Stevenage Borough Local Plan

Initial Transport Modelling Evidence

December 2016

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After SBC comments	20/12/2016	Text update based on SBC comments	Quico Burgos	Reviewer

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Executive Summary

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1. Executive Summary

Stevenage Borough Council (SBC) wishes to gather transport-related evidence to support the submission of their emerging Draft Local Plan to the Planning Inspectorate. The findings presented in this report aim to help SBC understand the implications of Local Plan-allocated growth and committed developments on the local highway network, particularly in the town centre of Stevenage. In order to generate this evidence, a series of tests in the previously-updated S-Paramics microsimulation traffic model for Stevenage which, coupled with a strategic traffic model, have provided a broad indication of future demand and network performance for integration into the upcoming Local Plan submission.

In order to evaluate the impact of the Stevenage Local Plan, it was suggested to analyse the network performance without considering the external growth in the area surrounding Stevenage. As such, only the committed developments in the Welwyn Hatfield and Stevenage and Hitchin area and Stevenage Local Plan planning data were considered as part of this exercise.

Existing planning data was revised and updated to produce new traffic demand for 2021 and 2031. The new level of demand was input to the Welwyn Hatfield and Stevenage Hitchin strategic model (WHaSH) to generate growth factors used to uplift demand matrices for the local Stevenage S-Paramics model. This model was then assigned for the morning and evening peak periods with updated planning data and demand matrices and observations were made on network performance and operation before and after the inclusion of the provisional Lytton Way Closure (LWC) and Multi-storey Car Park (MSCP) schemes proposed by SBC.

The introduction of the LWC and MSCP schemes, alongside increases in demand in 2021 and 2031 led to network pressure and congestion in both morning and evening peak periods. Conflicts and queues were observed at Fairlands Way/Lytton Way, Fairlands Way/St. George's Way, Fairlands Way/Gunnels Wood Road and Gunnels Wood Road/Six Hills Way roundabouts. For 2031, reductions of modelled traffic in the order of magnitude of 35-40% for town-centre related trips and 15-20% for all other Stevenage-related trips (or approximately 20-25% of total Stevenage demand) were shown to be needed to enable the model to function.

Previous Work

The *Stevenage Town Centre Model – S-Paramics Model Forecasting Report 2016* detailed the forecasting process used in this study and considered a number of scenarios and schemes for Hertfordshire County Council and Stevenage Borough Council. This work builds upon this aforementioned report.

Introduction

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2. Introduction

Background

In order to evaluate the impacts of proposed Local Plan development in Stevenage, the implementation of a partial closure of Lytton Way, and parking redistribution across the town centre, AECOM has undertaken an application of a previously-developed S-Paramics microsimulation traffic model for Stevenage. The Welwyn Hatfield and Stevenage Hitchin strategic model (WHaSH) has been use to inform the operational Stevenage microsimulation model (S-Paramics model) to evaluate the impacts of the updated scenario on the local and strategic road networks.

The *Stevenage S-Paramics Local Model Validation Report* (LMVR) details the development of the Stevenage S-Paramics base year model (referred to as the Stevenage model hereafter). The *Stevenage Town Centre Model – S-Paramics Model Forecasting Report 2016* details the forecasting process. This is the *Stevenage Local Plan – Initial Transport Modelling Evidence Report* which documents the current model application and scenario.

The objective of this forecasting exercise is to understand the cumulative effect of all Local Plan and committed growth as defined by Stevenage Borough Council (SBC) alongside the impact on the local road network of town centre regeneration and committed and prioritised schemes. Although this exercise considers committed development in the Welwyn Hatfiled and Stevenage Hitchin area, other Local Plan planning data external to Stevenage has not been considered. The analysis of the outputs will be used to produce indicative evidence to forecast the impacts of the emerging Stevenage Local Plan. However, a holistic exercise should be considered to evaluate the impacts of all the planned developments in the area.

This document does not draw conclusions on any individual development or scheme regarding its effect on the local or wider transport network, nor does it present a comparison of the modelled forecast relative to any other forecast with alternative assumptions.

Forecast Scenario

The forecast years have been defined by SBC as **2021** and **2031.** No other forecasts with alternative model years have been created. Modelling was conducted for only the morning and evening peak periods, here defined as 07:00 to 10:00 and 16:00 to 19:00 (as in the *Local Model Validation Report*).

An analysis of forecasted demand and the planned infrastructure improvements may provide an indication of potential traffic issues related to tested schemes, network constraints and bottlenecks, excessive concentration of demand and / or the suitability of urban transport options. This technical note outlines initial modelling results and discusses potential traffic issues as observed from the Stevenage S-Paramics model.

Report Structure

Following this introductory chapter, the remainder of the Forecasting Report is structured as follows:

3) Previous Model Application;
4) Demand Generation;
5) Network Testing in 2021 and 2031
6) Key Findings and Conclusions

Previous Model Applications

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3. Previous Model Applications

Previous Scenario Definition

Previous Stevenage model applications were focused on exploring the implications of a cumulative growth scenario identified by Hertfordshire County Council, in line with anticipated Local Plan growth. Two different scenarios were identified (*Do Minimum* and *Do Something*) for two growth years (*2021* and *2031*). Five schemes were considered (in different combinations) across the scenarios and growth years:

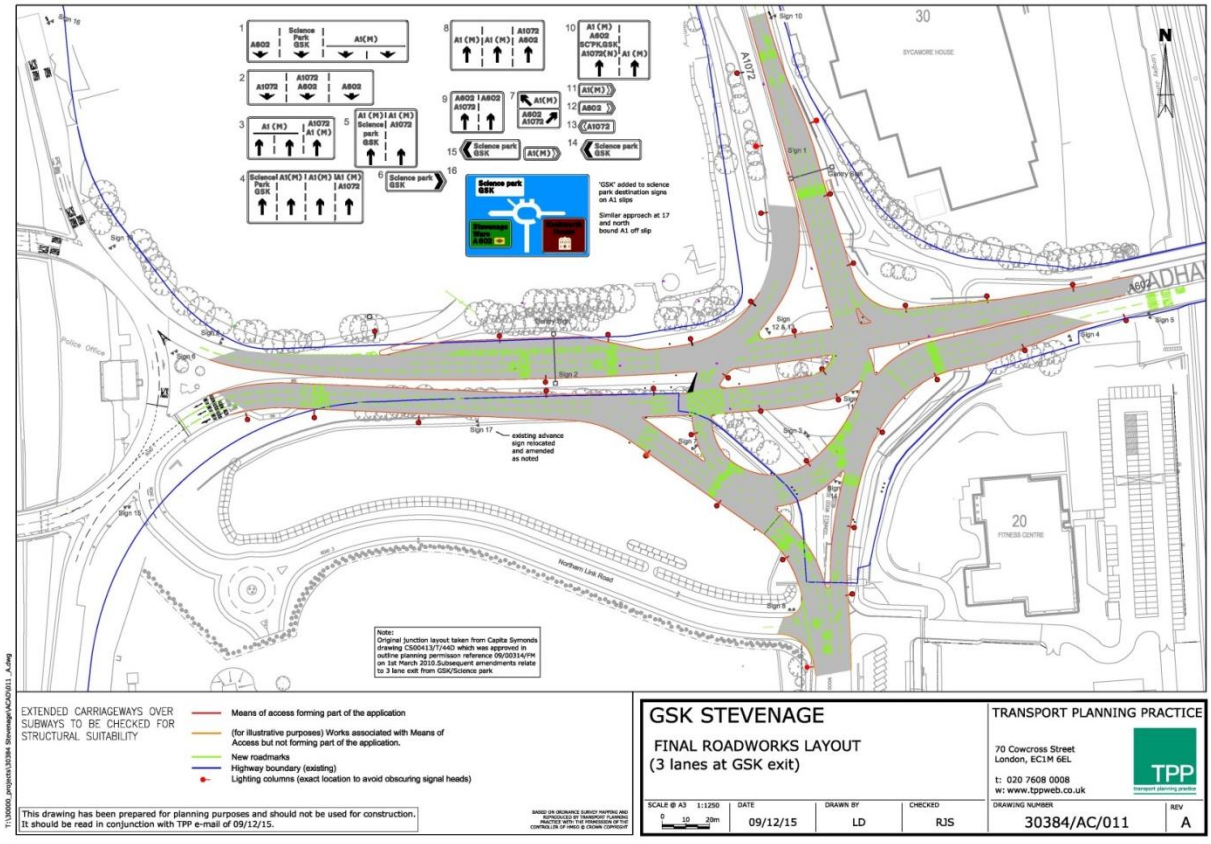
- Gunnels Wood Road – A602 Broadhall Way junction, named as GSK updated hamburger scheme;
- A1(M) 'all lane running' scheme between Junction 6 and 8, named as A1(M) Smart motorway;
- Stevenage town centre bus station relocation;
- Lytton Way Road closure; and
- Car park consolidation.

The characteristics of these schemes are detailed in the *Stevenage Town Centre Model – S-Paramics Model Forecasting Report 2016.* A brief description of the schemes, alongside any changes to the schemes for this model application, are provided below. Unless otherwise specified, all schemes shown below are provisional, and all assumptions made were agreed with SBC prior to this model application.

Gunnels Wood Road – A602 Broadhall Way Roundabout (GSK updated hamburger)

Figure 3.1 shows the layout used for the Stevenage model, which includes six traffic lights and three lanes for the exit from the GSK complex. Signal timing settings were taken from the A1(M) Junction 7 S-Paramics model.

Figure 3.1 GSK roundabout layout



A1(M) Smart Motorway – 'all lane running' scheme

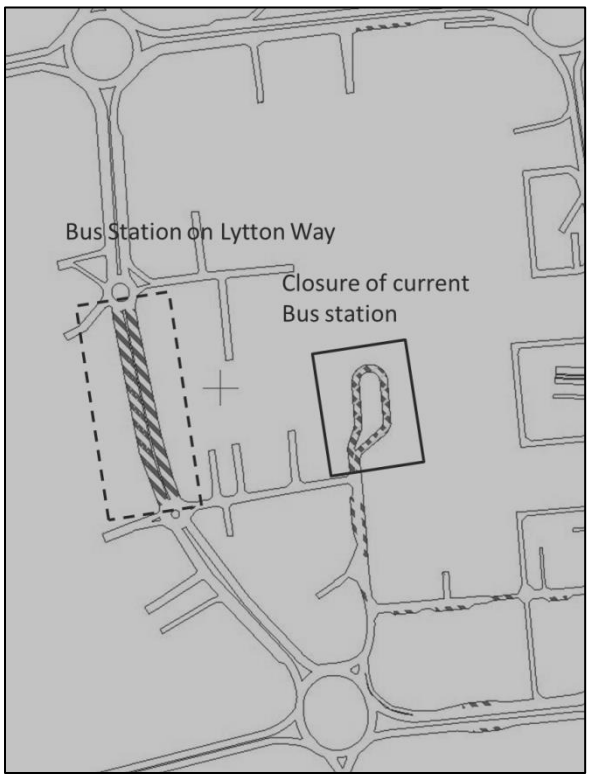
Based on information from Highways England, the A1(M) 'all lane running' scheme between Junction 6 and 8 is considered a committed scheme and is expected to be finished by 2021. For the Stevenage model, it was assumed the implementation of 'all lane running' applies to the A1(M) main carriageway both between as well as through junctions. This scheme will widen the current two-lane main carriageway to three-lane by allowing hard shoulder running and assumes shorter slips. This scheme increases the capacity on the A1(M) significantly and is expected to improve current congestion issues, particularly during the morning peak.

Bus Station Relocation and Lytton Way Closure

From the information provided by SBC, it is proposed that the current Stevenage town centre bus station should be relocated and the current bus station site to be reallocated as a regeneration and redevelopment site. Additionally, it was proposed that the middle section of Lytton Way be designated as "bus only" while the northern and southern sections are kept open for private vehicle access. The provisional design adopted for the HCC exercise considered two roundabouts at the edges of the 'bus only' section of Lytton Way to maintain full accessibility to car parks and other facilities in the town centre. The intention of this scheme is to improve pedestrian and public transport accessibility and environment in the town centre and particularly along Lytton Way.

The design of the roundabouts that give access to the 'bus only' section of Lytton Way is shown in **Figure 3.2**. It is important to highlight that the design adopted for the Stevenage model is provisional and this is an initial evaluation only.

Figure 3.2 Lytton Way closure and bus stops relocation provisional designs



Multi-Storey Car Park North/South and Car Park Consolidation

SBC planned to include a multi storey car park on Lytton Way at the location of the current Station Car Park (North). This proposed car park will replace the "Railway North" surface car park that currently exists on the western side of Lytton Way between the railway station and Lytton Way – Fairlands Way roundabout. The main access for the proposed multi storey car park north was assumed (for the purposes of modelling) to be located on Lytton Way, opposite Swingate.

Based on discussions with SBC and following conclusions from previous model applications, an additional smaller carpark expansion was considered for this exercise alongside the southern section of Lytton Way, where the "Railway South"

surface car park is currently located. Its access will be opposite to Danesgate on the proposed new roundabout as described in the Lytton Way Closure scheme.

It is known that SBC is currently developing the “Stevenage Town Centre – Planning For Future Parking Provision” report, which will consider the impacts of Stevenage Town Centre regeneration and redevelopment on parking provision, and will develop a car park strategy with costed options for future parking provision within the town centre.

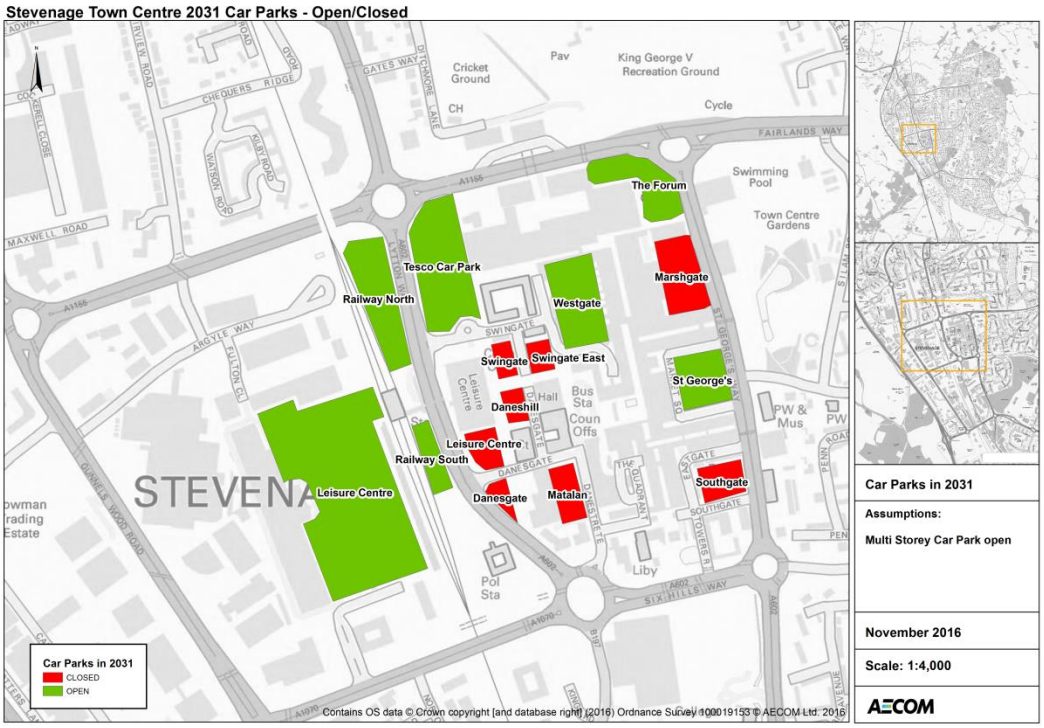
Based on SBC provisional information, this ongoing study will assume that Swingate, Southgate, Marshgate, Danesgate will be closed with the full regeneration of the town centre, and the cars demand will be displaced to the Forum, St George’s Way & Westgate car parks.

