Salisbury Transport Models

PD3.3 Forecasting Report

December 2009

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1	Draft Forecasting Report	RJ	GB	TM	TM	02/06/09
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4	Revised Forecasting Report	GB	GB	TM	TM	29/09/09
5	Final Forecasting Report	GB	GB	TM	TM	11/12/09

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1. Introduction

Background

1.1 Wiltshire Council (WC) commissioned Atkins to develop Transport Models for Salisbury in September 2008. The commission was a response to a need to test the impact of significant proposed development in the Salisbury area.

1.2 This Forecasting Report forms deliverable 3.3 of the commission and it describes the development and results of a demand forecast of land use in 2026 using the Salisbury Transport Models (STM). The STM include a demand model (SDM), a highways model (SHM) and a public transport model (SPTM). The modelling approach takes future year developments and changes in transport provision and produces forecasts of highway and public transport demand.

Context

Planning

1.3 The Secretary of State's modifications to the South West Spatial Strategy shows that Salisbury City is required to accommodate a 8,700 new dwellings and provide 13,500 new employment opportunities by 2026. A range of potential sites have been identified. The strategy identifies sites in and around Salisbury, including potentially major changes in land use through the redevelopment of Churchfields and new developments to the north-west and south of the City.

1.4 As such, the Salisbury Transport Model must be able to:

- identify the impact on the transport network of locating development in each of the strategic residential and employment sites;
- identify the potential for maximising the use of public transport, walking and cycling for movements to from and within sites;
- identify the potentially significant switches in travel patterns arising from major changes in employment type and location;
- assess the potential impact on movements to/from Salisbury arising from the location of development outside Salisbury and Wilton; and
- support the District Council through the Local Development Framework (LDF) process and any subsequent statutory processes.

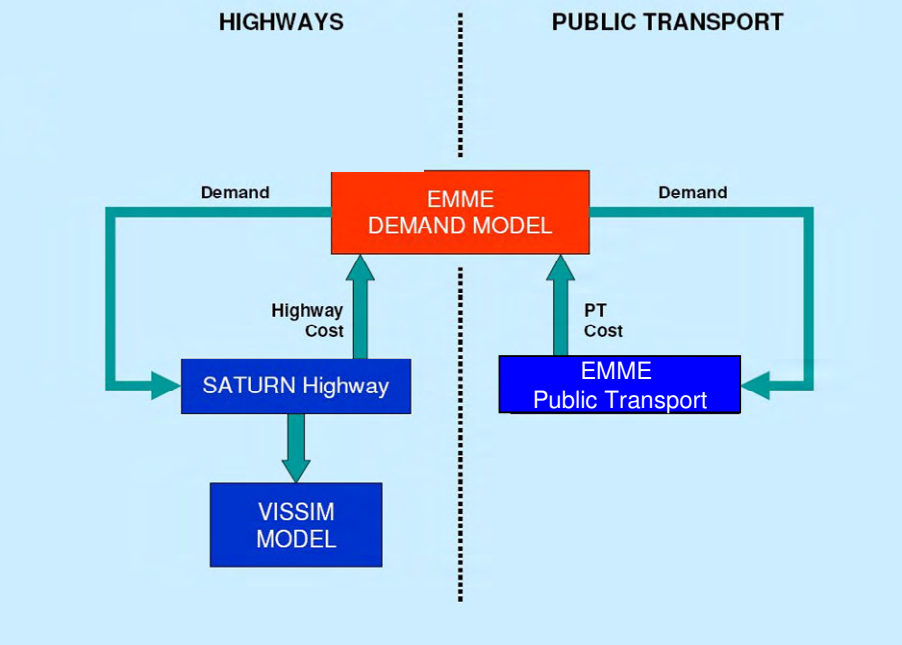
Approach

1.5 Our approach to this "macro-level" model, collectively referred to as the Salisbury Transport Model (STM) is developed using:

- an EMME demand model representing modal switching and redistribution effects and is referred to as the Salisbury Demand Model (SDM);
- a SATURN to represent the highway network and highway travel demands, referred to as the Salisbury Highway Model (SHM); and
- an EMME model representing the public transport network with individual bus, rail and park and ride services coded and are referred to as the Salisbury Public Transport Model (SPTM).

1.6 Figure 1.1 displays the linkages between the modelling framework.

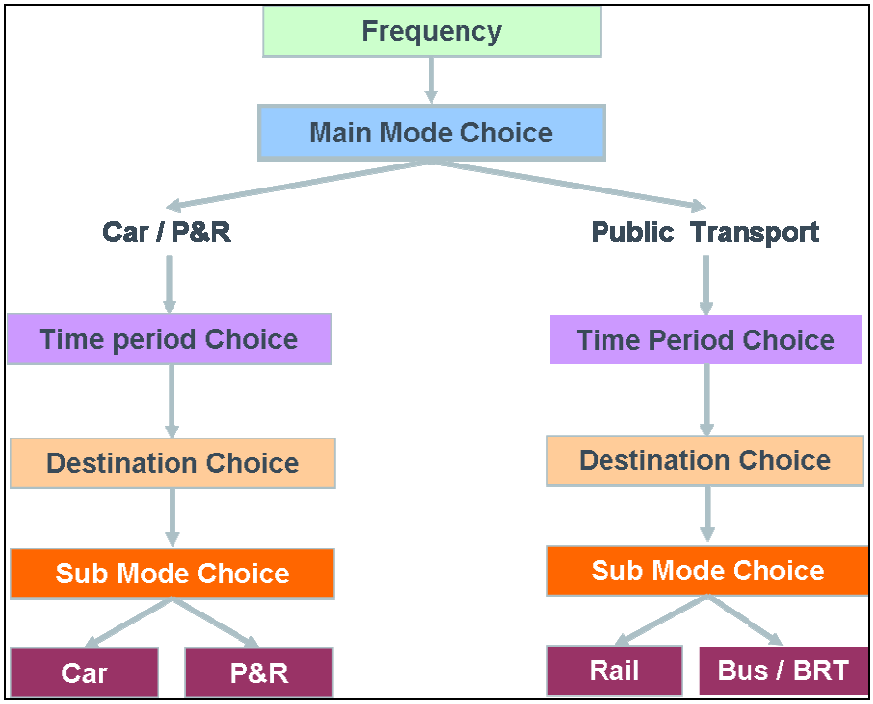
Figure 1.1 - Modelling Components and Linkages



Demand Model

1.7 The Salisbury is a 24-hour all-day demand model. The choice structure is shown in Figure 1.2. Compliant with WebTAG, it is an incremental demand modelling approach which responds to changes from the base generalised costs, measured in generalised minutes.

Figure 1.2 - Demand Model Choice Structure



Highway Model

1.8 The Salisbury Highway Model (SHM) model is a key element of the model framework. It is an integral part of the demand modelling process as it undertakes the highway assignment that in turn provides highway costs to the demand model. The highway model is SATURN based and

has been validated to a 2008 base year. The model can be used in forecasting mode and also be used 'stand-alone' to test small schemes that would be unlikely to result in a change of demand.

Public Transport Model

1.9 The Salisbury Public Transport Model (SPTM) is similarly a key element of the model framework a new model and has been developed using the SHM as its starting point. The model includes all bus and rail services serving Salisbury. The model is EMME based and has been calibrated to a 2008 base year. Again, the model can be used in forecasting mode and also be used 'stand-alone' to test small schemes that would be unlikely to result in a change of demand.

Forecasting Approach

1.10 The modelling framework has been developed to represent a 2008 Base Year to which the model has been calibrated and validated; and a 2026 forecast year. The transport network and public transport services have been updated to reflect the opening of Petersfinger Park and Ride, which is under construction now and will be open by 2026.

1.11 Adjusted TEMPRO projections of population, employment and trip ends were used in the model to forecast travel growth across Salisbury district for the STM, however in order to more realistically reflect projected land use changes, travel demand growth has been distributed throughout the area using more detailed local planning data supplied by the Wiltshire Council.

Scope of Report

The development of the forecast and the results of the demand model are contained in this report in the following Chapters:

- Chapter 2 describes the forecasting assumptions; and
- Chapter 3 describes the headline results.

2. Future Year Assumptions

Introduction

2.1 This chapter focuses on the development of the forecast year, describing the method used in calculating the trip ends and producing matrices. It also sets out how TEMPRO and local planning data have been utilised in the development of the future forecast year of 2026 matrices. This section also describes the assumptions for Petersfinger Park and Ride.

Demand

National Planning Data

2.2 The need to forecast growth in car, public transport and heavy goods vehicles trip ends from 2008 to 2026 is termed background growth. In order to calculate the vehicle and public transport forecast trip ends, TEMPRO (v5.4) was used to obtain growth forecasts supplemented by information relating to future land use provided by WC.

2.3 Table 2.1 summarises the overall TEMPRO population and employment figures for Salisbury. The numbers represent the Draft Regional Spatial Strategy (RSS) and show increase in households of 10,060 and an increase in jobs of 10,734.

Table 2.1 – Draft RSS Population, Household and Employment Growth Data

Authority	Population		Household		Employment	
	2008	2026	2008	2026	2008	2026
Salisbury	115,697	132,548	50,941	61,001	69,627	80,361

2.4 In this instance TEMPRO was adjusted to account for the Secretary of State's modifications to the draft Regional Spatial Strategy and are described below.

Local Planning Data

2.5 The Secretary of State's modifications to the draft Regional Spatial Strategy are assumed to add a further 2,086 households and 8,771 jobs to Salisbury between 2008 and 2026, making the total increase in households 12,147 and the total increase in jobs 19,506 between 2008 and 2026. The total number of people, households and jobs in Salisbury in 2028 and 2026 used in this forecast is shown in Table 2.2.

