire	15,194	15,556	15,008	15,014	14,242	14,201
3001 Bradford on Avon	16,243	16,556	16,565	16,430	15,725	15,279
3002 Trowbridge	34,194	34,596	35,020	34,948	33,136	29,446
3003 Hilperton	6,902	7,384	7,458	7,457	7,076	6,897
3004 South of Trowbridge	6,546	12,036	12,139	12,140	11,540	11,482
3005 Westbury	21,282	22,442	23,197	23,077	21,962	21,756
3006 Warminster	19,474	20,311	20,646	20,471	19,545	19,285
3007 South of Warminster	7,771	10,616	10,755	10,806	10,322	10,613
4001 Salisbury SW	11,823	11,787	12,210	12,220	11,664	11,745
4002 Salisbury West	9,956	10,388	10,486	10,503	9,992	9,754
4003 Salisbury	48,975	54,064	55,942	54,838	51,541	45,866
4004 Salisbury SE	23,977	25,665	28,055	28,099	26,492	26,505
4005 South of Amesbury	6,730	9,011	11,870	11,875	11,234	11,209
4006 Amesbury	13,678	14,677	15,649	15,510	14,646	14,314
4007 North of Amesbury	15,134	15,675	16,189	16,199	15,205	15,238
4008 Tidworth	16,734	18,873	21,323	21,336	19,887	19,995
4009 Pewsey	3,611	3,439	3,557	3,558	3,372	3,375
5001 Stroud	2,485	2,698	2,699	2,700	2,698	2,692
5002 South Gloucestershire	5,839	6,536	6,551	6,553	6,543	6,416
5003 Bristol	5,913	6,593	6,600	6,596	6,590	6,519
5004 Bath	10,475	11,080	11,112	11,120	11,082	10,839
5005 Rest of Bath & NES	2,503	2,648	2,653	2,655	2,651	2,631
5006 Mendip & South Som	10,448	11,800	11,854	11,861	11,827	11,601
5007 Dorset, B, C & P	10,502	11,361	11,387	11,393	11,367	11,367
5008 Rest of Gloucestershire	4,144	4,566	4,572	4,565	4,562	4,562
5009 Cotswold	9,636	10,055	10,058	10,064	10,048	9,947
5010 West Oxfordshire	1,473	1,588	1,587	1,588	1,585	1,581
5011 Vale of White Horse	4,542	5,657	5,669	5,670	5,658	5,638
5012 Oxford & South Oxforshire	1,489	1,673	1,679	1,679	1,675	1,674
5013 West Berkshire	4,512	5,105	5,130	5,136	5,104	5,123
5014 Basingstoke & Deane	1,353	1,609	1,626	1,621	1,607	1,587
5015 Test Valley	8,677	9,776	9,909	9,933	9,740	9,644
5016 New Forest & IW	4,667	5,048	5,061	5,062	5,025	5,024
5017 Southampton & Others	4,587	5,123	5,142	5,138	5,114	5,122
6001 South West	4,547	5,011	5,014	5,014	5,012	5,024
6002 London	3,515	4,129	4,136	4,130	4,133	4,137
6003 South East	9,180	10,339	10,381	10,379	10,324	10,348
6004 East of England	2,379	2,724	2,725	2,725	2,724	2,729
6005 East Midlands	1,697	1,856	1,856	1,856	1,856	1,858
6006 West Midlands	3,386	3,678	3,678	3,678	3,677	3,683
6007 Wales	4,015	4,275	4,275	4,275	4,275	4,278
6008 Rest of England	4,868	5,179	5,179	5,179	5,178	5,179
Grand Total	**913,439**	**1,025,414**	**1,041,006**	**1,039,072**	**1,008,298**	**983,502**

Table 6-7 - % Change in total trips from base

Sector	Base	Scenario 1 Core	Scenario 1 BAU LP	Scenario 2 Do Minimum	Scenario 3 Do Something	Scenario 4 Do Maximum
1001 Swindon	0%	11%	11%	11%	11%	9%
1002 Rest of Swindon	0%	89%	89%	89%	89%	89%
1003 Royal Wootton Bassett	0%	8%	19%	19%	12%	6%
1004 Rest of RWB	0%	5%	4%	4%	-3%	-9%
1005 West of Swindon	0%	10%	4%	4%	-1%	-1%
1006 Kennet North	0%	10%	2%	2%	-3%	-4%
1007 Kennet South	0%	6%	0%	0%	-5%	-5%
2001 North Wiltshire	0%	3%	-1%	-1%	-7%	-8%
2002 Chippenham	0%	20%	18%	16%	10%	-1%
2003 Pewsham	0%	-1%	-5%	-5%	-11%	-12%
2004 Corsham	0%	10%	8%	8%	2%	-2%
2005 West of Corsham	0%	2%	-1%	-1%	-6%	-5%
2006 Calne	0%	5%	1%	1%	-4%	-5%
2007 Chippenham Rural	0%	12%	81%	81%	73%	69%
2008 Melksham	0%	8%	5%	4%	-1%	-8%
2009 West of Melksham	0%	2%	-1%	-1%	-6%	-7%
2010 East of Melksham	0%	29%	68%	68%	60%	56%
2011 Devizes	0%	7%	6%	5%	0%	-3%
2012 Central Wiltshire	0%	2%	-1%	-1%	-6%	-7%
3001 Bradford on Avon	0%	2%	2%	1%	-3%	-6%
3002 Trowbridge	0%	1%	2%	2%	-3%	-14%
3003 Hilperton	0%	7%	8%	8%	3%	0%
3004 South of Trowbridge	0%	84%	85%	85%	76%	75%
3005 Westbury	0%	5%	9%	8%	3%	2%
3006 Warminster	0%	4%	6%	5%	0%	-1%
3007 South of Warminster	0%	37%	38%	39%	33%	37%
4001 Salisbury SW	0%	0%	3%	3%	-1%	-1%
4002 Salisbury West	0%	4%	5%	5%	0%	-2%
4003 Salisbury	0%	10%	14%	12%	5%	-6%
4004 Salisbury SE	0%	7%	17%	17%	10%	11%
4005 South of Amesbury	0%	34%	76%	76%	67%	67%
4006 Amesbury	0%	7%	14%	13%	7%	5%
4007 North of Amesbury	0%	4%	7%	7%	0%	1%
4008 Tidworth	0%	13%	27%	27%	19%	19%
4009 Pewsey	0%	-5%	-1%	-1%	-7%	-7%
5001 Stroud	0%	9%	9%	9%	9%	8%
5002 South Gloucestershire	0%	12%	12%	12%	12%	10%
5003 Bristol	0%	11%	12%	12%	11%	10%
5004 Bath	0%	6%	6%	6%	6%	3%
5005 Rest of Bath & NES	0%	6%	6%	6%	6%	5%
5006 Mendip & South Som	0%	13%	13%	14%	13%	11%
5007 Dorset, B, C & P	0%	8%	8%	8%	8%	8%
5008 Rest of Gloucestershire	0%	10%	10%	10%	10%	10%
5009 Cotswold	0%	4%	4%	4%	4%	3%
5010 West Oxfordshire	0%	8%	8%	8%	8%	7%
5011 Vale of White Horse	0%	25%	25%	25%	25%	24%
5012 Oxford & South	0%	12%	13%	13%	12%	12%
5013 West Berkshire	0%	13%	14%	14%	13%	14%
5014 Basingstoke & Deane	0%	19%	20%	20%	19%	17%
5015 Test Valley	0%	13%	14%	14%	12%	11%
5016 New Forest & IW	0%	8%	8%	8%	8%	8%
5017 Southampton & Others	0%	12%	12%	12%	11%	12%
6001 South West	0%	10%	10%	10%	10%	11%
6002 London	0%	17%	18%	17%	18%	18%
6003 South East	0%	13%	13%	13%	12%	13%
6004 East of England	0%	15%	15%	15%	15%	15%
6005 East Midlands	0%	9%	9%	9%	9%	9%
6006 West Midlands	0%	9%	9%	9%	9%	9%
6007 Wales	0%	6%	6%	6%	6%	7%
6008 Rest of England	0%	6%	6%	6%	6%	6%
Grand Total	**0%**	**12%**	**14%**	**14%**	**10%**	**8%**

Table 6-8 - Sector Level car trips by scenario

Sector	Base	Scenario 1 Core	Scenario 1 BAU LP	Scenario 2 Do Minimum	Scenario 3 Do Something	Scenario 4 Do Maximum
1001 Swindon	210,171	235,572	235,321	234,661	232,103	223,925
1002 Rest of Swindon	24,222	43,201	43,269	43,075	42,965	42,236
1003 Royal Wootton Bassett	9,666	10,586	11,699	11,267	9,507	291
1004 Rest of RWB	5,457	5,808	5,753	5,586	5,007	1,210
1005 West of Swindon	9,306	10,130	9,539	9,435	8,625	8,425
1006 Kennet North	12,113	13,289	12,327	12,047	10,995	10,527
1007 Kennet South	10,884	11,640	10,969	10,778	9,787	9,220
2001 North Wiltshire	22,647	23,373	22,474	22,098	20,088	19,525
2002 Chippenham	19,508	23,777	23,209	22,013	19,688	825
2003 Pewsham	4,364	4,338	4,181	3,936	3,365	83
2004 Corsham	10,093	11,238	11,044	10,441	9,046	4,736
2005 West of Corsham	5,714	5,861	5,663	5,581	5,039	4,937
2006 Calne	11,858	12,719	12,238	11,903	10,328	9,170
2007 Chippenham Rural	5,626	6,336	10,275	9,935	8,424	3,196
2008 Melksham	9,740	10,522	10,166	9,720	8,763	343
2009 West of Melksham	2,465	2,511	2,409	2,366	2,140	1,950
2010 East of Melksham	4,920	6,283	8,173	7,886	7,031	4,538
2011 Devizes	11,171	12,155	12,052	11,579	10,467	9,222
2012 Central Wiltshire	12,881	13,411	12,932	12,739	11,573	11,006
3001 Bradford on Avon	11,555	11,834	11,826	11,479	10,529	9,315
3002 Trowbridge	20,466	20,894	21,068	19,760	17,398	394
3003 Hilperton	5,077	5,413	5,450	5,147	4,672	1,262
3004 South of Trowbridge	4,962	8,968	9,008	8,465	7,706	6,575
3005 Westbury	15,236	15,751	16,202	15,729	14,155	12,753
3006 Warminster	11,933	12,664	12,850	12,376	11,247	10,219
3007 South of Warminster	6,762	9,275	9,389	9,179	8,425	8,419
4001 Salisbury SW	8,997	9,265	9,585	9,363	8,610	8,520
4002 Salisbury West	6,784	7,280	7,310	7,080	6,382	5,239
4003 Salisbury	25,213	28,697	29,426	25,554	22,177	6,663
4004 Salisbury SE	19,776	21,451	23,261	21,403	15,287	12,830
4005 South of Amesbury	5,270	7,003	9,129	8,524	6,855	6,210
4006 Amesbury	9,942	10,888	11,584	11,024	9,944	9,149
4007 North of Amesbury	10,186	10,805	11,111	10,851	9,762	9,154
4008 Tidworth	9,668	11,234	12,550	12,314	9,467	9,182
4009 Pewsey	3,230	3,084	3,185	3,135	2,855	2,753
5001 Stroud	2,361	2,575	2,576	2,575	2,571	2,539
5002 South Gloucestershire	5,625	6,322	6,336	6,335	6,321	6,152
5003 Bristol	5,283	5,979	5,988	5,978	5,961	5,779
5004 Bath	8,794	9,386	9,416	9,401	9,340	8,828
5005 Rest of Bath & NES	2,399	2,547	2,552	2,551	2,543	2,493
5006 Mendip & South Som	10,057	11,358	11,407	11,400	11,351	11,050
5007 Dorset, B, C & P	10,065	10,940	10,965	10,939	10,888	10,856
5008 Rest of Gloucestershire	3,797	4,218	4,224	4,213	4,206	4,148
5009 Cotswold	9,205	9,642	9,644	9,647	9,625	9,473
5010 West Oxfordshire	1,472	1,587	1,587	1,587	1,584	1,580
5011 Vale of White Horse	4,485	5,580	5,591	5,590	5,577	5,537
5012 Oxford & South Oxforshire	1,371	1,546	1,552	1,551	1,545	1,537
5013 West Berkshire	4,354	4,940	4,964	4,963	4,927	4,904
5014 Basingstoke & Deane	1,256	1,500	1,515	1,505	1,488	1,446
5015 Test Valley	8,364	9,495	9,617	9,597	9,387	9,286
5016 New Forest & IW	4,553	4,951	4,963	4,934	4,881	4,886
5017 Southampton & Others	4,212	4,727	4,737	4,712	4,676	4,598
6001 South West	4,227	4,699	4,701	4,695	4,683	4,610
6002 London	2,368	2,982	2,982	2,970	2,958	2,842
6003 South East	7,961	9,025	9,041	9,008	8,937	8,787
6004 East of England	2,378	2,723	2,724	2,722	2,721	2,727
6005 East Midlands	1,697	1,855	1,856	1,855	1,855	1,857
6006 West Midlands	3,386	3,677	3,678	3,678	3,677	3,683
6007 Wales	4,015	4,274	4,275	4,275	4,274	4,278
6008 Rest of England	4,868	5,178	5,178	5,177	5,176	5,175
Grand Total	**696,420**	**788,964**	**798,693**	**780,287**	**731,566**	**613,047**