In parallel, the proposed multi storey car parks are intended to replace some surface car parks in the town centre which could be released for redevelopment in 2021 and 2031. A significant proportion of car parking demand within the town centre is expected to be relocated to the multi storey car parks and to the remaining car parks in the town centre.

For the purpose of this exercise, other existing car parks in the town centre can potentially absorb displaced cars from closures at other car parks. Leisure Centre Car Park (West) and Tesco Car Park have been used to redistribute car demand in the forecast years. It is acknowledge that there are some restrictions to park in the Leisure Car Park Centre (West) and, recently, in Tesco Car Park, but those were not considered in the modelling exercise, and should be defined by the ongoing Car Park Strategy.

Figure 3.3 shows the car parks assumed closed by 2031. As it will be detailed in further sections, the redistribution of closed carparks demand is going to be undertaken considering that the most likely new destination or origin would be adjacent carparks.

Figure 3.3 Car park operational status in 2031 (based on “Planning For Future Parking Provision” assumptions)



Conversion of John Lewis Distribution Centre to Costco

A new Costco wholesale store is planned to be built where there is currently a John Lewis Warehouse. It is believed that the access for the store will be via Cavendish road, therefore the demand have been assigned to zone 42 in the model. **Figure 3.4** shows the location of zone 42 (west of Stevenage). The new demand associated to this business has been included for all the scenarios following discussions with SBC.

Figure 3.4 Location of Costco (Zone 42) in the model

The suggested impact of the conversion of John Lewis distribution centre to Costco was provided by HCC/SBC as follows:

- Net reduction in the morning peak hour: 119 less arrivals and 45 less departures.
- Net increase in the evening peak hour: 177 more arrivals and 106 less departures.
- Net increase in the Saturday peak hour: 391 more arrivals and 401 less departures.

Demand Generation

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4. Demand Generation

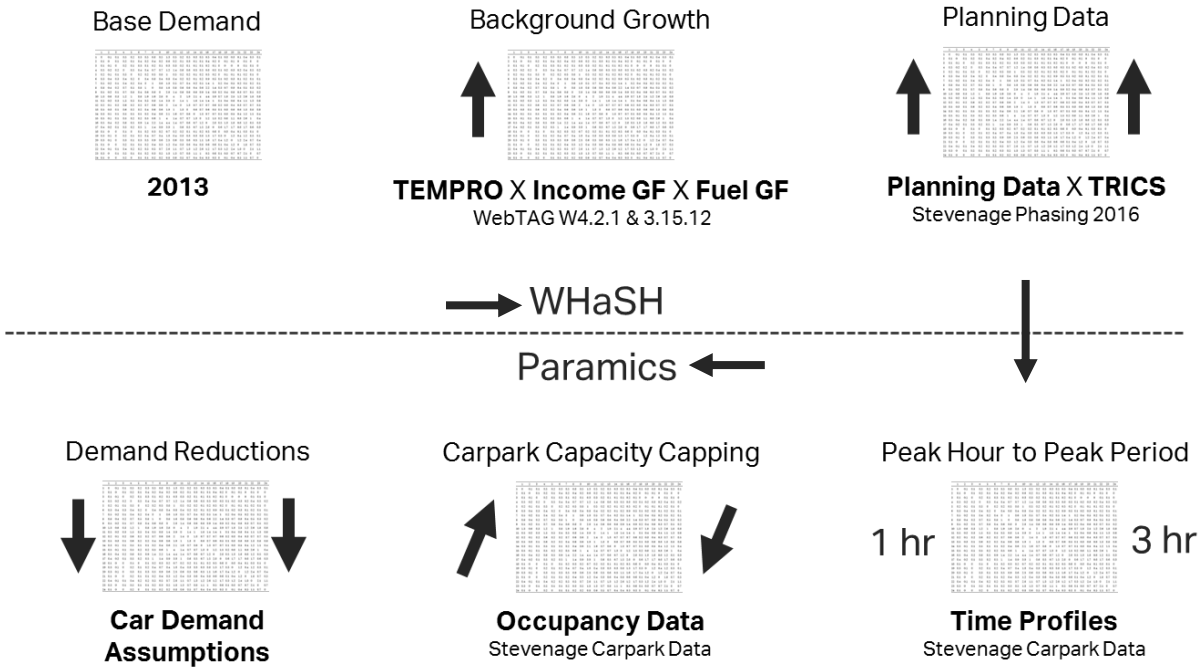
Introduction

This section details the process followed to generate demand forecasts. This process has been refined from previous modelling exercises based on updated planning data, demand assumptions, and phasing implementation provided by SBC.

Demand Generation Overview

Demand matrices were generated using a combination of background growth estimations and forecast residential and employment-related growth within the model area. Base year matrices were uplifted to the future year (2021 and 2031) matrices by applying growth factors estimated from the WHaSH Strategic Model for selected movements. This section outlines the main assumptions and metrics used to inform the generation of demand matrices, alongside any input data used in the preparation of demand growth factors. A summary of the full process detailed in this section is provided in **Figure 4.1**.

Figure 4.1 Summary of the future scenario model demand matrix generation process



Background Growth Generation

Modelled background growth was estimated through calculating zero-development trips rates, without dwellings and employment. Unadjusted zero-development trip rates were mined from TEMPRO 6.2 and adjusted for income and fuel cost changes to future years (as described in WebTAG guidance section 3.15.12) by using WebTAG Data Table M4.2.1. A simplified table M4.2.1 with adjustment values used in this model application is provided below in **Table 4.1**.

Table M 4.2.1: Forecast fuel price and income adjustment		
Year	Income adjustment factor	Fuel cost adjustment factor
2013	1.002	1.002
2021	1.022	1.044
2031	1.049	1.084

Table 4.1 WebTAG Data Table ~M4.2.1 - Forecast fuel price and income adjustments

Final background growth trip rate estimates for Stevenage- and non-Stevenage-related demand are provided in **Table 4.2**. These background growth rates are indicative of total background growth, based on solely on economic parameters , applied to WHaSH base matrices to uplift these matrices to the 2021 and 2031 future year scenarios (for each time period).

	AM		PM	
Background Growth	2021	2031	2021	2031
Origins (Stev)	1.04	1.04	1.06	1.07
Destinations (Stev)	1.06	1.08	1.06	1.05
External to Stev	1.10	1.21	1.10	1.19
Total	1.09	1.17	1.09	1.15

Table 4.2 Approximate background growth rates for Stevenage and non-Stevenage related demand

New Development Demand Generation

Committed developments and Stevenage Local Plan development related growth is added to the WHaSH demand matrices following the calculation of background growth. This process involves estimating tripends from new developments using TRICS-derived trip rates and new development phasing data. TRICS trip rates agreed with SBC and applied in this model application are provided below in **Table 4.3**.

Sites to Assess

	AM		PM		
Households	**Origin**	**Destination**	**Origin**	**Destination**	**Unit**
Residential	0.420	0.163	0.221	0.399	per dwelling
Student Halls	0.005	0.007	0.013	0.002	per dwelling
Employment					
Retail - A1					
Town Centre					
Town Centre Retail – Floor space	0.702	1.969	0.972	0.295	per 100sq metres
Town Centre Retail - Jobs	0.005	0.096	0.209	0.029	per job
Edge of Town					
Edge of Town Retail – Floor space	0.049	0.162	0.330	0.303	per 100sq metres
Edge of Town Retail - Jobs	0.026	0.086	0.174	0.160	per job
A3/4					
A Class – Floor space	0.000	0.000	1.388	2.065	per 100sq metres
A Class - Jobs	0.000	0.000	0.372	0.554	per job
B Class					
B1 Jobs	0.015	0.203	0.176	0.011	per job
B1 Floor space	0.086	1.153	0.994	0.060	per 100sq metres
B2 Jobs	0.04	0.49	0.402	0.025	per job
B2 Floor space	0.082	1.011	0.829	0.723	per 100sq metres
B8 Jobs	0.044	0.085	0.078	0.029	per job
B8 Floor space	0.051	0.099	0.091	0.033	per 100sq metres
Retirement					
Care homes - bedrooms	0.073	0.146	0.073	0.049	per bedrooms
Education					
D1 Primary Schools - pupils	0.142	0.213	0.042	0.029	Per pupils
D1 Secondary Schools - pupils	0.094	0.151	0.026	0.016	Per pupils

Table 4.3 TRICS trip rates used to calculate new development tripends

Planning Data Overview

The number of dwellings and total employment floor space used for this modelling application (broken down by location and planning data type) are provided in **Figure 4.2** and **Figure 4.3** respectively. This planning data has been received from, and confirmed with, SBC for the Local Plan. The committed/SMART developments for the WHaSH area were confirmed by HCC and used in the previous exercise. The spatial distribution of the new dwelling and employment developments are shown in through **Figure 4.7**. **Appendix A: Location of planning data** shows the maps in a bigger size.

The dwelling development considered in this application is allocated in the Stevenage Local Plan. A small number of Welwyn Hatfield SMART/Committed developments are also included. The majority of Town Centre related development is phased for completion between 2021 and 2031. This modelling application did not include any local plan-allocated development growth outside of Stevenage, and this should be taken into account for future considerations.

A smaller proportion of committed employment development is located in Stevenage relative to dwelling-related development. A significant number of North Hertfordshire SMART/Committed employment developments are also included, along with Welwyn Hatfield SMART/Committed employment development. A majority of employment-related development in 2031 is located in Stevenage. Additionally, the majority of Stevenage-related employment development is located outside of the town centre.

Figure 4.2 Planning data for all new dwellings in 2021 and 2031

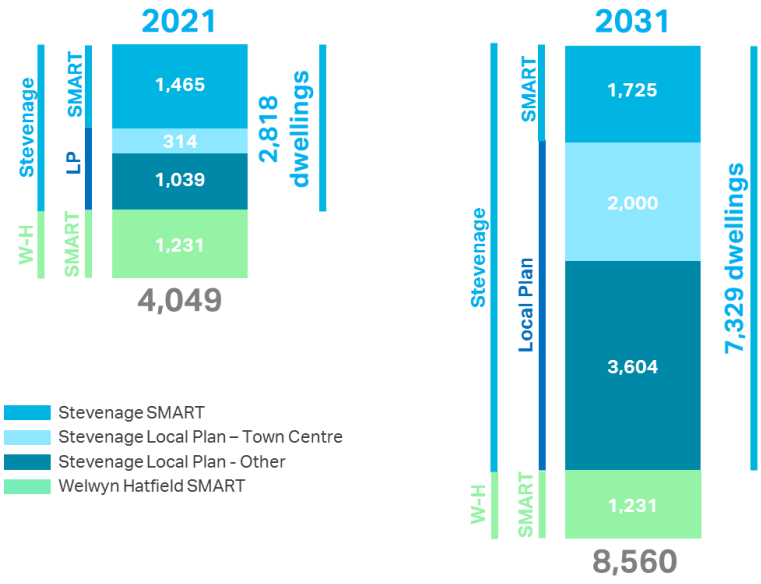


Figure 4.3 Planning data for all new employment land uses in 2021 and 2031

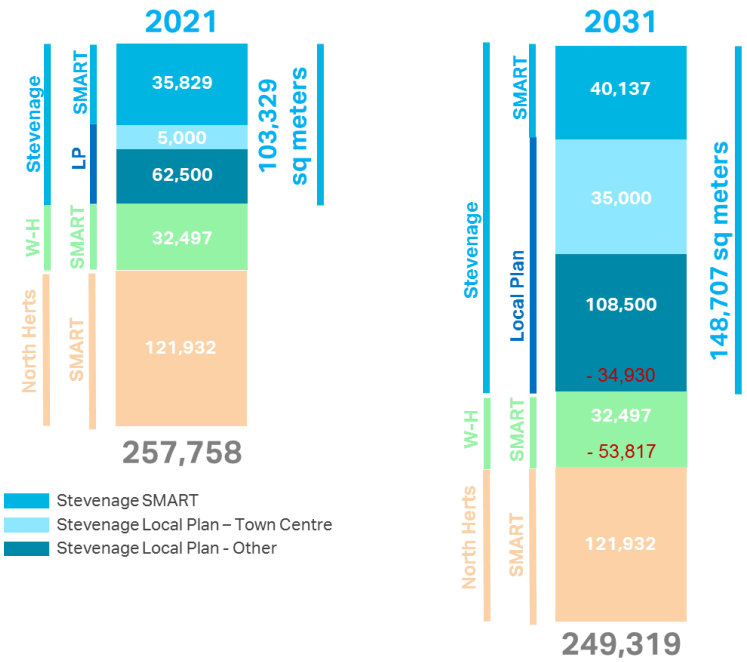


Figure 4.4 Planning data - Residential developments (2021)

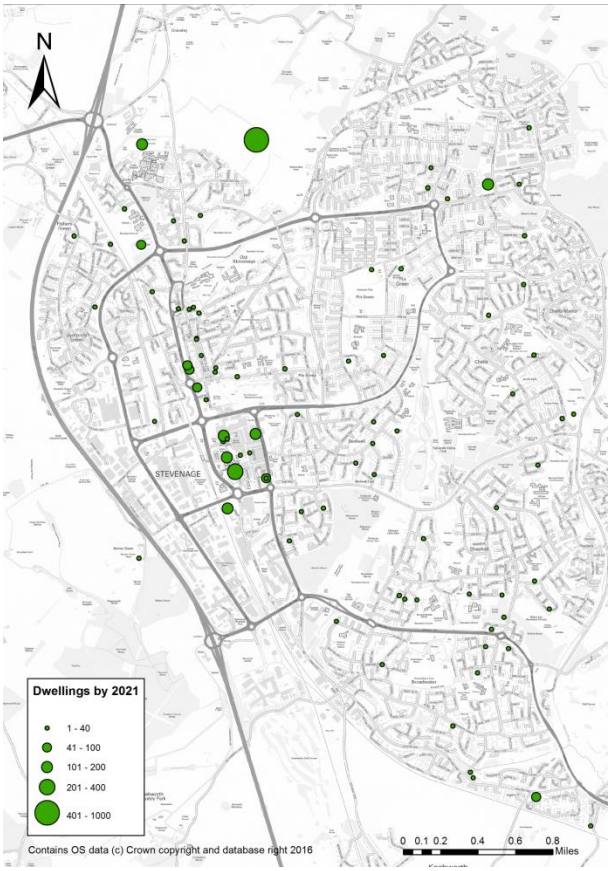


Figure 4.5 Planning Data - Employment developments (2021)