Table 2.2 – Secretary of State's modifications Population, Household and Employment Growth Data

Authority	Population		Household		Employment	
	2008	2026	2008	2026	2008	2026
Salisbury	115,697	136,987	50,941	63,087	69,627	89,132

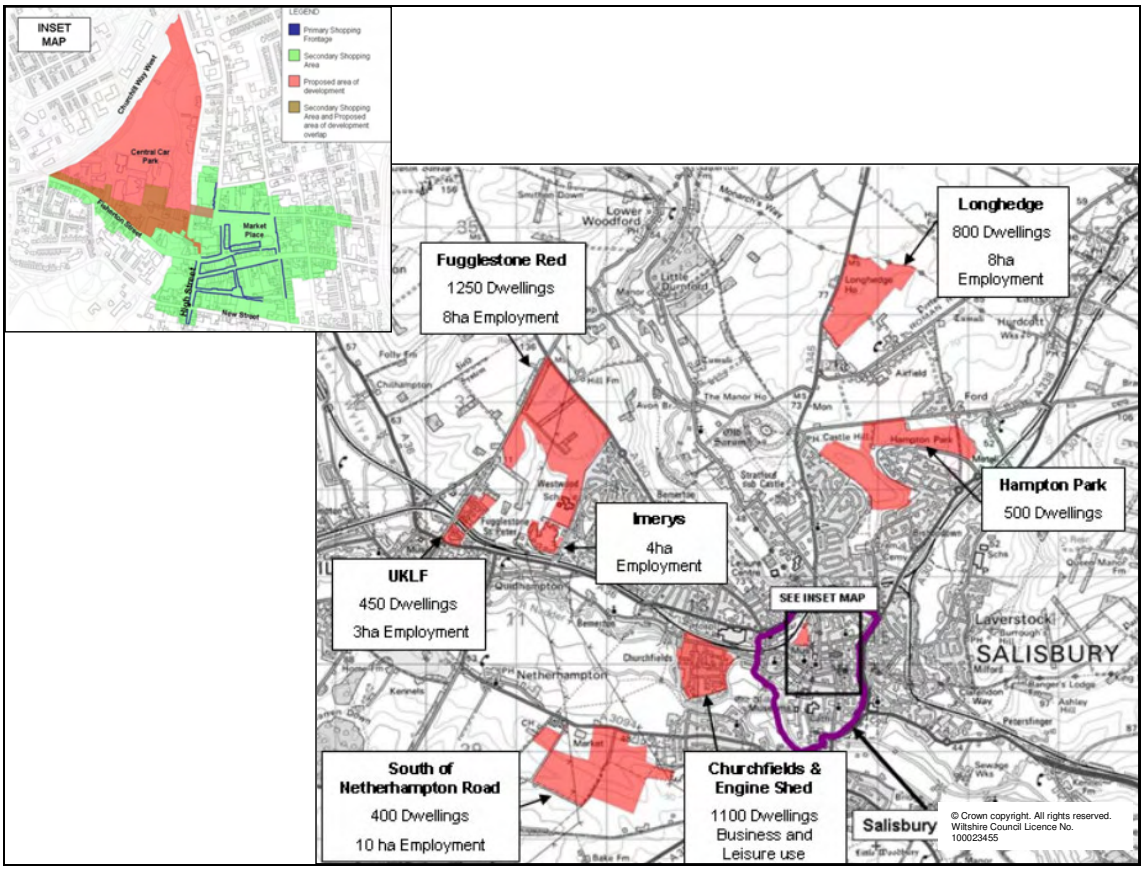
2.6 Each new development within the planning data was classified by land-use type as follows:

- Residential developments, specified in number of new houses.
- Employment developments , specified in Gross Floor Area (GFA); further subcategorised into:

- Retail
- B1 (Office/Light Industrial sites)
- B2 (General Industrial sites)
- B8 (Storage and Distribution sites)

2.7 In addition to this data the site locations for these planned developments provided the basis for the spatial distribution of trips for the forecast model, by considering the locality of the developments in relation to the zones in the model. The total number of new houses and jobs were then allocated to the appropriate model zones. The location of development sites is shown in Figure 2.1.

Figure 2.1 - Location of Developable Sites



Source: South Wiltshire Core Strategy (2009)

Development Trip Rates

2.8 In order to work out trip end estimates (required for the allocation process) trip rates were calculated and applied to the planning data supplied.

2.9 For this model the source data for the trip rate calculations was the trip rate database package TRICS2008, which uses data collected from surveys throughout the UK to calculate average rates for both highway and public transport trip generation according to different types of land use. In this instance trip rates for developments in towns of similar size across the south west.

Development Trips

2.10 A detailed breakdown of the number of jobs and houses for each development is shown in Appendix A. This information was provided by Wiltshire Council[1]. The number of trip productions and attractions are those that are added to the start of the demand process. The resultant number of trips by mode would be influenced by the demand model and converted from trip productions and attractions to trip origin and destinations.

LGV and HGV Growth

2.11 Growth rates, derived from the Department for Transports 2007 Road Forecasts for England, were used to forecast Light Goods Vehicles (LGV) and Heavy Goods Vehicles (HGV) from the Base Year to 2026. The growth factors were:

- LGV 1.7
- HGV 1.1

Supply

2.12 When forecasting it is necessary to include all committed highway and public transport schemes in the forecast transport networks. Only Petersfinger Park and Ride, which is currently under construction and will be open long before 2026, is committed and included in the 2026 forecast networks.

2.13 The Petersfinger Park and Ride has been assumed to be similar to the existing park and ride services in terms of cost, frequency and destination. The following frequencies were applied:

- six per hour in the morning peak;
- four per hour in the inter-peak; and
- six per hour in the evening peak.

2.14 Intermediate stops at College roundabout and Exeter Street roundabout in both directions were also added to the route.

2.15 The inclusion of this service also required changes to the zones that can use each park and ride site. This process works as a logic check to ensure that the model does not assign users to park and ride sites that may seem illogical in practice (such as the opposite side of the city) but may be the lowest possible route within the model.

Demand Model Factors

2.16 Forecasting not only involves changes to transport demand and supply, but also changes to a number of parameters in the demand model. The changes, relating to the following parameters, are shown in Appendix B:

[1] Development details sent to Atkins by V Albano contained in spreadsheet - *Revised Salisbury Transport Model 260809.xls*

3. Headline Indicators

Introduction

3.1 This section presents a set of headline indicators for the 2026 forecasts. The key indicates include:

- model convergence;
- demand response;
- highway network performance; and
- public transport network performance.

Model Convergence

3.2 Model convergence is an indicator of the stability of the model. Convergence is measured by the % Gap between supply and demand curves with the demand model. Perfectly converged models would have a % Gap of zero and the guidance recommends values of less that 0.2%.

3.3 The demand model convergence is shown in Table 3.1 and it can be seen that a suitable level of convergence has been reached. Highway model convergence is shown in Table 3.2. The nature of the public transport model assignment (i.e. without capacity restraint) means that very high levels of convergence are always reached and thus are not reported below.

Table 3.1 – Demand Model Convergence Results

Criteria	2026 (24 hr)
Convergence after Loop #	14
% Gap	0.084%

Table 3.2 - Highway Model Convergence Results

Criteria	AM Peak		Inter Peak		PM Peak	
	2008	2026	2008	2026	2008	2026
Convergence after loop #	22	37	17	28	15	102
% Link Flows differing by <5%	98.8	98.6	98.2	97.7	98.0	97.7
% Gap	0.007	0.022	0.001	0.0058	0.002	0.028

Demand Response

3.4 The total person trips by mode and mode split for motorised travel modes (i.e. excluding walking and cycling) are summarised in Tables 3.3 and 3.4 respectively for 2008 and 2026. Note that Park and Ride is shown as a discrete mode and the car and bus elements have not been separately counted under the car and bus mode share.

3.5 The increase in Park and Ride includes the addition of the new site. Furthermore, the model excludes any capacity restraint (reflecting the size of the car park) on Park and Ride.

Table 3.3 – Person Trips by Mode 2008 and 2026

Mode	Morning Peak Hour			Inter-Peak Hour			Evening Peak Hour		
	2008	2026	% Change	2008	2026	% Change	2008	2026	% Change
Car	17,750	20,996	18%	14,760	17,344	18%	18,455	23,180	26%
Bus	1,103	1,418	29%	966	1,136	18%	1,101	1,496	36%
Rail	578	608	5%	355	397	12%	744	815	10%
P&R	465	754	62%	136	267	95%	207	339	63%
Total	19,896	23,776	19%	16,218	19,143	18%	20,506	25,830	26%

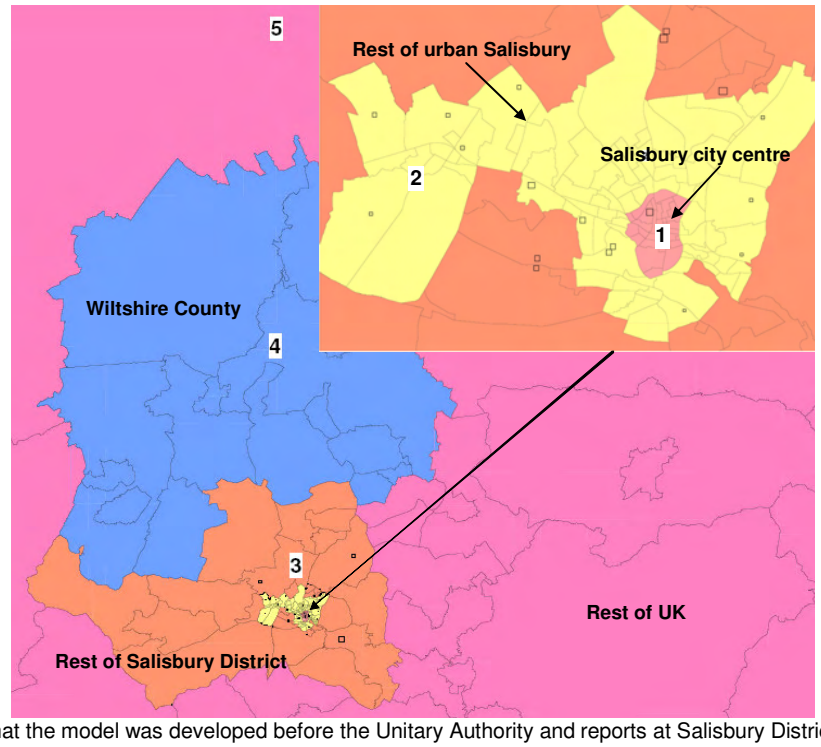
Table 3.4 - Mode Split 2008 and 2026

Mode	Morning Peak Hour		Inter-Peak Hour		Evening Peak Hour	
	2008	2026	2008	2026	2008	2026
Car	89%	88%	91%	91%	90%	90%
Bus	6%	6%	6%	6%	5%	6%
Rail	3%	3%	2%	2%	4%	3%
P&R	2%	3%	1%	1%	1%	1%
Total	100%	100%	100%	100%	100%	100%

Response by Location

3.6 The demand by mode has been sectored using the sector system shown in Figure 3.1 and below:

Figure 3.1 - Sector System



Note that the model was developed before the Unitary Authority and reports at Salisbury District Level

3.7 Tables 3.5 – 3.7 compare the change car trips (in vehicles per hour) for 2008 and 2026, for the morning peak, inter peak and evening peak respectively. The 33% increase in morning peak car trips is a combination of the increase in people travelling in cars and driving to park and ride and decreasing in car occupancy over time and is different to the person trips shown in Table 3.3.

3.8 The main increases are in sectors two and three and this follows the patterns of development in the Core Strategy, which favours growth on the urban fringe rather than the city centre.

3.9 Growth in traffic in the evening peak is a function of growth of return trips starting in the morning peak and inter-peak in addition to trips that start in the evening peak, hence growth is larger than the morning peak.