Table 6-9 - % change in car trips from base

Sector	Base	Scenario 1 Core	Scenario 1 BAU LP	Scenario 2 Do Minimum	Scenario 3 Do Something	Scenario 4 Do Maximum
1001 Swindon	0%	12%	12%	12%	10%	7%
1002 Rest of Swindon	0%	78%	79%	78%	77%	74%
1003 Royal Wootton Bassett	0%	10%	21%	17%	-2%	-97%
1004 Rest of RWB	0%	6%	5%	2%	-8%	-78%
1005 West of Swindon	0%	9%	3%	1%	-7%	-9%
1006 Kennet North	0%	10%	2%	-1%	-9%	-13%
1007 Kennet South	0%	7%	1%	-1%	-10%	-15%
2001 North Wiltshire	0%	3%	-1%	-2%	-11%	-14%
2002 Chippenham	0%	22%	19%	13%	1%	-96%
2003 Pewsham	0%	-1%	-4%	-10%	-23%	-98%
2004 Corsham	0%	11%	9%	3%	-10%	-53%
2005 West of Corsham	0%	3%	-1%	-2%	-12%	-14%
2006 Calne	0%	7%	3%	0%	-13%	-23%
2007 Chippenham Rural	0%	13%	83%	77%	50%	-43%
2008 Melksham	0%	8%	4%	0%	-10%	-96%
2009 West of Melksham	0%	2%	-2%	-4%	-13%	-21%
2010 East of Melksham	0%	28%	66%	60%	43%	-8%
2011 Devizes	0%	9%	8%	4%	-6%	-17%
2012 Central Wiltshire	0%	4%	0%	-1%	-10%	-15%
3001 Bradford on Avon	0%	2%	2%	-1%	-9%	-19%
3002 Trowbridge	0%	2%	3%	-3%	-15%	-98%
3003 Hilperton	0%	7%	7%	1%	-8%	-75%
3004 South of Trowbridge	0%	81%	82%	71%	55%	33%
3005 Westbury	0%	3%	6%	3%	-7%	-16%
3006 Warminster	0%	6%	8%	4%	-6%	-14%
3007 South of Warminster	0%	37%	39%	36%	25%	25%
4001 Salisbury SW	0%	3%	7%	4%	-4%	-5%
4002 Salisbury West	0%	7%	8%	4%	-6%	-23%
4003 Salisbury	0%	14%	17%	1%	-12%	-74%
4004 Salisbury SE	0%	8%	18%	8%	-23%	-35%
4005 South of Amesbury	0%	33%	73%	62%	30%	18%
4006 Amesbury	0%	10%	17%	11%	0%	-8%
4007 North of Amesbury	0%	6%	9%	7%	-4%	-10%
4008 Tidworth	0%	16%	30%	27%	-2%	-5%
4009 Pewsey	0%	-5%	-1%	-3%	-12%	-15%
5001 Stroud	0%	9%	9%	9%	9%	8%
5002 South Gloucestershire	0%	12%	13%	13%	12%	9%
5003 Bristol	0%	13%	13%	13%	13%	9%
5004 Bath	0%	7%	7%	7%	6%	0%
5005 Rest of Bath & NES	0%	6%	6%	6%	6%	4%
5006 Mendip & South Som	0%	13%	13%	13%	13%	10%
5007 Dorset, B, C & P	0%	9%	9%	9%	8%	8%
5008 Rest of Gloucestershire	0%	11%	11%	11%	11%	9%
5009 Cotswold	0%	5%	5%	5%	5%	3%
5010 West Oxfordshire	0%	8%	8%	8%	8%	7%
5011 Vale of White Horse	0%	24%	25%	25%	24%	23%
5012 Oxford & South	0%	13%	13%	13%	13%	12%
5013 West Berkshire	0%	13%	14%	14%	13%	13%
5014 Basingstoke & Deane	0%	19%	21%	20%	18%	15%
5015 Test Valley	0%	14%	15%	15%	12%	11%
5016 New Forest & IW	0%	9%	9%	8%	7%	7%
5017 Southampton & Others	0%	12%	12%	12%	11%	9%
6001 South West	0%	11%	11%	11%	11%	9%
6002 London	0%	26%	26%	25%	25%	20%
6003 South East	0%	13%	14%	13%	12%	10%
6004 East of England	0%	15%	15%	15%	14%	15%
6005 East Midlands	0%	9%	9%	9%	9%	9%
6006 West Midlands	0%	9%	9%	9%	9%	9%
6007 Wales	0%	6%	6%	6%	6%	7%
6008 Rest of England	0%	6%	6%	6%	6%	6%
Grand Total	**0%**	**13%**	**15%**	**12%**	**5%**	**-12%**

Appendix C. Scenario levers – evidence base

Levers	Impact	Evidence	Citation	Link	Data?
Avoid					
Active travel infrastructure					
Cycling infrastructure - genuine connected network		1) Elasticity of active-travel-oriented street design: -.05 on Vehicle Trips, -.03 on Vehicle Miles Travelled	1) Ewing, R., and R. Cervero - Travel and the Built Environment	1) https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.710.1517&rep=rep1&type=pdf	Y
Walking infrastructure - genuine connected network		1) Elasticity of active-travel-oriented street design: -.05 on Vehicle Trips, -.03 on Vehicle Miles Travelled	1) Ewing, R., and R. Cervero - Travel and the Built Environment	1) https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.710.1517&rep=rep1&type=pdf	Y
Logistics infrastructure					N
Micro-consolidation: trolley / cargo bike / electric vehicle last-mile delivery		Vehicles Reception Points (VRP) - locations normally serving a specific area of town and/or city centre, generally smaller than in the case of UDCs (Urban Distribution Centres), in which drivers are assisted in parking and unloading. Goods are then delivered to their final destination on foot / cycle. VRPs in use in towns and cities in France for number of years, in some cases achieved CO2 emissions reduction of up to 80% Have delivered up to 15% reduction in delivery vehicle traffic	1) Zanni, Alberto M., and Abigail L. Bristow - Emissions of CO2 from road freight transport in London: trends and policies for long run reductions	1) https://repository.lboro.ac.uk/ndownloader/files/17070599/1	Y
Flexible pick-up / drop-off points for home deliveries		Up to 20% reduction in LGV vehicle kilometres travelled	1) Zanni, Alberto M., and Abigail L. Bristow - Emissions of CO2 from road freight transport in London: trends and policies for long run reductions	1) https://repository.lboro.ac.uk/ndownloader/files/17070599/1	Y
Land use planning					
Focus development at public transport hubs		Wiltshire population, generally, quite some distance from rail stations. 18% are within 1km, 47% within 3km, 53% within 5km - this is -12%, -25% and -32% respectively compared to England and Wales overall. Number of settlements not served by rail, can only be accessed by car or bus. Some settlements where bus JT relatively competitive with car JT (Marlborough to Pewsey, Calne to Chippenham), however number of settlements where bus JT ≥50% longer than car JT (Amesbury, Devizes, Malmesbury) 1) Accessibility by transit: -0.05 elasticity impact on Vehicle Miles Travelled	Swindon & Wiltshire Local Enterprise Partnership (SWELP) - Rail Strategy Report 1) Ewing, R., and R. Cervero - Travel and the Built Environment	https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.710.1517&rep=rep1&type=pdf	Y
Local amenitieis within short walk and cycle (15-minute neighbourhood)		When 6-50 amenities are accessible locally (i.e. within 1 km) approximately 30-40% of residents walk/cycle and 60-70% drive to reach every day activities. Grocery store is the key variable in terms of the type of amenity - if present locally they signficantly affect mode choice Impact: Relative to zero local amenities: 1 local amenity: -0.057 VMT, 2 local amenities: -0.073 VMT, 3 local amenities: -0.125 VMT, 4 local amenities: -0.114 VMT, 5 local amenities: -0.133 VMT Everyday amenities available locally: -0.231 car use and -0.050 VMT Amenities locally + retail agglomeration: -0.084 VMT Amenities locally + health facilities: -0.168 car use In larger urban centres: High diversity of specialised amenities: +0.311 walk/cycle, -0.313 car use High diversity of everyday amenities: +0.325 walk/cycle, -0.549 car use	Erik Ellder et al - When local access matters: A detailed analysis of place, neighbourhood amenities and travel choice	https://journals.sagepub.com/doi/pdf/10.1177/0042098020951001	Y
Recreation space embedded in neighbourhoods		1) Trips to green space represent extremely distance-sensitive behaviour, much more distance sensitive than other leisure activities, shopping and work. Car owners cycle or walk 4-5 times (0.20 / 0.25) less when accessing green space and rarely cycle (0.16 - 0.18) or use PT (0.02 - 0.05) to reach green space 2) Results generally suggest good local provision and access promote urban green space use and satisfaction. Distance travelled to most used UGS well beyond the 300-500m buffer distance commonly used in provision or accessibility measurements (mediean of 1.4-1.9km) - distances imply increased use of motorised transport to access nature on a regular basis, with associated equity and emissions issues.	1) Kees Maat and Paul de Vries - Influence of Green Space Amenities in the Residential Environment on Travel Behaviour 2) Mirjam Schindler, Marion Le Texier, Geoffrey Caruso - How far do people travel to use urban green space? A comparison of three European cities	1) https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.575.3745&rep=rep1&type=pdf 2) https://www.sciencedirect.com/science/article/pii/S0143622822000443	Y
Co-working spaces (local, in new developments / disused shops)		1) Co-workers produce, an average of 30.5% less CO2 than mean employye CO2. This includes allowance for occasional travel to main / head office. For those only using co-working locations, CO2 emissions are 22% of regular head office commuters, or 78% less. 2) Distance traveled decreased significantly on TC days, with average reductions of 51 person-miles (58%) and 35 vehicle-miles (53%). When weighted by telecommuting frequency, average reductions of 11.9% in PMT and 11.5% in VMT were found over a fiveday work week. Person-trips and vehicle-trips increased slightly (but not significantly) on TC days. TC-day reductions were found for all pollutants analyzed: 15% for total organic gas emissions, 21% for carbon monoxide, 35% for oxides of nitrogen, and 51% for particulate matter	1) Timo Ohnmacht et al - Relationships between coworking spaces and CO2 emissions in work-related commuting 2) Patricia Mokhtarian - The Trade-Off Between Trips and Distance Traveled in Analyzing the Emissions Impacts of Center-Based Telecommuting	1) https://iopscience.iop.org/article/10.1088/2515-7620/abd33e/pdf 2) https://escholarship.org/content/qt43b756qg/qt43b756qg.pdf?t=krnooh	Y
Mixed-use developments meeting greater range of local needs		1) People in communities with highly mixed land-use found to drive 1.1 fewer miles / day than those in more segregated land use 2) Elasticity of local diversity: -.03 on Vehicle Trips, -.05 on Vehicle Miles Travelled. Land use mix (entropy index) -0.9 on Vehicle Miles Travelled	1) Holloway, Sundquist, McCahill - Built environment policies to reduce vehicle travel 2) Ewing, R., and R. Cervero - Travel and the Built Environment	1) https://ssti.us/wp-content/uploads/sites/1303/2017/02/SmartGrowthAnalysis_TRB_Style_REVISIONS_11.11.pdf 2) https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.710.1517&rep=rep1&type=pdf	Y
Increased residential density		1) Cervero and Murakami estimated the elasticity of VMT with respect to density to be -0.38 based on their analysis of VMT and population density in 370 urbanized areas in the US 2) Elasticity of density: -.05 on Vehicle Trips, -.05 on Vehicle Miles Travelled 3) Residents in denser residential areas travel 7.8% fewer miles per year and consume 7.5% fewer gallons of fuel. Simulation moving a household from suburban to urban reduces household annual mileage by 15%	1) Holloway, Sundquist, McCahill - Built environment policies to reduce vehicle travel 2) Ewing, R., and R. Cervero - Travel and the Built Environment 3) Jinwon Kim and David Brownstone - The impact of residential density on vehicle usage and fuel consumption	1) https://ssti.us/wp-content/uploads/sites/1303/2017/02/SmartGrowthAnalysis_TRB_Style_REVISIONS_11.11.pdf 2) https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.710.1517&rep=rep1&type=pdf 3) https://www.frbsf.org/economic-research/wp-content/uploads/sites/4/ResidentialDensity_Brownstone.pdf	Y
Provide breadth of housing options to retain community cohesion and reduce travel					N
Local health, education, employment, retail and leisure in new developments		When 6-50 amenities are accessible locally (i.e. within 1 km) approximately 30-40% of residents walk/cycle and 60-70% drive to reach every day activities. Grocery store is the key variable in terms of the type of amenity - if present locally they signficantly affect mode choice Impact: Relative to zero local amenities: 1 local amenity: -0.057 VMT, 2 local amenities: -0.073 VMT, 3 local amenities: -0.125 VMT, 4 local amenities: -0.114 VMT, 5 local amenities: -0.133 VMT Everyday amenities available locally: -0.231 car use and -0.050 VMT Amenities locally + retail agglomeration: -0.084 VMT Amenities locally + health facilities: -0.168 car use In larger urban centres: High diversity of specialised amenities: +0.311 walk/cycle, -0.313 car use High diversity of everyday amenities: +0.325 walk/cycle, -0.549 car use	Erik Ellder et al - When local access matters: A detailed analysis of place, neighbourhood amenities and travel choice	https://journals.sagepub.com/doi/pdf/10.1177/0042098020951001	Y
IT Infrastructure					
Home working (superfast broadband, house design to allow for work space)		1) 16% in car commute miles if people who worked from home during pandemic return to office for 50% of the work week 2) Wiltshire saw a slightly larger increase than UK average in proportion working from home during pandemic: up 3.8% from 20.7% to 24.5% (UK overall increased by 2.9% from 15.4% to 18.3%) 3) Vehicle Miles Travelled (VMT) by employees 53-77% lower for teleworkers than non-teleworkers & telecommuters estimated to save between 17 and 23kg of CO2 emissions per day	1) DecarboN8 & CREDS - Less is more: Changing travel in a post-pandemic society 2) ONS dataset Homeworking in the UK labour market 3) Timo Ohnmacht et al - Relationships between coworking spaces and CO2 emissions in work-related commuting	1) https://www.creds.ac.uk/wp-content/uploads/CREDS-Less-is-more-web.pdf 2) ONS 3) https://iopscience.iop.org/article/10.1088/2515-7620/abd33e/pdf	Y
Digital literacy training to maximise benefits of infrastructure investment					N
Remote study and 'blended learning' for further & higher education					N
Develop local digital hubs					N
Digital public services (e.g. GP online)					N
Access restrictions					
Low emission zones - Clean Air Zones	6% CO2 reduction 3-9% reduction in traffic volumes	Bristol's analysis of zone indicated: CO2 reduction of 0.4% in Cat C, 11.1% in Cat D zone, NO2 reduction of 9% in Cat C, 85% in Cat D, PM reduction of 4% in Cat C, 11% in Cat D London ULEZ: 37% reduction in NO2 concentrations roadside, 35% reduction in NOx emissions from road transport, 6% reduction in CO2 emissions from road transport, 3-9% reduction in traffic flows, 49% reduction in non-compliant / more polluting vehicles within the zone.	1) The Green Alliance - The Case for Clean Air Zones 2) Mayor of London - Central London Ultra Low Emission Zone - Ten Month Report	1) https://green-alliance.org.uk/wp-content/uploads/2021/11/The_case_for_clean_air_zones.pdf 2) https://www.london.gov.uk/sites/default/files/ulez_ten_month_evaluation_report_23_april_2020.pdf	Y
Behaviour change					
Improved information to the public					N
Workplace Travel Planning		1) Reduction in share of car use among commuters to workplace: 20 cities in UK - 18%, Norwich - 17.7%, Graz - 12-14%, Nantes - 12%, Brighton & Hove - 3%	1) Paula Kuss - A dozen effective interventions to reduce car use in European cities: lessons	1) https://www.sciencedirect.com/science/article/pii/S2213624X22000281	Y
School Travel Planning		1) Reduction in share of car use among trips to school: Norwick - 10.9%, Brighton & Hove - 5%	1) Paula Kuss - A dozen effective interventions to reduce car use in European cities: lessons	1) https://www.sciencedirect.com/science/article/pii/S2213624X22000281	Y
Personalised Travel Planning		1) Reduction in share of car use among individual residents: San Sebastián - 8-12%, Marseille - 6%, Munich - 5.6%	1) Paula Kuss - A dozen effective interventions to reduce car use in European cities: lessons	1) https://www.sciencedirect.com/science/article/pii/S2213624X22000281	Y
Carbon calculator tool					N
Carbon costs for different modes		1) 73% of app (app for sustainable mobility competition) reported reduced car use (study did not quantify level of reduction)	1) Paula Kuss - A dozen effective interventions to reduce car use in European cities: lessons	1) https://www.sciencedirect.com/science/article/pii/S2213624X22000281	Y
Shift					
Active travel					
Extended and improved routes					N