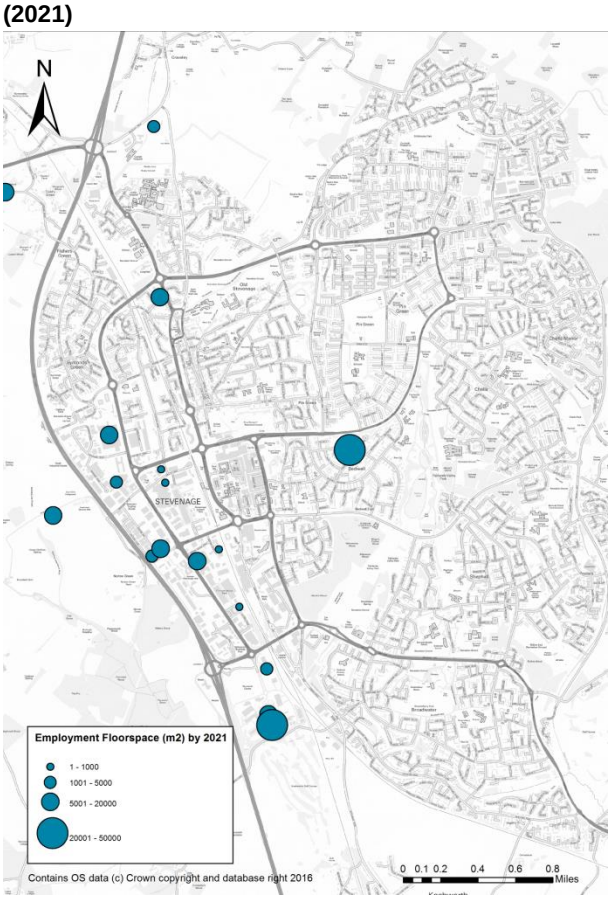


Figure 4.6 Planning data - Residential developments (2031, cumulative)

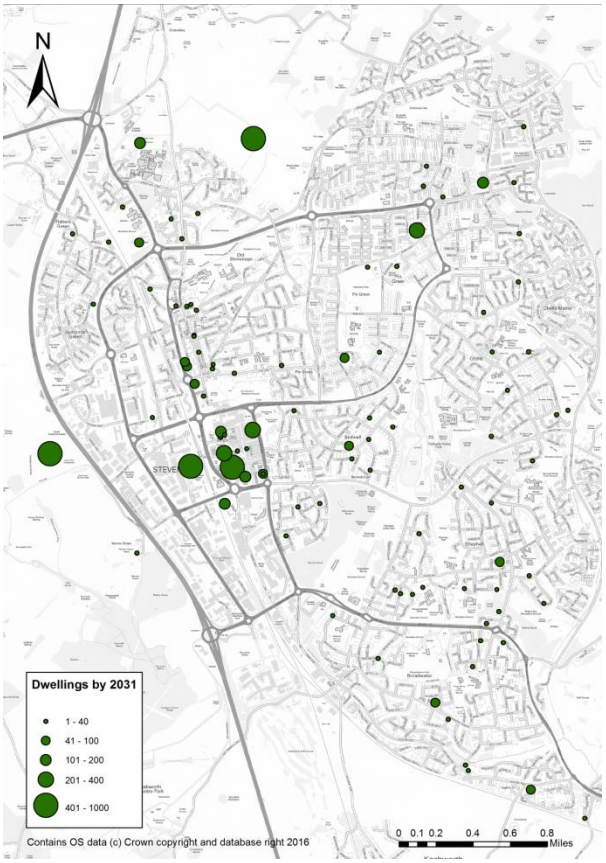
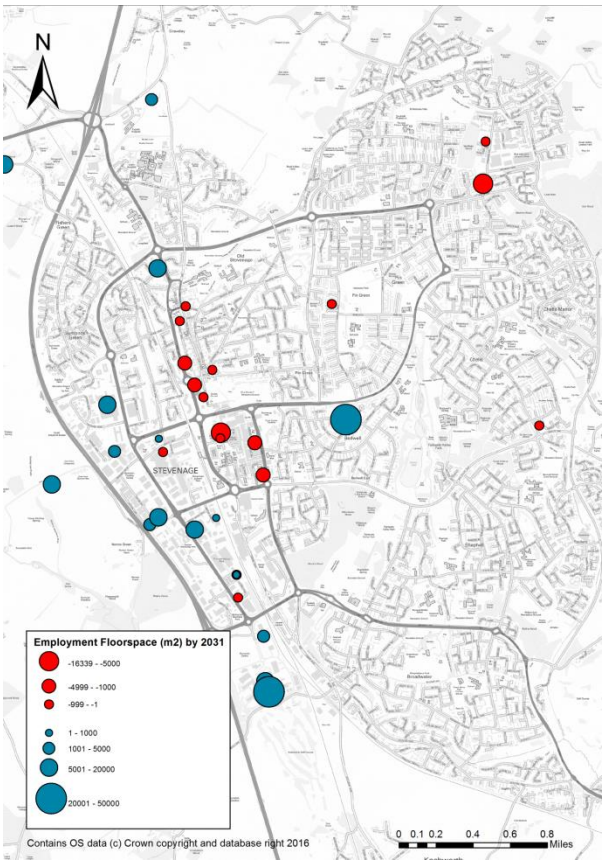


Figure 4.7 Planning Data - Employment developments (2031, cumulative)

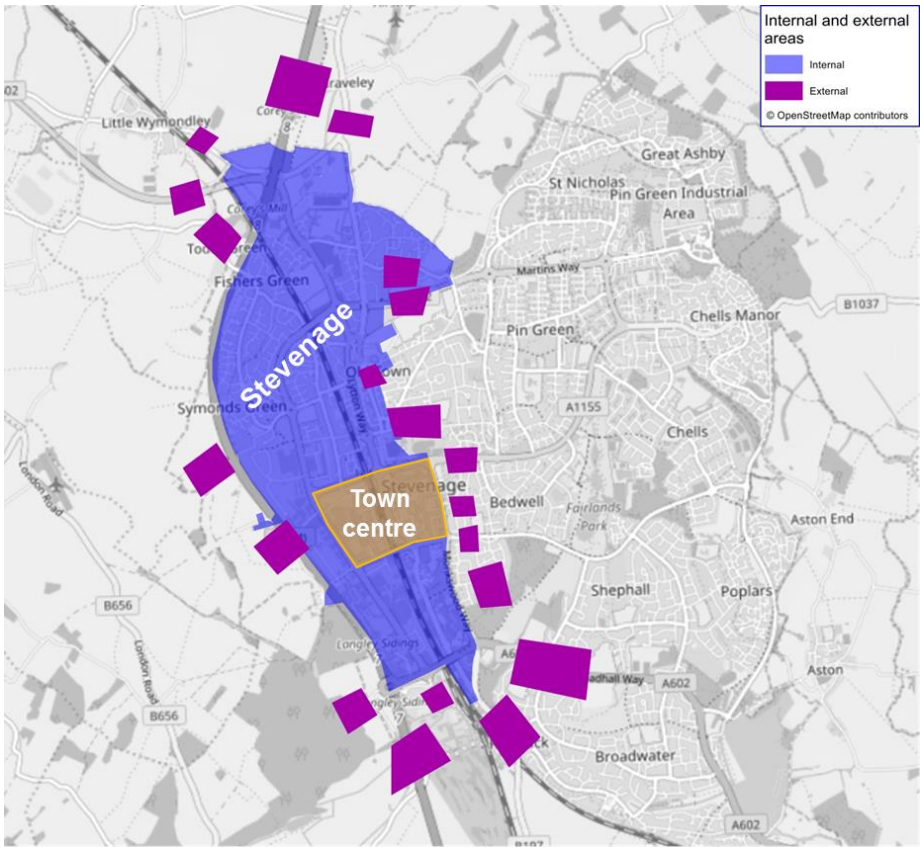


Local Model Matrix Generation

The planning data, as agreed with SBC, was processed and input into the WHaSH model. Each development was assigned to a WHaSH model zone based on the coordinates provided by SBC and the previous model application database. It was agreed with SBC to use the WHaSH model to forecast demand growth for input into the Stevenage S-Paramics model for 2021 and 2031 tests.

The WHaSH model was cordoned to approximate demand growth to 2021 and 2031 for Stevenage-related demand, which was then applied to the demand of the base year Stevenage Paramics model. The internal to internal sector matrix was generated through applying trip end estimates associated with new developments directly to the Paramics demand matrices and constraining total growth to TEMPRO (6.2) adjusted growth rates. All other sectors were generated by applying growth factors from WHaSH zones. **Figure 4.8** shows the internal and external model zones, based on the coverage defined and agreed.

Figure 4.8 Internal and external model zones



Growth factors derived from WHaSH were used to uplift base year demands for the morning and evening periods. Table 4.4 shows matrix growth factors for both modelled growth and TEMPRO unadjusted growth forecasting in 2021 and 2031, showing that the global model demand growth is roughly 2-3% higher than TEMPRO adjusted growth. A new version of TEMPRO (7.0) was released during the development of the project, however, comparisons against TEMPRO 6.2 were made to be consistent with previous modelling exercises.

	AM		PM	
	2021	2031	2021	2031
Forecasted Growth (TEMPRO inc. population)				
Stevenage	1.16	1.30	1.16	1.29
Actual Growth (MODEL)				
Stevenage	1.17	1.32	1.20	1.33

Table 4.4 Comparison between modelled and TEMPRO 6.2 adjusted car demand growth forecasts

Car Park Demand and Time Profile Adjustments

An analysis of the existing occupancy of the Car Parks in Stevenage was undertaken to better understand parking profiles in the town centre. The car park consolidation modelling does not take into account the changes to car parking demand that are likely to take place during the Local Plan period as a result of the implementation of the updated Car Parking Strategy. Initial analyses of occupancy data provided by SBC for a typical Wednesday[1] showed that a significant amount of vehicles parked before 09:00 in the town centre. **Appendix B: Car Park Occupancy** shows the time profiles of the occupancy for all town centre car parks managed by SBC for the morning and evening peak periods. These profiles indicate that many car parks, particularly those situated nearby Stevenage rail station and other long-stay carparks, reach capacity before 09:00. **Figure 4.9** shows the occupancy time profiles of all carparks and helps visualise the aforementioned capacity findings.

Given these observations, total forecast origins and destinations to and from the zones representing the car parks were "capped" to capacity and entries and exits data to better reflect observed demand at these sites. Any additional demand was redistributed to other nearby car parks with available capacity in an iterative process. It is important to reiterate, as indicated in the specification note, that the base year was not calibrated for car parks entries/exits. Therefore, the key findings of this model application are simply indicative of the potential impacts of the Local Plan and the planned schemes, and it is strongly recommended that a future recalibration of the base year model with this new information is undertaken.

Figure 4.9 2016 Town centre carpark occupancy time profiles

	Marshgate	St Georges	The Forum	Westgate	Church Ln N	Church Ln S	Primett Rd N	Primett Rd S	Danesgate	Daneshill	Leisure	Railway North	Railway South	Southgate	Swingate	Swingate S	Total
0	0.00	0.02	0.00	0.10	0.00	0.05	0.02	0.03	0.05	0.02	0.07	0.14	0.29	0.24	0.33	0.07	0.07
1	0.00	0.02	0.00	0.09	0.00	0.05	0.02	0.03	0.05	0.01	0.06	0.13	0.28	0.24	0.32	0.06	0.07
2	0.00	0.02	0.00	0.09	0.00	0.05	0.02	0.03	0.05	0.01	0.06	0.13	0.28	0.23	0.32	0.06	0.07
3	0.00	0.02	0.00	0.09	0.00	0.05	0.02	0.03	0.05	0.01	0.06	0.13	0.28	0.23	0.31	0.06	0.07
4	0.00	0.02	0.00	0.09	0.00	0.05	0.02	0.03	0.05	0.01	0.07	0.13	0.28	0.23	0.31	0.06	0.07
5	0.00	0.02	0.00	0.09	0.00	0.05	0.02	0.03	0.05	0.04	0.07	0.14	0.33	0.23	0.31	0.06	0.08
6	0.00	0.02	0.00	0.09	0.00	0.06	0.02	0.03	0.10	0.23	0.13	0.26	0.71	0.25	0.43	0.06	0.12
7	0.00	0.03	0.01	0.09	0.06	0.08	0.02	0.09	0.44	0.70	0.32	0.65	1.00	0.32	0.78	0.20	0.22
8	0.03	0.09	0.06	0.10	0.12	0.15	0.07	0.23	1.00	1.00	0.84	0.98	1.00	0.54	0.99	0.65	0.36
9	0.19	0.22	0.27	0.31	0.56	0.34	0.25	0.48	1.01	0.99	1.00	0.99	1.00	0.97	1.00	1.00	0.52
10	0.35	0.30	0.52	0.51	0.86	0.42	0.45	0.58	1.01	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.62
11	0.41	0.34	0.62	0.57	0.76	0.41	0.61	0.59	1.01	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.65
12	0.46	0.34	0.61	0.58	0.64	0.34	0.55	0.61	1.01	1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.65
13	0.41	0.33	0.61	0.60	0.74	0.33	0.50	0.61	1.01	1.00	0.99	1.00	1.00	0.99	1.00	1.00	0.65
14	0.41	0.33	0.49	0.57	0.74	0.33	0.44	0.63	1.01	1.00	1.00	0.99	0.99	0.99	0.99	0.98	0.63
15	0.31	0.29	0.37	0.47	0.63	0.38	0.36	0.54	1.01	0.99	0.94	0.96	0.98	0.93	0.98	0.93	0.57
16	0.25	0.26	0.32	0.39	0.64	0.40	0.30	0.46	0.93	0.92	0.90	0.94	0.97	0.82	0.90	0.83	0.52
17	0.14	0.17	0.17	0.26	0.48	0.29	0.24	0.29	0.79	0.86	0.94	0.85	0.97	0.58	0.93	0.77	0.41
18	0.03	0.07	0.05	0.24	0.34	0.17	0.20	0.13	0.51	0.67	0.91	0.68	0.88	0.34	0.93	0.88	0.31
19	0.01	0.04	0.01	0.27	0.26	0.10	0.13	0.09	0.28	0.45	0.76	0.49	0.70	0.25	0.80	0.85	0.24
20	0.01	0.04	0.00	0.25	0.25	0.09	0.09	0.09	0.19	0.38	0.53	0.36	0.57	0.24	0.78	0.72	0.20
21	0.01	0.03	0.00	0.19	0.17	0.08	0.06	0.05	0.15	0.20	0.45	0.29	0.48	0.25	0.60	0.46	0.15
22	0.01	0.02	0.00	0.13	0.08	0.06	0.03	0.02	0.10	0.11	0.28	0.22	0.42	0.21	0.42	0.24	0.11
23	0.01	0.02	0.01	0.11	0.03	0.05	0.02	0.01	0.05	0.10	0.10	0.14	0.30	0.22	0.37	0.14	0.08

Entries and exits observed data was also used to calibrate future year time profiles for peak hour to period demand matrix conversion processes. These time profiles are used to convert the peak hour (1 hour) matrices to peak period (3 hour) matrices by applying an expansion factor. Demand expansion factors were adjusted to reflect the peak hour entries and exits profiles for car park zones in the Stevenage S-Paramics model. These adjustments reduced total matrix demand by approximately 2-3%.