Table 3.5 - Sector Summary Car (including car leg P&R) - Morning Peak

	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Total
Sector 1	-2%	4%	38%	18%	16%	13%
Sector 2	4%	21%	67%	32%	31%	27%
Sector 3	33%	64%	68%	43%	46%	57%
Sector 4	26%	17%	67%	28%	21%	31%
Sector 5	6%	49%	41%	15%	17%	30%
Total	12%	31%	59%	29%	28%	33%

Table 3.6 - Sector Summary Car (including car leg P&R) - Inter Peak

	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Total
Sector 1	6%	13%	24%	35%	33%	19%
Sector 2	15%	23%	40%	49%	52%	28%
Sector 3	27%	41%	44%	61%	49%	41%
Sector 4	33%	47%	52%	25%	20%	37%
Sector 5	25%	42%	48%	22%	21%	33%
Total	19%	27%	39%	41%	38%	31%

Table 3.7 - Sector Summary Car (including car leg P&R) - Evening Peak

	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Total
Sector 1	0%	9%	34%	28%	33%	18%
Sector 2	10%	24%	58%	22%	84%	35%
Sector 3	33%	63%	66%	73%	80%	63%
Sector 4	19%	39%	53%	28%	13%	31%
Sector 5	40%	53%	72%	17%	15%	42%
Total	19%	31%	57%	31%	53%	39%

3.10 Tables 3.8 - 3.10 show the bus trips per hour by sector for the three time periods. Note that this includes the bus leg of park and ride trips. It is notable that there is some decrease in bus patronage towards the city centre which may be caused by either:

- congestion on these routes; or
- a result of increasing car ownership.

Table 3.8 - Sector Summary Bus (including bus leg P&R) - Morning Peak

	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Total
Sector 1	-18%	21%	19%	-17%	-18%	13%
Sector 2	38%	106%	131%	-5%	14%	53%
Sector 3	41%	67%	118%	-20%	-15%	57%
Sector 4	-15%	-6%	13%	2%	2%	-2%
Sector 5	-16%	-9%	30%	-1%	-1%	-3%
Total	34%	47%	79%	-6%	-1%	38%

Table 3.9 - Sector Summary Bus (including bus leg P&R) - Inter Peak

	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Total
Sector 1	-4%	17%	32%	-15%	-10%	18%
Sector 2	20%	68%	51%	1%	-9%	30%
Sector 3	69%	66%	92%	-4%	0%	70%
Sector 4	-6%	9%	-7%	-2%	-8%	-3%
Sector 5	0%	1%	6%	-5%	-6%	-4%
Total	32%	31%	49%	-5%	-7%	27%

Table 3.10 - Sector Summary Bus (including bus leg P&R) - Evening Peak

	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Total
Sector 1	-14%	21%	47%	-10%	-7%	27%
Sector 2	3%	98%	84%	-1%	-3%	43%
Sector 3	15%	142%	212%	20%	81%	122%
Sector 4	-29%	-18%	-16%	-1%	-4%	-11%
Sector 5	-26%	-23%	-7%	0%	-3%	-7%
Total	1%	44%	87%	0%	-1%	40%

3.11 Tables 3.11 – 3.13 show the rail trips per hour by sector for the three time periods (not that many rail trips from sectors 1 to 4 to sectors one to four are very small and a small change results in a large percentage decrease or increase. There is some increase in rail trips between sector 3 and external areas, and a slight reduction of trips by rail into Salisbury (sector 1), which may be a result of trips transferring to the Petersfinger Park and Ride. Otherwise, there is very little change.

Table 3.11 - Sector Summary Rail - Morning Peak

	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Total
Sector 1	no trips	no trips	42%	5%	-13%	-10%
Sector 2	no trips	no trips	24%	13%	-2%	-2%
Sector 3	15%	21%	374%	-10%	108%	79%
Sector 4	-24%	1547%	215%	no trips	-32%	-6%
Sector 5	-17%	5%	64%	-27%	-27%	-4%
Total	-17%	9%	85%	-14%	-1%	5%

Table 3.12 - Sector Summary Rail - Inter Peak

	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Total
Sector 1	no trips	no trips	21%	-16%	2%	-1%
Sector 2	no trips	no trips	33%	13%	25%	24%
Sector 3	no trips	47%	221%	578%	87%	101%
Sector 4	-5%	15%	122%	no trips	-41%	1%
Sector 5	12%	24%	81%	-39%	-30%	0%
Total	10%	24%	82%	1%	0%	12%

Table 3.13 - Sector Summary Rail - Evening Peak

	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Total
Sector 1	no trips	no trips	13%	-20%	-4%	-7%
Sector 2	no trips	no trips	24%	71%	14%	17%
Sector 3	0%	23%	435%	218%	60%	84%
Sector 4	-22%	6%	39%	no trips	-34%	-8%
Sector 5	-1%	22%	100%	-40%	-35%	1%
Total	-4%	21%	86%	-5%	-5%	10%

3.12 Details of the absolute numbers of trips are shown in Appendix C.

Highway Network Performance

Network Performance

3.13 The network performance for the city centre, urban area and Salisbury is each summarised in terms of the following:

- Total Distance Travelled (pcu kilometres) - the total distance travelled on the modelled highway network multiplied by the number of passenger car units (pcu's);
- Total Travel Time (pcu hours) - the total time travelled on the modelled highway network including delays multiplied by the number of passenger car units (pcu's);
- Average Network Speed (km/hr) - the average speed is the total distance travelled divided by the total travel time; and
- Total Delay (pcu hours) - total delay is taken as the difference between congested and free flow travel time on the modelled highway network in hours multiplied by the number of passenger car units (pcu's).

3.14 These are shown in Appendix D and summarised in Table 3.14 below.

3.15 It can be seen that distance travelled, as measured in pcu kilometres, increases in line with the increase in traffic shown in Tables 3.5-3.8 above. Where the increase in pcu kilometres is greater than the increase in trips, it indicates that longer routes are being taken as a result of traffic aiming to avoid congestion – this occurs in the evening peak.

3.16 Similarly, changes in travel time, as measured in vehicle hours, which are higher than the increase in vehicles suggests increased congestion. Again, travel time has increased most in the evening peak. The review of the increase in delay matches this observation.

3.17 The changes in average speed are a summary of the data above and show that traffic conditions have got worse in all time periods but more so in the morning peak and evening peak.

Table 3.14 – Summary of Change in Highway Network Performance in Salisbury

Metric	Morning Peak	Inter-Peak	Evening Peak
Total Distance Travelled (pcu km)	31%	35%	38%
Total Travel Time (pcu hr)	46%	43%	59%
Total Delay (pcu hr)	92%	72%	123%
Average Network Speed (km/hr)	-10%	-6%	-13%

3.18 A more detailed analysis of the data in Appendix D shows that there is little increase in flow or delay in the city centre between 2008 and 2026 but that most of the increase in traffic and congestion is in the urban area. This pattern matches the location of development, with relatively little additional development in the city centre but significant growth within the urban area of Salisbury.

3.19 There is also a considerable increase in traffic and congestion in the non-urban areas of the former Salisbury District boundary. Again, this reflects the development at Porton, Amesbury and the urban fringe of Salisbury.

Public Transport Model Performance

Network Wide

3.20 The overall public transport network performance for the whole of the modelled area is summarised in terms of the following:

- Total Travel Time (passenger hours) - the total time travelled on the modelled public transport network time;
- Total Distance Travelled (passenger kilometres) - the total distance travelled on the modelled public transport network multiplied by the number of passengers;
- Passenger boardings – the number of public transport boardings.

3.21 These are shown in Appendix E and summarised below.

3.22 The increase in bus patronage, as shown in Tables 3.9 – 3.11 above, is not matched by an increase in total travel time or distance. This indicates that public transport passengers are making both shorter trips and different trips (such as Park and Ride) due to changes in land use and / or congestion on the highway network.

Table 3.15 – Summary of Change in Public Transport Network Performance

	Morning Peak	Inter-Peak	Evening Peak
Total Travel Time (pax hr)	3%	4%	3%
Total Distance Travelled (pax km)	12%	8%	8%
Passenger boardings (pax)	26%	18%	15%

4. Highway Hot Spots

4.1 There are a number of congestion hotspots in the forecast years as a result of the increase in car traffic due to development:

- Wilton Roundabout;
- Park Wall Junction;
- Harnham Gyratory;
- Exeter Street Roundabout;
- roundabouts along Churchill Way; and
- sections along the A36.

4.2 These junctions have been coloured coded to demonstrate the level of congestion and delay experienced at these junctions and are presented below in Figures 4.1 and 4.2. It is noticeable that all of the junctions experience worse traffic conditions in the future.

4.3 The most severely impacted junctions are A36 / Bourne Way, College Roundabout, Exeter Street Roundabout and Park Wall Junction. These each experience at least a doubling of delay, an increase in the volume to capacity ratio of the entire junction and a greater increase in arms of the junction where the volume to capacity ratio is greater than 80%.

4.4 The other junctions have experienced either changes in the volume to capacity ratio of the entire junction or delays or an increase in arms of the junction where the volume to capacity ratio is greater than 80%; but not all three measures.

4.5 There a number of reasons why some junctions are not more affected by increases in traffic than other junctions. The effects of delays at some junctions results in re-routing strategies across the network. The highway network in Salisbury provides a number of alternative routes to avoid congestion. For instance, the model forecasts traffic travelling eastbound from Harnham to avoid the gyratory and use Old Blandford Road and Coombe Road to access Odstock (Figure 4.1). In reality, it is unlike that all of the forecast traffic would make this diversion.

Figure 4.1 - Traffic Avoiding Harnham Gyratory (2026 Morning Peak)

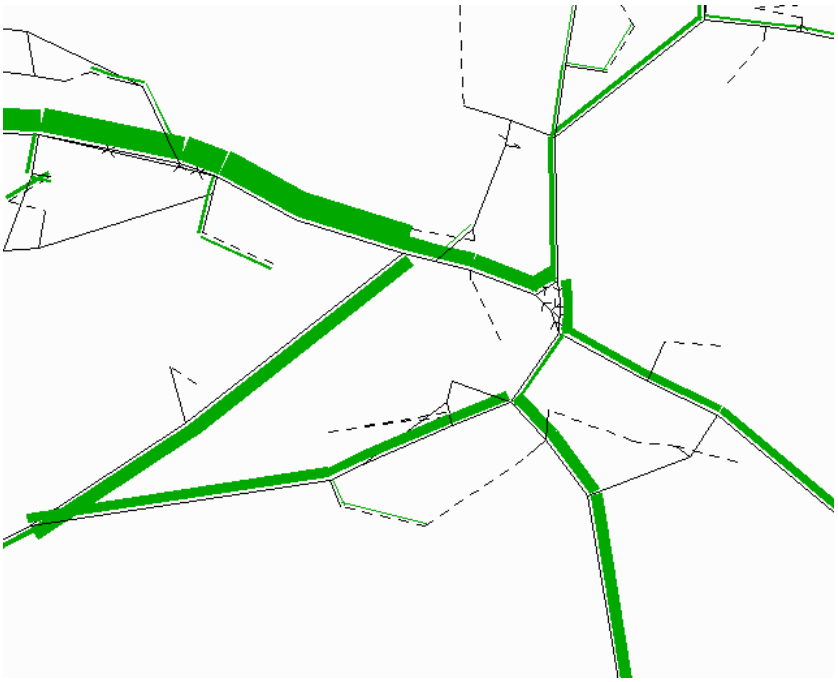


Figure 4.2 - Junction Assessment in Base Year (2008)