Reduced speed limits		A significant minority of residents said keeping traffic below 20mph makes it more likely they will walk (16%) or cycle (9%) to local places rather than use the car 5% of residents said they are walking more, 2% cycling more, since introduction of 20mph limits Small proportion of households with children reported children cycling locally more often since introduction of 20mph limits (9% of households for children aged 6-10, 6% of households for children aged 11-14, and 6% of households for children aged 15-17)	Atkins, Aecom and UCL for DfT: 20mph Research Study - Process and Impact Evaluation - Headline Report	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/757307/20mph-headline-report.pdf	Y
Storage & integration at residential locations & key destinations, e.g. stations, bus stops, town centres					N
Land use planning					
Reduce number of car parking spaces - off-street and on-street					N
Relocate parking to less central / convenient locations					N
Shared mobility					
Bike share		Mode shift to Bike Hire - most substituted trips from sustainable modes, mainly PT and walking, only small part shifting from car use. London - 2%, Dublin - 20%, Minesota 19%, Brisbane 21%. More car dependant locations lead to higher car replacement / substitution rates. The shift from car, even if small, shouldn't be disregarded / dismissed as modal shift from car use has been demonstrated to be difficult. Most studies concentrated in city centres, which tend to have lowe car modal shares, therefore smaller potential for substitution. Potential expansion of schemes to other urban areas may result in improved outcomes. **Typical trip-length** for electric micro-mobility (other than e-cargo bikes) are generally below 5km, majority around 2km. Higher than typical shared-bike trip length of 1.0 - 1.6km	João Filipe Teixeira, Cecília Silva, Frederico Moura e Sá - Empirical Evidence on the Role of Bikesharing in Reducing Car Use	https://d1rkab7tlqy5f1.cloudfront.net/CiTG/Over%20faculteit/Afdelingen/Transport%20%26%20Planning/Research/Labs/Activ	Y
eBike share		**Mode substitution:** Effect on driving. Mode: E-bike - 17% would have used car; 4-6% increased distance. Mode: E-cargo bike - 46% increased distance. Effect on Public Transport. Mode: E-bike - 30% would have taken PT. Effect on walking. Mode: E-bike - 27% would have walked. Effect on cycling. Mode: E-bike - 11% would have cycled. **Trip creation.** Mode: E-cargo bike - 13%.	1) Interreg North West Europe: eHUBS - Smart Shared Green Mobility Hubs - Deliverable 1.1 State-of-the-art related to eHUBS	1) https://www.nweurope.eu/media/9929/dt211_state-of-the-art_report_for_ehubs_final.pdf	Y
Car share (club)		1) 1 car club vehicle can replace, on average, 18 private vehicles (for edge of English town figure is **9 vehicles**, London pushes average up as 24 veh replaced in London) 2) Car club members across UK increased by 765% 2007-2017. 3) Number of private cars replaced per car sharing car: Bremen - 15, Genoa - 12	1) Collaborative Mobility UK (CoMo UK) - New developments and shared transport: cutting car dependency 2) DfT - Future of Mobility: Urban Strategy 3) Paula Kuss - A dozen effective interventions to reduce car use in European cities: lessons	1) https://como.org.uk/wp-content/uploads/2022/03/CoMoUK-New-Developments-Guidance-2022_final.pdf 2) https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/846593/future-of-mobility-strategy.pdf 3) https://www.sciencedirect.com/science/article/pii/S2213624X22000281	Y
Introduction of ride sharing apps and incentives					N
Electric vehicle car share (club)		**Mode substitution:** Effect on driving. Mode: EV - 11% increased distance, 27% decreased. Effect on Public Transport. Mode: EV - 8% increased frequency, 26% decreased. Effect on walking. Mode: EV - 7% increased frequency, 6% decreased. Effect on cycling. Mode: EV - 34% increased frequency, 9% decreased. **Car ownership.** Sold car - EV - 1 car per shared vehicle. Suppress future car purchase - EV - 6 per shared vehicle. **Car VMT.** Reduce VMT - EV: -7% for each household. **Emissions.** Reduce GHG emissions - EV: -6% for each household.	1) Interreg North West Europe: eHUBS - Smart Shared Green Mobility Hubs - Deliverable 1.1 State-of-the-art related to eHUBS	1) https://www.nweurope.eu/media/9929/dt211_state-of-the-art_report_for_ehubs_final.pdf	Y
Mobility hubs - integrated network		**Typical trip-length** for electric micro-mobility (other than e-cargo bikes) are generally below 5km, majority around 2km. Higher than typical shared-bike trip length of 1.0 - 1.6km **Mode substitution**: Effect on driving. Mode: EV - 11% increased distance, 27% decreased. Mode: E-bike - 17% would have used car; 4-6% increased distance. Mode: E-cargo bike - 46% increased distance. Mode: E-scooter - 34% increased distance. Effect on Public Transport. Mode: EV - 8% increased frequency, 26% decreased. Mode: E-bike - 30% would have taken PT. Mode: E-scooter - 11% increased frequency.. Effect on walking. Mode: EV - 7% increased frequency, 6% decreased. Mode: E-bike - 27% would have walked. Effect on cycling. Mode: EV - 34% increased frequency, 9% decreased. Mode: E-bike - 11% would have cycled. Mode: E-cargo bike - 15% increased frequency. Mode: E-scooter - 41% increased frequency. **Trip creation**. Mode: E-cargo bike - 13%. Mode: E-scooter - 7%. **Car ownership.** Sold car - EV - 1 car per shared vehicle. Suppress future car purchase - EV - 6 per shared vehicle. **Car VMT.** Reduce VMT - EV: -7% for each household. **Emissions**. Reduce GHG emissions - EV: -6% for each household.	1) Interreg North West Europe: eHUBS - Smart Shared Green Mobility Hubs - Deliverable 1.1 State-of-the-art related to eHUBS	1) https://www.nweurope.eu/media/9929/dt211_state-of-the-art_report_for_ehubs_final.pdf	Y
Modern public transport					
Demand Responsive Transport (DRT) & rideshare		1) 60% of customers in 1 trial would use their car less in favour of demand-responsive buses 47% of customers said they would use the bus less in favour of demand-responsive buses 29% of customers would have taken a car or taxi if demand-responsive bus had not been available 73% of journeys were quicker by demand-responsive bus vs. fixed public transport. 61% were more than 5 minutes quicker. 45% were more than 10 minutes quicker. 19% in the 2nd trial would have taken a car, and 13% a taxi if demand-responsive bus had not been available; 10% would not have travelled 86% rated the service good value for money 2) ArrivaClick (Liverpool and Sittingbourne) trial (2017 - 2019/2020). 61% of DRT users switched from using private cars. 43% adopted the service for their daily commute. 90% would recommend the service. 52% of Liverpool scheme customers previously used private cars and taxis.	1) TfL - Demand Responsive Bus Trials 2) WSP / Torbay Council - Demand Responsive Transport Services - Feasibility Study	1) https://tfl.gov.uk/cdn/static/cms/documents/drb-research-report-july-2021.pdf 2) https://www.torbay.gov.uk/media/16255/torbay-drt-feasibility-study-may21.pdf	Y
Bus Rapid Transport					N
Improved bus priority / reliability					N
Improved bus access / egress options (junctions, town centres)					N
Extended public transport routes and improved frequencies		short-run value of +0.4 for passenger trips re: bus-km run (i.e. 10% increase in km run will produce 4% more trips)	CILT - Factors affecting local bus demand and potential for increase	https://ciltuk.org.uk/Portals/0/Policy_AK/BCPG_LocalDemand_FINAL.pdf?ver=2021-04-13-114655-943&timestamp=1618310835837	Y
Increased service integration across types of PT and with active travel infrastructure & facilities					N
Automated vehicle shuttles - last mile connectivity					N
Mobility as a Service (MaaS) - integrated public transport, on-demand and shared mobility services		1) Mobility services for commuters (providing and marketing free public transport and private shuttles): 37% reduction in commuters travelling by car	1) Paula Kuss - A dozen effective interventions to reduce car use in European cities: lessons	1) https://www.sciencedirect.com/science/article/pii/S2213624X22000281	Y
Street design & access restrictions					
Low Traffic Neighbourhoods (LTNs) - active travel priority		1) 15% of displaced traffic disappears from the area entirely 2) 16% overall reduction in vehicles (including those roads which bordered the scheme, but were not part of it) 3) living within 2km of a new mini-Holland route was associated with 35.7 minutes extra active travel after two years, and a similar 33.0 extra minutes after three years 4) By year 3 - 20% decrease in probability of car ownership; For any car use in previous week - increase for those within the zone to 9% not using a car in Year 1, 22% not using a car in Year 2, and 19% not using a car in Year 3; For minutes of car use in previous week - decrease for those within the zone of 10 minutes/week in Year 1, 43 minutes/week in Year 2, and 17 minutes/week in Year 3; Increase in % doing any walking in prior week for those within the zone of between 3 and 14% depending on Year, and whether in a low-dose or high-dose LTN; Increase in number of minutes walking in prior week for those within the zone of between 11 and 115 minutes, depending on Year, and whether in low-dose or high-dose LTN; Increase in % doing any cycling in prior week for those within the zone of between 11% and 46%; Increase in number of minutes cycling in prior week for those within the zone of between 2 and 20 minutes, depending on Year, and whether in low-dose or high-dose LTN	1) Living Streets / London Cycle Campaign - A Guide to Low Traffic Neighbourhoods 2) Waltham Forest - 'The Village': Comparison of vehicle numbers before and after the scheme and during the trial 3) Aldred, R., Woodcock, J., & Goodman, A. (2020, September 1) - Major investment in active travel in Outer London: impacts on travel behaviour, physical activity, and health 4) Aldred, Rachel, and Anna Goodman - Low Traffic Neighbourhoods, Car Use, and Active Travel: Evidence from the People and Places Survey of Outer London Active Travel Interventions	1) https://londonlivingstreets.files.wordpress.com/2018/09/lcc021-low-traffic-neighbourhoods-detail-v9.pdf 2) https://enjoywalthamforest.co.uk/work-in-your-area/walthamstow-village/comparison-of-vehicle-numbers-before-and-after-the-scheme-and-during-the-trial/ 3) https://osf.io/preprints/socarxiv/5ny4c/download 4) https://doi.org/10.32866/001c.17128	Y
Car-free zones		1) Car-free days can lead to reductions between 20 and 60% in CO2 * N.B. other studies reviewed by the same paper found no statistically significant reduction. 2) Reduction of car traffic in town/city centre - Rome: 20% (during restricted access hours), 10% (during unrestricted hours)	1) Andrew Glazener, James Wylie, Willem van Waas, Haneen Khreis - The Impacts of Car-Free Days and Events on the Environment and Human Health 2) Paula Kuss - A dozen effective interventions to reduce car use in European cities: lessons	1) https://link.springer.com/content/pdf/10.1007/s40572-022-00342-y.pdf 2) https://www.sciencedirect.com/science/article/pii/S2213624X22000281	Y
Street space reallocation from car to active and public transport					N
20mph zones		A significant minority of residents said keeping traffic below 20mph makes it more likely they will walk (16%) or cycle (9%) to local places rather than use the car 5% of residents said they are walking more, 2% cycling more, since introduction of 20mph limits Small proportion of households with children reported children cycling locally more often since introduction of 20mph limits (9% of households for children aged 6-10, 6% of households for children aged 11-14, and 6% of households for children aged 15-17) Journey times estimated to have increased by 3% in residential areas and 5% in city centre areas	Atkins, Aecom and UCL for DfT: 20mph Research Study - Process and Impact Evaluation - Headline Report	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/757307/20mph-headline-report.pdf	Y
Controlled parking zones		1) Reduction in car traffic in town / city centre: Oslo - 11% (1st 2 years), 19% (3rd year) via parking and traffic control	1) Paula Kuss - A dozen effective interventions to reduce car use in European cities: lessons	1) https://www.sciencedirect.com/science/article/pii/S2213624X22000281	Y
Congestion charging zones		1) Between 2011 and 2019 (most recent pre-pandemic data) vehicle numbers entering the zone per-year fell by 6.6 million - reduction of 14.9% 2) Reduction in car traffic across cordon of the congestion charging zone: London - 33%, Milan - 31.1%, Stockholm - 22%, Gothenburg - 12%	1) TfL - Camera Captures and Confirmed Vehicles seen in the Congestion Charge Zone by Month 2) Paula Kuss - A dozen effective interventions to reduce car use in European cities: lessons	1) https://data.london.gov.uk/dataset?tag=congestion-charge 2) https://www.sciencedirect.com/science/article/pii/S2213624X22000281	Y
Fiscal measures					