Some developments in future year scenarios were located on zones which were occupied by parking lots in the base year. Trip ends from zones with carparks in the base year but residential developments in either 2021 or 2031 future year scenarios were then adjusted to reflect the closure of these car parks. New car park capacity was calculated at a rate of 0.375 parking spaces per dwelling and extra demand was reallocated to other zones. Car park closures in 2021 and 2031 are shown in **Figure 4.10** and **Figure 4.11**.

As discussed in Section 3 Previous Model Applications - Multi-Storey Car Park North/South and Car Park Consolidation, besides the car parks considered to remain opened by 2021 and 2031 based on "Stevenage Town Centre – Planning For Future Parking Provision" initial assumptions, Tesco Car Park, Leisure Centre Car Park (West) and the potential Multi-storey Car Park on the current Railway Car Parks location were considered also for the reallocation of excess of car demand in the town centre.

[1] Wednesday data for Weeks 39 and 42 of the calendar year were analysed.

Figure 4.10 2021 Car Park Occupancy in Stevenage Town Centre

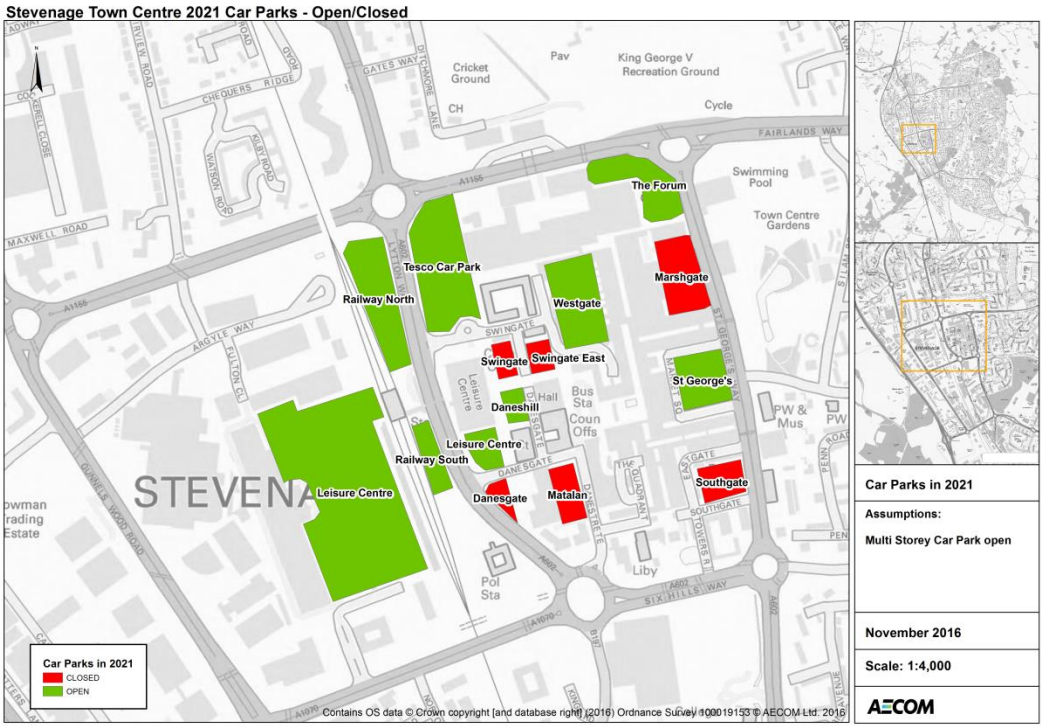
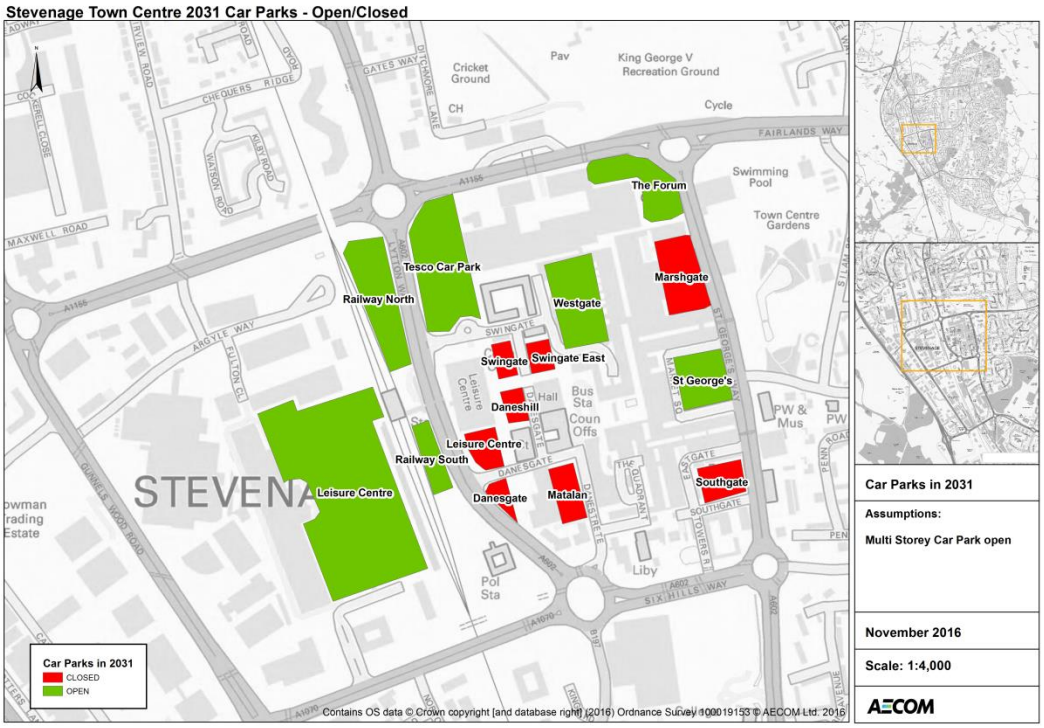


Figure 4.11 2031 Car Park Occupancy in Stevenage Town Centre



Network Testing in 2021 and 2031

5

5. Network Testing in 2021 and 2031

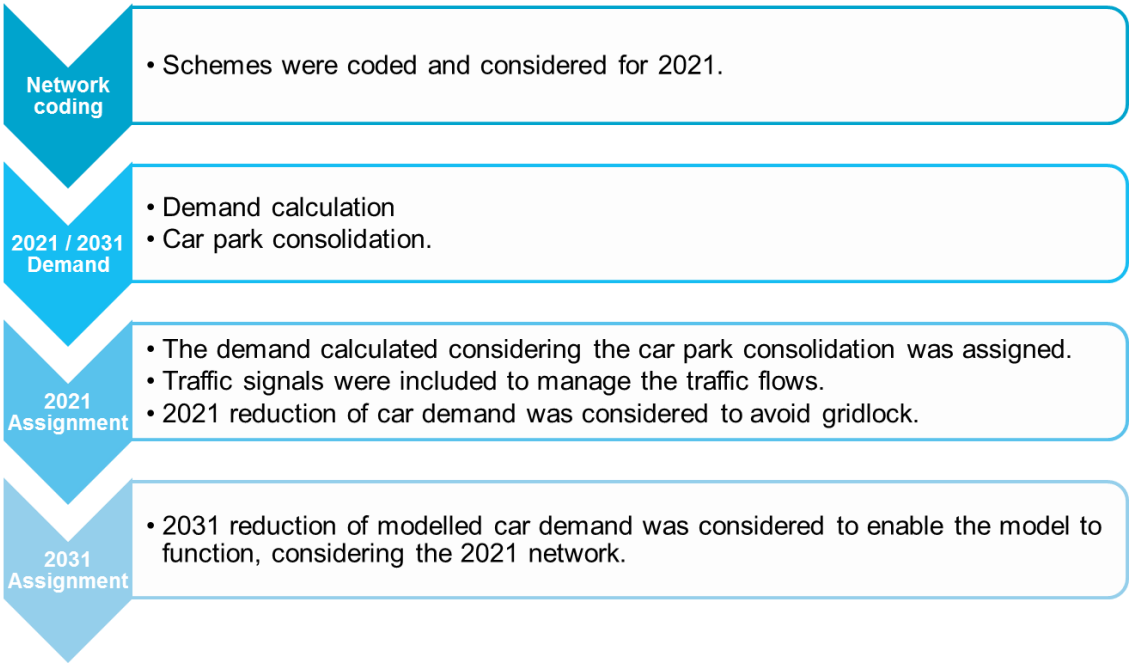
Introduction

The demand generation process described in the previous section was applied to calculate the growth of the demand matrices by 2021 and 2031. The proposed schemes detailed in Section 3 - Previous Model Applications were then coded in the S-Paramics model and the 2021 demand assigned for the morning and evening periods. This assignment was used to evaluate the impacts of proposed schemes on the model. Following discussions with SCB high level concept schemes for Lytton Way Closure (LWC) and the Multi-Storey Car Parks (MSCP) were agreed.

The 2021 assignment runs identified a number of network problems and conflicts which made necessary the inclusion of additional traffic signals to manage traffic flows and initial reduction of the demand to reduce the level of congestion on the network. An iterative process found a level of demand that, even with the presence of queues and hotspots in some periods of the peak hours, reduces the congestion to a level which enables the model to function. This network was used to evaluate the impacts of the 2031 demand matrices and to run an iterative process to find a demand level which enables the model to function.

The process followed to analyse the impacts of the Local Plan and the proposed schemes is shown in **Figure 5.1**.

Figure 5.1 Impact assessment process

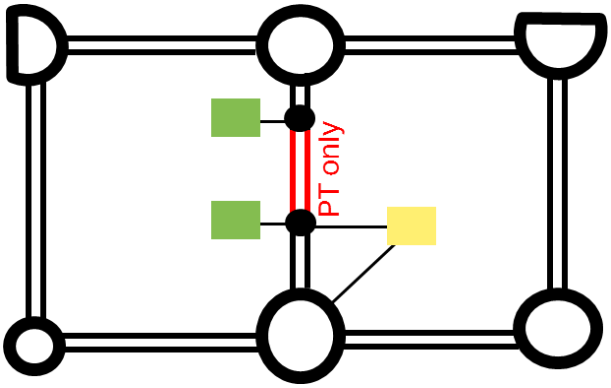


Assumptions tested

The list of assumptions related to schemes, car park adjustments and mitigation measures is as follows:

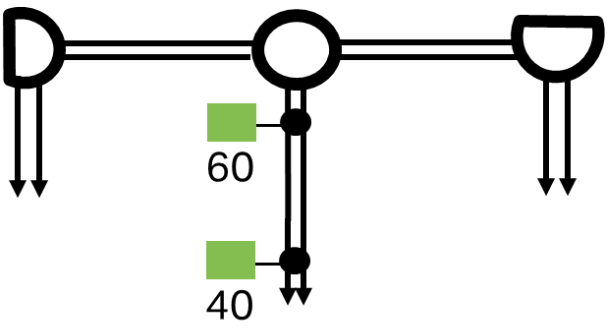
1) A1(M) Smart motorway,.
2) GSK hamburger roundabout, .
3) Car Park Consolidation .
4) Lytton Way Closure (LWC): It was agreed with SBC to use high level concept scheme for Lytton Way which introduces a partial closure, reserving the middle section for Public Transport and pedestrian but provides accessibility to the car parks in the Town Centre through two additional roundabouts. **Figure 5.2** shows the high level concept scheme.

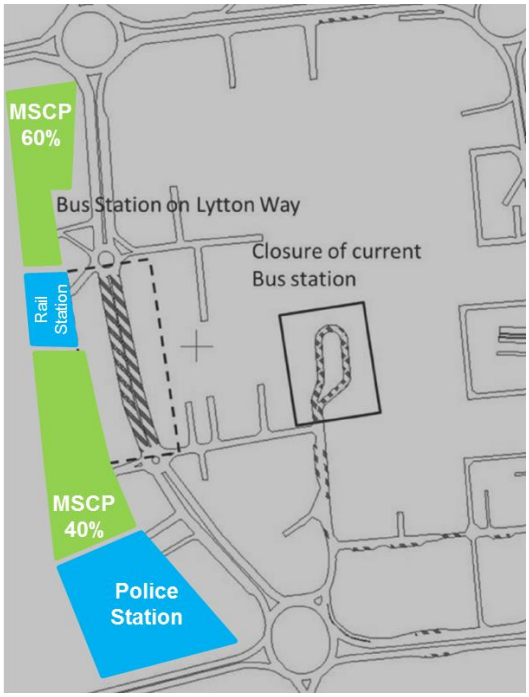
Figure 5.2 Lytton Way Closure concept



5) Multi-Storey Car Park (MSCP): This was agreed with SBC to consider a MSCP concept design to analyse the impacts on the network. A MSCP Railway North and a MSCP Railway South, assuming 60% and 40% of a total capacity of 770 parking spaces were considered. **Figure 5.3** shows the MSCP concept and the combination of both LWC and MSCP.

Figure 5.3 MSCP concept and combination of LWC and MSCP





6) Traffic signals slightly adjusted: some signals were adjusted to accommodate more demand on the network:

- Junction 8
- GSK
- Gunnels Wood Rd – Hitchin Road junction

7) Proposed traffic signals: additional traffic signals were included to manage new conflicts in the model based on the new demand and the redistribution of traffic flows based on the new schemes and new levels of demand:

- Fairlands Way – Lytton Way signalized roundabout.
- Fairlands Way – Gunnels Wood Road junction.
- Fairlands Way – St George's Way junction.
- Signalised junction at Coreys Mil Lane – North Road.

Traffic Signal Adjustment

A series of tests were undertaken to understand the impact of new development demand on the modelled network in Stevenage. Initial scoping tests for 2021 identified a number of junction-related conflicts arising from increased demand. Signal timings at A1(M) Junction 8, the GSK Roundabout, and Gunnels Wood Road-Hitchin Road Roundabout were adjusted to improve junction function and reduce queueing, although unreleased demand remained on some approached, especially on Junction 8 and Martins Way.

Signals were also added at a number of junctions in both the morning and evening peak periods to further manage conflicts and queueing, particularly within the town centre. These provisional signals were proposed for the three town centre Fairlands Way junctions (with Lytton Way, Gunnels Wood Road, and St. George's Way) and at Coreys Mill Lane-North Road (at present a double roundabout). The implementation of these signals improved model performance in both early scoping tests and in future tests with LWC and the MSCP managing the conflicts flows, but created unreleased demand in some of the junctions approaches. A summary of signal modifications is shown in **Figure 5.4** and individual signal locations are shown in **Figure 5.5** and **Figure 5.6**.