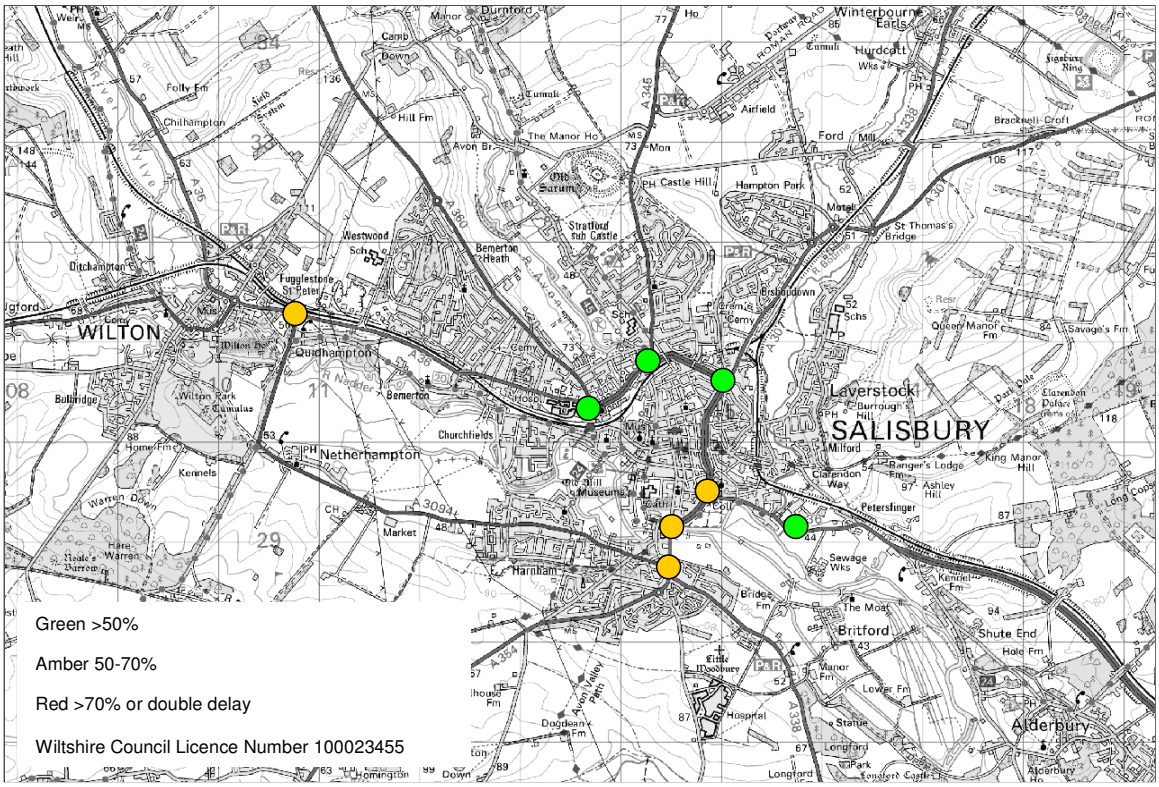
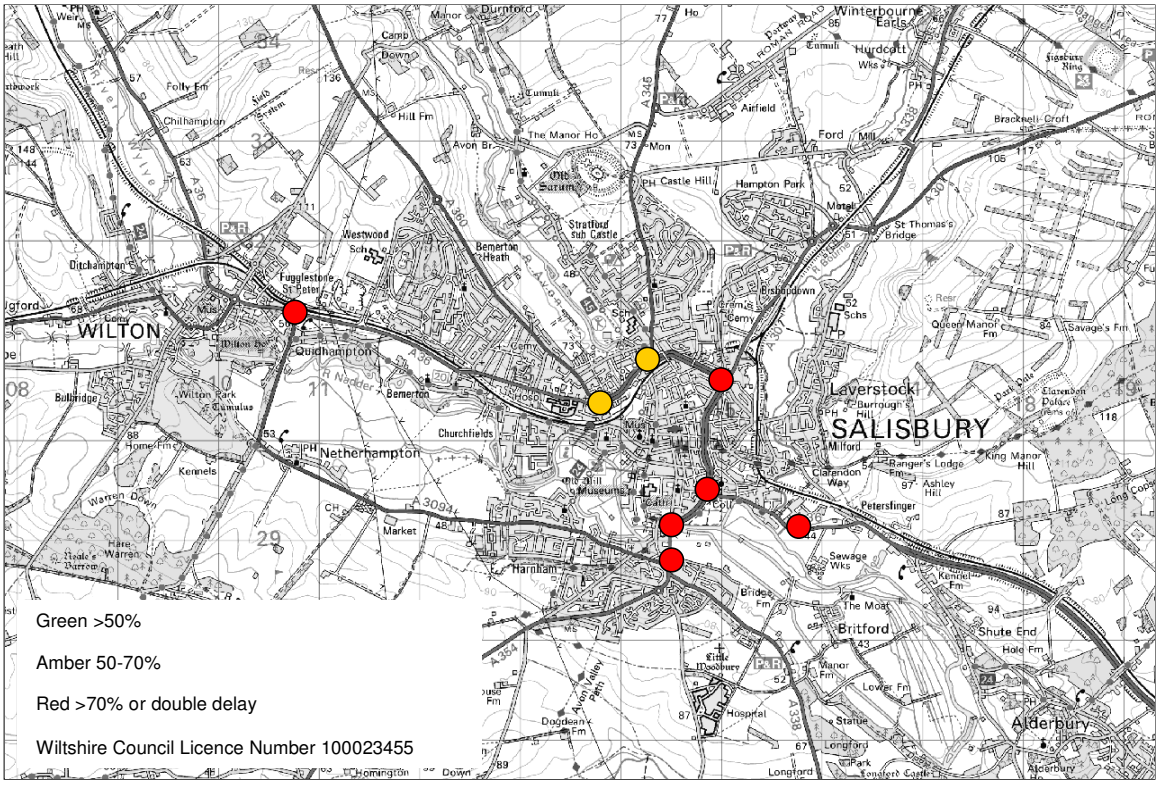


Figure 4.3 – Junction Assessment in Forecast Year (2026)



4.6 This assessment has not considered the improvement of any of the junctions in Salisbury, except the Petersfinger Park and Ride, making this is close to a 'do-nothing' scenario test. In reality, there would be a number of continual changes to the network to improve traffic conditions as well as enhanced public transport provision to the developments.

4.7 A model test that optimised all of the traffic signals automatically revealed that traffic flow improved through the Harnham Gyratory and eliminated the re-routing to avoid the gyratory and improved conditions along the A36 between St Paul's and St Mark's Roundabouts. Whilst this approach reduces the 'traffic control' element of the signals, it is indicative of the impact that changes to traffic signals, lane allocations and other 'within highway boundary' changes could make in reducing the impact of traffic growth at some of the key junctions in Salisbury.

4.8 Furthermore, this assessment has not included any improvements to public transport, changes in parking provision and cost or an assessment of further encouragement of smarter choices. The model will be able to test the impacts of changes in public transport and parking but not smarter choices. It is possible that a combination of demand management and smarter choices could reduce demand by as much as 10% for certain journeys.

4.9 The impact of a number of transport planning tools could lower the impact of traffic growth on key junctions around Salisbury and improve overall transport conditions. The Salisbury Transport Strategy will consider this further.

Appendix A - Development Proposals

Table A.1 – Modelled Developments

Ref	Area or Site	Ward	Use Class	Y2026 Total jobs	Y2026 Offices jobs	Y2026 Indus jobs	Y2026 Retail jobs	Y2026 Schools Jobs	Y2026 Dwellings
Extant Consents									
1	Crow Lane Wilton S/2003/1016	Wilton	C3	0	0	0	0	0	62
2	Pembroke Park S/2007/1152	Bemerton	C3	0	0	0	0	0	65
3	Conquered Moon S/2007/1785	Bemerton	C3	0	0	0	0	0	14
4	Booker S/2006/1521	Harnham West	C3	0	0	0	0	0	18
5	15/17 Middleton Road S/2007/1671	St Paul	C3	0	0	0	0	0	12
6	R/O 120 Fisherton Street S/2007/0832	Fisherton & Bemerton Village	C3	0	0	0	0	0	21
7	St Martins Church Hall S/2006/1437	St Martin and Milford	C3	0	0	0	0	0	10
8	Wilton Road/Devises Road S/2005/1546	Fisherton & Bemerton Village	C3	0	0	0	0	0	11
Local Plan Allocated sites									
9	Old Sarum	Laverstock	C3	1584	1202	382	?	?	650
11	Downton Road Extension	Harnham (East)	C3	0	0	0	0	0	130
12	Old Manor Hospital, Salisbury	Fisherton & Bemerton Village	C3	0	0	0	0	0	80
13	Salisbury Hospital	Britford	C3	0	0	0	0	0	45
14	Bulbridge, Wilton	Wilton	C3	0	0	0	0	0	45
Strategic Sites									
15	Fugglestone Red	Bemerton	C3 D1 B1 B2 B8	2112	1603	509	?	410	1250
16	Hampton Park	Laverstock	C3	0	0	0	0	210	500
17	Longhedge	Laverstock	C3 D1 B1 B2 B8	2112	1602	508	0	420	800
18-1	Churchfields and the Engine Shed Site	Fisherton & Bemerton Village	C3 D1 B1 B2 B8	263	200	63	0	0	550
18-2	Churchfields and the Engine Shed Site	Fisherton & Bemerton Village	C3 D1 B1 B2 B8	265	201	64	0	0	550
19	UKLF	Wilton	C3 B1 B2 B3	660	501	159	0	0	450
20	South of Netherhampton Road Harnham	Netherhampton	C3	2640	2003	636	0	0	400
21	Central Car park	St Edmund &	C3 A1	0	0	0	?	0	200

Ref	Area or Site	Ward	Use Class	Y2026 Total jobs	Y2026 Offices jobs	Y2026 Indus jobs	Y2026 Retail jobs	Y2026 Schools Jobs	Y2026 Dwellings
		Milford	A3 A4						
22	Kingsgate	Amesbury	C3	0	0	0	0	0	1300
23	IMERYS	Bemerton	B8, B2 Sui Generis	487	0	487	0	0	0
Salisbury Vision Sites (More certain areas of Search)									
24	Salt Lane Car park	St Edmund & Milford	C3	0	0	0	0	0	10
25	Brown Street Car park	St Martin & Milford	C3	0	0	0	0	0	12
26	Bus Station	St Edmund & Milford	C3	0	0	0	0	0	7
27	Bus Depot	St Edmund & Milford	B1 C3	287	287	0	0	0	25
28-1	Southampton Road - 1	St Martin & Milford	B1 C3 A1	0	0	0	?	0	250
28-2	Southampton Road - 2	St Martin & Milford		0	0	0	?	0	250
28-3	Southampton Road - 3	St Martin & Milford		0	0	0	?	0	250
28-4	Southampton Road - 4	St Martin & Milford		378	378	0	?	0	0
28-5	Southampton Road - 5	St Martin & Milford		378	378	0	?	0	0
28-6	Southampton Road - 6	St Martin & Milford		378	378	0	?	0	0
28-7	Southampton Road - 7	St Martin & Milford		378	378	0	?	0	0
Salisbury uncertain areas of search									
29	North		C3 D1 B1 B2 B8						283
30-1	East -1		C3 D1 B1 B2 B8						142
30-2	East-2		C3 D1 B1 B2 B8						141
31-1	South-1		C3 D1 B1 B2 B8						142
31-2	South-2		C3 D1 B1 B2 B8						141
32-1	West-1		C3 D1 B1 B2 B8						71
32-2	West-2		C3 D1 B1 B2 B8						71