Introduction of mobility credits		1) £2,500 mobility credit offered to 40,000 diesel car drivers. Mobility credit increases the £/mile opportunity cost of running a diesel car by 5%. 5% increase in car costs suggest take up of 35,000 additional shared transport users per year. Modelled policy reduces NOx by 67 tonnes in 1st year of scheme and by 1,272 over 10-yr appraisal period. Equivalent to taking 180,000 euro 5 compliant LGVs off the road for a year (assuming 30,000 average mileage) Modelling assumed 84.84 g/mile/person for 'shared car' element of mobility credits scenario vs. 203 g/mile/person for baseline diesel car in private ownership. 2) WMCA modelling - euro 1-5 diesel scrappage scheme of £2,000-£4,000 could result in 70% decrease in car/van mode share, 20% increase in bus/coach mode share, 5% increase in train mode share, and 4% increase in 'other' mode share - including walking, cycling, car club. 3) GMCA modelling - £4,000 mobility credit scheme could result in 1-2% increase in bus mode share, 1-3% increase in train mode share, and 1% increase in 'other' mode share (walk, cycle, car club)	1) British Vehicle Rental and Leasing Association (BVRLA) - Mobility credits: economic analysis 2) BVRLA - Mobility credits - Scrappage scheme 3) Urban Mobility Partnership - Consumers in the driving seat	1) https://www.bvrla.co.uk/uploads/assets/uploaded/0cff08cd-d653-4173-a2dfad0f2081951c.pdf 2) https://www.bvrla.co.uk/uploads/assets/uploaded/117ffa63-be62-49a1-9a518f4943eca7e4.pdf 3) https://www.ump.org.uk/wp-content/uploads/2019/05/Consumers-in-the-driving-seat.pdf	Y
Workplace Parking Levy		1) 8.6% of employees now travelling by sustainable modes switched from private car between 2010 and 2016. 50% cited WPL as important factor in decision to change 2) £379 charge per space (increased to £428 Apr '21) raised >£9m/year in its 1st 7 years of operation - all profits fund transport improvements. 3) Reduction in commuters travelling by car - Rotterdam: 20-25%	1) Dale, Simon; Frost, Matthew; Ison, Stephen; Budd, Lucy (2019): The impact of the Nottingham Workplace Parking Levy on travel to work mode share. Loughborough University. Journal contribution. https://hdl.handle.net/2134/10067039.v1 2) The Green Alliance - The Case for Clean Air Zones 3)	1) https://doi.org/10.1016/j.cstp.2019.09.001 2) https://green-alliance.org.uk/wp-content/uploads/2021/11/The_case_for_clean_air_zones.pdf 3) https://www.sciencedirect.com/science/article/pii/S2213624X22000281	Y
Improved (reduced) public transport fares		Is evidence for cross-elasticity values, i.e. effect of bus fare changes on use of other modes, but are much lower than 'own-mode' elasticities, around 0.05 for effect of bus fares on car demand - hence very large reductions in fares would only have a small effect on total car demand if low bus fares pursued as policy in isolation. fares - short-run (1 yr) elasticity of -0.04 (e.g. 10% fare increase produce 4% drop in patronage). This is an 'own mode' value, i.e. assessing change in bus travel in isolation - resultant changes being a mix of modal transfer and generation or suppression of trips.	CILT - Factors affecting local bus demand and potential for increase	https://ciltuk.org.uk/Portals/0/Policy_AK/BCPG_LocalDemand_FINAL.pdf?ver=2021-04-13-114655-943&timestamp=1618310835837	Y
Increase parking charges	Price elasticity of -0.52 per 1% price increase	Car parks do have low price elasticity - though prices can be increased significantly before behaviour change is material. Lehner, 2018 reviewed 50 studies which showed price elasticities ranging from -0.02 to -2.40. Suggested baseline price elasticity for commuting trips of -0.52, i.e. 1% increase in price results in 0.52% decrease in occupancy. Generally, EPO = EPD+EPV. EPO (price elasticity of parking occupancy) equals the sum of the EPD (price elasticity of parking dwell time) and the EPV (price elasticity of parking volume).	Stephan Lehner - The price elasticity of parking: a meta-analysis	https://www.researchgate.net/profile/Stefanie-Peer/publication/331443775_The_price_elasticity_of_parking_A_meta-analysis/links/5cd2a084299bf14d957e94c7/The-price-elasticity-of-parking-A-meta-analysis.pdf	Y
Differential parking charges for car-sharing / ride-sharing					N
Road user charging		Change in number of vehicles entering road user charging zone: Bologna: -23%, London: -16%, Milan: -14%, Rome: -18%, Stockholm: -22% Reduction in CO2 emissions within the zone: London: -16%, Milan: -14%, Rome: -21%, Stockholm: -13% Reduction in NOx emissions within the zone: London: -13%, Milan: -17%, Stockholm: -8% Reduction in PM10 emissions within the zone: London: -15%, Milan: -18%, Rome: -11%, Stockholm: -13%	White Rose University Consortium - Road User Charging and implications for Transport Policy - findings from the CURACAO project	https://eprints.whiterose.ac.uk/42661/5/filenale_front_koh2.pdf	Y
Improve					
EV charging infrastructure					
EV charging (residential) + vehicle to grid technology					N
EV charging (stations / shops / work / mobility hubs)					N
Hydrogen fuel cell charging (stations / shops / work)					N
Conversion of fleets					
Convert commercial delivery and servicing fleets to EVs					N
Convert municipal delivery and servicing fleets to EVs					N
Support EV uptake in corporate fleets, including requiring it within supply chains					N
Convert public transport fleets to EVs					N
Fiscal measures					
Grants to trade-in petrol / diesel for EVs					N
Introduce differential parking charges for smaller, lighter, car-club, and electric vehicles		1) SUVs are more difficult to electrify fully, and conventional SUVs consume 25% more fuel per kilometre than medium-sized cars. 2) Hammersmith and Fulham pay-and-display parking charges linked to emissions - Low CO2 emissions (g/km) - A-C = 0 to 75g/km, High CO2 emissions (g/km) - D-M = 76<>+226g/km). Low CO2 = £3/hr, High CO2 = £5/hr, plus £1/hr surcharge for diesel vehicles	1) IEA - World Energy Outlook 2019 2) Hammersmith and Fulham Council	1) WORLD ENERGY OUTLOOK 2019 (windows.net) 2) https://www.lbhf.gov.uk/parking/pay-and-display/parking-zone-times-and-charges	Y
Access restrictions					
Low emission zones - Clean Air Zones	6% CO2 reduction 3-9% reduction in traffic volumes	Bristol's analysis of zone indicated: CO2 reduction of 0.4% in Cat C, 11.1% in Cat D zone, NO2 reduction of 9% in Cat C, 85% in Cat D, PM reduction of 4% in Cat C, 11% in Cat D London ULEZ: 37% reduction in NO2 concentrations roadside, 35% reduction in NOx emissions from road transport, 6% reduction in CO2 emissions from road transport, 3-9% reduction in traffic flows, 49% reduction in non-compliant / more polluting vehicles within the zone.	1) The Green Alliance - The Case for Clean Air Zones 2) Mayor of London - Central London Ultra Low Emission Zone - Ten Month Report	1) https://green-alliance.org.uk/wp-content/uploads/2021/11/The_case_for_clean_air_zones.pdf 2) https://www.london.gov.uk/sites/default/files/ulez_ten_month_evaluation_report_23_april_2020.pdf	Y
Efficient driving / network					
Roll-out and support eco-driving training	2.6% - 4.8% - private vehicles 10% - freight (HGV and LGV)	1) CO2 reductions: 4.8% CO2 reduction: Conservative driving style (0.8m/s acceleration, engine speed shift up threshold 2250 RPM) vs an aggressive driving style (acceleration of 1.6m/s, engine speed shift up threshold 3250 RPM) at 30mph speed limit. 2.6% CO2 reduction: Conservative driving style (0.8m/s acceleration, engine speed shift up threshold 2250 RPM) vs balanced driving style (accleration 1.2m/s, engine speed shift up threshold 2750 RPM) at a speed limit of 30mph Using a conservative driving style at a speed limit of 20mph results in 7.7% fewer NOx emissions relative to a balanced driving style and 11.5% fewer NOx emissions relative to an aggressive driving style 2) the Safe and Fuel Efficient (SAFED) scheme has generated savings of up to 10% in fuel and CO2 emissions per vehicle according to DfT	1) Future Transport - Urban transport modelling – An investigation into the effects of urban traffic, speed limits and driving style on travel times, fuel efficiency and CO2 and NOx emissions 2) Zanni, Alberto M., and Abigail L. Bristow - Emissions of CO2 from road freight transport in London: trends and policies for long run reductions	https://futuretransport.info/wp-content/uploads/2022/04/Urban-Transport-Modelling-2022-03-29.pdf	Y
Implement speed limit reductions	10 - 20% (70 - 60mph) 22.3% (30mph to 20mph) - 75.9% (40mph to 30mph)	1) Reducing speed limit by 10kph (6.2mph) on motorways can lead to a 10%-20% CO2 reduction in the existing fleet 2) Travelling at 30mph speed limit results in 22.3% more CO2 emissions than travelling at a speed limit of 20mph Travelling at a speed limit of 40mph results in a significantly greater 75.9% increase in CO2 emissions relative to a speed limit of 20mph	1) Norbert E. Ligterink - Policy Brief: Reducing CO2 emissions of vehicles; a hard problem 2) Future Transport - Urban transport modelling – An investigation into the effects of urban traffic, speed limits and driving style on travel times, fuel efficiency and CO2 and NOx emissions	1) https://www.odyssee-mure.eu/publications/policy-brief/reducing-co2-emissions-vehicules-odyssee-mure.pdf 2) https://futuretransport.info/wp-content/uploads/2022/04/Urban-Transport-Modelling-2022-03-29.pdf	Y
Develop targeted capacity improvements					N