Figure 5.4 Adjusted and proposed signals used in Stevenage S-Paramics modelling tests

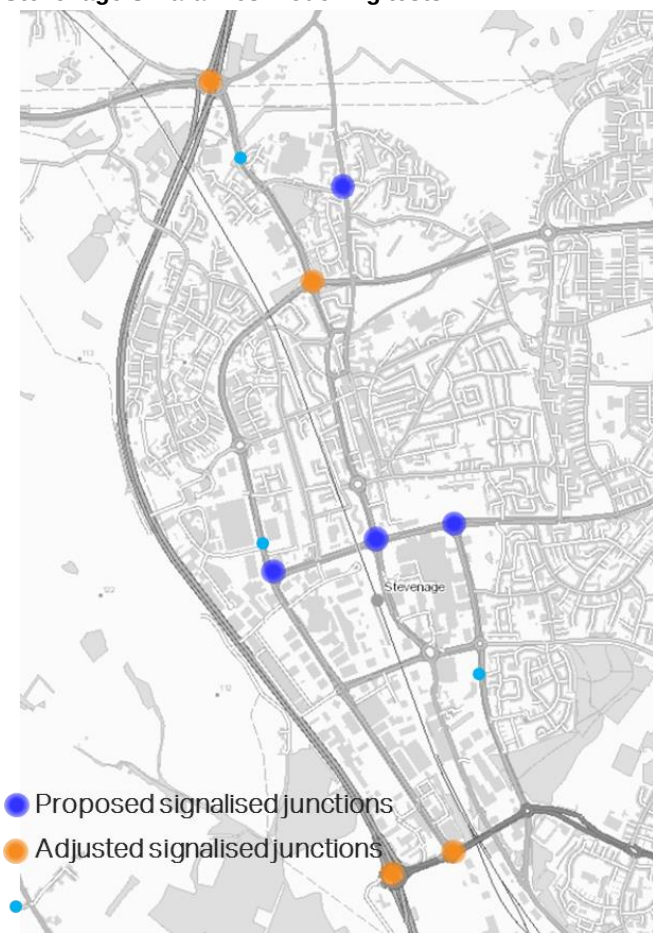


Figure 5.5 Coreys Mill Lane – North Road signalized junction

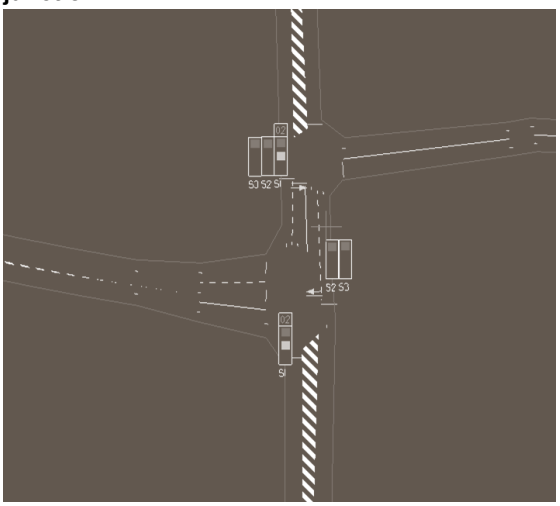


Figure 5.6 Fairlands Way with new traffic signals included

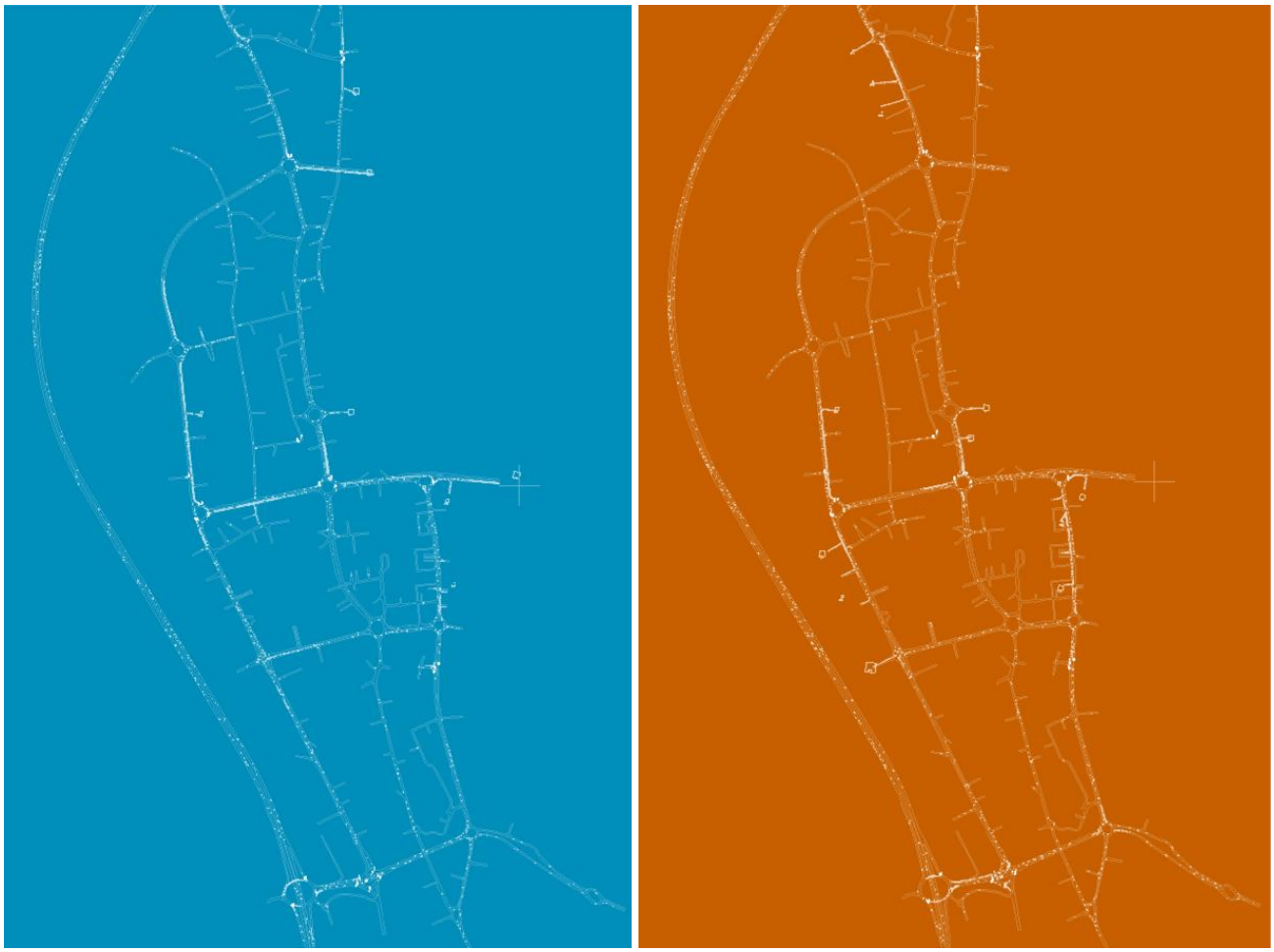
2021 Test Results

Model testing in 2021 considered the closure of Lytton Way to private cars and car park consolidation. Initial tests using unadjusted 2021 demand produced significant congestion and network pressure as a result of blocking back and queueing along Fairlands Way.

While signal changes and additions helped better manage conflict flows, significant unreleased demand across the network or model gridlock suggested that network capacity had been exceeded. Car demand for Stevenage-related trips was then lowered in 5% increments until a suitable network performance was achieved in the model.

A reduction of demand of 5% of all Stevenage-related trips improved network performance in the model in the morning peak period, but not in the evening peak period. A subsequent reduction of demand of 5% to total an overall reduction of 10% of all Stevenage-related car demand was shown to provide suitable network performance in the model for both the morning and evening peak periods. After the reduction of demand in the morning peak there were queues on Gunnels Wood Road southbound, Lytton Way North southbound, and Fairlands Way westbound. For the evening peak there were queues in St Geroge's Way northbound, Gunnels Wood Road northbound and southbound, Hitching Road northbound and Fairlands Way eastbound. A summary screenshot of both morning and evening peak period network performance and queueing is shown in **Figure 5.7**.

Figure 5.7 2021 Morning (blue) and evening (orange) mid-peak period (08:30/17:30) model screenshots with a 10% reduction of car demand



There is unreleased demand coincident with the base year situation, such as Martins Way westbound in the morning peak, but there are other zones where the unreleased demand becomes more significant with 2021 demand: Fairlands Way westbound in the morning peak and the industrial/residential zone in the western area of Stevenage which connects with Gunnels Wood Road – Six Hills Roundabout in the evening peak. The capacity of this roundabout seems not to be enough to manage the demand coming from this area in the evening period. Despite changes at Junction 8 traffic signals, unreleased demand was identified on the A602 approach from Hitchin.

2031 Test Results

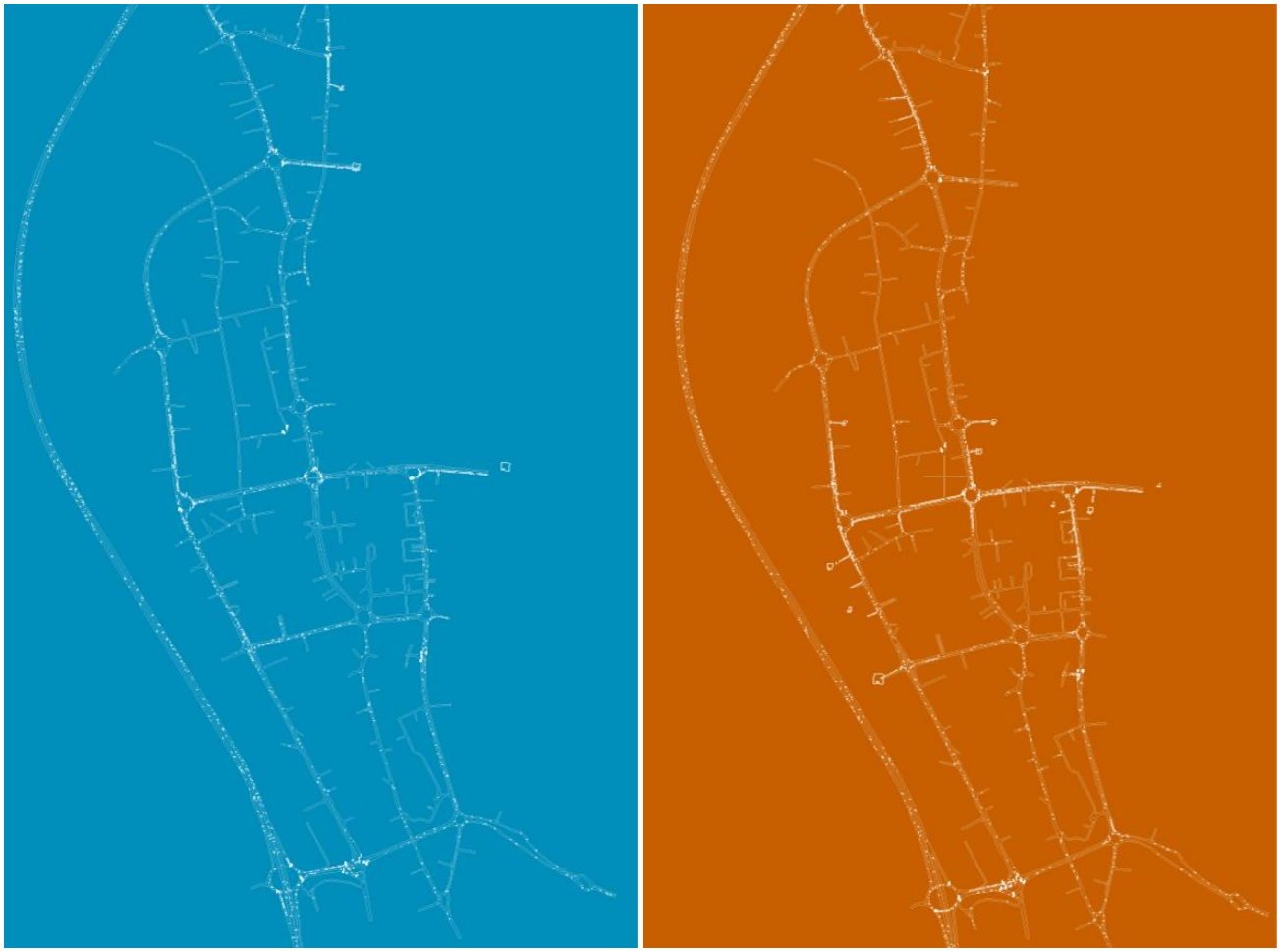
Upon the determination of a sufficient level of reduction of demand in 2021, tests were applied using 2031 demand matrices. No network changes (other than minor changes to signal timings) were included. Significant unreleased demand across the network or "model gridlock" was also observed, suggesting that network capacity had once again been exceeded. Car demand for Stevenage-related trips was then reduced in 5% increments (commencing with a 10% reduction) until a suitable network performance was achieved in the model.

Demand within the town centre and demand outside the town centre and within Stevenage were reduced at different rates, with town centre-related demand reduced at a higher rate than Stevenage-related demand. This was considered reasonable as SBC will limit the amount of parking spaces allocated to new developments in the town centre and thus reduce overall car demand in future scenarios.

A reduction of 15-20% of all Stevenage-related modelled demand and 35-40% of town centre-related demand was shown to provide a suitable network performance in the model. **Figure 5.8** shows summary screenshots of queueing in the morning and evening peak periods. The performance is similar to the situation with the 2021 demand, although heightened on some roads. The morning peaks shows queues on Gunnels Wood Road and Fairlands Way, and unreleased demand on Fairlands Way and Martins Way. In the evening the congestion happens in the same locations than with 2021 demand, but the Lytton Way – Fairlands Way junction is considerably more stressed, extending the queues. The unreleased demand from the industrial/ residential area connecting to Gunnels Wood Road – Six Hill Road junction is higher than with the 2021 demand, due to the new development planned there.

Junction 8 and Junction 7 traffic signals were adjusted to manage flows and to release the highest possible demand. These changes were not based on any specific design analysis and they were proposed to release additional demand without creating additional issues. However, Junction 8 presents significant unreleased demand on the A602 approach coming from Hitchin.

Figure 5.8 2031 Morning (blue) and evening (orange) mid-peak period (08:30) network screenshot with a 20/40% reduction of car demand



A summary of key junction observations and network issues are provided in **Table 5.1**. The modelled congestion is located in similar locations in 2021 and in 2031 scenarios, although is generally more significant in 2031.

Table 5.1 Main S-Paramics observations at key junctions and roundabouts in Stevenage

Junction	Morning Peak	Evening Peak
Fairlands Way/Lytton Way	Significant queues on southbound and westbound due to conflict flows. Extended queues in 2031.	Significant queues on all the approaches, mainly in 2031.
Fairlands Way/St. George's Way	Unreleased demand going westbound, due to flows going from Fairlands Way to St George's Way.	Significant queues in northbound and westbound movements, and congestion in Fairlands Way to St George's Way.
Gunnels Wood Road/Fairlands Way	Significant queues southbound and westbound due to conflict flows even with the traffic signals. Extended queues in 2031.	Significant queues on all the approaches, mainly in 2031.
Gunnels Wood Road/Six Hills Way	Slight northbound and westbound queues due to capacity constraints and demand going to the industrial area.	Queues in all directions due to capacity constraints and significant level of demand. Significant unreleased demand coming from industrial area.