Ref	Area or Site	Ward	Use Class	Y2026 Total jobs	Y2026 Offices jobs	Y2026 Indus jobs	Y2026 Retail jobs	Y2026 Schools Jobs	Y2026 Dwellings
32-3	West-3		C3 D1 B1 B2 B8						71
32-4	West-4		C3 D1 B1 B2 B8						70
Site Specific DPD (outside Salisbury)									
33	Wilton LSC (0)	Wilton	0	0	0	0	0	0	0
34	Rest of Wilton Community Area (826)		C3	0	0	0	0	0	826
35	Amesbury and Garrison villages (0)	Amesbury	0	0	0	0	0	0	0
36	Rest of Amesbury Community Area (525)		C3	264	200	64	0	0	525
37	Downton LSC (139)	Downton	C3	264	200	64	0	0	139
38	South Wiltshire Community Area (302)		C3	0	0	0	0	0	302
39	Tisbury LSC (11)	Tisbury	C3	264	200	64	0	0	11
40	Rest of Tisbury Community Area (259)		C3	0	0	0	0	0	259
41	Mere LSC (159)	Mere	C3	264	200	64	0	0	159
42	Rest of Mere Community Area (0)		0	0	0	0	0	0	0
Employment									
43	Porton Down	Idminston	B1	3000	3000	0	0	0	
44	Solstice Park	Amesbury	B1, B8	2903	2204	700	0	0	

Appendix B - Demand Model Parameters

Vehicle Occupancy

B.1.1 Vehicle occupancy is assumed to decrease per annum by the factors shown in Table 2.4.

Table B.1 - Annual Vehicle Occupancy Growth Factors

Time Period	Purpose	
	Work	**Non-Work**
AM	-0.48%	-0.67%
IP	-0.40%	-0.65%
PM	-0.62%	-0.43%

Vehicle Operating Costs and Values of Time

B.1.2 Vehicle operating costs are taken from WebTAG unit 3.5.6 and increased to 2006 prices. Non-fuel costs are assumed to remain constant in real terms over the forecast period. The cost parameters used are shown in Table 2.5 below. These parameters (non-fuel based vehicle operating costs) are used in calculating the PPK (pence per kilometre) values.

B.1.3 Fuel costs are assumed to increase in line with WebTAG recommendations.

B.1.4 Future year value of time is calculated from the 2006 figures in terms of pence per minute and pence per kilometre (based on fuel and speed) for vehicles, and only pence per minute for passengers within the demand model. These are increased by the percentage suggested in WebTAG unit 3.5.6 for the respective year and are shown in Table 2.6 for person pence per minute.

B.1.5 It is noted that the models are defined to work in real terms – i.e. excluding the effects of inflation. A constant inflation assumption of 2.5% per annum based on RPI has been used consistent with the advice given in WebTAG. This means that only changes in real costs and values need to be included in the forecasts. Calculated vehicle operating costs in pence per kilometre are shown, along with values of time in pence per minute in Table 2.7.

Table B.2 - Non Fuel Based Vehicle Operating Costs

Vehicle Category	Perceived Cost Parameters	
	a1	**b1**
Work Car	4.575	125.236
Non-Work Car	4.284	0.00
Average Car	4.333	21.415
Work LGV	6.645	43.401
Non-Work LGV	8.034	0.00
Average LGV	6.812	38.192
OGV1	6.185	243.032
OGV2	12.032	468.460
PSV	28.061	639.827

Table B.3 - Values of Time (Person Pence per Minute, 2006 prices)

Purpose	2016	2031
HBW IL	5.91	7.21
HBW IM	9.61	11.74
HBW IH	13.99	17.09
Other IL	7.44	9.09
Other IM	9.59	11.72
Other IH	11.53	14.09
Work	47.21	60.61

Table B.4 - Vehicle Values of Time and Distance 2008 (Person Pence per Minute, 2008 prices)

Purpose	AM		IP		PM	
	PPM	PPK	PPM	PPK	PPM	PPK
Non-Work	15.02	7.22	17.47	7.22	16.17	7.22
Work	59.69	14.06	58.31	14.06	57.49	14.06
LGV	22.85	15.15	22.85	15.15	22.85	15.15
HGV	49.54	46.57	39.56	46.86	63.92	50.03

* Note: The PPK value decreases in future years since fuel efficiency is assumed to improve in future years.
PPK = Pence Per Kilometre
PPM = Pence Per minute Bus Fares

Table B.5 - Vehicle Values of Time and Distance 2026 (Person Pence per Minute, 2008 prices)

Purpose	AM		IP		PM	
	PPM	PPK	PPM	PPK	PPM	PPK
Non-Work	20.41	5.60	23.36	5.60	21.95	5.60
Work	82.44	11.58	80.80	11.58	79.43	11.58
LGV	31.92	14.27	31.92	14.27	31.92	14.27
HGV	69.20	46.13	55.27	46.40	89.29	49.41

* Note: The PPK value decreases in future years since fuel efficiency is assumed to improve in future years.
PPK = Pence Per Kilometre
PPM = Pence Per minute

Bus Fares

B.1.6 Changes in bus fares were derived using historical fare data taken from the Bulletin of Public Transport Statistics. Table 2.8 shows the changes in bus fare receipts since 1990/91. On this basis, a linear bus fare growth factor of 1.096% p.a. in real terms was calculated for the period 1990/91 – 2005/06, and this was assumed to apply from 2008 base year onwards.

Table B.6 - Bus Fare Index (Constant Prices, Outside London)

Year	Fare Index, (constant prices)
1990/91	90.3
1991/92	93.7
1992/93	95.8
1993/94	97.8
1994/95	99.3
1995/96	100.5
1996/97	103.4
1997/98	105.9
1998/99	107.6
1999/00	110.6
2000/01	112.4
2001/02	116.0
2002/03	118.2
2003/04	119.5
2004/05	120.8
2005/06	125.4

Rail Fares

B.1.7 Similarly, fares indices were derived for non London and South East operators from data published in National Rail Trends. A linear rail fare growth of 1.05% p.a. in constant prices was calculated for the period January 1998 – January 2004. This was applied to factor up base year rail fares for each forecast year (Table 2.9).

Table B.7 - Rail Fare Indices – Non London and South East Operators

Year	Fares Index (Constant Prices) 1995=100
1998	99.4
1999	100.8
2000	102.9
2001	103.4
2002	105.7
2003	106.0
2004	105.9

Parking Charges

B.1.8 It was assumed that there would be no increase of parking charges in real terms or changes in parking supply for the Without-Intervention Case.

Appendix C - Forecast Demand

Table C.1 - Sector Summary Car (including car leg P&R) - Morning Peak

	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Total
2008						
Sector 1	104	843	362	38	173	1,520
Sector 2	1,380	2,879	1,254	90	636	6,240
Sector 3	610	1,337	910	94	405	3,355
Sector 4	76	218	130	7	137	569
Sector 5	435	670	612	96	559	2,371
Total	2,605	5,946	3,269	325	1,910	14,055
2026						
Sector 1	101	875	499	45	201	1,720
Sector 2	1,436	3,470	2,097	120	831	7,954
Sector 3	810	2,190	1,524	134	592	5,251
Sector 4	96	255	218	9	166	744
Sector 5	462	997	860	110	652	3,081
Total	2,906	7,787	5,198	417	2,441	18,749
Change						
Sector 1	-3	31	137	7	28	200
Sector 2	56	591	842	29	195	1,714
Sector 3	201	854	614	41	187	1,896
Sector 4	20	37	87	2	29	175
Sector 5	27	327	248	14	93	710
Total	301	1,840	1,929	93	532	4,695
Percent Change						
Sector 1	-2%	4%	38%	18%	16%	13%
Sector 2	4%	21%	67%	32%	31%	27%
Sector 3	33%	64%	68%	43%	46%	57%
Sector 4	26%	17%	67%	28%	21%	31%
Sector 5	6%	49%	41%	15%	17%	30%
Total	12%	31%	59%	29%	28%	33%

Table C.2 - Sector Summary Car (including car leg P&R) - Inter Peak

	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Total
2008						
Sector 1	62	938	450	55	270	1,775
Sector 2	934	1,925	896	97	483	4,335
Sector 3	428	876	564	57	357	2,282
Sector 4	48	76	49	2	73	248
Sector 5	256	461	332	79	481	1,608
Total	1,728	4,275	2,290	290	1,663	10,247
2026						
Sector 1	65	1,062	556	75	359	2,118
Sector 2	1,074	2,359	1,257	145	732	5,566
Sector 3	543	1,235	813	92	533	3,216
Sector 4	64	111	74	3	87	340
Sector 5	319	654	490	96	582	2,141
Total	2,065	5,421	3,190	410	2,294	13,381
Change						
Sector 1	3	125	107	20	89	343
Sector 2	139	434	361	48	250	1,231
Sector 3	115	359	249	35	177	934
Sector 4	16	36	25	1	15	92
Sector 5	63	193	158	18	101	533
Total	337	1,146	900	120	631	3,134
Percent Change						
Sector 1	6%	13%	24%	35%	33%	19%
Sector 2	15%	23%	40%	49%	52%	28%
Sector 3	27%	41%	44%	61%	49%	41%
Sector 4	33%	47%	52%	25%	20%	37%
Sector 5	25%	42%	48%	22%	21%	33%
Total	19%	27%	39%	41%	38%	31%

Table C.3 - Sector Summary Car (including car leg P&R) - Evening Peak

	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Total
2008						
Sector 1	107	1,525	597	69	402	2,700
Sector 2	1,025	3,016	1,307	172	620	6,140
Sector 3	446	1,202	745	76	546	3,015
Sector 4	42	94	65	6	94	300
Sector 5	233	629	399	117	572	1,949
Total	1,854	6,465	3,112	440	2,233	14,104
2026						
Sector 1	108	1,658	801	89	534	3,189
Sector 2	1,132	3,740	2,067	210	1,141	8,290
Sector 3	594	1,958	1,236	131	982	4,902
Sector 4	50	130	99	8	106	394
Sector 5	326	960	689	136	656	2,768
Total	2,210	8,447	4,891	575	3,420	19,542
Change						
Sector 1	1	133	204	20	131	489
Sector 2	106	725	760	38	522	2,151
Sector 3	148	756	491	55	436	1,886
Sector 4	8	37	34	2	12	93
Sector 5	94	332	289	20	85	819
Total	356	1,982	1,779	135	1,186	5,438
Percent Change						
Sector 1	0%	9%	34%	28%	33%	18%
Sector 2	10%	24%	58%	22%	84%	35%
Sector 3	33%	63%	66%	73%	80%	63%
Sector 4	19%	39%	53%	28%	13%	31%
Sector 5	40%	53%	72%	17%	15%	42%
Total	19%	31%	57%	31%	53%	39%