Appendix D. Cost information sourced from others

D.1. E-Cargo Bikes – cost information

Table D-1 - E-Cargo Bike - cost information

Number of bikes			DfT funding Amount	LA match funding (if known/available)			Local Authority
Pedal	E-bike	Total		Amount	Covering	Duration	
5	5	10	£60,972.00	£60,000.00	5 years OpEx	5 years	Stratford-on-Avon
0	4	4	£17,619.31	N/A	N/A	N/A	Harlow and Gilston Garden Town
0	6	6	£27,838.85	N/A	N/A	N/A	Bedford Borough Council
0	5	5	£36,584.66	N/A	N/A	N/A	Wirral Council
0	10	10	£40,194.46	N/A	N/A	N/A	Bath and North East Somerset Council
0	8	8	£41,824.00	N/A	N/A	N/A	Derby City Council
0	10	10	£47,896.85	N/A	N/A	N/A	Southampton City Council
0	15	15	£47,900.01	N/A	N/A	N/A	Nottingham City Council
0	13	13	£49,250.84	N/A	N/A	N/A	London Borough of Wandsworth
0	14	14	£56,734.51	N/A	N/A	N/A	London Borough of Richmond
0	20	20	£57,400.00	N/A	N/A	N/A	Birmingham City Council
0	10	10	£76,330.03	N/A	N/A	N/A	North Tyneside Council
0	13	13	£78,998.03	N/A	N/A	N/A	Devon County Council
0	13	13	£85,034.52	N/A	N/A	N/A	Brighton and Hove City Council
0	26	26	£123,500.00	N/A	N/A	N/A	Plymouth City Council
0	32	32	£158,360.00	N/A	N/A	N/A	Sheffield City Council

Number of bikes			DfT funding Amount	LA match funding (if known/available)			Local Authority
Pedal	E-bike	Total		Amount	Covering	Duration	
0	30	30	£135,987.99	N/A	N/A	N/A	Colchester Borough Council
0	21	21	£148,380.00	N/A	N/A	N/A	Milton Keynes Council
0	30	30	£168,679.00	N/A	N/A	N/A	Cambridgeshire County Council
0	34	34	£160,334.67	N/A	N/A	N/A	Bristol, North Somerset, South Gloucestershire Joint bid
0	5	5	£32,770.00	N/A	N/A	N/A	Coventry City Council
0	36	36	£160,000.00	N/A	N/A	N/A	West Yorkshire Region
0	32	32	£132,110.34	N/A	N/A	N/A	Salford City Council
0	14	14	£71,214.55	N/A	N/A	N/A	Oxfordshire County Council
0	13	13	£102,191.41	N/A	N/A	N/A	Lewes District Council
0	1	1	£2,866.67	N/A	N/A	N/A	London borough of Brent
0	3	3	£26,150.00	N/A	N/A	N/A	West Berkshire Council
0	6	6	£32,950.00	N/A	N/A	N/A	City of York Council
0	27	27	£147,938.00	N/A	N/A	N/A	London Borough of Waltham Forest
0	41	41	£173,638.30	N/A	N/A	N/A	Manchester City Council
0	14	14	£71,549.00	N/A	N/A	N/A	London Borough of Hackney
0	6	6	£34,531.05	N/A	N/A	N/A	Barnsley Metropolitan Borough Council

Sources: https://www.stratford.gov.uk/parking-roads-transport/e-cargo-bikes-initiative.cfm & https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1035420/e-cargo-bike-local-authority-project-summaries.csv/preview

D.2. Mobility hubs – cost information

Table D-2 - Mobility hubs - cost information

Type Ref	Type of hub	Item		Item cost	Total cost
A	**Large interchange or city centre** *Larger multi-purpose or a network or smaller mobility hubs* *High passenger numbers for starting / ending journeys / transferring between modes*	1.1	Works cost	**£427,000.00**	**£631,277.00**
		A	Individual structures	£151,000.00	
		B	External works and drainage		
		B.1	Site preparation	£62,000.00	
		B.2	Surface treatments	£158,000.00	
		B.3	Planting	£9,000.00	
		B.4	Fittings and furnishings	£28,000.00	
		B.5	Drainage	£11,000.00	
		B.6	External services	£8,000.00	
		1.2	Preliminaries (20%)	**£85,400.00**	
		1.3	Contractor overheads & profit (12%)	**£61,488.00**	
		1.4	Design development & construction contingency (10%)	**£57,389.00**	
B	**Transport corridor hub** *Focus on services which link residents in surrounding areas to key network services.* *Opportunity to offer greater choice for first and last trips*	1.1	Works cost	**£338,000.00**	**£499,699.00**
		A	Individual structures	£142,000.00	
		B	External works and drainage		
		B.1	Site preparation	£33,000.00	
		B.2	Surface treatments	£121,000.00	
		B.3	Planting	£6,000.00	
		B.4	Fittings and furnishings	£24,000.00	
		B.5	Drainage	£9,000.00	
		B.6	External services	£3,000.00	
		1.2	Preliminaries (20%)	**£67,600.00**	
		1.3	Contractor overheads & profit (12%)	**£48,672.00**	
		1.4	Design development & construction contingency (10%)	**£45,427.00**	
C	**Business park or new housing development hub** *High density of users. A need to offer commuting links and back-to-base solutions*	1.1	Works cost	**£185,000.00**	**£273,504.00**
		A	Individual structures	£71,000.00	
		B	External works and drainage		
		B.1	Site preparation	£27,000.00	
		B.2	Surface treatments	£58,000.00	
		B.3	Planting	£3,000.00	
		B.4	Fittings and furnishings	£15,000.00	
		B.5	Drainage	£5,000.00	
		B.6	External services	£6,000.00	
		1.2	Preliminaries (20%)	**£37,000.00**	
		1.3	Contractor overheads & profit (12%)	**£26,640.00**	

Type Ref	Type of hub	Item		Item cost	Total cost
		1.4	Design development & construction contingency (10%)	**£24,864.00**	
D	**Suburbs or mini hub** *Lower density of people with higher car ownership; hubs can be designed to address local issues, e.g. car club spaces to take away issues of over-crowded streets, bike share or secure cycle parking for flats without space for bike storage or DRT to supplement restricted bus services*	1.1	Works cost	**£225,000.00**	**£332,640.00**
		A	Individual structures	£72,000.00	
		B	External works and drainage		
		B.1	Site preparation	£35,000.00	
		B.2	Surface treatments	£72,000.00	
		B.3	Planting	£5,000.00	
		B.4	Fittings and furnishings	£28,000.00	
		B.5	Drainage	£5,000.00	
		B.6	External services	£8,000.00	
		1.2	Preliminaries (20%)	**£45,000.00**	
		1.3	Contractor overheads & profit (12%)	**£32,400.00**	
		1.4	Design development & construction contingency (10%)	**£30,240.00**	
E/F	**Small market town or village / tourism hub** *Market town: extra space can be used to provide a wider range of services as long as there is critical mass to ensure viability* *Tourism hubs: focus on services with easy registration for visitors which can provide seasonal boos to viability of service for rural residents*	1.1	Works cost	**£180,300.00**	**£266,890.00**
		A	Individual structures	£71,000.00	
		B	External works and drainage		
		B.1	Site preparation	£23,000.00	
		B.2	Surface treatments	£46,000.00	
		B.3	Planting	£4,500.00	
		B.4	Fittings and furnishings	£15,500.00	
		B.5	Drainage	£5,000.00	
		B.6	External services	£5,250.00	
		1.2	Preliminaries (20%)	**£36,200.00**	
		1.3	Contractor overheads & profit (12%)	**£26,064.00**	
		1.4	Design development & construction contingency (10%)	**£24,326.00**	

Source: CoMoUK - The Design Process - Mobility Hubs Realised: https://uploads-ssl.webflow.com/6102564995f71c83fba14d54/630f763354842c66afddb22c_CoMoUK%20The%20design%20process%20-%20mobility%20hubs%20realised.pdf

Table D-3 - Mobility hubs - CoMoUK specification guidance

Type Ref	Context & considerations	A1 Mobility components: Public transport	A2 Mobility components: non-PT	B – Mobility related components	C – Non-mobility & urban realm improvements
A	**Large interchange or city centre**	National & regional rail	Car club bay - electric & conventional	Large scale cycle parking	Covered waiting area