As indicative metrics for the evaluation of the relative performance of the model, some statistics have been extracted to evaluate the impacts of the demand and the proposed schemes. The metrics extracted for the peak hour are:

1) Average speed in the town centre, based on total distance travelled and total travel time.
2) Released / Unreleased vehicles on the whole network.
3) Total travel time on the whole network.

Table 5.2 shows a comparison between the base year, the 2021 scenario with 10% reduction of demand and the 2031 scenario with 20 to 40% reduction of car demand. The demand growth and the proposed schemes increase the re-routing and the conflict movements, which increases the congestion and produces a reduction of the average speed in the town centre.

The released demand increases considerably due to the growth, and consequently, the unreleased demand experiences a parallel growth during the peak hour. The unreleased / release demand ratio, increases significantly in the 2021 and 2031 scenarios. Due to the congestion and the increase of demand, but also because of the introduction of additional traffic signals to manage the conflict flows, the total travel time in the whole network increases considerably.

Table 5.2 Main metrics comparing the performance of the network in the time scenarios

Metric	Base Year		2021 (10% reduction of car demand)		2031 (40-20% % reduction of car demand)	
Peak Period	Morning	Evening	Morning	Evening	Morning	Evening
Average Speed (Town Centre) [km/h]	30	24	20	18	15	20
Released Vehicles (whole network) [vehicles]	23601	26367	24625	27665	26251	28642
Unreleased Vehicles (whole network) [vehicles]	109	93	429	1594	287	1186
Unreleased / Released demand ratio	0.5%	0.4%	1.7%	5.8%	1.1%	4.1%
Total Travel Time (whole network) [vehicles -hour]	2127	1991	2434	2848	2584	2771

The most significant unreleased demand in 2021 morning peak is around 200 vehicles that cannot access the network through Lytton Way/Trinity Road roundabout, due to queues on Lytton Way North southbound.

The most significant unreleased demand for the evening peak is around 350 vehicles in the same location in 2021 and around 150 vehicles for 2031. The industrial zone in western Stevenage presents significant unreleased demand in 2021 and 2031, having the highest value on the approach to Six Hills Way/Gunnels Wood Road roundabout with around 400 vehicles in the evening peak hour. There are is also around 100 unreleased vehicles on the eastbound approach to A1(M) Junction 8 roundabout for both 2021 and 2031 evening peak period.

Key Findings and conclusions

6

6. Key Findings and Conclusions

Carpark Demand

The carpark occupancy and capacity analysis was used to control the level of demand going to the town centre. As expected, a significant difference was identified between the base-year demand in zones with carparks and the observed data provided by SBC. This carpark information was not available at the time of the S-Paramics model calibration and it is strongly recommended that the base year model is re-calibrated to incorporate this new information to better reflect demand in these zones, which directly affect town centre demand and travel patterns. Due to time constraints of the study, the observed data provided by SBC was used to control the demand going to the town centre by 2021 and 2031, as well as for the car park consolidation, to enable a broad indication of the potential network issues in the town centre which may occur in the future.

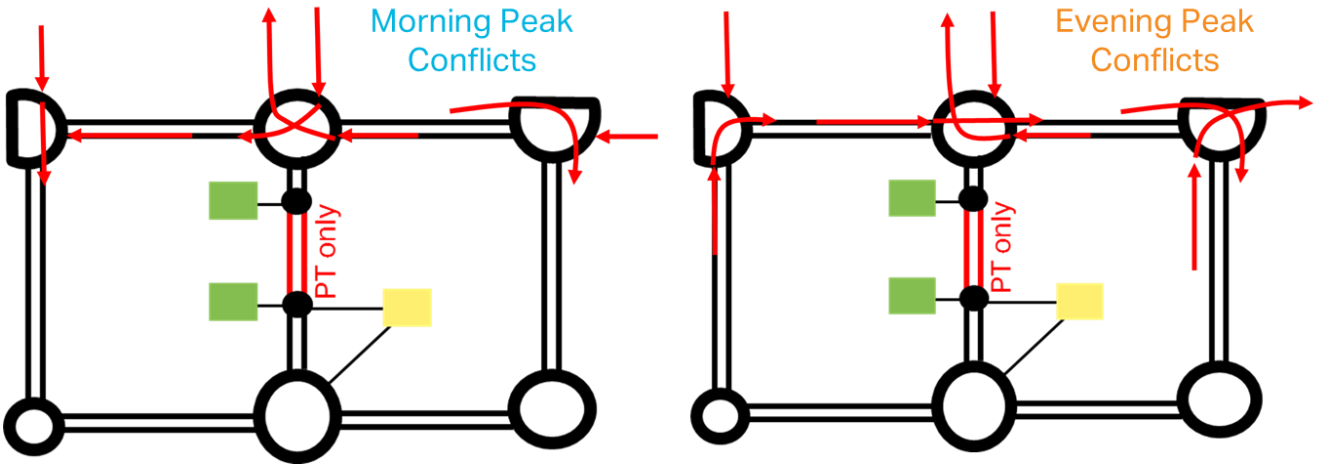
Lytton Way Closure and Multi-Storey Car Park Schemes

The implementation of LWC and the car park consolidation lead to significant rerouting of modelled traffic through central Stevenage. The modelling shows new conflicts at Fairlands Way and Gunnels Wood Road/Hitchin Road/St. Georges Way junctions which reduce the network performance.

The modelling found that at 2021, with the LWC and car park consolidation, the model functioned to an acceptable level with a reduction in modelled traffic flows and the introduction of additional signals at Fairlands Way/Gunnels Wood Road and Fairlands Way/St Georges Way and signalling changes at town centre junctions.

These traffic signals helped to control opposite movements observed in the with LWC and MSCP scenario.

Figure 6.1 Morning and evening peak period town centre junction movements



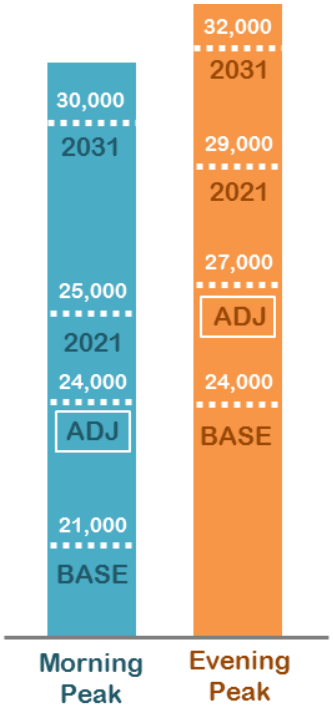
Reduction in Modelled Traffic

Reduction in modelled traffic to both 2021 and 2031 matrices were made in incremental reductions to evaluate the available network capacity.

For 2021, a reduction of modelled car traffic in the order of magnitude of 5-10% of all Stevenage-related trips was needed to provide a suitable network performance in the model. For 2031, reductions of modelled car traffic in the order of magnitude of 35-40% for town-centre related trips and 15-20% for all other Stevenage-related trips (or approximately 20-25% of total Stevenage demand) was shown to be needed to achieve a suitable network performance in the model.

Approximate matrix demand figures are shown in **Figure 6.2**, showing the approximate number of trips of the Base Year demand, the 2021 and 2031 demand, and the rounded adjusted demand finally considered for each time period.

Figure 6.2 Approximate matrix demands for morning and evening peak periods for unadjusted base, 2021, 2031, and adjusted 2021/2031 matrices.



Recommendations

The Local Plan developments should come with an Integrated Transport Strategy, along with significant investment in active travel (walking and cycling), public transport and other sustainable travel modes to minimise modelled traffic demand.

Appendices

7

7. Appendices

Appendix A: Location of planning data

Figure 7.1 Planning data - Residential developments (2021)

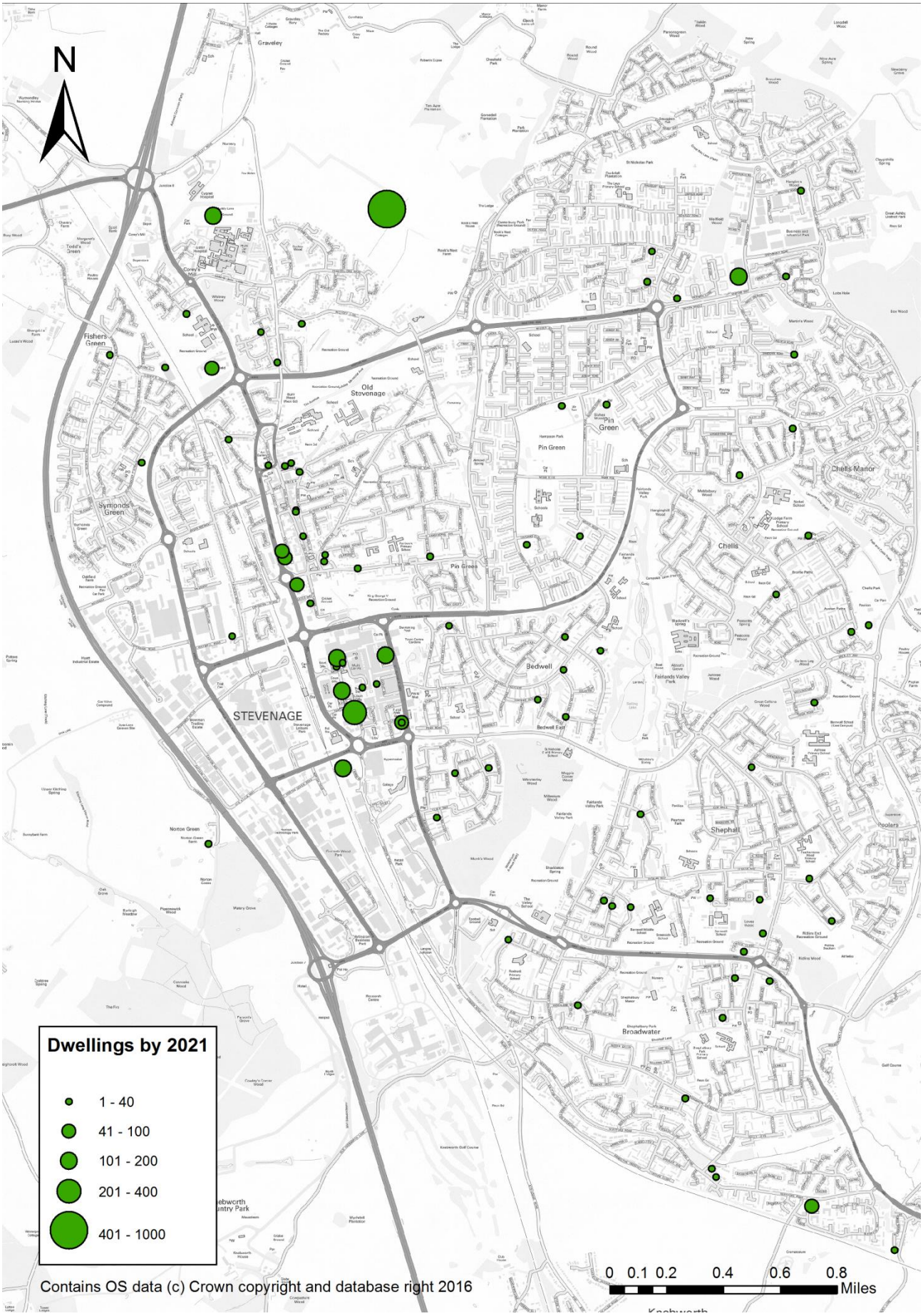


Figure 7.2 Planning Data - Employment developments (2021)

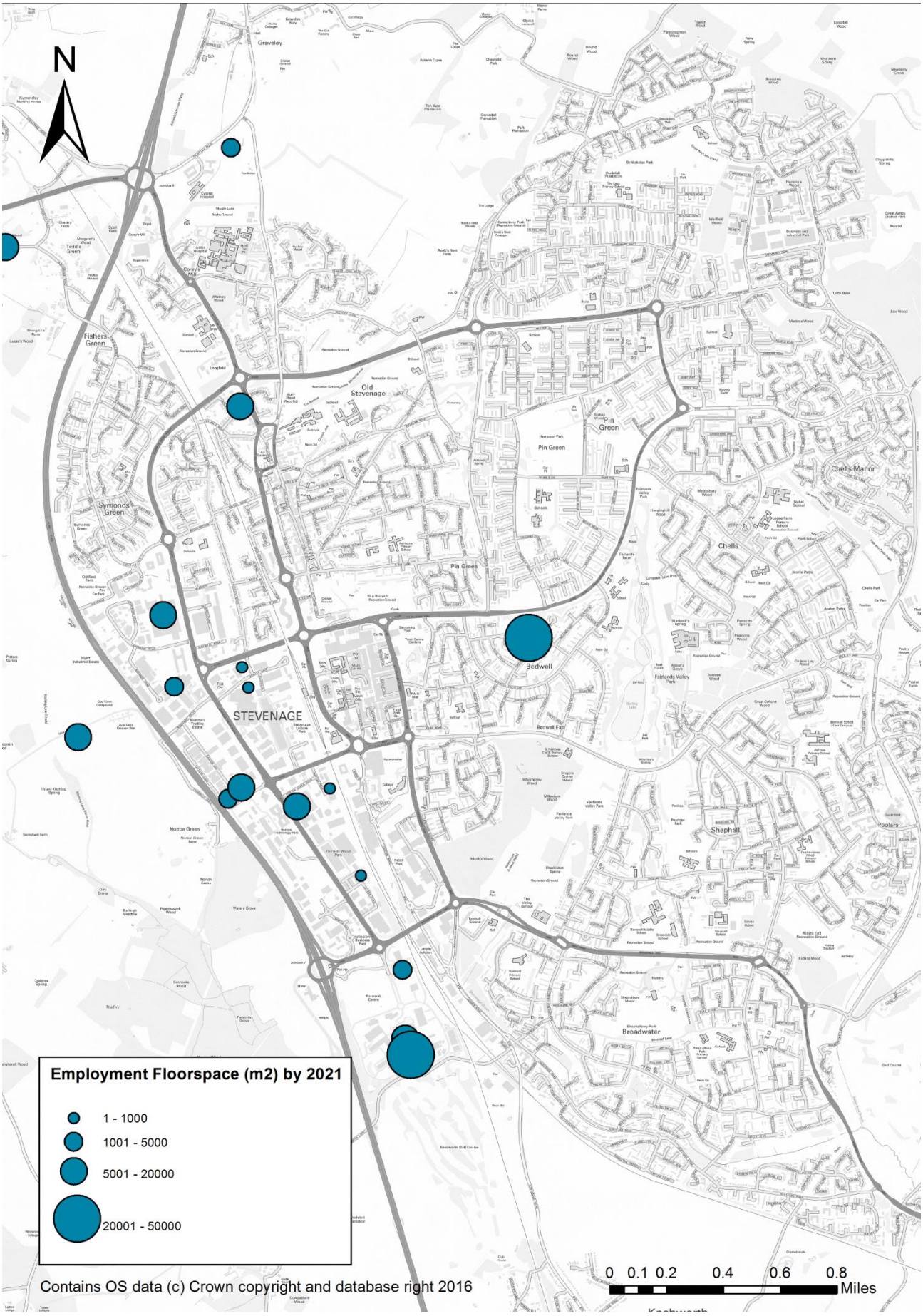


Figure 7.3 Planning data - Residential developments (2031, cumulative)