Table C.4 - Sector Summary Bus (including bus leg P&R) - Morning Peak

	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Total
2008						
Sector 1	32	100	93	6	8	238
Sector 2	323	60	41	10	19	453
Sector 3	336	126	103	13	12	590
Sector 4	17	15	7	28	14	80
Sector 5	19	48	7	6	128	208
Total	727	349	250	62	180	1,568
2026						
Sector 1	26	121	111	5	6	269
Sector 2	446	123	95	10	22	695
Sector 3	472	211	225	10	10	928
Sector 4	15	14	8	28	14	78
Sector 5	16	43	9	6	127	201
Total	975	512	447	59	179	2,172
Change						
Sector 1	-6	21	18	-1	-1	31
Sector 2	123	63	54	-1	3	242
Sector 3	136	85	122	-2	-2	339
Sector 4	-3	-1	1	1	0	-2
Sector 5	-3	-4	2	0	-1	-6
Total	248	163	197	-3	-1	604
Percent Change						
Sector 1	-18%	21%	19%	-17%	-18%	13%
Sector 2	38%	106%	131%	-5%	14%	53%
Sector 3	41%	67%	118%	-20%	-15%	57%
Sector 4	-15%	-6%	13%	2%	2%	-2%
Sector 5	-16%	-9%	30%	-1%	-1%	-3%
Total	34%	47%	79%	-6%	-1%	38%

Table C.5 - Sector Summary Bus (including bus leg P&R) - Inter Peak

	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Total
2008						
Sector 1	37	161	119	12	16	346
Sector 2	137	43	66	9	40	295
Sector 3	100	51	61	9	7	228
Sector 4	9	8	10	18	7	51
Sector 5	15	37	6	10	114	183
Total	298	300	263	57	184	1,103
2026						
Sector 1	36	189	158	10	15	407
Sector 2	165	73	100	9	36	382
Sector 3	170	85	117	8	7	387
Sector 4	8	8	10	17	7	50
Sector 5	15	38	7	10	107	176
Total	393	392	391	54	171	1,402
Change						
Sector 1	-2	28	39	-2	-2	61
Sector 2	28	29	34	0	-4	88
Sector 3	69	34	56	0	0	159
Sector 4	-1	1	-1	0	-1	-2
Sector 5	0	1	0	0	-7	-7
Total	95	92	128	-3	-13	299
Percent Change						
Sector 1	-4%	17%	32%	-15%	-10%	18%
Sector 2	20%	68%	51%	1%	-9%	30%
Sector 3	69%	66%	92%	-4%	0%	70%
Sector 4	-6%	9%	-7%	-2%	-8%	-3%
Sector 5	0%	1%	6%	-5%	-6%	-4%
Total	32%	31%	49%	-5%	-7%	27%

Table C.6 - Sector Summary Bus (including bus leg P&R) - Evening Peak

	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Total
2008						
Sector 1	37	231	205	14	20	507
Sector 2	108	55	103	12	49	327
Sector 3	72	48	87	9	6	221
Sector 4	9	10	12	24	8	62
Sector 5	11	28	11	12	129	190
Total	237	371	417	71	212	1,308
2026						
Sector 1	32	280	301	13	18	644
Sector 2	111	108	190	12	47	468
Sector 3	83	115	271	11	11	490
Sector 4	6	8	10	24	8	56
Sector 5	8	22	10	11	125	176
Total	240	533	781	71	210	1,835
Change						
Sector 1	-5	49	96	-1	-1	136
Sector 2	3	54	87	0	-2	142
Sector 3	11	68	184	2	5	269
Sector 4	-3	-2	-2	0	0	-7
Sector 5	-3	-7	-1	0	-4	-14
Total	3	162	364	0	-2	526
Percent Change						
Sector 1	-14%	21%	47%	-10%	-7%	27%
Sector 2	3%	98%	84%	-1%	-3%	43%
Sector 3	15%	142%	212%	20%	81%	122%
Sector 4	-29%	-18%	-16%	-1%	-4%	-11%
Sector 5	-26%	-23%	-7%	0%	-3%	-7%
Total	1%	44%	87%	0%	-1%	40%

Table C.7 - Sector Summary Rail - Morning Peak

	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Total
2008						
Sector 1	0	0	0	2	15	17
Sector 2	0	0	1	2	112	115
Sector 3	5	16	2	5	37	65
Sector 4	21	0	3	0	18	41
Sector 5	53	110	40	7	129	340
Total	79	126	46	15	312	578
2026						
Sector 1	0	0	1	2	13	15
Sector 2	0	0	2	2	110	114
Sector 3	5	20	9	4	77	116
Sector 4	16	3	8	0	12	39
Sector 5	45	115	65	5	95	325
Total	66	137	85	13	307	608
Change						
Sector 1	0	0	0	0	-2	-2
Sector 2	0	0	0	0	-3	-2
Sector 3	1	3	7	0	40	51
Sector 4	-5	2	6	0	-6	-3
Sector 5	-9	5	25	-2	-34	-15
Total	-13	11	39	-2	-4	30
Percent Change						
Sector 1			42%	5%	-13%	-10%
Sector 2			24%	13%	-2%	-2%
Sector 3	15%	21%	374%	-10%	108%	79%
Sector 4	-24%	1547%	215%		-32%	-6%
Sector 5	-17%	5%	64%	-27%	-27%	-4%
Total	-17%	9%	85%	-14%	-1%	5%

Table C.8 - Sector Summary Rail - Inter Peak

	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Total
2008						
Sector 1	0	0	1	7	32	40
Sector 2	0	0	5	9	47	60
Sector 3	0	3	2	0	23	28
Sector 4	4	9	1	0	5	19
Sector 5	26	47	23	7	105	208
Total	31	59	31	23	212	355
2026						
Sector 1	0	0	1	6	32	39
Sector 2	0	0	6	10	59	75
Sector 3	0	4	6	3	43	56
Sector 4	4	10	2	0	3	19
Sector 5	30	59	41	4	74	207
Total	34	73	56	23	211	397
Change						
Sector 1	0	0	0	-1	1	-1
Sector 2	0	0	2	1	12	15
Sector 3	0	1	4	3	20	28
Sector 4	0	1	1	0	-2	0
Sector 5	3	11	18	-3	-31	-1
Total	3	14	25	0	-1	42
Percent Change						
Sector 1			21%	-16%	2%	-1%
Sector 2			33%	13%	25%	24%
Sector 3		47%	221%	578%	87%	101%
Sector 4	-5%	15%	122%		-41%	1%
Sector 5	12%	24%	81%	-39%	-30%	0%
Total	10%	24%	82%	1%	0%	12%

Table C.9 - Sector Summary Rail - Evening Peak

	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Total
2008						
Sector 1	0	0	5	23	67	94
Sector 2	0	0	17	5	130	153
Sector 3	0	3	3	3	50	60
Sector 4	5	7	5	0	10	26
Sector 5	30	133	48	20	181	411
Total	35	142	77	51	438	744
2026						
Sector 1	0	0	5	18	64	88
Sector 2	0	0	22	8	149	179
Sector 3	0	4	16	10	80	110
Sector 4	4	7	7	0	7	24
Sector 5	30	161	95	12	117	415
Total	34	172	144	49	417	815
Change						
Sector 1	0	0	1	-5	-3	-7
Sector 2	0	0	4	4	19	26
Sector 3	0	1	13	7	30	50
Sector 4	-1	0	2	0	-3	-2
Sector 5	0	29	48	-8	-64	4
Total	-1	30	67	-2	-21	72
Percent Change						
Sector 1			13%	-20%	-4%	-7%
Sector 2			24%	71%	14%	17%
Sector 3	0%	23%	435%	218%	60%	84%
Sector 4	-22%	6%	39%		-34%	-8%
Sector 5	-1%	22%	100%	-40%	-35%	1%
Total	-4%	21%	86%	-5%	-5%	10%

Appendix D - Highway Performance

Figure D.1 - Total Distance Travelled – Morning Peak (PCU-Kilometres)

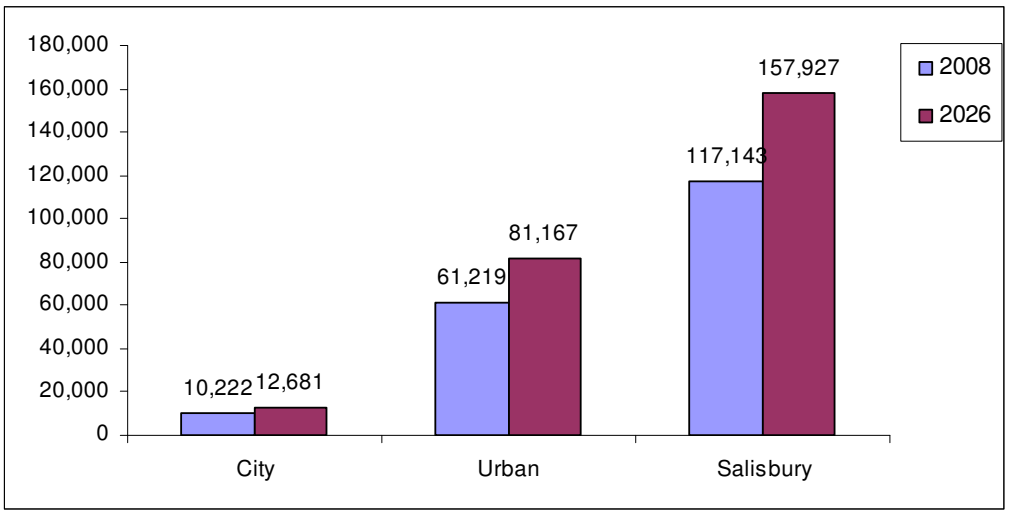


Figure D.2 - Total Distance Travelled – Inter-Peak (PCU-Kilometres)

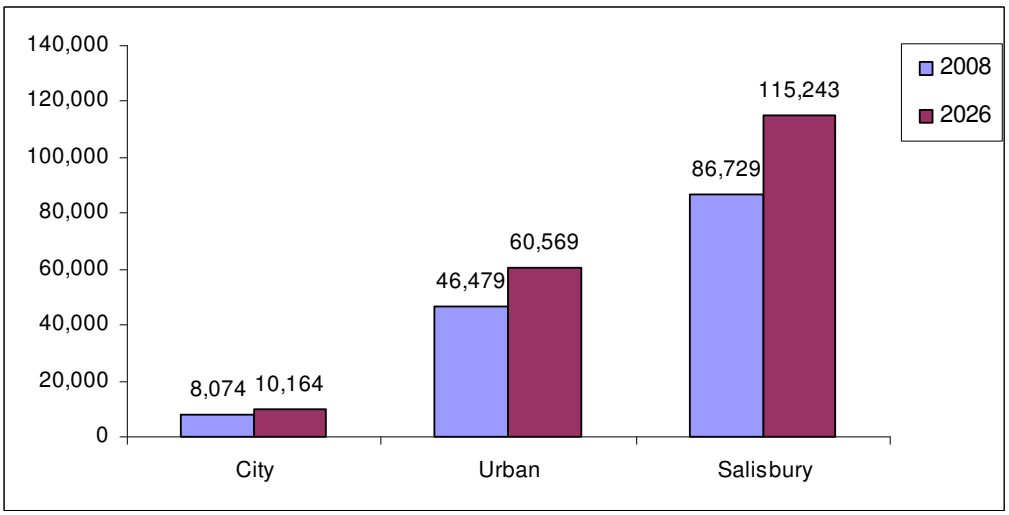


Figure D.3 - Total Distance Travelled – Evening Peak (PCU-Kilometres)