Type Ref	Context & considerations	A1 Mobility components: Public transport	A2 Mobility components: non-PT	B – Mobility related components	C – Non-mobility & urban realm improvements
	Larger multi-purpose or a network or smaller mobility hubs *High passenger numbers for starting / ending journeys / transferring between modes*	Tram	Bike share - electric & conventional	Digital pillar (transport info, ticketing, wayfinding, local services)	Improved public realm, safer crossing, carriageway or footway repairs
		Local bus		EV charging bays	Parklet or community art
		Taxi			Kiosk for refreshments
B	**Transport corridor hub** *Focus on services which link residents in surrounding areas to key network services.* *Opportunity to offer greater choice for first and last trips*	Regional rail or tram	Back to base Car club bay (incl. choice of van/estate car)	Secure cycle parking	Covered waiting area
		Local bus	Bike share - electric & conventional	Digital pillar (transport info, ticketing, wayfinding, local services)	Safer crossing & street repairs
		DRT feeder service	E-cargo bike share / trailers	Freight logistics hub	Package delivery lockers
		Taxi		EV charging bays	Wi-Fi / phone charging
					Kiosk for refreshments
C	**Business park or new housing development hub** *High density of users. A need to offer commuting links and back-to-base solutions*	Regional rail or tram	Back to base Car club bay (incl. choice of van/estate car)	Secure cycle parking	Covered waiting area
		Local bus	One-way, shuttle, or back to base bike share	Digital pillar (transport info, ticketing, wayfinding, local services)	Improved public realm
		DRT feeder service	E-cargo bike share / trailers		Package delivery lockers
D	**Suburbs or mini hub** *Lower density of people with higher car ownership; hubs can be designed to address local issues, e.g. car club spaces to take away issues of over-crowded streets, bike share or secure cycle parking for flats without space for bike storage or DRT to supplement restricted bus services*	Local bus	Back to base Car club bay with smaller vehicles	Secure cycle parking	Traffic calming & street repairs
		DRT feeder service		Bike repair stand	Parklet or community art
				EV charging bays	Community exercise equipment
E	**Small market town, village hubs**	Regional rail or tram	Back to base Car club bay (incl. choice of van/estate car)	Bike repair stand	Covered waiting area

Type Ref	Context & considerations	A1 Mobility components: Public transport	A2 Mobility components: non-PT	B – Mobility related components	C – Non-mobility & urban realm improvements
	The extra space in these types of areas can be used to provide a wider range of services as long as there is critical mass to ensure there is viability. Assess local needs such as the limited public transport with pools of shared e-bikes or 2+ ride share stops.	Local bus	Back to base bike share	EV charging bays	Package delivery lockers
		DRT feeder service	E-cargo bike share / trailers		
		Taxi			
F	**Tourism hubs** *Tourism hubs: focus on services with easy registration for visitors which can then provide seasonal boost to viability of service for rural residents. Ideally well integrated with journey planning and wider ticketing services.*	Regional rail or tram	Back to base Car club bay (incl. choice of van/estate car)	Secure cycle parking	Covered waiting area
		Local bus	One-way, shuttle, or back to base bike share	Digital pillar (transport info, ticketing, wayfinding, local services)	Improved public realm
		DRT feeder service	E-cargo bike share / trailers		Package delivery lockers

Source: CoMoUK - Mobility Hubs Guidance (Oct 2019) https://uploads-ssl.webflow.com/6102564995f71c83fba14d54/618d29b3d06c81de72c38fdc_CoMoUK%20Mobility%20hub%20guidance%20_Oct%202019.pdf

D.3. Bike share – cost information

Table D-4 - Bike share fleet ranges for different population levels

Fleet range	Population size		
	~250,000	~300,000	~750,000
Lower range	350	500	1,000
Higher range	800	1,000	2,500

Source: CoMoUK Bike Share Guidance for Local Authorities (2022) - https://uploads-ssl.webflow.com/6102564995f71c83fba14d54/637d049543d8ef05b11341e8_CoMoUK%20bike%20share%20guidance%20for%20local%20authorities%202022.pdf

CoMoUK also note the following:

- In locations where an area being served is open to interpretation, a bottom-up approach can be utilised: ensuring parking bays / docking stations, with an average of 10 bikes each, are placed every 300 – 400m;
- Optimum density quoted by extant UK bike share operators ranges between 1 bike per 700 people to 1 bike per 300 people where there is high demand.

Table D-5 - Typical range of income shortfall after ride income considered

Shortfall per bike annually	350 bike scheme	500 bike scheme	1,000 bike scheme
£200	£70,000	£140,000	£200,000
£200	£105,000	£205,000	£300,000

Source: CoMoUK Bike Share Guidance for Local Authorities (2022) - https://uploads-ssl.webflow.com/6102564995f71c83fba14d54/637d049543d8ef05b11341e8_CoMoUK%20bike%20share%20guidance%20for%20local%20authorities%202022.pdf

D.4. Car share club – cost information

Table D-6 - Start-up costs - Capital costs of setting up community car club

	Item	Independent, without telematics	Independent, with low-cost telematics	Franchise, with telematics
Capital cost per vehicle	Purchase price	£8,000	£8,000	£8,000
	Vehicle branding	£80	£80	£80
	Branding of parking space	£30	£30	£30
	System for accessing keys	£20	£350	£1,600
	Total upfront cost / vehicle	**£8,130**	**£8,460**	**£9,710**
Capital cost per scheme	Set-up of booking/billing system	£0	£770	£1,000
	Total upfront cost per scheme (irrespective of vehicle numbers)	**£0**	**£770**	**£1,000**

Source - CoMoUK Business Case for Community Car Clubs - https://uploads-ssl.webflow.com/6102564995f71c83fba14d54/62dab86144830462346a07c4_CoMoUK%20Business%20Case%20for%20Community%20Car%20Clubs.pdf

Table D-7 - Running costs - Annual running costs of a community car club

	Item	Independent, without telematics	Independent, with low-cost telematics	Franchise, with telematics
Costs per vehicle	Booking and billing system and member support	£0	£22	£2,000
	Insurance	£1,250	£1,250	£900
	Breakdown cover	£30	£30	£0
	Vehicle Excise Duty (VED)	£15	£15	£15
	Cleaning, checking, taking vehicles to the garage	£1,100	£1,100	£1,100
	Service and maintenance	£670	£670	£670
	Depreciation (per year)	£1,000	£1,000	£1,000
	Total operating costs per vehicle	**£4,065**	**£4,087**	**£5,685**
Costs per scheme	Staff costs	£16,500	£15,000	£15,000
	Booking system	£48	£0	£0
	Marketing	£2,000	£2,000	£2,000
	Storage / office space	£0	£0	£0
	Liability insurance	£300	£300	£0
	Legal fees / accountancy	£200	£200	£200
	Total operating costs per scheme	**£19,048**	**£17,500**	**£17,200**

Source - CoMoUK Business Case for Community Car Clubs - https://uploads-ssl.webflow.com/6102564995f71c83fba14d54/62dab86144830462346a07c4_CoMoUK%20Business%20Case%20for%20Community%20Car%20Clubs.pdf

Table D-8 - Income - Car club rates charged by commercial operators for diesel/petrol cars

Car club and vehicle type	Membership fee	Medium car £/hour
Enterprise Car Club Standard	£60 / annum	£6.20
Enterprise Car Club Enhanced	£240 / annum	£4.70
Enterprise Car Club (Glasgow)	£20 / annum	£4.45
Zipcar	£60 / annum	£6.00
Co-wheels	£25 joining, £5/month	£5.25

Source - CoMoUK Business Case for Community Car Clubs - https://uploads-ssl.webflow.com/6102564995f71c83fba14d54/62dab86144830462346a07c4_CoMoUK%20Business%20Case%20for%20Community%20Car%20Clubs.pdf

Table D-9 - Annual income from membership fees per car

Annual membership levels per car	14	14	14	14	14
Annual membership fee	£25	£30	£40	£50	£60
Annual income from membership per car	**£350**	**£420**	**£560**	**£700**	**£840**

Source - CoMoUK Business Case for Community Car Clubs - https://uploads-ssl.webflow.com/6102564995f71c83fba14d54/62dab86144830462346a07c4_CoMoUK%20Business%20Case%20for%20Community%20Car%20Clubs.pdf

Table D-10 - Annual income from mileage rates per car

Average annual mileage	8,800	8,800	8,800	8,800	8,800
Fuel cost per mile	£0.11	£0.11	£0.11	£0.11	£0.11
Charge per mile	£0.13	£0.15	£0.17	£0.19	£0.21
Annual income from mileage (after covering fuel cost)	**£176**	**£352**	**£528**	**£704**	**£880**

Source - CoMoUK Business Case for Community Car Clubs - https://uploads-ssl.webflow.com/6102564995f71c83fba14d54/62dab86144830462346a07c4_CoMoUK%20Business%20Case%20for%20Community%20Car%20Clubs.pdf

Table D-11 - Annual income from hourly charges per car

Hourly rate	£3.50	£4.50	£5.50
Utilisation rate (%)	14	14	14
Annual income	**£4,292**	**£5,519**	**£6,745**

Source - CoMoUK Business Case for Community Car Clubs - https://uploads-ssl.webflow.com/6102564995f71c83fba14d54/62dab86144830462346a07c4_CoMoUK%20Business%20Case%20for%20Community%20Car%20Clubs.pdf

Table D-12 - Breakeven utilisation levels and hourly rates for two-vehicle schemes

Utilisation rate (%)	14	25	30	38
Annual income needed from bookings and mileage (per vehicle) to cover costs	£13,039	£13,039	£13,039	£13,039
Income needed per hour per hire	£10.65	£5.93	£4.93	£3.93
Breakeven hourly rate	**£10.22**	**£5.50**	**£4.50**	**£3.50**

Source - CoMoUK Business Case for Community Car Clubs - https://uploads-ssl.webflow.com/6102564995f71c83fba14d54/62dab86144830462346a07c4_CoMoUK%20Business%20Case%20for%20Community%20Car%20Clubs.pdf

Table D-13 - Breakeven utilisation levels and hourly rates for six-vehicle schemes

Utilisation rate (%)	14	13	16	19
Annual income needed from bookings and mileage (per vehicle) to cover costs	£6,680	£6,680	£6,680	£6,680
Income needed per hour per hire	£5.46	£5.93	£4.93	£3.93
Breakeven hourly rate	**£5.03**	**£5.50**	**£4.50**	**£3.50**

Source - CoMoUK Business Case for Community Car Clubs - https://uploads-ssl.webflow.com/6102564995f71c83fba14d54/62dab86144830462346a07c4_CoMoUK%20Business%20Case%20for%20Community%20Car%20Clubs.pdf

The CoMoUK report highlights several key findings of note, including:

- *Average utilisation rates for existing community car club schemes is 14% (approx. 4 hrs / day);*
- *It is not desirable to achieve utilisation rates of above 25% - if members are unable to book a vehicle when desired they may leave the club and purchase a car;*
- *It is difficult to make a two-vehicle scheme financially viable / sustainable. At typical utilisation rates (14%), the scheme would need to charge >£10/hr – it is unlikely that people would pay this figure; and*
- *A scheme would require six vehicles to become financially sustainable at existing average utilisation rates while charging hourly rates comparable to some commercial operators.*

Appendix E. Cost information produced by Atkins

E.1. Active travel infrastructure – cost information

Table E-1 - Active travel infrastructure - cost information - Chippenham

Item	Cost rate	Unit	C1 Frogwell		C2 Bath Road		C3 Bristol Road		C4 Langley Road		C5 River Path / Cocklebury Road		C7 London Road		C22 Sandown Drive		C23 Drake Crescent		C24 Derriads Lane		C31 Marshfield Road Contraflow		C61 Baydons Lane		C82 Av de Fleche		C83 Westmead Lane		C91 Rowden Lane		C101 Saltersford Lane	
			#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost
Proposed cycle route																																
Mark new cycle lanes on-carriageway (lining only)	£16,000	per km	2.05	£33,000		£0		£0	1	£16,000		£0	0.87	£14,000		£0		£0	1.03	£16,500		£0		£0		£0	0.35	£5,500		£0		£0
Reconfigure road space for cycle lanes 2 directions	£360,000	per km		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0
Provide light segregation to cycle lane	£60,000	per km		£0		£0		£0	0.18	£11,000	0.6	£36,000		£0		£0		£0		£0	0.34	£20,500		£0		£0		£0		£0		£0
Full kerbed segregation (2-way cycle track)	£700,000	per km		£0		£0		£0		£0	0.23	£161,000	2.43	£1,701,000		£0		£0		£0		£0		£0	0.29	£203,000		£0		£0	0.14	£98,000
Full kerbed segregation (2x uni-directional track)	£1,120,000	per km		£0	1.27	£1,422,500		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0
New 3m cycle track in verge	£225,000	per km		£0		£0		£0		£0		£0		£0	0.23	£52,000	0.18	£40,500		£0		£0	0.35	£79,000		£0		£0		£0	0.79	£178,000
Reconfigure carriageway and new 3m cycle track in verge	£500,000	per km		£0	0.73	£365,000		£0		£0		£0		£0	0.23	£115,000		£0		£0		£0		£0		£0		£0		£0		£0
On-carriageway improvement to quiet routes	£10,000	per km		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0	0.59	£6,000		£0		£0	0.84	£8,500	0.64	£6,500
Upgrade existing rural PROW to all weather route	£200,000	per km		£0		£0		£0		£0	2.15	£430,000		£0		£0		£0		£0		£0	0.17	£34,000		£0	0.4	£80,000	0.89	£178,000		£0
Other items																																
Modal Filter - PoD.	£15,000	no.	1	£15,000		£0		£0		£0		£0	1	£15,000		£0		£0		£0		£0	1	£15,000		£0		£0		£0	1	£15,000
Pedestrian / Toucan Crossing	£100,000	no.	2	£200,000		£0	1	£100,000		£0		£0		£0		£0		£0		£0		£0		£0	1	£100,000	1	£100,000		£0		£0
Signalised junction - new equipment / revised layout	£150,000	no.		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0
Street lighting	£150,000	per km		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0
Low level lighting to path	£8,000	per km	0	£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0	0.29	£2,500		£0		£0