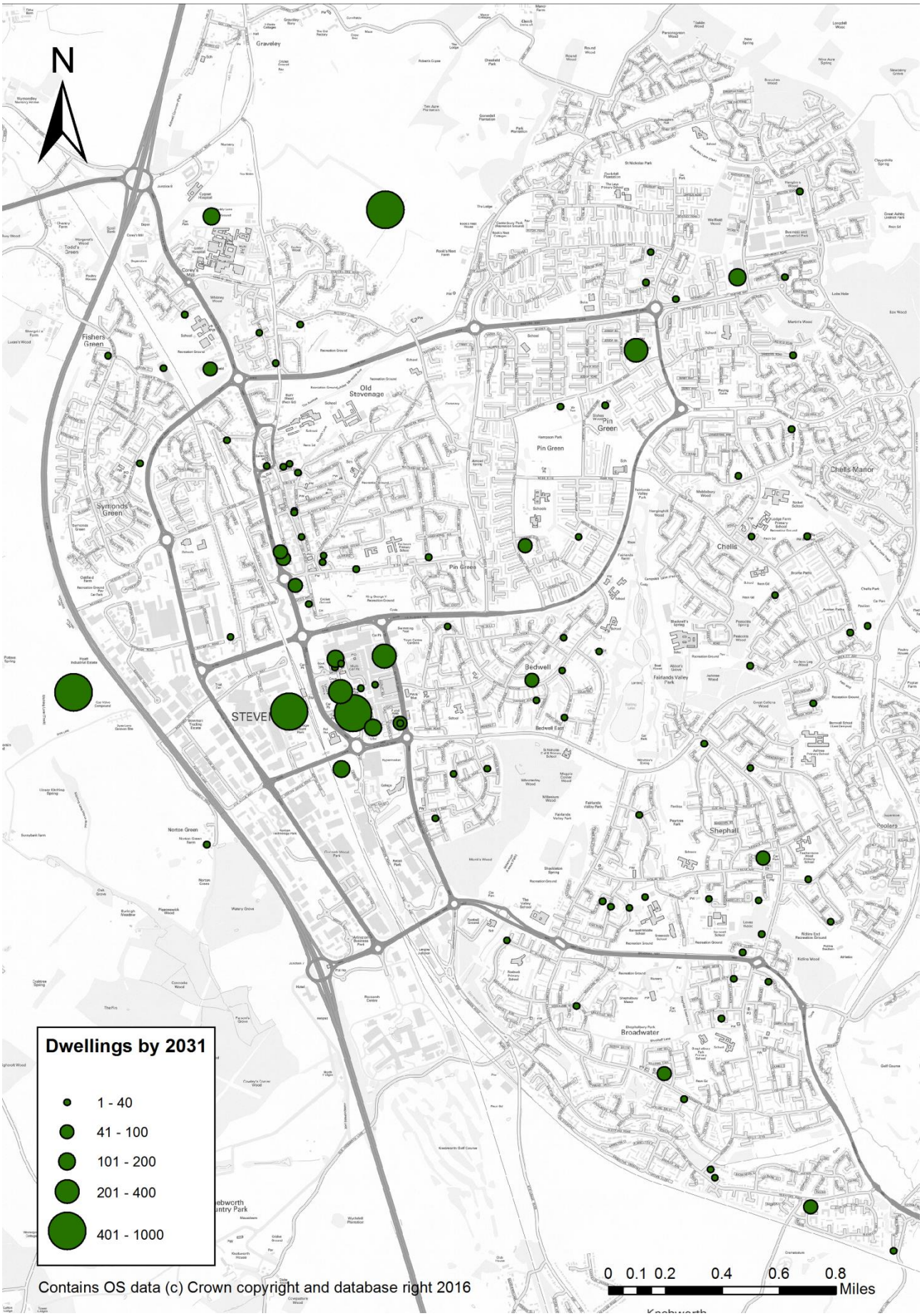
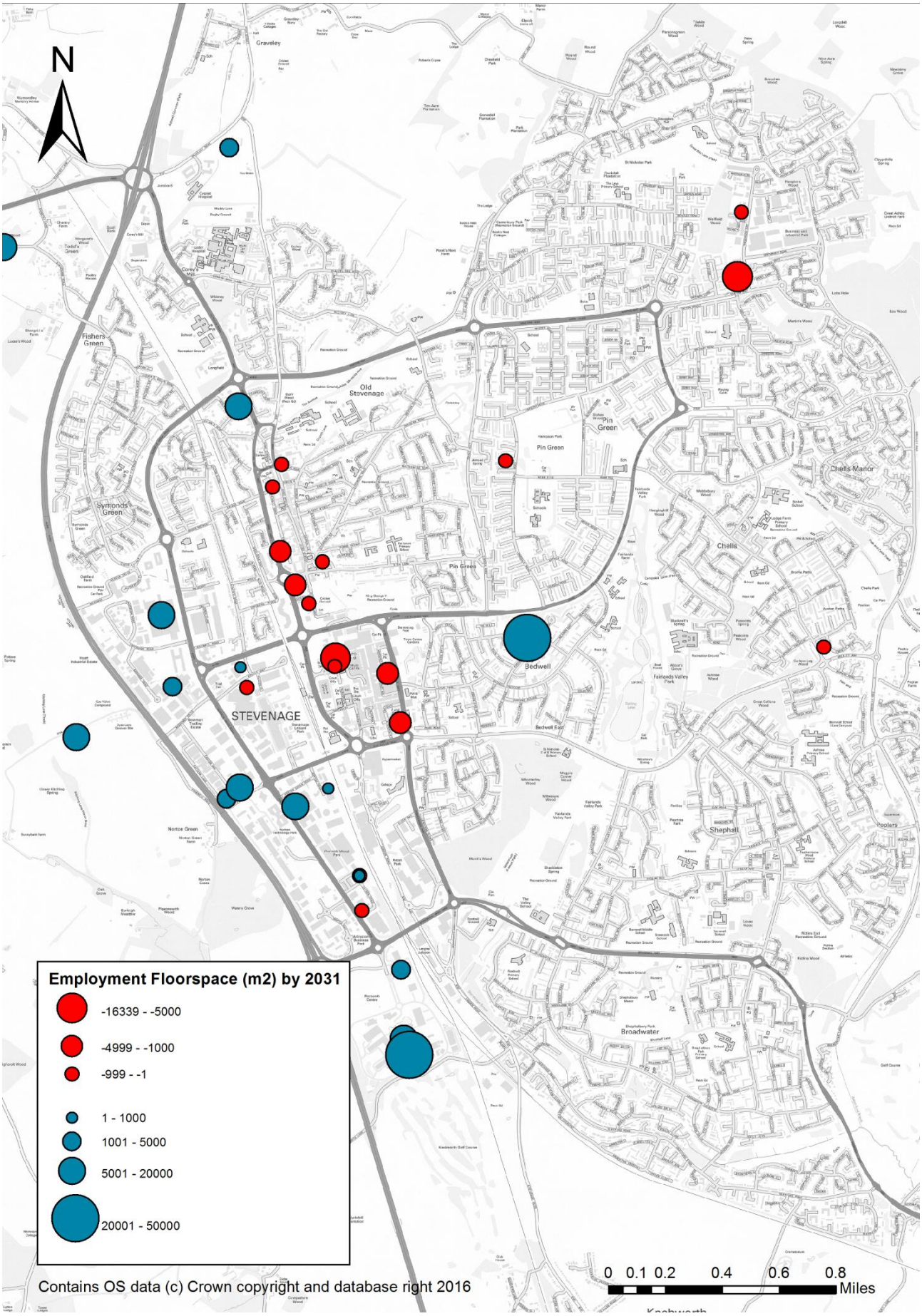
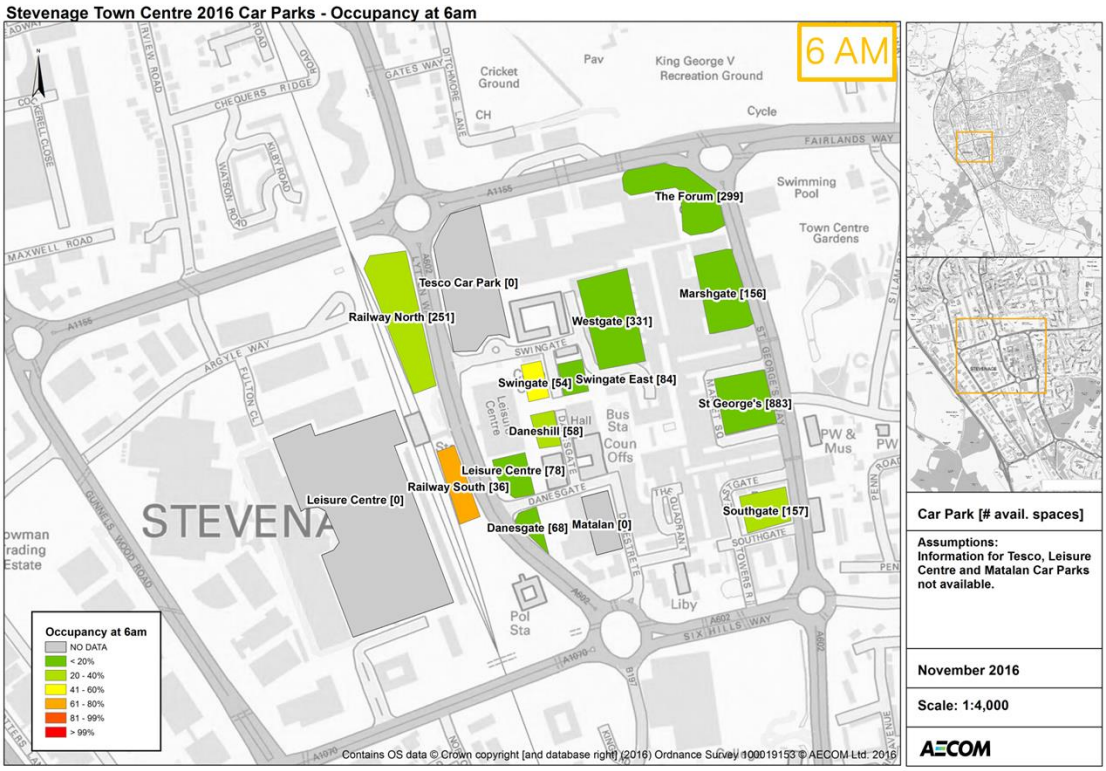


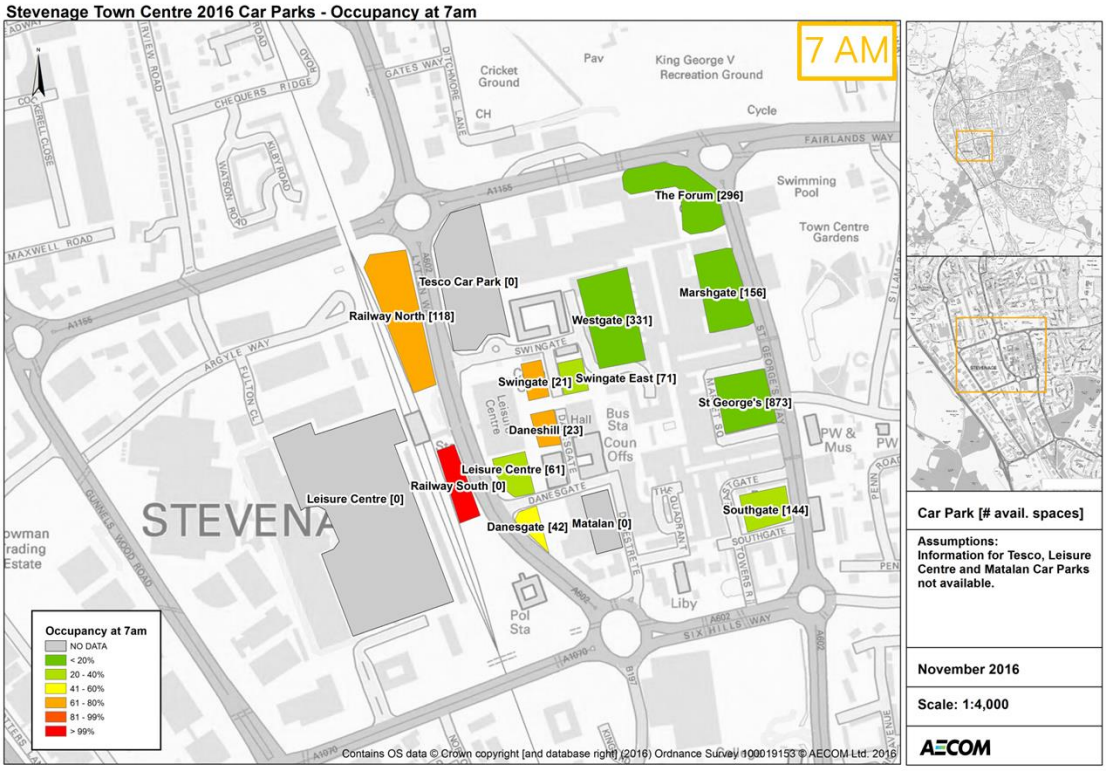
Figure 7.4 Planning Data - Employment developments (2031, cumulative)



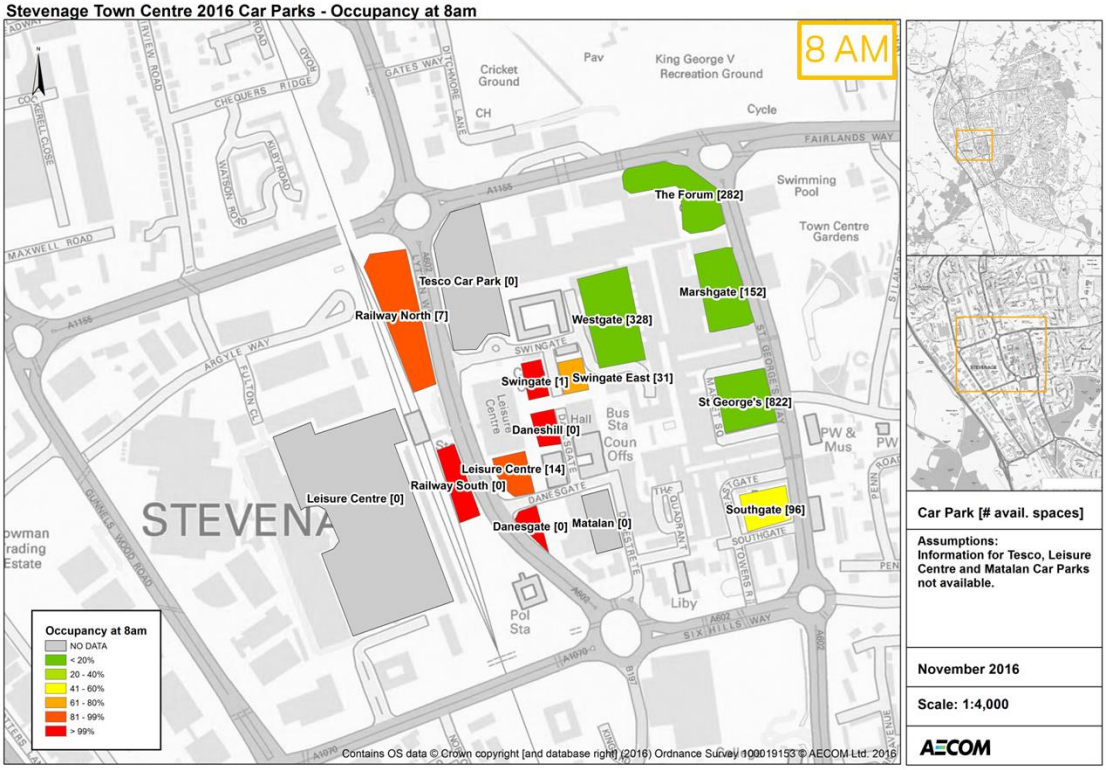
Appendix B: Car Park Occupancy Time Profiles