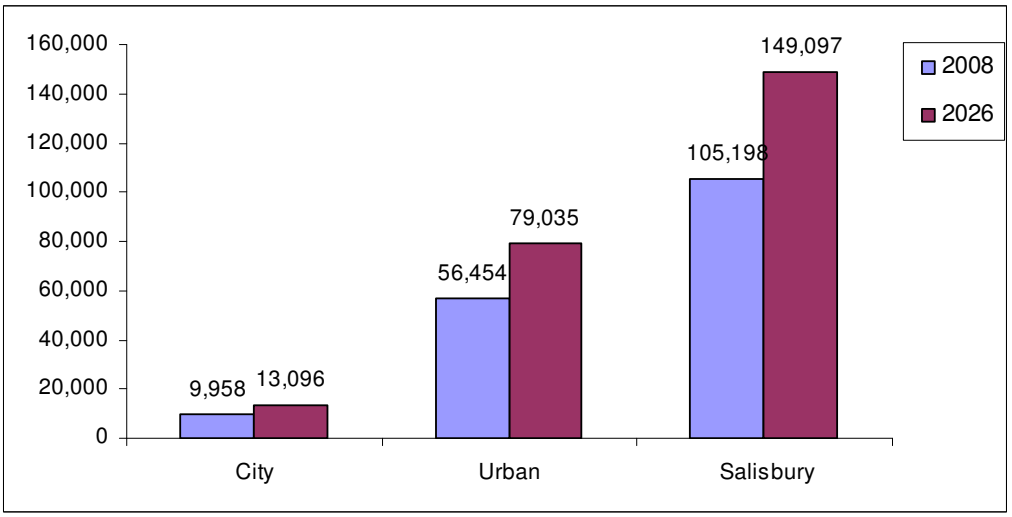


Figure D.4 - Total Travel Time Morning Peak (PCU Hours)

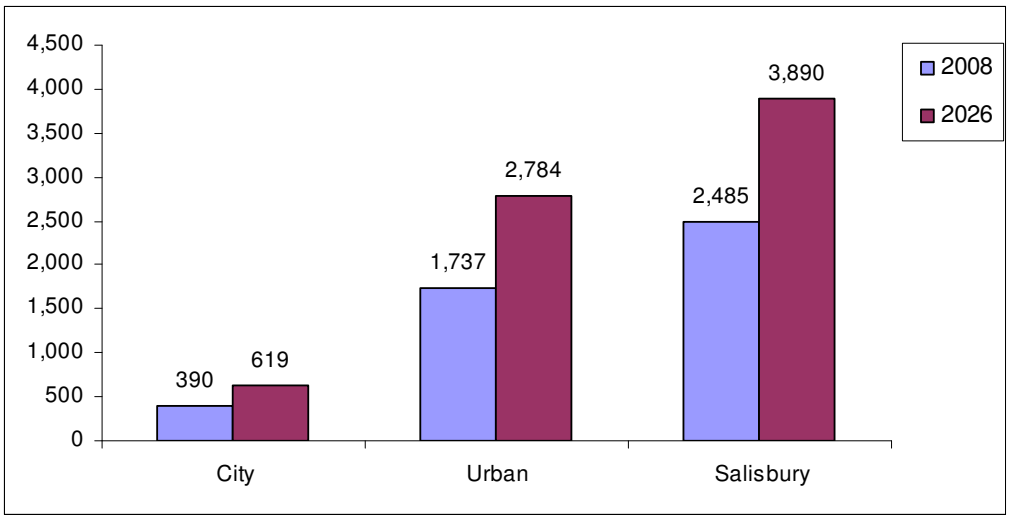


Figure D.5 - Total Travel Time Inter-Peak (PCU Hours)

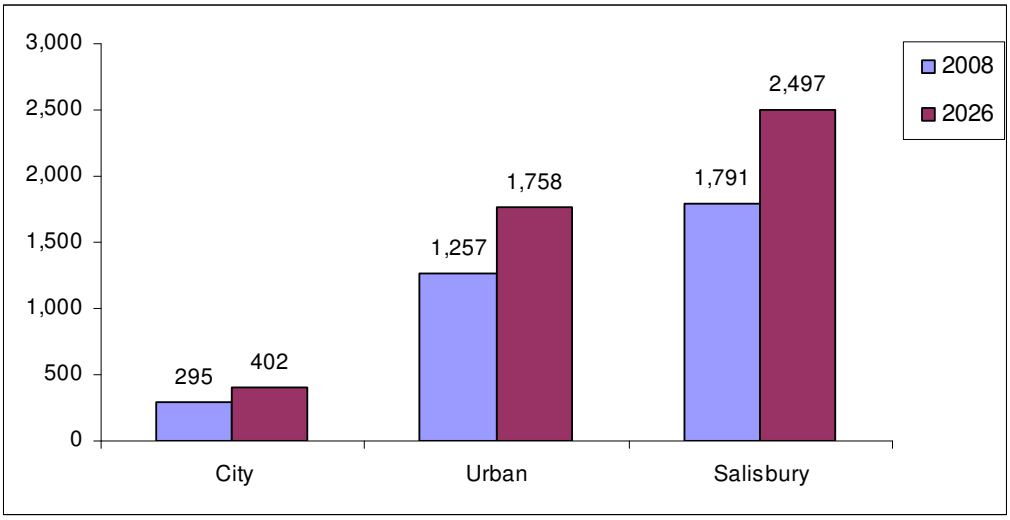


Figure D.6 - Total Travel Time Evening Peak (PCU Hours)

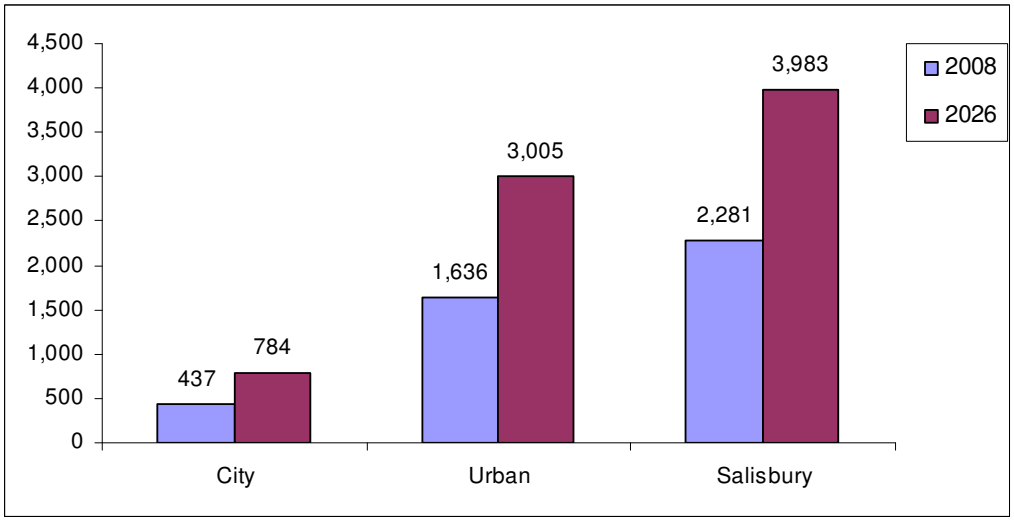


Figure D.7 - Average Network Speed Morning Peak (km/hr)

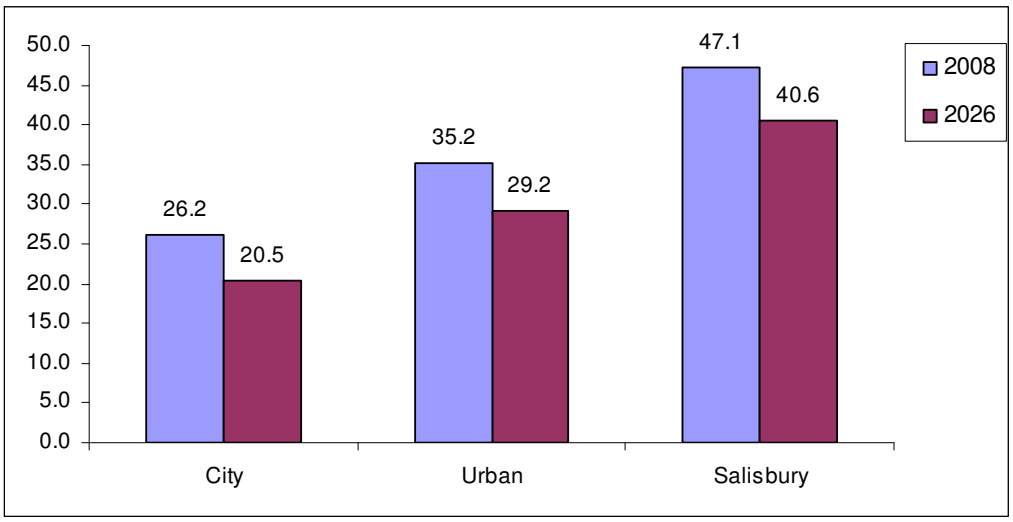


Figure D.8 - Average Network Speed Inter-Peak (km/hr)

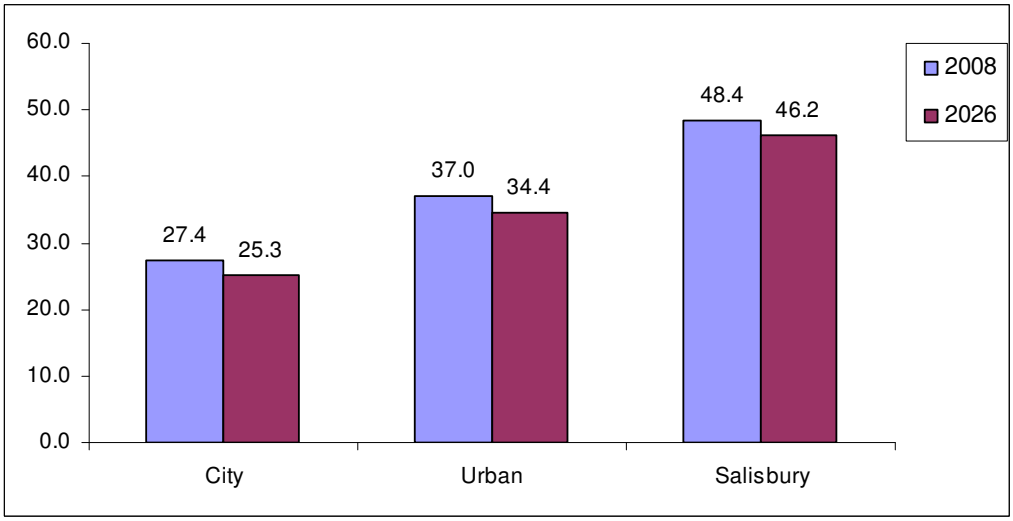


Figure D.9 - Average Network Speed Evening Peak (km/hr)