Item	Cost rate	Unit	C1 Frogwell		C2 Bath Road		C3 Bristol Road		C4 Langley Road		C5 River Path / Cocklebury Road		C7 London Road		C22 Sandown Drive		C23 Drake Crescent		C24 Derriads Lane		C31 Marshfield Road Contraflow		C61 Baydons Lane		C82 Av de Fleche		C83 Westmead Lane		C91 Rowden Lane		C101 Saltersford Lane	
			#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost
Bridge	£500,000	no.				£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0			1	£500,000		£0
Rail Station Cycle Infrastructure			1	£960,000																												
Total construction cost			***£1,208,000***		***£1,787,500***		***£100,000***		***£27,000***		***£627,000***		***£1,730,000***		***£167,000***		***£40,500***		***£16,500***		***£15,500***		***£134,000***		***£303,000***		***£188,000***		***£686,500***		***£297,500***	
Land	£40,000	Ha.		£0		£0	0	£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0
Prelims (16%)				£193,500		£286,000		£16,000		£4,500		£100,500		£277,000		£26,500		£6,500		£2,500		£2,500		£21,500		£48,500		£30,000		£110,000		£47,500
Fees (0%)				£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0
Site Supervision (4%)				£48,500		£71,500		£4,000		£1,000		£25,000		£69,000		£6,500		£1,500		£500		£500		£5,500		£12,000		£7,500		£27,500		£12,000
Total implementation cost (no risk budget)			***£1,450,000***		***£2,145,000***		***£120,000***		***£32,500***		***£752,500***		***£2,076,000***		***£200,000***		***£48,500***		***£19,500***		***£18,500***		***£161,000***		***£363,500***		***£225,500***		***£824,000***		***£357,000***	
Risk (44%)				£638,000		£944,000		£53,000		£14,500		£331,000		£913,500		£88,000		£21,500		£8,500		£8,000		£71,000		£160,000		£99,000		£362,500		£157,000
Total implementation cost (inc. risk budget)			***£2,088,000***		***£3,089,000***		***£173,000***		***£47,000***		***£1,083,500***		***£2,989,500***		***£288,000***		***£70,000***		***£28,000***		***£26,500***		***£232,000***		***£523,500***		***£324,500***		***£1,186,500***		***£514,000***	
Design (10%)			***£145,000***		***£214,500***		***£12,000***		***£3,500***		***£75,500***		***£207,500***		***£20,000***		***£5,000***		***£2,000***		***£2,000***		***£16,000***		***£36,500***		***£22,500***		***£82,500***		***£35,500***	
Total			**£2,233,000**		**£3,303,500**		**£185,000**		**£50,500**		**£1,159,000**		**£3,197,000**		**£308,000**		**£75,000**		**£30,000**		**£28,500**		**£248,000**		**£560,000**		**£347,000**		**£1,269,000**		**£549,500**	

Package totals

Total Implementation Cost (inc. risk budget)	**£12,663,000**
Design	**£880,000**
Total	**£13,543,000**

Table E-2 - Active travel cost information - Trowbridge

Item	Cost rate	Unit	T1 West Ashton Road		T2 Green Lane		T3 Middle Street		T5 Hillperton Road		T6 Canal Road		T7 Frome Road		T8 Wingfield Road		T21 Ashton Street		T61 Canal Towpath	
			#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost
Proposed Cycle route provision																				
Mark new cycle lanes on-carriageway (lining only)	£16,000	per km		£0		£0		£0		£0	1.76	£28,000	1.1	£17,500	0.75	£12,000	0.2	£3,000		£0
Reconfigure road space for cycle lanes 2 directions	£360,000	per km	1.1	£396,000		£0	1.9	£684,000		£0	1.5	£540,000	1.1	£396,000	0.25	£90,000	0.4	£144,000		£0
Provide light segregation to cycle lane	£60,000	per km	0.33	£20,000		£0		£0		£0		£0	0.5	£30,000		£0		£0		£0
Full kerbed segregation (2-way cycle track)	£700,000	per km		£0		£0		£0		£0		£0		£0		£0		£0		£0
Full kerbed segregation (2x uni-directional track)	£1,120,000	per km		£0		£0		£0		£0		£0		£0		£0		£0		£0
New 3m cycle track in verge	£225,000	per km	1.1	£247,500		£0		£0		£0		£0		£0		£0		£0		£0
Reconfigure carriageway and new 3m cycle track in verge	£500,000	per km	0.6	£300,000		£0		£0		£0		£0		£0		£0		£0		£0
On-carriageway improvement to quiet routes	£10,000	per km		£0		£0	1.42	£14,000		£0		£0		£0		£0		£0		£0
Upgrade existing rural PROW to all weather route	£200,000	per km		£0	1.2	£240,000	0.59	£118,000		£0		£0		£0		£0		£0	2.92	£584,000
Other items																				
Modal Filter - PoD.	£15,000	no.		£0	1	£15,000	2	£30,000	1	£15,000	1	£15,000		£0		£0		£0		£0
Pedestrian/Toucan Crossing	£100,000	no.		£0		£0		£0		£0		£0		£0		£0	1	£100,000		£0
Signalised junction - new equipment/revised layout	£150,000	no.		£0		£0		£0		£0		£0		£0		£0		£0		£0
Street lighting	£150,000	per km		£0		£0		£0		£0		£0		£0		£0		£0		£0
Low level lighting to path	£8,000	per km		£0	0.69	£5,500	0.59	£4,500		£0		£0		£0		£0		£0	2.92	£23,500
Traffic calming	£50,000	per km			0.78	£39,000	1.79	£89,500	1.27	£63,500	1	£50,000	0.62	£31,000	0.75	£37,500		£0		£0
Rail Station Cycle Infrastructure			1	£960,000																
Total Construction Cost				***£1,923,500***		***£299,500***		***£940,000***		***£78,500***		***£633,000***		***£474,500***		***£139,500***		***£247,000***		***£607,500***
Land	£40,000	Ha.	1.1	£44,000		£0	0.295	£12,000		£0		£0		£0		£0		£0		£0
Prelims (16%)				£308,000		£48,000		£150,500		£12,500		£101,500		£76,000		£22,500		£39,500		£97,000
Fees (0%)				£0		£0		£0		£0		£0		£0		£0		£0		£0
Site Supervision (4%)				£77,000		£12,000		£37,500		£3,000		£25,500		£19,000		£5,500		£10,000		£24,500
Total implementation cost (no risk budget)				***£2,352,500***		***£359,500***		***£1,140,000***		***£94,000***		***£760,000***		***£569,500***		***£167,500***		***£296,500***		***£729,000***
Risk (44%)				£1,035,000		£158,000		£501,500		£41,500		£334,500		£250,500		£73,500		£130,500		£321,000
Total implementation cost (inc. risk budget)				***£3,387,500***		***£517,500***		***£1,641,500***		***£135,500***		***£1,094,500***		***£820,000***		***£241,000***		***£427,000***		***£1,050,000***
Design (10%)				***£235,500***		***£36,000***		***£114,000***		***£9,500***		***£76,000***		***£57,000***		***£17,000***		***£29,500***		***£73,000***
Total				***£3,623,000***		***£553,500***		***£1,755,500***		***£145,000***		***£1,170,500***		***£877,000***		***£258,000***		***£456,500***		***£1,123,000***

Item	Cost rate	Unit	T1 West Ashton Road		T2 Green Lane		T3 Middle Street		T5 Hillperton Road		T6 Canal Road		T7 Frome Road		T8 Wingfield Road		T21 Ashton Street		T61 Canal Towpath	
			#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost
Package totals																				
Total Implementation Cost (inc. risk budget)			£9,314,500																	
Design			£647,500																	
Total			£9,962,000																	

Table E-3 - Active travel cost information - Salisbury

Item	Cost rate	Unit	S1 Downton Road		S2 Castle Road		S4 Laverstock Road		S5 Devizies Road		S21 Green Lane		S22 St Marks Avenue		S31 Old Blanford Road		S32 Heronswood / New Bridge Road		S33 Netherhampton Road		S61 Wilton Road	
			#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost
Proposed Cycle route provision																						
Mark new cycle lanes on-carriageway (lining only)	£16,000	per km		£0		£0	0.28	£4,500	2	£32,000	0.96	£15,500	0.5	£8,000		£0	1.6	£25,000	1.9	£30,500	1	£16,000
Reconfigure road space for cycle lanes 2 directions	£360,000	per km		£0	2.11	£759,500		£0	0.85	£306,000	0.42	£151,000	0.27	£97,000		£0		£0	1	£360,000	0.36	£129,500
Provide light segregation to cycle lane	£60,000	per km		£0	1	£60,000	0.45	£27,000		£0		£0		£0		£0	0.66	£39,500	0.5	£30,000	0.5	£30,000
Full kerbed segregation (2-way cycle track)	£700,000	per km		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0
Full kerbed segregation (2x uni-directional track)	£1,120,000	per km		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0
New 3m cycle track in verge	£225,000	per km		£0	4.87	£1,096,000		£0		£0	1.17	£263,500		£0		£0		£0		£0		£0
Reconfigure carriageway and new 3m cycle track in verge	£500,000	per km	0.91	£455,000		£0		£0		£0		£0		£0		£0	0.41	£205,000		£0		£0
On-carriageway improvement to quiet routes	£10,000	per km		£0		£0	3.41	£34,000		£0		£0		£0	1.73	£17,500	0.97	£9,500		£0		£0
Upgrade existing rural PROW to all weather route	£200,000	per km		£0		£0		£0		£0	1.96	£392,000		£0		£0		£0	1.4	£280,000		£0
Other items																						
Modal Filter - PoD.	£15,000	no.		£0		£0	2	£30,000		£0		£0		£0	1	£15,000		£0		£0		£0
Pedestrian/Toucan Crossing	£100,000	no.		£0		£0		£0		£0		£0		£0	1	£100,000	1	£100,000		£0		£0
Signalised junction - new equipment/revised layout	£150,000	no.		£0		£0	1	£150,000		£0		£0		£0		£0		£0		£0		£0
Street lighting	£150,000	per km		£0		£0		£0		£0		£0		£0		£0		£0		£0		£0
Low level lighting to path	£8,000	per km		£0		£0		£0		£0	1.96	£15,500		£0		£0		£0		£0		£0
Traffic calming	£50,000	per km				£0		£0	1	£50,000		£0	0.5	£25,000	1	£50,000	0.5	£25,000		£0		£0
Rail Station Cycle Infrastructure			1	£960,000																		
Total Construction Cost				***£1,415,000***		***£1,915,500***		***£245,500***		***£388,000***		***£837,500***		***£130,000***		***£182,500***		***£404,000***		***£700,500***		***£175,500***
Land	£40,000	Ha.		£0		£0	0	£0		£0		£0		£0		£0		£0		£0		£0
Prelims (16%)				£226,500		£226,500		£306,500		£39,500		£62,000		£134,000		£21,000		£29,000		£64,500		£112,000
Fees (0%)				£0		£0		£0		£0		£0		£0		£0		£0		£0		£0
Site Supervision (4%)				£56,500		£56,500		£76,500		£10,000		£15,500		£33,500		£5,000		£7,500		£16,000		£28,000
Total implementation cost (no risk budget)				***£1,698,000***		***£2,298,500***		***£295,000***		***£465,500***		***£1,005,000***		***£156,000***		***£219,000***		***£484,500***		***£840,500***		***£210,500***
Risk (44%)				£747,000		£1,011,500		£130,000		£205,000		£442,000		£68,500		£96,500		£213,000		£370,000		£92,500