Car Park Occupancy Time Profiles – Morning peak

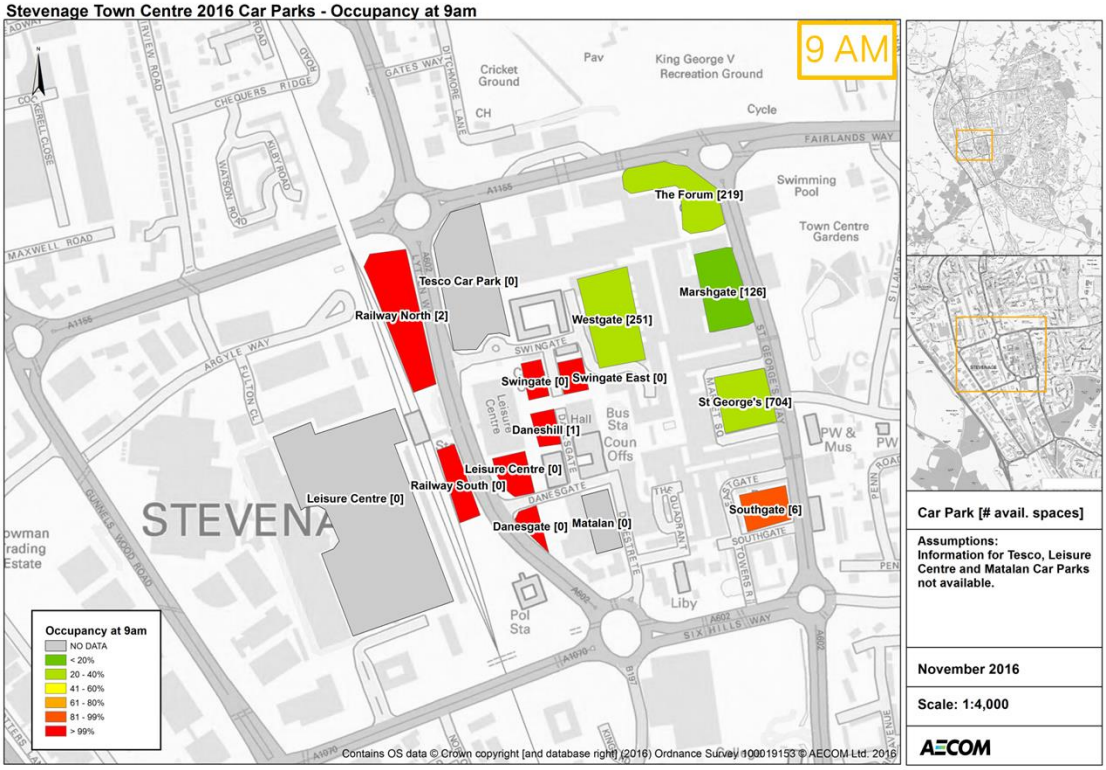




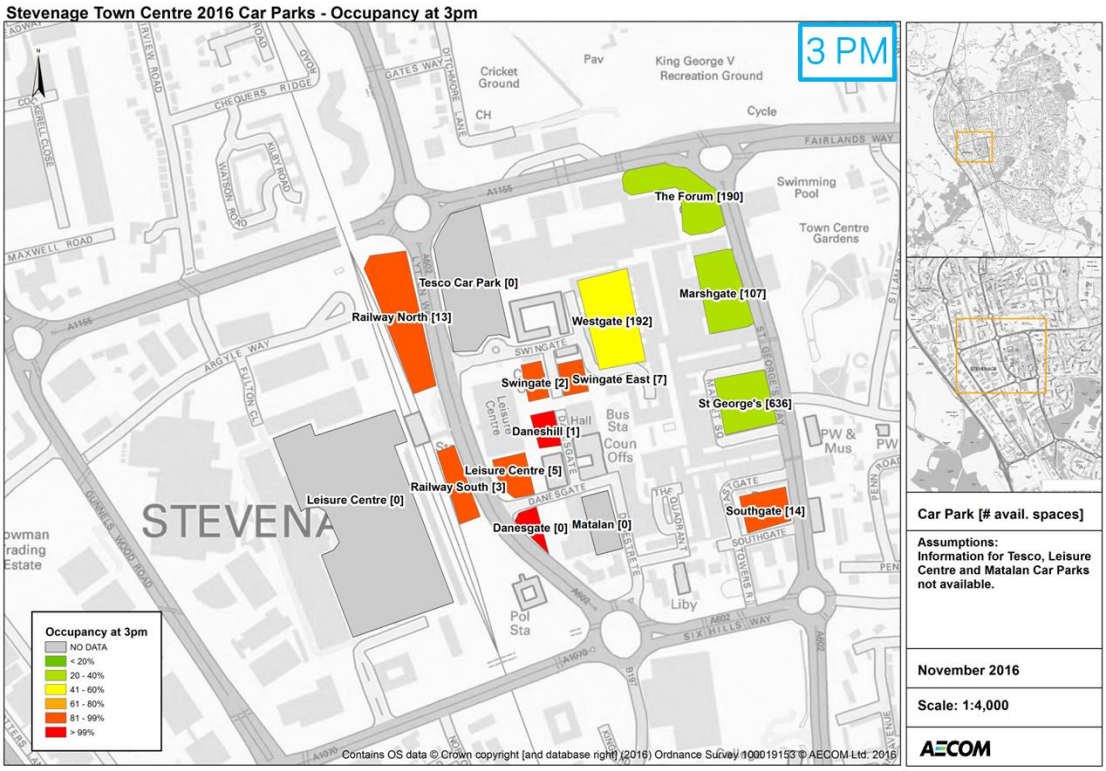
Stevenage Town Centre 2016 Car Parks - Occupancy at 8am

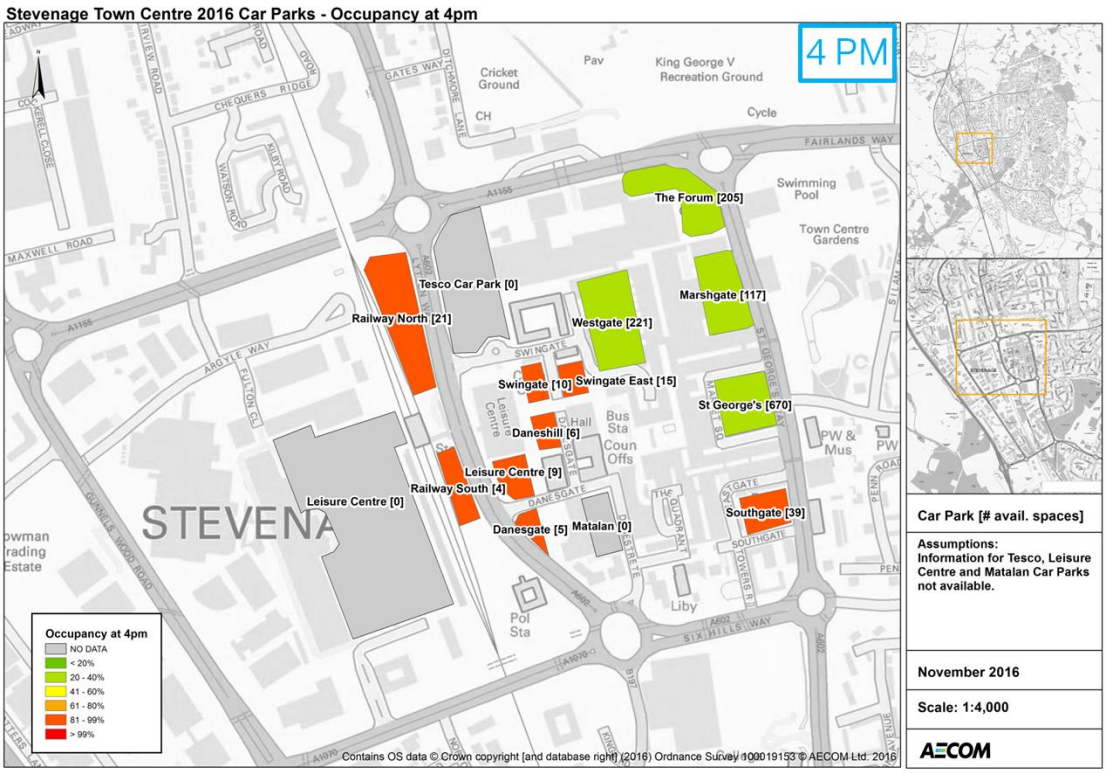


Stevenage Town Centre 2016 Car Parks - Occupancy at 9am

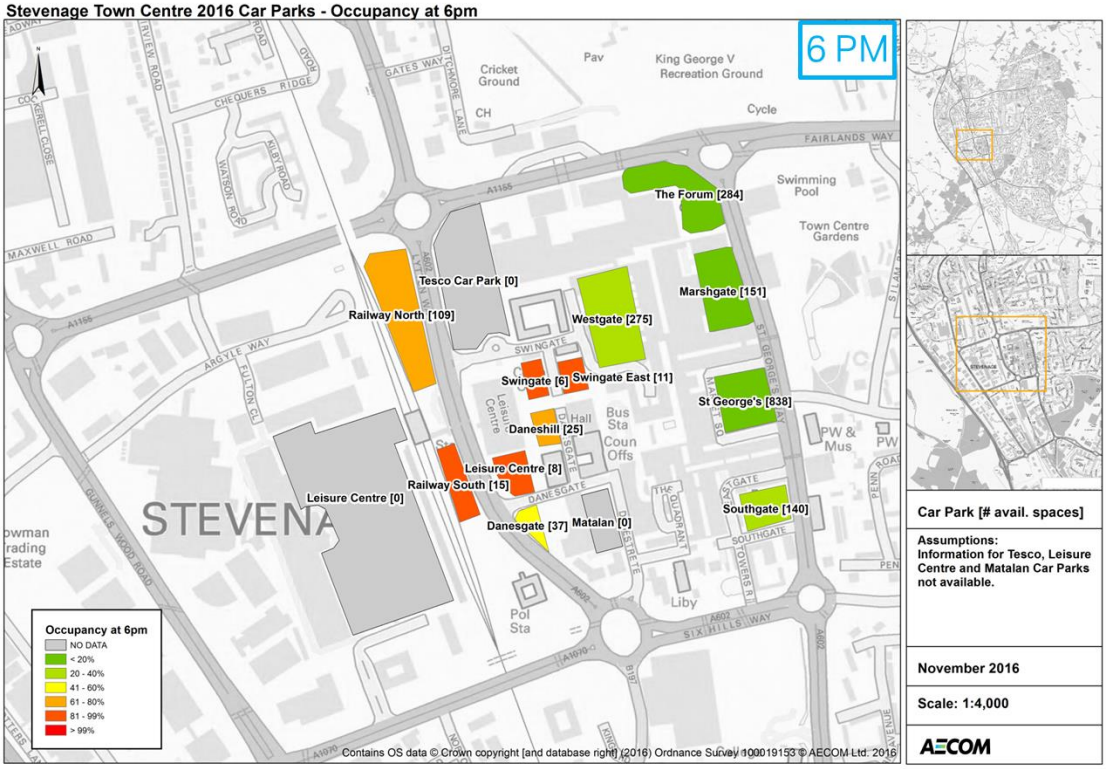


Car Park Occupancy Time Profiles – Evening peak

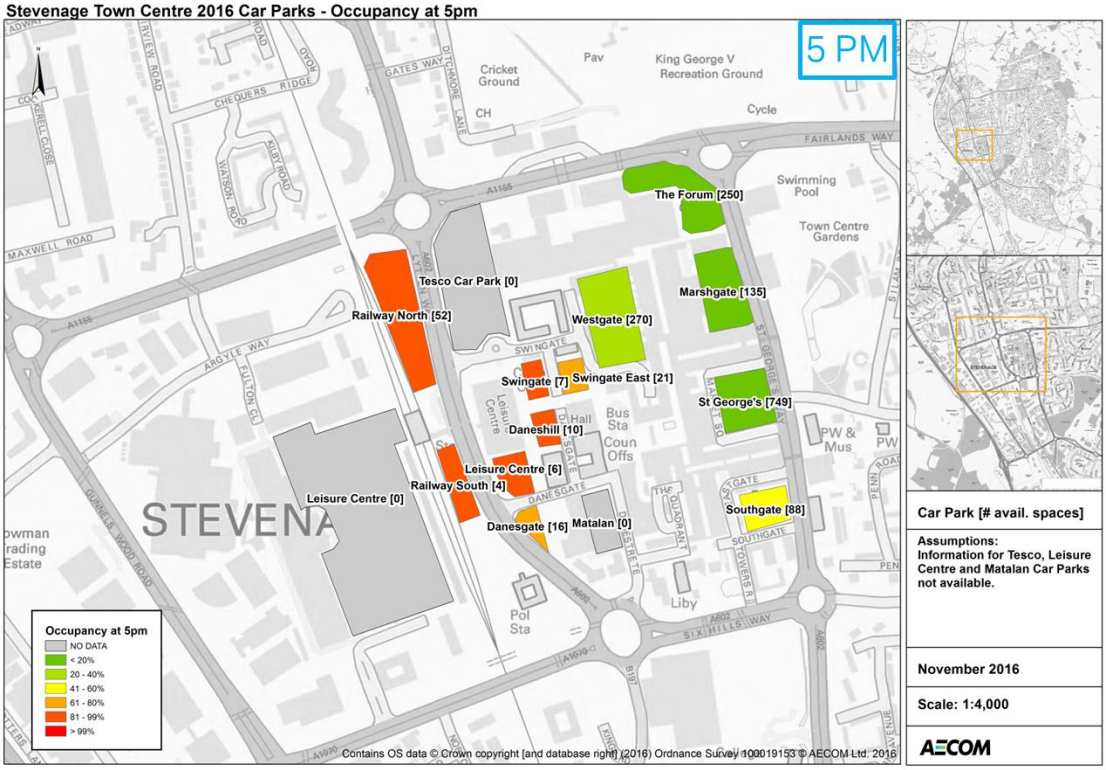




Stevenage Town Centre 2016 Car Parks - Occupancy at 6pm



Stevenage Town Centre 2016 Car Parks - Occupancy at 5pm



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