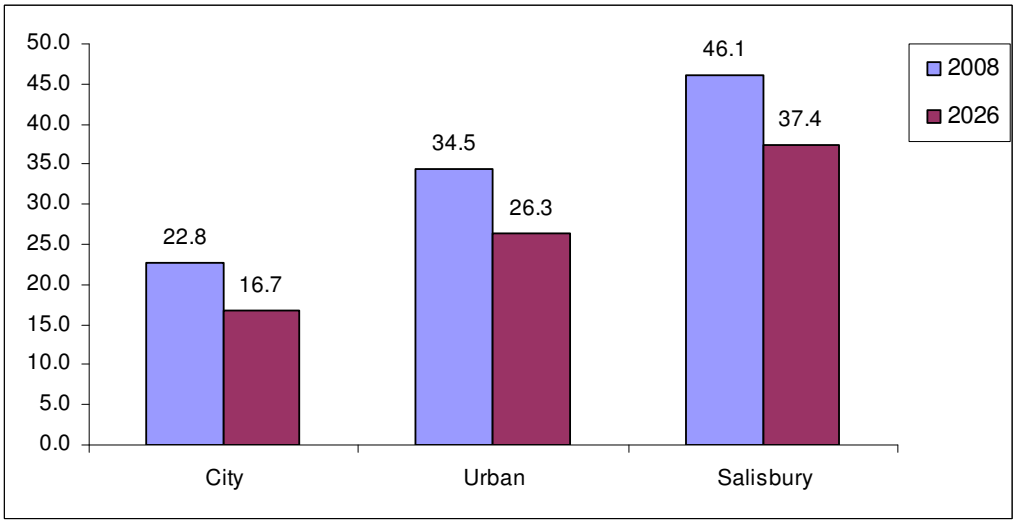


Figure D.10 - Total Vehicle Delay Morning Peak (hours)

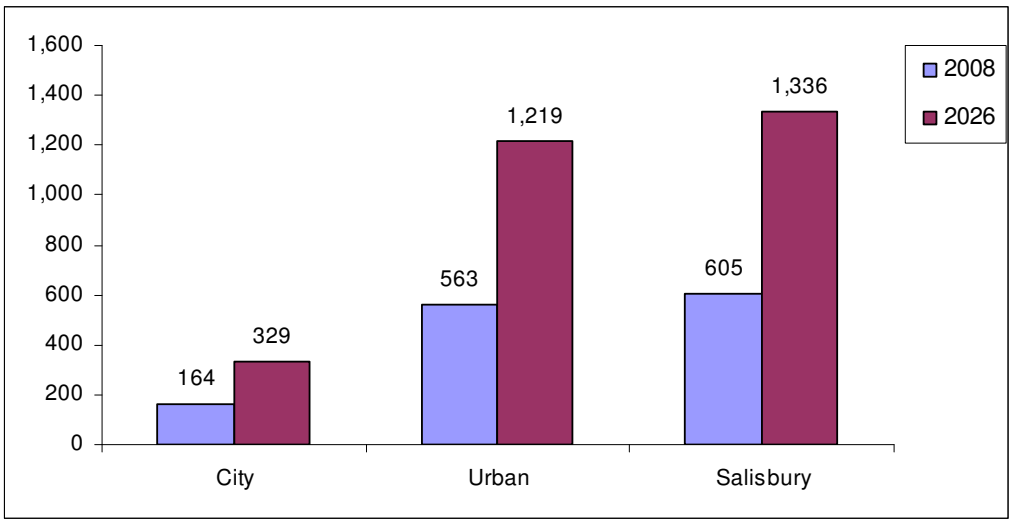


Figure D.11 - Total Vehicle Delay Inter-Peak (hours)

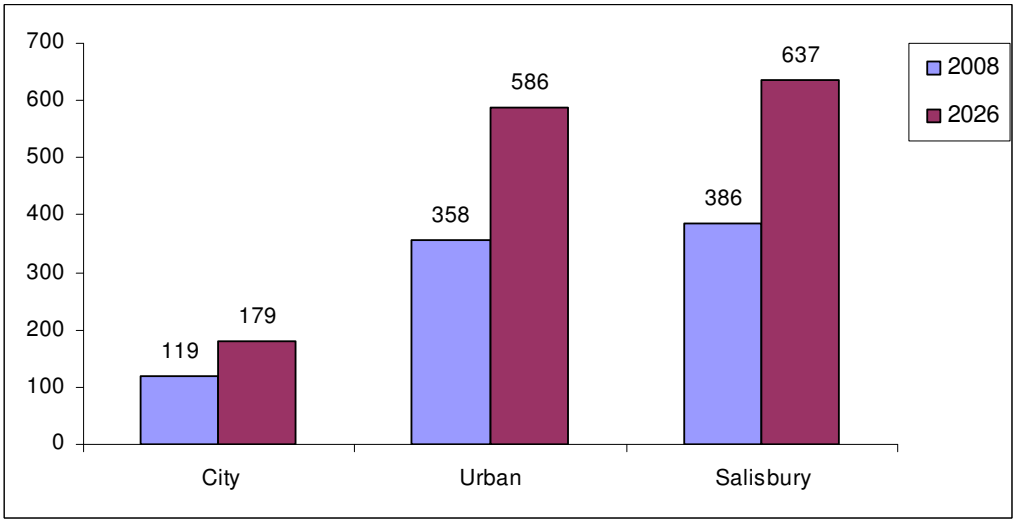
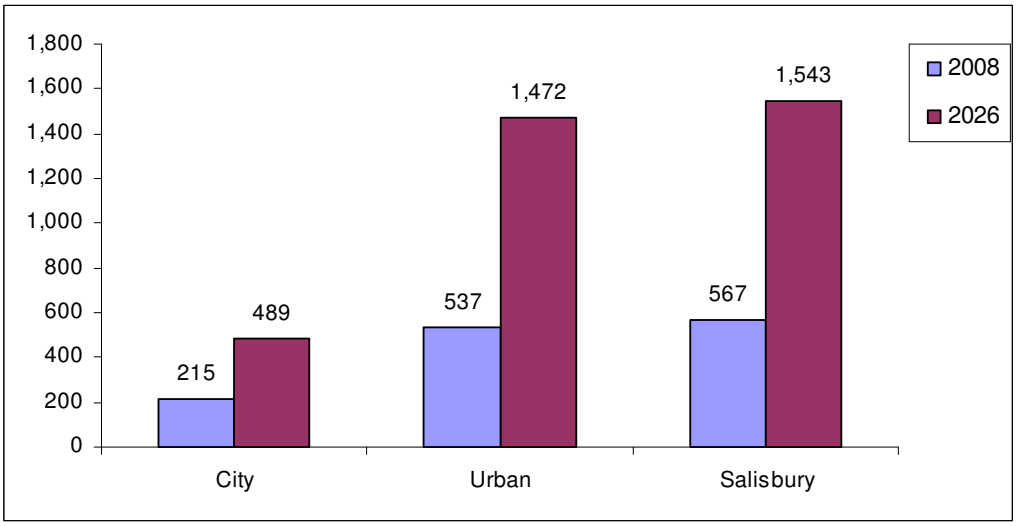


Figure D.12 - Total Vehicle Delay Evening Peak (hours)



Appendix E - Public Transport Performance

Figure E.1 - Passenger Hours

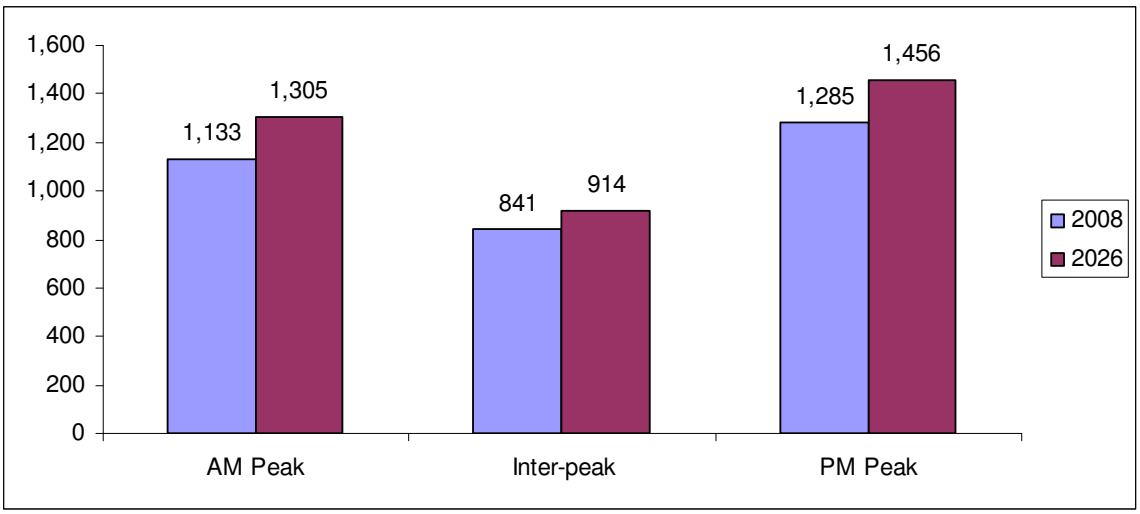


Figure E.2 - Passenger KM

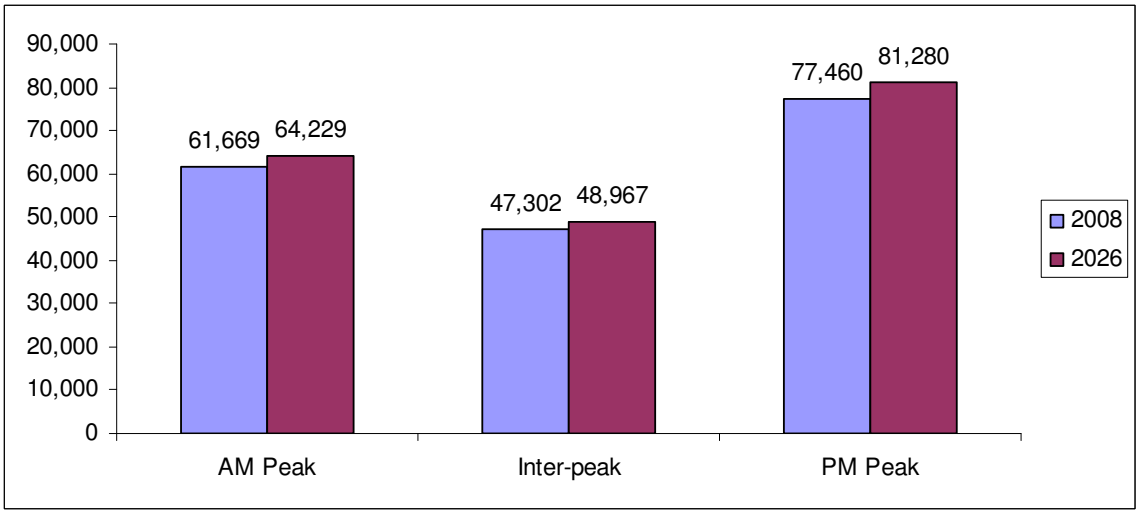


Figure E.3 - Boardings per hour