Item	Cost rate	Unit	S1 Downton Road		S2 Castle Road		S4 Laverstock Road		S5 Devizies Road		S21 Green Lane		S22 St Marks Avenue		S31 Old Blanford Road		S32 Heronswood / New Bridge Road		S33 Netherhampton Road		S61 Wilton Road	
			#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost
Total implementation cost (inc. risk budget)				*£2,445,000*		*£3,310,000*		*£425,000*		*£670,500*		*£1,447,000*		*£224,500*		*£315,500*		*£697,500*		*£1,210,500*		*£303,000*
Design (10%)				*£170,000*		*£230,000*		*£29,500*		*£46,500*		*£100,500*		*£15,500*		*£22,000*		*£48,500*		*£84,000*		*£21,000*
Total				*£2,615,000*		*£3,540,000*		*£454,500*		*£717,000*		*£1,547,500*		*£240,000*		*£337,500*		*£746,000*		*£1,294,500*		*£324,000*
Package totals																						
Total Implementation Cost (inc. risk budget)			**£11,413,500**																			
Design			**£793,000**																			
Total			**£12,206,500**																			

E.2. Public transport – cost information

Table E-4 - Public transport: bus service frequency improvements - cost information

Service Number	Operator	Currently operates on			Existing service frequency on			Required service frequency on			Current wait time			Required wait time (to meet 35% reduction)			Required improvements		
		Mon-Sat Daytime	Mon-Sat Evening	Sunday	Mon-Sat Daytime	Mon-Sat Evening	Sunday	Mon-Sat Daytime	Mon-Sat Evening	Sunday	Mon-Sat Daytime	Mon-Sat Evening	Sunday	Mon-Sat Daytime	Mon-Sat Evening	Sunday	Mon-Sat Daytime	Mon-Sat Evening	Sunday
2021 Costs (for improvements)																	**£150,000**	**£50,000**	**£30,000**
Salisbury services																			
R1	Salisbury Reds	✓	✓	✓	4	4	4	6.2	6.2	6.2	15.0	15.0	15.0	9.8	9.8	9.8	2.2	2.2	2.2
R2	Salisbury Reds	✓	✓	✓	2	1	1	3.1	1.5	1.5	30.0	60.0	60.0	19.5	39.0	39.0	1.1	0.5	0.5
R3 / PR3	Salisbury Reds	✓	✓	✓	2	1	1	3.1	1.5	1.5	30.0	60.0	60.0	19.5	39.0	39.0	1.1	0.5	0.5
R4	Salisbury Reds	✓			1	0	0	1.5	N/A	N/A	60.0	N/A	N/A	39.0	N/A	N/A	0.5	N/A	N/A
R5	Salisbury Reds	✓	✓	✓	2	1	1	3.1	1.5	1.5	30.0	60.0	60.0	19.5	39.0	39.0	1.1	0.5	0.5
R6	Salisbury Reds	✓		✓	1	0	1	1.5	N/A	1.5	60.0	N/A	60.0	39.0	N/A	39.0	0.5	N/A	0.5
PR9	Salisbury Reds	✓			2	0	0	3.1	N/A	N/A	30.0	N/A	N/A	19.5	N/A	N/A	1.1	N/A	N/A
R11/ PR11	Salisbury Reds	✓		✓	2	0	1	3.1	N/A	1.5	30.0	N/A	60.0	19.5	N/A	39.0	1.1	N/A	0.5
R12	Salisbury Reds	✓			1	0	0	1.5	N/A	N/A	60.0	N/A	N/A	39.0	N/A	N/A	0.5	N/A	N/A
R14	Salisbury Reds	✓			1	0	0	1.5	N/A	N/A	60.0	N/A	N/A	39.0	N/A	N/A	0.5	N/A	N/A
PR15	Salisbury Reds	✓			2	0	0	3.1	N/A	N/A	30.0	N/A	N/A	19.5	N/A	N/A	1.1	N/A	N/A
Regular rural / inter-urban services radiating from Salisbury / Amesbury																			
D1 / D1X	First West of England	✓			2	1	1	3.1	1.5	1.5	30.0	60.0	60.0	19.5	39.0	39.0	1.1	0.5	0.5
X3	Salisbury Reds	✓	✓	✓	2	1	1	3.1	1.5	1.5	30.0	60.0	60.0	19.5	39.0	39.0	1.1	0.5	0.5
X4	Salisbury Reds	✓	✓	✓	2	1	1	3.1	1.5	1.5	30.0	60.0	60.0	19.5	39.0	39.0	1.1	0.5	0.5
X5	Salisbury Reds	✓			1	0	0	1.5	N/A	N/A	60.0	N/A	N/A	39.0	N/A	N/A	0.5	N/A	N/A
X7 / X7R	Salisbury Reds	✓			1	0	0	1.5	N/A	N/A	60.0	N/A	N/A	39.0	N/A	N/A	0.5	N/A	N/A
Activ8	Salisbury Reds / Stagecoach	✓	✓	✓	4	1	1	6.2	1.5	1.5	15.0	60.0	60.0	9.8	39.0	39.0	2.2	0.5	0.5
2	Salisbury Reds	✓			1	0	0	1.5	N/A	N/A	60.0	N/A	N/A	39.0	N/A	N/A	0.5	N/A	N/A
20	Damory	**NS**			0.5	0	0	0.8	N/A	N/A	120.0	N/A	N/A	78.0	N/A	N/A	0.3	N/A	N/A

Service Number	Operator	Currently operates on			Existing service frequency on			Required service frequency on			Current wait time			Required wait time (to meet 35% reduction)			Required improvements		
		Mon-Sat Daytime	Mon-Sat Evening	Sunday	Mon-Sat Daytime	Mon-Sat Evening	Sunday	Mon-Sat Daytime	Mon-Sat Evening	Sunday	Mon-Sat Daytime	Mon-Sat Evening	Sunday	Mon-Sat Daytime	Mon-Sat Evening	Sunday	Mon-Sat Daytime	Mon-Sat Evening	Sunday
2021 Costs (for improvements)																	**£150,000**	**£50,000**	**£30,000**
25	Salisbury Reds	✓			0.5	0	0	0.8	N/A	N/A	120.0	N/A	N/A	78.0	N/A	N/A	0.3	N/A	N/A
29	Salisbury Reds	✓			0.75	0	0	1.2	N/A	N/A	80.0	N/A	N/A	52.0	N/A	N/A	0.4	N/A	N/A
37	Salisbury Reds	✓			0.5	0	0	0.8	N/A	N/A	120.0	N/A	N/A	78.0	N/A	N/A	0.3	N/A	N/A
44	Salisbury Reds	✓			0.75	0	0	1.2	N/A	N/A	80.0	N/A	N/A	52.0	N/A	N/A	0.4	N/A	N/A
66	Salisbury Reds / Stagecoach	✓			1	0	0	1.5	N/A	N/A	60.0	N/A	N/A	39.0	N/A	N/A	0.5	N/A	N/A
67, X67	Salisbury Reds / Stagecoach	✓			0.5	0	0	0.8	N/A	N/A	120.0	N/A	N/A	78.0	N/A	N/A	0.3	N/A	N/A
87 / 88	Salisbury Reds / Stagecoach	✓			0.75	0	0	1.2	N/A	N/A	80.0	N/A	N/A	52.0	N/A	N/A	0.4	N/A	N/A
Regular bus services in other parts of Wiltshire																			
10	Faresaver	✓			0.75	0	0	1.2	N/A	N/A	80.0	N/A	N/A	52.0	N/A	N/A	0.4	N/A	N/A
14, 15	FromeBus	✓			1	0	0	1.5	N/A	N/A	60.0	N/A	N/A	39.0	N/A	N/A	0.5	N/A	N/A
31	Coachstyle	✓			1	0	0	1.5	N/A	N/A	60.0	N/A	N/A	39.0	N/A	N/A	0.5	N/A	N/A
X31	Faresaver	✓	✓	✓	2	1	0.75	3.1	1.5	1.2	30.0	60.0	80.0	19.5	39.0	52.0	1.1	0.5	0.4
33 / X33	Faresaver	✓			1	0	0	1.5	N/A	N/A	60.0	N/A	N/A	39.0	N/A	N/A	0.5	N/A	N/A
X34	Faresaver	✓			2	0	0	3.1	N/A	N/A	30.0	N/A	N/A	19.5	N/A	N/A	1.1	N/A	N/A
43	Stagecoach West	✓			1	0	0	1.5	N/A	N/A	60.0	N/A	N/A	39.0	N/A	N/A	0.5	N/A	N/A
45A / 45B	FromeBus	✓			1	0	0	1.5	N/A	N/A	60.0	N/A	N/A	39.0	N/A	N/A	0.5	N/A	N/A
47	FromeBus	✓			1	0	0	1.5	N/A	N/A	60.0	N/A	N/A	39.0	N/A	N/A	0.5	N/A	N/A
50 / 50A	FromeBus	✓			1	0	0	1.5	N/A	N/A	60.0	N/A	N/A	39.0	N/A	N/A	0.5	N/A	N/A
54	Stagecoach West	✓			0.75	0	0	1.2	N/A	N/A	80.0	N/A	N/A	52.0	N/A	N/A	0.4	N/A	N/A
55	Stagecoach West	✓	✓	✓	3	1	2	4.6	1.5	3.1	20.0	60.0	30.0	13.0	39.0	19.5	1.6	0.5	1.1
60	Faresaver	✓			1	0	0	1.5	N/A	N/A	60.0	N/A	N/A	39.0	N/A	N/A	0.5	N/A	N/A
63	FromeBus	**NS**			1	0	0	1.5	N/A	N/A	60.0	N/A	N/A	39.0	N/A	N/A	0.5	N/A	N/A
65 / 65A	FromeBus / Faresaver	✓			1	0	0	1.5	N/A	N/A	60.0	N/A	N/A	39.0	N/A	N/A	0.5	N/A	N/A
67 / 67A	FromeBus	✓			1	0	0	1.5	N/A	N/A	60.0	N/A	N/A	39.0	N/A	N/A	0.5	N/A	N/A
68	FromeBus / Faresaver	✓			0.75	0	0	1.2	N/A	N/A	80.0	N/A	N/A	52.0	N/A	N/A	0.4	N/A	N/A
69	Faresaver	✓			0.5	0	0	0.8	N/A	N/A	120.0	N/A	N/A	78.0	N/A	N/A	0.3	N/A	N/A

Service Number	Operator	Currently operates on			Existing service frequency on			Required service frequency on			Current wait time			Required wait time (to meet 35% reduction)			Required improvements		
		Mon-Sat Daytime	Mon-Sat Evening	Sunday	Mon-Sat Daytime	Mon-Sat Evening	Sunday	Mon-Sat Daytime	Mon-Sat Evening	Sunday	Mon-Sat Daytime	Mon-Sat Evening	Sunday	Mon-Sat Daytime	Mon-Sat Evening	Sunday	Mon-Sat Daytime	Mon-Sat Evening	Sunday
2021 Costs (for improvements)																	**£150,000**	**£50,000**	**£30,000**
76 / 77	Faresaver / FromeBus	✓			0.5	0	0	0.8	N/A	N/A	120.0	N/A	N/A	78.0	N/A	N/A	0.3	N/A	N/A
87 / 877	Faresaver	✓			0.5	0	0	0.8	N/A	N/A	120.0	N/A	N/A	78.0	N/A	N/A	0.3	N/A	N/A
94	Libra Travel	**NS**			0.5	0	0	0.8	N/A	N/A	120.0	N/A	N/A	78.0	N/A	N/A	0.3	N/A	N/A
96	Libra Travel	**NS**			0.4	0	0	0.6	N/A	N/A	150.0	N/A	N/A	97.5	N/A	N/A	0.2	N/A	N/A
101 / 102	Salisbury Reds	✓			0.75	0	0	1.2	N/A	N/A	80.0	N/A	N/A	52.0	N/A	N/A	0.4	N/A	N/A
270	Faresaver	✓		✓	1	0	0.5	1.5	N/A	0.8	60.0	N/A	120.0	39.0	N/A	78.0	0.5	N/A	0.3
Total																	**33.7**	**7.0**	**8.8**
2021 Costs																	**£5,060,192.31**	**£350,000.00**	**£262,500.00**
2021 – 2023 Consumer Price Index (CPI) inflation factor																	**1.191**		
2023 Costs																	**£6,026,689.04**	**£416,850.00**	**£312,637.50**
TOTAL 2023 Costs																			**£6,756,176.54**

Alison Bryan
Atkins Limited